GRASS VALLEY GROUP

# Protocol Manual

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## KALYPSO
**VIDEO PRODUCTION CENTER**

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# *Preface*

## About This Manual

This document describes external protocols for the Kalypso Video Production Center. It assumes basic familiarity with production switchers, specifically Kalypso. Readers unfamiliar with these basics should refer to the *Kalypso User Manual*.

Section 1

# External Tally Protocol

The tally system of a production switcher provides status to devices and their operators. The most basic status is whether or not the device is on air, but other statuses can also be provided by the tally system.

The Kalypso Video Production Center has four program outputs. The tally system is not impacted when the output is simply a "clean feed" version of the main program output. However, customized feeds which depart from the program output are now possible. These customized outputs may include sources which are not present on the main program output. For example, the switcher may automatically substitute a "private" camera for a wide shot.

Kalypso provides 64 tally relays, and an additional 64 relays may be added as an option. Tally relay expansion is also provided as an option. An additional 768 relays may be added via external tally relays driven from the Kalypso frame via a serial interconnect.

In addition to the classic relay tally system, Kalypso provides a serial tally interface to provide more in-depth status than simple on/off air information.

## Tally Types

As mentioned above, tally requirements go beyond simple on/off air indication for each source. This section describes the types of tally information which can be provided via the Kalypso tally relays or the tally expansion serial protocol.

Kalypso performs five tally calculations: on-air tally, plus four other customer specified calculations. Each calculation may be customized by selecting the tally type and which buses contribute to the tally.

There are three basic types of tally calculations and two specific derivatives for the "output tally" type.

### Output Tally

Output tally indicates which sources contribute to a specific output or group of outputs (maximum of four outputs). On-air and look-ahead tally are specific cases of output tally.

Output tally needs a starting point for tally calculations. The customer can select one or more outputs which will be included in the tally calculation. Any sources which appear on those outputs will be tallied.

## On-air Tally

On-air tally indicates whether a source is on or off air. This information is most often used to provide camera tally so the camera operator and the talent know when the camera is included on the program output(s) of the production switcher. It is a special case of output tally. It is provided as a separate type to ease tally configuration.

Kalypso has more than one output which may be on air (e.g., all four program outputs of the Pgm-Pst bank may have different source contributions). On air tally includes sources which contribute to any of these outputs. On-air tally had no configuration. It tallies any source which contributes to any of the four Pgm-Pst program outputs.

## Look-ahead Tally

Look-ahead tally is similar to On-air tally but is based on the selection made on the switcher's main PRESET bus. It is intended to indicate which sources will be on air if a program-preset transition is performed. Look-ahead tally is also a special case of output tally. It is provided as a separate type to ease tally configuration. Look-ahead tally has no configuration. It tallies any source which contributes to the look-ahead state for any of the four program outputs of the Pgm-Pst bank.

## Iso Tally

Iso tally indicates which sources contribute to a specific point in the switcher video path whether or not those sources contribute to the program output. For example, an M/E iso tally indicates what sources contribute to one or more of an M/E's program outputs. Iso tally is similar to output tally except that the tally calculation is specified in terms of the M/E outputs not on physical outputs of the switcher. In fact, the M/E outputs do not have to be mapped to physical outputs in order to generate M/E Iso tally.

## Selection Tally

Selection tally indicates what source is selected on a particular bus or buses. Selection tally does not follow reentries or factor in bus visibility. The buses need not be on air for the sources to contribute to this information.

Selection tally requires specifying which buses of the switcher should be included in the tally calculation.

## Tally Calculation Basics

Tally status provides information about switcher sources based on the video composite at some point in the video path. This section describes the mechanisms used within Kalypso to calculate tally relay closures. The information is also useful when interpreting the "contribution tally" data described later.

Many sources may be combined at each M/E of the switcher and M/E banks can be reentered. In order to calculate tally status, the video and key paths must be traced backwards from the video output through all M/Es, keyers and external processing equipment (e.g., a DVE) to the primary sources.

At each stage in the video path, tally calculations must take into consideration whether or not a particular bus contributes to the composite and what source is selected on the bus. If the selection is a primary source, the end of that branch has been found. However, if the selection is a reentry (either another M/E or internal (e.g., frame store) or external processing (DVE), the trace must continue in order to find sources which contribute to that processing block's output.

Calculations must include both video and key paths through the switcher.

### Keyer Modifications

Keyers modify the video and key signals and affect tally calculations.

The keyer can either use the incoming video or replace it with a matte. In addition, the key signal can be derived either from the incoming video, incoming key signal or a wipe pattern generator. The video input contributes to the key if it is used as either the fill or as the key source. The key input contributes to the key if it is used as the key source.

An opacity setting of 0% negates all contributions of the keyer.

The processed cut signal or the masking signals may also change video contribution. If the result of key processing produces a completely transparent (i.e., cut signal is 0 for the entire raster), the video signal is not contributing to the key output. This calculation is normally not considered since it requires real time sampling of the cut signal and existing key processor ASICs do not include the calculations.

All of these factors are combined into a single flag within the contribution tally packet.

### Transition Mixer Modifications

The transition mixers modify the contribution of all inputs to an M/E bank. If the mixer makes an input transparent, there is no contribution to the mixer output for that input.

Separate contribution flags are provided for each path into a mixer. Each mixer (Kalypso has four per M/E) has its own set of contribution flags in the contribution tally packet.

### Internal and External Processing Loops

Images processed by DVEs, frame stores or other devices must also receive accurate tally. Since these devices have the ability to make their incoming video invisible, their current state must be included in the switcher tally calculations. For example, if the DVE positions an image completely off screen or the frame store is frozen, the on-air tally for that source should go away (assuming it isn't on air via some other path).

## Tally System

There are many inputs, outputs and paths through a production switcher. The tally system must be capable of determining which sources contribute to a specified output regardless of contributions to other outputs. In essence, there may be multiple tally paths through the switcher just as there are multiple video paths. It is essential to maintain tally independence back though each video processing path of the switcher and external gear (e.g., DVE).

For this reason, each device which processes video must build a "contribution map" which indicates which of its inputs are visible on or contributes to each output. Because the video path through the switcher is known, the tally system can then trace each output back through all paths and find all contributing sources. The set of contributing sources for each output is likely to be different, but can be tallied independently.

With this mechanism, most tally modes are a degenerate case of Output Tally. On-air tally is Output Tally for the Pgm-Pst Program output. Look-ahead tally is Output Tally for the Pgm-Pst Preview output.

If more than one program output exists, for example, the four programmable clean feed outputs of the Pgm-Pst bank, contributions can be combined after tracing each path from output back to all inputs.

## Tally Inputs

It may often be necessary to tally customized switcher outputs. For example, a camera tally should not occur for an iso record output unless the VTR is in RECORD. The VTR's RECORD light could be wired into a switcher tally input for this purpose.

Kalypso GPI inputs can be configured as tally inputs.

Kalypso video outputs can be configured as always on air (Pgm-Pst Program A, B, C and D are typically always on air), always off air or controlled by a tally input. The state of this output tally is provided in the output contribution information described later. If an output is not on air, there is no need to trace that path back to sources.

## Names

All tally information is number based to keep messages short and minimize communication time. Source names are provided through a separate mechanism because they change less frequently and require a higher bandwidth to transfer.

Source names name the source IDs including reentries.

## Tally Relay Outputs

Calypso provides 64 tally outputs as part of the standard system. A second card can be added for a total of 128 tally relays within the frame.

Tally relays can be configured for different tally calculations in groups of 32. For example, one group can provide on-air tally while another group can provide bus iso tally.

Each tally relay within the group can be associated with one of the 128 sources. In the previous example, on-air tally can be set up for any 32 of the 128 Kalypso sources using the first group. The second group could provide bus iso tally for the same set of 32 sources or a completely different set.

In many situations, 32 on-air closures will be sufficient. When this is not the case, additional groups can also be configured for on-air tally calculations and mapped to different sources. By using all four tally groups for on-air tally, all 128 sources can be tallied.

## Tally Expansion

Additional tally relay outputs may be added to the system via a tally expansion frame. Each tally expansion frame provides three tally modules each of which has 64 relays. A serial port on the Kalypso frame connects to all tally frames. Refer to the next section for port configuration and protocol.

Each tally module has a unique address (0 through 11) set via a DIP switch on the module. A maximum of 768 external relays are supported. Tally expansion is programmed just like the internal tally relays. Each tally expansion module provides two additional 32-relay groups.

The protocol used for tally expansion is described below.

## Serial Tally

Kalypso provides two different serial tally interfaces. The first is a simple "bit per relay" protocol used primarily for tally expansion. The second provides the necessary information to trace any tally path within Kalypso.

Both serial protocols are based on RS-422 asynchronous serial communications at 76.8 kb, 8 data bits, 1 stop bit, and no parity as a default.

Tally expansion protocol is fixed at 76.8 kb since this is designed to work with the Kalypso tally expansion frames.

Other baud rates (9600, 19,200 and 38,400) and odd or even parity selections can be selected for contribution tally but reduce throughput and hence latency in reporting tally. 76.8 kb/field with no parity yields about 128 characters per field and was assumed for all transmission times unless otherwise noted. At 9600 baud and even or odd parity, the link only supports 14 characters per field, making the link virtually useless for real time tally (contribution tally would require 16 fields to transmit).

They are binary protocols with easily identifiable message boundaries. All communication is from the Kalypso frame to the external device. Multiple listeners can be connected to this port. External devices should not transmit information on either pair of the link. Kalypso does not listen to this port, it only speaks.

Kalypso has 10 serial ports on its electronics frame and any of these ports can be configured for one of the serial tally protocols. Separate serial ports are required for each protocol.

## Bit per Relay Protocol

This simple protocol consists of message packets which represent the state of 64 relays. Each message begins with an address byte which uniquely identifies one of the 12 message packets. Address bytes have a 1 in the MSB, data bytes have a 0. All 12 message packets are sent out every field starting with packet 0. Refer to Table 1-1.

*Table 1-1. Bit per Relay Protocol*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | Block Address 0– 11 | | | | R64 |
| 0 | R63 | R62 | R61 | R60 | R59 | R58 | R57 |
| 0 | R56 | R55 | R54 | R53 | R52 | R51 | R50 |
| 0 | R49 | R48 | R47 | R46 | R45 | R44 | R43 |
| 0 | R42 | R41 | R40 | R39 | R38 | R37 | R36 |

*Table 1-1. Bit per Relay Protocol - (continued)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | R35 | R34 | R33 | R32 | R31 | R30 | R29 |
| 0 | R28 | R27 | R26 | R25 | R24 | R23 | R22 |
| 0 | R21 | R20 | R19 | R18 | R17 | R16 | R15 |
| 0 | R14 | R13 | R12 | R11 | R10 | R9 | R8 |
| 0 | R7 | R6 | R5 | R4 | R3 | R2 | R1 |

## Contribution Tally Protocol

Contribution tally makes it possible to determine which sources and processing blocks (an M/E or DVE) contribute to the image at any point in the video path. On-air tally, for example identifies which sources contribute in some way to the main program output of the switcher. M/E 2 iso tally starts at M/E 2's main program output.

Refer to the sections Tally Calculation Basics and Tally System for more details.

Contribution tally consists of approximately 220 bytes of information. Because bandwidth is limited to approximately 128 bytes per field at 76.8 kb, this information is broken into smaller messages. This allows sending changes at a higher priority than unchanging information. Even with prioritized updates, there is no guarantee that all changes will be communicated within one field. Worst case, updates will be transmitted within three fields.

One background update will always be sent every four fields, insuring that a complete tally update occurs at least once per second at 76,800, two seconds at 38,400, etc.

Contribution messages indicate which sources are selected on buses feeding the processing block (or output) and which of those inputs contribute to a processing block's output. In the cases where a processing block has several outputs, a separate contribution map is included for each output. Contribution tally for external processing blocks such as a DVE also lists the source IDs for this block's output(s) so that reentry paths through external devices can be identified and followed.

Contribution message codes start at 0x8 with an instance ID grater than or equal to one. This insures that command character value is always above 128 so it is recognized as a command code. Command codes 0xE and 0xF are not used, but overlap the address character of the Bit Per Relay protocol and are therefore reserved.

