RMX 16
REVERBERATION SYSTEM

OWNER'S MANUAL

model rmx 16: digital reverberation system: advanced music systems: burnley, england
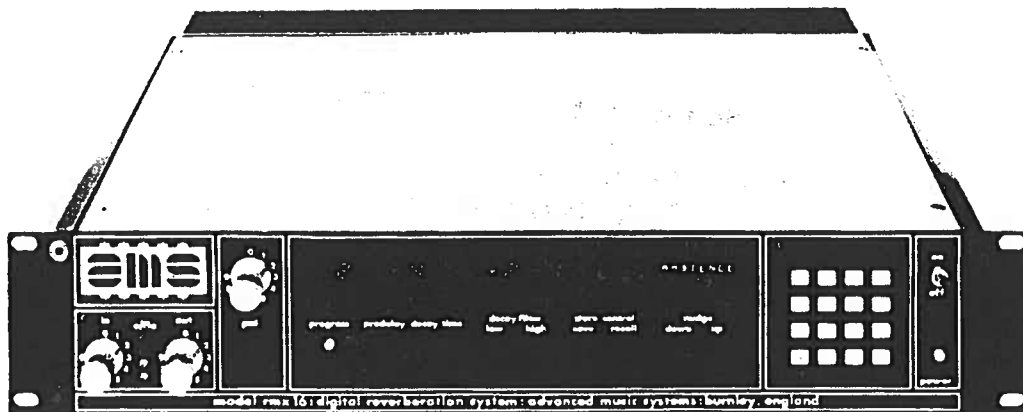
ams

•ADVANCED MUSIC SYSTEMS•

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1 SYSTEM OVERVIEW AND SPECIFICATIONS

1.1 SYSTEM OVERVIEW

The RMX16/DMX15R digital reverberation systems are totally electronic and thus the sound is completely unaffected by external vibrations or mechanical shocks. Unlike their mechanical counterparts the RMX16/DMX15R systems do not require special installations. This, together with the large reduction in size, the superior signal to noise performance, and and the greater bandwidth, gives the RMX16/DMX15R significant advantages over the old fashioned mechanical reverberation systems.

Many new digital reverberation systems offer either rack mounting mainframe units with no facility for remote operation, or hand held remote units with rack mounting mainframes but with no facility for control at the mainframe. The RMX16/DMX15R systems may be driven both at the mainframe or by our remote terminal which may be used 'hand held' or fitted into the mixing console.

Both the Mainframe and the Remote are small in size and are easier to handle and take up far less space than cumbersome floor standing models.

Advanced Music Systems does not charge for reverberation programs and therefore all nine proprietry programs are included in the unit as standard. This allows full use of the system from the moment of purchase. Further, updates to the programs will be supplied on request and free of charge for the period of the warranty. Since program development is an ongoing process and all of the programs are contained in user replaceable chips, RMX16/DMX15R users will be able to keep up to date with advances in this field. If program updating is required after the warranty has expired a small charge may be made to cover the costs involved.

The RMX16/DMX15R digital reverberation systems employ sophisticated micro-programmed parallel processing of 16 bit data offering an 18KHz bandwidth; 90dB dynamic range and 0.025% distortion in delay mode; low power consumption (and therefore cool running); independent control of each program's fundamental reverberant parameters; alphanumeric program descriptions for ease of use and 'at a glance' understanding of how the unit is currently programmed since all data, including the variables: pre-delay, decay time, high frequency decay profile and low frequency decay profile, are continuously displayed on the reverb front panel.

The systems are designed to be simple to operate with nine factory programs simulating different reverberant environments with the ability to control all parameters. Nine user definable settings may be stored within the mainframe and a further ninety within the remote terminal. The user definable settings may be as complex as required. All reverberation parameters whether they be factory preset programs or user definable settings are stored in non-volatile RAM and remain intact on power down.

A calculator styled keypad is provided for entry of user definable variables and for storing or recalling information from the unit's memory locations.

Both input and output levels are adjustable to accommodate units sending or requiring non-standard signal levels. Overflow indication on digital processing is provided as well as the standard 'traffic signal' LEDs enabling fine adjustment of input level for optimum signal to noise performance.

When changing basic reverberation programs the output is muted so that 'memory flush-out' is not output to the audio chain. If the basic program remains the same but the user has stored a number of differing variables in various memory locations then real time switching from one reverb setting to the other can be accomplished.

A useful feature incorporated into the RMX16/DMX15R reverberation systems is the use of 'Nudge Buttons'. These buttons when used will increment or decrement data for all selectable functions.

An intelligent remote interface is available for the RMX16/DMX15R reverberation systems. This 'Remote' is a hand held terminal that is interfaceable to the mainframe via the jack-field by a standard jack cable (the path however must not contain a transformer). All functions on the mainframe are available on the Remote and the display of variable parameters will be echoed on the Remote's liquid crystal display. Ninety nine non-volatile memory locations are available when using this terminal. Thus with the use of the remote terminal not only are the fundamental programs not lost on power-down but up to ninety nine personal reverberation patterns may be stored without loss.

A Remote once programmed with ninety nine memories may be removed and interfaced to any other A.M.S. reverberation system. All A.M.S. reverberation systems are compatible and thus once a sound has been found and stored within the Remote it may be regenerated on any RMX16/DMX15R system anywhere in the world.

Both the Remote and the Mainframe are engineered to the same high standard as the rest of Advanced Music Systems' equipment and both offer microprocessor controlled programmability, repeatability and storage capability putting the engineer in complete control of every system function. Control of reverberation programs and parameters is contained in EPROM, thus guaranteeing that the hardware will not become outdated as advances in reverberation techniques occur.

The unit can also be used as a very high quality, 18KHz bandwidth digital delay line. The delay can be varied from 0 to 810mS in 1mS increments.

The RMX16/DMX15R is designed as a rack mounting unit 3.5"/2U high and 13" deep, excluding knobs and connectors. A flight case is available as an option if required. The choice of components and quality of construction are of a high standard and because of the choice of a mother board system with plug in circuit cards and ribbon cables, maintenance problems are reduced to a minimum.

There is no doubt that the unit's small size and rugged construction, coupled with the unquestionable performance characteristics represents the best value in reverberation technology available in the world today.

1.2 SPECIFICATIONS

1.2.1 ELECTRICAL

Input Impedance (Zin):	10 K ohm : Electronically balanced.
Input Sensitivity:	-10 dBV : Ref. 0.775 Volts.
Input:	RMX16: One channel: 3 pin female XLR socket (XLR 3-31). DMX15R: Input is via control DDL through the D-type connector. Control DDL functions are unaffected by this addition.
Output Impedance:	150 ohm : Compensating Electronically balanced.
Maximum Output Level:	+20 dBV.
Outputs:	Two channel (Stereo): 3 pin male XLR sockets (XLR 3-32).
Distortion:	Less than 0.03% at 1 KHz, full output (typically 0.025%).
Dynamic Range:	90 dB.
Frequency Response:	20 Hz to 18 KHz : - 3 dB , + 0 dB.
S/N Ratio:	Dependent upon reverberation program selected but typically 86dB.
Power consumption:	70 VA maximum.
Power requirements:	110/220/240 VAC : Internally (50/60Hz) adjustable.
Power connector:	Standard IEC mains connector.
Preset program range:	9 individual programs.
User settings storage:	9 stores available on mainframe. 99 stores available with remote terminal.

