Model P9425
Avenue Layering Engine
3G/HD/SD

Installation, Configuration and Operations Guide

Revision 1.4 SW v2.0.0

ENSEMBLE DESIGNS

Purveyors of Fine Video Gear—Loved by Engineers Worldwide

Clearly, Ensemble wants to be in the broadcast equipment business. It's so rare anymore to find a company of this caliber that has not been gobbled up by a large corporation. They are privately held so they don't have to please the money people. They really put their efforts into building products and working with customers.

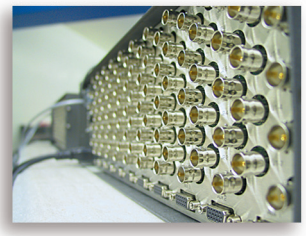
I'm really happy with the Avenue products and Ensemble's service, and even more important my engineers are happy. We've continued to upgrade the product and add more cards. We will be rebuilding our production control room and we will use Avenue again.

~ *Don McKay, Vice President Engineering, Oregon Public Broadcasting*

Who is Ensemble Designs?

By Engineers, For Engineers

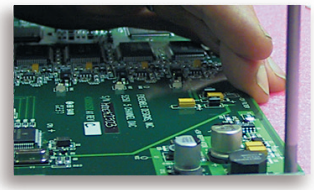
In 1989, a former television station engineer who loved designing and building video equipment, decided to start a new company. He relished the idea of taking an existing group of equipment and adding a few special pieces in order to create an even more elegant ensemble. So, he designed and built his first product and the company was born.



Avenue frames handle 270 Mb/s, 1.5 Gb/s and 3 Gb/s signals, audio and MPEG signals. Used worldwide in broadcast, mobile, production, and post.

Focused On What You Need

As the company has grown, more former TV station engineers have joined Ensemble Designs and this wealth of practical experience fuels the company's innovation. Everyone at the company is focused on providing the very equipment you need to complete your ensemble of video and audio gear. We offer those special pieces that tie everything together so that when combined, the whole ensemble is exactly what you need.



We're focused on processing gear– 3G/HD/SD/ASI video, audio and optical modules.

Notably Great Service for You

We listen to you – just tell us what you need and we'll do our best to build it. We are completely focused on you and the equipment you need. Being privately held means we don't have to worry about a big board of directors or anything else that might take attention away from real business. And, you can be sure that when you call a real person will answer the phone. We love this business and we're here to stay.

Come on by and visit us. Drop in for lunch and a tour!

Bricks and Mortar of Your Facility

The bricks and mortar of a facility include pieces like up/downconverters, audio embedders, video converters, routers, protection switches and SPGs for SD, HD and 3 Gb/s. That's what we're focused on, that's all we do – we make proven and reliable signal processing and infrastructure gear for broadcasters worldwide, for you.

Shipped with care to television broadcasters and video facilities all over the world.

Contents

Chapter 3: Getting Started 22

Chapter 4: Configuration Options 79

Preface

Document Organization at a Glance

This Getting Started and Reference Guide addresses all of the essential topics for understanding how to install, configure and use the P9425 Avenue Layering Engine and its optional 9440 I/O Expansion Modules. See the following table for a quick glance at what each chapter addresses. Note also that all of the items in the main table of contents, as well as the chapter titles below, are links.

Chapter Title	Topics Covered
Chapter 1: Introduction	A brief introduction to this document and to the Layering Engine. Includes a link to a short video by David Wood, Chief Design Engineer.
Chapter 2: System Overview	Describes the overall Layering Engine system with an overview, a functional description, and example applications.
Chapter 3: Getting Started	This chapter consists of three parts—Installation, Configuration, and Essential Operations. Since this is a Getting Started chapter, the intention is to provide only those essential instructions necessary for getting the P9425 cabled, configured and operating. It addresses the web browser user interface, performing multi-layer keying and background transitions, uploading graphics to the LogoStore, assigning keyer presets, and 5825 control panel operations. More detailed information regarding expansion options and configuration options is discussed in Chapter 4: Configuration Options.
Chapter 4: Configuration Options	Covers expansion options, additional configuration options for customers not using Avenue PC or Avenue Touch Screen, security and access to settings, port configuration, creating and editing profiles, control points and access authentication, timing and genlock, internal test signal generators, and switch point identification.
Chapter 5: External Control	Addresses how the Layering Engine handles external control integration; supported control protocols, including Ensemble Designs' unique Avenue FMR protocol that supports multiple simultaneous protocols and control profiles for external interfaces; SNMP Interface; and an SDK to be available in the future.
Chapter 6: Maintenance and Troubleshooting	This chapter addresses certain known issues and possible issues that new users may encounter while becoming familiar with the Layering Engine. Addresses how to update software for the 9430 module.
Specifications	Presents standard specifications regarding inputs, max cable length, outputs and reference.
Glossary	Includes definitions of commonly-used terms relevant to the video broadcast industry.

Chapter 1: Introduction

In this Chapter

This chapter addresses the following topics:

Purpose of Document

This guide supports the process of planning for, installing, configuring and operating the Ensemble Designs P9425 Layering Engine. This manual describes the elements of the system, how they work together, and the practical aspects of working with the Layering Engine to meet your facility's needs.

This document provides ample information for understanding the components of the system and the processes required to use it, ranging from initially connecting with the Layering Engine, assigning it an IP address compatible with your network environment, setting up customized Access Points and Profiles, configuring Ports, uploading logos, and many other critical aspects of configuration and operation.

Use the Contents and the Preface to quickly link to a specific chapter or topic.

Intended Audience

In addition to the target audience listed below, this document is meant for anyone who needs to target a specific area of functionality in order to meet an immediate need, as well as for those who need to have a comprehensive understanding of the Layering Engine from a systems planning point of view.

The intended audience for this manual includes people with the following roles:

- studio designers
- broadcast engineers
- installation and configuration personnel
- operators

Introductory Video from David Wood, Chief Design Engineer

Two Keyers, Background Transitions, Audio Mixing and Breakaway make the Layering Engine a good fit in broadcast, presentation and mobile applications. Please view the four-minute video below for a brief overview presentation of the Avenue Layering Engine by Chief Design Engineer, David Wood.

David Wood, Chief Design Engineer, talking about the new Avenue Layering Engine. Note that the photograph is a link to a video on YouTube.

Additional Resources

In addition to this document, please refer to these resources:

- Introductory video by Cindy Zuelsdorf, Marketing, about the Avenue Layering Engine
- Avenue Layering Engine Brochure
- Product page from the Ensemble Designs website

Chapter 2: System Overview

In this Chapter

This chapter addresses the following topics:

Overview

The P9425 Avenue Layering Engine provides multi-layer keying and mix effects. The Layering Engine can be used for broadcast, live venues, presentation, channel branding, small master control, central casting, fly-pack, and remote trucks.

The Program Output is produced using the Layering Engine's two independent linear keyers, program and preset Background transitions, and audio mixing and breakaway for combining audio and video content. Inputs can be driven by SDI signals from cameras, remote feeds, character generators, graphic and stillstore systems, and video servers. Real time processing and low latency make it easy to integrate, even in complex signal chains. The Layering Engine supports the full range of SDI signals from SD to HD and 3G formats.

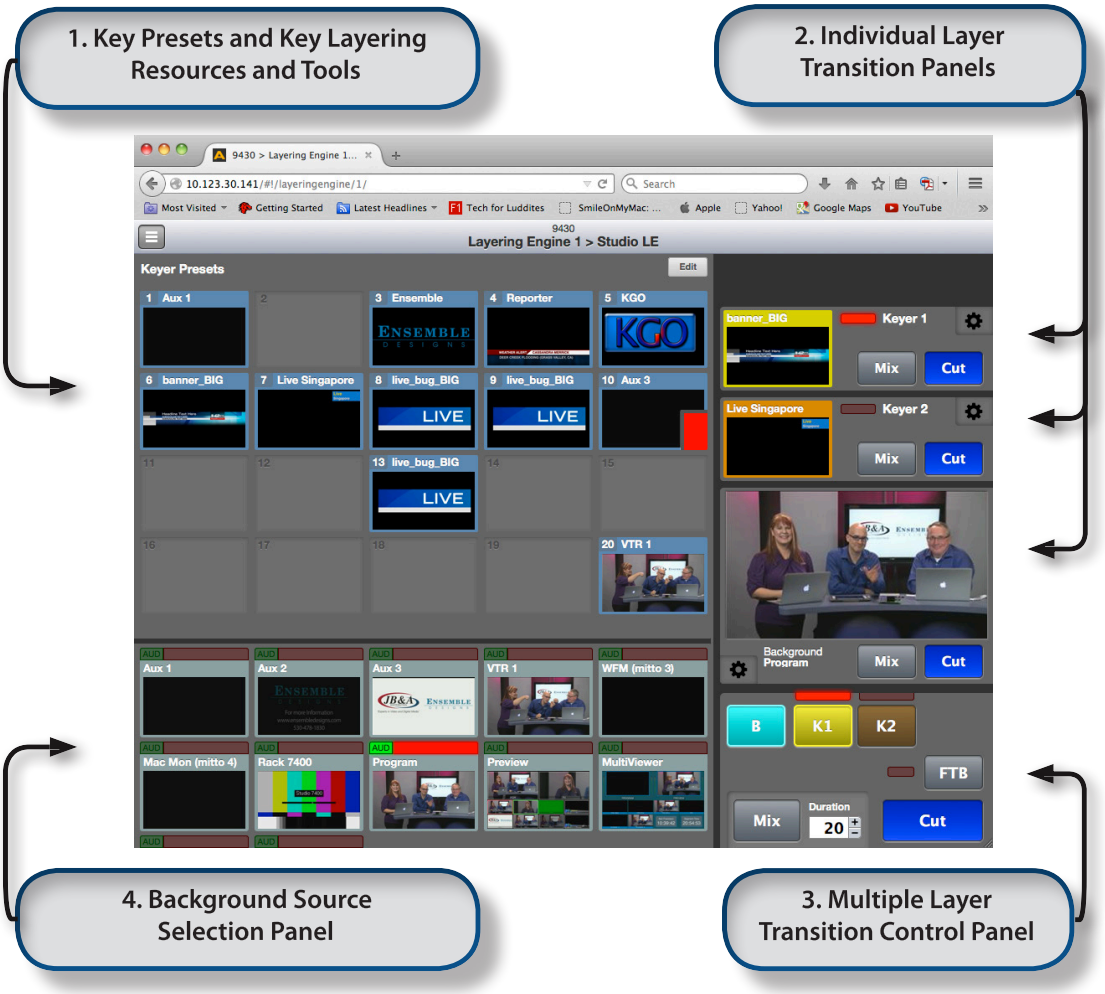
You can configure and operate the Layering Engine using a web interface, iPad interface and serial control. In its simplest form (a single card with 8 inputs and 2 outputs), the Layering Engine uses only one module slot in an Avenue 3RU or 1RU frame.

Two Key Layers and a Background source can be simultaneously combined to produce the Program Output.

The Web Browser Interface at a Glance

The web browser interface is organized into four areas, described in the illustration below by referencing the interface in a clockwise direction, beginning from the upper left area.

1. Key Presets and Key Layering Resources and Tools	Use this area for assigning a foreground to Keyer 1 or Keyer 2, assigning Key Presets, or modifying a Key.
2. Individual Layer Transition Panels	Use these four controls to mix or cut a single Background or Layer. For Voice Over, Keyer 1 and Keyer 2, click the corresponding gear icon to access that Layer's configuration options.
3. Multiple Layer Transition Control Panel	Use this area to mix or cut a combination of Layers simultaneously. Specify the Layers that you want to engage by selecting from the corresponding Layer button: B, K1, K2, VO. Any combination of Layers may be selected. After the mix or cut, the selected Layers will be in their opposite state.
4. Background Source Selection Panel	Use this area to select the Backgrounds you want to work with. The Background thumbnail with the high red tally is going out through the Program Output. The Background thumbnail that is framed in blue is Preset, meaning that it will go to the Program Output the next time that the Background is cut or mixed.



Functional Description

Keying and Layering

The features of the Avenue Layering Engine enable it to span a wide range of applications. This broad repertoire is matched by an intuitive control interface. Keyer Presets recall the entire configuration of a Layer with a single touch or keystroke.

The visual interface displays thumbnail views of connected sources and the content stored in the LogoStore. Input signals and control parameters are clearly presented and easily adjusted.

Keyer Adjustment Tools

The Keyer Adjustment Tools provide many ways to work with and adjust connected sources and the content stored in the LogoStore to develop Key Presets for assigning to Keyer 1 or Keyer 2.

Foreground

Choose Foreground video from any of the SDI inputs, an internal matte generator, or the built in LogoStore to recall both still and animated graphics.

Key/Alpha

The Key (Alpha) signal can be selected automatically according to the chosen Foreground video, or chosen independently from any input. Use full screen Alpha, along with Mask and Position, to produce mortise effects with live content.

Shadow

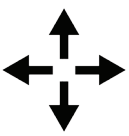
Drop shadows can be added to any Key. Adjust position and density to enhance the separation between Foreground and Background video.

Adjust

The Keyers support linear, luminance and additive keying from a variety of video sources. In linear and additive modes, external Key signals are passed to the overlay combiners with the option of user adjustments to fine-tune the effect with hi/lo clip.

Mask

Apply masking to any Key to exclude unwanted content, or to create window inserts.



Position

Position the overlay anywhere on the output raster. Positioning supports live video inputs as well as content from the LogoStore.

Timing and Synchronization

The Avenue Layering Engine genlocks to a house reference signal, allowing you to time the effects output to match system requirements in your facility. Even asynchronous sources can be used as inputs to the Layering Engine. Each input incorporates a frame synchronizer, automatically correcting each source to match system timing. When no external reference is available, as in a flypack system, the Layering Engine uses its internal reference signal.

LogoStore

Through the web interface, you can load logos and graphics created with paint and animation applications into the Avenue Layering Engine's LogoStore. These elements can then be keyed and combined with live video inputs. You can choose from multiple graphics in each Keyer.

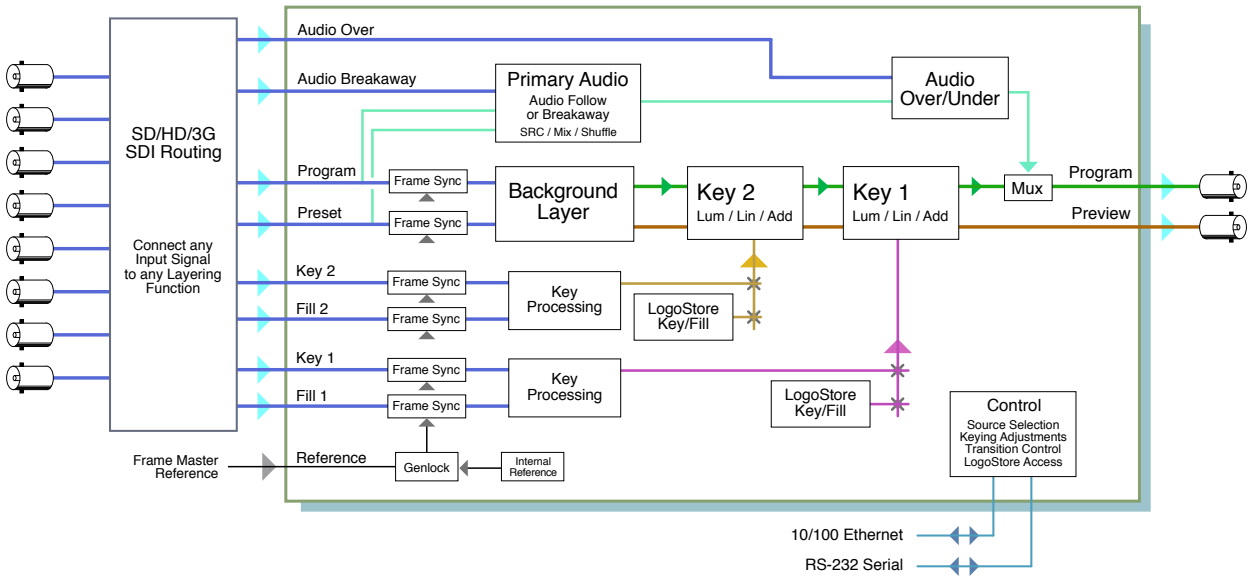
You can apply the positioning and masking tools to LogoStore content. Combined with Keyer Presets, those features allow you to use a single logo in a variety of ways. The LogoStore's non-volatile memory solves the need for sourcing lower third supers, branding logos, watermarks, and full screen titles.

Audio

The Avenue Layering Engine provides comprehensive audio support. The Layering Engine supports 16 channels of embedded audio throughout the entire processing chain. The channel swapping feature of the SDI port configuration tool allows full customization on an input-by-input basis.

The primary audio output can be taken automatically from the embedded content in a selected Background video source. This AFV (Audio Follow Video) mode will produce smooth, pop-free audio transitions that duplicate the Background video, whether cutting or mixing. Alternately, the audio can be selected independently (Audio Breakaway) of the Background video so that it comes from the embedded content of any connected source.

You can augment the primary audio by bringing in an audio overlay or voice over. Similarly to the way a video key contributes to parts of the video effect, this audio overlay can contribute to the final audio output. And just as a keyer can be adjusted to control how much it contributes to the video, the audio overlay has adjustments for the relative mix between the overlay and primary audio elements. This allows such diverse uses as mixing in a subtle music background, or dunking the primary audio and running a voice-over at full level.



Any of the P9425's inputs can be used as Background video, Key fill or source, or audio breakaway and voice over.

Signal Performance

The Layering Engine's SDI I/O ports support SD, HD, and 3G data rates. The full 10-bit SDI resolution is carried throughout all of the background, foreground, and alpha paths. Internal processing is performed at higher resolution so that the final, composited effect is true to every nuance and subtle detail in the original sources.

Integration and Expansion

The basic Avenue Layering Engine configuration provides 8 input ports and 2 output ports. Expansion is simple because the Layering Engine integrates seamlessly into the Avenue Flexible Matrix Router. When installed in one of the router's option positions, the Avenue Layering Engine gains full access to all of the router sources. And the program and look-ahead preview outputs become available as sources to be routed to any of the output destinations.

Control Interface

Web browser, iPad and control panel interfaces provide complete control over the Avenue Layering Engine. Automation control over Ethernet TCP/IP, SNMP, and RS-232 serial interfaces, using industry standard as well as product specific protocols, provide support for a wide variety of applications. Use an iPad, web browser or control panel to create Keyed Presets that can be recalled on-air by automation systems.

Applications

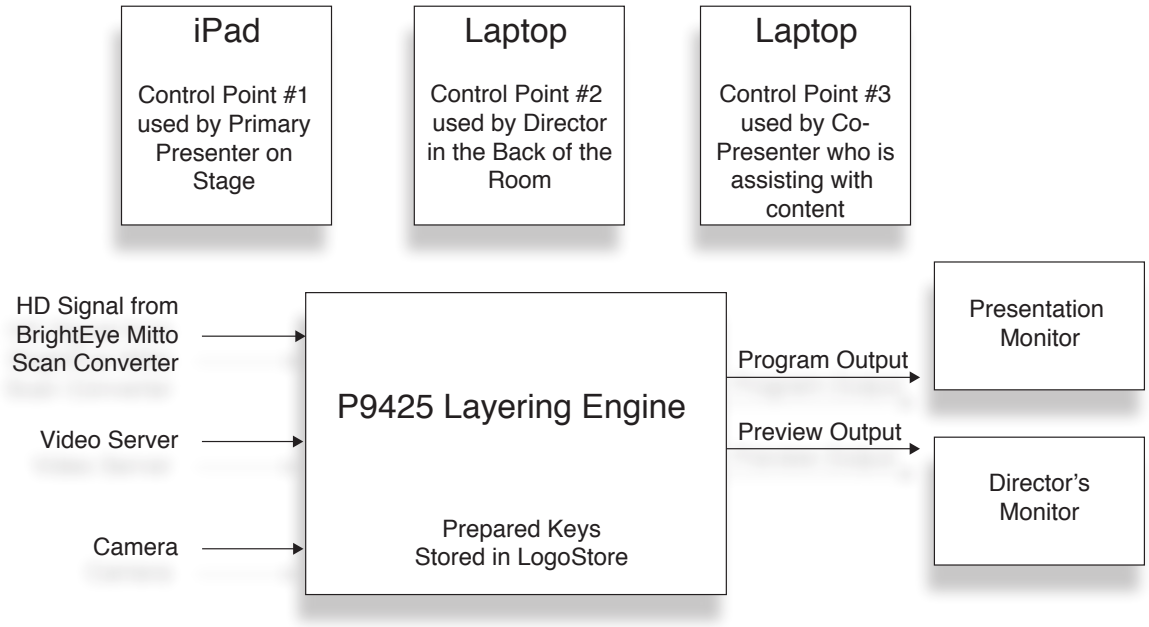
Presentations

In a corporate environment, a three-person team might collaborate to deliver a multi-media presentation. The primary presenter is on stage using an iPad as a Layering Engine control point. An operator or director in the back of the room uses a laptop or desktop computer as a second control point. And a co-presenter with a laptop assists with content using a third control point. If needed, each team member may have a unique Layering Engine profile to fit their particular role in the presentation.

The equipment setup looks like this:

1. One input of the Layering Engine is the HD signal coming from a BrightEye Mitto scan converter (BEM-1). The Mitto is scan converting the output of a computer that the presenter is using to show YouTube video content, project slides, and conduct video interviews over Skype. The computer output is converted to HD SDI using the Mitto. This HD signal feeding the Layering Engine can be used as Background video or as a Key.
2. A video server feeds another Layering Engine input with pre-produced HD video segments with embedded audio.
3. The Layering Engine has a dozen Keys prepared in advance and stored in the LogoStore. These graphics and animations can be keyed over the Background video.

The Layering Engine Preview Output is going to a small monitor visible to the director in the back of the room, while the Program Output feeds a large HD monitor in the front of the room.



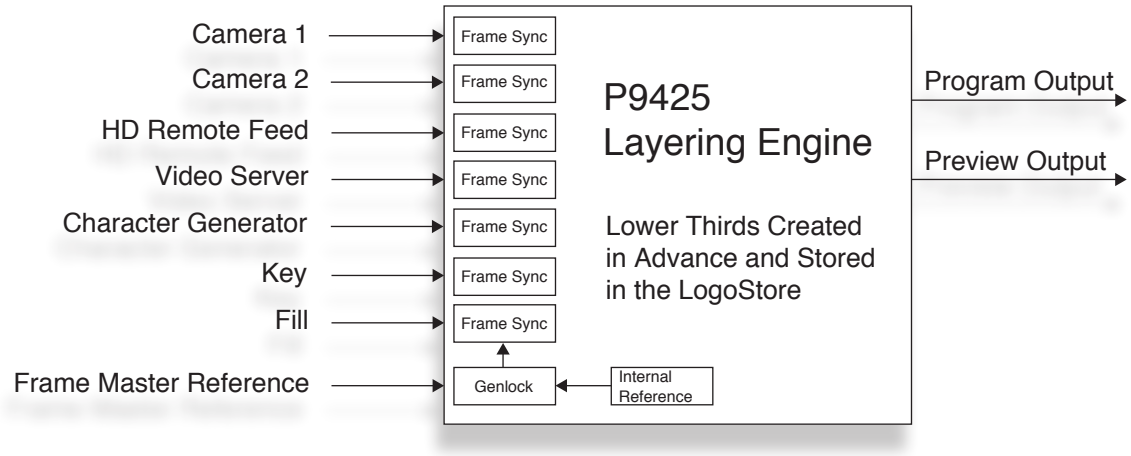
Live Broadcast

In a live broadcast setting, the P9425 Layering Engine can bring together multiple asynchronous sources, such as remote feeds, studio cameras, and video servers. The Layering Engine has a frame synchronizer at each input to allow for switching among the inputs.

With lower thirds created in advance and stored in the LogoStore, names and titles of studio guests can be keyed over camera shots as the director calls them. Multi-camera shoots are easily accommodated by the Layering Engine. Any source can be used as Background or Key material.

Example configuration:

- A basic 8 x 2 P9425.
- 2 studio camera inputs as Background video sources going into Inputs 1 and 2.
- An HD remote feed going into Input 3.
- A video server going into Input 4.
- A character generator feeding Input 5.
- Key and fill going into Inputs 6 and 7.



Because the Layering Engine has a frame synchronizer at each input, you can switch among the inputs. Any source can be used as Background or Key material.

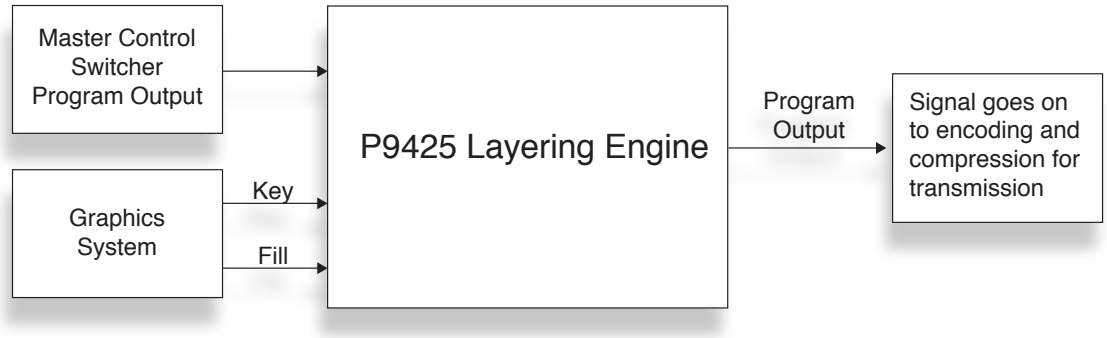
Down Stream Keyer/Channel Branding

In this application, the Layering Engine is being used for channel branding.

The Layering Engine is installed downstream from the Master Control Switcher. One of the Layering Engine's inputs is the Master Control Switcher's program out. This becomes the Layering Engine's Background video source.

An operator or an automation system can overlay and transition on and off independently two Key Layers onto the Background video for channel branding and program announcements. Key Layers 1 and 2 can include things like tickers and graphics in the lower third. These can be layered over any incoming video source, such as a file or a syndicated show delivered the night before by satellite.

The Layering Engine's Program Output is fed to the encoder for transmission.



The Layering Engine configured for channel branding

Chapter 3: Getting Started

In this Chapter

This chapter consists of three parts:

Detailed instructions for installing the Avenue frame itself are provided in the Avenue System Overview Manual.

Installation

Hardware Elements

The hardware elements that make up the P9425 Layering Engine are as follows:

- 9425 Layering Engine Sub Module
- 9430 Router Module
- 9440 I/O Expansion Module (Optional)
- 5825 Layering Engine Control Panel (Optional)

9425 Layering Engine Sub Module

The 9425 Layering Engine sub module is delivered pre-installed on the 9430 module. The 9425 sub module has access to all the SDI signals that are connected to the 9430 module.

9430 Module

The control system for the P9425 resides on this module. The control system, discussed at length in this chapter and in Chapter 4: Configuration Options, is accessed through a web browser interface.

The 9430 Module has eight Inputs and two Outputs. In addition to these Inputs and Outputs, the 9430 provides video thumbnail capture, Test Signal Generation, and Genlock/Timing. The smallest possible version of the Layering Engine consists of a 9430 module and a 9425 Layering Engine sub module.

Built-in Signal Diagnostics

Circuitry on the 9430 module detects and measures key parameters associated with each video source and makes these parameters available for display on the software panels. Parameters include synchronicity and timing, line and frame rate, embedded audio presence/absence, closed caption information, and timecode data.

Fail-Safe Relay Bypass Mechanism from Input 1 to Output 1

The fail-safe bypass feature of the Avenue Layering Engine supports a connection from Input 1 to Output 1 in the event of a system or power failure. The bypass mechanism connects the two ports (BNC connectors) together through a passive, mechanical relay. This means that the signal will be carried through the 9430 even when there is a total loss of power and control. But it also means that the length of the cable between the source and destination is now the total of the input and output cabling. That total must be less than the bit-rate appropriate maximum listed in the table shown in Cable Length Considerations on page 93. And since the 9430 in bypass mode is effectively a cable coupler, that maximum needs to be further reduced. If other elements or requirements in a system design render the bypass behavior irrelevant, this combined cable length consideration can be disregarded.

It is possible to extend performance beyond these maximums by the use of lower loss RG-11 cable such as Belden 7732LL. The low-loss performance comes from a larger dielectric cross section, so these alternatives are less flexible and more challenging to install and terminate.

Conversely, smaller diameter cable (Belden 1855A) is often favored for its lower weight and higher

9440 I/O Expansion Module Option

One or two 9440 I/O Expansion modules can be added to a 9430 to provide additional digital I/O Ports. Each 9440 adds ten bidirectional ports, each of which can be independently configured as an input or an output. These expansion modules attach to either side of the 9430 core module to form a maximum set of three boards. A Layering Engine with two 9440 modules has a total of 30 ports.

Program, Preview and all sources are routable. Any input source or the Layering Engine outputs can be routed to any destination.

Original Orders Pre-assembled

For original orders, Ensemble Designs will assemble all modules (the 9425 Layering Engine sub module, the 9430 module, and the 9440 module as applicable) before shipping them to your facility. You can then install the assembly into the Avenue frame as a single unit. However, if you add modules at a later time, these instructions will show you how to assemble and install them.

P9425 Layering Engine Assembly

Every Layering Engine sub module comes pre-installed on a 9430—a 10 port module with 8 Inputs and 2 Outputs, as shown below.

The P9425 Layering Engine consisting of the 9425 Layering Engine sub module mounted onto a 9430 Module

5825 Layering Engine Control Panel

The 5825 Layering Engine Control Panel communicates with the 9430 Core module by Ethernet to control the Layering Engine and display thumbnail previews of content. An essentially unlimited number of Layering Engine Control Panels can be used in a Layering Engine system. You can also access signal diagnostic information from the LCD Display on the Layering Engine Control Panel.

Being only 1.8" (45mm) deep, the Control Panel can be installed in very shallow positions. To avoid using a separate power supply for particularly tight installations, you can use PoE (Power over Ethernet), provided that you have a PoE-enabled Ethernet switch.

Long Distance Capability

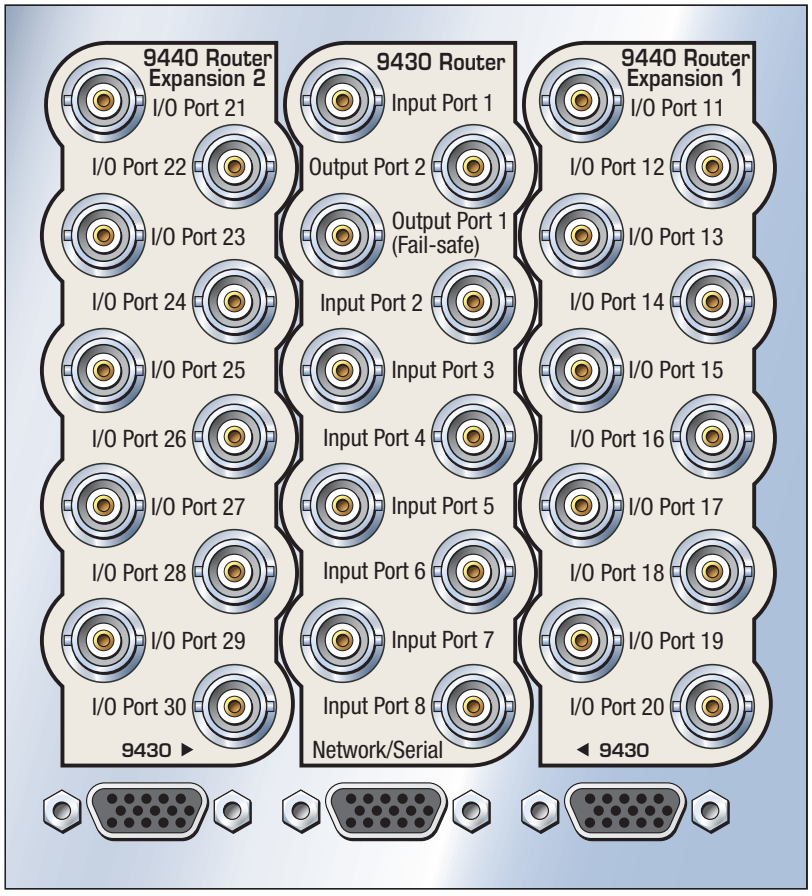
Because each Layering Engine Control Panel connects to the Layering Engine over Ethernet, Control Panels can be physically located very far away from the Layering Engine if desired.

Installing the BNC Plastic Overlays

On the rear of the Avenue frame, install the BNC plastic overlays provided onto the corresponding group of rear BNC connectors associated with the 9430 location.

The 9440 modules have two plastic overlays, one for the Expansion 1 position and one for the Expansion 2 position. As an orientation aid, the bottom of each 9440 plastic overlay is marked with an arrow that should be pointing toward the 9430 that sits between the 9440s.

Note that the plastic overlays have optional adhesive backings for securing them to the frame. Use of the adhesive backing is only necessary if you would like the location to be permanent and is not recommended if you need to change module locations.



BNC plastic overlays on the rear of the frame

Cable Considerations for Background, Key, Fill, Program and Preview

The digital inputs and outputs of the 9430 are all equally capable of supporting 3G SDI, HD SDI, SD SDI and AES audio signals. Connections to Background, Key, Fill, Program and pPeview are made with 75 ohm coaxial cable. For more detailed cable information, please see Cable Length Considerations on page 93.

Control Connections

Although the Avenue frame is equipped with both RS-232 and Ethernet interfaces, the 9430 has its own dedicated control connections. The communication bandwidth needed to support the Layering Engine's live video thumbnails and the expectation on the part of third-party control systems (automation, event control) for a dedicated control port require this.

RS-232 and 100 Mb Ethernet Interface Adaptor Cable

The connection to both the RS-232 and 100 Mb Ethernet interfaces on the 9430 are accomplished through an adaptor cable (part number 23700040) which connects to the HD-15 connector specific to the slot where the 9430 is installed. This adaptor is included with the P9425 Layering Engine. It is configured as a "Y" cable with a separate leg for the 9-pin D-Sub RS-232 and RJ-45 Ethernet connectors. If only one of these interfaces is required, it is acceptable (though irreversible) to cut off the unwanted leg.

The Ethernet port should be connected with CAT5 or CAT6 cabling to a network Ethernet router or switch to make it accessible to computers on the network. This port can also be directly connected to a computer. The Ethernet port will auto-sense cable direction, so a cross-over cable is not needed.

The RS-232 port operates from 1,200 to 115,200 baud.

The configuration of these interfaces and the selection of serial protocol are described in Chapter 5: External Control on page 114.

Rear BNC connectors and the HD-15 connector on the 9430

Adaptor "Y" cable (part number 23700040) for connecting the 9430 to RS-232 and 100 Mb Ethernet interfaces

Connecting a Timing Reference to the Avenue Frame

In order to genlock the video resources in the Layering Engine to a larger video system, connect a timing reference to the Master Reference Input on the Avenue Frame. This is a loop-through connection on the 3RU Frame which requires a termination. On the 1RU Frame it is an internally terminated input.

The Layering Engine will also use this reference input to determine the vertical interval switching point.

Connecting a Timing Reference to the Master Reference Input on the rear of the Avenue Frame. The loop through is terminated with a 75 ohm terminator.

Connecting a Timing Reference to the 9430

The reference input of the 9430 will accept these reference types:

- NTSC or PAL analog video
- Tri-Level Sync
- 10 MHz precision reference

When VITC (Vertical Interval Timecode) is present on NTSC or PAL analog composite reference sources, it will be available to the 9430 for event scheduling.

The 9430 can operate without a timing reference by utilizing its own internal SPG (Sync Pulse Generator).

See Setting Up Timing and Genlock on page 104 for more details about configuring the 9430's Timing and Genlock systems.

Layering Engine Control Panel Installation

Connecting Ethernet Cable to RJ-45 Port

Make an Ethernet connection to the RJ-45 port on the rear of the Layering Engine Control Panel. The Ethernet cable should be connected to a network Ethernet router or switch to make it accessible to the Layering Engine. The Ethernet port will auto-sense cable direction, so a cross-over cable is not needed.

A modular power supply is provided to power the Layering Engine Control Panel. Alternately, power can be supplied by the Ethernet connection using PoE (Power over Ethernet), provided that you have a PoE-enabled Ethernet switch to insert power into the Ethernet cables.

The rear of the Layering Engine Control Panel. Note the three connectors: the RJ-45 Port, the Power Input, and the 9-Pin GPI Connector.

Long Distance Capability

Because the Layering Engine Control Panel connects to the Layering Engine over Ethernet, and because Ethernet reaches much farther than coaxial cable, Layering Engine Control Panels can be physically located very far away from the Layering Engine if desired. Therefore, you can install the Layering Engine Control Panels wherever you need them to be located as long as you have Ethernet connectivity.

The Layering Engine Control Panel is only 1.8" (45mm) deep, so it can be installed in very shallow positions.

The front of the Layering Engine Control Panel.

Labeling Buttons

The Layering Engine Control Panel comes with two button labeling options:

1. Pre-printed key cap inserts, described on this page, and
2. A customizable label template that generates a PDF, described on the next page.

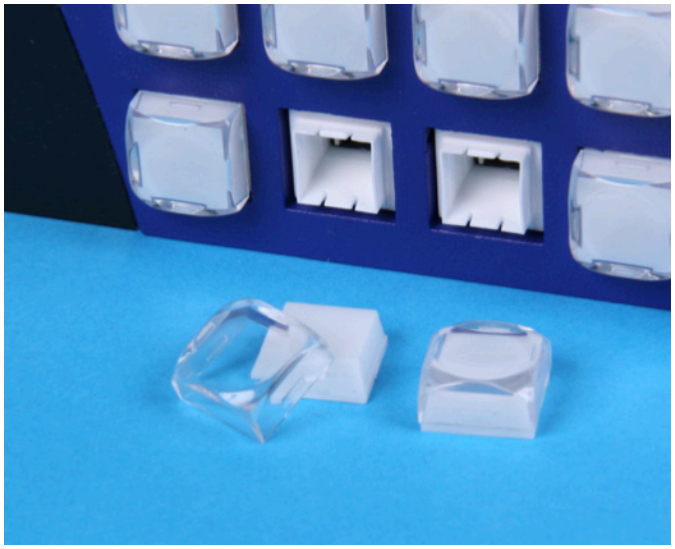
First Method: Key Cap Inserts

The provided key cap inserts give a broad range of terms and numbers printed on clear plastic sheets. Each individual button legend pops out from its sheet and can be inserted into the Layering Engine Control Panel buttons between the clear overcap and the white diffuser, if desired.

