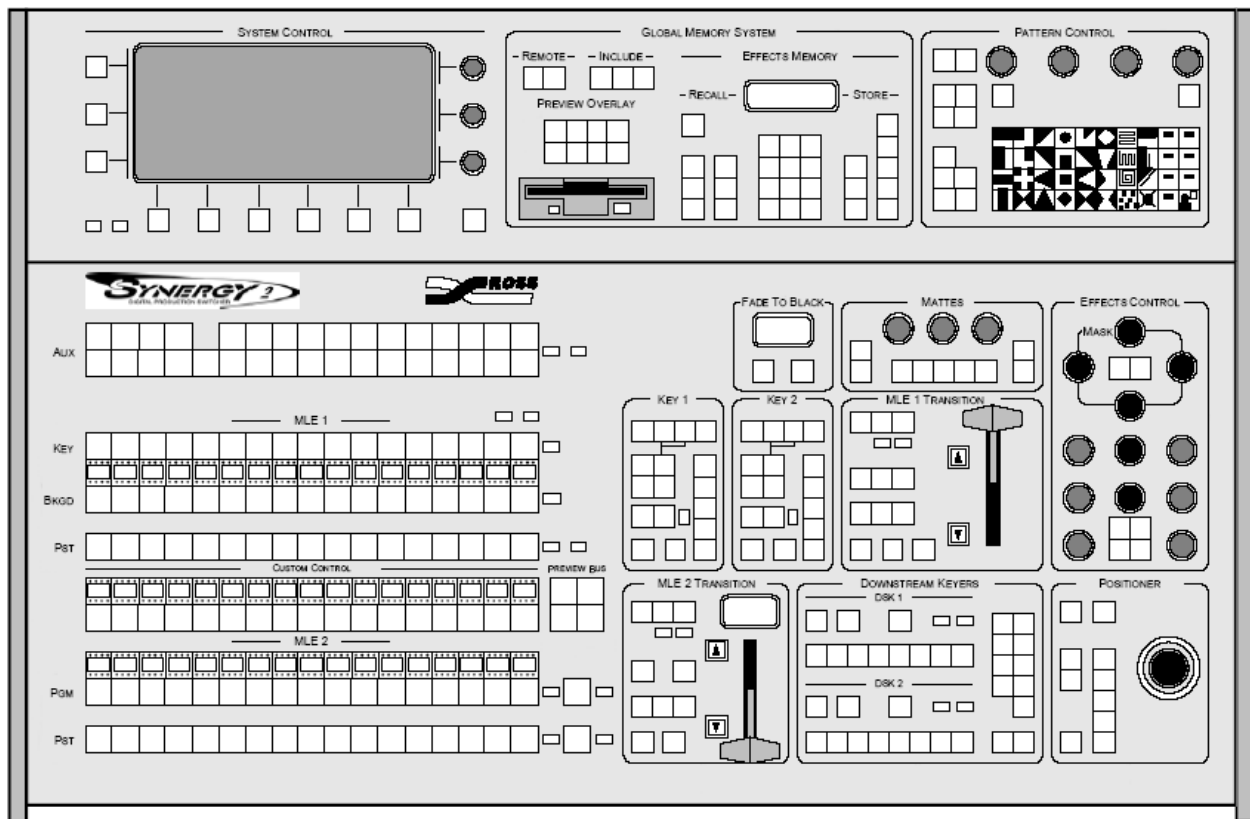


Basic Operation of the Ross Synergy 2 Switchers

Radio and Television Arts, Ryerson University - Revised, September, 2005

A switcher is a piece of electronic hardware that allows you to cut or transition immediately from one video source to another, and also add special video effects to your production. Think of switching as “live editing.”

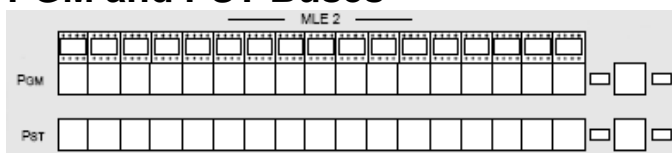
This is a picture of the switcher panel in control rooms A and B:



On the last page of this handout, you will find a larger picture, that you can tear away from the rest of this document and use as a “map” to follow along as we explain things.

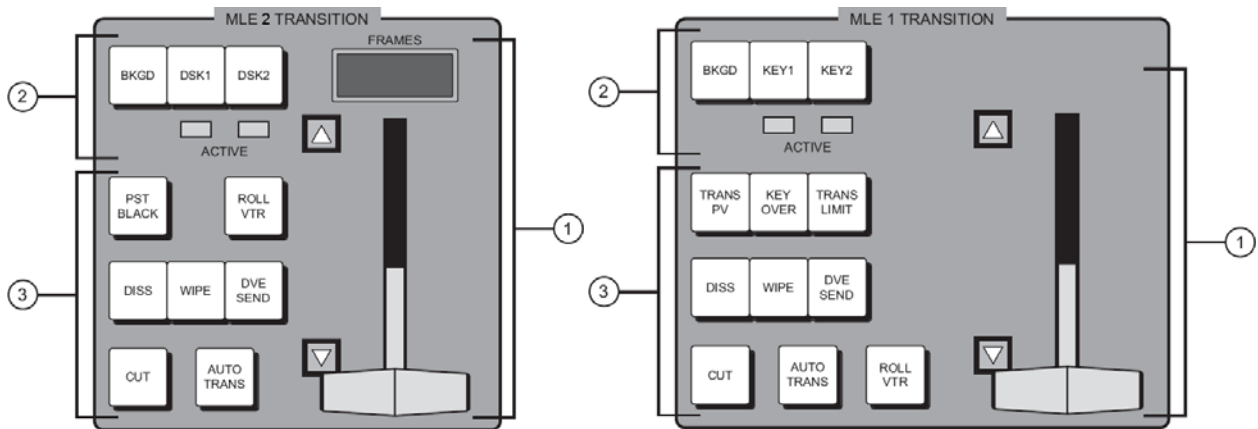
If you haven't used a switcher before, it can look fairly intimidating. But as we look at some of the basic parts of a switcher and the things you can do with them, you will see how all of the modules interact.

