

# **GRAPHITE**

## **Graphite Configuration Guide**

**v06**

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## Patents

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# Graphite

## Join our Growing Customer Base!

Deciding to purchase a Carbonite switcher will put you in good company, with many thousands of Ross switchers installed worldwide. Carbonite continues to build on a family of multi-definition switchers that have been delivering the goods every day in live sports, stadium scoreboards, and drama productions, mobile productions, as well as local and network newscasts.

## Experience Great Support!

Ross® has designed and manufactured production switchers for over 45 years, with significant year over year growth for the past 29 years. We believe that an important factor of our success is our focus on providing a superior customer experience. We continually benchmark our warranty and technical support to ensure that they are the best in the industry.

We hope that you join the many thousands of satisfied video professionals around the world that are proud owners of Ross® production switchers. Please do not hesitate to contact us with any questions or comments you have related to this Configuration Guide at Tel: +1-613-652-4886, Fax: +1-613-652-4425 or email us at [solutions@rossvideo.com](mailto:solutions@rossvideo.com).

# Feature Enhancements

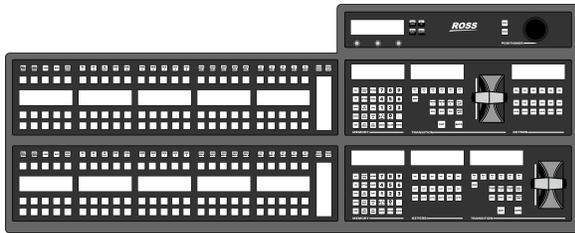
A number of features have been added, or updated, to this version of software. This section provides a brief introduction to these features, and how to use them.

## v5.0 Features

### TouchDrive Control Panel

Graphite now supports the new TouchDrive line of control panels. Running a Linux® operating system and giving you a familiar Dashboard interface with touchscreen mnemonics and panel displays, the new TouchDrive control panel represents the next level in user experience.

Visit <http://help.rossvideo.com/switcher-panels> for information on setting up and using the new TouchDrive control panel.



### New MediaManager

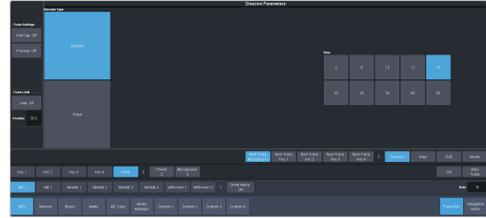
The MediaManager interface has been integrated into Dashboard and given a new look. All the same functionality, with the exception of playlists, plus the ability to upload media from your host Dashboard computer.



**Tip:** If you still need the playlist functionality, the legacy MediaManager can still be accessed by navigating a web browser to the IP address of the frame.

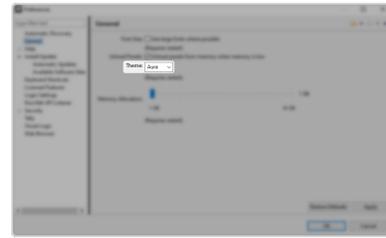
### New Dashboard Menus

The Dashboard interface has been extensively updated. Both the Configuration and Live Assist tabs have been updated to allow for a more intuitive layout and access to more switcher settings from Dashboard.



### Aura Dashboard Theme

Graphite now supports the Aura Dashboard theme.



### SoftPanel Has Moved

The SoftPanel interface is now separate from the master panel, but shares the same permissions. Create a new Dashboard device with the IP address of the frame and connect on port 5257.

### MultiPanel in Dashboard

MultiPanel can now be configured from Dashboard. Each frame supports up to 3 independent control connections (Master, Satellite 1, and Satellite 2) as well as SoftPanel/Satellite 3. Each connection, with the exception of SoftPanel, can be from a control panel, Dashboard, or a combination of the two. All devices on the same control connection mirror each other.



**Note:** SoftPanel shares the permissions of the Master Panel.

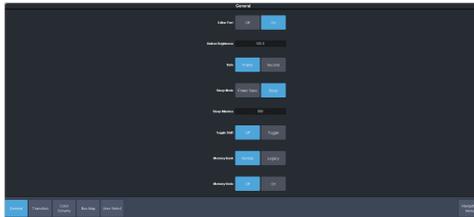
The independent control connections are selected by the port you connect to on the frame. Multiple panels and Dashboard connections can connect on the same port, but they will all share the same permissions and mirror each other for control.

- **Master Panel** — 5253
- **Satellite 1** — 5255

- **Satellite 2** — 5256
- **SoftPanel/Satellite 3** — 5257

## Personality Menu

More of the personality settings for the control panel and frame have moved into DashBoard. Bus maps, user button assignments, and color schemes can all be applied independently to the master and satellite panels.



## User Select Buttons Expanded

You can now set the user select buttons from DashBoard. These buttons have been expanded to include all buttons on that row and include functionality like key type, show alpha, and memory and custom control selection.



User select button assignment are part of switcher personality for the control panel.

## Import/Export Switcher Sets

You can now export switcher sets from the switcher using DashBoard. These sets are stored on the computer running the DashBoard control system and can then be imported to another switcher.



## Improved Memory Interface

The memory interface in DashBoard has been improved to make it more intuitive in showing what the inclusions are for a memory and what attributes will be recalled.

## Features

Thank you for your interest in the Graphite All-In-One Production System. Graphite builds on the Ross® reputation for designing and integrating broadcast quality production equipment together into a compact system. Graphite integrates the Carbonite production engine with the XPression Graphics System and Clip Server and the RAVE Audio Engine.

### RAVE Audio Mixer

RAVE (Ross Audio Video Engine) breaks the mold of uninspired audio capability in all-in-one production systems. RAVE includes internal audio routing and output channel shuffling, together with a hardware-based 24bit digital audio production mixer. The audio production capabilities of Graphite are matched only by independent audio production systems, but adds the benefit of host PC access for additional audio input and monitoring.

The number of audio inputs and outputs depends on the model and options you have. All audio streams are 24bit at 48kHz and can be controlled from Dashboard.

**Note:** XPression only supports 16bit audio.

The 1RU Audio Breakout Module (ABM) provides a number of analog and AES input and output ports. The analog inputs have direct control over gain, phantom power on/off, and 20dB pad on/off. These audio inputs and outputs are fed back and forth to the production system as embedded audio in the SDI-Audio Loop.



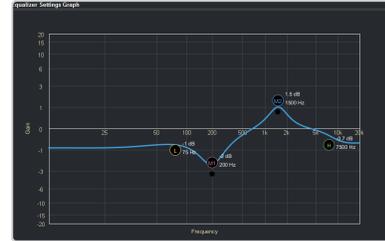
### MIDI Panel

RAVE supports the Behringer X-TOUCH COMPACT MIDI panel to control audio levels and other mixer functions, as well as EQ/CL.

The MIDI controller is used to control the RAVE audio mixer through Dashboard.

### Audio Equalization (EQ)

The audio equalizer (EQ) allows you to enhance the sound quality of audio sources. An independent stereo equalizer is available for every audio fader in the system and allows for adjustment in four bands (low-shelf, mid-range 1/2, high-shelf).



The EQ graph allows you to visualize the EQ adjustments as well as actively change them on the graph.

**Tip:** You can change the processing order of the EQ and CL.

### Compressor/Limiter (CL)

The audio compressor allows you to restrict audio levels from passing a threshold level. These are often used to prevent digital clipping of audio levels that are too high for output equipment. Once the threshold is reached, the compressor starts to reduce the gain at a specific ratio. The higher the compression ratio, the harsher the reduction in gain. The compression continues until the audio level falls below the threshold. You can adjust how quickly the compressor is applied once the threshold is surpassed as well as how long after the level drops below the threshold that the compressor is still applied.

