

GRAPHITE

Graphite Configuration Guide

v1.1

Document Information

- Ross Part Number: **4850DR-100-04**
- Release Date: April, 2018. Printed in Canada

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Patents

Patent numbers US 7,034,886; US 7,508,455; US 7,602,446; US 7,802,802 B2; US 7,834,886; US 7,914,332; US 8,307,284; US 8,407,374 B2; US 8,499,019 B2; US 8,519,949 B2; US 8,743,292 B2; US D752,530 S; GB 2,419,119 B; GB 2,447,380 B; and other patents pending.

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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 40 years, with significant year over year growth for the past 25 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.

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 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.

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.

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.

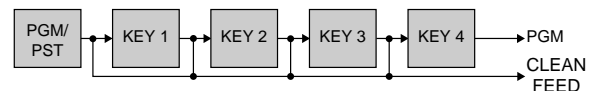
Carbonite Black Production Switcher

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

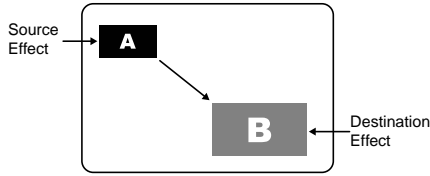
The switcher can control a number of external devices, such as video servers and robotic cameras. For a complete list of supported devices, and information on how to set up and control these devices, visit the Ross Video website (rossvideo.com/production-switchers/carbonite/interface-list).

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.

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).

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™

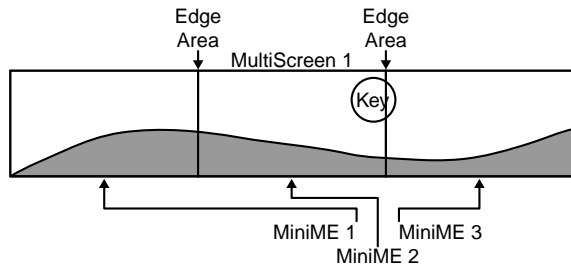
The MiniME™ is an additional ME that is provided with the switcher to perform basic dissolves and cuts. Each MiniME™ has 2 keyers, background, and preset buses. Unlike a full ME, the MiniME™ only supports dissolves and cuts, restricts key 1 to DVE keys only, and has no preview output. Key 2 on a MiniME™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

MultiScreen

The switcher comes standard with 2 integrated MultiScreen generators. Each MultiScreen can break a scene into up to 4 outputs that can be sent to independent projectors or displays to make a unified picture. Integrated edge blending allows you to compensate for

the overlap in projector outputs, or the outside bezel of your display.

Each screen in the MultiScreen output uses a MiniME™ to create the background and keys of the output. This allows you to have 2 MultiScreen generators with 2 screens each, or 1 MultiScreen generator with 3 or 4 screens.



MultiViewer

Each MultiViewer allows you to view up to 16 video sources, in 45 different layouts, from a single output. 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.

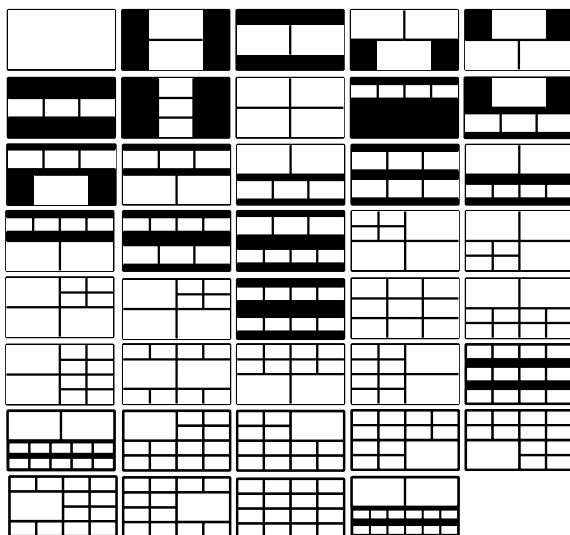


Figure 1: HD Layouts (not including ViewControl layouts)

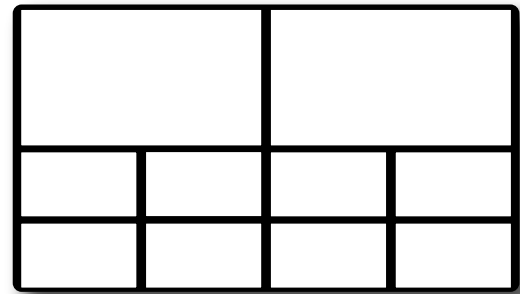


Figure 2: MultiViewer Grid

If the switcher is operating in a standard-definition video format, the MultiViewer can be set to output high-definition.

