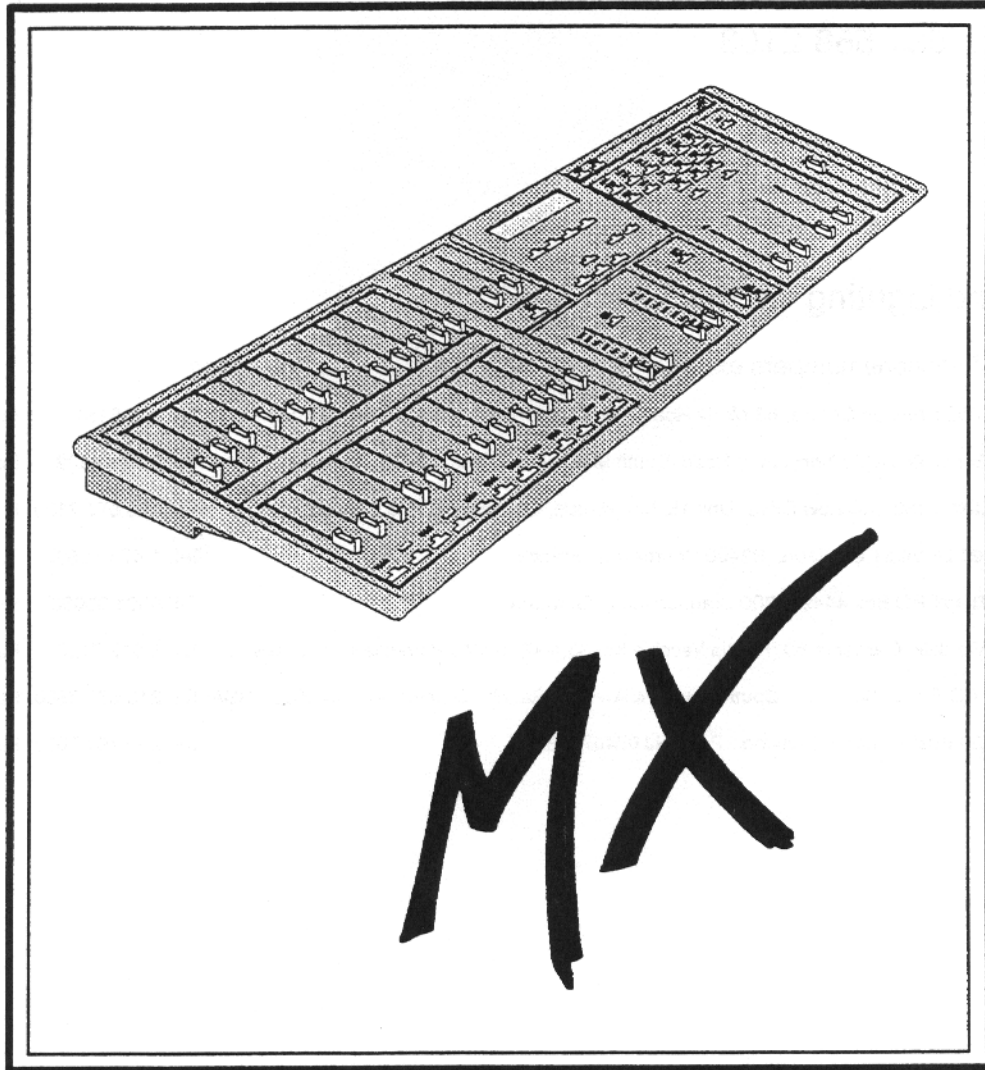


# OPERATIONAL HANDBOOK

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# Safety Information and Warning

The equipment described in this manual is designed and manufactured to comply with international safety standards IEC65 and is intended for use as a lighting control system. It must not be used for other purposes where there is any risk of safety to persons. It is important that installation be carried out in accordance with the instructions given in this manual.

In the interests of continued safe and reliable operation, observe the following guide-lines:

- **DANGER:** do not attempt to open the power supply unit casing.
- Only operate the equipment with the power supply provided.
- Keep the control system at a room temperature of 0–35°C and a relative humidity of 10–95%(non–condensing) during operation.
- Avoid sudden extremes of temperature, rain, direct sunlight or heat sources.
- Make sure that wires and cables are routed sensibly so that they cannot be snagged or tripped over. Do not tug or twist any wires or cables or use them to lift the unit.
- **DON'T** drop the equipment or subject it to excessive bumping or jarring.
- **DON'T** spill liquids on the surface of the unit. If liquids do spill, switch off the system immediately and contact your supplier.
- **DO** protect the unit from excessive dust or other contamination when not in use.

# Foreword

This handbook is intended to guide the new user of MX through the many features and unique versatility of the system, from basic manual operation to highly complex special effects. It does not attempt to serve as a tutorial on stage lighting techniques, but we recognise that many new users of MX may have had little previous experience of lighting control systems. We therefore include some explanation of basic concepts and terminology, and a glossary of terms at the end of the Introduction section of this handbook which the inexperienced user may find a valuable reference.

Note that the lighting process is potentially hazardous, using mains voltage electrical equipment, hot luminaires and requiring use of ladders etc. for access. Equipment should be regularly checked and maintained, safe working practices observed and caution exercised at all times.

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Sections of text which contain particularly important information or will help to solve common difficulties are included in bold type, as in this paragraph.

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MX



# Introduction

Lighting for entertainment is a creative art, and the development of sophisticated electronic control systems, such as MX, have removed the restrictions placed on the lighting designer and technician by former manual control systems. Basic principles have not changed over the years, but the versatility and wealth of features offered by a control system like MX require the user to have a reasonable level of understanding of lighting techniques if those capabilities are to be used creatively. The following sections define the terms which will be used frequently throughout this handbook, and explain some of the most basic entertainment lighting concepts.

## **BASIC TERMS AND CONCEPTS**

Any entertainment lighting set-up consists essentially of a number of lights (often referred to as **lanterns** or **luminaires**), connected individually or in small groups to some form of **dimmer**. The dimmers enable the lighting operator to control brightness with **repeatable precision** through the lighting control system. Modern electronic controls allow both the dimmers and the control system to be sited wherever is most convenient, without the need for large connecting cables.

The control system comprises a number of **channels**, each of which will generally provide control of one dimmer or a group of dimmers by a fader. The effect created by any given combination of channels and their levels is known as a **scene**. Most lighting systems allow for more than one scene to be set up at any one time, and for **crossfades** to be performed between scenes by means of **master faders**. The scene currently live is often referred to as the **active scene** and the one or more set up to follow it as the **preset scene**.

Transitions between **scenes** may take the form of a **crossfade**, as mentioned above, where one scene completely replaces the previous one, or may be a separate **fade-up** or **fade-down**, where scenes are added to, or taken away from, the current scene. The precise duration from the start to the finish of a fade is called the **fade time**.

In the case of a manual lighting control system, the description of each scene has to be **plotted** on paper, taking careful note of all fader settings, fade times and types. This was traditionally a lengthy process, as was the resetting of each preset scene during performances. A memory control system enables the **plotting** to be achieved instantly at the press of a **record** button, and for the recorded states to be recalled one-by-one, in any required order, or as a **sequence**. Each lighting change is often referred to as a **cue**.

## INTRODUCTION

Sometimes more complex lighting changes are required, which may involve rapid or repetitive actions, such as **flash**, **chase** or **flicker**, and these are usually called **effects**. The control system may be able to produce these effects automatically, and this is the case with MX.

The memory system allows the lighting designer or technician total creativity and less opportunity for operational errors. An understanding of the capability of his control system will enable the user to take best advantage of that versatility, and will enable even the most complex productions to be handled simply and efficiently.

## INTRODUCTION TO MX

Your MX console has been designed to be simple to use, but it incorporates many sophisticated features which may be unfamiliar to many users. It will therefore be helpful to introduce some of these concepts before describing MX in detail.

A diagram of the Control Module on the right-hand side of the console is provided at the beginning of this section, and may be folded out for reference.

Users who are only familiar with older manual control desks will be used to the concept of one fader per channel, with perhaps a number of duplicate fader banks providing presets. MX has two distinct modes, **CHANNEL** and **SCENE**, and in **Channel** mode the console can be used as a simple two-scene preset desk. **Scene** mode dramatically extends the capability of the desk, by enabling the lower row of faders (B) to each act as a **Scene Master** controlling a memorised lighting state (Scene) comprising all of the channels on the desk. These Scene Masters can be combined together to form new lighting states, which can themselves be recorded for future use.

---

**It is important to understand this dual function of the B Faders, which in Channel Mode control Channels, and in Scene Mode control entire Scenes as Scene Masters.**

Scene Mode provides the operator with enormous creative flexibility, but requires the use of the lower bank of faders as Scene Masters, and they are not therefore available for normal 2-preset operation. MX avoids this potential limitation by providing a **HOLD** mode, which enables a current lighting state to be **HELD** in memory, and 2-scene preset operation carried out using the 'A' Preset faders only. In this mode the lower faders remain available as Scene Masters.

Previously recorded Scenes are stored and recalled in **SCENE PAGES**, and the number of Scenes in a page equals the number of channels on the desk. When a

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page is recalled, the Scenes in the page are assigned in numerical order to the Scene Master Faders (the lower bank of faders), with one Scene instantly available on each of the Scene Masters. Each page selected recalls a different set of Scenes. Scenes may be used individually or mixed in any combination to create new scenes, or overlapped for particular lighting changes.

A similar arrangement of Pages is used to recall Effects, and in that case a block of six Effects makes up an EFFECT PAGE, and these are assigned in numerical order to the six Effect Select buttons.

A full explanation of these facilities can be found in the following Sections.

## GENERAL DESCRIPTION AND FACILITIES

MX is a portable lighting controller, and is essentially a two scene preset board, with comprehensive memory and effects features. Scene-masters are provided allowing memories to be mixed to form complex scenes very simply. It is produced in three sizes, comprising 12, 24 or 48 channels, and each provides three methods of control:

- a) Manual operation using channel faders
- b) Memory control, providing playback of recorded scenes under the control of scene-master faders.
- c) Playback of recorded lighting effects.

These methods of control can be combined freely to produce complex effects, and the resulting output will be the highest level produced for each channel from the three control sections. This way of combining multiple control signals for the channels is called a 'highest-takes-precedence' basis. The FLASH function is the one exception to this rule, which can be arranged to flash channels or scenes to a lower level or OFF for particular effects.

MX provides 4 'pages' of scenes, each comprising the same number of scenes as there are channels on the desk, i.e. 12, 24 or 48. Four separate 'pages' each comprising 6 recorded effects are provided, and these effects may be triggered from an external audio or MIDI source. (MIDI stands for Musical Instrument Digital Interface, and is an international standard for transmitting data between electronic instruments. It is explained Section 9). Scenes are retained indefinitely while MX is connected to the mains, or if power is removed, for at least a month by an internal re-chargeable battery. The battery will be fully re-charged after MX has been operated for twelve hours. Additionally, all recorded information may be copied to removable cards for library storage of productions, or security back-ups.

## INTRODUCTION

MX is a completely integrated system, and provides all controls and associated electronics in a compact and easily portable unit. A separate power supply feeds only low voltage dc to the desk, ensuring that the latter is intrinsically safe to the operator. Connection to the dimmers is via a multiplexed data link, avoiding the cumbersome one-wire-per-dimmer cabling of older systems.

MX is unusually versatile in that it incorporates a large number of interfaces to dimmers and other external devices. The system supports SMX and DMX512 digital interfaces, and D54 and AMX192 analogue interfaces. A standard RS232 interface provides a connection for a printer, and a bi-directional MIDI port enables the desk to link to sequencers, other electronic music systems and other MXs.

## GLOSSARY OF TERMS

### ***Active Scene***

The lighting state currently seen.

### ***Blind Recording***

Recording a scene on faders which do not produce any effect on the active scene while their master fader is at zero. This allows new scenes to be created, or previously recorded scenes to be modified while another scene is active.

### ***Channel***

The smallest system element of the console, which can be assigned to control a single output, or number of outputs to the dimmers, depending on internal patching.

### ***Crosstade***

The transition from one lighting state (scene) to another, where the second scene completely replaces the first.

### ***Dimmer***

The power-controlling element of a lighting system, which accepts the low-voltage signals from the control desk, and converts these accurately and repeatably into variable power output for mains voltage lamps.

### ***Dimmer Protocols***

The communication languages used by the control system to transmit levels to the dimmers, e.g. SMX, DMX512, AMX192, D54.

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***Fade***

The transition of a dimmer or group of dimmers from one brightness level to another.

***Fade Law***

The definition of the relationship of linear fader movement to lamp brightness.

***Fade Time***

The duration of a fade from start to finish

***FX***

An abbreviation of Effects

***FX Page***

A block of memories containing recorded Effects. On MX there are four pages, each comprising six Effects, one for each of the Effects Select buttons.

***Highest-Takes-Precedence***

A function of the control system whereby the **highest** of two or more levels for the same channel is the level which is output.

***Latest-Takes-Precedence***

A function of the control system whereby the **latest** control operation on a channel determines the level which is output.

***Manual Fade***

A fade controlled entirely by mechanical faders under direct operator control.

***Memory***

A numbered electronic storage location for the recording of a single scene or effect.

***Plotting***

Physical or electronic recording of channel levels in a scene.

## INTRODUCTION

### ***Preset Scene***

A scene set up to follow the Active Scene.

### ***Sequence***

An operating mode whereby memories are automatically recalled in numerical sequence each time a fade is completed.

### ***Scene Page***

A block of memories containing Scenes. On MX four Scene Pages are provided each comprising one memory per channel fader (i.e. 12, 24 or 48).

MX

## 2

# Installation

### LOCATION

The compactness and low profile of your MX console allow table-top positioning without any special mounting requirements, and make MX equally suitable for touring or fixed installation. However, you should be careful to choose a location which gives the operator a clear view of the performance area, and where you can provide adequate and controllable low-level lighting for the control desk and cue sheets, scripts etc.

A dust-free environment and 'office' level cleanliness are vital for long and trouble-free use of your MX console, and you should always remember to keep it covered when not in use. Ambient temperature should be maintained within the range 0-35°C during operation, and -20 to +55°C at other times.

### DIMENSIONS

#### 12 Way

Length: 651 mm      Depth: 285 mm      Height: 65 mm

#### 24 Way

Length: 912 mm      Depth: 285 mm      Height: 65 mm

#### 48 Way

Length: 822 mm      Depth: 545 mm      Height: 80 mm (137 mm with leg extended)

### UNPACKING

Strand Lighting Ltd. take every precaution to ensure that your MX control reaches you in perfect condition. However, accidents can occur in transit, so we recommend that a thorough visual inspection is made against the check list below as the unit is removed from its packaging. Should any damage be evident, or parts missing, please inform Strand Lighting Ltd. or your supplier at once.

Unpack the unit carefully, retaining all original packing materials in case the unit has to be returned for any reason, or for storage or transport. If the console is to be part of a touring system, we recommend that a suitable transit case be manufactured.

## INSTALLATION

The carton should contain:

- 1 MX console
- 1 Power Supply Unit
- 1 Operator's Handbook
- 1 5m D54 Multiplex Cable (certain territories only)

### CONNECTING UP

Check that the power supply provided is correct for your local mains voltage, and that the supply is in the range 198–264V a.c. or 96–132V a.c. to suit the version supplied.

Connect the wire from the power supply to the power socket on the MX console, and place the power supply unit in a position which allows free air flow for ventilation, and which does not impose any strain on the power supply cable or connectors. Do not plug the power supply into the mains at this stage.

MX provides interfaces for four different dimmer protocols, namely SMX, DMX512, AMX192 and D54. You must check that your dimmers or demultiplexing unit conform to one of these standards. Two female and one male connector types are fitted to the console to allow correct connection and these are as follows:

SMX, DMX512	5-pin XLR	Female
AMX192	4-pin XLR	Male
D54	3-pin XLR	Female

See the Appendix for full connection details and cable/connector specifications.

Plug the appropriate multiplex cable from the rear of the console to your dimmers or demultiplex unit.

---

**You may only connect one multiplex cable at any one time. The console only transmits the dimmer protocol selected in the menu.**

Note: The DMX512 protocol conforms to the standard USITT DMX 512/1990. The SMX implementation uses version 2 in unidirectional broadcast mode (Class 0) with application data type 9.

If an audio source is to be used, connect this via the 5-pin DIN socket on the rear panel. MX can accept a wide range of sources, and you should ensure that the signal is compatible with a 47k $\Omega$  input impedance, and is in the range 10mV–10V r.m.s.

MX



## SWITCHING ON

Check all connections, and plug the power supply into the mains and switch on at the socket, and at the switch on the top left-hand side of the console when viewed from the rear. The console will carry out a sequence of diagnostic tests, during which all the console panel LEDs will flash for about one second, confirming that all the LEDs are functional.

---

MX is capable of distinguishing between power loss caused by turning off at the rear panel, and power loss caused by a temporary power failure or removal of mains power at the supply. If the console was turned off at the rear panel switch, this is known as a 'Cold Start', and will initiate the series of diagnostic tests followed by the console's default state. Loss of power by any other means will be followed by a 'Warm Start', and the console will be restored almost instantly to the same state that it was in before the power failed, including any running effects or timed fades.

The diagnostic tests performed after a Cold Start do not affect the stored data in any way, and are effectively invisible to the user, unless an error is detected. In the unlikely event of a fault, an error message will be displayed on the LCD screen. Refer to Section 8 - Maintenance and also Appendix 2 for an explanation of these messages.

Connect luminaires to each of your dimmers and follow the steps below to check that your MX console is operating correctly, referring to the front panel layout diagram if necessary.

1. Check that **BLACKOUT** is not set (red LED off).
2. Check that the **GRAND MASTER FADER** is at full (up).
3. Check that **CHANNEL/SCENE** is selected to **CHANNEL** (green LED illuminated). If **SCENE** is selected (yellow LED illuminated) press the button below the LEDs to toggle to **CHANNEL** mode.
4. Check that **HOLD** is off (LED off). This will have happened automatically if **CHANNEL/SCENE** is switched to **CHANNEL** as a result of Step 3, otherwise move both **CROSSFADER A** and **CROSSFADER B** to the top and press **HOLD** to turn off this mode.
5. Set **TIME CONTROLS** to manual (top).
6. Move **CROSSFADER A** to maximum (top), and **CROSSFADER B** to minimum (top). Set **CROSSFADER C** to minimum (bottom), and **CROSSFADER D** also to minimum (top).

## INSTALLATION

7. Check that the **DIMMER PATCH** is set to **DEFAULT**. This is accessed via the menu system, and you should see Section 4 – The Menu System for guidance on how to check this setting.
8. Set the multiplex standard to that required using the **SETUP ⇒ I/O ⇒ DIMMER** key sequence. See Section 4 for details. Note that it is possible to adjust the nominal output voltage of either D54 or AMX protocols within this menu. The default setting of 100% gives 5.0V, the normal specification voltage, but it is possible to adjust this from 80% (4.0V) to 120% (6.0V) to allow for very long cable runs or maladjusted dimmers / multiplexers. All settings are retained when the system is switched off.
9. Move faders on **PRESET A** and check that lights are faded up on the corresponding dimmer outputs.

If you do not get a correct response from the dimmers after following these steps, switch off the MX console at the rear panel switch, re-check your connections and settings and repeat the sequence.

A chassis earth, marked with the international earth symbol, is provided on the rear panel of the MX console. In circumstances where static electricity is often encountered (such as where there is a nylon carpet or exceptionally low relative humidity), it will be advantageous to connect this point to a secure mains earth. This will prevent any electrostatic discharge from damaging the console.

If the response is still unsatisfactory, refer to the maintenance section.

MX

## 3

# Front Panel Controls

The following section describes each control on the front panel of MX, and this will help you familiarise yourself with the position and function of each switch, fader and LED before moving on to the explanation of Basic Operation in Section 5. You will find it helpful to refer to the front panel layout diagram while you read the following pages.

MX is divided into two sections. On the right-hand side of the console is the Control Module, which provides all master controls, crossfade controls, effects controls and the LCD display. To the left of the Control Module are a number of identical Fader Modules, each controlling twelve channels.

## CONTROL MODULE

### On/Off Switch

The On/Off switch on the rear panel of MX switches the dc power from the power supply to the whole console.

---

#### WARNING!

**The On/Off switch does not isolate the power supply unit from the mains. Turn off power at the mains socket when the console is not in use.**

The console always undergoes a cold start after being turned on by the On/Off switch, and will run through diagnostic tests before loading the default settings for each function.

### Blackout Button and associated LED

The Blackout button operates as a master blackout switch for the whole console, and overrides all outputs. Pressing the button toggles between Blackout (LED lit) and normal output.

---

#### NOTE

**When Blackout is selected, any fades in progress continue in the background until they are finished, although there is no visible output.**

### **Grand Master Fader**

This fader operates as a master control over the output levels of every output channel on MX.

### **Record Button and associated LED**

This button is safeguarded by the RECORD LOCK accessed from the setup menu on the LCD display (see Display Menus – Section 4).

When RECORD LOCK is ON, this button has no effect. When RECORD LOCK is OFF, pressing this button switches MX into RECORD mode, and the LED illuminates. Pressing the button a second time de-selects RECORD mode.

Any active effects are temporarily de-selected but will remain running when you enter RECORD mode, and are restored as soon as RECORD is turned OFF.

---

For additional security it is good practice to make back-up copies of your productions and special patches etc. using the memory card facility included on MX.

### **Channel/Scene Mode Button and associated LEDs**

This button toggles between Channel and Scene modes, as shown by the two LEDs, indicating GREEN for Channel and YELLOW for Scene.

### **Hold Button and associated LED (yellow)**

HOLD mode allows MX to temporarily store the scene on the A Faders, and release the A and B Crossfaders for two-scene preset operation. Whilst the B Faders are in use, the active scene and the use of B Faders as scene-masters remain available throughout HOLD mode, allowing the most complex lighting changes to be performed.

When MX is in SCENE mode, this button toggles HOLD mode on and off. The LED illuminates when Hold is active.

---

You may only enter and exit HOLD mode when the A Crossfader is at full and the B Crossfader is at zero, i.e. both in the fully UP position.

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The A and B Crossfaders, whilst in HOLD mode, successively crossfade from the Held scene to the scene on the A Faders. At the completion of each crossfade (up or down) the scene on the A Faders is loaded automatically into the Held scene and the A Faders disabled, allowing a new scene to be preset before crossfading to it. For a more detailed description, see the 'Hold Mode' description in the Basic Operations section.

If Hold is ON, and you switch to Channel mode, then Hold is turned off automatically, regardless of A/B Crossfader position.

### **A Active LED (red)**

When Hold mode is ON, this LED illuminates whenever the Preset A channel faders are contributing to the output as a result of A/B Crossfades. When the LED is off you can safely change the Preset A faders without affecting the stage output.

### **Flash Mode Select Button and associated LEDs**

This button has three LEDs above it, the lower two of which indicate either Normal or Solo Flash mode, while the top red LED lights to show that Flash operation is OFF. If Flash mode has been enabled from the Setup menu the button toggles between Normal Flash and Solo Flash modes, and one of the lower two LEDs will be lit to show the current state.

