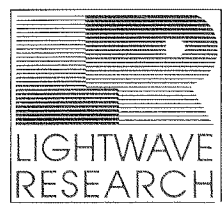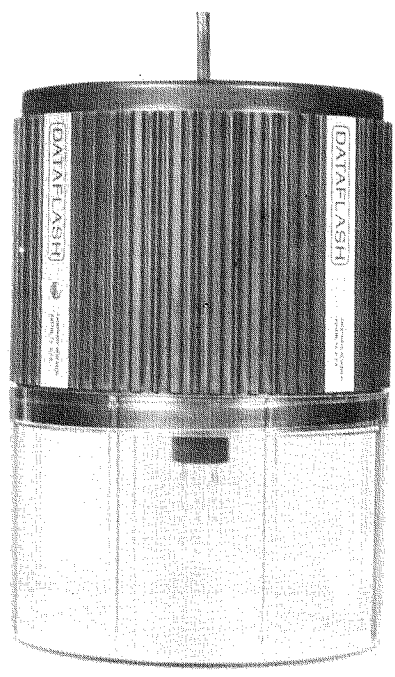# DATAFLASH

## User Manual

LIGHTWAVE RESEARCH

2209 West Braker Ln.
Austin, TX. 78758

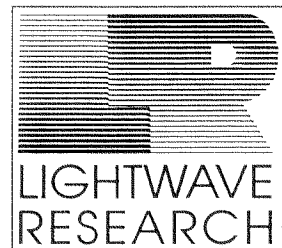Part # 60600004

# DATAFLASH ®

U.S. PATENT
5,078,039

EUROPEAN PATENT
PENDING

# User Manual

LIGHTWAVE
RESEARCH

Lightwave Research
2209 W. Braker Lane
Austin, TX. 78758
U.S.A.

# D A T A F L A S H

## USER MANUAL

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# D A T A F L A S H

## INTRODUCTION

We realize that you may not choose to read this manual
closely unless you encounter a problem.  But we urge you
to consider that, with a product as powerful as this, a
close study of the following information will not only
help you avoid possible problems, but will also allow you
to take full advantage of this electrifying product.


DATAFLASH is... the world's most advanced Xenon Flashlamp
System.  Multiple flashlamps, each
individually addressable and dimmable,
provide short-term bursts of incredible
pyro-technics power or soft hues for
more subtle effects.  Colored domes,
color-correcting domes, narrow-beam
reflectors and dichroic filtration are
available options.  Each controller can
individually control or communicate with
up to 256 channels of illuminators via a
single 2-conductor shielded cable
daisy-chained from one illuminator to the
next.  Each controller may contain up to
99 programs, and a unique remote analog
interface allows the user to call up
programs instantly for live control.  Two
different audio-advance selections provide
complete audio synchronization.

... The end result:  A powerful pulsed xenon
illumination system that delivers
THE POWER OF LIGHT ON DEMAND!


We at Lightwave Research, Inc., have designed DATAFLASH
and its specific programming for YOUR venue and allowed
you, the user, to select and modify all programs.  These
combinations of programmed patterns can be stored for
later recall, complete with modifications and cues.

So whether your requirements are stage, screen, or club,
DATAFLASH has the power and versatility to achieve the
desired effect.

# D A T A F L A S H

## APPLICATIONS

The following illustrations are provided to inform you of some of the different ways to use and maximize the effectiveness of a DATAFLASH system. These drawings show an eight channel system arranged in a circle with different viewing and display angles.

The standard DATAFLASH illuminator produces an omnidirectional effect over a large area. This provides for the largest possible viewing area with some vantage points better than others. The first example shows the viewer able to see the complete display sequencing, and therefore all of the action. The same layout is shown in example two but notice that the viewer can now only see part of the entire display. This means that the complete sequence cannot be seen. Reflected light from those illuminators outside his viewpoint will be visible but will not convey the complete action as well as in example one.

A reflector installed in a DATAFLASH illuminator creates a more directional effect, concentrated where the beam is aimed. In example three, the viewer is outside of the display area with no obstructions and has an excellent view of the effect. Even though the units are aimed down, the concentrated beams would be highly visible. If the display is similar to example four, the entertainer would be adequately illuminated but the viewer would only be able to see half of the illuminators directly. Those units facing away would put out the same amount of light but allow the viewer to see only reflected light.

# D A T A F L A S H

**Example #1 - COMPLETE ACTION**
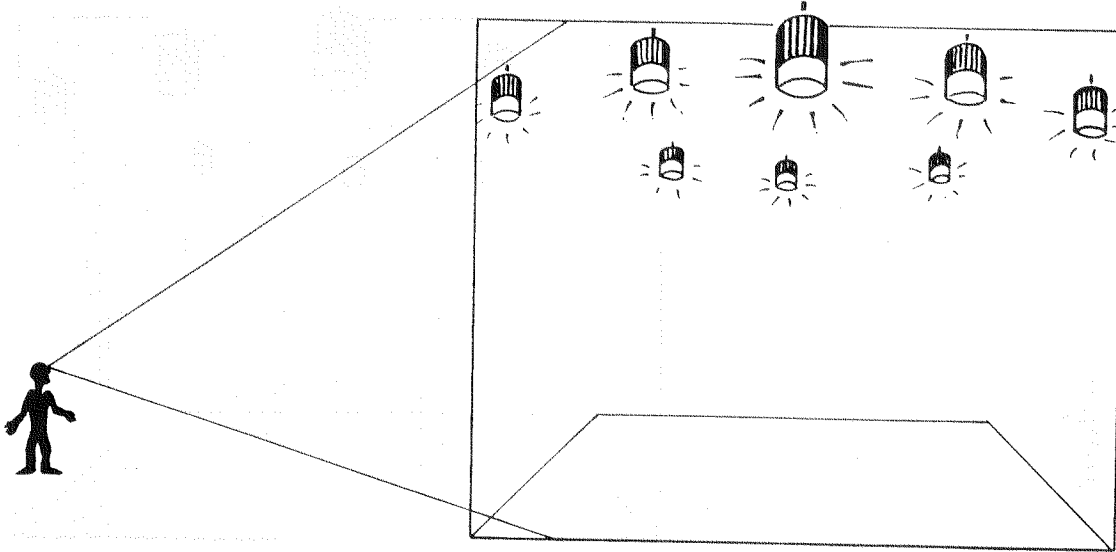
VIEWER IS ABLE TO EXPERIENCE THE COMPLETE ACTION OF THE
SYSTEM AS THERE ARE NO OBSTRUCTIONS TO THE OMNIDIRECTIONAL
OUTPUT OF THE LUMINAIRES

**Example #2 - VIEWER CENTERED BELOW LUMINAIRES HAS LIMITED
VISIBILITY**
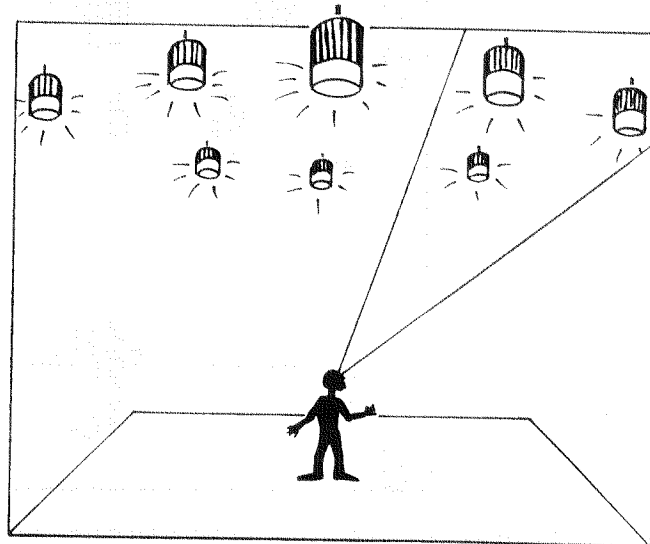
VIEWER IS UNABLE TO SEE ALL ILLUMINATORS AND SO IS UNABLE
TO EXPERIENCE ALL OF THE ACTION

