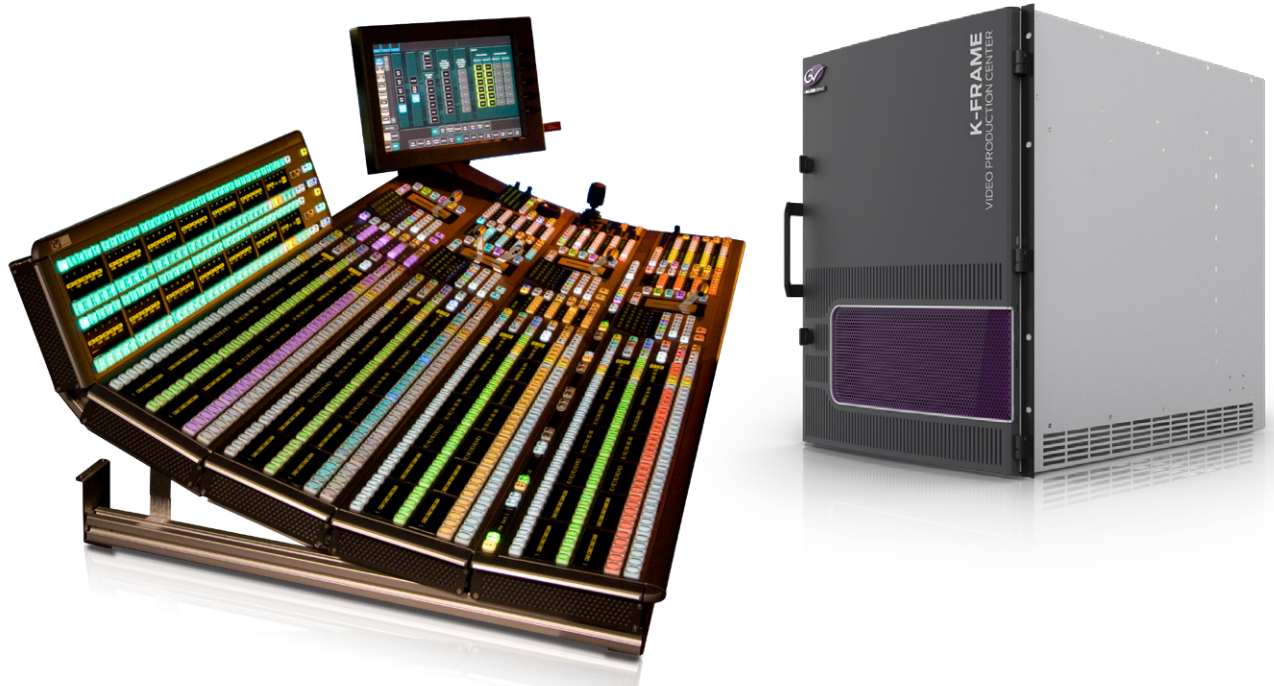




## Using the Kayenne 4.5 M/E for “5D” Production

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A single Kayenne Video Production Center switcher can provide a complete solution for simultaneously producing a show in 2D and 3D.

## Introduction

The “5D” production concept requires a production switcher to simultaneously output both a 2D and 3D version of the same program, with the technical director (TD) managing and manipulating only the 2D program. The Kayenne Video Production Center switcher from Grass Valley, a Belden Brand, includes the unique capability to automatically conform a matching 3D program based on the TD’s switching of a 2D program, while accommodating the need for clean feeds. Kayenne’s control panel provides the required on-the-fly delegation via panel memory (P-MEM) which allows the TD to have instant access to any part of the program (i.e., 2D, left eye, or right eye). The function-specific color coding and transition module status display of the Kayenne provides invaluable feedback to the TD.

The Kayenne has standard functionality which makes this possible:

### Bus Linking

- A sources cut on any bus forces matching cuts on any combination of other buses with source substitution for left/right eye as well as the creation of clean feeds
- A Grass Valley exclusive software feature permits multiple master and slave buses. For example, a slaved bus can also act as a master to another bus. *This is especially useful for making stereo 3D aux buses*
- **Source combination flexibility** — there are no built-in rules which force left/right eye source definition
- Grass Valley has pioneered stereo 3D look-ahead preview

### Transition Chaining

- Transition elements, such as individual keyers or backgrounds, on a **single M/E** can automatically select the matching transitions **on any other M/E or a combination of M/Es**. *This makes switching 3D seamless to the TD. The versatile panel delegation can instantly show the status of the “slaved” sections*
- There is a unique transition synchronization function that guarantees stereo 3D transition matching. *This ensures field accuracy between the left-eye and right-eye feeds. The panel shows this mode via color coding of the Primary and Secondary buttons providing the operator added confidence*

