Chapter 7 Advanced Features

This manual describes the functions available with the standard Keyboard Control Unit (KCU) 080 series software. This chapter describes those functions uniquely available in other configurations, including KCU 600 and KCU 300 series software.

The Advanced Features chapter has the following product sections:

- Varispeed (KCU 600 series software)

  Varispeed configuration requirements
  X-frame synchronization
  Varispeed operation with KCU
  Varispeed pivot points and offsets
  Varispeed options menu differences
  Calculating with varispeed
  Displaying varispeed status
  Varispeed error messages

- System Supervisor Unit (KCU 300 series software)

  Installing the SSU
  KCU options menus with the SSU
  Event [EVNT] Select GPI options menu
  Group [GRP] options menu
  Record Enable [REC] options menu
  System options menu
  Time Code Generators

Varispeed (KCU 600 Series Software)

With the KCU, Lynx-2 modules will operate both X-Frame rate and Varispeed synchronization. Varispeed synchronization permits machines to be locked together and run at different speeds to allow time compression or expansion.

Varispeed synchronization allows many operational features:

- Tapes that have different running times can be fitted together.

- Program material with non-synchronous time code can be locked.

- NTSC 0.1% pull up and pull downs available.

- Standard conversion between 24- and 25-frame time codes requiring 4% speed compensation can be performed.

Varispeed Configuration Requirements

Varispeed synchronization requires KCU 600 series software, and Lynx-2 software version V-700, or Lynx V-600 or higher. Please contact the factory for ordering and installation information.

Any combination of Lynx-2 and Lynx modules fitted with Gearbox Option cards and V500 modules can be used with the KCU.

X-Frame Synchronization

X-Frame synchronization of mixed code types is only possible with Lynx-2 and V600 slave modules. V500 modules can be used as slave modules, but only with the code type combinations that are shown in the following table. When a combination of Lynx modules are used in a system, the most flexible configuration can be obtained by selecting a V500 module as the master machine. The permitted combinations are shown in the following tables.

Table Chapter 7 -1. X-Frame Combinations

Varispeed Operation with KCU

To varispeed a tape, varispeed must be turned on and a varispeed source sync point marked. The KCU detects Lynx-2 modules and Lynx modules fitted with V600 on the Lynx bus, and switches for X-Frame and Varispeed operation automatically.

In some instances when using the KCU, subframe amounts appear in the time code registers. This is a normal side effect of either the X-Frame time code conversion or varispeed adjustment process. For example, 30:15 in 30 frame code will become 30:12.50 if it is converted to 25 frame time code. The internal calculations performed by the KCU are all high precision and always take into account the subframe contents of the time code registers.

Varispeed Pivot Points and Offsets

The *varispeed pivot point,* or the absolute offset, is the only point in the 24 hour clock where the actual offset is completely independent of the varispeed adjustment. Regardless of the varispeed rate selected, the positional relationship of the machines does not change.

On the slave tape, it is at this point that the offset is defined. The pivot point is the place where the difference between the off tape time code is exactly the same as the value in the slave offset register.

In non-varispeed KCU operation, setting a source sync point is optional and used only as a method of calculating offsets. Machines in varispeed, by default, must have a pivot point for the varispeed synchronization calculation. If a sync point (varispeed pivot point) is not set, the KCU uses zero for the varispeed calculations regardless of accuracy. It is very important that the source sync point entered is related to the program material. If not, the sync relationship moves significantly when the varispeed amount is changed.

The significant difference from non-varispeed operation is that a source sync point must be set, even if no offset is required between the machines. Capturing an offset or using sync points to calculate an offset automatically enters the varispeed pivot point at a suitable time code.

Example of Pivot Points

In this example, the varispeed pivot point is at 00:00:00 (no offset has been entered). There are two tapes with a zero offset. The master machine is running at standard speed, and the slave running with a +10% varispeed. If these tapes are played from 00:00:00, at 10 minutes the master machine will be at 10:00:00 and the slave time 11:00:00. Even though the tapes started with a zero offset, at 10 minutes the tapes have a positional offset of one minute.

If the master tape is at 10:00:00 and the slave varispeed percentage is changed from +10% to 0%, the slaves actual offset will be recalculated, and the tape would move back one minute to establish its proper, positional relationship at the new zero varispeed rate.