3

## Example #3 - WITH REFLECTORS AIMED DOWN
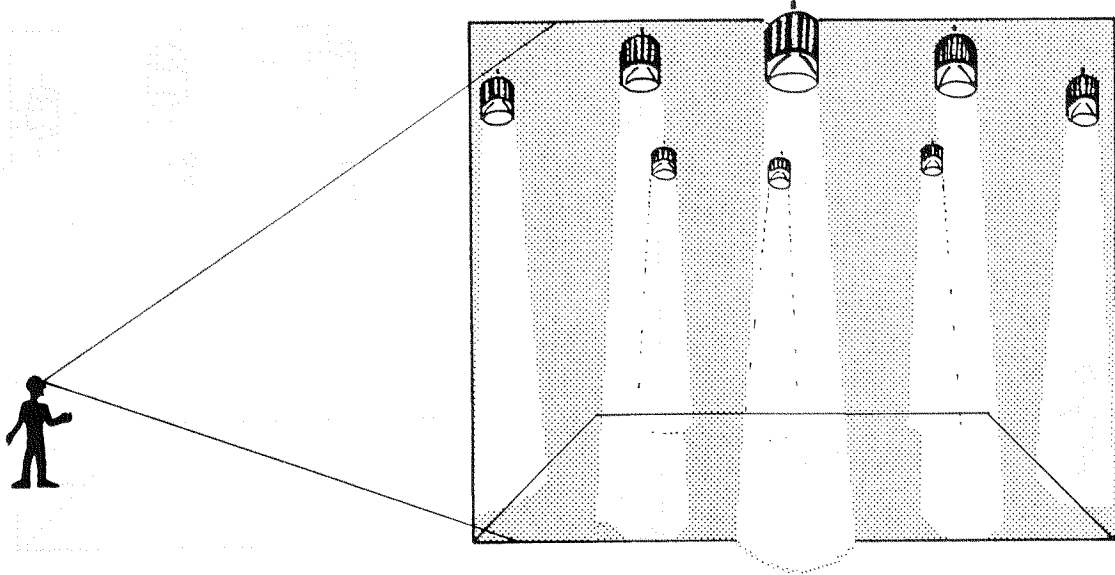


THE VIEWER IS ABLE TO SEE ALL BRIGHTLY LIT REFLECTORS AS
WELL AS THEIR REFLECTED OUTPUT DUE TO THE VIEWING ANGLE.

## Example #4 - REFLECTORS AIMED TOWARDS CENTER
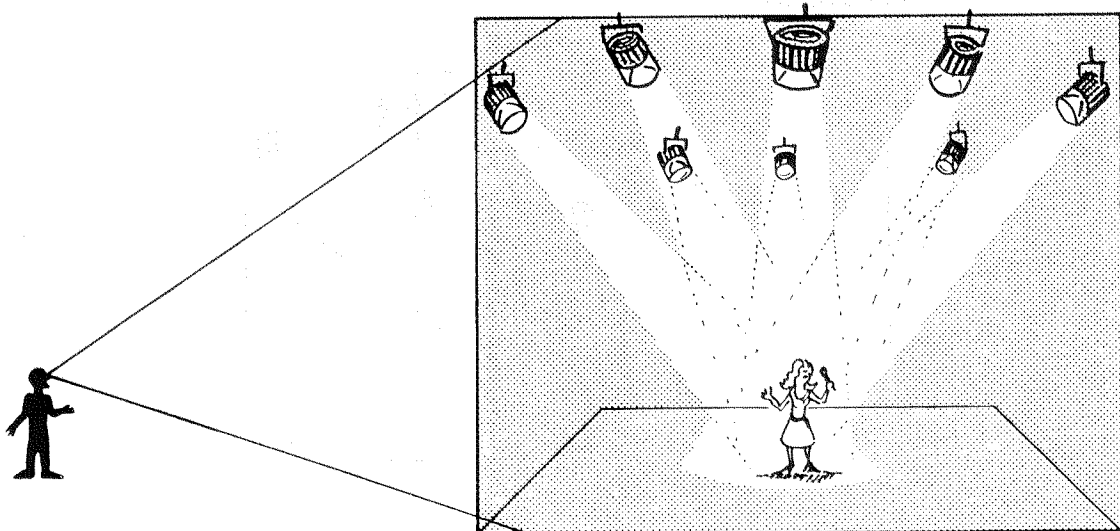


VISIBLE ACTION IS LIMITED TO THE ILLUMINATORS ACROSS FROM
THE VIEWER AS THE OTHERS CANNOT BE SEEN DIRECTLY.
ILLUMINATED AREA ON STAGE MAY LOOK GOOD BUT THE VIEWER
ONLY EXPERIENCES A PART OF THE SEQUENCING ACTION.