PGM and PST Buses



We have to have some way of actually selecting which video sources we will use for our effects. To do that, we use the PGM and PST buses. You simply push one of the labeled buttons to select the source you want to work with.

Transition Groups



The switcher includes one Program/Preset Transition group which you will find near the bottom of the switcher (left picture.)

And it also has one MLE (Multi Level Effects) Transition group, which is located in the panel's upper MLE - above the Program/Preset Bus. It looks almost exactly like the other transition group, with a few minor differences (right picture.)

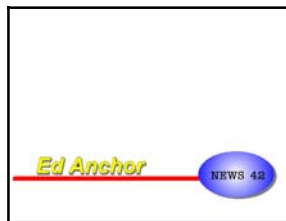
Think of these modules as being divided into three sections:

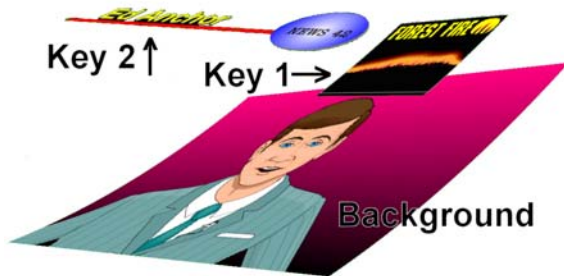
1. the fader section
2. the "next transition" section, and
3. the "transition parameter" section.

The fader section has a T-bar that you can push and pull to allow you to do effects transitions manually. It also has a small screen with some transition rate information in it.

The "next transition" section is where you tell the switcher what level of transition you'll be making: background transition (for cuts, dissolves and wipes) or a key transition (e.g., adding people's names on the screen from a character generator, adding split screens, chromakeys, and lots of other special effects.) Note that you can do more than one of these transition types at a time, just by pressing more than one button at once - you could change the background on air and add a key simultaneously, for example.

Think of these levels as "layers" in a composite image. Those of you who have used paint programs like Photoshop will be familiar with the concept of layers. Here's an example of transition layers that you might be using in a switcher:





This is the way the switcher handles them... but this is what you see on air!

Finally, the “transition parameter” section of the Transition group allows you to add modifiers to the transition you’ll be doing, as well as having two buttons - CUT and AUTO TRANS - which are other ways of letting you actually make the transition on air.

Cutting

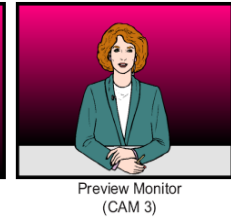
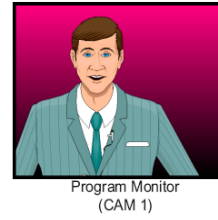
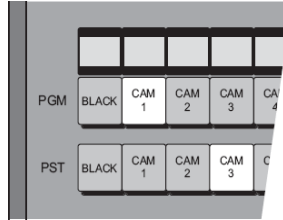
Background transitions are the most frequently used switcher operation. The simplest transition is a direct selection of the next picture on the PGM bus, performed by pressing another crosspoint. This simple “cut” provides an instantaneous change, but does not allow you to preview the next picture, and doesn’t allow you an opportunity to do any other kind of transition except “cut.” For this reason, most people don’t cut sources live to air on the PGM bus.

As well, the other types of transitions we’ll try in a moment involve the PST bus and the controls in the Program/Preset Transition group and the MLE Transition group. This uses the full capacity of the switcher and it means that while doing cuts, dissolves and wipes, you have a full preview of the upcoming picture.

Let’s do a simple “cut” background transition using the Program/Preset Transition group and the PGM and PST buses. A “background cut” is an instant switch between the PGM and PST buses (in the Program/Preset Transition group), or between the BKGD and PST buses (in the MLE Transition group).

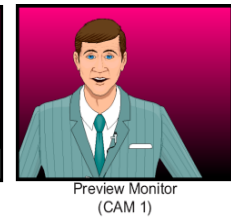
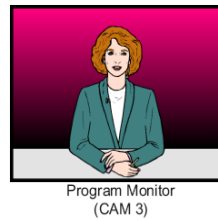
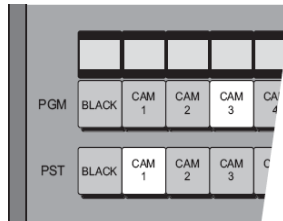
Use the following steps to perform a cut:

- Select an input on the MLE's PGM bus if the source you want on air isn't there already.
- Select a different input on the MLE's PST bus.
- In the Next Transition Section, select BKGD as the next transition.



Press CUT. The inputs selected on the PGM and PST buses instantly exchange and the buses flip-flop (their selections swap.)

Press CUT again to repeat the process and restore the original background.



As you preset different sources, the director can always see what source is coming up next in the Preview monitor...and so can you. You can preset/take, preset/take a lot of sources very quickly, and with assurance that you're setting up the right source every time. You can see that this is much more reliable and versatile than cutting the sources directly on the PGM bus.

Dissolves

Dissolves are a gradual fade-through transition from one video source to another. Dissolves can be performed in any MLE. In a "background dissolve" transition, the PGM bus video and PST bus video signals are gradually mixed together, until the PST bus video completely replaces the PGM bus video.