**Tip:** You can change the processing order of the EQ and CL.

### XPression Graphite

High quality compelling graphics are an everyday essential for any production. An incredibly powerful graphics engine, XPression Graphite is integrated within the system. Scenes and templates are designed, built, and saved for later use, or immediately available for keying over video inputs. An independent user interface allows on-the-fly creation and editing - even during production.

For information on using XPression Graphite, refer to the XPression documentation package that came with your system.

### XPression Clips

Video clips and prerecorded animations are another key production element. Graphite includes two channels of XPression Clips, clip servers that add another layer of production sophistication. Users are able to record, manage,

and play-out video clips on-the-fly or from within a predetermined sequence or rundown.

For information on using XPression Clips, refer to the XPression documentation package that came with your system.

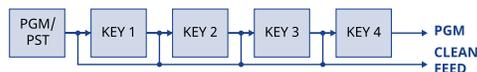
## Carbonite Black Production Switcher

Graphite contains our most successful product of all time, the Carbonite Black Production Switcher. Enjoy the high-end production power of the most popular midsized switcher in the world in a compact all-in-one production system.

### Clean Feed Output

Clean feed is typically used for bilingual and live-to-tape productions. It provides a second Program output that is derived from a different location than the standard program output. A frequent application is the recording of shows for later airing without call-in phone numbers inserted.

The clean feed output can come from before or between the keyers.



### Custom Controls

This feature brings the power of macros to the switcher operator. Button presses, menu selections, event commands, or even the switcher state can be recorded to a custom control with pauses or holds between the events. A simple button press can play these events back again. Step through complex show openings as easily as pressing Custom Control buttons 1, 2, then 3.

### Device Control

The switcher can control a number of external devices, such as video servers and robotic cameras. For a complete list of supported devices, and information on how to set up and control these devices, visit the Ross Video website ([rossvideo.com/production-switchers/carbonite/interface-list](http://rossvideo.com/production-switchers/carbonite/interface-list)).

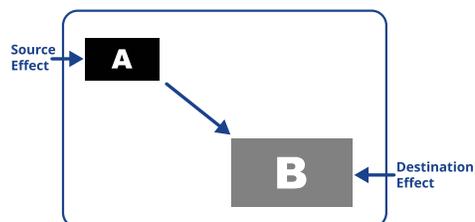
### DVE (Fly Key)

The advanced 2D DVE comes standard with each switcher, and can be used for performing over

the shoulder, or picture in picture shots. This allows all key types to be zoomed, cropped, and repositioned horizontally and vertically to create the look you want, or you can use one of the useful pre-built 2D effects to perform 2D background transitions.

### Effects Dissolve

The Effects Dissolve feature allows you to interpolate from one memory to another using a memory recall. The switcher will interpolate from the starting memory to the destination memory, creating a smooth, two key frame effect.



Only elements such as clip level and pattern position can be interpolated in the effects dissolve. Other elements, such as crosspoint selection, pattern, and next transition data are recalled first, and then the switcher will slew to the recalled memory.

An effects dissolve can be performed on as many elements and MEs as required, based on the memory that is being recalled.

### Frame Sync and Format Conversion

The switcher has multiple input frame synchronizer / format converter (FSFC) and input de-interlacers that can be used to convert video input signals to the format that the switcher is operating in, as well as correct mistimed, or drifting, video input signal. The frame synchronizers cannot completely correct badly formatted video, mistimed switches, signal drops, or similar issues.

FSFCs are fixed to the first 6 SDI inputs

### Frame Delay

A delay of up to 16 frames can be added to the first 6 SDI inputs. This allows you to delay the timing of an input to compensate for the delay in another source. For example, in a virtual set environment it may take a few frames for the system to track the position of the camera and render the background. In this case you want

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to delay the foreground cameras to compensate for this delay.

**Note:** The frame sync functionality is disabled when a frame delay is applied to an input.

## LiveEDL

Edit Decision Lists (EDL) are files used by non-linear editing (NLE) suites to aid in post-production. Your switcher can capture EDL data in a file that you load into your NLE suite.

For information on using the LiveEDL feature, visit the Ross Video Website ([rossvideo.com](http://rossvideo.com)).

## Matte/Wash Generator

A matte generator and complex wash generator per ME, capable of multi-color washes comes standard. Any one of the color generators can be assigned to MATTE, or wipe pattern edges. An additional simple color generator is available for an Aux Bus.

## ME Effect System

The ME (Multi-level Effect) systems are standard. The number of MEs depends on the chosen switcher model.

Each ME provides 4 keyers supporting pattern mask, box mask, self-key, linear key, and an UltraChrome advanced chroma key for each ME and is available to each keyer.

## Media-Store

Up to 4 independent channels of still/animations are available switcher-wide, allowing for thousands of full screen stills and logos that can be cached and used on the switcher.

Media-Store provides 2 GB of cache. The number of images cached increases considerably when smaller, non-full screen images like logos are loaded from USB.

## MediaManager

The MediaManager allows you to easily manage stills and animations on the switcher in a graphics interface.

## MediaWipe

A MediaWipe allows you to use an animation from the Media-Store to play over a background or key transition. When the transition starts, the switcher plays the selected animation over top of the background and keys that are being

transitioned. A cut, dissolve, wipe, or DVE wipe is then performed layered under the animation to bring up the next shot when the animation ends.

## MemoryAI Recall Mode

We take the guessing out of memory recalls by ensuring that a memory recall will not affect what is currently on-air. MemoryAI uses the content of the memory to configure the Next Transition area and Preview bus for the background and keyers so that the next transition takes the same sources on-air that were on-air in the memory.

For example, store a memory that has a key on-air with CAM1 and CAM2 selected on the background. When this memory is recalled normally, it pops the same key on-air with CAM1 and CAM2 on the background. When the memory is recalled with MemoryAI turned on, CAM1 is selected on the preset bus, and CAM2 is selected on a key that is not on-air. The transition area is then set up for a background transition to bring CAM2 onto the background, take any on-air keys off, and take a key on-air with CAM1.

## Memory System

Storage for 100 complete switcher snapshots per ME, MiniME™, and MultiScreen comes standard with all switchers. All of these memories can be stored to a USB media drive, providing custom tailored memories for every operator and every show.

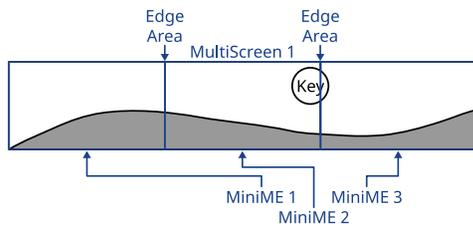
## MiniME™

The MiniME™ is an additional ME that is provided with the switcher to perform basic dissolves and cuts. Each MiniME™ has 2 keyers, background, and preset buses. Unlike a full ME, the MiniME™ only supports dissolves and cuts, restricts key 1 to DVE keys only, and has no preview output. Key 2 on a MiniME™ is the same as an ME keyer. The MiniME™ shares all the same sources as the ME.

## MultiScreen

The MultiScreen is made up of a number of MultiScreen generators. Each MultiScreen breaks the scene up into separate outputs (MiniME™ outputs) that can be sent to independent projectors or displays to make a unified picture.

Each screen in the MultiScreen output uses a MiniME™ to create the background and keys of the output.