The button legends are designed to be used individually—one per button, or as a combined set—two on a button. When combining them, one appears higher on the button and the other appears lower.

To Place a Button Legend Inside a Control Panel Button

1. Pull a button off of the Control Panel by simply squeezing and pulling. Each button is held to the Panel with a pressure fit. A bit of pressure is required.
2. Remove the inner white diffuser part of the button from the clear overcap with a fingernail or a sharp edged tool. Note the orientation of each button: there are slightly indented slits located on the top and bottom of both the clear overcap and white diffuser.
3. Place a button legend between the clear overcap and the white diffuser, keeping both parts aligned top to bottom and noting orientation. Snap the two button pieces back together.
4. Snap the button back in place on the Control Panel with some slight pressure. The button must be level to the plane of the Panel before it will snap correctly back into place.



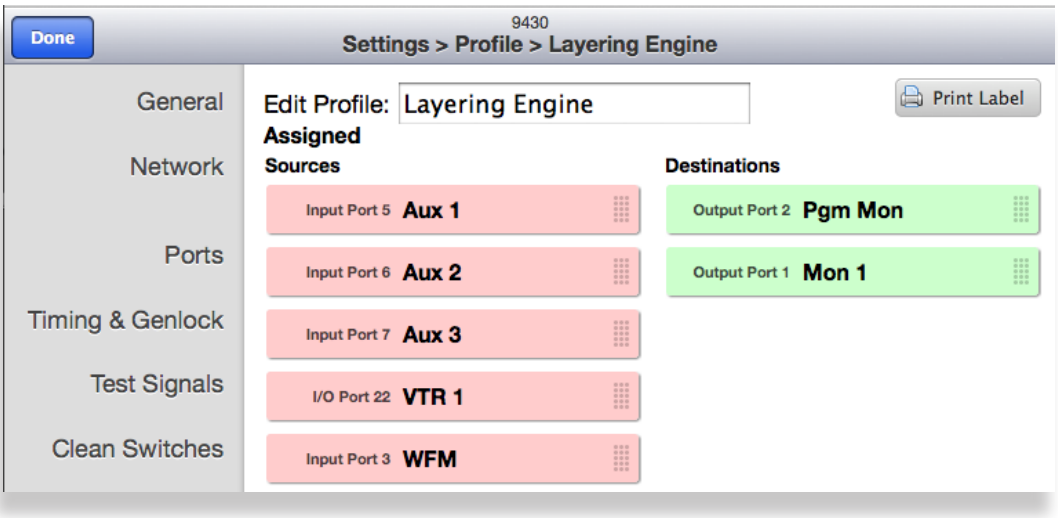
Button legends can be inserted between the clear overcap and the white diffuser of the key cap.

Second Method: Customizable Label Template

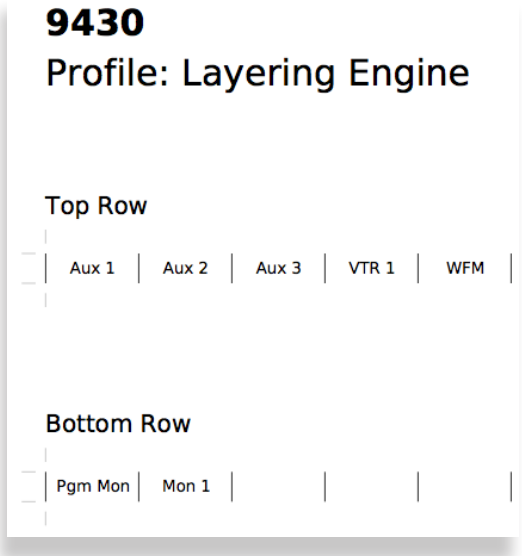
You can create your own customized button labels directly from one of your Profiles. (For more information about Profiles, see Creating and Editing Profiles on page 59.) The template draws from the Port names associated with the Profile you choose. This automatically generates a PDF document of precisely scaled and aligned labels that you can print on paper or acetate.

To Print Labels from a Selected Profile

1. From a web browser that has access to the Layering Engine, click **Settings** in the upper left corner. The Settings > General page displays.
2. Select **Profiles** in the left navigation panel. The Profiles page displays.
3. For the Profile that you want to use as a basis for printing labels, click **Edit**. The Edit Profile page displays.

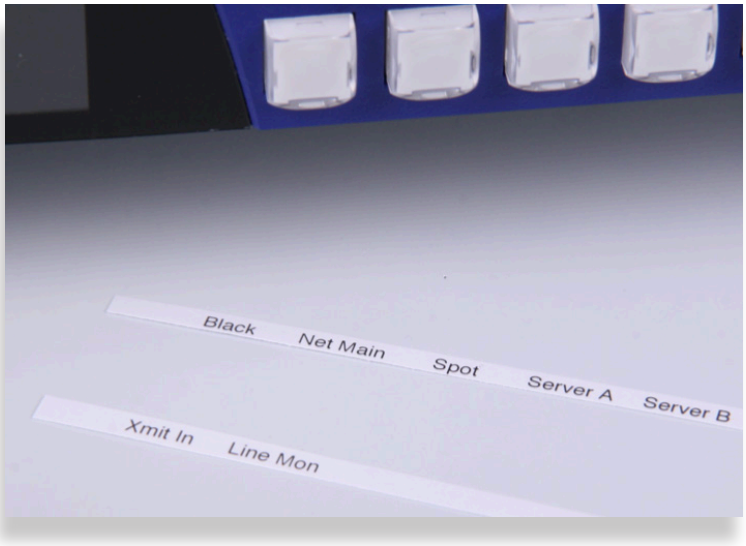


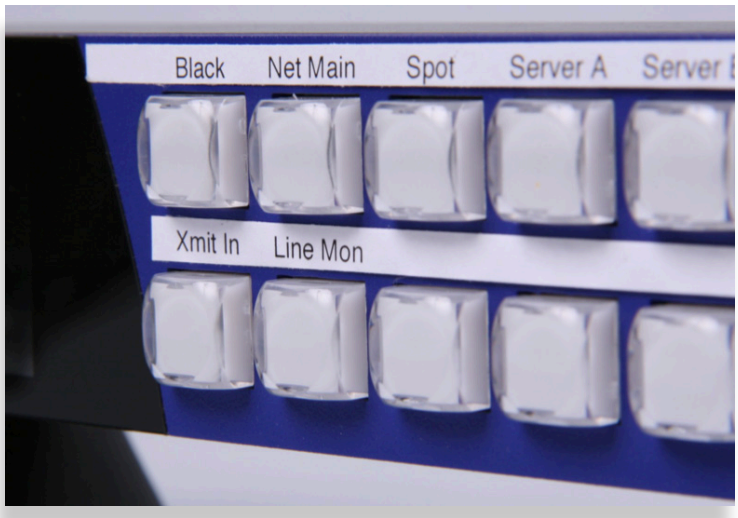
4. In the upper right area of the Edit Profile page, click **Print Label**. A Labels.cgi page is created and displays in a new browser tab or window.



1. Toward the bottom of the generated label page, click the **Print** icon. If you do not see this toolbar, move your mouse cursor across the screen. It may not constantly display itself.

2. Cut the printed labels into two strips as shown below. Align and place the labels onto the Layering Engine Control Panel.





Configuration

The Layering Engine's Network Environment

The P9425 Layering Engine communicates over a 100 Mb Ethernet LAN (Local Area Network). In this section, we cover the essential factors for configuring the Layering Engine in a typical networking environment. Your own networking environment may differ. While we recommend certain practices, you must nevertheless configure the network parameters in each of these devices in accordance with your network.

Avenue Touch Screen and Avenue PC Controls

While the primary method for controlling the Layering Engine is through the web browser interface discussed in Essential Operations and Step-by-Step Procedures on page 55, the Avenue Touch Screen or Avenue PC Controls are used for initially assigning the 9430 a new IP Address and Subnet Mask as required.

If you do not use Avenue Touch Screen or Avenue PC, see For Customers Not Using Avenue Touch Screen or Avenue PC on page 84.

Connecting Network Cables

Establishing Network Connectivity between Controlling Computer and 9430

Please review the section Control Connections on page 27 if necessary to make sure you have network connectivity between your controlling computer and the 9430. It is critical that the controlling computer be networked to the "Y" adaptor cable which connects to the HD-15 connector specific to the slot in the frame where the Layering Engine is installed.

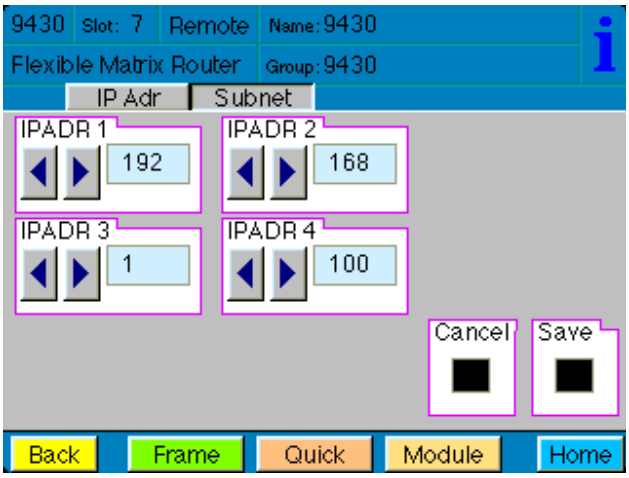
Assigning the Layering Engine a New IP Address

When you initially power up the Layering Engine as received from the factory, the 9430 module will take the self-assigned static IP address of 192.168.1.100. The 9430 needs to be configured for a manually assigned static IP address and subnet mask that are compatible with your network environment.

For Customers Using Avenue Touch Screen or Avenue PC

To Set the IP Address

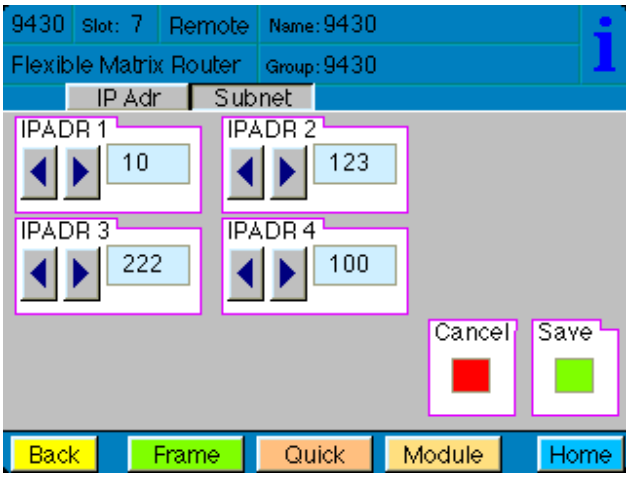
1. From the Avenue Frame, select the 9430 module from the Touch Screen. The 9430 menus display.



The Touch Screen interface showing the IP address of the 9430 as received from the factory.

2. From the **IP Adr** menu, enter the IP address you want to use that is compatible with your own network. The simplest method is to touch each number field, using the keypad to enter the new numbers. For example, you may want to change the IP address to something like the following:
    - 10.123.222.100

Note that when using Avenue PC instead of the Touch Screen interface, after entering numbers into the number fields, you will need to hit the "enter" or "return" key for the change to register.



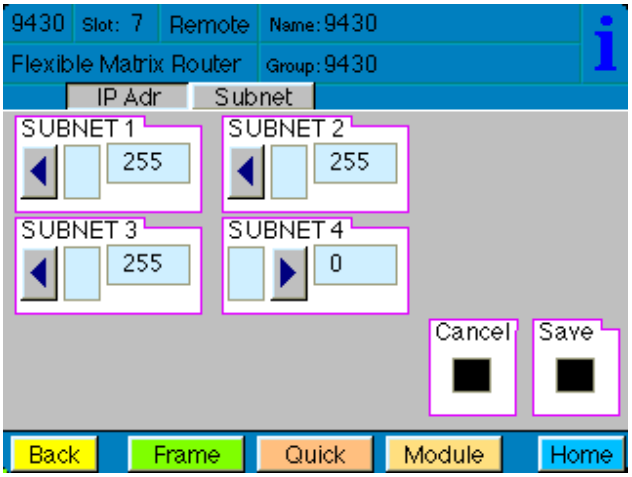
A new IP address has been entered, but not yet saved.

To Set the Subnet Mask

The subnet mask must be set in accordance with the size and topology of your network. The default setting as received from the factory is 255.255.255.0. This is a typical setting for a smaller network. For a larger network, a typical setting is 255.255.0.0. If in doubt, use the setting for a larger network.

1. From the **Subnet** menu, modify the settings as needed. Use the arrow buttons to change the settings, or touch each number field to use the keypad.
2. When finished, press **Save**. Both the **Cancel** and **Save** buttons turn black to indicate that your new settings have been saved.

It should now be possible to browse to the 9430 from a computer on your network.



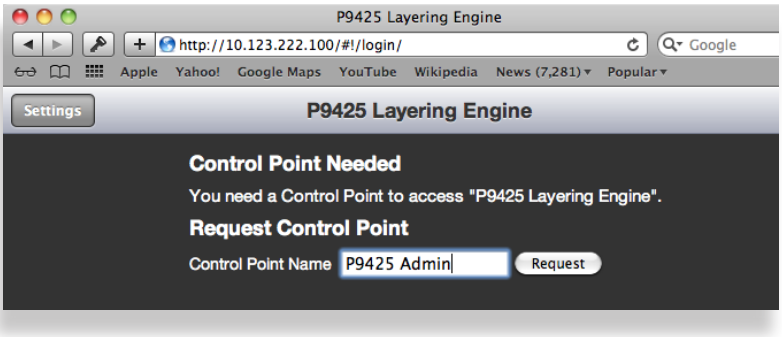
The Subnet Touch Screen menu. The black Cancel and Save buttons indicate that the settings have been saved.

Establishing Initial Control Point and Profile for Administrator Functions

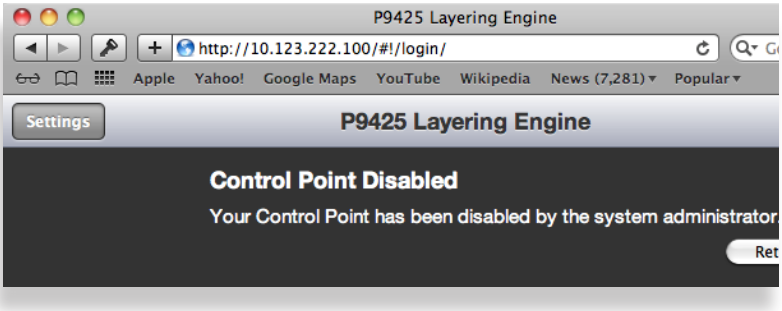
Now that you have set the Layering Engine's IP address and subnet mask in a manner that suits your network environment, you can start the configuration process. From the controlling computer, connect to the 9430 to establish an initial Control Point for administrator functions.

To Create an Initial Control Point

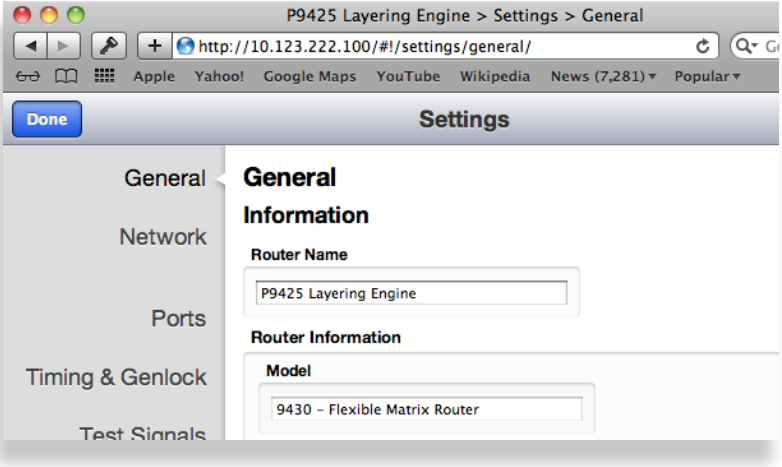
1. Navigate to the 9430's new IP address with your browser. The Control Point Needed window displays.
2. From the Control Point Needed window, enter the name you want to use to refer to the initial Control Point (for example, "P9425 Admin").



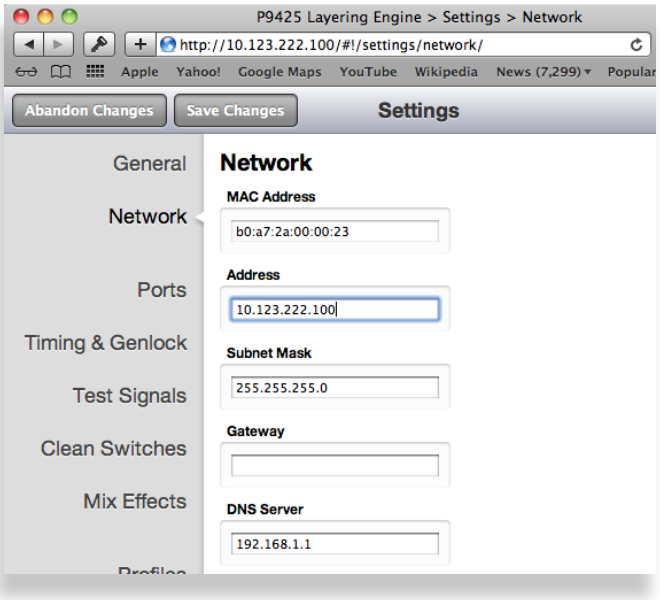
3. Click Request. The message "Control Point Disabled" displays.



4. Click **Settings** in the upper left part of the browser window. The Settings > General window displays.

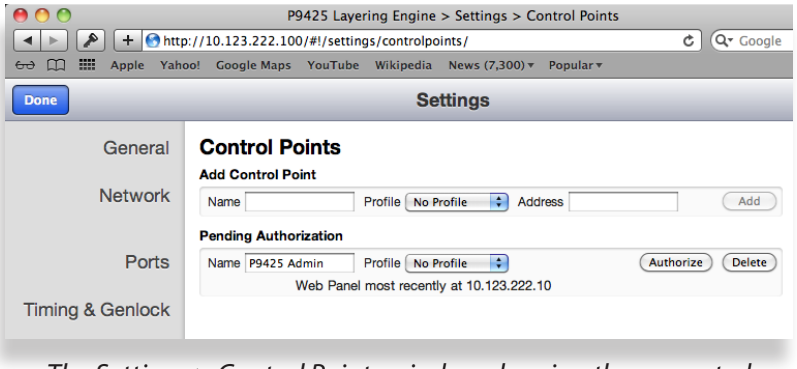


5. From the left navigation panel, click **Network**. The Network page displays.



6. Set the Gateway and DNS Server parameters according to your network configuration. In general, these settings will be required only in installations with extended networking requirements, such as a remote site connected by VPN.

7. From the left navigation panel, click **Control Points**. The Control Points window displays. The Control Point you just requested is listed under the Pending Authorization heading.

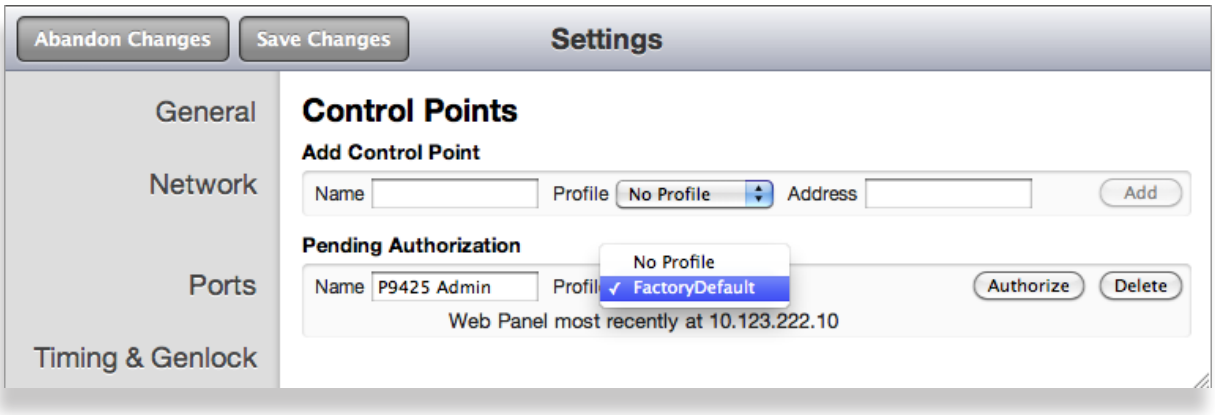


The Settings > Control Points window showing the requested Control Point as a Pending Authorization

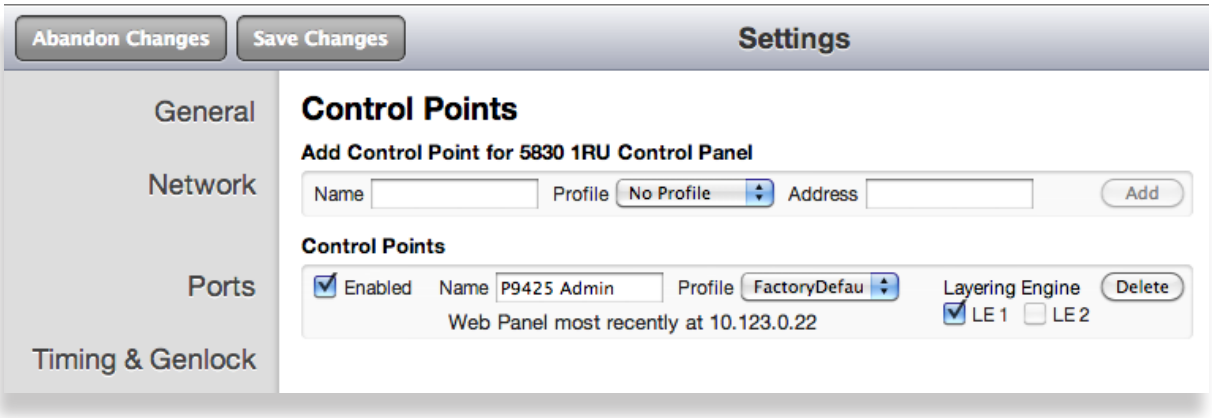
To Assign the Factory Default Profile to the P9425 Admin Control Point

You must assign a Profile that defines which sources and destinations this Control Point can access. To begin with, choose the Factory Default Profile. It provides access to the eight Inputs, two Test Signal Generators, and two Outputs of the basic 9430 module.

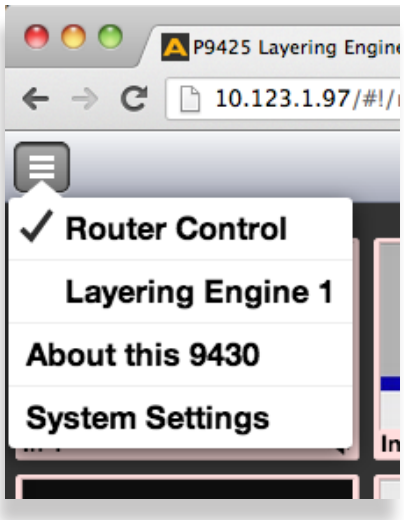
1. Under Pending Authorization, select **FactoryDefault** from the Profile drop-down control.



2. Click **Authorize**. The P9425 Admin Control Point now displays in the list of authorized Control Points.



3. Select both the **Enabled** checkbox and the **LE1** checkbox.



Important! In order to be able to access the Layering Engine interface, it is necessary to select the **LE 1** checkbox that is associated with the control point you are using. If the **LE 1** checkbox is not selected, the upper left pull-down menu will not display the Layering Engine option.

4. Click **Save Changes** in the upper left area of the window.
5. Click **Done**.

You are now presented with a 9430 control view with thumbnail icons. Without video signals present, the thumbnails will indicate "No Input." In the example below, however, video signals are connected to 9430 Inputs 1 - 8.

Now that you have set the 9430's IP address, assigned a Profile and authorized an initial Control Point, you have access to all of the Layering Engine's configuration settings.

In the example just discussed, the P9425 Admin Control Point is specific to the controlling computer. Later sections of this chapter discuss how to create additional Control Points for other computers, laptops, and iPads. You can also use external control panels using serial protocols.

For more details, see:

- Creating and Editing Profiles on page 99
- Establishing Control Points and Access Authentication on page 101
- Chapter 5: External Control on page 114

Examples of Control Points

- 5825 Layering Engine Control Panel
- Laptops, iPads and other computers using a web browser
- External control using serial protocols

Configuring the 5825 Layering Engine Control Panel

Configuring the Layering Engine Control Panel involves:

- Connecting it to the network with an Ethernet cable,
- Turning on the power, (unless it is being powered using Power over Ethernet, or PoE),
- Configuring its Network Settings through the LCD Display Panel
- Enabling its Control Point through the Web interface

Note: Please connect the Layering Engine Control Panel to the network before turning on its power. The Layering Engine Control Panel can be powered using PoE (if you have a PoE switch upstream from the Panel), or it can be powered by the power supply included with each Panel.

About Control Panel Profile

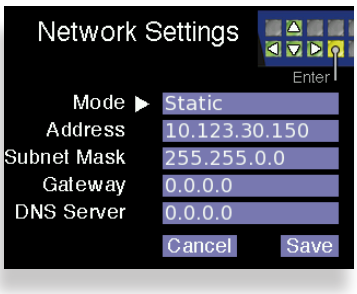
The 5825 Control Panel uses the same profile that is assigned to the Layering Engine module through the web interface. There is no independent profile selection for the 5825.

5825 Control Panel Default Settings

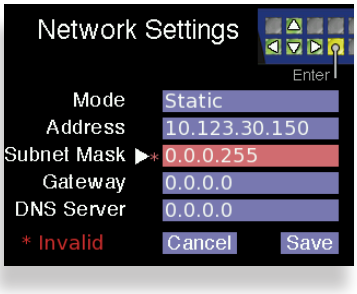
The Control Panel comes from the factory with the following default network settings:

Menu	Default Network Setting
Mode	Static
Address	192.168.1.101
Subnet	255.255.255.0
Gateway	192.168.1.101
DNS Server	192.168.1.101

Network Configuration Controls



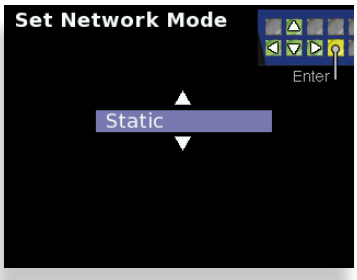
- For one full second, simultaneously press both small round buttons located to the left of the LCD Display. The Network Settings screen displays.
- Five panel buttons to the right of the LCD Display change both color and function while the Network Settings screen is displaying. A map of the green and yellow button functionality is shown in the upper right corner of the screen.
- Use the green buttons to navigate up, down, left and right among the Network Settings menus and submenus.
- When changing numeric values, pressing and holding the up or down navigation buttons accelerates the the rate at which the numbers change.
- Use the yellow button (Enter) to enter and exit menus and to select Cancel or Save.
- A white arrow points to the currently selected menu or submenu.
- Entering invalid combinations of network settings causes errors. Invalid network settings cannot be saved.

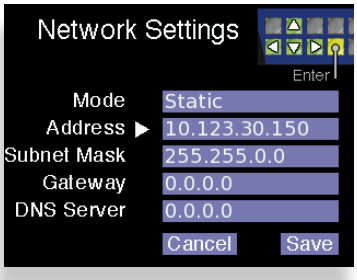


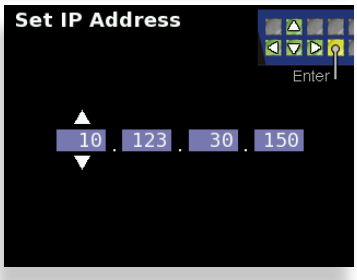
Modifying the Control Panel's Network Settings

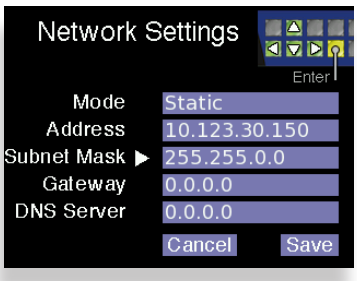
Configure the Network Settings appropriately for your network. Gateway and DNS Server fields are optional.

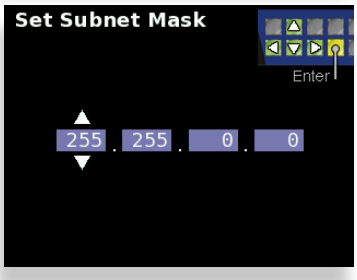
Menu	Configuration Steps
Mode	1. With Mode selected, press Enter (yellow button) to access the Mode menu settings. The Set Network Mode screen displays. 2. Use the Up and Down navigation buttons to select either Static or DHCP. 3. Press Enter to exit the Mode menu. **Note:** Although the Layering Engine Module must use a fixed (static) IP Address, it is possible to operate the 5825 Control Panel with either a static address or one that is automatically assigned by your network under DHCP. If DHCP is selected from the Mode menu, the 5825 will obtain an address from the DHCP server on your network. However, we recommend using a fixed (static) IP Address.



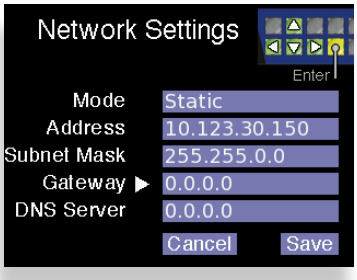
<table>
<tr><th>Menu</th><th>Configuration Steps</th></tr>
<tr><td>Address</td><td>
1. Use the navigation buttons to select the Address menu.


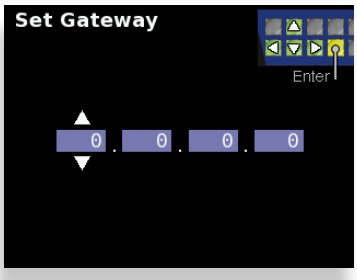
2. Press Enter. The Set IP Address screen displays.
3. Use the Up and Down navigation buttons to change values. Use the Left and Right navigation buttons to move to the different segments of the IP address.


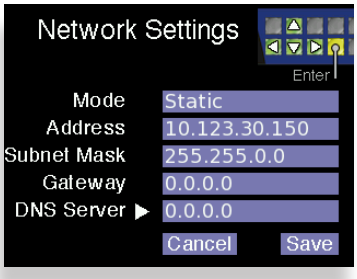
4. Once you have set the IP address to your desired setting, press Enter to exit the Address menu and return to the Network Settings screen.
</td></tr>
<tr><td>Subnet Mask</td><td>
1. Use the navigation buttons to select the Subnet Mask menu.


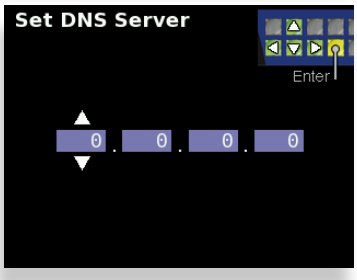
2. Press Enter. The Set Subnet Mask screen displays.
3. Use the Up and Down navigation buttons to change values. Use the Left and Right navigation buttons to move to the different segments of the Subnet Mask menu.


4. Once you have set the Subnet Mask to your desired setting, press Enter to exit the menu and return to the Network Settings screen.
</td></tr>
</table>

<table>
<tr><th>Menu</th><th>Configuration Steps</th></tr>
<tr><td>Gateway (optional)</td><td>
1. Use the navigation buttons to select the Gateway menu.


2. Press Enter. The Set Gateway screen displays.
3. Use the Up and Down navigation buttons to change values. Use the Left and Right navigation buttons to move to the different segments of the Gateway menu.


4. Once you have set the Gateway to your desired setting, press Enter to exit the menu and return to the Network Settings screen.
</td></tr>
<tr><td>DNS Server (optional)</td><td>
1. Use the navigation buttons to select the DNS Server menu.


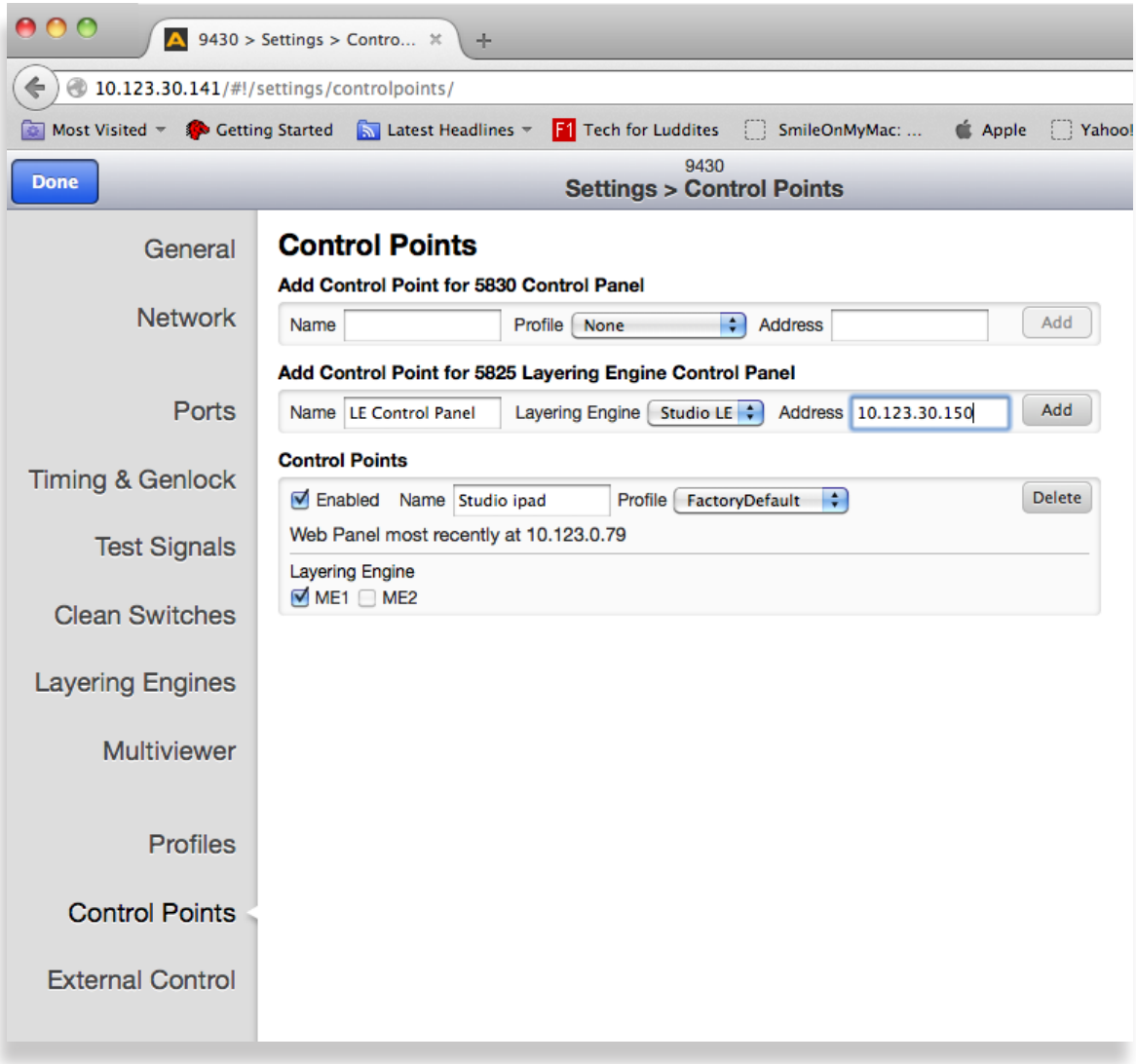
1. Press Enter. The Set DNS Server screen displays.
2. Use the Up and Down navigation buttons to change values. Use the Left and Right navigation buttons to move to the different segments of the DNS Server menu.


3. Once you have set the DNS Server to your desired setting, press Enter to exit the menu and return to the Network Settings screen.
</td></tr>
<tr><td>Save</td><td>
1. Once finished modifying the control panel's network settings, select Save to save your changes, or select Cancel to cancel all changes.
2. Press Enter. The LCD Display returns to operational mode, displaying the currently selected Background.
</td></tr>
</table>

Creating a Control Point for the 5825 Panel

1. Browse to the 9430 Settings > Control Points page.
2. Under the heading Add Control Point for 5825 Layering Engine Control Panel, enter a name for the 5825 Panel in the Name field.
3. Select a Layering Engine profile from the Profile drop-down control.
4. Enter the IP address of the 5825 into the Address field.
5. Click **Add**.
6. Click **Done**.

At this point, now that you have assigned a compatible IP address to the Control Panel and you have added it as a Control Point, it will be able to connect to the Router.