## CONTROLLER ILLUSTRATION
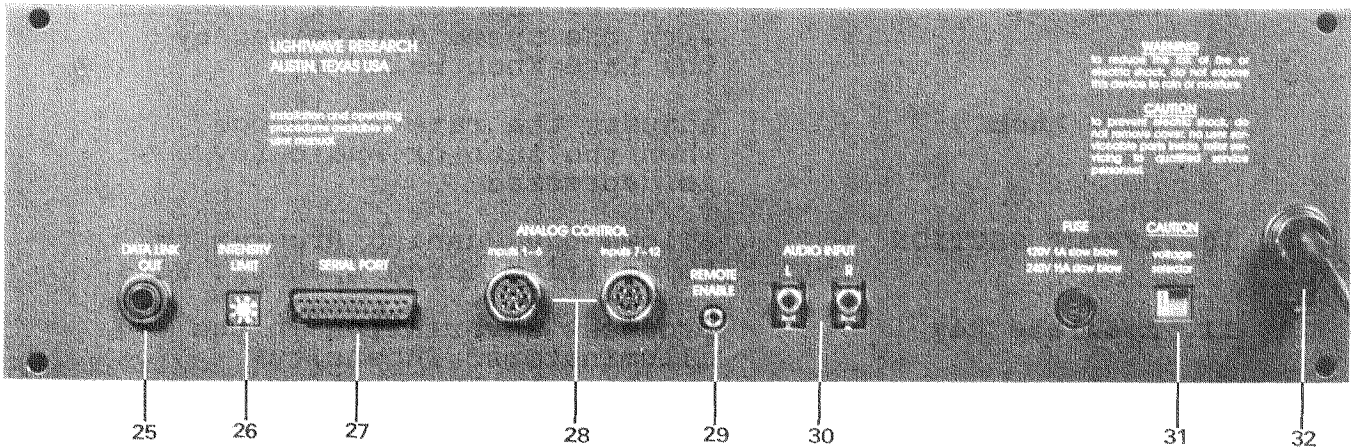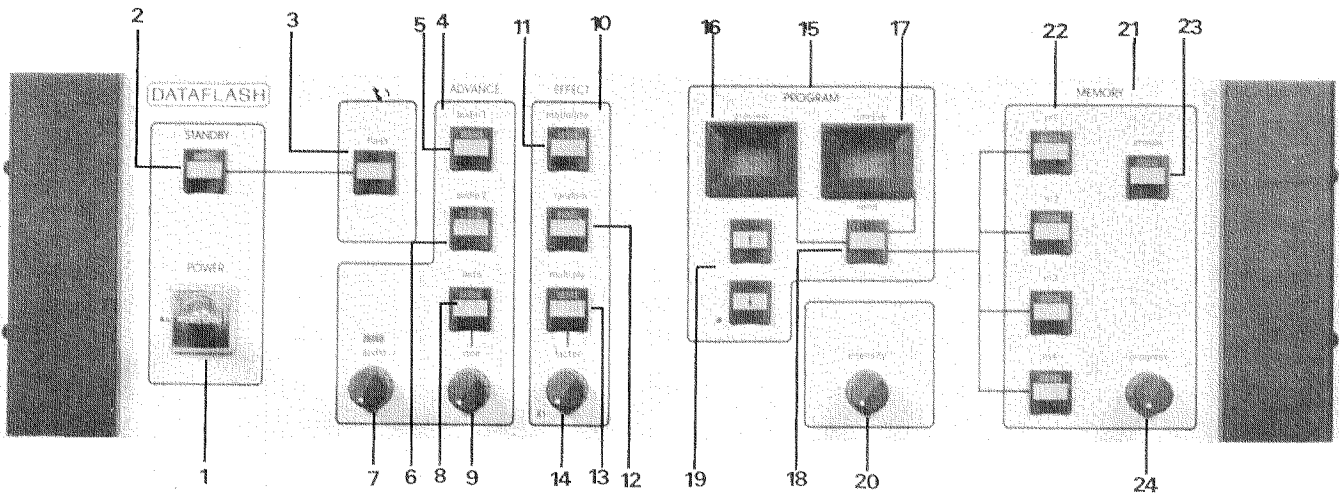


## FRONT AND REAR PANEL DESCRIPTION

1. **POWER KEYSWITCH** – turns the controller on and off and "Enables" all interconnected illuminators

2. **STANDBY KEY** – disables controller output to all illuminators regardless of status

3. **flash key** – causes all illuminators to flash at maximum Intensity, regardless of status, one or more times, depending upon how long the key is depressed

4.  **ADVANCE SECTION** -    determines the type of Advance
                             for a Program three ways, with
                             one mode engaged at all times

5.  **audio 1 key**     -    accelerates a Program's
                             Advance speed when an audio
                             pulse is sensed

6.  **audio 2 key**     -    halts the acceleration of a
                             Program's Advance speed when an
                             audio pulse is sensed

7.  **audio knob**      -    used in conjunction with Audio
                             1, Audio 2, and Modulate to
                             adjust the audio sensitivity.
                             The LED above it indicates the
                             presence and level of program
                             input

8.  **auto key**        -    Advances the steps of a Program
                             with the speed determined by
                             the Rate Knob below it

9.  **rate knob**       -    adjusts the rate of change
                             when the Auto or Audio Key
                             is depressed

10. **EFFECT SECTION**  -    allows the Running Program to
                             be modified three specific ways

11. **modulate key**    -    produces a variation in the
                             illuminators' Intensity
                             relative to the amplitude
                             of the audio signal

12. **random key**      -    when the Send key is depressed
                             with effect enabled, the
                             Previewed Program begins
                             running at a random location
                             instead of its normal
                             beginning.  The Program then
                             continues to run sequentially.

13. **multiply key**    -    repeats each Step of the
                             Program a number of times as
                             determined by the Factor Knob
                             below it

14. **factor knob**     -    adjusts the number of times
                             a Step is repeated

**15. PROGRAM SECTION** –    contains Displays and Keys
                             necessary to select and use
                             the controller's Programming

**16. preview display** –    denotes three modes:
     a. NORMAL:  shows the Program
        number that can be Sent to
        the Running position
     b. MEMORY PLAYBACK:  displays
        "P" (Play) and the Memory
        number being Played back
        (1,2,3, or 4)
     c. ANALOG INPUT:  displays the
        letters "AC" (Analog
        Control) when an analog
        signal is detected at the
        DIN inputs

**17. running display** –    also has three modes:
     a. NORMAL:  displays the
        Program number currently
        Running
     b. MEMORY PROGRAMMING:
        displays "E" (Enable) and
        the selected Memory number.
        When Send is depressed
        or an analog input is
        sensed, the Memory Step
        (01-99) will be shown
     c. MEMORY PLAYBACK:  indicates
        the current Playback Step of
        the selected Memory.  If the
        Send key is depressed or an
        analog signal is detected,
        the display shows the Memory
        Step number

**18. send key** –           "Sends" either a Previewed
                             Program to the Running Display
                             or a modified Running Program
                             into an Enabled Memory

**19. up/down keys** –       provide forward and reverse
                             access to Preview Program &
                             Special Function numbers

**20. intensity knob** –     regulates maximum brightness

21. **MEMORY SECTION**   &mdash;   contains user-Programmable Memories, the Enable key used to access the Memories, and the Progress Knob used during Playback

22. **m1,m2,m3,m4 keys**   &mdash;   accesses one of the four user-Programmable Memories, each capable of storing up to 99 Steps of modified Programs

23. **enable key**   &mdash;   "opens" the Memory section for the loading of pre-stored Programs (or Editing when used with an analog controller) when followed by the depression of a numbered Memory Key

24. **progress knob**   &mdash;   adjusts the number of times the Steps are repeated as a Memory plays back

25. **DATA LINK OUT**   &mdash;   provides digitally encoded Serial Data to the fixtures

26. **INTENSITY LIMIT SWITCH**   &mdash;   adjusts the overall Intensity and power requirements of the illuminators

27. **SERIAL PORT**   &mdash;   for communication with external control systems

28. **REMOTE ANALOG CONTROL**   &mdash;   two locking 8-pin DIN connectors for analog access of Programs and Memory Steps

29. **REMOTE ENABLE**   &mdash;   accepts a 3.5mm mini-plug for signaling Remote Standby

30. **AUDIO INPUT**   &mdash;   two RCA-type phono connectors for line-level stereo input

31. **FUSE HOLDER**   &mdash;   1A @ 120V - .5A @ 240V slo-blow type, 5mm X 20mm

32. **240V/120V SELECTOR**   &mdash;   variable mains voltage selector

33. **LINE CORD**   &mdash;   mains connection

# D A T A F L A S H

## CONTROLLER SPECIFICATIONS

1.          up to 99 programs

2.          up to 256 channels

3.          touch panel analog interface

4.          multiple intensities per step

5.          master intensity

6.          audio advance

7.          audio modulation

8.          memory storage

9.          step multiply

10.         installer power level select

11.         remote enable

12.         security keylock

13.         positive feel switches

14.         communications port

15.         standard rack mount, 3 units

16.         voltage 120V/60Hz - 240V/50Hz,
            switchable

17.         current 1A @ 120V - 0.5A @ 240V

18.         dimensions 13.3cm H x 48.2cm W x 28cm D
            boxed      26.7cm H x 56.5cm W x 38cm D