## UltraChrome

The UltraChrome chroma keyers uses advanced video processing technology to provide exceptional blue spill reduction and clean edges, even with difficult source material. Glass, smoke, translucent materials, and natural shadows are handled superbly.

There are 2 floating Chroma Keys that are available across all MEs.

## MultiViewer

Each MultiViewer allows you to view up to 16 video sources, in 45 different layouts, from a single output BNC. Any video source on the switcher, including ME Program, Preview, and Media-Store channels, can be routed to any box on the MultiViewer. All boxes on the MultiViewer output include mnemonic source names and red and green tallies.

There are 2 broadcast-quality integrated MultiViewer generators in the switcher subsystem. The MultiViewer outputs are only available on out BNCs 5 and 6, and the HDMI outputs.

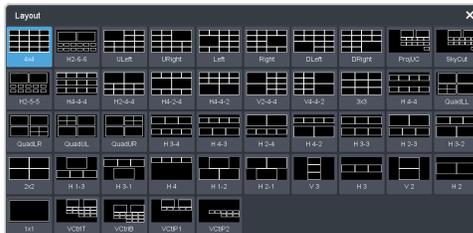


Figure 1: HD Layouts

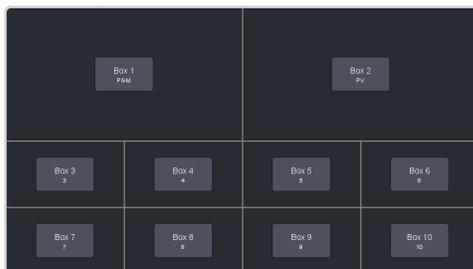


Figure 2: MultiViewer Grid

## Pattern and Matte/Wash Generators

A single pattern generator dedicated to wipes comes standard, and is equipped with 10 classic wipes. Most wipes can be rotated, bordered, multiplied, aspectized, and repositioned.

## Product Comparison

Use the following table to compare the different switchers in the product line.

### Graphite PPC (Portable Production Center)

Graphite is available in a standard 4RU rack server or a portable workstation. The Portable Production Center (PPC) has the same features and performance capabilities as the standard 4RU Production Engine, but with an integrated 17 inch monitor and foldable keyboard with touchpad.

### Graphite Systems

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
<b>Video Inputs</b>				
SDI Inputs	4	8	8	12
HDMI™ Inputs	1			
<b>Video Outputs</b>				
SDI Outputs	2	6		
HDMI™ Outputs	2			
<b>Resources</b>				
MEs	1	2		
Keys per ME	4			
DVE Channels (2D DVE)	4 (floating)			
FSFCs	6 (inputs 1-6 only)			
UltraChrome Chroma Keys	2 (floating)			
Media-Store Channels	4			
GPII/Os (1RU Audio Breakout Module only)	24			
Tallies (1RU Audio Breakout Module only)	16			

## TouchDrive Control Panels

	TD1C	TD1	TD2	TD2S	TD3S
<b>Control Panel</b>					
Panel Source Buttons per Row	15	15	15	25	25
Number of User Assignable Buttons per Row	15	15	25	25	25
Number of Control Panel Rows	1	1	2	2	3
DashBoard Interface	Yes				
Touchscreen Monitor	Optional				
Integrated Touchscreen Panel Displays	Yes				
Button Colors	Full HSL				
Mnemonic Colors	20 (background and text)				
Source Mnemonic Icons	Yes				
Legendary Ross Fader Handle with Lifetime Guarantee	Yes				
Positioner	Z Axis				
In Row Memory Keypad	No	No	No	Yes	Yes
<b>Engineering and Networking</b>					
Redundant Power	Yes (optional)				
Ethernet Connectivity	1 × GigE				
USB	4 × USB 2.0, 1 × USB 3.0				

# Standard Systems

The Graphite integrated production system comes in a number of configurations, depending on the chassis and number of MEs and inputs you want.

## 4RU Integrated Production System

Option	Description
GRAPHITE-4RU-1ME-5IN	The GRAPHITE-4RU-ENGINE with 1 ME, 4 SDI + 1 HDMI™ inputs, and 2 SDI + 2 HDMI™ outputs.
GRAPHITE-4RU-1ME-9IN	The GRAPHITE-4RU-ENGINE with 1 ME, 8 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.
GRAPHITE-4RU-2ME-9IN	The GRAPHITE-4RU-ENGINE with 2 MEs, 8 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.
GRAPHITE-4RU-2ME-13IN	The GRAPHITE-4RU-ENGINE with 2 MEs, 12 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.

## Portable Production Center

Option	Description
GRAPHITE-PPC-1ME-5IN	The GRAPHITE-PPC-ENGINE with 1 ME, 4 SDI + 1 HDMI™ inputs, and 2 SDI + 2 HDMI™ outputs.
GRAPHITE-PPC-1ME-9IN	The GRAPHITE-PPC-ENGINE with 1 ME, 8 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.
GRAPHITE-PPC-2ME-9IN	The GRAPHITE-PPC-ENGINE with 2 MEs, 8 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.
GRAPHITE-PPC-2ME-13IN	The GRAPHITE-PPC-ENGINE with 2 MEs, 12 SDI + 1 HDMI™ inputs and 6 SDI + 2 HDMI™ outputs.

## 1RU Audio Breakout Module

Option	Description
GRAPHITE-1RU-AUDBKM	The 1RU Audio Breakout Module with 8 analog audio in XLR/Audio Jacks, 1 AES Audio in XLR, 5 analog audio out XLRs, 1 AES audio out XLR, 24 GPIs, and 16 tallies.

## TouchDrive Control Panel

Select the control panel that meets the needs of your production environment.

Option	Description
TD1C-PANEL	A compact rack-mountable panel with 15 source buttons, 15 user select buttons (plus 3 in the transition area), independent keyer and transitions areas, updated 3-knob menu interface, and an advanced z-axis positioner.
TD1-PANEL	The same features as the TD1C panel but in a standard panel row design.
TD2-PANEL	The same features as the TD1 panel, but with 2 panel rows.
TD2S-PANEL	The same features as the TD2 panel, but with 25 source buttons, 25 user select buttons (plus 3 in the transition area), and an Acuity® style memory area with keypad and rate buttons.
TD3S-PANEL	The same features as the TD2S panel, but with 3 panel rows.

**Note:** The TouchDrive control panels do not come with a power supplies. You must pick either a standard brick power supply (CUF-PSU), or a rack power option (CUF-RACKPWR) to provide power for the control panel.

## TouchScreen Display (TD-DISPLAY)

A 15.6-inch touchscreen monitor that connects directly to the TouchDrive control panel for power, DashBoard interface, and touch-control.

**Note:** A separate VESA®-100 (VESA® MIS-D, 100, C) mounting arm is required for the display.

## Power Supplies

The redundant power supply options provides protection against AC power failure. It allows two external power supplies to receive power from independent power sources. Complete failure of one source, or power supply, will not affect standard operations. If the main AC power fails, power is drawn from the remaining source. The transition from one power source to the other is totally transparent and has no effect on operations; a critical feature should one power source fail during an on-air broadcast.

**Tip:** You can order a second CUF-PSU option to provide redundant power for the control panel.

Option	Description
CUF-PSU	Adds a brick power supply for the control panel.

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Option	Description
CUF-RACKPWR	Adds the Ultripower rack power supply for the control panel.