There is only one place where the varispeed percentage does not affect the tape position. If the slave tape as well as the master tape had been at 00:00:00 (the varispeed pivot point, altering the varispeed percentage would not have moved the tape as it is already in the correct place.

In practice, the varispeed pivot point is not set at 00:00:00, but at the start of the program material, or at some other relevant point (i.e., the beginning of a sound effect). Then, if the varispeed rate needs to be altered, the start time is locked in place and the sync does not move.

Setting Pivot Points

Set varispeed pivot points for machines in either of the following ways:

- Enter slave Source Sync (SRC SYNC) points and master a Reference Sync (REF SYNC) point.

- Enter slave Source Sync points and slave offset numbers.

If source sync points are not entered, the default time of 00:00:00 hours is used as the varispeed pivot point.

Using Offsets with Varispeed

Slave machines lock internally in varispeed. A machine in varispeed can be thought of as having a constantly moving offset. At any point, the actual offset (the real difference between the tape and time codes) is made up of two parts: the entered offset (time in the offset register) plus a varispeed offset adjustment. These two offset components determine the positional relationship between machines.

Machines running in varispeed can be offset by all standard methods. The offset can be entered manually, captured, or calculated from sync points. Offsets can be recalled and trimmed dynamically, if required, using the [+] and [-] keys or the Jog/Shuttle wheel. When offsets are calculated for X-frame machines, the time codes are converted in the offset calculation to the reference machine code type.

Manually entered offsets are applied at the slave source sync point (varispeed pivot point). Some care must be taken when manually entering or adjusting offsets. If the slave tape is not located at or close to the source sync point, the machine will relocate to maintain the correct varispeed positional relationship.

Capturing Varispeed Offsets

Offsets can be captured by soloing the slave machine and pressing [CAPT], followed by the [OFST/5] key. Offsets are calculated by subtracting the current master position from the current slave position. If either of the machines is operating in X-Frame rate mode, the time code is converted in the offset calculation to the reference code type.

The source sync register is updated automatically to the current time code value. In normal operation, each time an offset is captured [CAPT], [OFST], and the source sync point register is inactive, [SRC SYNC] key LED off. The source sync point remains inactive (LED off), but the new value is used as the slave varispeed pivot point.

If the source sync point is active when the offset is captured, the register will not be overwritten and the captured offset will be compensated by the varispeed adjustment. This action makes the offset value correct at the varispeed pivot point (source sync point).

Calculating Offsets

The normal offset calculation functions of the reference sync [REF SYNC] and source sync [SRC SYNC] keys and registers have not been changed. If reference and source sync points are set for varispeed machines, the offset will be calculated in the normal way and applied at the source sync point. If no reference sync point is set, the system uses the record edit in point to calculate the offset.

When the reference sync or edit in points are changed, <u>all</u> machines with active source sync point registers will have their offset recalculated and reposition. The source sync point is active if the [SRS SYNC] key LED is on in solo or status modes. If you do not want a particular slave machine offset to recalculate, the source sync point for that machine should be made inactive by holding the [CLR] key and pressing the [SRC SYNC] key, before changing the reference or edit in points.

Making the source sync point inactive does not affect the varispeed pivot point. The system continues to use the value in the source sync point register for the varispeed calculation.

KCU sync point software allows slave varispeed pivot points to be moved without changing the actual offset relationship with the master machine. In normal operation, if a slave varispeed pivot point is moved and the offset is not changed, the slave machine will recalculate its position and relocate.

If the reference sync and edit points are inactive, the KCU does a special calculation to prevent the slave from moving when a new source sync point is entered. The KCU automatically updates the slave machine offset to take into account the varispeed offset adjustment between the old and new source sync points. By updating the offset, the positional relationship defined by the previous source sync point and offset is maintained.

Clearing In Points

To clear the reference or edit in points temporarily, press [CLR] and the [REF SYNC] and [IN] special function keys simultaneously. The register values are not cleared, but are made inactive and can be recalled and restored if needed after the slave machine sync point has been moved.

Varispeed Options Menu Differences

Two additional setup options are available in the Transport options menu and one additional option in the System options menu to control varispeed setup and operation.

Transport [TRAN] Options Menu Differences

Varispeed setup options are in the Transport options menu. These options are available only with KCU 600 series software.