Contribution information for each processing block is sent as a separate message. Information for Kalypso outputs is sent in six messages of eight outputs each. All portions of the system are included in the contribution dump even if they are inactive. Inactive blocks will contain data which

indicates inactive status for all inputs to the processing block. In addition, that block's outputs will never appear as selections on any bus of the switcher.

## Source IDs

Valid source IDs used in this protocol range from 1 to 128. Source IDs in the range of 93 - 128 originate within Kalypso and never change. Source IDs in the range of 1 - 92 represent external sources, including any external processing blocks.

A source value of 0 indicates the input or bus is not in use, or to indicate that an external DVE is being used in an effects send loop. In this case, the DVE's contribution information is included in the M/E's contribution information and additional tally calculations are not necessary. No further tally can be calculated for source IDs of zero, and it should not be counted as a primary input.

Tally is source based. Which physical inputs are used is not factored into tally information.

Table 1-2 summarizes source IDs for M/E reentries and internal sources.

*Table 1-2. Source IDs*

| Source ID | Reentry | Source ID | Reentry |
|---|---|---|---|
| 93 | M/E 1 PGM A | 94 | M/E 1 PGM B |
| 95 | M/E 1 PGM C | 96 | M/E 1 PGM D |
| 97 | M/E 1 PVW A | 98 | M/E 1 PVW 2 |
| 99 | M/E 2 PGM A | 100 | M/E 2 PGM B |
| 101 | M/E 2 PGM C | 102 | M/E 2 PGM D |
| 103 | M/E 2 PVW A | 104 | M/E 2 PVW 2 |
| 105 | M/E 3 PGM A | 106 | M/E 3 PGM B |
| 107 | M/E 3 PGM C | 108 | M/E 3 PGM D |
| 109 | M/E 3 PVW A | 110 | M/E 3 PVW 2 |
| 111 | Pgm-Pst PGM A | 112 | Pgm-Pst PGM B |
| 113 | Pgm-Pst PGM C | 114 | Pgm-Pst PGM D |
| 115 | Pgm-Pst PVW A | 116 | Pgm-Pst PVW 2 |
| 117 | Test Signal | 118 | Black |
| 119 | Background 1 | 120 | Background 2 |
| 121 | Still Store 1 | 122 | Still Store 2 |
| 123 | Still Store 3 | 124 | Still Store 4 |
| 125 | Still Store 5 | 126 | Still Store 6 |
| 127 | Still Store 7 | 128 | Still Store 8 |

## M/E Contribution Information

Kalypso has up to 4 M/Es. Each M/E has 12 input buses (4 video/key pairs, 2 backgrounds and 2 utility buses), 4 program outputs (PGM A – PGM D) and two preview outputs. PVW A is always associated with PGM A. PVW 2 is selectable as the preview for PGM B, C or D. Preview output contribution depends on the preview mode selected and active keyer "hold to previews" or "show keys".

Contribution information is provided for all six real outputs and for the look-ahead state of the four program outputs. "LAP" contribution always indicates what the program contribution information would be following a main transition.

The Keyer buses "in use" flags indicate whether or not the cut and fill would be visible if the keyer was contributing to an output. The Contribution flags indicate whether or not the keyer contributes to the output. These flags need to be combined (ANDed) to determine if a keyer cut or fill bus is actually contributing to the output. This was done to limit size of the message without eliminating information.

The source information indicates which source is feeding the M/E inputs. These may be primary sources or reentries. Sources and in use flags apply to all outputs from an M/E, but contribution information may be different for each output. Refer to Table 1-3.

*Table 1-3. M/E Contribution*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M/E Contribution (0x8) | | | | M/E ID | | | | M/E IDs<br>1 – M/E 1<br>2 – M/E 2<br>3 – M/E 3<br>4 – Pgm-Pst | Source IDs | | | |
| M/E Contribution (0x8) | | | | M/E ID | | | | | M/E 1 | M/E 2 | M/E 3 | Pgm-Pst |
| Key 1 Fill Source (1 – 128) | | | | | | | | | | | | |
| Key 4 Cut | Key 4 Fill | Key 3 Cut | Key 3 Fill | Key 2 Cut | Key 2 Fill | Key 1 Cut | Key 1 Fill | Keyer buses in use | | | | |
| Key 1 Cut Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PGM A Contribution | 93 | 99 | 105 | 111 |
| Key 2 Fill Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PGM B Contribution | 94 | 100 | 106 | 112 |
| Key 2 Cut Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PGM C Contribution | 95 | 101 | 107 | 113 |
| Key 3 Fill Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PGM D Contribution | 96 | 102 | 108 | 114 |
| Key 3 Cut Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | LAP A Contribution | | | | |
| Key 4 Fill Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | LAP B Contribution | | | | |
| Key 4 Cut Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | LAP C Contribution | | | | |
| A Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | LAP D Contribution | | | | |
| B Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PVW A Contribution | 97 | 103 | 109 | 115 |
| Utility 1 Source (1 – 128) | | | | | | | | | | | | |
| Key 4 | Key 3 | Key 2 | Key 1 | Util 2 | Util 1 | B | A | PVW 2 Contribution | 98 | 104 | 110 | 116 |
| Utility 2 Source (1 – 128) | | | | | | | | | | | | |

## External Processing Contribution Information

External video processing blocks such as DVEs must be included for accurate tally calculations. This protocol supports up to two external processing blocks, each with up to four input pairs and six outputs.

External processing blocks use primary inputs for reentry paths. The output source IDs identify these paths. These source IDs should be treated just like an M/E reentry. Output contribution maps and reentry source IDs are provided for the 6 outputs.

The input mode flags indicate whether the B side of an input pair is an independent video signal or linked to the A side as the input's key. Refer to Table 1-4.

*Table 1-4. External Processing Contribution*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes |
|---|---|---|---|---|---|---|---|---|
| External Proc Contribution (0x9) | | | | Ext Proc ID | | | | Ext Proc ID<br>1 – DPM 1<br>2 – DPM 2 |
| External Proc Contribution (0x9) | | | | Ext Proc ID | | | | |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 1 Contribution |
| Output 1 Source (1 – 128) | | | | | | | | Output 1 reentry ID |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 2 Contribution |
| Output 2 Source (1 – 128) | | | | | | | | Output 2 reentry ID |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 3 Contribution |
| Output 3 Source (1 – 128) | | | | | | | | Output 3 reentry ID |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 4 Contribution |
| Output 4 Source (1 – 128) | | | | | | | | Output 4 reentry ID |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 5 Contribution |
| Output 5 Source (1 – 128) | | | | | | | | Output 5 reentry ID |
| Input 4B | Input 4A | Input 3B | Input 3A | Input 2B | Input 2A | Input 1B | Input 1A | Output 6 Contribution |
| Output 6 Source (1 – 128) | | | | | | | | Output 6 reentry ID |
| 0 | | | | Input 4B | Input 3B | Input 2B | Input 1B | Input Mode<br>0 – Video<br>1 – Key |
| Input 1A Source (1 – 128) | | | | | | | | |
| Input 1B Source (1 – 128) | | | | | | | | |
| Input 2A Source (1 – 128) | | | | | | | | |
| Input 2B Source (1 – 128) | | | | | | | | |
| Input 3A Source (1 – 128) | | | | | | | | |
| Input 3B Source (1 – 128) | | | | | | | | |
| Input 4A Source (1 – 128) | | | | | | | | |
| Input 4B Source (1 – 128) | | | | | | | | |

## Still Store Contribution Information

The Kalypso internal still store has 8 outputs. Outputs can be configured in pairs as two independent outputs or as a video-key pair. The Output Mode flags identify the configuration for each output pair.

The Kalypso still store has two inputs. They can be configured as two independent video inputs or as a video-key pair. The Input Mode flag indicates which mode the inputs are operating in.

The Record flags indicate whether or not the input is in use. If an input is grabbing a frame or recording an animation, the bit will be 1. An active record flag is essentially a beginning point for tally regardless of still store output usage since the indicated source is being recorded on the still store's hard disk. Refer to Table 1-5.

*Table 1-5. Still Store Contribution*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes |
|---|---|---|---|---|---|---|---|---|
| Still Store Contribution (0xA) | | | | 1 | | | | Only one instance of Still Store contribution |
| Still Store Contribution (0xA) | | | | 1 | | | | |
| Input 1 Source (1 – 128) | | | | | | | | |
| Input 2 Source (1 – 128) | | | | | | | | |
| 0 | Output 7/8 Mode | Output 5/6 Mode | Output 3/4 Mode | Output 1/2 Mode | Input Mode | Input 2 Rec | Input 1 Rec | Mode<br>0 – Video-video<br>1 – Video-key |

## Output Contribution Information

Kalypso has 46 programmable outputs (Outputs 39 and 40 are not programmable). An output can be programmed as either an aux bus or as a dedicated output for an M/E, etc. From a tally standpoint, the only difference is what source is selected on the output. A dedicated output won't change sources while an aux bus might. That is, the tally protocol won't indicate what the output is being used for (dedicated output or aux bus) and the receiver of the information shouldn't care. It may be necessary to identify which physical outputs are starting points for tally calculations.

Output status is communicated in 6 messages of 8 outputs each. For example, status for output 10 would be sent as output 2 in the second block.

The on-air flags indicate whether or not Kalypso considers the output to be on air. This information can be hard coded, or may be based on status from some external device. For example, the Pgm-Pst PGM A output is the main program output and is normally assumed to be on air. The feed to an iso recorder may utilize a GPI input (running status via the Kalypso-VTR control interface) so that output is on air only when the VTR is in record. Tally calculations may choose to ignore these flags.

Outputs used as aux buses may be paired in order to deliver a video-key pair to an external device. The Output Mode flags indicate whether the two buses of a pair are independent (video-video) outputs or are being used as a video-key pair. Refer to Table 1-6.

*Table 1-6. Output Contribution*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes |
|---|---|---|---|---|---|---|---|---|
| Outputs Status (0xB) | | | | Block ID | | | | Block ID<br>1 – Outputs 1 - 8<br>2 – Outputs 9 - 16<br>3 – Outputs 17 - 24<br>4 – Outputs 25 - 32<br>5 – Outputs 33 - 40[a]<br>6 – Outputs 41 - 48[b] |
| Outputs Status (0xB) | | | | Block ID | | | | |
| Output 1 Source (1 – 128) | | | | | | | | |
| 0 | 0 | 0 | 0 | Out 7/8 | Out 5/6 | Out 3/4 | Out 1/2 | Mode<br>0 – Video-video<br>1 – Video-key |
| Output 2 Source (1 – 128) | | | | | | | | |
| Out 8 | Out 7 | Out 6 | Out 5 | Out 4 | Out 3 | Out 2 | Out 1 | On-air |
| Output 3 Source (1 – 128) | | | | | | | | |
| Output 4 Source (1 – 128) | | | | | | | | |
| Output 5 Source (1 – 128) | | | | | | | | |
| Output 6 Source (1 – 128) | | | | | | | | |
| Output 7 Source (1 – 128) | | | | | | | | |
| Output 8 Source (1 – 128) | | | | | | | | |

[a] Outputs 39 and 40 are not programmable and are always Black and Test, respectively.

[b] Outputs 41 through 48 are the effects send outputs.

## Source Names

Source names are not really part of tally, but often provide valuable information to devices which utilize switcher tally information. Source names are limited to twelve characters and each is sent in its own message along with the source's ID. Kalypso supports 128 sources (including internal sources). Kalypso source names are not necessarily unique. That is, two sources could have the same name.

Kalypso supports an optional nickname for each source as well as the full source name. Nicknames are a shortened version of the full source name intended for displays with limited space. These are blank if undefined in which case the full source name should be used.

Kalypso supports the notion of aliasing source names, i.e., replacing generic names for names more specific to the intended usage of the source. When aliases are activated in suite preferences, the tally system reports aliases. Otherwise, the contribution tally reports engineering source names. The name set ID indicates which name set is being reported.

Characters are limited to 7-bit ASCII. Names shorter than 12 characters are left justified and null (0) filled. The message format is indicated in Table 1-7.

