

Phantom 800 User Guide



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WELCOME

ABOUT THIS MANUAL

This manual contains information about the Phantom 800 processor. Material is presented under the following chapters:

Chapters

Chapter 1, "Welcome."

Chapter 2, "Product Information."

Chapter 3, "Getting Ready to Install."

Chapter 4, "Installation Instructions."

Chapter 5, "About the Web-Server GUI."

Chapter 6, "Matrix Switching."

Chapter 7, "Video Scaling."

Chapter 8, "Frame Grabbing."

Appendix A, "RS-232 and 10/100T Protocol."

Appendix B, "Upgrading Firmware."

Description

Use this section to get to know this product manual, understand key safety measures, and learn about the key features and functionality of the Phantom 800

Use this section to learn about installing the Phantom 800. Included in this section are both an overview of the installation process, and detailed, step-by-step installation instructions.

Use this section to learn about the digital video processing capabilities of the Phantom 800. Get detailed instructions on how to use the matrix switching, video scaling, and frame grabbing features.

Use this section to refer to detailed remote control command set information, firmware upgrade information and instructions, and a glossary of key terms used in this manual.

SAFETY INFORMATION AND INSTRUCTIONS

The following safety instructions are to ensure the safety of personnel using this equipment and to protect this device and working environment from potential damage.

CAUTION!



- 1 **ELECTRIC SHOCK HAZARD. DO NOT OPEN.**
- 2 **REMOVAL OF COVER MAY RESULT IN ELECTRIC SHOCK. There are no user-serviceable parts inside. Contact Black Diamond Video for authorized repair service.**

WELCOME

Customer Service and Support

IMPORTANT SAFETY INFORMATION:

- Read and follow all instructions – Read all safety and operating instructions before operating this equipment. Follow all operating instructions in this manual and adhere to all warnings on this equipment and in this manual.
- Keep all documentation – Retain the User Guide and accompanying safety instructions for future reference.
- Maintain proper ventilation – This equipment should be maintained in a well-ventilated room with adequate air flow. Do not obstruct the ventilation slots on the device.
- Keep away from heat – Do not place this device near a heat source. Failure to comply could result in overheating and damage to the equipment.
- Keep away from water and moisture – Do not place this equipment near areas of running water or dense condensation.
- Cleaning - Unplug the device before cleaning. The device can then be wiped with a water-dampened soft cloth.
- Proper electrical grounding - This device must be plugged into a properly grounded outlet in order to avoid electric shock. Do not bypass the grounding features of the power cable or plug. When using an extension cord, make sure the cord is designed for grounded plugs.

CUSTOMER SERVICE AND SUPPORT

For technical support and service, contact Black Diamond Video at:

Black Diamond Video

1000 Atlantic Ave, Suite 114

Alameda, California, 94501

Phone: (510) 769-2959

Fax: (510) 769-2949

Visit us on the web at www.blackdiamondvideo.com.

PRODUCT INFORMATION

INTRODUCING THE PHANTOM 800

The Phantom 800 is an all-digital DVI processor that integrates seamless 8 x 8 DVI matrix switching, post-output scaling, and frame-grabs into a single unit. When combined with Black Diamond Video's DVI converters, the Phantom 800 provides the same level of switching, scaling, and frame-grabs for any analog, SDI, or HD-SDI signal source eliminating the need for multi-format switches and cables.

The Phantom 800 supports DVI operation at the maximum TMDS rate of 1.65 Gb/s. The Phantom 800 works seamlessly with Black Diamond Video's DVI X-treme Cable Kits, allowing the transmission of DVI signals over 60 meters of copper on both the input and output sides of the processor.

The Phantom 800 block diagram (*Figure 1*) illustrates the full functionality of this DVI processor when combined with Black Diamond Video's DVI Converters and DVI X-treme Cable Kits.

Creating a DVI “Digital Backbone” That Accommodates Any Signal Source and Any Monitor

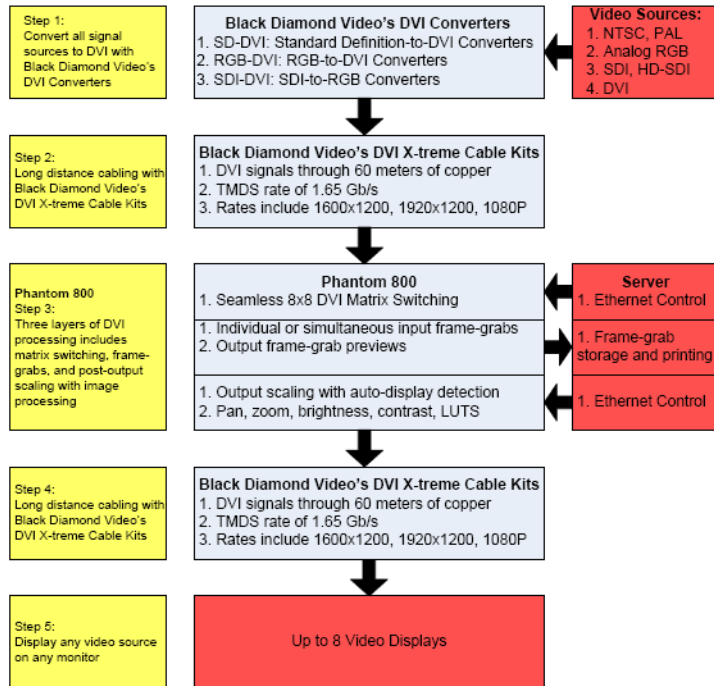


FIGURE 1. Phantom 800 Block Diagram

Architecture

The Phantom 800 processor has three layers of DVI processing:

SEAMLESS 8 X 8 DVI MATRIX SWITCHING

Seamless 8 x 8 DVI matrix switching implies no monitor blanking between switched images, irrespective of the video source.

POST-OUTPUT VIDEO SCALING AND IMAGE PROCESSING

Post-output scaling and image processing is performed with Black Diamond Video's S-1 Cards. The Phantom 800 can be populated with up to 8 S-1 Cards. The S-1 image processors have a number of features including built-in autodisplay detection which allows any video

source to be automatically displayed on any monitor at its maximal resolution and proper aspect ratio.

FRAME-GRABS

Frame-grabs can be performed on any input source, individually or simultaneously, and files can be archived in a server.

Phantom-Power

The Phantom 800 provides phantom-power to Black Diamond Video’s DVI Converters, including the standard-definition-to-DVI converter (SD-DVI), the RGB-to-DVI converter (RGB-DVI), and the SDI-to-DVI converter (SDI-DVI), as well as to DVI Xtreme Signal Conditioners. The Phantom 800 system diagram (Figure 2), gives an example of video sources and how they can be integrated using the Phantom 800.

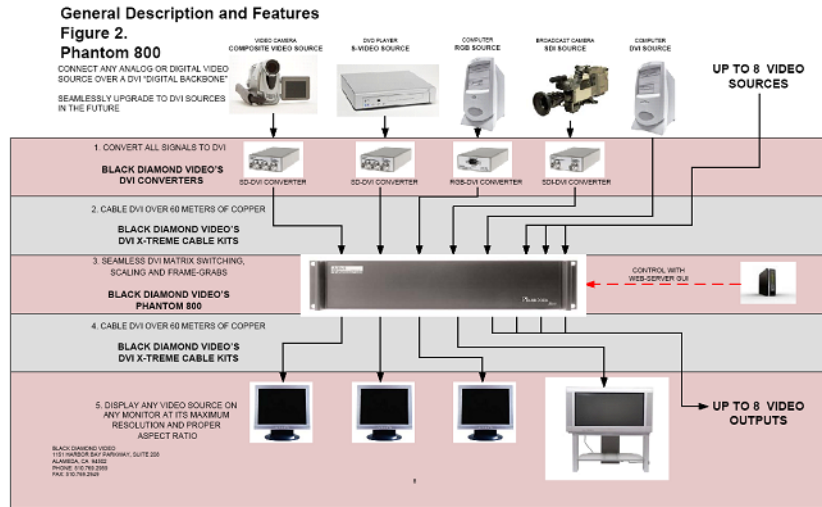


FIGURE 2. Phantom 800 System Diagram

Control

The Phantom 800 processor has three control methods. The processor has both RS-232 and 10/100T Ethernet controls. For remote applications, the Phantom 800 is equipped with a built-in, customizable, web-server graphical user interface (GUI).

KEY FEATURES

Features include the following:

SWITCHING

- Seamless, non-blocking 8 x 8 DVI matrix switching
- Supports single-link DVI matrix switching at the maximum TMDS rate of 1.65 Gb/s
- Input and output rates from 640 x 480 up to and including 1920 x 1200, interlaced or progressive

IMAGE PROCESSING - VIDEO SCALING

- Each output can be populated with one S-1 video processing card for up to eight cards per Phantom 800
- Auto-resolution display so that any video input will be displayed at its maximum resolution and proper aspect ratio on any video monitor
- Image controls include pan, zoom, position, contrast, brightness, and programmable LUTS
- Frame latency < 1.5 frames
- Built-in test pattern generator

FRAME-GRABS

- Individual or simultaneous frame-grabs from any input source
- Output frame-grab previews

PHANTOM-POWER AND CONVERTER CONTROLS

- Phantom-power to Black Diamond Video DVI X-treme Cable Kits
- Phantom-power and control for Black Diamond Video DVI Converters

CONTROLS

- RS-232 serial
- 10/100T Ethernet
- Customizable Web-server GUI

GENERAL

- 2U high, rack mountable
- Remote diagnostic capability

OPTIONS

The following options are available for the Phantom 800:

- **DVI X-treme Cable and Cable Kits** are phantom-powered and allow DVI signals to be transmitted up to 60 meters on both the input and output sides of the switch for a cumulative distance of 120 meters. These kits contain output cable and a DVI signal conditioner and are used when the distance between the Phantom 800 and the display device exceeds 60 meters.
- **SD-DVI Converter** converts any standard-definition analog signal (NTSC, PAL) to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the Phantom 800.
- **RGB-DVI Converter** converts any analog RGB signal to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the Phantom 800.
- **SDI-DVI Converter** converts any SDI or HD-SDI source to DVI. This converter is phantom-powered and is controlled and integrates seamlessly with the Phantom 800.
- **Front Panel Controls** - optional.

FRONT PANEL DETAIL

Figure 3 details the standard Phantom 800 front panel.



FIGURE 3. Phantom 800 Front Panel

REAR PANEL DETAIL

Figure 4 details the Phantom 800 rear panel.

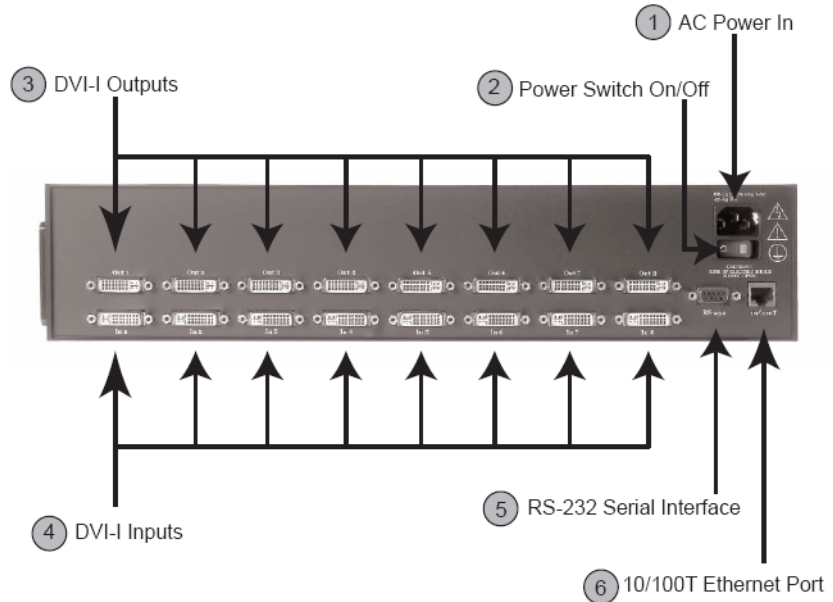


FIGURE 4. Phantom 800 Rear Panel

1. AC POWER IN

AC input power connection (120/240 VAC).