The 9430 Settings > Control Points window showing the process of adding the 5825 Control Panel as a Control Point

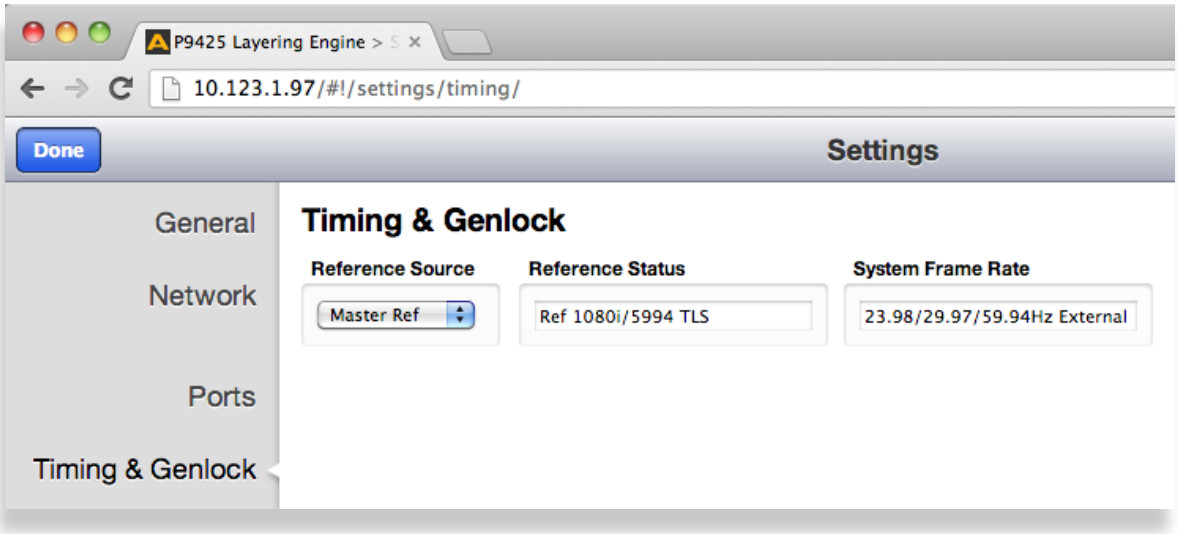
Configuring the Reference Source, System Frame Rate and Vertical Interval Switch Point for 9430 and Layering Engine

In this next section, you'll be establishing the reference source for the 9430, along with the system frame rate and vertical interval switch point for both the 9430 and the Layering Engine sub-module.

Selecting the 9430 Reference Source

To configure the reference source for the 9430:

1. From the upper left pull-down menu, select **System Settings**. The Settings > General Information page displays.
2. From the left navigation panel, select **Timing & Genlock**. The Timing & Genlock page displays.

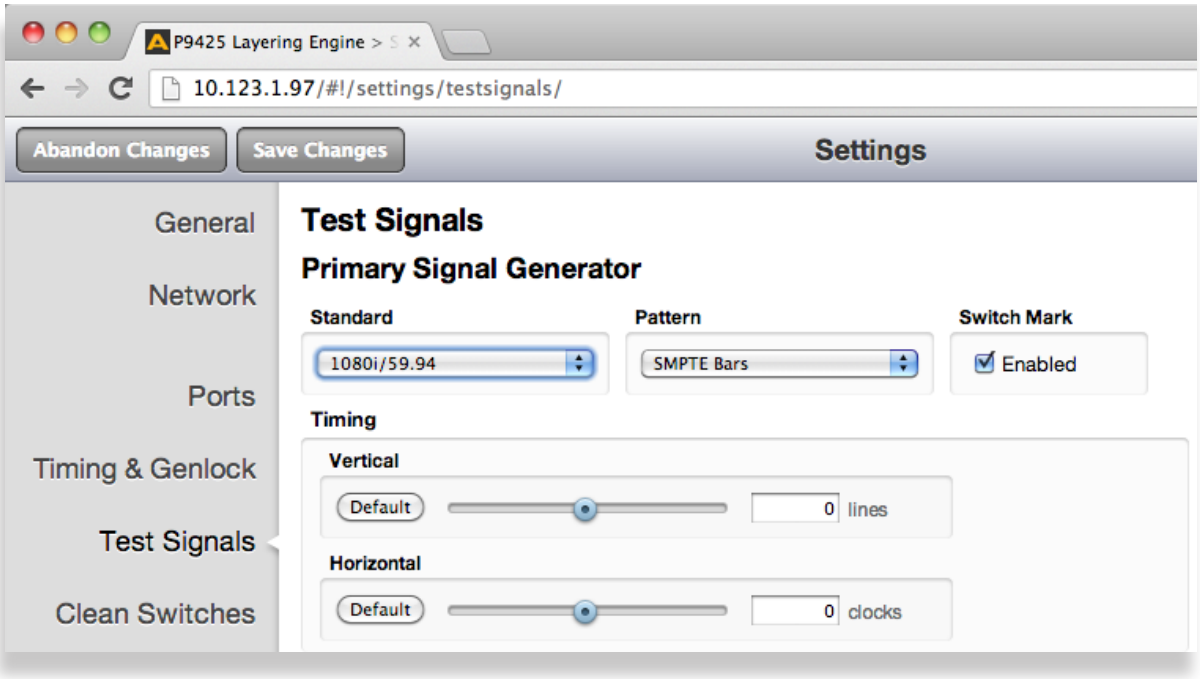


3. From the Reference Source pull-down control, select one of these options:
   - **Master Ref** – the frame reference will come through the Avenue Frame Master Reference input.
   - **Internal** – the frame reference will come from the 9430's internal precision reference.
4. Click **Save Changes**.
5. Click **Done**.

Selecting the 9430 System Frame Rate and Vertical Interval Switch Point

To configure the system frame rate and vertical interval switch point for the 9430:

1. From the upper left pull-down menu, select **System Settings**. The Settings > General Information page displays.
2. From the left navigation panel, select **Test Signals**. The Test Signals page displays.



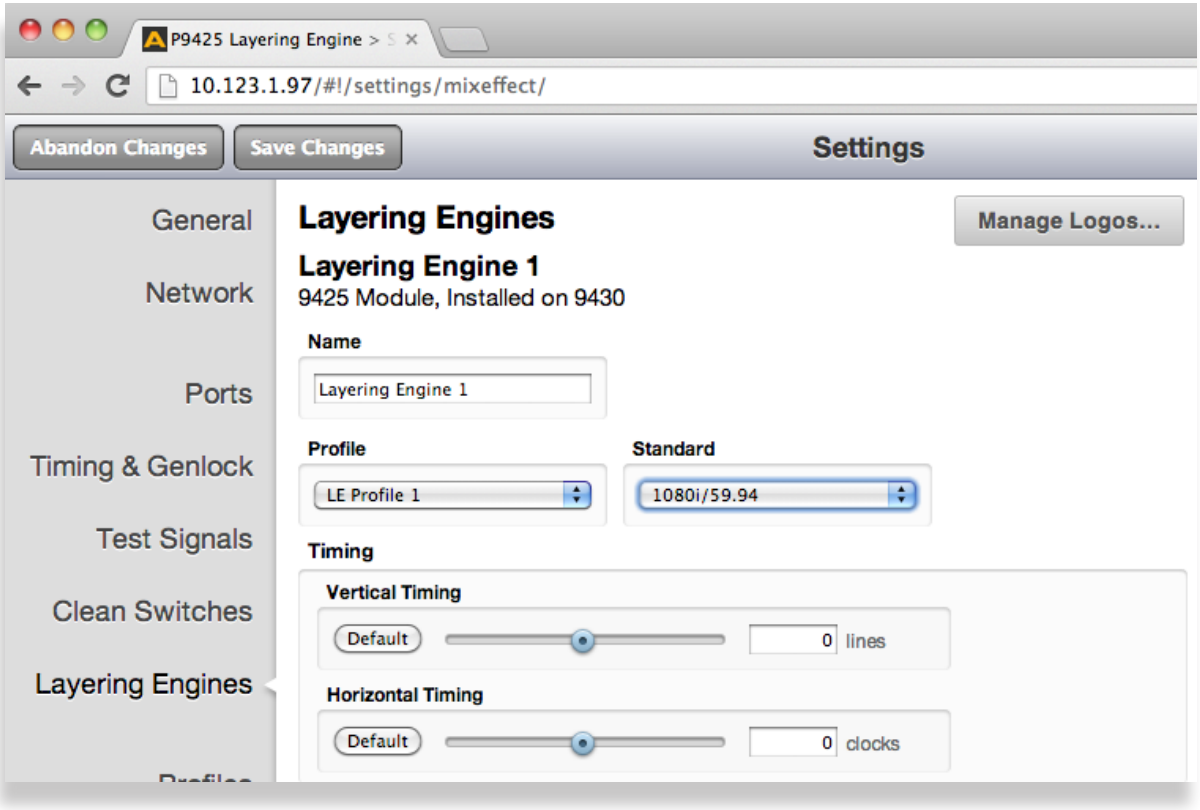
3. From the Primary Signal Generator area, make a selection from the Standard pull-down control. This selection determines the system frame rate and the vertical interval switch point for the 9430.
4. Click **Save Changes**.
5. Click **Done**.

For more details, see Setting Up Timing and Genlock on page 104.

Selecting the Layering Engine System Frame Rate and Vertical Interval Switch Point

To configure the system frame rate and vertical interval switch point for the Layering Engine:

1. From the upper left pull-down menu, select **System Settings**. The Settings > General Information page displays.
2. From the left navigation panel, select **Layering Engines**. The Layering Engines page displays.



3. From the Layering Engine 1 area, make a selection from the Standard pull-down control. This selection determines the system frame rate and the vertical interval switch point for the Layering Engine sub-module.

Important! The choice of system frame rate standard is CRITICAL for the Layering Engine sub-module to function correctly with the 9430.

The standard you select for the 9430 Primary Signal Generator (from the Test Signals tab) and the standard you select for the Layering Engine (from the Layering Engines tab) must be set to standards with identical frame rates. The standards themselves do not need to be identical, but the standards must have identical frame rates.

For example, if the Primary Test Signal Generator is configured for SD 525, then the Layering Engine will work in any of the /59 family standards.

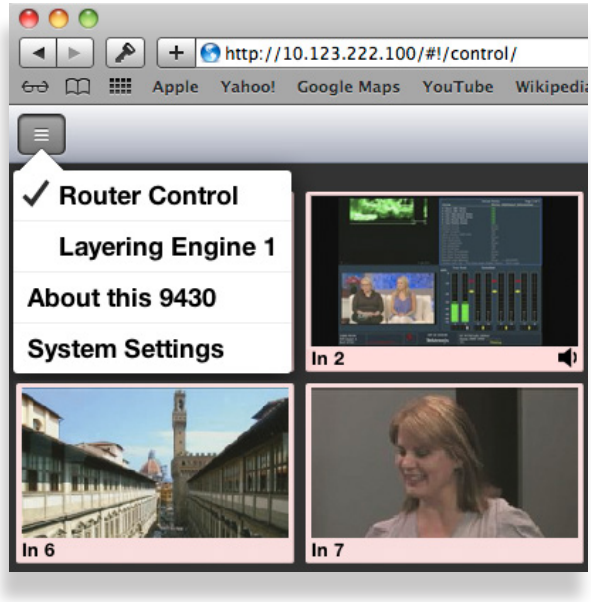
See also: Note on Frame Rates on page 105.

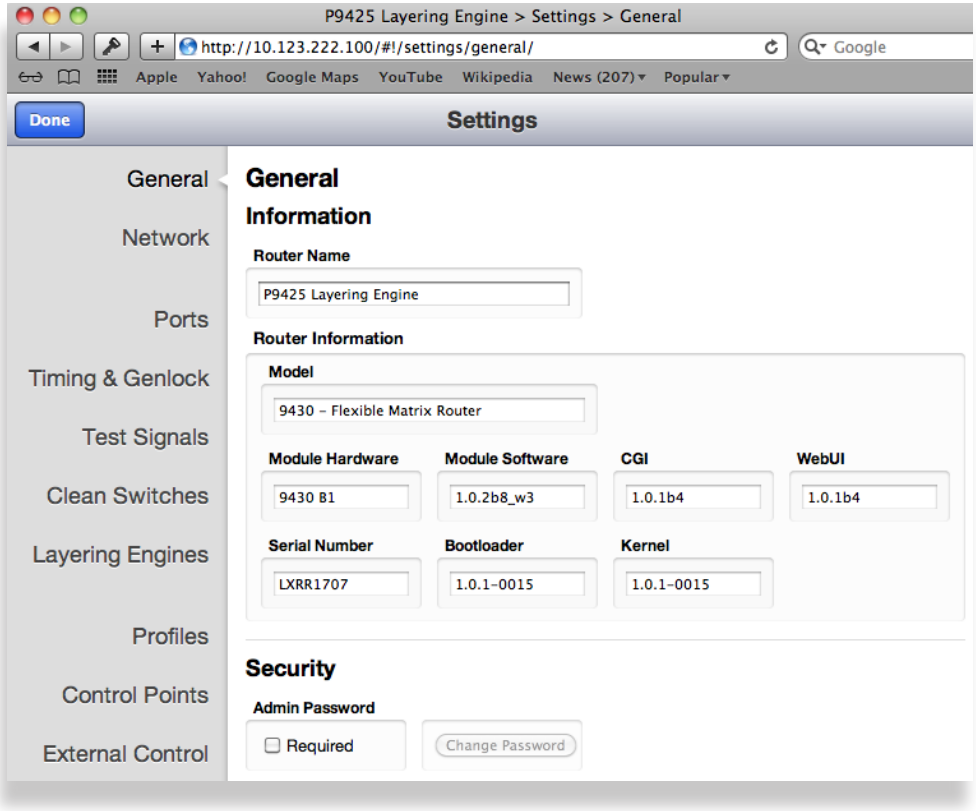
Routing Virtual Ports ME1 Program and ME1 Preview to Outputs 1 and 2

The Layering Engine architecture uses virtual ports to generate the Program Output and Preview Output. In order for the signals from the virtual ports to be sent to the outputs, the virtual ports must be configured as Sources, then routed to specific BNC Outputs. In the case of an 8 x 2 P9425, virtual ports ME1 Program and ME1 Preview must be routed to Outputs 1 and 2. In the case of an expanded Layering Engine that uses one or two 9440s, virtual ports ME1 Program and ME1 Preview could be routed to any two 9440 I/O ports provided that those ports are configured as Destinations.

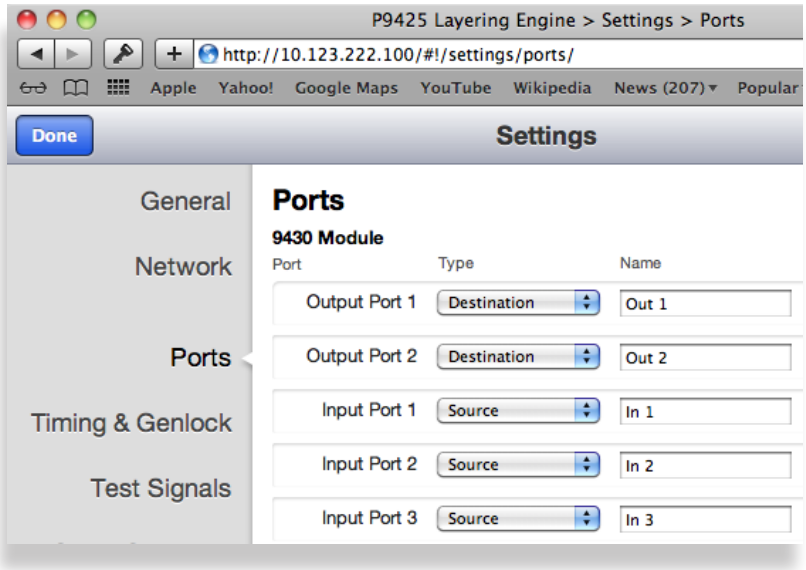
To Assign Virtual Ports ME1 Program and ME1 Preview as Sources

1. From the upper left corner of the browser user interface, click the pull-down menu icon, and select **System Settings**. The Settings > General page displays.

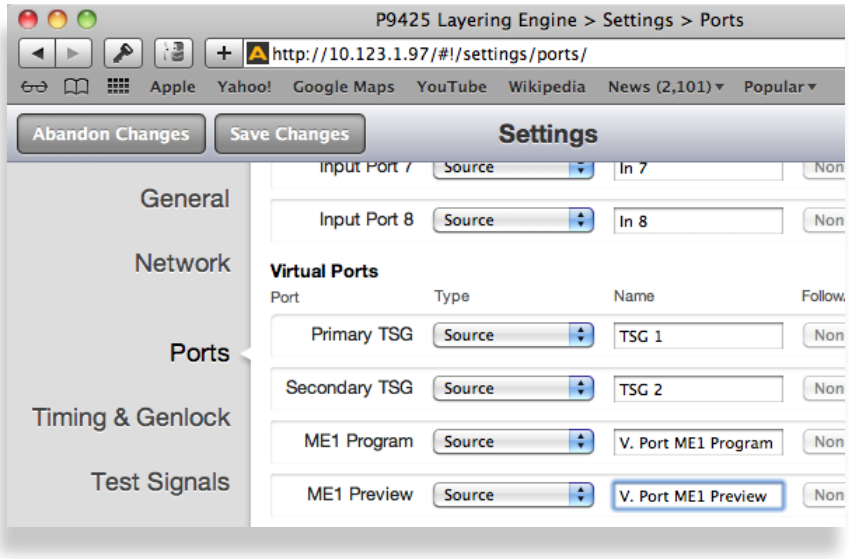




2. From the left navigation panel, select Ports. The Ports page displays.



3. Scroll down the Ports page to find the Virtual Ports.

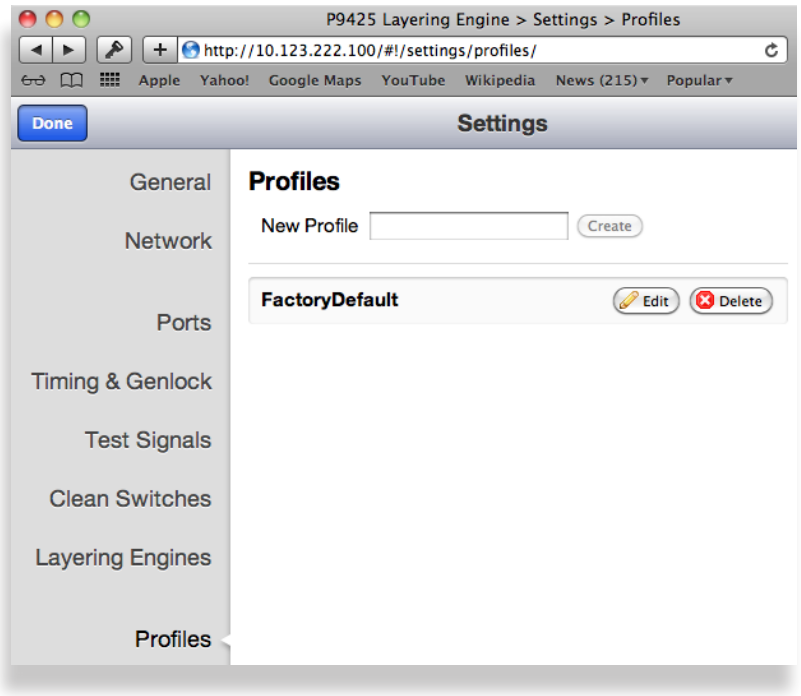


4. For virtual ports ME1 Program and ME1 Preview, use the Type pull-down controls to assign them both as **Source**, as shown above.
5. In the Name field to the right of ME1 Program and ME1 Preview, enter a name. To maximize clarity for upcoming steps, you could use names such as "V. Port ME1 Program," and "V. Port ME1 Preview."
6. In the upper left corner of the Settings page, click **Save Changes**, then click **Done**. The Router Control page displays.

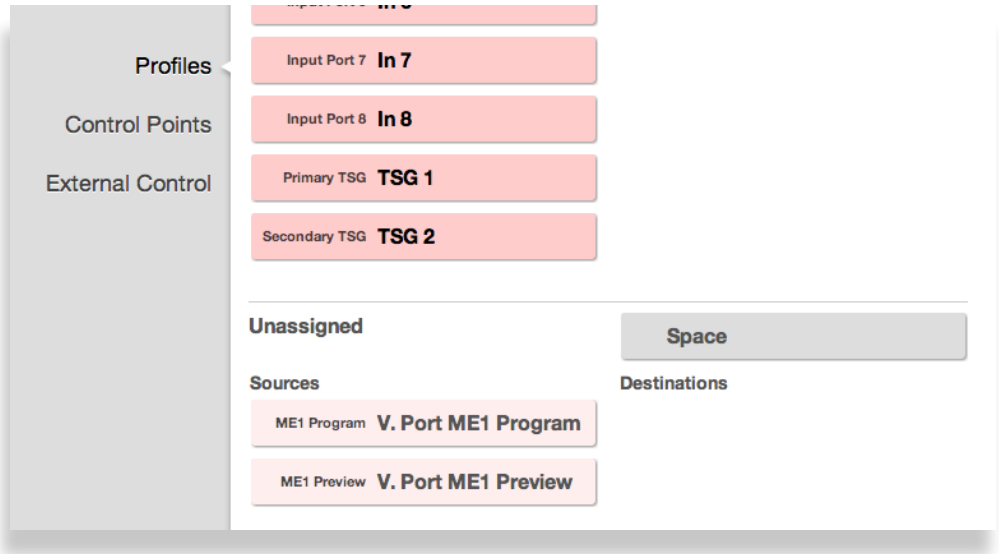
To Create a Profile that Includes Virtual Ports ME1 Program and ME1 Preview

Next, it is necessary to create or edit a Profile so that it includes Virtual Ports ME1 Program and ME1 Preview. As a result, it will be possible to route these virtual ports to the output BNCs.

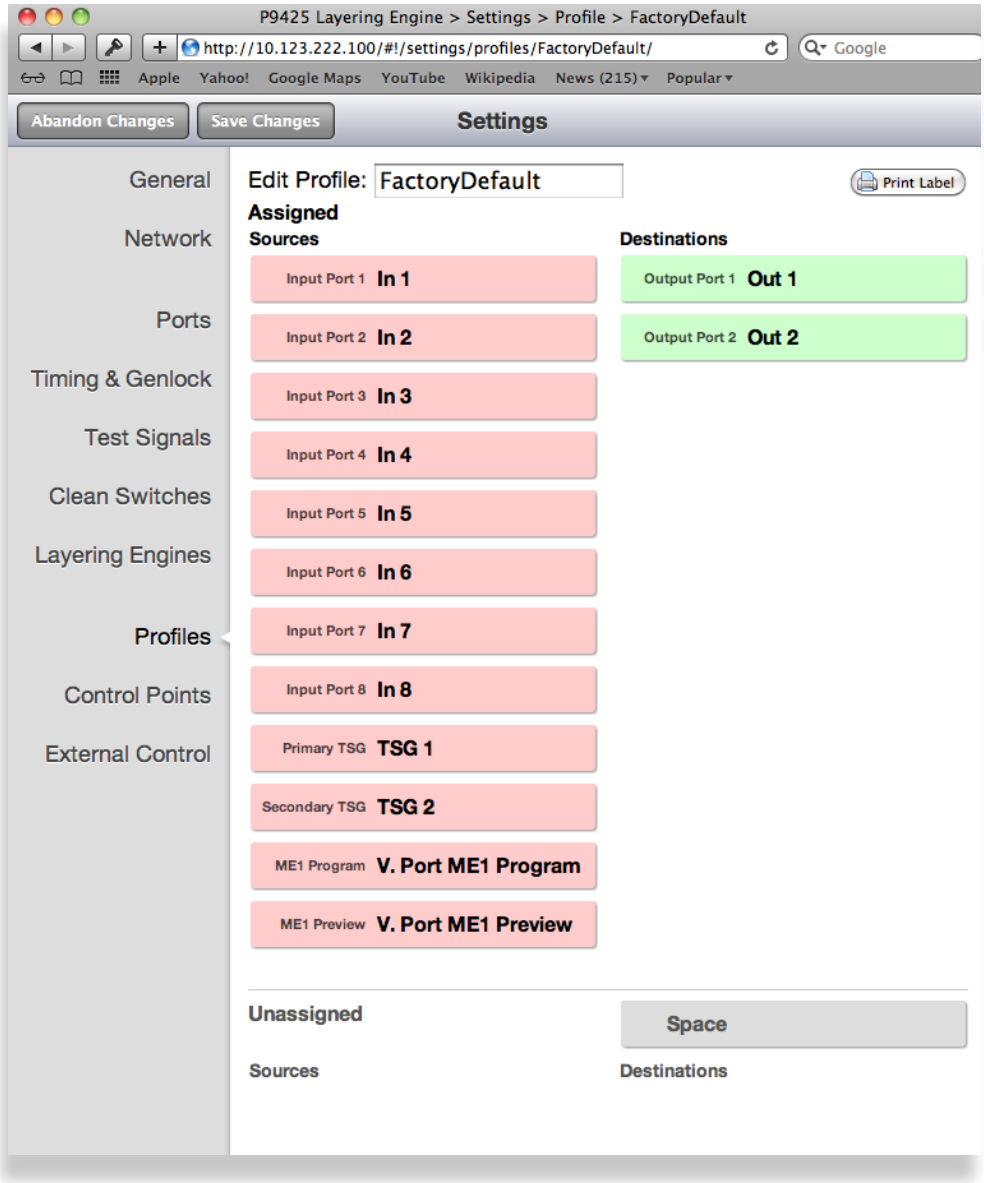
1. From the upper left corner of the browser user interface, select **System Settings** from the pull-down control. The Settings > General page displays.
2. From the left navigation panel, select **Profiles**. The Settings > Profiles page displays.



3. In this case, we will edit the Factory Default Profile to include the virtual port sources. Next to the FactoryDefault profile, click Edit. The Settings > Edit Profile page displays. Notice the unassigned sources at the bottom of the page for the virtual ports.



4. Click and drag the unassigned Sources for ME1 Program and ME1 Preview up into the Assigned area of the profile.



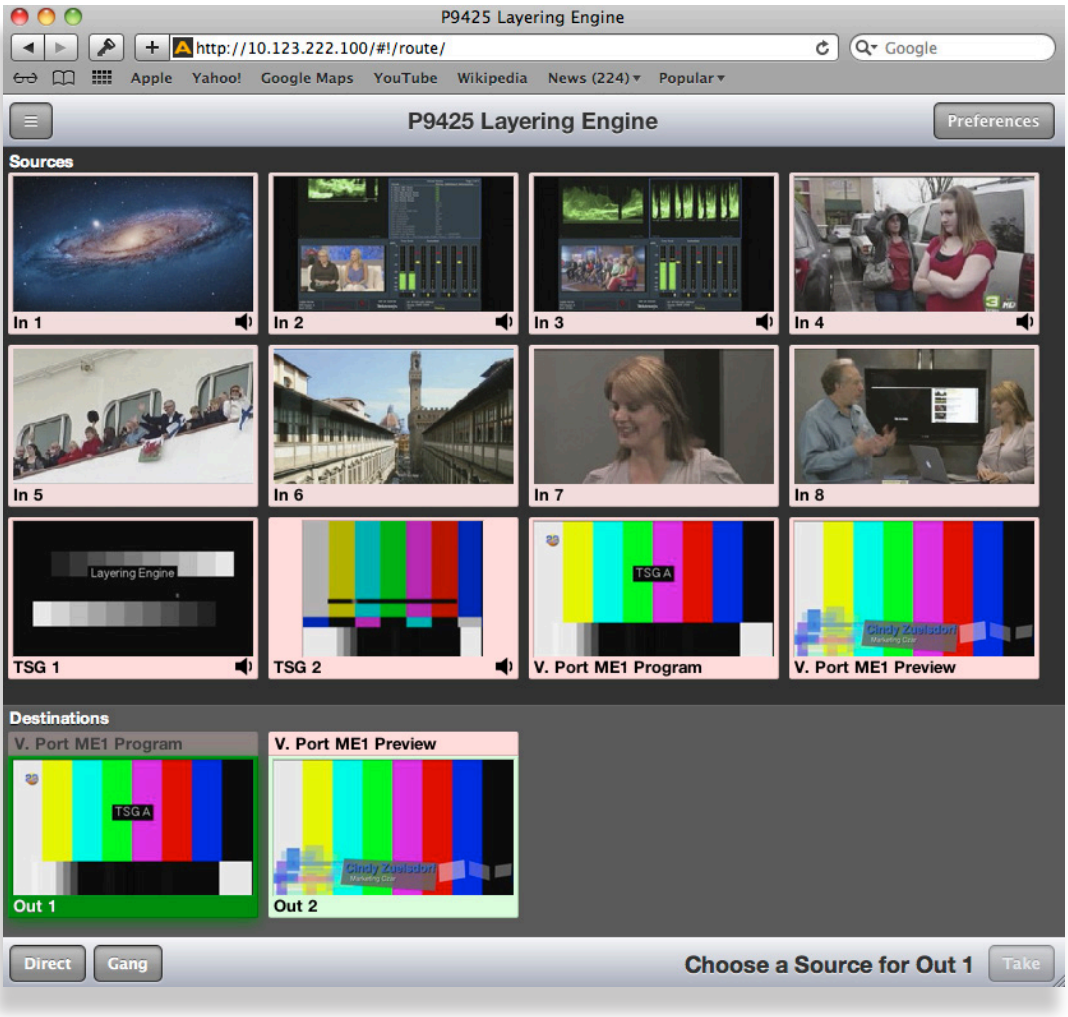
5. Click **Save Changes**. Click **Done**. The Router Control page displays.

To Route Virtual Ports ME1 Program and ME1 Preview to Outputs 1 and 2

From the Router Control page, notice that you can now see video thumbnails representing virtual port ME1 Program and virtual port ME1 Preview as Sources that can be routed.

1. From the Router Control page, select the video thumbnail for virtual port ME1 Program.
2. Select the video thumbnail for destination Out 1.
3. Click the Take button in the lower right corner.
4. Select the video thumbnail for virtual port ME1 Preview.
5. Select the video thumbnail for destination Out 2.
6. Click the Take button in the lower right corner.

At this point, you have finished this process, and the Program and Preview signals from the Layering Engine are now routed to BNC Outputs 1 and 2. The result is shown on the next page.



An example of the Router Control page after you have routed the virtual ports ME1 Program and ME1 Preview to Outputs 1 and 2.

This completes the groundwork for creating one or more Layering Engine profiles, discussed on the next page.

See also: Distinction Between 9430 Profile and Layering Engine Profile on page 99.

Creating Layering Engine Profiles

Whereas the purpose of a 9430 Router profile is to route sources to destinations, the purpose of a Layering Engine profile is to give you access to the resources you need to create the Layering Engine output. An effective Layering Engine profile gives you access to all the video inputs that you may want to use for Backgrounds and Keys.

To Create a Layering Engine Profile

1. From the upper left corner of the browser user interface, select **System Settings** from the pull-down control. The Settings > General page displays.
2. From the left navigation panel, click **Profiles**. The Profiles page displays.
3. Enter a profile name in the New Profile field.
4. Click **Create**. The new Profile is listed on the Profiles page.
5. Next to the newly created Profile, click **Edit**. The Edit Profile page displays. At the outset of creating a new profile, all the available Sources and Destinations are presented.
6. Click and drag unassigned Sources and Destinations up to the assigned area as needed for this specific profile. Note that you can rearrange the order as desired. Additionally, you can include empty spaces to create groupings of Sources and Destinations by clicking and dragging a Space icon up to be a source or destination.
7. When finished, click **Save Changes** in the upper left part of the screen, then click **Done**.

This newly created Profile is now available to assign to one or more Control Points.

Repeat steps 1 through 6 until you have as many Profiles as you need.

To Assign a Layering Engine Profile to a Control Point

1. From the upper left corner of the browser user interface, select **System Settings** from the pull-down control. The Settings > General page displays.
2. From the left navigation panel, click **Layering Engines**. The Layering Engines page displays.
3. From the Profile drop-down control, select the Profile that you want to assign to the control point.
4. Click **Save Changes**.
5. Click **Done**.

Note: Router Profiles are assigned through the Control Points menu, while Layering Engine Profiles are selected through the Layering Engines menu.

Layering Engine Operations with the Web Browser Interface

You can control the Layering Engine through its web browser user interface to perform cuts, mixes, select backgrounds, select video or images as additional layers using Keyer 1 and Keyer 2, and related tasks described in more detail in this chapter.

Operations with the 5825 Layering Engine Control Panel is discussed beginning on page 74.

Prerequisites for Accessing the Web Browser Control Interface

Before you can access the Layering Engine through a web browser, you need to have access to an authenticated Control Point and the Layering Engine's IP address. For further details about these requirements, please see the following sections:

- Assigning the Layering Engine a New IP Address on page 33
- Routing Virtual Ports ME1 Program and ME1 Preview to Outputs 1 and 2 on page 48
- Establishing Initial Control Point and Profile for Administrator Functions on page 36
- Configuring Control Points on page 102

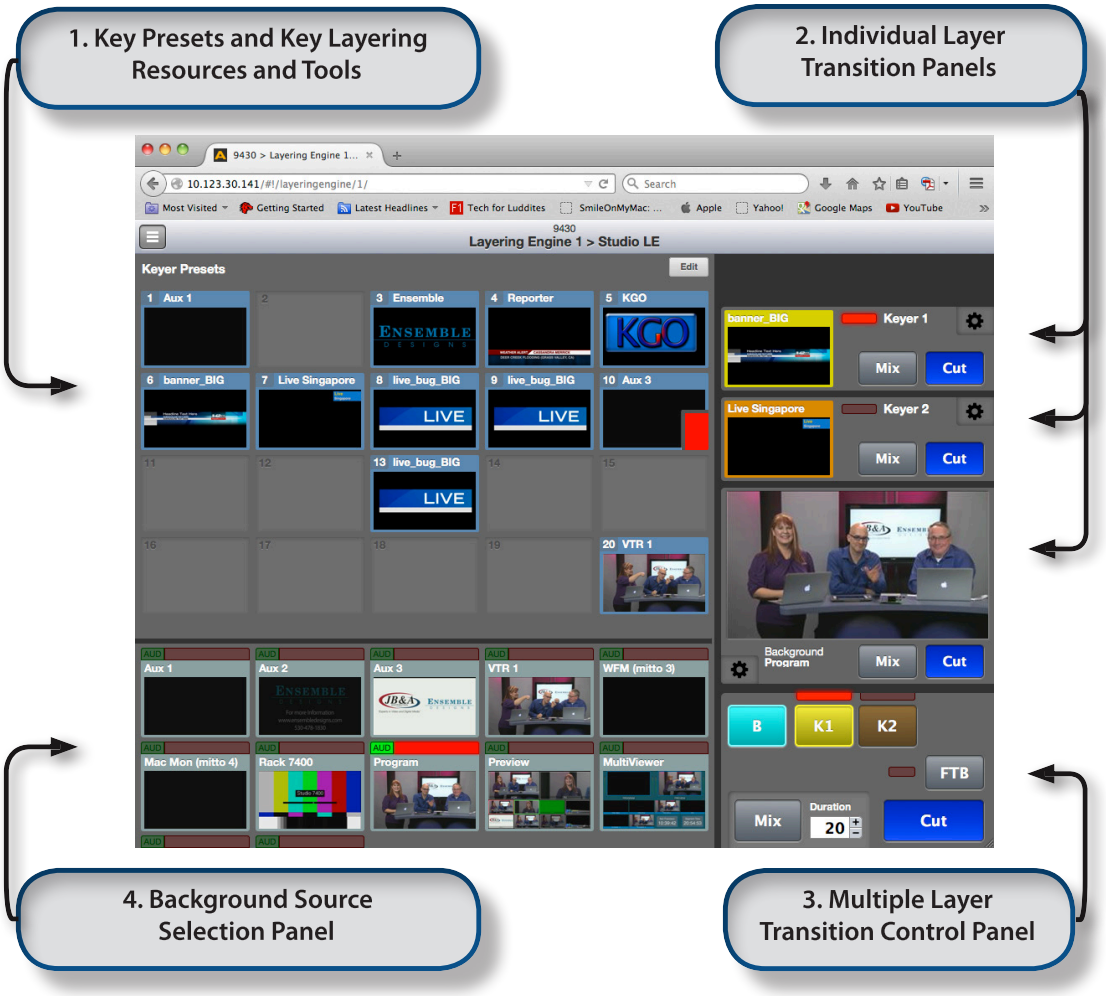
To access the web browser control interface

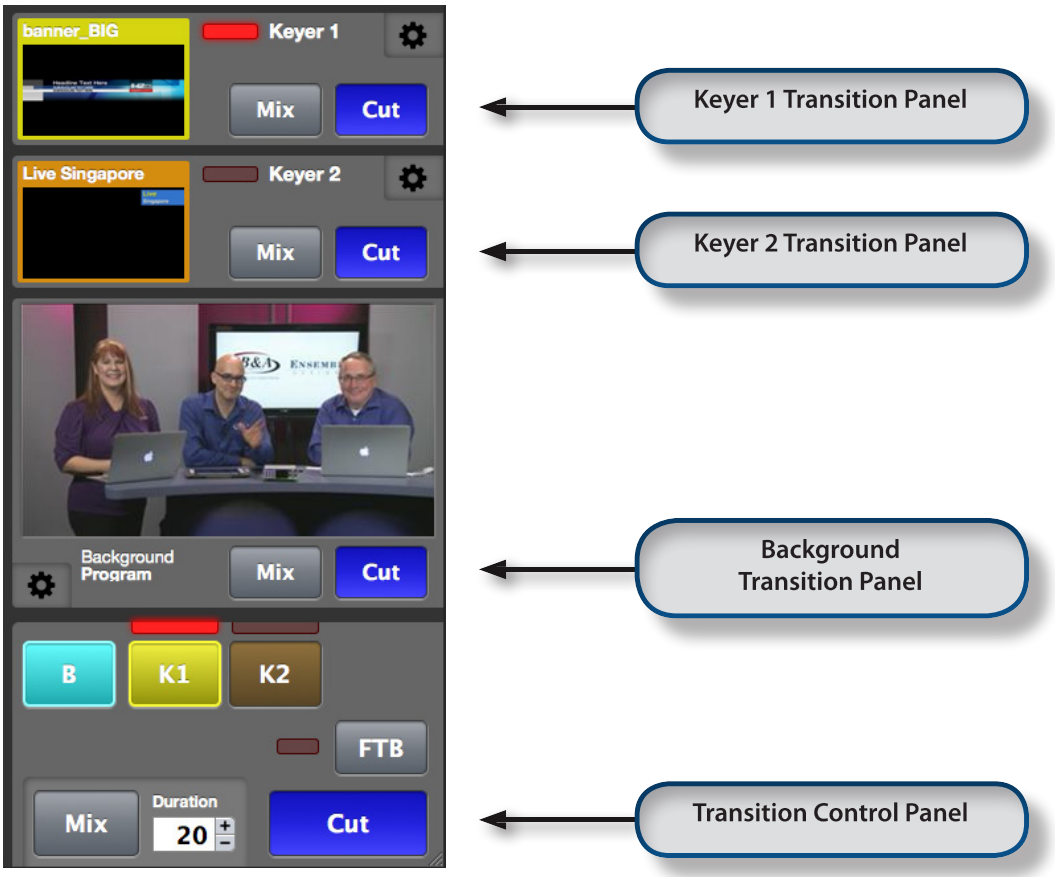
1. Enter the Layering Engine's IP address into the browser's address bar. The 9430 interface displays.
2. In the upper left corner, click Mix Effect 1. The Layering Engine interface displays, showing the Key Presets Panel, the Voice Over Transition Panel, Keyer 1 and Keyer 2 Transition Panels, Background Transition Panel, Multiple Layer Transition Control Panel, and the Background Source Selection Panel.

