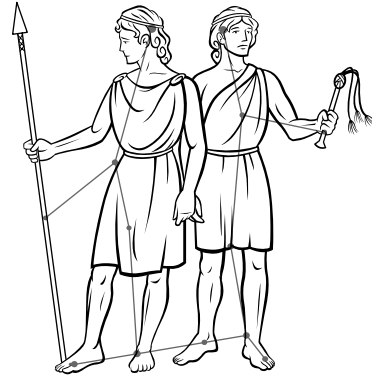


## CHAPTER 10: THE GEMINI GENERAL PURPOSE CONTROLLER



### INTRODUCTION

The *Gemini General Purpose Controller* is one of the *Intelligent Controllers* that comprise the *Universal Theater Control System (UTCS)*. Each *Gemini* provides four independent control ports capable of generating the appropriate low voltage control signals for slide projectors, special effects projectors, and/ or slew-zoom projectors. Additional *Device Interfaces* are necessary to convert the low voltage control signals into the appropriate higher power projector controls. The *Gemini* control ports can be configured to accept any combination of device interfaces listed below.

1. *Castor Slide Projector Interface*
2. *Pollux Special Effect Interface*
3. *Mirak Dual DC Motor Interface*
4. *Dubhe Multiplexed Special Effects Interface*

The *Gemini* also provides eight low power switch closures (relays) to provide additional control opportunities. They can be used as is, or in conjunction with a *BOB Break Out Box*. The *BOB* can turn the low power switch closures from the *Gemini* into convenient switched 120 VAC outlets, or can provide higher powered switch closures for other applications.

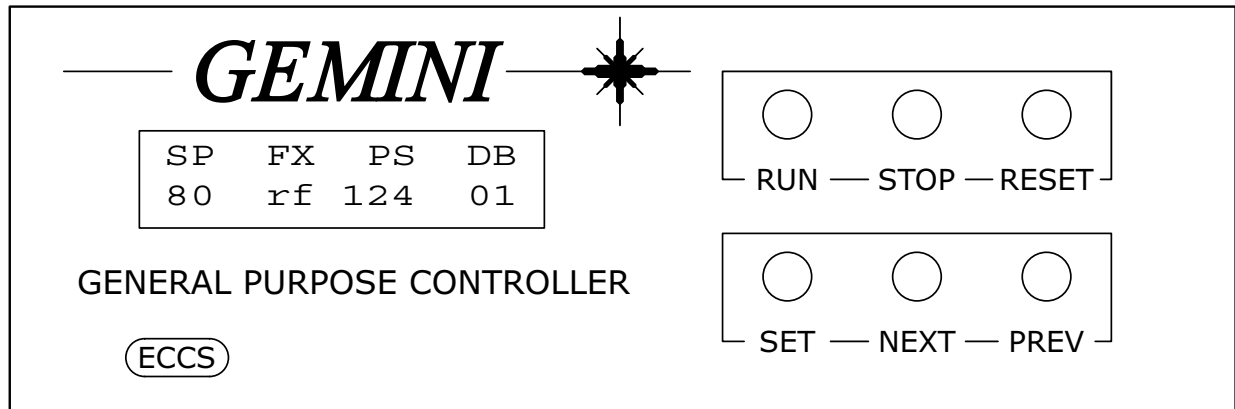
The *Universal Theater Control System (UTCS)* can have up to 64 *Intelligent Controllers* attached to the communication network. This allows direct access to up to 256 devices. All functions can be automated using the *Hercules Central Processor*, or manually operated with the *Cygnus Manual Control System*.

The *Gemini* and the other *Intelligent Controllers* in the *UTCS* are ‘smart boxes’ that can be periodically updated with newer internal software to enhance and/ or increase their capabilities. These upgrades are done over the *UTCS* network and can be performed by theater personnel. This means the theater can continue to expand without the need for downtime and expensive service calls.

# GEMINI GENERAL PURPOSE CONTROLLER

## THE GEMINI FRONT PANEL LCD DISPLAY AND CONTROLS

During normal operation and depending on the devices connected to the control ports, the LCD display will appear as illustrated below:



### **LCD Display:**

When first turned on, the LCD display will show the software version currently installed in the *Gemini*. This screen will be replaced with the one illustrated above as soon as the *Hercules Show Control Software* issues a command to the *Gemini*, or the front panel menu is accessed. The top line of the display shows the Device Interface that has been selected for each control port of the *Gemini*. The bottom line displays the current status information for each interface. The device codes and related status information are shown in the table below.

Type	Interface	Displayed Information
SP	Castor	Slide tray position ( $0 \leq \# \leq 80$ ).
FX	Pollux	Auxiliary motor status.
PS	Mirak	Position ( $0 \leq \# \leq 255$ ).
DB	Dubhe	Dubhe bank ( $1 \leq \# \leq 8$ ).

The LCD display will also show any error messages that are generated during operation. Error messages will overwrite the top line of the display. Error messages will be visible until the successful execution of a subsequent command takes place, or until the front panel menu is accessed.

The LCD display is used in conjunction with the six front panel buttons to set the **Unit Number** and operational mode of the *Gemini*.

### **LCD Display Backlight:**

The LCD display is equipped with a backlight to make it easier to read. When the *Gemini* is in the **Normal Mode** of operation, not the **Settings Mode**, the backlight can be turned on by pressing the <NEXT> button. Pressing the <PREV> button turns the backlight off.

# GEMINI GENERAL PURPOSE CONTROLLER

## USING THE FRONT PANEL BUTTONS FOR LOCAL CONTROL OF THE GEMINI

The front panel buttons are divided into two functional groups. The top trio of buttons provide a basic amount of 'local' device control. Pressing the <RUN> button will activate power to any slide projectors connected to the *Gemini* control ports. Pressing the <STOP> button deactivates power to any slide projectors connected to the *Gemini* control ports, provided the slide projectors are not otherwise active. Pressing the <RESET> button twice in succession activates a reset sequence that turns slide projector lamps off, sends slide trays and special effect motions to HOME positions, and resets *Dubhe Multiplex* banks.

## USING THE FRONT PANEL CONTROLS TO CONFIGURE THE GEMINI

The lower trio of buttons, in conjunction with the LCD display, provide a convenient menu-driven method for setting the operating characteristics of the *Gemini* for use with the UTCS. Menu settings may be viewed or altered at any time.

To view or change menu selections, enter **Settings Mode** by pressing the <SET> button. The top line of the LCD display shows the current setting selected, while the bottom line shows the current option selected for the setting. The <NEXT> and <PREV> buttons navigate through the options for the current setting. To select a particular option, press the <SET> button. This keeps the current option displayed for the setting and moves to the next menu setting. Pressing <RESET> once, will exit the **Settings Mode** without stepping through all the settings.

After stepping through all the settings, the *Gemini* will return to operating in **Normal Mode**. Any changes made will be maintained until they are changed again, even if the *Gemini* is powered down between uses.

If while attempting to change a setting, the 'LOCKED!!' message appears, the setting must be 'unlocked' before any changes may be made. Press the <SET> button until the last setting, 'SET LOCK:', is reached. Press either the <NEXT> or <PREV> button to 'unlock' all settings. The bottom line in the 'SET LOCK:' setting should say 'EDIT SETTINGS OK' when 'unlocked', and 'SETTINGS LOCKED' when 'locked'.

The table on the next page provides a list of the settings, options for each setting, and a description for each option available through the *Gemini* front panel menu.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SETTINGS AND OPTIONS