2. POWER SWITCH ON/OFF

The power switch is used to turn the unit on or off. The system status light on the front panel indicates when the unit is powered on.

3. DVI-I OUTPUT CONNECTIONS

The DVI-I output connectors are digital DVI outputs used to connect to a digital display device. When connecting to a display device more than 15 feet from the Phantom 800, a DVI X-treme Cable Kit should be used with the DVI X-treme conditioner placed on the display side of the cable.

4. DVI-I INPUT CONNECTIONS

The DVI-I input connectors are used to connect a video source to the Phantom 800. If the input source is a DVI source, it can be connected directly to the device. If the input source is an analog or SDI source, the signal must first be converted to DVI using a Black Diamond Video DVI converter before connecting it to the Phantom 800.

For cable distances greater than five meters, Black Diamond Video certified DVI cable should be used. Black Diamond Video certified DVI cable is factory tested and guaranteed for distances up to 60 meters. A DVI X-treme conditioner is not required on the input side of the Phantom 800.

5. RS-232 SERIAL INTERFACE

The RS-232 interface is a DCE type used to control the Phantom 800 by an external host over a serial-com port or alternate RS-232 controller.

6. 10/100T ETHERNET PORT

The 10/100T Ethernet port is used for controlling the Phantom 800 from a remote location. This port is also used for firmware upgrades in the field. The 10/100T Ethernet port can control the Phantom 800 through commands similar to the RS-232 port.

PHANTOM 800 PRODUCT SPECIFICATIONS

VIDEO SPECIFICATIONS

- Video Format: DVI Single-link, supports maximum TMDS rate of 1.65 Gb/s
- Video Resolution: DVI I/O rates from 640 x 480 to 1920 x 1200, interlaced or progressive, 25-165 MHz
- Connectors: DVI-I female
- Scaler Functions: Fit, Fill, Center, Stretch, Pan, Zoom, Programmable LUTS

CONTROLS

- Serial Controls: RS-232, DB9 female connector
- Ethernet Controls: 10/100T Ethernet, Protocols: Telnet, FTP, HTTP
- GUI: Customizable web-server GUI

GENERAL

- Dimensions/Weight: 2U, 19" rack-mountable enclosure, 16.73"W x 12"D x 3.5"H, 12 pounds



PRODUCT INFORMATION

Phantom 800 Product Specifications

- Temperature Rating: 0-55° C
- Power: 90-240 VAC, 47-63Hz, 200 Watts

GETTING READY TO INSTALL

This chapter presents an overview of the installation process. Read this chapter to get an introduction to how to install the Phantom 800. Included is information about using DVI converters (required if you have video sources that are not in DVI format) and Black Diamond cable kits.

For detailed installation instructions see Chapter 4, “Installation Instructions.”

IMPORTANT!	This product must be tested with the intended equipment before being permanently installed. Failure to do so voids any warranty and limited liability. Although Black Diamond Video tests the product to its fullest extent, situations may arise giving marginal results or potential compatibility issues when used with digital video display devices that are non-compliant or incompatible.
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OVERVIEW OF THE INSTALLATION PROCESS

Installing the Phantom 800 can be divided into two phases:

- System Test Installation.** Begin your installation process by performing a complete system test installation. The purpose of this phase is to establish remote control of the Phantom 800, and verify that all input and output channels are working. You will use a single test video input and at least one of the display devices you plan to use in your final system installation. You will verify that your test video input is properly displayed on the display device when routed through each input and output channel.
- Final System Installation.** Complete the installation process by doing the final system installation. In this phase, you will install the Phantom 800 in its final location. You will establish permanent remote control, connect all necessary input and output cabling, apply all input sources (including any DVI converters as necessary), and connect all display devices. Finally, you will verify that each video source is properly displayed on each display device.

SYSTEM TEST INSTALLATION OVERVIEW

The system test installation should be performed first to verify your equipment is working properly. It will also help you begin to plan for and organize the video sources, cabling equipment, and display devices in preparation for the final system installation.

NOTE: This is an overview of the system test installation to help inform and prepare you for the actual installation process. For detailed installation instructions, see Chapter 4, "Installation Instructions."

The system test installation consists of four steps. These steps are described below and illustrated in *Figure 5*.

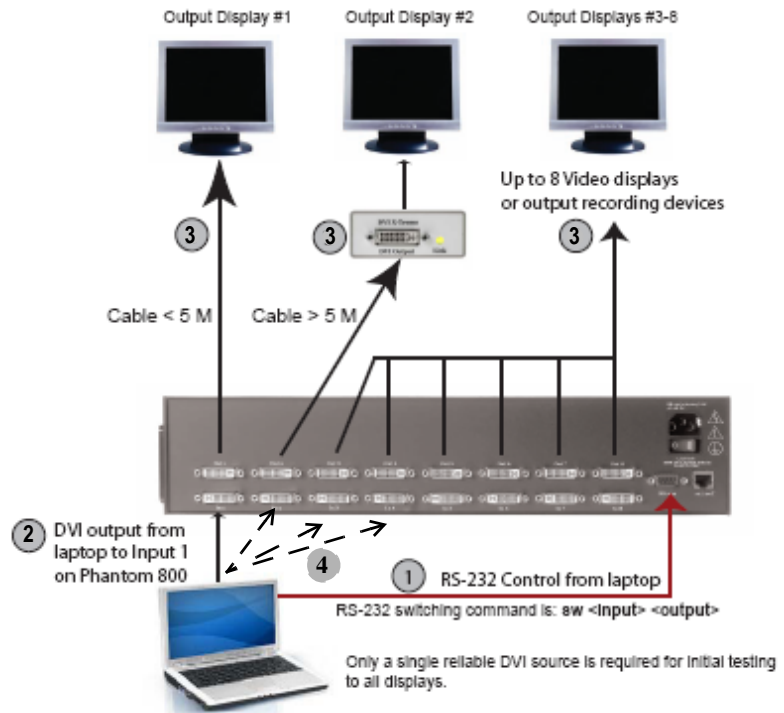


FIGURE 5. Phantom 800 System Test Installation Diagram

Step 1. Establish Temporary Remote Control of the Phantom 800

Establish temporary remote control of the Phantom 800 through a laptop computer or personal computer using the RS-232 serial interface. This allows control of the Phantom 800 so that the video signals going into and out of the processor can be tested.

Step 2. Connect a Test DVI Input Source

Connect a test DVI video source to Input 1 on the Phantom 800. Only a single DVI source is required for the system test installation phase. Use Black Diamond Video tested DVI cable to connect your DVI source to the Phantom 800.

NOTE: If the computer you used in Step 1 has a DVI output, you can use it for the test DVI video source in this step. This computer should have a built-in DVI graphics card.

Step 3. Connect one or more Display Devices and Establish Video Output

Connect a display device to Output 1 on the Phantom 800. Connect additional display devices as desired. Using the test DVI input connected in *Step 2*, use serial commands to switch the input to each connected display device. Verify that all video displays or output devices (such as DVD recorders, etc.) are functioning correctly.

Step 4. Test all Remaining Input Channels

Verify that all remaining input channels are functioning properly. Using the test DVI video source, connect it to each input channel on your Phantom 800 and then route the signal to each connected display device.

FINAL SYSTEM INSTALLATION OVERVIEW

The final system installation should be performed after you have completed the system test installation. You should have all of your video sources, cabling equipment, and display devices assembled in preparation for the final system installation.

NOTE: This is an overview of the system test installation to help inform and prepare you for the actual installation process. For detailed installation instructions, see Chapter 4, "Installation Instructions."

The final system installation consists of four steps. These steps are described below.

Step 1. Place the Phantom 800 into the Rackmount or Other Permanent Location

The Phantom 800 can be installed in a 2U rackmount. Place your unit in its permanent location before making any other system connections. Be sure to follow the safety warnings regarding proper ventilation of the equipment.

Step 2. Connect all Video Inputs

Connect all DVI sources directly to the Phantom 800 input channels. All non-DVI sources must first be converted to DVI using a Black Diamond Video DVI Converter. See “Using DVI Converters” on page 14 for more information.

All cabling from the DVI Converters to the Phantom 800 should be done using Black Diamond Video tested DVI cable. Black Diamond Video can not guarantee the quality of cable purchased from other manufacturers. See “Using Black Diamond Cable and Cable Kits” on page 15 for more information.

Step 3. Connect all Display and Output Devices

Connect all display and output devices to the Phantom 800 output channels. All cabling from the Phantom 800 to the display devices should be done using Black Diamond Video tested DVI cable. Black Diamond Video can not guarantee the quality of cable purchased from other manufacturers. See “Using Black Diamond Cable and Cable Kits” on page 15 for more information.

Step 4. Establish Permanent Remote Control

Establish permanent remote control to the Phantom 800 using RS-232 or 10/100T Ethernet control.

Step 5. Test all Input/Output Switching Configurations

Route each input to each output in turn and verify the video displays properly on the display device. If video output option boards are installed, test the video processing functions of these boards.

USING DVI CONVERTERS

The Phantom 800 accepts DVI video inputs only. Black Diamond Video offers a line of DVI converters which you can use to convert your RGB, SD or S-Video (NTSC and PAL), and SDI video signals to DVI. With the appropriate DVI converter, you can use any of these video formats as a source for the Phantom 800.

The converter should be located as close to the video source as possible to eliminate cabling problems such as attenuation and noise.

See “Options” on page 7 for more information about the available DVI converters and the converters’ product documentation.



USING BLACK DIAMOND CABLE AND CABLE KITS

All cabling from the video source to the Phantom 800, and from the Phantom 800 to the display devices, should be done using Black Diamond Video tested DVI cable.

Signal conditioners should be applied within the last three meters of cabling before each display device. Black Diamond Video offers both single-link DVI and a dual-link DVI cable kits which include Black Diamond Video tested DVI cable and a signal conditioner.

See Chapter 2, “Product Information,” for more information about DVI converters, cable, and cable kit options.



GETTING READY TO INSTALL

Using Black Diamond Cable and Cable Kits

INSTALLATION INSTRUCTIONS

This chapter tells you how to install your Phantom 800 system. You should read Chapter 3, “Getting Ready to Install,” first to familiarize yourself with the installation process.

The installation of your Phantom 800 should be conducted in two phases:

System Test Installation. Begin your installation process by performing a complete system test installation. The purpose of this phase is to establish remote control of the Phantom 800, and verify that all inputs and outputs are working. You will use a single test video input and one of the display devices you plan to use in your final system installation. You will verify that your test video input is properly displayed on the display device when routed through each of the input and output channels.

Final System Installation. Complete the installation process by doing the final system installation. In this phase, you will install the Phantom 800 in its final location. You will connect all necessary input and output cabling, apply all input sources (including any DVI converters as necessary), connect all display devices, and establish permanent remote control.

