DI-6000 & VP-6000 SERIES PROCESSOR

OPERATION MANUAL

P1634 & P1848

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DAKTRONICS

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Table of Contents

1 **Introduction** 1
Daktronics Contact Information 1
Product Information 1
DI-6000 2
DI-6000-2RU 2
DI-6000-3RU 2
VP-6000 3
System Login 3
Dashboard 3
2 **User Interface Basics** 4
Interface Elements 4
Main Menu 5
Right-Side Menu 5
Advanced 5
Update 6
Controller 6
Display 6
Restore Points 8
Help 10
About 10
3 **Dashboard** 11
Dashboard Tiles 11
4 **Configuration** 13
Identification 13
Identification 13
Customer 13
VCS Registration 13
Registration Code 13
Active/Inactive 14
Network 14
Hostname 14
IPv4 Configuration 15
DNS Configuration 15
Brightness 16
Brightness Manager 16
Brightness Limits 17
Limit Range 17
Day and Night 17
Peripherals 18
Inputs 20
Video Processors 22
Static Engine 22
Information 23
Configuration 23
Channel 23
NextGen Engine 24
Information 24
Canvases 24
Sources 25
Javascript Engine 25
Information 25
Canvas 25
Outputs 27
Time 29
Time 30
NTP 30
Network Monitors 31
Fan Control 32
Security 33
Storage 33
5 **Monitoring** 34
6 **Calibration** 35
Module Adjustment 35
Camera 38
Auto Blending 38
Edge Adjustment 40
7 **Test Patterns** 44
Test Pattern Details 46
All On 46
All On Rotate 46
Bouncing Box 46
Diagonal Lines 46
Grid 46
Image 47
Module ID Grid 47
Module Locator Grid 47
Standard Video Pattern 47
Wand 47
8 **Configuration Backup** 48
9 **Troubleshooting** 50
Reboot 50
Power Control 50

Table of Contents

10 Image Playback.....51
Playback Control.....51
Status.....51
Image List.....52
11 Glossary.....53
A Supplementary Documents.....55
B Daktronics Warranty & Limitation of Liability.....57

1 Introduction

This manual helps Daktronics customers operate the DI-6000 series display interface and VP-6000 series video processor. Review all of the information in this manual to understand the features that these products offer.

This manual assumes the user has a basic working knowledge of personal computer operations such as using menus and folders. Terms that describe commonly used computer operations are used frequently in this manual.

Daktronics Contact Information

Reach Daktronics customer support online:

- www.daktronics.com/mysupport

For further assistance contact Daktronics Customer Service via telephone.

- Domestic (U.S. and Canada): 1-800-325-8766
- International: +1-605-275-1040

Product Information

The DI-6000 series display interface and VP-6000 series video processor are rack-mounted control equipment that deliver video content and graphics to Daktronics LED displays.

> **Note:** Daktronics computer systems meet current standards for required safety and EMC compliance. A full listing of applicable safety and EMC compliance standards is available upon request.

Components

Both the DI-6000 and VP-6000 have a flexible form-factor design with components that can be arranged in various configurations. Specific models may look different from the examples in this manual. The basic components are shown in **Figure 1**.

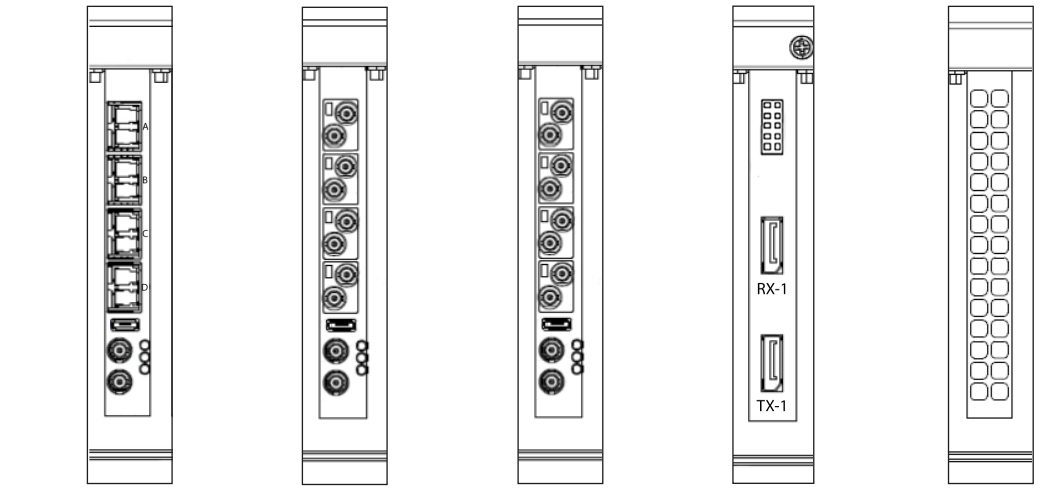

Figure 1: *Processor Components*

DI-6000

DI-6000 is designed to encode upstream control systems and deliver content to the display. Refer to the **DI-6000 Series Quick Guide (DD3122248)** in **Appendix A: Supplementary Documents (p.55)** for information on initial hardware setup.

DI-6000-2RU

Figure 2 shows the rear view of a typical DI-6000-2RU with one output card. The DI-6000-2RU accepts a maximum SDI input feed of 1080p resolution and supports 3840x2160 DisplayPort™ input. This DI-6000 has an output capability of 4 million pixels.

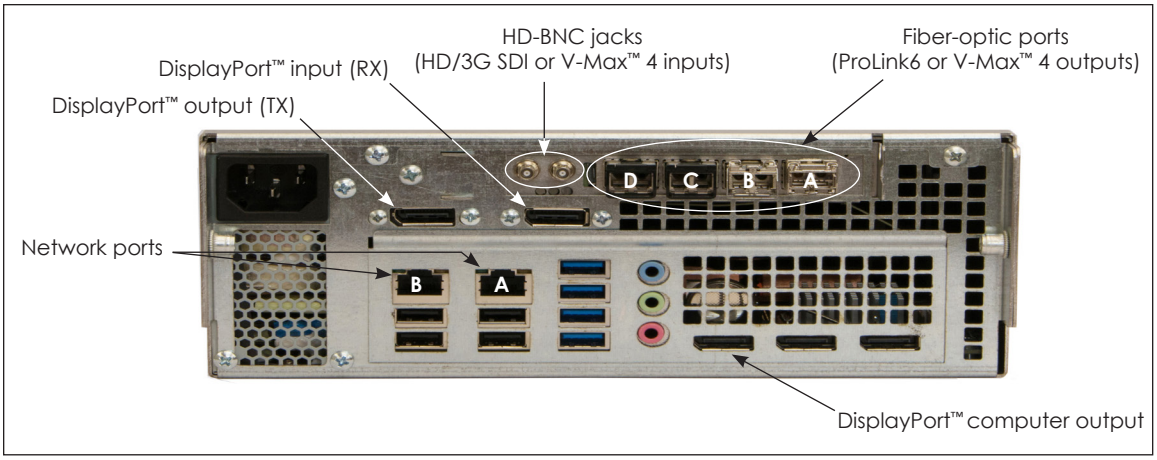

Figure 2: *DI-6000-2RU (1-Card)*

DI-6000-3RU

Figure 3 shows the rear view of a typical DI-6000-3RU with four output cards. The DI-6000-3RU accepts a maximum SDI input feed of 1080p resolution and supports 3840x2160 DisplayPort™ inputs. This DI-6000 has an output capability of 16 million pixels.

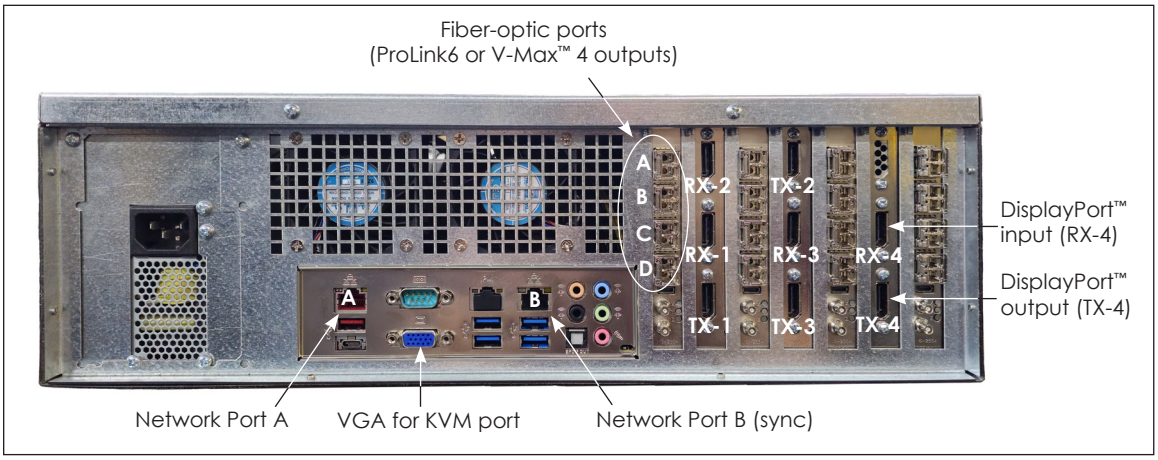

Figure 3: *DI-6000-3RU (4-Card)*

VP-6000

VP-6000 is designed to directly control display content. It can accept multiple different types of inputs simultaneously, scale the inputs, and seamlessly switch between them using transition and keying effects. **Figure 4** shows the rear view of a typical VP-6000-3RU with one output card. Refer to the **VP-6000 Series Quick Guide (DD3446939)** in **Appendix A: Supplementary Documents (p.55)** for information on initial hardware setup.

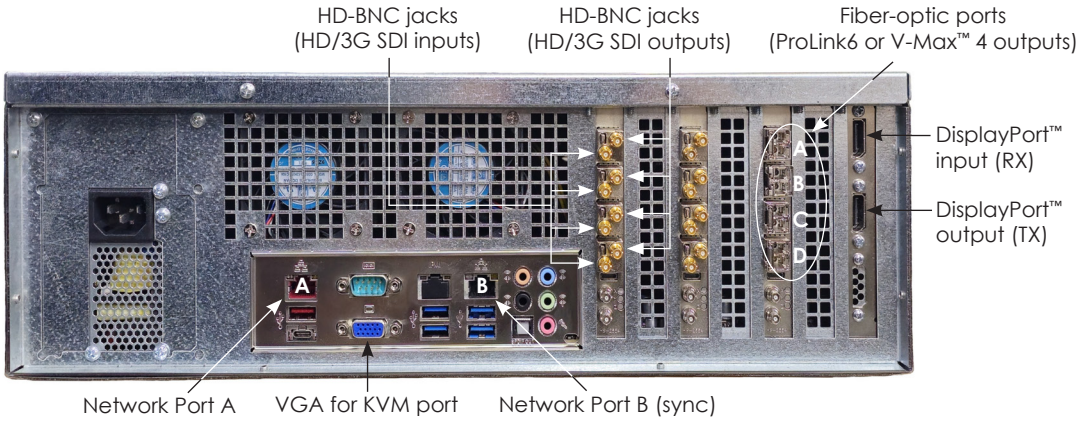

Figure 4: *VP-6000-3RU*

VP-6000 accepts a maximum SDI input feed of 1080p resolution and has an output capability of 2 million pixels per output card. It includes six polyphase scalers, six compositors, and a Luma key. VP-6000 supports display look packages to create zones on the display canvas.

System Login

To log in to the DI-6000 or VP-6000 (version 9+), enter the IP address into an internet browser.

> **Note:** Currently Google® Chrome® is the only supported internet browser.

Dashboard

After logging into the DI-6000 or VP-6000, an initial **Dashboard** screen opens showing status tiles for various aspects of the device. For a general overview of the system interface, refer to **Section 2: User Interface Basics (p.4)**. For details on the dashboard, refer to **Section 3: Dashboard (p.11)**.

Click **Menu** ☰ in the upper-left corner of the screen to expand the main menu. The main menu options are listed in **Main Menu (p.5)**. For more detailed information on each menu command, refer to **Section 3: Dashboard (p.11)** - **Section 6: Calibration (p.35)** in this manual.

2 User Interface Basics

Interface Elements

The DI-6000 or VP-6000 user interface has elements that are always visible including a header bar, main menu, right-side menu, and main window with status tiles. Refer to **Figure 5**.

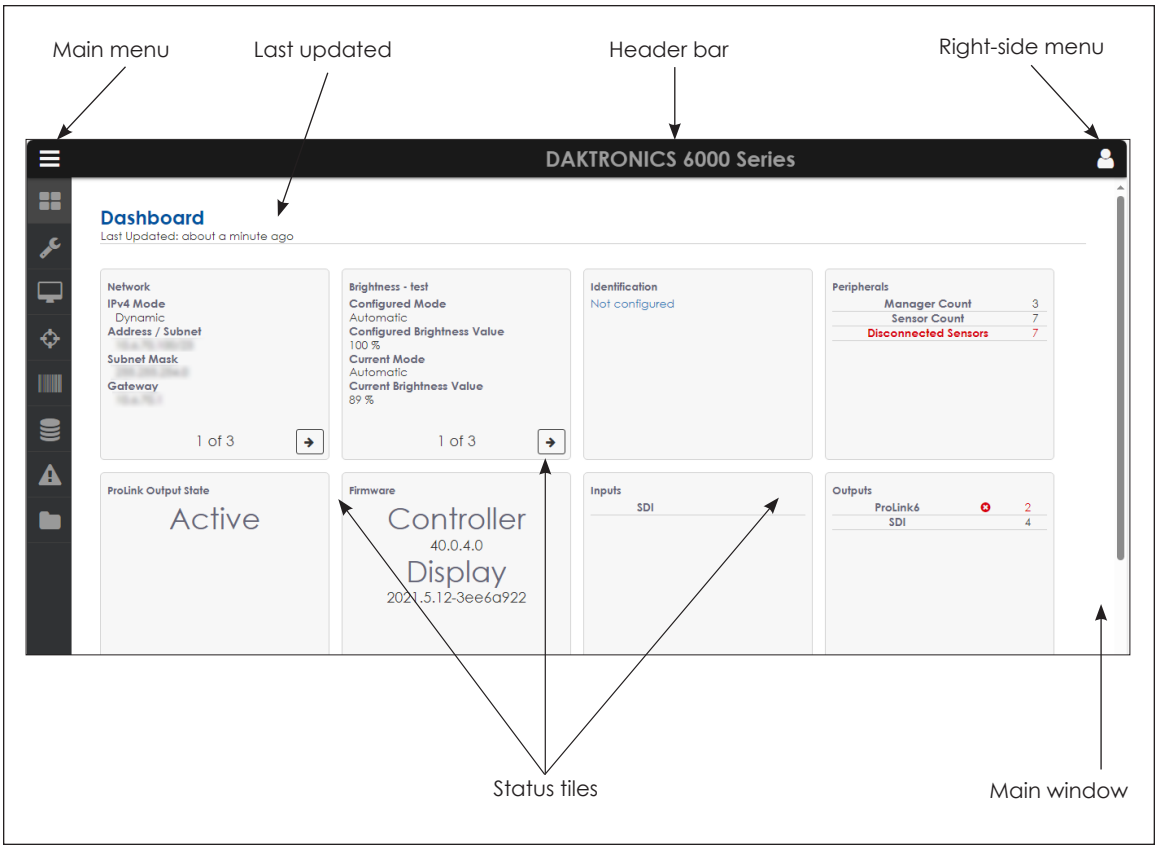

Figure 5: *Interface Elements*

- **Header bar** contains the device name and mode entered in the **Configuration** settings. Refer to **Identification (p.13)**.
- **Main menu** is on the left side of the screen. Click **Menu** ☰ in the upper-left corner of the screen to expand the menu panel to show the full navigation information. Refer to **Main Menu (p.5)**. For more detailed information on each menu command, refer to **Section 3: Dashboard (p.11) - Section 6: Calibration (p.35)** of this manual.
- **Right-side menu** is in the upper-right corner of the screen. Click **User** 👤 to expand the menu panel to show session-specific navigation information. Refer to **Right-Side Menu (p.5)** for more information.
- **Last updated** shows how long ago the system information was received from the DI-6000 or VP-6000. Because system data is not live, all interface pages with status information show the **Last Updated** field. To refresh the data, refresh the web browser or swipe down on a mobile device.
- **Main window** displays elements, information, and data related to current user selections and system triggers. The example in **Figure 5** shows the initial **Dashboard** screen with status tiles in the main window.

Main Menu

Click **Menu** in the upper-left corner of the screen to expand the main menu panel or hover over the icon to see the menu command name. Refer to the table below.

Menu Command	Description
Dashboard	Shows status tiles for the DI-6000 or VP-6000; some tiles only provide system information and others open menu functions
Configuration	Lists configuration settings and tools including brightness managers and peripheral sensors
Monitoring	Shows a snapshot of the video content passing through the DI-6000 or VP-6000
Calibration	Lists calibration tools used to adjust individual modules or edges to blend with surrounding modules
Test Patterns	Lists test patterns used as a simulated input or in place of a configured output to test the display
Configuration Backup	Creates a backup of the current configuration file or restores the configuration to a previously saved backup file
Troubleshooting	Reboots the DI-6000 or VP-6000 hardware and resets the SmartLink device used for power control
Image Playback	Shows exising stored content files and allows images to be added or removed for playback

For more detailed information on each main menu command, refer to **Section 3: Dashboard (p.11) - Section 10: Image Playback (p.51)** in this manual.

Right-Side Menu

Click **User** to expand the right-side menu panel. Refer to the table below.

Menu Command	Description
Advanced	Opens an advanced configuration window for use by Daktronics Technical Support only; this option may not be available
Update	Opens a window with options to update the controller firmware and manage the system's firmware and configuration restore points
Help	Downloads an electronic version of this manual
About	Opens a window with Daktronics contact information and the open source libraries and licenses used to build the DI-6000 or VP-6000 user interface

Advanced

Advanced opens a window with advanced configuration options for use by Daktronics Technical Support. Make changes to these settings only under the direction of Daktronics personnel.

Update

Update opens a window with options to update the DI-6000 or VP-6000 firmware, bootload the display, create a restore point, or restore the system to a previous version.

Controller

Click **Controller** to upload a new firmware package. Refer to **Figure 6**. Click **Update** and select a firmware package with the file extension **.tar.gz** to update the pertinent files. The update should take less than 20 minutes.

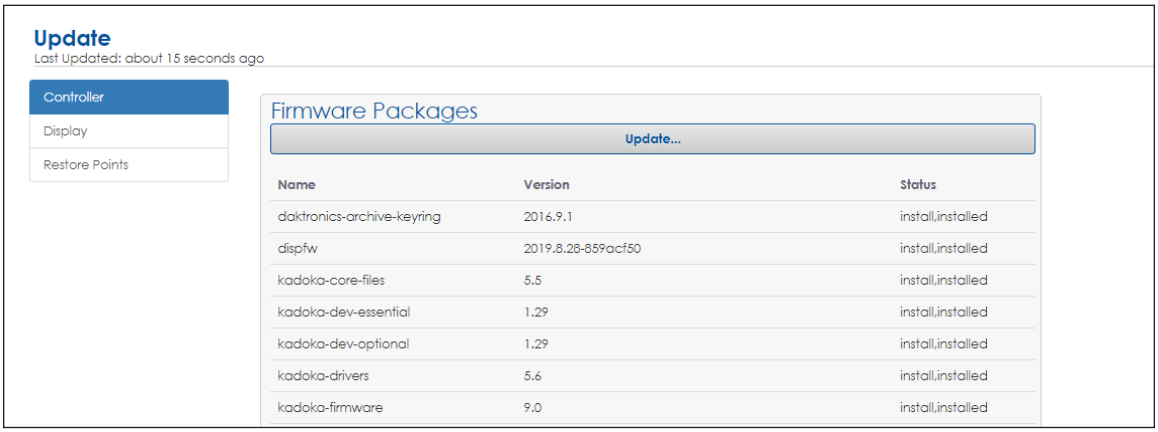

Figure 6: *Firmware Update*

Display

Click **Display** to bootload the display devices. Choose **Automatic** or **Manual** from the drop-down list. Refer to **Figure 7** and **Figure 9**.

- **Automatic** updates display devices using a display firmware package.
- **Manual** updates a specific program on display devices using a single bootload file.

Note: Perform manual bootloading only under the direction of Daktronics technicians.

To automatically bootload the display devices with a firmware package, follow these steps:

1. Choose **Automatic** from the drop-down list. Refer to **Figure 7**.

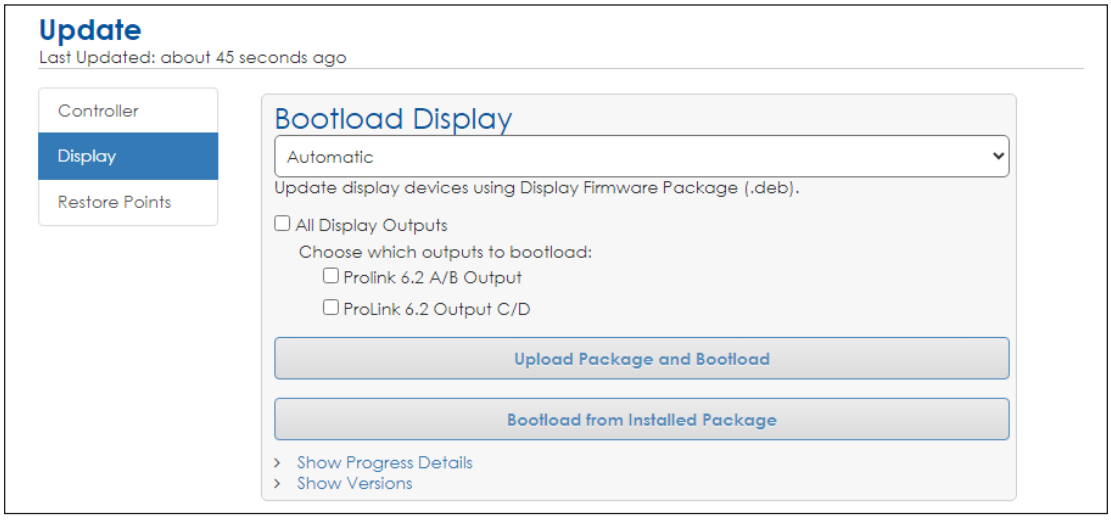

Figure 7: *Bootload Display – Automatic*

2. Select the specific output(s) to bootload or select the **All Display Outputs** check box for all outputs.
3. Click **> Show Versions** to review each output's current program type and version before beginning the bootload process.
4. Click **Upload Package and Bootload** to send a package or **Bootload from Installed Package** to use a currently installed package and start the bootloading process. Outputs are bootloaded one at a time; this step takes time to complete.
5. Click **> Show Progress Details** to see the bootloading progress bar for each output. If any errors are found, a red box with the number of detected errors appears next to the output name. Refer to **Figure 8**.

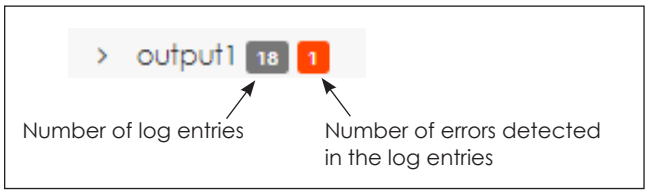

Figure 8: *Bootloading Details*

6. Click the **>** symbol next to any output name to expand the list of log entries associated with that output. If an error exists, expand this list to see the error information.
7. Click **> Show Versions** again after the bootload is complete to review the updated information for each output.

To manually bootload the display devices with a single bootload file, follow these steps:

1. Choose **Manual** from the drop-down list. Refer to **Figure 9**.

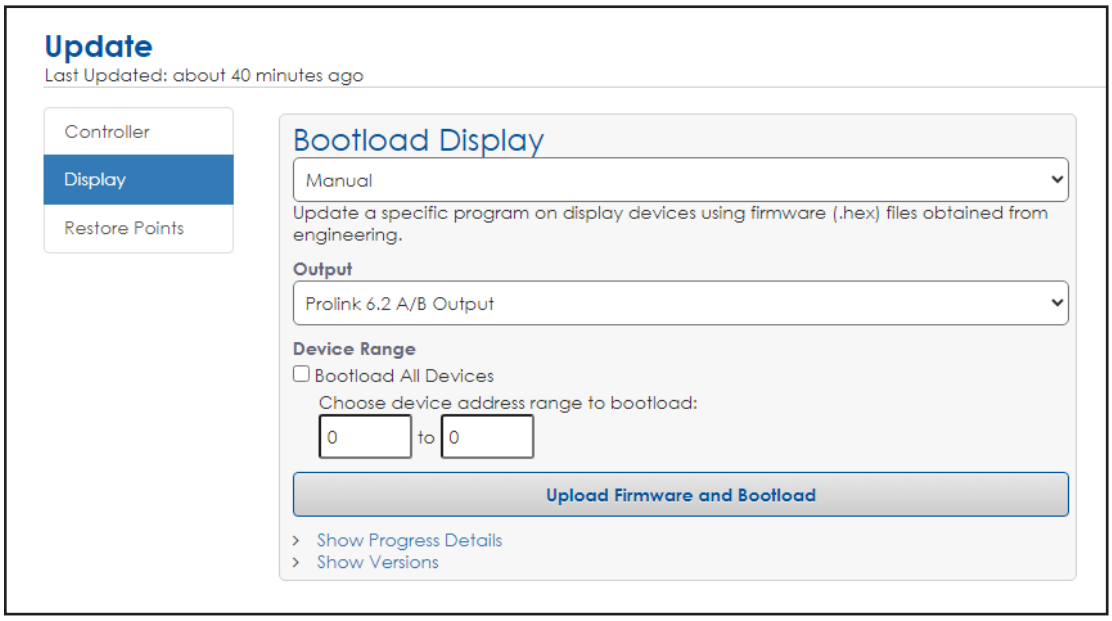

Figure 9: *Bootload Display – Manual*

2. Select the specific output to bootload from the drop-down list.
3. Enter the device address range to bootload or select the **Bootload All Devices** check box.