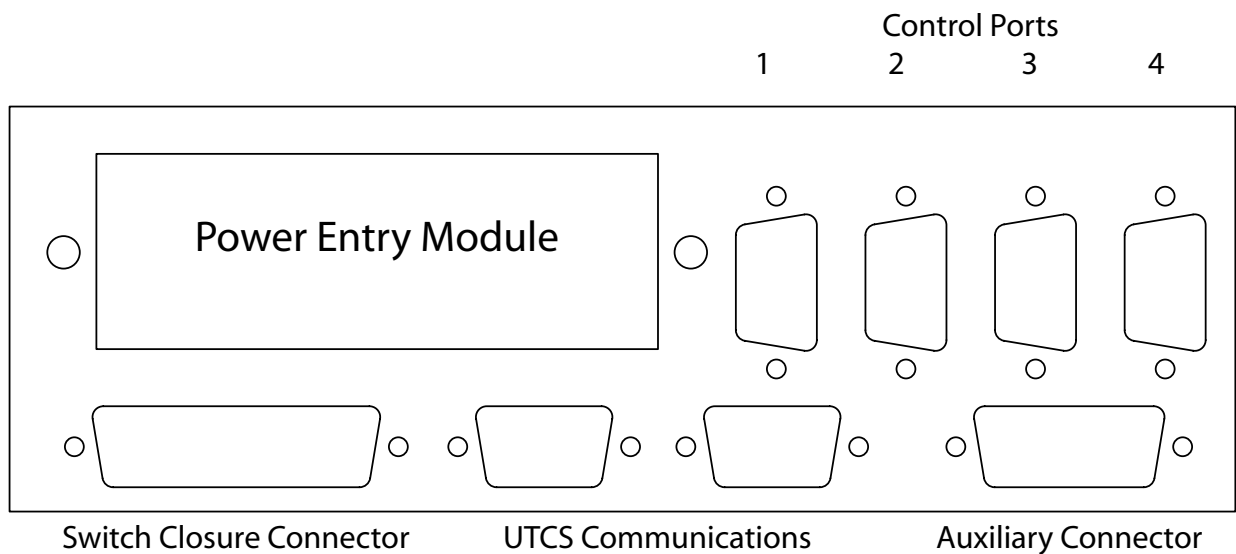
<u>Setting</u>	<u>Option</u>	<u>Description</u>
SET UNIT NUMBER:	1 - 64	Set <i>Intelligent Controller</i> <b>Unit Number</b> for <b>UTCS</b> identification.
SET MODE PROJ 1:	SP - CASTOR FX - POLLUX PS - MIRAK MPX FX - DUBHE PS - SERVO AMP	Sets device as a slide projector. Sets device as a special effect. Sets device as position control with <i>Mirak</i> . Sets device as multiplexed special effect. Sets device as position control with servo amp.
SET MODE PROJ 2:	-- Same as PROJ 1	See above descriptions.
SET MODE PROJ 3:	-- Same as PROJ 1	See above descriptions.
SET MODE PROJ 4:	-- Same as PROJ 1	See above descriptions.
SET MODE SWITCH:	S1-8 DVC OF 1 SW S8-1 DVC OF 8 SW 18-1 DVC, 1 OF 8 24-2 DVC, 1 OF 4 42-4 DVC, 1 OF 2	Eight independent switches each treated as a separate device. Eight switches treated as one device. One group of 8 interlocked switches treated as one device. Two groups of 4 interlocked switches treated as two devices. Four groups of two interlocked switches treated as four devices.
SET LOCK:	EDIT SETTINGS OK SETTINGS LOCKED	Allows settings to be changed. Prevents settings from being changed.

# GEMINI GENERAL PURPOSE CONTROLLER

## REAR PANEL CONNECTIONS

The *Gemini* has eight wedge-shaped (**DB**) connectors on the rear panel. All input and output connections are made here. The four female 9-pin (**DB9**) connectors to the right of the power entry module are the control ports where the *Device Interfaces* connect to the *Gemini*. Port one closest to the power module. The two **DB9** connectors, one male and one female, below the power entry module are the UTCS communication network connectors.

The male 25-pin (**DB25**) connector provides access to the eight dry contact switch closures. The female 15-pin (**DB15**) connector is the auxiliary connector.



# GEMINI GENERAL PURPOSE CONTROLLER

## COMMUNICATION NETWORK CONNECTORS

The *Gemini* receives commands sent from the *Hercules Central Processor* or the *Cygnus Manual Control System* over the **UTCS** communication network. The communication network can support up to 64 *Intelligent Controllers*, but each *Intelligent Controller* must have a unique **Unit Number**. The **Gemini Unit Number** is set using the front panel menu and button controls.

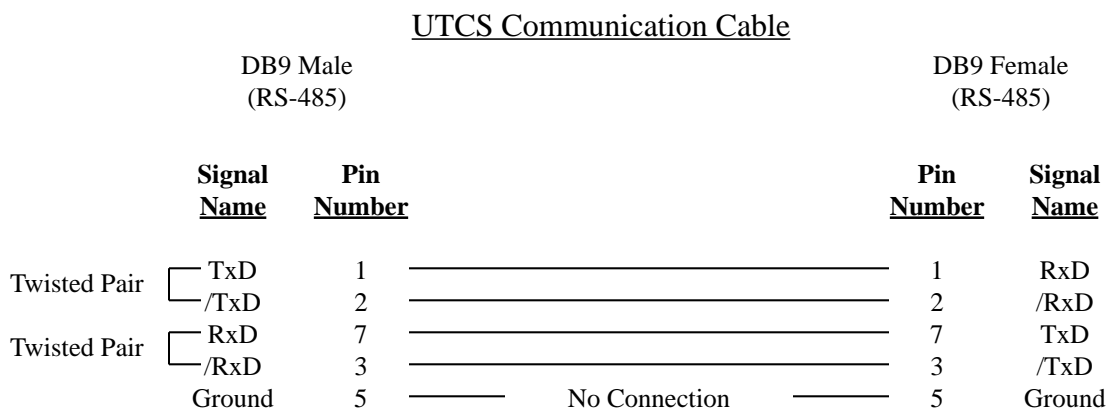
The communication network connectors are located on the *Gemini* rear panel. There are two black **DB9** connectors, a male and a female, mounted horizontally in the center of the rear panel. In a typical installation, the male connector will connect towards the *Hercules Central Processor*, and the female will connect towards the next *Intelligent Controller*.

The *Gemini* can be ‘inserted’ anywhere in the existing communication network **Daisy Chain**, or as the last *Intelligent Controller* in the **UTCS** network. Placement of the unit is dependent only convenience and ease of operation.

## COMMUNICATION CABLE WIRING

All communications are four conductor cables with a male **DB9** connector at one end and a female **DB9** connector at the other.

Communication cables are wired straight through, with pin 1 on the male end tied to pin 1 on the female end, pin 2 to pin 2, pin 3 to pin 3, and pin 7 to pin 7. For optimal performance, the wires should be twisted pairs with one pair on pins 1 and 2 and the other on pins 3 and 7. The wiring diagram is illustrated below.



# GEMINI GENERAL PURPOSE CONTROLLER

## SWITCH CLOSURE CONNECTOR (MALE DB25)

The male **DB25** connector on the rear panel of the *Gemini* provides eight dry contact switch closure outputs for user defined applications. **Normally Open** and **Normally Closed** contacts are available for each of the eight switches. Each switch is capable of carrying up to ½ amp of a resistive load. The pin assignment for this connector is listed in the following table.

Pin	Signal	Description	Pin	Signal	Description
1	NC1	Normally Closed Switch 1	14	NO1	Normally Open Switch 1
2	C1	Common Switch 1	15	NC2	Normally Closed Switch 2
3	NO2	Normally Open Switch 2	16	C2	Common Switch 2
4	NC3	Normally Closed Switch 3	17	NO3	Normally Open Switch 3
5	C3	Common Switch 3	18	NC4	Normally Closed Switch 4
6	NO4	Normally Open Switch 4	19	C4	Common Switch 4
7	NC5	Normally Closed Switch 5	20	NO5	Normally Open Switch 5
8	C5	Common Switch 5	21	NC6	Normally Closed Switch 6
9	NO6	Normally Open Switch 6	22	C6	Common Switch 6
10	NC7	Normally Closed Switch 7	23	NO7	Normally Open Switch 7
11	C7	Common Switch 7	24	NC8	Normally Closed Switch 8
12	NO8	Normally Open Switch 8	25	C8	Common Switch 8
13	GND	Frame Ground			

## AUXILIARY CONNECTOR (FEMALE DB15)

The female **DB15** connector on the rear panel of the *Gemini* is the Auxiliary Connector. There are several, seldom used, signals available through this connector. The signals are provided for special applications and future expansion.

There are eight TTL and CMOS compatible digital inputs available. The inputs are tied to a logic high internally through 10K pull up resistors, and are activated by pulling them to ground with a switch closure, transistor, TTL or CMOS IC, or equivalent. Six of the inputs are used with the front panel buttons and the other two are currently undefined in the *Gemini* software. The pin assignment for this connector is listed in the following table.

Pin	Signal	Description	Pin	Signal	Description
1	NC	No Connection	9	GND	Ground
2	NC	No Connection	10	NC	No Connection
3	NC	No Connection	11	NC	No Connection
4	+5V OUT	+5 Volts Out (250 mA maximum)	12	PB0	Run
5	PB1	Stop	13	PB2	Reset
6	PB3	Set	14	PB4	Next
7	PB5	Prev	15	PB6	Unassigned
8	PB7	Unassigned			

# GEMINI GENERAL PURPOSE CONTROLLER

## DEVICE INTERFACE CONNECTIONS

A *Device Interface* may be connected to each of the four *Gemini* control channels by means of four blue female 9-pin (**DB9**) connectors vertically mounted on the *Gemini* rear panel. The control channels are numbered 1 through 4, with channel 1 located close to the power entry module. The following *Device Interfaces* are currently available for the *Gemini*:

1. The *Castor Slide Projector Interface* contains the power handling electronics to control projector power switching, lamp dimming, bidirectional tray motions, and tray home sensing.
2. The *Pollux Special Effect Interface* contains the power handling electronics to control fan switching, lamp dimming, and two motor controls, one with home sensing capabilities.
3. The *Mirak Dual DC Motor Interface* contains the electronics to control bidirectional DC motor control with position sensing to eight bits (256 points). Motion limit sensing by means of mechanical or optical sensors is also supported, but not required.
4. The *Dubhe Multiplexed Special Effects Interface* contains the electronics to control a group of special effects, one at a time. The *Dubhe* is available in three configurations. The *8x1 Dubhe* can control 8 lamps, one at a time. The *4x2M Dubhe* can control 4 lamp/ motor pairs, one at a time. The *4x2F Dubhe* can control 4 lamp/ fan pairs, one at a time.