In Normal Flash mode, pressing one of the Flash buttons below the Preset B faders will take the output of that Channel (or Scene Master in Flash Scene mode) to the stage output, at a level set by the Flash Level fader. All other Channels (or Scene Masters) are unaffected. The Flash Level fader may be above or below the level of the selected channel, and Flash Mode may therefore be used to 'flash out' or 'flash down' a particular Channel or Scene. This is the one exception to the 'highest-takes-precedence' rule on MX.

In Solo Flash mode, pressing one of the Flash buttons below the Preset B faders will replace the current stage output with the output of that Channel (or Scene Master in Flash Scene mode), at a level set by the position of the Flash Level fader. Releasing the Flash button returns the stage output to the previous settings. This may be above or below the previous active level.

Flash operation may be inhibited in the setup menu, and is disabled in RECORD mode.

### **Flash Channel/Scene Select Button and associated LEDs**

This button works in conjunction with the Channel/Scene mode selection.

## FRONT PANEL CONTROLS

In Channel mode the green Channel LED will be lit, and this button has no effect.

In Scene Mode the button toggles MX between Flash Channel (green LED lit) and Flash Scene (yellow LED lit).

### Flash Level Master Fader

This fader controls the level to which Channels or Scene Masters will be flashed when a Flash button is pressed and Flash mode is active. The position of this fader will override the current output level for the selected Channel or Scene Master, allowing you to flash Channels or Scene Masters to Full or Out, depending on whether the Flash Level Fader is at full or zero respectively. Settings between top and bottom positions allow Channels or Scene Masters to be flashed to any desired level.

### Crossfader A

This fader controls either the combined output of all the Preset A faders in Channel mode or alternately the A Faders and the Held Scene, if MX is in Hold mode. See Section 5 – Basic Operations for a full description of Hold Mode. The fade time is set by the A/C Time Control Fader positioned directly above it. Crossfader A is active in both Channel and Scene modes.

### Crossfader B

This fader controls either the combined output of all the Preset B faders when in Channel mode, or alternately the A Faders and the Held Scene when MX is in Scene mode with Hold active. See Section 5 – Basic Operations for a full description of Hold Mode.

The fade time is set by the B/D Time Control Fader positioned directly above it. Crossfader B is active in both Channel and Scene modes.

### Crossfaders C and D

These faders allow crossfades to be performed between two Scenes selected on the LCD display. Smooth, dipless crossfades are produced by moving the two faders up and down together, and Scenes are automatically incremented when the faders reach the end of their travel at top and bottom, providing a Scene Sequence capability. Any cleared scenes are ignored in the sequence. The fade times can be set by either the A/C and B/D Fade Time Controls or by the use of the recorded fade times.

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## A/C and B/D Time Control Faders

These faders control the response of the Crossfaders, as described above. At the top end of the scale or 'Manual' any movement of a Crossfader will produce an instantaneous response. At the lower end of the scale or 'Infinity(∞)' any Crossfader movement is effectively delayed indefinitely, enabling fades to be frozen if required. The position of the Time Control Faders may be changed while a fade is in progress, and the duration of the fade will be altered instantaneously.

The Time Control Faders may be switched between the A/B Crossfaders and the C/D Crossfaders using the menu system (see Section 4).

They may also be switched to 'OVERRIDE'. In this mode they may be used to speed up a sequenced crossfade with recorded time. The fade progresses at a rate that is the fastest of the recorded time and that set on the A/C and B/D time control faders.

The time control faders are also used to record fade times. Whenever an empty scene is recorded, the fade in time is taken from the A/C fader, the fade out time from the B/D fader.

## LED Fade Progress Displays

A column of LEDs is located between each pair of Crossfaders, and these show how a timed fade is progressing by following the movement of the Crossfader, delayed by a time set on the corresponding Time Control Fader. One LED lights for each Crossfader, and these LEDs will move in the direction corresponding to their Crossfader movement. There will therefore be occasions when the movement of the LEDs will overlap, and only a single LED will be lit during the transition.

The LED Fade Progress Displays always show the current output level. If the Crossfade direction is reversed or the Fade time changed during a fade, the movement of the illuminated LEDs will reflect the updated progress of the fade.

## Effect Select Buttons and associated LEDs

These six buttons and associated LEDs make up an Effect 'page' on MX. Pressing any button selects one of the six Effects, and cancels selection of any previous effect. The corresponding green LED will light to indicate the selected effect. Pressing the button associated with an effect which is already selected will de-select that effect.

When an effect is selected it immediately takes the current FX Fade Time, Step Time and Audio/MIDI level, while Effect Type and Direction need to be specified as described below.

## FRONT PANEL CONTROLS

The Effect Select buttons are used to control and record an effect sequence.

When a number of effects are running, these buttons enable a particular effect to be selected, and allow the type, direction, fade time, step time and Audio/MIDI trigger level to be altered.

### Effect Go/Stop Button and Effect Running LEDs

A selected Effect may be started or stopped by pressing the Go/Stop button. The corresponding yellow LED above the Effect Select Buttons will light to show that the effect is running and pressing the button will stop the effect. Any, or all of the six Effects may be running at any time, and those that are running will be shown by the corresponding yellow LEDs. Go/Stop status can only be altered on an individual basis.

Note that an effect will only stop or start instantly in response to the Go/Stop button if the FX Fade Time fader is set to zero, otherwise it will fade in or fade out in the time set on that fader.

### Effect Type Buttons and associated LEDs

These six buttons with corresponding LEDs select one of six types of lighting effect, and may be changed at any time. If the effect is running the change will be instantaneous on the output.

Effects are made up of a number of 'steps', and the effect will sequence through these steps in a number of different patterns. Each step can be a simple selection of a single channel, any number of channels, or can be a complete Scene, allowing very dramatic effects to be produced.

Note that it is normally only the selection of channels or scenes which is used to create the effect step. The level at which those channels or scenes appear at the output is defined by the Effect Type as described below.

The Effect Step types, which can be assigned to any selected effect are as follows:

- |       |  |
|-------|--|
| CHASE | The selected Channel, group of Channels or Scene in the step flash in sequence. Only one step will be active at any time.  |
| BUILD | Similar to CHASE, except that each Channel, group of Channels or Scene remains on as the sequence advances. After the final step in the sequence all Channels or Scenes are de-selected and the BUILD repeats. |

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CYCLE	Similar to CHASE, except that each step is performed as a dipless crossfade.
FLICKER	The Channels or Scenes in an effect sequence are selected at random and flashed to random levels.
RANDOM	Similar to FLICKER, except that the selected Channels or Scenes are flashed to full intensity.
AUDIO/MIDI	Similar to CHASE, except that each step is initiated by the bass level of an audio source connected to the rear panel socket, or by the MIDI IN timing signal.

### Effect Direction Buttons and associated LEDs

These buttons and corresponding LEDs select one of three direction modes for each effect. Pressing a Direction Button selects that mode and cancels any other.

The Direction of a selected effect may be changed at any time, and if the effect is running that change will be instantaneous on the output. Direction has no effect on FLICKER or RANDOM effect types.

The three Effect Direction modes are as follows:

FORWARD	The selected Channels or Scenes are run in step sequence.
REVERSE	The selected Channels or Scenes are run in reverse step sequence.
BOUNCE	The selected Channels or Scenes are run first in forward step sequence, then reverse step sequence, and then this process is repeated.

### Effect Step Button

The Step button either advances a selected running effect by one step, or if in RECORD mode it advances a recorded effect sequence to the next un-recorded step. In RECORD mode, if the last step has been reached, no further effects information can be entered, and pressing the step button again will have no effect.

Recorded Effect Steps can be modified, deleted, or new steps inserted from the menu system. See Sections 4 and 5 for an explanation of this facility.

### Audio/Midi Level Fader and LED

This fader controls the bass trigger threshold for an audio source connected to the rear panel DIN socket, or adjusts the timing period for the MIDI timing signal. The effect of the Level Fader is monitored by the LED, which flashes on each resultant beat.

This fader also controls the level of the Channel or Scene controlled by the audio input when the Sound-to-Light facility is turned ON in the menu system.

This fader only has an effect when an Audio/Midi Effect type is selected or the Sound-to-Light facility is active.

### Effect Fade Time Control

This fader is the equivalent of the a Crossfade Time fader, and controls the fade-in and fade-out time of a selected effect when it is started or stopped. When set to MANUAL the GO or STOP occurs instantaneously, or the fade time can be varied up to 120 seconds.

### Effect Step Time Fader

This fader controls the speed at which a running effect moves from one step to another, and this is variable between 20 steps per second and infinity, at which setting the effect is frozen. The effect may be advanced one step at a time by the STEP button, regardless of the position of this fader.

### Effects Master Fader

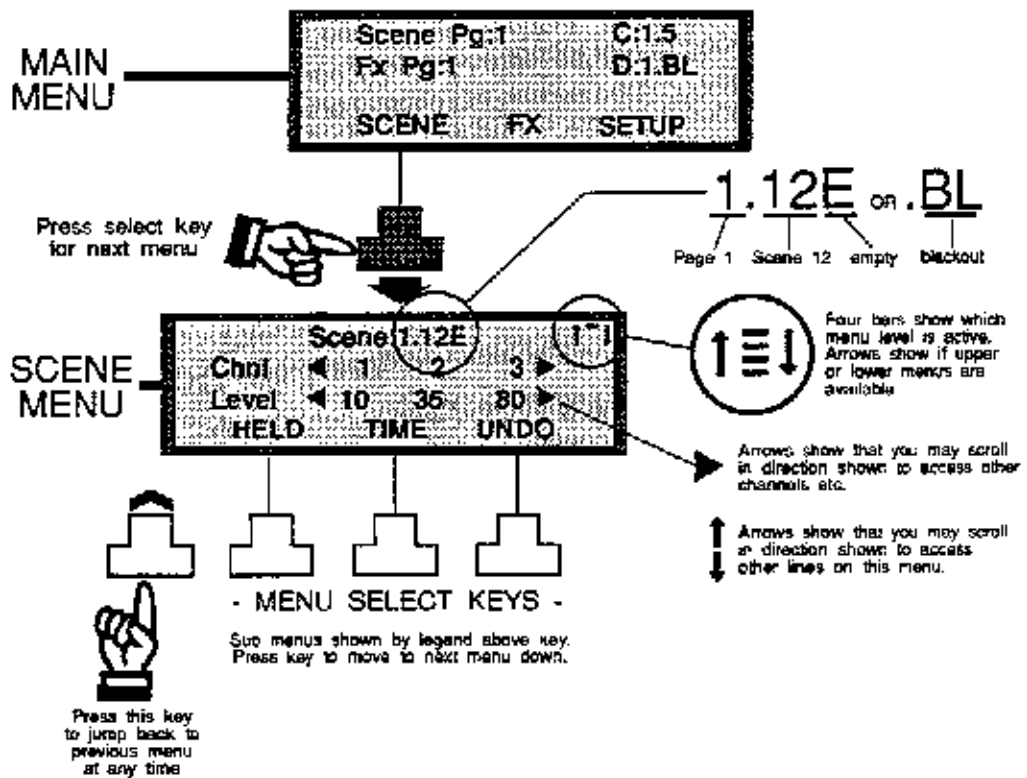
This acts as a master control over all currently running effects. The output of the effects section combines with the output from manual or memory control on a highest-takes-precedence basis.

### The LCD Display

MX provides many powerful features to the operator via an LCD display, which is based around a branching structure of simple menus, which only require minimal key-presses in response to prompt words above three function keys.

MX does not need a full computer keyboard to enter commands. Instead the associated array of ten buttons provide all the necessary operator control. For faster entry of information a numeric keypad facility is provided using a dual function on the Effects buttons. This is described in the following Section.

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The MX Menu System LCD Display

Of the four lines of text, the top line is the menu title, the middle two lines provide data entry or information fields, and the bottom line labels any appropriate options or sub-menus, which may be actioned by pressing the function key below each label. Where a function key is not required, the display space above it is left blank. The Menu Exit button on the left-hand side below the display exits the current menu and moves to the next menu up the tree until the top menu is reached, at which point it has no effect.

At the top right-hand corner of the LCD display an array of two arrows and four horizontal bars give a visual reminder to the user of the current menu level and availability of upper or lower menus.

The four cursor buttons allow you to move around the data entry fields and operate menu scrolling. Where there are additional lines of text or longer lines available, the display shows direction arrows to indicate that scrolling is available.

## FRONT PANEL CONTROLS

The +/- buttons control data entry at the current cursor position if appropriate, otherwise they are inactive.

A diagram of the complete menu structure and more detailed explanation of the menu system is given in the next Section.

### FADER MODULES

The fader modules comprise, for each channel, a Preset A Channel Fader, a Preset B Channel Fader, a Flash Button and an LED indicator.

#### Preset A Channel Faders

These form the upper row of faders, and each provide a dedicated manual control fader for one lighting channel. They are always live, except when Scene mode is selected and the HOLD facility is active. They are a means by which Scenes can be created.

#### Preset B Channel Faders

These form the lower row of faders, and each provide an additional dedicated manual control fader for one lighting channel when Channel mode is selected. In this mode they can always produce an output if the B Master fader is above zero.

In Scene mode one of four 'pages' of Scenes may be assigned to the Preset B Faders, and they become Scene Masters. Each fader then controls a single Scene, and any number of Scenes (up to the maximum number of faders) may be mixed to form complex lighting states.

#### Flash Buttons

When Flash mode is selected, and RECORD is off, the Flash buttons can be used to flash either a Channel or a Scene to the level set on the Flash Level fader, or can be disabled via the menu system.

In Channel mode they flash only their corresponding channels, while in Scene mode they provide a dedicated button for each Scene Master if Flash Scene is selected, or Channel if Flash Channel is selected.

The Flash buttons have a particularly important function in Record mode. When Record is activated and NO effect is selected, MX is placed in Record Scene mode, and pressing a Flash button will load a Scene onto the corresponding Scene Master. This scene may either be the Preset A Fader output, or the combined

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output from the entire desk, and this option can be set via the menu system at the time of recording. The Menu system provides a warning, and also an LED flashes, if you try to record a Scene in a memory which already contains a valid Scene, allowing the choice of overwriting that one or choosing an alternative Scene which is clear.

When Record is activated and an effect is selected, MX is in Record Effect mode, and the Flash buttons have different functions according to the Channel/Scene selection. In Channel mode, pressing a Flash button will add or subtract the corresponding channel to the group of channels used for the current effect step. In Scene mode, pressing a Flash button will cause the corresponding Scene to be used for the current effect step, and will cancel any other selected Scene.

### LED Indicators

Each channel has a corresponding LED indicator above the Flash button, and the function of these LEDs is determined by the current operating mode.

#### When RECORD is OFF:

The LEDs always show the output from the Channels.

#### When RECORD is ON:

The function of the LEDs changes to provide information to help recording, rather than to provide information about the channel outputs.

In Record Scene mode (no effect selected), the LEDs are lit on those Scene Masters which contain a recorded scene, and therefore identify those Scene Masters which are free for other Scenes.

In Record Effect mode (any effect selected), and Channel mode selected the LEDs show which channels have been selected as part of the current effect step. If Scene mode is selected, only one LED may be lit to show if a Scene Master is active for the current effect step and Scene Page.

Channel or Scene mode for a particular step can be displayed and modified via the Menu system. See the following Section for guidance.

# 4

## The Menu System

### INTRODUCTION

MX incorporates some very advanced facilities, many of which do not need immediate access during performance. These control functions have been included in a menu system, using the four line LCD display on the Control Module.

The Menu System provides the following facilities:

- Fast access control functions in the top menu
- Scene Display/Editor
- Held Scene Display/Editor
- Recorded Fade Time Display
- Effects Display/Editor
- Setup for RS232 Communications
- Setup for MIDI Communications
- Selection and Setup of Dimmer protocol
- Diagnostic menu
- Error Log
- Dimmer Patch Display/Editor
- Setup for System Configuration
- Memory Card control
- Printer control
- Clear menu
- Record menus

The menus are arranged in five levels, with movement between levels controlled by single key-presses in response to displayed legends above three function keys. A fourth key returns the display to the menu in the next level upwards.

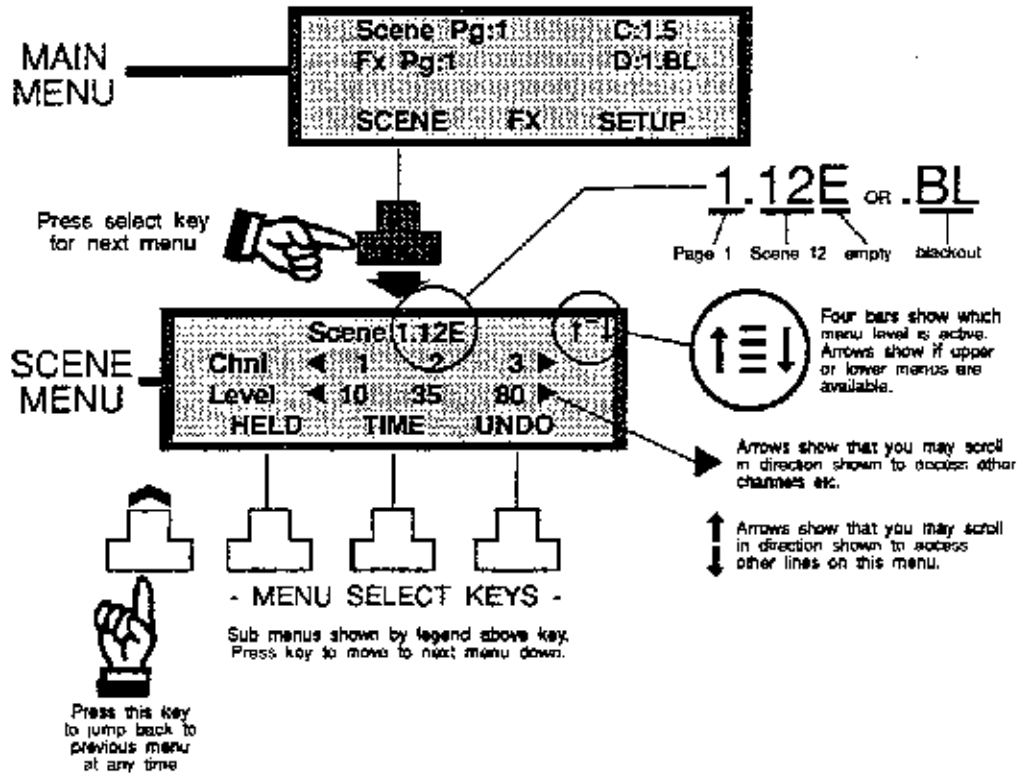
The general concepts of the Menu System are described on the following pages, and you may refer to the detailed menu level diagrams to find the path to particular functions.

Specific use of the menu system for the more frequently used functions is given in Section 5 – Basic Operations.

### BASIC OPERATION

MX does not need a full computer keyboard to enter commands. Instead an array of ten buttons provide all the necessary operator control, some of which are shown in the figure below.

# THE MENU SYSTEM



The MX Menu System LCD Display

Of the four lines of text, the top line is the menu title, the middle two lines provide data entry or information fields, and the bottom line labels any appropriate options or sub-menus, which may be actioned by pressing the function key below each label. Where a function key is not required, the display space above it is left blank and the key inactive. The Menu Exit button on the left-hand side below the display exits the current menu and moves to the next menu up the tree until the top menu is reached, at which point it has no effect.

At the top right-hand corner of the LCD display an array of two arrows and four horizontal bars give a visual reminder to the user of the current menu level and availability of upper or lower menus.

The four cursor buttons allow you to move around the data entry fields and operate menu scrolling. Where there are additional lines of text or longer lines available, the display shows direction arrows to indicate that scrolling is available.

The +/- buttons control data entry at the current cursor position if appropriate, otherwise they are inactive.

In general, values 'wrap round' from their minimum to their maximum and vice versa. The main exception is channel levels which stop at their limits. Also note that any changes occur immediately - there is no ENTER key.

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An UNDO facility is provided for menus that offer multiple editing facilities, such as Scene. Any changes made to a menu since the last time it was entered can be undone. Note that the effects of UNDO are immediate and cannot be reversed and also that the UNDO function has no effect once the changes have been made permanent by leaving the menu.

For faster data entry, a numeric keypad is provided using some of the buttons on the Effects section to the right of the LCD Display. These are enabled by pressing NUMLOCK which is located just above those buttons. The LED will light to show that the numeric keypad is active, and the Effects functions are disabled. Values may be entered on the display using this keypad. Leading zeros are not needed, and the entry cursor will move to the left if more digits can be entered.

Releasing NUMLOCK, moving off the edited field or using the +/- keys effectively enters the edited number.

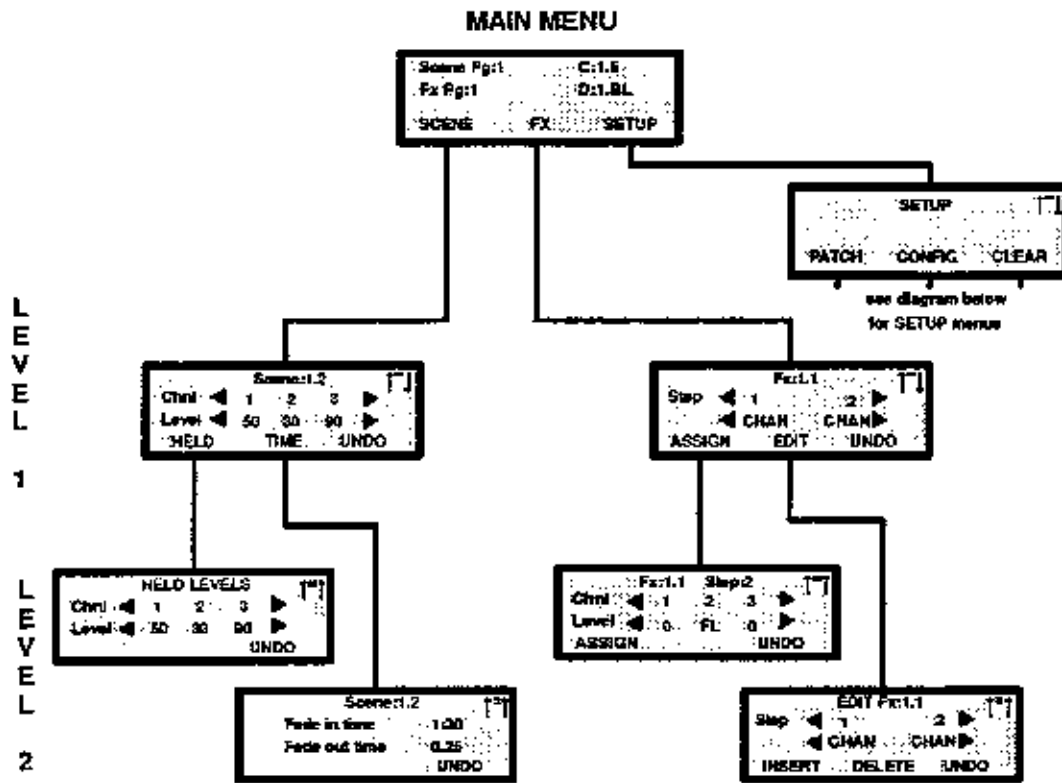
The readability of the display may be adjusted to suit personal preference from the CONFIG SYSTEM menu. This is accessed by the button sequence SETUP⇒CONFIG⇒SYSTEM from the top menu. Within this menu, both the brightness (LCD BACKLIGHT) and the contrast (LCD CONTRAST) may be smoothly altered from 0% to 100%. A contrast value towards the bottom end of the scale improves the readability from in front of the board whereas a value closer to 100% improves readability from directly above the board. The default setting for both values is 50%. An option to make the cursor blink is also available from this menu. This may be considered useful whilst editing, to improve readability.