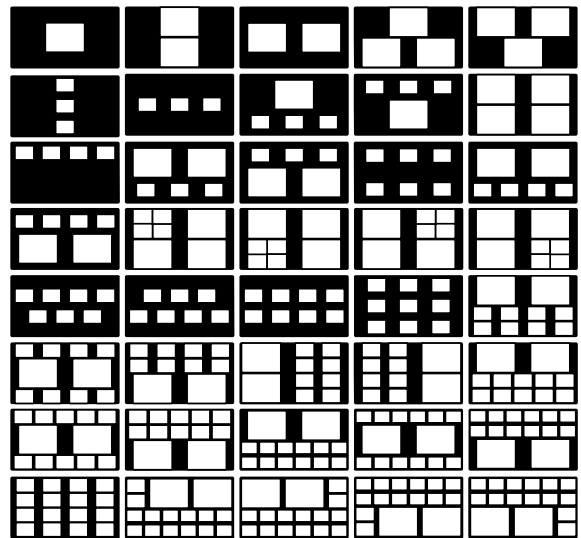


Figure 3: HD in SD Layouts (480i 4:3)

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.

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.

Product Comparison

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

Graphite Systems

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
Hardware				
Rack Frame Height	4 RU			
Sliding Rack Rails	Included			
Server OS	Microsoft® Windows® 7			
Video Inputs				
SDI Inputs	4	8	8	12
HDMI™ Inputs	1			
Video Outputs				
SDI Outputs	2	2	2	6
HDMI™ Outputs	2			
Audio Inputs				
SDI Audio Inputs (stereo pairs)	4	8	8	12
PC Audio Inputs (stereo pairs)	1			
Media-Store Audio Inputs (stereo pairs)	2			
XPression Audio Inputs (stereo pairs)	4			
Analog Audio Inputs (1RU Audio Breakout Module only)	8			
AES Audio Inputs (1RU Audio Breakout Module only)	1			
Audio Outputs				
Main SDI Audio Outputs (stereo pairs)	1			
Aux SDI Audio Outputs (stereo pairs)	3			
PC Audio Outputs (stereo pairs)	1			
Analog Audio Outputs (1RU Audio Breakout Module only)	5			
AES Audio Outputs (1RU Audio Breakout Module only)	1			
Resources				
MEs	1	2		
Keys per ME	4			
DVE Channels (2D DVE)	4 (floating)			
FSFCs	6 (inputs 1-6 only)			
UltraChrome Chroma Keys	2 (floating)			

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
Media-Store Channels	4			
GPI I/Os (1RU Audio Breakout Module only)	24			
Tallies (1RU Audio Breakout Module only)	16			

Carbonite Black Control Panels

	CB9	CB1	CB1S	CB2	CB2S	CB3S	CB3X
Control Panel							
Panel Source Buttons per Row	9	16	24	16	24	24	32
Number of User Assignable Buttons per Row	8	12	16	12	16	16	24
Number of Control Panel Rows	1	1	1	2	2	3	3
Total Panel Buttons	75	102	162	186	298	434	530
Custom Control Buttons	9	16	24	16	24	24	32
Source and Keyer Mnemonics	No	Yes					
Legendary Ross Fader Handle with Lifetime Guarantee	Yes						
Positioner	2 Axis		3 Axis				
ME Memory Keypad	No	No	Yes	No	Yes	Yes	Yes
Engineering and Networking							
Redundant Power	Yes (optional)						
External Link Port	No	2 (not available at this time)					
Ethernet Connectivity	2 × GigE (only 1 is available at this time)						

Standard System

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

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 2 SDI + 2 HDMI outputs.
GRAPHITE-4RU-2ME-9IN	The GRAPHITE-4RU-ENGINE with 2 MEs, 8 SDI + 1 HDMI inputs and 2 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.
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.