19.         weight     7.0kg
            boxed      8.6kg


specifications subject to change without prior notice

# D A T A F L A S H

## ILLUMINATOR ILLUSTRATION
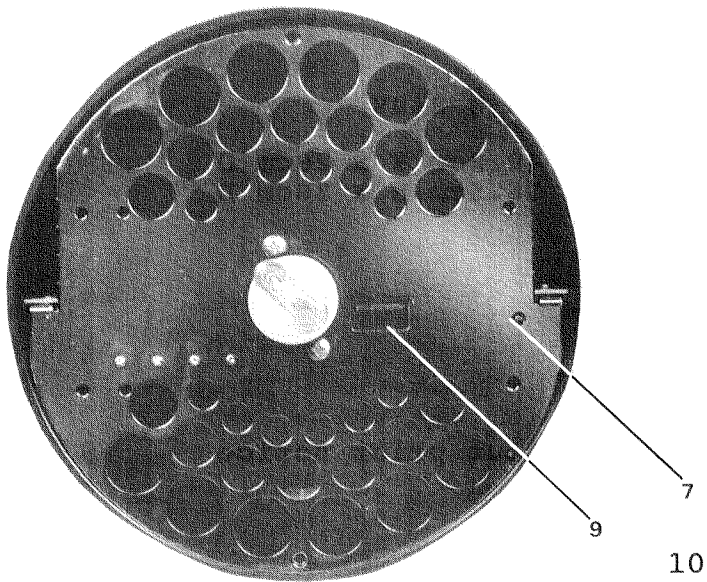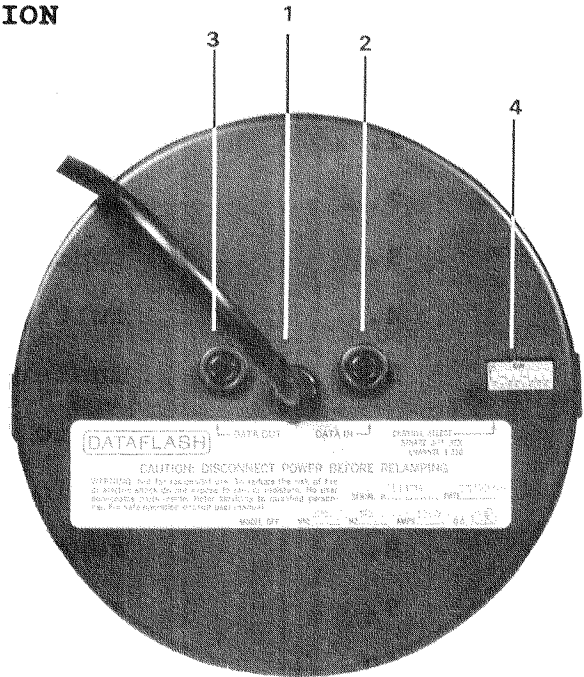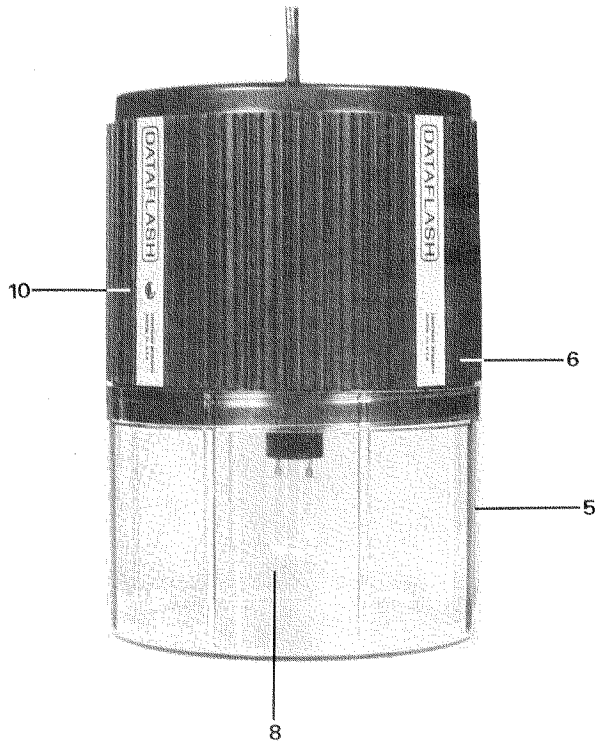


1.   MAINS CONNECTION

2.   DATA-IN JACK

3.   DATA-OUT JACK

4.   8-POSITION DIP
     SWITCH FOR CHANNEL
     ASSIGNMENT

5.   DOME

6.   BASE

7.   LED CONFIRMATION
     INDICATOR

8.   XENON FLASHLAMP

9.   THERMAL SENSOR

10.  YOKE-THREAD
     RECEPTACLE

# D A T A F L A S H

## ILLUMINATOR SPECIFICATIONS

1.      maximum flash rate of 17fps

2.      minimum flash rate of .5fps

3.      xenon lamp power 1000 watts @ 10fps
duty cycle regulated

4.      lamp life dependent on intensity:
@ 50% : 500,000 flashes average

5.      digital assignment selector of 256
channels

6.      self-diagnostics

7.      data-active indicator

8.      easy octal-socketed lamp replacement

9.      3-phase system capability

10.     self-resetting thermal breaker

11.     thermal fuse

12.     adjustable current consumption,
10A RMS Max.

13.     voltage  120V/60Hz - 240V/50Hz

14.     dimensions   28.5cm H x 20cm Diameter
boxed, each  31.1cm H x 21cm D x 21cm W
carton of 4  32.4cm H x 43cm D x 43cm W

15.     weight       2.0kg
boxed, each  2.3kg
carton of 4  10.9kg


specifications subject to change without prior notice

# D A T A F L A S H

## INSTALLATION

Thank you for purchasing a DATAFLASH system. To ensure
an uninterrupted installation, please take the time as you
unpack the items, to note their condition and confirm that
all parts listed have been removed before storing the
boxes.


## UNPACKING

The DATAFLASH controller box contains this users manual, a
book of schematics, and one 1/4" three-way connector.
Each DATAFLASH illuminator box includes two 1/4" three-way
connectors and one lamp for the unit. If you purchased
the special XLR version, connectors are not provided,
allowing the use of your own or pre-made cables.

If you purchased any of the optional accessories such as
the Yoke or the Reflector, they will be shipped in their
own cartons. The Yoke carton will contain the yoke, two
handles with threaded shafts, two rubber washers, and
instructions for installation. The Reflector carton will
contain the reflector and its installation instructions.


## POWER REQUIREMENTS

With its Duty Cycle monitoring, DATAFLASH illuminators can
produce incredibly high light output. During this time
the illuminator's mains requirements is at its highest
level. At 120V 60Hz and depending on the length of the
mains line to the panel, an illuminator may require 5 to 8
Amps RMS. At 240V 50Hz, an illuminator under the same
conditions may require 3 to 6 Amps RMS. At 120V 60Hz
up to 4 DATAFLASH illuminators may be connected to a
20 Amp breaker. The mains circuit breaker, as with any
flashlamp system, should be a thermal, high-surge unit.
Do not use magnetic or fast-acting breakers.

If more DATAFLASH units are to be used on one circuit,
simply adjust the installer Intensity Limit switch located
on the rear panel of the controller. This rotary switch
allows the installer to fine tune the system for specific
power requirements or to prolong flashlamp life. One
should not forget that at full power, DATAFLASH is capable
of greater than 1000 watt-seconds. A single flash can
have an instantaneous value of 10 Kilowatts per unit. But
these power requirements for DATAFLASH are low in
comparison to standard theatrical lighting in the 1000
Watt range.

# D A T A F L A S H

## INTERCONNECT CABLES

An unlimited number of units can be linked together,
daisy-chain fashion, to form up to a 256-channel system,
with two-conductor, shielded cable.  To construct these
cables, solder the shield to the sleeve of the provided
1/4" stereo plugs, the black wire to the ring and the red
to the tip.  The special XLR versions use Pin 1 for shield
or sleeve, Pin 2 as Ring, and Pin 3 as Tip.  All cables
should be tested with a Volt Ohm Meter before use to
minimize installation interruptions.  These cables may
also be paralleled if necessary as long as polarity is
maintained.

Once all of the cables have been made up and the
illuminator's DIP switches have been set (refer to pages
12-14), hang and plug the units in.  Begin plugging the
interconnect and power cables in, starting with the
controller first and then to the first unit's DATA-IN
jack.  From there, in daisy-chain fashion, plug the next
cable into the DATA-OUT jack and then to the DATA-IN of
the next fixture and so on.