Use the following steps to perform a dissolve:

- Set up your PGM and PST buses as you did for a cut.
- In the Next Transition Section, select BKGD as the next transition.
- In the Transition Parameter Section, press DISS.

Once you're set up, you can either do the dissolve manually by moving the T-bar, or have it happen automatically for a preset duration by using the AUTO TRANS button:

- To perform a manual transition, move the Fader T-bar from limit to limit.
- To perform an auto transition, press the AUTO TRANS button.

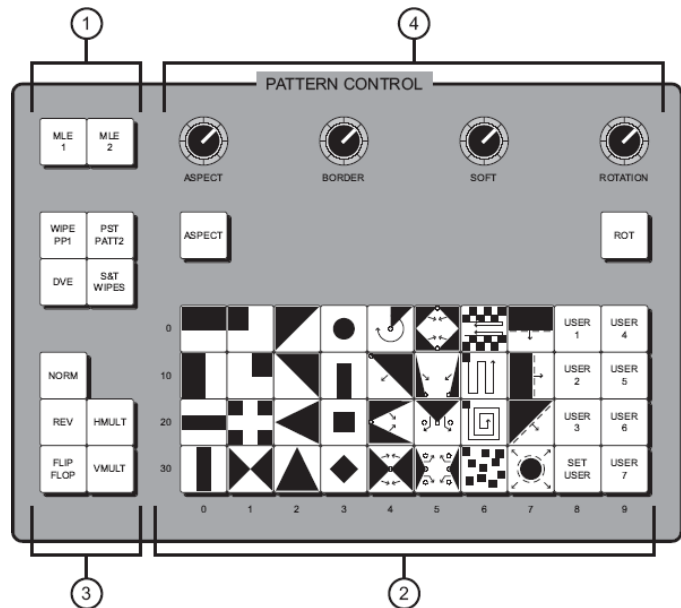
During the transition, the PST bus video signal gradually mixes into the PGM signal, as shown below. At the end of the transition, the PST video completely replaces the PGM video, and the buses flip-flop.

Wipes

A wipe is a transition where the PGM bus video is gradually replaced with the PST bus video according to a wipe pattern that you have pre-selected. To select the wipe pattern, and modify it, you'll work with the Pattern Control group.

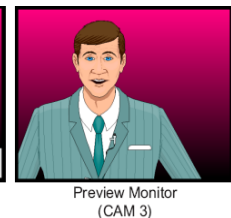
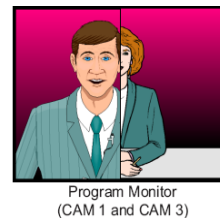
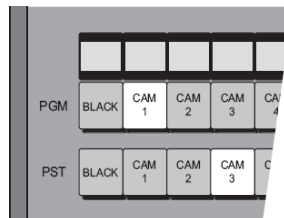
This module has four sections in it:

1. the pattern assignment area
 2. the pattern selection area
 3. the direction selection and
 4. the pattern control section
1. The assignment section simply tells the control group what MLE it's affecting: MLE 1 or 2.
 2. The selection area is the area with all the pictures of the wipe patterns - select the one you want to use by pushing its button.
 3. The direction section tells the switcher which way the wipe will move - normal, reverse, or alternating (flip flop). The area also lets you multiply the horizontal or vertical parameter of some wipes.
 4. Finally, the pattern control area lets you change the aspect ratio of some wipes, add a border to the edge of the wipe, soften that edge, or rotate the angle of the wipe movements.



Use the following procedure to perform a wipe:

- Set up your PGM and PST buses as usual.
- In the Next Transition Section, select BKGD as the next transition.
- In the Transition Parameter Section, press WIPE. This action automatically assigns the Pattern Control group to the MLE.
- In the Pattern Selection Section, press the button for the desired wipe pattern.
- In the Pattern Direction Section, choose the direction for the wipe. Select between NORM, REV, or FLIP FLOP.
- Turn the BORDER knob fully clockwise, then fully counterclockwise. For this first exercise, this ensures that there is no border.
- To perform a manual transition, move the Fader from limit to limit. To perform an auto transition, press the AUTO TRANS button. During the transition, the PST bus video signal gradually replaces the PGM/BKGD signal using the selected wipe, as shown.

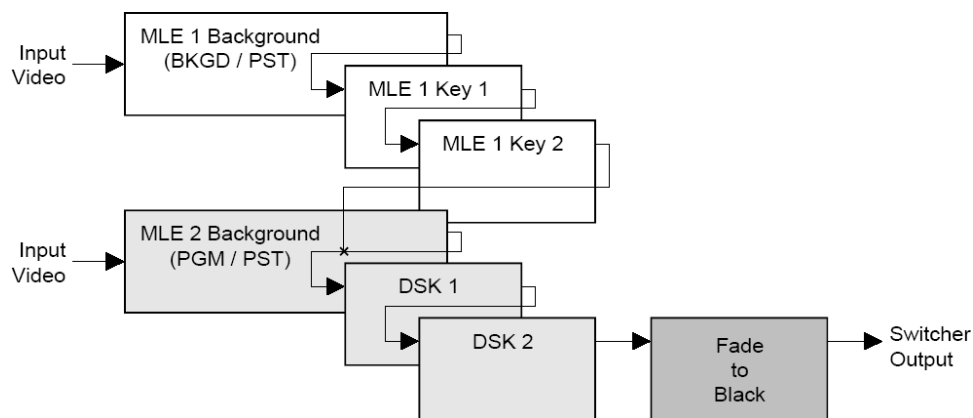


At the end of the transition, the PST video completely replaces the PGM/BKGD video, and the buses flip-flop.