## Stereo 3D Using Only One M/E

Every mix effects bank can be split into two partitions using Grass Valley DoubleTake software. This means that each M/E, including the simple M/E (M/E 50), may be made into two signal flow providers. The TD can decide how many keyers each partition uses. The optimal configuration for stereo 3D is to dedicate three keyers to each partition. This allows three “left eye” keyers to essentially be “married” to three “right eye” keyers within the same M/E. There are also two additional outputs for left-eye/right-eye programmable clean feeds. Those outputs can be tied to E-MEMs allowing the operator to change clean feed signals on an effect-by-effect basis.

Kayenne stores a set of up to 15 Source Tables for bus linking to define which source is selected on the secondary bus when one is selected on the primary bus. These tables are shared across all bus links.

Bus links and their association to a Source Table can now be stored and recalled via an E-MEM.

The parameters for Transition Chaining are not learned or recalled by E-MEM to prevent accidental or unintentional changes to the way a show is cut. The decision of which buses transition together is the core of a 5D show and is intended to be defined prior to on-air operations.

In the figure below, the choice of which keyers are bus-linked and transition-chained ensures that both left and right eyes have equivalent keyers to be able to, for instance, use iDPM channels or make chromakeys.

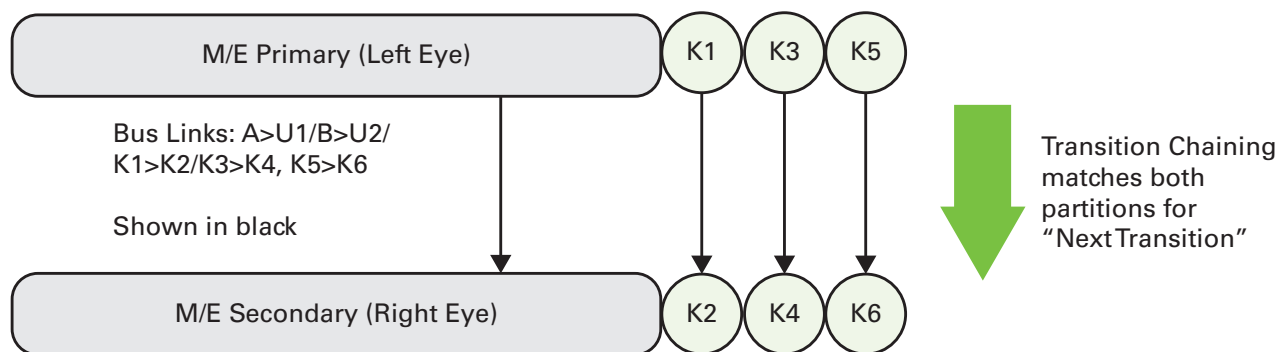


Figure 1 – Single M/E in DoubleTake mode for stereo 3D operation.

## Stereo 3D Using Two M/Es

In some cases — especially those in which complex keying takes place or where up to three stereo 3D clean feeds are required—the TD may decide that a split M/E as described previously does not give enough keying flexibility.

To make a more powerful stereo 3D M/E, the TD may choose to bus-link and transition-chain across two M/Es.

The TD or engineer in charge (EIC) must acquire full M/E hardware in the Engineering Menu for both PGM/PST and M/E 4 in the example above to ensure that the two stereo halves of the stereo 3D M/E have equivalent power in terms of keying and iDPM usage.

The bus link is a direct one-to-one link from one controlling “left-eye” M/E bus to its matching controlled “right-eye” M/E bus. One of the 15 pre-defined Source Tables is applied here to define all linked right-eye sources. Transition-chaining in this example is directly between M/Es.

The new double M/E that is used in stereo 3D has:

- Four stereo 3D program outputs:
  - This provides one program and three stereo 3D clean feeds
  - Two stereo 3D look-ahead previews
- Six stereo 3D keyers:
  - Four of these are full keyers with access to iDPM
  - If the M/Es are operated in DoubleTake mode, the primary side can be set to perform operations for the 2D show and the secondary partition can be used for the 3D show (or vice versa). Bus linking with Source Tables for source substitution accomplishes this.