The Web Browser Interface at a Glance

The web browser interface is organized into four areas, described in the illustration below by referencing the interface in a clockwise direction, beginning from the upper left area.

1. Key Presets and Key Layering Resources and Tools	Use this area for assigning a foreground to Keyer 1 or Keyer 2, assigning Key Presets, or modifying a Key.
2. Individual Layer Transition Panels	Use these four controls to mix or cut a single Background or Layer. For Voice Over, Keyer 1 and Keyer 2, click the corresponding gear icon to access that Layer's configuration options.
3. Multiple Layer Transition Control Panel	Use this area to mix or cut a combination of Layers simultaneously. Specify the Layers that you want to engage by selecting from the corresponding Layer button: B, K1, K2, VO. Any combination of Layers may be selected. After the mix or cut, the selected Layers will be in their opposite state.
4. Background Source Selection Panel	Use this area to select the Backgrounds you want to work with. The Background thumbnail with the high red tally is going out through the Program Output. The Background thumbnail that is framed in blue is Preset, meaning that it will go to the Program Output the next time that the Background is cut or mixed.





The Four Transition Panels identified individually. The Keyer 1, Keyer 2, and Background Transition Panels can be mixed or cut individually, or all Layers can be mixed or cut through the main Transition Control Panel.

Working with Backgrounds

The Background Source Selection Panel (lower left area) of the web browser user interface displays thumbnail views of all connected SDI sources that are within the Layering Engines Profile. These thumbnails are regularly being updated to reflect their video content.

Switching Backgrounds may be performed using either the Background Transition Panel or the Multiple Layer Transition Control Panel. The Background thumbnail with the high red tally (the bright red strip) is on air. The Background thumbnail with the blue tally is Preset to go on air after you perform the next cut or mix.

Background source Program, with the high red tally, is on air. Background source Aux 2, with the blue tally, is Preset.

Background Thumbnails

The thumbnail images for Background Sources display their names on the upper part of each image frame. These names are established through the Port configuration process and can be renamed. SDI sources are configured through the 9430 ports.

See also: Port Configuration Options on page 93.

Cutting and Mixing Backgrounds

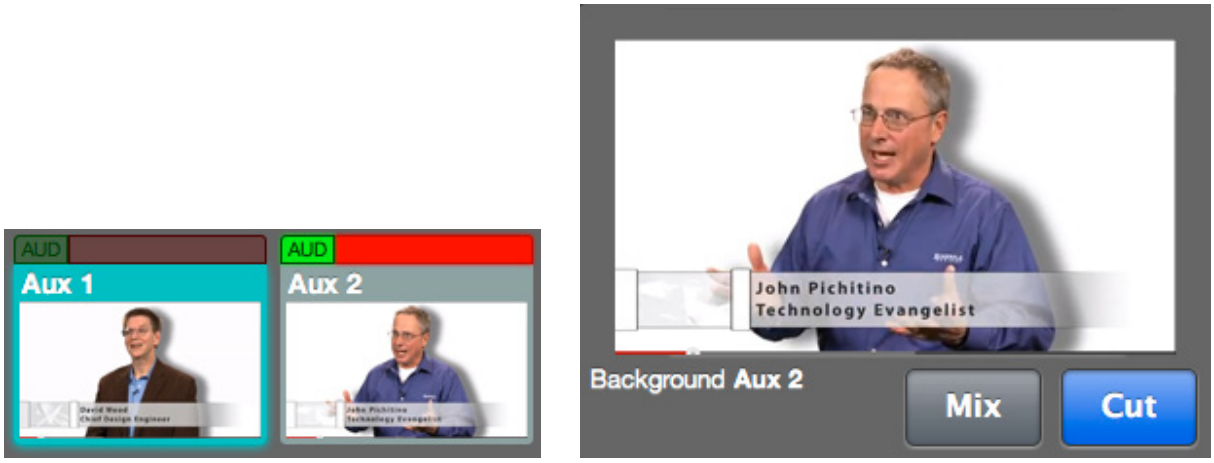
Cutting and mixing Backgrounds involves selecting a Background Source thumbnail, then using either the Background Transition Panel or the Multiple Layer Transition Control Panel to execute the transition.

To Cut or Mix a Background with the Background Transition Panel

1. From the Background Source selection panel, select the thumbnail image (representing an SDI source) that you want to use for the Background video. The thumbnail turns blue, indicating that it is Preset. Preset means that it will go live to the Program Output after the next transition.
2. Select the Mix or Cut button on the Background Transition Panel. The Background you selected is now going to the Program Output. It is also shown in the Background Transition Panel.

The Aux 1 Background thumbnail is going to the Program Output, indicated by the high red tally. Additionally, the Background mix and cut control displays the Background that is going to the Program Output. Aux 2 is Preset, indicated by the blue tally.

3. Select a different Background thumbnail from the Background Source Selection Panel. The frame of your newly selected thumbnail turns blue, indicating that it is Preset.
4. Select the Mix or Cut button on the Background Transition Panel. The Background thumbnail that was Preset is now going to the Program Output, and the Background that had been going to the Program Output is now Preset.

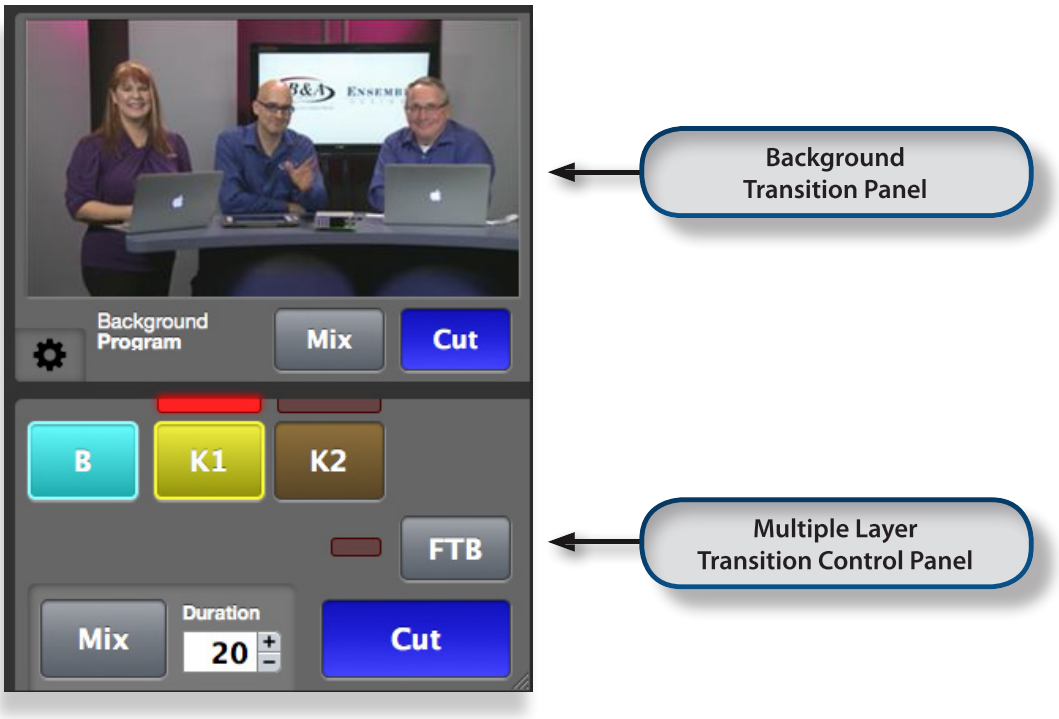


Without making any new or different selections, after another mix or cut, the Aux 1 and Aux 2 Backgrounds trade places. The Aux 2 Background is now going to the Program Output. Aux 1 is now Preset.

To Cut or Mix a Background using the Multiple Layer Transition Control Panel

1. From the Background Source Selection Panel, select the thumbnail image (representing an SDI source) that you want to use for the Background video. The thumbnail turns blue, indicating that it is Preset.
2. Directly below the Background Transition Panel is the Multiple Layer Transition Control Panel. Selecting one or more of the Layer buttons (B, K1, K2, VO) tells the Layering Engine which Layers will be impacted by a Cut or a Mix. For now, let's proceed with only the Background Layer button selected, meaning that only the Background Layer will be impacted by a Cut or Mix. The Background Layer button will display with a brighter color to indicate that it is selected.

3. Select the Mix or Cut button on the Multiple Layer Transition Control Panel. The Background you selected is now going to the Program Output. It is also shown in the Background Transition Panel. Notice that the indicator strip at the top of the thumbnail image is illuminated bright red, indicating that it is live on the Program Output.
4. Select the Mix or Cut button on the Multiple Layer Transition Control Panel again. The Background thumbnail that was Preset is now going to the Program Output, and the Background that had been going to the Program Output is now Preset. Selecting Cut or Mix again would cause these two Backgrounds to trade places. This will remain true until you select a different Background as a Preset.



Transition control panel showing only the Background and K1 buttons selected. In this example, the Background and K1 are the only Layers that will be impacted by a Mix or Cut.

Populating the Logo Store

Overview

The process of populating the Logo Store involves three main steps:

1. Creating the graphic image
2. Converting the graphic to Ensemble Designs' .logo file format
3. Uploading the .logo file to the Layering Engine's Logo Store

This section of the Layering Engine manual addresses each of these three steps.

Creating the Graphic

You will need to design and produce your logo graphics independently with your own resources and tools. Some good examples of authoring tools for graphics include the following applications:

- Photoshop,
- InMotion,
- Logo Design Studio,
- InkSpace,
- SketchUp,
- PixelMator.

Preferred and Compatible File Formats

The preferred file formats for graphics are Targa (.tga) and Portable Network Graphic (.png).

Other compatible file formats include Tagged Image Format File (.tiff), Bitmap Image (.bmp), and Graphics Interchange Format (.gif).

The above file formats have these characteristics:

- They are raster images
- They have lossless compression
- They are RGB images
- The Alpha (key) is included

An additional compatible file type is Joint Picture Expert Group (.jpg). This file type is compressed and consists only of an image. It does not include an Alpha (key).

Converting to the .logo Format

Use Ensemble Designs' **Logo Converter** software application for Mac and PC to convert graphic images from their original file format into Ensemble Designs' .logo file format. Logos must be in the .logo file format in order to be uploaded to the Layering Engine. The **Logo Converter** software is a stand-alone application. After converting graphics to the .logo file format, you can upload them to your Layering Engine's Logo Store.

The **Logo Converter** application performs colorspace conversion (RGB to YCrCb), bandwidth and edge filtering if desired, progressive to interlace conversion, Alpha (key) conversion if it is missing, and it multiplies the Key (Alpha) against the foreground if needed.

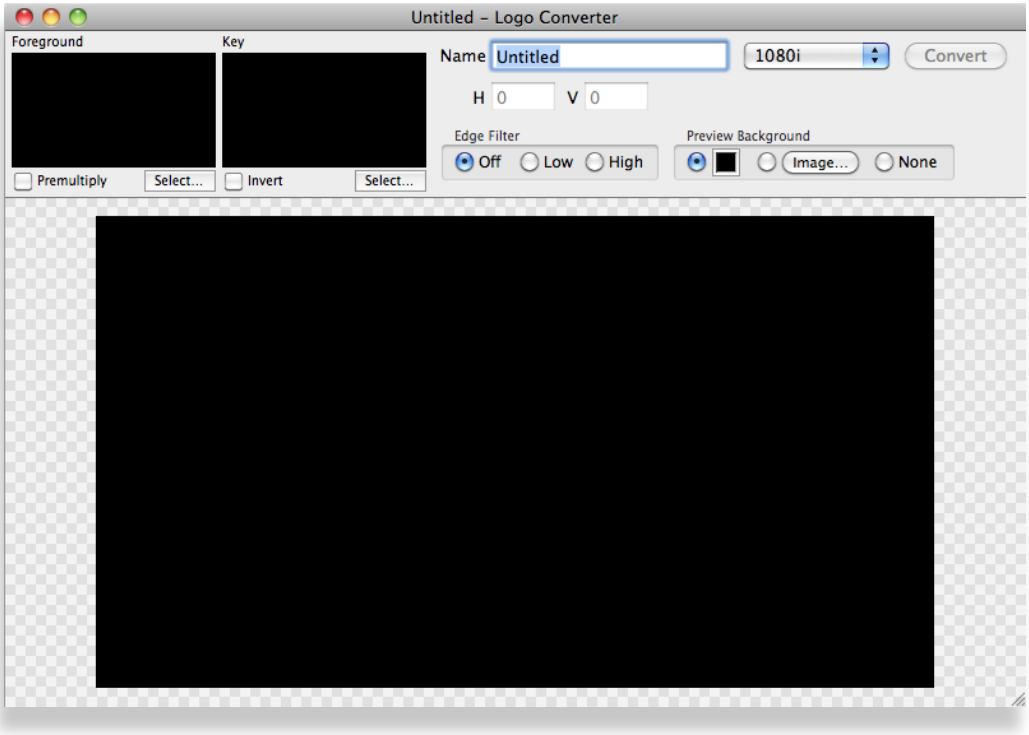
About Ensemble Logo (.logo) File Format

Graphics that have been converted to the .logo file format contain a number of elements: foreground (fill), key (alpha), a thumbnail image used by the Layering Engine user interface, and the display name. The key and fill use lossless compression. The .logo file format supports compressed and uncompressed material in the following raster formats:

- 1080i/50
- 1080i/59
- 1080p/50
- 1080p/59
- 720p/50
- 720p/59
- PAL 625i
- NTSC 525i

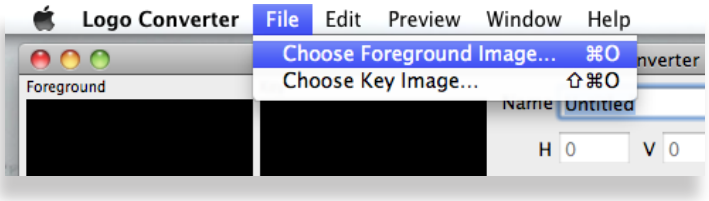
To Convert a Graphic to the .logo Format

1. Launch the **Logo Converter** software by double-clicking its icon. The **Logo Converter** window displays.

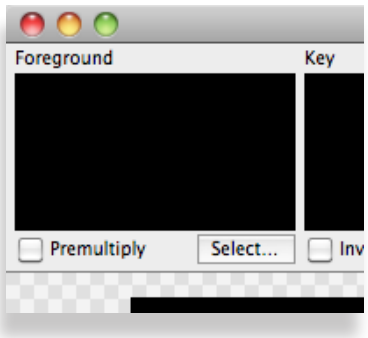


The Logo Converter Window

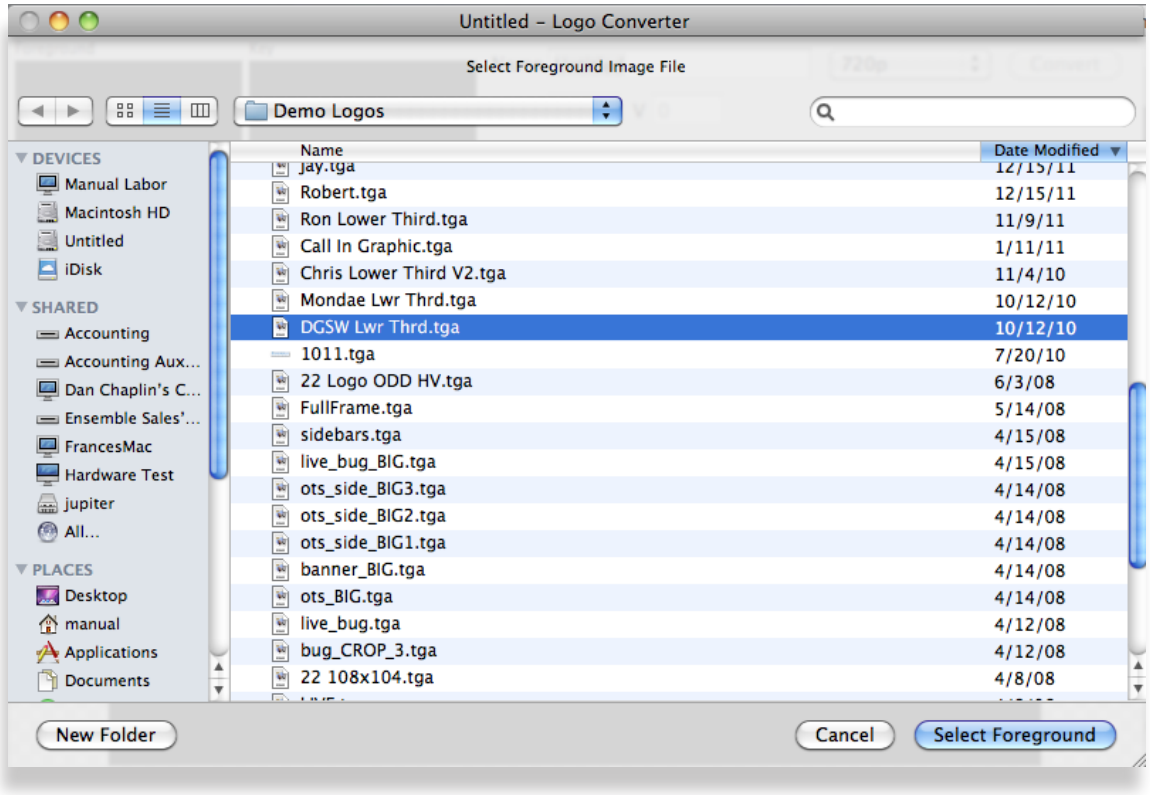
2. From the Logo Converter **File** menu, select **Choose Foreground Image**, or click the **Select** button under the Foreground box in the upper left area. A file navigation window opens.



The File > Choose Foreground Image menu

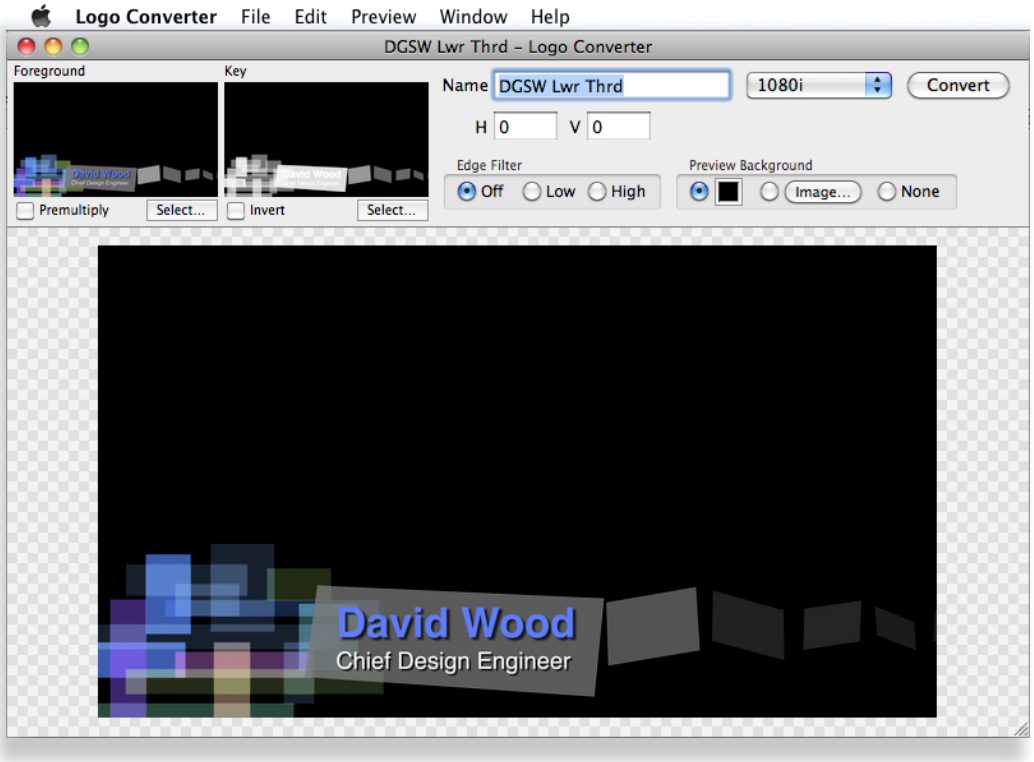


The Foreground Select button

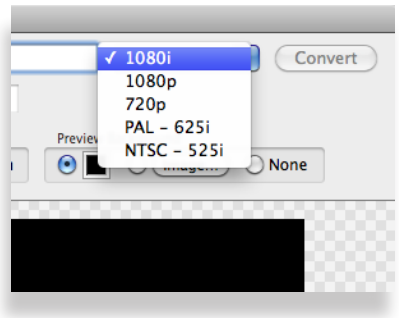


File navigation window

3. From the file navigation window, navigate to the graphic you want to convert, then click **Select Foreground**. The image loads into the Logo Converter window.

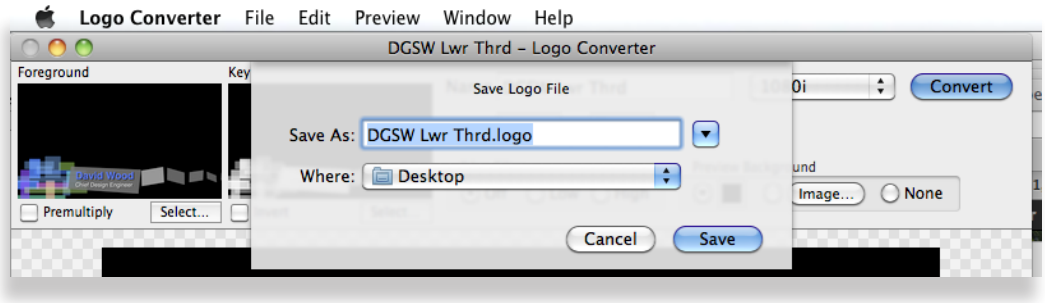


4. Select the raster format you want to use from the pull-down menu. Choices are: 1080i, 1080p, 720p, PAL 625i, and NTSC 525i. The **Logo Converter** will automatically tag the converted .logo file with the raster format you select here.



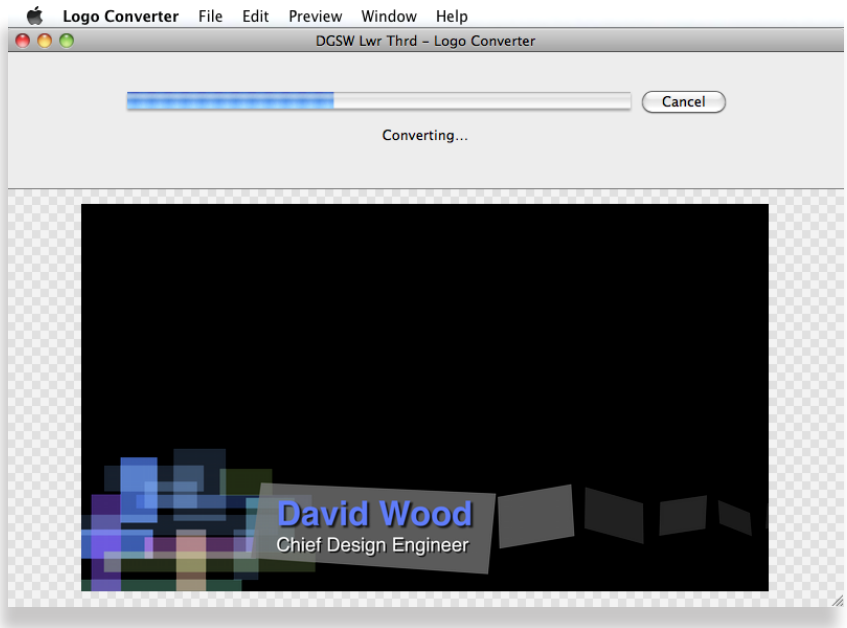
The raster format pull-down menu

5. After making any additional adjustments you may want, click **Convert**. The **Save Logo File** dialog window displays.



The Save Logo File dialog window

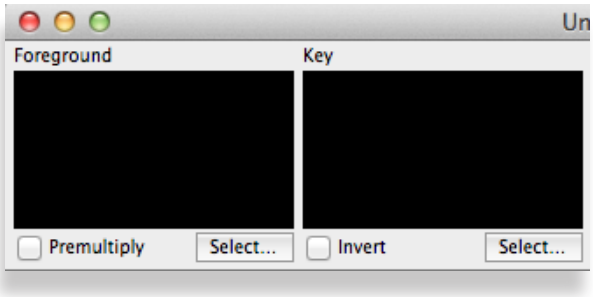
6. Determine your file name and file location, then click **Save**. The **Converting** progress bar displays.



The Logo Converter window showing the progress bar

7. After a few moments, the conversion will be complete. The converted .logo file will be in the location you selected, and it is ready to be uploaded to the Layering Engine Logo Store.

Logo Converter Settings



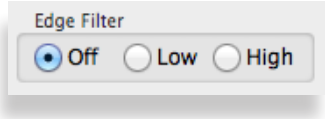
Premultiply Foreground

Check this box if you want to premultiply the foreground.

Invert Key

Check this box if you want to invert the Key.

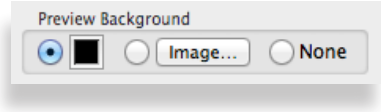
Edge Filter



The **Edge Filter** control gives you three choices for how you want **Logo Converter** to treat the bandwidth limiting filtering. If your incoming logo has already been filtered (for example, anti-aliased in Photoshop), then it would be best to select "Off." If your logo has fast transitions that may cause out of bandwidth artifacts, you may want to select "Low" or "High."

- **Off** – no bandwidth limiting filtering is applied.
- **Low** – applies partial bandwidth limiting filtering.
- **High** – applies full bandwidth limiting filtering.

Preview Background



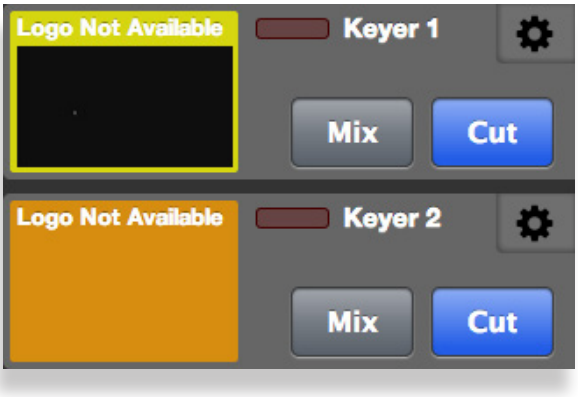
There are three options for preview Background.

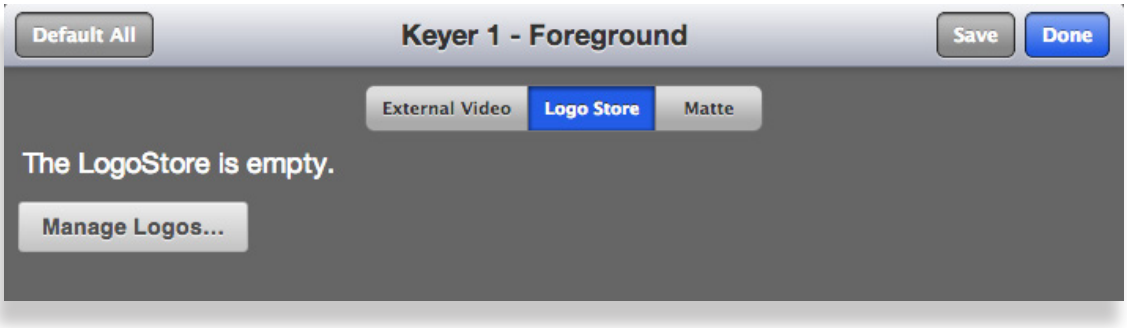
1. Select the checkbox next to the black square for a black Background.
2. Select the checkbox next to the "Image" button if you want to upload your own image to use as a Background.
3. Select the None checkbox if you do not want to use a Background.

Uploading Graphics to the Logo Store

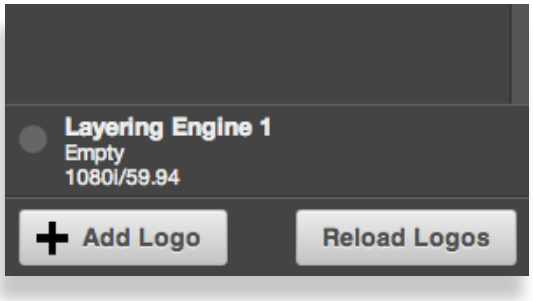
Use the following process to upload one or more .logo files to the Layering Engine Logo Store:

1. From the Layering Engine browser interface, click the gear button for Keyer 1 or Keyer 2. In this example, we're using Keyer 1. The **Keyer 1 - Foreground** window displays.

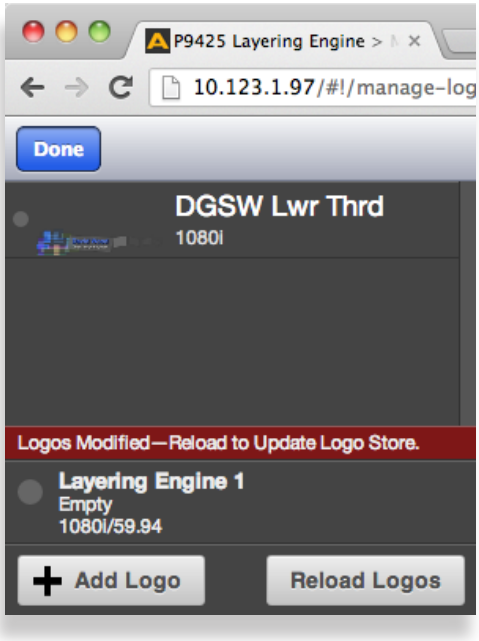




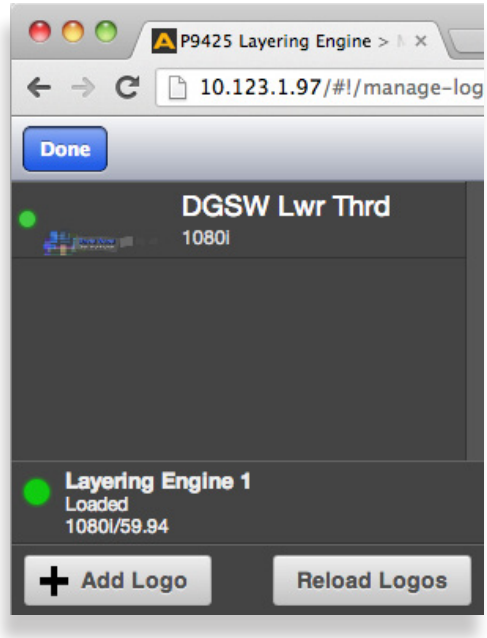
2. From the **Keyer 1 - Foreground** window, select **Logo Store**, then click **Manage Logos**. The browser interface displays a panel along the left side.



3. In the lower part of this panel, click **Add Logo**. A file directory navigation window opens. Navigate to the .logo file you want to upload. Select the .logo file, then click **Open**. The panel updates to display a message: "Logos Modified–Reload to Update Logo Store."



4. Click **Reload Logos**. Two green indicator circles illuminate to indicate that the .logo file has been uploaded successfully.



5. In the upper left corner, click **Done**. The **Keyer 1 - Foreground** window displays. In the upper right corner, click **Done**. The Layering Engine browser interface displays.

Working with Foregrounds

About Foregrounds

Two Key Layers and a Background Source can be simultaneously combined to produce the Program Output. The foreground is created by using the Layering Engine's two independent linear Keyers. Keyer Presets recall the entire configuration of a Layer, including whether it is set to go live immediately upon being assigned to a Keyer.

The foreground visual interface displays thumbnail views of connected SDI sources. These thumbnails are regularly being updated to reflect their video content. The foreground interface also shows the content stored in the LogoStore as well as the Matte controls. You can adjust input signals and control parameters.

Types of Foreground Inputs

Foreground inputs can be driven by SDI signals from cameras, remote feeds, character generators, graphic and stillstore systems, and video servers. Foreground inputs also include the built-in LogoStore to recall both still and animated graphics, as well as an internal matte generator.

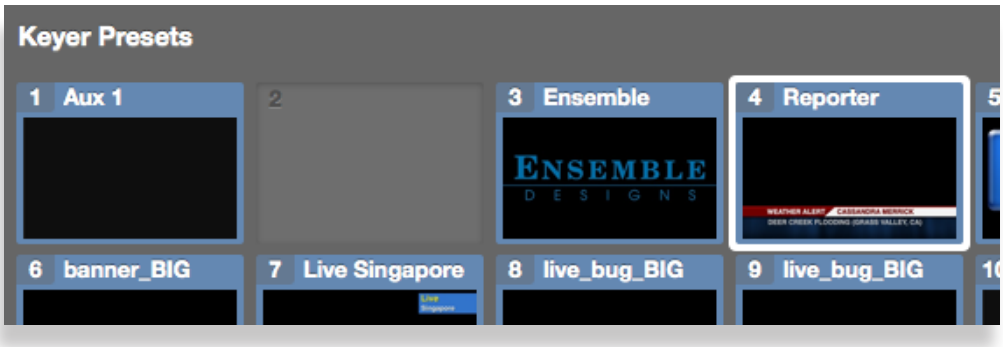
The Keyers support linear, luminance and additive Keying from a variety of video sources. In linear and additive modes, external Key signals are passed to the overlay combiners with the option of fine-tuning the effect with hi/lo clip or clip and gain adjustments.

Assigning Key Presets to Keyers

Once you have selected the Background video, you can overlay one or two Key Layers on top of it. This process involves selecting a foreground, assigning it to a Keyer, then using that Keyer's transition panel or the multiple Layer transition control panel to take it to air.

To Assign a Key Preset to Keyer 1

1. From the Key Presets panel in the upper left area of the web browser interface, select the thumbnail for the Key Preset that you want to assign to Keyer 1. The thumbnail you selected displays with a white outline.



Example of a selected Key Preset. The white border indicates that it is selected, but not yet assigned to a Keyer.

2. With the Key Preset still selected, select the Keyer 1 thumbnail within the Keyer 1 Transition Panel. The thumbnail for Keyer 1 updates to show the same content as the selected Key Preset. Once these thumbnail images match, you have successfully assigned the Key Preset to Keyer 1.

This example illustrates what it looks like after a Key Preset has been assigned to Keyer 1. Note that the content of Keyer 1 now matches the content of Keyer Preset 4.

To Bring In a Third Layer

Once you have a Background in place and have added a Layer through one of the Keyers, you can bring in a third Layer through the other Keyer. Let's assume you have already brought in a Key Preset through Keyer 1, as just described, and you want to bring in a third Layer through Keyer 2.

1. For the third Layer, select a Key Preset to use from the Key Presets Panel. The Key Preset thumbnail displays with a white outline to indicate that it is selected.
2. Assign your selected Key Preset to Keyer 2 by selecting the Keyer 2 thumbnail. The thumbnail for Keyer 2 updates to show the same video thumbnail as your Key Preset choice.
3. From the Keyer 2 Transition Panel, select Mix or Cut. The high tally for Keyer 2 illuminates bright red to indicate that it is being sent to air through the Program Out feed.
4. Alternatively, you can use the Transition Control Panel to mix or cut Keyer 2 to air. The K2 button must be selected before mixing or cutting in order for the Transition Control Panel to engage Keyer 2.

To Transition Keyer 1 or Keyer 2 On and Off

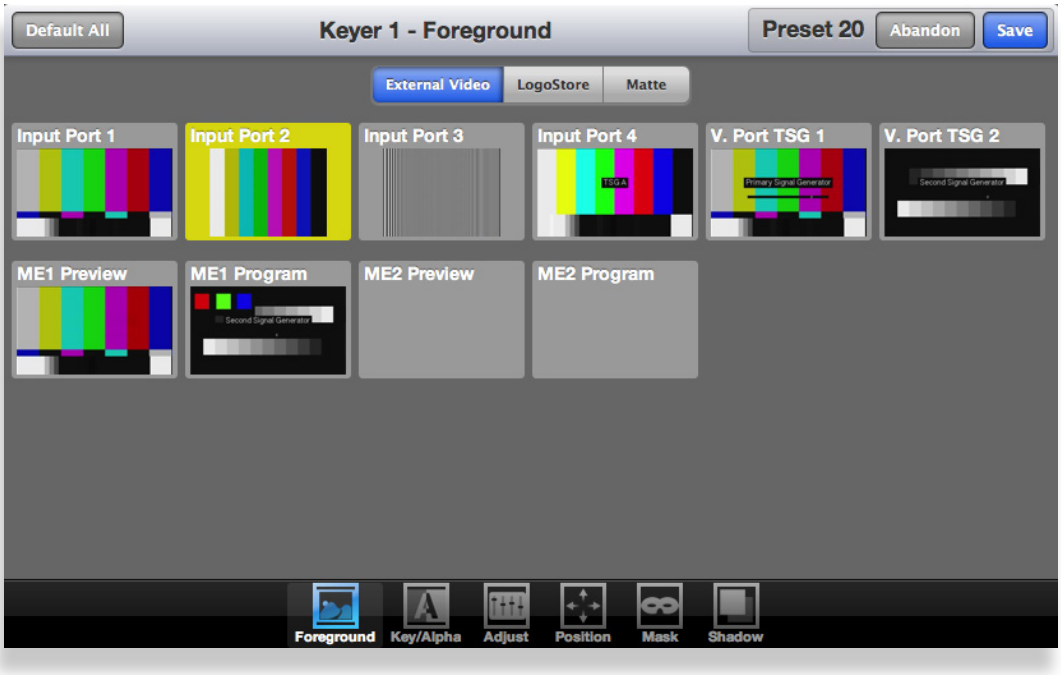
1. From the Keyer 1 or Keyer 2 Transition Panel, select Mix or Cut. The high tally for the selected Keyer illuminates bright red, indicating that it is being sent to air through the Program Out feed.
2. Alternatively, you can use the Transition Control Panel to mix or cut Keyer 1 or Keyer 2 to air. The K1 or K2 button must be selected before mixing or cutting in order for the Transition Control Panel to engage the corresponding Keyer.
3. Select Mix or Cut again. The Keyer red tally goes out, indicating that the Key has transitioned off.