Nudge:

Program: Will nudge through programs allowing
                                  quick selection of program required.
Predelay: Nudges from 0 to maximum in steps of
                                  10 milliseconds.
Decay time: Nudges from 0 to maximum in 0.1
                                  Second steps.
Decay filtering: Nudges up and down in single digit
                                  steps.

Computer Control:

Program Entry: Keypad entry 1 to 9.
Predelay Entry: Keypad entry 0 to maximum (dependent
                                  upon program selected); least
                                  significant digit = 1mS
Decay Time Entry: Keypad entry least significant digit
                                  = 0.1 Second. '*' acts as decimal
                                  point.
Filter settings: Keypad entry : signed single digit
                                  numeric. '*' acts as minus sign.
                                  Positive value implied if digit not
                                  preceded by '*'.
Display: All parameters displayed. Display
                                  Comprises: 11 x 7Segment digital
                                  characters   with 8 x 17Segment
                                  starburst alphanumeric characters.

1.2.2 PHYSICAL DIMENSIONS

These units are designed for 19" rack mounting and have the
following dimensions:

CASE DIMENSIONS
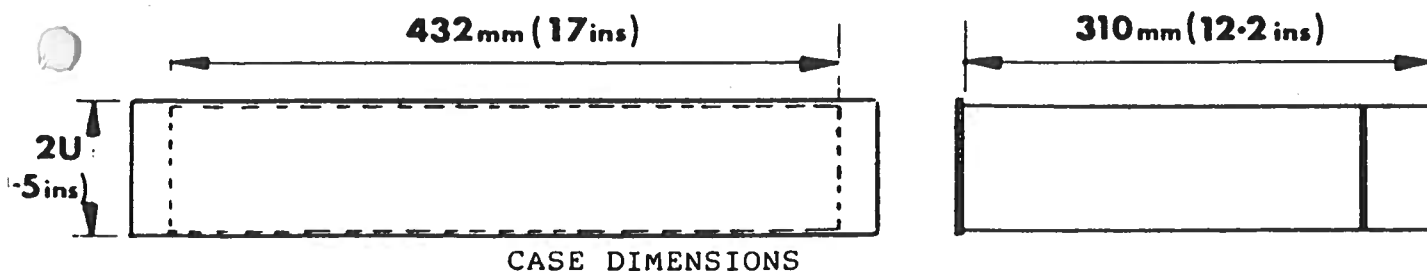
Height: 2U (3.5")
Width: 432mm (17"); Behind front panel
Depth: 310mm (12.2"); Behind front panel
Weight: 12Kg (including packaging)

1.2.3 OPTIONS

(A) MAINFRAME TYPES:

1. RMX16 self contained (stand alone) reverberation system.

2. DMX15R add-on reverberation system for any DMX Digital Delay Line. The reverberation system derives its input from one of the D.D.L's input channels (selectable - see APPENDIX A). The DMX15R has two output stages of it's own, thus the D.D.L. itself is completely unaffected by this addition and is still driven by the same input(s) and still gives the same output(s).

Both units are functionally identical, except for input/output controls and the 'traffic signal' LED array (see section 2.4.2).

(B) REMOTE TERMINAL:

The hand held remote terminal is phantom powered via the connecting cable from the RMX16/DMX15R. The terminal uses a three wire system for transmitting and receiving data and therefore may be connected via a stereo jack field using normal audio leads (so long as the path does not contain a transformer); the maximum length of signal path between the Remote and the Reverb is 25 metres.
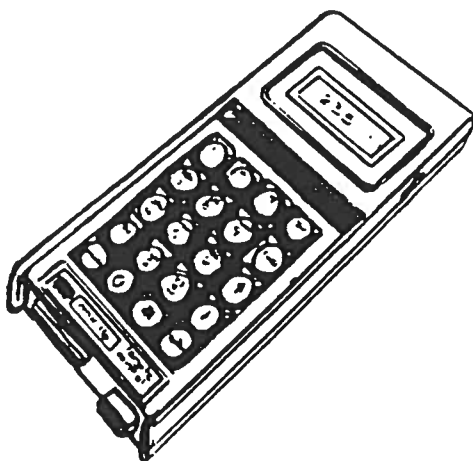
The battery back-up within the remote is trickle charged when used with the reverberation system (see APPENDIX D for operating instructions).

(C) BAR CODE WAND:

The RMX16/DMX15R reverberation systems have provision for the addition of a bar code reading pen. This allows reverberation program updates immediately new software is available. A bar code pen user will receive software in the form of bar codes on sheets of A4 paper and thus a library of reverberation programs can be built up.

(D) FLIGHT CASE:

A flight case is available as an option if required.

2 OPERATING INSTRUCTIONS

2.1 INTRODUCTION

This section of the manual contains information regarding installation and operation of the RMX16/DMX15R Stereo Reverberation Systems. It is recommended that the contents of this section are read and understood before attempting to operate the unit. Should any difficulties arise during operation contact your nearest A.M.S. representative or contact:

ADVANCED MUSIC SYSTEMS.
WALLSTREAMS LANE,
WORSTHORNE VILLAGE,
BURNLEY,
LANCASHIRE,
ENGLAND.

OR TELEPHONE: 0282 36943
TELEX: 63108

2.2 SHIPPING INFORMATION

2.2.1 The RMX16/DMX15R is packaged in a specially designed container for the best possible protection. Upon receipt of the equipment a thorough inspection should be made to reveal any possible snipping damage. If damage is found a claim should be made against the shipping company immediately or at least on the following working day.

2.2.2 If the unit is returned for service or modifications etc., the original container should be used. If the original container is not available, a new container can be obtained from Advanced Music Systems. Please specify the model number when requesting the new container.

2.3 INSTALLATION

2.3.1 The model RMX16/DMX15R can be operated with a line input voltage of 110, 220 or 240 Volts, adjustable internally. Before connecting the equipment to primary power check that the line voltage setting is correct (see the label on the back of the unit); if the line voltage is not specified assume, for safety, a line voltage setting of 110 Volts. If it is found that the line voltage setting is incorrect use the following procedure to change it:

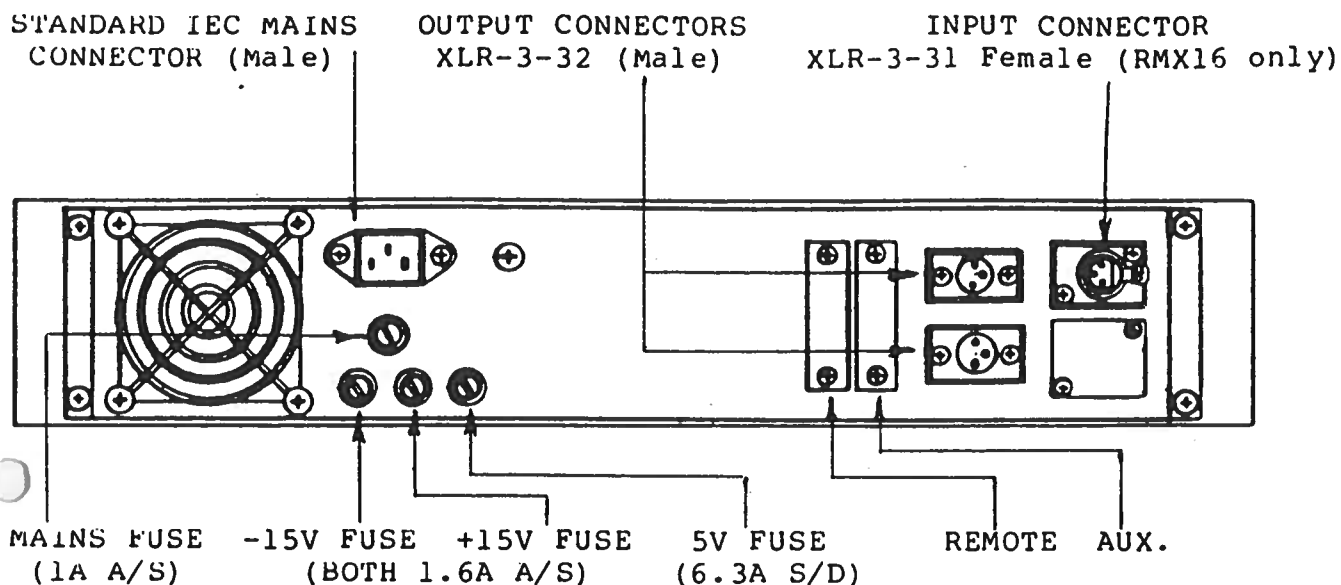[a] Disconnect the line power cord from the unit and remove the top cover plate.