4. Click **> Show Versions** to review each output's current program type and version before beginning the bootload process.
5. Click **Upload Firmware and Bootload** to start bootloading the selected output.
6. Click **> Show Progress Details** to see the bootloading progress bar for the selected output. If any errors are found, a red box with the number of detected errors appears next to the output name. Refer to **Figure 10**.

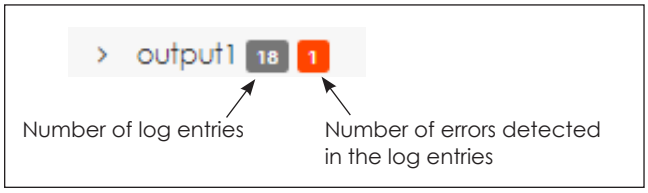

Figure 10: *Bootloading Details*

7. Click the **>** symbol next to any output name to expand the list of log entries associated with that output. If an error exists, expand this list to see the error information.
8. Click **> Show Versions** again after the bootload is complete to review the updated information for each output.

Restore Points

Click **Restore Points** to manage the system's restore points. Use a restore point to bring the processor back to a previously saved firmware version and previously saved configuration settings.

> **Note:** The system automatically creates and saves a restore point just before updating the controller firmware. This automatically-created restore point cannot be deleted or renamed.

The example in **Figure 11** shows options to manually create a new restore point or restore to an existing, automatically-created restore point.

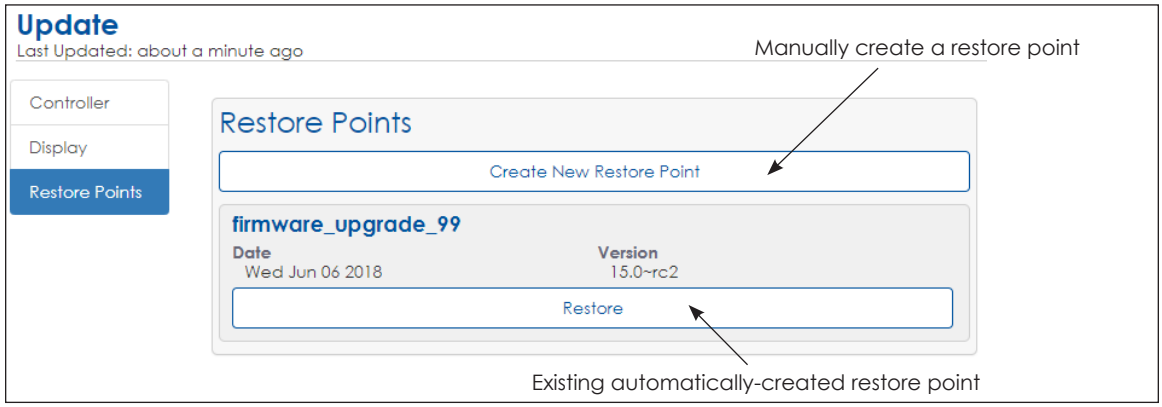

Figure 11: *Restore Points*

> **Note:** Always manually create a restore point when initially setting up a new system. Verify that the system is running with no errors or warnings before creating a restore point.

Click **Create New Restore Point** to manually create a restore point and enter a descriptive name. Numbers, letters, and underscores can all be used in the restore point name. Refer to **Figure 12**.

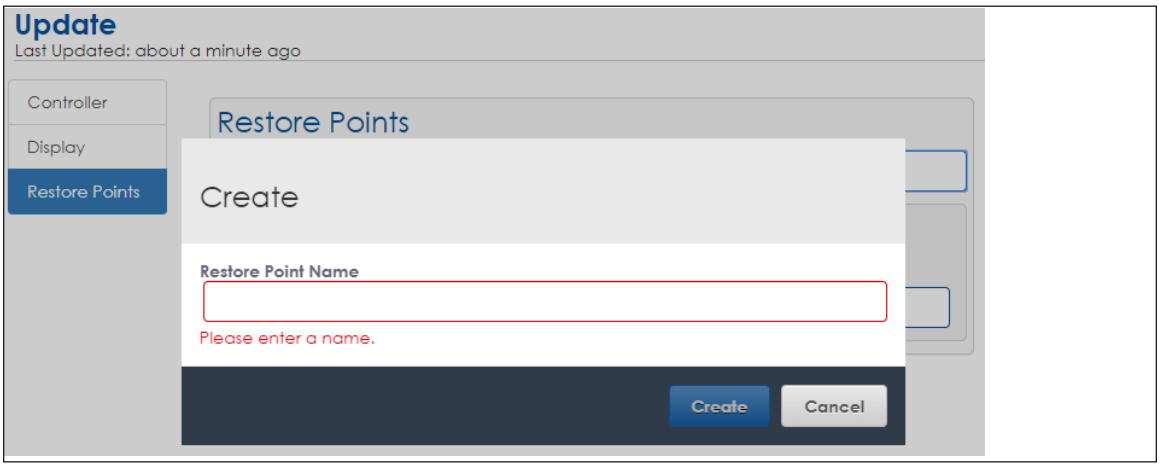

Figure 12: *Create New Restore Point*

There is a limit to the number of manual restore points that can be saved. If this limit is reached, the create button is disabled and the following message appears: **maximum number of restore points reached**. Delete one or more restore points until the number is below this limit and the **Create New Restore Point** button is re-enabled.

Once a restore point is manually created, it can be used to restore the system, renamed, or deleted. Refer to **Figure 13**.

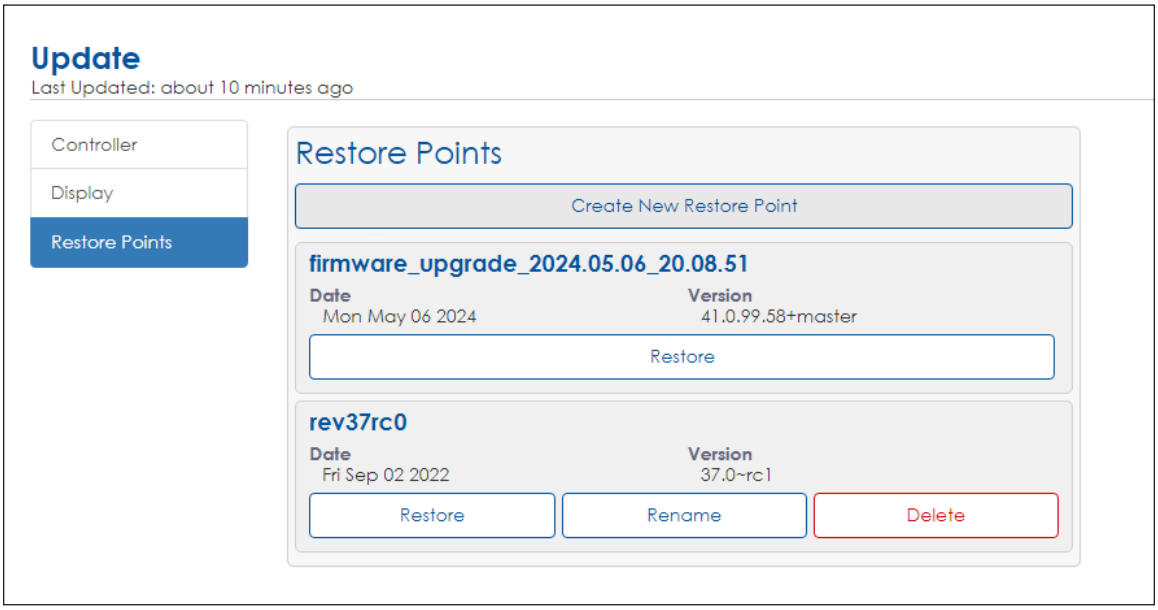

Figure 13: *Firmware Restore*

Click **Restore** to restore the system back to the state it was in when the restore point was created. The date and version of the last restore point are shown above the buttons. Refer to **Figure 13**.

Do not use the **Restore** function if the **Version** is **Unknown**. Refer to **Figure 14**.

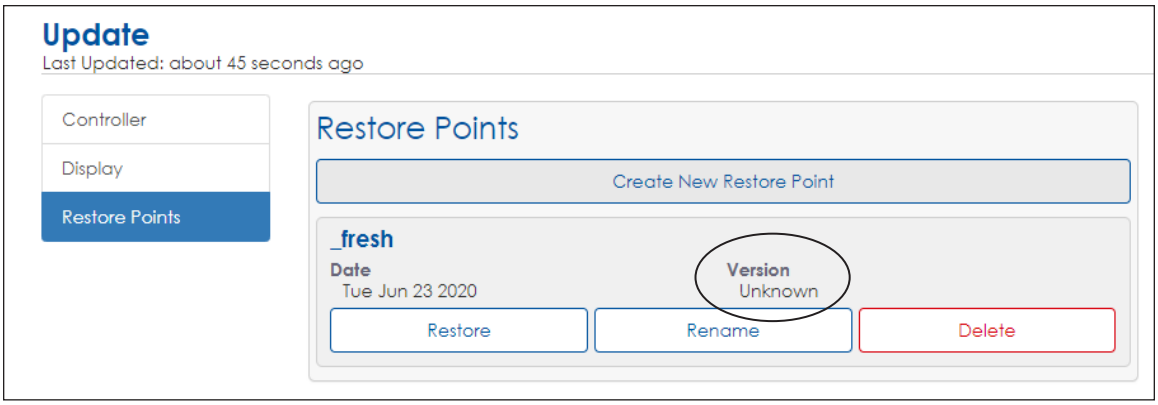

Figure 14: *Firmware Version Unknown*

Note: Use caution when using the restore function. Any changes made to the system since the last saved restore point are lost when **Restore** is selected. Contact Daktronics Technical Support for more information.

Help

Click **Help** to open the latest version of this manual.

About

Click **About** to open a window with a link to the Daktronics website and the Daktronics customer support number. Refer to **Figure 15**.

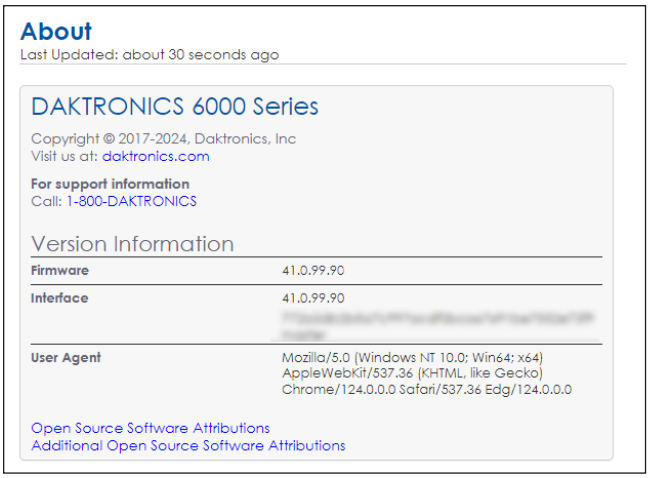

Figure 15: *Contact Information*

The current system firmware version is listed under **Version Information**.

Click **Open Source Software Attributions** for a listing of the open source licenses used for the DI-6000 or VP-6000 user interface. Click **Additional Open Source Software Attributions** for a listing of the open source libraries used for the DI-6000 or VP-6000 user interface.

3 Dashboard

Click **Dashboard** to show the system status tiles. Refer to **Figure 16**.

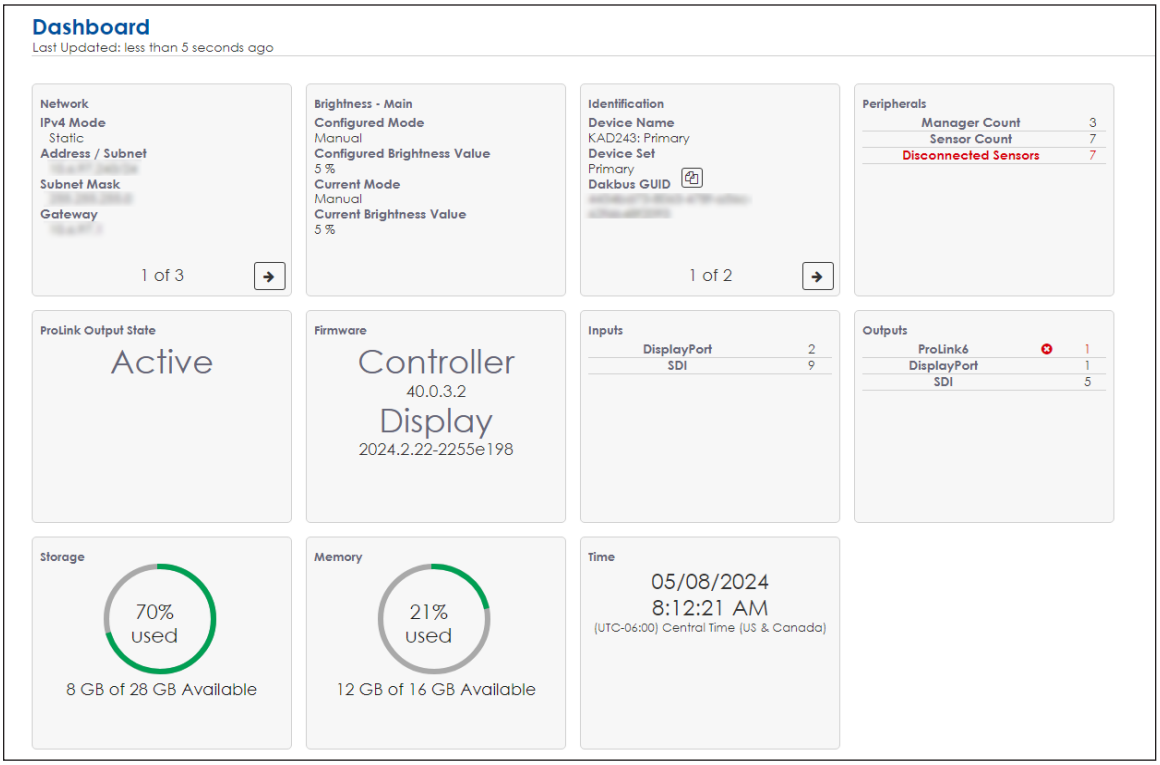

Figure 16: *Dashboard Status Tiles*

Dashboard Tiles

Many of the dashboard status tiles are interactive; click an interactive tile to open an operational window or menu command. For example, the **Memory** tile provides information only. When the cursor is placed over an interactive tile, the arrow changes to a hand symbol. If the tile is not interactive, the cursor remains as an arrow symbol.

Click the arrow at the bottom-right of any tile to open another page of information within that tile.

- **Network** – This tile shows network device and address information. Click this tile to open the **Network** tab under the **Configuration** menu.
- **Brightness** – This tile shows configured brightness settings and the current output for each brightness manager. The **Configured** information categories show how the brightness level is determined and the brightness value that the DI-6000 or VP-6000 is attempting to achieve. The **Current** information categories show the actual brightness settings in use. Click this tile to open the **Brightness** tab under the **Configuration** menu.
- **Identification** – This tile shows the DI-6000 or VP-6000's descriptive data including the device name, ID number, and description. Click the copy icon to copy the computer GUID information to the computer's clipboard. Click this tile to open the **Identification** tab under the **Configuration** menu.

- **Peripherals** – This tile shows the total number of configured peripheral managers and total number of sensors. One manager can control more than one sensor; however, each sensor is controlled by only one manager. Click this tile to open the **Peripherals** tab under the **Configuration** menu.
- **ProLink Output State** – This tile shows whether or not the display's ProLink output is currently set as active or inactive. Click this tile to open the **Active/Inactive** tab under the **Configuration** menu.
- **Firmware** – This tile shows the current version of the controller and display firmware. Click this tile to open the **Update** tab under the right-side **User** menu. Refer to **Update (p.6)**.
- **Inputs** – This tile shows the types and number of the processor's configured inputs. If any type of input has an error, this is indicated in red.
- **Outputs** – This tile shows the types and number of the processor's configured outputs. If any type of output has an error, this is indicated in red. Refer to **Figure 16**.
- **Storage** – This tile shows how much file storage is currently being used and how much is available on the DI-6000 or VP-6000. Click this tile to open the **Storage** tab under the **Configuration** menu.
- **Memory** – This tile shows how much RAM is currently being used and how much is available on the DI-6000 or VP-6000.
- **Time** – This tile shows the current date and time. Click this tile to open the **Time** tab under the **Configuration** menu.

4 Configuration

Click **Configuration** to open a configuration menu with a number of options. The currently selected tab is highlighted in blue. Refer to **Figure 17**.

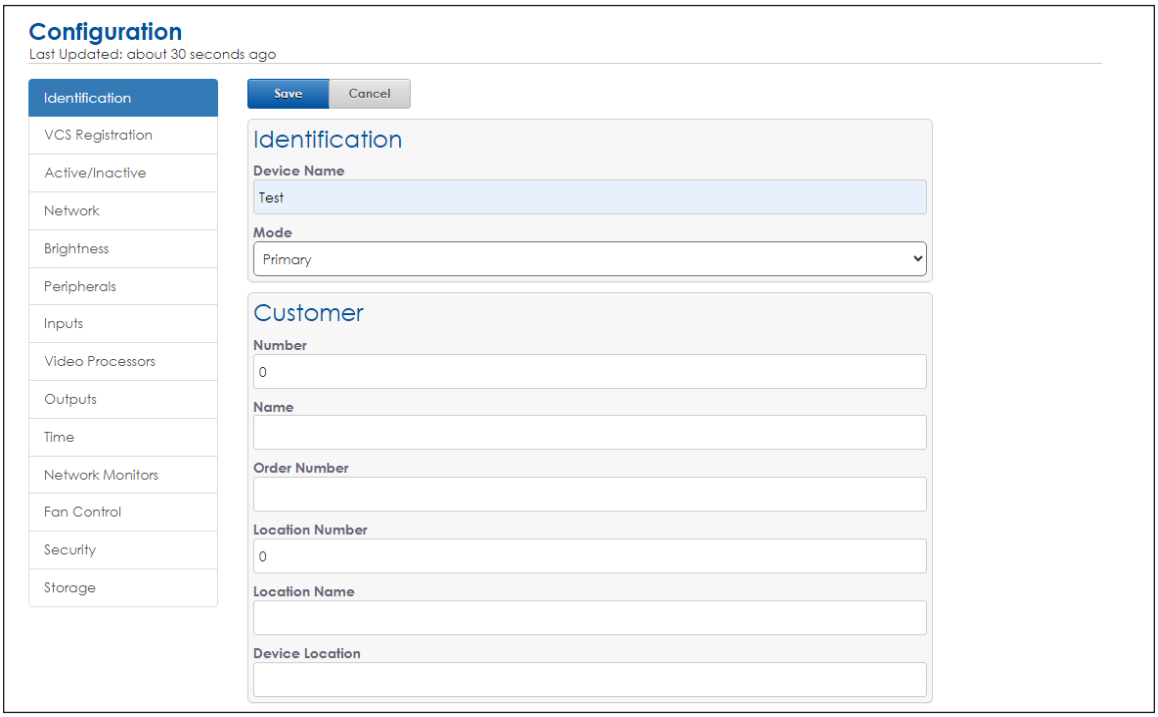

Figure 17: *Configuration*

Identification

Identification

Identification shows general information about the DI-6000 or VP-6000 that is set by Daktronics during system installation. Changing the **Device Name** or **Mode** changes the header bar information. Refer to **Interface Elements (p.4)**. Select the **Mode** to configure the DI-6000 or VP-6000 as part of the **Primary** or **Backup** system.

Customer

Customer shows the basic system registration information. These fields are filled out by Daktronics personnel during system installation.

VCS Registration

Registration Code

The DI/VP-6000 processor has a unique registration code that is used to pair the device with a customer account.

Click **Enable** to have the **Registration Code** shown on the display, refer to **Figure 18**. The code can be entered into a Venus Control Suite (VCS) account.

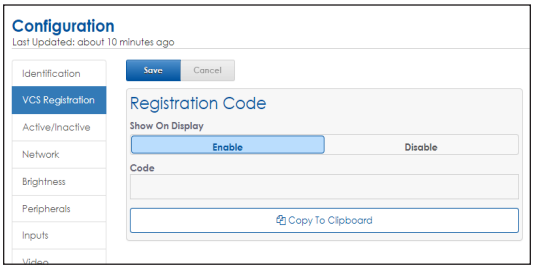

Figure 18: *VCS Registration Code*

This feature is set to **Disable** by default so that the code is not shown on the display accidentally.

Active/Inactive

Set all the system ProLink display outputs to either **Active** or **Inactive** with the **Active/ Inactive** function. Refer to **Figure 19**.

Displays can be configured to use both primary and backup systems. If the DI-6000 or VP-6000 is the primary system, the **ProLink Output State** is set to **Active**. If the DI-6000 or VP-6000 is the backup system, the **ProLink Output State** is set to **Inactive**.

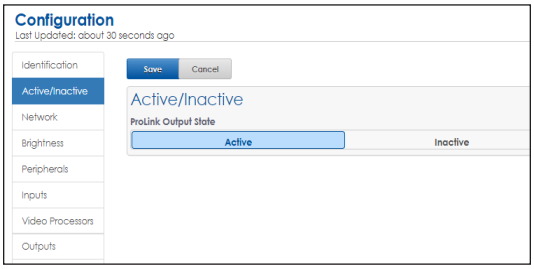

Figure 19: *Active/Inactive Output State*

Both primary and backup systems cannot be set as **Active** at the same time.

> **Note:** If the **ProLink Output State** is set as **Inactive** and there is no backup system, the display will be blank.

If the display system is configured for Venus® Control Suite software, the Venus® Control Suite settings override the DI-6000 or VP-6000 settings.

> **Note:** Use this setting for ProLink output only. If the DI-6000 or VP-6000 is configured to send out V-Max® 4 signal, this setting should be **Inactive**.

Network

Set the processor's network configuration with the **Network** function. Configure the host name, Internet Protocol (IP) address, and the Domain Name Server (DNS) address to communicate with the local area network (LAN). Refer to **Figure 20**.

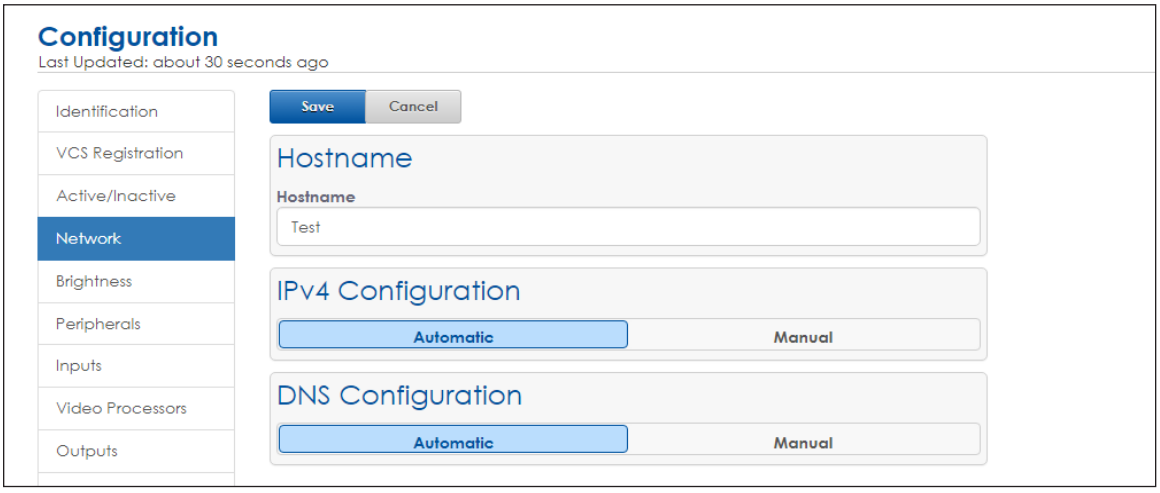

Figure 20: *Configuration – Network*

Hostname

The **Hostname** is the device's Dynamic Host Configuration Protocol (DHCP) name. This is populated by default or set by Daktronics during system installation.

IPv4 Configuration

Configure the IPv4 Internet Protocol (IP) address either automatically or manually. Refer to **Figure 21.**

- **Automatic**: The Dynamic Host Configuration Protocol (DHCP) automatically assigns an IP address to the processor. A DHCP server is required on the network for proper operation. If the network configuration is left in this mode and no DHCP server exists on the network, the address will default to **169.254.x.y**, where **x** and **y** will vary to assign a unique address on the network.