**Note:** The *Dubhe* used as a *Device Interface* with the *Gemini* should not be confused with the *Dubhe II* and *Dubhe IV*. The *Dubhe II* and *Dubhe IV* are *Intelligent Controllers* that require unique **Unit Numbers** and can do not require the use of a *Gemini*.

Each device that can be attached to the *Gemini* not only has a different interface, it must also have its own unique low voltage control signal characteristics. This means that before a device can be correctly controlled, the *Gemini* must be told what type of device is attached to each of the control ports. Those selections are made using the front panel menu. The different *Device Interface* control cable pin assignments are listed on the following page.



# GEMINI GENERAL PURPOSE CONTROLLER

## CONTROL CABLE PIN ASSIGNMENTS

### Slide Projector Control Cable Pin Assignment:

Pin	Signal	Description	Pin	Signal	Description
1	Ground	Ground Supply and Reference	6	+5V Ext.	+5 Volt supply for interface
2	Power	Projector Power Output (low = on)	7	/Tray Home	Tray Home Input (low = Home)
3	/Ready	Projector Ready Input (low = Ready)	8	Proj Reverse	Tray Reverse Output (low =on)
4	/Lamp OK	Lamp OK Input (low = Lamp OK)	9	Lamp	Lamp Output (low = on)
5	Proj Forward	Tray Forward Output (low = on)			

### Special Effect Control Cable Pin Assignment:

Pin	Signal	Description	Pin	Signal	Description
1	Ground	Ground Supply and Reference	6	+5V Ext.	+5 Volt supply for interface
2	Fan	Projector Fan Output (low = on)	7	/Home	Motion 1 Home Input (low = Home)
3	/Ready	Projector Ready Input (low = Ready)	8	Motion 2	Motion 2 Output (low =on)
4	/Lamp OK	Lamp OK Input (low = Lamp OK)	9	Lamp	Lamp Output (low = on)
5	Motion 1	Motion 1 Output (low = on)			

### Position Control Cable Pin Assignment:

Pin	Signal	Description	Pin	Signal	Description
1	Ground	Ground Supply and Reference	6	+5V Ext.	+5 Volt supply for interface
2	VRL	Voltage Reference (pot low side)	7	Limit	Analog Limit Input
3	/Ready	Projector Ready Input (low = Ready)	8	Direction	Motion Direction (low = forward)
4	Position	Analog Position Input (pot wiper)	9	Rate	Motion Rate (low = on)
5	VRH	Voltage Reference (pot high side)			

# GEMINI GENERAL PURPOSE CONTROLLER

## INTERNAL JUMPER REQUIREMENTS

Located inside the *Gemini*, near to where the four ribbon cables attach to the motherboard is a pair of jumpers for each of the four device control ports. These jumpers must be set a particular way to match the interface that is being connected to the control port. These jumpers are typically set in the ‘**Normal**’ position at the factory, which is correct for most devices.

The following table lists the correct jumper settings, depending on control port and *Device Interface*:

Device Interface	Channel 1 W2 & W4	Channel 2 W5 & W7	Channel 3 W8 & W9	Channel 4 W10 & W11
Castor	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3
Pollux	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3
Mirak	"PS" Jumper pins 1 & 2	"PS" Jumper pins 1 & 2	"PS" Jumper pins 1 & 2	"PS" Jumper pins 1 & 2
Dubhe	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3
Servo Amp	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3	"NORM" Jumper pins 2 & 3

# GEMINI GENERAL PURPOSE CONTROLLER

## UNIT SETUP CHECKLIST

Use the following checklist to insure that the *Gemini* is installed into the theater **UTCS** and ready to be added to the system *Configuration File*.

1. The *Gemini* has been securely placed in convenient location near the video sources in the theater, and the **UTCS** communication network connections have been made.
2. All Device Interface control cables are connected. All devices are connected properly to their interfaces.
3. A unique **Unit Number** has been selected for the *Gemini* using the front panel menu system.
4. Make sure the **SET MODE PROJ #:** option of the front panel menu has been correctly set for each Device Interface connected to a control port.
5. Once all necessary changes have been made to the *Gemini* menu options, use the front panel menu to select the **SET LOCK:** option and set it to **SETTINGS LOCKED**. This keeps any of the options from being accidentally changed.
6. The following information has been noted for entry into the *Configuration File*.
  - a) The **Gemini Unit Number**.
  - b) The **Device Type** for each of the target devices.
  - c) The **Slot Number**, control port number, each target device is connected to.

## DEVICE CONTROL

All device control, except for limited aspects using the front panel menu, is handled via *Hercules*. In order to access these devices and their control channels, the *Configuration File* must contain device assignments for the each device to be operated.

Device commands are issued from the *Hercules*. Some commands are fairly general in nature. For example, many device types have lamps, and will respond to any of the lamp commands. Other commands are **Device Type** specific such as the **FS# (FIND SLIDE)** command works only with slide projectors. Issuing that command to another type of device makes no sense. The *Gemini* performs tests on the commands as they are received. Incorrect commands will not be executed, and will generate an error that will be displayed on the *Gemini* LCD display, as well as reported to the *Hercules Central Processor*.

# GEMINI GENERAL PURPOSE CONTROLLER

## CONFIGURATION FILE EXAMPLE

The example below uses from a default *Configuration File* which is distributed with new *Hercules* program disks. For the purpose of this example all *Gemini* and devices will be added to the same page. *Intelligent Controllers* and their devices do not need to be added to the *Configuration File* in any particular order, but the default *Configuration File* should be used as a guide to help create some sort of consistency between installations.

<ALT>	(N)ew	(O)pen	(S)ave	Save(A)s	(D)elete	(P)rint	(Q)uit	Editor		
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9				0	0	0	-	-	0	100
10	AURORA	AURORA	FX	2	3	0	-	-	0	100
11	OVERLAYS	CONSTELL OVERLAYS	D8	2	4	0	-	-	0	100
12				0	0	0	-	-	0	100
13	SLEW	SLEW ZOOM SLD PROJ	SP	3	1	0	-	-	0	100
14	XSLEW	MIRROR SLEW X AXIS	PS	3	2	0	-	-	0	100
15	YSLEW	MIRROR SLEW X AXIS	PS	3	3	0	-	-	0	100
16	ZOOM	ZOOM LENS	PS	3	4	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

The example shows three different *Intelligent Controllers* with four devices each. Each *Intelligent Controller* happens to be a *Gemini*. **Unit 1** controls four slide projectors, so it has four *Castors* connected to the control ports. **Unit 2** controls two slide projectors and two special effect projectors, it has two *Castors*, a *Pollux* and a *Dubhe* connected to the control ports. **Unit 3** controls one slide projector and all three motions of a slew-zoom projector, so it has one *Castor* and three *Miraks* connected to the control ports.

The **Unit Number** is user defined and can be any previously unassigned value from 1 to 64. Some *Intelligent Controllers*, with internally set **Unit Numbers**, are limited to a range from 1 to 32.

The **Device Code** and **Device Name** are also user defined. The **Device Code** is limited to eight alphanumeric characters, but spaces are not allowed. The **Device Name** can be up to eighteen alphanumeric characters, and spaces are allowed. Both entries should be as descriptive as possible to make them easy to remember.

The **Device Type** will determine how the *Hercules Central Processor* to correctly display and update the device status. See Chapter 4 for more information about valid **Device Types**.

# GEMINI GENERAL PURPOSE CONTROLLER

## SLIDE PROJECTOR CONTROL

The *Gemini* can control the following aspects of a compatible slide projector:

1. Projector Power
2. Project or Lamp Brilliance
3. Tray Forwarding and Tray Reversing
4. Tray Homing

### **Power Cycling For Slide Projectors:**

The *Gemini* can be instructed to turn the projector power on and off by explicit software command, or by means of the front panel controls. It can also perform automatic power cycling on slide projectors. This allows the projector to sit quietly until it is needed, and can significantly extend time between servicing.

When the *Gemini* is turned on, it is always in the automatic power cycling mode for slide projectors. Either a **PWRON** (**POWER ON**) command from *Hercules* or a manual press of the <RUN> button will instruct it to keep the power on continuously to that projector. A **PWROFF** (**POWER OFF**) command from the *Hercules* or a manual press of the <STOP> button will result in a return to automatic power cycling. Under no circumstances can the power be commanded to go off if the projector is cycling the tray or if the lamp is on.

When automatic power cycling is active, the *Gemini* will apply power to a quiescent projector as soon as it receives a command for that projector. The projector will then remain powered until 60 seconds after the last projector access.