### SCENE AND FX MENUS

The Top (Scene Page) Menu displays the current Scene Page, Effects Page and Scenes selected to the C and D Crossfaders. Each entry can be selected using the cursor buttons and changed as required using the +/- buttons or numeric keypad. All other menus are accessed from this main menu by pressing the function button below the appropriate displayed legend. Note that a 'safe' cursor position is provided in the centre of line 3, preventing accidental changes to the top level menu. The Scene and FX menu levels are shown below:



# THE MENU SYSTEM

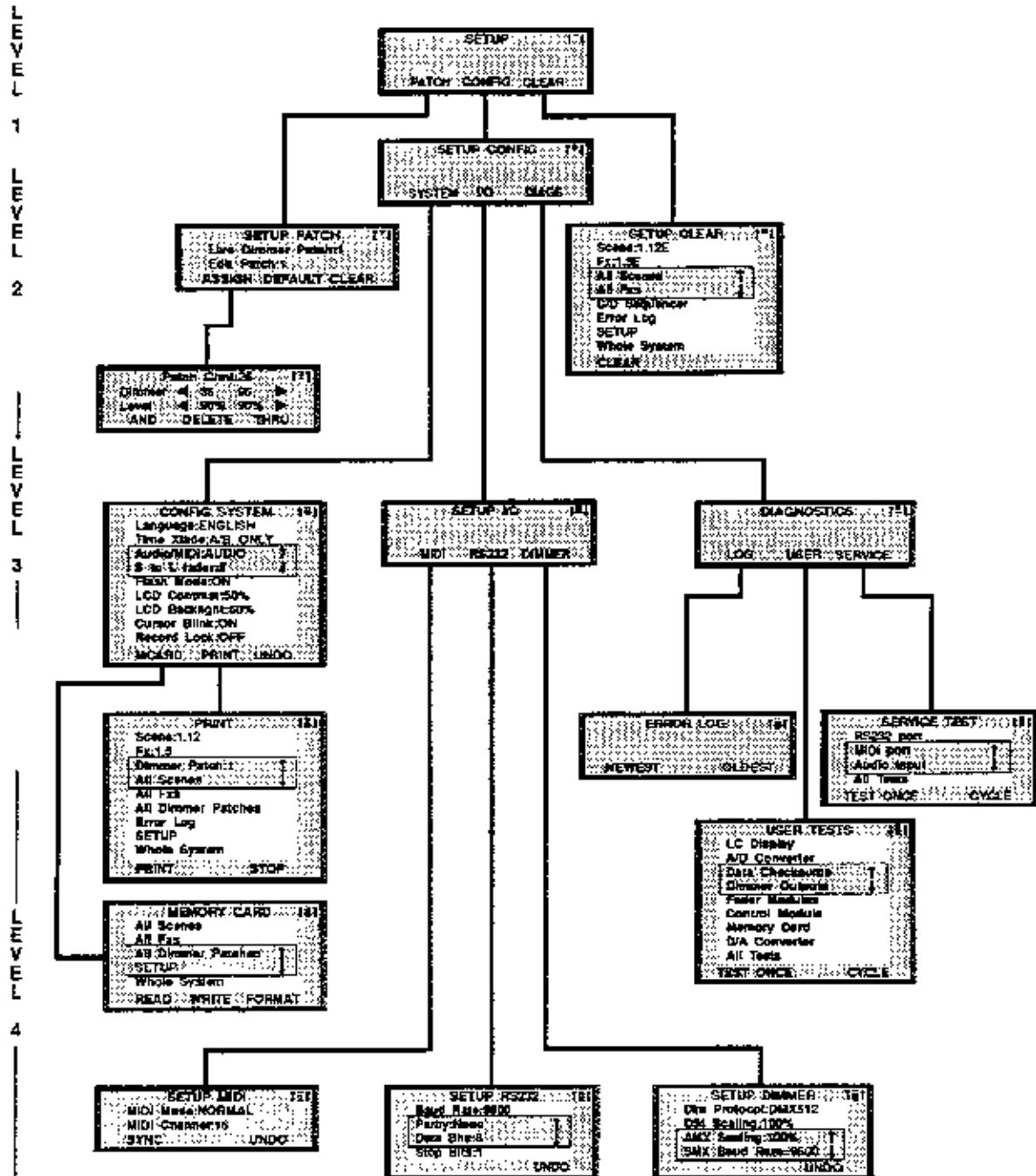


The Menu System - Scene & Fx Menus

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## THE SETUP MENUS

The Setup Menu levels are shown below:



The Menu System - Setup Menus

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## THE RECORD MENUS

The Record Menu is automatically selected when the RECORD button is pressed, and provides selection of A FADERS or OUTPUT recording modes.

In A FADERS mode, a lighting state set up on the Preset A Channel Faders may be entered into a Scene memory for subsequent playback, unaffected by the position of the A Crossfader or Grand Master. This allows 'blind' recording of scenes while other Scene Masters or Effects are active.

In OUTPUT mode, the total desk output is entered into a Scene memory for subsequent playback, and this output state can be composed of any Presets, active Scenes and running Effects. This allows the operator to use existing Scenes as building blocks for other lighting states.

The Record Effect Menu is selected as soon as an Effect is selected when in RECORD mode, and this provides access to selecting Scene Pages when a Scene is used as an Effect Step, one of four FX Pages, and scrolling between steps.

The Record Menus are shown below:



The Menu System - Record Menus

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## Basic Operations

### LIGHTING A SCENE

MX is a highly versatile lighting control system, capable of performing highly complex lighting effects, and offers considerable scope for the experienced operator. The careful design of the control surface makes the desk equally suitable for very straightforward operation by users with little previous experience of lighting control systems, and this Section takes you stage by stage through very simple operation, and on to the more complex features.

For the benefit of the inexperienced user, it will be helpful to explain one or two basic concepts which should be understood.

### OUTPUT

The final output from MX to the dimmers may be a combination of channel levels created by a number of different sections of the console simultaneously, allowing very versatile operation. It may not be immediately obvious which controls on the desk are making the active contribution to the output, and it is therefore important that you become familiar with all of the front panel controls.

### BLACKOUT

The Blackout button is always active, and when pressed will inhibit all output from MX, producing a Blackout on stage. The output is restored when the Blackout button is pressed again.

The same effect is achieved using the Grand Master Fader, but this allows a manual fade to Blackout, or to an intermediate level.

Blackout should not be set, and the Grand Master Fader should be at full for MX to operate normally. It is good practice to always leave the Grand Master Fader at full, except for particular effects to ensure that Scenes will be played back at the intended levels.

### DIPLESS CROSSFADES

Those users who are familiar with older manual control desks will have experienced the dip which will occur as one preset is crossfaded with another, and will know how difficult it can be to produce a smooth fade. On MX, all automatic,

## BASIC OPERATIONS

equal time fades are 'dipless' which means that all channels make a smooth transition from their current level to the new level, without dropping below that new level. Any channels which have the same level in the starting and finishing Scene will be unaffected during a fade with similar or faster incoming scene time than outgoing scene time.

### FADE TIMES

Another important concept which is vital to producing smooth fades is that of Fade Time. The Time Control Faders set a duration for each automatic fade, and all channels will complete the required crossfade in that set time. This means that, for instance, a channel whose level is moving only from 5 to 6 will complete that fade in exactly the same time as a channel whose level is moving from 0 to 10. This ensures that all fades complete at the same time, ensuring that they appear smooth.

Let us now look at the basic operation of MX.

### ADJUSTING CHANNELS

Before setting up a Scene for the first time, check that:

Blackout is not set.

All channel faders are at 0.

The Grand Master Fader is at 10 (top).

Crossfader A is at 10, Crossfader B is at 0 (i.e. both at top).

The Time Control Faders are at their top position, i.e. manual.

Channel/Scene selection is to Channel.

You can now bring up lights using the Channel A Faders, setting individual channel brightness as required. This is the most basic form of manual operation. The LEDs below the faders will be lit when the fader is above zero to show that the channel is active.

### PRODUCING MANUAL CROSSFADES BETWEEN PRESETS A & B

You have just set up a Scene using the Preset A faders, and this is live because Crossfader A is at 10. If you move Crossfader A to 0, this Scene will fade out.

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Now Set Crossfader B to 10, and set up a different Scene using the Preset B faders.

Move the A & B Crossfaders together, and you will see a smooth crossfade between the Preset B Scene, and the Preset A Scene. Move the faders back towards you to return to the previous Scene.

You will see the LED Fade Progress displays move to follow the Crossfader movement.

### PRODUCING A TIMED CROSSFADE BETWEEN PRESETS A & B

Move the two Time Control Faders to the 10 second position. With the two Scenes which you have already set up on Presets A & B, and with the A & B Crossfaders pushed furthest away from you, Preset A will be live.

Check that the Time Control Faders are selected to A/B or BOTH in the menu system.

Quickly move the A & B Crossfaders together to the opposite end of the scale. Preset A will fade out, and Preset B will fade up over about ten seconds. The LED Fade Progress Displays will monitor the fade. Try repeating this process with different Fade Times, and notice how you can alter the Fade Time while the fade is in progress. Setting the Time Control Faders to infinity will freeze a fade.

### FLASHING A CHANNEL OR SCENE

Channels may be flashed to any required level using the Flash buttons below the faders. The channel will flash to the level set by the Flash Level Master Fader. The corresponding LEDs will flash as the button is pressed to show that a channel is active.

Flash Mode must be enabled in the Setup Menu (see Section 4) for the Flash buttons to work, and the Flash Mode OFF LED will not be lit.

When Channel/Scene is switched to Scene mode, the preset B faders become Scene Masters, and the Flash buttons are then able to Flash whole Scenes to a level set by the Flash Level Master Fader.

This is the Normal Flash mode, allowing multiple channels or Scenes to be flashed together.

Now press the Flash Mode Select button until the Solo LED is lit. Try pressing a series of Flash buttons while a Scene is live on stage. You will notice that as each

Flash button is pressed the live Scene is replaced by only the channel or Scene corresponding to the button.

Often the Flash buttons will be used for very marked effects, but it is worth remembering that by setting the Flash Master Level at a position close to the levels in the active Scene, very subtle rippling and pulsating effects can also be produced.

### HOW TO RECORD A SCENE

Scenes which have been set up manually can be recorded and played back in any order, under the control of the Preset B faders which become Scene Master Faders when MX is in Scene mode.

Scenes can be set up and recorded in two modes, which are selected via the Record Scene menu, and these are called A Faders and Output. In A Faders mode the recorded scene will comprise only the channels set up on the Preset A faders, and the stored channel levels are not affected by the position of the A Crossfader. This allows Scenes to be set up and recorded 'blind', without disturbing the current MX output.

In Output mode the recorded scene will comprise the complete output from the desk, however that is created, and allows new Scenes to be created from a combination of other Scenes, Channels or Effects.

Record a scene in the following way:

Press Record to put MX into Record mode. The Record LED will light and any effects will be de-selected. If any Scenes in the current Page are already recorded, the LED below the corresponding Scene Master fader will light. The Record Scene Menu will appear in the LCD display, and Flash mode will be disabled. You may select between A Faders and Output mode on the menu if required.

Select a Scene page number and A Faders Record mode (see Section 4 for an explanation of the Menu System)

Set up the required Scene using the Preset A faders.

To record the Scene, press the Flash button below the Scene Master which you wish to program. The display will prompt you if the specified Scene is already recorded, allowing you to choose a different Scene on the current page. The LED below that Scene Master will flash and over-recording may be achieved by either using the menu or by pressing the flash button again. Alternatively you may select another page on the menu. If you confirm that you wish to record, the Scene will be stored as that Scene, and may be recalled for future use.

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At the moment the scene is recorded, the A/C and B/D fade time controls are also recorded, as fade in and fade out times respectively for that scene.

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**This only happens, however, if the scene was previously clear. If the scene is over-recorded, the fade times are preserved, allowing rapid re-recording of levels without affecting times.**

Fade times may later be edited in the SCENE → TIME menu.

Press the Record button to take MX out of Record mode. Any selected effects will be restored to their previous state.

### HOW TO PLAY BACK A SCENE USING A SCENE MASTER

Put MX in Scene mode. The yellow Scene LED will be lit above the Channel/Scene button. Ensure that Record mode is OFF.

A page of recorded Scenes is now loaded on the Preset B faders, and can be recalled by raising the appropriate faders. The LEDs below the faders will light to show those channels which are producing an output.

Any number of Scenes can be activated, and these will combine on a highest-takes-precedence basis.

Each Scene Page contains the same number of Scenes as there are channels on the desk. Four Scene Pages are available, and these are selected via the top menu on the LCD display. Each Scene Page selected loads a new set of Scenes on the Preset B faders.

You may sometimes wish to move from a Scene on one particular Scene Page to a Scene on a different page, and MX makes special provision for this. When a Scene Page is changed, any ACTIVE Scene Masters remain unchanged, until their level is reduced to zero, at which point the new Scene will be loaded. In this way it is possible to combine Scenes from different pages, and it is possible to mix scenes from all pages using this facility.

### HOW TO PLAY BACK TIMED CUES

Timed crossfades can be performed between any recorded Scenes using the C and D Crossfaders, or recorded times or a combination of both. Scenes are selected to



## BASIC OPERATIONS

each Crossfader from the Main Menu, and a fade performed by moving the C and D Crossfaders together. The selected Scenes will crossfade according to the setting of the Time Control Faders, or recorded times or a combination of both.

Start with both the C Crossfader at 0, and the D Crossfader at 10 (both down). Any existing Scene loaded on the D Crossfader will now be on the output of the desk.

Select the Main(top) menu, and enter a Scene number for C. Note that although no visible change occurs at the output at this stage, the Scene assigned to the C Crossfader is loaded ready for use.

Note that it is possible to select a Scene 'live' by, for example, setting C to 10 and then scrolling through the available scenes using the +/- keys on the 'C:' field. This is a useful method of previewing a Scene, or quickly reviewing a complete show.

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**Loading either the C or D Crossfader only occurs when that Crossfader is moved to 0, and the other Crossfader is moved to 10. The next load occurs when the Crossfaders are both moved to the opposite ends of their travel at which point the other Crossfader is loaded with the Scene selected on the menu.**

Check that the Time Control Faders are set to the required mode in the menu system (see Sections 3 & 4) and, if required, set the time for the crossfade.

In **VERRIDE** mode, the fastest of the recorded times and the Time Control Faders is used. This gives the option of 'speeding up' on recorded time in an emergency. The fade can be frozen by pulling the C/D faders back to meet the fade progress LEDs.

Now move both C and D Crossfaders quickly to the opposite end of the scale. A crossfade will take place between the existing Scene on D and the new Scene on C.

At the point that the C and D Crossfaders reach the top of the scale (C at 10, D at 0), the D Crossfader will be loaded with a new Scene as selected on the menu.

Moving both Crossfaders together back to the other end of the scale will produce another timed crossfade.

---

Scene 0 in every page is a non-recordable blackout scene. These scenes are shown on the LCD as 1.BL, 2.BL etc. If such a Scene is loaded, and a crossfade performed, a fade to Blackout will be produced.

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## HOW TO PLAY BACK IN SEQUENCE

The playback of timed cues described above is taken one step further by MX, which also provides a Sequence facility, allowing very simple replay of Scenes previously recorded in the required order.

Operation is almost identical to 'How to Play Back Timed Cues' above, except that MX will automatically increment the Scene selected to C or D on the Main Menu when one Crossfader reaches 0 and the other reaches 10. Each time the Crossfaders are moved together from one end of the scale to the other, the next Scene is automatically preset, providing the simplest possible means of playing back prerecorded lighting states during performance.

At the end of one page of Scenes the first Scene in the next page is selected, and so on until the last scene on page four, at which point MX scrolls back to Page 1, Scene 1. Any cleared Scenes are ignored in the sequence.

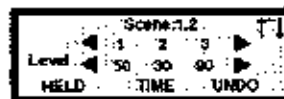
## HOW TO MODIFY A RECORDED SCENE

MX allows you to modify recorded scenes, either by re-recording the Scene with a new Scene, or by manually editing the data via the Display/Edit Menu.

To re-record a Scene, simply follow the normal procedure to set up the new Scene, and record this on the relevant Scene Master. The previous scene will be replaced in memory by the new Scene. MX will give a warning prompt and flash the relevant LED if you try to record over an existing scene. In this case you may proceed using the prompts on the LCD or by pressing the flash button again.

If the required changes are only minor, it will be simpler to edit the recorded information using the Menu System.

The procedure is shown below:

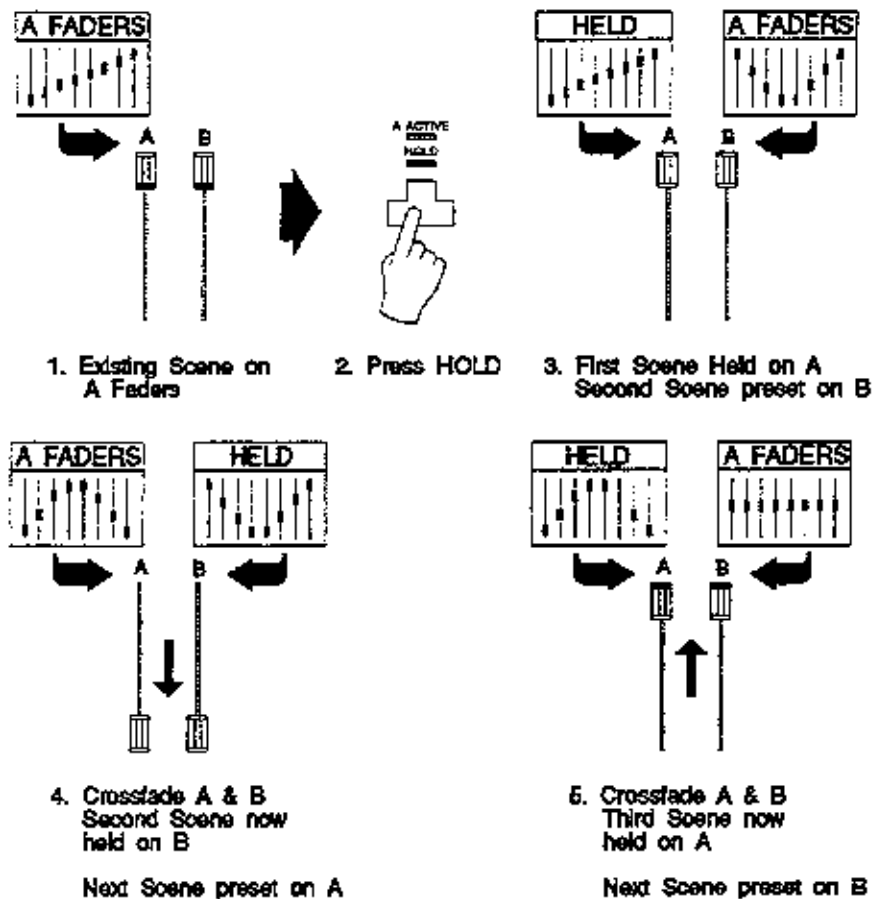


1. Select the Scene Menu by pressing SCENE from the top menu.
2. Select the required Scene using the cursor and +/- or numeric keypad.
3. Scroll through channels using arrow keys. Levels may be amended as required by positioning the cursor and using +/- or the numeric keypad.

- Fade in/out times may be edited in the TIME Menu.

**HOLD MODE – 2 SCENE PRESET OPERATION ON PRESET A FADERS ONLY**

When MX is in Scene mode, the lower channel faders function as Scene Masters, and are therefore not available for normal two–preset operation. HOLD mode is a facility which enables a Scene to be temporarily held in memory, while a new Scene is preset on the A Faders, with control of the Held Scene and Preset Scene alternating between the A and B Crossfaders. The principle of operation is shown below:



The HOLD facility can only be activated when the A Crossfader is at 10 and the B Crossfader is at 0. When the HOLD button is pressed, the Scene set on the Preset A faders is recorded into Hold memory, and placed under the control of the A Crossfader, without any output change. At this point the 'HOLD' LED will light, and the 'A Active' LED goes out to indicate that the Preset A faders can be altered

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without affecting the output. These faders are now under the control of the B Crossfader, which is at 0, and therefore are not contributing to the output.

As shown above, when the Crossfaders are moved to the other end of the scale, a dipless crossfade occurs between the two Scenes, and at the end point the Scene previously on the Preset A faders is transferred to the Hold memory, and the A Crossfader assumes control of the Preset A faders.

During the transition the 'A Active' LED is lit to warn that moving the A Faders could affect the output.

A new Scene can now be preset on the A Faders, and the sequence repeated as often as required.

To exit from Hold mode, the two Crossfaders must end up in the top position, and it may be that after the last crossfade they are in the opposite position. If this is the case, by leaving the Preset A faders unchanged, the Crossfaders may be moved up and down without affecting the output and may therefore be returned to the up position. Hold mode can then be de-selected by pressing the hold button, and MX returns to normal Scene mode.

Throughout the use of Hold mode, Scenes may also be used as normal under the control of the Scene Masters.

### HOW TO MODIFY A HELD SCENE

The Held Scene is normally inaccessible from the console faders, and modifications must therefore be done manually via the Hold Display/Edit Menu. The procedure is shown below:

The menu sequence ⇒SCENE⇒HELD produces the Held Scene display.



The Held Scene may be modified as required by scrolling across channels, and altering the recorded data using +/- or the numeric keypad. If Hold mode is active at the time, these changes will occur instantly on the output.