Carbonite Black Control Panel

Select a Carbonite Black control panel to go with your 4RU Integrated Production System to allow for a more tactile work-flow.

Note: The larger Carbonite Black control panel have more MEs and source buttons than can be used with Graphite.

Option	Description
CB9-PANEL	A single panel row with 9 source and buttons, 4 key select and transition buttons, 4 key type buttons, and 8 user select buttons.
CB1-PANEL	A single panel row with 16 source and custom control buttons, 4 key select and transition buttons, 4 key type buttons, 4 aux bank buttons, and 4 custom control bank buttons.
CB1S-PANEL	The same features as the previous panel, but with 24 source and custom control buttons, 8 aux bank buttons, an expanded global memory area, and an effects memory keypad per ME.
CB2-PANEL	The same features as the CB1 panel, but with 2 panel rows.
CB2S-PANEL	The same features as the CB1S panel, but with 2 panel rows.
CB3S-PANEL	The same features as the CB1S panel, but with 3 panel rows.
CB3X-PANEL	The same features as the CB3S panel, but with 32 source and custom control buttons and 4 user assignable buttons.

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 4RU Integrated Production System and the 1RU Audio Breakout Module.



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 Single Channel or the Studio Multi-Channel.

Note: These upgrades are for software only.

Option	Description
GRAPHITE-PRIME-SCE-UPG	XPression Studio Single Channel Upgrade.
GRAPHITE-SCE-DUAL-UPG	XPression Studio Multi-Channel Upgrade.

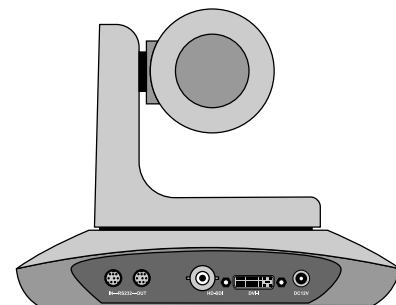
ACID UltraChromeHR Camera

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-20 (PIVOTCAM-20)

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.



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.
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.

TSC-9902 Linear Timecode to Serial Converter (TSC-9902)

The TSC-9902 Linear Timecode to Serial Converter is a high-quality signal conversion solution within the family of GearLite compact, self-contained modular products. Supporting Linear Timecode Signal (LTC) to Serial conversion, the TSC-9902 is the ideal converter for interpreting linear timecode and sending the timecode over a serial port to Carbonite Solo.

The TSC-9902 provides a single DB-9 connector for 38,400 baud serial RS-422 communication, and one BNC connector for LTC input. Note that the shell of the BNC connector is isolated from ground. Power, LTC Status, and Serial Tx LEDs show activity status.

A universal power adapter and line cord, suitable for the country of use, is supplied with each module. Various mounting options are included that enable a wide range of installation choices.

The TSC-9902 connect to the switcher via the serial port on the frame, or an external port expander such as the Control® 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
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.

Option	Description
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.
GRAPHITE-4RU-1ME-5IN-SHM	Adds an additional year of software/hardware warranty to the 4RU Integrated Production System with 1 ME, and 5 video inputs.
GRAPHITE-4RU-1ME-9IN-SHM	Adds an additional year of software/hardware warranty to the 4RU Integrated Production System with 1 ME, and 9 video inputs.
GRAPHITE-4RU-2ME-9IN-SHM	Adds an additional year of software/hardware warranty to the 4RU Integrated Production System with 2 MEs, and 9 video inputs.
GRAPHITE-4RU-2ME-13IN-SHM	Adds an additional year of software/hardware warranty to the 4RU Integrated Production System with 2 MEs, and 13 video inputs.
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-1RU-AUDBKM-ROSSCARE	Adds an additional year of warranty to the 1RU Audio Breakout Module.
CB9-PANEL-ROSSCARE	Adds an additional year of warranty to the CB9 control panel.
CB1-PANEL-ROSSCARE	Adds an additional year of warranty to the CB1 control panel.
CB1S-PANEL-ROSSCARE	Adds an additional year of warranty to the CB1S control panel.
CB2-PANEL-ROSSCARE	Adds an additional year of warranty to the CB2 control panel.
CB2S-PANEL-ROSSCARE	Adds an additional year of warranty to the CB2S control panel.
CB3S-PANEL-ROSSCARE	Adds an additional year of warranty to the CB3S control panel.
CB3X-PANEL-ROSSCARE	Adds an additional year of warranty to the CB3X control panel.