SYSTEM TEST INSTALLATION

Complete a thorough test of your Phantom 800 equipment before doing the final system installation. The system test installation consists of the following series of steps:

Step 1: AC Power Connection and System Power Up

WHAT YOU WILL NEED FOR THIS STEP:

- Power cord (supplied)
- Surge protector (recommended)
- Line conditioner (recommended)

DESCRIPTION:

Begin your system test installation by connecting the Phantom 800 to an AC power supply and powering it up.

- 1 Connect the power cord (supplied) to the AC input on the Phantom 800.**
- 2 Plug the power cord into a surge protector (recommended).**
- 3 Plug the surge protector into a conditioned AC power source.**

- 4 Turn on the Phantom 800 using the power switch on the rear panel.

Step 2: Establish Test Remote Control

WHAT YOU WILL NEED FOR THIS STEP

- Laptop or personal computer with a serial port
- RS-232 direct-connect type serial cable with DB9 (male) connector

DESCRIPTION

The Phantom 800 can be controlled over either an RS-232 or 10/100T Ethernet connection. For initial testing of this equipment, Black Diamond Video recommends temporary control of the Phantom 800 with a laptop computer using the RS-232 terminal. Using the RS-232 interface and commands allows for the easy set-up and rapid ability to debug any installation problems.

- 1 Connect a laptop or PC to the Phantom 800 RS-232 serial interface using a direct-connect type cable.
- 2 Open up a serial port terminal on the laptop or PC connected to the Phantom 800. For Microsoft Windows-based programs access this with Start > All Programs > Accessories > Communications > Hyperterminal.

The New Connection window appears.

- 3 Enter a name for your connection and choose an icon.
- 4 Click OK.

The Connect To window appears.

- 5 In the Connect using field, select "COM1" port.
- 6 Click OK.

The Port Settings window appears.

- 7 Configure the settings as follows:
 - Baud: 9600
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: None

- 8 Click Apply.

The RS-232 connection to the Phantom 800 is established and the processor can be controlled using the RS-232 command set found in Appendix A, "RS-232 and 10/100T Protocol."

Step 3: Connect and Test a DVI Input on all Output Channels

WHAT YOU WILL NEED FOR THIS STEP

- DVI video input source. Black Diamond Video recommends that, for this DVI input source, you use the same laptop or personal computer that is being used to temporarily control the Phantom 800.
- Display device capable of displaying a DVI video input signal.
- DVI cable.
- (Optional) DVI signal conditioners. If the distance to the display requires more than 5 meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used with the DVI X-treme II Conditioner and appropriate length of cable provided in the cable kit.
- RS-232 Commands:

SWITCH (SW)	<input>	<output>
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DESCRIPTION

For the system test installation, apply a single DVI test video input signal and connect at least one of the display devices you plan to use in your final system installation. Verify that your test video input is properly displayed on the display device when routed through each input and output channel. The easiest method to ensure transmission is to connect a reliable DVI video source directly to the Phantom 800 input.

1 Connect a DVI source to Input 1 of the Phantom 800.

This should be done using Black Diamond Video tested DVI cable. Black Diamond Video recommends that you use the same laptop that is being used to temporarily control the Phantom 800 simultaneously as the DVI source.

2 Make certain that the display being tested has been set to display a DVI digital signal.

3 Connect Output 1 of the Phantom 800 to the display device using Black Diamond Video tested DVI cable.

NOTE: If the distance to the display device requires more than 5 meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used with the DVI X-treme II Conditioner.

If a DVI X-treme Cable Kit is needed, do the following:

- a** Connect the long length of cable from Output 1 of the Phantom 800 to the input of the DVI X-treme II Conditioner.

- b Connect the output of the DVI Xtreme II Conditioner using the short length of DVI cable to the display. The red indicator light on the DVI X-treme II Conditioner indicates a good DVI signal is being transmitted to the display.
- 4 Within the serial port terminal, type in the command: `sw 1 1`.**
Input 1 is switched to display to Output 1. Video should now be displayed on your test output device.
- 5 Move the output cable from Output 1 to Output 2 so that Output 2 is now connected to the display device.**
- 6 Within the serial port terminal type in the command: `sw 1 2`.**
Input 1 is switched to display to Output 2. Video should again appear on the test output device.
- 7 Repeat steps Step 5 and Step 6, moving the output cable to each of the remaining output channels in turn. Use the SWITCH command to route the video through the connected channel. Verify the video displays properly through each output channel.**
- 8 Move the input cable from Input 1 to Input 2 so that Input 2 is now connected to the DVI test signal.**
- 9 Within the serial port terminal, type in the command: `sw 1 [output #]`, where [output #] is the output channel which is currently connected to your test display device.**
- 10 Repeat Step 8 and Step 9, moving the input cable to each of the remaining input channels in turn. Use the SWITCH command to route the video from the connected channel. Verify the video displays properly coming from each input channel.**

This completes the system test installation.

FINAL SYSTEM INSTALLATION

Once you have completed a thorough test of your Phantom 800 equipment you are ready to do the final system installation. *Figure 6* illustrates an installation with multiple video sources, both DVI format, as well as analog format using Black Diamond Video DVI Converters.

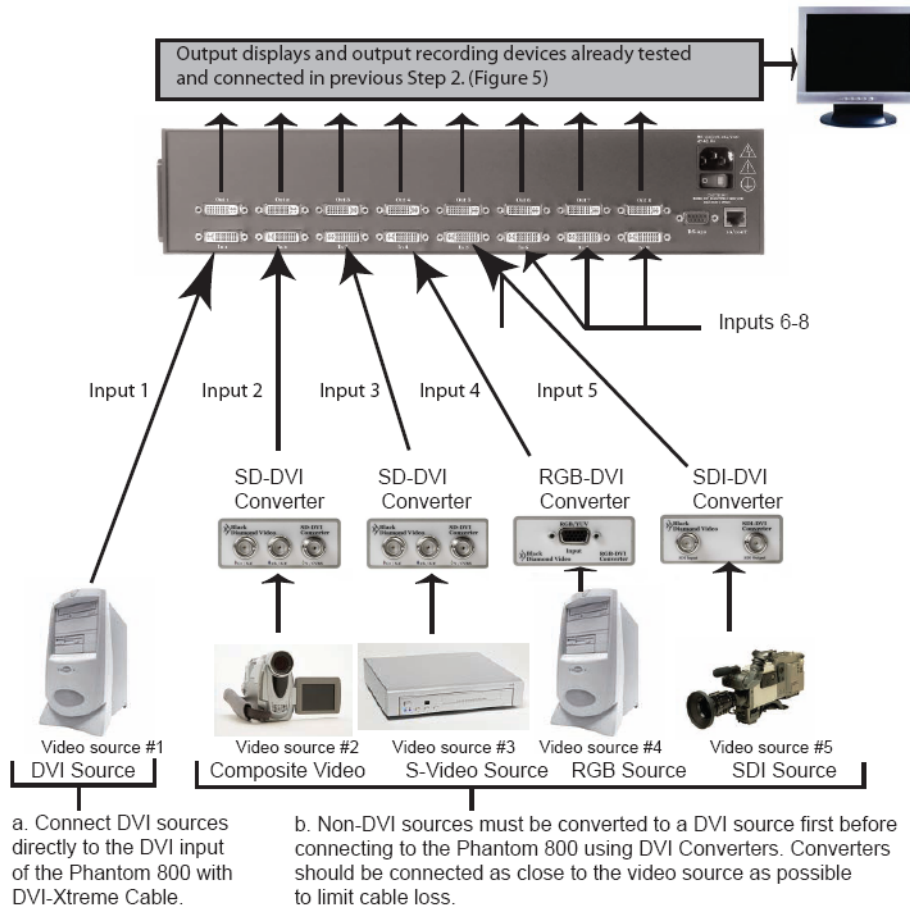


FIGURE 6. System Installation Illustration

The final system installation consists of the following series of steps:

Step 1: AC Power Connection

WHAT YOU WILL NEED FOR THIS STEP

- Power cord (supplied)

- Surge protector (recommended)
- Line conditioner (recommended)

DESCRIPTION

Begin your final system installation by connecting the Phantom 800 to an AC power supply and powering it up.

- 1 Connect the power cord (supplied) to the AC input on the Phantom 800.**
- 2 Plug the power cord into a surge protector (recommended).**
- 3 Plug the surge protector into a conditioned AC power source.**
- 4 Turn on the Phantom 800 using the power switch on the rear panel.**

Step 2: Connect All DVI Inputs

WHAT YOU WILL NEED FOR THIS STEP

- All DVI video input sources you want to display through the Phantom 800
- All non-DVI video sources you want to display through the Phantom 800
- DVI converters for the non-DVI video sources
- DVI cable

DESCRIPTION

Connect all DVI sources directly to the Phantom 800 input channels. All non-DVI sources must first be converted to a DVI signal before they connecting them to the Phantom 800. See Figure 6, “System Installation Illustration,” on page 21 for an example of a typical Phantom 800 installation.

- 1 Connect any DVI signals directly to Phantom 800 input channels.**
- 2 Apply DVI converters to any non-DVI signals and connect the output of the converters to input connectors on the Phantom 800.**

Step 3: Connect Phantom 800 Outputs to All Displays

WHAT YOU WILL NEED FOR THIS STEP

- All DVI-capable display devices you want to use in your installation
- DVI cable
- (Optional) DVI signal conditioners. If the distance to the display requires more than 5 meters of DVI cable, a Black Diamond Video DVI X-treme Cable Kit should be used

with the DVI X-treme II Conditioner and appropriate length of cable provided in the cable kit.

DESCRIPTION

Connect all DVI-capable displays to the Phantom 800 output channels. See *Figure 7* for an illustration of a typical Phantom 800 system diagram.

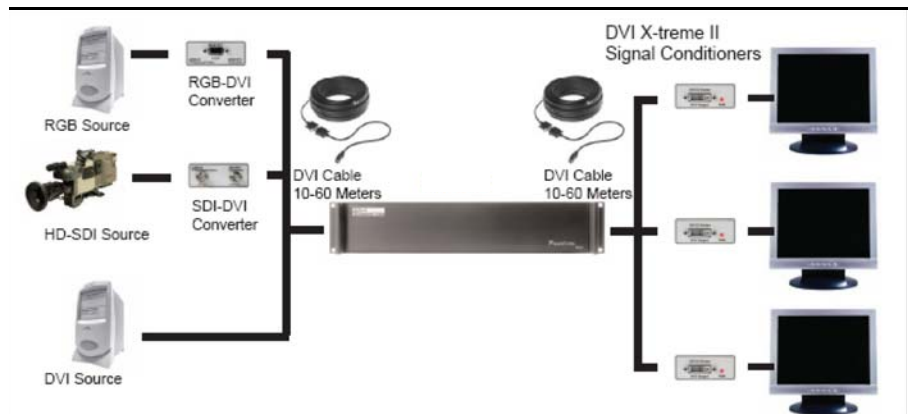


FIGURE 7. System Installation Overview Diagram

- 1** Connect DVI cable to Output 1 of the Phantom 800.
- 2** Connect the other end of the DVI cable as follows:
 - a** If the cable is more than five meters in length, connect it to the input of the DVI X-treme II Conditioner. Connect a second DVI cable, no more than five meters in length, to the DVI display device.
 - b** If the cable is less than five meters in length, connect it directly to the DVI display device.
- 3** Repeat **Step 1** and **Step 2** for all other output channels to be used in your installation.