[b] With the front panel facing you, you will see the line voltage selection connector on the right hand side near the front of the unit.

[c] Remove the cover over the mains wiring; then remove the brown wire and insert it into the correct position.

[d] Replace the cover over the mains wiring, the top cover plate and the line power cord.

2.3.2 The connections to the rear of the unit are as follows:

STANDARD IEC MAINS   OUTPUT CONNECTORS   INPUT CONNECTOR
  CONNECTOR (Male)   XLR-3-32 (Male)   XLR-3-31 Female (RMX16 only)

MAINS FUSE   -15V FUSE +15V FUSE   5V FUSE   REMOTE   AUX.
  (1A A/S)   (BOTH 1.6A A/S)   (6.3A S/D)

2.3.3 The outputs of the RMX16/DMX15R are balanced electronically but are compensating. This ensures normal operation if an unbalanced line is connected to the unit.

2.3.4 MAINS WIRING

All mains leads supplied with equipment manufactured at A.M.S. are wired in accordance with the European (I.E.C.) colour code. The code is as follows:

        BROWN   .... LIVE
        BLUE   .... NEUTRAL
        GREEN/YELLOW   .... EARTH

2.3.5 DMX15R INSTALLATION

For further instructions on installing the DMX15R see APPENDIX A at the back of this manual.

2.3.5 FUSE REPLACEMENT

All power supply rails within the RMX16/DMX15R reverberation systems are protected by current limiting and also against overvoltage. If for any reason the voltage on a particular rail exceeds certain limits, a thyristor connected across that power rail is activated, thus blowing the fuse and protecting the unit's electronics. It should be noted that this may (very occasionally) happen when no fault is present, but a sharp and possibly dangerous mains surge has occurred.
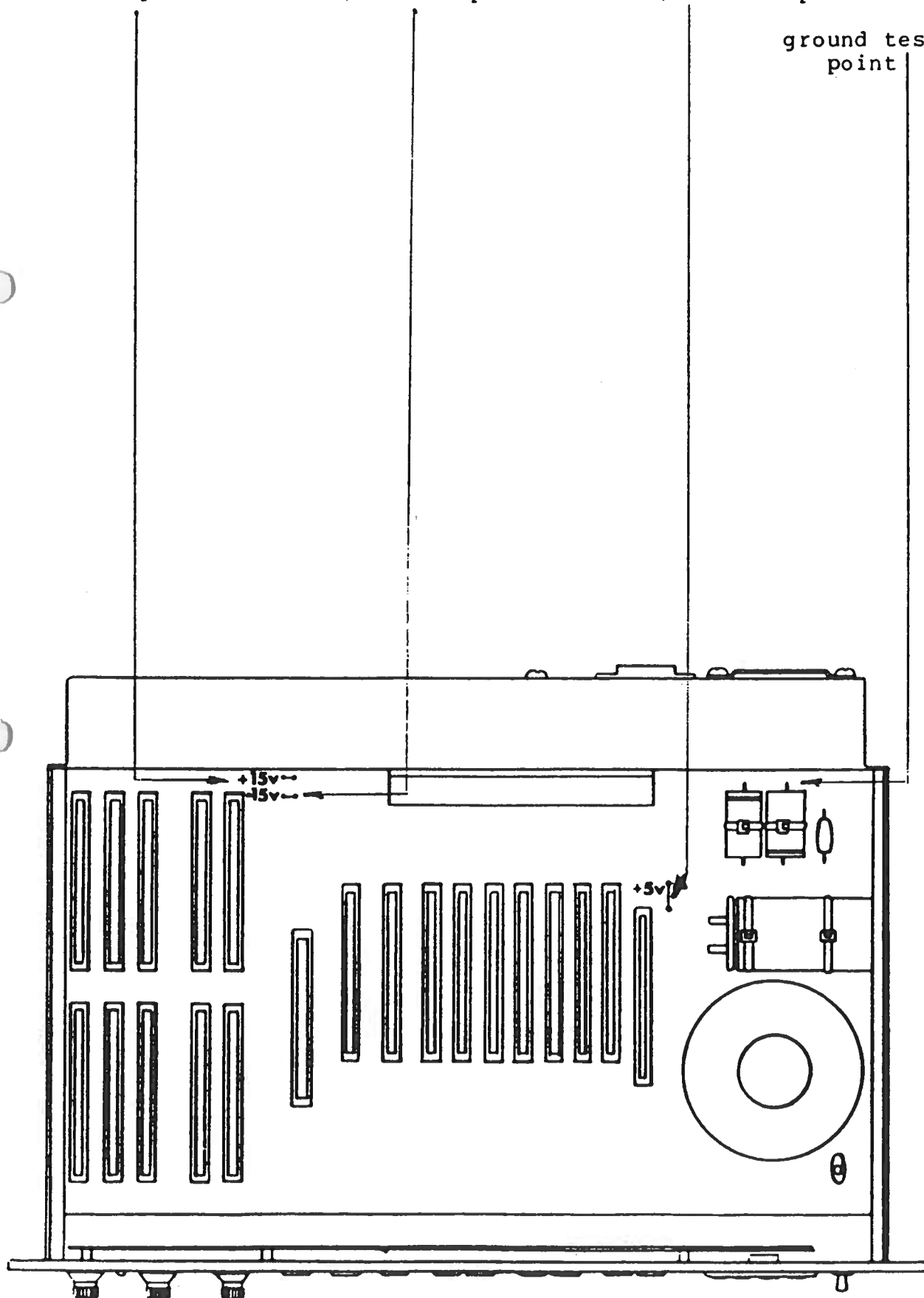
There are four fuses contained within the RMX16/DMX15R reverberation units. All are immediately accessible on the rear panel of the RMX16/DMX15R. The three power supply test points are marked below:

+15V test point   -15V test point   + 5V test point

ground test
point

2.4 OPERATION

2.4.1 GENERAL INTRODUCTION

This section is intended to familiarise the user with the front panel controls of the RMX16/DMX15R reverberation systems.

If the DMX15R is in use in combination with a DMX range DDL the DDL should be switched on first so that when the DMX15R is powered up the correct program is loaded. Accidently switching the DMX15R on first will not damage either of the units but to start up the reverberation system a program number, other than the one selected on power-up, will have to be loaded in.