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
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**
MultiViewer Boxes	16
MultiViewer Layouts	45
MultiViewer Outputs	2
Pattern Generators per ME	2
Input FSFCs	6 (inputs 1-6 only)
Output Format Converters	0
GPI I/Os****	24
Tallies****	16
Aux Buses	20
Max 1RU Audio Breakout Module	3
SDI Inputs (HD-BNC)	12
Video Inputs (HDMI)	1
SDI Outputs (HD-BNC)	6
Video Outputs (HDMI)	2
LTC Input (HD-BNC)	1
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

- ** 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.
- **** The Tally and GPI connectors are only present on the optional 1RU Audio Breakout Module.

Table 1: Audio Mixer Inputs/Outputs

Resource	Mixer Inputs	Mixer Outputs
SDI	12 stereo pair	4 stereo pair
AES	1 stereo pair	1 stereo pair
PC	1 stereo pair	1 stereo pair
XPression Playout Frame Buffer	4 stereo pair	2 stereo pair
Media-Store 1/2	2 stereo pair	0
Mono	8 mono	5 mono
Total	28	11

Table 2: Audio Inputs

	4RU Integrated Production System	1RU Audio Breakout Module
SDI‡	12 stereo pair	0
PC	1 stereo pair	0
XPression Playout Frame Buffer	4 stereo pair	0
Media-Store 1/2	2 stereo pair	0
AES	0	1 stereo pair
Mono	0	8 mono

Table 3: Audio Outputs

	4RU Integrated Production System	1RU Audio Breakout Module
SDI‡	6 stereo pair	0
PC	1 stereo pair	0
AES	0	1 stereo pair
Mono	0	5 mono

Notes

- ‡ When the 1RU Audio Breakout Module is connected to the 4RU Integrated Production System, 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
CB9 Panel	8lbs (3.63kg)
CB1 Panel	13lbs (5.90kg)
CB1S Panel	17lbs (7.71kg)
CB2 Panel	20lbs (9.07kg)
CB2S Panel	26lbs (11.79kg)
CB3S Panel	35lbs (15.88kg)
CB3X Panel	40lbs (18.14kg)
Graphite	62lbs (28.1kg)

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

Output Specification	Value
	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.

Analog Audio Input Specifications

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	<ul style="list-style-type: none"> • -95dB • "A" Weighting • -98dB • CCITT Weighting • -107dB
THD	>93dB or <0.002%
Amplitude Linearity	<0.8dB @ -100dBFS
Crosstalk	-94dB

Analog Audio Output Specifications

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

Specification	Value
	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 — Control Panel

	CB9	CB1	CB1S	CB2	CB2S	CB3S	CB3X
Power	24W 2.0A 12V	25W 2.1A 12V	30W 2.5A 12V	35W 2.9A 12V	45W 3.8A 12V	65W 5.4A 12V	80W 6.7A 12V
Input Voltage	100 - 120V~, 220 - 240V~, 47-63Hz						

Power Consumption

	4RU Integrated Production System	1RU Audio Breakout Module
Power	520W 4.7A 120V	45W 3.75A 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.