### **Tray Cycling For Slide Projectors:**

The *Gemini* can be instructed to move the tray forward or reverse, find the tray home position, or even find a particular slide in a random access fashion by means of software commands from *Hercules*. It can even be instructed to automatically forward the slide after the lamp has faded out.

On compatible projectors, the *Gemini*, by means of the *Castor*, can sense whether or not the tray is at the **HOME** (0) position. This provides an automatic homing capability to increase show presentation reliability. The slide projectors may be instructed to seek the **HOME** position by a software command or by manually pressing the <RESET> button on the *Gemini* twice in succession. The *Gemini* will also attempt to **HOME** the projector when the *Gemini* is activated.

On projectors that lack a home sense switch, the *Castor* DIN plug is left unconnected. This results in the **HOME** sense being continuously satisfied. This causes no operational problems for the system, but may require the operator to manually **HOME** the projectors when the system is powered up at the start of the day, and after any power interruptions.

To increase reliability, tray motion sensing (on compatible projectors) is provided by the *Castor* and *Gemini*. Before it attempts to move a slide tray, the *Gemini* tests the **READY** signal from the *Castor*. If all is well, the *Gemini* will move the tray. If the projector is not ready, the *Gemini* will wait until it is. In fact, the *Gemini* will remember all of the tray commands issued while the projector is not ready and move the tray to the correct location when the projector becomes **READY**. The **READY** signal will not be satisfied if the projector power switch is in the off position, or if the projector is not plugged into the *Castor*. The **READY** signal also goes off during a slide tray cycle, which allows the system to function correctly even when the tray cycling mechanism is slower than normal (dirty), or when a slow projector such as the SAV2000 is used.

# GEMINI GENERAL PURPOSE CONTROLLER

## SLIDE PROJECTOR CONTROL (CONTINUED)

### **Lamp Control For Slide Projectors:**

Lamp control for slide projectors is very much like lamp control for other devices. The **UTCS** has a very robust set of lamp commands. The functioning of some are obvious, while others may invoke certain automatic features when used with slide projectors.

Certain lamp commands use the **Parameter Field** of the cue to set the level, in percent, that the lamp should ultimately attain. In this way the fade rate and the ultimate lamp level can be programmed in the same command line. The **Parameter Field** is the last column of the cue line and is labeled '**Limit**'.

Certain slide projector lamp cues invoke an automatic slide tray forwarding feature. This feature will cause the slide tray to be automatically forwarded after the projector lamp has gone off.

One special lamp command is available for all lamps. This is the **F#,# (FLASH)** command. Use this command to flash the lamp at regular intervals. Both the on time and the off time are easily programmable. This command is special in that it is a *layered* command. Its effect is not visible unless the lamp is turned on with another lamp command. This allows for flash fades and other unique effects.

# GEMINI GENERAL PURPOSE CONTROLLER

## SLIDE PROJECTOR COMMANDS (TYPE SP)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to control a slide projector using a *Castor Slide Projector Interface*:

Hercules Command	Command Name	Command Description
#A	# Sec Alternate (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#D	# Sec Dissolve (0.1 ≤ # ≤ 999.9)	Changes state of lamp in ramp of # seconds duration. Slides are advanced by one tray position at the end of the down ramp.
#N	# Sec Dissolve On (0.1 ≤ # ≤ 999.9)	Lamp dims up in a ramp of # seconds duration to a lamp level of % (Limit). Can be used to ramp from one % (Limit) to new % (Limit).
#F	# Sec Dissolve Off (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration. Slides are advanced by one tray position at the end of the down ramp.
#FNF	# Sec Dissolve Off (No Forward) (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration. Slides are advanced by one tray position at the end of the down ramp.
FA	Fast Alternate	Changes state of lamp (on to off or off to on) instantly. Slide trays are not advance when lamp turns off.
HC	Hard Cut	Changes state of lamp (on to off or off to on) instantly. Slide trays are not advance when lamp turns off.
LN	Lamp On	Turns lamp on to a level of % (Limit).
LF	Lamp Off	Turns lamp off. Slide trays do not advance.
FZ	Freeze	When issued during a lamp ramp, the ramp will freeze at that level. When issued again, the lamp ramp will resume.
PLMP	Pulse Lamp	Triggers ½ second lamp pulse.
F#,#	Flash Lamp #1, #2 (0 ≤ # ≤ 99)	Flashes lamp at regular intervals. #1 represents 'on' time in system heartbeats; #2 represents 'off' time in system heartbeats. FO,0 disables flashing. This command is a layered command. The lamp must be ramped on with another command to see the effect. After the lamp is faded down, a FO,0 cue must be entered to disable the flash.
FS#	Find Slide # (0 ≤ # ≤ 80)	Access slide in tray position #.
PF	Projector Forward	Advances tray position by one slide.
PR	Projector Reverse	Reverses tray position by one slide.
PH	Projector Home	Turns lamp off. Reverses tray until home sensor is reached, or until tray has been reversed 81 times.
PWRON	Power On	Activates projector power manually.
PWROFF	Power Off	Returns projector power to automatic cycling.

# GEMINI GENERAL PURPOSE CONTROLLER

## SPECIAL EFFECTS PROJECTOR CONTROL

The *Gemini* can control the following aspects of a special effects projector:

1. Projector Fan
2. Projector Lamp Brilliance
3. Two Auxiliary Motors, one with Home Sensing Capabilities

### **Fan Cycling For Special Effects:**

The *Gemini* can be instructed to turn the projector fan on and off by explicit software command, or by means of the front panel controls. It can also perform automatic fan cycling on special effects. This allows the projector to sit quietly until it is needed, and can significantly extend time between servicing.

As with slide projectors, the *Gemini* will automatically activate the fan whenever the lamp is instructed to be on. After the lamp fades out, the fan will stay on for 60 seconds after the lamp is fully extinguished. This eliminates the danger of a projector melt down, as may occur in systems that use the lamp circuit to power the fan.

Under no circumstances can the fan be commanded to go off if the projector lamp is on.

### **Auxiliary Motor Control For Special Effects:**

The *Gemini* can control up to two auxiliary motors or other on/ off functions. On compatible projectors, the *Gemini*, by means of the *Pollux*, can sense whether or not Motor 1 is at the HOME position. This provides an automatic homing capability to increase show presentation reliability. Motor 1 may be instructed to seek the HOME position by a software command or by manually pressing the <RUN> button on the *Gemini* twice in succession. The *Gemini* will also attempt to HOME the projector when the *Gemini* is activated.

Motor 1 can have one of three states: **On**, **Off**, and **Homing**. Motor 2 has no home sense capability, and therefore can have only two states: **On** and **Off**.

**Note:** Activation of Motor 1 or Motor 2 will not automatically activate the projector fan.

### **Lamp Control For Special Effects:**

Lamp control for special effects is very much like lamp control for other devices. The **UTCS** has a very robust set of lamp commands. The functioning of some are obvious, while others may invoke certain automatic features when used with special effects.

Certain lamp commands use the **Parameter Field** of the cue to set the level, in percent, that the lamp should ultimately attain. This way the fade rate and the ultimate lamp level can be programmed in the same command line. The **Parameter Field** is the last column of the cue line and is labeled '**Limit**'.

Special effect lamp cues always trigger the automatic fan cycling feature described earlier.

One special lamp command is available for all lamps. This is the **F#,# (FLASH)** command. Use this command to flash the lamp at regular intervals. Both the on time and the off time are easily programmable. This command is special in that it is a *layered* command. Its effect is not visible unless the lamp is turned on with another lamp command. This allows for flash fades and other unique effects.



# GEMINI GENERAL PURPOSE CONTROLLER

## SPECIAL EFFECT COMMANDS (TYPE FX)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to control a special effect projector using a *Pollux Special Effect Interface*:

Hercules Command	Command Name	Command Description
#A	# Sec Alternate (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#D	# Sec Dissolve (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#N	# Sec Dissolve On (0.1 ≤ # ≤ 999.9)	Lamp dims up in a ramp of # seconds duration to a lamp level of % (Limit). Can be used to ramp from one % (Limit) to new % (Limit).
#F	# Sec Dissolve Off (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
#FNF	# Sec Dissolve Off (No Forward) (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
FA	Fast Alternate	Changes state of lamp (on to off or off to on) instantly.
HC	Hard Cut	Changes state of lamp (on to off or off to on) instantly.
LN	Lamp On	Turns lamp on to a level of % (Limit).
LF	Lamp Off	Turns lamp off.
FZ	Freeze	When issued during a lamp ramp, the ramp will freeze at that level. When issued again, the lamp ramp will resume.
PLMP	Pulse Lamp	Triggers ½ second lamp pulse.
F#,#	Flash Lamp #1, #2 (0 ≤ # ≤ 99)	Flashes lamp at regular intervals. #1 represents 'on' time in system heartbeats; #2 represents 'off' time in system heartbeats. FO,0 disables flashing. This command is a layered command. The lamp must be ramped on with another cue command to see the effect. After the lamp is faded down, a FO,0 cue must be entered to disable the flash.
M1N	Motion 1 On	Activates special effect motion #1.
M1F	Motion 1 Off	Deactivates special effect motion #1.
M1R	Motion 1 Reset	Instructs special effect motion #1 to seek HOME position.
PM1	Pulse Motion 1	Triggers ½ second pulse on motion #1.
M2N	Motion 2 On	Activates special effect motion #2.
M2F	Motion 2 Off	Deactivates special effect motion #2.
PM2	Pulse Motion 2	Triggers ½ second pulse on motion #2.
PH	Projector Home	Turns lamp off. Homes special effect motion #1.
PWRON	Power On	Activates projector power manually.
PWROFF	Power Off	Returns projector power to automatic cycling.