*Table 1-7. Source Names*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes |
|---|---|---|---|---|---|---|---|---|
| Source Name (0xC) | | | | Nameset ID | | | | Nameset ID<br>1 – Name & Nickname<br>2 – Alias |
| Source Name (0xC) | | | | Nameset ID | | | | |
| Source ID (1 – 128) | | | | | | | | |
| 0 | Name Character 1 | | | | | | | Left-most character |
| 0 | Name Character 2 | | | | | | | |
| 0 | Name Character 3 | | | | | | | |
| 0 | Name Character 4 | | | | | | | |
| 0 | Name Character 5 | | | | | | | |
| 0 | Name Character 6 | | | | | | | |
| 0 | Name Character 7 | | | | | | | |
| 0 | Name Character 8 | | | | | | | |
| 0 | Name Character 9 | | | | | | | |
| 0 | Name Character 10 | | | | | | | |
| 0 | Name Character 11 | | | | | | | |
| 0 | Name Character 12 | | | | | | | Right-most character |
| 0 | Nickname Character 1 | | | | | | | Left-most character |
| 0 | Nickname Character 2 | | | | | | | |
| 0 | Nickname Character 3 | | | | | | | |
| 0 | Nickname Character 4 | | | | | | | |
| 0 | Nickname Character 5 | | | | | | | |
| 0 | Nickname Character 6 | | | | | | | Right-most character |

## Update

Update messages inform the receiver of critical state changes. Initialize indicates the start of Kalypso tally processing (the beginning of life). Data Consistent indicates that all tally packets are up to date. Since updates for one change may span several packets, to avoid tallying sources improperly, tally calculations should only be performed when data is consistent (all updates have been sent). See Table 1-8. Refer to *Command Code and Instance Summary* for the use of these messages.

*Table 1-8. Update Messages*

| b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 | Notes |
|---|---|---|---|---|---|---|---|---|
| Update (0xD) | | | | Update ID | | | | Update ID<br>1 – Initialize<br>2 – Data Consistent |
| Update (0xD) | | | | Update ID | | | | |

## Command Code and Instance Summary

Refer to Table 1-9 for a list of the valid command codes and valid instance IDs for each command, and message lengths.

*Table 1-9. Command Code and Instance*

| Command Code | Instances | Message Length | |
|---|---|---|---|
| | | Data Only | With Command |
| M/E Contribution (0x8) | 1 – M/E 1<br>2 – M/E 2<br>3 – M/E 3<br>4 – Pgm-Pst | 23 | 25 |
| External Proc Contribution (0x9) | 1 – DPM 1<br>2 – DPM 2 | 21 | 23 |
| Still Store Contribution (0xA) | n/a | 3 | 5 |
| Outputs Status (0xB) | 1 – Outputs 1 - 8<br>2 – Outputs 9 - 16<br>3 – Outputs 17- 24<br>4 – Outputs 25 - 32<br>5 – Outputs 33 - 40<br>6 – Outputs 41 - 48 | 10 | 12 |
| Source Name (0xC) | 1 = Name & Nickname<br>2 = Alias | 19 | 21 |
| Update (0xD) | 1 – Initialize<br>2 – Data Consistent | 0 | 2 |
| unused (0xE) | | | |
| unused (0xF) | | | |

## Message Structure

Messages start with a message code. Message codes are repeated twice in order to provide positive identification of the message start. Data bytes could match a valid message code, however the messages have been laid out such that no two consecutive data bytes have values above 128. Since all message code characters are above 128, it is not possible for message data to duplicate the repeated message code.

## Communication Specifics

When Kalypso begins sending tally information, it will issue an Initialize command, then send all tally packets as fast as possible. After all packets have been sent a Data Consistent message is sent.

During idle times (no changes), one background contribution update will be sent at the frequency specified in the table below followed by a Data Consistent message. All instances of all message codes are always sent regardless of which portions of Kalypso are currently active.

The source name set is sent one name at a time. All 128 source names are sent in order and the process repeats.

Background contribution updates and the source name messages are spaced out and interleaved as shown in the following table. Remaining serial bandwidth is used for contribution change updates, if any.

When changes occur, many messages may be required to communicate the change. At the end of the stream of packets, a Data Consistent message will be sent.

Kalypso will insure that data is inconsistent for no longer than indicated in Table 1-10.

*Table 1-10. Communication Specifics*

| | **Baud Rate** | | | |
|---|---|---|---|---|
| | **76,800** | **38,400** | **19,200** | **9600** |
| Background update frequency/max data inconsistency time | 4 fields (< 80 mS) | 8 fields (<160 mS) | 16 fields (<320 mS) | 32 fields (< 640 mS) |
| Contribution Background | 1st field | | | |
| Source Name | 2nd field | 3rd field | 5th field | 9th field |
| | 3rd field | 5th field | 9th field | 17th field |
| | 4th field | 7th field | 13th field | 25th field |
| Contribution Background refresh time | 52 fields (~1 sec.) | 104 fields (~2 sec.) | 208 fields (~4 sec.) | 416 fields (~8 sec.) |
| Source Name refresh time | 171 fields (~3 sec.) | 342 fields (~6 sec.) | 683 fields (~12 sec.) | 1366 fields (~24 sec.) |
| Inactivity timeout | 100 mS | 200 mS | 400 mS | 800 mS |

## Message Parsing and Processing

Message code recognition and parsing can use the following algorithm:

```
messageCode = INVALID
lastChar = 0
bytesReceived = 0
dataConsistent = FALSE

repeat forever
currentChar = next byte on input stream

// message header – set up for new message
if (currentChar > 128 && currentChar == lastChar)
messageCode = currentChar >> 4 // message code is 4 MSBs
instance = currentChar & 0xF // instance is 4 LSBs
bytesReceived = 0

if (messageCode == UPDATE)
switch (instance) // instance is really update type
case INITIALIZE:
invalidateAllData ()
dataConsistent = FALSE
break
case DATA_CONSISTENT:
if ( allDataValid ())
dataConsistent = TRUE
processTally ()
break
end switch

// prevent tally processing while receiving tally updates
// but source name updates shouldn't prevent tally calcs
else if (messageCode < SOURCE_NAME)
dataConsistent = FALSE

// assemble message starting with message code and instance ID
if (messageCode != INVALID)
messageBuffer[bytesReceived++] = currentChar
if (bytesReceived == messageLength (messageCode) + 1)
copyTally (messageBuffer, messageCode, instance)
messageCode = INVALID // end of message
else
// waiting for valid message header - discard char
lastChar = currentChar
end repeat

onSerialTimeout ((76,800 / baudRate) * 100mS)
invalidateAllData ()
dataConsistent = FALSE
```

This routine looks for two consecutive characters greater than 128. The message type is extracted from the 4 most significant bits of this character. An instance ID is extracted from the 4 least significant bits of this same character. Instance IDs indicate specific information for identical objects (e.g., M/Es). The meaning of instance (if any) for a command is indicated in the command descriptions above.

Each message type has a known message length. **`messageLength`** returns the number of data characters in the message. Message data lengths are specified in the command descriptions above.

Characters are assembled in a buffer including the message code and instance ID. When all characters have been received, **`copyTally`** is called to move the completed message out of the message buffer to somewhere it can contribute to tally calculations.

This algorithm assumes the program keeps track of valid receipt of each and every contribution tally data block (every instance of all messages). It is not appropriate to process tally data if all data blocks are not up to date. When a data block is received, it is marked as valid (possibly by **`copyTally`**). The only thing which invalidates any data block is **`invalidateAllData`** which invalidates all data blocks. This only occurs on loss of communication or when Kalypso sends the Initialize message.

**`allDataValid`** is routine which checks all the data block flags to make sure all the data is valid. If it is, tally calculations can be performed. If not, they must wait until all blocks have been received. Since Kalypso sends a Data Consistent message after every background update and after a stream of changes, this is the appropriate time to check the data flags and determine if processing should be permitted.

**`processTally`** is routine which performs the desired tally calculations. An alternative is to perform tally calculations in a different part of the program but only if dataConsistent is true. Specific tally calculations depend on the application and are beyond the scope of this document. In practice, you wouldn't need both dataConsistent and **`processTally`**.

Failure of the communications link for even a short period of time may allow tally updates to be missed and the receiver's view of the data to be out of date. For this reason, some mechanism (represented by **`onSerialTimeout()`**) should be implemented which detects lack of communication activity. If this occurs, tally calculations should be suspended and all data blocks should be marked as invalid. Tally calculations can resume after all data blocks have been refreshed and a Data Consistent message has been received.

At least one background update will be sent on a regular basis. The frequency of this update is a function of the link baud rate as shown in the table above. The inactivity timeouts listed in the table are based on 120% of the update sequence length for 50 Hz operation (since it has a longer field time (20 mS)).

Section 2

# Editor Interface Commands

This section describes the traditional editor command set which bears a family resemblance to earlier generation Grass Valley switchers such as the Model 200 and the Model 300.

References to pushbuttons are shown in capital letters, using the legends as they appear on a Control Panel. Control Panel section names are shown in initial capitals.

**Note** All values within tables are hexadecimal unless otherwise indicated by the notation “decimal.”

Editor interface commands are detailed in tables presented on the following pages. Addresses, byte counts, important names, and supporting details are listed for each command.

These interface commands follow the Model 4000 interface closely. They are designed to respond to existing Model 4000 commands from an editor. Each command has been extended to provide access to Kalypso features, like Keyer 3 and 4, which do not exist on the Model 4000. This allows an existing Model 4000 editor interface to be useful without modification, or expanded to access new Kalypso functionality.

E-MEM Levels are used differently in Kalypso than in the Model 4000. The Effects Address in this protocol refer to Kalypso E-MEM enable groups as identified by the default names. Kalypso may be configured to assign any E-MEM level to any enable group. This protocol assumes that the enable group will be referenced even if the E-MEM levels assigned may change.

The E-MEM data transfer commands have been replaced with Save and Load commands. Instead of transferring data over the RS-422 serial line the Load and Save commands transfers data to and from files located on Kalypso’s internal hard drive. These files may be transferred from Kalypso’s hard drive to the editor using FTP over an ethernet connection.

Note the following:

- The E3 (Mask) command is not implemented. Mask buses do not exist in Kalypso, instead the Utility buses are used for masking.
- The E8 (Layered) command is not implemented. Split layered mode is not accessible.
- Access is provided to new busses: K3, K4, U1, U2 and Aux Bus 1 – 46 (see Command C0, C1).
- Access is provided to all 128 Kalypso sources (see Command C0, C1).
- Access is provided to secondary wipe generator (see Command C8)
- Access is provided to Primary and Secondary M/E partitions when Kalypso is in split mode (via effect address).

## Command Usage

The appropriate command to use may be determined by referring to Table 2-1.

*Table 2-1. Command Use Summary*

| Purpose | Command(s) |
|---|---|
| Basic Source Control | Source Bus (C1 – C4) Commands – page 3 |
| | Source Select (C0) Command – page 6 |
| | Preview Bus (E2) Command – page 8 |
| | Split Key (E6, E7, E9 and EA) Commands – page 8 |
| To simulate the pressing of certain buttons | Pushbutton Select and Control (C6, C7 and FB) Commands – page 9 |
| Selection of Wipe Patterns | Wipe Pattern (C8) Command – page 12 |
| Control of Transition mode pushbuttons | Transition Mode (CA) Command – page 13 |
| Set transition rates | Auto and Key Transition Rate (CC and CD) Commands – page 14 |
| E-MEM learns and recalls | Learn and Recall E-MEM Register (DA and DB) Commands – page 17 |
| E-MEM and Configuration Save and Load Data | Save and Load Data (5F and DF) Commands – page 22 |
| | Save and Load Status (6D and ED) Commands – page 27 |
| Timeline control for multiple keyframe effects | Timeline Control (4E, 4F, CE, and CF) Commands – page 28 |
| Commands for general use by an editor | All Stop (F2) Command – page 31 |
| | Software Version (6C and EC) Commands – page 32 |

### Application Examples

Several examples of serial communications using the switcher Editor Interface are provided on the following pages in the sections appropriate to the commands. In general, “Transmit” refers to communication from the editor to the switcher and “Receive” refers to communication from the switcher to the editor. Refer to specific command tables for details on these examples.

