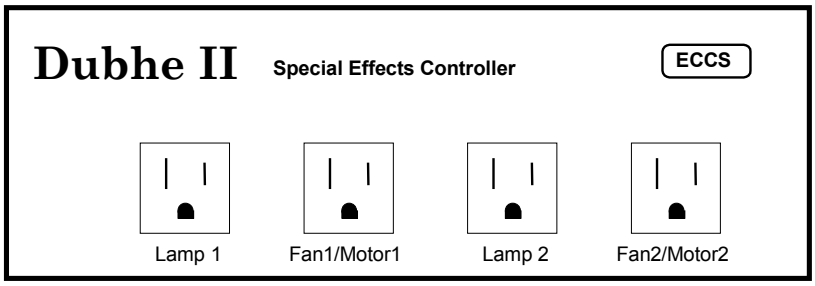
The Dubhe II

Special Effects Controller



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The *DUBHE II* Special Effects Controller

General Description

The *Dubhe II* is an intelligent special effects control box designed for performance, flexibility, and ease of use. The unit is capable of handling up to four special effects simultaneously with no control limitations and without the need for effects bank selection.

Dimmable and switchable 120VAC power is provided to control the special effects projectors. Special effects connections are simplified through the use of standard grounded AC plugs.

An embedded microcontroller provides the intelligence for the *Dubhe II*, insuring the smoothest and most accurately timed lamp fades available in the industry. As with other ECCS controls, lamp fades may be commanded to occur from any lamp level to any other of 101 lamp levels at any of 1000 rates when commanded from the *Hercules Central Processor*.

Fan and motor control for special effects can also be easily accomplished. Each motor function can be designated as either an automatic fan control or as an independent motor control.

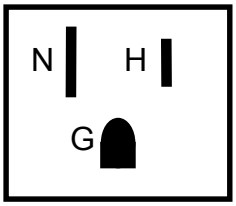
The *Dubhe II* connects to the standard UTCS communications system, providing for quick installation and flexible device assignments. The unit can be commanded from the *Hercules* for computer control, any *Cygnus Manual Panel* for manual control, or both for the ultimate in control capabilities.

Projector Installation

Projector Control Outlets

Located on the front and rear panels are a total of eight AC outlets. They provide dimmable or switched 120VAC power for direct connection of up to four special effect projectors. The maximum current that can be drawn from any single outlet is five amps, which translates into a maximum lamp load of 600 watts. In addition, the maximum simultaneous load (with multiple projectors activated) on the *Dubhe II* is limited to six amps, or 720 watts.

The four outlets labeled as lamp controls supply a dimmable voltage to operate special effect lamps. The remaining four outlets labeled for fan or motor controls will supply a switched 120VAC. They can be configured to operate in a variety of modes depending upon the setting of internal jumpers.



Each AC outlet is composed of three connections, which are internally wired according to standard electrical practices. The description of each connection follows:

G — The Safety Ground, also called Frame Ground, is internally wired directly to the corresponding pin on the power cord. The metal parts of the enclosure are also connected to Ground.

N — The Neutral Conductor, also called the Grounded Conductor, is internally wired directly to the corresponding blade on the power cord. In operation, this conductor will always remain within a few volts of the Ground, depending on facility wiring.

H — Each Hot Conductor connects to an internal solid-state switch that regulates the voltage seen here. The voltage for a fully activated switch should be around 120 volts referenced to either the Ground or the Neutral.

Under some circumstances, it is important to be aware of plug polarity. While it is unlikely that a grounded three-prong plug can get plugged in incorrectly, older two prong plugs can be turned either way and still inserted. While this may not be a problem on simple projectors that only use one power cord, it can be an issue on projectors with multiple power cords that may share common wires internally. For this reason, ECCS makes the following recommendation:

When using projectors with multiple power cords that share an internal common connection, the common conductors should always be tied to the Neutral, with the independent wires tied to the Hot. If two prong plugs are used with this connection scheme, always use polarized plugs, and connect the wide blade of the plug(s) to the common wires and the narrow blade of the plug(s) to the independent ones.

The Fan Mode Of Operation

The four outlets labeled as fan/motor outlets can be configured to operate in one of two basic modes.

Under the fan mode of operation, the power at the outlet will be automatically activated whenever the associated lamp outlet is activated. In addition, the fan outlet will stay until 60 seconds after the lamp outlet has been deactivated. This assures that any cooling fan associated with a lamp is running at full speed whenever the lamp is on at any level.