### HOW TO PRODUCE EFFECTS

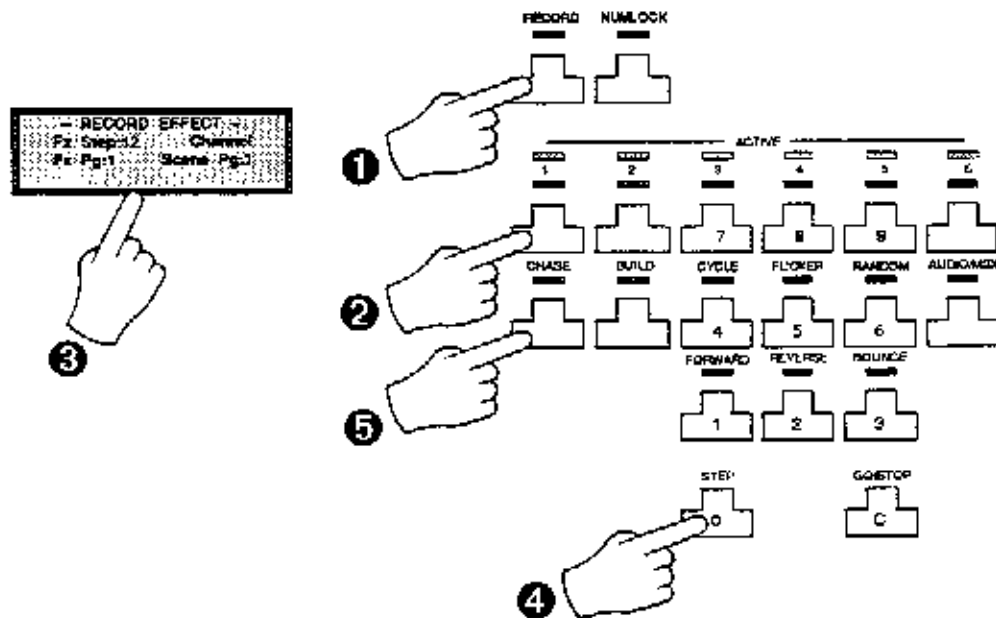
The Effects features on MX are very powerful, and allow up to six complex Effects to be run together at any one time. Effects are set up as an Effect Sequence,

## BASIC OPERATIONS

and each of these Sequences can have up to 48 steps, each comprising any number of channels, or a single Scene. In the same way that Scenes are arranged in Pages, so also are the Recorded Effects, and 4 Pages, each comprising 6 effects are available. Each Effect Page assigns one Effect to each of the six Effect Select Buttons, and each of these can be modified, started and stopped individually.

An explanation of the six Effect types is given in Section 3.

An Effect Sequence is recorded or may be edited as shown below:



1. Select Record mode. Record Menu is displayed.
- 2,3. Select Effect to be recorded. Record Effect Menu is displayed. The Effect Page can be changed if required. The current record effect step is displayed, and this can be changed between the first and last step numbers. If the effect is currently cleared, step 1 will be shown, otherwise the step will be the last step in the effect sequence. Select the step as Channel or Scene on the menu, depending on the step type required.
4. If the step is made up of channels, select which channels make up the step by toggling any of the flash buttons. If the step is a Scene, select the Scene using the flash buttons and the Scene Page number in the menu. Once the selection for the step has been made, advance to the next un-programmed step by pressing the Step button. Repeat the procedure until the required Effect is complete or the maximum step number (48) is reached.

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5. Select the Effect type and direction at any time while the Effect is being recorded.
6. Press Record to take MX out of Record mode. Any previously selected effect will be re-selected on exit.

The Go/Stop button is NOT recorded, and is only used during Effects replay.

## HOW TO MODIFY A RECORDED EFFECT USING THE MENU SYSTEM

A recorded effect may be edited live or blind using the FX menus.

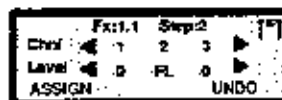
The top level FX menu is accessed from the main menu by pressing the FX button.



The effect to be edited is set on the first line. After moving the cursor down to the next line, each of the steps from 1 to the highest recorded can be scrolled through.

'Chnl' indicates that the step consists of a number of channels programmed to either full or 0. As each step may also contain a scene, 'Chnl' may be replaced by the scene number written in the notation 'page.scene'. A scene step is edited by changing the scene number.

A channel step is edited by firstly pressing ASSIGN. Initially it will toggle to a scene step. A channel step can be changed to a scene step, allowing the required scene to be set. The effects channel edit menu is accessed by pressing ASSIGN again.



Within this menu, all of the channels in the system may be scrolled through for any selected step, toggling the step between 0 and full as required. The previous menu can be returned to by pressing ASSIGN again or by pressing the menu exit button. The function of the ASSIGN key is to allow cycling through the two menus whilst maintaining the selected scene number.

## BASIC OPERATIONS

Pressing the Edit Function key causes the display to change to the FX Edit menu. At this menu level, steps can be inserted into or deleted from an effect.



To insert a step, the cursor is moved to one of the steps shown and INSERT is pressed. This causes a new step to be inserted in front of the selected step. The number of the selected step and all higher steps are increased by 1. The new step is, by default, a channel type step. It can be set or modified to a scene step by going back to the top FX menu. Once 48 steps have been set, INSERT no longer functions.

A step is deleted in a similar manner. The cursor is moved to the step to be deleted and DELETE is pressed. The numbers of all of the other steps above it are decreased by 1. Once the effect has been reduced to 2 steps, DELETE forces the selected step to a default setting whereby all channels are set to 0.

## EFFECT PLAYBACK

Effects can be played back alone or in combination with a scene created using Channel Presets or Scene Masters.

Up to six Effects can be run, at different speeds, at any one time. Each running Effect can have any Effect type and direction.

Effects are replayed by selecting the appropriate FX Page on the top menu, and pressing one of the six Effects Select buttons. The corresponding green LED will light. The Effect is started by pressing the Go/Stop button, and when running the Yellow 'ACTIVE' LED will light. The direction may be changed on a selected Effect while it is running, or the Effect may be de-selected and left running while another effect is created or edited. Effects from different Fx Pages can be run together, so long as they do not share the same Effect Select button. When an Effect is selected, the type and direction keys display the recorded settings.

Once the Effect is running, it may be stopped by pressing the appropriate Effect Select button, and pressing Go/Stop.

## SOUND TO LIGHT CONTROL

The external Audio Input can be used to control a selected B Fader, in Channel or Scene mode. The B Fader assignment is made in the 'CONFIG SYSTEM' menu.

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The Channel or Scene selected will flash, as triggered by the audio input, with the level controlled by the Audio/MIDI fader, and this level will combine with any level currently set on the B Fader on a highest-takes-precedence basis.

---

Note that changing the Audio/MIDI level will also affect the trigger level of any Audio/MIDI effects which are running.

## **HOW TO SAFEGUARD RECORDED MEMORIES**

MX stores data in integrated circuit memories powered by an internal battery. Under normal use the battery will be kept charged by the MX power supply, and data will be retained indefinitely. If the console is left without power for a long period, there is a risk of memory corruption as the internal battery discharges. The memories will normally be retained intact for at least a month, but it is prudent to save any important memories to a Memory Card.

---

### **CAUTION!**

Attempting to fit a Memory Card other than Strand Lighting Part no. 04-900-00 may damage the equipment.

It is in any case good practice to safeguard the considerable time spent creating Scenes by providing a back-up of all data on a memory card, and storing this carefully in a safe place away from the console. Typically the data will be retained on the Memory Card for about five years, with the longest life achieved by storing the cards in as cool a place as possible, but not below 0°C.

The menu sequence **SETUP⇒CONFIG⇒SYSTEM⇒MCARD** selects the Memory Card display, from which you can choose to **READ** or **WRITE** the whole System, or selectively all Scenes, Fxs, Dimmer Patches or Setup. The information is saved as four MS-DOS files named **SCENES.MX1**, **FX.MX1**, **PATCH.MX1** and **SETUP.MX1**. The **SETUP** file contains information about the various modes selected, the dimmer protocol, language etc. When this file is read, the board is immediately set to the appropriate modes.

To use the Memory Card, insert the card positively in the slot on the right-hand end of the console. Choose which memories you wish to write or read on the menu, and press **READ** or **WRITE** as appropriate. Make sure that you label all Memory Cards clearly to avoid confusion.



All Memory Cards must be 'formatted' before use, and this can be carried out from the Memory Card menu display by pressing the FORMAT key with the new Memory Card inserted in the slot. Ensure that the write-protect switch on the end of the card is off before attempting to format a new card, or write data to it.

The recorded memories can be safeguarded on MX by The Record Lock feature available on the Setup Menus. When Record Lock is ON, no recording or modification of memories is possible, either on the front panel controls or the Menu System.

MX performs checks for corruption on all memories as they are read, and also every time the system powers up, providing the user with a warning if any errors are found. You then have the option of continuing with the error ignored, or aborting the read process.

### HOW TO CLEAR MEMORIES

The Menu System provides the way to clear any recorded Scenes, Effects, Setup and Dimmer Patch information to the default settings.

The sequence SETUP⇒CLEAR selects the SETUP CLEAR menu, from which the memories to be cleared can be selected using the cursor. Pressing the CLEAR button will prompt you for confirmation before clearing the selected memory.

Clearing the whole system will clear the unit to factory defaults, giving a default 1:1 dimmer patch as opposed to a 'clear' dimmer patch. Dimmer patch can be set to clear or default in the SETUP PATCH menu.

Note that clearing the factory defaults will change the dimmer protocol to D54.

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## Printer Operation

---

The PRINT menu allows all or selected parts of memory to be printed out via the RS232 interface, providing a hard copy of specific information, or additional back-up of scene data. Printing is carried out in the background which allows normal console operation to continue.

### CONNECTING A PRINTER

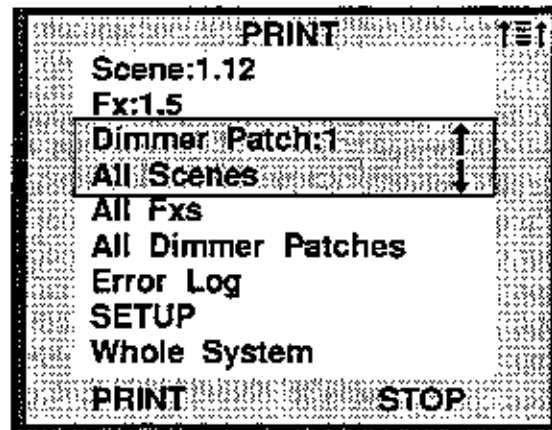
The printer, which should be an Epson®-compatible unit with a serial input, is connected to the RS232 port on the rear of the MX console. You will need to know the baud rate, parity, data and stop bit settings for the printer, and set up the MX output to the same values via the SETUP RS232 menu. MX uses XON/XOFF flow control, and your printer configuration may need changing to accept this type of handshaking.

The default settings for the RS232 port are: 9600 baud, odd parity, 7 bit data, 1 stop bit.

The electrical connections are shown in Appendix A. A cable is required with a 25 pin 'D' connector at each end. The connector at the MX end of the cable will be male but the gender of the connector at the printer end will depend on the printer used. Pins 1, 2, 3 and 7 on the MX end connector are wired to pins 1, 2, 3 and 7 on the printer end connector. The remaining pins are not used. The cable may be made up or purchased from a computer suppliers such as INMAC (part no. 056213 male to female or part no. 056212 male to male).

### OPERATION

The menu system provides access to the print selection with the key sequence SETUP⇒CONFIG⇒SYSTEM⇒PRINT, which displays the following menu:



The data required is selected using the cursor and the scroll up/down keys. Pressing the PRINT button marks the data for printing, and starts the print output immediately. The selected data is highlighted with an asterisk (\*) whilst it is printing.

Further blocks of data may be selected as required while a print is in progress, and pressing PRINT after each selection adds this data to the print queue. It should be noted that the output may not necessarily be in the order of selection.

Pressing STOP at any time cancels the current printer output, and clears any further blocks in the print queue.

Samples of typical print output are shown below:

```

SETUP

Live Dimmer Patch:1
Dim Protocol:D54
D54 Scaling:100%
AMX192 Scaling:100%
EMX Baud Rate:250K
Baud Rate:9600
Parity:NONE
Data Bits:8
MIDI Mode:NORMAL
MIDI Channel:1
Language:ENGLISH
Time Xfade:C/D ONLY
Audio/MIDI:AUDIO
S to L fader:1
Flash Mode:ON
LCD Contrast:50%
LCD Backlight:70%
Cursor Blink:OFF
Record Lock:OFF
Record:A Faders
    
```

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# PRINTER OPERATION

## All Scenes

```

Scene 1.1
Chan 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Level 0 0 0 0 0 20 45 45 45 80 FL FL 40 0 34 95 0 0 0 0 34 56 C 0
Chan 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
Level 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Scene:1.2E          Scene:1.3E          Scene:1.4E          Scene:1.5E
Scene:1.6E          Scene:1.7E          Scene:1.8E          Scene:1.9E

```

etc...

## All FXs

```

Fx:1.1
Step 1 2 3 4 5 6 7 8
Scene CHAN CHAN CHAN CHAN 1.6 1.7E 1.8 1.8L
Step:1
Chan 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
LevelFL 0 0 FL 0 0 0 FL 0 0 0 0 0 0 0 C 0 0 0 0 0 0 C C 0
Chan 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
Level 0 0 0 0 0 0 FL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Step:2

```

etc...

## Error Log

```

1390 ROM checksum failed
1393 LCD contrast fault
1400 RS232 ext-loop flt
1321 Card R/w error

```

## Dimmer Patch:1

```

Dimmer 1 2 3 4 5 6 7 8 9 10 11 12
Chan 1 2 3 4 5 6 7 8 9 10 11 1
Level 100% 100% 100% 100% 100% 100% 50% 100% 100% 100% 100% 100%

Dimmer 13 14 15 16 17 18 19 20 21 22 23 24
Chan 13 14 15 16 17 18 19 20 21 22 23 24
Level 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%

Dimmer 25 26 27 28 29 30 31 32 33 34 35 36
Chan 1 1 1 1 1 1 1 1 1 1 1 1
Level 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0% 0%

```

etc...

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## Advanced Operation

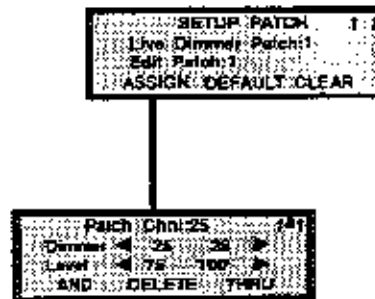
### DIMMER PATCH

MX provides two separate Dimmer Patches, which allow the assignment of dimmer outputs to channels to be altered to suit specific installations.

The Dimmer Patches allow re-assignment of any dimmer to any channel, or any number of dimmers to be combined on a single channel. No dimmer can be assigned to more than one channel at any time.

The Patch also allows the trimming of dimmer output levels to suit local requirements.

The default patch of all dimmers to the equivalent numbered channel, with levels at 100% may be modified via the menu system, by cursor position and +/- or numeric keypad entry. The Menu levels are shown below:



The key sequence SETUP⇒PATCH accesses the Patch menu, and selecting ASSIGN allows individual channels to be patched to one or more dimmers, with proportional levels set for each dimmer. Multiple entries are made by pressing AND followed by a dimmer number, or one number followed by THRU and then a second number enters a consecutive series of dimmers. Individual levels may be entered by scrolling left or right, and positioning the cursor on the field that you wish to update. The field may be changed using the +/- keys or the numeric keypad.

In the SETUP PATCH menu, DEFAULT will set the default 1:1 patch for the selected EDIT patch (1 or 2). If this patch is also the LIVE DIMMER PATCH, then the output will be affected immediately. Selecting CLEAR will 'unpatch' all

## ADVANCED OPERATION

channels and hence all output will be inhibited. this option is provided for users who wish to start with a 'clean sheet'.

Note that the Patch option differs from most other menus in that all editing is done 'blind' – the new patch only takes effect when the ASSIGN menu is exited. This allows a high level of flexibility when editing. Also, any dimmers assigned to a given channel are automatically removed from their previous channel assignment, possibly leading to unassigned channels.

## MIDI CONTROL

The MIDI communications facilities on MX enable many functions of the console to be controlled from an external MIDI source, or allow the operator to send or receive selectable blocks of data across the MIDI link.

MIDI channels (1 to 16) and modes of operation (NORMAL, IN, OUT or SLAVE), are selectable via the menu system. The SETUP MIDI menu is accessed by the menu sequence SETUP⇒CONFIG⇒I/O⇒MIDI.

When SYNC is pressed, the complete current status of the board is sent to any device connected to MX. This ensures that a newly connected device knows the current state of MX.



```

  SETUP: MIDI
  MIDI Mode: NORMAL
  MIDI Channel: 15
  SYNC      UNDO

```

Full details of the MIDI facilities are given in Section 9 of this handbook.

## RS232 INTERFACE

An RS232 communications interface is provided on MX, conforming to the EIA 232D standard, for the connection of an external printer.

This enables all or selected parts of memory to be printed out as a background operation, allowing normal console operation to continue at the same time.

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The interface incorporates standard XON/XOFF flow control, and baud rate, parity, data and stop bits are selectable to suit individual requirements from the SETUP RS232 menu shown below, accessed by the key sequence SETUP⇒CONFIG⇒I/O⇒RS232.



The default settings are 9600 baud, odd parity, 7 data bits and 1 stop bit.

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## Maintenance

### **ROUTINE MAINTENANCE BY THE USER**

No routine preventive maintenance is necessary for MX, but care in use and regular physical inspection for signs of damage will avoid problems during a performance.

### **PERIODIC INSPECTION**

Inspect the power supply cable, multiplex and audio/MIDI cables for signs of damage or strain on the connectors. If any suggestion of damage be found, replace or repair those parts at the earliest opportunity.

The Power Supply should be examined for mechanical damage, and replaced if safety is compromised.

### **CLEANING**

A console which is kept in a clean and neat condition will be far more reliable than one which is allowed to become contaminated with dust, cigarette ash or liquids. Sensible precautions, and regular cleaning with a cloth moistened with water and detergent will keep the console in good condition. It is very important not to wet the circuit boards below the panels during cleaning.

Do not use any solvents, which may affect the surface finish, and do not use spray polish which may cause permanent damage to fader sliders.

### **USER DIAGNOSTICS**

MX incorporates a considerable number of self-diagnostic tests which will provide the operator with valuable information about detected faults, or give advance warning of potential trouble.

In many cases, even though an error message may appear, the console will still be able to function. It is however very important that all reported faults are investigated as soon as possible, to avoid the risk of more serious trouble.

All faults are reported to the Error Log page which can be viewed via the menu system. These entries are updated every time the diagnostic tests are run or a fault detected.



## MAINTENANCE

Every time a cold start occurs (see Section 2) MX automatically runs a series of diagnostic tests. These are completed very quickly, and are invisible to the user unless an error is detected.

The menu system also provides the user with a series of User Tests, which prompt you to carry out a sequence of operations to verify certain controls or particular processor functions.

There are two modes of operation – CYCLE and TEST ONCE.

TEST ONCE mode will perform a selected test once only, while CYCLE will continue repeating the test until the process is aborted by the user.

Whilst normal connection of the console is possible during most tests, the nature of some tests will interfere with normal operation, and disconnection of the dimmers is recommended.

A full list of Tests and Error Messages can be found in Appendix B.

## SERVICE DIAGNOSTICS

A more sophisticated series of tests are incorporated for service purposes. These require special test jigs and will give errors and could cause memory corruption if run. They should therefore not be attempted except by authorised service dealers. The DIAGNOSTICS menu, accessed by the key sequence SETUP⇒CONFIG⇒DIAGS prompts the user if the desk is in Service Diagnostics mode.

## EQUIPMENT BREAKDOWN

The MX console contains sophisticated electronic components, which can be easily damaged by mishandling. NO internal repair should be undertaken by the user, and should a fault occur, this should be referred to Strand Lighting or your nearest service dealer.

Before returning any item for service, you should carry out a number of elementary checks, to verify that a genuine fault is present.

If your MX console does not operate correctly you should check the following:

- The status of the Blackout Button, Master Faders and dimmer patch.
- The mains supply to MX, the power supply, the dimmers and any demultiplex units.

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- The condition of all cables.
- That all connectors are fitted correctly and fully inserted in the correct sockets.
- Mains fuses on the dimmers and any demultiplex units.

## MIDI Interface

### INTRODUCTION

This section of the manual describes the **MX** MIDI interface (Musical Instrument Digital Interface). In order to accurately specify the way in which the interface works, this section also defines the actual MIDI message formats used.

### Notation

Because, by its nature, a description of any MIDI implementation involves references to computer terms, these are briefly described below:

**BYTE:** The smallest entity of information transmitted over a MIDI link. A byte contains 8 BITS. The upper and lower groups of four BITS may be referred to as **NIBBLES**.

All numbers are expressed in decimal format unless otherwise stated.

Hexadecimal numbers are expressed in capitals followed by 'H'.

The least significant nibble of a MIDI Status byte contains the MIDI Channel number, 1 to 16 (coded as 0 to 15). This is represented throughout the text by a lower case 'n'.

The MIDI System Exclusive messages include a manufacturers unique identification code represented by 'ID'. Strand has its own MIDI System Exclusive Manufacturers ID and this is **00 20 01H**.

SMPTE is short for the (US) Society of Motion Picture and Television Engineers.

### THE MIDI INTERFACE

MIDI was developed during the 1980s as a musical instrument interface. Since then, MIDI has been expanded from just synthesizers and other musical instruments into a whole industry of compatible intelligent devices. There are now sequencers, home computers and PC plug-in cards with MIDI interfaces, and the SMPTE time code has been taken aboard, giving a gateway into the film and video world. It is possible to synchronise a number of MIDI devices using SMPTE-MIDI control units.

Each MIDI-equipped instrument usually contains a receiver, a transmitter, and an optional buffer providing a through facility for daisy-chaining devices together. **MX** contains these three ports.

Technically, all MIDI communication is achieved through multi-byte "messages" consisting of one Status byte followed by one or two Data bytes. The exceptions to this are Real-Time and System Exclusive messages. The basic MIDI protocol provides no error checking, any bytes which are lost or received erroneously will be accepted in the form in which they are received.

MIDI is not a transparent protocol; it is not possible to send 8 bit data as the eighth bit is used to signal a status byte. The MX implementation is slightly limited as a result, in that fader levels must be 7 bit, and other data must be filtered to pass through the interface. However, for all practical purposes, the user does not perceive this limitation.

### **MX MODES AND APPLICATIONS**

MIDI is used on MX is to provide a connection to the rapidly expanding MIDI world which provides ready-made gateways to other systems such as SMPTE.

Any console using this specification can be controlled by synthesizers, MIDI sequencers (for timed and synchronised shows) and hence also SMPTE interface devices.

The implementation uses MIDI in a number of ways which are detailed below. All control items (faders and switches) are given specific control codes, allowing a complete replay of the users actions if the output is recorded by a MIDI device. Some devices, such as PC based sequencers are sufficiently intelligent to allow the user to edit a set of codes. In this way the user can manipulate his show off-line.

The user may also connect two or more consoles to one MIDI network and achieve a mimic of playback operations. In this way larger numbers of channels and dimmers can be controlled by one unit acting as master and the others as slaves.

The MIDI capabilities of MX are divided into four modes, all of which are mutually exclusive. These are MIDI NORMAL, MIDI OUT, MIDI IN and MIDI SLAVE. The modes are described in the following sections.

MIDI NORMAL is the default mode at power up. The mode may be changed via the MIDI menu in the LCD (See the Advanced Operation section of this handbook).

MX always provides a copy of the MIDI IN signal at the MIDI THRU socket.