Step 4: Establish Permanent Remote Control

WHAT YOU WILL NEED FOR THIS STEP

- Laptop or personal computer
- For RS-232 control: RS-232 direct-connect type serial cable with DB9 (male) connector

- For Ethernet control: Ethernet cable. If you are connecting your control computer *directly* to the Phantom 800, then you will need a crossover cable.
- RS-232 and Telnet Commands:

SHOWNET		
ipaddr	<ipaddr>	
telnet	<ipaddr>	8998

DESCRIPTION

When all video sources going into the Phantom 800 and all video outputs going to the displays or recording devices have been shown to function correctly, permanent control of the Phantom 800 can be established using the RS-232 serial interface or the 10/100T Ethernet controls, or the web-server GUI. Black Diamond Video recommends that you read this section carefully before establishing permanent controls.

IMPORTANT!	<p>When connecting a control computer to the RS-232 connector on the Phantom 800, you must use a direct-connect type cable.</p> <p>When connecting a control computer directly to the Ethernet connector you must use a crossover cable. Both the control computer and the Phantom 800 must then use a static IP address.</p>
-------------------	---

Whether the Phantom 800 is controlled through an RS-232 terminal or through a 10/100T Ethernet port using Telnet commands, or the web-server GUI, all control begins with the RS-232 terminal. The RS-232 terminal is used to check and assign an IP address for the Phantom 800.

Details of the serial control commands and telnet protocols are in Appendix A, “RS-232 and 10/100T Protocol.”

An introduction to the web-server GUI is in Chapter 5, “About the Web-Server GUI.” Details of the web-server GUI controls are in Chapter 6, “Matrix Switching,” and Chapter 8, “Frame Grabbing.” Control of the Phantom 800 can be accomplished using any one of the following five methods:

- **RS-232 Only**—This method is used when only RS-232 control is desired. Controls are managed using the Command Set (Appendix A).
- **10/100 T Ethernet and RS-232**—This method is used when 10/100T Ethernet control of the Phantom 800 is desired and the control computer is a client on a larger network which uses DHCP (dynamic host configuration protocol) to assign IP addresses. This is the default setting for 10/100T Ethernet control of the Phantom 800. RS-232 control is used to determine the dynamic IP address of the Phantom 800.

- **10/100 T Ethernet Only**—This is a simpler method than control by 10/100 T Ethernet and RS-232, but it requires that a static IP address be assigned to the Phantom 800 and to the control computer. A static IP address is where a computer uses the same address every time a user logs on to a network. By default, the Phantom 800 is configured with a dynamic IP address.

The type of IP address for the control computer depends upon whether the computer is connected directly to the Phantom 800 Ethernet connector, or if it is connected via a network:

Connection Route	IP Address Type
Direct to Phantom 800	Static only
Through a network	Dynamic or Static

If the computer controlling the Phantom 800 is a client assigned to a larger network, the network administrator will need to assign the static IP address to the control computer and Phantom 800. If the static IP address of the Phantom 800 is unknown, it can be accessed using the RS-232 `SHOWNET` command. The RS-232 controls must be used for initial set-up of the Phantom 800 IP address, and thereafter will no longer be required.

- **Web-Server GUI and RS-232 Control**— This method uses a web-server GUI rather than Telnet commands to control the Phantom 800 over a network. In this instance, the control computer is a client on a larger network which uses DHCP to assign IP addresses. The web-server GUI within the Phantom 800 is invoked by opening a web-browser on the control computer (Black Diamond Video recommends Mozilla Firefox) and entering the IP address of the Phantom 800 into the address bar of the browser.
- **Web-Server GUI without RS-232 Control**— With this method, a “static” IP address is assigned to the Phantom 800 and the control computer. A web-browser (Black Diamond Video recommends Mozilla Firefox) is opened and the static IP address of the Phantom 800 is entered into the address bar of the browser. This is the easiest method of controlling the Phantom 800.

RS-232 ONLY

- 1 **Connect the control computer to the RS-232 connector on the Phantom 800 using an RS-232 direct-connect type cable.**
- 2 **Open up a serial port terminal on the control computer connected to the Phantom 800.**
On Microsoft Windows, you can use HyperTerminal for serial communications.
- 3 **Configure the port settings as follows:**
 - Baud: 9600
 - Data bits: 8

- Parity: None
- Stop bits: 1
- Flow control: None

The RS-232 connection to the Phantom 800 is established and the processor can be controlled using the RS-232 command set found in Appendix A, “RS-232 and 10/100T Protocol.”

NOTE: To avoid recreating the connection parameters each time you reestablish RS-232 connection to the Phantom 800, you can save the connection for subsequent control sessions.

10/100T ETHERNET AND RS-232

- 1 Connect the Phantom 800 to your network using the Ethernet connector.**
- 2 Connect the RS-232 control computer to the Phantom 800 with an RS-232 direct-connect type cable.**

NOTE: The RS-232 control computer and the Ethernet control computer can be the same machine or two different machines.

- 3 From the RS-232 control computer, determine the Phantom 800 IP address:**
 - a** Establish RS-232 control of the Phantom 800 as described in “RS-232 Only” on page 25.
 - b** Enter the command: `SHOWNET` (see Appendix A, “RS-232 and 10/100T Protocol,” for details).

The Phantom 800 IP address is returned.

- 4 From the Ethernet control computer, which must be connected to the same network as the Phantom 800, open All Programs > Accessories > Command Prompt and enter the command `telnet <IP address> 8998` using the IP address obtained in Step 3.**

The Telnet session is initiated.

Telnet control is established. See Appendix A, “RS-232 and 10/100T Protocol,” for a list of key commands and how they are used to control the Phantom 800

To exit the network connection, enter the command `exit`.

NOTE: If the Phantom 800 is powered off for several days, when the equipment is powered back on, the DHCP server within the network may issue a new IP address. If this happens, 10/100T Ethernet control can only be restarted by beginning at Step 3 and determining the new IP address using the RS-232 `SHOWNET` command again.

10/100T ETHERNET ONLY

- 1 **Connect the control computer directly to the Phantom 800 with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.**
- 2 **Set the static IP address of the Phantom 800:**
 - a Establish RS-232 control of the Phantom 800 as described in “RS-232 Only” on page 25.
 - b Issue the IPADDR command. For example:


```
IPADDR 192.168.1.103
```

The Phantom 800 is assigned the static IP address 192.168.1.103.
- 3 **Set the static IP address of the control computer. If you are using Microsoft Windows, follow these steps:**
 - a Click Start > All Programs > Accessories > Communications > Network Connections.

The Network Connections window appears.
 - b Right-click on Local Area Connection and select Properties.

The Local Area Connection Properties window appears.
 - c Click on Internet Protocol (TCP/IP) to highlight it and click Properties.

The Internet Protocol (TCP/IP) Properties window appears.
 - d Select Use the following IP address and enter an address in the IP address field.

For example, enter 192.168.1.10.
 - e Click on Subnet mask and the number 255.255.255.0 should appear.
 - f Enter the static IP address in the Default gateway field.

For example, enter 192.168.1.1.
 - g Click OK.

The static IP address of the control computer is set.
- 4 **Click Start and navigate to All Programs > Accessories > Command Prompt.**

The Command Prompt window appears.
- 5 **Enter the command `telnet <IP address> 8998` using the IP address assigned to the Phantom 800 in Step 2 above.**

Telnet control is established. See Appendix A, “RS-232 and 10/100T Protocol,” for a list of commands and how they are used to control the Phantom 800.

Because the Phantom 800 now has a static IP address, the RS-232 interface is no longer required. If the IP address of the Phantom 800 is misplaced, simply reconnect the RS-232 controls and use the `SHOWNET` command to retrieve the IP address.

The final system installation process is complete.

WEB-SERVER GUI AND RS-232

- 1 Download Java software onto the RS-232 control computer:**
 - a** Open your web browser and go to www.java.com
 - b** For Windows operations systems, download the Windows Offline version.
- 2 (Recommended) Download and install the Mozilla Firefox web browser onto the control computer from www.mozilla.com/firefox/.**
- 3 Connect the control computer directly to the Phantom 800 with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.**
- 4 From the RS-232 control computer, determine the Phantom 800 IP address:**
 - a** Establish RS-232 control of the Phantom 800 as described in “RS-232 Only” on page 25.
 - b** Enter the command: SHOWNET (see Appendix A, “RS-232 and 10/100T Protocol,” for details).

The Phantom 800 IP address is returned.

- 5 Open the Firefox web browser on the control computer and enter the IP address obtained in Step 4 into the browser address bar.**

The GUI is initiated and control of the Phantom 800 is now done through the GUI.

Details of the web-server GUI controls are in Chapter 6, “Matrix Switching,” and Chapter 8, “Frame Grabbing.”

NOTE: If the Phantom 800 is powered off for several days, when the equipment is powered back on, the DHCP server within the network may issue a new IP address. If this happens, web-server GUI control can only be restarted by beginning at Step 3 and determining the new IP address using the RS-232 SHOWNET command again.

WEB-SERVER GUI ONLY

- 1 Download Java software onto the RS-232 control computer:**
 - a** Open your web browser and go to www.java.com. For Windows operations systems, download the Windows Offline version.
- 2 (Recommended) Download and install the Mozilla Firefox web browser onto the control computer from www.mozilla.com/firefox/.**
- 3 Connect the control computer directly to the Phantom 800 with an RS-232 direct-connect type cable and a 10/100T Ethernet crossover cable.**

NOTE: The RS-232 control computer and the Ethernet control computer can be the same machine or two different machines.

4 Set the static IP address of the Phantom 800:

a Establish RS-232 control of the Phantom 800 as described in “RS-232 Only” on page 25.

b Issue the IPADDR command. For example:

```
IPADDR 192.168.1.103
```

The Phantom 800 is assigned the static IP address 192.168.1.103.

5 Set the static IP address of the control computer. If you are using Microsoft Windows, follow these steps:

a Click Start > All Programs > Accessories > Communications > Network Connections.

The Network Connections window appears.

b Right-click on Local Area Connection and select Properties.

The Local Area Connection Properties window appears.

c Click on Internet Protocol (TCP/IP) to highlight it and click Properties.

The Internet Protocol (TCP/IP) Properties window appears.

d Select Use the following IP address and enter an address in the IP address field.

For example, enter 192.168.1.10.

e Click on Subnet mask and the number 255.255.255.0 should appear.

f Enter the static IP address in the Default gateway field.

For example, enter 192.168.1.1.

g Click OK.

The static IP address of the control computer is set.

6 Open the Mozilla Firefox web-browser and type the Phantom 800 IP address set in Step 4 into the address bar of the browser and press Enter.

The GUI will be invoked and control of the Phantom 800 is now done through the GUI. Details of the web-server GUI controls are in Chapter 6, “Matrix Switching,” and Chapter 8, “Frame Grabbing.”

Because the Phantom 800 now has a static IP address, the RS-232 interface is no longer required. If the IP address of the Phantom 800 is misplaced, simply reconnect the RS-232 controls and use the `SHOWNET` command to retrieve the IP address.

STARTUP MACRO

The Startup Macro feature allows the user to set up a list of commands that will be executed automatically by the Phantom 800 after it is powered on, or after a power cycle or interruption. This feature is available beginning with firmware version 3.01.00. There are four commands related to the Startup Macro: CSM, DSM, RSM, and VSM.

These Startup Macro commands are detailed below.