Press [SETUP], then [TRAN], to access the transport options menu. There are two options specific to varispeed, 3–VARISPEED and 4–VARIABLE %.

Access the options by pressing the appropriate calculator key (3 or 4), or step through the list using the [LAST] and [NEXT] keys.

Table Chapter 7 -2. Transport Options Menu

KEY	MENU	SUB-MENU	RANGE
TRAN	Tran Options		
	A-F Machine Keys	0 Capstan Mode	Wild, *Resolved*
		1 Ser TC Option	*Enable*, Inhibit
		2 Track Select	*KCU*, Transport
		3 Varispeed	*Off*, -0.1%, +0.1%, Variable
		4 Variable %	85.00-115.00 (*100.00*)

- **3–VARISPEED.** +0.1%, -0.1% are highly accurate preset calculations used for pulling up or down the NTSC 29.97 fps to the 30.00 fps frame rate difference. The pull up and down settings are used to run machines at the correct speed when synchronizing with NTSC tapes. Select -0.1% to run a slave tape at 29.97 fps when using a PAL reference. Select +0.1% to run slave tapes at 25 or 24 fps when using a NTSC reference. X-Frame rate code combinations for the preset NTSC varispeed settings are shown in the following table.

Table Chapter 7 -3. NTSC Varispeed Corrections

Ref Src Rate	Slave Code 30	DF	25	24
30.00*	-0.1%	-0.1%	0	0
29.97	0	0	+0.1%	+0.1%
25.00	-0.1%	-0.1%	0	0
24.00	-0.1%	-0.1%	0	0

*   This case is unusual, because 29.97 fps would normally be selected for NTSC operation.

VARIABLE is used with the VARIABLE % option to set varispeed rates to synchronize program material with different running times, or where standards conversion is required.

- **4–VARIABLE %.** The variable percentage can be adjusted by ±15%. The jog/shuttle wheel adjusts in 10ths of a percent, and the [+] and [–] keys in 100ths of a percent. Use the [CLR] key to reset the varispeed amount back to 100%, the default setting. The varispeed percentage will be automatically updated if varispeed sync, in and out points are entered in the Transport varispeed calculation register to calculate a varispeed rate. (See *Calculating with Varispeed*.)

System [SYS] Options Menu Differences

Press [SETUP], then the [SYS] key to acces the System Options Menu

Table Chapter 7 -4. System Options Menu

KEY	MENU	SUB-MENU	RANGE
SYS	System Options	0 System Ref SRC	Int Xtal, *Ext Vid*, Mains, VSO
		1 Calc Entry Mode	*Normal*, CMX Style
		2 Flash Rec Lamp	*No*, Yes
		3 Wheel Rate	1-10 (*1*)

Calculating with Varispeed

Unless the varispeed is a standard value, the simplest method of determining the correct varispeed rate is to use the KCU varispeed calculator. The calculator calculates the rate as a ratio of two durations, or from four points or positions on tape:

- Reference start

- Reference end

- Slave start

- Slave end

The KCU varispeed software has a special transport mode for varispeed percentage calculation. This mode is independent from non-varispeed KCU operation and is only used for marking points on each tape or for entering known program durations for varispeed calculation. In transport setup mode, the calculator automatically recalculates the rate, each time a point is marked, and enters the new varispeed value for that machine.

The current varispeed percentage is shown if the selected machine will varispeed. If the varispeed percentage flashes, it indicates that the rate, computed from the current varispeed calculator register values, doesn't match the actual varispeed percentage. A varispeed percentage will not be shown for the reference machine and V500 modules.

Accessing the Varispeed Calculator

Press the [TRAN] key twice to access the varispeed calculator. The KCU flashes the *TRAN: (A-F) VARISPEED* message to indicate that the KCU is in the transport varispeed mode.

The varispeed calculator uses the [IN/7] and [OUT/8] calculator keys to store start and end times for each machine. The calculator then compares the slave times with the reference machine times and calculates the slave varispeed percentage. Because each machine has independent In and Out registers, it is possible to

enter different points on the reference machine to calculate individual varispeed rates for each slave machine.

Varispeed Tran Mode

Varispeed tran mode is a special version of the normal solo mode. When varispeed tran mode is engaged, the KCU transport functions can be used to solo a transport in the usual way, and to locate to specific points on the tape for marking the start and end time registers for each machine. In varispeed tran mode, the start and end point registers for each machine can be captured, stored, recalled, and trimmed in the usual way.