# GEMINI GENERAL PURPOSE CONTROLLER

## POSITION CONTROL

### **Description:**

Each control channel of the *Gemini* is capable of controlling the operation of one axis of motion on a mechanism such as an XY Mirror Slew or motorized Zoom lens. Each axis of motion must be interfaced with the *Gemini* using one channel of a *Mirak Dual DC Motor Interface*. The mechanism must be powered by a bidirectional DC motor. Contact **ECCS** about solutions for mechanisms that use other types of motor drives.

If a potentiometer is included in the mechanism as a position sensor, then the *Gemini* can provide absolute position control on the axis. If a pot is not included, then control is limited to speed and direction.

Each control channel of the *Gemini* includes 8 bit D/A converter electronics. When attached to a position sensing potentiometer on the mechanism, it can be used to identify up to 256 discrete positions on any axis of travel. The circuitry involved is purposefully very simple in order to provide adequate results without the need for maintenance and adjustments.

Please refer to the chapter on the *Mirak Dual DC Motor Interface* to learn more about interfacing a compatible motion axis with the *Mirak*, as well as how to calibrate a *Gemini* control channel to operate with a particular motion.

### **Operation:**

The command structure includes **RATE** commands to provide smooth motion across the field. A **RATE** command will cause the motion to travel at the rate and direction specified in the command until interrupted by a subsequent command, or until the motion reaches its predefined **LIMIT**. Note that the **RATE** command simply tells the *Gemini*, via the *Mirak*, to supply a certain amount of electrical power to the motor. Since this is not a true servo system, the manner in which the mechanism responds to that stimulation will vary from device to device. A high quality mechanism should react in a predictable and repeatable manner. Note that a low **RATE** value may not supply enough power to the mechanism to force it to break friction and make it move.

The following command instructs the *Gemini* to apply 45% of full power to the axis and move it in a negative direction:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	RT=-45	Rate = -45	XSLEW	X AXIS MIRROR SLEW	
0002					
0003					
0004					

The command structure also includes **POSITION** commands to provide absolute positioning for the motion axis. A **POSITION** command actually has two parts. The first part is the actual position of the motion. This position is represented by a number with a value between 0 and 255 inclusive. The numbers are not degrees or other specific units of measurement. Rather, the number represents a ratio of where the motion is in its travel. If 0 represents a motion axis at its leftmost extreme and 255 represents its position at its rightmost extreme, then 127 will represent its position at the center of its travel. How these numbers relate to the resulting position of an image on the dome varies widely from mechanism to mechanism and dome to dome.

# GEMINI GENERAL PURPOSE CONTROLLER

## POSITION CONTROL (CONTINUED)

### **Operation (continued):**

The number actually represents the rotational position of the pot used to determine position. It is common to find that the actual travel range of the mechanism does not correspond to the full travel range of the pot. In these cases, the actual range of usable numbers will be less than 0 to 255. The only way to improve this situation is to perform a mechanical modification on the slew mechanism, such as changing the gear ratio between the axis and the pot.

In addition to supplying position information, the **POSITION** command also includes an argument for rate in the **LIMIT** field of the command. For example, to command the axis to move from its present position to its center position at half power, use the following command:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	PS=127	Position = 127	XSLEW	X AXIS MIRROR SLEW	+050
0002					
0003					
0004					

**Note:** The sign of the **LIMIT** command is ignored. The direction of the motion will be such that it will move from its current position to its destination. Be aware that the motion may not move at all if the rate value supplied by the **LIMIT** command is too low for the mechanism to break friction.

In an XY mirror slew and zoom system, it is customary to set it up such that the lowest number represents the left extreme for **X**, the lower extreme for **Y**, and the small extreme for **Z**.

# GEMINI GENERAL PURPOSE CONTROLLER

## POSITION CONTROL (CONTINUED)

### Setting Limits to Motions:

This section does not apply to any mechanism axis that does not include a potentiometer as a position sensor.

Before a *Gemini* controlled mechanism is deemed fully operational, it must first be calibrated. The full procedure for this is presented in the *Mirak* chapter of the manual. However, a description of the commands used follow.

The INIT command instructs the *Gemini* to automatically run the axis in both directions to the limits of the motion in order to determine what potentiometer values correspond with these limits. After the *Gemini* learns these limits, it will never try to move the axis past either limit.

**Note:** If attempting to run the motion to the limits of the pot travel, the INIT command should not be used because it could inadvertently damage the mechanism.

As an alternative to automatically setting the limits with the INIT command, the motion limits may be set manually with the following POSITION commands. Note that special values of the LIMIT argument are used to tell the *Gemini* that the POSITION argument is actually a high or low limit.

Use the following command to set the low limit to 45:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	PS=45	Position = 45	XSLEW	X AXIS MIRROR SLEW	-999
0002					
0003					
0004					

Use the following command to set the high limit to 210:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	PS=210	Position = 210	XSLEW	X AXIS MIRROR SLEW	+999
0002					
0003					
0004					

**Note:** The motion limits that are set automatically with the INIT command or manually with the special cases of the POSITION command are “permanently” stored in the *Gemini* and will be remembered even after the *Gemini* is powered down and back up again. Commands that set these limits should not be used in actual *Show Files*. These procedures are meant to be used during setup and calibration only.

# GEMINI GENERAL PURPOSE CONTROLLER

## POSITION CONTROL (CONTINUED)

### **Improving Response to the RATE Command:**

It was noted earlier that the `RATE` command simply instructs the *Gemini* to send a certain amount of power to a motion axis. A little experimentation with different values of `RATE` will demonstrate some of the less desirable characteristics of this method of control. The relationship between the power supplied to a DC motor and the actual movement of the mechanism is always a very nonlinear relationship.

For example, supplying 10% power to a motor will almost definitely not result in the mechanism moving at 10% of its maximum rate. Similarly, supplying 90% power will not result in movement at 90% of maximum rate.

Careful study of the applied power/ resulting rate ratio for several instances of applied power will show two general characteristics of this method of operation. First, one will notice that a certain minimum of power must be applied before the axis will ‘break friction’ and start to move. It is not unusual for this value to be in the 10% to 20% range. This will vary from mechanism to mechanism, and perhaps be different on the same mechanism depending on direction.

The second characteristic is that the mechanism will usually reach a high percentage of full speed by the time the applied power reaches 50%. Any increase of power beyond 50% may result in only moderate increases in speed.

This means that, for some mechanisms, the most useful `RATE` values may be in the range of perhaps 20% to 50%. This can be a little discouraging. Fortunately, the *Gemini* has a solution for this that will improve the response in some cases.

The `MIN=# (MINIMUM)` command can be used to vary the way that the `RATE` command supplies power to the mechanism. As an example, say that a particular motion axis doesn’t move until it gets a `RATE` command in excess of 10%. The `MIN=# (MINIMUM)` command can be used to tell the *Gemini* never to send less than 10% power to this axis, as follows:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	MIN=10	Minimum = 10	XSLEW	X AXIS MIRROR SLEW	
0002					
0003					
0004					

This value is ‘permanently’ stored in the *Gemini*, and will be remembered even after the *Gemini* is powered down and back up again. In fact, this command should not be used in actual *Show Files*. This command is meant to be used during setup and calibration only.

# GEMINI GENERAL PURPOSE CONTROLLER

## POSITION CONTROL (CONTINUED)

### **Improving Response to the RATE Command (continued):**

Once this value has been set, the *Gemini* uses it to ‘distort’ the relationship between the RATE values it receives and the percentage power it put out. For example, if the *Gemini* receives a RATE=1 command, it will convert that to a percentage power of about 10%, the MIN (MINIMUM) that was set earlier.

Increasing values of RATE will increase the percentage power in a linear fashion, up to the fixed point of RATE=70, which will correspond to a power of 50%. RATE values from 71 to 100 will result in power values from 51% to 100%.

The actual value of the MIN (MINIMUM) command will vary from mechanism to mechanism, and may need to be fine tuned by trial and error. Before setting the MIN (MINIMUM) value, use the RATE command with different values to determine the minimum RATE value that must be used to “break friction”, then set MIN (MINIMUM) a point or two below that.