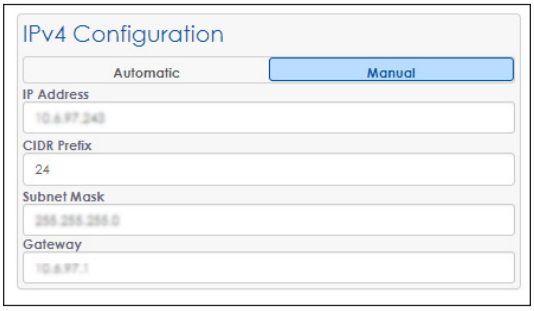

Figure 21: *Network – IP Configuration*

- **Manual:** The processor is manually configured to use a specific IP address. Enter the **IP Address**, **CIDR Prefix**, **Subnet Mask**, and **Gateway** values manually when a DHCP server does not exist or when the installation requires the processor to always use a static IP address.

> **Note:** The **CIDR Prefix** and the **Subnet Mask** convey the same information in two different formats. When one field is edited, the other one automatically updates.

DNS Configuration

Domain Name Server (DNS) configuration is required to resolve host names for several services running on the processor. Services such as diagnostics, control (Venus® Control Suite), and time servers require internet host names to be expressed in their dotted IP address format. An example of such a name resolution is the internet host name **www.daktronics.com** resolved to **64.233.169.147**. Refer to **Figure 22**.

Configure the DNS address either automatically or manually.

- **Automatic**: Information is received from a local Dynamic Host Configuration Protocol (DHCP) server to assign the address. To use this option, the **IPv4 Configuration** also must be set to **Automatic**.

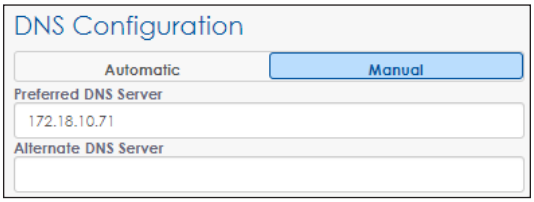

Figure 22: *Network – DNS Configuration*

- **Manual:** The processor is manually configured to use a specific DNS server on the internet or on the network. Use this option when a DHCP server is not available on the local network or the network administrator wants to use a specific DNS server. Enter a **Preferred DNS Server** (primary server) and an **Alternate DNS Server**. The processor queries the alternate DNS server address if the primary server does not respond.

Brightness

Set the brightness (or dimming) level of the display with the **Brightness** function. Normally, display brightness is set at a greater value during the day or in bright areas, and set at a lesser value at night or in dim areas.

Brightness Manager

If no brightness managers are configured, this tab shows the message **No managers configured**. Refer to **Figure 23**. Each configured brightness manager shows a tile with configuration details. Refer to **Figure 24**.

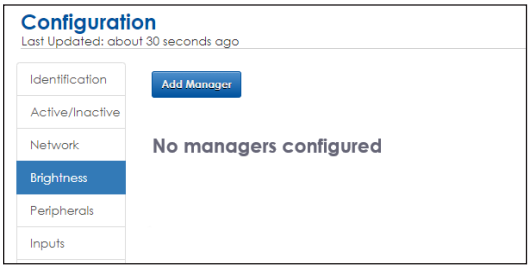

Figure 23: *No Brightness Managers*

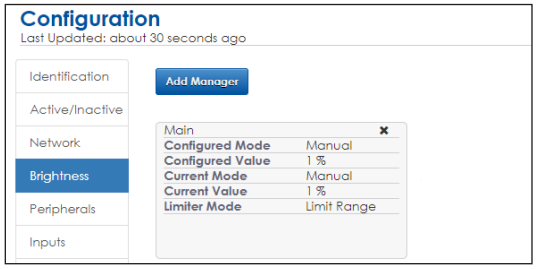

Figure 24: *Existing Brightness Manager*

If a brightness manager is configured but has a problem sending out the dimming information, a red warning icon appears at the bottom of the brightness manager tile. One warning indicates a **broken source**, and one warning indicates a **broken output**. Refer to **Figure 25** and **Figure 26**.

A **broken source** usually occurs when the sensor is disconnected; in this case, a corresponding error appears in the sensor's tile. It can also mean that the GPS mode was chosen but the GPS coordinates are not set. A **broken output** occurs when the output has been deleted or did not start up properly.

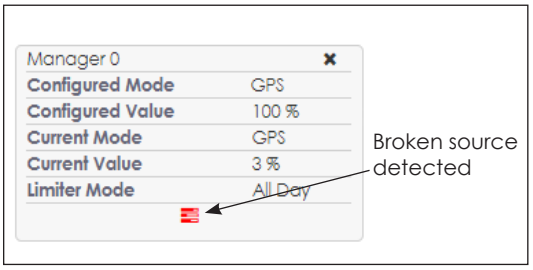

Figure 25: *Broken Source Indicator*

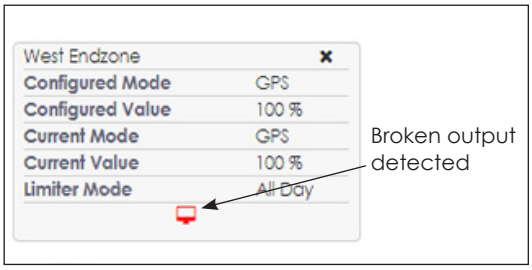

Figure 26: *Broken Output Indicator*

Click any existing brightness manager tile to edit its configuration.

To add a new brightness manager, follow these steps:

1. Click **Add Manager**.
2. Enter a descriptive name in the **Name** field.
3. Select the targeted output(s) from the list.
4. Select the **Mode** from the drop-down list.
    - **Auto** – Brightness values are determined by a light sensor with GPS coordinates used as a backup. Light sensors provide information on ambient light conditions that determine display brightness. If there is more than one sensor, choose the desired sensor from the drop-down list. GPS coordinates provide location information that determines brightness if the light sensor becomes unavailable.

- **GPS** – Brightness values are determined by the display's location using GPS coordinates. Enter the latitude and longitude directly or click **Lookup** to set the display location. Nighttime brightness is set at 0% and daytime brightness is 100%. The transition from night to day starts 30 minutes before sunrise and finishes 10 minutes before sunrise. The transition from day to night starts 10 minutes after sunset and finishes 30 minutes after sunset. If GPS coordinates are not set, the default is the **Minimum Brightness** setting; refer to **Brightness Limits (p.17)**
- **Manual** – Brightness values are set with the slider. The display will continue to run at this brightness level until changed by the user.

Brightness Limits

Select the **Mode** to determine the minimum and maximum display brightness for either the whole day (24-hours) or specific times of the day and night.

Limit Range

Set the display's minimum and maximum brightness for a 24-hour period with the slider in the **Limit Range** mode. These limits do not change based on time of day. Refer to **Figure 27**.

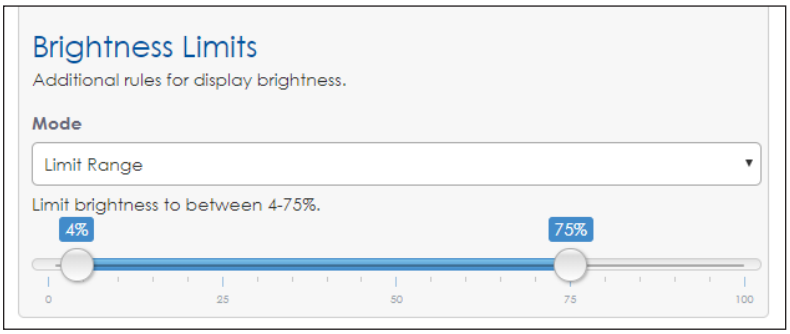

Figure 27: *Brightness Limits – Limit Range*

Day and Night

Set the display's minimum and maximum brightness values based on the time of day in the **Day and Night** mode. Set the time of day as the current sunrise/sunset times or enter specific times of the day.

> **Note:** To set the brightness limits based on the sunrise and sunset, the status file retrieves these times. If they cannot be retrieved, the firmware defaults to a value of 6:00 AM for sunrise and 9:00 PM for sunset.

Set the transition time between brightness levels (how long it takes for the sign to change brightness levels between the day and night settings).

The example in **Figure 28** shows brightness levels starting to transition from nighttime to daytime limits 60 minutes before sunrise and completing the transition at 5 minutes before sunrise. The settings also show the brightness level starting to transition from daytime to nighttime limits 10 minutes before sunset and completing the transition at 15 minutes after sunset.

> **Note:** Time-based dimming control depends on GPS coordinates. The interface will not allow time-based brightness limiters if GPS coordinates are not set. To set GPS coordinates, refer to **Brightness Manager (p.16)**.

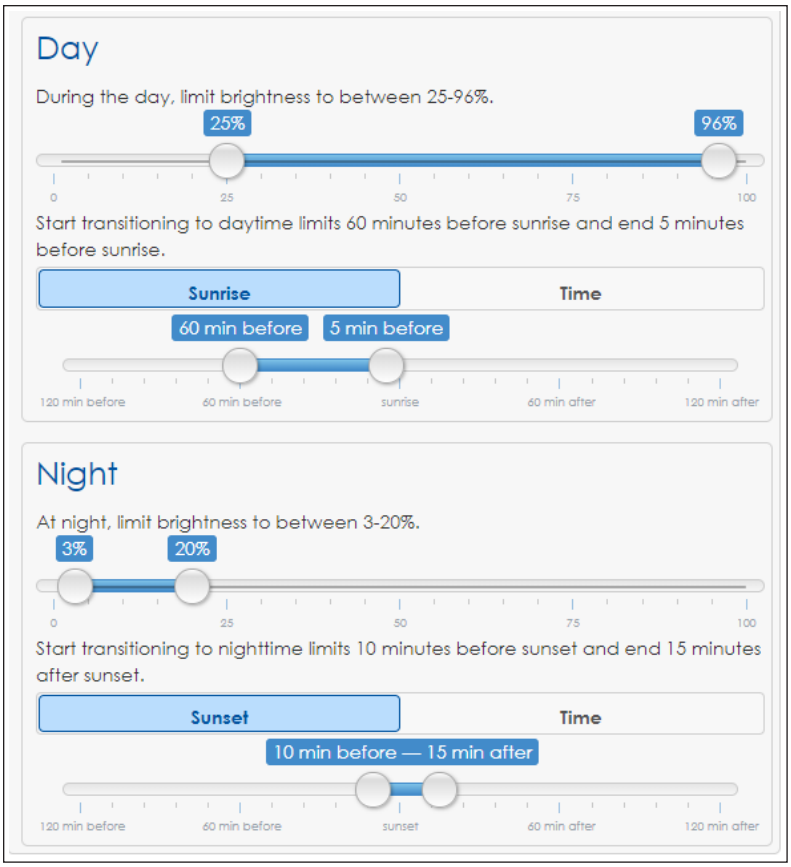

Figure 28: *Brightness Limits – Day and Night, Sunrise and Sunset*

Peripherals

Configure the peripheral display sensors with the **Peripherals** function. Available peripheral types are listed in the **Add Peripheral** drop-down list within the **Peripheral Manager** tile. A peripheral manager can control a number of peripheral sensors; however, each sensor is controlled by only one manager.

If no peripheral managers are configured, this tab shows the message **No peripheral managers configured**. Refer to **Figure 29**.

Each configured peripheral manager shows a tile with configuration details. Refer to **Figure 30**. Click any peripheral manager tile to see details about the sensor(s) entered under that manager. Refer to **Figure 32**.

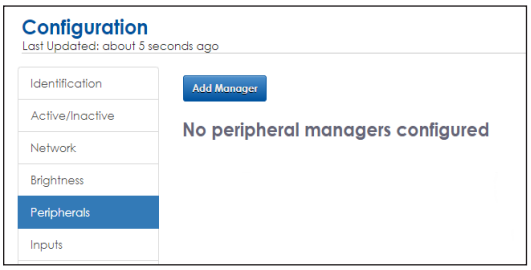

Figure 29: *No Peripheral Managers*

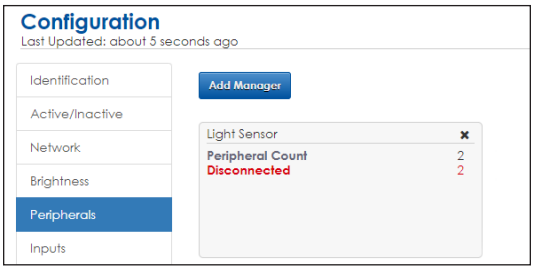

Figure 30: *Existing Peripheral Manager*

To add a new peripheral manager, follow these steps:

1. Click **Add Manager**. A new **Peripheral Manager** tile appears with the message **No peripherals configured**. Refer to **Figure 31**.
2. Click the new **Peripheral Manager** tile to configure the manager.
3. Enter a descriptive name in the **Name** field.
4. Click **Add Peripheral** and select the sensor type(s) from the drop-down list.

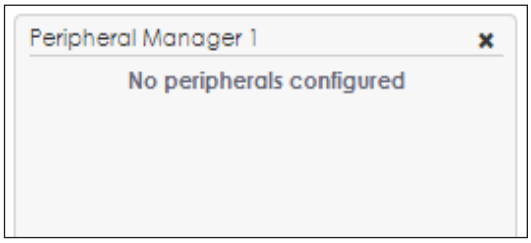

Figure 31: *Add Peripheral Manager*

- **CAN Light Sensor** – a controller area network-based (CAN) sensor that returns light intensity readings
- **Light Lux Sensor** – a CAN sensor that returns light intensity readings in LUX units
- **Multidirectional Light Sensor** – a CAN sensor that returns light intensity readings or LUX unit readings from several directions
- **Temperature Sensor** – a CAN sensor that returns the current temperature at the display location
- **Power Control** – a SmartLink device that toggles power control relays

A new peripheral sensor tile appears with various configuration fields. Refer to **Figure 32**.

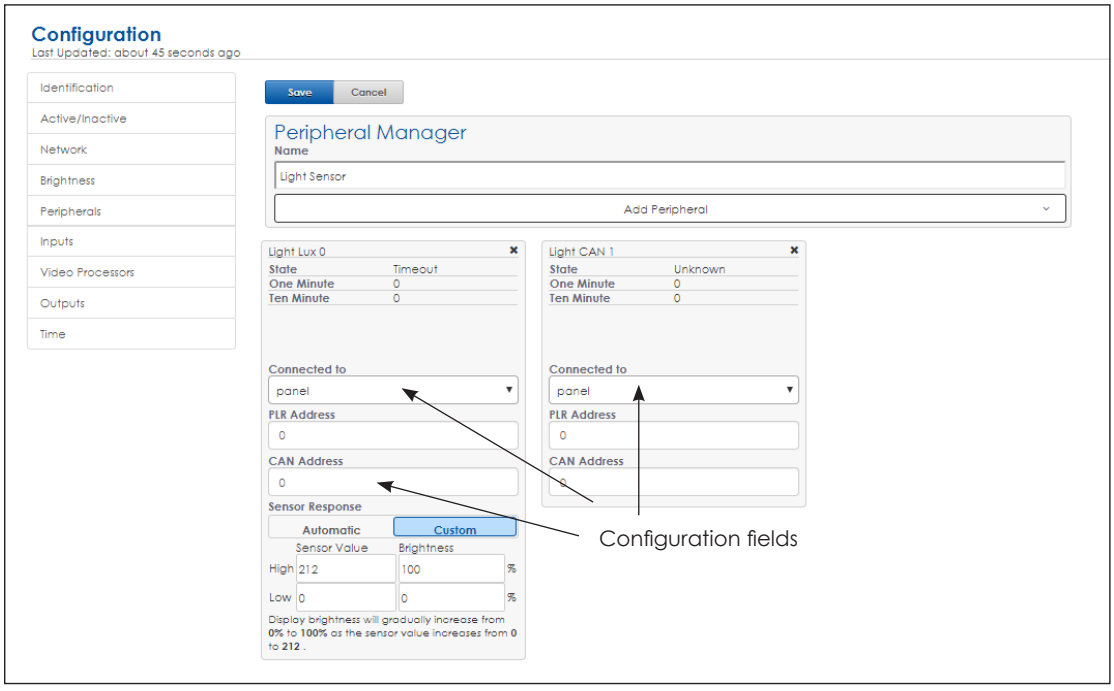

Figure 32: *Peripheral Sensor Configuration*

5. Fill out the configuration fields based on the type of sensor:
   - Select the output from the **Connected to** drop-down list.
   - Enter the PLR number in the **PLR Address** field.
   - Enter the CAN number in the **CAN Address** field.

- Select **Automatic** for standard light sensor operation or click **Custom** to customize the brightness curve based on the sensor reading. This option is available only for the **Light Lux Sensor**. Normally **Automatic** is used.
- Enter a value in the **Contrast Scalar** field (50-250) or move the slider. The default scalar value is **50**. This option is available only for the **Multidirectional Light Sensor**.
- Enter a value in the **Offset** temperature field (°C) or move the slider; the default offset value is **0**. The offset adjusts the external temperature sensor at the display site to compensate for environmental conditions such as a sensor mounted too close to a heat source or in the shade. Compensate for these conditions by a specified amount (-9 °C to +9 °C).
- Enter a descriptive **Relay** name and choose the power control option from the drop-down list: **None** (default) for no power control, **Full** includes both the **Cycle** and the **On/Off** options, **On/Off** sends an On or Off command and remains in that state until the user makes a change, **Cycle** sends a command to turn the relay off for 10 seconds and then turns it back on.

6. Click **Save** at the top of the screen to save the changes.
7. Click an existing peripheral manager and repeat **Steps 4-6** to add any additional peripherals to the peripheral manager.

To edit an existing peripheral manager, click the peripheral manager tile to open the configuration.

To edit an existing peripheral sensor, make changes to the peripheral sensor tile within the peripheral manager.

Inputs

Inputs shows the details of each processor input sorted by type. An error symbol indicates that the input has an error. A warning symbol indicates notable changes to an input such as a test pattern or override. Refer to **Figure 33**.

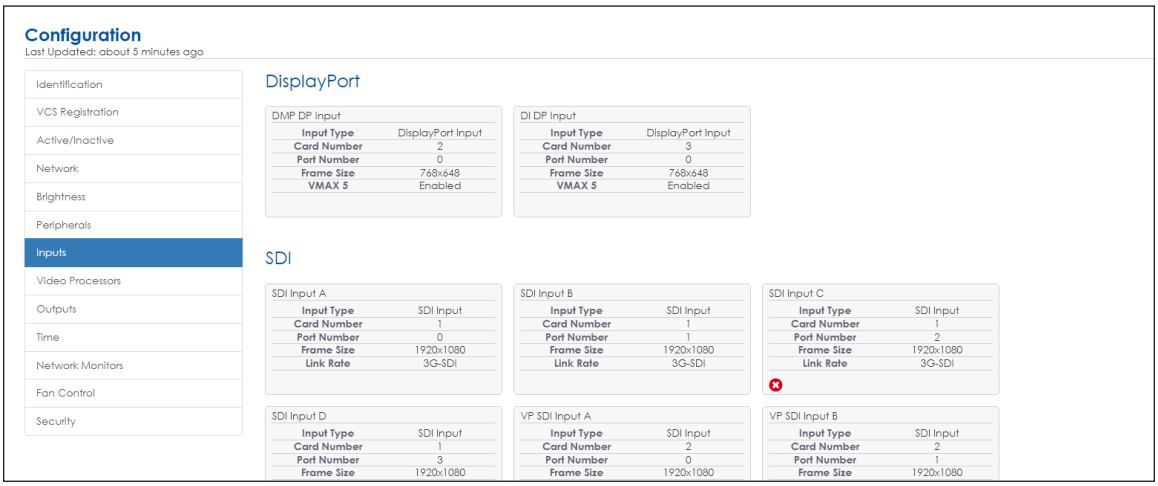

Figure 33: *Inputs*

Select an input tile to see more details or make changes to the input configuration. Any errors or warnings are listed in a banner at the top of the window. Refer to **Figure 34**. Processor inputs cannot be added or deleted, only changed.

Note: Change inputs only under the direction of Daktronics Technical Support.

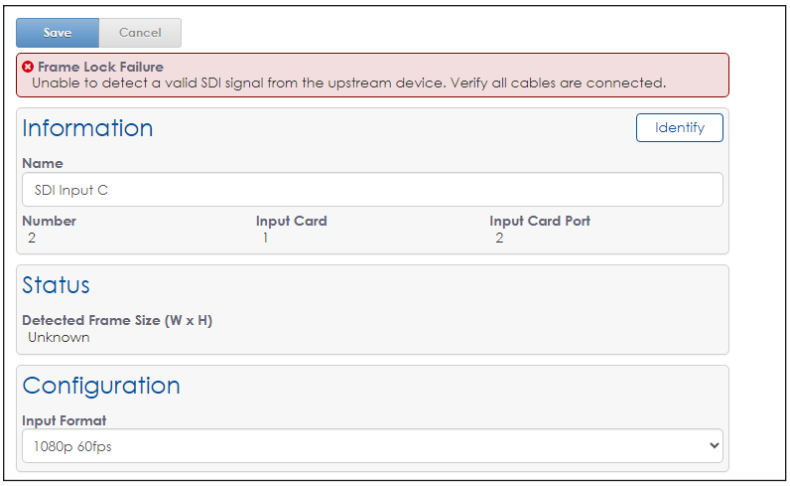

Figure 34: *SDI Input Details*

Depending on the type of input (SDI or DisplayPort), different status information fields and configuration options are available. Refer to **Figure 34** and **Figure 35**.

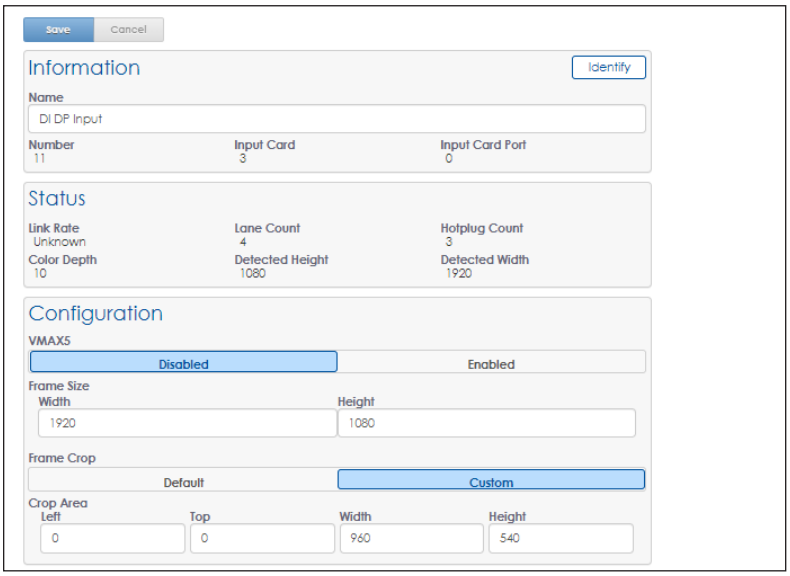

Figure 35: *DisplayPort Input Details*

- **Identify** – this button identifies the input card in the processor itself. The card's LED will turn solid white for 5 minutes before returning to the normal green state. Navigating away from the input returns the LED to the normal green state immediately.

  > **Note:** Only one card can be in **Identify** mode at a time.

- **Information** – this section allows the user to change the name of an input.
- **Status** – this section gives details about detected frame size for SDI inputs and other details such as link rate and color depth for DisplayPort inputs.
- **Configuration** – this section allows the user to change different input parameters depending on the type of input.

Video Processors

Video processor cards receive multiple signal inputs, process them, and send them out onto the display at the same time. The **Video Processors** tab shows tiles for each type of video processor available in the DI/VP-6000. Refer to **Figure 36**.

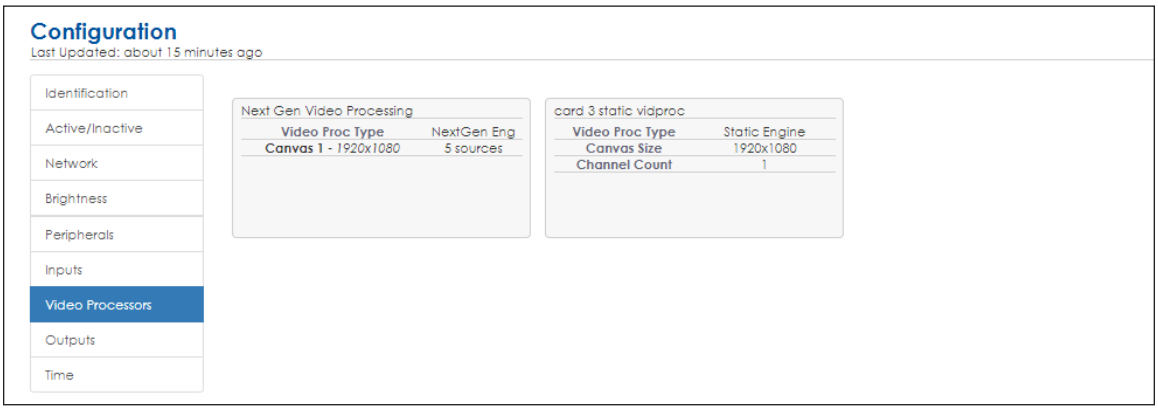

Figure 36: *Video Processors*

> **Note:** The **Video Processors** settings are contract-specific and based on the customer's requirements.