Graphite Option Codes

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
Base 4RU Integrated Production System	GRAPHITE-4RU-ENGINE			
System Configurations	GRAPHITE-4RU-1ME-5IN	GRAPHITE-4RU-1ME-9IN	GRAPHITE-4RU-2ME-9IN	GRAPHITE-4RU-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			
1RU Audio Breakout Module	GRAPHITE-1RU-AUDBKM			
AJA® HELO	GRAPHITE-HELO-STREAM			
HD-BNC to BNC Adapters Kit (20 cables)	GRAPHITE-HDBNC-BNC			
XPression Graphite to XPression Studio Single Channel Upgrade (software only)	GRAPHITE-PRIME-SCE-UPG			
XPression Graphite to XPression Studio Multi-Channel Upgrade (software only)	GRAPHITE-SCE-DUAL-UPG			
Graphite Software Maintenance (4RU Integrated Production System)	GRAPHITE-4RU-1ME-5IN-SM	GRAPHITE-4RU-1ME-9IN-SM	GRAPHITE-4RU-2ME-9IN-SM	GRAPHITE-4RU-2ME-13IN-SM
Graphite Hardware Extended Warranty (4RU Integrated Production System)	GRAPHITE-4RU-1ME-5IN-HM	GRAPHITE-4RU-1ME-9IN-HM	GRAPHITE-4RU-2ME-9IN-HM	GRAPHITE-4RU-2ME-13IN-HM
Graphite Software/Hardware Maintenance (4RU Integrated Production System)	GRAPHITE-4RU-1ME-5IN-SHM	GRAPHITE-4RU-1ME-9IN-SHM	GRAPHITE-4RU-2ME-9IN-SHM	GRAPHITE-4RU-2ME-13IN-SHM
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 Multi-Channel Upgrade)	GRAPHITE-SCE-DUAL-UPG-SM			
SideShotNet	CPS-SIDESHOT			
DashBoard Display	CBPS-DashMenu			
SHC-9642 SDI to HDMI Converter	SHC-9642			

	Graphite 1 ME, 5 Inputs	Graphite 1 ME, 9 Inputs	Graphite 2 ME, 9 Inputs	Graphite 2 ME, 13 Inputs
TSC-9902 Linear Timecode to Serial Converter	TSC-9902			
PIVOTCam-20	PIVOTCAM-20			
ACID AC-H200-UCHR	AC-H200-UCHR			
ACID AC-Z50-UCHR	AC-Z50-UCHR			
Aux Panels	RCP-NK1, RCP-QE18, RCP-QE36			
Online Operational Training, Carbonite	CARBONITE-ONL-1DAY			
Onsite Commissioning, Carbonite	CARBONITE-COM-1DAY			
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			

Control Panel Options

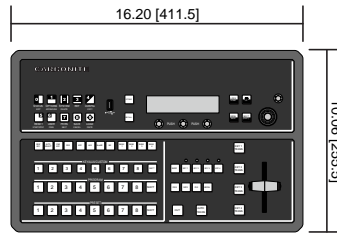
Control Panel	Panel Option Code	Redundant Power, Panel	Extended Warranty, Panel
CB9	CB9-PANEL	PSU-12V16A-6PIN	CB9-PANEL-ROSSCARE
CB1	CB1-PANEL	PSU-12V16A-6PIN	CB1-PANEL-ROSSCARE
CB1S	CB1S-PANEL	PSU-12V16A-6PIN	CB1S-PANEL-ROSSCARE
CB2	CB2-PANEL	PSU-12V16A-6PIN	CB2-PANEL-ROSSCARE
CB2S	CB2S-PANEL	PSU-12V16A-6PIN	CB2S-PANEL-ROSSCARE
CB3S	CB3S-PANEL	PSU-12V16A-6PIN	CB3S-PANEL-ROSSCARE
CB3X	CB3X-PANEL	PSU-12V16A-6PIN	CB3X-PANEL-ROSSCARE

Panel Dimensions

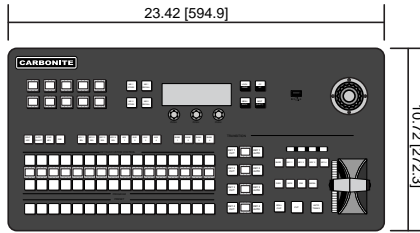
These dimensions are provided as a guide only. Contact Ross Video Technical Support for scale CAD drawings of the control panels and frames.