2.4.2 INPUT/OUTPUT LEVEL AND LEVEL MONITORING SECTION
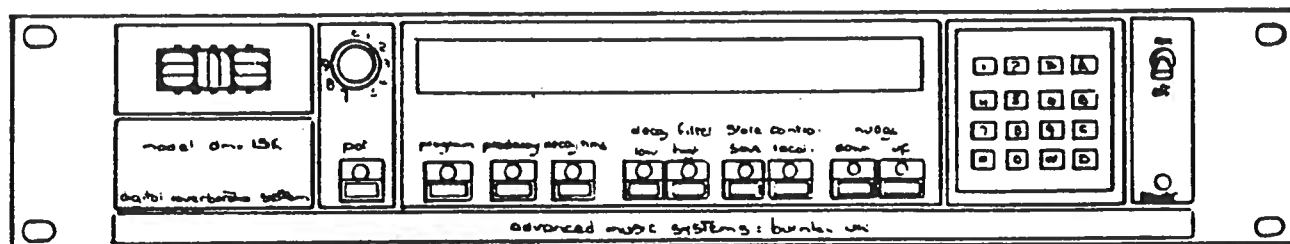
DMX15R users only (RMX16 users please turn to next page):

The input level control knob and the 'traffic signal' LEDs on the controlling DDL are used to monitor and vary the input level. If the output of the DMX15R overloads the input stages of the mixing desk the unit may be 'level-matched' by adjusting the two preset potentiometers on the output card, internal to the DMX15R, as follows:

(i) Remove the DMX15R top plate.

(ii) Looking at the output card (second card from the left) you will see two preset potentiometers. The one nearest the front panel controls the output of channel 'A' (top XLR) and the other the output of channel 'B' (bottom XLR).

(iii) The potentiometers are factory set to give maximum output and clockwise turning of the potentiometer screws will reduce the output level.
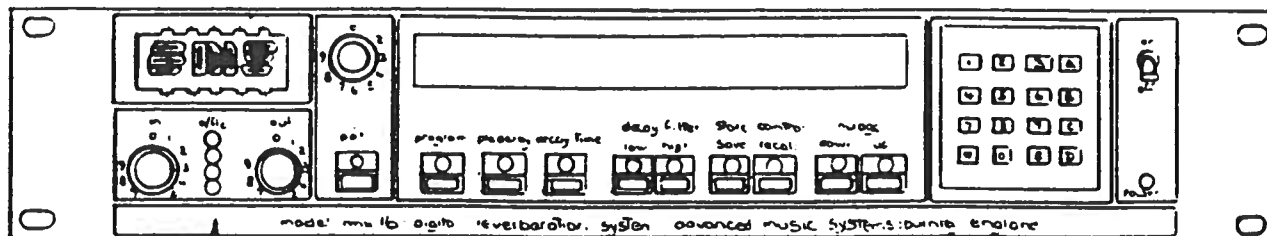
input/output
controls

RMX16 users only:

On switching on the unit the front panel LEDs will
illuminate. Between the Input level and Output level control
knobs there are four LEDs (green, yellow, red, red). The first
three (ie. green, yellow and red) are basic "traffic signal"
level LEDs. The red LED is illuminated 6 dB before clipping,
the yellow LED 12 dB and the green LED 18 dB. In normal
operation, with a signal present, the input level should be
adjusted so that the red LED is illuminated only when the
highest programme peaks occur. The remaining red LED indicates
processing overflow. Should this occur, due to exceptional
program material, "backing off" the input level slightly will
prevent internal clipping of the signal.

Once the input signal has been 'level matched' using the
traffic signal LEDs the output (stereo) can be adjusted to give
a good match on the mixing desk.

Both RMX16 and DMX15R users:

The output from the RMX16/DMX15R is true stereo and whilst
these outputs may be used singly, a more solid spatial sound
will be obtained by using the stereo pair.
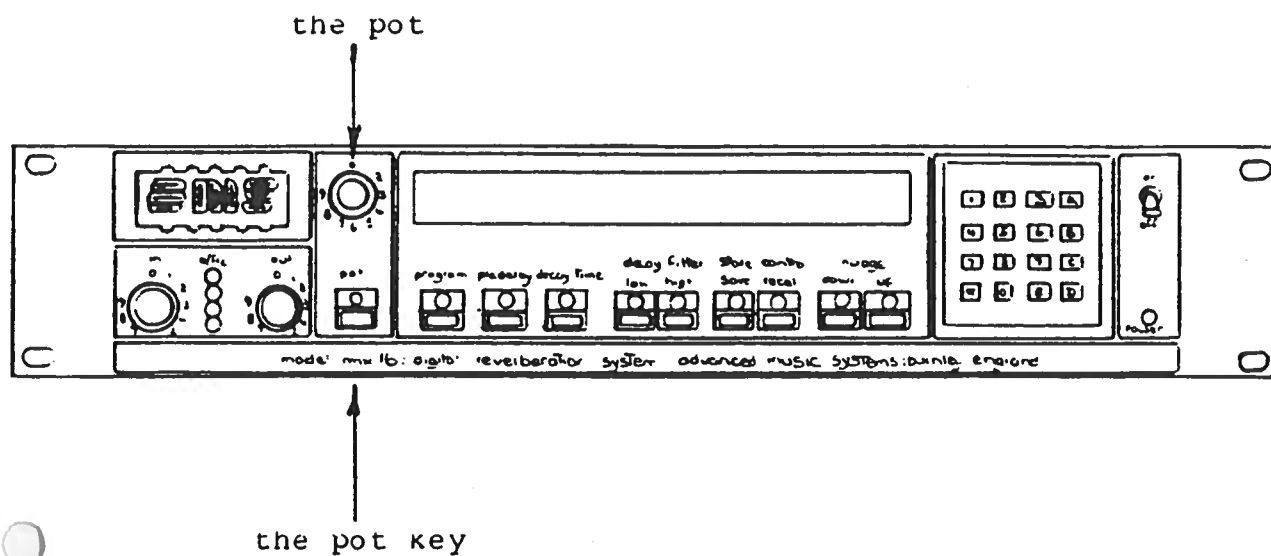
the pot

the pot key

2.4.3 THE POT CONTROL SECTION

Depressing the POT key hands control of decay time over to the rotary control knob above the actual pot key. This facility can only be used once the decay time function has been selected.
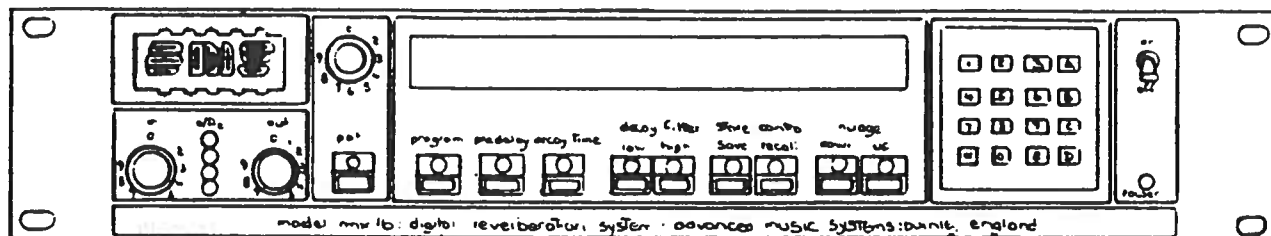
the program key

2.4.4 PROGRAM SELECTION

To select one of the reverberation programs first push the 'program' key, the LED on this key will now illuminate. Actual program selection can be accomplished in two distinct ways:

(A) KEYPAD ENTRY:

To select a reverberation program using the keypad enter a single digit number between 1 and 9 on the keypad followed immediately by the 'enter' key (#); the required program will then be loaded down into the temporary store location. Once a program number has been selected the LED on the 'program' key will flash until the 'enter' key (#) is pressed. If a second digit is entered before the 'enter' key is depressed the error message (E) will be displayed above the 'program' key. No change in program will result and therefore the program LED will still flash. Re-pressing of the 'program' key will clear the error condition from the display.