### **MIDI Channel Number**

MX may be configured to support any one of the 16 available MIDI channels. The selected channel will be known as the Base or Basic channel and is identified with

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the letter 'n' in this description. The console will only respond to its configured Base Channel in MIDI's defined Mode 3 (OMNI OFF/POLY) with the exception of the system messages, which are always supported. It will always transmit and receive MIDI messages on the base channel.

### MIDI Normal Mode

MX can select either Audio or MIDI as the control source for AUDIO/MIDI effects. The selection affects all effects running the AUDIO/MIDI type. In NORMAL mode the console will decode the MIDI timing signal to provide control over the sequence of the effects. The AUDIO/MIDI fader is used to provide division of the MIDI timing signals, allowing the step rate to be adjusted to varying fractions of the signal. In the SETUP CONFIG SYSTEM Menu, the Audio/MIDI selection needs to be set to MIDI in order to use the timing signal.

MX also uses the MIDI System Timing messages to stop and re-start MIDI type effects.

### MIDI Out Mode

All faders and switches are allocated unique MIDI codes. In this mode, when a switch is pressed or a fader is moved, the appropriate code will be transmitted via the MIDI OUT connector to a MIDI sequencer, or other device, allowing 'real time' recording.

In this mode only, pressing the SYNC function key transmits the current level of all faders and position of all switches, and sends a Strand System Exclusive Message containing other information about the status of the console. This facility ensures that the receiving board is in the same state as when the recording was made.

A synchronisation message is also transmitted whenever MIDI OUT mode is selected.

In general, the menu system is not controllable over MIDI, so changes to the setup will not be transmitted. The exceptions to this rule are those items contained in the System Exclusive Message (see later).

### MIDI In Mode

Most console functions are suppressed and board control is via the MIDI signal.

In this mode, the Grand Master and Blackout switch take precedence over the MIDI controlled grand master and blackout switch in a lowest-takes-precedence

## MIDI INTERFACE

manner. This gives the user the ability to top-limit or shut off the console's output at all times.

During MIDI IN mode, the LCD will be fixed to a MIDI IN mode display. However, the MIDI mode may be changed to MIDI NORMAL, MIDI OUT or MIDI SLAVE mode. Normal menu operation can only occur in MIDI NORMAL and MIDI OUT modes.

When the mode is changed back to either MIDI NORMAL or MIDI OUT mode, the output will be controlled immediately by the fader levels set on the console.

The state of the console, as set by MIDI (such as effect control and selection of operating modes) will be maintained when MIDI mode is switched.

### MIDI Slave Mode

In scene mode the master controls, including scene masters (B faders), are inhibited. However, channel controls are active. To slave one MX from another, set the receiving board to MIDI SLAVE mode, the master board to OUT mode and press SYNCH to synchronise the two. Multiple MXs may then be used in parallel. Note that the recording of scenes and effects must be done independently and that the overall number of scenes and effects does not increase with multiple MXs.

### MIDI DEFINED MESSAGES

This section lists the different types of message that MIDI supports.

Status Byte (Hex)	Description	Data Bytes
<b>Channel voice:</b>		
8n	Note off	1. Key number 2. release velocity
9n	Note on	1. Key number 2. key velocity
An	Polyphonic Key pressure	1. Key number 2. key pressure
Bn	Control change	1. control number 2. control value
Cn	Program change	1. program number
Dn	Channel pressure	1. channel pressure
En	Pitch bender	1. pitch bend (LSB) 2. pitch bend (MSB)

**MX**

**System messages:**

F0	Start System Exclusive	1. manufacturers ID 2. data 3. data . . . . . . (any number of data bytes)
F1	Undefined	
F2	Song position	1. LSB 2. MSB
F3	Song select	1. song number
F4	Undefined	
F5	Undefined	
F6	Tune request	none
F7	End of Exclusive	none
F8	Timing clock	none
F9	Undefined	
FA	Start	none
FB	Continue	none
FC	Stop	none
FD	Undefined	
FE	Active sensing	none
FF	System Reset	none

The table defines all MIDI messages and their expected data bytes except for the System Exclusive messages. These always contain manufacturer specific information.

**MX MIDI CODES**

This section describes, in some detail, the principles and codes that are used in MX. It is intended for the user who wishes to experiment with remote control and editing of the MIDI information on such things as MIDI sequencers. The information is summarised in the standardised MIDI implementation chart at the end of this section.

**The MX Requirement**

It is clear from the MIDI defined messages above that there is no direct mapping into lighting control. Some of the system features are useful and will map directly, but the control of channels, submasters and play-backs are not catered for

directly. Therefore a scheme has been devised to allocate general purpose 'controllers' to such things as specific faders and switches.

### Implementation

The aim of the implementation is to efficiently encode the controls that MX operates with whilst remaining, as far as possible, within the spirit of the MIDI specification.

In order to maintain MIDI compatibility, the MIDI codes used for identifying the Fader levels and Switches fit into the existing MIDI Channel voice message format without using any code that has already been defined. As there are not enough spare control codes available, some special coding is used.

During normal operation this should not affect a MIDI system. MIDI Control Change messages are Channel specific and it is intended that all lighting equipment should be set to use a single lighting MIDI channel.

In order to minimise the number of MIDI codes required to define all the possible functions, some degree of generic encoding is used. To compress the number of codes used, and to remain within the MIDI specification, both MIDI running status and a special paging arrangement are implemented.

### RUNNING STATUS

In order to speed up transmission MIDI implements Running Status. If a receiver does not receive a status byte, only further data bytes, the receiver assumes that the data is more of the same. MX will transmit and receive messages supporting Running Status. This implementation also uses an internal form of running status, in order to compress data transmission and allow expandability. This is detailed below.

### MIDI Commands Used

This section describes those MIDI commands that have been selected for MX. Any MIDI command not recognised will be discarded. Similarly, MX will not generate any MIDI message not defined in this document (see the MIDI Implementation Chart at the end of this section).

### MIDI Control Change

These messages are generally used by MIDI to control synthesizer features. Each fader and switch is assigned to a unique MIDI Control Change code. These codes

MX



are not configurable so that codes used in recording and playback operate consistently. This also ensures that data is transportable between consoles. The message contains two data bytes; the first is the control number and second is the control value:

Bn <control number> <control value>.

The full complement of 128 bytes, defining the control number, is divided into 4 main areas by the MIDI specification:

- 1) Continuous Controllers – faders : 0 to 63 ( 0H to 3FH).
- 2) Continuous Controllers – switches : 64 to 95 (40H to 5FH).
- 3) An undefined area : 96 to 121 (60H to 79H).
- 4) Channel Mode messages (reserved) : 122 to 127 (7AH to 7FH).

Of the 128 possible control numbers several have already been defined in MIDI.

Control Number	MIDI	Function
0		—undefined
1	MIDI	Modulation Wheel
2	MIDI	Breath Controller
3		—undefined
4	MIDI	Foot Controller
5	MIDI	Portamento Time
6	MIDI	Data Entry Knob
7	MIDI	Main Volume
8	MIDI	Balance
9		—undefined
10 (0AH)	MIDI	Pan
11 (0BH)	MIDI	Expression controller
12 (0CH)		Control Page
13 (0DH)		Grand Master
14 (0EH)		Channel Page
15 (0FH)		FX Speed
16 (10H)	MIDI	Data Channel 0
17 (11H)	MIDI	Data Channel 1
18 (12H)	MIDI	Data Channel 2
19 (13H)	MIDI	Data Channel 3
20 (14H)		Data Channel 4
21 (15H)		Data Channel 5
22 (16H)		Data Channel 6

# MIDI INTERFACE

23 (17H)		Data Channel 7	
24 (18H)		Data Channel 8	
25 (19H)		Data Channel 9	
26 (1AH)		Data Channel 10	
27 (1BH)		Data Channel 11	
28 (1CH)		Data Channel 12	
29 (1DH)		Data Channel 13	
30 (1EH)		Data Channel 14	
31 (1FH)		Data Channel 15	
32 (20H)		}	
		}	LSB for values 0 - 31.
63 (3FH)		}	
64 (40H)	MIDI	Sustain Pedal	
65 (41H)	MIDI	Portamento	
66 (42H)	MIDI	Sostenuto	
67 (43H)	MIDI	Soft Pedal	
68 (44H)		—undefined	
69 (45H)	MIDI	Hold 2	
70 (46H)		—undefined	
79 (4FH)		—undefined	
80 (50H)	MIDI	General Purpose Controller	5
81 (51H)	MIDI	" " "	6
82 (52H)	MIDI	" " "	7
83 (53H)	MIDI	" " "	8
84 (54H)		—undefined	
91 (5BH)		—undefined	
92 (5CH)	MIDI	Tremolo Depth	
93 (5DH)	MIDI	Chorus Depth	
94 (5EH)	MIDI	Celeste (Detune) Depth	
95 (5FH)	MIDI	Phaser Depth	
96 (60H)	MIDI	Data Increment	
97 (61H)	MIDI	Data Decrement	
98 (62H)	MIDI	Non-Registered Param. No.	LSB
99 (63H)	MIDI	" " "	MSB
100 (64H)	MIDI	Registered Parameter No.	LSB
101 (65H)	MIDI	" " "	MSB
102 (66H)		—undefined	

MX

121 (79H)		—undefined
122 (7AH)	MIDI	Local Control
123 (7BH)	MIDI	All Notes
124 (7CH)	MIDI	OMNI Mode off
125 (7DH)	MIDI	OMNI Mode on
126 (7EH)	MIDI	Mono Mode on
127 (7FH)	MIDI	Poly Mode on

For the MX implementation, the control value byte either represents the fader level for a continuous controller or it can be used to identify a switch and its current on/off state.

## Pages

There are two paging controllers to codify the available 16 continuous controllers. Because there may be a future requirement to control large numbers of channels, these are allocated a separate page control – Channel Page. Other controls are under Control Page.

The control sends a setting up code – the Page – to tell the board how to interpret the control change codes which follow in the Data Block. There may be 128 different pages of each type.

These will be defined within the following ranges:

Control Page	Description
00	Submaster Faders Page 1
15 (0FH)	Submaster Faders Page 16
16 (10H)	Control Faders Page 1
31 (1FH)	Control Faders Page 16
32 (20H)	General Lighting Control 1
47 (2FH)	General Lighting Control 16
48 (30H)	Flash Switch Page
63 (3FH)	Flash Switch Page 16
64 (40H)	Control Switch Page 1
80 (4FH)	Control Switch Page 16
81 (50H)	—undefined
127 (7FH)	—undefined

Channel Page	Description
00	A Channel Faders Page 1 (channels 1–16)
63 (3FH)	A Channel Faders Page 64
64 (40H)	B Channel Faders Page 1
127 (7FH)	B Channel Faders Page 64

## Data Block Coding

The Data Block is defined as 16 consecutive MIDI Control Change numbers starting at 16 (10H) and finishing at 31 (1FH). The Data Block will control up to 16 data variables of the type defined by the last received MIDI Control Page message 12 (0CH) or Channel Page message 14 (0EH) on a latest takes precedence basis, giving the facility to control up to 2048 separate lighting functions and 2 scenes of 1024 channels.

Page 00 is defined to be submasters 1-16 for systems that do not provide or accept the paging facility. The default setting for both pages is 00.

The allocation of controllers is defined in the MIDI Implementation Chart at the end of this section.

## Data Byte Coding

The MIDI Control Page or Channel Page message specifies the data variable followed by a data byte which provides the new state or level for the data variable.

The data byte can give the new level for a fader or the new state for a switch.

A fader level is coded into the last seven bits of the data byte giving a range of between 0 [zero] and 127 (7FH) [full].

For transmission, the off, inactive or de-selected state of a switch is represented by a data byte with a value 00. The on, active or selected state of a switch is represented by a data byte with a value 127 (7FH).

For reception, to allow for the MIDI specification, the off, inactive or de-selected state of a switch is represented by a data byte with a value between 00 and 3FH. The on, active or selected state of a switch is represented by a data byte with a value between 40H and 7FH inclusive.

So, a message to set channel 1 to level 50 might be:

```
<Bn> <0EH> <00H> <Bn> <10H> <50>
```

A message to set channels 34 to 36 to level 0 might be:

```
<Bn> <0EH> <02H> | <Bn> <12H> <00> | <Bn> <13H> <00> | <Bn> <14H>  
<00>
```

Note there is no need to repeat the Channel Page after the first message. Using running status, the following is also acceptable and is more efficient:

MX

<Bn> <0EH> <02H> | <12H> <00> | <13H> <00> | <14H> <00>

MX generally uses running status when transmitting.

## MX Control Page Assignments

On MX the following pages have been assigned:

Control Page	Description
00H	Submaster Faders 1–16
01H	Submaster faders 17–32
02H	Submaster Faders 33–48
10H	Control Faders
20H	General Lighting Controllers (defined for special functions)
30H	Flash Switch 1–16
31H	Flash Switch 17–32
32H	Flash Switch 33–48
40H	Control Switch 1
41H	Control Switch 2

Channel Page	Description
00H	Preset A Faders 1–16
01H	Preset A faders 17–32
02H	Preset A Faders 33–48
40H	Preset B Faders 1–16
41H	Preset B faders 17–32
42H	Preset B Faders 33–48

None of the menu keys or the record switch are assigned to a MIDI control change code; these facilities are kept local to MX. This is to maintain integrity of operation and simplicity of design. Note that the scene B faders which double as submasters in scene mode are given individual codes. MX will transmit codes for scene masters when scene B faders are used in scene mode.

## MX Control Code Assignment

Each of the MX console functions that require a unique MIDI control code message are summarised below, the full MIDI Type and Data messages are shown:

<Bn> <0EH> <02H> | <12H> <00> | <13H> <00> | <14H> <00>

MX generally uses running status when transmitting.

## MX Control Page Assignments

On MX the following pages have been assigned:

Control Page	Description
00H	Submaster Faders 1–16
01H	Submaster faders 17–32
02H	Submaster Faders 33–48
10H	Control Faders
20H	General Lighting Controllers (defined for special functions)
30H	Flash Switch 1–16
31H	Flash Switch 17–32
32H	Flash Switch 33–48
40H	Control Switch 1
41H	Control Switch 2

Channel Page	Description
00H	Preset A Faders 1–16
01H	Preset A faders 17–32
02H	Preset A Faders 33–48
40H	Preset B Faders 1–16
41H	Preset B faders 17–32
42H	Preset B Faders 33–48

None of the menu keys or the record switch are assigned to a MIDI control change code; these facilities are kept local to MX. This is to maintain integrity of operation and simplicity of design. Note that the scene B faders which double as submasters in scene mode are given individual codes. MX will transmit codes for scene masters when scene B faders are used in scene mode.

## MX Control Code Assignment

Each of the MX console functions that require a unique MIDI control code message are summarised below, the full MIDI Type and Data messages are shown:

## MIDI INTERFACE

Faders:	MIDI message (HEX)
	(n = MIDI channel 0-F)
A Crossfader	Bn 0C 10 10 vv (vv = 00 to 7F)
B Crossfader	Bn 0C 10 11 vv
C Crossfader	Bn 0C 10 12 vv
D Crossfader	Bn 0C 10 13 vv
Flash Master	Bn 0C 10 14 vv
FX Fade	Bn 0C 10 15 vv
FX Master	Bn 0C 10 17 vv
Crossfader A Time Control	Bn 0C 10 18 vv
Crossfader B Time Control	Bn 0C 10 19 vv
Audio/MIDI Fader	Bn 0C 10 1B vv
Grand Master Fader	Bn 0D vv <b>Note this is for compatibility</b>
FX speed	Bn 0F vv <b>Note this is for compatibility</b>

### Application Note:

All fader levels are stored as bytes in MX. These are reduced to 7 bits by shifting the byte one bit to the right. Note that the above coding uses running status.

MX

**Switches:**

Scene Mode	Bn 0C 40 10 vv (vv = 00 or 7F)
Flash Mode	Bn 0C 40 11 vv
Hold	Bn 0C 40 12 vv
Blackout	Bn 0C 40 13 vv
Flash Ch/Sc	Bn 0C 40 14 vv
FX Step	Bn 0C 40 15 vv
FX Go/Stop	Bn 0C 40 16 vv
FX 1	Bn 0C 40 17 vv
FX 2	Bn 0C 40 18 vv
FX 3	Bn 0C 40 19 vv
FX 4	Bn 0C 40 1A vv
FX 5	Bn 0C 40 1B vv
FX 6	Bn 0C 40 1C vv
FX Chase Type	Bn 0C 40 1D vv
FX Build Type	Bn 0C 40 1E vv
FX Cycle Type	Bn 0C 40 1F vv
FX Flicker Type	Bn 0C 41 10 vv
FX Random Type	Bn 0C 41 11 vv
FX Audio/MIDI Type	Bn 0C 41 12 vv
FX Forward	Bn 0C 41 13 vv
FX Reverse	Bn 0C 41 14 vv
FX Bounce	Bn 0C 41 15 vv

**LCD Functions:**

Submaster Page number	Bn 0C 20 10 vv (vv = page number) 0 → 3
FX Page number	Bn 0C 20 11 vv (vv = page number) 0 → 3
Sequence C Page number	Bn 0C 20 12 vv (vv = page number) 0 → 3
Sequence C Scene number	Bn 20 13 vv (vv = scene number) 0 → no. of chans.
Sequence D Page number	Bn 20 14 vv (vv = page number) 0 → 3
Sequence D Scene number	Bn 20 15 vv (vv = scene number) 0 → no. of chans.
Dimmer Patch number	Bn 20 16 vv (vv = patch number, 0 or 1)

Functions that are not configured to a specific MIDI control change code cannot be controlled via the MIDI link.

**MIDI TIMING MESSAGES – FX CONTROL**

The MIDI Timing Clock (F8 hex), Start (FA hex), Cont. (F0 hex) and Stop (FC hex) will be used to control any MIDI effect. These messages do not have any associated data bytes and can be received by MX at any time, even within another message.



## MIDI INTERFACE

Once running, the timing clock signals are divided by the AUDIO/MIDI fader setting – from timing signal divided by 3 at the top to timing signal divided by 48 at the bottom – and used to increment the effect until an FC HEX 'Stop' message is received.

### Active Sensing

MX does not support active sensing.

### Strand Lighting System Exclusive Messages

#### (Setup Information)

These messages will be used by MX to transmit and receive the current status of the board (in OUT mode this message is generated by pressing the SYNC softkey).

The messages incorporate Strand's System Exclusive ID, this is:

**00 20 01 (HEX)**

The product code for MX is:

**01**

The code for SYNC is:

**01**

The format is as defined as follows:

**F0 <ID> <MIDI channel number> <product code> <function code> <message> <message> ... F7**

The messages are made up of 2 bytes. The first is a parameter identifier, the second is its value. The messages may be transmitted in any order:

*MX*

Parameter	Allowed Values	Meaning
0 = scene page	0 - 3	pages 1 - 4
1 = fx page	0 - 3	pages 1 - 4
2 = C master page	0 - 3	pages 1 - 4
3 = C master scene	0 - number of channels	0 = blackout scene
4 = D master page	0 - 3	pages 1 - 4
5 = D master scene	0 - number of channels	0 = blackout scene
6 = Dimmer patch no.	0 or 1	select patch 1 or 2
7 = Active C/D master	0 or 1	0 = C active, 1 = D active
8 = Mode	0 or 1	0 = channel, 1 = scene
9 = Flash mode	0 or 1	0 = channel, 1 = scene
10 = Flash state	0 or 1	0 = normal, 1 = solo
11 = Flash enable	0 or 1	0 = disabled, 1 = enabled
12 = Hold state	0 or 1	0 = off, 1 = on
13 = Blackout state	0 or 1	0 = normal, 1 = blackout
14 = Selected FX no.	0 - 5 or 7FH	FX 1 - 6 or 7F = none

### MIDI NOTE ON / NOTE OFF

In MIDI IN mode, MX will respond to MIDI Note on/Note off commands in addition to those listed above. A received Note on message will act as a flash button (using the flash level set on the flash level fader), according to the following rules:

Each note activates its correspondingly numbered channel +1 up to the number of channels on the board. So, Note 0 activates channel 1, note 11, channel 12 etc. Notes higher than the number of channels are used MODULO the number of channels on the board. So on a 12 channel board, note 12 activates channel 1, as does note 24 etc. On a 48 way board, therefore, notes 0-47 activate channels 1-48 as do notes 48-95 etc.

Note off messages de-activate the corresponding channels.

The details of the codes responded to are summarised in the MIDI Implementation Chart under the VELOCITY function heading.

## MIDI IMPLEMENTATION CHART

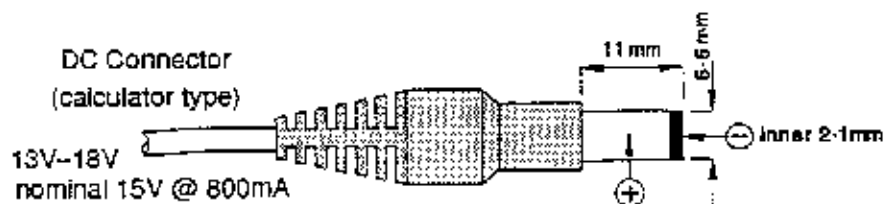
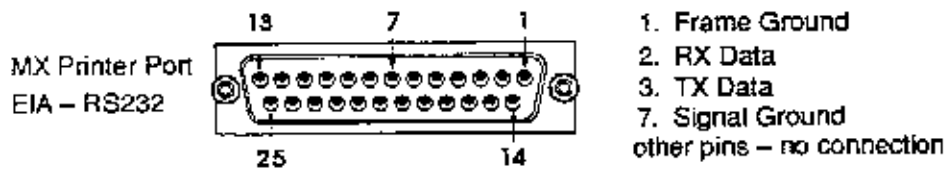
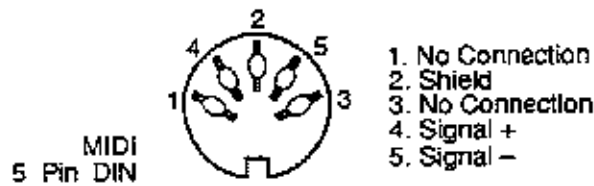
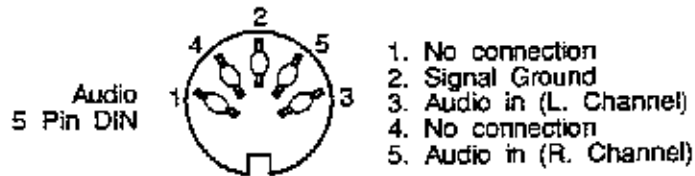
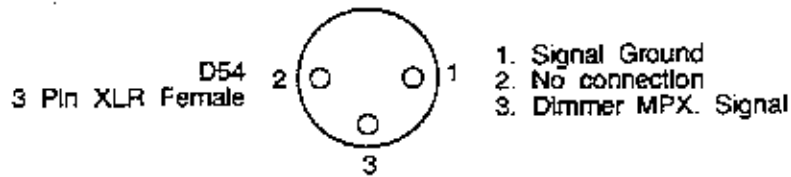
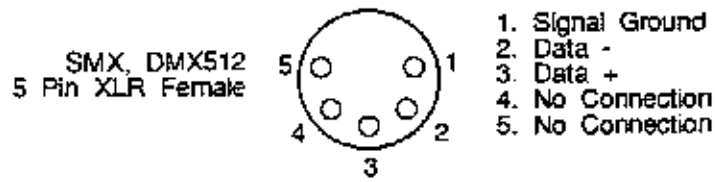
Strand Lighting  
[LIGHTING CONTROL DESK]MX  
Version 1.0 Date: 1st Sept 1990

Function...	Transmitted	Recognised	Remarks
Basic Channel Default Channel	1 - 16 1 - 16	1 - 16 1 - 16	memorized TX - RX always
Mode Default Messages Altered	Mode 3 X *****	Mode 3 X X	
Note Number True Voice	X *****	0 - 127 X	Flash Button - Note * Number of Channels (?)
Velocity Note ON Note OFF	X X	9n v = 1 - 127 9n v = 0, 8n v = xx	(?) ... No Function
After Touch Key's Ch's	X X	X X	
Pitch Bender	X	X	
Control Change Control Page 12 Grand Master 13 Channel Page 14 FX Speed 15 Data Channel 0 16 ↓ Data Channel 15 31	OX OX OX OX OX OX	OX OX OX OX OX OX	control of lighting parameters (1) (2) Control Page and Channel Page determine the controller allocation for Data Channel values Refer to MX manual
Prog Change True #	*****	X	
System Exclusive	OX	OX	(1) (2) memory dumps and control Refer to MX manual
System Common :Song Pos :Song Sel :Tune	X X X	X X X	
System Real Time :Clock :Commands	X X	Timing Clock Start, Stop, Cont	May control a running effect
Aux Messages :Local ON/OFF :All Notes Off :Active Sense :Reset	X X X X	X X X X	
Notes	*1) MIDI messages only Transmitted in MIDI OUT mode *2) MIDI messages only Received in MIDI IN mode		

Mode 1: OMNI ON, POLY    Mode 2: OMNI ON, MONO    O :Yes  
 Mode 3: OMNI OFF, POLY    Mode 4: OMNI OFF, MONO    X :No

MX

APPENDIX A – CONNECTOR CONFIGURATIONS



MX

## APPENDIX B – DIAGNOSTIC TESTS & ERROR MESSAGES

### Diagnostic Tests

All tests are performed on the premise that if successful, they will return control to the user without any message. It is therefore assumed that if the given test does not produce an ERROR it is successful. There is no positive indication of "PASS". All test failures are indicated by an ERROR in the format described in this appendix. This appendix lists the tests with the possible ERROR numbers that may be generated.