If no video processors are configured, this tab shows the message **No video processors configured**. Refer to **Figure 37**.

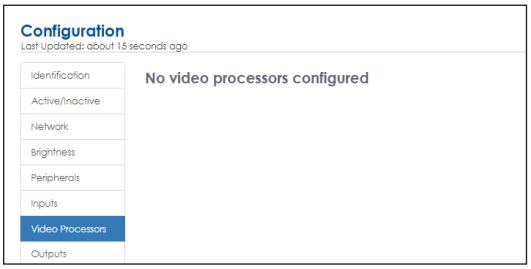

Figure 37: *No Video Processors*

The number and type of available video processors depend on the DI/VP-6000 model. For example, a 1-card DI-6000 has only a **Static Engine** video processor, but a 3-card VP-6000 has a **Static Engine** video processor and either a **NextGen Engine** video processor or a **Javascript Engine** video processor.

Select a video processor tile to see more details or make changes to the video processor configuration. Video processors cannot be added or deleted, only changed.

> **Note:** Use caution when changing the configuration settings within **Video Processors**; contact Daktronics Technical Support with any questions.

Static Engine

A **Static Engine** video processor has a maximum of two channels; each channel can be fed by two SDI inputs, one SDI input and one DisplayPort input, a single SDI input, or a single DisplayPort input. The processor composites the video feed(s) onto the canvas and the **Outputs** take signal from the canvas. There are two ProLink outputs and one monitor output (DisplayPort or SDI). Refer to **Figure 38** and **Outputs (p.27)**.

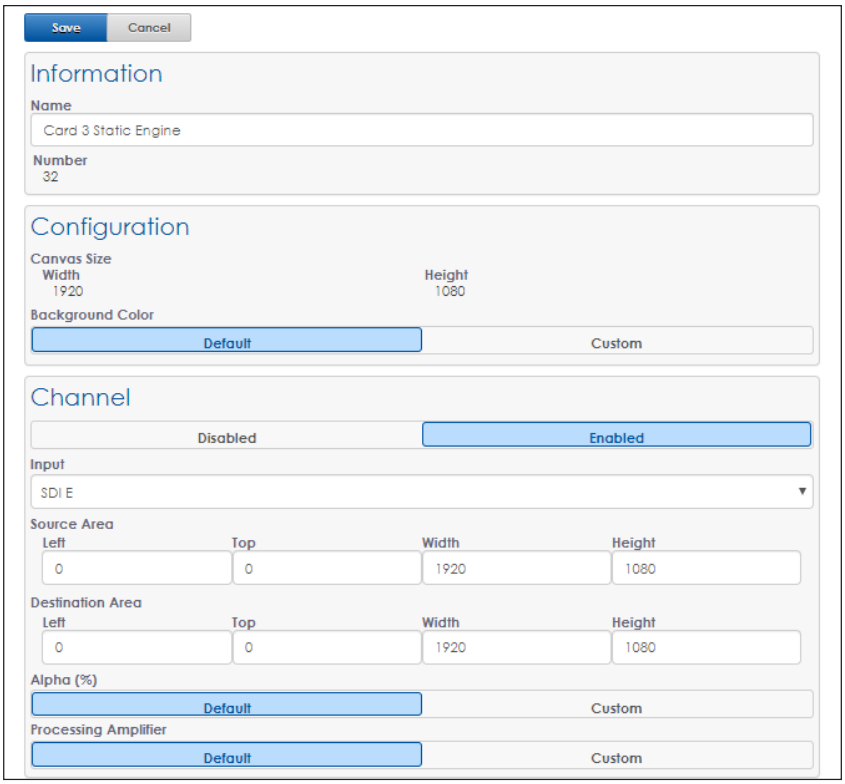

Figure 38: *Static Engine Video Processor*

Information

The video processor card **Name** and **Number** are both set by Daktronics. Normally the information in these fields is not changed.

Configuration

The **Canvas Size** is contract-specific and pre-configured by Daktronics. The **Background Color** is the color shown on the canvas in any area the channel input does not cover (i.e. outside the channel's configured **Destination Area**). The default color is purple but this can be changed by clicking the **Custom** button and using the **Color** drop-down list.

Channel

The **Channel** refers to one video processing pipeline. For example, a DI-6000 has a maximum of two channels. If only one channel is required, the second channel is normally **Disabled**. Each configured **Channel** input is an input that is available for switching or toggling within the Display Studio software. The **Channel** section configures the properties for each input:

- **Input** – Choose the correct input from the drop-down list; this information comes from the wiring diagram.
- **Source Area** – Enter the location and size of the area of the incoming signal to capture. For example, an incoming signal source may be 1080x1920 but only 540x960 is captured.
- **Destination Area** – Enter the location and size of the signal that is placed on the canvas. Use these settings to place content from two incoming channels on the canvas at the same time.
- **Alpha** – Change this value to adjust the transparency of the incoming signal. Normally this is set to the default **100%** (no transparency).

- **Processing Amplifier** – The values for **Brightness**, **Contrast**, **Saturation**, and **Hue** are normally set to the default, however these can be set to custom values to adjust the incoming signal. The values for **Color Correction** are normally set to the default, however the **Matrix** and **Vector** values can be set to custom values.

Note: If two DI-6000 channels are configured for different inputs and have the same destination area, video content can be effectively switched by adjusting the **Alpha** values. With both inputs enabled, one input can be visible with **Alpha** set to **100%**, while the other input is invisible with Alpha set to **0%**.

NextGen Engine

A **NextGen Engine** video processor receives four SDI inputs from the input card as well as a DisplayPort input from the player. The processor takes these inputs and composites them together. The video processor outputs one DisplayPort signal to the output card (static engine) as described in **Static Engine (p.22)**. Refer to **Figure 39**.

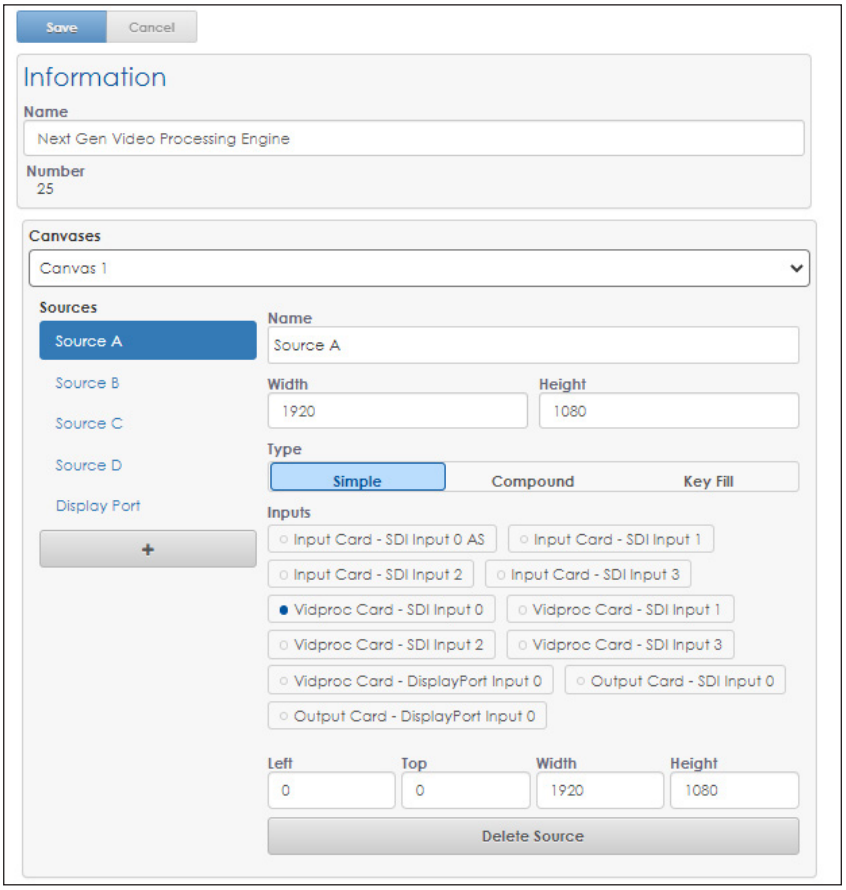

Figure 39: *NextGen Engine Video Processor*

Information

The video processor card **Name** and **Number** are both set by Daktronics. Normally the information in these fields is not changed.

Canvases

The canvases drop-down list shows the available canvases as set by Daktronics. Normally there is only one canvas.

Sources

Use the **Sources** function to configure the incoming video signal sources. These sources are used by the Venus® Control Suite Layout Editor.

- **Name** – Enter a name for the source. This name is used in the Layout Editor to identify a source that can be selected when applying sources to a particular look.
- **Width** and **Height** – Enter the size of the incoming source signal.
- **Type** – Select **Simple** for a single video feed that is fed into one physical input, **Compound** to select a source that is split across more than one physical input on separate video processing cards, or **Key Fill** for two sources (key and fill) that are combined.
- **Left/Top/Width/Height** – Enter the location and size of the area of the incoming signal to capture. This is used to crop the incoming source. Typically the entire source is used.

Javascript Engine

A **Javascript Engine** video processor receives four SDI inputs from the input card as well as a DisplayPort input from the player. The processor takes these inputs and composites them together. The video processor outputs one DisplayPort signal to the output card (static engine) as described in **Static Engine (p.22)**. Refer to **Figure 40**.

Figure 40: *Javascript Engine Video Processor*

Information

The video processor card **Name** and **Number** are both set by Daktronics. Normally the information in these fields is not changed.

Canvas

The **Name**, **Number**, and **Canvas Size** are contract-specific and pre-configured by Daktronics. Refer to **Figure 41**.

The **Compositors** section lists the available compositors. These are contract-specific and set by Daktronics. In a standard 3-card VP-6000, usually there is one compositor that has the same width and height as the canvas. In more complex VP-6000 models, one compositor may control the left side of a display and another compositor the right side. Refer to **Figure 41**.

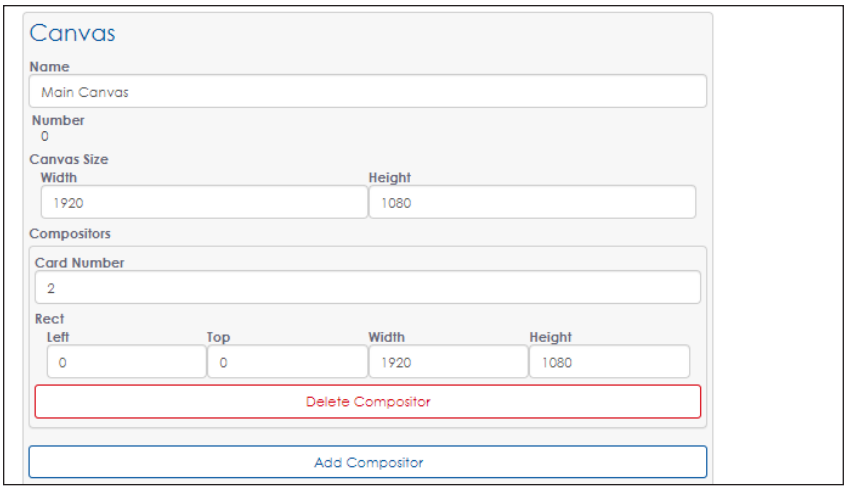

Figure 41: *DisplayPort Input Details*

- **Card Number** – Use the up and down arrows to enter the compositor card number.
- **Rect** – Enter the location and size of the area of the canvas the compositor card is responsible for. In the 3-card VP example shown in **Figure 41**, this is the same size as the canvas.
- **Delete Compositor** – Delete the compositor card configuration.
- **Add Compositor** – Add a compositor card configuration.

The **Sources** section refers to the logical video feed(s) that provide video content to one or more cards. A source can consist of one or more inputs. Refer to **Figure 42**.

> **Note:** A **Source** is the video feed (actual content), an **Input** is the physical connector. For example, one **Source** video can be sent into the card through two different **Inputs** in a display with a left/right video split.

- **Name/Number** – Enter a source **Name** that describes the logical source eg. Switcher Program. Source numbers must be unique.
- **Rect** – Enter the location and size of the area of the incoming input(s) to capture. For a compound source, this normally matches the **Rect** information under **Compositors**.
- **Inputs** – Select the desired source input(s) from the drop-down list. Add a new input to the source with the **Add Input** button or delete an input with the **Delete** button.
- **Delete Source** – Delete the source video feed.
- **Add Simple Source** – Add a new source with a single logical video feed. Enter the **Rect** and **Inputs** information.
- **Add Compound Source** – Add a new source with multiple video inputs that are different parts of the same logical video feed. Enter the **Rect** and **Inputs** information.

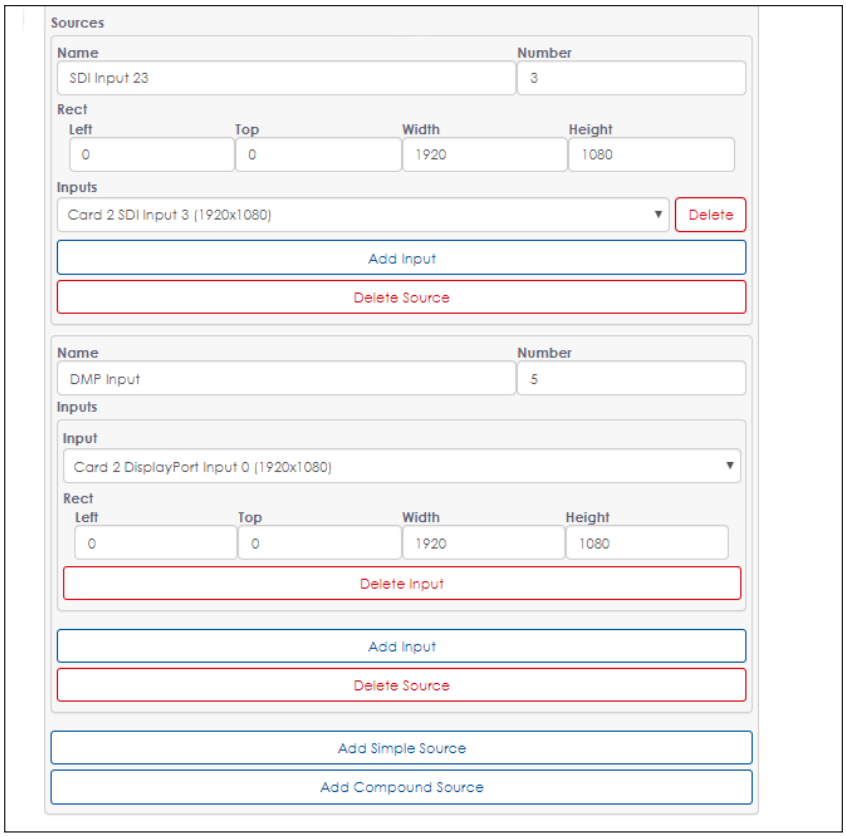

Figure 42: *Javascript Engine Video Processor – Sources*

Outputs

Outputs shows the details of each processor output sorted by type. An error symbol indicates that the output has an error. A warning symbol indicates notable changes to an output such as a test pattern or override. Refer to **Figure 43**.

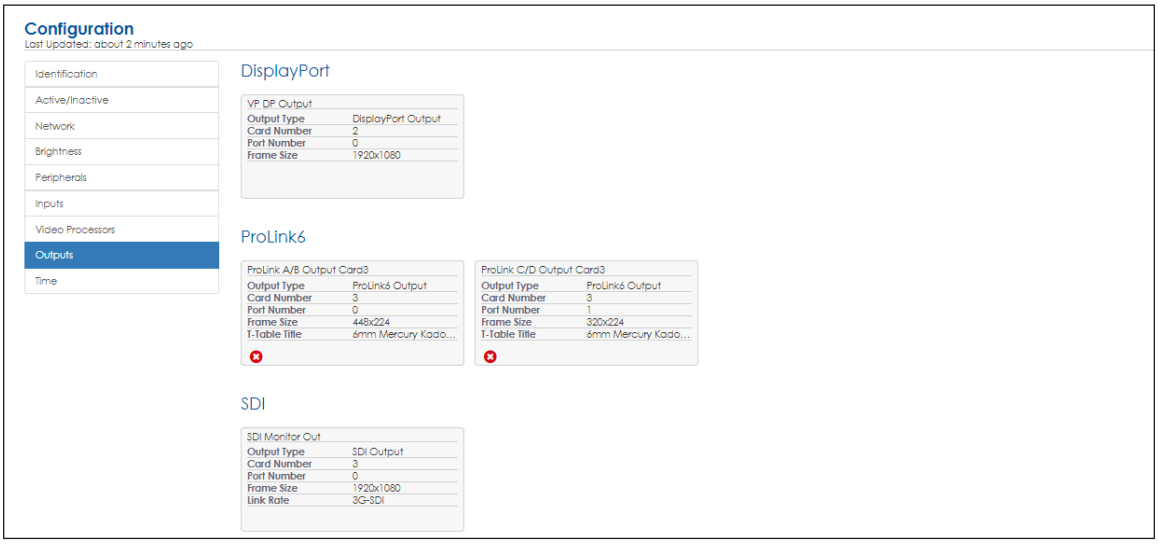

Figure 43: *Outputs*

Typically a monitor output (SDI or DisplayPort) takes content from the whole canvas and the ProLink outputs take content from part of the canvas. Select an output tile to see more details and make changes to the output configuration. Any errors or warnings are listed in the **Notifications** section. Refer to **Figure 44**. Processor outputs cannot be added or deleted, only changed.

Note: Change outputs only under the direction of Daktronics Technical Support.

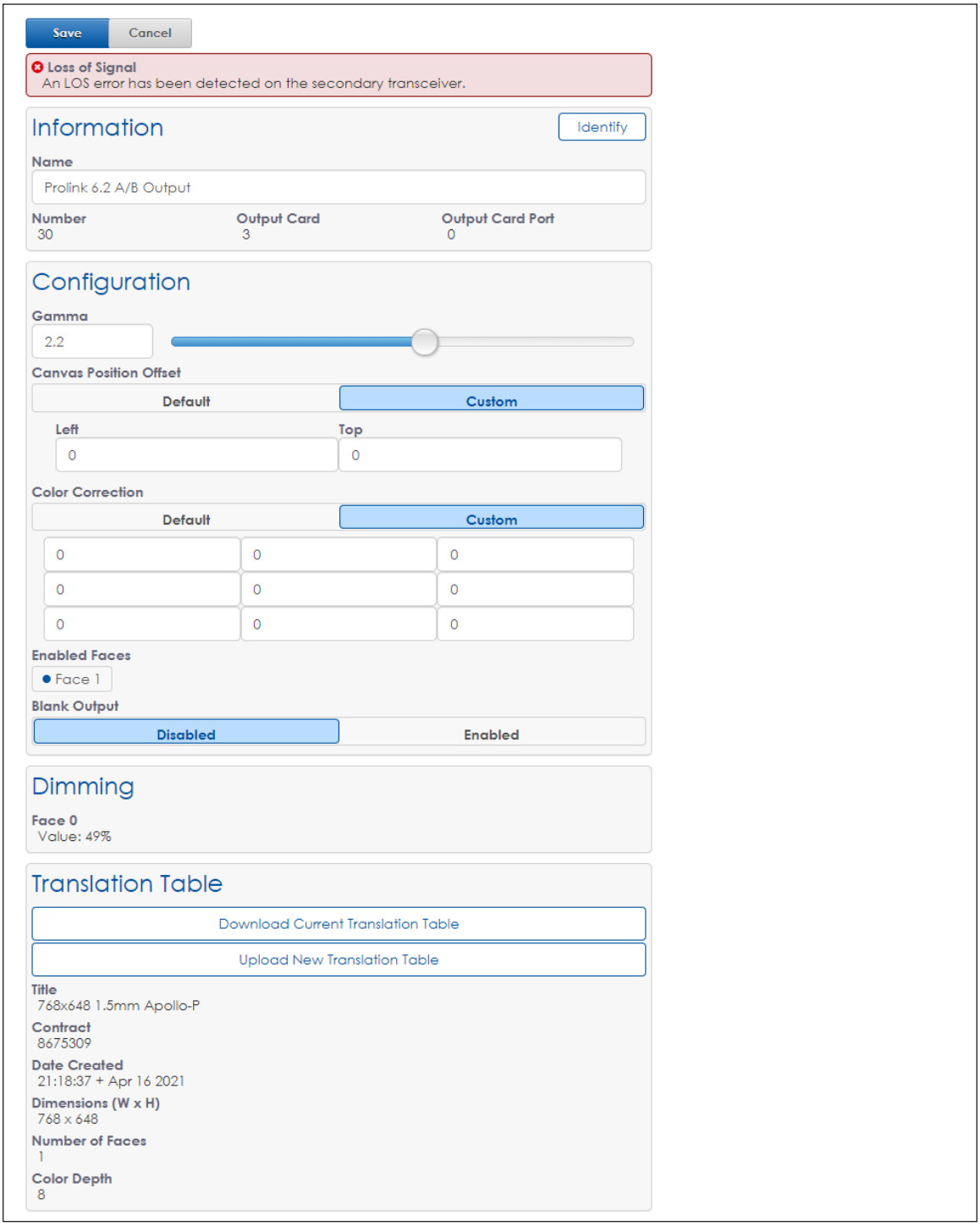

Figure 44: *ProLink 6 Output Details*

- **Notifications** – this section gives details about any detected errors or warnings. This section is only shown if errors or warnings are present.
- **Identify** – this button identifies the output card in the processor itself. The card's LED will turn solid white for 5 minutes before returning to the normal green state. Navigating away from the output returns the LED to the normal green state immediately.

> **Note:** Only 1 output card can be in **Identify** mode at a time.

- **Information** – this section allows the user to change the name of an output.
- **Status** – this section gives details for DisplayPort outputs such as link rate and color depth.
- **Configuration** – this section allows the user to change different input parameters depending on the type of input.

> **Note: Gamma** is set at **2.2** by default for SDR (Standard Dynamic Range). For HDR (High Dynamic Range), change this to **0.1** for PQ, or to **0.0** for HLG.

- **Dimming** – this section shows the dimming values set for ProLink6 or V-Max 4 outputs.
- **Translation Table** – this section provides details of the current translation table with options to download the current translation table or upload a new translation table. Restart the firmware after uploading a new translation table. This is available only for ProLink 6 outputs.
- **VMax4 Configuration File** – this section has options to download the current V-Max 4 configuration file or upload a new V-Max 4 configuration file. This is available only for V-Max 4 outputs.
- **Viewport Mapping** – this section allows the user to place content onto specific portions of the output. This option is available only for DisplayPort or SDI outputs.

Time

Set the time zone for the processor and configure the Network Time Protocol (NTP) servers with the **Time** function. Refer to **Figure 45**.

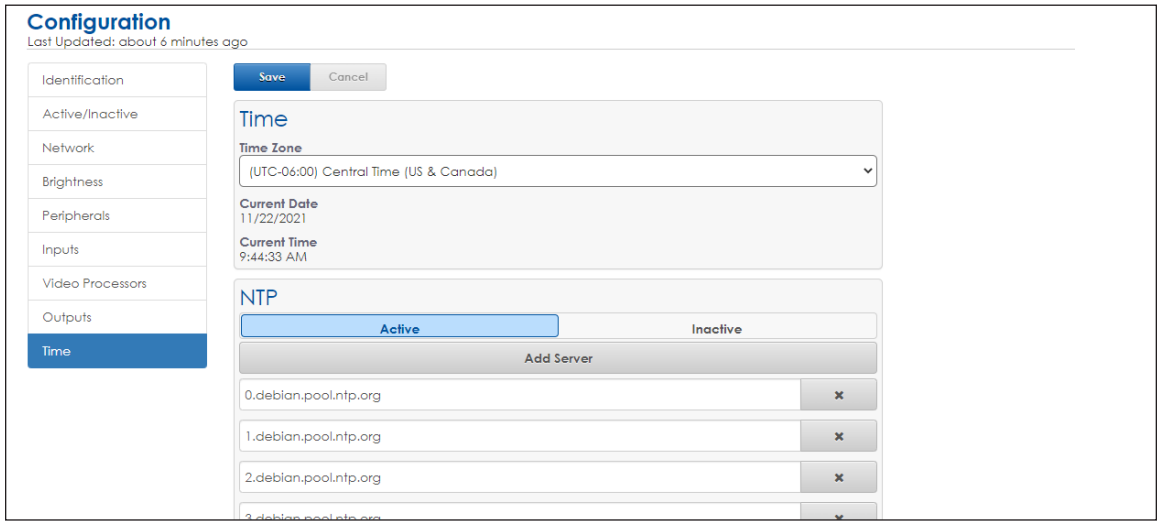

Figure 45: *Time*

Time

Use the **Time Zone** drop-down list to select the correct time zone for the display. The correct time zone is necessary for accurate astronomical brightness control and system log time stamps. The default time zone is **(UTC-06:00) Central Time (US & Canada)**.

NTP

Network Time Protocol (NTP) servers synchronize the controller's clock with the added time server(s). This setting is the default clock source and runs in the background to automatically maintain a precise time. The controller's network settings must be correct and the user must have access to the time server for this function to operate.