(B) USING THE NUDGE KEYS:

The 'nudge' keys are very useful for jumping from one program to another. Once 'program' has been selected a nudge up will increase the program number whilst a nudge down will decrease the program number.

It should be noted that when changing between basic programs the output is muted for a short period so that 'memory flush-out' is not output to the audio chain.

This does not happen when changing from the basic program to a user variation of that same program. With this type of change real time program jumping can be accomplished.
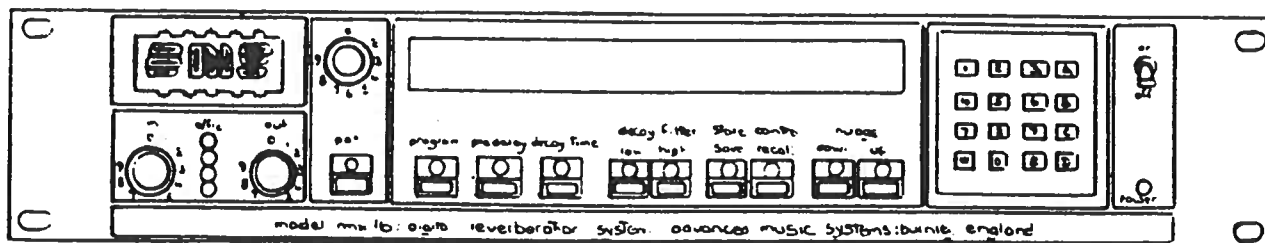
predelay key

2.4.5 PRE-DELAY ENTRY

Pre-delay delays the onset of reverberation. To introduce a pre-delay before reverberation occurs, first push the 'predelay' key, the LED on this key will now illuminate. Again actual predelay setting can be accomplished in two distinct ways:

(A) KEYPAD ENTRY:

Using the keypad enter the amount of pre-delay required. The amount (mS) of pre-delay will be displayed above the 'predelay' key and whilst entry is being made the LED on the 'predelay' key will flash. If the requested pre-delay time is within limits the output will be delayed with respect to the input by this amount and the LED will stop flashing. If the requested pre-delay time is greater than that which is available using the program selected the error message (E) will be displayed above the 'predelay' key, no change in the program will result and therefore the 'predelay' LED will continue flashing. To clear this error the predelay key should be pressed again.

(B) USING THE NUDGE KEYS:

If the 'nudge' keys are used the pre-delay amount will be increased or decreased in 10mS steps.

It is important to remember that the maximum available pre-delay time depends on the basic reverberation program in use. The maximum pre-delay time for each reverberation program is given in the program notes at the back of this manual (see APPENDIX C).
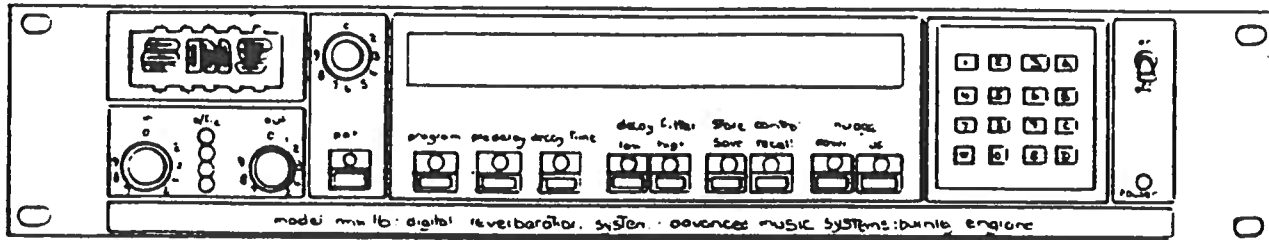
decay time

2.4.6 DECAY TIME ENTRY

To vary the decay time first push the 'decay time' key, the LED on that key will now illuminate. There are three ways of adjusting decay time:

(A) KEYPAD ENTRY:

Decay time may be selected using the keypad. Both the minimum and the maximum decay times are dependent upon the program selected. Fractions of a second are entered by using the '*' key as a decimal point. Hence 2.8 Seconds would be entered by first pressing the 'decay time' key followed by the '2' key, the '*' key, the '8' key and finally the enter key (#).

(B) USING THE NUDGE KEYS:

Once the 'decay time' key has been pressed an increase or decrease in the decay time can be accomplished by the use of the nudge keys. Depressing the 'nudge up' key will result in the illumination of the nudge up LED and an increase in the decay time. Depressing the 'nudge down' key will result in illumination of the nudge down LED and a corresponding decrease in the decay time. The decay time will increase or decrease in 0.1 Second steps

(C) 'POT' CONTROL ENTRY:

To vary the decay time using the pot control simply press the 'pot' key. Control of the decay time is immediately surrendered to the rotary pot directly above the 'pot' key.
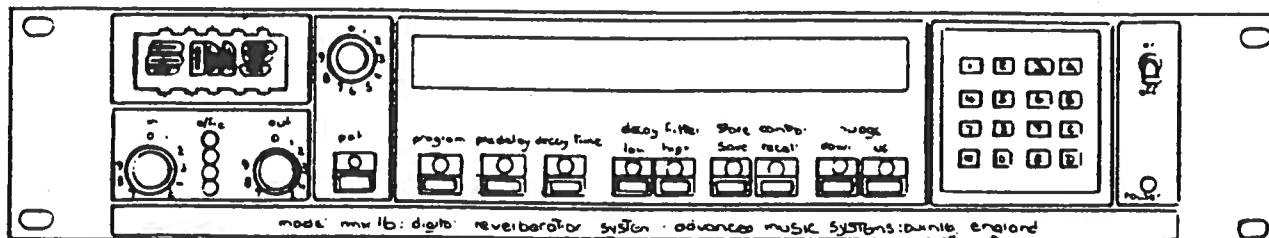
decay filter keys

2.4.7 DECAY FILTER CONTROLS

The availability and use of these controls is dependent upon the basic reverberation program in use. For example PROGRAM 1 allows use of both the high and low filter controls whilst PROGRAM 3 allows for use of the high filter control only.

A positive filter setting will produce an increase in reverberation time in the selected frequency band whilst a negative value will give a decrease. Thus a low frequency filter setting of say +9 will give a large increase in reverberation time in the low frequency band.

To select negative values the '*' key must be pressed prior to entering the numeral. If the '*' key is not pressed a positive value is assumed.