## SETTING THE DIP SWITCHES

To set the DIP switches on the fixtures, refer to the
example below and the charts on the following pages.
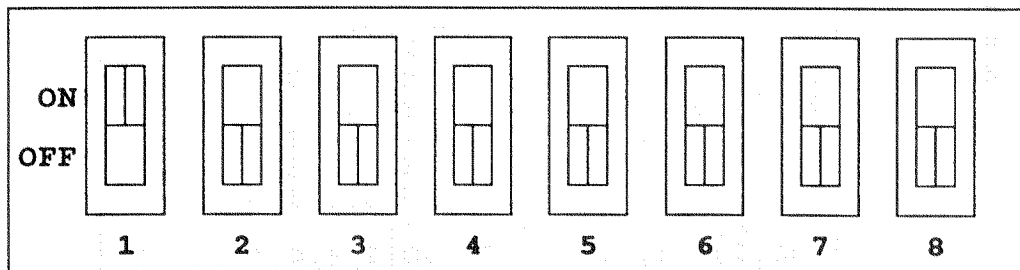


**8-PIN DIP SWITCH LOCATED ON TOP OF EACH DATAFLASH UNIT
(THIS EXAMPLE ILLUSTRATES SWITCH 1 ON, ALL OTHERS OFF)**

# D A T A F L A S H
## 256-CHANNEL DIP SWITCH SETTING CHART

| CH# | SWITCHES ON | CH# | SWITCHES ON | CH# | SWITCHES ON |
|-----|-------------|-----|-------------|-----|-------------|
| 001 | none | 051 | 2,5,6 | 101 | 3,6,7 |
| 002 | 1 | 052 | 1,2,5,6 | 102 | 1,3,6,7 |
| 003 | 2 | 053 | 3,5,6 | 103 | 2,3,6,7 |
| 004 | 1,2 | 054 | 1,3,5,6 | 104 | 1,2,3,6,7 |
| 005 | 3 | 055 | 2,3,5,6 | 105 | 4,6,7 |
| 006 | 1,3 | 056 | 1,2,3,5,6 | 106 | 1,4,6,7 |
| 007 | 2,3 | 057 | 4,5,6 | 107 | 2,4,6,7 |
| 008 | 1,2,3 | 058 | 1,4,5,6 | 108 | 1,2,4,6,7 |
| 009 | 4 | 059 | 2,4,5,6 | 109 | 3,4,6,7 |
| 010 | 1,4 | 060 | 1,2,4,5,6 | 110 | 1,3,4,6,7 |
| 011 | 2,4 | 061 | 3,4,5,6 | 111 | 2,3,4,6,7 |
| 012 | 1,2,4 | 062 | 1,3,4,5,6 | 112 | 1,2,3,4,6,7 |
| 013 | 3,4 | 063 | 2,3,4,5,6 | 113 | 5,6,7 |
| 014 | 1,3,4 | 064 | 1,2,3,4,5,6 | 114 | 1,5,6,7 |
| 015 | 2,3,4 | 065 | 7 | 115 | 2,5,6,7 |
| 016 | 1,2,3,4 | 066 | 1,7 | 116 | 1,2,5,6,7 |
| 017 | 5 | 067 | 2,7 | 117 | 3,5,6,7 |
| 018 | 1,5 | 068 | 1,2,7 | 118 | 1,3,5,6,7 |
| 019 | 2,5 | 069 | 3,7 | 119 | 2,3,5,6,7 |
| 020 | 1,2,5 | 070 | 1,3,7 | 120 | 1,2,3,5,6,7 |
| 021 | 3,5 | 071 | 2,3,7 | 121 | 4,5,6,7 |
| 022 | 1,3,5 | 072 | 1,2,3,7 | 122 | 1,4,5,6,7 |
| 023 | 2,3,5 | 073 | 4,7 | 123 | 2,4,5,6,7 |
| 024 | 1,2,3,5 | 074 | 1,4,7 | 124 | 1,2,4,5,6,7 |
| 025 | 4,5 | 075 | 2,4,7 | 125 | 3,4,5,6,7 |
| 026 | 1,4,5 | 076 | 1,2,4,7 | 126 | 1,3,4,5,6,7 |
| 027 | 2,4,5 | 077 | 3,4,7 | 127 | 2,3,4,5,6,7 |
| 028 | 1,2,4,5 | 078 | 1,3,4,7 | 128 | 1,2,3,4,5,6,7 |
| 029 | 3,4,5 | 079 | 2,3,4,7 | 129 | 8 |
| 030 | 1,3,4,5 | 080 | 1,2,3,4,7 | 130 | 1,8 |
| 031 | 2,3,4,5 | 081 | 5,7 | 131 | 2,8 |
| 032 | 1,2,3,4,5 | 082 | 1,5,7 | 132 | 1,2,8 |
| 033 | 6 | 083 | 2,5,7 | 133 | 3,8 |
| 034 | 1,6 | 084 | 1,2,5,7 | 134 | 1,3,8 |
| 035 | 2,6 | 085 | 3,5,7 | 135 | 2,3,8 |
| 036 | 1,2,6 | 086 | 1,3,5,7 | 136 | 1,2,3,8 |
| 037 | 3,6 | 087 | 2,3,5,7 | 137 | 4,8 |
| 038 | 1,3,6 | 088 | 1,2,3,5,7 | 138 | 1,4,8 |
| 039 | 2,3,6 | 089 | 4,5,7 | 139 | 2,4,8 |
| 040 | 1,2,3,6 | 090 | 1,4,5,7 | 140 | 1,2,4,8 |
| 041 | 4,6 | 091 | 2,4,5,7 | 141 | 3,4,8 |
| 042 | 1,4,6 | 092 | 1,2,4,5,7 | 142 | 1,3,4,8 |
| 043 | 2,4,6 | 093 | 3,4,5,7 | 143 | 2,3,4,8 |
| 044 | 1,2,4,6 | 094 | 1,3,4,5,7 | 144 | 1,2,3,4,8 |
| 045 | 3,4,6 | 095 | 2,3,4,5,7 | 145 | 5,8 |
| 046 | 1,3,4,6 | 096 | 1,2,3,4,5,7 | 146 | 1,5,8 |
| 047 | 2,3,4,6 | 097 | 6,7 | 147 | 2,5,8 |
| 048 | 1,2,3,4,6 | 098 | 1,6,7 | 148 | 1,2,5,8 |
| 049 | 5,6 | 099 | 2,6,7 | 149 | 3,5,8 |
| 050 | 1,5,6 | 100 | 1,2,6,7 | 150 | 1,3,5,8 |