## System Options

Options are typically ordered when the switcher is purchased. However, you can order options if your needs change in the future. Most of our options can be easily installed in the field. You can take comfort in knowing that you can purchase options in the future and that installation at your site will be a smooth process.

### 1RU Audio Breakout Module (GRAPHITE-1RU-AUDBKM)

The 1RU Audio Breakout Module supports the RAVE audio engine by providing dedicated analog (XLR and headphone) and AES inputs and outputs for the audio mixer. The audio signals are embedded/de-embedded into video streams going between the switcher and the 1RU Audio Breakout Module.



You can connect up to 3 1RU Audio Breakout Modules to the switcher.

The GPI and Tally ports for the switcher are also provided at the back of the first 1RU Audio Breakout Module panel.

You can connect up to 3 1RU Audio Breakout Modules to the 4RU Integrated Production System.

### 1 to 2 ME Upgrade (GRAPHITE-1ME-2ME-UPG)

This option increases the number of MEs in your 4RU Integrated Production System from 1 to 2.

### Additional SDI Video Inputs

The 4RU Integrated Production System comes with the hardware (HD-BNCs) for all the video inputs and outputs the system supports, but depending on the configuration you originally order, these inputs may not be available to the switcher. You can add support for a total of 9 or 13 video inputs.

**Note:** If you have a GRAPHITE-4RU-1ME-5IN and want to expand to the full 12 SDI inputs, you must order both GRAPHITE-5IN-9IN-UPG and GRAPHITE-9IN-13IN-UPG options.

Option	Description
GRAPHITE-5IN-9IN-UPG	Increases the number of video inputs from 4 to 8 SDI HD-BNCs. The single HDMI™ input is included with the base configuration.
GRAPHITE-9IN-13IN-UPG	Increases the number of video inputs from 8 to 12 SDI HD-BNCs. The single HDMI™ input is included with the base configuration.

### HD-BNC to BNC Cables (GRAPHITE-HDBNC-BNC)

The 4RU Integrated Production System uses HD-BNC connectors for SDI video inputs and outputs. A set of HD-BNC to BNC adapter cables can be ordered to provide a standard size BNC connector for integration into existing cable runs. Twenty 12-inch adapter cables are provided in the kit.

### XPression Graphite Upgrade

The XPression Graphite system can be upgraded to a full version of the XPression Studio with multiple channels.

**Note:** These upgrades are for software only.

**Note:** You must have the GRAPHITE-PRIME-SCE-UPG before you add additional channels.

Option	Description
GRAPHITE-PRIME-SCE-UPG	XPression Graphite to XPression Prime Studio Single Channel Upgrade (software only)
GRAPHITE-SCE-DUAL-UPG	XPression Prime SCE to DUAL (2 channels) Upgrade.
GRAPHITE-SCE-XST3-UPG	XPression Prime SCE to XST3 (3 channels) Upgrade.
GRAPHITE-SCE-XSTF-UPG	XPression Prime SCE to XSTF Upgrade.

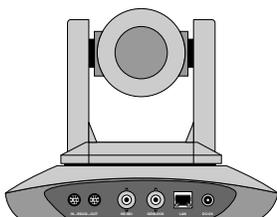
### ACID® UltraChromeHR Camera

ACID® cameras have been designed for maximum HD performance in any studio production environment. They offer best-in-class resolution, sensitivity and signal to noise ratio, plus unique UltraChromeHR outputs for chroma key applications.

Option	Description
AC-H200-UCHR	ACID® AC-H200-UCHR camera.
AC-Z50-UCHR	ACID® AC-Z50-UCHR camera.

## PIVOTCam

PIVOTCam offers high performance image capture with quiet and accurate PTZ functionality, at a fantastic value. Get on-the scene fast watching, following, and twisting to capture those pivotal moments.



Option	Description
PIVOTCAM-SE	PIVOTCam-SE camera.

## SideShot Custom Control Shot Box (CPS-SideShot)

This option provides quick access to the first 24 custom controls on the first 4 custom control banks of the switcher.

The SideShot requires either a serial connection to the control panel or a serial connection to a CarboNET.

## Remote Panels

This option provides external control for selecting sources on an Aux bus from a remote panel. There are a number of options for the remote control panels, depending on your requirements.

These panels connect to the switcher through an NK-IPS and NK-NET over ethernet (T-BUS connection between the NK-IPS and remote control panel).

Option	Description
NK-NET	Adds the NK-NET ethernet adapter that converts ethernet communications to T-Bus serial communications. This is used to connect the switcher to the T-BUS network on the NK-IPS.

Option	Description
NK-IPS	Adds the NK-IPS network bridge for the T-BUS connected remote control panels.
RCP-NK1	Adds the 32 source button NK remote control panel.
RCP-QE18	Adds the 18 mnemonic button, 8 standard button, ethernet enabled RCP-QE18 remote control panel.
RCP-QE36	Adds the 36 mnemonic button, 8 standard button, ethernet enabled RCP-QE36 remote control panel.

## AJA® HELO (GRAPHITE -HELO-STREAM)

The AJA® HELO is a flexible H.264 streaming and recording device providing both SDI and HDMI™ inputs and outputs with the ability to record to SD™ cards, USB drives, or network drives and simultaneously stream to the network.

## DashBoard Display (CBPS-DashMenu)

The DashBoard Display combines a DashBoard computer with a touchscreen into a single unit that can be installed onto a standard VESA-100 mount. The DashBoard Display connects to the switcher over ethernet to provide the advanced menu system interface to the setup and operation of your Carbonite or Carbonite Black switcher.

The DashBoard Display eliminates the need to connect another computer to your switcher network just to run DashBoard.

## SMC-9901 Serial to MIDI Converter (SMC-9901)

The SMC-9901 Serial to MIDI Converter is used to allow control of an Audio Mixer from a Ross Video switcher.

The SMC-9901 provides a single DB-9 connector for 38,400 baud serial RS-422 communication, one 5-pin DIN connector for MIDI in, and two 5-pin DIN connectors for MIDI out. Power, Serial Tx and Rx, MIDI In and MIDI Out Status LEDs next to the ports show activity status.

The SMC-9901 connect to the switcher via the serial port on the frame, or an external port expander such as the Comtrol® DeviceMaster®.

## SHC-9642 SDI to HDMI Converter (SHC-9642)

The SHC-9642 SDI to HDMI Converter is a high-quality signal conversion solution within the family of GearLite compact, self-contained modular products. The SHC-9642 is the ideal solution for converting any SDI input signal (up to 3Gb/s) into an HDMI Type-A output format. User-selectable audio decoding is available with unbalanced, stereo analog audio outputs. Up to 16 channels of embedded audio are selectable, in stereo pairs, for de-embedding and decoding.

## Onsite Operational Training (one day)

Although Ross Video products are designed to be as easy as possible to install and operate, training is highly recommended to ensure that the process of taking your Ross Video product to air is a smooth one.

Training is provided on the customer's equipment at their site. Expenses are extra, and billed at the completion of the visit. Ross Video cannot guarantee the availability of a local Trainer, as such, travel costs to all locations will be invoiced at cost. Two (2) days, or more, of training is recommended for multiple ME systems. Four (4) weeks advanced scheduling notice is required. Additional days of training can be added by ordering one additional option for each additional day of training required.

Customers cancellation or rescheduling of on-site services without seven (7) calendar days advanced notice will incur full invoice.

Option	Description
CARBONITE-OTR-1DAY	Onsite operational training for the CarboNET subsystem.
XPRESSION-OTR-1DAY	Onsite operational training for the XPression subsystem.