The decay filter controls may be changed by the use of the nudge buttons.
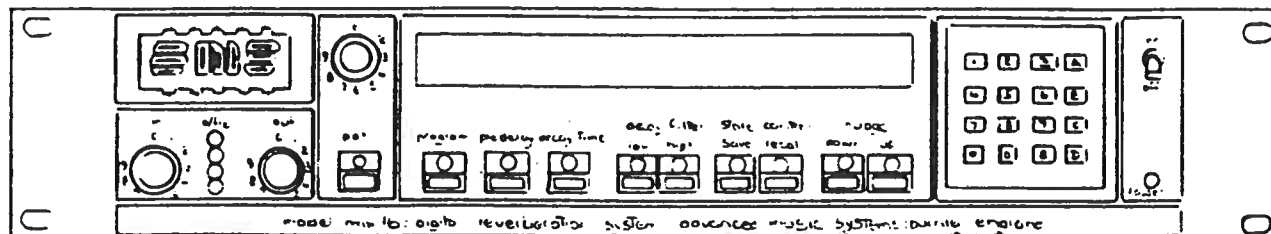
save and recall
(the store controls)

2.4.8 DATA STORAGE

The basic structure of each program is such that it will simulate the environment it is designed to replicate; for this reason it is fixed. However, as seen above, extensive control of parameters within the basic framework is possible. When a program is 'called' the control parameters are entered into a temporary store (the letter 't' is displayed in place of the program number or store location), the output and display reflecting the contents of the temporary store and not the preset program. The temporary store (t) is none-volatile and tnerefore data in this location, like all other store locations, is not lost on power down.

There are nine non-volatile user setting store locations incorporated in the mainframe of the RMX16/DMX15R reverberation units.

To transfer a set of parameters from the temporary store to a user settings store location press the 'save' key, at this point the LED on the 'save' key will flash and the store control digit in the display will reflect the last store location accessed. If this is the required store location then continue as indicated otherwise enter a number between 1 and 9 (other than the one displayed) and press the enter key (#). The 'save' LED will now be extinguished and the temporary store location (t) will reflect the stored data. Alterations to the displayed data will not affect the stored data since you will now be working on the temporary store.

To recall a store location that has been previously set up simply press the 'recall' key followed by the store location number and then the enter key (#).

As mentioned previously, if a jump between pre-set programs is requested the output is temporarily muted to ensure that 'memory flush-out' is not sent to the audio chain. If however a jump between differing parameters is requested (using the same basic pre-set program) then no such muting will take place, thus allowing real time switching between completely different user settings.
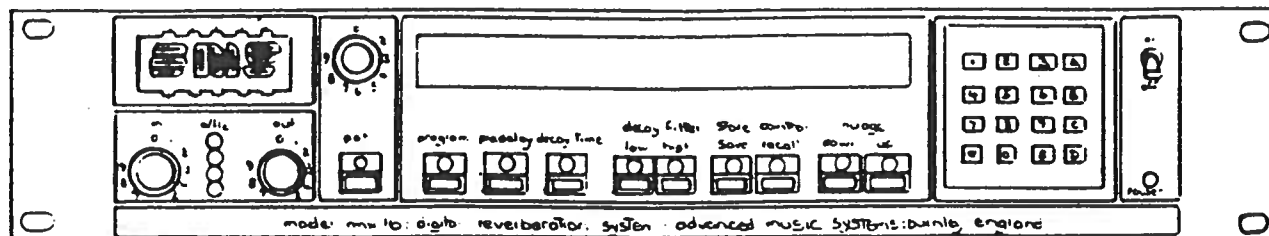
                                        the nudge keys

2.4.9 THE NUDGE KEYS

        The nudge keys as described earlier provide a quick and
convenient method of changing variables. If a nudge key is
pressed and kept down whilst nudging, the parameter will change
at the nudge rate. If the key is pressed and released in quick
succession then the basic nudge rate can be exceeded.
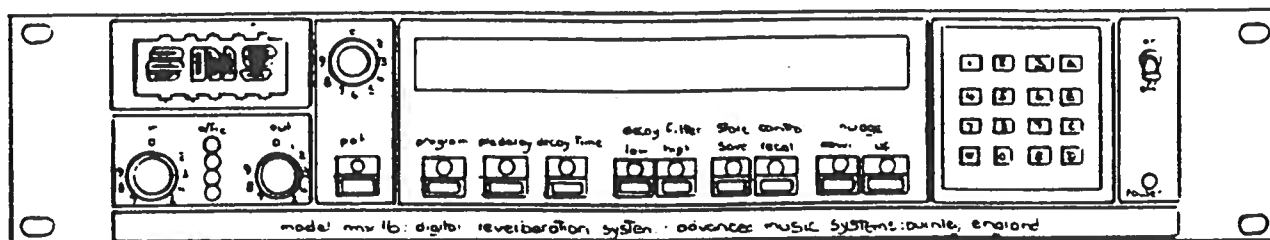
the keypad

2.4.10 THE KEYPAD

Keypad data entry is provided for entering variable data and for storing programs. This type of data entry is precise and repeatable giving the engineer accurate control over program functions.

The A, B, C and D keys have been reserved for future software expansion. As yet only the D key has been assigned and is to be used for control of the 'depth' of reverberation in future software issues.
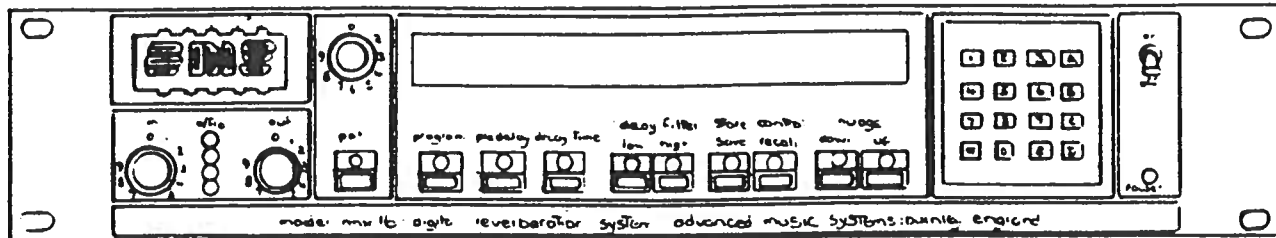
power on/off

2.4.11 POWER SWITCHING

Switching the power 'off' in this case does not mean a loss of program details. Not only are the pre-set programs non-volatile, but all memory locations are also non-volatile. This means that nine personal settings may be stored in the mainframe together with the temporary settings and none of these will be lost when the unit is switched off.

2.5 A USER'S GUIDE TO THE RMX16/DMX15R REVERBERATION SYSTEMS.

2.5.1 INTRODUCTION

This section of the manual outlines the universal principles of reverberation and describes in more detail how the RMX16/DMX15R reverberation system can be used in the studio.

2.5.2 UNDERSTANDING REVERBERATION

The acoustic phenomenon known as reverberation accompanies nearly all of the sounds we hear, in fact we are so conditioned to hearing the accompanying reverberant field that on hearing sound totally lacking in reverberation (in anechoic chambers, well damped studios, etc.) we are immediately struck by its unnatural character.

Natural reverberation not only adds a certain amount of character, or colouration, to the actual sound it is accompanying but also 'tells' our ears from which direction the sound is coming; approximately how far away the sound is; how loud the initial sound was; what type of acoustic space we are in; how large the space is; what the boundaries are like (hard walls, curtained walls, etc.) etc..