# D A T A F L A S H
## 256-CHANNEL DIP SWITCH SETTING CHART
### (CONTINUED)

| CH# | SWITCHES ON | CH# | SWITCHES ON | CH# | SWITCHES ON |
|---|---|---|---|---|---|
| 151 | 2,3,5,8 | 186 | 1,4,5,6,8 | 221 | 3,4,5,7,8 |
| 152 | 1,2,3,5,8 | 187 | 2,4,5,6,8 | 222 | 1,3,4,5,7,8 |
| 153 | 4,5,8 | 188 | 1,2,4,5,6,8 | 223 | 2,3,4,5,7,8 |
| 154 | 1,4,5,8 | 189 | 3,4,5,6,8 | 224 | 1,2,3,4,5,7,8 |
| 155 | 2,4,5,8 | 190 | 1,3,4,5,6,8 | 225 | 6,7,8 |
| 156 | 1,2,4,5,8 | 191 | 2,3,4,5,6,8 | 226 | 1,6,7,8 |
| 157 | 3,4,5,8 | 192 | 1,2,3,4,5,6,8 | 227 | 2,6,7,8 |
| 158 | 1,3,4,5,8 | 193 | 7,8 | 228 | 1,2,6,7,8 |
| 159 | 2,3,4,5,8 | 194 | 1,7,8 | 229 | 3,6,7,8 |
| 160 | 1,2,3,4,5,8 | 195 | 2,7,8 | 230 | 1,3,6,7,8 |
| 161 | 6,8 | 196 | 1,2,7,8 | 231 | 2,3,6,7,8 |
| 162 | 1,6,8 | 197 | 3,7,8 | 232 | 1,2,3,6,7,8 |
| 163 | 2,6,8 | 198 | 1,3,7,8 | 233 | 4,6,7,8 |
| 164 | 1,2,6,8 | 199 | 2,3,7,8 | 234 | 1,4,6,7,8 |
| 165 | 3,6,8 | 200 | 1,2,3,7,8 | 235 | 2,4,6,7,8 |
| 166 | 1,3,6,8 | 201 | 4,7,8 | 236 | 1,2,4,6,7,8 |
| 167 | 2,3,6,8 | 202 | 1,4,7,8 | 237 | 3,4,6,7,8 |
| 168 | 1,2,3,6,8 | 203 | 2,4,7,8 | 238 | 1,3,4,6,7,8 |
| 169 | 4,6,8 | 204 | 1,2,4,7,8 | 239 | 2,3,4,6,7,8 |
| 170 | 1,4,6,8 | 205 | 3,4,7,8 | 240 | 1,2,3,4,6,7,8 |
| 171 | 2,4,6,8 | 206 | 1,3,4,7,8 | 241 | 5,6,7,8 |
| 172 | 1,2,4,6,8 | 207 | 2,3,4,7,8 | 242 | 1,5,6,7,8 |
| 173 | 3,4,6,8 | 208 | 1,2,3,4,7,8 | 243 | 2,5,6,7,8 |
| 174 | 1,3,4,6,8 | 209 | 5,7,8 | 244 | 1,2,5,6,7,8 |
| 175 | 2,3,4,6,8 | 210 | 1,5,7,8 | 245 | 3,5,6,7,8 |
| 176 | 1,2,3,4,6,8 | 211 | 2,5,7,8 | 246 | 1,3,5,6,7,8 |
| 177 | 5,6,8 | 212 | 1,2,5,7,8 | 247 | 2,3,5,6,7,8 |
| 178 | 1,5,6,8 | 213 | 3,5,7,8 | 248 | 1,2,3,5,6,7,8 |
| 179 | 2,5,6,8 | 214 | 1,3,5,7,8 | 249 | 4,5,6,7,8 |
| 180 | 1,2,5,6,8 | 215 | 2,3,5,7,8 | 250 | 1,4,5,6,7,8 |
| 181 | 3,5,6,8 | 216 | 1,2,3,5,7,8 | 251 | 2,4,5,6,7,8 |
| 182 | 1,3,5,6,8 | 217 | 4,5,7,8 | 252 | 1,2,4,5,6,7,8 |
| 183 | 2,3,5,6,8 | 218 | 1,4,5,7,8 | 253 | 3,4,5,6,7,8 |
| 184 | 1,2,3,5,6,8 | 219 | 2,4,5,7,8 | 254 | 1,3,4,5,6,7,8 |
| 185 | 4,5,6,8 | 220 | 1,2,4,5,7,8 | 255 | 2,3,4,5,6,7,8 |
| ---- | | ---- | | 256 | ALL ON |

# D A T A F L A S H

## ILLUMINATOR SELF-DIAGNOSTICS

Each DATAFLASH illuminator is equipped with its own
micro-processor which performs the numerous functions
necessary for its sophisticated operation.  Two of the
more unique tasks it performs are a self-test, to check
the flashlamp and its associated electronics, and
automatic duty cycle management, to protect the fixture.


## SELF-TEST

This self-test is performed only under certain conditions
to prevent unwanted or inappropriate flashing.  When power
is applied to a fixture (or removed and then reapplied), a
red confirmation LED on the illuminator will light.  If no
data line is plugged into the unit or no active data is
present (i.e., the controller is off), the self-test,
consisting of approximately 15 seconds of varying flash
rates and Intensities, is performed.  When this test is
completed, the LED and illuminator will turn off.

**NOTE:** **Self-test will NOT occur when power is reapplied,
(i.e., after a power failure) IF the controller is
on and the fixture is receiving active data.**


## DUTY CYCLE MANAGEMENT

The merging of the microprocessor and the flashlamp give
birth to intelligent duty cycle control.  Each DATAFLASH
illuminator monitors the power it consumes and thus the
amount of heat produced.  As the unit is flashing, the
Intensity level and duration are being calculated as
power.  If a significant amount of power is achieved
within a certain amount of time, a "cool-down cycle"  will
be initiated.  After the cool-down cycle of approximately
2.5 minutes has elapsed, the fixture will recalculate
Intensity and duration and, if necessary, produce another
cool-down cycle.  Depending on the number of illuminators
in a system, most applications would rarely require
frequent cool down intervals.

# D A T A F L A S H

## OPERATIONS

All operations are regulated by the Advance, Effect, and
Program areas.  These areas offer control of the methods,
modes, and sequences of any of the installed Programs.
Turning the security keyswitch clockwise applies power to
the controller and is indicated by the Standby and Auto
LED.  All other LEDs will be off and the Preview and
Running display will show **01.**  The controller will now run
Program 01 if the Standby key is depressed.

## ADVANCE SECTION

The Advance section controls the progression through a
selected Program's steps, either by rate alone (Auto) or
with music (Audio) or a combination of the two.  One
method of Advance will always be enabled and its
corresponding LED lit (Auto is the default selection).  To
change Advance methods, depress the new selection's key
and the change will be confirmed with the illumination of
its LED.  The LED of the previously selected function will
extinguish.

**Auto**
This method of advancing through a Program's steps allows
the rate of change to be varied by the Rate knob below it.

**Audio 1**
This selection advances a Program's steps with the rhythm
of the music.  The sensitivity is adjustable via the Audio
knob in the lower left of this area.  The flashing of the
LED should be adjusted to coincide with the music's peaks.
The Auto knob adjusts how much (i.e.,the # of steps) the
program **advances** when an audio pulse occurs.

**Audio 2**
Operates much the same as Audio 1, but instead **halts** step
advancement with the rhythm.  Audio and Auto trim is
performed the same as with Audio 1.

# D A T A F L A S H

## EFFECT SECTION

This area of the DATAFLASH controller consists of three combinable modes. All, one, or none of these can be selected to modify the steps of a Program as it runs.

### Modulate

The Modulate effect results in the illuminators' intensity varying with the amplitude of the musical information. When an Audio signal is sensed, its amplitude is translated to an intensity level no greater than the Program's maximum (this level can be further limited by the use of the Intensity control knob). Sensitivity is adjusted with the Audio knob in the Advance section.

### Random

The Random effect establishes a Program's beginning at random, rather than at the preset starting point, when the Send key is depressed or an analog control device is activated. This feature allows a multitude of different looks, even within the same Program, as the starting point will consistently be different.

**Example:** Program number 01 is advancing through its steps sequentially. With Random enabled, as the Send key is depressed, the controller will shift into the Previewed Program somewhere but not its beginning as would normally occur. If the Previewed Program is the same as that Running, a random re-starting point of that Program will be established.

### Multiply

The Multiply effect "echoes" the individual steps of a Program and repeats them a number of times based on the setting of the Factor knob below it.

**Example:** Program number 01 is Advancing through its steps sequentially and the Multiply function is enabled. Depending upon where the Factor knob is set, the Program's steps will be repeated that number of times, i.e., step number 1,1,1,1 then 2,2,2,2 then 3,3,3,3 and so on for a Multiply Factor of four.

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## PROGRAM SECTION

This area of the controller displays the current and
upcoming Program numbers, allows for their selection, and
"sends" those programs to the fixtures and/or Memories.
The controller contains up to 99 Programs as well as an
additional selection of Special Function Programs (denoted
by an F preceding the number, i.e., F1). All Programs are
accessed by the up/down keys with the Special Function
Programs located at their extremes.

### Preview
The Preview window displays the Program number that can be
sent to the Running position. This number is selected
using the up/down keys located below it.

### Running
The Running window displays the Program number currently
being sent to the data output. This display changes only
when the Send key is depressed and a different Program
number has been selected in the Preview window. If the
Preview number is the same as the currently displayed
Running Program, no change will occur.

### Send
This key is used to "send" a Previewed Program number to
the Running position and to "send" Programs to the User
Memories. When Send is depressed, the Previewed Program
will begin Running. If the Previewed Program is the same
as the one Running, then it will start over at its
beginning. With Random on, it will re-start somewhere in
that Program.