If **Active** is selected, the NTP service is enabled and servers can be added to the list.

Default addresses are used for synchronizing the time. Refer to **Figure 45**. These default addresses may be changed or deleted. Click **Add Server** to add additional NTP servers.

The clock can be manually synchronized but only when the NTP service is inactive. To synchronize the clock, follow these steps:

1. Click **Inactive** then click **Save**. The **Sync Clock** option appears. Refer to **Figure 46**.

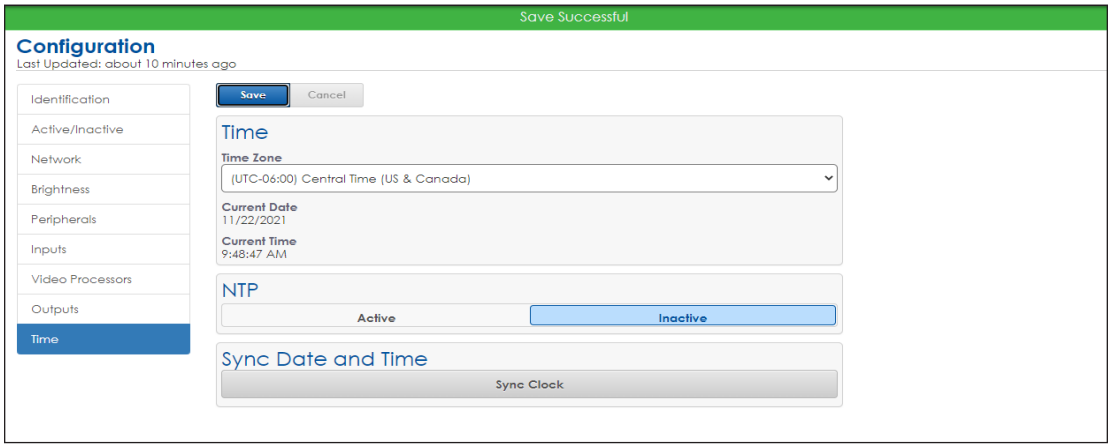

Figure 46: *Sync Date and Time*

2. Click the **Sync Clock** button. The controller's clock is immediately synchronized to the current computer's time.
3. Select **Active** to re-enable the NTP service. The **Sync Clock** option disappears.

> **Note:** If **Active** is clicked before the **Sync Clock** button is clicked, as shown in **Figure 47**, it is possible to edit the servers but the **Sync Clock** option remains. Click **Save** to re-enable the NTP service and remove the **Sync Clock** option.

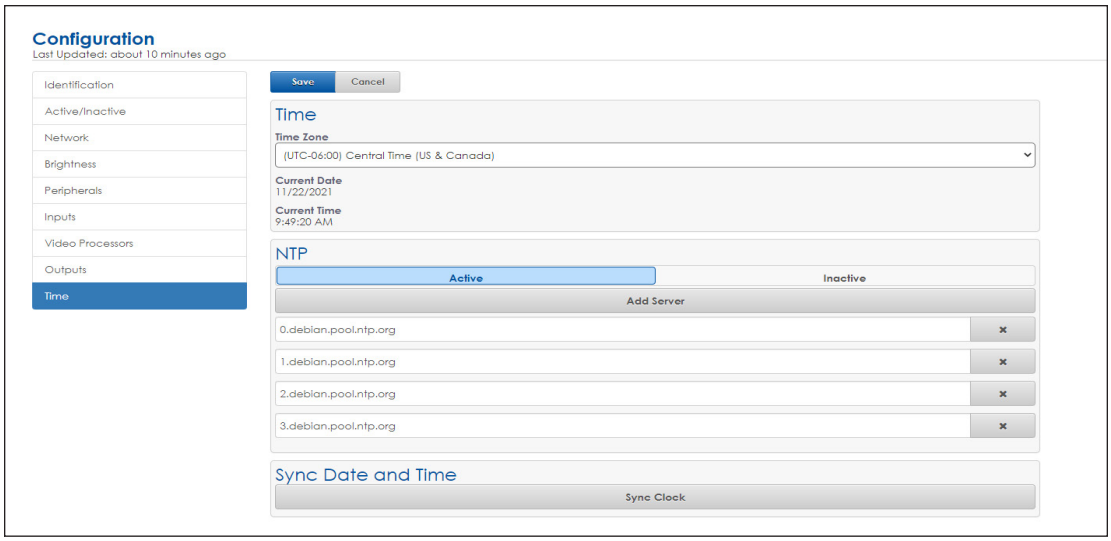

Figure 47: *Sync Date and Time – Active Selected*

Network Monitors

Network Monitors configures the monitoring system for the network. Monitors are used in conjunction with power control relays and attempt a recovery if a device becomes unresponsive on the network. Refer to **Peripherals (p.18)**.

Network monitors ping the processor to determine why the display is not working, possibly eliminating the need for a service call. Refer to **Figure 48**.

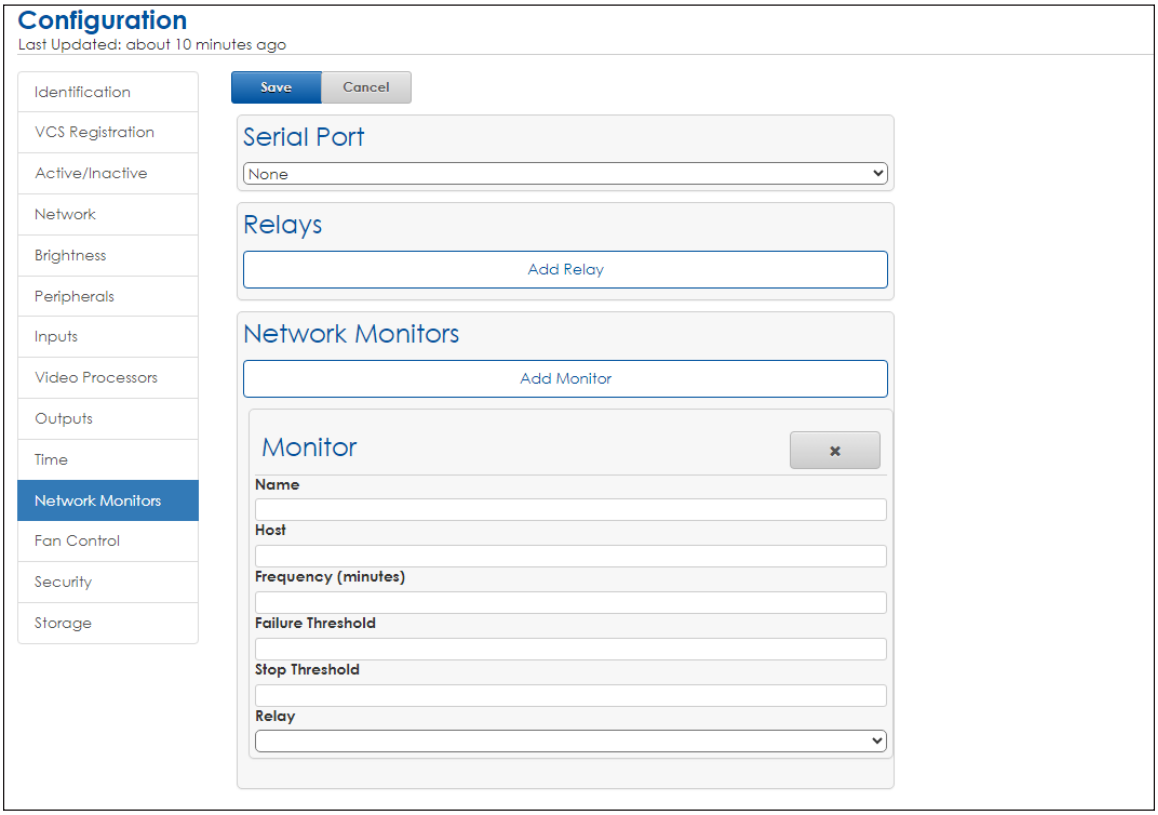

Figure 48: *Network Monitors*

To configure network monitors, follow these steps:

1. Choose the correct **Serial Port** from the drop-down list.
2. Click **Add Relay** to add the power control relay and choose the power control option from the drop-down list:
   - **None** (default) for no power control
   - **Full** includes both the **Cycle** and the **On/Off** options
   - **On/Off** sends an On or Off command and remains in that state until the user makes a change
   - **Cycle** sends a command to turn the relay off for 10 seconds and then turns it back on
3. Click **Add Monitor** to open the **Monitor** window.
   - Type a descriptive name in the **Name** field.
   - Type the host address in the **Host** field.
   - Enter how often the monitor will check the network in minutes (1 to 60) in the **Frequency** field.
   - Type the number of times the system will receive a failure message before an action is taken in the **Failure Threshold** field.
   - Type the number of times the system will receive a failure message before the action is stopped in the **Stop Threshold** field.
   - Choose the desired power control relay from the **Relay** drop-down list.
4. Click **Save** at the top of the screen to save the changes.

Fan Control

Use the **Fan Control** function to control the fans that are connected to the PLRs in the display.

Enter a **High** temperature and a **Low** temperature (in Celsius) for a selected output. If 10% of modules in the display register a temperature above the set **High** temperature, the fans will turn on and will not turn off until all modules are under the lower limit.

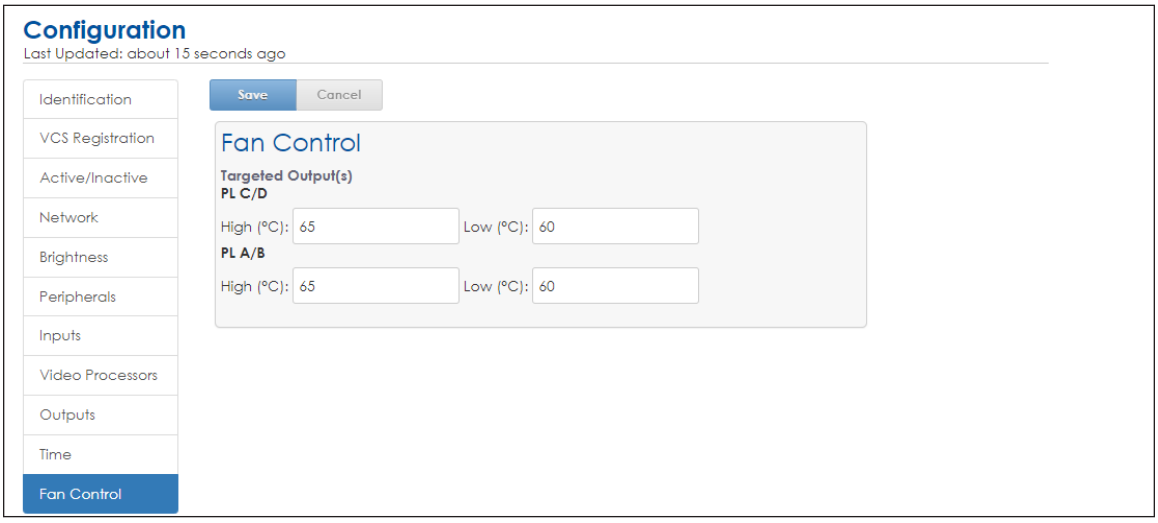

Figure 49: *Fan Control*

Security

Use the **Security** function to enable the level of security for client-server communication. Enable the HTTPS to create an encrypted connection. When enabled, this feature uses a self-signed certificate. The default setting for the SSL Server is **Disabled**. Refer to **Figure 50**.

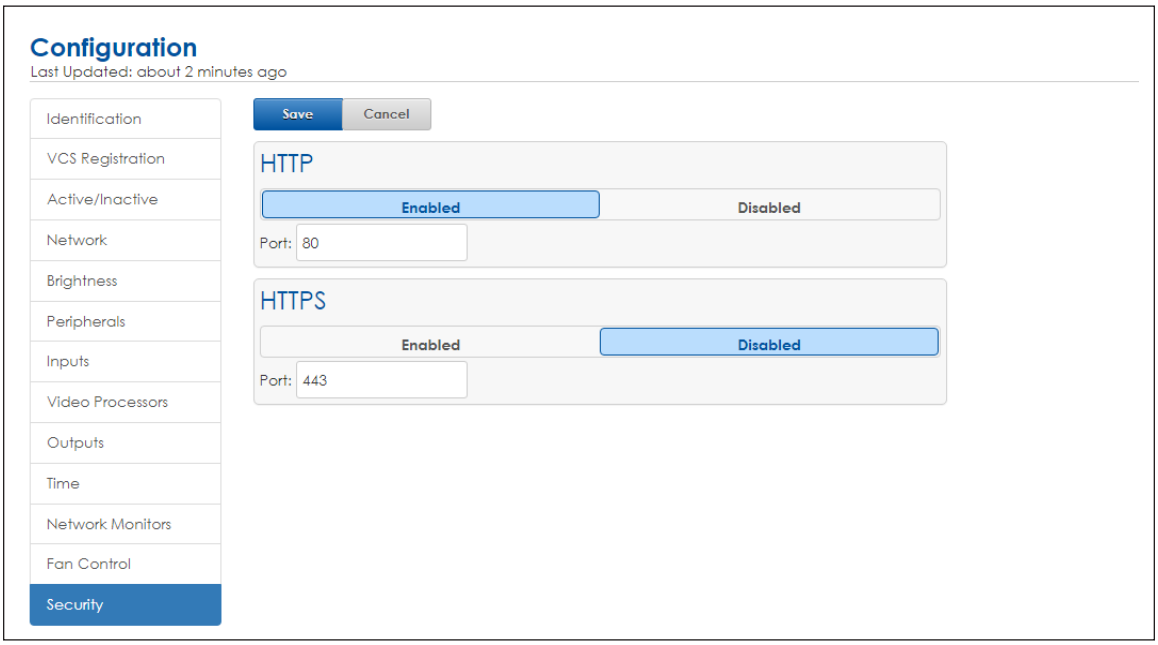

Figure 50: *Security*

Storage

Use the **Storage** function to perform a disk cleanup in order to free up hard drive space. Select **Perform Cleanup Now** to immediately start the disk cleanup or set the day and time for a **Scheduled Cleanup**. Refer to **Figure 51**.

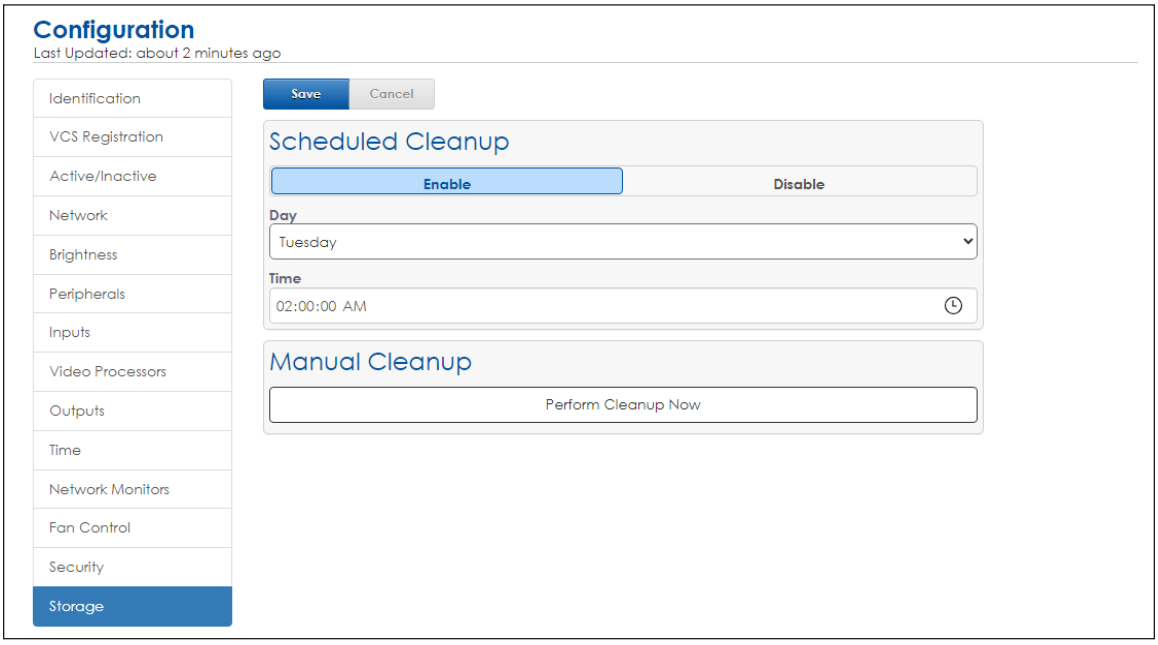

Figure 51: *Storage*

5 Monitoring

Click **Monitoring** to view an image of the video signal at any point in the system. **Monitoring** monitors the input sources for each card and shows a thumbnail image of what each card is transmitting. Refer to **Figure 52**.

Figure 52: *Monitoring*

Click any thumbnail for a larger view of the captured signal. Press **F5** to refresh the image.

To see the video signal that is going out to the display, click the thumbnail for the **Compositor Output** on each card.

Note: The message **No Image Available** indicates that a source is not configured.

6 Calibration

Click **Calibration** to open a window with options for adjusting the display output. Refer to **Figure 53**.

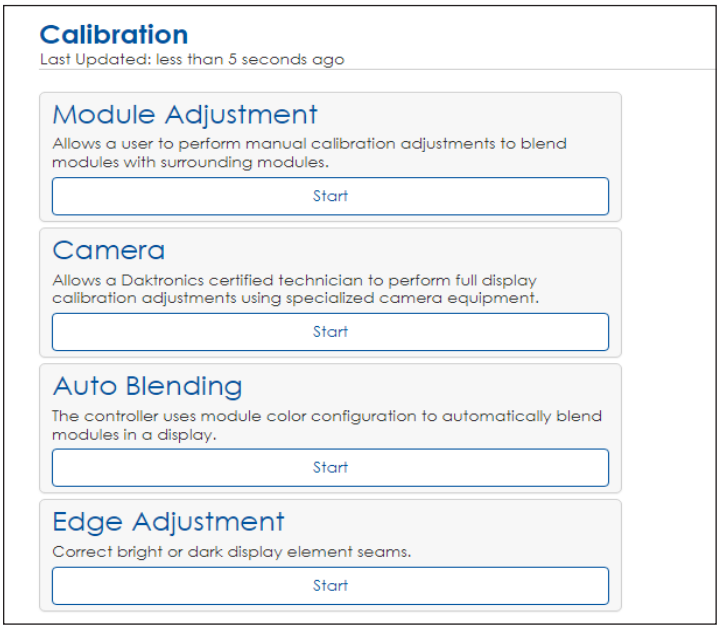

Figure 53: *Calibration*

Module Adjustment

Manually adjust individual modules to improve the uniform intensity of the entire display with the **Module Adjustment** function.

> **Note:** This action interrupts the active content on the display.

To manually adjust the modules, follow these steps:

1. Click **Start**. A **Session Options** window opens. Refer to **Figure 54**.

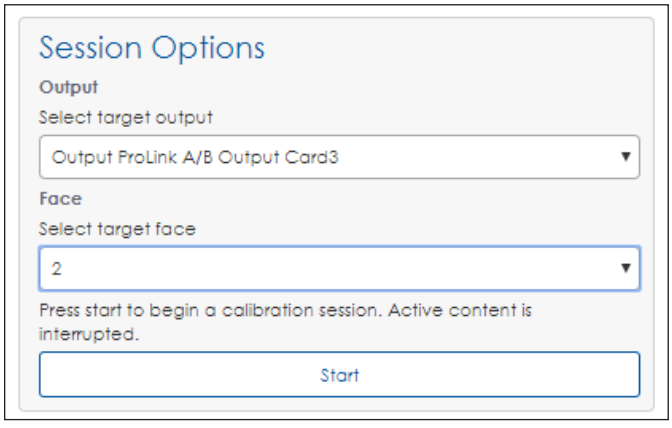

Figure 54: *Calibration Session Options*

2. Select the target output and target face from the drop-down lists.

> **Note:** If the DI-6000 or VP-6000 has only one configured target output, or if the display has only one face, these drop-down lists are not available.

3. Click **Start** to open the **Module Adjust** tool. A graphic representation of the display modules (or tiles for NPP displays) opens with adjustment tools along the right side. Refer to **Figure 55**.

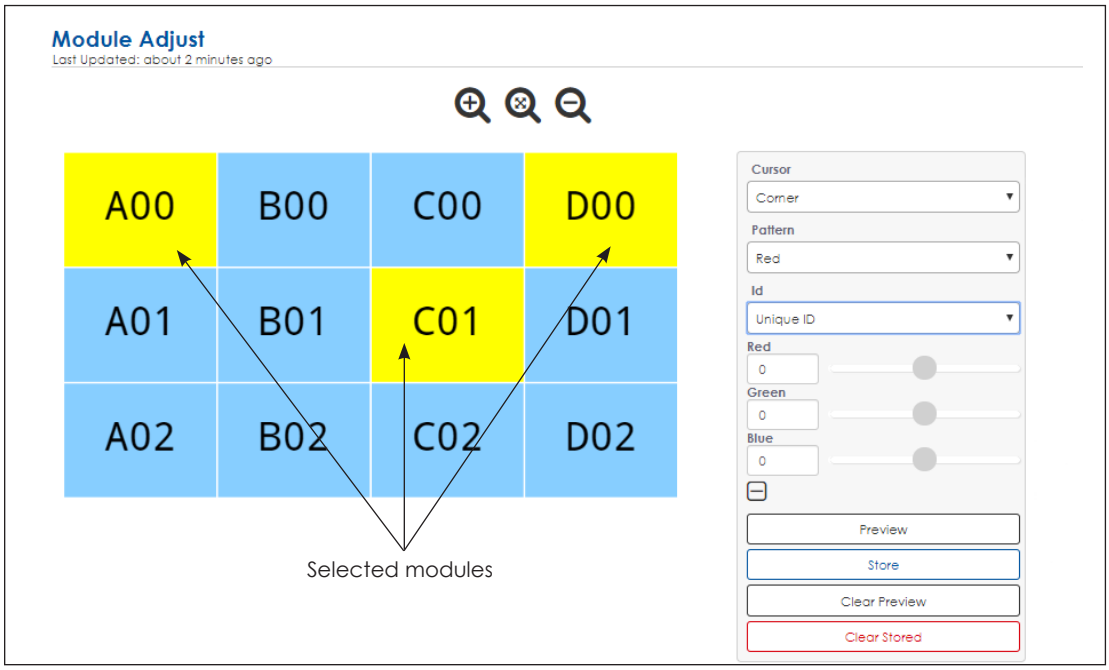

Figure 55: *Module Adjustment*

4. Select individual modules or groups of modules for adjustment by highlighting them with the cursor. Click any highlighted module to de-select it.

5. Choose how the modules will be shown on the display itself during the adjustment process with the **Cursor** drop-down list. Refer to **Figure 56**.

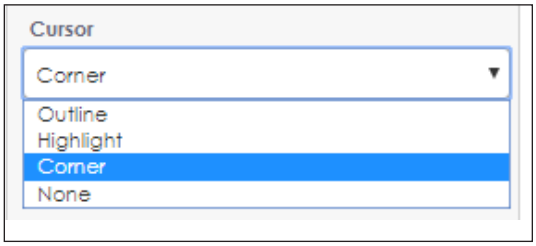

Figure 56: *Cursor Options*

   - **Outline** – shows the chosen color pattern on all modules with the selected module(s) outlined in black
   - **Highlight** – shows the chosen color pattern only on the selected module(s); this is the only option available for ProPixel® display calibration
   - **Corner** – shows the chosen color pattern on all modules with the selected module(s) with a black chevron at each corner
   - **None** – no marks are shown around the module(s) during the calibration

6. Choose a display output color from the **Pattern** drop-down list to view the module's current color calibration and evaluate the need for manual module adjustment. Refer to **Figure 57**.

Figure 57: *Output Color Patterns*

7. Choose the module identification method from the **Id** drop down list to make it easier to identify modules that need adjustment. Refer to **Figure 58**.

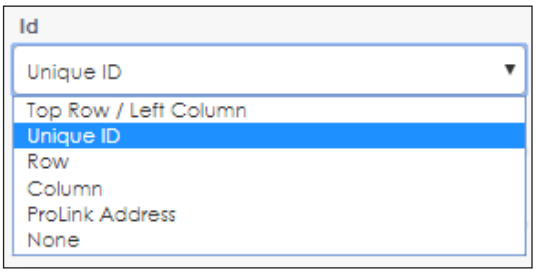

Figure 58: *Module Identification*

   - **Top Row / Left Column** – the top row is identified with letters (AA, AB, AC etc.) and the left column with numbers (00, 01, 02 etc.)
   - **Unique ID** – each module is identified with a unique letter and number corresponding to the row and column (A00, B00, A01, B01 etc.)
   - **Row** – each module row is numbered
   - **Column** – each module column is numbered
   - **ProLink Address** – each module's ProLink address is shown
   - **None** – no identifying information is shown on the modules

8. Adjust the selected module(s) using the **White** slider. This action uniformly adjusts the red, green and blue values. Refer to **Figure 59**.