The tran mode In and Out varispeed calculation registers are not the same as the edit In and Out registers.

Press the [TRAN] key to enter varispeed tran mode. The [TRAN] key LED flashes, and information relating to the selected machine is displayed.

Press the [TRAN], [GRP], [SOLO] or [ALLSTOP] key to exit varispeed tran mode.

Calculating by Duration

The varispeed rate also can be calculated by entering two program durations. If the existing running time is stored in the reference machine Duration register, and the new running time in the slave Duration register, the calculator compares the two durations and calculates a varispeed percentage.

See *Using Time Code Registers* in the Getting Started chapter for a discussion of Duration registers.

Displaying Varispeed Status

The KCU and the Lynx-2 module have status displays to indicate X-Frame and varispeed status of each machine.

The Lynx-2 module front panel indicates that a machine is in varispeed by lighting the VARI LED, and by displaying *VL 00* in the offset error display. In X-Frame, a Lynx module code type LED flashes to indicate the reference machine code type if the type is different from the off-tape time code type.

The KCU displays XL for machines in X-Frame lock, and VL for machines in varispeed lock in both group and solo modes. If a machine is in X-Frame and Varispeed lock, only VL is displayed.

The double letter group lock indicators in the upper right portion of the display have not been changed, and still indicate the system reference source. For example, LL indicates external video and II indicates internal crystal. When VV is displayed, it indicates that VSO is the system reference. VV is not an indication of varispeed lock status.

Varispeed Error Messages

A varispeed limits error message is displayed when an out of range varispeed calculation has been entered. The KCU software recalculates the speed every time the reference or slave In, Out, or Duration varispeed calculation registers are altered.

When a number is entered that causes the varispeed to exceed the ±15% range, the varispeed percentage for that machine is reset to 100%, and the *Varispeed reset, Limits exceeded!* message is displayed. Because the speed calculation may have been exceeded The actual values in each register are retained temporarily while new points are entered, the actual values in each register are retained.

System Supervisor Unit (KCU 300 Series Software)

With the System Supervisor Unit (SSU), the KCU becomes a powerful editor/controller within console and automation systems. The SSU becomes the central communication hub of a TimeLine machine control system.

Installing the SSU

In installation, the KCU and Lynx modules are all routed through the SSU. The ES bus communications of the SSU will monitor and control all communication, including KCU/CCU and RMC machine controllers, console automation systems, TimeLine Lynx and Lynx-2 modules, Digital Audio Workstations (DAWs), and system tally and GPI controllers.

Software Requirements

The KCU requires software version KCU 330 or later. The SSU must have software version 1.40 or later. Please contact the factory if software upgrades are needed.

Connecting the System Supervisor Unit

Instead of daisy-chaining Lynx modules from the KCU power supply, the ES bus software of the KCU requires that the KCU be connected to the SSU. The Lynx modules are daisy-chained from the RS422 port of the SSU.

1. Connect the KCU to its power supply.

2. Connect a KCU Serial cable between the KCU power supply GPI/SUPERVISOR connector and the SSU COMPUTER/ CONTROL PORT 1.

3. Connect the Lynx modules to the TRIBUTARY PORT 1.

Initializing the System Supervisor Unit

After initialization, all setup and control functions take place at the KCU. The SSU need only be used as a communications monitoring device, as all SSU communications become transparent within the system.

To initialize the KCU with the SSU,

1. Verify that the KCU, SSU, and Lynx modules are powered ON.

2. Place the Lynx modules to be used ONLINE.

3. Press the KCU status [POLL] key to poll the communications bus.

   Note: When the system is powered on, communication on the bus is unavailable until the KCU polls the system.

4. Verify the RS422 Tributary Port 1 and COMPUTER/ CONTROL PORT 1 communications on the SSU.

Using the SSU

When the KCU and SSU are installed and initialized with the Lynx modules, KCU operation is the same as stand-alone operations. The KCU is controlling all fundamental operations of the SSU and Lynx modules, while functioning as the editing controller.

In some cases, console automation systems will be used along with the KCU. This in no way limits any operations or functions of the KCU, but allows machine control from either the console transport keys, or the KCU transport keys. Commands will be overwritten from the last location where the command was issued.