The Send key also has a special effect of its own. If it
is depressed and held, the Program will return to the
starting point of that Program and "freeze" at that step,
flashing at 10 flashes per second. Releasing the key
allows the Program to continue. This function is
available during Memory Playback as well where it will
"freeze" the Program on the current step when Send is
depressed. This function is visible at all times but the
effect cannot be stored in a Memory.

# D A T A F L A S H

## REMOTE ANALOG PROGRAM CHANGE

On the rear of the DATAFLASH controller are two locking
8-pin DIN connectors.  These allow for the direct access
of Program numbers and the individual steps that make up a
Memory (for playback or editing).  Any analog control
device (such as a touch panel, rock desk, or stage
lighting board) capable of providing at least 12 output
channels of **0VDC** to positive **10-16VDC** will work and allow
remote access.

The pinouts for hookup are as follows:

| REMOTE PROGRAM CONNECTORS 1 - 6 & 7 - 12 | |
|---|---|
| KEY / CHANNEL NUMBER | PIN NUMBER |
| 1 or 7 | 3 |
| 2 or 8 | 4 |
| 3 or 9 | 5 |
| 4 or 10 | 6 |
| 5 or 11 | 7 |
| 6 or 12 | 8 |
| common negative | 2 |
| not used | 1 |

A touch panel will be used for discussion in the following
examples, although any of the above mentioned devices will
function similarly.  The following chart explains how the
combinations of 12 channels access values up to 99.

| Keys #1-12 | Access Programs 1-12 |
|---|---|
| Keys #10-12 | are also **special** function keys |
| Key #10 | Functions as the **"tens"** key.  Keys #2-9 touched with the #10 key allows access to Programs 20, 30, 40, 50, 60, 70, 80, & 90. |
| Key #11 | Functions as the **"doubler"** key.  Keys #2-9 touched with the #11 key allows access to Programs 22, 33, 44, 55, 66, 77, 88, & 99. |
| Key #12 | Functions as the **"reverse"** key.  The two lowest numbered keys pressed with this key will "reverse."  2, 3, & 12 is 32 not 23 as it would be normally without the #12 key activated. |

If more than two keys are pressed with the #10, 11 or 12
key, only the lowest value integer will be selected.  The
Advance, Effect, and Memory playback selection will remain
as programmed during touch panel use.  If you attempt to
recall a invalid number, the controller will go into
Standby (Standby LED flashes) and display **AC** in the
Preview window followed by three horizontal rows of "bars"
in the Running window.  The touch panel has priority on
Program or step selection and only the Remote Enable plug
can override it.  If a key is pressed and latched you may
not change Programs or steps on the controller until you
change or release the touch panel setting.

There are two modes of control afforded by the touch panel
hook up, depending upon whether the controller is in or
out of Standby.  If Standby is enabled (LED lit), the
touch panel functions as a momentary and allows the chosen
Program to run only as long as the key is held.  When the
key is released, the controller will return to Standby and
the last Program accessed will be displayed in the Preview
and Running windows.  If Standby is not enabled (LED
dark), the touch panel causes the controller to run the
chosen Program and latches there until another Program is
chosen, even when the keys are released.

**NOTE:** The Standby LED will flash whenever there is input
        to the controller at the DIN plugs.

**MEMORY PLAYBACK**
Another unique feature available with the use of a touch
panel is its use during Memory playback.  If a Memory is
playing back and the analog inputs are activated, an
individual step of that Memory is accessed and continues
to run as long as that input is active.  When the input
becomes inactive, the controller continues sequencing the
steps of that Memory.

**REMOTE ENABLE**

Also located on the back panel of the controller is a
3.5mm mini-jack that accepts a 3.5mm (1/8") mini-plug.
This jack is normally closed so the controller functions
routinely with nothing inserted.  But with a plug
inserted, the controller goes into Standby and remains
there until voltage (+5 through +16VDC) is sensed.  The
controller is then restored to the mode of operation it
was in prior to being Remotely disabled.

# D A T A F L A S H

## MEMORY

There are four user-programmable Memories contained in this section of the controller. Your controller comes from the manufacturer with **up to** 99 regular Programs and with additional Special Function Programs installed. The Memories can be used to link these together in any order and store them complete with all front-panel settings to enable a rehearsed show or sequence to be repeated exactly as recorded. Each Memory position has a capacity of up to 99 steps (99 Program "Sends") and automatically creates a loop, regardless of the number entered, for continuous playback. Editing of the individual steps may be performed with the aid of an analog control device.

### PLAYBACK
To playback any of the Memories, depress that Memory's key and adjust the Standby, Intensity, Flash, and Progress controls as desired. The maximum Intensity, Advance, and Effect of a Program will have been set during Memory Programming and will not be adjustable. The Progress knob can be used during playback to repeat each individual step in a Memory a number of times. The Send key will cause the Memory to stop on and repeat a particular step as long as it is depressed. The Standby key will halt the Program at the current step number (disabling output to the fixtures) until depressed again. The analog control inputs have priority during Memory playback and allow direct access to individual steps.

### STANDARD MEMORY STORAGE - WITHOUT EDITING

To initiate Memory storage, depress the Enable key followed by the key of the Memory you wish to program. (Note: When the Enable key is depressed, the Running display will show E0 until a Memory is selected). The Enable and Memory LED will light to confirm your selection. Now the Preview window displays the actual Program Running, and the Running window displays E1, E2, E3, or E4 to denote the Memory Enabled for programming.

Next, choose the Program number with the up/down keys, and make any modifications to the Advance, Effect, and Intensity to be stored with that Program. All modifications will be visible if the controller is not in Standby. Depress Send and the number of the step just programmed will become visible in the Running display. The example on the following page will more simply illustrate the storage process and the displays that accompany each action.

# D A T A F L A S H

The following simplified example applies to both Standard and Advanced Memory storage.

**WARNING:  It is important to note that when a Memory is Enabled for reprogramming, all prior programming is removed from that Memory when the Send key is first depressed.**

**Example:**  Programming Memory #2

| ACTION | RESULT |
|---|---|
| **1. Depress the Enable key** | Enable LED lights<br>Running Display shows E0<br>Preview Display shows<br>    Program # as before |
| **2. Depress the Memory 2 key** | Memory 2's LED lights<br>Preview display now shows<br>    "running" Program #<br>Running display now shows<br>    E2 (Memory 2 enabled) |
| **3. Select a Program** with the up/down keys and modify the Advance, Effect, and Intensity as desired | The Program shown in the Preview display is now actually the one Running with any modifications visible as they are made |
| **4. Depress Send** | Running display will now show (briefly) the number of the step just Programmed and Preview will go dark momentarily each time Send is depressed |

Repeat operations three and four until you have Programmed all steps (up to 99) that you wish.  If all 99 available steps in a Memory are Programmed and an attempt is made to Send another step, both displays will go dark, indicating that the Memory is full.  When finished storing Programs in a Memory, depress the Enable key and the controller will return to normal operations, with the Preview and Running windows displaying the last Program number sent.

**NOTE:  If an Intensity is stored at a low level, this will be the maximum available during playback.  You may always turn the Intensity down during playback but not up above the level that has been recorded.**

# D A T A F L A S H

## ADVANCED MEMORY STORAGE WITH ANALOG CONTROL

Memory storage can also be performed with the aid of an
analog control device which allows the direct access of a
particular Step number.  This access allows Editing to be
performed.  Steps are chosen with the analog control
device in the same way as Program numbers.  The analog
control device will have priority on Step selection.  If
it is used to begin the programming of a sequence it must
be used to change the Step numbers while programming that
Memory.

### STORAGE
In the previous example for Programming Memory 2, an
analog control device would be used between operations 2
and 3 to call up Step number one.  Momentarily activate
(do not latch) the first channel of the device to call up
Step one.  The controller will briefly display **AC 01**
before returning to the normal Programming displays.
Select and modify the Program as before and depress the
Send key to store it (the Running window will display 01
as Send is depressed).