## Onsite Commissioning (1-Day)

On-site Commissioning is a great way to ensure that your equipment is properly installed into your facility and tuned to maximum performance.

Once the customer has installed and cabled the equipment, a Ross Commissioning expert will come on site to get the equipment configured, verify that all peripheral interfaces are operating properly, provide a basic technical orientation, and help you get on the air.

Training is provided on the customer's equipment at their site. Expenses are extra, and billed at the completion of the visit. Ross Video cannot guarantee the availability of a local Trainer, as such, travel costs to all locations will be invoiced at cost. Two (2) days, or more, of training is recommended for multiple ME systems. Four (4) weeks advanced scheduling notice is required. Additional days of training can be added by ordering one additional option for each additional day of training required.

Customers cancellation or rescheduling of on-site services without seven (7) calendar days advanced notice will incur full invoice.

**Note:** Commissioning does not replace operator or technical training. Contact your Ross representative to discuss which types of assistance are best suited to your needs.

Option	Description
CARBONITE-COM-1DAY	Onsite commissioning for the CarboNET subsystem.
XPRESSION-COM-1DAY	Onsite commissioning for the XPression subsystem.

## Onsite Technical Training (1 Day)

On-site technical training introduces the user to some of the technical aspects of switcher operation and maintenance. This includes, but is not limited to; Basic operation, Switcher installation and configurations, Peripheral interfaces, Video signal flow, System timing requirements, Circuit block diagrams, Circuit board overviews, Jumpers and indicators, Troubleshooting tips, Software upgrading, and Routine maintenance.

Training is provided on the customer's equipment at their site. Expenses are extra, and billed at the completion of the visit. Ross Video cannot guarantee the availability of a local Trainer, as such, travel costs to all locations will be invoiced at cost. Two (2) days, or more, of training is recommended for multiple ME systems. Four (4) weeks advanced scheduling notice is required. Additional days of training can be added by ordering one additional option for each additional day of training required.

Customers cancellation or rescheduling of on-site services without seven (7) calendar days advanced notice will incur full invoice.

Option	Description
CARBONITE-OTT-1DAY	Onsite technical training for the CarboNET subsystem.

## Online Operational Training (1 Day)

Sometimes you don't need the hands-on attention that having a trainer come to your facility provides. In these situations Ross Video provides comprehensive, web-based, online training.

Two (2) days, or more, of training is recommended for multiple ME systems. Four (4) weeks advanced scheduling notice is required. Additional days of training can be added by ordering one additional option for each additional day of training required.

Customers cancellation or rescheduling of on-site services without seven (7) calendar days advanced notice will incur full invoice.

Option	Description
CARBONITE-ONL-1DAY	Online operational training for the CarboNET subsystem.
XPRESSION-ONL-1DAY	Online operational training for the XPression subsystem.

## Extended Warranty

This adds software maintenance and an additional year of hardware warranty to your system. Additional years can be purchased by ordering more than one of an option.

Option	Description
<b>Panels</b>	
TD1C-PANEL-HW	Adds an additional year of warranty to the TD1C control panel.
TD1-PANEL-HW	Adds an additional year of warranty to the TD1 control panel.
TD2-PANEL-HW	Adds an additional year of warranty to the TD2 control panel.
TD2S-PANEL-HW	Adds an additional year of warranty to the TD2S control panel.

Option	Description
TD3S-PANEL-HW	Adds an additional year of warranty to the TD3S control panel.
TD-DISPLAY-HW	Adds an additional year of warranty to the touchscreen display.
<b>Graphite 4RU</b>	
GRAPHITE-4RU-1ME-5IN-SM	Adds an additional year of software maintenance to the 4RU Integrated Production System with 1 ME, and 5 video inputs.
GRAPHITE-4RU-1ME-9IN-SM	Adds an additional year of software maintenance to the 4RU Integrated Production System with 1 ME, and 9 video inputs.
GRAPHITE-4RU-2ME-9IN-SM	Adds an additional year of software maintenance to the 4RU Integrated Production System with 2 MEs, and 9 video inputs.
GRAPHITE-4RU-2ME-13IN-SM	Adds an additional year of software maintenance to the 4RU Integrated Production System with 2 MEs, and 13 video inputs.
GRAPHITE-4RU-1ME-5IN-HM	Adds an additional year of hardware warranty to the 4RU Integrated Production System with 1 ME, and 5 video inputs.
GRAPHITE-4RU-1ME-9IN-HM	Adds an additional year of hardware warranty to the 4RU Integrated Production System with 1 ME, and 9 video inputs.
GRAPHITE-4RU-2ME-9IN-HM	Adds an additional year of hardware warranty to the 4RU Integrated Production System with 2 MEs, and 9 video inputs.
GRAPHITE-4RU-2ME-13IN-HM	Adds an additional year of hardware warranty to the 4RU Integrated Production System with 2 MEs, and 13 video inputs.
<b>Graphite PPC</b>	
GRAPHITE-PPC-1ME-5IN-SM	Adds an additional year of software maintenance to the Graphite PPC with 1 ME, and 5 video inputs.
GRAPHITE-PPC-1ME-9IN-SM	Adds an additional year of software maintenance to the Graphite PPC with 1 ME, and 9 video inputs.

Option	Description
GRAPHITE-PPC-2ME-9IN-SM	Adds an additional year of software maintenance to the Graphite PPC with 2 MEs, and 9 video inputs.
GRAPHITE-PPC-2ME-13IN-SM	Adds an additional year of software maintenance to the Graphite PPC with 2 MEs, and 13 video inputs.
GRAPHITE-PPC-1ME-5IN-HM	Adds an additional year of hardware warranty to the Graphite PPC with 1 ME, and 5 video inputs.
GRAPHITE-PPC-1ME-9IN-HM	Adds an additional year of hardware warranty to the Graphite PPC with 1 ME, and 9 video inputs.
GRAPHITE-PPC-2ME-9IN-HM	Adds an additional year of hardware warranty to the Graphite PPC with 2 MEs, and 9 video inputs.
GRAPHITE-PPC-2ME-13IN-HM	Adds an additional year of hardware warranty to the Graphite PPC with 2 MEs, and 13 video inputs.
<b>XPression</b>	
GRAPHITE-PRIME-SCE-UPG-SM	Adds an additional year of software maintenance to the XPression with the GRAPHITE-PRIME-SCE-UPG option.
GRAPHITE-SCE-DUAL-UPG-SM	Adds an additional year of software maintenance to the XPression with the GRAPHITE-SCE-DUAL-UPG option.
GRAPHITE-SCE-XST3-UPG-SM	Adds an additional year of software maintenance to the XPression with the GRAPHITE-SCE-XST3-UPG option.
GRAPHITE-SCE-XSTF-UPG-SM	Adds an additional year of software maintenance to the XPression with the GRAPHITE-SCE-XSTF-UPG option.
<b>ABM</b>	
GRAPHITE-1RU-AUDBKM-ROSSCARE	Adds an additional year of warranty to the 1RU Audio Breakout Module.

# Specifications

The information in this section is subject to change without notice.

## Switcher Resources

The number of resources specific to your switcher depends on the options installed.