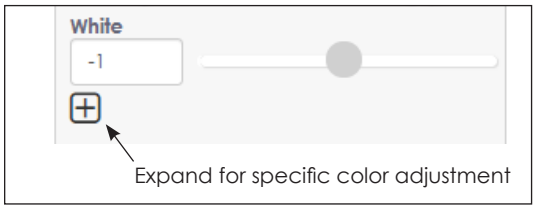

Figure 59: *White Adjustment*

9. Click the expand icon ⊞ as shown in **Figure 59** to open the options for specific red, green, or blue values. Adjust the values for any of these colors with the sliders or by entering values in the text boxes. Refer to **Figure 60**.

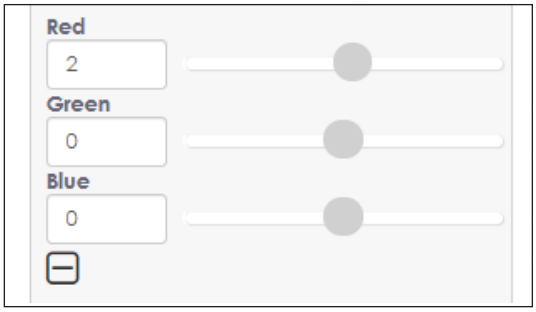

Figure 60: *Color Adjustment*

10. Click one or more of the following options after adjusting the modules:

    a. Click **Preview** to see how the adjusted modules look on the display.

    b. Click **Store** to save the newly changed calibration values.

    c. Click **Clear Preview** to clear the recently made changes (all changes made since the last **Store**).

    d. Click **Clear Stored** to delete the previously stored module-adjust values. If the display is camera calibrated, the camera calibration becomes the default; otherwise, the settings revert to the factory default.

> **Note:** Use caution with the **Clear Stored** command. This action removes all previously stored module-adjust values from the entire display. If this action is taken, manual adjustments will be required to blend modules. Click **Clear Stored** to clear the stored values or **No** to exit.

Camera

Use **Camera** calibration to adjust the LED video display pixel by pixel to improve the uniform intensity of the entire display.

Note: Camera calibration should only be performed by Daktronics technicians.

Auto Blending

Use the **Auto Blending** function to automatically adjust the color space of individual modules. This process works only with certain generations of modules and with a display that is 100% functional. After **Auto Blending**, perform **Module Adjustment (p.35)** to improve the uniform intensity of the entire display.

Note: This action interrupts the active content on the display.

To automatically adjust the modules, follow these steps:

1. Click **Start**. A **Session Options** window opens. Refer to **Figure 61**.

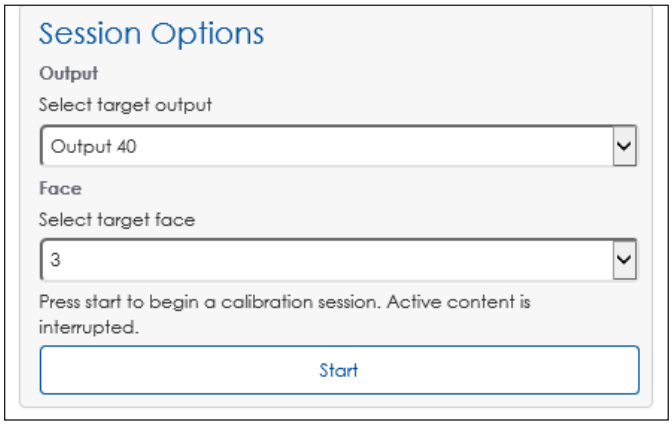

Figure 61: *Calibration Session Options*

2. Select the target output and target face from the drop-down lists.

Note: If the DI-6000 or VP-6000 has only one configured target output, or if the display has only one face, these drop-down lists are not available.

3. Click **Start** to open the **Autoblend Calibration** tool. Refer to **Figure 62**.

4. Choose how the modules will be identified during the adjustment process with the **Cursor** drop-down list. Refer to **Figure 63**.

   - **Outline** – shows the chosen color pattern on all modules with the selected edge(s) outlined in black
   - **Highlight** – shows the chosen color pattern only on the selected module(s); this is the only option available for ProPixel® display calibration
   - **Corner** – shows the chosen color pattern on all modules with the selected edge(s) with a black chevron at each corner

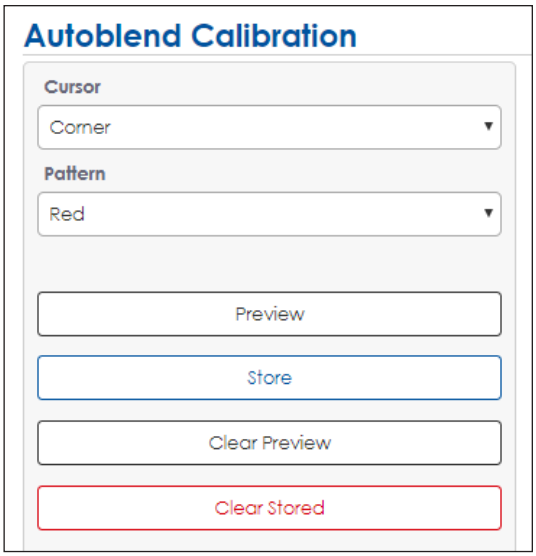

Figure 62: *Autoblend Calibration*

Figure 63: *Cursor Options*

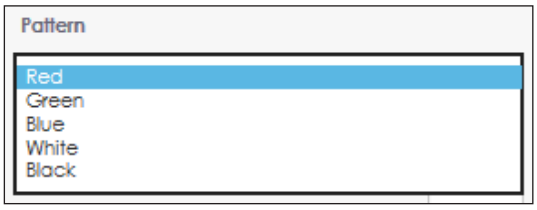

Figure 64: *Output Color Patterns*

5. Choose a display output color from the **Pattern** drop-down list to view the display's current color calibration and evaluate the need for automatic module adjustment. Refer to **Figure 64**.

6. Click **Preview** to start the automatic calibration process. This can take a few seconds or a few minutes depending on the size of the display. A progress bar shows the status of the calibration process. Review the changes to the display.

7. Click one or more of the following options after adjusting the display:

   a. Click **Store** to save the newly changed calibration values.

   b. Click **Clear Preview** to clear the recently made changes (all changes made since the last **Store**).

   c. Click **Clear Stored** to delete the stored calibration. If the display is camera calibrated, this will become the default; otherwise, the settings will revert to the factory default.

> **Note:** Use caution with the **Clear Stored** command. This action removes all previously stored module-adjust values from the entire display. Click **Yes** to clear the stored values or **No** to exit.

Edge Adjustment

Use **Edge Adjustment** to manually adjust bright or dark display element seams. This function is useful when calibrating narrow-pixel pitch (NPP) displays.

The general process starts with all edges and seams bright, select all edges and bring them down by 2%, then adjust individual seams as needed.

> **Note:** This action interrupts the active content on the display.

To manually adjust the seams and corners, follow these steps:

1. Click **Start**. A **Session Options** window opens. Refer to **Figure 65**.

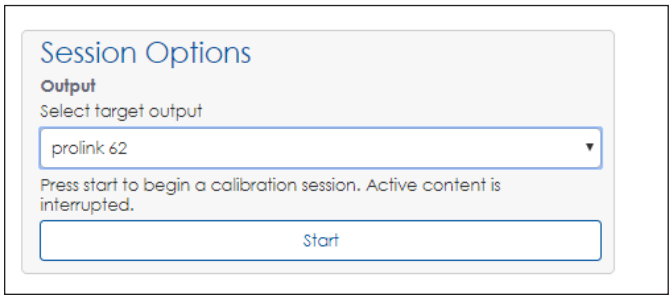

Figure 65: *Calibration Session Options*

2. Select the target output and target face from the drop-down lists.

> **Note:** If the DI-6000 or VP-6000 has only one configured target output, or if the display has only one face, these drop-down lists are not available.

3. Click **Start** to open the **Edge Adjustment** tool. A graphic representation of the display modules (or tiles for NPP displays) opens with adjustment tools along the right side. Refer to **Figure 66**.

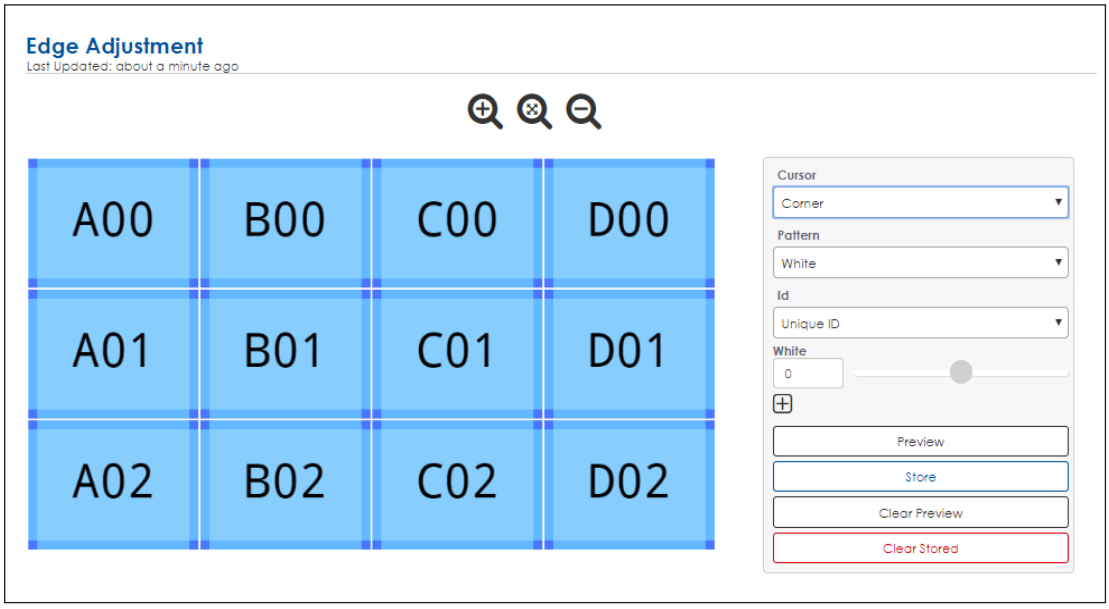

Figure 66: *Edge Adjustment*

4. Click and drag the cursor across the whole graphic to select all seams and corners at once. Select individual seams and corners or groups of seams and corners for adjustment by highlighting them with the cursor. Refer to **Figure 67**.

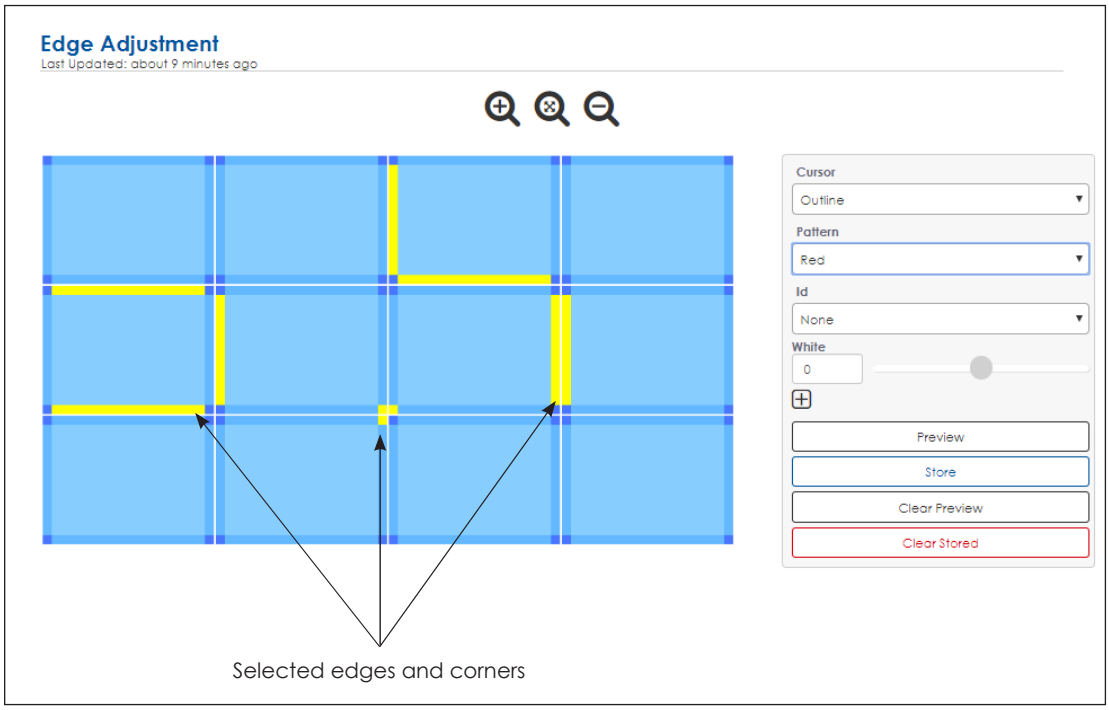

Figure 67: *Selected Seams and Corners*

5. Choose how the edges will be shown on the display itself during the adjustment process with the **Cursor** drop-down list. Refer to **Figure 68**.

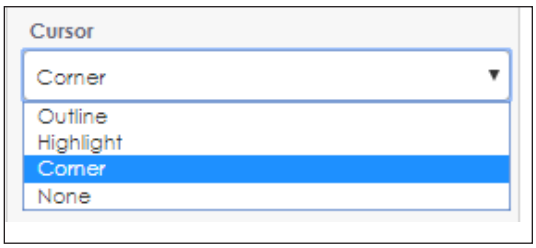

Figure 68: *Cursor Options*

   - **Outline** – shows the chosen color pattern on all edges with the selected edge(s) outlined
   - **Highlight** – shows the chosen color pattern only on the selected edge(s); this is the only option available for ProPixel® display calibration
   - **Corner** – shows the chosen color pattern on all edges with the selected edge(s) with a colored chevron at each corner
   - **None** – no marks are shown around the edge(s) during the calibration

6. Choose a display output color from the **Pattern** drop-down list to view the display's current color calibration and evaluate the need for manual edge adjustment. Usually white is the first color. Refer to **Figure 69**.

Figure 69: *Output Color Patterns*

7. Choose the module identification method from the **Id** drop down list to make it easier to identify modules that need adjustment. Refer to **Figure 70**.

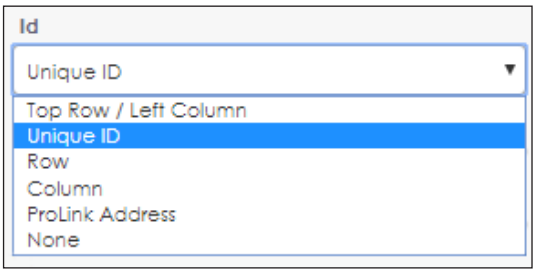

Figure 70: *Module Identification*

   - **Top Row / Left Column** – the top row is identified with letters (AA, AB, AC etc.) and the left column with numbers (01 02, 03 etc.)
   - **Unique ID** – each module is identified with a unique letter and number corresponding to the row and column (A00, B00, A01, B01 etc.)
   - **Row** – each module row is numbered
   - **Column** – each module column is numbered
   - **ProLink Address** – each module's ProLink address is shown
   - **None** – no identifying information is shown on the modules

8. Adjust the selected edge(s) using the **White** slider. This action uniformly adjusts the red, green and blue values. Start with **-1** and adjust gradually in increments of **1** after previewing the changes. Refer to **Figure 71**.

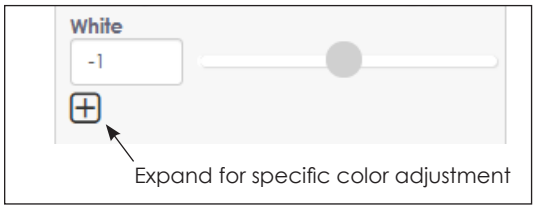

Figure 71: *White Adjustment*

9. Click the expand icon ⊞ as shown in **Figure 71** to open the options for specific red, green, or blue values. Adjust the values for any of these colors with the sliders or by entering values in the text boxes. Usually only the white value needs to be changed. Refer to **Figure 72**.

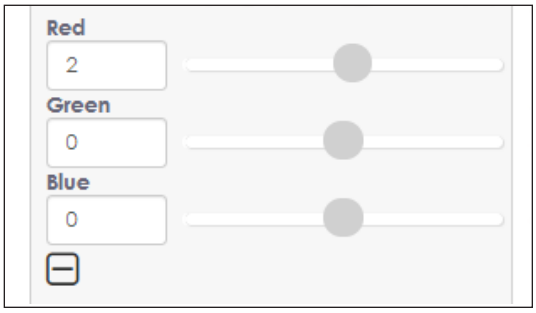

Figure 72: *Color Adjustment*

10. Click one or more of the following options after adjusting the edges:

   a. Click **Preview** to see how the adjusted edges look on the display. It takes a minute for the adjusted modules to be visible on the display. Check if individual seams or corners need further adjustment.

   b. Click **Store** to save the newly changed calibration values. This commits the changes to the modules and can take about 5 minutes.

   c. Click **Clear Preview** to clear the recently made changes (all changes made since the last **Store**).

   d. Click **Clear Stored** to delete the previously stored edge-adjust values.

> **Note:** Use caution with the **Clear Stored** command. This action removes all previously stored edge-adjust values from the entire display as well as any saved **Camera Calibration**. Click **Clear Edge & Camera** to clear the stored values or **No** to exit. Refer to **Figure 73**.

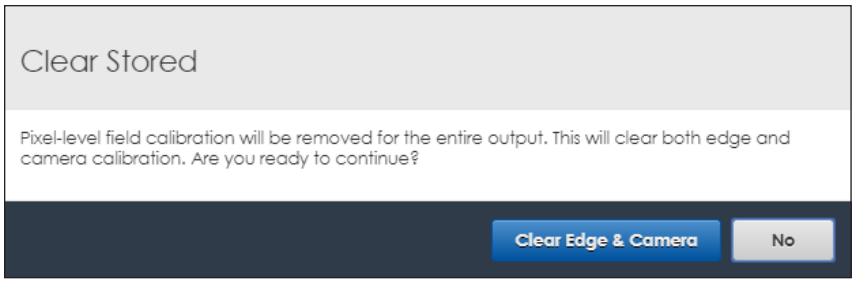

Figure 73: *Clear Stored Calibration Settings*

11. Power off the display for 15 minutes, then turn it back on to check the final calibration and make sure that there are no outstanding seams.

> **Note:** Be aware that if a seam is turned off for a long time (approximately 30 minutes), the LEDs can start to shift their output characteristics and it is possible to over-calibrate. Check the calibration by blanking the display for 5-10 minutes between adjustments.

7 Test Patterns

Click **Test Patterns** to open a window with options for configuring and showing different test patterns on the display.

To run a test pattern for the first time, follow these steps:

1. Click **Add** to create the test pattern. Refer to **Figure 74**.

Figure 74: *Create a Test Pattern*

2. Choose where the test pattern is inserted in the signal path. The test pattern can be used to override an input or override an output. Refer to **Figure 75**.

> **Note:** If the test pattern overrides an output, set the output brightness with the slider or use the current setting from the brightness manager by checking the **Filtered Brightness** check box.

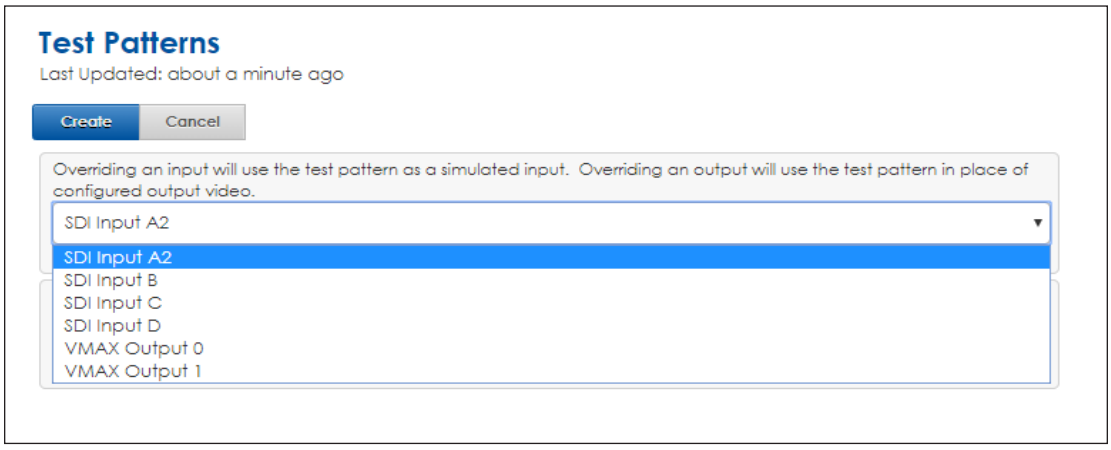

Figure 75: *Test Pattern as Input or Output*

3. Select the desired test pattern. Refer to **Figure 76** and **Test Pattern Details (p.46)**.

Figure 76: *Test Patterns*

4. Configure the selected test pattern. Refer to the example in **Figure 77** and **Test Pattern Details (p.46)**.

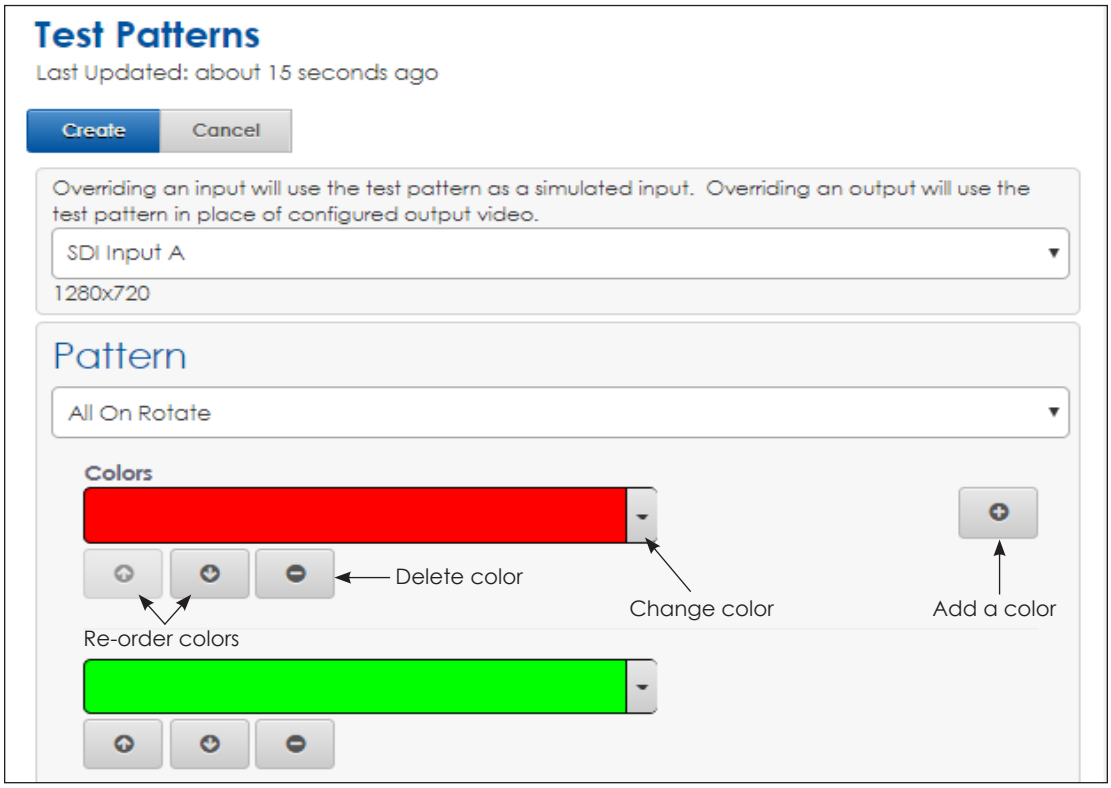

Figure 77: *Configure Test Pattern Parameters*

5. Click **Create** to run the test pattern. A message warns that this action interrupts active display content. Refer to **Figure 78**. While the test pattern is running, a tile appears with the pattern's details. To stop the test pattern, click the **x** in the upper-right corner of the tile. Refer to **Figure 79**.

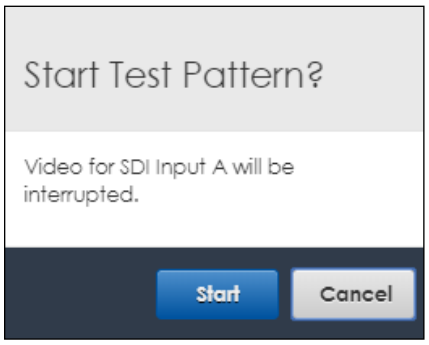

Figure 78: *Test Pattern Warning*

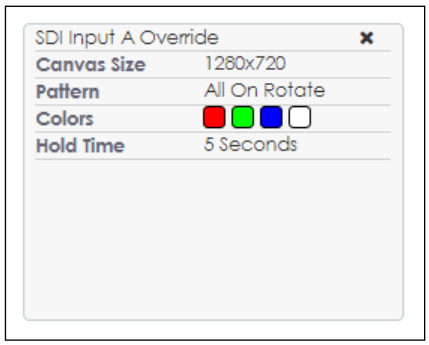

Figure 79: *Test Pattern Tile*

6. Click the test pattern tile while the test pattern is running to open the test pattern details and make any changes to the configuration. Refer to **Figure 79**, **Figure 80**, and **Test Pattern Details (p.46)**.