Placing an External Video Layer Using Keyer 1

You can use one of the Keyers to place an external video signal as a Layer over the Background. Using the Keyer adjustment tools, you can place a mask over part of the video signal and use the Position tool to place the masked video signal in a precise location over the Background.

To Place an External Video Layer Using Keyer 1

1. Select the Mix or Cut button if necessary so that Keyer 1 is going to the Preview Output. This gives you the opportunity to set the parameters how you want them before taking it to the Program Output.
2. From the Keyer 1 control panel, click the gear icon. The Keyer 1 adjustment tools window displays.
3. Along the top of the window, select External Video. The currently connected video signals that are part of the assigned Layering Engines Profile display. These are the same video signals that are available from the Background Source Selection Panel.



The Keyer 1 adjustment tools window showing the External Video options

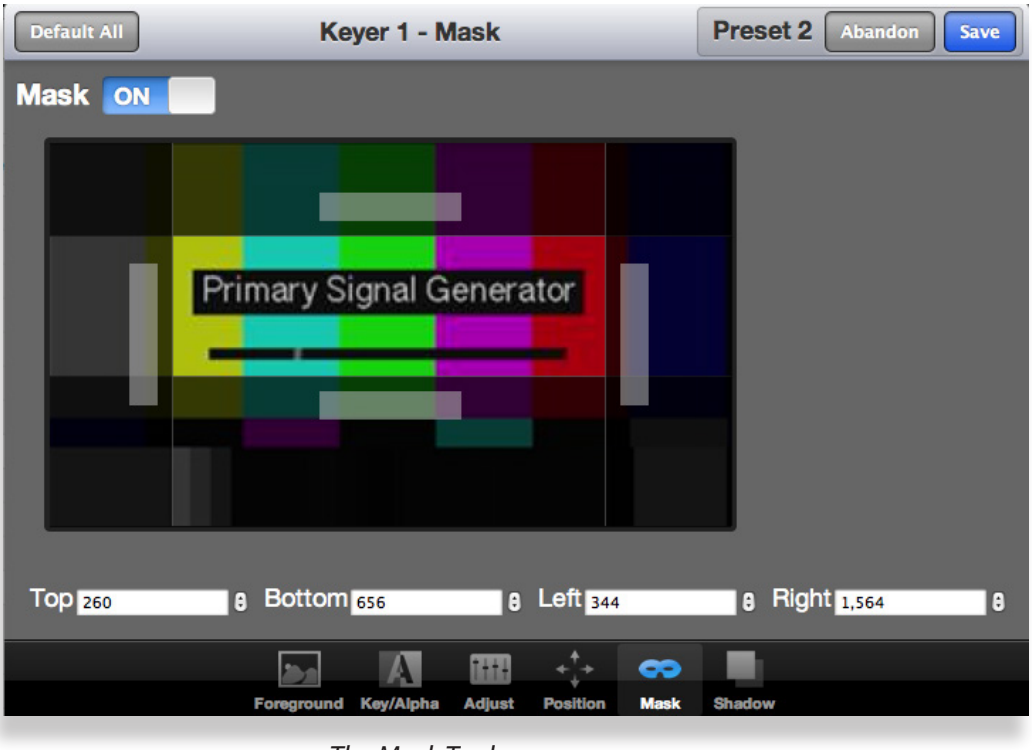
4. Along the bottom of the Keyer 1 adjustment tools window, select Key/Alpha. The Keyer 1 Key/Alpha window displays.
5. Along the top row of buttons, select Full. This sends the full signal to the foreground. In the Preview Monitor, it may appear to have replaced the Background, but it is layered on top of the Background.

Applying a Mask to an External Video Layer

The masking function provides a method of covering up portions of the Key signal so that only the part of the Key that you want to show will display on top of the Background. The masking tool has sliding panels that you can drag from the top, bottom, left and right.

To Mask Portions of the External Video Layer

1. Continuing on from the previous steps, from the Keyer 1 - Key/Alpha window, select Mask from the bottom row of buttons. The Mask control displays.
2. From the upper left corner, turn the Mask function On by clicking the Mask On/Off control.
3. Click and drag the masking panels from the top, bottom, left and right as desired. The portion of the video signal that is not covered up will be sent out through Keyer 1.



The Mask Tool

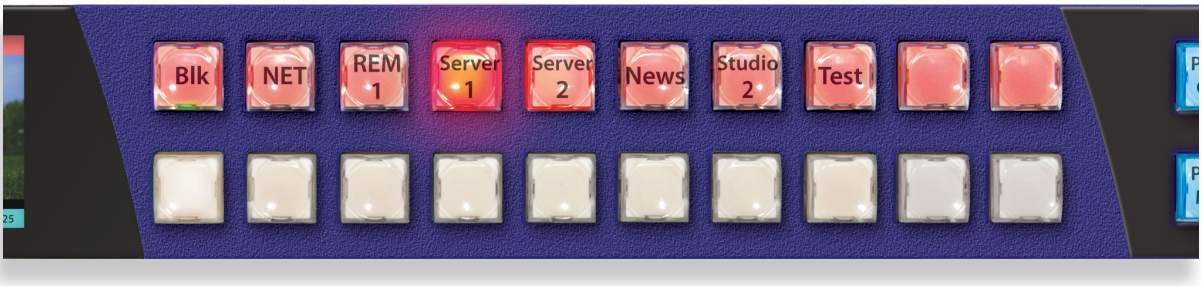
Layering Engine Operations with the 5825 Control Panel

Orientation of Front Panel

The Layering Engine Control Panel has an LCD Display on the left that shows the signal currently going out through the Program Output. The two small round buttons to the left of the LCD Display are used for accessing network configuration controls and ancillary data.

The two rows of buttons immediately to the right of the LCD Display are used for Background Sources and illuminate red. Background Source buttons that are not assigned in the profile are not illuminated.

Once networked to the Layering Engine module, the Control Panel uses the same profile that is assigned to the Layering Engine.



To the right of the two rows of Background Source buttons are the following Action buttons:

- PGM Cut
- K1 Cut
- K2 Cut
- FTB (fade to black)
- PGM Mix
- K1 Mix
- K2 Mix
- Key Sel
- Set Rate

Cutting and Mixing Backgrounds with the Control Panel

Cutting and mixing Backgrounds involves selecting a Background source button, then using either the Program Cut (**PGM Cut**) button or Program Mix (**PGM Mix**) button to execute the transition.

All the Background buttons that are slightly illuminated red represent Background sources. The button that is illuminated more brightly represents the Background source that is currently going to the Program Output.

Selecting Presets

You can browse among the available Backgrounds to find the signal you want to use for your next Preset by pressing the Background buttons one at a time. Observe which signal each button is associated with on the LCD Display. You can quickly scan through all available Background sources using this method, and after you have found the one you want to use, press **PGM Cut** or **PGM Mix** to make the transition.

Once you have established your Preset, it remains in place until you select a different one.

To Select a Preset

Press a Background button. The button flashes for approximately 25 seconds and displays its Background source in the LCD Display. While the button is flashing, it is Preset. If you press **PGM Cut** or **PGM Mix** while it is flashing, a transition will occur. If you do not make a transition while the Background button is flashing, the Preset that was already in place will remain in place.

Background and Preset Toggle

Cutting or mixing a Background behaves in a toggling manner. When **PGM Cut** or **PGM Mix** is pressed, the Preset Background goes to the Program Output, and what had been the Program Output is now Preset. These two Backgrounds will toggle back and forth for every transition until you select a new Preset.

To Cut or Mix a Background

1. Press **PGM Cut** to cut the Background, or **PGM Mix** to mix the Background. The Background that was Preset is now going out through the Program Output. Its button illuminates bright red and a thumbnail of its video signal displays in the LCD Display. The Background that had been going to the Program Output is now Preset.

   When mixing, the Mix Rate (see "Setting the Mix Rate" on page 77) determines the duration of time over which the mix occurs. While the mix is occuring, both the Preset and current Background buttons are brightly illuminated. As soon as the mix has completed, only the newly active Background button remains brightly illuminated.

2. Pressing **PGM Cut** or **PGM Mix** a second time causes the Preset and the active Background to switch places.

Assigning Key Presets

Once you have selected the Background video, you can overlay one or two Key Layers. This process involves selecting a foreground, assigning it to a Keyer, then using that Keyer's action button (**K1 Cut**, **K1 Mix**, **K2 Cut**, **K2 Mix**) to take it to air.

Note: Please keep in mind that any key preset that is assigned a different logo when that key is already on air will go to air immediately.

To Assign a Key Preset to Keyer 1

1. Press and hold the **Key Sel** action button. It flashes green. Keep pressing and holding **Key Sel** until you have finished all the steps for this procedure.
2. While pressing and holding **Key Sel**, press **K1 Cut**. The **K1 Cut** button illuminates bright green. The two rows of buttons immediately to the right of the LCD Display now represent all available Key Layers and illuminate red. Key Layer buttons that are not assigned in the profile are not illuminated. The Key Layer currently assigned to Keyer 1 (current Key Preset) illuminates bright red.

   Note: If the control panel does not show any Key Layers at this step, check to make sure that the keyer has already been set up through the web interface. Otherwise, the control panel will not be able to access them.
3. Select the Key Layer button that represents the image you want to assign to Keyer 1. The LCD Display shows its thumbnail image and the selected Key Layer button illuminates bright red.
4. Release the **Key Sel** button. The **Key Sel** button illuminates pale blue. The 5825 Control Panel immediately reverts to standard display mode, displaying the Background currently going to the Program Output in the LCD Display.

To Assign a Key Preset to Keyer 2

1. Press and hold the **Key Sel** action button. It flashes green. Keep pressing and holding **Key Sel** until you have finished all the steps for this procedure.
2. While pressing and holding **Key Sel**, press **K2 Cut**. The **K2 Cut** button illuminates bright green. The two rows of buttons immediately to the right of the LCD Display now represent all available Key Layers and illuminate red. Key Layer buttons that are not assigned in the profile are not illuminated. The Key Layer currently assigned to Keyer 2 (current Key Preset) illuminates bright red.
3. Select the Key Layer button that represents the image you want to assign to Keyer 2. The LCD Display shows its thumbnail image and the selected Key Layer button illuminates bright red.
4. Release the **Key Sel** button. The **Key Sel** button illuminates pale blue. The 5825 Control Panel immediately reverts to standard display mode, displaying the Background currently going to the Program Output in the LCD Display.

Cutting and Mixing Key Layers

Cutting and Mixing Key Layers involves using the **K1 Cut**, **K1 Mix**, **K2 Cut**, **K2 Mix** action buttons on the Layering Engine Control Panel. When a Key Layer is live, its button illuminates bright green. When a Key Layer is not live, its button illuminates more dimly. The **K1 Mix** and **K2 Mix** buttons illuminate during mix transitions.

To Cut a Key Layer

1. If performing a cut, press **K1 Cut** for Key Layer 1, or **K2 Cut** for Key Layer 2. The button illuminates bright green, indicating that the Key Layer is going to the Program Output. Both Key Layers can be live at the same time.
2. Pressing **K1 Cut** or **K2 Cut** a second time turns off the Key Layer. The button illuminates more dimly, indicating that the Key Layer is not going to the Program Output.

To Mix a Key Layer

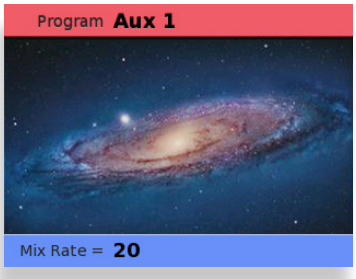
1. If performing a mix, press **K1 Mix** for Key Layer 1, or **K2 Mix** for Key Layer 2. The Mix Rate determines the duration of time over which the mix occurs. While the mix is occuring, both the Mix and Cut buttons are brightly illuminated. As soon as the mix has completed, only the Cut button remains brightly illuminated, indicating that the Key Layer is going to the Program Output.
2. Press **K1 Mix** or **K2 Mix** a second time. The Mix Rate determines the duration of time over which the mix occurs. While the mix is occuring, both the Mix and Cut buttons are brightly illuminated. As soon as the mix has completed, both the Cut button and Mix button dim, indicating that the Key Layer is no longer going to the Program Output.

Cutting and Mixing Multiple Layers at Once

You can simultaneously change one, two or three layers using any combination of cutting and mixing for Background, Keyer 1 and Keyer 2. Press **PGM Cut** or **PGM Mix**, **K1 Cut** or **K1 Mix**, and/or **K2 Cut** or **K2 Mix** to cut or mix the Background along with one or both Key Layers at the same time.

Setting the Mix Rate

1. Press and hold **Set Rate**. The LCD Display shows the message "Type in Mix Rate" along with a number representing the current mix rate. All the buttons on the action panel illuminate blue.
2. While still pressing and holding **Set Rate**, enter a new number between 1 and 999. The top row of buttons on the action panel correspond to numbers 1 through 5, and the bottom row of buttons correspond to numbers 6 through 0. These numbers are shown on the panel label above each button.
3. Release the **Set Rate** button. The Control Panel returns to its default display mode. The new mix rate is shown in the footer of the LCD Display source image.



Fading to Black

Fading to black causes the Program Output to transition to a solid black signal. This is particularly useful when ending a broadcast.

To Fade to Black

Press **FTB**. The **FTB** button illuminates bright blue.
The LCD Display shows the message "Fade to Black on."
The Program Output transitions to a solid black signal. The Mix Rate determines the duration of time over which the fade to black mix occurs.

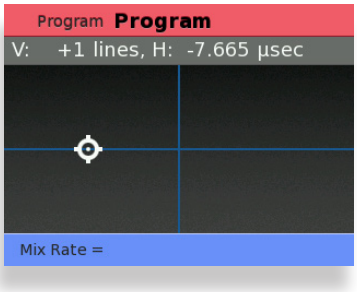
Press **FTB** a second time to turn Fade to Black off.

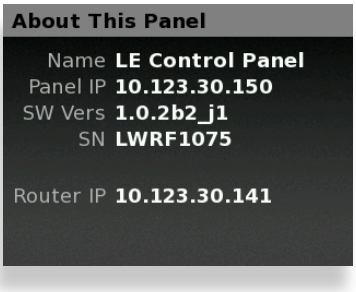
Accessing Ancillary Data with the Control Panel

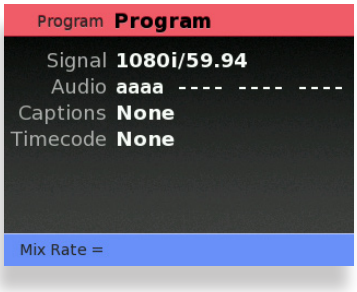
For each video source, the Layering Engine detects and measures key parameters such as synchronicity, timing, line and frame rate, embedded audio presence/absence, closed caption information, and timecode data.

To Access Ancillary Data

For the Source currently showing in the LCD Display, use the two small buttons located to the left of the LCD Display to navigate among the screens that show ancillary data. There are three ancillary data screens. Use either button to step through these screens:







Chapter 4: Configuration Options

In this Chapter

This chapter addresses the following topics:

Layering Engine Expansion Options

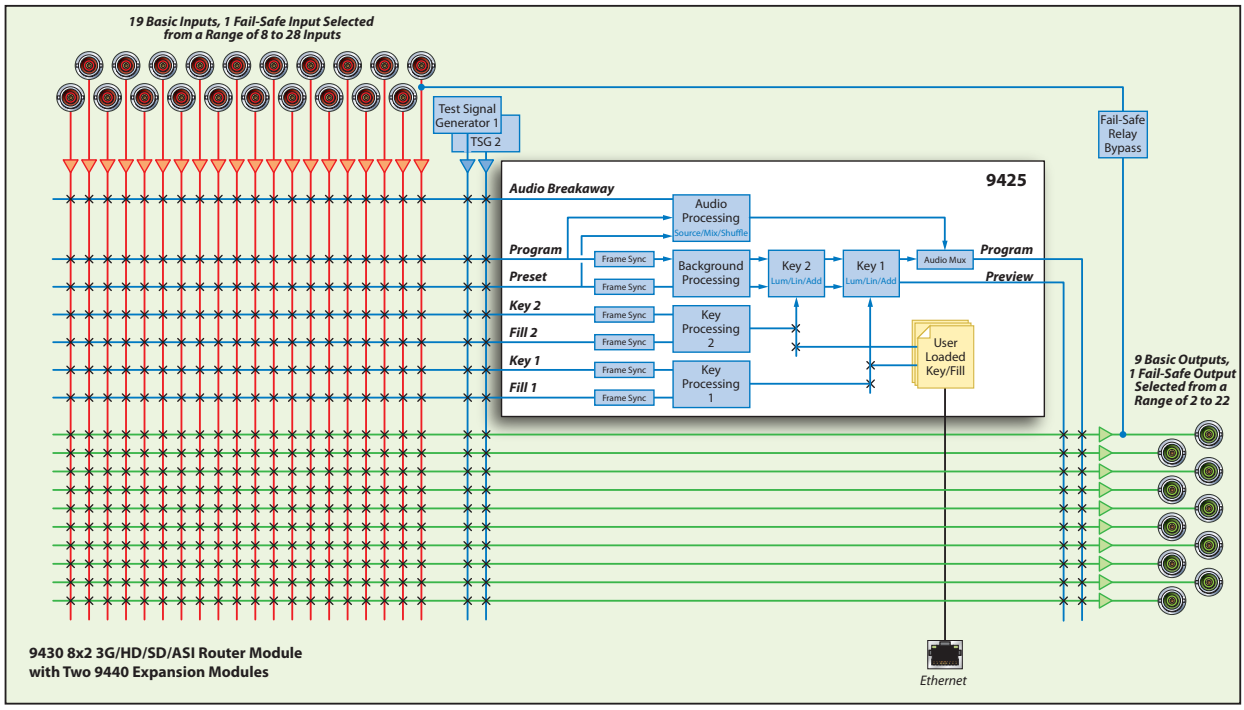
You can expand the P9425 Layering Engine by attaching one or two 9440 I/O Expansion Modules, one per side, creating a 20-port or 30-port system. The configuration example shown below uses 3 module slots in the 3RU Avenue frame. This flexible architecture puts video effects, audio mixing and routing functionality into a single package.

Alternate configurations are available for every application, from remote trucks to news bureaus to presentation. Connect a source with a single cable and it is simultaneously available for both routing and mix effects.

30-Port System Using Two 9440 Expansion Modules

With an expanded 30-port system, the Layering Engine can leverage 20 additional ports that are configurable as inputs or outputs.

Those ports that are configured as inputs can be used for additional Background video, Key fill or source, or audio breakaway and voice over. The Layering Engine Program and Preview signals can be routed to any of the ports that are configured as outputs.



Example of a 30-port system that is configured with 20 inputs and 10 outputs. Program, preview and all sources are routable. This system uses 3 module slots in an Avenue frame.

Seating the Board Set Firmly in the Frame

Install the board set in the frame, taking care to insure that the modules are fully seated into the frame backplane connector. This requires more force than with a single module.

Avenue 3RU Frame Partition Divider Consideration

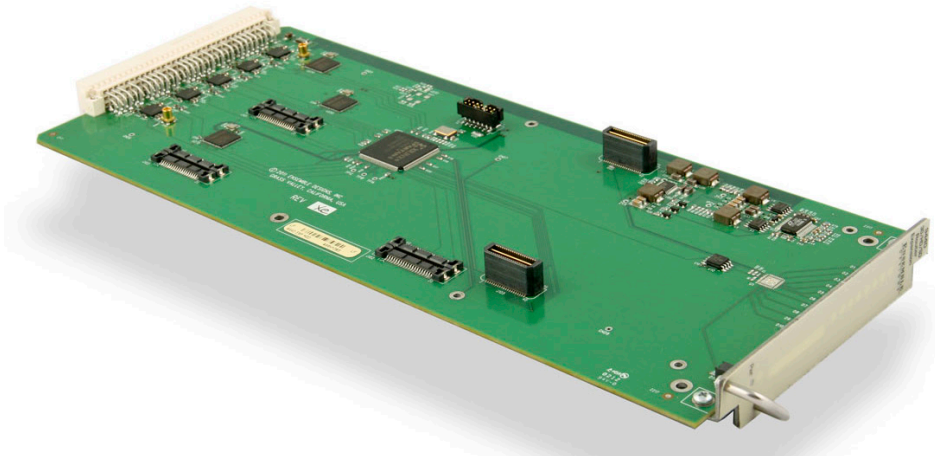
Because a multi-board assembly cannot span the divider in the Avenue 3RU Frame between slots 4 and 5, the three modules making up a 30 Port Layering Engine **cannot** be installed in either of these two ranges:

- Slots 3, 4, 5
- Slots 4, 5, 6

It is strongly recommended to take this into account during frame and slot planning. Otherwise, you may have to make a last-minute change to an otherwise carefully planned installation design. Despite this restriction, it is still possible to install as many as three 30 Port Layering Engines in a single 3RU frame.

Assembling the 9440 Expansion Option

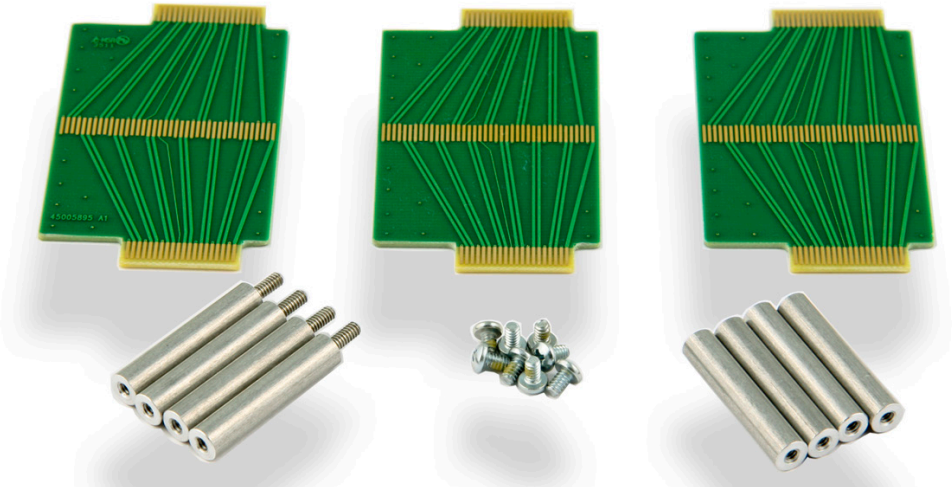
The 9440 I/O Expansion Modules are mechanically attached to the 9430 board with screws and stand-offs. The signal electrical connection is made by three high-speed routing backplanes with precision transmission lines designed to support signals up to 3 Gb/s.



A 9440 I/O Expansion Module

Two Types of Routing Backplane Kits

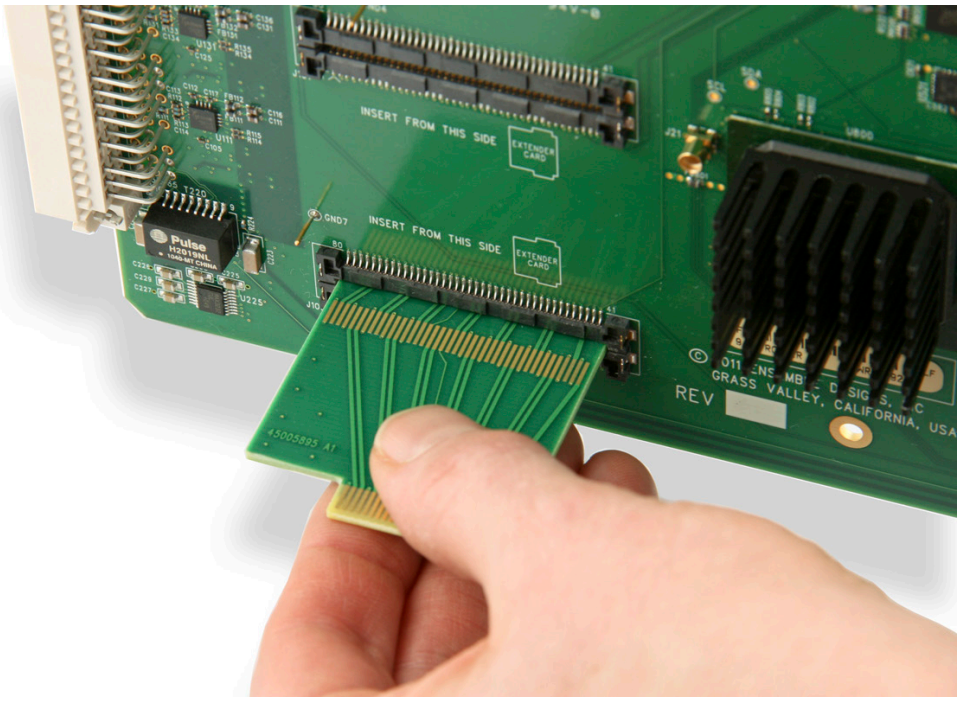
There are two types of routing backplanes, one for 20-port systems (using one 9440 I/O Expansion Module), and one for 30-port systems (using two 9440 I/O Expansion Modules). Pictured below is the attachment kit for a 30-port Layering Engine.



An attachment kit for a 30 Port Layering Engine

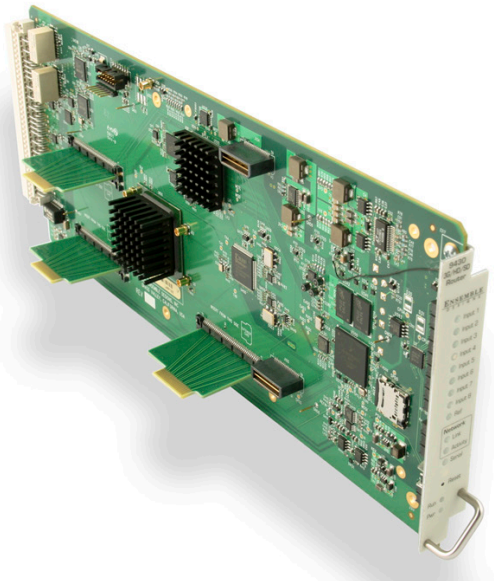
Sliding Routing Backplanes through Slots in the 9430

The routing backplanes slide through slots in the 9430 module, picking up electrical connections on each side from these slot connectors.



From the top side of the 9430, gently insert the routing backplanes through the slot connectors.

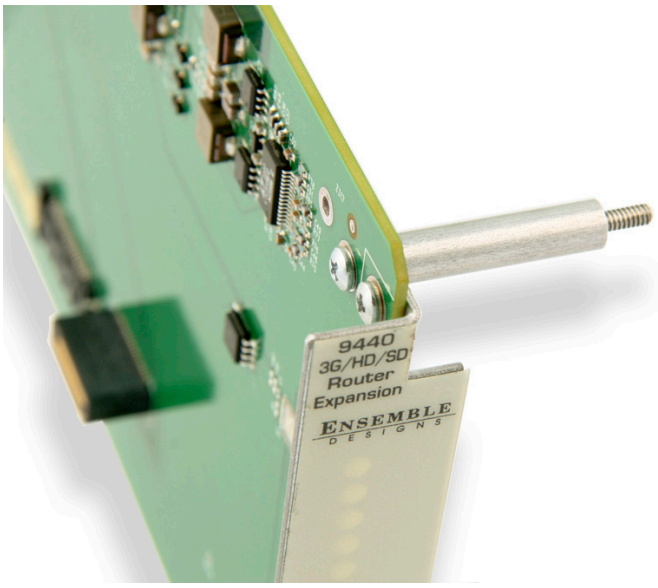
The slot connectors on the 9440s are set back farther from the module edge connector than on the 9430. Therefore, the routing backplanes must be oriented with the small ends offset away from the edge connector. Beyond that, the backplanes do not have polarity.



The 9430 ready to accept a 9440 I/O Expansion Module.

Installing Stand-Offs on the 9440

Install the four stand-offs on each 9440 using one screw per stand-off, as shown below.

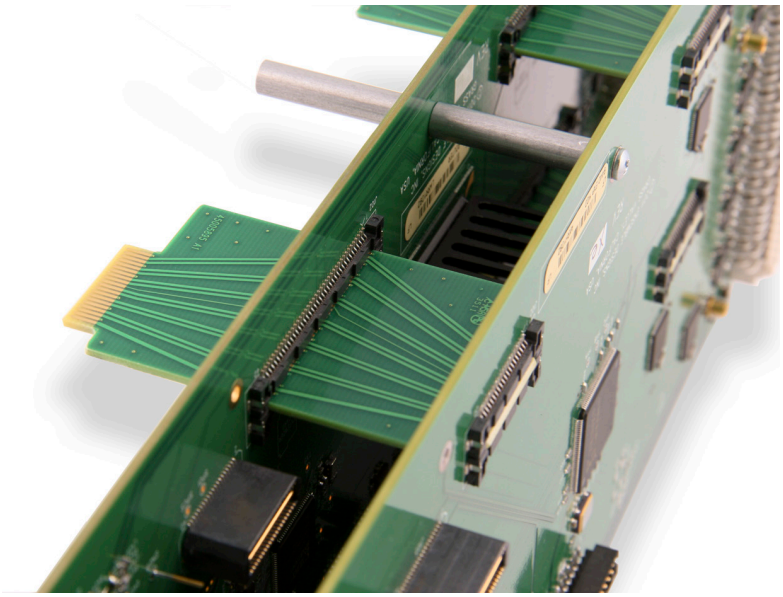


Stand-offs on the 9440 Expansion Module

Aligning the 9440 with Routing Backplanes

Align the 9440 with the routing backplanes. Gently guide the backplanes into the smaller slot connectors on the 9440. The narrow end of the backplane will be flush with the connector on the 9440.

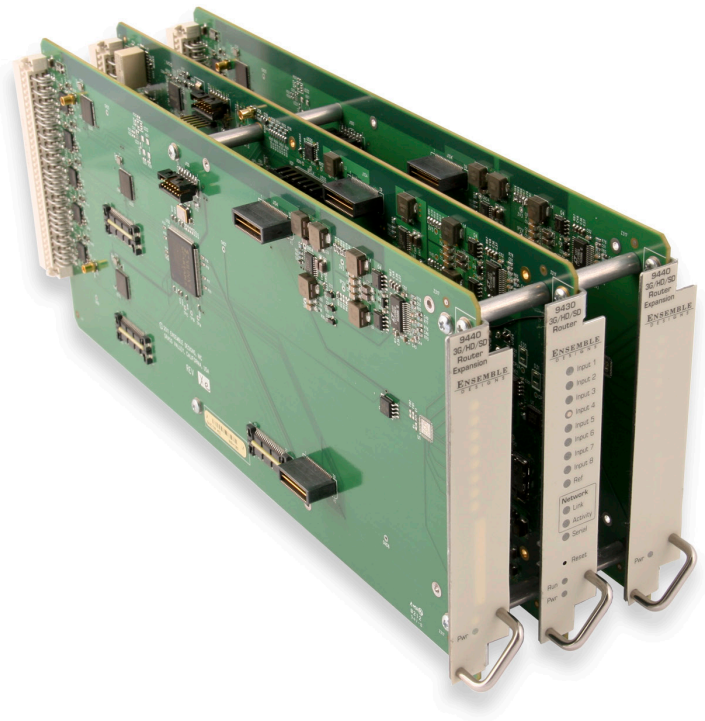
Complete the mechanical attachment with screws in the stand-offs.



A completed stand-off with screw in place and backplanes connected to 9430 and 9440

Example of Completed Assembly

The example shown below consists of one 9430 and two 9440s, with backplanes and stand-offs in place, providing 30 ports. This assembly is ready to install in an Avenue 3RU Frame.



An Assembled 30 Port Layering Engine ready to install in an Avenue 3RU Frame

For Customers Not Using Avenue Touch Screen or Avenue PC

Temporarily Changing IP Address on Controlling Computer

When you initially power up the 9430 as received from the factory, it will take the self-assigned static IP address of 192.168.1.100.

In order to connect initially with the Layering Engine to assign it an IP address that suits your own network, you must first temporarily change the controlling computer's IP address so that it is in the same range as the 9430's default IP address.

For example, you could use the following settings temporarily on the controlling computer:

- IP address: 192.168.1.10
- Subnet mask: 255.255.255.0.

Consideration

Depending on how your computer network is configured, it may be simpler to use a computer, such as a laptop, that is outside of the network solely for the purpose of assigning the Layering Engine its new IP address. This may be simpler than temporarily changing the IP address of the controlling computer that is within your network.

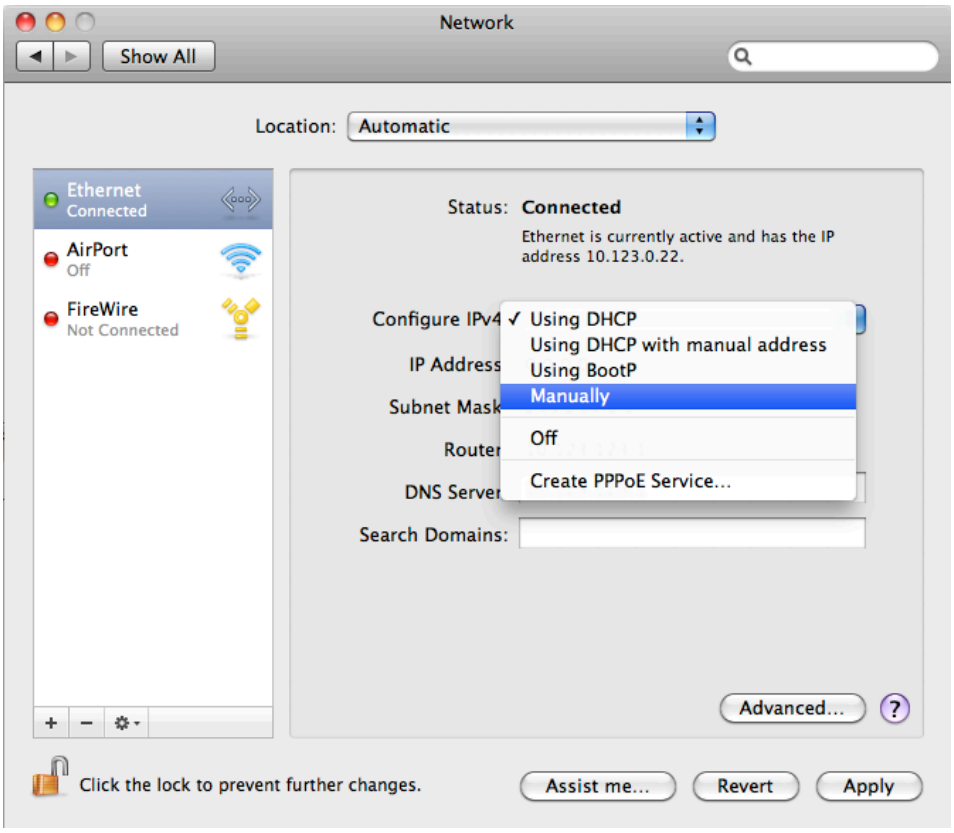
Instructions for Temporarily Changing the IP Address for Mac and Windows XP

For the Mac

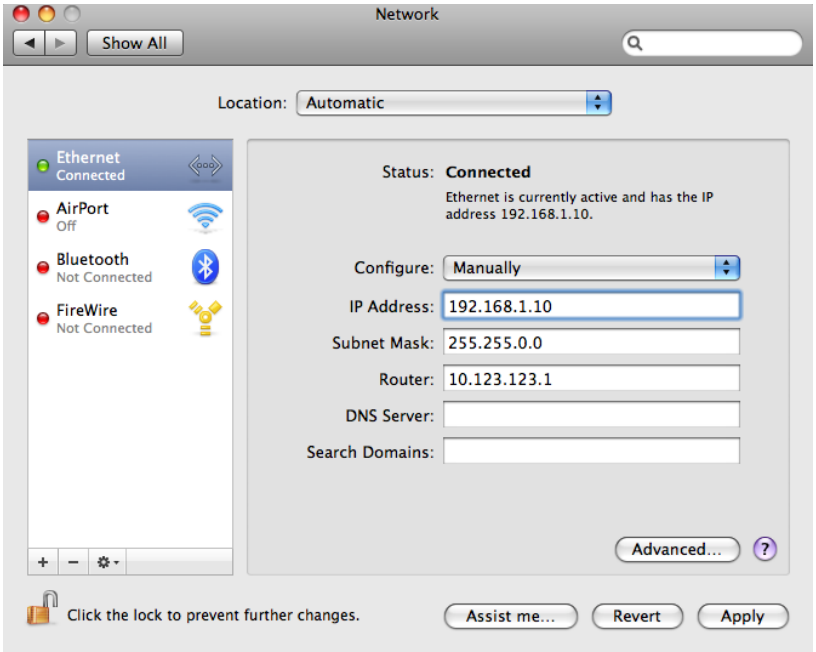
1. From the dock, click the System Preferences icon.
   The System Preferences window displays.