Some projectors have the lamp and fan wired together internally. While this will adequately cool the projector at high lamp levels, it is probable that the fan will not supply enough airflow at low levels to cool the projector sufficiently. This can result in projector overheating, with possible projector or image damage. It can even be a fire hazard. For this reason, ECCS strongly recommends that the projector lamp and fan wiring be brought out separately, with the fan plugged into either the associated fan outlet on the Dubhe II, or into a facility outlet that is guaranteed to supply power whenever the Dubhe II unit is powered.

Another common use of the fan mode of operation is to power auxiliary motors that are meant to run whenever the image is visible. For example, most rotating planet projectors will be rotating whenever the image is visible. Therefore, operating the rotation motor from a fan designated outlet will insure that the rotation is occurring without the need for a separate command or control panel activation.

The Motor Mode Of Operation

Under the motor mode of operation, the power at the outlet is activated only by means of an explicit computer command or and explicit control panel switch activation. This is entirely independent of the status of the lamp. This mode is appropriate whenever it is desirable to start and stop an auxiliary motion on command.

Setting the Fan/Motor Mode of Operation

The fan and motor mode of operation can be set independently for each projector. In order to change the mode, the enclosure must be opened to access the mode select jumpers. The following procedure should be followed to open the enclosure:

1. *UNPLUG the Dubhe II from the power source.*

2. Remove the two screws that hold the front plate in place.

3. Remove the front plate by pulling on the plastic bezel. Modes for projectors 1 & 2 can now be adjusted by means of the jumpers in the lower corner of the front panel circuit board.

4. To access the mode select jumpers for projectors 3 & 4, remove the vinyl clad steel cover by sliding it forward and off the base. Look for the mode select jumpers for those projectors in the lower corner of the rear panel circuit board.

5. After the jumpers are adjusted, reassemble the enclosure by reversing the disassembly steps. Be careful not to pinch any wires between the base and the bezel during this process.

Jumper Settings and Resultant Modes

As is obvious from the previous explanations, each fan/motor outlet can be set to operate in either a fan or independent motor mode of operation. In addition, a third mode exists that involves 'stealing' the switched outlet from projector 2 (and 4) for use with projector 1 (and 3). This mode provides projector 1 (and 3) with one lamp, one fan and one motor outlet, and leaves projector 2 (and 4) with just a lamp outlet.

The following table illustrates possible mode settings. Remember that the jumpers for projectors 1 and 2 are on the front panel circuit board, while jumpers for projectors 3 and 4 are on the rear panel circuit board.

Projector	Mode	Jumper	Setting	Fan/Motor Comments
1	Lamp/Fan	W1	FANA	Automatic - lamp activated
1	Lamp/Motor	W1	MTRA	Independent function
1	Lamp/Fan/Motor	W1	FANA/MTRB	Steals fan/motor outlet from 2
2	Lamp/Fan	W2	FANB	Automatic - lamp activated
2	Lamp/Motor	W2	MTRB	Independent function
2	Lamp/Fan/Motor	W2	LAMPONLYB	None
3	Lamp/Fan	W1	FANA	Automatic - lamp activated
3	Lamp/Motor	W1	MTRA	Independent function
3	Lamp/Fan/Motor	W1	FANA/MTRB	Steals fan/motor outlet from 4
4	Lamp/Fan	W2	FANB	Automatic - lamp activated
4	Lamp/Motor	W2	MTRB	Independent function
4	Lamp/Fan/Motor	W2	LAMPONLYB	None

Connecting to the System

The *Dubhe II* executes commands that are transmitted from the *Hercules* or the *Cygnus* by means of the standard UTCS serial communications system. This implies that each *Dubhe II* must be hooked into the communication daisy chain and must be assigned a unique unit number. Up to 32 smart units, such as *Dubhe II*, *Gemini*, and *Virgo* units, may be hooked up on a single communications line.

Communication Network Connections

A male and a female 9-pin (DB9) connector are located on the rear panel of the *Dubhe II* to handle systems communication. Two connectors are provided so that communication link may easily daisy chain from one unit to another. In a typical installation, the male connector from the *Dubhe II* (or other smart box) will connect back towards the host, while the female will connect forward towards the end of the communication line. The last smart box in the network will not have a cable connected to the female connector. The pins and signals on these connectors are listed below.