Key Transitions

The “Keying” function allows you to insert (or electronically “cut”) portions of one scene into another, or to place titles over background images. Two signals are essentially required for a key:

- The “key” signal (also known as an alpha signal) is used to electronically *cut a hole* in the background video.
- The “fill” signal (also known as the key foreground) is used to electronically *fill the key signal’s hole with video*.



As we have seen before, keys are arranged as layers, which can be built up to create the desired composite image. With our switchers in studio A and B, you have a lot of flexibility in adding those layers.

All MLEs can generate two individual keys, which appear downstream (on top of) that MLE’s background images. The priority of those keys (which one’s on top of the other) can be also changed within the MLE itself.

- Each of the two DSKs (Down Stream Keyers) on the Program Transition group generates a single key, which is displayed visually downstream of all Program/Preset video images.

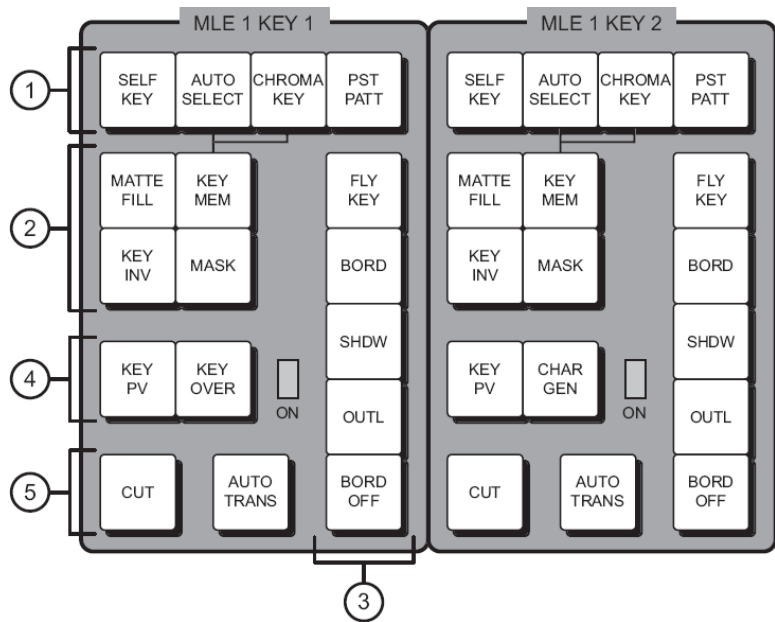
This means that with our switchers, you can generate *four* simultaneous keys on air (two in MLE 1 and two in the DSKs). That, along with the background transitions, means you can layer and change a lot of stuff at once!

There are a lot of visual effects you can do with a keyer, and so you will become familiar with the Key Groups on the switcher.

Here is where you can select and modify your keyer effects. Again, think of this module as a series of sections:

1. type of key
2. main modifiers
3. secondary modifiers
4. preview section and
5. transition section.

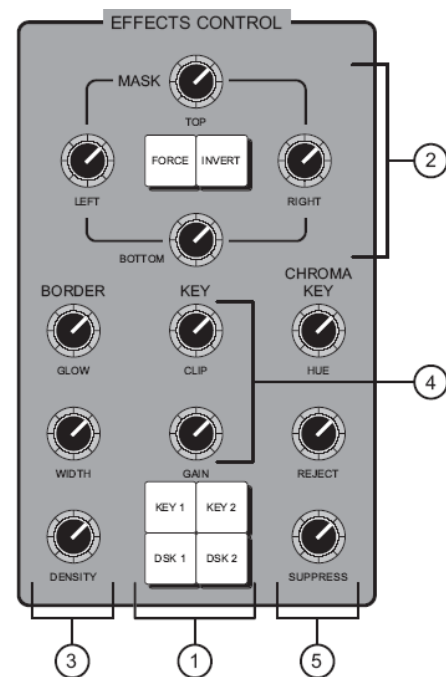
1. The key type area lets you select what kind of special effect you'll be doing.
2. The main modifier section lets you select some fill options, invert the key's background and fill, and crop portions of the key signal.
3. The secondary modifier section adds borders and shadows and more to your key.
4. The preview section lets you see the key transition before you actually take it to air, and also lets you decide which keyer (1 or 2) is "on top of" the other, in terms of layering.
5. Finally the transition section is something you've seen before - this is where you CUT or AUTO TRANS your key on and off air.



There are even more modifiers to key effects, so a separate group, Effects Control, is on the right side of the switcher.

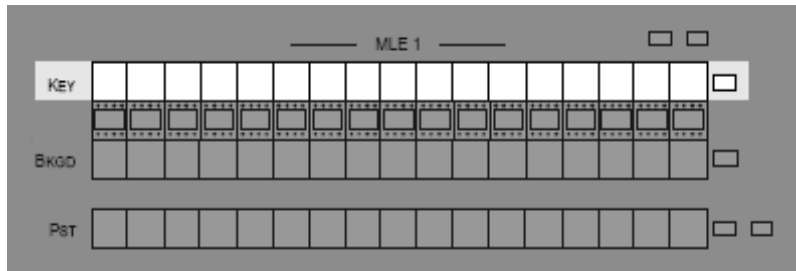
Here, you have sections for:

1. which keyer the control group is assigned to
2. modifiers for the masking (cropping) of your key
3. border control (for the key effects only, this isn't for wipe borders)
4. key clip and gain controls (to make the hole for your keys cut 'cleanly', with no fringing), and
5. chroma key controls



MLE Keys

Just as we use the PGM and PST buses to affect our background video sources, we use the KEY bus to tell the switcher what sources will be the “key” and “fill” signals for each of our keysers.



Here are some basic video effects.

Self Key

A Self Key is one in which the luminance (or brightness) values of the key source itself are used to cut the hole.