2. Click the Network icon.
   The Network window displays.

3. From the Configure drop-down control, select Manually.



4. Enter the IP address and subnet mask settings as applicable, then click Apply.

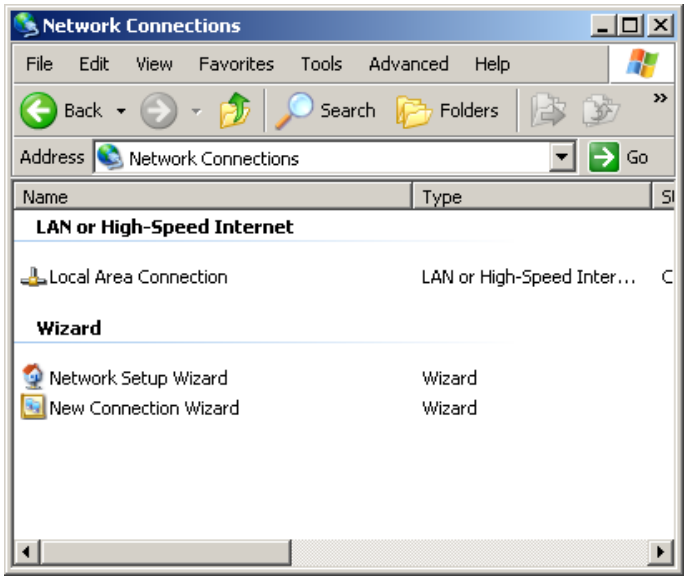


Example of network configuration settings for temporarily changing the IP address of a Mac to make the initial connection to the 9430

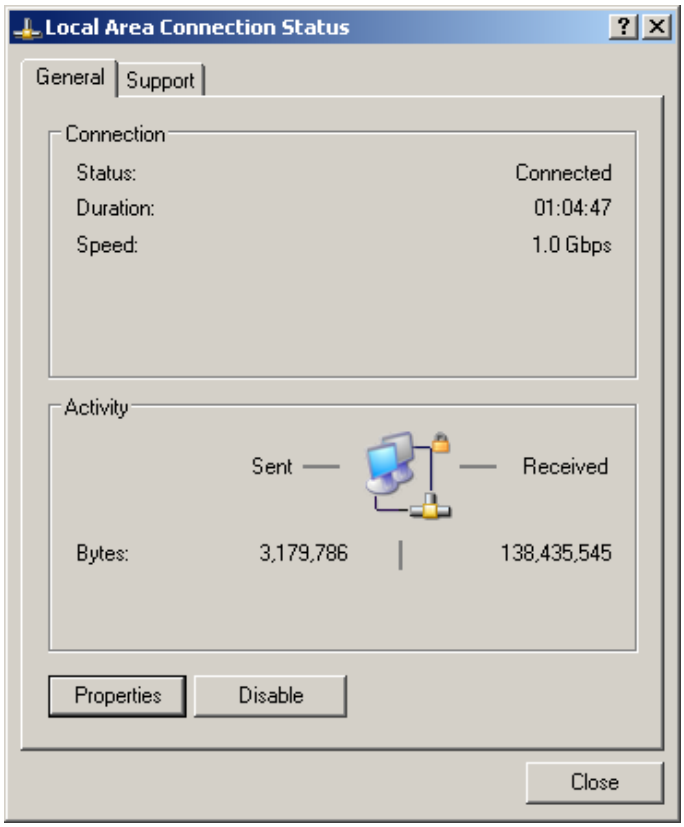
For Windows XP

1. Select Start > Control Panel. The Control Panel displays.

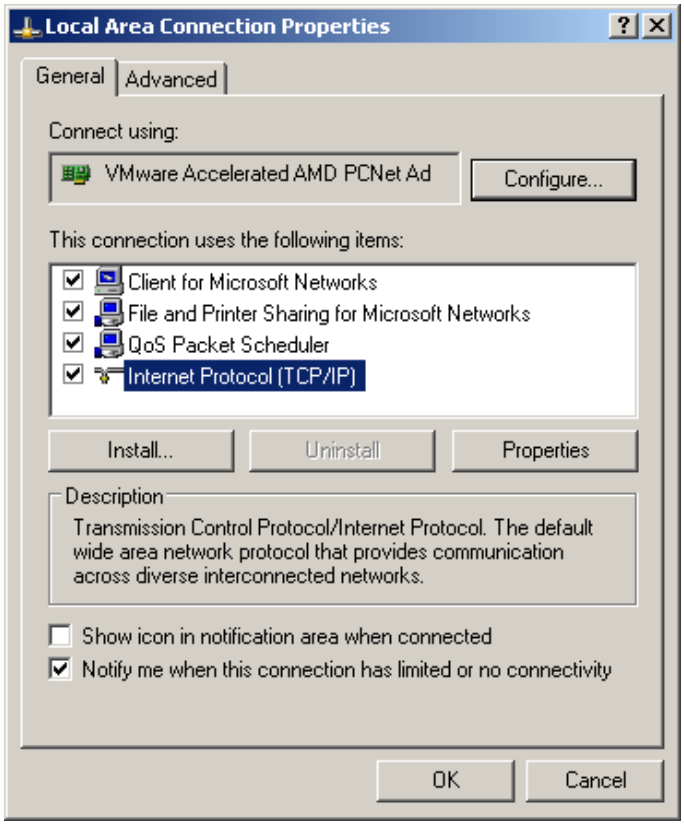
2. Double-click the Network Connections icon. The Network Connections window displays.



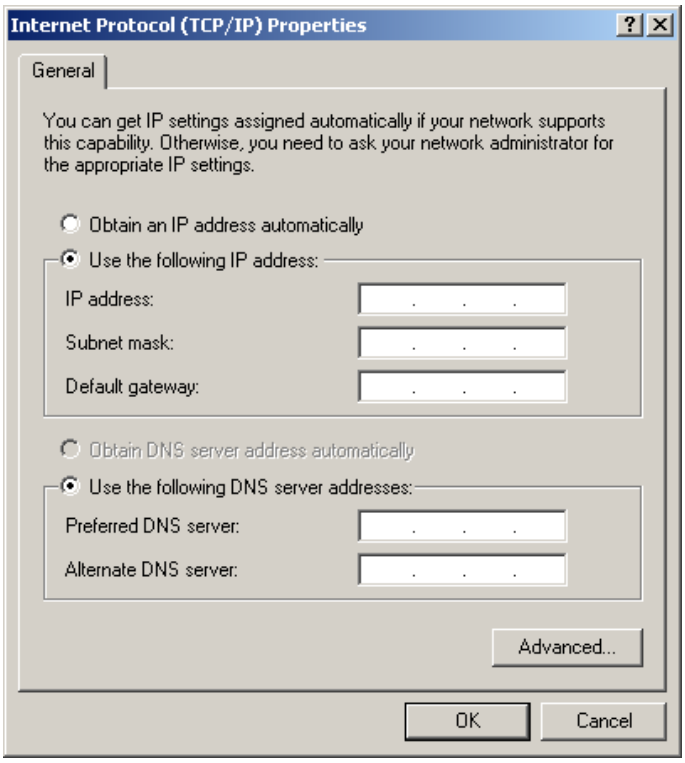
3. Double-click the Local Area Connection icon. The Local Area Connection Status window displays.



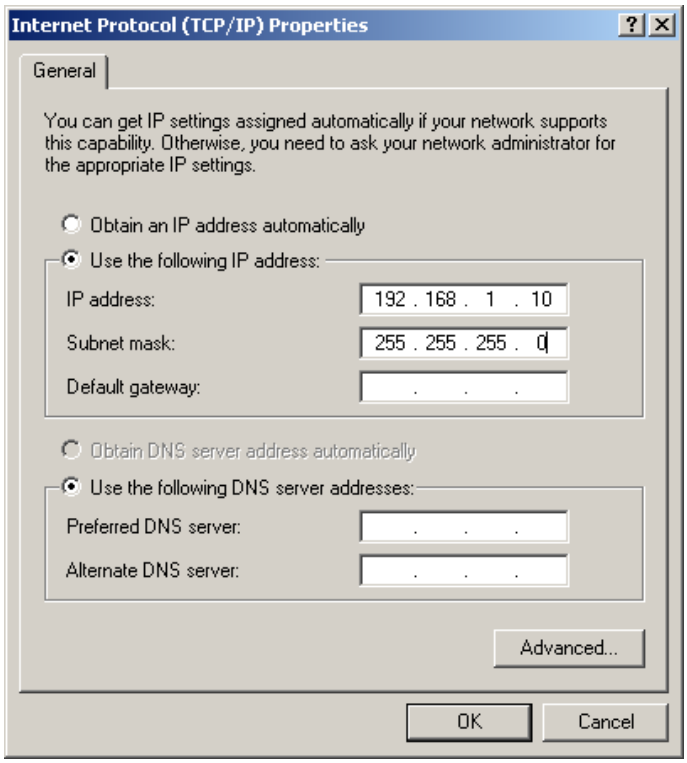
4. Click the Properties button. The Local Area Connection Properties window displays.



5. Select Internet Protocol (TCP/IP), then click the Properties button. The Internet Protocol (TCP/IP) Properties window displays.
6. Select the radio button for "Use the following IP address."

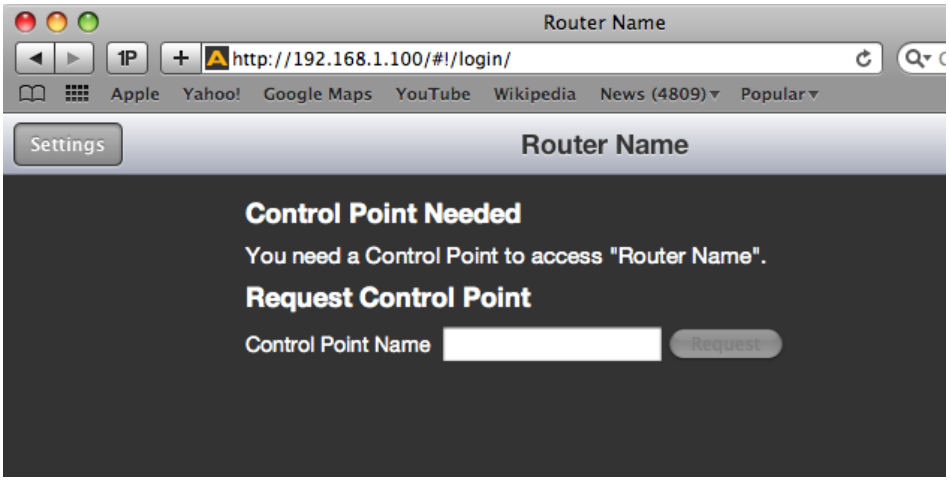


7. Enter the IP address and Subnet mask information as applicable, then click OK.



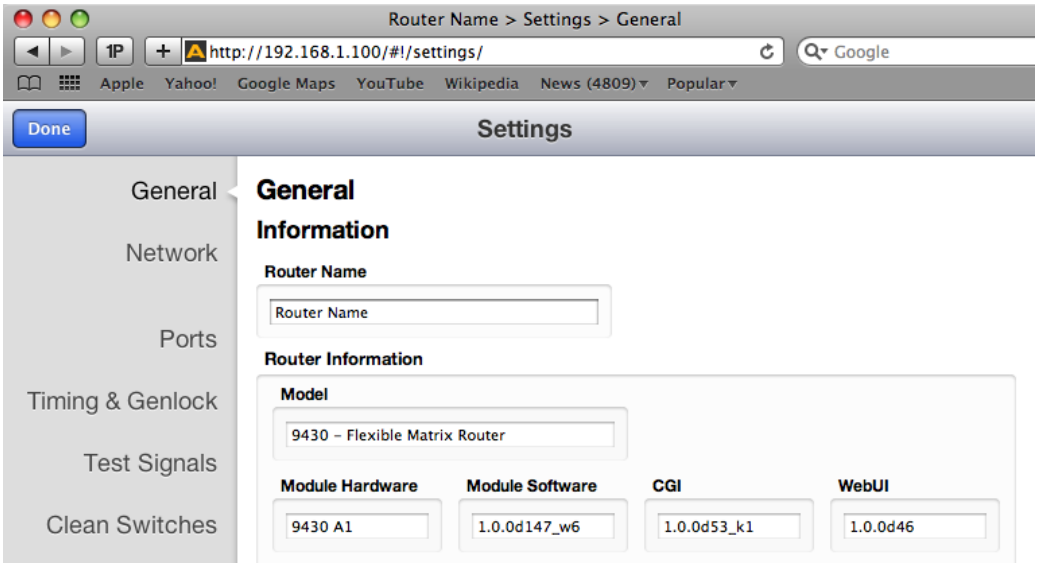
To Set the IP Address on the 9430

1. At this point, you are ready to connect to the Layering Engine from your web browser. Navigate to the URL http://192.168.1.100. The first time that you browse to the 9430's IP address, a web page displays with the message "Control Point Needed."



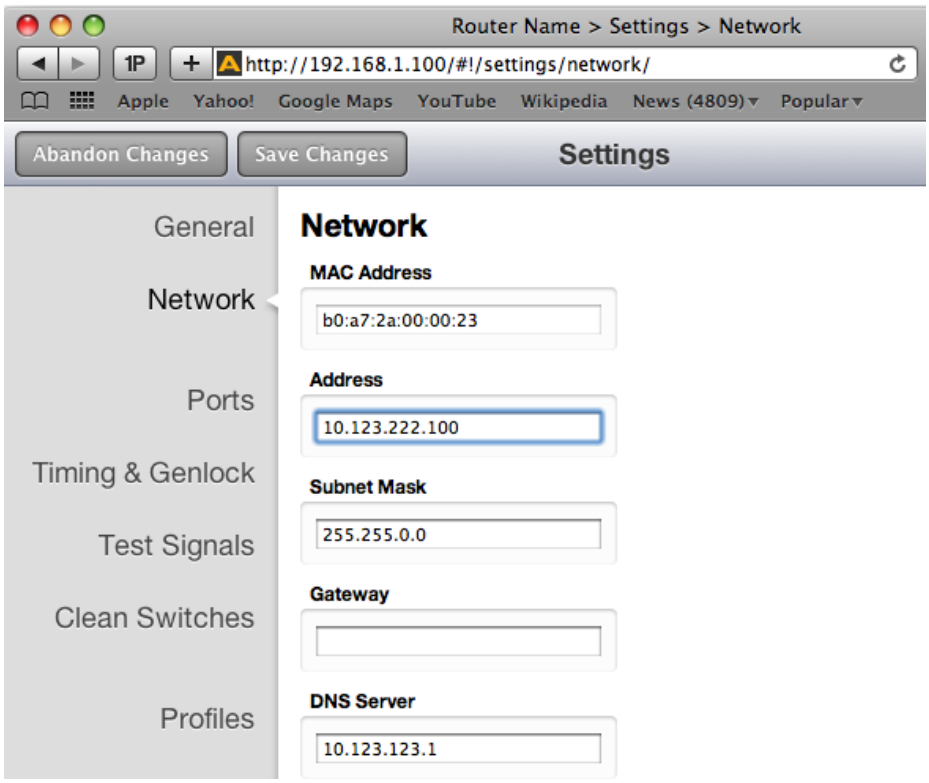
The message "Control Point Needed" appears only the first time you browse to the 9430's assigned IP address.

2. Click **Settings** in the upper left part of the browser window. The Settings > General window displays.



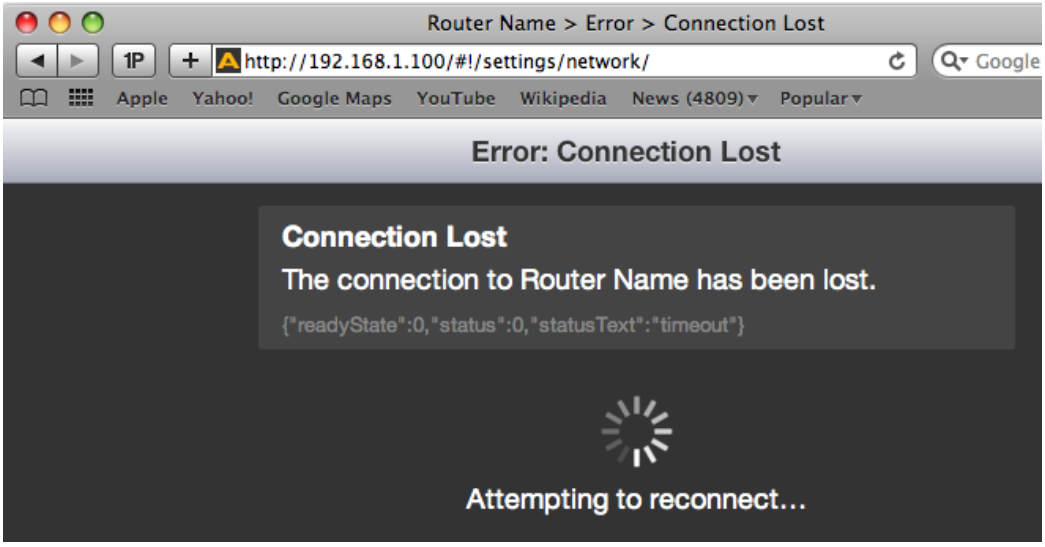
The Settings > General window

3. From the left navigation panel, click **Network**. The Network window displays.
4. In the Address field, enter the IP address you want to use for the Layering Engine; for example, 10.123.222.100. If you know the Gateway and DNS Server information, enter that information.



Entering the IP address you want to use for the 9430 that suits your own network environment

5. Click **Save Changes**, then click **Done**. You will temporarily lose connection to the Layering Engine at this point because it is now using an IP address that is outside of the range of your computer.

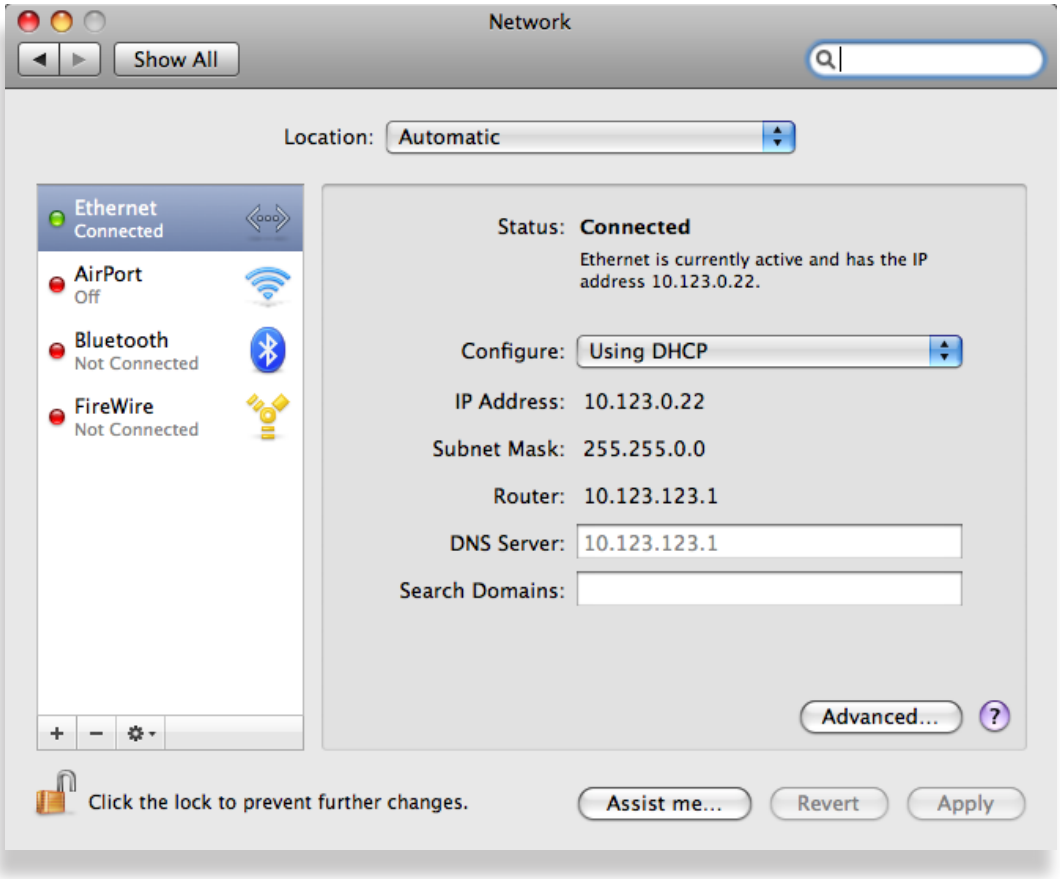


An expected temporary loss of connection as part of the initial configuration process

Readjusting Controlling Computer's IP Address to be in Range of Layering Engine's Newly Assigned IP Address

Now that you have set the Layering Engine's IP address away from its factory default in favor of an IP address suitable for your own network environment, you must change the IP address of the controlling computer once again so that it is in a compatible range with the Layering Engine's new IP address.

This may be as simple as reverting to a dynamically assigned IP address if the controlling computer is on a network with a DHCP server compatible with the Layering Engine's new IP address. Or you may want to assign a static IP address, provided that it is one that allows you to access the Layering Engine with its newly assigned IP address.



Example of readjusting the controlling computer's IP address to be within range of the Layering Engine's newly assigned IP address.

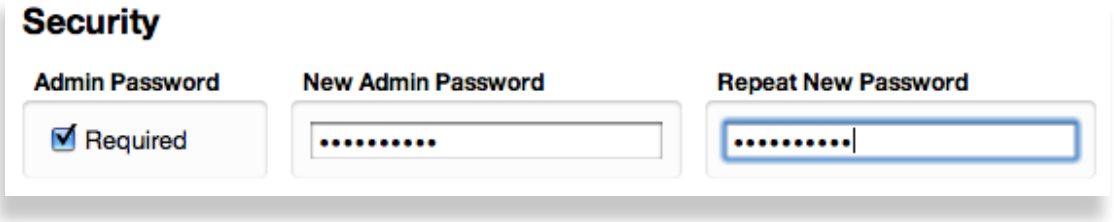
Security and Administrative Access to Settings

All of the Layering Engine's configuration parameters can be accessed through the **Settings** button in the upper left corner of the web interface. Without enabling a password, anyone with access to the Layering Engine (meaning anyone who has an authorized Control Point with an assigned Profile) can make changes to its Settings.

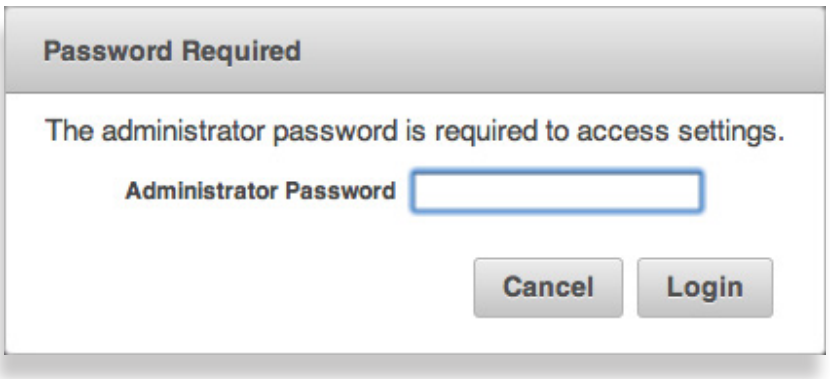
Depending on the security needs of your facility, you may wish to limit access to the Layering Engine's Settings to only certain people. From the General > Settings page, you can limit administrative access to the Layering Engine by creating a password.

To Limit Access to the Layering Engine's Settings

1. From the Layering Engine's web interface, click **Settings**. The Settings > General page displays.
2. In the Security section, click the Required checkbox to enable the password functionality.



3. Select a password and enter it into the New Admin Password field. Enter it a second time in the Repeat New Password field.
4. Click **Save Changes**, then click **Done**. The main 9430 web interface displays.



When a password is required for administrative access, users who try to access Settings will get a message that says "Password Required."

Next, we will go over the background information necessary to understand how to configure the 9430's Ports according to your facility's intended use. All of the video signals coming into the 9430 through Ports that are designated as Sources are available to the Layering Engine.

Port Configuration Options

Planning Port Configuration

Typically, during the planning stage of your Layering Engine implementation, you would determine in advance how you want to initially use the P9425 in terms of inputs, outputs, and test signals.

Cabling P9425 to Match Plan

Based on your plan, connect cables to the ports to match your intended use. After you have completed cabling the P9425, you will then configure the ports to match the cabling.

Cable Length Considerations

An important technical consideration in system wiring is the length of the cables that run between different pieces of equipment. The high frequency content of the serial digital signal, which is attenuated in proportion to the length of the cable, sets an upper limit to the distance over which the interface will work reliably. Beyond that distance, data bit errors will corrupt the signal and render the content unusable. The maximum length for digital grade, RG-6 type cable (such as Belden 1694A) varies according to the data bit-rate of the interface as follows:

Type	Bit-Rate	Maximum Cable Length
3G HD SDI	3 Gb/s	70 meters (229 feet)
HD SDI	1.5 Gb/s	100 meters (328 feet)
SD SDI	270 Mb/s	300 meters (984 feet)
AES	3 Mb/s	100 meters

These numbers are conservative in order to provide a margin of safety that accommodates variations in the output amplitude and jitter content of sources, and the input sensitivity of destinations. Do not exceed these values because when a system is pushed beyond its design limitations, what works one day may not work the next day.

Furthermore, these numbers assume a direct, single cable connection between devices. If the signals are passing through patch panels or cable couplers, the maximum total cable length must be reduced.

Definitions of Port Configuration Choices

Before going step-by-step through the process of configuring the ports, it is necessary to go over some background information in order to understand what the configuration options mean. Port configuration choices are described below, followed by detailed examples.

Unassigned

For all Port Types

A port can be set to Unassigned when it is not in use. This will remove it from the list of Sources and Destinations that can be assigned to a Control Profile.

Source

For Fixed Input and Bidirectional Ports

When configured as a Source, a port is an input to the switching matrix. The Source can be given a name, and under that name it will be available for assignment in a Control Profile. Making this selection on bidirectional ports will cause them to operate as inputs.

Destination

For Fixed Output and Bidirectional Ports

Configuring a port as a Destination makes it available for use in Control Profiles under its assigned name as a 9430 output. A bidirectional port configured as a Destination will cause it to operate as an output.

Follow

For Fixed Output and Bidirectional Ports

Output capable ports can be configured to Follow, or duplicate, the signal on any Source or Destination. The Follow configuration essentially makes a port into a DA. Ports that are configured to Follow will not appear on the list of Sources and Destinations that can be assigned to a Control Profile.

Paired

For all Port Types

This is used to create pairs of Inputs or Outputs to support signals such as Key & Fill, RGB444 Link A & B, or 3D Left & Right. Pairing associates the port to an existing Source or Destination assignment.

Note: While the Paired configuration is valid on all port types, only input capable ports can be paired to a Source, and only output capable ports can be paired to a Destination.

Assigning Virtual Ports for TSG and ME1 Program, ME1 Preview

Only ports that are configured as Sources or Destinations are available to assign to the Source and Destination buttons on a control panel. Virtual ports must be configured as Sources in order to be able to assign them to a Destination.

Primary TSG

For Fixed Output and Bidirectional Ports

The Primary TSG virtual port delivers the test signal being generated in the Primary TSG to an output port. It must be routed to a particular output port.

Secondary TSG

For Fixed Output and Bidirectional Ports

The Secondary TSG virtual port delivers the test signal being generated in the Secondary TSG to an output port. It must be routed to a particular output port.

The Layering Engine sends its Program Output and Preview Output to virtual ports ME1 Program and ME1 Preview, respectively. Therefore, these two virtual ports must be configured as Sources, then routed to Output 1 and Output 2.

For more details, see Routing Virtual Ports ME1 Program and ME1 Preview to Outputs 1 and 2 on page 48.

ME1 Program

For Fixed Output and Bidirectional Ports

This ME1 Program configuration delivers the Mix Effects Program Output being generated in the Layering Engine to an output port. The ME1 Program virtual port must be routed to an Output Port that is designated as the Layering Engine Program Output Port. For a 10-port system, this would be either Output 1 or Output 2.

ME1 Preview

For Fixed Output and Bidirectional Ports

This ME1 Preview configuration delivers the Mix Effects Preview output being generated in the Layering Engine to an output port. The ME1 Preview virtual port must be routed to an Output Port that is designated as the Layering Engine Preview Output Port. For a 10-port system, this would be either Output 1 or Output 2.

Port Configuration Choices Available According to Port Type

These three port types (fixed input, fixed output, bidirectional) can accept 3G, HD, SD and AES, and can be configured in the following ways:

For Fixed Input

Fixed Input ports can be configured in one of three ways:

1. Unassigned
2. Source (the default on a new installation)
3. Paired

For Fixed Output

Fixed Output ports can be configured in one of six ways:

1. Unassigned
2. Destination (the default on a new installation)
3. Follow
4. Paired
5. Primary TSG
6. Secondary TSG

For Bidirectional

Bidirectional ports can be configured in one of seven ways:

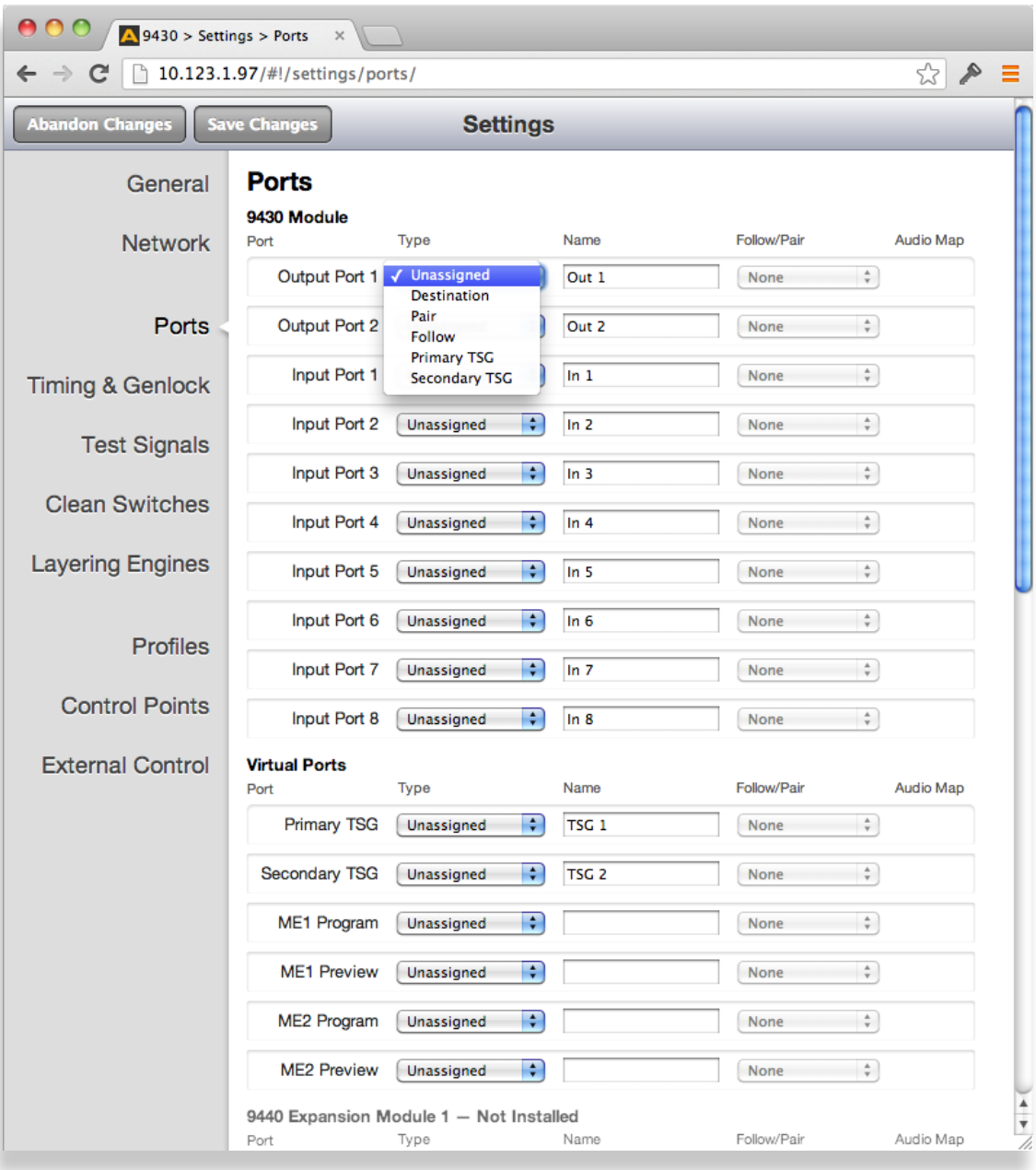
1. Unassigned (default on new installation)
2. Source
3. Destination
4. Follow
5. Paired
6. Primary TSG
7. Secondary TSG

Implementing 9430 Port Configuration Plan

Now that we have covered the background context for numbers and types of ports available and what the various configuration selections mean, you are ready to configure the 9430's ports.

To Configure the 9430's Ports

From the left navigation panel, select **Ports**. The Ports page displays. Initially, all the ports show "Unassigned" for the Type drop-down control.

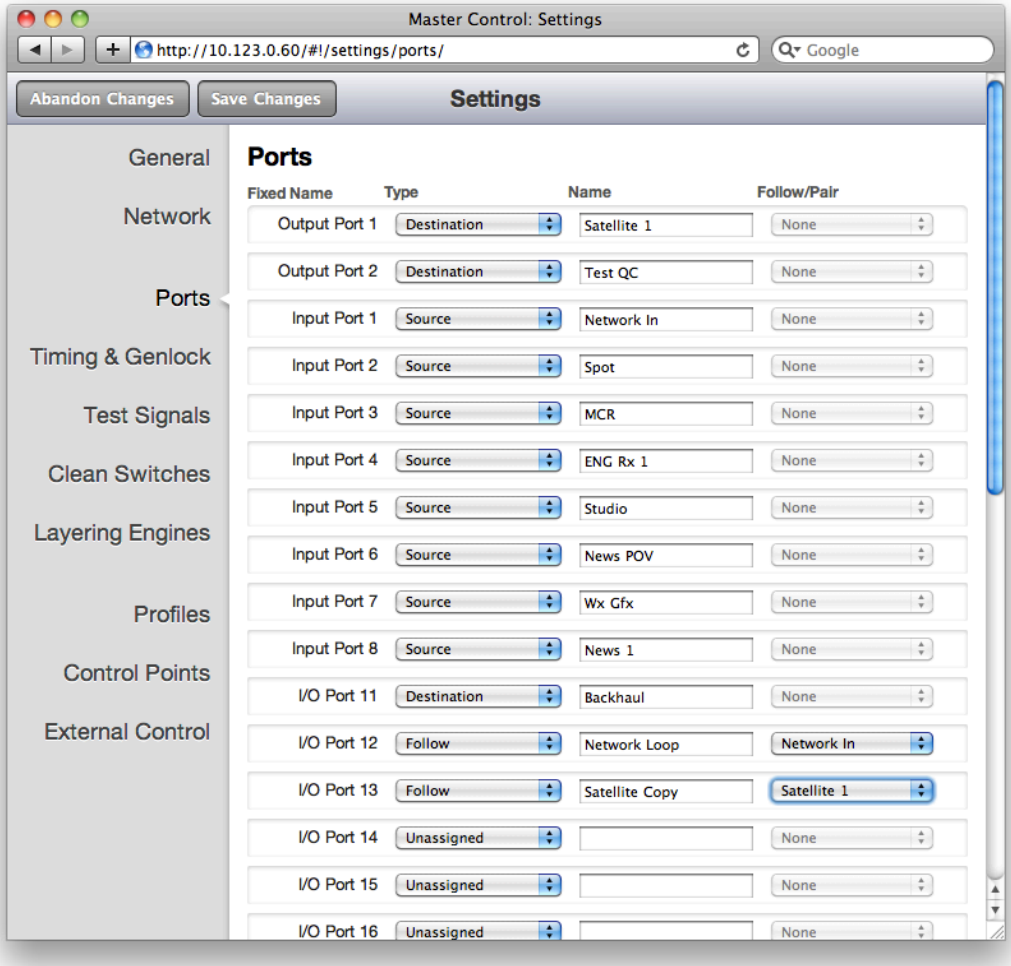


Configuring Ports: Making a selection from the Type drop-down control for Output Port 1

On the Ports page, take the following steps for each port that you plan to use:

1. Select its Type from the Type drop-down control.
2. Indicate a Name (this is the Port's name that is visible when creating Profiles).
3. If applicable, make a selection from the Follow/Pair drop-down control.
4. Click **Save Changes** near the upper left area of the browser window to save your changes, or click **Abandon Changes** if you want to cancel your changes.

Now that you have configured the 9430's Ports, the next stage of Layering Engine configuration is to create Profiles and Control Points to accommodate as many users as you need in your facility.



An Example Port Configuration

Creating and Editing Profiles

A Profile provides each Control Point with a configured view of the Sources and Destinations on the Router, or of the Background Sources and Kay Layers of the Layering Engine. A Profile defines which Sources and Destinations, or Background Sources and Key Layers, can be accessed from any given Control Point.

A Profile also defines the order in which Sources and Destinations, or Background Sources and Key Layers, display for a Control Point. This ordering feature is of particular interest in the case of RS-232 and TCP/IP control for automation because it provides a simple means to map Sources and Destinations to suit the automation protocol.

Every Control Point, such as a web browser, an iPad, or a serial interface for external control, must have a Profile assigned to it in order for that Control Point to be able to use the Layering Engine. Multiple Control Points can share the same Profile.

Distinction Between 9430 Profile and Layering Engine Profile

It is important to understand the relationship between the profiles for the Router versus the Layering Engine because these two types of profiles are used for different purposes.

In practical terms, a profile for the Router is used to route Sources to Destinations, whereas a profile for the Layering Engine is used to provide a view of the resources you want to use for creating the Preview and Program Output of the Layering Engine.

A profile for the Router determines what can be viewed when looking at the Router interface. The Router interface displays Sources and Destinations. In contrast, a profile for the Layering Engine determines which resources can be used for creating the Layering Engine Background Sources, Keyer 1 and Keyer 2 video sources, which combine to create the Preview and Program Outputs.

A single control point may be used for both the Router and the Layering Engine. A Router profile would be assigned for the Router functions, while a separate Layering Engine profile would be assigned for the Layering Engine functions. Because the Router and Layering Engine can each have unique profiles from a single control point, it is important to understand the relationship between the two.

For instance, from the point of view of the Layering Engine, the ME1 Preview and ME1 Program thumbnails do not need to be displaying as Background Sources. But from the perspective of the Router, ME1 Preview and ME1 Program need to be available to a Router profile so that they can be assigned to output ports. Examples are discussed in the following pages.