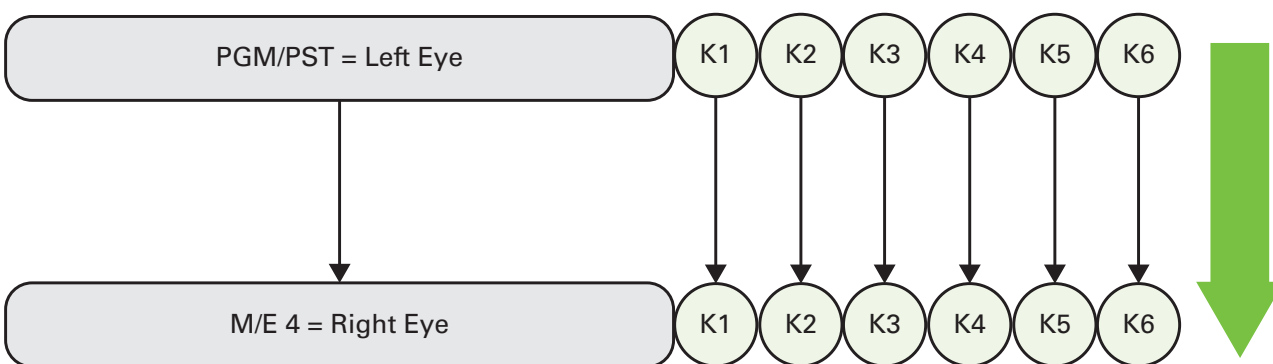


Figure 2. 2 M/Es linked and chained to build one stereo 3D M/E

## 5D Operation Using One More M/E

In both previous examples, only the stereo 3D operation was described. By adding an M/E (which has buses linked from the left-eye partition or M/E) to the 2D sources, and including a transition chain, a standard 2D output with up to three clean-feeds can be made available.

The TD may choose to set up two stereo 3D M/Es as shown so that the traditional way of cutting a program on M/E 3 (upstream of the powerful PGM/PST where complex keying takes place) can be performed. In this case (shown with the green bus-link arrow), the TD may also choose to chain the transitions of M/E 3 and M/E 1 for backgrounds, and the keyers of PGM/PST and M/E 1 for keying. This is very hard to accomplish with other switchers and causes users to limit the way they build stereo 3D programs. Transition Chaining provides a means for the TD to insert one key and have several others follow (i.e., insert M/E 3 K1 and M/E 1 K1 + M/E 2 K1 all follow). Chains are not one-to-one. The TD can configure any key or M/E to control any other keyer or M/E.

For some segments it may be necessary for the TD to cut sources on PGM/PST. If so, the bus linking and transition chaining will need to be altered so that PGM/PST is exclusively the master. This is achieved by using an E-MEM recall to alter the bus links; the E-MEM may also contain a macro to alter the pattern of transition chaining. Macros are well suited for this as it takes a very deliberate action to record and embed such a powerful change.

The user may program a macro on the panel at M/E 3 and at PGM/PST which recalls the two E-MEMs required to flip-flop control as they move around the switcher.

As shown in Figure 3, if complex graphical transitions are used for the stereo 3D output at PGM/PST, the TD has one more M/E still unused. This is a simple M/E, and may be added into the signal flow as the 2D PGM/PST equivalent with extra bus linking and transition chaining. The simple M/E does not perform wipes, but experience shows that wipes are not typically used as a transition style in 3D and so a matching 2D show might not use them either.

Grass Valley’s exclusive Partial Keyframing feature and definable levels permit the TD to control only the sections of an M/E that are required for a particular effect. Definable levels provide a way to control external devices, such as DDRs dedicated to transitions, at a local E-MEM level. The Kayenne ClipStore option offers four stereo pairs for up to 10 hours of transition playback. With Master E-MEM, Partial Keyframing and definable levels, the TD has a multitude of options available for very specific effects buses.