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

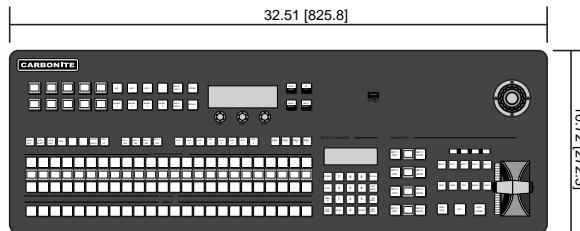
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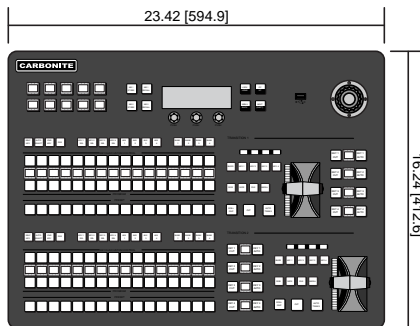
CB1



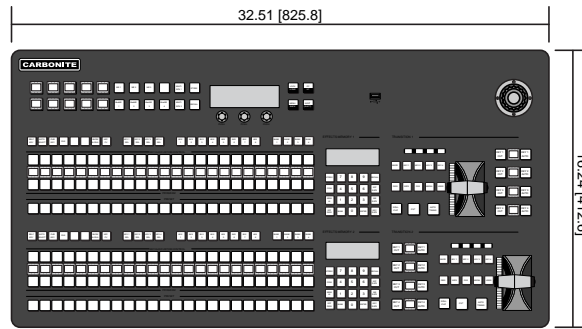
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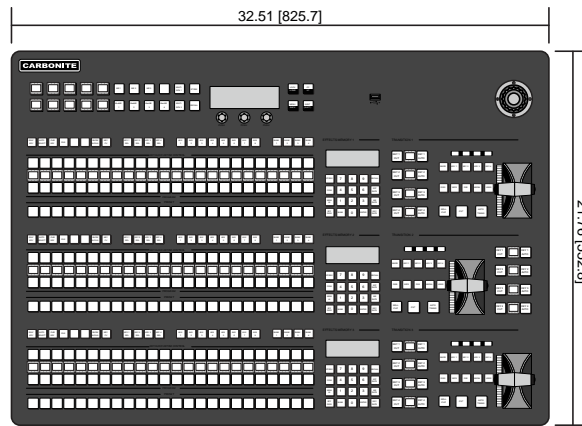
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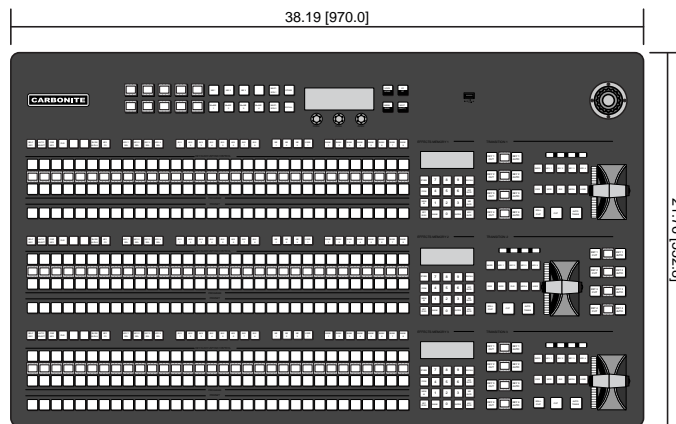
CB2S



CB3S



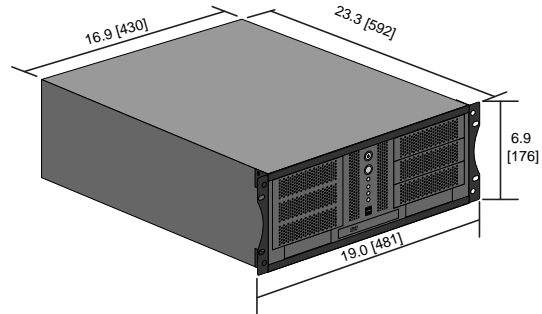
CB3X



Dimensions

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

4RU Integrated Production System Dimensions



1RU Audio Breakout Module Dimensions