### Example 1: Bringing the Editor Interface into a Ready State

*Table 2-2. Transmit*

| Break | Address |
|---|---|
| BRK | 30 |

*Table 2-3. Receive*

| Status |
|---|
| 84 |

### Example 2: How to Set Crosspoint #6, A Row, Mix/Effects 2

*Table 2-4. Transmit*

| Byte Count | Ex Address | Command | Data |
|---|---|---|---|
| 03 | 02 | C1 | 06 |

*Table 2-5. Receive*

| Byte Count | Status |
|---|---|
| 01 | 80 |

## Source Bus (C1 – C4) Commands

The Source Bus commands enable the editor to select any source on a bus specified by the effects address, and the command code.

*Table 2-6. Source Bus Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| BKGD A/AUX | 03 | EX | C1 | Source # |
| BKGD B | 03 | EX | C2 | Source # |
| KEY1 | 03 | EX | C3 | Source # |
| KEY2 | 03 | EX | C4 | Source # |

## Effects Addresses

Valid effects addresses for the Source Bus commands are as indicated in Table 2-7.

*Table 2-7. Effects Addresses - Source Bus Commands*

| | Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment |
|---|---|---|---|---|---|---|---|---|
| Accessible Model 4000 Code | 00 | PGM-PST | 07 | Mix/Effects 3 Secondary Partition[a] | 12 | Aux Bus 4A | 19 | Aux Bus 7B |
| | 01 | Mix/Effects 1 | 0C | Aux Bus 1A | 13 | Aux Bus 4B | 1A | Aux Bus 8A |
| | 02 | Mix/Effects 2 | 0D | Aux Bus 1B | 14 | Aux Bus 5A | 1B | Aux Bus 8B |
| | 03 | Mix/Effects 3 | 0E | Aux Bus 2A | 15 | Aux Bus 5B | 1C | Aux Bus 9A |
| | 04 | PGM-PST Secondary Partition[a] | 0F | Aux Bus 2B | 16 | Aux Bus 6A | 1D | Aux Bus 9B |
| | 05 | Mix/Effects 1 Secondary Partition[a] | 10 | Aux Bus 3A | 17 | Aux Bus 6B | -- | -- |
| | 06 | Mix/Effects 2 Secondary Partition[a] | 11 | Aux Bus 3B | 18 | Aux Bus 7A | -- | -- |
| Kalypso Code | 40 | AuxBus1A | 57 | AuxBus12B | 6E | AuxBus24A | 85 | AuxBus35B |
| | 41 | AuxBus1B | 58 | AuxBus13A | 6F | AuxBus24B | 86 | AuxBus36A |
| | 42 | AuxBus2A | 59 | AuxBus13B | 70 | AuxBus25A | 87 | AuxBus36B |
| | 43 | AuxBus2B | 5A | AuxBus14A | 71 | AuxBus25B | 88 | AuxBus37A |
| | 44 | AuxBus3A | 5B | AuxBus14B | 72 | AuxBus26A | 89 | AuxBus37B |
| | 45 | AuxBus3B | 5C | AuxBus15A | 73 | AuxBus26B | 8A | AuxBus38A |
| | 46 | AuxBus4A | 5D | AuxBus15B | 74 | AuxBus27A | 8B | AuxBus38B |
| | 47 | AuxBus4B | 5E | AuxBus16A | 75 | AuxBus27B | 8C | AuxBus39A |
| | 48 | AuxBus5A | 5F | AuxBus16B | 76 | AuxBus28A | 8D | AuxBus39B |
| | 49 | AuxBus5B | 60 | AuxBus17A | 77 | AuxBus28B | 8E | AuxBus40A |
| | 4A | AuxBus6A | 61 | AuxBus17B | 78 | AuxBus29A | 8F | AuxBus40B |
| | 4B | AuxBus6B | 62 | AuxBus18A | 79 | AuxBus29B | 90 | AuxBus41A |
| | 4C | AuxBus7A | 63 | AuxBus18B | 7A | AuxBus30A | 91 | AuxBus41B |
| | 4D | AuxBus7B | 64 | AuxBus19A | 7B | AuxBus30B | 92 | AuxBus42A |
| | 4E | AuxBus8A | 65 | AuxBus19B | 7C | AuxBus31A | 93 | AuxBus42B |
| | 4F | AuxBus8B | 66 | AuxBus20A | 7D | AuxBus31B | 94 | AuxBus43A |
| | 50 | AuxBus9A | 67 | AuxBus20B | 7E | AuxBus32A | 95 | AuxBus43B |
| | 51 | AuxBus9B | 68 | AuxBus21A | 7F | AuxBus32B | 96 | AuxBus44A |
| | 52 | AuxBus10A | 69 | AuxBus21B | 80 | AuxBus33A | 97 | AuxBus44B |
| | 53 | AuxBus10B | 6A | AuxBus22A | 81 | AuxBus33B | 98 | AuxBus45A |
| | 54 | AuxBus11A | 6B | AuxBus22B | 82 | AuxBus34A | 99 | AuxBus45B |
| | 55 | AuxBus11B | 6C | AuxBus23A | 83 | AuxBus34B | 9A | AuxBus46A |
| | 56 | AuxBus12A | 6D | AuxBus23B | 84 | AuxBus35A | 9B | AuxBus46B |

[a] New effects address assignment associated with Kalypso.

## Source Numbers

Valid source numbers for all busses are provided in Table 2-8.

*Table 2-8. Common Source Numbers for all Busses*

| | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accessible Model 4000 Code | Source 1 | 01 | 1 | Source 15 | 0F | 15 | Source 29 | 1D | 29 | Source 43 | 2B | 43 |
| | Source 2 | 02 | 2 | Source 16 | 10 | 16 | Source 30 | 1E | 30 | Source 44 | 2C | 44 |
| | Source 3 | 03 | 3 | Source 17 | 11 | 17 | Source 31 | 1F | 31 | Source 45 | 2D | 45 |
| | Source 4 | 04 | 4 | Source 18 | 12 | 18 | Source 32 | 20 | 32 | Source 46 | 2E | 46 |
| | Source 5 | 05 | 5 | Source 19 | 13 | 19 | Source 33 | 21 | 33 | Source 47 | 2F | 47 |
| | Source 6 | 06 | 6 | Source 20 | 14 | 20 | Source 34 | 22 | 34 | Source 48 | 30 | 48 |
| | Source 7 | 07 | 7 | Source 21 | 15 | 21 | Source 35 | 23 | 35 | ME1 PGM A | 31 | 49 |
| | Source 8 | 08 | 8 | Source 22 | 16 | 22 | Source 36 | 24 | 36 | ME2 PGM A | 32 | 50 |
| | Source 9 | 09 | 9 | Source 23 | 17 | 23 | Source 37 | 25 | 37 | ME3 PGM A | 33 | 51 |
| | Source 10 | 0A | 10 | Source 24 | 18 | 24 | Source 38 | 26 | 38 | ME4 PGM A | 34 | 52 |
| | Source 11 | 0B | 11 | Source 25 | 19 | 25 | Source 39 | 27 | 39 | ME1 PVW A | 35 | 53 |
| | Source 12 | 0C | 12 | Source 26 | 1A | 26 | Source 40 | 28 | 40 | ME2 PVW A | 36 | 54 |
| | Source 13 | 0D | 13 | Source 27 | 1B | 27 | Source 41 | 29 | 41 | ME3 PVW A | 37 | 55 |
| | Source 14 | 0E | 14 | Source 28 | 1C | 28 | Source 42 | 2A | 42 | ME4 PVW A | 38 | 56 |

*Table 2-8. Common Source Numbers for all Busses - (continued)*

| | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal | Source Name | Hexadecimal | Decimal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kalypso Code | ME1 PGM B | 39 | 57 | Bkgnd1 | 4B | 75 | Source 57 | 5D | 93 | Source 75 | 6F | 111 |
| | ME2 PGM B | 3A | 58 | Bkgnd2 | 4C | 76 | Source 58 | 5E | 94 | Source 76 | 70 | 112 |
| | ME3 PGM B | 3B | 59 | StillStore 1 | 4D | 77 | Source 59 | 5F | 95 | Source 77 | 71 | 113 |
| | ME4 PGM B | 3C | 60 | StillStore 2 | 4E | 78 | Source 60 | 60 | 96 | Source 78 | 72 | 114 |
| | ME1 PGM C | 3D | 61 | StillStore 3 | 4F | 79 | Source 61 | 61 | 97 | Source 79 | 73 | 115 |
| | ME2 PGM C | 3E | 62 | StillStore 4 | 50 | 80 | Source 62 | 62 | 98 | Source 80 | 74 | 116 |
| | ME3 PGM C | 3F | 63 | StillStore 5 | 51 | 81 | Source 63 | 63 | 99 | Source 81 | 75 | 117 |
| | ME4 PGM C | 40 | 64 | StillStore 6 | 52 | 82 | Source 64 | 64 | 100 | Source 82 | 76 | 118 |
| | ME1 PGM D | 41 | 65 | StillStore 7 | 53 | 83 | Source 65 | 65 | 101 | Source 83 | 77 | 119 |
| | ME2 PGM D | 42 | 66 | StillStore 8 | 54 | 84 | Source 66 | 66 | 102 | Source 84 | 78 | 120 |
| | ME3 PGM D | 43 | 67 | Source 49 | 55 | 85 | Source 67 | 67 | 103 | Source 85 | 79 | 121 |
| | ME4 PGM D | 44 | 68 | Source 50 | 56 | 86 | Source 68 | 68 | 104 | Source 86 | 7A | 122 |
| | ME1 PVW 2 | 45 | 69 | Source 51 | 57 | 87 | Source 69 | 69 | 105 | Source 87 | 7B | 123 |
| | ME2 PVW 2 | 46 | 70 | Source 52 | 58 | 88 | Source 70 | 6A | 106 | Source 88 | 7C | 124 |
| | ME3 PVW 2 | 47 | 71 | Source 53 | 59 | 89 | Source 71 | 6B | 107 | Source 89 | 7D | 125 |
| | ME4 PVW 2 | 48 | 72 | Source 54 | 5A | 90 | Source 72 | 6C | 108 | Source 90 | 7E | 126 |
| | Test | 49 | 73 | Source 55 | 5B | 91 | Source 73 | 6D | 109 | Source 91 | 7F | 127 |
| | Black | 4A | 74 | Source 56 | 5C | 92 | Source 74 | 6E | 110 | Source 92 | 80 | 128 |

## Source Select (C0) Command

The Source Bus command enables the editor to select any Source on a bus specified by the effects address, and the command code. This command includes compatibility of commands C1, C2, C3 and C4.

*Table 2-9. Source Bus Command*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Source Bus | 03 | EX | C0 | Source # |

## Effects Addresses

Valid effects addresses for the Source Bus command are defined in Table 2-10.