Resource	Graphite
<b>Audio</b>	
Audio Mixer Faders	48
Mix Layers	13
Max 1RU Audio Breakout Module	3
<b>Video</b>	
2D DVE Channels	4
Chroma Keys per ME	2 (floating)
Custom Controls	256 (8 Banks × 32 CCs)
Keyers per ME	4
Matte Generators per ME	2
Media-Store CACHE	2 GB
Media-Store Channels (Max)	4
Memories per ME	100
MEs (Max)	2
MiniME™ Engines	4
MultiScreen Generators	2 <sup>1</sup>
MultiViewer Boxes	16
MultiViewer Layouts	45
MultiViewer Outputs	2
Pattern Generators per ME	2
Input FSFCs	6 (inputs 1-6 only)
Frame Delay (Max Frames)	16 (inputs 1-6 only)
Output Format Converters	0
GPI I/Os <sup>2</sup>	24
Tallies <sup>2</sup>	16
Aux Buses	20
SDI Inputs (HD-BNC)	12
Video Inputs (HDMI)	1
SDI Outputs (HD-BNC)	6
Video Outputs (HDMI)	2
LTC Input (HD-BNC)	1

Resource	Graphite
Reference Input (HD-BNC)	1
Carbonite IP	192.168.0.123
XPression IP	192.168.0.113
Panel/CarboNET IP	192.168.0.129

### Notes

<sup>1</sup> Each MultiScreen consumes MiniME™ engines to generate the output. The number of MultiScreen outputs that are available depends on the number of MiniME™ engines that are available.

<sup>2</sup> The Tally and GPI connectors are only present on the optional 1RU Audio Breakout Module.

**Table 1: Audio Mixer Available Audio Channels**

	0 ABM	1 ABM	2 ABM	3 ABM
Analog	0	4 stereo pairs	8 stereo pairs	12 stereo pairs
AES	0	1 stereo pair	2 stereo pairs	3 stereo pairs
SDI (1-12) <sup>3</sup>	96 stereo pairs	88 stereo pairs	80 stereo pairs	72 stereo pairs
Media-Store (1-2)	2 stereo pairs	2 stereo pairs	2 stereo pairs	2 stereo pairs
PC Audio	8 stereo pairs	8 stereo pairs	8 stereo pairs	8 stereo pairs
XPression (1-4)	32 stereo pairs	32 stereo pairs	32 stereo pairs	32 stereo pairs
<b>Total Channels</b>	<b>138 stereo pairs</b>	<b>135 stereo pairs</b>	<b>132 stereo pairs</b>	<b>129 stereo pairs</b>

### Notes

<sup>3</sup> When the 1RU Audio Breakout Module is connected to the switcher, the HD-BNCs used for the SDI-Audio Loop are not available for embedded audio. This uses one SDI input and one SDI output.

## Hardware Weights

Hardware	Weight
Graphite 4RU	62 lbs (28.1 kg)
Graphite PPC	42 lbs (19.05 kg)

## Video Input Specifications

Input Specification	Value
Equalization (using Belden 1694 cable)	>50m @ 3Gb/s
	>100m @ 1.5 Gb/s
	>300m @ 270 Mb/s (5°-40°C)
Impedance	75 ohm, terminating
Video Inputs, SDI	SMPTE 259M/292M/424M (non-looping)
Video Inputs, HDMI	HDMI 1.4
	High Speed HDMI Cable (Max 10m)
Reference Inputs (75 ohm, terminated)	Standard Definition — analog black
	High Definition — tri-level sync

## Video Output Specifications

Output Specification	Value
Return Loss (w/o bypass)	>15dB 5Mb/s to 1.5Gb/s
	>10dB 1.5Gb/s to 3Gb/s
Return Loss (w/ bypass)	>13dB 5Mb/s to 1.5Gb/s
	>10dB 1.5Gb/s to 3Gb/s
Rise and Fall Time	800ps ±10% (SD)
	240ps ±10% (HD)
Signal Level	800mV ±10%
DC Offset	0 Volts
Overshoot	<10%
Video Outputs, SDI HD Mode	10-bit SMPTE-292M/424M serial digital
Video Outputs, HDMI	HDMI 1.4
	High Speed HDMI Cable (Max 10m)

## Bypass Relay Loop

If the switcher subsystem is not running there is a pair of loop-through bypass replays.

- IN1 — OUT1
- IN3 — OUT3

**Note:** The cable length for the loop-through depends on the equipment you are using.

## ABM Analog Audio Input Specifications

Analog audio inputs on the 1RU Audio Breakout Module.

Specification	Value
Input Impedance	XLR: 2K ohm
	¼" Jack: 10K ohm
Maximum Level	+24dBu
Frequency Response	±0.3dBu (22Hz to 20kHz @ Fs = 48kHz)
Signal to Noise Ratio	-95dB
	-98dB
	-107dB
THD	>93dB or <0.002%
Amplitude Linearity	<0.8dB @ -100dBFS
Crosstalk	-94dB

## ABM Analog Audio Output Specifications

Analog audio outputs on the 1RU Audio Breakout Module.

Specification	Value
Maximum Level	+24dBu
Frequency Response	±0.4dB (22Hz to 20kHz @ Fs = 48kHz)
Signal to Noise Ratio	-103dB
THD	>93dB
Amplitude Linearity	<0.3dB @ -100dBFS
Crosstalk	-106dB (20Hz to 20kHz)

## Jitter

Specification	Value
HD - Tri-Level Sync	Alignment (> 100KHz) < 0.2UI
	Timing (<10Hz) < 1.0UI
HD - Composite Reference	Performance not guaranteed with composite reference
SD - Tri-Level Sync	Alignment (> 1KHz) < 0.2UI
	Timing (<10Hz) < 0.2UI
SD - Composite Reference	Alignment (> 1KHz) < 0.2UI
	Timing (<10Hz) < 0.5UI

## System Timing

- All video inputs zero time relative to reference input, auto timing will correct for inputs out of time by up to +/- 0.25 line.
- System delay is less than 1 line.

## Power Consumption — Panel

	TD1	TD2	TD2S	TD3S
Power	73W 4.87A 15V	85W 5.67A 15V	107W 7.13A 15V	165W 11A 15V
Input Voltage	100 - 120V~, 220 - 240V~, 47-63Hz			

## Power Consumption — Frame

	Graphite 4RU	Graphite PPC	1RU Audio Breakout Module
Power	520W 4.7A 120V	185W 1.5A 120V	45W 3.8A 12V
Input Voltage	100~240VAC, 50-60Hz, 14-7A		

# Option Summary

Use the available options listed in the following tables for each control panel or frame.

## Frame Options

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
<b>Frames</b>				
Base 4RU Integrated Production System	GRAPHITE-4RU-ENGINE			
Base Portable Production Center	GRAPHITE-PPC-ENGINE			
<b>Frame Options</b>				
4RU System Configurations	GRAPHITE-4RU-1ME-5IN	GRAPHITE-4RU-1ME-9IN	GRAPHITE-4RU-2ME-9IN	GRAPHITE-4RU-2ME-13IN
PPC System Configurations	GRAPHITE-PPC-1ME-5IN	GRAPHITE-PPC-1ME-9IN	GRAPHITE-PPC-2ME-9IN	GRAPHITE-PPC-2ME-13IN
1-2 ME Upgrade	GRAPHITE-1ME-2ME-UPG			
5-9 Input Upgrade	GRAPHITE-5IN-9IN-UPG			
9-13 Input Upgrade	GRAPHITE-9IN-13IN-UPG			
<b>Audio Options</b>				
1RU Audio Breakout Module	GRAPHITE-1RU-AUDBKM			
<b>Switcher Options</b>				
AJA® HELO	GRAPHITE-HELO-STREAM			
HD-BNC to BNC Adapters Kit (20 cables)	GRAPHITE-HDBNC-BNC			
Aux Panels	RCP-NK1, RCP-QE18, RCP-QE36			
SHC-9642 SDI to HDMI Converter	SHC-9642			
SideShot	CPS-SideShot			
SMC-9901 Serial to MIDI Converter	SMC-9901			
XPression Live CG	XDS0-0001-CPS			
ACID® AC-H200-UCHR	AC-H200-UCHR			
ACID® AC-Z50-UCHR	AC-Z50-UCHR			
PIVOTCam-SE	PIVOTCAM-SE			
RCP-ME Remote Control Panel	RCP-ME			
RCP-QE18 Remote Control Panel	RCP-QE18			
RCP-QE36 Remote Control Panel	RCP-QE36			
2RU Ulritouch	ULTRITOUCH-2RU			
Ulritouch Redundant Power	ULTRITOUCH-PS			