DB9 Communication Connector Pinout

1	TxD	Transmit Data
2	/TxD	Transmit Data (inverted)
3	/RxD	Receive Data (inverted)
5	GND	Frame Ground - connected to cable shield on male end of cable
7	RxD	Receive Data

To simplify installation, all communications cables are wired identically. The 'front' end of the cable is a male DB9 connector, while the 'rear' end of the cable is a female DB9 connector. The 'front' end of the cable always attaches towards the host, or the source of the command data.

All communication cables are wired 'straight through'. That is, pin 1 on the male end is 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 optimum operations, the wires on pins 1 and 2 should be a twisted pair, as should be the wires on pins 3 and 7.

Setting the *Dubhe II* Unit Number

Each smart unit must be given a unique unit number. For the *Dubhe II*, this address is set by means of a DIPswitch on the controller board inside the unit. In order to change the unit number, the enclosure must be opened to access the DIPswitch. The following procedure should be followed to open the enclosure:

1. *UNPLUG the Dubhe II from the power source.*
2. Remove the two screws that hold the front plate in place.
3. Remove the front plate by pulling on the plastic bezel.
4. Remove the vinyl clad steel cover by sliding it forward and off the base.
5. After the DIPswitch is adjusted, reassemble the enclosure by reversing the disassembly steps. Be careful not to pinch any wires between the base and the bezel during this process.

With the *Dubhe II* open, locate the eight-position DIPswitch on the Controller board. (The Controller board is mounted to the *Dubhe II* baseplate.) Positions one through five of the eight positions are used to determine the unit number. Using the numbers and the ON position indication printed on the switch, the table on the following page provides correlation between switch settings and unit numbers.

***Dubhe II* Switch Settings and Unit Numbers**

Unit	Switch Positions				
Number	1	2	3	4	5
1	ON	ON	ON	ON	ON
2	OFF	ON	ON	ON	ON
3	ON	OFF	ON	ON	ON
4	OFF	OFF	ON	ON	ON
5	ON	ON	OFF	ON	ON
6	OFF	ON	OFF	ON	ON
7	ON	OFF	OFF	ON	ON
8	OFF	OFF	OFF	ON	ON
9	ON	ON	ON	OFF	ON
10	OFF	ON	ON	OFF	ON
11	ON	OFF	ON	OFF	ON
12	OFF	OFF	ON	OFF	ON
13	ON	ON	OFF	OFF	ON
14	OFF	ON	OFF	OFF	ON
15	ON	OFF	OFF	OFF	ON
16	OFF	OFF	OFF	OFF	ON
17	ON	ON	ON	ON	OFF
18	OFF	ON	ON	ON	OFF
19	ON	OFF	ON	ON	OFF
20	OFF	OFF	ON	ON	OFF
21	ON	ON	OFF	ON	OFF
22	OFF	ON	OFF	ON	OFF
23	ON	OFF	OFF	ON	OFF
24	OFF	OFF	OFF	ON	OFF
25	ON	ON	ON	OFF	OFF
26	OFF	ON	ON	OFF	OFF
27	ON	OFF	ON	OFF	OFF
28	OFF	OFF	ON	OFF	OFF
29	ON	ON	OFF	OFF	OFF
30	OFF	ON	OFF	OFF	OFF
31	ON	OFF	OFF	OFF	OFF
32	OFF	OFF	OFF	OFF	OFF

Projector Control

Configuration File Entries For *Dubhe II* Projectors

All projector control is handled from *Hercules* or the *Cygnus*. In order to access these projectors from *Hercules*, the system *Configuration File* must contain device assignments for the each projector to be operated. The minimum Configuration File information required for device operation is the *Device Code* to uniquely identify the projector, a *Device Type* to insure that the projector is handled correctly, and a *Unit Number* and a *Slot Number* so that the *Hercules* can find the projector in the system. It is also comforting to enter in a *Device Name*, which can be a fairly verbose description of the projector. For more detailed information, refer to section 3, *Setting Up the System*, in the *Hercules* manual.

Additional information can also be found in the section, *The Configuration File*, also in the *Hercules* manual.

For the *Dubhe II*, it just so happens that the Unit Number used in the Configuration File is the same unit number set by the DIP switch inside the *Dubhe*, as described in the previous section. The Slot Number used in the Config File refers to the projector control receptacle numbers on the *Dubhe* and will be in the range of 1 through 4. The Device Type depends on the mode setting of each projector control slot, and will correspond to the fan/motor settings as follows:

Fan/Motor Setting	Device Type (Configuration File)
Fan	LO (Lamp Only)
Motor	FX (Special Effect)
Fan/Motor	FX (Special Effect)
Lamp Only	LO (Lamp Only)

Projector Commands For the *Dubhe II*

Projector commands, issued from the *Hercules*, are very simple in nature. Lamp commands are used for all the projectors on a *Dubhe II*. Commands to control the motors are device type specific, as will be described later. The *Dubhe II* performs tests on the commands as they are received. Incorrect commands will not be executed, and will generate an error that will cause the Ready indicator to blink These errors will also be reported to the *Hercules* as a *Command/Device Mismatch* error.