Create Startup Macro

The CSM command creates the Startup Macro. To create the startup Macro:

- 1 Issue the command: CSM.**
- 2 Enter the commands you would like stored in the Macro, up to 500 characters.**
 - a** Editing the Macro commands is difficult to do in the terminal program as it is not a text editor. Therefore, it is suggested that a real text editor be used to create or edit the macro. The commands may then be copied and pasted into the command prompt.
- 3 Press Esc.**
- 4 Press carriage return.**

Delete Startup Macro

The DSM command deletes the Startup Macro. To delete the Startup Macro, issue the command: DSM.

Run Startup Macro

The RSM command runs the Startup Macro manually. After powering the system on, the Startup Macro will run automatically. To run the Startup Macro manually, issue the command: RSM.

View Startup Macro

The VSM command allows the user to view the commands in the Startup Macro. To view the commands in the Startup Macro, issue the command: VSM.

ABOUT THE WEB-SERVER GUI

The most common Phantom 800 functions can be handled using the web-server GUI (*Figure 8*). This chapter introduces the GUI appearance and function, and describes how to customize the labelling of the application buttons.

More information on using the GUI appears in the following operational chapters covering matrix switching, video scaling, and frame-grabs.

APPEARANCE AND FUNCTIONS OF THE GUI

The GUI is divided into three sections:

- **I/O Switching Selection**—this section indicates the channel status and allows you to switch between input sources and output displays using a mouse or touch-panel. The indicator on each input and output button is green if a valid input signal is present or a display device is connected to the output. The indicator is red if there is no input signal or connected display device.

- **Inputs/Outputs**—this section identifies which inputs are going to which displays. In the grid example in *Figure 8*, input 1 is going to outputs 1 and 3. Inputs 2, 4, 5, 6, 7, and 8 are each going to outputs 2, 4, 5, 6, 7, and 8 respectively.

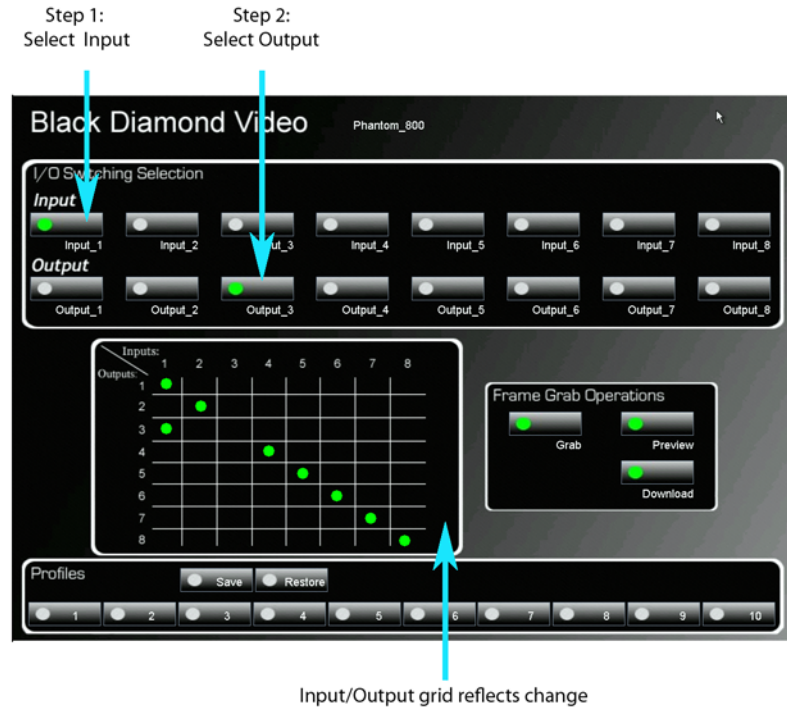


FIGURE 8. Phantom 800 Web-Server GUI

- **Frame-Grab Operations**- this section allows you to perform frame-grabs on a selected output, and frame-grab downloads.
- **Profiles**- this section allows you to save switching assignments to a preset profile button.

CUSTOM LABELLING OF INPUT/OUTPUT BUTTONS

You can customize the labels of the Input and Output buttons in the I/O Switching Selection section of the GUI. The input and output labels are limited to a maximum of eight characters.



Defaults: Input buttons are labeled Input_#. Output buttons are labeled Output_#.

To rename an input button

- Enter the RS-232 or Telnet command `inlbl <input> <label>` where `<input>` is the input # on the GUI and `<label>` is the new name for the button.

EXAMPLE


To rename the GUI label for Input 2 to “Camera”, issue the command:
`inlbl 2 Camera.`

To rename an output button

- Enter the RS-232 or Telnet command `outlbl <output> <label>` where `<output>` is the output # on the GUI and `<label>` is the new name for the button.

EXAMPLE

To rename the GUI label for output #5 to “Remote”, issue the command:
`outlbl 5 Remote.`



ABOUT THE WEB-SERVER GUI
Custom Labelling of Input/Output Buttons

MATRIX SWITCHING

This chapter explores the matrix switching capabilities of the Phantom 800.

ABOUT MATRIX SWITCHING

The Phantom 800 provides 8 x 8 DVI matrix switching and is controlled with the web-server GUI or by using RS-232 or Telnet commands. Any connected input can be switched to any output channel.

For information about setting up remote control of your device, see “Step 4: Establish Permanent Remote Control” on page 23.

MATRIX SWITCHING CONTROL- GUI

The GUI I/O Switching Selection buttons let you quickly and easily set up and modify matrix switching assignments. The Input/Output grid provides a dynamic visual representation of the current routing pattern.

Figure 9 shows an example of the Phantom 800 GUI being used to control the matrix switching assignments.

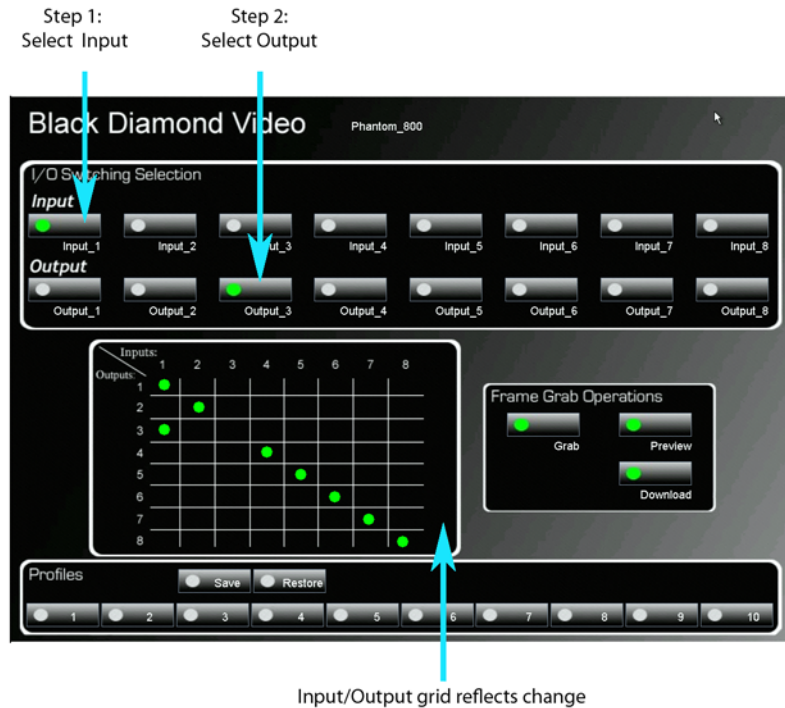


FIGURE 9. Matrix Switching -- Phantom 800 Web-Server GUI Example

To switch an input to an output

- 1** In the I/O Switching Selection of the GUI, click the input button for the input you want to switch.
The button indicator blinks to indicate that the input is selected. You have 10 seconds to complete the net step.
- 2** Click the Output button for the output to which you want to route the selected input.
- 3** The selected input is routed to the chosen output channel and the new assignment is reflected on the Inputs/Outputs grid.

NOTE A red indicator on an input button means that there is no valid input signal present on that channel. When a valid signal is present, the status indicator is green.



EXAMPLE

As illustrated in *Figure 9*, to route Input_1 to display at Output_3, you first click the Input_1 button, and then click the Output_3 button. The Inputs/Outputs grid updates to reflect the new matrix switching assignment, with an indicator in column 1 on row 3.

MATRIX SWITCHING CONTROL- RS-232 AND 10/100T ETHERNET

For matrix switching control, there are two commands: SWITCH and OSTAT. With these commands you can switch any input to display on any output channel and you can check which input is currently set to display on any output.

By default, the first single link DVI input is routed to all single link outputs and the first dual link DVI input is routed to all dual link outputs. Single-link DVI inputs can be displayed on any output channel, but dual-link DVI inputs can only be displayed on the output channels of the boards in odd-numbered slots.

For a complete list of serial control commands, see Appendix A, “RS-232 and 10/100T Protocol.”

NOTE RS-232 commands and Telnet protocol are identical.

Switch Command

The SWITCH command is used to route any input to display on any output channel. The command is:

```
SW <input #> <output #>
```

An input can be routed to multiple outputs, which lets you display the same input image on multiple displays.

EXAMPLE

In *Figure 10*, the switch command is used to route a DVI video source connected to Input 3 to three different output channels. If all three commands are issued in succession, the result is that Input 3 would appear on all three output devices.

Command	Action
SW 1 1	Example A —routes Input 1 to Output 1
SW 1 3	Example B —routes Input 1 to Output 3
SW 1 5	Example C —routes Input 1 to Output 5

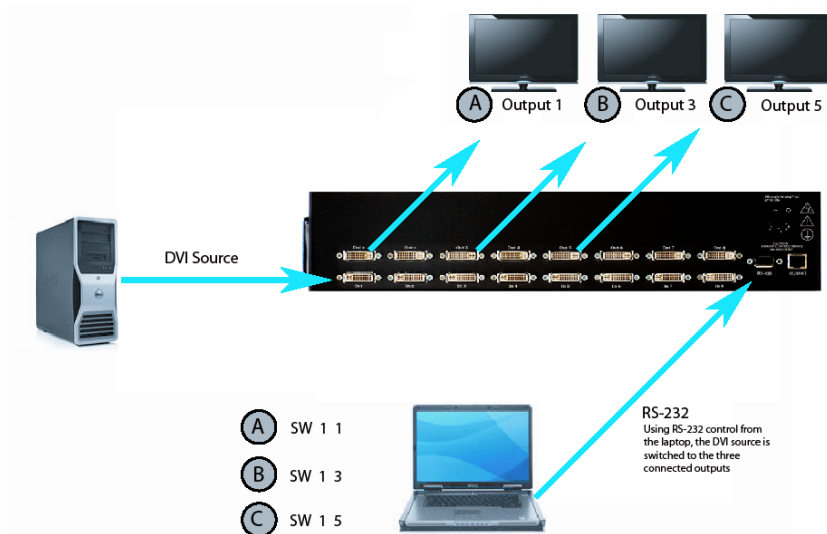


FIGURE 10. Matrix Switching Example

Output Status Command

The OSTAT command is used to determine which input is connected to a particular output. The command is:


OSTAT <output #>



EXAMPLE

Referring to *Figure 10*, the OSTAT command would be used as follows:

Command	Action
OSTAT 1	Example A —checks the input channel routed to Output 1. Returns input : 1.



MATRIX SWITCHING

Matrix Switching Control- RS-232 and 10/100T Ethernet

VIDEO SCALING

ABOUT VIDEO SCALING

The Phantom 800 output slots can each be populated with an S-1 Scalar card for a maximum of eight scalar cards. With the S-1 card, the video output can be manipulated. The output image can be scaled up or down or modified to fit a display resolution different than the native resolution of the input signal.