Characteristics of Profiles

- Required for every Control Point
- Show only Sources and Destinations
- Define which Sources and Destinations can be accessed
- Define the order in which Sources and Destinations are displayed
- Can be assigned to multiple Control Points

Creating an Initial Set of Router Profiles

Complete the process of creating as many profiles as your Router users will require. While you can always create additional Profiles or edit existing ones, you may want to systematically think through your users' needs to determine what the initial set of Profiles will be. This will simplify the overall configuration process as you begin assigning Profiles to Control Points.

To Create a Router Profile

1. From the left navigation panel, click **Profiles**. The Profiles page displays.
2. Enter a profile name in the New Profile field.
3. Click **Create**. The new Profile is listed on the Profiles page.
4. Next to the newly created Profile, click **Edit**. The Edit Profile page displays. At the outset of creating a new profile, all the available Sources and Destinations are presented.
5. Click and drag unassigned Sources and Destinations up to the assigned area as needed for this specific profile. Note that you can rearrange the order as desired. Additionally, you can include empty spaces to create groupings of Sources and Destinations by clicking and dragging a Space icon up to be a source or destination.
6. When finished, click **Save Changes** in the upper left part of the screen, then click **Done**.

This newly created Profile is now available to assign to one or more Control Points.

Repeat steps 1 through 6 until you have as many Profiles as you need.

See also: Creating Layering Engine Profiles on page 55.

Establishing Control Points and Access Authentication

There are many ways to control the Layering Engine and many possible Control Points. In order to manage these and selectively limit access, each possible Control Point must be authenticated.

An administrator grants access to Control Points through configuring the Control Points page. Access the Control Points page by selecting **Control Points** from the left navigation panel of the web interface. The administrator assigns a previously created Profile to each of the various Control Points. Control Points can be either assigned or requested. These methods are discussed in more detail shortly.

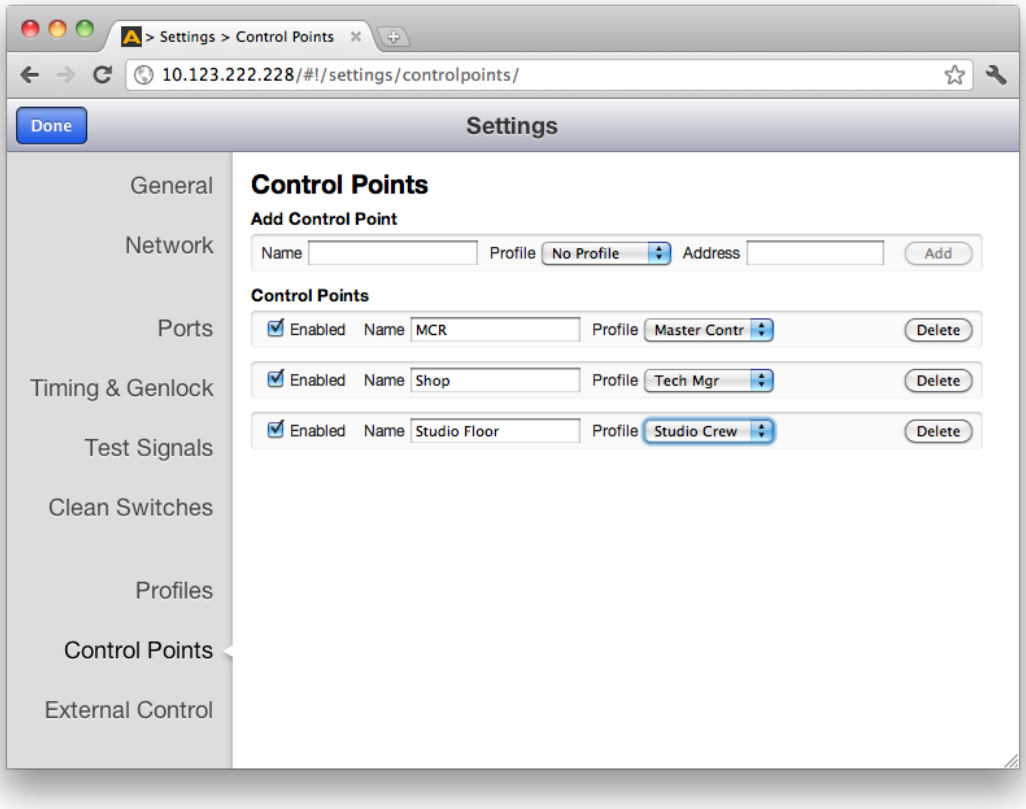
Characteristics of Control Points

For each Control Point, only the Sources and Destinations that have been defined by its assigned Profile will be available.

For a Control Point to work, it must meet these conditions:

- It must be authenticated, meaning that the Enabled check box is selected in the Control Points window.
- It must have a Profile assigned to it.

If these conditions are not met, the browser window displays the message, "Control Point Disabled."



The Control Points window showing three Control Points. Note that these Control Points are enabled (the Enabled check box is selected) and have Profiles assigned to them.

Configuring Control Points

For control points such as iPads and web browsers, there are two methods for adding them. One method is to request access from a Control Point. The other method is to assign an IP address to a Control Point. These two methods are described as follows:

First Method: Requesting Access from a Control Point

1. From the desired control point, whether from an iPad or from a computer web browser, enter the Layering Engine's IP address (for example, http://10.123.222.240) into the browser's address field. A browser window displays indicating that a Control Point is needed.
2. Enter your desired Control Point name in the Control Point Name field, then click **Request**. The browser window indicates that your Control Point has been disabled. Your request has become a Pending Authorization item for the administrator.

Second Method: Assigning an IP Address as a Control Point

To assign the IP address of a device to create a Control Point:

1. Navigate to the IP address of the Layering Engine.
2. In the upper left area, click **Settings**. The Settings page displays.
3. From the left navigation panel, click **Control Points**. The Control Points page displays.
4. Under the heading Add Control Points, indicate a name in the Name field.
5. Select a profile from the Profile drop-down control.
6. Enter the IP address for the device into the Address field.
7. Click **Add**. The Control Points page refreshes to show that the newly assigned Control Point is enabled.

Approving Pending Authorizations

To approve an authorization request:

1. Click **Settings** in the upper left area of the browser.
2. Click **Control Points** in the left navigation panel. The Control Points page displays.
3. Under Pending Authorizations, you will see the request that was just submitted.
4. For this new request, select a Profile from the drop-down control.
5. Click **Authorize**. The Control Points page refreshes and now includes the newly requested Control Point.

Note: In order to access **Settings**, you must have administrator access. See Security and Administrative Access to Settings on page 92 for more details.

Number of Control Points That Can Operate Simultaneously

The Layering Engine performs best with a maximum of four control points operating simultaneously. The Layering Engine's data bandwidth is shared across all of the control points. Each additional control point adds an incremental load on the system. When more than four control points are being used, the Layering Engine's video thumbnail display performance may begin to degrade.

Asymmetrical Bandwidth Requirements

The continuous delivery of video thumbnails to each control point requires more bandwidth than is required for performing cuts and mixes. The video thumbnails, comprising the vast bulk of the data, flow outward from the Layering Engine to each control point. The return data, in contrast, consists primarily of crosspoint commands, or cuts and mixes. Because the Layering Engine has greater bandwidth for cuts and mixes, the execution of cuts and mixes will be quite responsive even in a large system.

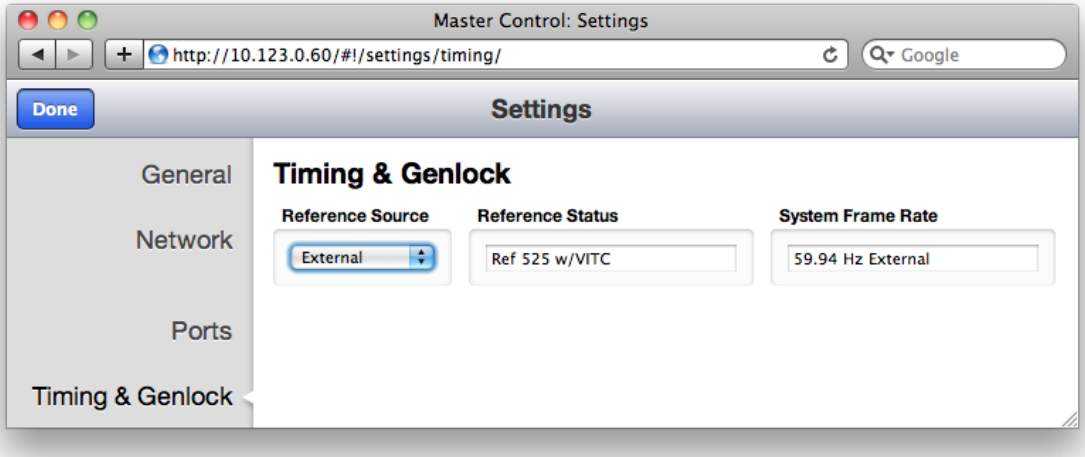
Best Practice: Closing Web Browser Control Points When Not In Use

To minimize the load on the Layering Engine, it is recommended to close any Web Browser Control Points that are not being used.

Setting Up Timing and Genlock

The P9425 can be locked to a Frame Reference (through the Avenue Frame Master Reference input), or operated from an internal precision reference. The Reference Source control selects between those two choices.

The Reference Status indicator displays the status of the currently selected reference.



The P9425 uses the video format selection of the Primary Test Signal Generator to determine two system-wide parameters—System Frame Rate, and Vertical Interval Switch Point.

System Frame Rate

Distributed within the 9430 is a System Frame Rate Reference. It is used to vertically lock the outputs of the internal Test Signal Generators. The System Frame Rate is selected by the Primary Test Signal Generator. If the selected genlock reference is in the same frame rate family (see the Note on Frame Rates on page 105), the System Frame Rate Reference will also be locked to the external reference. If the external reference is in a conflicting frame rate family (for example, SD 525 reference vs. 1080p/50 in the Primary Test Signal Generator), the System Frame Rate Reference will be internally generated.

Vertical Interval Switch Point

The precise point in the vertical interval where the crosspoint switch will occur is taken from the timing of the Primary Test Signal Generator. This provides flexibility in the system by allowing, for example, the use of an SD reference with a matrix that changes at HD switch points.

Note on Frame Rates

Despite the large number of video formats supported by the Layering Engine, there are only three frame rate families.

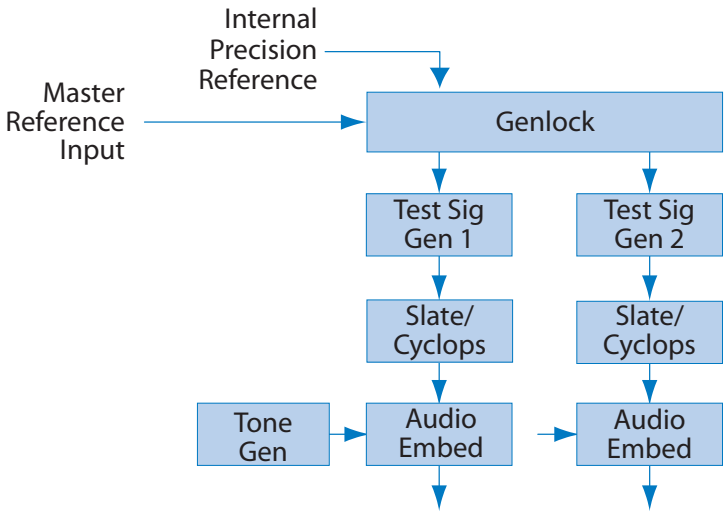
25/50 Hz	SD625, 720p/50, 1080i/50, 1080p/50 The 50 Hz frame rate family includes 25 Hz and 50 Hz frame and field rates. This family includes all of the "PAL" related standards in both standard and high definition.
23.98/29.97/59.94 Hz	SD525, 720p/59, 1080i/59, 1080p/59 All of the NTSC-derived standards, including 23.98, 29.97, and 59.94 Hz field and frame rates. There is a 4 Frame to 5 Frame relationship between 23.98 and 59.94 which allows these to peacefully co-exist.
24/30/60 Hz	720p/60, 1080i/60, 1080p/60 The "not quite 60 Hz" challenges of the 59.94 world are addressed with this family which includes 24 Hz, 30 Hz, and 60 Hz field and frame rates. Though not used for broadcast, this family is useful for film rate and scientific/industrial applications.

The vast majority of applications, even those including both SD and HD formats, will all fall within a single frame rate family. For example, as members of the 59.94 family, both SD 525 and 1080i/59.94 can be simultaneously vertically locked to a single reference.

Configuring Internal Test Signal Generators

The 9430 is equipped with two independent internal Test Signal Generators (TSG). These generators are driven from the genlock source chosen by the Reference Source control on the Timing and Genlock page.

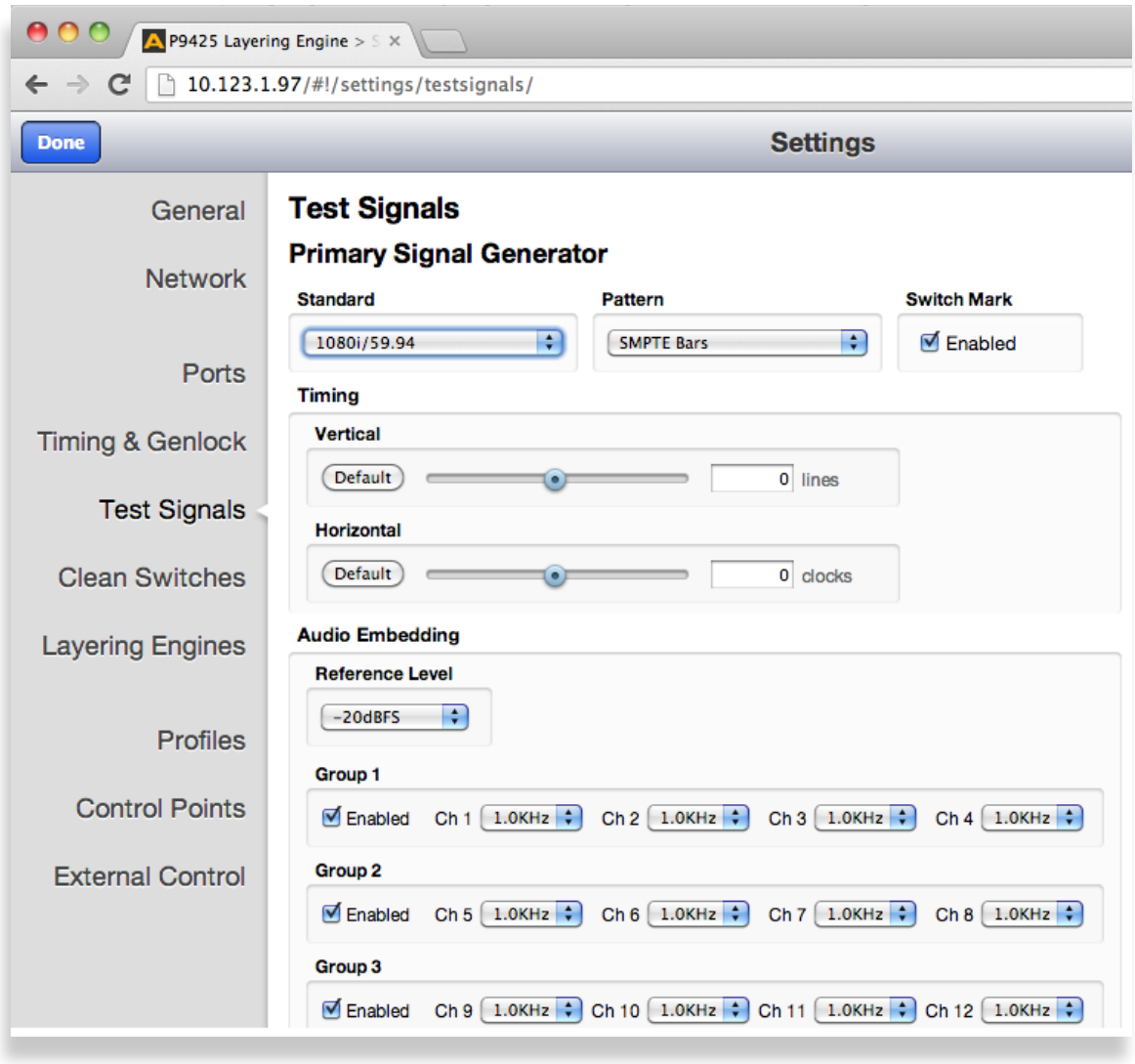
Each TSG can be independently configured for format, frame rate, and test pattern. The TSG outputs will always be clock-locked to the reference source. Further, they will be vertically locked and timed if the video standard the TSG is configured for is compatible with the provided reference.



Because the 9430 generates the test signals internally, the TSGs are available as sources in the Layering Engine (without consuming a physical input BNC) and can be selected to any output destination. Source names can be assigned to them in the Port Configuration menu, and their position on control panels is assigned in the **Profiles** menu.

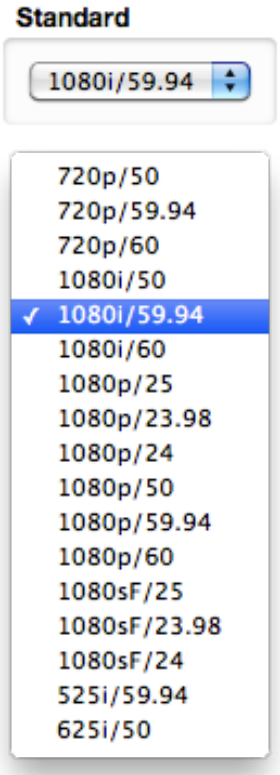
Test Signal Generator Configuration

There are two sets of configuration controls, one for each TSG. These configurations are independent, allowing the two generators to operate in different formats – and even at different frame rates. To configure them to the same standard, and to set them to matching timing (relative to the genlock reference), make the same settings for Standard, Vertical Timing, and Horizontal Timing.



The Test Signals configuration page

The configuration controls for the TSGs as are follows:

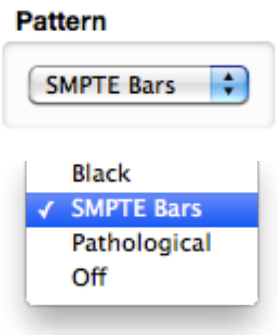


Standard

Select the desired operating format and frame rate.

Note: The choice of Standard for the Primary Test Signal Generator sets the System Frame Rate for the entire 9430. This is detailed earlier in the section Setting Up Timing and Genlock on page 104.

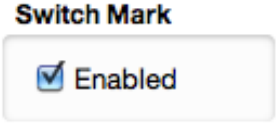
If the Secondary TSG is set to a Standard which is incompatible with the System Frame Rate (determined by the Primary TSG), then it will have a free-running H and V. This makes it possible, for example, to produce both HD1080i/59.94 in the Primary TSG, and 1080i/50 in the Secondary TSG. Both will have the same frequency accuracy (from the genlock reference), but only one will be vertically and horizontally timeable.



Pattern

Choose the desired test pattern to be presented by the TSG.

In addition to Black and Bars, the Pathological test pattern is provided. Also known as Digital Checkfield, it is a "worst-case" signal that stresses SDI cable drivers and equalizers. It is extremely useful in proving the integrity of a system.

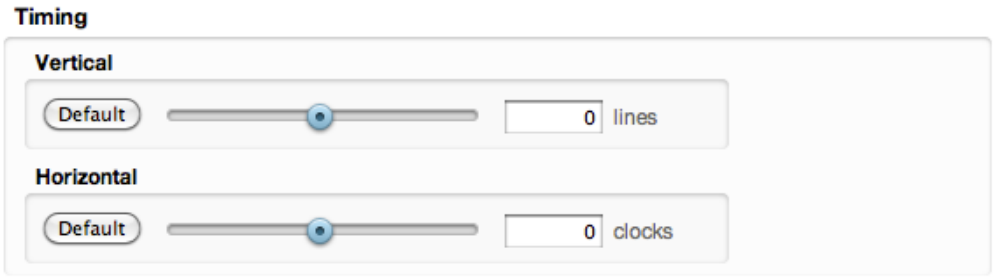


Switch Mark

This control enables the Switch Mark feature to identify the point in the vertical interval where the matrix crosspoint switch will occur. See Switch Point Identification on page 112 for more details.

Note: The Switch Mark is always valid on the Primary Test Signal Generator because its format and timing configuration drives the entire Layering Engine. It is only valid on the Secondary TSG when it is configured to match the Primary.

Vertical and Horizontal Timing



The Vertical and Horizontal Timing controls adjust the timing of the TSG relative to the genlock reference. Setting the H and V parameters to 0 will "zero" time the TSG to the reference. Negative values will cause the TSG to be early with respect to the reference; positive values will make the TSG later in time.

When the 9430 is being operated from an external 10 MHz reference, or when it is configured to use its internal precision frequency reference, there is no external video reference against which H and V timing can be adjusted. In that case, the TSGs will be adjusted against a common, internally generated video timing reference. This means that they can be adjusted relative to each other. If all of their H and V Timing parameters are set to identical values (like 0), they will all be locked (synchronous) to each other and they will all be in vertical and horizontal alignment with each other.

Note: The timing adjustments for the Primary Test Signal Generator are also used to position the vertical interval switching point in the 9430's matrix. The timing of the Primary TSG can be compared to other sources on a Waveform Monitor to ensure that the switch point will be properly aligned to the sources feeding the Layering Engine.

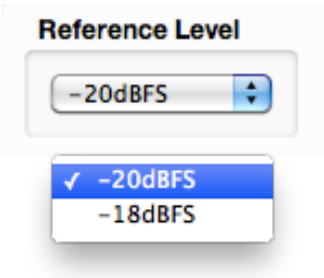
Audio Embedding

Each TSG has an Audio Embedder (Multiplexer) that can embed 16 channels of audio into the TSG SDI output. Audio is embedded in groups, each of which contains 4 channels. There are 9 audio sources for each channel – 8 tone generators, plus silence.

Note: In the world of digital audio, there is a big difference between "Silence" and "no signal present." In the same way that Black is a legitimate video signal, digital silence must be sent to destinations rather than just sending "nothing." Thus, TSGs should generally be configured to embed ALL of the groups that may be in use in a facility, with Silence chosen as the audio signal for channels where no content is needed or desired. Otherwise, switching between a TSG with only one group enabled, and a source with two groups of embedded audio present, will produce undesirable effects in downstream equipment.

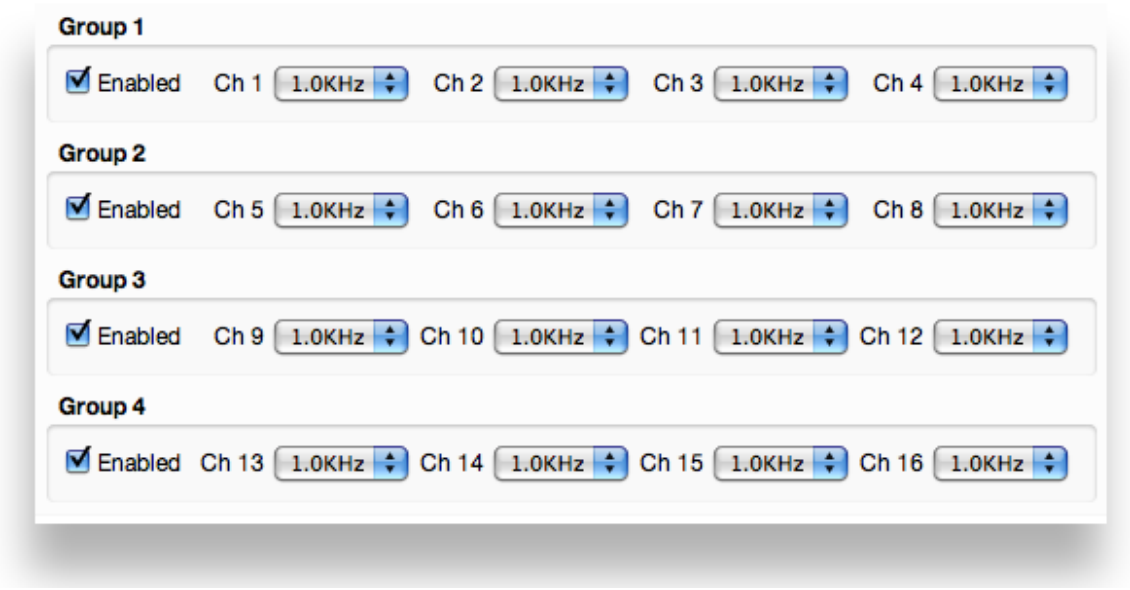
Audio Reference Level

This control selects the Digital Reference Level for the audio tone generators. This sets the nominal reference level (or 0 VU) relative to Digital Full Scale (DFS). This relationship is expressed on a logarithmic (decibel) scale. Since DFS is the "loudest" signal that can be represented, a setting of -18 dBFS will be 18 dB below Full Scale which is 2 dB greater than a setting of -20 dBFS. This control should be set in accordance with the audio practice in use in your facility. Frequently, -20 dBFS is the common practice in NTSC countries, while -18 dBFS is used in PAL countries.



Audio Group Enable

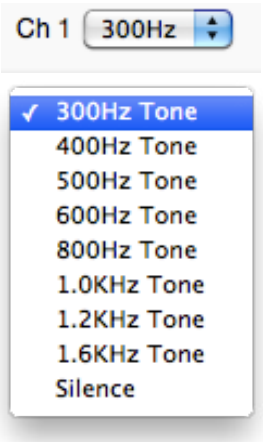
Each of the four possible audio groups can be Enabled independently.



Audio Source Selection

Choose between Silence, or one of eight tone frequencies. The tone generators produce sine waves with precision at 24 bits of quantization. This can be verified with a digital audio distortion analyzer with a noise floor at -144 dBFS.

Any tones that are selected will be dynamically modified if the Cyclops control is configured for Audio Pop or Beep. (The Cyclops control adds motion, audio pop or beep, and closed caption elements to the video test signal which proves that the signal reaching a given destination is a true live signal and not a freeze frame from a frame synchronizer that has lost its input.)



Slate Enable

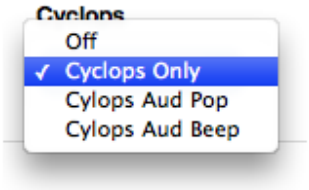
When enabled, the text which has been entered in the Slate Text field will appear over top of the test pattern.

Slate Text

Enter the desired Slate text in this field, then hit the Tab key or click outside of the Slate Text field. As with all of the configuration settings in the 9430, this will be saved in non-volatile memory so that it persists when the Layering Engine is powered down. The text entered in this field is not lost when **Slate Enabled** is turned off.

Cyclops

In order to produce a dynamic, constantly changing Test Pattern, enable one of the **Cyclops** modes to affect the picture, sound or both. The Cyclops feature adds a motion element which is overlaid over the test pattern video. It is located below the Slate field. The white cyclops pulse continuously sweeps horizontally back and forth in its black window. At the left and right extremes of its excursion the pulse makes a one frame bright flash.



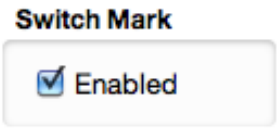
Meanwhile, the Beep/Pop feature will add variety to the tones carried by the embedded audio. Selecting **Beep** will produce a short beep (and is otherwise silent), while **Pop** momentarily takes the selected tone to silence. Industry practice identifies odd numbered channels as carrying Left content, and even numbered channels as the Right half of a stereo program. The Pop and Beep timing in the audio follows this convention, with the odd channels being marked when the Cyclops makes its left flash, and the even channels marked when the right edge flash occurs. Further, the left channel is a single Beep/Pop, while the right channel is a double Beep/Pop. This allows left/right identification even after the audio has been disembedded (demultiplexed) and has lost the implied channel association.

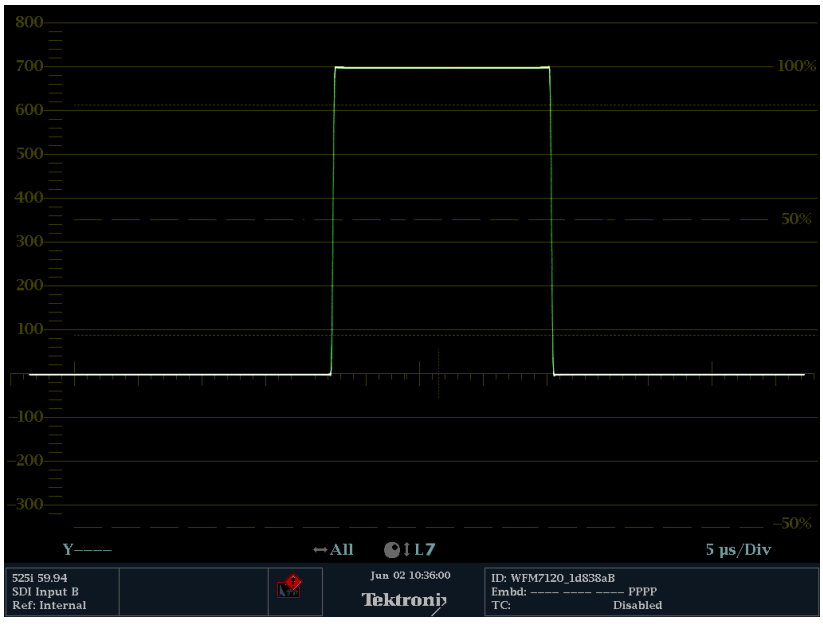
These aural and visual markers provide proof at downstream points in a transmission chain that it is producing live, uninterrupted delivery of content – even when not in active service. The precise synchronization between the visual Cyclops and the aural Beep/Pop are also useful to verify sound/picture lip-sync.

Switch Point Identification

As described in the section Setting Up Timing and Genlock on page 104, the video format and horizontal and vertical timing for the Primary TSG determines timing and location of the switch point in the vertical interval. Under SMPTE RP 168, the switch point varies from one format to another. In general, it should occur during the middle portion of a specific line in the vertical interval. These locations, which are as far away as possible from the SAV and EAV digital sync words, offer the best opportunity to minimize the disturbance that is inevitably produced by switching between two digital bit streams – even streams that are very closely timed to each other.

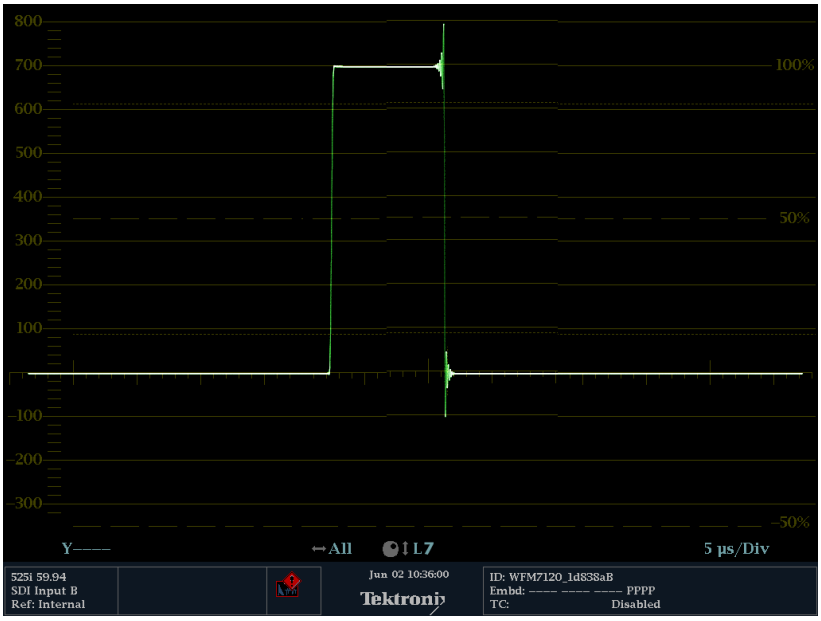
In order to help identify when and where the switch is taking place, the TSGs have a marking feature. When the Switch Mark is enabled, a white pulse will be inserted on the switching line. The beginning and ending of the pulse corresponds to the RP 168 specified switching area. This line can be viewed on a digital waveform monitor, or on a picture monitor which offers V Delay.





Display of Y Channel for 1080i/59.94 with Switch Mark Enabled.

When switching away from the TSG output with Switch Mark to a source without, there will be a momentary frame where the switching discontinuity will be visible.



Chapter 5: External Control

The Layering Engine's Approach to Control Integration

The Layering Engine provides control from external systems like automation and event controllers. As there is a significant legacy of protocols and usage models in current practice, the Layering Engine supports a variety of external control protocols, offering a range of commands and control capabilities in order to make control integration as easy as possible. These protocols can be used with both the RS-232 and Ethernet physical interfaces. This approach generally allows the Layering Engine to be used without having to adapt current systems.

Supported Control Protocols

The 9430 supports the following control protocols:

- Avenue FMR
- Grass Valley TenXL
- Grass Valley 100
- Generic ASCII
- RS-232
- Telnet
- TCP/IP

Avenue FMR

Unique to the Avenue 9430/9440 Flexible Matrix Router and Avenue P9425, this is an ASCII (human readable) control protocol with an extensive command set, offering very useful and powerful external control functionality. These interfaces are enabled, disabled and configured through the **External Control** tab on the web configuration tool.

Simultaneous Support for Multiple Protocols

These protocols are accessible over three different interfaces. Each interface is independent, allowing simultaneous support for different protocols on different interfaces.

Control Profiles for External Interfaces

An interface is "connected" to the P9425 through a **Control Profile** – similar to a physical control panel. This allows for the choice of available **Sources** and **Destinations**, and the order in which they are mapped to the interface protocol to be customized on the P9425 rather than on the controlling device.

Grass Valley TenXL

The P9425 supports both the ASCII (human readable) and SMPTE ESbus (binary) variants of this protocol. Supports only source to destination control.

Grass Valley 100

The P9425 supports SMPTE ESbus with and without the "break" character requirement. Though widely implemented, this protocol is limited in usefulness because it supports only 4 output busses. Supports only source to destination control.

Generic ASCII

The P9425 supports this simple human readable protocol with both space and comma variable separators. Supports source to destination routing and salvos.

RS-232

The conventional RS-232 serial interface is provided from the 9430 module through the control breakout cable. This interface can operate from 1200 to 115,200 baud (bits per second).

Telnet

Using the Ethernet port on the control breakout cable, you can open a Unix-style Telnet session with the 9430 module. As a text-oriented communications facility, Telnet is only suited to ASCII protocols. It provides easy access from a distance (even a great distance) and can be of particular utility for system debugging. If the Telnet interface is disabled in the External Control configuration, the 9430 will refuse the connection.

TCP/IP

You can open a TCP/IP session at a private port number (to be specified) to enable network control. As with Telnet, this interface must be enabled in the External Control configuration in order for the 9430 to accept the connection. This is the preferred network equivalent to RS-232 and it works with both ASCII and binary protocols and command sets.

Additional GPI and Serial Connections through JL Cooper eBOX

Additional GPI and Serial connections for the Layering Engine can be made through the JLCooper eBOX, a third-party device. It provides 24 GPI inputs, 24 GPI outputs and 4 serial connectors. Please see Using the JL Cooper eBOX with Ensemble Designs Avenue Equipment for a detailed description of the process of configuring the Layering Engine for GPIO (general purpose input/output) functionality using the eBOX.

SNMP Interface

A Simple Network Management Protocol (SNMP) agent in the 9430 supports Control and Status queries from an SNMP manager.

Programming Reference Document

The Management Information Base (MIB) document, specific to the 9430, is a required programming reference while customizing the SNMP manager. You can either download the MIB document directly from the 9430's web interface or request it from Ensemble Designs.

The SNMP interface will be active only if enabled through External Control configuration. SNMP support will not be available on initial product shipments, but will be provided by a subsequent system software upgrade.

Software Development Kit (SDK)

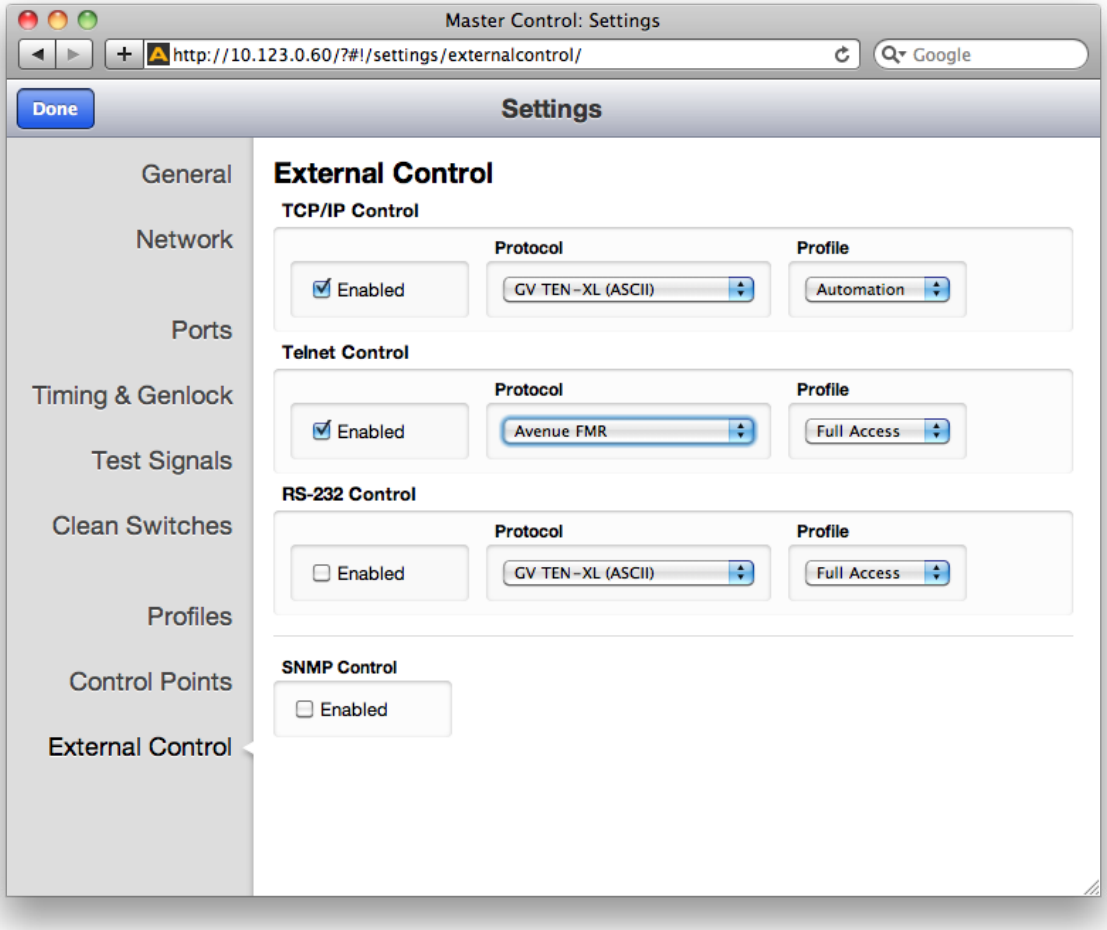
When control requirements go beyond straight forward functions, such as source to destination routing and salvo execution, you may need to develop an interface more specific to your needs. To that end, Ensemble Designs will be releasing an interface design guide, or software development kit (SDK), to support such efforts.