Setting the MIN (MINIMUM) value to zero will remove the distortion algorithm from operation and restore the linear relationship between the RATE value and the percentage power. This is shown in the following command:

Cue#	Dev Cmd	Cmd Description	Dev Code	Device Name	Limit
0000	MQ	>>> MANUAL CUE <<<			
0001	MIN=0	Minimum = 0	XSLEW	X AXIS MIRROR SLEW	
0002					
0003					
0004					

## SLEW-ZOOM COMMANDS (TYPE PS)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to control an axis of motion with a *Mirak Dual DC Motor Interface*:

Hercules Command	Command Name	Command Description
INIT	Initialize	Triggers sequence to determine motion limits.
RT=#	Rate = (0 ≤ # ≤ 100)	Runs slew-zoom in positive direction at # at % (Limit) of full rate.
RT=-#	Rate = -(0 ≤ # ≤ 100)	Runs slew-zoom in negative direction at # at % (Limit) of full rate.
PS=#	Position = (0 ≤ # ≤ 255)	Finds slew-zoom position # at % (Limit) of full rate.

# GEMINI GENERAL PURPOSE CONTROLLER

## MULTIPLEXED SPECIAL EFFECTS PROJECTOR CONTROL

While the *Pollux Special Effect Interface* is an excellent choice for controlling complex special effects projectors, many special effects are much simpler to control. These simple special effects may only need control over a lamp, a lamp/ fan pair, or a lamp/ motor pair.

The *Gemini* can use the extra control bits on each control port as ‘projector address’ bits, and the *Dubhe Multiplexed Special Effects Interface* to operate up to eight special effect projectors, one at a time. This technique of switching control signals from projector to projector is known as *Bank Switching*, or *Multiplexing*.

Since only one projector per control port is available for use at any instant in time, projectors which are heavily used should not be controlled in this fashion. In addition, projectors which are often used in conjunction with each other should not be placed on different banks of the same *Dubhe*.

Each *Dubhe* has eight AC receptacles for special effects. These receptacles can have different functions based on the settings of some internal jumpers on the circuit board. These factory installed jumpers set the ‘**Mode**’ of the *Dubhe*. The *Dubhe* can have one of three operating configurations, as follows:

1.       **8x1**     Eight lamp channels, one accessed at a time.
2.       **4x2F**   Four lamp/ fan channels, one accessed at a time.
3.       **4x2M**   Four lamp/ motor channels, one accessed at a time.

# GEMINI GENERAL PURPOSE CONTROLLER

## THE 8x1 DUBHE SPECIAL EFFECT CONTROL (TYPE D8)

The *Gemini* can control the following aspect of a special effects projector by means of an *8x1 Dubhe*:

1. Projector Lamp Brilliance of eight projectors, one at a time.

### **Dubhe Bank Selection (Type D8):**

Each projector is plugged into a different *Dubhe Bank*. Before issuing any lamp commands to projectors attached to a *Dubhe*, the correct projector must be selected with one of the *Dubhe Bank* commands. The *Gemini* can be instructed to select an explicit bank, or can be instructed to select the next bank.

### **Lamp Control For 8x1 Dubhes (Type D8):**

Lamp control for special effects is very much like lamp control for other devices. The UTCS has a very robust set of lamp commands. Unlike other interfaces, lamp commands for the *8x1 Dubhe (Type D8)* do not invoke any automatic features.

Certain lamp commands use the **Parameter Field** of the cue to set the level, in percent, that the lamp should ultimately attain. This way the fade rate and the ultimate lamp level can be programmed in the same command line. The **Parameter Field** is the last column of the cue line and is labeled '**Limit**'.

One special lamp command is available for all lamps. This is the **F#,# (FLASH)** command. Use this command to flash the lamp at regular intervals. Both the on time and the off time are easily programmable. This command is special in that it is a *layered* command. Its effect is not visible unless the lamp is turned on with another lamp command. This allows for flash fades and other unique effects.



# GEMINI GENERAL PURPOSE CONTROLLER

## 8x1 DUBHE COMMANDS (TYPE D8)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to operate the *8x1 Dubhe*:

Hercules Command	Command Name	Command Description
#A	# Sec Alternate (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#D	# Sec Dissolve (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#N	# Sec Dissolve On (0.1 ≤ # ≤ 999.9)	Lamp dims up in a ramp of # seconds duration to a lamp level of % (Limit). Can be used to ramp from one % (Limit) to new % (Limit).
#F	# Sec Dissolve Off (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
#FNF	# Sec Dissolve Off (No Forward) (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
FA	Fast Alternate	Changes state of lamp (on to off or off to on) instantly.
HC	Hard Cut	Changes state of lamp (on to off or off to on) instantly.
LN	Lamp On	Turns lamp on to a level of % (Limit).
LF	Lamp Off	Turns lamp off.
FZ	Freeze	When issued during a lamp ramp, the ramp will freeze at that level. When issued again, the lamp ramp will resume.
PLMP	Pulse Lamp	Triggers ½ second lamp pulse.
F#, #	Flash Lamp #1, #2 (0 ≤ # ≤ 99)	Flashes lamp at regular intervals. #1 represents 'on' time in system heartbeats; #2 represents 'off' time in system heartbeats. FO,0 disables flashing. This command is a layered command. The lamp must be ramped on with another command to see the effect. After the lamp is faded down, a FO,0 cue must be entered to disable the flash.
DB#	Dubhe Bank (1 ≤ # ≤ 8)	Sets <i>Dubhe Bank</i> to #.
DB+	Increment Dubhe Bank	Sets next <i>Dubhe Bank</i> .

# GEMINI GENERAL PURPOSE CONTROLLER

## THE 4x2F DUBHE SPECIAL EFFECT CONTROL (TYPE DF)

The *Gemini* can control the following aspects of a special effects projector by means of an *4x2F Dubhe*:

1. Projector Fan of four projectors, one at a time.
2. Projector Lamp Brilliance of four projectors, one at a time.

### **Dubhe Bank Selection (Type DF):**

Each projector is plugged into a different *Dubhe Bank*. Before issuing any lamp or fan commands to projectors attached to a *Dubhe*, the correct projector must be selected with one of the *Dubhe Bank* commands. The *Gemini* can be instructed to select an explicit bank, or can be instructed to select the next bank.

### **Fan Cycling For Multiplexed Special Effects (Type DF):**

The *Gemini* can be instructed to turn the projector fan on and off by explicit software commands. It can also perform automatic fan cycling on special effects. This allows the projector to sit quietly until it is needed, and can significantly extend time between servicing.

As with slide projectors, the *Gemini* will automatically activate the fan whenever the lamp is instructed to be on. After the lamp fades out, the fan will stay on for 60 seconds after the lamp is fully extinguished. This eliminates the danger of a projector melt down, as may occur in systems that use the lamp circuit to power the fan.

Under no circumstances can the fan be commanded to go off if the projector lamp is on.

**Note:** If the *Dubhe Bank* is changed while the fan is on, the fan control follows the bank.

### **Lamp Control For 4x2F Dubhes (Type DF):**

Lamp control for special effects is very much like lamp control for other devices. The *UTCS* has a very robust set of lamp commands. The functioning of some are obvious, while others may invoke certain automatic features when used with special effects.

Certain lamp commands use the **Parameter Field** of the cue to set the level, in percent, that the lamp should ultimately attain. This way the fade rate and the ultimate lamp level can be programmed in the same command line. The **Parameter Field** is the last column of the cue line and is labeled '**Limit**'.

Special effect lamp cues always trigger the automatic fan cycling feature described earlier.

One special lamp command is available for all lamps. This is the **F#,# (FLASH)** command. Use this command to flash the lamp at regular intervals. Both the on time and the off time are easily programmable. This command is special in that it is a *layered* command. Its effect is not visible unless the lamp is turned on with another lamp command. This allows for flash fades and other unique effects.

# GEMINI GENERAL PURPOSE CONTROLLER

## 4x2F DUBHE COMMANDS (TYPE DF)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to operate the *4x2F Dubhe*:

Hercules Command	Command Name	Command Description
#A	# Sec Alternate (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#D	# Sec Dissolve (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#N	# Sec Dissolve On (0.1 ≤ # ≤ 999.9)	Lamp dims up in a ramp of # seconds duration to a lamp level of % (Limit). Can be used to ramp from one % (Limit) to new % (Limit).
#F	# Sec Dissolve Off (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
#FNF	# Sec Dissolve Off (No Forward) (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
FA	Fast Alternate	Changes state of lamp (on to off or off to on) instantly.
HC	Hard Cut	Changes state of lamp (on to off or off to on) instantly.
LN	Lamp On	Turns lamp on to a level of % (Limit).
LF	Lamp Off	Turns lamp off.
FZ	Freeze	When issued during a lamp ramp, the ramp will freeze at that level. When issued again, the lamp ramp will resume.
PLMP	Pulse Lamp	Triggers ½ second lamp pulse.
F#, #	Flash Lamp #1, #2 (0 ≤ # ≤ 99)	Flashes lamp at regular intervals. #1 represents 'on' time in system heartbeats; #2 represents 'off' time in system heartbeats. FO,0 disables flashing. This command is a layered command. The lamp must be ramped on with another command to see the effect. After the lamp is faded down, a FO,0 cue must be entered to disable the flash.
DB#	Dubhe Bank (1 ≤ # ≤ 8)	Sets <i>Dubhe Bank</i> to #.
DB+	Increment Dubhe Bank	Sets next <i>Dubhe Bank</i> .
PWRON	Power On	Activates projector power manually.
PWROFF	Power Off	Returns projector power to automatic cycling.