Figure 80: *Changed Test Pattern Parameters*

7. Click **Save** to save any changes to the test pattern, **Cancel** to exit the configuration, or **Delete** to stop the test pattern.

Test Pattern Details

This section describes the various standard test patterns and their configuration options.

All On

This pattern shows all modules as one solid color. Choose the color to display using the color drop-down menu. The default color is red.

All On Rotate

This pattern shows all modules as a solid color rotating through a sequence of different colors. Choose the colors to display using the color drop-down menu. Change the order that the colors are shown with the up and down arrows. Select the hold time that each color is shown on the display. The default colors are red, green, and blue with a hold time of 5 seconds. Refer to **Figure 77**.

Bouncing Box

This pattern shows a box moving back and forth over the display. Choose the color and size of the box. Add a margin to create a frame for the bouncing box within the display. Adjust the start angle and speed to make the test useful for different display sizes.

Diagonal Lines

This pattern shows scrolling diagonal lines moving across the display from left to right. Choose the line color as either **RGB** (red, green, blue) or **White**. Set **Smoothing** on or off to enable or disable anti-aliasing; this setting changes the way the diagonal lines appear on the display. Adjust the hold time to change how fast the diagonal lines scroll.

Grid

This pattern shows crosshatch patterns. Use this test pattern to check and calibrate centering, aspect ratio, convergence, and both vertical and horizontal linearity. Choose the grid size to match the module size and the color of the crosshatch pattern.

Image

This pattern shows an uploaded image on the display. Click the **Choose Image** button to upload an image from a file. After choosing the image, its placement on the display is shown as a preview. Refer to **Figure 81**. The image aligns to the top-left corner of the display; if the image is too big, the bottom and right side of the image will be cropped.

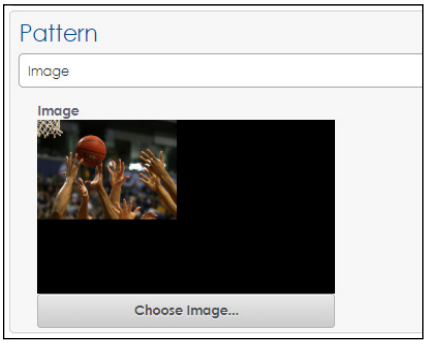

Figure 81: *Test Pattern – Image*

Module ID Grid

This pattern shows the number sequence of each display module. Use this pattern to check that the modules are in the correct order and verify the translation table and connections. Choose the grid size to match the module size.

Module Locator Grid

This pattern shows an alternating red and green number pattern. Red indicates the row and green indicates the column of each module in the display. Use this pattern to locate a specific module that needs troubleshooting. Choose the grid size to match the module size. Adjust the hold time to change how fast the row and column numbers alternate.

Standard Video Pattern

This section contains four standard video test patterns: **SMPTE HD**, **Simple Bars 100%**, **Simple Bars 75%** and **Tartan Bars**. Use these patterns to check chroma and luminance levels for color calibration against a standard pattern.

Wand

This pattern shows a line moving across the display horizontally or vertically. Use this pattern to see any issues with seaming or tearing. Choose the thickness of the line in pixels and the speed that the line moves across the display.

8 Configuration Backup

Click **Configuration Backup** to create a backup of the current configuration file or restore the configuration to a previously saved configuration file. Refer to **Figure 82**.

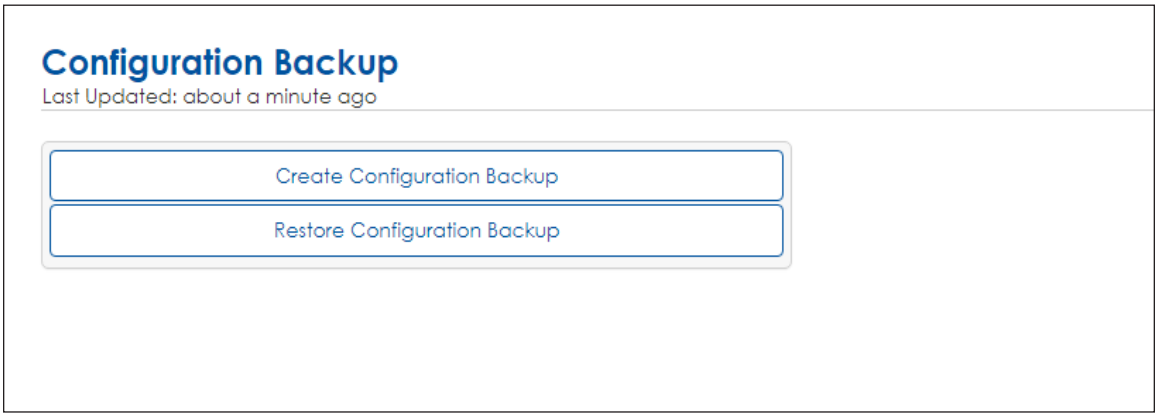

Figure 82: *Configuration Backup*

Click the **Create Configuration Backup** button to create a backup file. If using Google® Chrome®, the backup file is saved in the browser **Downloads** folder. Refer to **Figure 83**.

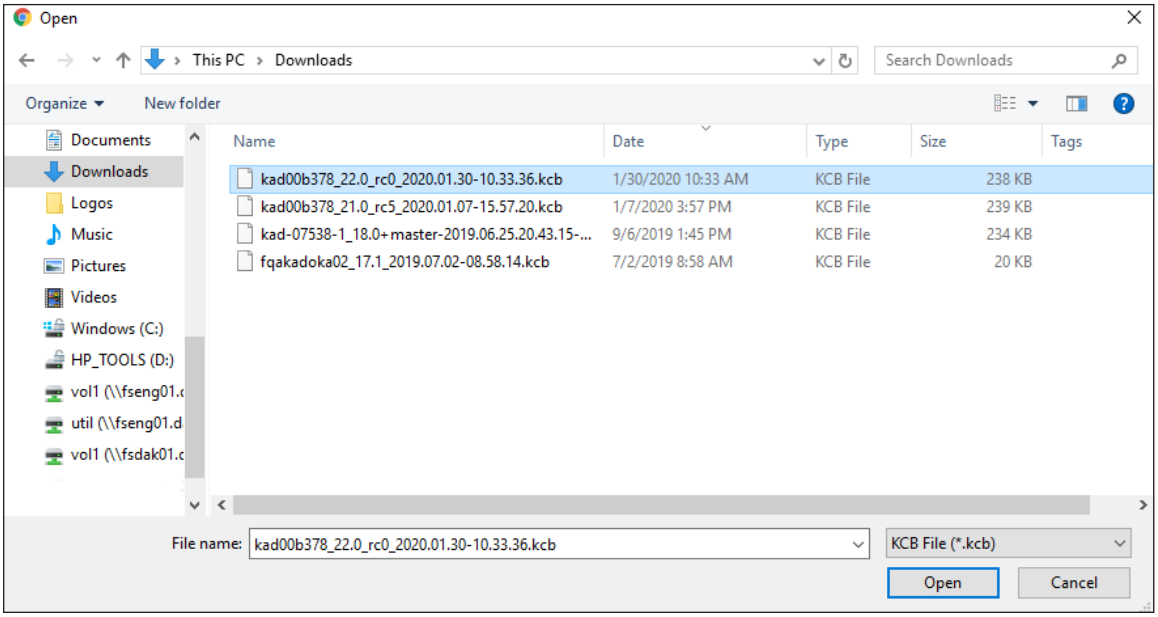

Figure 83: *Saved Configuration Files*

> **Note:** The backup file is specific to the firmware version in use when it was created and that system's hardware description (number and type of cards). For example, a backup created from Rev 40 can only be used to restore to a system running Rev 40 with the same card configuration.

Click the **Restore Configuration Backup** button to select a saved KCB configuration file and restore it to the processor. A message warns that overwriting the configuration file may cause network connectivity issues. Refer to **Figure 84**.

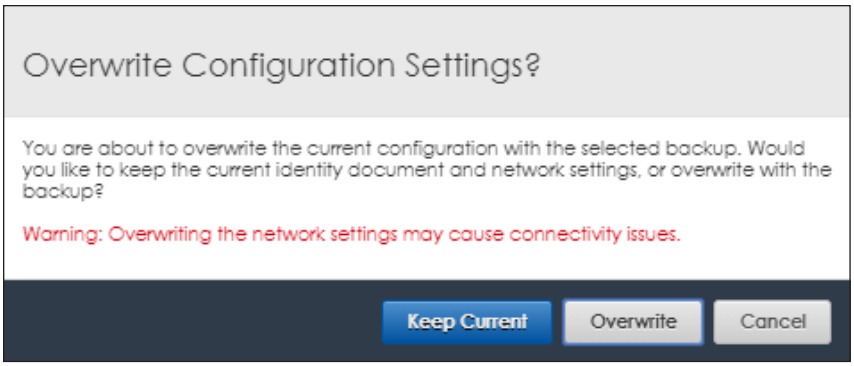

Figure 84: *Clear Stored Calibration Settings*

The configuration backup and restore function is particularly useful when setting up a system with both primary and backup processors. In this case, first create the configuration backup file from the primary processor. Next, go to the backup processor, click **Restore Configuration Backup,** and select the saved configuration backup file.

9 Troubleshooting

Click **Troubleshooting** to reboot the processor or reset the power relay control device. Refer to **Figure 85**.

Figure 85: *Troubleshooting - Reboot*

Reboot

Click the **Reboot** button to initiate a hardware reboot; wait a few minutes for the reboot to complete.

Under normal operating conditions, the DI/VP-6000 processor does not need to be rebooted. The device is designed to run continuously and automatically detect and apply any configuration changes; however, if the system is not operating properly, manually rebooting the system may help resolve any issues.

Power Control

Click the **Power Control** button to reset the power control. This function performs a soft restart of the power relay control device and is used primarily in billboard applications. Power control uses a SmartLink device that provides relays to toggle something connected to them such as the processor, player, ISP equipment etc. It also provides the **Network Monitors (p.31)** functionality. Refer to **Figure 86**.

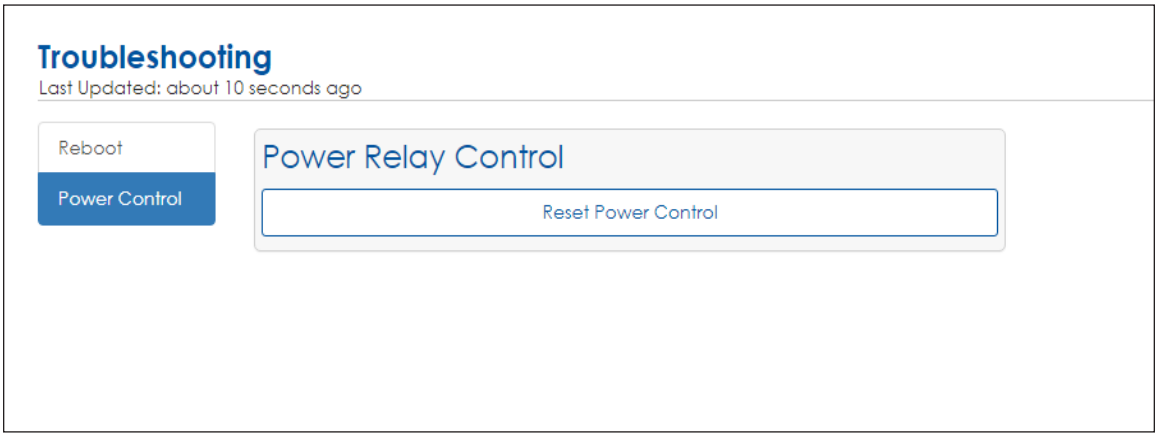

Figure 86: *Troubleshooting - Power Control*

10 Image Playback

Click **Image Playback** to manage a playlist of image files that can be shown on the display when configured for a specific playback mode. Locally stored image files can be added to the playlist and shown when the primary content source is unavailable.

Typically this function is used during system installation if the upstream player is not yet connected; locally stored image files can be used to show content by using an internal player. Image files are easily added or deleted form this list. Refer to **Figure 87**.

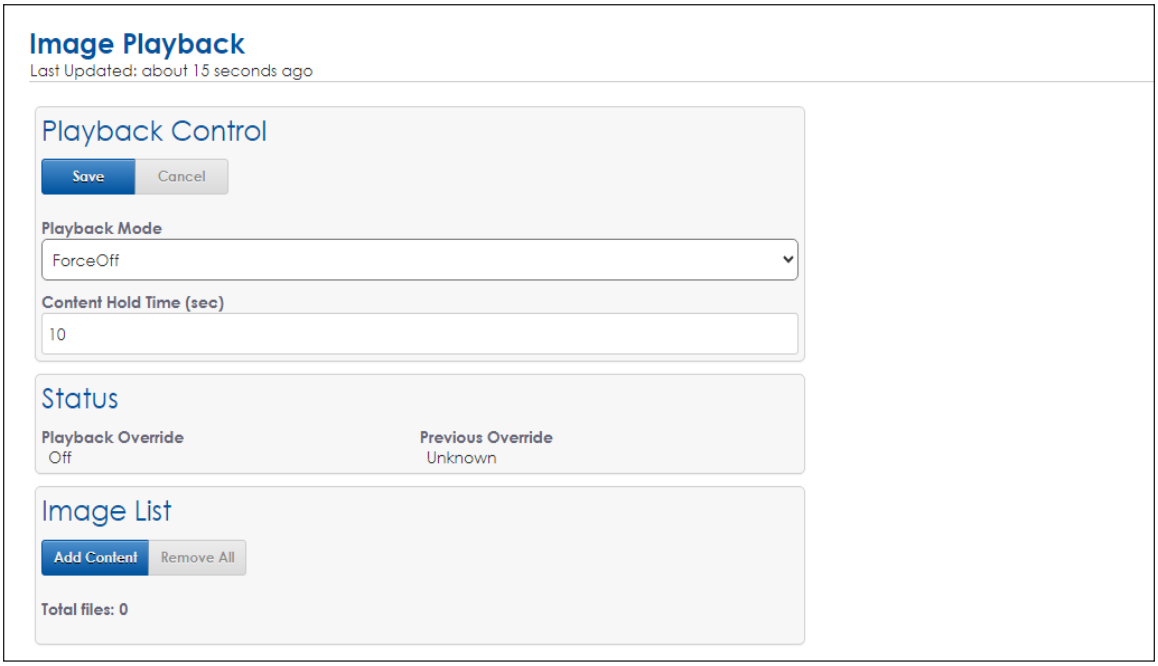

Figure 87: *Image Playback*

Playback Control

Choose the **Playback Mode** from the drop-down list:

- **ForceOff** – disables the playback of stored content
- **Normal** – plays stored content when there is no valid input
- **ForceOn** – overrides the output and plays stored content

Set the **Content Hold Time** in seconds to set the time for the stored content to be shown on the display.

Status

The **Status** section shows the current state of the **Playback Override** and the **Previous Override** status.

Image List

To manage the stored content files, follow these steps while referring to **Figure 88**.

1. Click **Add Content**. This triggers an **Open** dialog box.
2. Select the desired content file to upload. The content files are added to the list in the order they are uploaded.
3. Click the delete icon to remove any uploaded image.

> **Note:** Use caution when deleting any stored content files. The file is deleted as soon as the user clicks the delete icon next to the file name.

4. Click the download icon to download a stored content file from the processor.
5. Click **Remove All** at the top of the screen to remove all stored content files.

> **Note:** Use caution when removing all stored content files. The files are deleted as soon as the user clicks the **Remove All** button.

Supported image types are 24-bit JPEG, BMP, and PNG. The number of stored files is limited only by the storage space available on the processor. The available storage space is shown on the dashboard Storage tile. Refer to **Dashboard Tiles (p.11)**.

Figure 88: *Image Playback - Image List*

11 Glossary

Boot Loading: Process that allows changes to the display firmware.

Brightness: Adjustment of the overall brightness or dimming of a sign. The brightness level should be highest during the day to compete with daylight and lower at night for comfortable viewing. Manual brightness adjustment is performed by the user; automatic brightness adjustment is performed by the software based on information received from a light sensor.

Brightness Manager: Program that determines the appropriate brightness as configured by the user.

Calibration: Process of moving the color space of each pixel in a Daktronics LED video display as needed to improve the uniform intensity of the entire display.

CAN (Controller Area Network): Serial network of microcontrollers that enables real-time control applications by connecting devices and sensors.

Display Interface: Device used to deliver content from standard video interfaces to LED displays and performs non-video controls.

EOTF (Electro-Optical Transfer Function): Mathematical equation or set of instructions that translate voltages or digital values into brightness values.

Firmware: Software (programs or data) that has been written onto read-only memory as a permanent part of a computing device. It allows software to be read and executed but does not allow modification. Firmware is embedded in a hardware device and is considered a combination of software and hardware.

HDCP (High-bandwidth Digital Content Protection): Authorization and encryption process that prevents displaying or copying digital content by unauthorized devices.

HDR (High Dynamic Range): Video signal with greater bit depth, luminance, and color volume than standard dynamic range.

HLG (Hybrid Log-Gamma): An EOTF created by the BBC and NHK. HLG has backwards compatibility with SDR and was built to work with television.

LUX (Luxmeters): SI measurement of light intensity.

Peripheral: Component such as a light sensor used to detect ambient light at the display.

Peripheral Manager: Program that manages peripheral devices.

PQ (Perceptual Quantizer): An EOTF created by Dolby Vision and used in a 12-bit proprietary adaptation. HDR-10 is a 10-bit non-proprietary adaptation and has been standardized as SMPTE ST 2084. PQ was built to work with cinema.

ProLink Signal: Proprietary signal used between Daktronics devices.

SDR (Standard Dynamic Range): Video signal that uses a standard gamma curve and is normally limited to 8-bits.

Sensor Cable: Wire link between a controller and its corresponding sensor.

V-Max™ Signal: Proprietary signal used with Daktronics displays.

Video Processor: Device used to input and output a number of signal types.

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A Supplementary Documents

This section includes the following:

- DI-6000 Series Quick Guide (**DD3122248**)
- VP-6000 Series Quick Guide (**DD3446939**)

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The DI-6000 is a rack-mounted display interface that delivers content to Daktronics displays. The DI-6000 has a flexible form-factor design and accepts DisplayPort™, V-Max™ 4, or HD/3G SDI image sources. This quick guide explains basic DI-6000 connections and setup as shown in **Figure 1**.

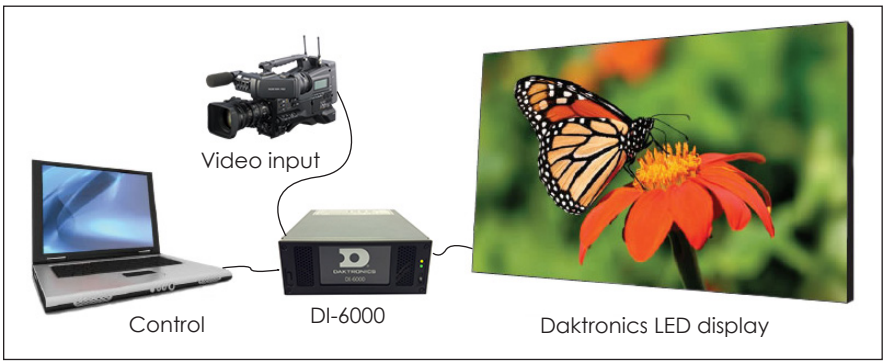

Figure 1: *DI-6000 Connections*

Hardware Setup

The main components of the DI-6000 are illustrated in **Figure 2** and **Figure 3**.

Figure 2: *DI-6000-2RU (1-Card) Front View*

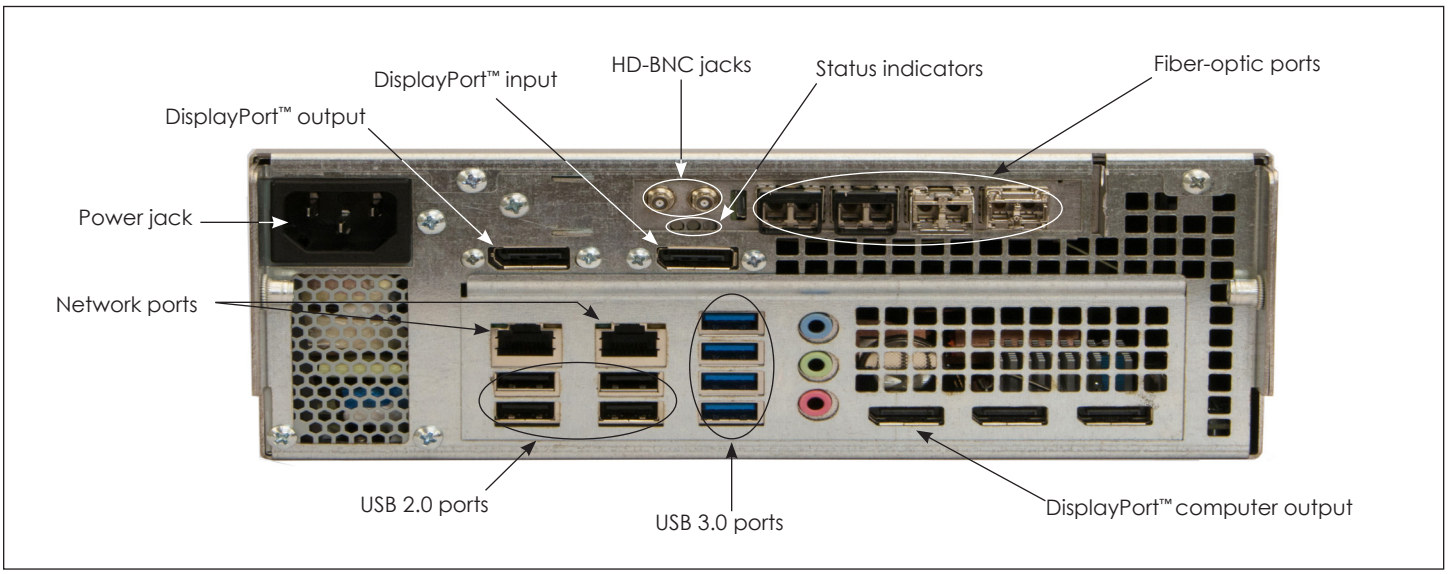

Figure 3: *DI-6000-2RU (1-Card) Rear View*

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Connecting to the LED Display(s)

The DI-6000 connects to the LED display using fiber-optic connections with a proprietary Daktronics protocol. The DI-6000 may run one or more displays in many possible configurations. Connect the display(s) to the fiber-optic ports starting with Port A and continuing from right to left (Port A to Port D) per the contract-specific drawings.

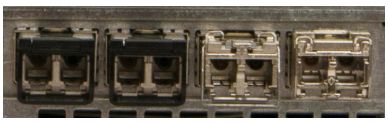

Figure 4: *Fiber-Optic Ports*

1. Locate fiber-optic ports on the DI-6000. Refer to **Figure 3** on page 1.
2. Insert duplex LC fiber-optic cables into their corresponding ports. The cables will click into place when seated properly. Refer to **Figure 4**.

> **Note:** Remove fiber dust covers from cables prior to inserting into ports.

Connecting to the Video Source

Any window from the video input can be selected as the displayed data; display content is scaled if the source window is not the same size as the destination/output window. The DI-6000 supports a maximum 1080p input format with a V-Max™ 4, HD/3G SDI, or DisplayPort™ input.

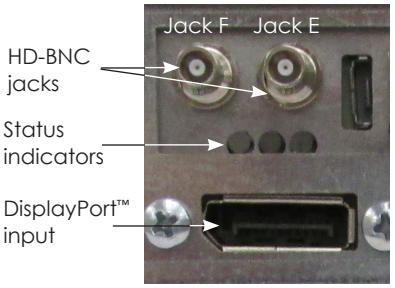

Figure 5: *Coax & DisplayPort™ Inputs*

1. For V-Max™ 4 or HD/3G SDI signal input, connect one end of the coax cable to one of two HD-BNC jacks. Refer to **Figure 5** and the contract-specific drawings.
2. For DisplayPort™ input, connect one end of the DisplayPort™ cable to the DisplayPort™ input port. Refer to **Figure 5**.

Connecting to the Network

1. Connect one end of the RJ45 network cable to the network Ethernet Port A. Refer to **Figure 6**.
2. Connect the other end of the cable to the computer or network.

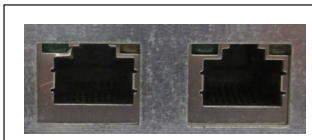

Figure 6: *Network Ports*

> **Note:** Use network Port A to connect to the facility network. Refer to site-specific shop drawings for more information. Currently all network settings are configured by Daktronics technical support.

Connecting the Power

1. Connect the power cord to the power jack. Refer to **Figure 7**.
2. Plug the other end of the cord into an outlet.

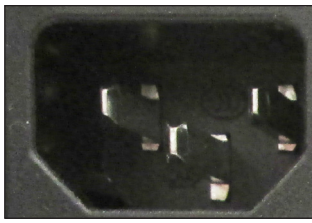

Figure 7: *Power Jack*

Contact Info

If further assistance is required, contact Daktronics Customer Service:

- www.daktronics.com/mysupport
- Domestic (U.S. and Canada): 1-800-325-8766
- International: +1-605-275-1040

The VP-6000 is a 3RU rack-mounted display interface that delivers content to Daktronics displays. The VP-6000 has a flexible form-factor design and accepts DisplayPort™ or HD/3G SDI SMPTE-compliant video sources. This quick guide explains basic VP-6000 connections and setup as shown in **Figure 1**.