'Dead Room' acoustics, approaching anechoic proportions, are found more and more in modern studio designs and because of the resulting lack in natural reverberation a good reverberation system has been found to be mandatory in modern recording studios. 'Good reverberation' is not enough however, since the studio must be capable of reproducing all types of reverberant situations from 'sitting rooms' to 'great halls'. Only modern digital systems with carefully designed programs and large memory capacity such as the RMX16/DMX15R reverberation systems are capable of producing such a variety.

The Fundamentals of Reverberation:

Let us say you are in the centre of a small hall and
someone, standing a few feet away, claps his hands. Immediately
the resulting sound wave will radiate in all directions at an
approximate rate of one foot every millisecond. The first sound
you will hear will be that which comes directly towards you from
the clapped hands. Thanks to our well developed binaural
hearing this 'Direct Sound' will tell us where the sound source
is.
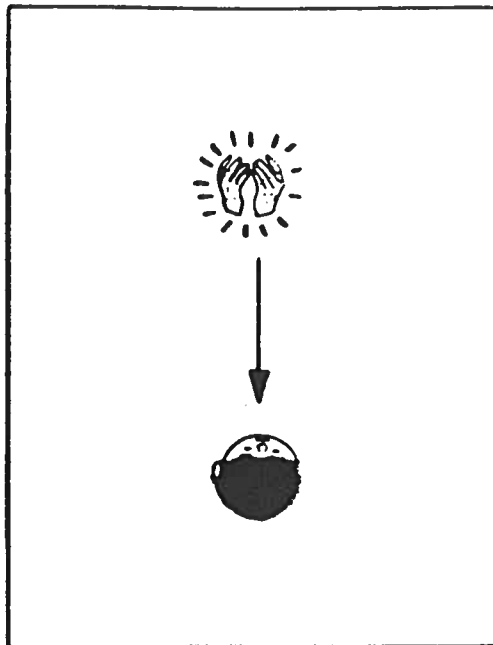
Next come the 'early reflections'; remember sound was
radiated in all directions and some of this radiated energy, on
striking room boundaries (walls, floors, ceilings, etc.), will
again be directed towards your ears. These early reflections
may be slightly different in character from the original sound
since not only is some of the energy absorbed by the boundary
upon which the wave strikes, but this absorption also varies
depending on the frequency.
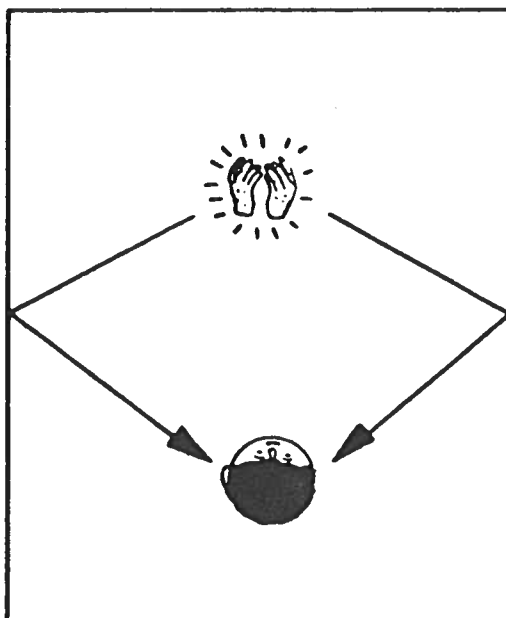
These early reflections can extend from 5mS in a small room to some 200mS in a large hall. Even at 200mS, if the sound is not impulsive we are unable to pick out individual reflections during this period, but we are able to extract important phsycoacoustic information about the type of hall and the type of boundaries involved.
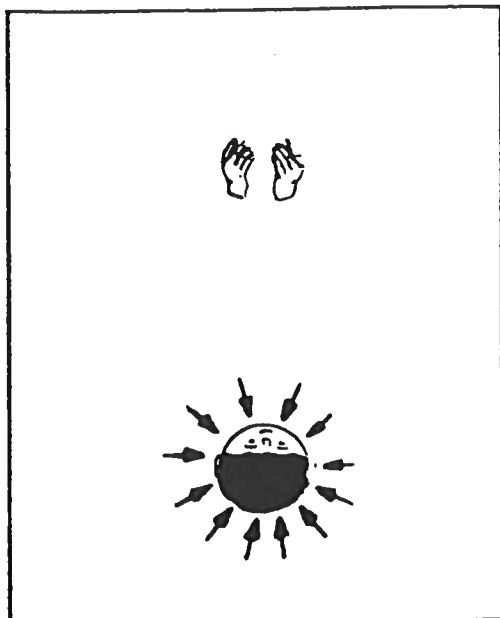
These reflections eventually build up into an extremely dense, omni-directional reflection pattern called the 'reverberant period'. At this stage so many reflections are arriving at once that a pleasing diffuse sound is heard which slowly dies away.
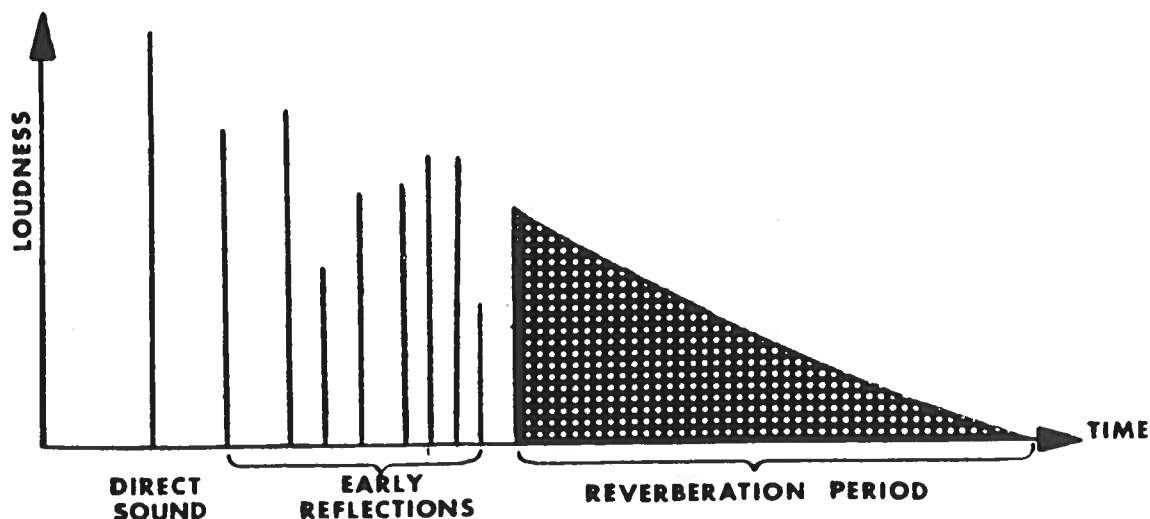
Stereo From a Mono Source ?

     Another important aspect of sound in any acoustic space is
its binaural nature.   Sound occurs in three dimensional space
and even a single hand clap is heard in stereo, even if it did
start out. from a mono source. The stereo image is created by
each ear receiving a slightly different pattern of reflections,
coming from different directions at different times. 'The
stereo image' in artificial reverberation is an extremely
important concept and should not be ignored. We never hear
truly mono sounds in nature.

2.5.3 USING THE RMX16/DMX15R

     Once the unit has been correctly 'level matched' decide
which basic program is needed for the effect you require.
Reading through the program list in APPENDIX C will help if you
are already familiar with basic reverberation sounds. If you
are not it is advisable to listen to all of the basic pre-set
programs using the material you wish to record as the source.
You will then be able to select the basic program nearest to the
effect you require.