The following tests are performed on COLD START, in the order listed:

FADER CONNECTIONS TEST  
RAM TEST  
ROM TEST  
NMI TEST  
CHECK DATA AREAS  
A TO D REF TEST  
D TO A REF TEST  
BATTERY TEST  
D TO A TEST  
D54 SYNC. TEST  
RS232 TEST (internal only)  
MIDI TEST (internal only)  
DMX/SMX TEST  
FADER MODULE TEST (LEDs and stuck keys only)  
CONTROL MODULE TEST (LEDs and stuck keys only)

The following tests are performed on WARM START, in the order listed:

FADER CONNECTIONS TEST  
CHECK DATA AREAS

### TEST DESCRIPTIONS

#### ROM TEST

This test checks the EPROM set.

Possible errors: 1390

#### RAM TEST

This test non-destructively tests the RAM, ie writes patterns to the RAM, testing each bit in turn.

Possible errors: 1389

MX

**NMI TEST**

This test checks that a Non-Maskable interrupt is seen when an attempt is made to write to an area of protected memory. There are 3 areas – the data areas, the memory card and the EPROM.

Possible errors: 1391

**CHECK DATA AREAS**

This test checks the integrity of the protected data areas, by verifying their checksums.

Possible errors: 1384, 1385, 1386, 1387

**FADER CONNECTIONS TEST (at every power-up)**

This test checks that a valid set of fader modules are connected to the control PCB.

Possible errors: 1388

**LCD TEST (Menu only)**

This test invokes the LCD CONTRAST TEST. Having done this it puts all segments of the LCD on for the user to check visually.

Possible errors: 1393

**LCD CONTRAST TEST**

This test checks that the LCD contrast can be controlled by the processor. It changes the contrast between max. and min, checking the LCD reference voltage.

Possible errors: 1393

**A TO D REF TEST**

This test checks that the A/D reference (set by two equal resistors R95, 96) is reading 2.6V A/D (+/- 10%).

Possible errors: 1392

**BATTERY TEST**

This test checks that the back-up battery is within tolerance. Also tests measuring circuit, giving indication of possible A/D problems.

Possible errors: 1395, 1396

### D TO A REF TEST

This test checks the D/A reference generator by setting it to a known value and checking against the A/D.

Possible errors: 1394

### D TO A TEST

Having performed a test to ascertain full-scale on the D/A, this test checks the D/A by setting each bit in turn and checking it against the A/D.

Possible errors: 1397

### D54 SYNC. TEST

This test checks that the processor has full control of the D/A and associated circuitry. It generates a voltage with the D/A and checks that the D54 sync. pulse can be correctly superimposed. It also checks that the D/A can be enabled / disabled.

Possible errors: 1398

### RS232 TEST(internal)

This test checks that RS232 part of the DUART (IC25) is working correctly by sending / receiving a stream of data internally.

Possible errors: 1399

### RS232 TEST (external)

This test checks that RS232 part of the DUART (IC25) is working correctly by sending / receiving a stream of data externally using the interface ICs. It therefore requires a physical loopback on the 25 pin D type between pins 2 & 3

Possible errors: 1400

### MIDI TEST (internal)

This test checks that MIDI part of the DUART (IC25) is working correctly by sending / receiving a stream of data internally.

Possible errors: 1401

### MIDI TEST (external)

This test checks that MIDI part of the DUART (IC25) is working correctly by sending / receiving a stream of data externally using the interface ICs. It therefore requires a physical loopback between the MIDI IN and MIDI OUT

Possible errors: 1402

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**DMX/SMX TEST**

This test checks that RS 485 port is working correctly by sending / receiving a stream of data externally using the interface ICs. No loopback is required, but it is necessary to ensure that there is no significant load on the port.

Possible errors: 1403

**AUDIO INPUT TEST**

This is a complex test. It requires the AUDIO/MIDI fader to be set to full to operate successfully. This is tested before the actual audio input is tested. An incorrect setting will give error 404. A series of tone bursts, at increasing frequency and low level, are then generated by the processor. These are fed into the audio processor, which should generate appropriate interrupts.

Possible errors: 404, 1405

**MEMORY CARD TEST**

**BEWARE:** This test requires a memory card and will **FORMAT** it, so **destroying any valuable data held.**

This test does two things. First, it attempts to create a file on the card called TEST.BIN (The card is MS-DOS formatted). Having created this file, it checks it for integrity. In the second part of the test it writes a pattern of bytes into the 32 pages of the card (64 kbyte) to check that the card page register is working correctly.

Possible errors: 320, 322, 324, 325, 326, 336, 337, 338, 1321, 1323, 1406, 1407

**FADER MODULE TEST**

This test has a number of sub-tests. The first is a sequence through the flash LEDs, followed by all on. Next, the LCD prompts the user to press each flash key in turn. The associated LED will light in each case. Finally, the LCD prompts the user to cycle each fader in turn through its full travel. A full excursion is required in each case. The percentage level is displayed on the LCD. The user should check for acceptable performance. The faders must all be at 0 before starting this test.

Possible errors: 1408, 1409



### CONTROL MODULE TEST

This test has a number of sub-tests. The first is a 'build' through the control PCB LEDs. Next, the LCD prompts the user to press each named key in turn. Finally, the LCD prompts the user to cycle each fader in turn through its full travel. A full excursion is required in each case. The percentage level is displayed on the LCD. The user should check for acceptable performance. The faders must all be at their 0 positions before starting this test (Faders set away from front: TIME A, TIME B, B MASTER, D MASTER, FX FADE TIME, FX STEP TIME. All others set nearest front)

Possible errors: 1410, 1411, 1412

### ERROR MESSAGES

All ERROR's are reported in a uniform way using MX's central error handler and the LCD display.

The format is always:

— ERROR #### — (#### is the error number)

Ident. string

Diagnostic info.

PROMPT

Each error is allocated a unique number and identification string as a brief description. Depending on the type of error, some diagnostic information may be presented. This varies in type depending on the error, and is described below. The user is prompted with the soft key labels at the bottom of the screen, or if the error is Fatal (ie the system cannot continue with such a serious fault), the user is warned that the system is about to RESET itself with the string: "Resetting system!"

Error numbers appear in two types:

Those with numbers less than 1000 are generally of a less serious nature and are not logged.

Errors with numbers greater than 1000 are regarded as serious and are logged in the internal ERROR LOG. The log is for both user and service purposes, and allows the last 100 errors to be viewed.

The errors are not consecutively numbered because each number comprises:

The software module where the error was generated.

MX

The error number within that module.

Some errors, particularly those that are likely to be seen by the user (for example when a memory card transfer is attempted with no card in place), are translated into the 3 languages supported. Test and system type errors are only presented in English.

There are 3 types of general diagnostic data:

1) Voltages:

These are presented as a result of internal tests in the form:

X.XX Y.YY Z.ZZ, where X is the voltage read, Y is the highest voltage and Z is the lowest voltage allowed.

2) Addresses/Data:

These are presented in the form HHHH, where H is a hexadecimal number.

3) Fader levels:

These are presented as AAA, where A is the percentage of full travel as read from the fader in question. Other forms of data may be used – these are described in individual cases.

## ERROR DESCRIPTIONS

ERROR	12
Identification:	"Record Inhibited!"
Diagnostic Information:	None
Type:	System/Warning
Description:	Record lock is activated, disallowing record/modify actions
Probable cause:	
Remedy:	Turn RECORD/LOCK to OFF

ERROR	288
Identification:	"MIDI framing error"
Diagnostic Information:	None
Type:	MIDI interface/Warning
Description:	A byte of MIDI data was received with incorrect format
Probable cause:	Faulty MIDI connections or MIDI cable too long
Remedy:	Find fault or shorten cable

## APPENDICES

ERROR	289
Identification:	"MIDI RX overrun"
Diagnostic Information:	None
Type:	MIDI interface/Warning
Description:	A byte of MIDI data was received before the last was processed
Probable cause:	MIDI data was transmitted to MX too fast, or MIDI data transmitted to MX during test
Remedy:	Reduce amount of MIDI data transmitted to MX or disconnect MIDI device.
ERROR	320
Identification:	"Card full"
Diagnostic Information:	File name accessed
Type:	Memory Card/Warning
Description:	The memory card is full.
Probable cause:	There is insufficient room to save data to the memory card.
Remedy:	Delete DOS files not used by MX, or FORMAT card.
ERROR	322
Identification:	"Card missing!"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The memory card is not inserted correctly
Probable cause:	
Remedy:	Insert card, try again.
ERROR	324
Identification:	"Card write protected"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The card is write protected and may not have data saved on it
Probable cause:	The card write protection switch is set to ON
Remedy:	Confirm that you wish to overwrite data, then change write protection to OFF and re-try
ERROR	325
Identification:	"Invalid card format"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The card is not MS-DOS formatted, so may not be used yet
Probable cause:	The card is new, or data has been lost due to battery failure
Remedy:	Use FORMAT to initialize the card
ERROR	326
Identification:	"Card directory full"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The card directory has insufficient room for MX data files
Probable cause:	The card may only contain 8 files, MX needs 4 spare entries
Remedy:	Delete DOS files not used by MX, or FORMAT card

MX

ERROR	336
Identification:	"Card file error"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The software has detected a fault in the MX card file read
Probable cause:	The card data has been partially corrupted
Remedy:	QUIT card reading
ERROR	337
Identification:	"Card file closed"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The software has detected a fault in the MX card file read
Probable cause:	The card file has been edited in some way
Remedy:	QUIT card reading
ERROR	338
Identification:	"Card file missing"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The card file requested was not found on the card
Probable cause:	The card does not contain the requested data
Remedy:	QUIT card reading
ERROR	339
Identification:	"Partial Transfer"
Diagnostic Information:	Filename accessed
Type:	Memory Card/Warning
Description:	The card file requested was only partially saved or read
Probable cause:	There was a fault in the data, and the transfer was QUITTED
Remedy:	Try again, use CONTINUE to finish reading card data
ERROR	352
Identification:	"RS232 framing error"
Diagnostic Information:	None
Type:	RS232 interface/Warning
Description:	A byte of RS232 data was received with incorrect format
Probable cause:	Format of data transmitted to MX is different to SETUP RS232
Remedy:	Check format of data transmitted and change either MX or remote device SETUP accordingly
ERROR	353
Identification:	"RS232 RX overrun"
Diagnostic Information:	None
Type:	RS232 interface/Warning
Description:	A byte of RS232 data was received before the last was processed
Probable cause:	RS232 data was transmitted to MX too fast, or data transmitted to MX during test
Remedy:	Reduce baud rate or disconnect RS232 device.

## APPENDICES

<b>ERROR</b>	354
Identification:	"RS232 parity error"
Diagnostic Information:	None
Type:	RS232 interface/Warning
Description:	A byte of RS232 data was received with incorrect parity
Probable cause:	Remote devices' RS232 data SETUP was different to MX, faulty connections present, or cable too long
Remedy:	Change EITHER MX OR remote device SETUP accordingly, find bad connection or shorten cable
<b>ERROR</b>	404
Identification:	"Audio fader too low"
Diagnostic Information:	% level read, valid max / min % levels
Type:	Test/Warning
Description:	The audio fader is set too low for the audio input test
Probable cause:	Fader set incorrectly
Remedy:	Set audio fader to full (10)
<b>ERROR</b>	1001
Identification:	"No such handle!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The system has attempted to access a non-existent "device".
Probable cause:	Program fault
Remedy:	System reset
<b>ERROR</b>	1002
Identification:	"No such read!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The system has attempted to access a non-existent "device".
Probable cause:	Program fault
Remedy:	System reset
<b>ERROR</b>	1003
Identification:	"No such write!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The system has attempted to access a non-existent "device".
Probable cause:	Program fault
Remedy:	System reset
<b>ERROR</b>	1004
Identification:	"Null Ptr used!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The system has attempted to access a non-existent string or function.
Probable cause:	Program fault
Remedy:	System reset

**MX**

<b>ERROR</b>	<b>1005</b>
Identification:	"Circ buffer full!"
Diagnostic Information:	None
Type:	System/Warning
Description:	The system has run out of space in a data buffer
Probable cause:	Too much data being transmitted to MX or I/O device fault
Remedy:	Reduce amount data being transmitted or investigate fault
<b>ERROR</b>	<b>1006</b>
Identification:	"Invalid parameter!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	Invalid information was sent to a data buffer
Probable cause:	Program fault
Remedy:	System reset
<b>ERROR</b>	<b>1007</b>
Identification:	"Watchdog timed out!"
Diagnostic Information:	Module number
Type:	System/Fatal
Description:	A watchdog timer has expired.
Probable cause:	Program fault or system overloaded in some way
Remedy:	System reset
<b>ERROR</b>	<b>1008</b>
Identification:	"Bad interrupt!"
Diagnostic Information:	Interrupt number (HEX)
Type:	System/Fatal
Description:	An unexpected/unused interrupt was received.
Probable cause:	Program or processor fault, probably due to noisy environment
Remedy:	System reset
<b>ERROR</b>	<b>1009</b>
Identification:	"Duplicate string!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	A duplicate string was found whilst initializing the hash table
Probable cause:	EPROM fault
Remedy:	Replace EPROM set
<b>ERROR</b>	<b>1010</b>
Identification:	"No such open!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The system has attempted to access a non-existent "device"
Probable cause:	Not used
Remedy:	

## APPENDICES

ERROR	1011
Identification:	"Power fail stuck!"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The power fail signal is stuck in its active state or power on signal absent.
Probable cause:	Inter-PCB cable faulty, PSU chip failure or switch faulty.
Remedy:	Find and correct fault.
ERROR	1192
Identification:	"LED - I/O fault"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The LED controller is not responding to commands
Probable cause:	2MHz clock failure or failure of IC20
Remedy:	Check clock and IC20
ERROR	1224
Identification:	"LCD I/O fault"
Diagnostic Information:	None
Type:	System/Fatal
Description:	The LCD is not responding to commands.
Probable cause:	LCD cable or LCD controller failure.
Remedy:	Find and correct fault.
ERROR	1225
Identification:	"LCD - invalid ansi"
Diagnostic Information:	None
Type:	System/Fatal
Description:	An attempt was made to write a non-ansi symbol to the LCD
Probable cause:	Program fault
Remedy:	System reset
ERROR	1226
Identification:	"LCD - invalid pos"
Diagnostic Information:	None
Type:	System/Fatal
Description:	An attempt was made to write to an invalid position on the LCD
Probable cause:	Not used
Remedy:	
ERROR	1321
Identification:	"Card R/W error"
Diagnostic Information:	File written
Type:	Memory Card/Warning
Description:	The data written to the card was not verified correctly
Probable cause:	Faulty memory card or card interface circuitry
Remedy:	Try again, if error persists, replace card and/or service MX

MX

<b>ERROR</b>	1323
Identification:	"Card battery low"
Diagnostic Information:	File name accessed
Type:	Memory Card/Warning
Description:	The card battery voltage is too low for reliable operation
Probable cause:	The card battery has fallen below 2.6V and is exhausted
Remedy:	Replace Memory card battery – see repair handbook for details
<b>ERROR</b>	1384
Identification:	"Scene corrupt!"
Diagnostic Information:	Scene in format Pg.Scene
Type:	Test/Warning
Description:	A scene checksum has failed
Probable cause:	Internal battery discharged, or mem. card battery exhausted, or power fail detection circuitry faulty
Remedy:	Press CONTINUE to clear the scene, or, if performing memory card transfer, press CONTINUE to carry on after ignoring scene or QUIT to end the transfer.
<b>ERROR</b>	1385
Identification:	"Effect corrupt!"
Diagnostic Information:	Effect in format Pg.Effect
Type:	Test/Warning
Description:	An Effect checksum has failed
Probable cause:	Internal battery discharged, or mem. card battery exhausted or power fail detection circuitry faulty
Remedy:	As error 1384
<b>ERROR</b>	1386
Identification:	"Setup corrupt!"
Diagnostic Information:	None
Type:	Test/Warning
Description:	The setup checksum has failed
Probable cause:	Internal battery discharged, or mem. card battery exhausted or power fail detection circuitry faulty
Remedy:	CONTINUE or QUIT – cause setup to be reset to factory defaults
<b>ERROR</b>	1387
Identification:	"Patch corrupt!"
Diagnostic Information:	Patch number (1 or 2)
Type:	Test/Warning
Description:	A dimmer patch checksum has failed
Probable cause:	Internal battery discharged, or mem. card battery exhausted or power fail detection circuitry faulty
Remedy:	As error 1384



## APPENDICES

<b>ERROR</b>	1388
Identification:	"Fader module fault"
Diagnostic Information:	Module code
Type:	Test/Fatal
Description:	A fault has been detected in the fader module connections
Probable cause:	Fader module cable fault or invalid id switch combination
Remedy:	Find fault and check switch settings
<b>ERROR</b>	1389
Identification:	"RAM test failed"
Diagnostic Information:	Address, byte read, byte written
Type:	Test/Fatal
Description:	A RAM test pattern has read back incorrectly
Probable cause:	Backup battery low or RAM faulty
Remedy:	Find fault or allow battery to charge
<b>ERROR</b>	1390
Identification:	"ROM checksum failed"
Diagnostic Information:	Checksum read, correct checksum
Type:	Test/Fatal
Description:	The ROM checksum does not agree with the programmed value
Probable cause:	EPROM faulty
Remedy:	Replace EPROM set.
<b>ERROR</b>	1391
Identification:	"NMI fault"
Diagnostic Information:	Address of byte written to stimulate NMI
Type:	Test/Fatal
Description:	An NMI was not seen by the processor when stimulated
Probable cause:	PLD device IC28 incorrectly programmed or faulty.
Remedy:	Find fault or replace IC28.
<b>ERROR</b>	1392
Identification:	"A/D Reference fault"
Diagnostic Information:	Voltage read, max., min. valid voltages
Type:	Test/Warning
Description:	The A/D converter is out of spec.
Probable cause:	R95/96 incorrect or IC26 faulty
Remedy:	Find fault or replace IC26.
<b>ERROR</b>	1393
Identification:	"LCD contrast fault"
Diagnostic Information:	Voltage read, max., min. valid voltages
Type:	Test/Warning
Description:	The LCD contrast control not working correctly.
Probable cause:	VT10, R70, 73, 76, or C64 faulty
Remedy:	Find fault

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<b>ERROR</b>	1394
Identification:	"D/A Reference fault"
Diagnostic Information:	Voltage read, max., min. valid voltages
Type:	Test/Warning
Description:	The D/A converter reference is out of spec.
Probable cause:	Inter-PCB cable faulty or D_A_SET signal not present
Remedy:	Find fault
<b>ERROR</b>	1395
Identification:	"Battery volts fault"
Diagnostic Information:	Voltage read, max., min. valid voltages
Type:	Test/Warning
Description:	The battery voltage is out of spec.
Probable cause:	Battery discharged or faulty, Inter-PCB cable faulty
Remedy:	Find fault, or charge battery for several hours, if error persists replace battery.
<b>ERROR</b>	1396
Identification:	"Battery ref fault"
Diagnostic Information:	Voltage difference read, max., min. valid voltages
Type:	Test/Warning
Description:	The battery reference voltage is out of spec.
Probable cause:	R60 faulty, IC18 faulty, A/D faulty (excessive leakage)
Remedy:	Find fault
<b>ERROR</b>	1397
Identification:	"D to A fault"
Diagnostic Information:	EITHER: Voltage read, max., min. valid voltages OR: PWM setting, valid max., min settings
Type:	Test/Warning
Description:	D/A converter is out of spec.
Probable cause:	IC6, IC4, IC7 or associated components faulty, Inter-PCB cable faulty, or IC25 faulty.
Remedy:	Find fault
<b>ERROR</b>	1398
Identification:	"D54 sync. fault"
Diagnostic Information:	Voltage read, max., min. valid voltages
Type:	Test/Warning
Description:	EITHER: The D54 synchronisation pulse is not being generated. OR: The D/A converter ENABLE control is not working.
Probable cause:	R21, 22, D6, Inter-PCB cable faulty, IC6 or IC26 faulty.
Remedy:	Find fault