- Select an input on the MLE’s BKGD bus. This provides the background over which the key will appear.
- On the Key Bus, select the desired luminance key source (such as a title camera or VTR).
- In the MLE’s Key 1 or Key 2 group, press SELF KEY.
- To adjust clip level, use the CLIP knob in the Effects Control Section.
- To adjust gain (softness), use the GAIN knob in the Effects Control Section.
- Press CUT (in the MLE Key group) to cut the key on (or off) air.
- Press AUTO TRANS (in the MLE Key group) to dissolve the key on (or off) air.
- Use the proper KEY 1 or KEY 2 “next transition” button (in the MLE Transition Group) and then CUT or AUTO TRANS in the Transition Group to bring the key on (or off) air.

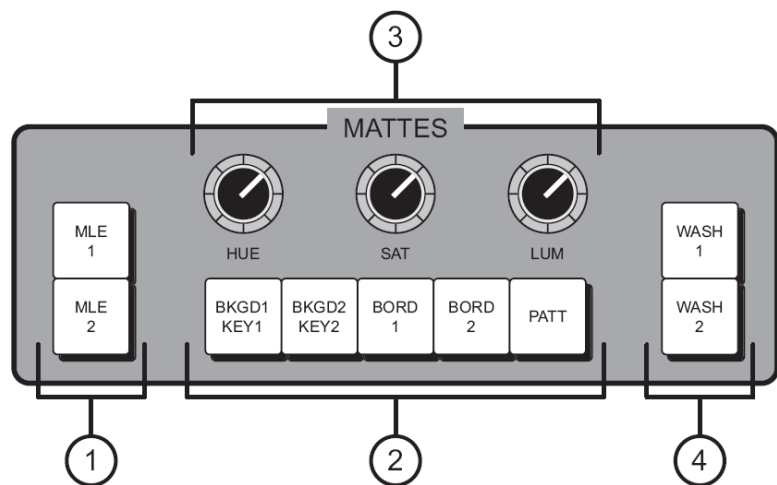
Modifications to A Key

Matte Key

You can fill the hole you’ve cut with a solid colour (internally generated in the switcher) called a matte. If you do that, you’ll likely want to modify the colour you use, and you’ll use the Mattes Group to do that.

It has sections for

1. which MLE is being affected by the matte modifier controls
2. exactly what matte generator you’re affecting within a given MLE
3. colour knobs, and
4. activation of colour washes (blends between two different colours)



To modify your key to be a matte key:

- In the selected MLE keyer, press MATTE FILL. The matte generator's current color now fills the key hole.
- Use the HUE, SAT and LUM controls in the Matte Group to modify the matte's hue, saturation and luminance, respectively.
- If desired, press WASH 1 or WASH 2 to display the Wash Menu. This menu allows you to design a custom wash color with which to fill the key.

Mask A Key

Sometimes the key source will have extraneous information around the edges that you don't want to appear on screen in the final key. You can crop that material out, using the MASK.

Use the following steps to mask a key:

- In the selected keyer, press MASK. The mask generator's current settings are now applied to the key. Move the edges around using the TOP, BOTTOM, LEFT and RIGHT trim knobs in the Effects Control group.
- Pressing the INVERT button to the On position will invert or "reverse" the mask.
- Pressing the FORCE button will "force" the masked portion of the signal onto the screen.

Invert A Key

Occasionally, the material you're using to key with is "wrong way around". For example, you may be supplied with a camera graphic that has black letters on a white background (someone's given you regular paper printout, but television graphics are normally supplied with black backgrounds.) In that case, you will want to invert the key's polarity so the lettering appears properly on screen.

Use the following steps invert a key:

- Set up the desired key type and source, and clip the key using the controls in the Effects Control group.
- In the selected MLE keyer (or Downstream keyer), press KEY INV. The polarity of the selected key is now reversed.
- Re-adjust the key's clip and gain settings as required. This step is often necessary when a key is inverted.
- Add additional key modifiers as required, then select the desired manual or auto transition in the normal manner.

Add Borders To A Key



The Key Border function allows you to place borders, shadows and outlines around any key type on the switcher. The following figures show samples of the three types of borders that can be created by the Border Generator.

- Press BORD to add a border behind the selected key type. The border can surround the key, or it can appear as a detached image that can be offset to any distance and direction. Border width, color and transparency are all adjustable
- Press SHDW to add a drop shadow behind the selected key type. The shadow is connected to the key signal, instead of being detached. Shadow width, color and transparency are all adjustable.
- If the GHOST function is enabled using BORD or SHDW, the key fill is turned off, leaving just the key borders.
- Press OUTL to add an outline around the selected key type, with variable width, color and transparency. With OUTL selected, the key fill is completely transparent.

Auto Select Key

An Auto Select (or “linear”) key is one in which two signals are used to cut and fill the hole - a key (alpha) signal, and a fill signal. These signals originate from devices such as character generators, still stores, DVEs and graphics systems.

Use the following procedure to perform an auto select key on an MLE Keyer:

- Select an input on the MLE’s BKGD bus. This provides the background over which the key will appear.
- On the Key Bus, select the desired linear key source (such as a character generator).
- In the MLE’s Key 1 or Key 2 group, press AUTO SELECT.
- The key’s clip and gain settings were set during the installation process. Typically, they should not need to be adjusted. If you do need to adjust them temporarily, turn off the KEY MEM button and adjust clip and gain as you did with a self key.
- Press CUT (in the MLE Key group) to cut the key on (or off) air.
- Press AUTO TRANS (in the MLE Key group) to dissolve the key on (or off) air.
- Use the proper KEY 1 or KEY 2 “next transition” button (in the MLE Transition Group) and then CUT or AUTO TRANS in the Transition Group to bring the key on (or off) air.

You can also matte fill, add a mask, invert, or add border effects as you learned with self keys.