*Table 2-10. Effects Addresses- Source Select Command*

| Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment |
|---|---|---|---|---|---|---|---|
| 00 | PGM-PST A | 2B | Mix/Effects 3 Key 2 | 56 | AuxBus12A | 79 | AuxBus29B |
| 01 | Mix/Effects 1 A | 2C | PGM-PST Key 2 Secondary Partition | 57 | AuxBus12B | 7A | AuxBus30A |
| 02 | Mix/Effects 2 A | 2D | Mix/Effects 1 Key 2 Secondary Partition | 58 | AuxBus13A | 7B | AuxBus30B |
| 03 | Mix/Effects 3 A | 2E | Mix/Effects 2 Key 2 Secondary Partition | 59 | AuxBus13B | 7C | AuxBus31A |
| 04 | PGM-PST A Secondary Partition | 2F | Mix/Effects 3 Key 2 Secondary Partition | 5A | AuxBus14A | 7D | AuxBus31B |
| 05 | Mix/Effects 1 A Secondary Partition | 30 | PGM-PST Key 3 | 5B | AuxBus14B | 7E | AuxBus32A |
| 06 | Mix/Effects 2 A Secondary Partition | 31 | Mix/Effects 1 Key 3 | 5C | AuxBus15A | 7F | AuxBus32B |
| 07 | Mix/Effects 3 A Secondary Partition | 32 | Mix/Effects 2 Key 3 | 5D | AuxBus15B | 80 | AuxBus33A |
| 08 | PGM-PST B | 33 | Mix/Effects 3 Key 3 | 5E | AuxBus16A | 81 | AuxBus33B |
| 09 | Mix/Effects 1 B | 38 | PGM-PST Key 4 | 5F | AuxBus16B | 82 | AuxBus34A |
| 0A | Mix/Effects 2 B | 39 | Mix/Effects 1 Key 4 | 60 | AuxBus17A | 83 | AuxBus34B |
| 0B | Mix/Effects 3 B | 3A | Mix/Effects 2 Key 4 | 61 | AuxBus17B | 84 | AuxBus35A |
| 0C | PGM-PST B Secondary Partition | 3B | Mix/Effects 3 Key 4 | 62 | AuxBus18A | 85 | AuxBus35B |
| 0D | Mix/Effects 1 B Secondary Partition | 40 | AuxBus1A | 63 | AuxBus18B | 86 | AuxBus36A |
| 0E | Mix/Effects 2 B Secondary Partition | 41 | AuxBus1B | 64 | AuxBus19A | 87 | AuxBus36B |
| 0F | Mix/Effects 3 B Secondary Partition | 42 | AuxBus2A | 65 | AuxBus19B | 88 | AuxBus37A |
| 10 | PGM-PST U1 | 43 | AuxBus2B | 66 | AuxBus20A | 89 | AuxBus37B |
| 11 | Mix/Effects 1 U1 | 44 | AuxBus3A | 67 | AuxBus20B | 8A | AuxBus38A |
| 12 | Mix/Effects 2 U1 | 45 | AuxBus3B | 68 | AuxBus21A | 8B | AuxBus38B |
| 13 | Mix/Effects 3 U1 | 46 | AuxBus4A | 69 | AuxBus21B | 8C | AuxBus39A |
| 18 | PGM-PST U2 | 47 | AuxBus4B | 6A | AuxBus22A | 8D | AuxBus39B |
| 19 | Mix/Effects 1 U2 | 48 | AuxBus5A | 6B | AuxBus22B | 8E | AuxBus40A |
| 1A | Mix/Effects 2 U2 | 49 | AuxBus5B | 6C | AuxBus23A | 8F | AuxBus40B |
| 1B | Mix/Effects 3 U2 | 4A | AuxBus6A | 6D | AuxBus23B | 90 | AuxBus41A |
| 20 | PGM-PST Key 1 | 4B | AuxBus6B | 6E | AuxBus24A | 91 | AuxBus41B |
| 21 | Mix/Effects 1 Key 1 | 4C | AuxBus7A | 6F | AuxBus24B | 92 | AuxBus42A |
| 22 | Mix/Effects 2 Key 1 | 4D | AuxBus7B | 70 | AuxBus25A | 93 | AuxBus42B |
| 23 | Mix/Effects 3 Key 1 | 4E | AuxBus8A | 71 | AuxBus25B | 94 | AuxBus43A |

*Table 2-10. Effects Addresses- Source Select Command - (continued)*

| Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment | Effects Address | Assignment |
|---|---|---|---|---|---|---|---|
| 24 | PGM-PST Key 1 Secondary Partition | 4F | AuxBus8B | 72 | AuxBus26A | 95 | AuxBus43B |
| 25 | Mix/Effects 1 Key 1 Secondary Partition | 50 | AuxBus9A | 73 | AuxBus26B | 96 | AuxBus44A |
| 26 | Mix/Effects 2 Key 1 Secondary Partition | 51 | AuxBus9B | 74 | AuxBus27A | 97 | AuxBus44B |
| 27 | Mix/Effects 3 Key 1 Secondary Partition | 52 | AuxBus10A | 75 | AuxBus27B | 98 | AuxBus45A |
| 28 | PGM-PST Key 2 | 53 | AuxBus10B | 76 | AuxBus28A | 99 | AuxBus45B |
| 29 | Mix/Effects 1 Key 2 | 54 | AuxBus11A | 77 | AuxBus28B | 9A | AuxBus46A |
| 2A | Mix/Effects 2 Key 2 | 55 | AuxBus11B | 78 | AuxBus29A | 9B | AuxBus46B |

## Preview Bus (E2) Command

The Preview Bus command enables the editor to select any Source on the preview primary bus.

*Table 2-11. Source Bus Command*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Preview Bus | 03 | 06 | E2 | Source # |

### Source Numbers

Valid Source numbers are shown in Table 2-8, “Common Source Numbers for all Busses,” on page 5.

## Split Key (E6, E7, E9 and EA) Commands

These commands allow an editor to use the Split Key feature of the Kalypso Switcher. There are two modes for selecting the key source: Auto Select mode uses the key source assigned to the selected fill source. Video Select mode uses the selected fill video as the key source.

*Table 2-12. Split Key Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Key 1 | 04 | EX | E6 | Fill Source #, Key Source # |
| Key 2 | 04 | EX | E7 | Fill Source #, Key Source # |
| Key 3 | 04 | EX | E9 | Fill Source #, Key Source # |
| Key 4 | 04 | EX | EA | Fill Source #, Key Source # |

## Effects Addresses

Valid effects addresses for the Split Key command defined in Table 2-13 come from existing Model 4000 code.

*Table 2-13. Effects Addresses - Split Key Commands*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 1 Secondary Partition[a] |

[a] New effects address assignment associated with Kalypso.

## Source Numbers

Valid Source numbers are shown in Table 2-8, “Common Source Numbers for all Busses,” on page 5.

The fill source is a valid source in hex. The format of the Key Source byte is provided in Table 2-14.

*Table 2-14. Key Source Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Combination of 7 bits makes valid sources (00H to 7FH) with special case: 00 is 80H

0 = Auto Select Mode, 1 = Video Select Mode

# Pushbutton Select and Control (C6, C7 and FB) Commands

The Pushbutton Select command (FB) is a command that performs a “push” of the specified pushbutton number, just as if the button had actually been pressed at the control panel.

The Pushbutton commands turn the designated pushbutton "on" (C6) or "off" (C7). These commands are valid with all pushbuttons.

*Table 2-15. Pushbutton Select and Control Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| PB/L# ON | 04 | EX | C6 | PB/L# High, PB/L# Low |
| PB/L# OFF | 04 | EX | C7 | PB/L# High, PB/L# Low |
| PB/L# PRESS | 04 | EX | FB | PB/L# High, PB/L# Low |

## Effects Addresses

Valid effects addresses for the Pushbutton Control commands defined in Table 2-16 come from existing Model 4000 code.

*Table 2-16. Effects Addresses - Pushbutton Select and Control*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 0B | Master E-MEM |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 3 Secondary Partition[a] |

[a] New effects address assignment associated with Kalypso.

## Pushbutton Numbers

Pushbutton numbers supported by these commands are specified in Table 2-17.

**Note** Invalid pushbutton numbers will be ignored. To insure that at least one transition element is on, the editor should turn on the desired transition element (e.g., Bkgd, Key 1, etc.) before turning off unwanted ones. Normally, Transition Wipe 1 will use Complex 1 and Transition Wipe 2 will use Complex 2, but, this is not a requirement. It may be impossible for the edit controller to select the wipe pattern if the operator has changed this association from the Kalypso UI.

*Table 2-17. Pushbutton Numbers*

| M/E Pushbuttons | | | |
|---|---|---|---|
| **Number** | **Function** | **Press** | **On / Off** |
| 0201H | Cut | X | |
| 0202H | Auto Tran | X | |
| 0203H | Preset Black | X | |
| 0206H | Mix | X | |
| 0207H | A/B Bkgd | | X |
| 0208H | Pri Wipe | X | |
| 0204H | Sec Wipe[a] | X | |
| 022DH | User Trans 1[a] | X | |
| 022EH | User Trans 2[a] | X | |
| 022FH | User Trans 3[a] | X | |
| 020EH | Key 1 | X | X |
| 0210H | Key 2 | X | X |
| 022BH | Key 3[a] | X | X |
| 022CH | Key 4[a] | X | X |
| 0212H | Key Priority | X | X |
| 0213H | Trigger[a] | X | X |
| 0223H | Key 1 Cut | X | |
| 0224H | Key 1 Mix | X | |
| 0225H | Key 2 Cut | X | |
| 0026H | Key 2 Mix | X | |
| 0227H | Key 3 Cut [a] | X | |
| 0228H | Key 3 Mix[a] | X | |
| 0229H | Key 4 Cut[a] | X | |
| 022AH | Key 4 Mix[a] | X | |
| 1607H | Wipe 1 Direction - Normal | X | |
| 1608H | Wipe 1 Direction - Reverse | X | |
| 1687H | Wipe 2 Direction - Normal | X | |
| 1688H | Wipe 2 Direction - Reverse | X | |

| Master E-MEM/Effects Edit/Effects Run Pushbuttons | | | | |
|---|---|---|---|---|
| **Number** | **Function** | **Press** | **On / Off** | **M/E** |
| 0502H | ENABLE M/E 1[a] | | X | |
| 0503H | ENABLE M/E 2[a] | | X | |
| 0504H | ENABLE M/E 3[a] | | X | |
| 0501H | ENABLE PGM-PST[a] | | X | |
| 0507H | ENABLE MISC 1[a] | | X | |
| 0510H | ENABLE MISC 2[a] | | X | |
| 0511H | ENABLE MISC 3[a] | | X | |
| 0512H | ENABLE MISC 4[a] | | X | |
| 0513H | ENABLE MISC 5[a] | | X | |
| 0514H | ENABLE MISC 6[a] | | X | |
| 0515H | ENABLE MISC 7[a] | | X | |
| 0508H | ENABLE DPM [a] | | X | |
| 050CH | ENABLE ALL | | X | |
| 0516H | Still Store Grp A[a] | | X | |
| 0517H | Still Store Grp B[a] | | X | |
| 0518H | Still Store Grp C[a] | | X | |
| 0544H | Prev KF[a] | X[b] | | |
| 0545H | Next KF[a] | X[b] | | |
| 0560H | Rew[a] | X[b] | | |
| 0561H | Hold Inputs[a] | X[b] | | |
| 0562H | Rev[a] | X | X | |
| 0563H | Auto Run[a] | X | X | X |
| 0564H | Stop Next[a] | X | X | |
| 0565H | Run[a] | X | | X |
| 0580H | Auto Recall[a] | X | X | |

[a] New pushbutton function associated with Kalypso.

[b] Effects addresses are irrelevant and will be ignored. All effects addresses will be treated as 0X0B.

# Wipe Pattern (C8) Command

The Wipe Pattern command selects the specified Transition Wipe 1 or Transition Wipe 2 pattern for an M/E. Only one Transition Wipe 1 and one Transition Wipe 2 pattern can be active at a time for each M/E.

*Table 2-18. Wipe Pattern Command*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Wipe Pattern | 03 | EX | C8 | Wipe # |

## Effects Addresses

Valid effects addresses for the Wipe Pattern command defined in Table 2-19 come from existing Model 4000 code.

*Table 2-19. Effects Addresses - Wipe Pattern Command*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 3 Secondary Partition[a] |

[a] New effects address assignment associated with Kalypso.

## Wipe Numbers

Wipe numbers range from 00H to 41H, corresponding to decimal numbers 0 through 65.

The format of the Wipe Number byte is provided in Table 2-20.

*Table 2-20. Wipe Number Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| P/S | W | W | W | W | W | W | W |

The seven least significant bits (W W W W W W W) represent the wipe number in hexadecimal. When the P/S bit is a 0, the editor selects a Transition Wipe 1 Pattern; however, when the P/S bit is a 1, the editor selects a Transition Wipe 2 Pattern. The Keyer Wipe generators are not accessible.