MX

## APPENDICES

<b>ERROR</b>	1399
Identification:	"RS232 int-loop fault"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The internal loopback in IC25 for the RS232 port is faulty
Probable cause:	Memory decoding faulty (IC28, 32) or IC25 faulty, or data being transmitted to MX during test
Remedy:	Find fault, or disconnect RS232 device
<b>ERROR</b>	1400
Identification:	"RS232 ext-loop fault"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The external loopback for the RS232 port is faulty
Probable cause:	No loopback connector installed?, IC5 faulty
Remedy:	Fit loopback or find fault
<b>ERROR</b>	1401
Identification:	"MIDI int-loop fault"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The internal loopback in IC25 for the MIDI port is faulty
Probable cause:	4MHz clock failure, Memory decoding faulty (IC28, 32), IC25 faulty or MIDI data being transmitted to MX during test
Remedy:	Find fault or disconnect external MIDI device
<b>ERROR</b>	1402
Identification:	"MIDI ext-loop fault"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The external loopback for the MIDI port is faulty
Probable cause:	No loopback connector installed?, IC5 faulty
Remedy:	Fit loopback or find fault
<b>ERROR</b>	1403
Identification:	"SMX/DMX port fault"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The DMX/SMX port loopback is not responding.
Probable cause:	Short on RS485 lines. IC9, IC3 faulty
Remedy:	Find fault
<b>ERROR</b>	1405
Identification:	"Audio test fault"
Diagnostic Information:	Frequency at which test failed
Type:	Test/Warning
Description:	The audio threshold detector has not seen signals at the required test frequencies.
Probable cause:	Wrong components around IC2, IC4, or audio source connected during test
Remedy:	Re-try, find fault., or remove audio source

MX

<b>ERROR</b>	1406
Identification:	"Memory card error"
Diagnostic Information:	Byte read, byte written
Type:	Test/Warning
Description:	The memory card has not read back the test values written
Probable cause:	Connector problem, card interface circuitry problem
Remedy:	Find fault, try another card
<b>ERROR</b>	1407
Identification:	"Mcard paging fault"
Diagnostic Information:	Page number accessed
Type:	Test/Warning
Description:	The memory card has not read back the test values written
Probable cause:	Wrong size card used (64kbyte required) or IC41 faulty
Remedy:	Find fault, try another card
<b>ERROR</b>	1408
Identification:	"Flash key stuck"
Diagnostic Information:	Corresponding channel number
Type:	Test/Warning
Description:	A flash key is stuck in the "on" state
Probable cause:	Key damaged, corresponding pull-up resistor disconnected, or something resting on key during power-up sequence
Remedy:	Find fault
<b>ERROR</b>	1409
Identification:	"Channel fader stuck"
Diagnostic Information:	Corresponding channel number
Type:	Test/Warning
Description:	An A or B preset fader is set at the wrong level
Probable cause:	Faders not reset prior to fader test.
Remedy:	Reset fader!
<b>ERROR</b>	1410
Identification:	"Control key stuck"
Diagnostic Information:	Key number
Type:	Test/Warning
Description:	A control module key is stuck in the "on" state
Probable cause:	Key damaged, corresponding pull-up resistor disconnected, or something resting on key during power-up sequence
Remedy:	Find fault
<b>ERROR</b>	1411
Identification:	"Control key bounced"
Diagnostic Information:	Key name
Type:	Test/Warning
Description:	A control module key has "bounced"
Probable cause:	Key damaged
Remedy:	Find fault or replace key

## APPENDICES

ERROR	1412
Identification:	"Control fader stuck"
Diagnostic Information:	Fader number, fader expected, % level read
Type:	Test/Warning
Description:	A control fader is set at the wrong level
Probable cause:	Faders not reset prior to fader test.
Remedy:	Reset fader!
ERROR	1416
Identification:	"Watchdog timed out!"
Diagnostic Information:	Module number
Type:	System/Fatal
Description:	A watchdog timer has expired.
Probable cause:	Program fault or system overloaded in some way
Remedy:	System reset
ERROR	1417
Identification:	"Invalid interrupt!"
Diagnostic Information:	Interrupt number (HEX)
Type:	System/Fatal
Description:	An unexpected interrupt was received.
Probable cause:	Program fault, probably due to noisy environment
Remedy:	System reset

MX

# Strand Lighting MX

RECORD

NUM LOCK

BLACKOUT

GRAB MASTER

ACTIVE

1 CHASE  2 BUILD  3 CYCLE  4 FLICKER  5 RANDOM  6 AUDIO/MIDI

7 FORWARD  8 REVERSE  9 BOUNCE  0 STOP

10 9 8 7 6 5 4 3 2 1 0

AUDIO/MIDI

FX FADE TIME

STEP TIME

PR MASTER

GRAB MASTER

Scene 1-10  
FX 1-10  
SCENE FX SETUP

Scene 1-10  
FX 1-10  
SCENE FX SETUP

TIME A/C

TIME B/D

MANUAL

2 5 10 15 30 45 1min 2min 5min 10min 00

A ACTIVE

HELD IN

EXPOSED

SCENE CHANNEL

FLASH LEVEL

FLASH MODE

OFF  
FLASH  
SCLO

10 9 8 7 6 5 4 3 2 1 0

SCENE CHANNEL

MODE

A 10 9 8 7 6 5 4 3 2 1 0

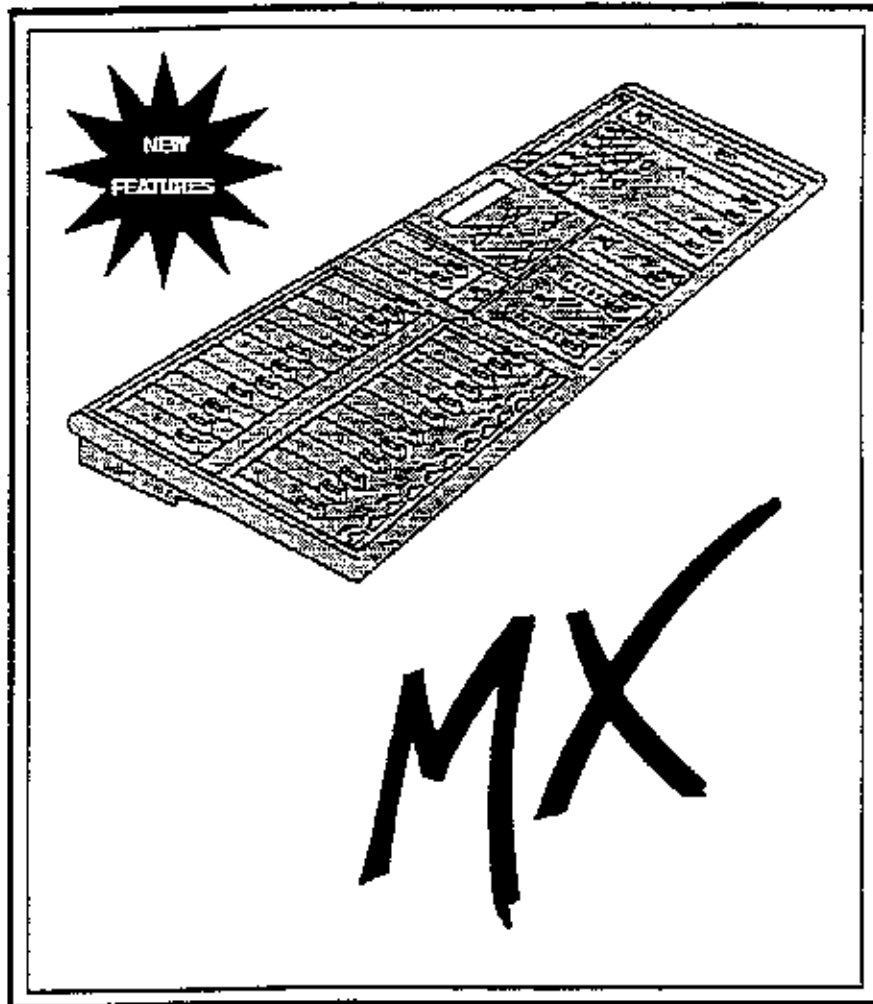
B 10 9 8 7 6 5 4 3 2 1 0

C 10 9 8 7 6 5 4 3 2 1 0

D 10 9 8 7 6 5 4 3 2 1 0

# OPERATOR HANDBOOK – Supplement

( BI Version Onwards )



Document No.: 8807005  
(A7S /Z)

Issue : 2

Date : January 1993

## Strand Lighting Offices

Note: Telephone numbers exclude international and national dialling codes

<b>Asia:</b> 802 Houston Centre, 63 Mody Road, Tsimshatsui East, Kowloon, Hong Kong	Tel: 366 5161	Fax: 369 4990
<b>Canada:</b> 2430 Lucknow Drive, Unit 15, Mississauga, Ontario L5S 1V3 Canada	Tel: 416 677 7130	Fax: 416 677 6859
<b>France:</b> 25 Villa Des Fleurs, 92400 Courbevoie, France	Tel: 1 478 86666	Fax: 1 433 37175
<b>Germany:</b> Salzbergstrasse, 3340 Wolfenbunel-Salzzahlum, Germany	Tel: 6331 30080	Fax: 5331 78883
<b>Italy:</b> Via delle Gardenie 80 (Pontina Vecchia Km 33,400), 00040 Pomezia-Roma, Italy	Tel: 6 914 7123	Fax: 6 914 7136
<b>United Kingdom:</b> Grant Way, (off Syon Lane), Isleworth, Middx., TW7 5QD U.K.	Tel: 081 660 9171	Fax: 081 558 2108
<b>USA:</b> PO Box 9004, 18111 South Santa Fe Avenue, Rancho Dominguez, CA 90221 USA	Tel: 310 637 7500	Fax: 310 632 5519

Whilst every effort has been made to ensure the completeness and accuracy of the information in this handbook, no liability can be accepted for any errors or omissions.

Strand Lighting Ltd. reserves the right to amend the specifications of the product at any time.

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## TERMINAL DISPLAY

### Introduction

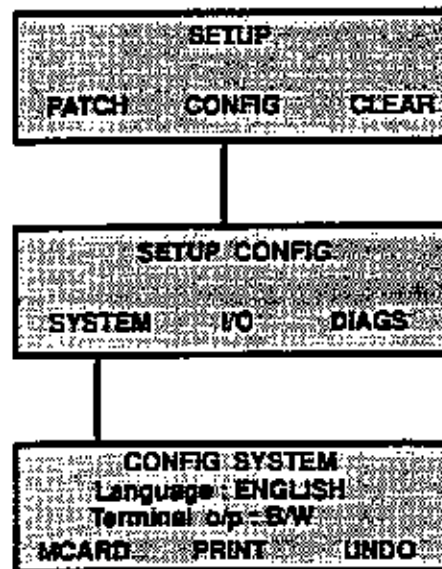
The facility now exists to view the output levels and status modes of MX 'at a glance' either directly via an ANSI terminal available from Strand Lighting, or alternatively a Terminal Emulator program is available for any PC compatible, running any level of DOS, with the option to view in colour.

Part Number for the terminal and interface lead  
04 900 01.

Part Number for the lead only  
04 900 02.

The emulator version is a 'display only' feature and involves no input from the PC keyboard other than booting up and exiting.

The CONFIG SYSTEM menu on the MX now shows an extra parameter, *Terminal o/p : B/W*, which is the default mode. This can be altered to *COL* or *OFF*.



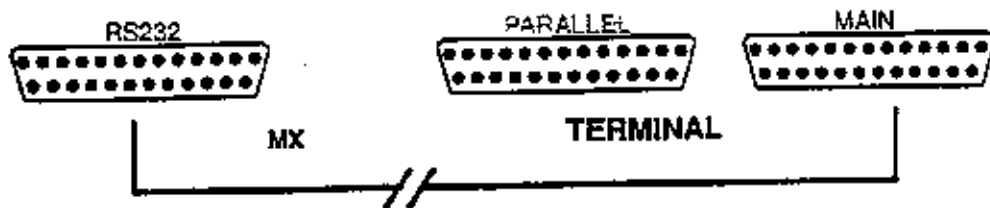
A B/W output will run slightly faster than a colour one.

*OFF* will stop all terminal output processing and will therefore speed up the user interface.

MX

### Connecting MX To The Strand Terminal Monitor

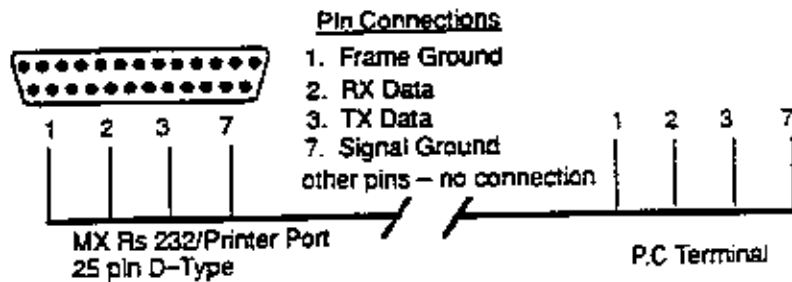
The output data from MX to the terminal is taken from the RS232 port (25 way D type connector). Connect the interface lead into the MAIN (not PARALLEL) port of your terminal and the RS232 port of the MX.



If any other terminal is to be used, connection should be made to the units' COMMS socket.

### Connecting MX To a PC

A suitable interface lead needs to be sourced for connecting MX to a P.C. Wiring for this is shown below and please note that it is PIN to PIN, which is not standard for some commercially available RS232 leads.



### Running MX TERM on a PC

The Emulation software is supplied on 3.5 inch floppy disc. Once connected, load the disc into the PC drive and Type:-

A:> Mxterm 1

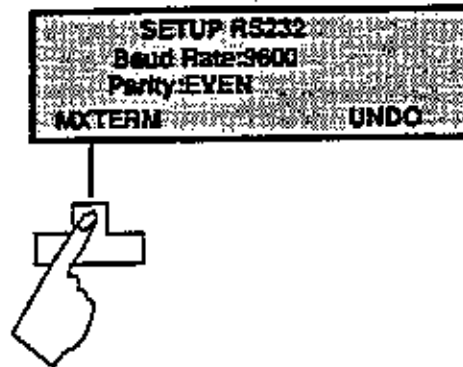
If you have connected up to Port 2 then type in Mxterm- 2

*MX*

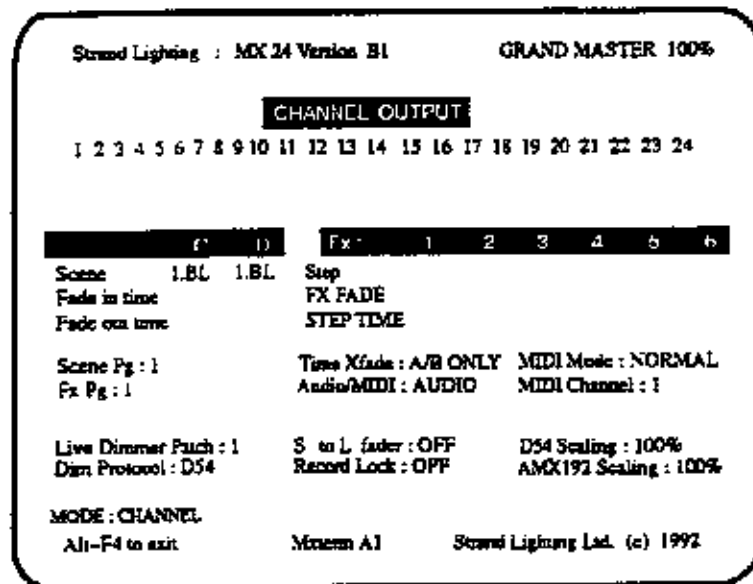
## Setting Up Mx for Terminal Monitor & PC

MXTERM is setup up to run at: 9600 baud, EVEN parity, 1 stop & 7 data

In the RS232 menu this can be matched by simply pressing the MXTERM function key.



Once the connections have been made and the units switched on the display will now appear as shown on the default screen below.



If the screen display does not appear correctly within a few seconds, reselect the *Terminal o/p* mode in the CONFIG SYSTEM LCD menu. Alternatively switching off MX and then switching back on again will rectify the problem.

MX

## Display Options

The following parameters are also displayed along the MODE line if selected on the desk:-

CHANNEL SCENE HOLD RECORD BLACKOUT FLASH OFF NUMLOCK  
( BLACKOUT and RECORD will appear in inverse video when selected ).

If some errors have occurred CHECK LOG will appear.

If effects are running, these are also displayed showing the CURRENT STEP, FADE TIMES and STEP TIMES.



Entering the LIVE DIMMER PATCH will firstly display the current live patch. This can be scrolled using the up and down arrow keys, they effect both cursor movement in the LCD and scrolling of the patch display.

Strand Lighting : MX24 Version B1 GRAND MASTER 100%

**Live Dimmer Patch : 1**

Dimmer	1	2	3	4	5	6	7	8	9	10	11	12
Chan	1	2	3	4	5	6	7	8	9	10	11	12
Level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Dimmer	13	14	15	16	17	18	19	20	21	22	23	24
Chan	13	14	15	16	17	18	19	20	21	22	23	24
Level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Live Dimmer Patch : 1    S to L fader : OFF    D54 Sealing : 100%  
 Dim Protocol : DS4    Record Lock : OFF    AMX192 Sealing : 100%

MODE : CHANNEL  
 Alt-F4 to exit    Maxterm A1    Strand Lighting Ltd. (c) 1992

When in the EDIT PATCH patch edit menu, the currently edited patch will be displayed. Unlike the live patch display this is context sensitive and will display the dimmer shown in the left most block of the LCD at the start of line 2 in the terminal display.

Strand Lighting : MX24 Version B1 GRAND MASTER 100%

**Edit Patch : 1**

Dimmer	1	2	3	4	5	6	7	8	9	10	11	12
Chan	1	1	1	1	1	2	2	2	3	3	3	3
Level	100%	100%	100%	100%	100%	0%	0%	0%	50%	50%	50%	50%

Dimmer	13	14	15	16	17	18	19	20	21	22	23	24
Chan	4	4	4	5	5	5	5	5	6	6	6	6
Level	100%	100%	100%	70%	70%	70%	70%	70%	100%	100%	100%	100%

Live Dimmer Patch : 1    S to L fader : OFF    D54 Sealing : 100%  
 Dim Protocol : DS4    Record Lock : OFF    AMX192 Sealing : 100%

MODE : SCENE HOLD    FLASH OFF    CHECK LOG  
 Alt-F4 to exit    Maxterm A1    Strand Lighting Ltd. (c) 1992

Exiting from the patch menus will return the terminal to the OUTPUT display.

## Printing

In order to use the printer, the terminal must be disconnected and the printer plugged in.

When entering the print menu, the terminal output is always halted, allowing a print to be made. Terminal output will resume only when not in the print menu, any printing has completed and any key is pressed on the console.

MX



## MIDI APPLICATIONS

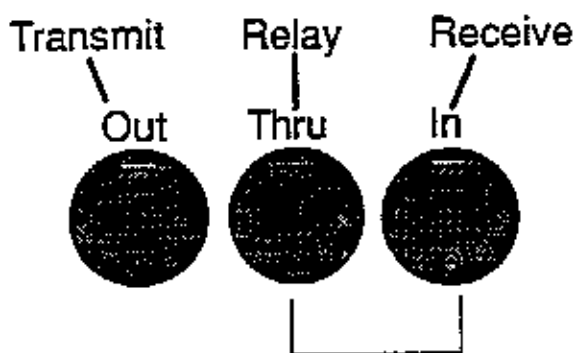
### Introduction

The main purpose of incorporating MIDI into Strands lighting desks is to create an interface between light and sound. MIDI is now an industry standard, in much the same way that SMPTE is for the film industry, and all faders and switches on MX are allocated unique MIDI codes for use with this interface.

MIDI transmits and receives over 16 channels. These are dedicated MIDI channels and have nothing in common with any light channels. All MIDI devices generally default to Channel 1 including MX.

Each MIDI-equipped instrument usually contains a receiver, a transmitter, and an optional socket providing a through (THRU) facility for relaying information to other Midi devices. MX contains these three ports.

The THRU socket is a duplicate of the signals on the IN socket therefore allowing information from a master unit to be relayed to another MIDI unit. A line is normally drawn signifying this as shown in the figure below.



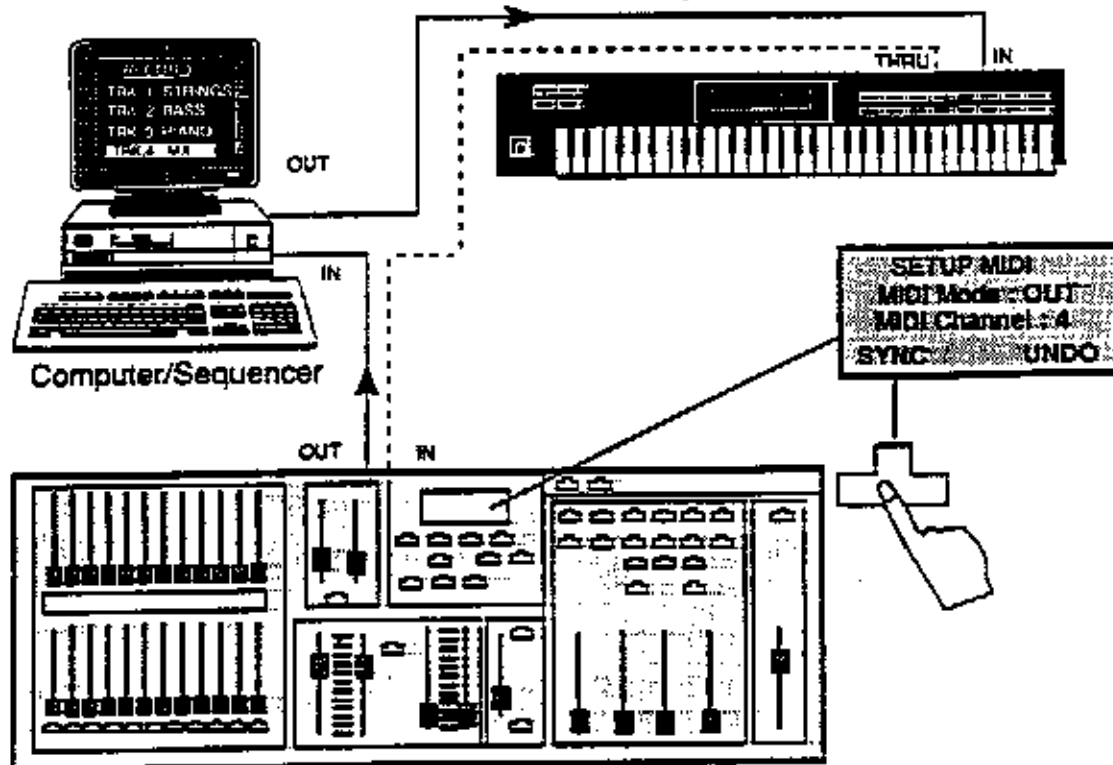
Most Midi sequencers are software orientated and run on a variety of personal computers, the most popular being the Atari, Mac, and more recently the P.C. At present only the Atari has built in Midi Sockets, hence to date this has been the most popular computer for Midi applications, others require separate interfaces to be purchased before Midi software can be utilised.

## Recording MX with Music Sequencers

**EXAMPLE 1** – The purpose of this exercise is to make lighting changes occur automatically in harmony with a musical sequence. The figure below shows a typical setup ready for recording utilising sequencer software available for most popular computers. A good understanding of your particular sequencer is essential before attempting to overdub lighting scenes.