Preset Pattern Key

A Preset Pattern key is one in which the hole is cut based on a wipe pattern that you select in the Pattern Control group. The pattern (which acts just like the alpha signal used with an auto select key) is filled with video from the Key Bus. Please note the following rules:

- When you press PST PATT, the system automatically selects FLY KEY and, by default, selects a box wipe. To use a preset pattern key without the Fly Key mode enabled, simply press FLY KEY.
- If you perform a Preset Pattern key in the MLE’s Key 1, the pattern generator is full-featured but it is shared with the MLE’s Wipe Generator.
- If you perform a Preset Pattern key in the MLE’s Key 2, the pattern generator is not shared, but it is restricted to the first six columns of wipes (minus the circle). Matrix wipes are not available.

Use the following steps to perform a Preset Pattern key on an MLE keyer:

- Select an input on the MLE's PGM or BKGD bus. This provides the background that will appear outside the wipe pattern.
- On the Key Bus, select the desired source that you want to appear inside the wipe pattern.
- In the MLE's Key 1 or Key 2 group, press PST PATT. The Fly Key mode is automatically enabled,
- If the FLY KEY button lights up, press it once to disable the Fly Key mode.
- In the Pattern Control group, select the desired wipe pattern.
- In the Pattern Control group, adjust wipe parameters such as ASPECT, BORDER, SOFT, ROTATION, NORM and REV.
- Select and adjust additional key modifiers as desired, using the controls in Key Modifier Sections 1 and 2. Modifiers include KEY INV, MASK, FLY, POSITIONER, and Border Effects.
- Select the desired transition.

Chroma Key

A Chroma Key is one in which the hole is cut based on a color value (hue), rather than on a luminance value or an alpha signal. The color is electronically removed and replaced with background video from another image.

Use the following steps to perform a Chroma Key on an MLE keyer:

- Select an input on the MLE's PGM or BKGD bus. This provides the background over which the Chroma Key will appear.
- On the Key Bus, select the desired Chroma Key source (typically, a camera or a graphics system).
- In the MLE's Key 1 or Key 2 group, press CHROMA KEY.
- Clip, gain, and hue can be adjusted with the controls in the Effects Control Section.
- The Reject parameter (the width of the selected hue) can be adjusted with the REJECT knob in the Effects Control Section.
- The Chroma Suppress parameter (the amount of chroma retained in the key's foreground) can be adjusted with the SUPPRESS knob in the Effects Control Section.

Downstream Keys

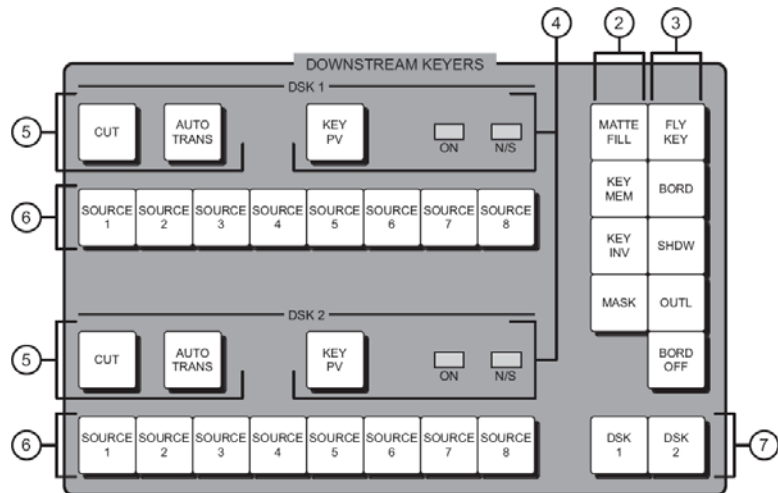
Downstream keys (DSKs) are a little different than MLE keys:

- They are, electronically speaking, positioned as the last keys you can layer onto your video output before it goes to air so they are often used as title keys and "name" keys.
- They have a limited selection of key sources, which are available on a mini-key buss within the Downstream Key group. Within each of these selections is memorized the parameters for each key including key type, sources, modifiers, clips - *everything*. These parameters were set up when the switcher was installed in the control room.
- Keys in the DSK module can only cut or dissolve the keys on and off air.

Other than that, this Key group has the same functionality and operation as a regular MLE key group:

You have:

2. The main modifier section, which lets you select some fill options, invert the key's background and fill, and crop portions of the key signal.
3. The secondary modifier section which adds borders and shadows and more to your key.
4. The preview section lets you see the key transition before you actually take it to air.
5. The transition section is something you've seen before - this is where you CUT or AUTO TRANS your key on and off air.
6. The mini-buses for selecting your key source.
7. The modifier selection buttons, which tell the module which downstream keyer you will be modifying with sections 2 and 3 - directly above the selection buttons.



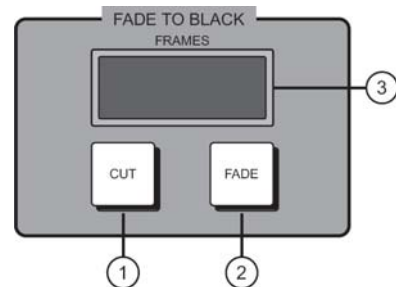
Other Groups

There are a few other group modules we haven't discussed yet.

Fade To Black

The switcher's basic "Fade to Black" function allows you to cut or fade (auto-transition) the entire switcher output to black, including all downstream keys and all effects currently on air.

1. Cut to Black - Press CUT to instantly cut the switcher output to black. When the switcher is in black, press CUT again to cut the switcher back to the previous full on-air program output.
2. Fade to Black - Press FADE to fade (auto transition) the switcher output to black, using the assigned fade-to-black rate. When the switcher is in black, press FADE again to fade the switcher up from black — back to the previous full on-air program output.
3. Display - The 3-digit display shows the current fade-to-black transition rate.