*Table 2-21. Wipe Pattern Names and Hexadecimal Numbers*

| Wipe Pattern Name | Hexadecimal Number | Wipe Pattern Name | Hexadecimal Number | Wipe Pattern Name | Hexadecimal Number |
|---|---|---|---|---|---|
| 0 Vertical | 00H | 22 POINT LT | 16H | 44 8 PT STAR | 2CH |
| 1 T/L Corner | 01H | 23 SQUARE | 17H | 45 TEXTURE | 2DH |
| 2 POINT DN | 02H | 24 CROSS | 18H | 46 SLITSCAN | 2EH |
| 3 CIRCLE | 03H | 25 V SAWTOOTH | 19H | 47 V ZIG ZAG | 2FH |
| 4 DIAG LT | 04H | 26 H SAWTOOTH | 1AH | 48 V SCAN | 30H |
| 5 TRIANGLE | 05H | 27 5 PT STAR | 1BH | 49 H X-CROSS | 31H |
| 6 CLOCK | 06H | 28 HEART | 1CH | 50 V X-CROSS | 32H |
| 7 ARROW | 07H | 29 H SCAN | 1DH | 51 V SNOWFALL | 33H |
| 8 HEXAGON | 08H | 30 H SPLIT | 1EH | 52 H SNOWFALL | 34H |
| 9 SPIRAL | 09H | 31 B/L CORNER | 1FH | 53 V QUAD SPIRAL | 35H |
| 10 HORIZONTAL | 0AH | 32 POINT UP | 20H | 54 DIAG ZIG ZAG | 36H |
| 11 T/R CORNER | 0BH | 33 DIAMOND | 21H | 55 H QUAD SPIRAL | 37H |
| 12 POINT RT | 0CH | 34 DUAL DIAGONAL | 22H | 56 T/B ZIG ZAG | 38H |
| 13 ELLIPSE | 0DH | 35 DOUBLE H SAWTOOTH | 23H | 57 L/R ZIG ZAG | 39H |
| 14 DIAG RT | 0EH | 36 DOUBLE V SAWTOOTH | 24H | 58 CHECKERBOARD | 3AH |
| 15 PENTAGON | 0FH | 37 4 X 3 RECTANGLE | 25H | 59 EXTERNAL | 3BH |
| 16 DUAL CLOCK | 10H | 38 SMALL RANDOM | 26H | 60 USER 1 | 3CH |
| 17 DIAGONAL CROSS | 11H | 39 LARGER RANDOM | 27H | 61 USER 2 | 3DH |
| 18 OCTAGON | 12H | 40 3 PT STAR | 28H | 62 USER 3 | 3EH |
| 19 H ZIG ZAF | 13H | 41 4 PT STAR | 29H | 63 USER 4 | 3FH |
| 20 V SPLIT | 14H | 42 6 PT STAR – Small | 2AH | 64 USER 5 | 40H |
| 21 B/R CORNER | 15H | 43 6 PT STAR – Large | 2BH | 65 USER 6 | 41H |

## Transition Mode (CA) Command

The Transition Mode command sets up the mode for the “next transition” that will occur.

*Table 2-22. Transition Mode Command*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Transition Mode | 03 | EX | CA | Mode |

### Effects Addresses

Valid effects addresses for the Transition Mode command defined in Table 2-23 come from existing Model 4000 code.

*Table 2-23. Effects Addresses - Transition Mode Command*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 3 Secondary Partition[a] |

[a] New effects address assignment associated with Kalypso.

### Mode Byte

The format of the Transition Mode byte for an M/E is provided in Table 2-24.

*Table 2-24. Transition Mode Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | X | X | X | 0 | X | X | X |

- Bit 0 = 1 = KEY 2 on
- Bit 1 = 1 = KEY 1 on
- Bit 2 = 1 = BKGD on
- Bit 3 = 0
- Bit 4 = 1 = Key Priority on
- Bit 5 = 1 = Key 4 on[a]
- Bit 6 = 1 = Key 3 on[a]
- Bit 7 = 0

[a] New bit assignment associated with Kalypso

## Auto and Key Transition Rate (CC and CD) Commands

The Transition Rate commands set the rates used by the switcher to perform a transition. They can also cause a transition to take place by setting the “execute bit.” The “next transition” which will occur should have been previously selected, either manually at the panel or by sending a Transition Mode command.

Five transition rates may be set in the switcher:

- Auto transition rate,
- Key 1 transition rate,
- Key 2 transition rate,
- Key 3 transition rate, and
- Key 4 transition rate.

Which rate is used depends on:

- The “next transition” which has been selected, and
- The effects address.

The transition rates that are set depend on the effects address and the keyer bits in the units digit of the rate data. The effects address specifies which M/E. The keyer bits control which of the keyer transition rates are also set.

The Auto Transition Rate command is primarily intended to set the auto transition rate but can also set the Key 1, 2, 3 and Key 4 transition rates. If the execute bit is set, the auto transition will be performed. The Key transition rate command only sets Key transition rates.

*Table 2-25. Auto and Key Transition Rate Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Auto Transition Rate | 05 | EX | CC | HD TN UN |
| Key Transition Rate | 05 | EX | CD | HD TN UN |

## Effects Addresses

Valid effects addresses for the Auto Transition Rate command defined in Table 2-26 come from existing Model 4000 code.

*Table 2-26. Effects Addresses - Auto Transition Rate Command*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 3 Secondary Partition[a] |

[a] New effects address assignment associated with Kalypso.

## Transition Rate

Transition rates are specified in numbers of frames. To translate a transition rate in seconds to number of frames, use the following formulae:

### NTSC

Frame Rate = (transition time in seconds) x (30 frames/second)

### PAL

Frame Rate = (transition time in seconds) x (25 frames/second)

Example: A four second AUTO TRAN would have a frame rate of 120 frames in the NTSC standard (4 seconds x 30 frames/second = 120 frames). For the PAL standard, substitute 25 frames/second to arrive at frame rate of 100 frames.

The command specifies the auto transition rate in terms of frames ranging from 000 to 999. Specify the auto transition rate in the command by supplying three data bytes:

- HD — The hundreds digit in BCD. The MSB is the “execute” bit.
- TN — The tens digit in BCD.
- UN — The units digit in BCD. The four MSBs are control bits to select Key 1, 2, 3 and Key 4 rates in addition to the auto transition rate.

The format of the HD byte is provided in Table 2-27.

*Table 2-27. HD Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| X | 0 | 0 | 0 | X | X | X | X |

Combination of 4 bits makes Hundreds digits

Rate value of 0 through 9 in BCD (0000 to 1001)

0 = Set rate only, do not perform the transition
1 = Set rate and perform the auto transition

The format of the TN byte is provided in Table 2-28.

*Table 2-28. TN Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | X | X | X | X |

Combination of 4 bits makes Tens digits

Rate value of 0 through 9 in BCD (0000 to 1001)

The format of the UN byte is provided in Table 2-29.

*Table 2-29. UN Byte Format*

| Bit[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| X | X | X | X | X | X | X | X |

Combination of 4 bits makes Units digits

Rate value of 0 through 9 in BCD (0000 to 1001)

1 = Set Key 3 rate also[b]

1 = Set Key 4 rate also[b]

1 = Set Key 1 rate also

1 = Set Key 2 rate also

[a] If bits 4, 5, 6 and 7 are set to 1, or are all zero, then all Key rates will be set. If bits 4, 5, 6 and 7 are all zero, command CC will set no Key rates; command CD will set all Key rates.

[b] New bit assignment associated with Kalypso.

## Learn and Recall E-MEM Register (DA and DB) Commands

The Learn E-MEM Register command is a command that causes the Effects Address state data in the specified E-MEM register to be stored or "learned" into the E-MEM register specified in the Mode byte. This command has the same effect as manually pressing the LRN button and then selecting an E-MEM register number (0 through 99). The command also supports learning an Effects Dissolve into a register.

The Recall E-MEM command, when sent, causes the state data in the specified E-MEM (Effects Memory) register to be recalled, thus changing the current state of the switcher to the stored settings for the given effects addresses. This command performs the same action as manually recalling an E-MEM register number of 0 through 99.

Control bits may be set to force or inhibit the recall of the register as an effects dissolve. Additionally, control bits may be used to force or inhibit the running of an effect which contains multiple keyframes, and the recall of learned enables prior to the recall of the register.

**Note** Do not send this command more than once per video frame. Also note that a new recall command received by the switcher will override any recall that is still in progress for an effects address.

*Table 2-30. Learn and Recall E-MEM Register Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Learn E-MEM Register | 04 | EX | DA | Mode, Register Number |
| | 06 | FF | DA | Mode, Register Number, 2-byte Bit-Mask |
| | 06 | FE | DA | Mode, Register Number, 2-byte Bit-Mask Kalypso Format |
| Recall E-MEM Register | 04 | EX | DB | Mode, Register Number |
| | 06 | FF | DB | Mode, Register Number, 2-byte Bit-Mask |
| | 06 | FE | DB | Mode, Register Number, 2-byte Bit-Mask Kalypso Format |

## Effects Addresses

Valid effects addresses for the Learn and Recall E-MEM Register commands are defined in Table 2-31.

*Table 2-31. Effects Addresses – Learn and Recall E-MEM Register Commands*

| | Effects Address | Assignment |
|---|---|---|
| Accessible Model 4000 Code | 00 | PGM-PST |
| | 01 | Mix/Effects 1 |
| | 02 | Mix/Effects 2 |
| | 03 | Mix/Effects 3 |
| | 06 | Miscellaneous |
| | 07 | DPM 1 |
| | 0B | All enabled levels |
| | FF | All specified levels[a] |
| | FE | Kalypso Format[b] |

| | Effects Address | Assignment |
|---|---|---|
| Kalypso Code | E0 | PGM-PSTSecondary Partition |
| | E1 | Mix/Effects1 Secondary Partition |
| | E2 | Mix/Effects2 Secondary Partition |
| | E3 | Mix/Effects3 Secondary Partition |
| | E5 | Miscellaneous1 |
| | E6 | Miscellaneous2 |
| | E7 | Miscellaneous3 |
| | E8 | Miscellaneous4 |
| | E9 | Miscellaneous5 |
| | EA | Miscellaneous6 |
| | EB | Miscellaneous7 |
| | EC | DPM |
| | ED | Still Store A |
| | EE | Still Store B |
| | EF | Still Store C |

[a] The editor may learn/recall a specific Effects Address or may learn / recall all levels currently enabled on the control panel. If the Effects Address is FF then the levels to be learned / recalled are specified in a 2-byte Bit-Mask.

[b] New effects address assignment associated with Kalypso.

## Learn Mode Byte

The Mode byte allows an E-MEM learn with Effects Dissolve. The format of the Learn Mode byte is provided in Table 2-32.

*Table 2-32. Learn Mode Byte Format*

| Bit[a] | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | X | 0 | 0 | 0 | 0 | 0 | 0 |

1 = Learn with Effects Dissolve

[a] Setting Bit 6 to one causes an Effects Dissolve to automatically occur when the specified E-MEM register is recalled.

## Recall Mode Byte

The Mode byte allows an E-MEM recall with Effects Dissolve, Auto Recall, and Run, either separately or together. The Mode byte takes precedence over the Switcher button tallies. The mode byte looks at four operations:

- Force the Run/Auto Recall/Effects Dissolve/Sequence operation
- Inhibit the Run/Auto Recall/Effects Dissolve/Sequence operation
- Operate according to current Switcher panel settings

The format of the Recall Mode byte is provided in Table 2-33.

*Table 2-33. Recall Mode Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| X | X | X | X | X | X | X | X |

1 = Recall E-MEM Register and Inhibit Auto Recall

1 = Recall E-MEM Register and Inhibit a Run

1 = Recall E-MEM Register and Inhibit Effects Dissolve

1 = Recall E-MEM Register and Inhibit Sequence

1 = Recall E-MEM Register and Force Auto Recall

1 = Recall E-MEM Register and Force Run

1 = Recall E-MEM Register and Force Effects Dissolve

1 = Recall E-MEM Register and Start Sequence

Effects Dissolve, Sequence, Auto Recall, and Run each have a Force bit and an Inhibit bit. If the Force bit is on, the action is performed irrespective of the state of the switcher. If the Inhibit bit is on, the action is not performed, irrespective of the state of the switcher. If both bits are off, then the action

is performed according to the switcher state, that is, what has been recalled from E-MEM, modified by the current state of the panel. (Refer to Table 2-34.)