The most common scalar operations are discussed below. Scalar operations are performed using either RS-232 or Telnet control. Currently, GUI control of scalar operations is not available.

NOTE RS-232 commands and Telnet protocol are identical.

AUTO-RESOLUTION DISPLAY

By default, any input routed through an S-1 card output channel is automatically scaled up or down to fit the resolution of the connected display device. The original aspect ratio of the input image is maintained. If this input aspect ratio is different than that of the display device, black bars fill the areas of unfilled pixels.

This is an automatic feature of the scalar card and does not need to be programmed. This feature automatically detects the display resolution and displays any input source at its maximum resolution and proper aspect ratio.

For example, if you have a 1024 x 768 input and you route it through an S-1 output to a display device operating at 1900 x 1200, the image is automatically scaled up to fill the screen vertically. Black bands appear on either side of the image in the areas of unfilled pixels, and the 4:3 aspect ratio is maintained on the output.

PRESET VIDEO POSITIONING

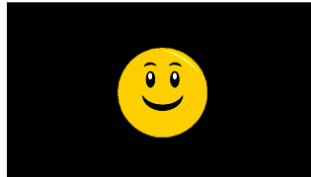
In addition to the default auto-resolution display processing, video going out to a display device can be positioned in different ways to fit within the display. *Figure 11* illustrates the four most common methods for positioning video within a display. All of these methods use

the OWS command paired with an argument to select the positioning method: **FIT**, **CENTER**, **FILL**, or **STRETCH**.



FIT

Full image is displayed with the proper aspect ratio at the display's maximum resolution.



CENTER

Full image is displayed at the image's native resolution, with a proper aspect ratio, and centered on the display.



FILL

Either full vertical or horizontal portion of the image is displayed, with remaining portion of the image cropped. Aspect ratio is maintained.



STRETCH

Image is stretched to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The aspect ratio will not be maintained if the image is stretched.

FIGURE 11. Video Output Positioning Presets

Fit Command

The **FIT** command scales an image up or down to match a display's maximum resolution. At the same time, the proper aspect ratio of the video input is maintained and the entire picture is visible. The entire output image is "fit" onto the display.

The command is:

```
OVS <output #> FIT
```

NOTE: FIT is actually the same as auto-resolution (see “Auto-Resolution Display” on page 41). You can use the FIT command to return to this default processing behavior after setting an alternative video position, such as with the CENTER or FILL commands, or with a custom setting.

EXAMPLE ONE

To display the 800 x 600 image (4:3 aspect ratio) coming from Output 1 on a 1920 x 1080 display (16:9 aspect ratio) by scaling the image up such that the entire image is visible, and maintaining its proper 4:3 aspect ratio, issue the command: OVS 1 FIT.

Black vertical bars appear on either side of the image in areas of unfilled pixels.

EXAMPLE TWO

To display the 1920 x 1080P image coming from Output 5 on a 1280 x 1024 display (5:4 aspect ratio) by scaling the image down and maintaining its 16:9 aspect ratio, issue the command: OVS 5 FIT.

Horizontal black bars appear above and below the image in areas of unfilled pixels.

Center Command

The CENTER command maintains the native resolution of the image and centers it within a display that has a different resolution. The output image is “centered” on the display and surrounded by black borders in the area of unfilled pixels.

The command is:

```
OVS <output #> CENTER
```

EXAMPLE

To display the 800 x 600 image coming from Output 1, at its native resolution, centered and surrounded by black borders on a 1280 x 1024 display, issue the command:

```
OVS 1 CENTER.
```

Fill Command

The FILL command scales an image up or down to match a display’s maximum resolution and also maintains the proper aspect ratio of the video input. Unlike the FIT mode, however, the entire image may or may not be displayed. If the input aspect ratio matches the aspect ratio of the display device, the entire image will appear. However, if the aspect ratios are different, then one dimension of the image will be cropped.

When scaling up, the image is scaled until it fills the screen both horizontally and vertically. With different aspect ratios, this means that the dimension which required less scaling

VIDEO SCALING

Custom Video Positioning

before filling the screen is cropped as scaling continues in order to fill the screen in the other dimension.

When scaling down, the image is scaled until one dimension fills the screen. At that point, scaling ceases and the other dimension is cropped.

The command is:

```
OWS <output #> FILL
```

EXAMPLE

To display the 800 x 600 image (4:3 aspect ratio) coming from Output 1 on a 1920 x 1080 display (16:9 aspect ratio) by scaling the image up and maintaining its proper 4:3 aspect ratio so that it fills the entire display, issue the command: `OWS 1 FILL`.

As more scaling is required to fill the horizontal dimension than the vertical dimension, the image fills the screen and is cropped vertically on the display.

Stretch Command

STRETCH “stretches” an image to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device. The resulting image may be horizontally and/or vertically stretched to fit onto the entire display, and thus will not maintain its original aspect ratio.

The command is:

```
OWS <output #> STRETCH
```

EXAMPLE

To display the 800 x 600 image coming from Output 1, stretched to fit a 1280 x 1024 display, issue the command: `OWS 1 STRETCH`. The image will be stretched both horizontally and vertically to fit the display screen, not maintaining its original aspect ratio.

CUSTOM VIDEO POSITIONING

Besides the preset video function of the S-1 card, you can also assign specific horizontal and vertical dimensions to a video output. With this command, aspect ratios are not constrained, and, depending on the custom dimensions you specify, the original aspect ratio may not be preserved.

The command is:

```
OWS <output #> <hsize> <vsize>
```

where `<hsize>` represents a custom number of display pixels and `<vsize>` represents a custom number of lines.

EXAMPLE

To display an 800 x 600 image from Output 3 as a 1280 x 1024 image size, and not maintain the original 4:3 aspect ratio, issue the command: `OWS 3 1280 1024`.

The image is scaled up from 800 x 600 to 1280 x 1024, with a modified aspect ratio of 5:4.

PAN AND ZOOM

The S-1 card output offers both pan and zoom functions. These functions let you focus on portions of an image and increase and decrease the zoom.

You have two types of controls. The first is a step pan or zoom, where you pan or zoom a percentage each time you issue the command. The second type of control is a continuous pan or zoom. This type of zoom is meant for use with a programmable external control device.

Pan

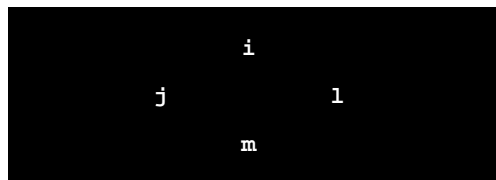
With the PAN command, you can to pan up, down, left, and right at slow or accelerated speeds.

The command is:

`PAN <output #>`

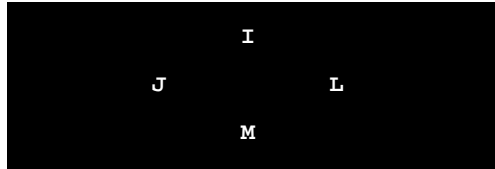
When you issue this command, the following field appears to let you control the pan action:

Pan control: i - up, m - down, j - left, l - right q - quit



Each time you press one of these letters, you pan in the selected direction by a set percentage.

Accelerated pan control: use upper-case letters



Zoom

The standard zoom control lets you step zoom in or out of an image at slow or accelerated speeds.

The command is:

ZOOM <output #>

When you issue this command, the following field appears to let you control the zoom action:

Zoom control: <+> zoom in, <-> zoom out, <q> quit



Each time you press + or -, you zoom in or out a set percentage.

Accelerated zoom control:



Pan & Zoom (continuous)

In addition to the standard pan and zoom controls described above, there are special controls meant for use with a programmable external control device. The continuous pan and zoom controls lets you continue an action until the STOP command is issued.

For details on continuous pan and zoom controls, see “Continuous Pan & Zoom” on page 63.

ADVANCED VIDEO SCALING OPERATIONS

This section deals with advanced video scaling operations that are primarily applicable to custom applications. These scaling operations are:

- Genlock**
 - Match the output timing to the input timing
 - Turn off all output scaling
- Programmable Look-up Tables**
 - Customize the red, green, and blue color values of an output
 - Modify one or more color values for custom effects

Genlock

This command synchronizes the output timing to the input timing. Genlocking video signals is used when you want to match the output timing to the input timing *exactly*. The image is passed through to the output without any scaling or timing shift.

The command is:

```
GL <output #> <ON|OFF>
```

EXAMPLE

To genlock the output timing of Output 7 to the input source timing, issue the command:

```
GL 7 ON.
```

Programmable Look-Up Tables

The table below shows the four look-up table commands you can employ to customize your output's color settings.

WLUT	WLUT <output #> <value>	Changes the output gain for all three color channels: red, green, and blue. <value> is a value from 0-200. Default = 100.
WBLUT	WBLUT <output #> <value>	Changes the output gain for blue channel. <value> is a value from 0-200. Default = 100.
WGLUT	WGLUT <output #> <value>	Changes the output gain for green channel. <value> is a value from 0-200. Default = 100.

VIDEO SCALING

Advanced Video Scaling Operations

WRLUT	WRLUT <output #> <value>	Changes the output gain for red channel. <value> is a value from 0-200. Default = 100.
-------	--------------------------	--

FRAME GRABBING

ABOUT OUTPUT FRAME GRABBING

The Phantom 800 can perform frame grabs on up to 8 outputs.

The frame grab commands also allow previewing and downloading of the images into memory within the Phantom 800. Once grabbed, frames can be saved to a network or control computer.

The commands for grabbing and saving frames are handled through two different processes:

- Frame grab commands can be executed using the web-server GUI, RS-232 control, or using Telnet commands over the 10/100T Ethernet connection.
- Saving frame grabs to files within a network or control computer requires the use of separate FTP (file transfer protocol) commands which are issued through the 10/100T Ethernet only.

OVERVIEW - THE FRAME GRABBING PROCESS

The process of issuing commands and storing images is represented in *Figure 12*.

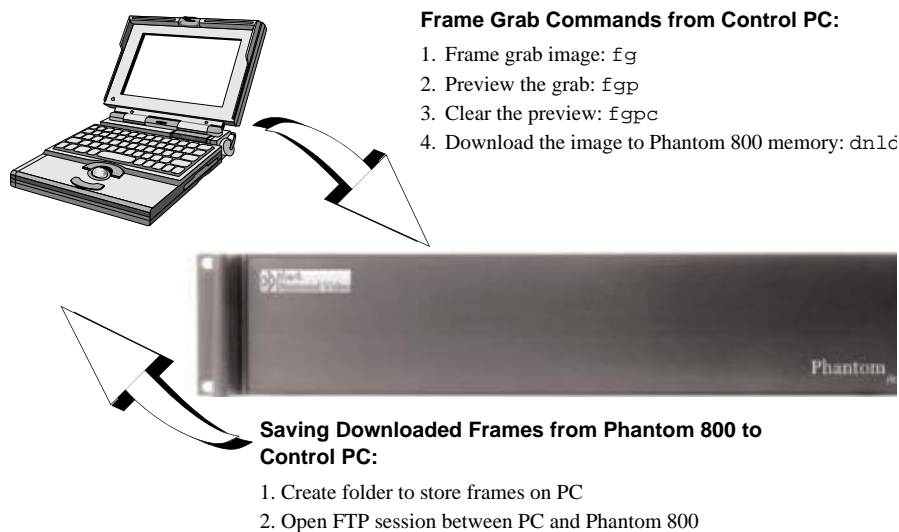


FIGURE 12. Frame Grabbing and Saving Process—RS-232 and Telnet Control

The web-server GUI provides frame grab functionality to grab, preview, and download images.