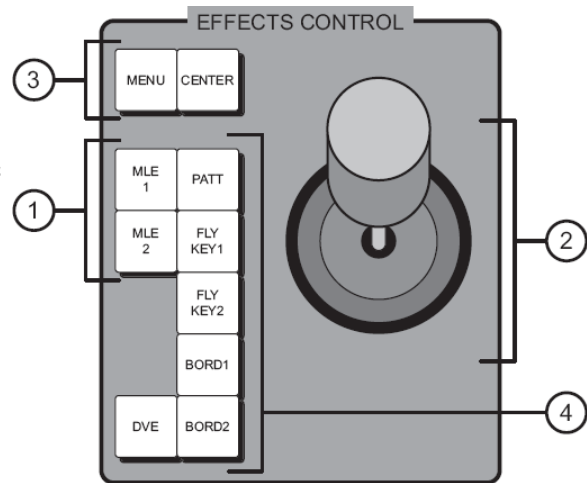
Please note the following important points regarding the Fade to Black function:

- Once the switcher is in black, it stays in black until CUT or FADE is pressed again.
- When the switcher is in black, the FADE button stays lit to indicate that the switcher is in full Fade to Black mode. In addition, any on-air tally LEDs and any active keyer LEDs (that were previously lit in the on-air mode) will flash - as an extra attention-getting indication of the switcher's mode.

Positioner

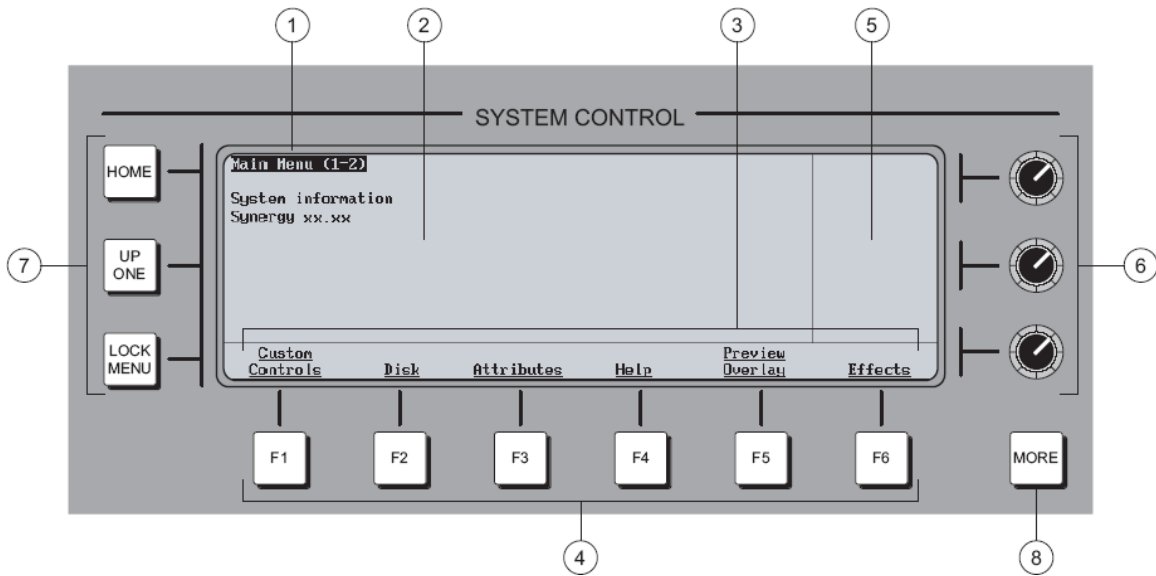
The Positioner group is an assignable module that allows you to manipulate the position of wipe patterns, borders and flying keys - depending upon the selected mode.

With it, you can control the size and position of preset pattern keys, the colour information for borders, and more.



1. The Positioner Assignment Section provides a group of buttons that allow you to assign the Positioner group to individual MLE's.
2. The 3-axis Positioner (also known as a joystick) allows you to manipulate the position of various functions selected in the MLE.
3. Positioner Function Section 1
 - a. Enable MENU to assign Positioner control to menu functions (see next section on system control), temporarily disabling control over positionable functions. When the button is turned off, Positioner control (for a selected MLE and function) is restored.
 - b. Press CENTER to return the wipe, flying key or border to its default position, typically removing all X, Y, and Z-axis offsets from the image.
4. Positioner Function Section 2
 - a. Press PATT to switch Positioner control over to the selected MLE's pattern generator.
 - b. Press FLY KEY 1 to switch Positioner control over to the selected MLE's Key group or DSK 1 group.
 - c. Press FLY KEY 2 to switch Positioner control over to the selected MLE's Key 2 group or DSK 2 group.
 - d. Press BORD 1 to switch Positioner control over to the selected MLE's first custom border generator (for Key 1 or DSK 1).
 - e. Press BORD 2 to switch Positioner control over to the selected MLE's second custom border generator (for Key 2 or DSK 2).

System Control



Each switcher includes a System Control group in its top panel. At the center of the group is the System Control Display, a bright LCD screen that provides a variety of clear menus for various system setup and operational functions.

The display is in fact a menu tree, with various branches that arrange switcher functions into concise categories.

There are two ways that the display can change:

- The display changes automatically, depending on certain functions that you select on the panel. In this way, additional parameters are instantly available to you, as soon as you press a control panel button.
- You can also navigate the menu tree manually to reach the desired menu - simply by following the desired path through the menu tree.

1. Each menu is named in the upper left corner.

2. The large center area of the display is your main working area for each specific menu. It is typically reserved for status, text, mini "help" messages, descriptions of parameters, entry fields, etc.