To Program Step 2, it must be selected in the same manner
as the first Step was.  But this time the display will
differ slightly, showing AC and three rows of horizontal
bars in the Running window, and indicating that Step 2 has
yet to be Programmed.  If a Step is chosen out of
sequence, for instance if 3 were accidentally chosen after
1, the controller would have the same display, but when
Send was depressed, the current Programming would be
written over the previous information on Step 1.  This
would be shown by 01 appearing in the Running window again
when Send is depressed.

(NOTE:  Step numbers must be chosen sequentially for
correct Program storage to occur.  If they are not, the
controller will remain on the last sequential step and
each Send will write over the previous one.)

After choosing the Program for Step 2 and depressing Send,
any additional steps up to 99 are chosen in the same way.
When finished storing Programs in the Memory, depress the
Enable key to return to normal operations.

# D A T A F L A S H

**EDITING**

This is probably the most useful function of the analog
interface as it allows for corrections or adjustments to
be made after Programs have been committed to a Memory
without starting over.  Editing is performed in a similar
manner to Programming with the analog device being used to
access the Steps in a Memory.

To Edit an existing Memory, depress the Enable key
followed by the key of the Memory to be edited.  Then with
the analog control device, call up the Step to be Edited.
Make the necessary changes and depress the Send key to
store those changes.  There is no limit to the number of
times a Step may be Edited or the number of Steps Edited
at a time.  When all changes have been made, depress the
Enable key to return the controller to normal functioning.

The addition of Steps to a Memory containing less than 99
Steps is also allowed, but must be done sequentially. The
last step number Programmed in that Memory is accessed
with an analog control device after the Memory is Enabled.
If a invalid step number is called up (i.e., one not
programmed before or outside the sequence), AC will be
displayed in the Preview window and three horizontal rows
of "bars" in the Running window.  To check if it is
actually the next Step in the sequence, momentarily
activate the preceding Step number.  If a number appears
in the Running display then choose the next Step, make the
desired modifications and depress Send as in regular
Programing.  Choose any other Steps the same way and
depress Enable when complete.

# D A T A F L A S H

## MEMORY LOCKOUT

This memo is to inform you of a step-by-step instructions in using memory lockout.

Entries can be protected from unauthorized editing or programming. Depress and hold the standby key while turning on the key switch. Continue depressing the standby key and you may lock or unlock the memories by depressing the corresponding key numbers (1-4) in the memory section. When an led in the memory section is lit while standby is depressed, it indicates that the memory is unlock and programmable. If an led is off, the memory is locked but not necessarily programmed. You may toggle between locked and unlocked as long as standby is depressed.

Once you release standby, the controller will return to its normal function displaying 01 01. When locked, a memory is protected form all erase and record functions. When a locked memory is accessed and an attempt is made to record, L.C. is displayed in the second window, indicating that any changes are temporary but not recordable.

# D A T A F L A S H

## MAINTENANCE

**Controller and power should be off when any cleaning or maintenance is done.**

Your DATAFLASH system has been designed for longevity and ease of use, and cleanliness will prolong its life. Controllers and fixtures should be dusted regularly with a soft cloth or feather duster.

When replacing lamps, it is advisable to unplug the unit to minimize or avoid any potential shock hazard. To remove the dome, grasp the base and unscrew the dome counter-clockwise. Remove the lamp by grasping the base and pulling. To replace, insert the lamp into the octal socket after lining up the pins. Replace the dome by screwing it onto the base clockwise.

## PRECAUTIONS

Please note on the fixture and the controller the various precautions. Keep both units away from rain or moisture to reduce the risk of fire or electrical shock. These units are not for residential use and contain no user-serviceable parts inside. Servicing must be conducted by the manufacturer or other qualified service personnel. For continued protection against fire, fuses must be replaced only by those with the specified voltage and current ratings.

# D A T A F L A S H

## WARRANTY DISCUSSION

Your DATAFLASH system is covered by a **1 year**, limited, parts and
labor warranty.  It is the owner's responsibility to furnish
receipts or invoices for verification of purchase, date, and
dealer or distributor.

It is necessary to obtain a return authorization number **BEFORE**
any units are sent in for repair.  The manufacturer will make the
final determination as to whether or not the unit is covered by
warranty.  This warranty does not cover lamps or fuses.

All shipping will be paid by the purchaser, and warranted items
will have return shipping paid by the manufacturer in the
Continental United States.

Under no circumstances will freight collect shipments be
accepted!  Prepaid shipping does not include rush expediting such
as air freight.  Air freight can be sent customer collect in the
Continental United States.

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**REPAIR OR REPLACEMENT AS PROVIDED FOR UNDER THIS WARRANTY IS THE
EXCLUSIVE REMEDY OF THE CONSUMER.  LIGHTWAVE RESEARCH, INC.,
SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES
FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ON THIS PRODUCT.
EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED
WARRANTY OF MERCHANTABILITY FOR FITNESS FOR A PARTICULAR PURPOSE
ON THIS PRODUCT IS LIMITED TO THE DURATION OF THIS WARRANTY.**

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Warranty is **void** if the product has been opened, misused,
damaged, or modified in any way.  This warranty gives you
specific legal rights, some of which may vary from state to
state.

# D A T A F L A S H

## TROUBLE-SHOOTING
## CHART

| PROBLEM OR SYMPTOM | POSSIBLE CAUSES / REMEDIES |
|---|---|
| SINGLE ROW OF HORIZONTAL "BARS" IN DISPLAYS | POWER FAILURE - TURN CONTROLLER OFF THEN BACK ON |
| THREE ROWS OF HORIZONTAL "BARS" IN RUNNING DISPLAY AND AC IN PREVIEW DISPLAY | PROGRAM OR STEP # CALLED UP BY ANALOG CONTROL IS INVALID; CHOOSE A VALID NUMBER |
| ADVANCE, EFFECT, OR PROGRAM KEYS INOPERABLE | CONTROLLER IN MEMORY-PLAYBACK MODE.  DEPRESS LIT MEMORY KEY TO RETURN TO NORMAL OPERATION |
| LED ILLUMINATED ON FIXTURE BUT NO FLASH OCCURRING | 1.CONTROLLER IN STANDBY<br>2.DIPSWITCH NOT SET CORRECTLY ON FIXTURE<br>3.LAMP OUT - TEST WITH NEW OR KNOWN WORKING LAMP |
| SOME ILLUMINATORS WORKING WHILE OTHERS ARE NOT. THOSE NOT FLASHING HAVE NO ACTIVE DATA LEDS LIT | 1.CHECK FOR POWER AT FIXTURES<br>2.DATA CABLE NOT SECURELY INSERTED OR FAULTY AT LAST FUNCTIONING FIXTURE |
| SAME AS ABOVE BUT ALL HAVE ILLUMINATED LEDS | 1.FIXTURE(S) IN COOL DOWN<br>2.INCORRECT CHANNEL SETTING |
| INTERMITTENT FLASHES, FLICKERING OR INCORRECT INTENSITIES AS PER PROGRAM | POSSIBLE FAILED OR FAILING LAMP |
| WINDOWS DISPLAY:<br> F1 ---- F9<br> P1 01 - P4 99<br> E1 01 - E4 01<br> AC 01 - AC 99 | SPECIAL FUNCTION PROGRAMS<br>MEMORY PLAYBACK<br>MEMORY ENABLED<br>ANALOG CONTROL 1-99 |
| STANDBY LED FLASHING | ANALOG CONTROL SIGNAL BEING RECEIVED AT DIN PLUGS |
| STEP NUMBER REMAINS THE SAME DURING PROGRAMMING OR EDITING AFTER ANALOG SIGNAL IS REMOVED | WHEN USING AN ANALOG CONTROL DEVICE, THE CONTROLLER WILL STAY AT THE PREVIOUS STEP # UNTIL DIRECTED TO ANOTHER. YOU MUST MANUALLY CHOOSE THE NEXT STEP WITH THE A.C. |