Graphite 1 ME, 5 Inputs					Graphite 1 ME, 9 Inputs					Graphite 2 ME, 9 Inputs					Graphite 2 ME, 13 Inputs									
<b>XPression Upgrades</b>																								
XPression Graphite to XPression Studio Single Channel Upgrade (software only)					GRAPHITE-PRIME-SCE-UPG																			
XPression Graphite to XPression Studio Two Channel Upgrade (software only)					GRAPHITE-SCE-DUAL-UPG																			
XPression Graphite to XPression Studio Three Channel Upgrade (software only)					GRAPHITE-SCE-XST3-UPG																			
XPression Graphite to XPression Studio FLEX Channel Upgrade (software only)					GRAPHITE-SCE-XSTF-UPG																			
<b>Extended Warranty</b>																								
Graphite Software Maintenance (4RU)					GRAPHITE-4RU-1ME-5IN-SM					GRAPHITE-4RU-1ME-9IN-SM					GRAPHITE-4RU-2ME-9IN-SM					GRAPHITE-4RU-2ME-13IN-SM				
Graphite Software Maintenance (Graphite PPC)					GRAPHITE-PPC-1ME-5IN-SM					GRAPHITE-PPC-1ME-9IN-SM					GRAPHITE-PPC-2ME-9IN-SM					GRAPHITE-PPC-2ME-13IN-SM				
Graphite Hardware Extended Warranty (4RU)					GRAPHITE-4RU-1ME-5IN-HM					GRAPHITE-4RU-1ME-9IN-HM					GRAPHITE-4RU-2ME-9IN-HM					GRAPHITE-4RU-2ME-13IN-HM				
Graphite Hardware Extended Warranty (Graphite PPC)					GRAPHITE-PPC-1ME-5IN-HM					GRAPHITE-PPC-1ME-9IN-HM					GRAPHITE-PPC-2ME-9IN-HM					GRAPHITE-PPC-2ME-13IN-HM				
Extended Warranty (1RU Audio Breakout Module)					GRAPHITE-1RU-AUDBKM-ROSSCARE																			
XPression Software Maintenance (Studio Single Channel Upgrade)					GRAPHITE-PRIME-SCE-UPG-SM																			
XPression Software Maintenance (Studio SCE Two Channel Upgrade)					GRAPHITE-SCE-DUAL-UPG-SM																			
XPression Software Maintenance (Studio SCE Three Channel Upgrade)					GRAPHITE-SCE-XST3-UPG-SM																			
XPression Software Maintenance (Studio SCE Flex Channel Upgrade)					GRAPHITE-SCE-XSTF-UPG-SM																			

## Training Options

Code	
Online Operational Training, Carbonite	CARBONITE-ONL-1DAY
Onsite Commissioning, Carbonite	CARBONITE-COM-1DAY

Code	
Onsite Operational Training, Carbonite	CARBONITE-OTR-1DAY
Onsite Technical Training, Carbonite	CARBONITE-OTT-1DAY
Online Operational Training, XPression	XPRESSION-ONL-1DAY
Onsite Commissioning, XPression	XPRESSION-COM-1DAY
Onsite Operational Training, XPression	XPRESSION-OTR-1DAY

## TouchDrive Control Panel Options

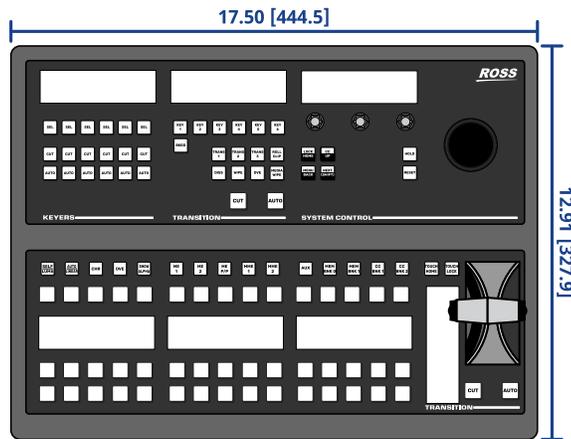
	TD1C	TD1	TD2	TD2S	TD3S
<b>Control Panels</b>					
Panel	TD1C-PANEL	TD1-PANEL	TD2-PANEL	TD2S-PANEL	TD3S-PANEL
Brick Power Supply	CUF-PSU				
Ultripower Rack Power Supply	CUF-RACKPWR				
Extended Warranty, Panel	TD1C-PANEL-HW	TD1-PANEL-HW	TD2-PANEL-HW	TD2S-PANEL-HW	TD3S-PANEL-HW
<b>TouchScreen Display</b>					
Display	TD-DISPLAY				
Extended Warranty, Display	TD-DISPLAY-HW				

# Panel Dimensions

These dimensions are provided as a guide only. Contact Ross Video Technical Support for scale CAD drawings of the control panels and frames.

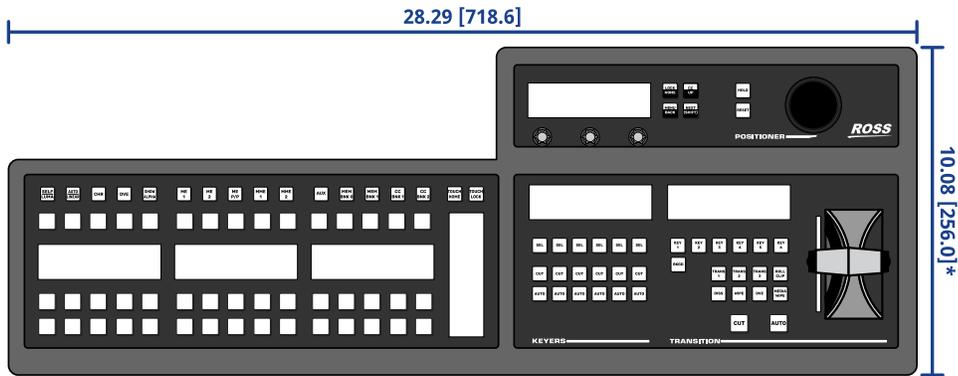
Dimensions are in inches with metric dimensions shown in brackets [mm].