*Table 2-34. Force/Inhibit Bits*

| Force | Inhibit | Action |
|---|---|---|
| 1 | 0 | Perform action |
| 0 | 1 | Inhibit action |
| 0 | 0 | Act according to panel state and register contents |
| 1 | 1 | Invalid |

Setting Bit 5 to one recalls an E-MEM register and runs any keyframes stored in that register. This has the same effect as pushing the AUTO RUN pushbutton and then recalling an E-MEM register from the control panel. Setting Bit 1 to one recalls an E-MEM which does not run, irrespective of the state of the AUTO RUN button. If both Bits 5 and 1 are set to zero, then the E-MEM is recalled and will run only if the AUTO RUN button is on.

Setting Bit 6 to one recalls an Effects Dissolve into an E-MEM register. This has the same effect as pushing the EFF DIS pushbutton and then recalling an E-MEM register from the control panel. Setting Bit 2 prevents the Effects dissolve from taking place irrespective of whether the effect was learned with Effects Dissolve on, or the Effects Dissolve button was pressed prior to sending the Recall E-MEM command. If both Bits 6 and 2 are zero, then the Effects Dissolve will occur if the effect was learned with Effects Dissolve on, or if the Effects Dissolve button is on (has just been pressed).

Auto Recall is controlled by the bits in the same manner as Auto Run, described above.

It is possible to combine Force bits to automatically run a register starting with an effects dissolve after the enabled levels have been recalled.

## Registers

Valid E-MEM registers are 00 through 99 (00H–63H). The format of the Effects Register Number byte is provided in Table 2-35.

*Table 2-35. Effects Register Number Byte Format*

| Bit | | | | | | | |
|---|---|---|---|---|---|---|---|
| **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | X | X | X | X | X | X | X |

Combination of 7 bits makes values used for Effects Register 00H – 63H

## Bit-Mask Format

The two-byte bit mask allows the editor to specify any combination of effects addresses 00 through 7FF. The LSB (bit 0) represents the first address, and bit 10 represents the DPM 4 address. The top 5 bits are “don't care.”

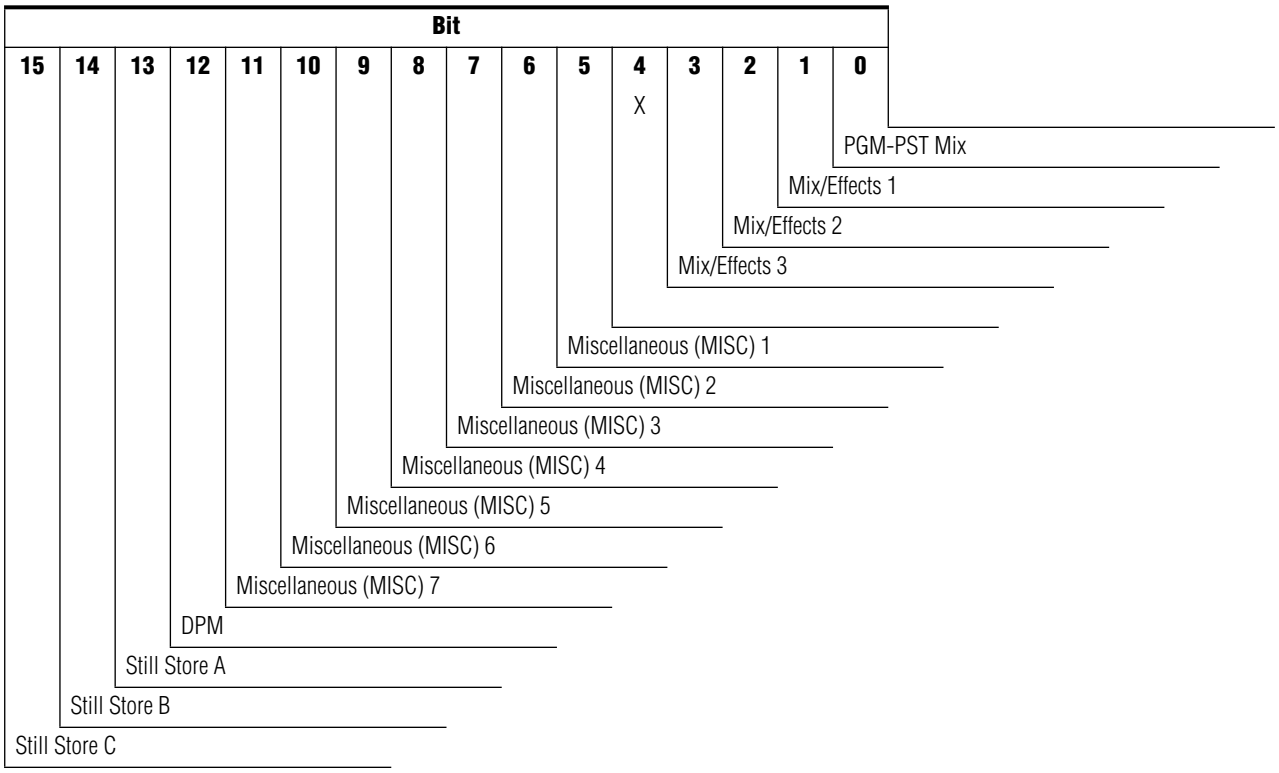
*Table 2-36. Effects Addresses Byte Format*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| | | | | | | | | DPM 1 | Miscellaneous (MISC) | | | | | | PGM-PST Mix |
| | | | | | | | | | | | | | | Mix/Effects 1 | |
| | | | | | | | | | | | | | Mix/Effects 2 | | |
| | | | | | | | | | | | | Mix/Effects 3 | | | |
| | | | | | | | | | | | 4 | | | | |

### Bit-Mask Kalypso Format

The two-byte bit mask allows the editor to specify any combination of effects addresses 00 through 7FFF. The LSB (bit 0) represents the first address, and bit 15 represents the Still Store C address. The 4 bit is “don't care.”

*Table 2-37. Effects Addresses Byte Format*




## Save and Load Data (5F and DF) Commands

An editor may request the switcher to save an E-MEM register to a disk file using a specified file name. At a later time the editor may request that the disk file be loaded to a specified E-MEM register. There is a separate message type for each of these operations. The message specifies the E-MEM register number and an option field followed by a null terminated text file name. The effects address specifies whether E-MEM data or config-

uration (either suite prefs or user prefs) are saved or loaded. An “Ack” is returned if a valid command is received. Use Status Request Command (6D) to determine if the file operation is successful.

*Table 2-38. Save and Load Data Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Save Data | 06H to FFH | EX | 5F | Reg Number, Opt(2bytes), Name (up to 250 bytes) |
| Load Data | 06H to FFH | EX | DF | Reg Number, Opt(2bytes), Name (up to 250 bytes) |

## Effects Addresses

Valid effects addresses for the Save and Load Data commands defined in Table 2-39 are new for Kalypso.

*Table 2-39. Effects Addresses - Save and Load Data Commands*

| Effects Address | Assignment | Byte Format Reference | |
|---|---|---|---|
| | | Save Option | Load Option |
| 0B | All E-MEM Levels | Table 2-40 | Table 2-46 |
| 1B | Source Mem | Table 2-41 | Table 2-47 |
| 1C | RMem | Table 2-42 | Table 2-48 |
| 1D | System Config | Table 2-43 | Table 2-49 |
| 1E | Suite Prefs | Table 2-44 | Table 2-50 |
| 1F | User Prefs | Table 2-45 | Table 2-51 |

## Reg Number

The value in this byte is a register number from 0 to 99 (decimal).

## Name

The name is a null terminated string from 1 to 250 bytes long that specify a path name for the E-MEM file to be loaded or saved. The name specified is appended to the string “C:\EMEM\” to form the complete path name. If the editor supplies no name (a single zero byte) the editor interface uses a default name of “EDITOR”, so that the complete path name is “C:\EMEM\EDITOR”.

The file name is automatically generated by Kalypso and is of the form “REGnnn.EMM”, where nnn is the decimal register number.

### Examples

```
09 0B 5F 00 00 00 41 42 43 00
```

Makes Kalypso save E-MEM register 0 to the following file: “C”\EMEM\ABC\REG000.EMM”

**09 0B DF 63 00 00 41 42 43 00**

Makes Kalypso load the following file to E-MEM register 99:
“C”\EMEM\ABC\REG099.EMM”

**06 0B 5F 01 00 00**

Makes Kalypso save to E-MEM register 1 the following file:
“C”\EMEM\EDITOR\REG001.EMM”

## Save Option Byte Formats

*Table 2-40. E-MEM (0B)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X |

0 = Don't Overwrite; 1 = Force Overwrite

1 = All Levels Learned; 0 = All Levels Enabled

*Table 2-41. SourceMem (1B)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

1 = Don't Overwrite; 0 = Force Overwrite

*Table 2-42. RMem (1C)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

1 = Don't Overwrite; 0 = Force Overwrite

*Table 2-43. System Config (1D)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

1 = Don't Overwrite; 0 = Force Overwrite

*Table 2-44. Suite Prefs (1E)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

1 = Don't Overwrite; 0 = Force Overwrite

*Table 2-45. User Prefs (1F)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X |

1 = Don't Overwrite; 0= Force Overwrite

## Load Option Byte Formats

*Table 2-46. E-MEM (0B)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X |

1 = All Levels Learned; 0 = All Levels Enabled

0 = Load; 1 = Recall after Load

*Table 2-47. SourceMem (1B)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Table 2-48. RMem (1C)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Table 2-49. System Config (1D)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Table 2-50. Suite Prefs (1E)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | X | X | 0 |

Opt 4

Opt 3

Opt 2

Opt 1

No Options are currently defined.

*Table 2-51. User Prefs (1F)*

| Bit | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | **14** | **13** | **12** | **11** | **10** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | X | X | X | X | 0 |

Opt 4

Opt 3

Opt 2

Opt 1

No Options are currently defined.

# Save and Load Status (6D and ED) Commands

The switcher will respond with a Status Response message on receipt of a Status Request command. The status code reflects the current state of file operations.

*Table 2-52. Save and Load Status Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Status Request | 02 | EX | 6D | None |
| Status Response | 04 | EX | ED | Status (2bytes) |

## Effects Addresses

Valid effects addresses for the Save and Load Status command are defined in Table 2-53. (This is new code generated for Kalypso.)

*Table 2-53. Effects Addresses - Save and Load Status Command*

| Effects Address | Assignment |
|---|---|
| 0B | All E-MEM Levels |
| 1B | Source Mem |
| 1C | RMem |
| 1D | System Config |
| 1E | Suite Prefs |
| 1F | User Prefs |

## Status Message

Valid Status code for the Save and Load commands are defined in Table 2-54. (This is new code generated for Kalypso.)

*Table 2-54. Status Codes - Save and Load*

| Status | Message |
|---|---|
| 0 | Idle |
| 1 | Error |
| 2 | Loading |
| 3 | Saving |

## Timeline Control (4E, 4F, CE, and CF) Commands

The Timeline Control commands allow the editor to manipulate a specified effect's timeline. The controlling device may read the current position, write a new position, or trim the current position by a specified amount. All positions or trims are measured as a field count. The switcher's response to the Read Timeline command is the Set Timeline command.

*Table 2-55. Timeline Control Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Read Timeline Time (1) | 02 | EX | 4E | None |
| Set Timeline Time (2) | 06 | EX | CE | 4 byte value |
| | 08 | FF | CE | Value + 2 byte bit mask |
| | 08 | FE | CE | Value + 2 byte bit mask Kalypso format |
| Trim Timeline Time (2) | 06 | EX | CF | 4 byte value |
| | 08 | FF | CF | Trim value + 2 byte bit mask |
| | 08 | FE | CF | Trim value + 2 byte bit mask Kalypso format |
| Run Timeline (2) | 06 | EX | 4F | 4 byte value |
| | 08 | FF | 4F | Speed value + 2 byte bit mask |
| | 08 | FE | 4F | Speed value + 2 byte bit mask Kalypso format |

## Effects Addresses

Valid effects addresses for the Timeline Control commands are defined in Table 2-31.