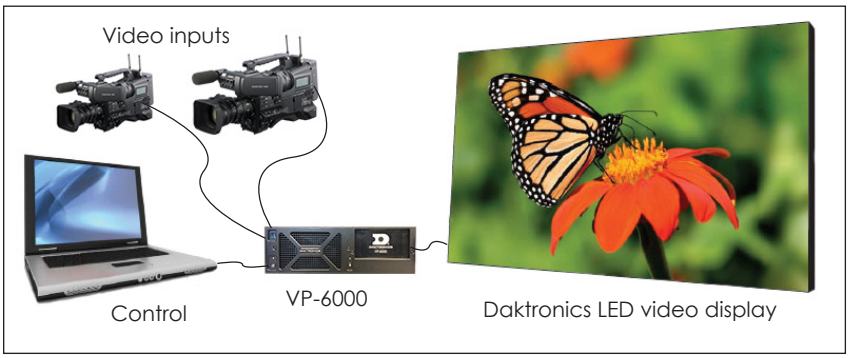

Figure 1: *VP-6000 Connections*

Hardware Setup

The main components of the VP-6000 are illustrated in **Figure 2** and **Figure 3**.

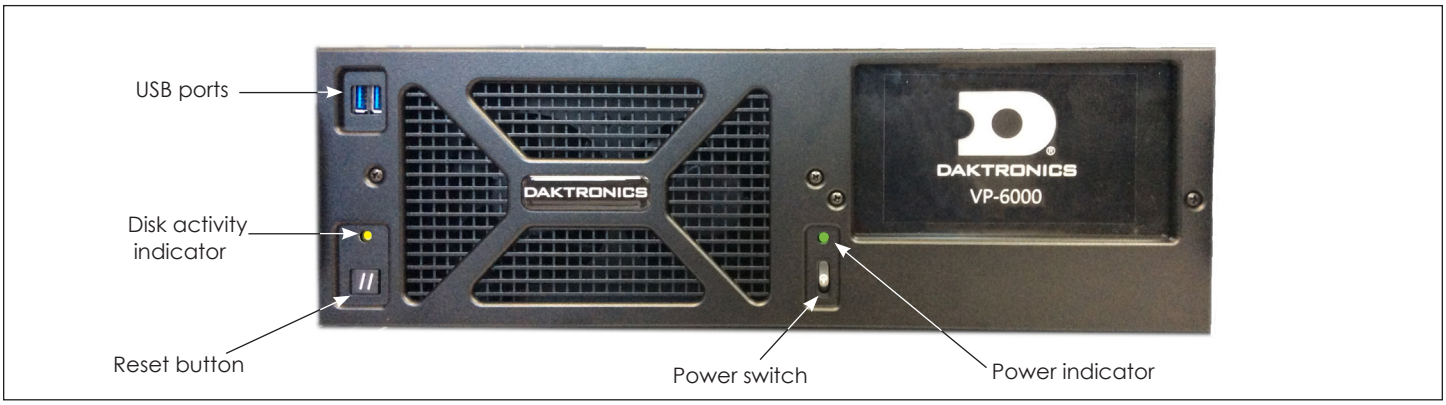

Figure 2: *VP-6000 Front View*

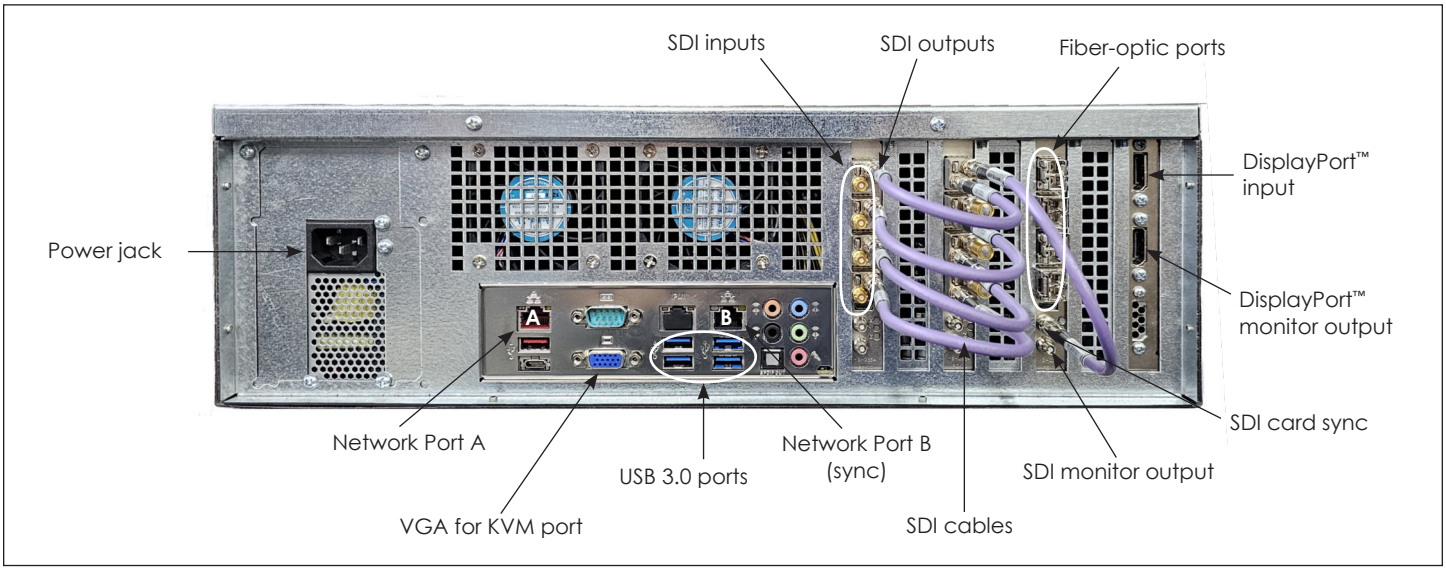

Figure 3: *VP-6000 Rear View*

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Connecting to the LED Video Display(s)

The VP-6000 connects to the LED display using fiber-optic connections with a proprietary Daktronics protocol. The VP-6000 may run one or more displays in many possible configurations. Any particular configuration is unique to that system installation. Connect the display(s) to the VP-6000 ports per the contract-specific drawings.

1. Locate fiber-optic ports on the VP-6000. Refer to **Figure 4**.
2. Insert duplex LC fiber-optic cables into their corresponding ports. The cables will click into place when seated properly.

Note: Remove fiber dust covers from cables prior to inserting into ports.

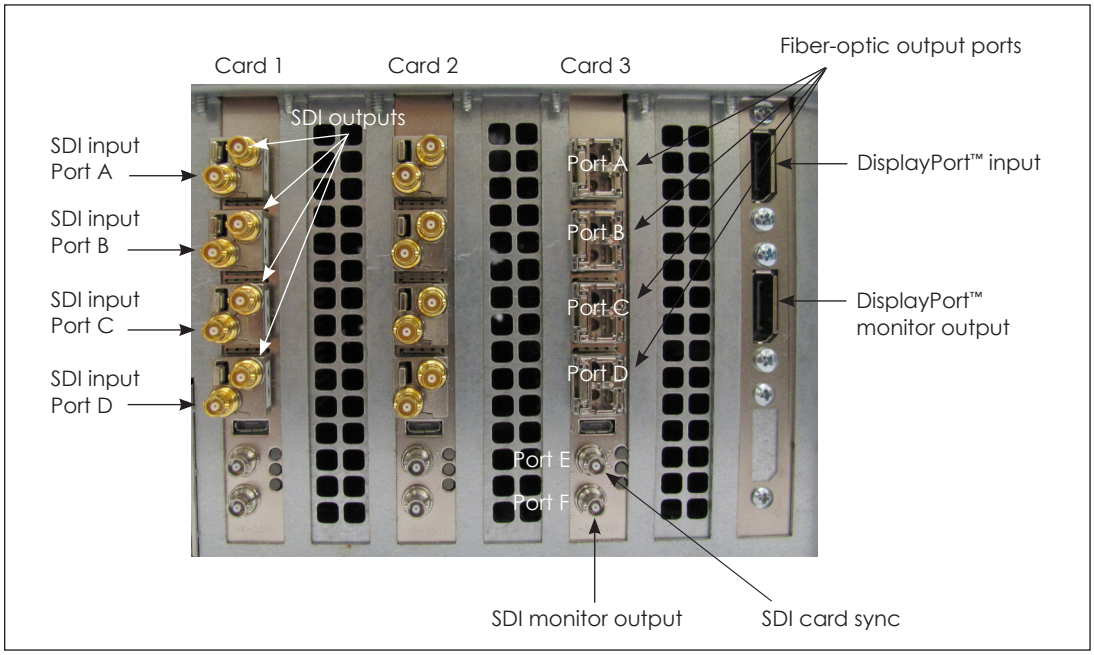

Figure 4: *SDI, Fiber-Optic, & DisplayPort™ Ports*

Connecting to the Video Source

The VP-6000 has four HD-BNC SDI input ports (A-D) available on Card 1 and one DisplayPort™ input port available on the upper-right side of the device. Refer to **Figure 4**. Connect the video source per the contract-specific drawings.

1. Connect one end of the SDI cable to one of the four SDI input ports for SDI input. Start with Port A at the top and work down toward Port D.
2. Connect one end of the DisplayPort™ cable to the DisplayPort™ input port.

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Connecting to the Network

1. Connect one end of the RJ45 network cable to the network Ethernet Port A. Refer to **Figure 5**.

Figure 5: *Network Ports*

2. Connect the other end of the cable to the computer or network.

> **Note:** The left Ethernet network port should be connected to the local network. Refer to site-specific shop drawings for more information. Currently, all network settings are configured by Daktronics technical support.

Connecting the Power

1. Connect the power cord to the power jack. Refer to **Figure 3** on page 1.
2. Plug the other end of the cord into an outlet.

Configuration

The VP-6000 configuration consists of three parts: video input, design layout (looks), and video output. Some aspects of the configuration are completed during the manufacturing process and others, such as SDI input configuration, are completed on site by Daktronics service personnel. After all configuration is complete, a user interface program such as Show Control triggers the VP-6000 to deliver content to a display in a specific format.

Video Input

Video input is configured by Daktronics.

Design Layout

Commands that specify design layouts, or "looks", for the video feed are created by Daktronics and provided to the customer as a file package. This file contains four variables used to position the video on the display: left, right, top, and bottom. The values for each of these variables determines the placement of the video on the display canvas. These pre-configured looks are set during the initial display setup according to the customer's preference. Typical configurations include "L-Bar" and "U-Bar". Refer to **Figure 6**. The exact distances from the sides of the display are set by Daktronics personnel.

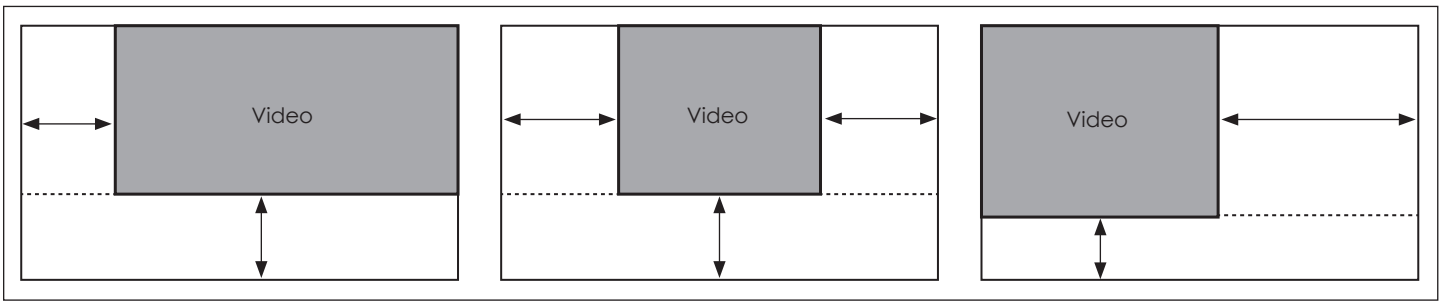

Figure 6: *Examples of Display Looks*

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Once a look is configured and named, this name can be used in the Show Control software to trigger that layout. A Show Control button is created in Display Studio to execute the command that places the video on the display in the correct location. Refer to **Figure 7**.

Additional buttons may be created to choose which video source comes into the display as well as determining other properties such as transition time and easing.

More than one property (video placement, video source, transition time, or easing) may be combined into one button.

Figure 7: *Show Control Scripting Button*

Video Output

Video output is configured by Daktronics.

Contact Info

If further assistance is required, contact Daktronics Customer Service:

- www.daktronics.com/mysupport
- Domestic (U.S. and Canada): 1-800-325-8766
- International: +1-605-275-1040

B Daktronics Warranty & Limitation of Liability

This section includes the Daktronics Warranty & Limitation of Liability statement.

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DAKTRONICS WARRANTY & LIMITATION OF LIABILITY

This Warranty and Limitation of Liability (the "Warranty") sets forth the warranty provided by Daktronics with respect to the Equipment. By accepting delivery of the Equipment, Purchaser and End User agree to be bound by and accept these terms and conditions. Unless otherwise defined herein, all terms within the Warranty shall have the same meaning and definition as provided elsewhere in the Agreement.

DAKTRONICS WILL ONLY BE OBLIGATED TO HONOR THE WARRANTY SET FORTH IN THESE TERMS AND CONDITIONS UPON RECEIPT OF FULL PAYMENT FOR THE EQUIPMENT

1. Warranty Coverage.

A. Daktronics warrants to the original end user (the "End User", which may also be the Purchaser) that the Equipment will be free from Defects (as defined below) in materials and workmanship for a period of one (1) year (the "Warranty Period"). The Warranty Period shall commence on the earlier of: (i) four weeks from the date that the Equipment leaves Daktronics' facility; or (ii) Substantial Completion as defined herein. The Warranty Period shall expire on the first anniversary of the commencement date.

"Substantial Completion" means the operational availability of the Equipment to the End User in accordance with the Equipment's specifications, without regard to punch-list items, or other non-substantial items which do not affect the operation of the Equipment

B. Daktronics' obligation under this Warranty is limited to, at Daktronics' option, replacing or repairing, any Equipment or part thereof that is found by Daktronics not to conform to the Equipment's specifications. Unless otherwise directed by Daktronics, any defective part or component shall be returned to Daktronics for repair or replacement. This Warranty does not include on-site labor charges to remove or install these components. Daktronics may, at its option, provide on-site warranty service. Daktronics shall have a reasonable period of time to make such replacements or repairs and all labor associated therewith shall be performed during regular working hours. Regular working hours are Monday through Friday between 8:00 a.m. and 5:00 p.m. at the location where labor is performed, excluding any holidays observed by Daktronics.

C. Daktronics shall pay ground transportation charges for the return of any defective component of the Equipment. All such items shall be shipped by End User DDP Daktronics designated facility per Incoterms® 2020. If returned Equipment is repaired or replaced under the terms of this Warranty, Daktronics will prepay ground transportation charges back to End User and shall ship such items DDP End User's designated facility per Incoterms® 2020; otherwise, End User shall pay transportation charges to return the Equipment back to the End User and such Equipment shall be shipped Ex Works Daktronics designated facility per Incoterms® 2020. All returns must be pre-approved by Daktronics before shipment. Daktronics shall not be obligated to pay freight for any unapproved return. End User shall pay any upgraded or expedited transportation charges

D. Any replacement parts or Equipment will be new or serviceably used, comparable in function and performance to the original part or Equipment and warranted for the remainder of the Warranty Period. Purchasing additional parts or Equipment from the Seller does not extend the Warranty Period.

E. Defects shall be defined as follows. With regard to the Equipment (excepting LEDs), a "Defect" shall refer to a material variance from the design specifications that prohibit the Equipment from operating for its intended use. With respect to LEDs, "Defects" are defined as LED pixels that cease to emit light. Unless otherwise expressly provided, this Warranty does not impose any duty or liability upon Daktronics for partial LED pixel degradation. Notwithstanding the foregoing, in no event does this Warranty include LED pixel degradation caused by UV light. This Warranty does not provide for the replacement or installation of communication methods including but not limited to, wire, fiber optic cable, conduit, trenching, or for the purpose of overcoming local site interference radio equipment substitutions.

EXCEPT AS OTHERWISE EXPRESSLY SET FORTH IN THIS WARRANTY, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, DAKTRONICS DISCLAIMS ANY AND ALL OTHER PROMISES, REPRESENTATIONS AND WARRANTIES APPLICABLE TO THE EQUIPMENT AND REPLACES ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ACCURACY OR QUALITY OF DATA. OTHER ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY DAKTRONICS, ITS AGENTS OR EMPLOYEES, SHALL NOT CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THIS LIMITED WARRANTY.

THIS LIMITED WARRANTY IS NOT TRANSFERABLE.

2. Exclusion from Warranty Coverage

This Warranty does not impose any duty or liability upon Daktronics for any:

A. damage occurring at any time, during shipment of Equipment unless otherwise provided for in the Agreement. When returning Equipment to Daktronics for repair or replacement, End User assumes all risk of loss or damage, agrees to use any shipping containers that might be provided by Daktronics, and to ship the Equipment in the manner prescribed by Daktronics;

B. damage caused by: (i)the improper handling, installation, adjustment, use, repair, or service of the Equipment, or (ii) any physical damage which includes, but is not limited to, missing, broken, or cracked components resulting from non-electrical causes;

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altered, scratched, or fractured electronic traces; missing or gauged solder pads; cuts or clipped wires; crushed, cracked, punctured, or bent circuit boards; or tampering with any electronic connections, provided that such damage is not caused by personnel of Daktronics or its authorized repair agents;

C. damage caused by the failure to provide a continuously suitable environment, including, but not limited to: (i) neglect or misuse; (ii) improper power including, without limitation, a failure or sudden surge of electrical power; (iii) improper air conditioning, humidity control, or other environmental conditions outside of the Equipment's technical specifications such as extreme temperatures, corrosives and metallic pollutants; or (iv) any other cause other than ordinary use;

D. damage caused by fire, flood, earthquake, water, wind, lightning or other natural disaster, strike, inability to obtain materials or utilities, war, terrorism, civil disturbance, or any other cause beyond Daktronics' reasonable control;

E. failure to adjust, repair or replace any item of Equipment if it would be impractical for Daktronics personnel to do so because of connection of the Equipment by mechanical or electrical means to another device not supplied by Daktronics, or the existence of general environmental conditions at the site that pose a danger to Daktronics personnel;

F. statements made about the product by any salesperson, dealer, distributor or agent, unless such statements are in a written document signed by an officer of Daktronics. Such statements as are not included in a signed writing do not constitute warranties, shall not be relied upon by End User and are not part of the contract of sale;

G. damage arising from the use of Daktronics products in any application other than the commercial and industrial applications for which they are intended, unless, upon request, such use is specifically approved in writing by Daktronics;

H. replenishment of spare parts. In the event the Equipment was purchased with a spare parts package, the parties acknowledge and agree that the spare parts package is designed to exhaust over the life of the Equipment, and as such, the replenishment of the spare parts package is not included in the scope of this Warranty;

I. security or functionality of the End User's network or systems, or anti-virus software updates;

J. performance of preventive maintenance;

K. third-party systems and other ancillary equipment, including without limitation front-end video control systems, audio systems, video processors and players, HVAC equipment, batteries and LCD screens;

L. incorporation of accessories, attachments, software or other devices not furnished by Daktronics; or

M. paint or refinishing the Equipment or furnishing material for this purpose.

3. **Limitation of Liability**

A. Daktronics shall be under no obligation to furnish continued service under this Warranty if alterations are made to the Equipment without the prior written approval of Daktronics.

B. It is specifically agreed that the price of the Equipment is based upon the following limitation of liability. In no event shall Daktronics (including its subsidiaries, affiliates, officers, directors, employees, or agents) be liable for any claims asserting or based on (a) loss of use of the facility or equipment; lost business, revenues, or profits; loss of goodwill; failure or increased cost of operations; loss, damage or corruption of data; loss resulting from system or service failure, malfunction, incompatibility, or breaches in system security; or (b) any special, consequential, incidental or exemplary damages arising out of or in any way connected with the Equipment or otherwise, including but not limited to damages for lost profits, cost of substitute or replacement equipment, down time, injury to property or any damages or sums paid to third parties, even if Daktronics has been advised of the possibility of such damages. The foregoing limitation of liability shall apply whether any claim is based upon principles of contract, tort or statutory duty, principles of indemnity or contribution, or otherwise

C. In no event shall Daktronics be liable for loss, damage, or injury of any kind or nature arising out of or in connection with this Warranty in excess of the Purchase Price of the Equipment. The End User's remedy in any dispute under this Warranty shall be ultimately limited to the Purchase Price of the Equipment to the extent the Purchase Price has been paid.

4. Assignment of Rights

A. The Warranty contained herein extends only to the End User (which may be the Purchaser) of the Equipment and no attempt to extend the Warranty to any subsequent user-transferee of the Equipment shall be valid or enforceable without the express written consent of Daktronics.

5. Governing Law; Election of Remedies

A. The rights and obligations of the parties under this Warranty shall not be governed by the provisions of the United Nations Convention on Contracts for the International Sales of Goods of 1980. The parties consent to the application of the laws of the State of South Dakota to govern, interpret, and enforce each of the parties' rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Warranty, without regard to conflict of law principles.

B. Any dispute, controversy or claim arising from or related to this Warranty, the parties shall first attempt to settle through negotiations. In the event that no resolution is reached, then such dispute, controversy, or claim shall be resolved by final and binding arbitration under the Rules of Arbitration of the International Chamber of Commerce. The language of the arbitration

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shall be English. The place of the arbitration shall be Sioux Falls, SD. A single arbitrator selected by the parties shall preside over the proceeding. If a single arbitrator cannot be agreed upon by the parties, each party shall select an arbitrator, and those arbitrators shall confer and agree on the appointed arbitrator to adjudicate the arbitration. The arbitrator shall have the power to grant any provisional or final remedy or relief that it deems appropriate, including conservatory measures and an award of attorneys' fees. The arbitrator shall make its decisions in accordance with applicable law. By agreeing to arbitration, the Parties do not intend to deprive any court of its jurisdiction to issue a pre-arbitral injunction, pre-arbitral attachment, or other order in aid of arbitration proceedings and the enforcement of any award. Without prejudice to such provisional remedies as may be available under the jurisdiction of a court, the arbitrator shall have full authority to grant provisional remedies and to direct the Parties to request that any court modify or vacate any temporary or preliminary relief issued by such court, and to award damages for the failure of any Party to respect the arbitrator's orders to that effect.

6. Availability of Extended Service Agreement

A. For End User's protection, in addition to that afforded by the warranties set forth herein, End User may purchase extended warranty services to cover the Equipment. The Extended Service Agreement, available from Daktronics, provides for electronic parts repair and/or on-site labor for an extended period from the date of expiration of this warranty. Alternatively, an Extended Service Agreement may be purchased in conjunction with this Warranty for extended additional services. For further information, contact Daktronics Customer Service at 1-800-DAKTRONics (1-800-325-8766).

Additional Terms applicable to sales outside of the United States

The following additional terms apply **only** where the installation site of the Equipment is located outside of the United States of America.

1. In the event that the installation site of the Equipment is in a country other than the U.S.A., then, notwithstanding Section 5 of the Warranty, where the selling entity is the entity listed in Column 1, then the governing law of this Warranty is the law of the jurisdiction listed in the corresponding row in Column 2 without regard to its conflict of law principles. Furthermore, if the selling entity is an entity listed in Column 1, then the place of arbitration is listed in the corresponding row in Column 3.

Column 1 (Selling Entity)	Column 2 (Governing Law)	Column 3 (Location of Arbitration)
Daktronics, Inc.	The state of Illinois	Chicago, IL, U.S.A.
Daktronics Canada, Inc.	The Province of Ontario, Canada	Toronto, Ontario, Canada
Daktronics UK Ltd.	England and Wales	Bristol, UK
Daktronics GmbH	The Federal Republic of Germany	Wiesbaden, Germany
Daktronics Hong Kong Limited	Hong Kong, Special Administrative Region of the P.R.C.	Hong Kong SAR
Daktronics Shanghai Co., Ltd.	The Peoples Republic of China	Shanghai, P.R.C.
Daktronics France, SARL	France	Paris, France
Daktronics Japan, Inc.	Japan	Tokyo, Japan
Daktronics International Limited	Macau, Special Administrative Region of the P.R.C.	Macau SAR
Daktronics Australia Pad Ltd	Australia	Sydney, Australia
Daktronics Singapore Pte. Ltd	Singapore	Singapore
Daktronics Brazil LTDA	Brazil	São Paulo, Brazil
Daktronics Spain S.L.U.	Spain	Madrid, Spain
Daktronics Belgium N. V	Belgium	Kruibeke, Belgium
Daktronics Ireland Co. Ltd.	Ireland	Dublin, Ireland

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