FREEZING FRAMES

The Freeze command simply “freezes” an image on a designated output but does not save this image to memory. A frozen image cannot be downloaded or saved. This command is useful if you just want to pause on a single frame of an output.

Freeze

The command is:

```
FZ <output #> <ON|OFF>
```

EXAMPLE

To freeze an image on Output 4, issue the command: FZ 4 ON.

CAPTURING FRAMES

The frame grab command directs the Phantom 800 to store a video image in temporary memory. While in this state, the image can be previewed (see “Previewing & Clearing Captured Frames”) or downloaded into final memory (see “Downloading Captured Frames to Memory”).

Frame Grab—Command

To frame grab the image from a specific output, the command is:

```
FG <output #>
```

Frame Grab- GUI

- 1 In the I/O Switching section of the GUI, select the output channel that you want to grab.
- 2 In the Frame Grab Operations section of the GUI, select Grab.

PREVIEWING & CLEARING CAPTURED FRAMES

Frame grabs can be previewed on the same output on which they have been “grabbed.” The preview will appear on the display attached to the output from which the image was grabbed.

Frame Grab Preview—Command

To preview a frame once it has been grabbed, the command is:

```
FGP <output #>
```

EXAMPLE

After you grab an image from Output 2, you want to preview the frame grab before you download it to the Phantom 800 final memory. You issue the command:

FGP <output 2>. The image appears on the display attached to Output 2.

Frame Grab Preview- GUI

- Once a frame has been grabbed, select Preview in the Frame Grab Operations section of the GUI.

- The preview appears on the display connected to the output from which the image was grabbed.

Clearing Frame Grab Preview—Command

To clear a frame grab preview, the command is:

```
FGPC <output #>
```

Clearing Frame Grab Preview- GUI

- 1 In the I/O Switching section, select the input button for the input channel that provided the preview image.
- 2 Click the output button that is assigned to the input channel selected in *Step 1*. The preview image is cleared from the display. However, the frame grab is still active and can be downloaded to the Phantom 800 memory.

DOWNLOADING CAPTURED FRAMES TO MEMORY

After a frame is captured, the frame grab can be downloaded to the Phantom 800 memory. In order to later save the image to a computer or network location, the frame grab must first be downloaded into the Phantom 800 memory.

Only one frame can be downloaded at a time. The download process converts the frame to a TIFF file; the default file name is **image.tif**.

For details on saving frame grabs to a computer, see “Saving Downloaded Frames” on page 53.

Download—Command

After you perform a frame grab, the image is stored in temporary memory. From this state, the image can be downloaded to final memory.

The command is:

```
dnld <output #>
```

EXAMPLE

You have just grabbed the frame from output channel 5, and after previewing it you decide you want to download it to the Phantom 800 final memory. You issue the command:

```
dnld 5. The image is converted to TIFF file format and downloaded to memory and available to be saved to a computer or network location.
```

Download- GUI

- **After you perform a frame grab, select Download in the Frame Grab Operations section. The image is automatically downloaded into the Phantom 800's memory.**

SAVING DOWNLOADED FRAMES

Frame grabs that have been stored in the Phantom 800 memory are saved as *.tiff images and can be downloaded to a control computer or network using FTP (file transfer protocol) over the 10/100T Ethernet. For Windows-based control or network computers the process is as follows:

How to store a downloaded frame grab

- 1 Create a folder to store frame-grabbed *.tiff images.**

In this example, we create the folder on the Local Disk (C:) and name it `framegrab`.

- 2 Open the 10/100T Network Connection Between the Computer and the FTP Server within the Phantom 800.**

For Windows-based computers:

- a** Open the Command Prompt window by navigating from the Start menu:
Start > Programs > Accessories > Command Prompt.

The Command Prompt window opens:

- b** Change the directory into the same directory (folder) into which you will download the frame grab. In this example from *Step 1*, this is done by typing in the command:
`cd\framegrab`.

The new command prompt is: `C:\framegrab>`

- c** Open the 10/100T Ethernet connection to the FTP server in the Phantom 800 by typing in the command:

```
FTP<ip address>
```

```
User: bdv
```

```
Password: blackdiamond
```

A prompt sign appears: >

NOTE: If the IP address of the Phantom 800 is not known, establish RS-232 control of the unit and use the SHOWNET command to acquire the address. See "Step 4: Establish Permanent Remote Control" on page 23 for more information.

FRAME GRABBING

Saving Downloaded Frames

- 3 Download the frame grab: Enter the command: `get image.tif`.**

The image downloads in approximately eight to fifteen seconds.

RS-232 AND 10/100T PROTOCOL

PHANTOM 800 COMMAND SET

The Phantom 800 is controlled by using RS-232 or Ethernet connection using telnet protocol. Commonly used commands are presented and defined in the following tables covering switching, scaling, frame grabbing, windowing, and general system commands.

SWITCHING COMMANDS

Command	Syntax	Action
BRIGHTNESS	BRI <input #> <bright>	Adjusts the brightness of the input signal. RGB and SD inputs only. <bright> is a value from -100 to 100.
CONTRAST	CONT <input #> <contrast>	Adjusts the contrast of the input signal. RGB and SD inputs only. <contrast> is a value from 0 to 200.
HUE	HUE <input #> <hue>	Adjusts the hue of the input signal. SD inputs only. <hue> is a value from -180 to 180.
SATURATION	SAT <input #> <sat>	Adjusts the saturation of the input signal. SD inputs only. <sat> is a value from 0 to 200.
CREATEINPUTHOST	CINHOST <slot #> <name> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	Creates an input host timing in the designated slot number, with the specified parameters. <name> is limited to 16 characters. <hfreq> in Hz. <sync> is 3,4, or 5 wire. <vpol> is vertical sync polarity; 1 = positive, 0 = negative. <hpol> is horizontal sync polarity. <interlace> is 1 = interlaced, 0 = non-interlaced.

SWITCHING COMMANDS

Command	Syntax	Action
CREATEOUTPUTHOST	COUTHOST <slot #> <name> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	Creates an output host timing in the designated slot number, with the specified parameters. <slot#> is a value from 501 to 540. <name> is limited to 16 characters. <hfreq> in Hz. <sync> is 3,4, or 5 wire. <vpol> is vertical sync polarity; 1 = positive, 0 = negative. <hpol> is horizontal sync polarity. <interlace> is 1 = interlaced, 0 = non-interlaced.
HOSTLIST	HLIST	Lists the host timing table.
HOSTMATCH	HM <input #>	Lists the default hosts that match the input timing. RGB inputs only.
INPUTFORMAT	INFMT <input #> <format>	Changes the input format of the selected channel. <format> can be composite, s-video, or component.
INPUTLABEL	INLBL <input #> <label>	Adds a label to the specified input. Default = Input_#.
INPUTLIST	INLIST	Lists the user timing table.
INPUTLISTDEL	INLISTDEL <user slot #>	Deletes the timing in the user timing table at the selected slot.
INPUTMODULUS	INMOD <input #>	Adjusts the modulus of the input signal. RGB inputs only.
INPUTNAME	INN <input #> <name>	Creates a name for the input signal. RGB inputs only.
INPUTPHASE	INPH <input #>	Adjusts the phase of the input signal. RGB inputs only.
INPUTPOSITION	INPOS <input #>	Adjusts the position of the input signal. RGB inputs only.
INPUTSAVE	INS <input #> <user slot #>	Saves the input timing to the user timing table. RGB inputs only.
INSTATUS	INSTATUS <input #>	Verifies whether there is a valid signal applied to the input. 1 indicates a valid signal. 0 indicates there is no signal on the input.
INPUTTIMING	INT <input #>	Shows the input timing.
OUTPUTLIST	OUTLIST	Lists the output custom host timing table.
OUTPUTLISTDEL	OUTLISTDEL <slot #>	Deletes the output custom host timing at the specified slot.

SWITCHING COMMANDS

Command	Syntax	Action
OUTPUTLABEL	OUTLBL <output #> <label>	Adds a label to the specified output. Default = Output_#.
OUTPUTSTATUS	OSTAT <output #>	Returns the input number connected to the output.
OUTPUTSTATUSALL	OSTATALL	Returns all of the input/output switching assignments.
OUTT	OUTT <output #>	Displays the output timing of the selected output channel.
PROFILEDELETE	PROFILEDELETE <profile #>	Deletes a profile.
PROFILERECALL	PROFILERECALL <profile #>	Sets up the input/output configuration from a stored profile.
PROFILESAVE	PROFILESAVE <profile #>	Allows the user to save the current input/output configuration as a profile.
SETINPUTTIMING	SETIT <input #> <host>	Assigns a default host timing to the input. The Vtotal, Hperiod, and interlace mode of the host must match the input source. <host> is a number which refers to the built in host table. Use the command HOSTLIST to display the host table
SETOUTPUTTIMING	SETOT <output #> <host>	Assigns a default host timing to the output. <host> is a number which refers to the built in host table. To display the host table, use the HOSTLIST command.
SWITCH	SW <input #> <output #>	Routes the input to the output. An input can be routed to more than one output.
VIDEOFORMAT	VFMT <input #>	Returns the video format of the specified input channel.

SCALING COMMANDS

Command	Syntax	Action
OUTPUTWINDOWSIZE	OWS <output #> <FIT FILL CENTER STRETCH>	Applies preset video positioning to the specified output channel. <FIT> Fits the entire image to the display, maintaining the original aspect ration. Equivalent to resetting the video scaling to the default auto-resolution display. <FILL> Scales an image up or down to fill the display, maintaining proper aspect ratio of the input. Image will be cropped if the input and output aspect ratios do not match <CENTER> Maintains native resolution of the input and centers it within a display with a different resolution. <STRETCH> “Stretches” an image to fit onto the display without cropping when the aspect ratio of the input is different than that of the display device.
	OWS <output #> <hsize> <vsize>	Specifies a custom output resolution for the specified output channel. Aspect ratio is not constrained.
PAN	PAN <output #>	Activates controls to pan around the active boundary of zoomed video. Control pan action with: i - up, m - down, j - left, l - right q - quit Accelerated pan action with: I - up, M - down, J - left, L - right
ZOOM	Zoom <output #>	Activates zoom control for the selected output channel. Control zoom action with: <+> zoom in <-> zoom out Accelerated zoom action with: a - accelerate, d - decelerate
ZOOM2	ZM2 <output #><output #>	Activates zoom control for two output channels simultaneously. Note: The two outputs must share the same input.
GAMMA	GAMMA <output #> <value>	Changes the gamma of the selected output channel. <gamma> is a value from 70-240. 70 is equal to gamma 0.7 and 240 is equal to gamma 2.4. Default = 100, which equals gamma 1.0.
GENLOCK	GL <output #> <ON OFF>	Genlocks the output timing to the associated input timing.
COLORPICK	CP <output #>	Returns the R, G, B value of a pixel

SCALING COMMANDS

Command	Syntax	Action
SQUAREPIXEL	SPXL <output #> <ON OFF>	Switches between ITU601 and square pixel for NTSC and PAL signals.
WLUT	WLUT <output #> <value>	Changes the output gain for all three color channels: red, green, and blue. <value> is a value from 0-200. Default = 100.
WBLUT	WBLUT <output #> <value>	Changes the output gain for blue channel. <value> is a value from 0-200. Default = 100.
WGLUT	WGLUT <output #> <value>	Changes the output gain for green channel. <value> is a value from 0-200. Default = 100.
WRLUT	WRLUT <output #> <value>	Changes the output gain for red channel. <value> is a value from 0-200. Default = 100.