3. Labels on the bottom row represent functions, or will route you to further sub-menus. These labels change depending upon the selected mode and menu. A menu function is activated by pressing the corresponding Softkey.

4. The six Softkey buttons below the display correspond to labels that appear in the Label Area of the display. Pressing a Softkey activates the selected function, or switches to the selected menu.

5. The right-hand section of the display (adjacent to the three Scroll Knobs) is reserved for functions that you can adjust conveniently with the scroll knobs. Up to three different adjustable parameters can appear in this section, each of which will be labeled accordingly.

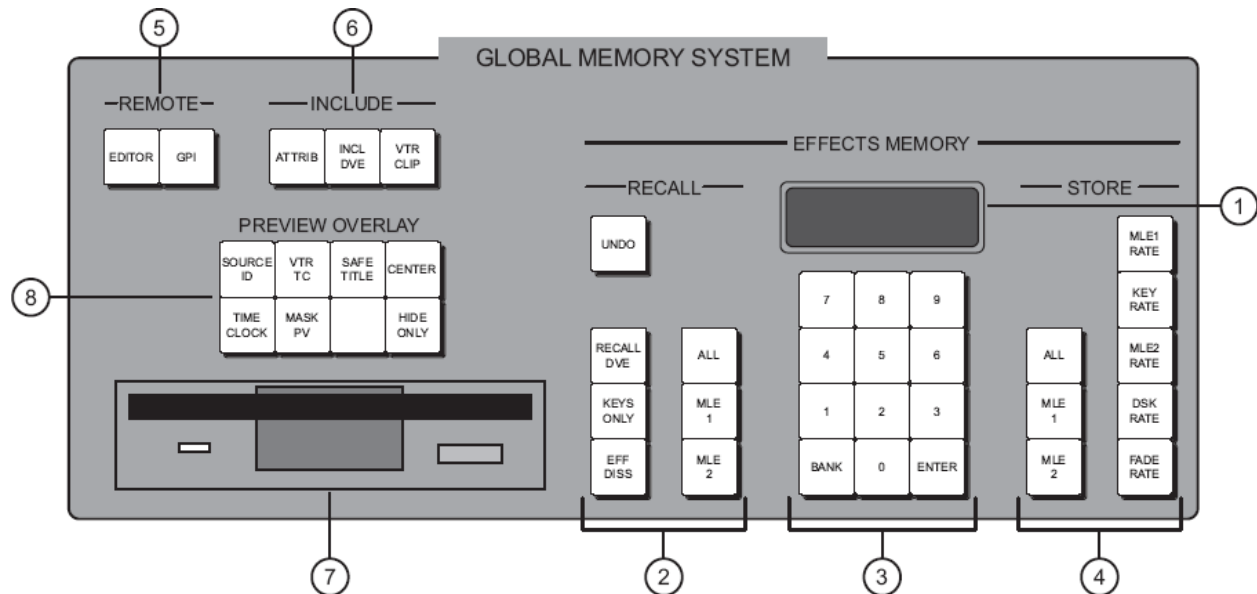
6. The three scroll knobs are assignable. Depending upon the selected mode (and menu), the functions of the knobs change just like the display labels. When a function requires a knob to adjust a parameter, up to three labels (and their associated

functions) will appear in the right-hand section of the display - arranged vertically. Turn the appropriate knob to adjust the associated parameter.

7. HOME - Press to display the Main Menu 1-2. UP ONE - Press to take the display up one level in the menu tree. LOCK MENU - Press to lock the display on the current menu. Regardless of which control panel button is pressed, the display remains in its current location.

8. The MORE button lights to indicate that additional menus (and functions) are available on the current level. The numbers in the menu name will indicate how many additional menus are available. While the softkeys move you vertically through the menu system, MORE moves you horizontally.

Global Memory System



The Global Memory System group is used to store and recall switcher memory registers for all MLEs on the panel. A memory register is a “snapshot” of an MLE (or multiple MLEs). Up to 100 registers can be stored and recalled. A register can be as simple as the contents of one MLE’s keyer, or as comprehensive as the contents of the entire switcher, including all MLEs, Aux Buses and settings.

1. The Display provides five data fields. All rates are indicated in frames:

REG:## — Indicates the current memory register number.

Memory# — Displays the current memory.

M:### — Indicates the Program/Preset MLE’s transition rate.

D:### — Indicates the transition rate for both DSKs.

F:## — Indicates the Fade to Black transition rate.

2. The Recall Section allows you to recall switcher memory registers into selected MLEs.

3. The Keypad allows you to enter transition rates, fade rates and switcher memory registers. Press BANK to select the bank of switcher memory registers that you want to store or recall. Ten banks of 10 registers each are provided, for a total of 100 registers. Press ENTER to conclude all numeric entry procedures such as storing memory registers, entering transition rates, fade rates, DVE registers and VTR clips. Note that ENTER is not required for memory recall functions for rapid recalling of your setups.

4. The Store Section allows you to store snapshots of the selected MLEs and enter selected transition rates.
5. Section 5 is used for remote control of the switcher by external edit control systems.
6. Section 6 is used to tell the switcher what category of information is recalled when a memory register is called up. For most uses, the main ATTRIButes and occasionally a DVE move will be what you will recall. In our studios, we don't control VTRs from the switcher, so the third button VTR CLIP isn't used.
7. The Disk Drive is used to store and recall six categories of switcher registers, using a standard high-density floppy disk.
8. The Preview Overlay group allows you to control specific overlay information that is displayed on the preview monitor, such as VTR time code, a count up/down timer, source ID, safe title, etc. Displays are individually selectable on the preview monitor for quick reference.