Lamp Control For Projectors

The UTCS has a very robust set of lamp commands, and they are all valid for any projector controlled by a *Dubhe II*.

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 you can program the fade rate and the ultimate lamp level in the same command line. Commands that use the parameter field are noted in the command table with the letters PARM.

One special lamp command is available. This is the 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.

Projector Lamp Commands

Remember that all commands must be issued from the *Hercules* and directed at a particular projector. The following table lists all of the lamp commands that the *Dubhe II* understands:

LN	Lamp On - turns the lamp on instantly to level designated by PARM.
LF	Lamp Off - turns the lamp off instantly.
FA	Fast Alternate - changes state of the lamp instantly (on to off or off to on).
HC	Hard Cut - same as FA for a special effect.
#A	# Second Alternate - changes the state of the lamp in a smooth ramp. The duration of the ramp, in seconds, is determined by the # entry. Allowed values for # are from 1 to 999 inclusive.
#D	# Second Dissolve - same as #A for a special effect.
#N	# Second Dissolve On - ramps lamp to level designated by PARM. # designates duration of the ramp. Allowed values for # are all integers from 1 to 999 inclusive.
#F	# Second Dissolve Off - turns the lamp off in a ramp of # seconds duration. Allowed values for # are all integers from 1 to 999 inclusive.
#FNF	# Second Dissolve Off (No Forward) - same as #F for a special effect.
FZ	Freeze - if issued during a ramp lamp, the ramp will freeze, holding the lamp at that level. If issued again, the ramp will continue from that point.
PLMP	Pulse Lamp - activates lamp for 1/2 second.
F#,#	Flash Lamp #1,#2 - Flashes lamp at regular intervals. #1 is lamp 'on' time in system heartbeats; #2 is lamp 'off' time in system heartbeats. F50,50 flashes lamp on for 1/2 second, then off for 1/2 second. F0,0 disables flashing. The range for both numbers is 0<=#<=99. This command is a layered command. The lamp must be turned on with another command to see the effect.

Fan Cycling For Projectors

For Projectors set to the fan mode of operation, the *Dubhe II* can be instructed to turn the projector fan on and off by explicit software commands. It will also perform automatic fan cycling on the projectors. This allows the projector to sit quietly until it is needed, and can significantly extend time between servicing.

A PWRON command from the *Hercules* will instruct it to keep the fan on continuously to that projector. A PWROFF command from the *Hercules* will result in a return to automatic fan cycling. Under no circumstances can the fan be commanded to go off if the projector lamp is on.

When automatic fan cycling is active, the *Dubhe II* will apply power to a quiescent projector as soon as it receives a command for that projector. The fan will then remain powered until 60 seconds after the lamp has fully extinguished.

Projector Fan Commands

PWRON Power On - Activates projector fan and deactivates automatic fan cycling.
PWROFF Power Off - Activates automatic fan cycling, deactivates fan if lamp is off.

Motor Control For Projectors

For projectors set to the independent motor mode of operation, the *Dubhe II* must be instructed to turn the projector motor on and off by explicit software commands. There is no automatic function associated with the operation of the motor.

Projector Motor Commands

M2N Motor 2 On - Activates motor receptacle.
M2F Motor 2 Off - Deactivates motor receptacle.

The *Ready* Indicator

In the center of the front panel of the *Dubhe II* is located the *Ready* Indicator. This computer controlled LED can provide some rudimentary trouble shooting. This light is indicative of three possible situations, as follows:

1. Under normal operation, the *Ready* LED will be lighted. This indicates not only that the *Dubhe II* is powered, but also that the internal controller detects no problems with the unit.

2. The *Ready* light blinks off for 1/2 second every time the *Dubhe II* receives a valid command.

3. When the *Dubhe II* receives an invalid command, the *Ready* light blinks off for a short time, and then gives a number of short pulses. After another short pause, the *Ready* light returns to its normal status. The number of pulses is indicative of the slot number to which the invalid command was sent.