### Recording Procedure

- 1.) Connect three MIDI leads as shown, those not in operation at this stage are shown in dotted lines.
- 2.) Record music sequence, tracks 1–3, in this case.
- 3.) The music sequence is played back via the MIDI OUT link on the computer to the keyboard.
- 4.) Set MX to MIDI OUT – CHANNEL 4.
- 5.) Set sequencer in record mode.
- 6.) Press SYNC on MX as soon as possible after step 5 is completed. (see SYNC function following this section).
- 7.) Information from MX can now be input in 'real time' i.e. the music sequencer will recognise fader/switch operations in the correct sequence and at the correct time. These are overdubbed onto track 4, just like normal sound recording.

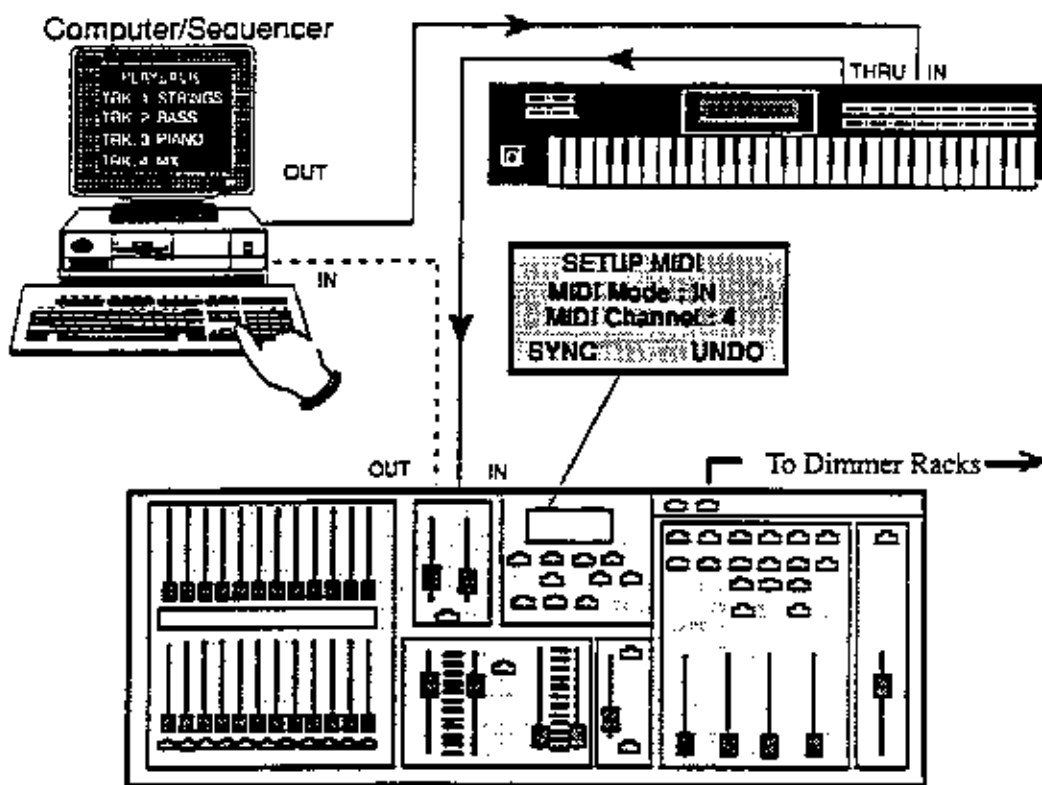


MX

To playback our automated music and light sequence, the THRU socket comes into play.

**Playback Procedure**

- 1.) Set MX to MIDI IN
- 2.) Simply press the appropriate computer key to playback the complete sequence, light and sound should be synchronised as required.
- 3.) Save the sequence if happy, if not re-record or even overdub more lighting changes by following the same procedure. Most sequencers will allow you to overdub on the same track, so it is quite possible to build up complex and subtle lighting changes very easily.



**Note:-** As mentioned earlier, the THRU socket relays the signals from the computer to MX via the MIDI IN socket on the musical instrument. Whilst in MIDI IN mode most MX functions are suppressed and the console becomes under the control of the external sequencer or other Midi device.

The Grand Master and Blackout switch take precedence over the MIDI controlled grand master and blackout switch in a lowest-takes-precedence manner. This gives you the option to shut off the console's output at all times.

*MX*

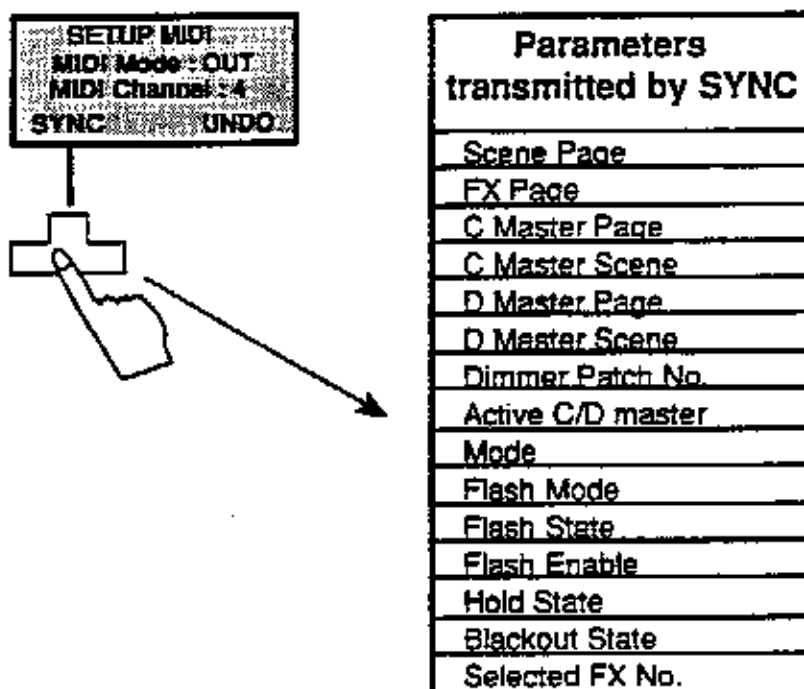
During MIDI IN mode, the LCD will be fixed to a MIDI IN mode display. However, the MIDI mode may be changed to MIDI OFF, MIDI OUT or MIDI SLAVE mode. Normal console operation can only occur in MIDI OFF and MIDI OUT modes.

Note:- When the mode is changed back to either MIDI OFF or MIDI OUT mode, the output will be controlled immediately by the fader levels set on the console.

The state of the console, as set by MIDI (such as effect control and selection of operating modes) will be maintained when MIDI modes are switched.

### SYNC Function

SYNC records a 'snapshot' of the desk i.e it acts as a form of reset signal by resetting the MX parameters shown back to the state they were in just before the button is pressed. A good illustration of this is when used with our musical sequence example just explained.



In effect this means that when MX is set up for other applications the information for the previous example setup is not lost as it has been stored with the music sequence software.

When the example is used again and the sequencer is played back, the first bit of information transmitted to MX will be the code for resetting MX back to its starting position, assuming the recording procedure has been correctly adhered to.

*MX*

### Slave Mode

In this mode, it now becomes possible to link-up 2 MXs for the purposes of increasing channel capacity. The maximum channel capacity of MX is 48, should more channels be desirable, another MX can be linked and setup via the MIDI ports.

In the configuration shown, the 48 way MX becomes the master unit whilst the 12 way becomes the slave. All controls on the 12 way unit are inhibited apart from the Channel faders, Master faders and Blackout switch.

EXAMPLE : - An extra 12 channels are required to supplement scene 10 of a production.



#### Procedure

##### Record

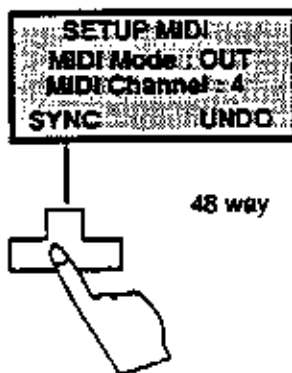
- 1.) Another MX is linked to the existing 48 Way as shown overleaf.
- 2.) Both MXs should be set at MIDI NORMAL for this stage.
- 3.) Set up the scene as required using BOTH desks.
- 4.) RECORD as scene 10 on BOTH desks

##### Playback

- 1.) Set the 12 way to SLAVE and the 48 way to OUT both on the same MIDI channel.



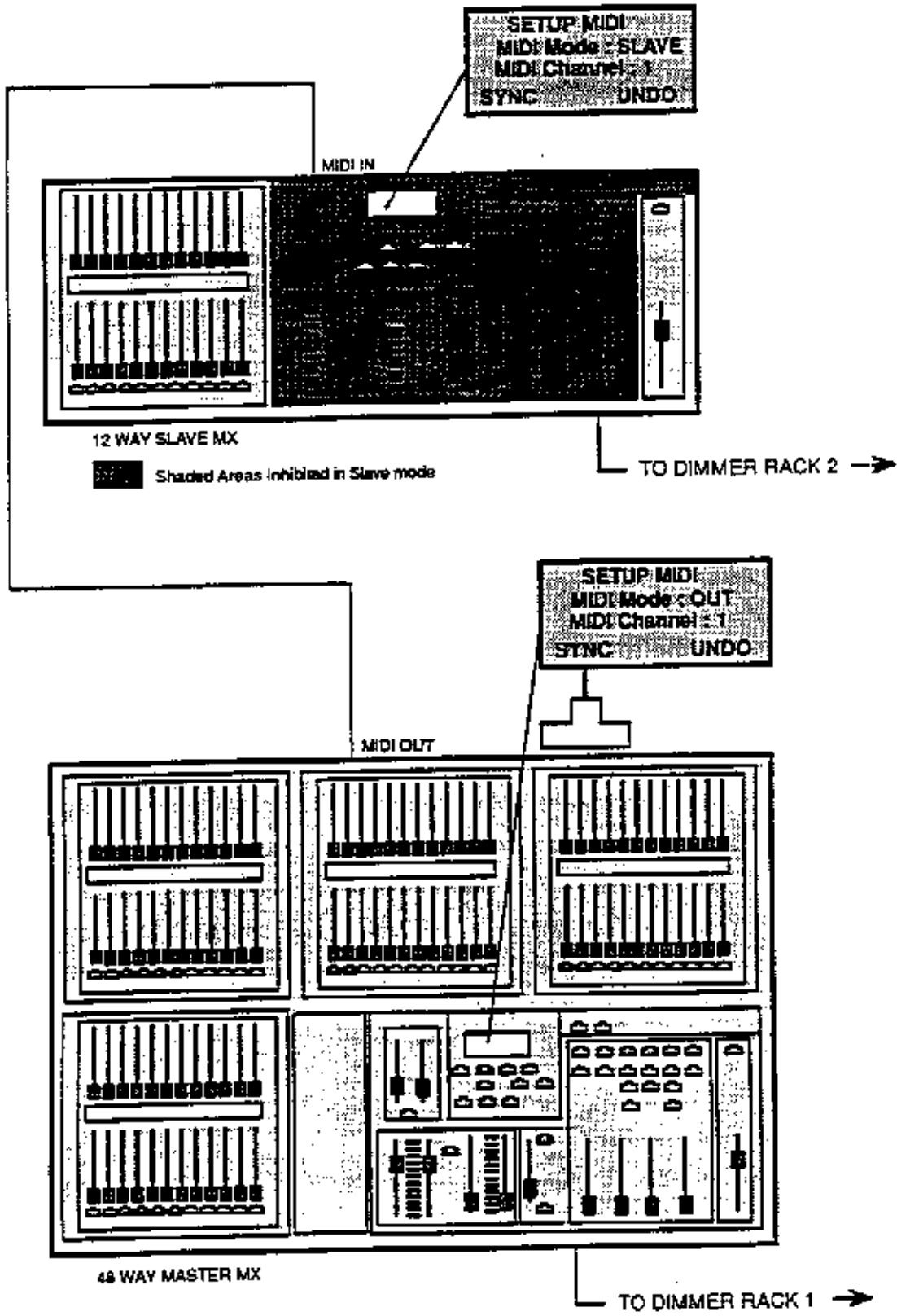
- 2.) Press SYNC on the MASTER MX, this will reset the SLAVE MX to the same settings as the MASTER.



- 3.) Playback scene 10 which is now under the control of the 48 way desk.

Note:- The Multiplexed outputs cannot be linked and require routing to separate dimmer units.

*MX*



MX



## REMOTE GO CUE

It is now possible to remotely trigger lighting scenes that have been pre-recorded into the CD sequencer by means of an external control such as an audio signal, MIDI timing signal or a MIDI PROGRAMME CHANGE command. This feature will be extremely useful to any production that has music or sound effects, whether it be on tape or played 'live' by one of today's modern keyboards.

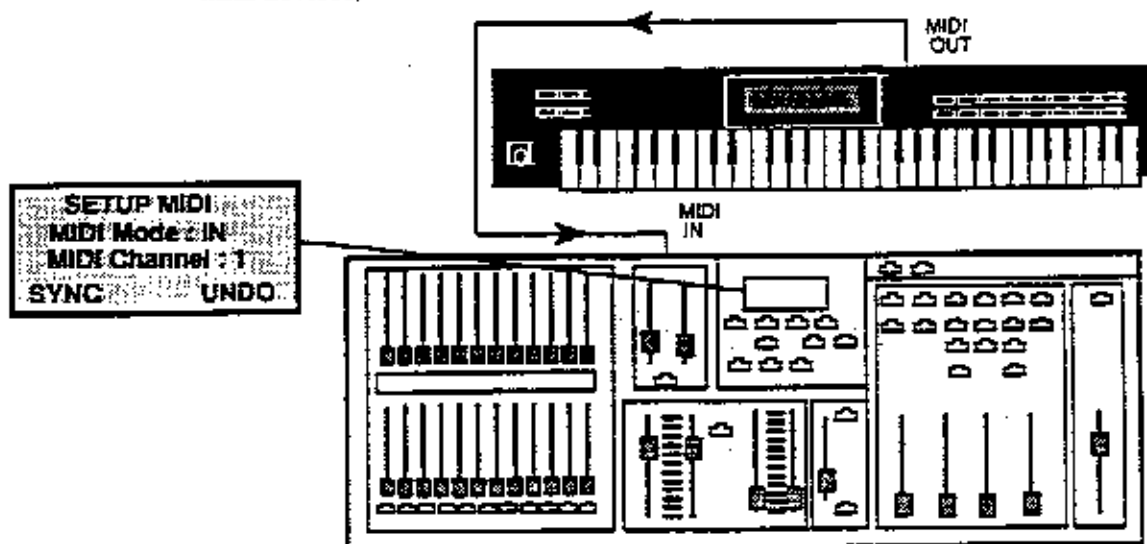
### Midi GO

Most of today's keyboard synthesisers are Midi based and are classed as MULTI TIMBRAL which means that different instrument voices can play on different MIDI channels at the same time. Pressing a button on the synth to change the 'voice' normally sends out a PROGRAMME CHANGE command over a MIDI channel and it is this command that can be utilised by MX.

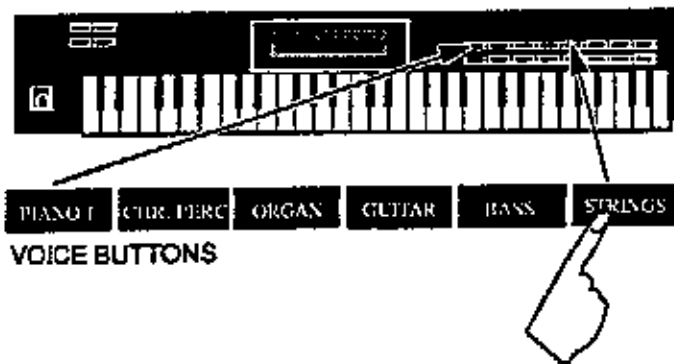
The effectiveness of the GO cue will depend on the MIDI capabilities of the device used, some have 2 or 3 banks of buttons to change voices and some have only 1 or 2 and need to be programmed to change voices, but as long as a PROGRAMME CHANGE is sent possible the GO cue will work.

**EXAMPLE** – We wish to change a lighting scene every time we change voices. This makes sense, as switching from a percussive piano sound to some lush sounding strings will obviously create a different mood.

- 1.) Programme the sequence of lights in the CD sequencer inclusive of both fade in and fade out times.
- 2.) Check that AUDIO/MIDI on CONFIG SYSTEM menu is on AUDIO (i.e. MIDI timing signals are ignored).
- 3.) Set MX to MIDI IN.
- 4.) Connect the synth MIDI OUT to MIDI IN on MX.
- 5.) Set MX to receive on MIDI CHANNEL 1 and the synth to transmit on the same channel. (MIDI CHANNEL 1 is always the default channel for all midi devices).



- A musical piece can now be played 'live' and at the appropriate time the synth voice button can be pushed and as the sound changes a lighting crossfade will occur as programmed.



**Note:-** The buttons are not scene selective i.e if you had 20 scenes in the CD sequencer, pressing button 10 does not mean the sequence will jump to scene 10. ANY button pressed will make MX go to the next scene in sequence.

### Audio / MIDI Fader

The primary function of the Audio /MIDI fader is to act as a threshold level for triggering audio signals which may be used to control remote GO cues (see next Section). If the AUDIO/MIDI parameter in the SYSTEM SETUP menu is set to MIDI however, then it is possible to control cues by means of clock cycles i.e in reality these can be regarded as actual beats of music.

MX





## Audio GO

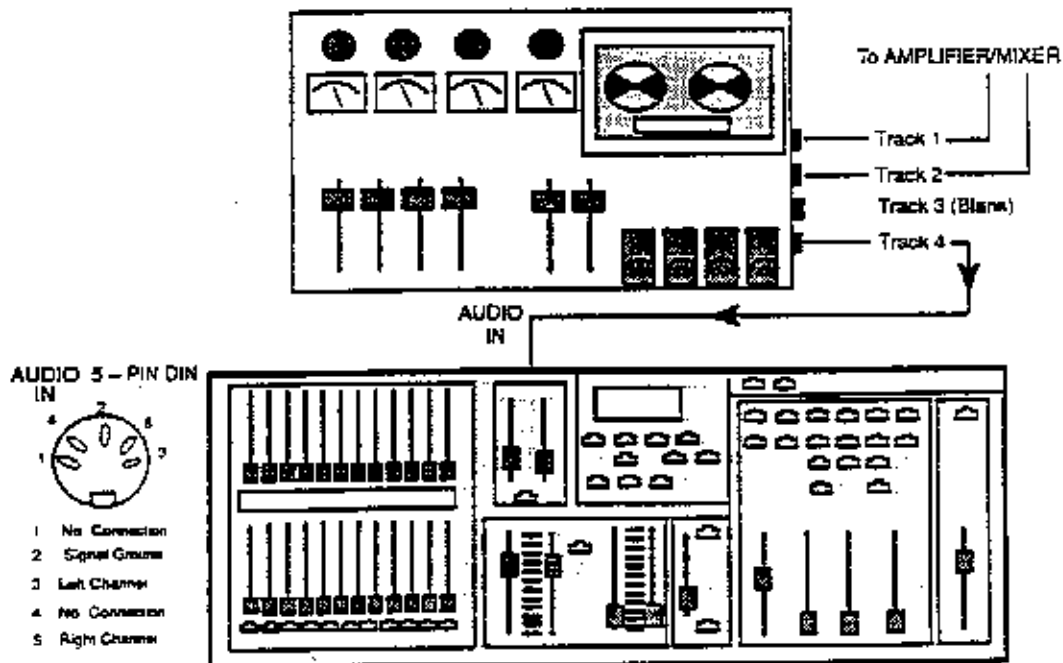
By recording a tone of below 1 KHz on one of the tracks of a Multi-Track tape recorder it is possible to trigger a sequence of lighting scenes automatically in perfect sync with a sound-track.

**EXAMPLE** – A piece of music has been recorded in stereo on tracks 1 and 2 of a 4-track recorder. At various stages in the composition lighting changes are required.

- 1.) The sequence of lights is programmed in the CD sequencer.
- 2.) A suitable tone, such as a bass beat or low speaking voice, should be recorded on Track 4 wherever a lighting scene change is required. Using the adjacent track 3 is likely to result in cross-talk problems and is not advisable. The duration of this audio signal is not important as it only requires a signal of less than 50 milliseconds to activate a GO cue.

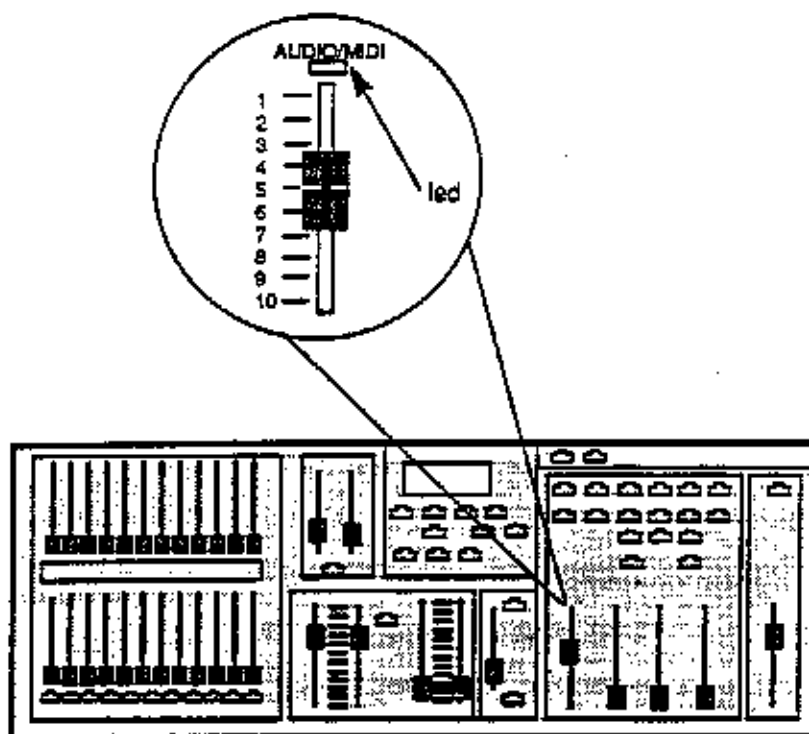


- 3.) A suitable connection must now be made to the tape deck – **TRACK 4 OUTPUT** – and the **MX –AUDIO IN**. Make up a suitable lead and connect as shown in the diagram below.



*MX*

- 4.) The complete piece should now be played back and the trigger level set by adjusting the MIDI/AUDIO fader on MX. i.e. the led should flicker on with the recorded tones.



- 5.) Set MX to AUDIO on CONFIG SYSTEM menu.

```

CONFIG SYSTEM
Time Xfade : BOTH
Audio/MIDI : AUDIO
MCARD PRINT UNDO
  
```

- 6.) Then set to MIDI IN. Important DO NOT PERFORM THIS STEP BEFORE STEP 4 or 5 AS ONCE IN MIDI MODE. MX CONTROLS BECOME INHIBITED.

```

SETUP MIDI
MIDI Mode : IN
MIDI Channel : 1
SYNC : UNDO
  
```

- 7.) The performance can now be played back and at the appropriate time the lighting scenes will change automatically.

MX