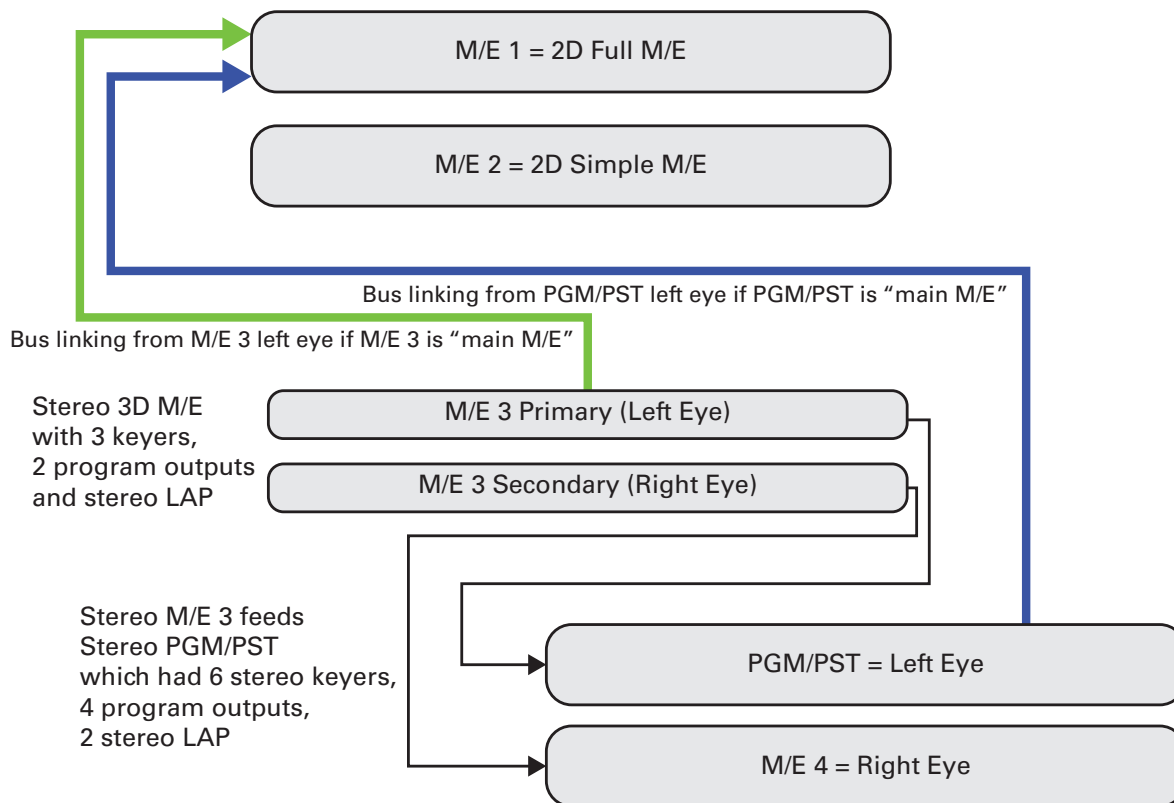


Figure 3. 5D operation with simple M/E 2 unused. In this example, the 2D M/E can be operated in the split mode thus supplying three additional video streams with its own unique bus linking for the 2D show.

## Suggested Setup: M/E In Layered Mode To Combine Keys

If an M/E is in layered mode, then keys 1, 3 and 5 can be put on one output pair (A&B) and the right eye (keys 2, 4, 6) on the other output. Key Chaining could be used to tie those keyers to the keyer buttons on the M/E where the primary switching is done. In this scenario, six keys (three stereo pairs) can be available and only two keyers on the main switching M/E (usually M/E 3) are used. This means 10 keyers (five stereo pairs) can be used on the same M/E.

## Conclusion

A standard Kayenne 4.5 M/E system can produce “5D” coverage using a mixture of DoubleTake split M/Es with linked and chained M/Es. The maximum number of stereo 3D M/Es is four with one 2D M/E. A more standard operation will provide:

- 2 x 2D M/Es
- 1 x DoubleTake 3D M/E
- 1 x twinned M/E 3D M/E

Aux buses may also be used as 3D outputs. There is 3D look-ahead preview as well as 3D clean feeds available from each 3D M/E which are equivalent to the standard 2D M/Es.

Kayenne’s eDPM system can also be easily configured for 3D. An eDPM offers four programmable outputs with four channels of DPM that translates into two 3D left-eye/right-eye streams. The output configuration can be saved as an E-MEM (just like the M/Es) so it is not locked into a preset configuration. The eDPM also offers partial key-framing, as well as separate E-MEM control of the Primary and Secondary (two 3D left-eye/right-eye streams) partitions.

Grass Valley’s advanced panel provides seemingly limitless tools for TDs to configure the Kayenne panel for a particular show, as well as for the specific individual. Panel Memory provides a way to instantly change panel configurations on-the-fly to meet the demands of specific portions of a program, then to instantly change the configuration back to the TD’s “normal” mode of operation. Function-specific color coding provides the TD instant status feedback at a glance. The Status Display area of each M/E shows sources in all buses, states of keyers, states of DPMs, as well as other necessary feedback so that the TD can quickly and easily see the status of all buses. This becomes very important when switching three distinct feeds: 2D, left-eye and right-eye for a “5D” program.

GVB-1-0154B-EN-AN



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