KCU Options Menus with the SSU

This section describes only those options unique to the KCU in SSU operation. See the *KCU Options Menus* section of the Getting Started chapter for detailed information on options menus.

The following KCU options menus contain options specific to SSU operations, or are available only with the SSU:

- Event [EVNT] Select GPI options menu

- Group [GRP] options menu

- Record Enable [REC] options menu

- System options menu

- Time Code Generators and TCG [GEN] options menu.

Event [EVNT] Select GPI Options Menu

The Event Select GPI options menu contains several settings that are used exclusively with the SSU.

- There are eight available GPIs rather than the two available in stand-alone KCU systems.

- The additional GPI SYS MUTE option sets the relay during machines all locked mode, all stopped mode, and Master machine shuttle mode. The relay is reset during any machine motion that is non-play.

- ADR beep options are located in GPI 8. The beep options are identical in both systems.

For an SSU configuration, refer to the following information on the Event options menu. This information supersedes the discussion of the Event Select GPI options menu in the Getting Started chapter.

GPIs in the SSU

GPI switch closures are output from the SSU, rather than from the KCU power supply as in stand-alone operation. A 4-3-2-1 annunciator countdown is also available prior to each GPI relay closure. An additional output is programmed as system lock indicator. Status indicators for all eight GPIs are located on the front panel of the SSU.

Accessing the Event [EVNT] Select GPI Options Menu

Each GPI has a Preroll and Duration register. The Preroll register is used to advance the closure time to allow for slow start of externally triggered devices. Duration can be set to suit the closure type required. The following transport keys affect GPI operation:

STOP   Takes the GPI offline.

PLAY   Sets the GPI to ready or active.

REH   Rehearses the closure

To access the Event Select GPI options menu, press [SETUP], then [EVNT].

Event Options Menu Choices

The KCU 080 series software Event options menu has two GPI choices. Configured with the SSU, the KCU 300 software offers eight choices. Choose GPI 1 through GPI 8 from the Event Select GPI options menu.

Table Chapter 7 -5. Event Options Menu

KEY	MENU	SUB-MENU	PARAMETERS
EVENT	Select GPI Options		
	1 GPI	0 Mode	Normal, Autoset, *Rec Tally*, Edit Rec, Reh Tally, Edit Reh, Lock Tally, Sys Mute
	2 GPI 2	0 Mode	*Edit Rec*
	3 GPI 3	0 Mode	*Reh Tally*
	4 GPI 4	0 Mode	*Edit Reh*
	5 GPI 5	0 Mode	*Lock Tally*
	6 GPI 6	0 Mode	*Autoset*
	7 GPI 7	0 Mode	*Autoset*
	8 GPI 8	0 Mode	Normal, *Autoset*, Rec Tally, Edit Rec, Reh Tally, Edit Reh, Lock Tally, Sys Mute
		1 Beep Mode	Off, *On*
		2 Beep Spacing	10-30 (*20*)
		3 Last Beep	*Muted*, On

Group [GRP] Options Menu

The Group options menu contains settings for group machine operation. The Group options menu is only available with KCU 300 series software.

Press [SETUP], then [GRP], to access the Group options menu.

Table Chapter 7 -6. Group Options Menu

KEY	MENU	SUB-MENU	RANGE
GRP	Group Options	0 Search Mode	Chase, *Group*
		1 Ref Follow Mstr	*Off*, On
		2 Group Parkahead	0-30 (*25*)

- CHASE allows each controlled transport to locate and chase at its fastest wind speed.

- GROUP (default) restricts the slave machine chase speed to that of the master machine. The slave machines locate to a point as a group, rather than on their own.

- REF FOLLOW MSTR indicates that whenever the master machine is designated, it will automatically be the reference machine. This is true even if the master machine is redesignated.

- GROUP PARK AHEAD is the time, in frames, that slave machines will park ahead of the master machine.

Record Enable [REC] Options Menu

Press [SETUP] followed by the red status [REC] key to access the Record Enable options menu. This is available in 300 software.

Table Chapter 7 -7. Record Enable Options Menu

KEY	MENU	SUB-MENU	RANGE
RDY	Record Options	0 Flash Rdy Lamp	*No*, Yes
		1 Bar Status	Track Enable, *Rec Enable*

- The setting of FLASH REC LAMP determines if the REC (Record Status) LED flashes when a transport is in record.