FRAME GRABBING COMMANDS

Command	Syntax	Action
DOWNLOAD	DNLD <output #>	Downloads the grabbed frame as a TIFF file.
FRAMEGRAB	FG <output #>	Grabs the frame on the designated output.
FRAMEGRABPRVW	FGP <output #>	Displays a preview of the grabbed frame on the designated output.
FRAMEGRABPVWCLR	FGPC <output #>	Clears the preview of the grabbed frame from the designated output.
FREEZE	FZ <output #> <ON OFF>	Freezes or unfreezes the image on the designated output. Note: A frozen image is <i>not</i> saved to memory, nor can it be downloaded or saved.

SYSTEM COMMANDS

Command	Syntax	Action
BLANKOUTPUT	BO <output #>	Blanks the selected output channel.

SYSTEM COMMANDS

Command	Syntax	Action
COPYEDID	CPEDID <output #> <input #>	Copies the EDID from the display device to the input. NOTE: Before issuing this command, disconnect the input from the source.
CSM	CSM	Creates the startup macro. Issue this command, then issue every command you would like stored in the macro. When finished, press Esc and then carriage return to end the session.
CUSTOMEDID	CEDID <input #> <hsize> <vsize>	Sets the EDID timing from the host table. <hsize> and <vsize> values are compared to the resolution of the hosts in the host table. When the first match is found, the timing of that host is used to calculate the EDID value, which is then programmed to the input channel. NOTE: Before issuing this command, disconnect the input from the source.
DSM	DSM	Deletes the startup macro.
FORCEOUTPUT	FOUT <output #> <ON OFF>	Forces the specified output channel to send out a signal even when the Phantom 800 cannot detect a connected display device. NOTE: If a monitor is connected to the Phantom 800 via a fiber cable, there will be no hot plug, and thus the output will be undetected by the Phantom 800. To combat this issue, use the FOUT command to force output detection.
GET8051	G8051 <input #>	Reads back the RGB to DVI converter timing of the selected input channel.
GETEDID	GEDID <output #>	Returns the EDID data from the display device connected to the selected output channel.
GETEXTREME	GEX <output #>	Reads back the ID of the Extreme Cable Conditioner at the selected output channel.
HELP	H	Lists all user commands.
HOSTLIST	HLIST	Lists the host timing table.
ID	ID	Returns system information.
INPUTAUTOSENSE	INAS [on/off]	Turns the SD input auto sensing on or off. When autosense is ON, the unit attempts to automatically identify the format of the input signal (component, svideo, or composite). When autosense is OFF, the format of the input signal must be set using the INPUTFORMAT command. Default = ON.

SYSTEM COMMANDS

Command	Syntax	Action
INPUTTESTPATTERN	INTP <host> <pattern>	<p>Turns on the test pattern <pattern> with host <host> from the input RGB converter. The converter generates an RGB host signal internally.</p> <p>To turn the test pattern generator off, issue the command <code>intp F <host></code>. Although it is required, the <host> setting is ignored.</p> <p>Test patterns <pattern>:</p> <ul style="list-style-type: none"> 0 color bars 1 grey ramp 2 red ramp 3 green ramp 4 blue ramp 5 grey 64 steps 6 red 64 steps 7 green 64 steps 8 blue 64 steps 9 Auto Calibration F Turns the test pattern generator off <p>Output modes <host>:</p> <ul style="list-style-type: none"> 0 800x600 1 1024x768 2 1280x1024 3 1600x1200 4 1920x1080 5 1920x1200
IPADDRESS	IPADDR <ip address>	Sets the static IP address for network use.
IPGATEWAY	IPGW <ip gateway>	Sets the network gateway.
IPNETMASK	IPNM <net mask>	Sets the network mask.
NEWEDID	NEDID <INPUT #> <hfp> <hs> <hbp> <hact> <vfp> <vs> <vbp> <vact> <hfreq> <sync> <phase> <vpol> <hpol> <interlace>	<p>Creates a special EDID timing for the designated input, with the specified parameters.</p> <p><hfreq> in Hz.</p> <p><sync> is 3,4, or 5 wire.</p> <p><vpol> is vertical sync polarity; 1 = positive, 0 = negative.</p> <p><hpol> is horizontal sync polarity.</p> <p><interlace> is 1 = interlaced, 0 = non-interlaced.</p>
PROGEDID	PROGEDID <input #>	Programs the default dual link or single link EDID value to the selected input channel. NOTE: Before issuing this command, disconnect the input from the source.
RESETOUTPUTTIMING	RSTOT <output #>	Resets the output timing according to the EID information from the display device. If no EDID information is available, host #4 is used.
RESTOREDEFAULT	RFD	Restores the factory defaults for user parameters

SYSTEM COMMANDS

Command	Syntax	Action
RSM	RSM	Runs the startup macro manually. After the Phantom 800 is powered on, the macro will run automatically.
SHOWNETWORK	SHOWNET	Shows the network setup parameters.
SOFTDEINTERLACER	SDI <output #> <ON OFF>	Turns the soft deinterlacer ON or OFF for the specified output channel. Default = ON.
UNBLANKOUTPUT	UBO <output #>	Unblanks the selected output channel.
UPDATEFIRMWARE	UFW	Initiates a firmware update.
VERSION	VER	Returns the firmware version of the system.
VSM	VSM	Shows the content of the startup macro.

USING AN EXTERNAL CONTROLLER

For a more robust communications protocol, the Phantom 800 supports external controllers, such as Crestron or AMX devices. Black Diamond Video has developed a special control protocol which will enable most control applications. This protocol is enabled and disabled with the command `EXTCTL <ON|OFF>`.

Once the protocol is enabled, all commands sent to the Phantom 800 are echoed back to the controller. The feedback from the Phantom 800 is structured as follows:

```
STX(0x02) [command in upper case] [result] ETX(0x03)
```

EXAMPLE

With a DVI signal connected to input 3, you want to know if input 1 has a valid signal. You use the `INSTATUS 3` command. As a valid signal is present, the result is 1.

The ascii code issued from the controller for this example is:

```
0x69 0x6E 0x73 0x74 0x61 0x74 0x75 0x73 0x20 0x31 0x0A 0x0D
```

The Phantom 800 echoes back the command in upper case together with the result, and bracketed by the start and end transmission codes:

```
0x02 0x49 0x4E 0x53 0x54 0x41 0x54 0x55 0x53 0x20 0x31 0x20
0x31 0x0A 0x0D 0x03
```

Continuous Pan & Zoom

This type of pan and zoom is meant for use with a programmable external control device. The continuous pan and zoom controls lets you continue an action until the *STOP* command is issued.

The command is:

```
ZOOM <output #> <action> <speed>
```

Where:

- *<action>* represents the type of pan or zoom:

Action	Description
ZI	Zoom in
ZO	Zoom out
PL	Pan left
PR	Pan right
PU	Pan up
PD	Pan down
STOP	Stop action

- *<speed>* is a value from 1 - 10 and sets the speed of the action.

RS-232 PINOUT

The RS-232 connector on the Phantom 800 uses the pinout configuration as shown in *Figure 13*.

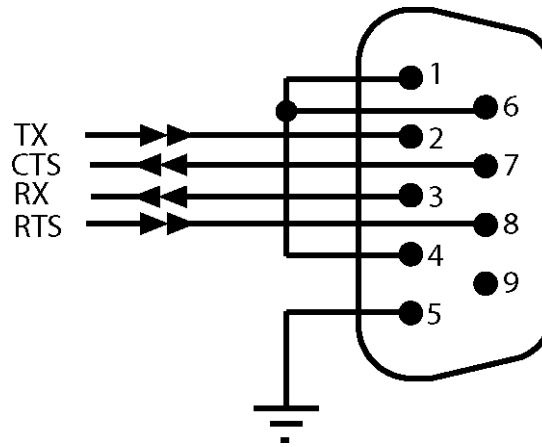


FIGURE 13. Phantom 800 RS-232 Pinout

UPGRADING FIRMWARE

As a hardware device, the Phantom 800 contains firmware. Firmware is embedded software that provides the necessary machine instructions for how the device operates. From time to time, Black Diamond Video publishes firmware updates. These updates may add functionality to or improve the operational efficiency of the Phantom 800.

Firmware updates, as they become available, are accessible from the Support page of the Black Diamond Video web site (www.blackdiamond.video.com). You may also receive a firmware upgrade on a CD.

Firmware upgrades are performed using a 10/100T Ethernet connection, and, optionally, RS-232 control.

Download or Copy Firmware Upgrade to the Control Computer

The first step in performing a firmware upgrade for your Phantom 800 is to acquire the update file and store it to a location on the Ethernet control computer. Firmware updates may be downloaded from the Black Diamond Video web site or provided to you on a CD.

- 1 On the Ethernet control computer, create a folder to store the firmware upgrade.**

For this example, we'll create the folder on the Local Disk (C:) and name it `upgrade`.

NOTE: You may save the upgrade file to any drive you wish and use any folder name you like.

- 2 Download the firmware upgrade file from a CD or from the Black Diamond Video web site into the folder created in *Step 1*.**

The file name is `bdvimg.bin.xxx`, where `.xxx` is the firmware version number. You are now ready to upgrade the firmware of the Phantom 800.

Upgrade the Phantom 800 Firmware

The upgrade can be accomplished entirely through Ethernet control, or you can use RS-232 control to issue the final upgrade command.

- 1 Open the Command Prompt on the Ethernet control computer. For Windows, navigate to Start > Programs > Accessories > Command Prompt.**

The Command Prompt window opens.

- 2 Change the directory to the directory (folder) into which the firmware upgrade was downloaded from the task "Download or Copy Firmware Upgrade to the Control Computer." In our example this is done by entering the command: `cd\upgrade`.**

The new command prompt is `C:\upgrade>`.

- 3 Open the 10/100T Network Connection between the control computer and the FTP Server within the Phantom 800 by typing in the commands:**

```
ftp <ip address>
```

```
User: bdv
```

```
Password: blackdiamond
```

A prompt sign appears: `>`

NOTE: If the IP address is not known, establish RS-232 control of the Phantom 800 and issue the `SHOWNET` command. This returns the IP address of the device.

- 4 Type the command: `bin`**

A command prompt appears again: `>`

- 5 Type the command: `put <filename>`, where the file name is the name of the file you downloaded in Step 2 of “Download or Copy Firmware Upgrade to the Control Computer.”**

In our example, the command is: `put bdvimg.bin.xxx`

- 6 Close the connection to the Phantom 800 ftp server by typing the command: `quit`**

The connection to the Phantom 800 ftp server is closed.

- 7 Open a Telnet session with the Phantom 800 by typing the command: `telnet <ipaddr> 8998`**

The Telnet session is initiated.

- 8 Enter the network password.**

The default password is “blackdiamond”.

- 9 Issue the upgrade firmware command in one of two ways:**

- a** From the serial port terminal issue the RS-232 command: `ufw`

Progress information about the upgrade process appears on the terminal.

- b** From the Ethernet connection Command Prompt, type in the command: `ufw`

- 10 The upgrade process takes approximately 2 - 3 minutes. When the upgrade is done, you are instructed to power cycle the Phantom 800.**

Once the power cycle operation is complete, your firmware upgrade is complete.