## TD1C



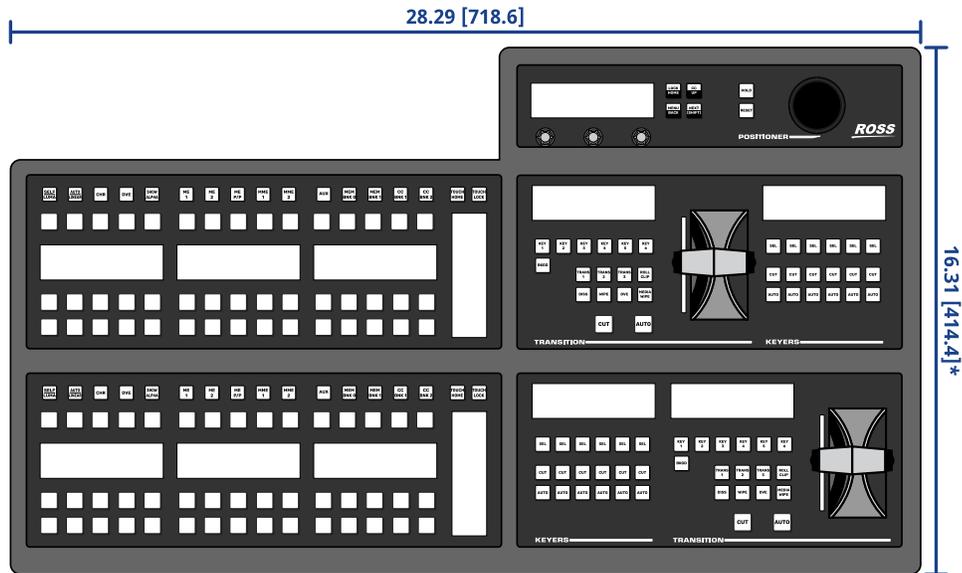
## TD1

**Note:** \* Because the TouchDrive control panel is curved, the depth measurement is only approximate.



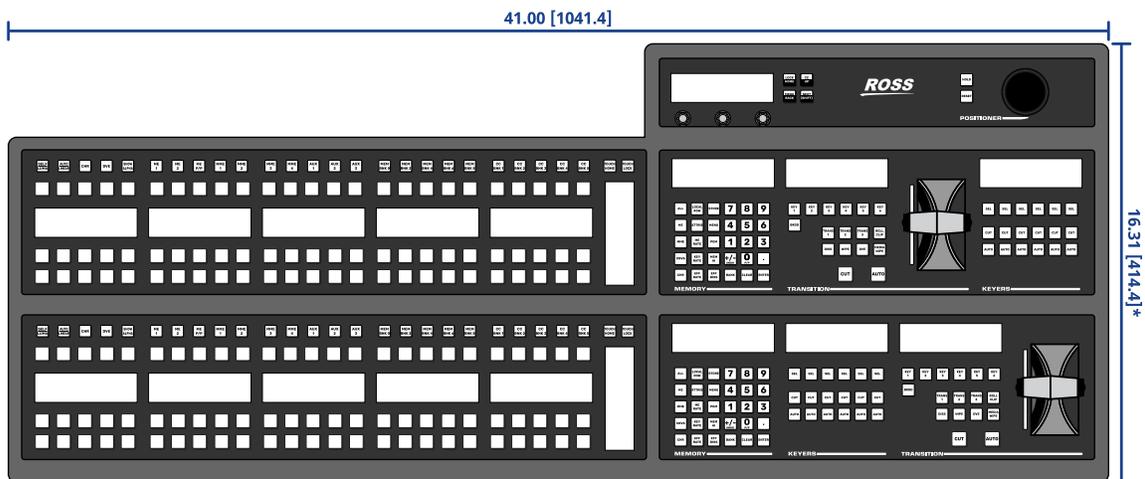
## TD2

**Note:** \* Because the TouchDrive control panel is curved, the depth measurement is only approximate.



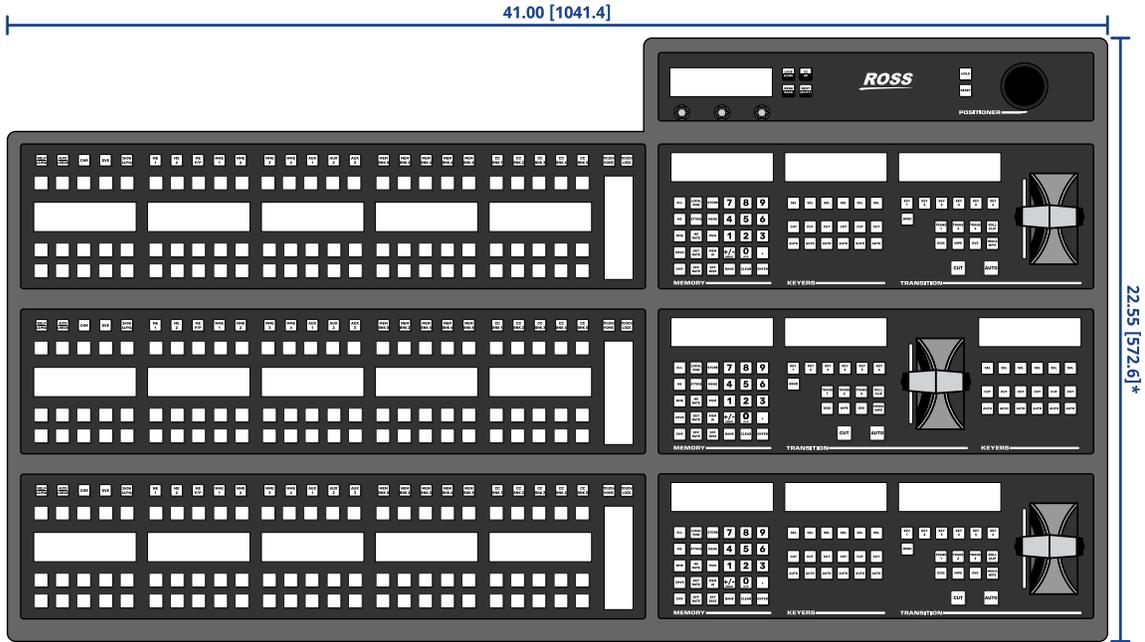
## TD2S

**Note:** \* Because the TouchDrive control panel is curved, the depth measurement is only approximate.



## TD3S

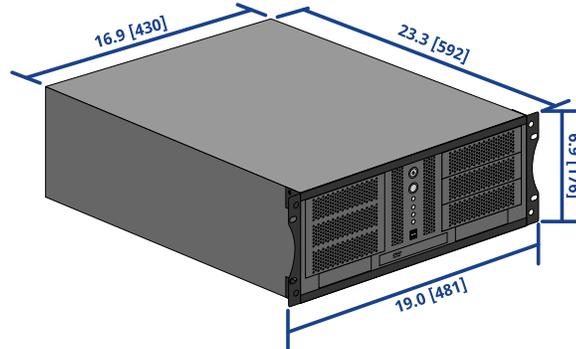
**Note:** \* Because the TouchDrive control panel is curved, the depth measurement is only approximate.



## Frame Dimensions

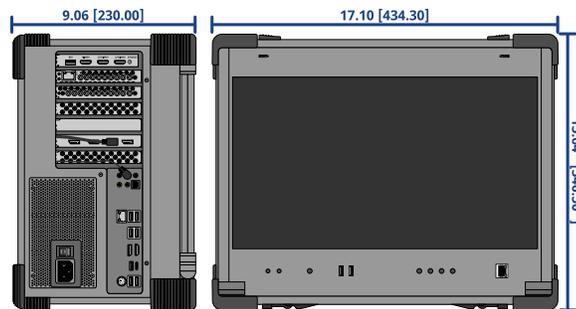
Dimensions are in inches with metric dimensions shown in brackets [mm].

### 4RU Integrated Production System Dimensions



### Graphite PPC Dimensions

**Note:** \*Total height is 14.74in [374.50mm] with handle on top.



### 1RU Audio Breakout Module Dimensions