# GEMINI GENERAL PURPOSE CONTROLLER

## THE 4x2M DUBHE SPECIAL EFFECT CONTROL (TYPE DM)

The *Gemini* can control the following aspects of a special effects projector by means of an *4x2M Dubhe*:

1. Projector Lamp Brilliance of four projectors, one at a time.
2. One Auxiliary Motor on each of four projectors, one at a time.

### ***Dubhe Bank Selection (Type DM):***

Each projector is plugged into a different *Dubhe Bank*. Before issuing any lamp or motor commands to projectors attached to a *Dubhe*, the correct projector must be selected with one of the *Dubhe Bank* commands. The *Gemini* can be instructed to select an explicit bank, or can be instructed to select the next bank.

### **Auxiliary Motor Control For Multiplexed Special Effects (Type DM):**

The *Gemini* can control one auxiliary motor or other on/ off function per *Dubhe Bank*. There is no *Pollux*-like motion home sense capability on the *Dubhe Multiplexed Special Effects Interface*. Therefore, for the sake of command consistency, the motor function is commanded with **MOTOR 2** commands.

### **Lamp Control For Multiplexed Special Effects (Type DM):**

Lamp control for special effects is very much like lamp control for other devices. The **UTCS** has a very robust set of lamp commands. Unlike other interfaces, lamp commands for the *4x2M Dubhe (Type DM)* do not invoke any automatic features.

Certain lamp commands use the **Parameter Field** of the cue to set the level, in percent, that the lamp should ultimately attain. This way the fade rate and the ultimate lamp level can be programmed in the same command line. The **Parameter Field** is the last column of the cue line and is labeled '**Limit**'.

One special lamp command is available for all lamps. This is the **F#,# (FLASH)** command. Use this command to flash the lamp at regular intervals. Both the on time and the off time are easily programmable. This command is special in that it is a *layered* command. Its effect is not visible unless the lamp is turned on with another lamp command. This allows for flash fades and other unique effects.

# GEMINI GENERAL PURPOSE CONTROLLER

## 4x2M DUBHE COMMANDS (TYPE DM)

Remember that all commands must be issued from the *Hercules* and directed at a particular device. The following table lists all the commands available to operate the *4x2M Dubhe*:

Hercules Command	Command Name	Command Description
#A	# Sec Alternate (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#D	# Sec Dissolve (0.1 ≤ # ≤ 999.9)	Changes state of lamp (on to off or off to on) in a ramp of # seconds duration.
#N	# Sec Dissolve On (0.1 ≤ # ≤ 999.9)	Lamp dims up in a ramp of # seconds duration to a lamp level of % (Limit). Can be used to ramp from one % (Limit) to new % (Limit).
#F	# Sec Dissolve Off (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
#FNF	# Sec Dissolve Off (No Forward) (0.1 ≤ # ≤ 999.9)	Lamp dims down in ramp of # seconds duration.
FA	Fast Alternate	Changes state of lamp (on to off or off to on) instantly.
HC	Hard Cut	Changes state of lamp (on to off or off to on) instantly.
LN	Lamp On	Turns lamp on to a level of % (Limit).
LF	Lamp Off	Turns lamp off.
FZ	Freeze	When issued during a lamp ramp, the ramp will freeze at that level. When issued again, the lamp ramp will resume.
PLMP	Pulse Lamp	Triggers ½ second lamp pulse.
F#, #	Flash Lamp #1, #2 (0 ≤ # ≤ 99)	Flashes lamp at regular intervals. #1 represents 'on' time in system heartbeats; #2 represents 'off' time in system heartbeats. FO,0 disables flashing. This command is a layered command. The lamp must be ramped on with another command to see the effect. After the lamp is faded down, a FO,0 cue must be entered to disable the flash.
DB#	Dubhe Bank (1 ≤ # ≤ 8)	Sets <i>Dubhe Bank</i> to #.
DB+	Increment Dubhe Bank	Sets next <i>Dubhe Bank</i> .
M2N	Motion 2 On	Activates special effect motion.
M2F	Motion 2 Off	Deactivates special effect motion.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES

As mentioned earlier, each *Gemini* contains eight dry contact switch closures in addition to the four main control ports. Like the control ports, these devices require **Type:** setting through the front panel menu. In order to send commands to these devices, the *Configuration File* must contain **Device Number** assignments for each device. Each device must be set to the **Device Type** that matches the type set from the *Gemini* front panel. The **Unit Number** should be set to match the *Gemini* unit number containing the switches. The **Slot Number** should be set according to the information in the following sections.

These switches can be used in any one of several configurations, as follows:

Type	Set Mode Switch:	Description
S1	S1-8 DVC OF 1 SW	Eight independent switches with each treated as a separate device.
S8	S8-1 DVC OF 8 SW	Eight switches treated as one device.
S18	18-1 DVC, 1 OF 8	One group of 8 interlocked switches (one on at a time) treated as one device.
24	24-2 DVC, 1 OF 4	Two groups of four interlocked switches (one on in each group at a time) treated as two devices.
42	42-4 DVC, 1 OF 2	Four groups of two interlocked switches (one on in each group at a time) treated as four devices.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES (CONTINUED)

### **Eight Independent Switches (Type S1):**

In this configuration, all eight switches function independently and can be individually commanded to turn on and off. Each switch is a separate device, and therefore needs its own entry in the **Configuration File**. The **Slot Numbers** of the eight devices should be set as follows:

<ALT> (N)ew (O)pen (S)ave Save(A)s (D)elete (P)rint (Q)uit Editor										
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9	SW1	SWITCH CLOSURE 1	S1	1	5	0	-	-	0	100
10	SW2	SWITCH CLOSURE 2	S1	1	6	0	-	-	0	100
11	SW3	SWITCH CLOSURE 3	S1	1	7	0	-	-	0	100
12	SW4	SWITCH CLOSURE 4	S1	1	8	0	-	-	0	100
13	SW5	SWITCH CLOSURE 5	S1	1	9	0	-	-	0	100
14	SW6	SWITCH CLOSURE 6	S1	1	10	0	-	-	0	100
15	SW7	SWITCH CLOSURE 7	S1	1	11	0	-	-	0	100
16	SW8	SWITCH CLOSURE 8	S1	1	12	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

## SWITCH CLOSURE COMMANDS (TYPE S1)

Remember that all commands must be issued from the *Hercules* and directed at a particular device, which is in this case a switch. The following table lists all the commands available to operate the switch closures:

Hercules Command	Command Name	Command Description
SN	Switch On	Activates <i>Gemini</i> switch closure.
SF	Switch Off	Deactivates <i>Gemini</i> switch closure.
SPLS	Switch Pulse	Triggers ½ second switch pulse.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES (CONTINUED)

### **Eight Switches Treated as One Device (Type S8):**

In this configuration, all eight switches are commanded as one device. Activating or deactivating any single switch will not affect the status of any other switch. There is only one entry in the **Configuration File**. The **Slot Number** of this device should be set as follows:

<ALT> (N)ew (O)pen (S)ave Save(A)s (D)elete (P)rint (Q)uit Editor										
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9	SWG1	SWITCH GROUP 1	S8	1	5	0	-	-	0	100
10				0	0	0	-	-	0	100
11				0	0	0	-	-	0	100
12				0	0	0	-	-	0	100
13				0	0	0	-	-	0	100
14				0	0	0	-	-	0	100
15				0	0	0	-	-	0	100
16				0	0	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

## SWITCH CLOSURE COMMANDS (TYPE S8)

Remember that all commands must be issued from the *Hercules* and directed at a particular device, which is in this case a switch. The following table lists all the commands available to operate the switch closures:

Hercules Command	Command Name	Command Description
S#N	Switch # On (1 ≤ # ≤ 8)	Activates <i>Gemini</i> switch closure 1 to 8. Other switches in the group are not affected.
S#F	Switch # Off (1 ≤ # ≤ 8)	Deactivates <i>Gemini</i> switch closure 1 to 8. Other switches in the group are not affected.



# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES (CONTINUED)

### One Group of Eight Interlocked Switches (Type 18):

In this configuration, all eight switches function as one device. The eight switches are interlocked so that only one switch can be activated at a time. Each time a switch is activated, all other switches in the group are deactivated automatically. There is only one entry in the **Configuration File**. The **Slot Number** of this device should be set as follows:

<ALT> (N)ew (O)pen (S)ave Save(A)s (D)elete (P)rint (Q)uit Editor										
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9	SWG1	SWITCH GROUP 1	18	1	5	0	-	-	0	100
10				0	0	0	-	-	0	100
11				0	0	0	-	-	0	100
12				0	0	0	-	-	0	100
13				0	0	0	-	-	0	100
14				0	0	0	-	-	0	100
15				0	0	0	-	-	0	100
16				0	0	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

## SWITCH CLOSURE COMMANDS (TYPE 18)

Remember that all commands must be issued from the *Hercules* and directed at a particular device, which is in this case a switch. The following table lists all the commands available to operate the switch closures:

Hercules Command	Command Name	Command Description
S#N	Switch # On (1 ≤ # ≤ 8)	Activates <i>Gemini</i> switch closure 1 to 8. Any other switch in the group is turned off.
S#F	Switch # Off (1 ≤ # ≤ 8)	Deactivates <i>Gemini</i> switch closure 1 to 8.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES (CONTINUED)

### Two Groups of Four Interlocked Switches (Type 24):

In this configuration, the eight switches are divided into two devices of four switches each. The switches of each device are interlocked so that only one switch of the four can be activated at a time. Each time a switch is activated, all other switches in the group are deactivated automatically. There are two entries in the **Configuration File**. The **Slot Numbers** of these devices should be set as follows:

<ALT>	(N)ew	(O)pen	(S)ave	Save(A)s	(D)elete	(P)rint	(Q)uit	Editor		
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9	SWG1	SWITCH GROUP 1	24	1	5	0	-	-	0	100
10	SWG2	SWITCH GROUP 2	24	1	6	0	-	-	0	100
11				0	0	0	-	-	0	100
12				0	0	0	-	-	0	100
13				0	0	0	-	-	0	100
14				0	0	0	-	-	0	100
15				0	0	0	-	-	0	100
16				0	0	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

## SWITCH CLOSURE COMMANDS (TYPE 24)

Remember that all commands must be issued from the *Hercules* and directed at a particular device, which is in this case a switch. The following table lists all the commands available to operate the switch closures:

Hercules Command	Command Name	Command Description
S#N	Switch # On (1 ≤ # ≤ 4)	Activates <i>Gemini</i> switch closure 1 to 4 in addressed group. Any other switch in the group is turned off.
S#F	Switch # Off (1 ≤ # ≤ 4)	Deactivates <i>Gemini</i> switch closure 1 to 4 in addressed group.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI SWITCH CLOSURES (CONTINUED)

### Four Groups of Two Interlocked Switches (Type 42):

In this configuration, the eight switches are divided into four devices of two switches each. The switches of each device are interlocked so that only one switch of the two can be activated at a time. Each time a switch is activated, the other switch in the group is deactivated automatically. There are four entries in the **Configuration File**. The **Slot Numbers** of these devices should be set as follows:

<ALT>	(N)ew	(O)pen	(S)ave	Save(A)s	(D)elete	(P)rint	(Q)uit	Editor		
File: HERCMS.CFG										
Dvc#	DevCode	Description	Type	Unit#	Slot#	Branch	Bank	Scrn	Init	Max
1	L1	SLD PROJ LEFT 1	SP	1	1	0	-	-	0	100
2	L2	SLD PROJ LEFT 2	SP	1	2	0	-	-	0	100
3	C1	SLD PROJ CENTER 1	SP	1	3	0	-	-	0	100
4	C2	SLD PROJ CENTER 2	SP	1	4	0	-	-	0	100
5	R1	SLD PROJ RIGHT 1	SP	2	1	0	-	-	0	100
6	R2	SLD PROJ RIGHT 2	SP	2	2	0	-	-	0	100
7	INFO1	INFO SLIDE GROUP 1	GP	0	0	0	-	-	0	100
8	INFO2	INFO SLIDE GROUP 2	GP	0	0	0	-	-	0	100
9	SWG1	SWITCH GROUP 1	42	1	5	0	-	-	0	100
10	SWG2	SWITCH GROUP 2	42	1	6	0	-	-	0	100
11	SWG3	SWITCH GROUP 3	42	1	7	0	-	-	0	100
12	SWG4	SWITCH GROUP 4	42	1	8	0	-	-	0	100
13				0	0	0	-	-	0	100
14				0	0	0	-	-	0	100
15				0	0	0	-	-	0	100
16				0	0	0	-	-	0	100

EDIT DEVICE CODE - Enter (1-8) alphanumeric characters (spaces are illegal).  
The first character must be alphabetic.

## SWITCH CLOSURE COMMANDS (TYPE 42)

Remember that all commands must be issued from the *Hercules* and directed at a particular device, which is in this case a switch. The following table lists all the commands available to operate the switch closures:

Hercules Command	Command Name	Command Description
S#N	Switch # On (1 ≤ # ≤ 4)	Activates <i>Gemini</i> switch closure 1 to 2 in addressed group. Any other switch in the group is turned off.
S#F	Switch # Off (1 ≤ # ≤ 4)	Deactivates <i>Gemini</i> switch closure 1 to 2 in addressed group.

# GEMINI GENERAL PURPOSE CONTROLLER

## USING THE BOB BREAK OUT BOX

The switch closures may be used directly from the **DB25** connector on the rear of the *Gemini* for low power applications. For higher powered applications, or for the sake of convenience, the **BOB Break Out Box** can be used as a *Device Interface*.

The **BOB** is available in three versions.

1. The **BOB 8P** provides 8 powered 120 VAC receptacles for directly supplying switched power to eight devices.
2. The **BOB 4P4S** supplies 4 powered 120 VAC receptacles and 4 higher power switch closures realized as 4 chassis mounted 2 pin Jones plugs.
3. The **BOB 8S** provides 8 higher power switch closures realized as 8 chassis mounted 2 pin Jones plugs.

# GEMINI GENERAL PURPOSE CONTROLLER

## GEMINI ERROR MESSAGES

Just like all **ECCS Intelligent Controllers**, the **Gemini** checks all commands received from the **Hercules Central Processor** before attempting to execute them. If any problems are detected, command execution is terminated and an error is returned to **Hercules Central Processor** to be displayed on the **Hercules** screen. The following table lists the possible errors along with how they appear both on the **Gemini** LCD display and on the **Hercules** screen. The table also provides explanations for the errors and/ or suggestions to fix the problem.

## POSSIBLE ERROR MESSAGES GENERATED BY HERCULES/ GEMINI COMMUNICATIONS

Errors and Messages	Meaning	Problem or Solution
Gemini LCD: <i>no message</i> Hercules: <i>no message</i>	The last <b>Hercules</b> command was good and is being executed.	No problem.
Gemini LCD: ILLEGAL SLOT # Hercules: ILLEGAL SLOT	The <b>Gemini Slot Number</b> of the device in the last command does not exist.	This is a <b>Hercules Configuration File</b> problem. Edit the device entry in the <b>Configuration File</b> and enter the correct slot #.
Gemini LCD: CMD/UNT MISMATCH Hercules: COMMAND/UNIT MISMATCH	The last <b>Hercules</b> command was not valid for the <b>Gemini</b> or any device controlled by the <b>Gemini</b> .	This is a <b>Show File</b> problem. The programmer is using the wrong <b>Hercules</b> command.
Gemini LCD: CMD/PRJ MISMATCH Hercules: COMMAND/DEVICE MISMATCH	The last <b>Hercules</b> command was not valid for the Device, according to the <b>Gemini</b> .	This is a <b>Show File</b> problem. The programmer is using the wrong <b>Hercules</b> command, or the <b>Device Type</b> has been set incorrectly at the <b>Gemini</b> front panel menu.
Gemini LCD: ARG OUT OF RANGE Hercules: ARGUMENT OUT OF RANGE	The last <b>Hercules</b> command included a numerical argument that is not valid for the Device, according to <b>Gemini</b> .	This is a <b>Show File</b> problem. The programmer is using the wrong numerical value in a <b>Hercules</b> command.
Gemini LCD: SYNTAX ERROR Hercules: <i>not applicable</i>	The last <b>ASCII</b> text command was not worded correctly, according to <b>Hercules</b> .	This problem can only occur when uploading a new version of firmware to the <b>Gemini</b> . Restart the upload.
Gemini LCD: <i>no message</i> Hercules: COMMUNICATION FAILURE, UNIT #	<b>Hercules</b> could not establish contact with the <b>Gemini</b> .	This is a <b>Hercules/ Gemini</b> Communication problem. The <b>Gemini</b> may be powered off. Also could be a bad cable, a bad connection, or a bad communications chip.
Gemini LCD: CHECKSUM ERROR Hercules: CHECKSUM ERROR	The last <b>Hercules</b> command was garbled.	This is a <b>Hercules/ Gemini</b> Communication Problem. Could be a bad cable, a bad connection, or a bad communications chip.