Accessing Features Unique to the 9430

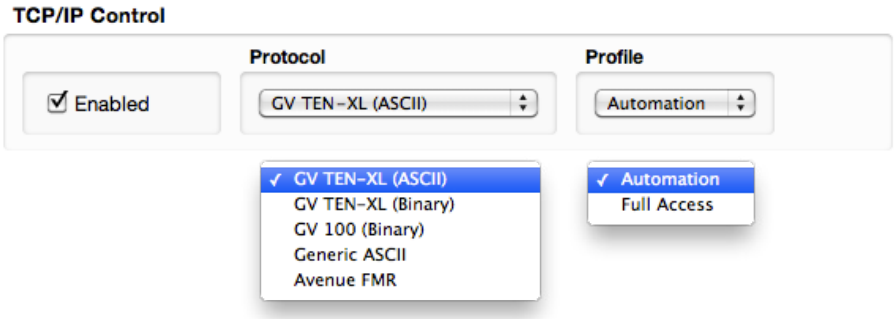
That more extensive interface will be necessary when you need to access features unique to the 9430, such as:

- reading the input signal metadata;
- controlling the internal TSGs; and
- capturing video thumbnails remotely

Configuring External Control



For each of the enabled interfaces, select the desired protocol. The mapping of that protocol to Sources and Destinations will be controlled by the Profile that is assigned to the interface. Any Profile can be edited to modify the Sources and Destinations that are available to it and the order in which they are listed. For more information, see Creating and Editing Profiles on page 99.



Chapter 6: Maintenance and Troubleshooting

This chapter addresses certain known issues and possible issues that new users may encounter while becoming familiar with the Layering Engine.

Troubleshooting the 9430 Module

Cannot Connect to the 9430

If you are having difficulty connecting to the 9430, check that the IP addresses of the 9430 and the computer or device are not in conflict. Check also that the cabling is correct.

- Review the instructions in Connecting Network Cables on page 33 to make sure you have configured the IP addresses correctly.
- See also Control Connections on page 27 to make sure you have correctly cabled the control connections between the 9430 and the controlling computer.

9430 Not Running

To Determine if the 9430 is Running

Open the front door of the Avenue frame and check the Run light on the front panel of the 9430. When the 9430 is running properly, the Run light will be blinking on and off. Note that the rate of blinking will not match the rate of blinking of the Run lights of other modules running in the Avenue frame. However, if the Run light stops blinking, whether it remains on or off, it means that the 9430 has stopped.

Resetting the 9430

There are two types of resets for the 9430. One is a reboot. The other is a reset to the factory default settings.

Rebooting

To reboot the 9430, use something with a fine point, such as a paperclip, to press into the small "Reset" hole on the lower part of the front panel. Press once briefly and release. The module will reboot. A reboot typically takes a few minutes. After the reboot is complete, the Run light will resume blinking.

Resetting to Factory Default Settings

If you want to reset your module to factory default settings, use something with a fine point, such as a paperclip, to press and hold into the small "Reset" hole on the lower part of the front panel. Continue holding the Reset button in its pressed in position until you see all of the Input lights on the front panel illuminate several times (approximately 15 seconds), then release. The 9430 will reboot with factory default settings. Note that the IP address and all other settings will have to be reconfigured.

Authorized Control Point Unable to Connect to 9430

If you are using an authorized Control Point but you are seeing the message "Control Point Disabled," check to make sure that the Control Point has been assigned a Profile. Without an assigned Profile, it is expected behavior that you would see the message "Control Point Disabled."

For more details on this issue, please see:

- Establishing Initial Control Point and Profile for Administrator Functions on page 36
- Creating and Editing Profiles on page 99
- Establishing Control Points and Access Authentication on page 101

Configuration Changes are not Taking Effect

After making changes to configuration settings, make sure you are doing two things:

- Click the **Save Changes** button
- Click the **Done** button

If you save changes without also clicking **Done**, the changes may not be implemented.

Troubleshooting the Web Browser Control UI

Supported Browsers

The Layering Engine supports current versions of the following browsers for Mac and PC:

- Safari (version 5 or later)
- Firefox (version 12 or later)
- Chrome (version 17 or later)
- Internet Explorer (version 9 or later)

Enabling cookies is required for all browsers.

Software Updating

Step 1. Record Your Configuration Settings

Updating the software may erase configuration settings including profiles, control points, port configurations and frame rate information. Therefore, it is important that you keep track of your configuration settings. You may consider taking screen shots of each menu as a record.

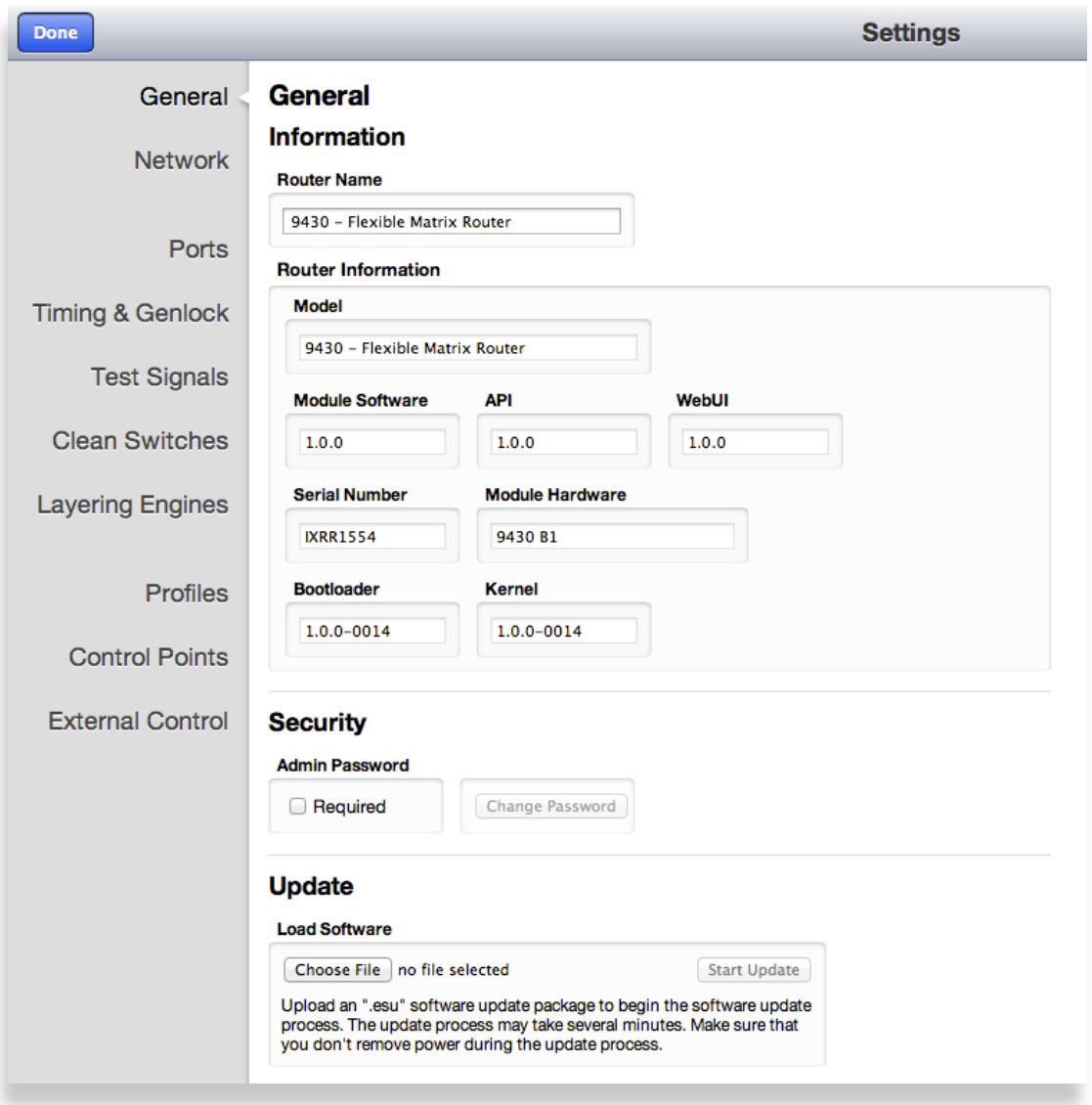
Step 2. Download Software to Your Computer

Download the updated software (.esu file) for the 9430 module to your PC or Mac from the following webpage:

http://www.ensembledesigns.com/support/avenue-support/avenue-software

Step 3. Navigate to your 9430 Module through a Web Browser

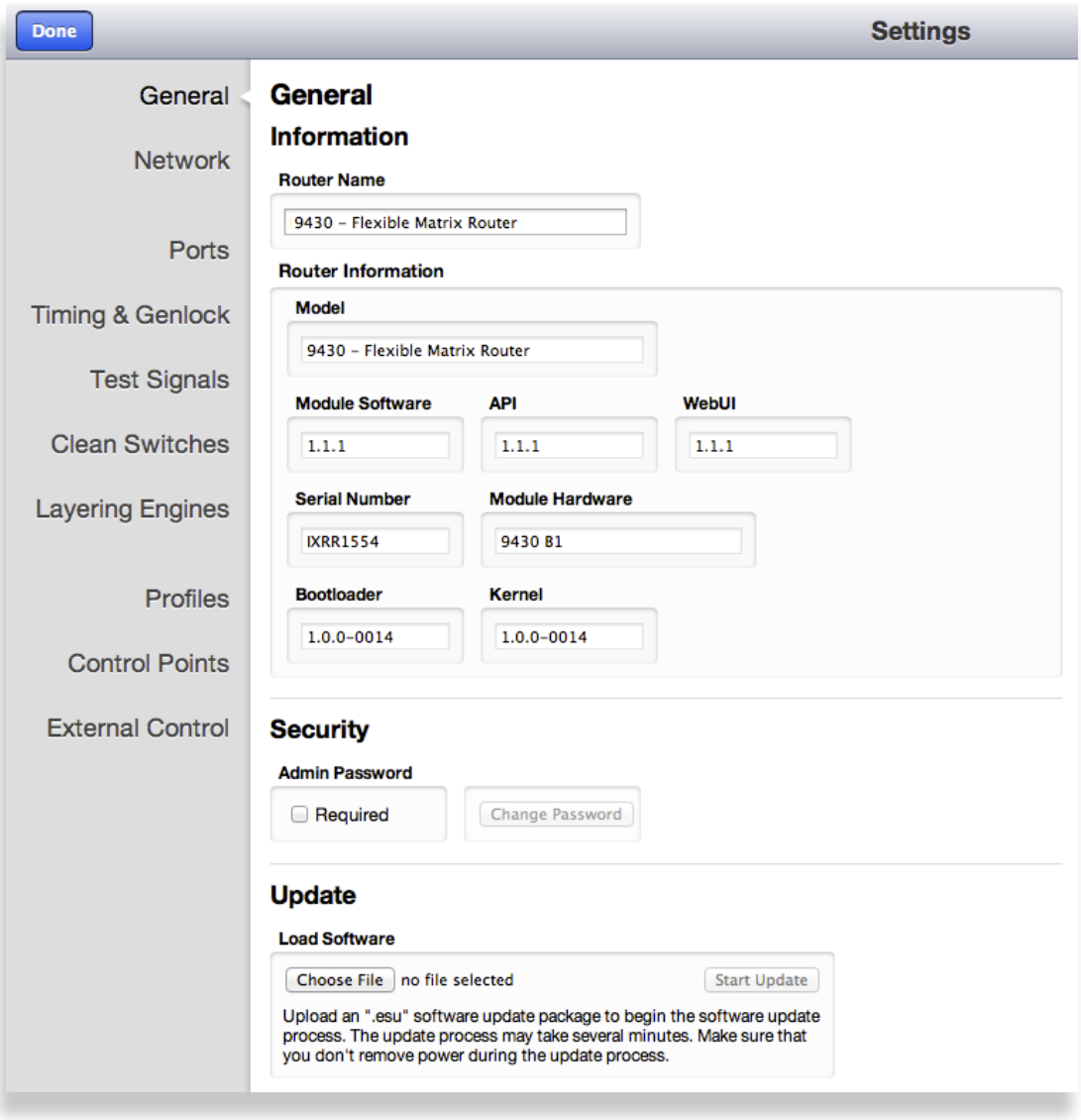
On a computer that is networked to the Avenue frame, type the IP address of the 9430 into the address bar of your web browser. Navigate to the Settings: General Information window, shown below.



Step 4. Update the Module Software

In the lower part of the General Information window, click **Choose File**. Navigate to the updated 9430 .esu software file that you downloaded to your computer in Step 2. Click **Start Update**. The Updating Firmware window will come up, shown below. The updating process can take several minutes.

When the update is complete, the General Information window will come up, and the updated software version will be indicated in the "Module Software" field, as shown below.



Step 5. Reset your Configuration Settings

Using the information you recorded in Step 1, reset your Configuration Settings for the module.

Warranty and Factory Service

This module is covered by a five year limited warranty. If you require service (under warranty or not), please contact Ensemble Designs and ask for customer service before you return the unit. This will allow the service technician to provide any other suggestions for identifying the problem and recommending possible solutions.

If you return equipment for repair, please get a Return Material Authorization Number (RMA) from the factory first.

tel +1 530.478.1830
fax +1 530.478.1832

service@ensembledesigns.com

www.ensembledesigns.com

Ship the product and a written description of the problem to:

Ensemble Designs, Inc.
Attention: Customer Service RMA #####
870 Gold Flat Rd.
Nevada City, CA 95959 USA

Be sure to put your RMA number on the outside of the box.

Specifications

The hardware elements that make up the P9425 Layering Engine are the 9425 Layering Engine Sub Module, the 9430 Router Module, and optionally one or two 9440 Expansion Modules.

9430 Module

Inputs

Number	Eight
Signal Type	HD Serial Digital 1.485 Gb/s, SMPTE 274M, 292M or 296M HD Serial Digital 2.97 Gb/s, SMPTE 424M, 425M SD Serial Digital 270 Mb/s, SMPTE 259M DVB-ASI at 270 Mb/s, SMPTE 310M AES3id
Impedance	75Ω
Return Loss	>15dB to 1.485 GHz

Max Cable Length

270 Mb/s	300 meters Belden 1694A
1.485 Gb/s	100 meters Belden 1694A
2.97 Gb/s	70 meters Belden 1694A
Automatic Cable EQ	

Outputs

Number	Two
Signal Type	Follows input
Impedance	75Ω
Return Loss	>15dB to 1.485 GHz
Output DC	None (AC coupled)

Reference

Number	One via frame master ref input
Signal Type	Composite black, Tri-Level Sync, 10 MHz

Standards Supported

1080i 50, 59.94 or 60 Hz, SMPTE 274M -4,5,6
720p 50, 59.94 or 60 Hz, SMPTE 296M -1,2,3
1080p 23.98, 24 or 25 Hz, SMPTE 274M -9,10,11
1080p 50, 59.94, 60 Hz, SMPTE 424M, 425M
Level A, Level B (9435 Level A only)
1080sF 23.98, 24 or 25 Hz, RP211 -14,15,16
625i 50
525i 59.94

9440 Expansion Module (Optional)

Inputs

Number	**Up to ten, user configurable**
Signal Type	**Same as 9430**
Impedance	**75Ω**
Return Loss	**>15dB to 1.485 GHz**

Outputs

Number	**Up to ten, user configurable**
Signal Type	**Follows input**
Impedance	**75Ω**
Return Loss	**>15dB to 1.485 GHz**
Output DC	**None (AC coupled)**

Glossary

AES/EBU

The digital audio standard defined as a joint effort of the Audio Engineering Society and the European Broadcast Union. AES/EBU or AES3 describes a serial bitstream that carries two audio channels, thus an AES stream is a stereo pair. The AES/EBU standard covers a wide range of sample rates and quantizations (bit depths). In television systems, these will generally be 48 KHz and either 20 or 24 bits.

AFD

Active Format Description is a method to carry information regarding the aspect ratio of the video content. The specification of AFD was standardized by SMPTE in 2007 and is now beginning to appear in the marketplace. AFD can be included in both SD and HD SDI transport systems. There is no legacy analog implementation. (See WSS).

ASI

A commonly used transport method for MPEG video streams, ASI or Asynchronous Serial Interface, operates at the same 270 Mb/s data rate as SD SDI. This makes it easy to carry an ASI stream through existing digital television infrastructure. Known more formally as DVB-ASI, this transport mechanism can be used to carry multiple program channels.

Aspect Ratio

The ratio of the vertical and horizontal measurements of an image. 4:3 is the aspect ratio for standard definition video formats and television and 16:9 for high definition. Converting formats of unequal ratios is done by letterboxing (horizontal bars) or pillar boxing (vertical pillars) in order to keep the original format's aspect ratio.

Bandwidth

Strictly speaking, this refers to the range of frequencies (i.e. the width of the band of frequency) used by a signal, or carried by a transmission channel. Generally, wider bandwidth will carry and reproduce a signal with greater fidelity and accuracy.

Beta

Sony Beta SP video tape machines use an analog component format that is similar to SMPTE, but differs in the amplitude of the color difference signals. It may also carry setup on the luminance channel.

Bit

A binary digit, or bit, is the smallest amount of information that can be stored or transmitted digitally by electrical, optical, magnetic, or other means. A single bit can take on one of two states: On/Off, Low/High, Asserted/ Deasserted, etc. It is represented numerically by the numerals 1 (one) and 0 (zero). A byte, containing 8 bits, can represent 256 different states. The binary number 11010111, for example, has the value of 215 in our base 10 numbering system. When a value is carried digitally, each

additional bit of resolution will double the number of different states that can be represented. Systems that operate with a greater number of bits of resolution, or quantization, will be able to capture a signal with more detail or fidelity. Thus, a video digitizer with 12 bits of resolution will capture 4 times as much detail as one with 10 bits.

Blanking

The Horizontal and Vertical blanking intervals of a television signal refer to the time periods between lines and between fields. No picture information is transmitted during these times, which are required in CRT displays to allow the electron beam to be repositioned for the start of the next line or field. They are also used to carry synchronizing pulses which are used in transmission and recovery of the image. Although some of these needs are disappearing, the intervals themselves are retained for compatibility purposes. They have turned out to be very useful for the transmission of additional content, such as teletext and embedded audio.

CAV

Component Analog Video. This is a convenient shorthand form, but it is subject to confusion. It is sometimes used to mean ONLY color difference component formats (SMPTE or Beta), and other times to include RGB format. In any case, a CAV signal will always require 3 connectors – either Y/R-Y/B-Y, or R/G/B.

Checkfield

A Checkfield signal is a special test signal that stresses particular aspects of serial digital transmission. The performance of the Phase Locked-Loops (PLLs) in an SDI receiver must be able to tolerate long runs of 0's and 1's. Under normal conditions, only very short runs of these are produced due to a scrambling algorithm that is used. The Checkfield, also referred to as the Pathological test signal, will "undo" the scrambling and cause extremely long runs to occur. This test signal is very useful for testing transmission paths.

Chroma

The color or chroma content of a signal, consisting of the hue and saturation of the image.
See also Color Difference.

Component

In a component video system, the totality of the image is carried by three separate but related components. This method provides the best image fidelity with the fewest artifacts, but it requires three independent transmission paths (cables). The commonly used component formats are Luminance and Color Difference (Y/Pr/Pb), and RGB. It was far too unwieldy in the early days of color television to even consider component transmission.

Composite

Composite television dates back to the early days of color transmission. This scheme encodes the color difference information onto a color subcarrier. The instantaneous phase of the subcarrier is the color's hue, and the amplitude is the color's saturation or intensity. This subcarrier is then added onto the existing luminance video signal. This trick works because the subcarrier is set at a high enough frequency to leave spectrum for the luminance information. But it is not a seamless matter to pull

the signal apart again at the destination in order to display it or process it. The resultant artifacts of dot crawl (also referred to as chroma crawl) are only the most obvious result. Composite television is the most commonly used format throughout the world, either as PAL or NTSC. It is also referred to as Encoded video.

Color Difference

Color Difference systems take advantage of the details of human vision. We have more acuity in our black and white vision than we do in color. This means that we need only the luminance information to be carried at full bandwidth, we can scrimp on the color channels. In order to do this, RGB information is converted to carry all of the luminance (Y is the black and white of the scene) in a single channel. The other two channels are used to carry the "color difference". Noted as B-Y and R-Y, these two signals describe how a particular pixel "differs" from being purely black and white. These channels typically have only half the bandwidth of the luminance.

Decibel (dB)

The decibel is a unit of measure used to express the ratio in the amplitude or power of two signals. A difference of 20 dB corresponds to a 10:1 ratio between two signals, 6 dB is approximately a 2:1 ratio. Decibels add while the ratios multiply, so 26 dB is a 20:1 ratio, and 14 dB is a 5:1 ratio. There are several special cases of the dB scale, where the reference is implied. Thus, dBm refers to power relative to 1 milliwatt, and dBu refers to voltage relative to .775V RMS. The original unit of measure was the Bel (10 times bigger), named after Alexander Graham Bell.

dBFS

In Digital Audio systems, the largest numerical value that can be represented is referred to as Full Scale. No values or audio levels greater than FS can be reproduced because they would be clipped. The nominal operating point (roughly corresponding to 0 VU) must be set below FS in order to have headroom for audio peaks. This operating point is described relative to FS, so a digital reference level of -20 dBFS has 20 dB of headroom before hitting the FS clipping point.

DVI

Digital Visual Interface. DVI-I (integrated) provides both digital and analog connectivity. The larger group of pins on the connector are digital while the four pins on the right are analog.

EDH

Error Detection and Handling is a method to verify proper reception of an SDI or HD-SDI signal at the destination. The originating device inserts a data packet in the vertical interval of the SDI signal and every line of the HD signal which contains a checksum of the entire video frame. This checksum is formed by adding up the numerical values of all of the samples in the frame, using a complex formula. At the destination this same formula is applied to the incoming video and the resulting value is compared to the one included in the transmission. If they match, then the content has all arrived with no errors. If they don't, then an error has occurred.

Embedded Audio

Digital Audio can be carried along in the same bitstream as an SDI or HD-SDI signal by taking advantage of the gaps in the transmission which correspond to the horizontal and vertical intervals

of the television waveform. This technique can be very cost effective in transmission and routing, but can also add complexity to signal handling issues because the audio content can no longer be treated independently of the video.

Eye Pattern

To analyze a digital bitstream, the signal can be displayed visually on an oscilloscope by triggering the horizontal timebase with a clock extracted from the stream. Since the bit positions in the stream form a very regular cadence, the resulting display will look like an eye – an oval with slightly pointed left and right ends. It is easy to see from this display if the eye is "open", with a large central area that is free of negative or positive transitions, or "closed" where those transitions are encroaching toward the center. In the first case, the open eye indicates that recovery of data from the stream can be made reliably and with few errors. But in the closed case data will be difficult to extract and bit errors will occur. Generally it is jitter in the signal that is the enemy of the eye.

Frame Sync

A Frame Synchronizer is used to synchronize the timing of a video signal to coincide with a timing reference (usually a color black signal that is distributed throughout a facility). The synchronizer accomplishes this by writing the incoming video into a frame buffer memory under the timing direction of the sync information contained in that video. Simultaneously the memory is being read back by a timing system that is genlocked to a house reference. As a result, the timing or alignment of the video frame can be adjusted so that the scan of the upper left corner of the image is happening simultaneously on all sources. This is a requirement for both analog and digital systems in order to perform video effects or switch glitch-free in a router. Frame synchronization can only be performed within a single television line standard. A synchronizer will not convert an NTSC signal to a PAL signal, it takes a standards converter to do that.

Frequency Response

A measurement of the accuracy of a system to carry or reproduce a range of signal frequencies. Similar to Bandwidth.

H.264

The latest salvo in the compression wars is H.264 which is also known as MPEG-4 Part 10. MPEG-4 promises good results at just half the bit rate required by MPEG-2.

HD

High Definition. This two letter acronym has certainly become very popular. Here we thought it was all about the pictures – and the radio industry stole it.

HDMI

The High Definition Multimedia Interface comes to us from the consumer marketplace where it is becoming the de facto standard for the digital interconnect of display devices to audio and video sources. It is an uncompressed, all-digital interface that transmits digital video and eight channels of digital audio. HDMI is a bit serial interface that carries the video content in digital component form over multiple twisted-pairs. HDMI is closely related to the DVI interface for desktop computers and their displays.

IEC

The International Electrotechnical Commission provides a wide range of worldwide standards. They have provided standardization of the AC power connection to products by means of an IEC line cord. The connection point uses three flat contact blades in a triangular arrangement, set in a rectangular connector. The IEC specification does not dictate line voltage or frequency. Therefore, the user must take care to verify that a device either has a universal input (capable of 90 to 230 volts, either 50 or 60 Hz), or that a line voltage switch, if present, is set correctly.

Interlace

Human vision can be fooled to see motion by presenting a series of images, each with a small change relative to the previous image. In order to eliminate the flicker, our eyes need to see more than 30 images per second. This is accomplished in television systems by dividing the lines that make up each video frame (which run at 25 or 30 frames per second) into two fields. All of the odd-numbered lines are transmitted in the first field, the even-numbered lines are in the second field. In this way, the repetition rate is 50 or 60 Hz, without using more bandwidth. This trick has worked well for years, but it introduces other temporal artifacts. Motion pictures use a slightly different technique to raise the repetition rate from the original 24 frames that make up each second of film—they just project each one twice.

IRE

Video level is measured on the IRE scale, where 0 IRE is black, and 100 IRE is full white. The actual voltages that these levels correspond to can vary between formats.

ITU-R 601

This is the principal standard for standard definition component digital video. It defines the luminance and color difference coding system that is also referred to as 4:2:2. The standard applies to both PAL and NTSC derived signals. They both will result in an image that contains 720 pixels horizontally, with 486 vertical pixels in NTSC, and 576 vertically in PAL. Both systems use a sample clock rate of 27 MHz, and are serialized at 270 Mb/s.

Jitter

Serial digital signals (either video or audio) are subject to the effects of jitter. This refers to the instantaneous error that can occur from one bit to the next in the exact position of each digital transition. Although the signal may be at the correct frequency on average, in the interim it varies. Some bits come slightly early, others come slightly late. The measurement of this jitter is given either as the amount of time uncertainty or as the fraction of a bit width. For 270 Mb/s SD video, the allowable jitter is 740 picoseconds, or 0.2 UI (Unit Interval – one bit width). For 1.485 Gb/s HD, the same 0.2UI spec corresponds to just 135 pico seconds.

Luminance

The "black & white" content of the image. Human vision had more acuity in luminance, so television systems generally devote more bandwidth to the luminance content. In component systems, the luminance is referred to as Y.

MPEG

The Moving Picture Experts Group is an industry group that develops standards for the compression of moving pictures for television. Their work is an on-going effort. The understanding of image processing and information theory is constantly expanding. And the raw bandwidth of both the hardware and software used for this work is ever increasing. Accordingly, the compression methods available today are far superior to the algorithms that originally made the real-time compression and decompression of television possible. Today, there are many variations of these techniques, and the term MPEG has to some extent become a broad generic label.

Metadata

This word comes from the Greek, meta means 'beyond' or 'after'. When used as a prefix to 'data', it can be thought of as 'data about the data'. In other words, the metadata in a data stream tells you about that data – but it is not the data itself. In the television industry, this word is sometimes used correctly when, for example, we label as metadata the timecode which accompanies a video signal. That timecode tells you something about the video, i.e. when it was shot, but the timecode in and of itself is of no interest. But in our industry's usual slovenly way in matters linguistic, the term metadata has also come to be used to describe data that is associated with the primary video in a datastream. So embedded audio will (incorrectly) be called metadata when it tells us nothing at all about the pictures.

Multi-mode

Multi-mode fibers have a larger diameter core than single mode fibers (either 50 or 62.5 microns compared to 9 microns), and a correspondingly larger aperture. It is much easier to couple light energy into a multi-mode fiber, but internal reflections will cause multiple "modes" of the signal to propagate down the fiber. This will degrade the ability of the fiber to be used over long distances.
See also Single Mode.

NTSC

The color television encoding system used in North America was originally defined by the National Television Standards Committee. This American standard has also been adopted by Canada, Mexico, Japan, Korea, and Taiwan. (This standard is referred to disparagingly as Never Twice Same Color.)

Optical

An optical interface between two devices carries data by modulating a light source. This light source is typically a laser or laser diode (similar to an LED) which is turned on and off at the bitrate of the datastream. The light is carried from one device to another through a glass fiber. The fiber's core acts as a waveguide or lightpipe to carry the light energy from one end to another. Optical transmission has two very significant advantages over metallic copper cables. Firstly, it does not require that the two endpoint devices have any electrical connection to each other. This can be very advantageous in large facilities where problems with ground loops appear. And secondly, and most importantly, an optical interface can carry a signal for many kilometers or miles without any degradation or loss in the recovered signal. Copper is barely useful at distances of just 1000 feet.

Oversampling

A technique to perform digital sampling at a multiple of the required sample rate. This has the advantage of raising the Nyquist Rate (the maximum frequency which can be reproduced by a given sample rate) much higher than the desired passband. This allows more easily realized anti-aliasing filters.

PAL

During the early days of color television in North America, European broadcasters developed a competing system called Phase Alternation by Line. This slightly more complex system is better able to withstand the differential gain and phase errors that appear in amplifiers and transmission systems. Engineers at the BBC claim that it stands for Perfection At Last.

Pathological Test Pattern – see Checkfield

Progressive

An image scanning technique which progresses through all of the lines in a frame in a single pass. Computer monitors all use progressive displays. This contrasts to the interlace technique common to television systems.

Return Loss

An idealized input or output circuit will exactly match its desired impedance (generally 75 ohms) as a purely resistive element, with no reactive (capacitive or inductive) elements. In the real world, we can only approach the ideal. So, our real inputs and outputs will have some capacitance and inductance. This will create impedance matching errors, especially at higher frequencies. The Return Loss of an input or output measures how much energy is returned (reflected back due to the impedance mismatch). For digital circuits, a return loss of 15 dB is typical. This means that the energy returned is 15 dB less than the original signal. In analog circuits, a 40 dB figure is expected.

RGB

RGB systems carry the totality of the picture information as independent Red, Green, and Blue signals. Television is an additive color system, where all three components add to produce white. Because the luminance (or detail) information is carried partially in each of the RGB channels, all three must be carried at full bandwidth in order to faithfully reproduce an image.

ScH Phase

Used in composite systems, ScH Phase measures the relative phase between the leading edge of sync on line 1 of field 1 and a continuous subcarrier sinewave. Due to the arithmetic details of both PAL and NTSC, this relationship is not the same at the beginning of each frame. In PAL, the pattern repeats ever 4 frames (8 fields) which is also known as the Bruch Blanking sequence. In NTSC, the repeat is every 2 frames (4 fields). This creates enormous headaches in editing systems and the system timing of analog composite facilities.

Setup

In the NTSC Analog Composite standard, the term Setup refers to the addition of an artificial offset or pedestal to the luminance content. This places the Black Level of the analog signal 54 mV (7.5 IRE) positive with respect to ground. The use of Setup is a legacy from the early development of television receivers in the vacuum tube era. This positive offset helped to prevent the horizontal retrace of the electron beam from being visible on the CRT, even if Brightness and Contrast were mis-adjusted. While the use of Setup did help to prevent retrace artifacts, it did so at the expense of dynamic range (contrast) in the signal because the White Level of the signal was not changed.

Setup is optional in NTSC systems, but is never used in PAL systems (see 'Perfection' characteristic of PAL). This legacy of Setup continues to persist in North American NTSC systems, while it has been abandoned in Japan.

In the digital component world (SD and HD SDI) there is obviously no need for, and certainly every reason to avoid, Setup. In order for the interfaces between analog and digital systems to operate as transparently as possible, Setup must be carefully accounted for in conversion products. When performing analog to digital conversion, Setup (if present) must be removed and the signal range gained up to account for the 7.5% reduction in dynamic range. And when a digital signal is converted back to analog form, Setup (if desired on the output) must be created by reducing the dynamic range by 7.5% and adding the 54 mV positive offset. Unfortunately, there is no truly foolproof algorithm to detect the presence of Setup automatically, so it's definitely a case of installer beware.

SDI

Serial Digital Interface. This term refers to inputs and outputs of devices that support serial digital component video. This could refer to standard definition at 270 Mb/s, HD SDI or High Definition Serial Digital video at 1.485 Gb/s, or to the newer 3G standard of High Definition video at 2.97 Gb/s.

SMPTE

The Society of Motion Picture and Television Engineers is a professional organization which has done tremendous work in setting standards for both the film and television industries. The term "SMPTE"' is also shorthand for one particular component video format - luminance and color difference.

Single Mode

A Single mode (or mono mode) optical fiber carries an optical signal on a very small diameter (9 micron) core surrounded with cladding. The small diameter means that no internally reflected light waves will be propagated. Thus only the original "mode" of the signal passes down the fiber.
A single mode fiber used in an optical SDI system can carry a signal for up to 20 kilometers. Single mode fibers require particular care in their installation due to the extremely small optical aperture that they present at splice and connection points. See also Multi-mode.

TBC

A Time Base Corrector is a system to reduce the Time Base Error in a signal to acceptable levels. It accomplishes this by using a FIFO (First In, First Out) memory. The incoming video is written into the memory using its own jittery timing. This operation is closely associated with the actual digitization of the analog signal because the varying position of the sync timing must be mimicked by the sampling function of the analog to digital converter. A second timing system, genlocked to a stable reference,

is used to read the video back out of the memory. The memory acts as a dynamically adjusting delay to smooth out the imperfections in the original signal's timing. Very often a TBC will also function as a Frame Synchronizer. See also Frame Sync.

Time Base Error

Time base error is present when there is excessive jitter or uncertainty in the line to line output timing of a video signal. This is commonly associated with playback from video tape recorders, and is particularly severe with consumer type heterodyne systems like VHS. Time base error will render a signal unusable for broadcast or editing purposes.

Timecode

Timecode, a method to uniquely identify and label every frame in a video stream, has become one of the most recognized standards ever developed by SMPTE. It uses a 24 hour clock, consisting of hours, minutes, seconds, and television frames. Originally recorded on a spare audio track, this 2400 baud signal was a significant contributor to the development of video tape editing. We now refer to this as LTC or Longitudinal Time Code because it was carried along the edge of the tape. This allowed it to be recovered in rewind and fast forward when the picture itself could not. Timecode continues to be useful today and is carried in the vertical interval as VITC, and as a digital packet as DVITC. Timecode is the true metadata.

Tri-Level Sync

For many, many years, television systems used composite black as a genlock reference source. This was a natural evolution from analog systems to digital implementations. With the advent of High Definition television, with even higher data rates and tighter jitter requirements, problems with this legacy genlock signal surfaced. Further, a reference signal with a 50 or 60 Hz frame rate was useless with 24 Hz HD systems running at film rates. Today we can think of composite black as a bi-level sync signal – it has two levels, one at sync tip and one at blanking. For HD systems, Tri-Level Sync, which has the same blanking level (at ground) of bi-level sync, but the sync pulse now has both a negative and a positive element. This keeps the signal symmetrically balanced so that its DC content is zero. And it also means that the timing pickoff point is now at the point where the signal crosses blanking and is no longer subject to variation with amplitude. This makes Tri-Level Sync a much more robust signal and one which can be delivered with less jitter.

USB

The Universal Serial Bus, developed in the computer industry to replace the previously ubiquitous RS-232 serial interface, now appears in many different forms and with many different uses. It actually forms a small local area network, allowing multiple devices to coexist on a single bus where they can be individually addressed and accessed.

VGA

Video Graphics Array. Traditional 15-pin, analog interface between a PC and monitor.

Word Clock

Use of Word Clock to genlock digital audio devices developed in the audio recording industry. Early digital audio products were interconnected with a massive parallel connector carrying a twisted pair for every bit in the digital audio word. A clock signal, which is a square wave at the audio sampling frequency, is carried on a 75 ohm coaxial cable. Early systems would daisychain this 44.1 or 48 kilohertz clock from one device to another with coax cable and Tee connectors. On the rising edge of this Work Clock these twisted pairs would carry the left channel, while on the falling edge, they would carry the right channel. In most television systems using digital audio, the audio sample clock frequency (and hence the 'genlock' between the audio and video worlds) is derived from the video genlock signal. But products that are purely audio, with no video reference capability, may still require Word Clock.

WSS

Wide Screen Signaling is used in the PAL/625 video standards, both in analog and digital form, to convey information about the aspect ratio and format of the transmitted signal. Carried in the vertical interval, much like closed captioning, it can be used to signal a television receiver to adjust its vertical or horizontal sizing to reflect incoming material. Although an NTSC specification for WSS exists, it never achieved any traction in the marketplace.

YUV

Strictly speaking, YUV does not apply to component video. The letters refer to the Luminance (Y), and the U and V encoding axes using in the PAL composite system. Since the U axis is very close to the B-Y axis, and the V axis is very close to the R-Y axis, YUV is often used as a sort of shorthand for the more long-winded "Y/R-Y/B-Y".

Y/Cr/Cb

In digital component video, the luminance component is Y, and the two color difference signals are Cr (R-Y) and Cb (B-Y).

Y/Pr/Pb

In analog component video, the image is carried in three components. The luminance is Y, the R-Y color difference signal is Pr, and the B-Y color difference signal is Pb.