- BAR STATUS sets the REC (Record Status) LEDs to indicate either that a machine is in record ready, or that individual tracks are armed on a specific transport.

System Options Menu

For an SSU configuration, refer to the following information on the System options menu. This information supersedes the discussion of the System options menu in the Getting Started chapter.

To access the System options menu,

1. Press [SETUP].

    [SETUP] key flashes.

2. Press the [SYS] key.

    [SYS] key flashes, the LAST and NEXT LEDs light, and the [+] and [-] keys light.
    The message *System Ref Src: Ext Vid* is displayed.

3. Use the [+] or [–] key to change the reference selection.

4. Press [SETUP] to exit the menu.

The following choices are available from the System options menu:

Table Chapter 7 -8. System Options Menu

KEY	MENU	SUB-MENU	RANGE
SYS	System Options	0 Calc Entry Mode	*Normal*, CMX Style
		1 Jog Speed	1-10 (*6*)
		2 Trim Frame	01-10 (*01*)
		3 Trim Subframe	01-25 (*01*)

Time Code Generators

The time code generator (TCG) operates as another machine in the group, similar to a virtual machine. The TCG can be either the master or slave. An offset can be applied if the time code output needs to be offset from the master machine time code. The TCG can be soloed to stripe time code onto a transport.

When using the KCU with the SSU, TCGs can be added from the SSU.

When the KCU is initialized with the SSU, the message *Press the GRP key and adds Groups in order of priority* is displayed. At this point, the [GEN] key flashes in addition to any machine keys that are flashing to prompt a new group. Adding the TCG into the group as a slave allows you to control the time code generator output of the SSU as if it were another machine. The TCG jams the master machine time code during all transport operations, allowing TCG output to control a console automation system, digital audio workstations, or another time code-controlled device.

Time Code Generator [GEN] Options Menu

The Time Code Generator options menu is available only with KCU 300 series software. The GEN (Time Code Generator) key provides access to the system reference and timing options.

Press [SETUP], then device select [GEN] key, to access the Time Code Generator options menu.

Table Chapter 7 -9. Time Code Generator Options Menu

KEY	MENU	SUB-MENU	RANGE
TCG	TCG Options	0 System Ref	Intfix, Intvar, *Extvid*, Mains, Pilot, Exttc, VSO Master, Aux
		1 System Spd/Code	24 Hz/24, *25 Hz/25 (PAL)*, 29.97 Hz/DF*, 29.97 Hz/30 (NTSC)*, 30 Hz/DF, 30 Hz/30
		2 Varispeed %	82.00-118.00 (*100.00*) Jog/Shuttle Wheel = ±0.1% +/- = ±0.01%
		3 TCG Group Mode	Play, Run; Play, Mute; *Play, Wind*
		4 TCG Still Mode	Off, *On*
		5 TCG Tran Mode	Virtual (*SSL/Neve*), *Machine*

- SYSTEM REF selects the system reference for the SSU.

- SYSTEM SPEED/CODE defines the time code type and speed of the SSU time code generators.

- VARISPEED % allows adjustment of the internal crystal synthesizer of the SSU.

- JOG/SHUTTLE WHEEL adjusts the setting in 0.1% amounts.

- TCG GROUP MODE determines the operating parameters of the virtual machine time code generators of the SSU. Choices are PLAY/RUN, PLAY/MUTE, and PLAY/WIND.

  PLAY/RUN starts generating time code when a play command is detected, and continues generating time code until an All Stop command is used.

  PLAY/MUTE generates time code in play only.

  PLAY/WIND (default) generates time code in play and wind speeds.

- TCG STILL MODE causes the time code generator to generate the same time code value for one second after a stop command is issued.

- TCG TRAN MODE configures the SSU time code generators for use with console automation systems.

  VIRTUAL is used during NEVE and SSL operation. In this mode, the TCG automatically groups itself with the machines grouped to provide time code to the automation system in use.

  MACHINE is used to group the TCG manually with the other machines.

MIDI Time Code

When the TCG is active and generating time code, MIDI time code is also generated out the MIDI connectors of the SSU. This can be used to control a MIDI device or other equipment that requires a MIDI time code input.