*Table 2-56. Effects Addresses – Timeline Control commands*

| | Effects Address | Assignment |
|---|---|---|
| Accessible Model 4000 Code | 00 | PGM-PST |
| | 01 | Mix/Effects 1 |
| | 02 | Mix/Effects 2 |
| | 03 | Mix/Effects 3 |
| | 06 | Miscellaneous |
| | 07 | DPM 1 |
| | 0B | Master Timeline (all enabled levels) |
| | FF | All levels specified in the bit mask |
| | FE | Kalypso Format[a] |

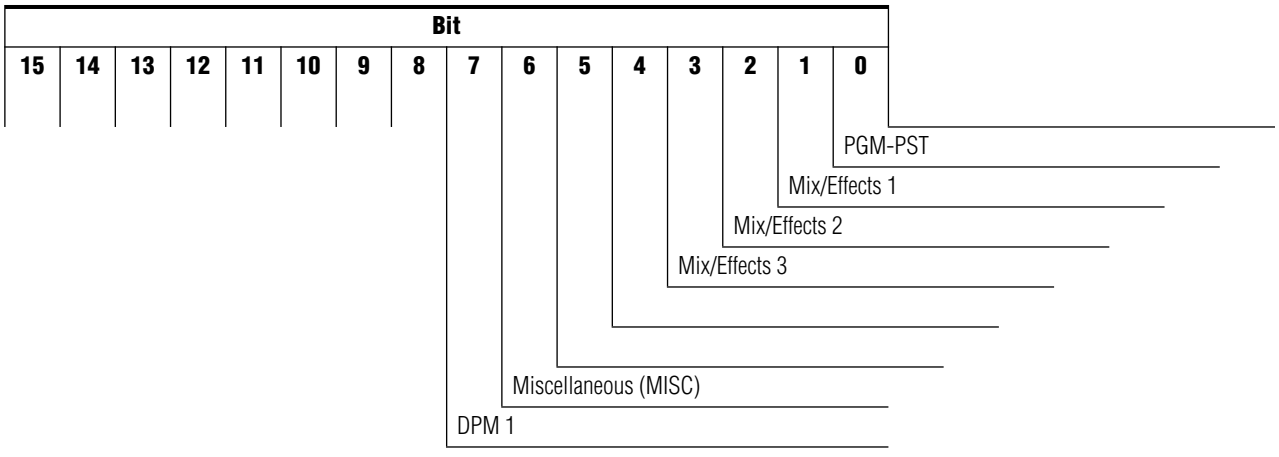
| | Effects Address | Assignment |
|---|---|---|
| Kalypso Code | E0 | PGM-PSTSecondary Partition |
| | E1 | Mix/Effects1 Secondary Partition |
| | E2 | Mix/Effects2 Secondary Partition |
| | E3 | Mix/Effects3 Secondary Partition |
| | E5 | Miscellaneous1 |
| | E6 | Miscellaneous2 |
| | E7 | Miscellaneous3 |
| | E8 | Miscellaneous4 |
| | E9 | Miscellaneous5 |
| | EA | Miscellaneous6 |
| | EB | Miscellaneous7 |
| | EC | DPM |
| | ED | Still Store A |
| | EE | Still Store B |
| | EF | Still Store C |

[a] New effects address assignment associated with Kalypso.

## Bit-Mask Format

The two-byte bit mask allows the editor to specify any combination of effects addresses 00 through 7FF. The LSB (bit 0) represents the first address, and bit 10 represents the DPM 4 address. The top 6 bits are “don't care.”

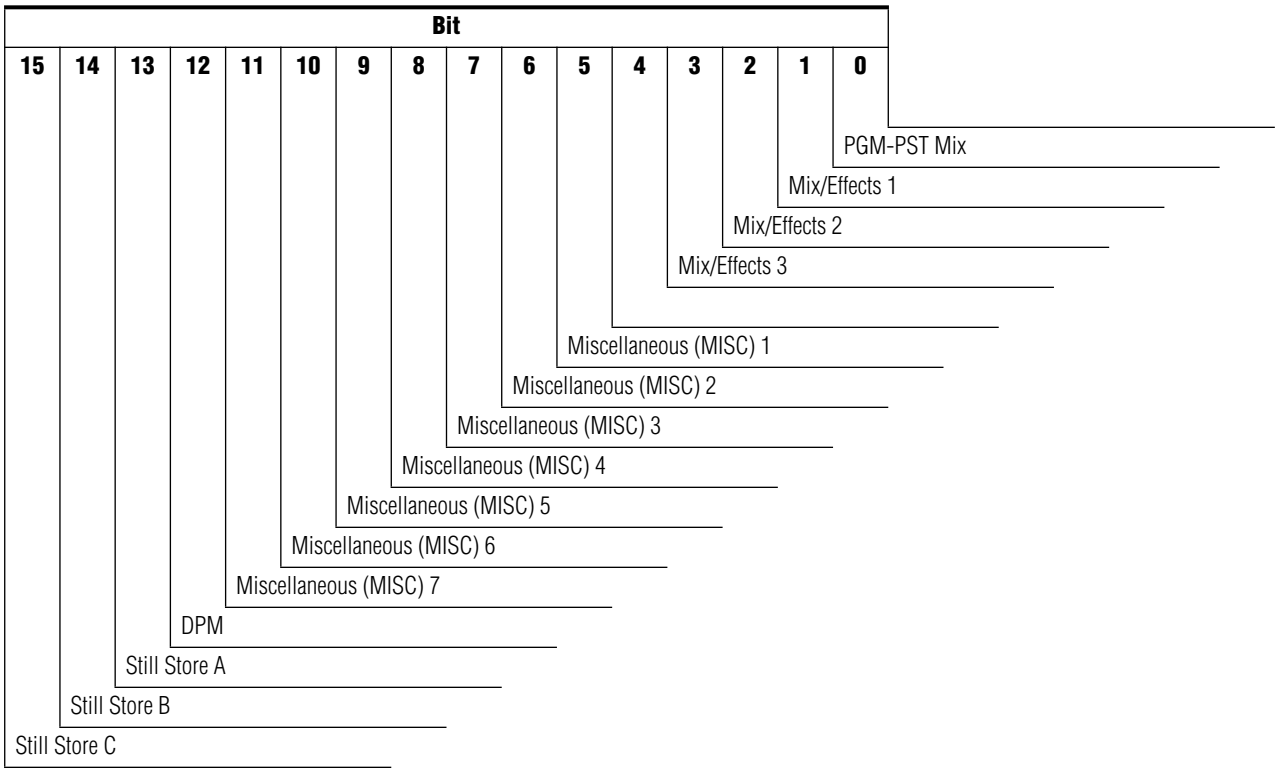
*Table 2-57. Effects Addresses - Byte Format*



## Bit-Mask Kalypso Format

The two-byte bit mask allows the editor to specify any combination of effects addresses 00 through 7FFF. The LSB (bit 0) represents the first address, and bit 14 represents the Still Store C address. The 15 bit is “don't care.”

*Table 2-58. Effects Addresses - Byte Format*




## Data Field Format

All time data (field count) and speed data is specified to be binary data in S15.16 format. The lower two bytes specify a fractional field value. The topmost bit is the sign bit and the next 15 bits represent whole field values. Note the following examples.

+1 field : 00 01 00 00

– 1 field : FF FF 00 00

+1 (unity) speed : 00 01 00 00

– 1/2 speed : FF FF 80 00

Setting the Run Time for a speed of zero is the same as sending a STOP command.

The editor is allowed to write a negative field count or to trim in a negative direction which results in a negative field count. In either case the result is to display a negative timecode in the menu and position the video at the 1st keyframe. The video will remain at that position until one of the following occurs:

- The effect runs long enough for the field count to pass zero
- The editor successively trims the field count in a positive direction until zero is passed
- The editor writes a positive, non-zero field count to the switcher

### Examples

Note the following examples:

**08 0C CF FF FF 00 00 07 80** ==> Trim all DPM levels by –1 field.

**08 0C CE 00 1E 00 00 00 0E** ==> Set the 3 M/Es to 30 fields.

**08 0C 4F 00 01 00 00 00 0E** ==> Run the effects for all 3 M/Es.

## All Stop (F2) Command

The ALL STOP command is issued to set all or a specific part of the switcher to a known state. The command causes the following functions to occur:

- Any ongoing KEY MIX is stopped,
- An ongoing AUTO TRAN (Transition) is stopped,
- An ongoing EFF DIS (Effects Dissolve) is stopped,
- An ongoing SEQ (Sequence) is stopped,
- The lever arms are set to a limit,
- The transition type is set to MIX,
- The transition mode is set to BKGD,
- All Keys are removed,
- Stop Effect Run, and
- The Source selections remain unchanged.

*Table 2-59. All Stop Command*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Write | 03 | EX | F2 | FF |

### Effects Addresses

Valid effects addresses for the All Stop command defined in Table 2-60 come from existing Model 4000 code.

*Table 2-60. Effects Addresses - All Stop Command*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |
| 01 | Mix/Effects 1 |
| 02 | Mix/Effects 2 |
| 03 | Mix/Effects 3 |
| 04 | PGM-PST Secondary Partition[a] |
| 05 | Mix/Effects 1 Secondary Partition[a] |
| 06 | Mix/Effects 2 Secondary Partition[a] |
| 07 | Mix/Effects 3 Secondary Partition[a] |
| 0B | All Levels |

[a] New effects address assignment associated with Kalypso.

## Software Version (6C and EC) Commands

The switcher will respond with a Software Version Response message on receipt of a Request Software Version command. The response will be returned two fields after the request is received. The Version string is ASCII Text of the format:

**`<major>.<minor>.<patch><A or B><release>`**, e.g., 2.0.0B19

*Table 2-61. Software Version Commands*

| Function | Byte Count | Effects Address | Command Code | Message |
|---|---|---|---|---|
| Request Software Version | 02 | EX | 6C | None |
| Software Version Response | 04H to FFh | EX | EC | Model number, version string |

### Effects Address

The valid Effects Address for the Software Version command is defined in Table 2-62.

*Table 2-62. Effects Address - Software Version Command*

| Effects Address | Assignment |
|---|---|
| 00 | PGM-PST |

### Model Number

Model numbers are as defined in Table 2-63.

*Table 2-63. Model Numbers*

| Model Number | Meaning |
|---|---|
| 01 | 3000-2 |
| 02 | 3000-3 |
| 03 | 4000-2A |
| 04 | 4000-2B |
| 05 | 4000-3 |
| 06 | 2200-2 |
| 07 | 2200-2i |
| 08 | Kalypso 3-M/E + PP |
| 09 | Kalypso 2-M/E + PP |
| 0A | Kalypso 1-M/E + PP |
| 0B | Kalypso 0-M/E + PP |

### Version Number

The software Version number comprises a Major Version number, a Minor Version number, and two fix-level parameters. The Major Version and Minor Version are each represented as a two-byte ASCII character, and the two fix-level parameters are each represented as a one-byte ASCII character.

## Switcher Model Features

The following is a brief summary of the features associated with the various switcher models.

*Table 2-64. Switcher Model Summary*

| Model | Crosspoint Buttons | M/Es | PGM-PST/DSK | Other |
|---|---|---|---|---|
| 3000-2 | 16 | 2 | Yes | Composite |
| 3000-3 | 24 | 3 | Yes | Composite |
| 4000-2B | 16 | 2 | Yes | Component |
| 4000-2A | 24 | 2 | Yes | Component, layered mode on DSK |
| 4000-3 | 24 | 3 | Yes | Component |
| 2200-2 | 16 | 2 | No | Component |
| 2200-2i | 16 | 2 | No | Component, Krystal control |
| Kalypso 3M/E + PP | 128 | 3 | Yes/No | Component |
| Kalypso 2M/E + PP | 128 | 2 | Yes/No | Component |
| Kalypso 1M/E + PP | 128 | 1 | Yes/No | Component |
| Kalypso 0M/E + PP | | | | |

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