     DO NOT use source material with a fundamentally different
frequency character than the material you will eventually
record, this will give you a false impression of the final
sound. Almost all reverberation effects, especially when using
large amounts of filter boost or cut, are dependent upon the
frequency character of the source material.

     Press the 'program' key and nudge up or down through the
programs to the one required. The program number appears on the
left of the display, the program name on the right. Whether
nudging up or down the output will be muted for a short time.
There are nine factory pre-set programs; choose the one you wish
to use and refer to the program notes at the back of this manual
(APPENDIX C). These notes will tell you the maximum pre-delay,
the maximum decay time and the decay filter ranges available
when using that particular program.

     Pre-delay:

     Pre-delay offsets the output of the RMX16/DMX15R relative
to the input. When mixing the original with the output of the
reverberation system a variety of material can be enhanced by
adding pre-delay; knowing when to use pre-delay and how much to
use comes with experience.

     Decay time:

     Increasing decay time effectively increases the length of
the final phase of reverberation ie. the reverberant period.
By using the 'pot' control the decay time may be varied at any
time during a mix.

Decay filtering:

The effectiveness of these controls depends to a large extent on the frequency character of the source material. The high frequency filter will have no effect at all on low range instruments like the bass guitar whilst cymbals, violins, etc., will be affected to a large degree; there is no substitute for experimentation.

Storage:

If you find a setting different from the basic pre-set program and would like to store this setting for recall at a later date you should read section 2.4.8 DATA STORAGE; this will describe the basic storage rules.

In section 2.4.8 reference is made to the possibility of real time switching between reverberation patterns during a mix. To accomplish this first set up the two (or more) reverberation patterns required and store them; say store locations 1 and 2. REMEMBER you must only use one basic pre-set program to set both reverberation patterns. This will prevent audio muting when switching between stores. Now recall the initial reverberation pattern say 'STORE 1' and start the recording. Well before the moment that the program jump is required press the 'recall' key followed by the '2' key (STORE 2); do not press the enter key (#) at this point. At the precise moment that the second program is required press the enter key (#).

3 THEORY OF OPERATION

3.1 INTRODUCTION

This section of the manual contains a description of how the RMX16/DMX15R reverberation system works together with a functional block diagram of the unit (Fig 3.1).

3.2 OVERALL FUNCTIONAL DESCRIPTION

The balanced input whether within the actual mainframe (RMX16) or within the parent D.D.L. (DMX15R) is processed into unbalanced form and fed through low pass filtering to prevent aliasing components appearing at the output of the reverberation system. The sampler card accepts this filtered signal which is fed to sample and hold circuitry and then to a comparator/gain switching section. At this point the signal is scaled by 1, 2, 4, or 8 to optimise the signal to noise ratio and a two bit exponent number is generated to note the scaling factor used. Control and timing are derived from the memory control boards, the clock inputs being generated by a crystal oscillator. When an analogue to digital conversion (ADC) command is decoded, the resulting response 'conversion complete' is used to control the latching of the correct exponent for that sampling period.

The sampled analogue output from the sampler card is fed into the ADC via a buffer amplifier. Timing signals from the sampler card cause a conversion to be initiated. The twelve bit result and the two bit range data are converted into linear sixteen-bit format and latched into a set of registers/data highway drivers for storage in memory.

This sixteen bit data is then manipulated by an array of arithmetic processors which are microprogrammed to perform the large number of multiplications, additions, divisions and subtractions required in each sampling period to generate the high quality reverberation required. In fact, the equivalent of over 1,000 delay taps, each with its associated amplitude weighting, is required per second to simulate an acceptable natural reverberation.

The 64K byte memory is used for audio delay generation and as scratchpad memory. Internal data word length in the arithmetic processors is twenty eight bits. The two sixteen bit results from the arithmetic processor calculated as representing the stereo reverberation outputs are converted back to analogue form on the DAC (Digital to Analogue Converter) card. The two outputs from the DACs are buffered and filtered to remove any sampling steps and recover the high frequency information. After adjustment of amplitude by the output level control the signals are then fed through balanced compensating output stages to the output XLRs on the rear of the unit.

Operator communication to and from the 'Executive processor' is accomplished via the display board which contains the drive for the display, together with the display itself.

RMX16 BLOCK DIAGRAM
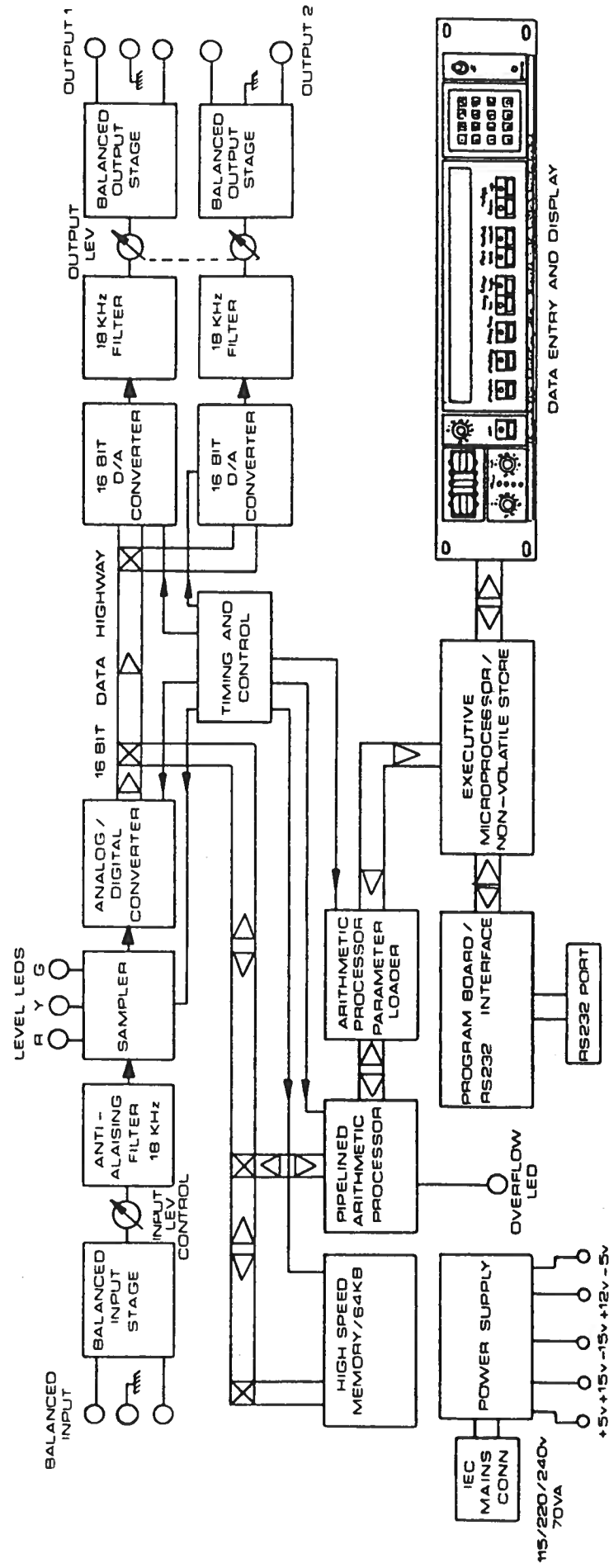
FIGURE 3.1

4 MAINTENANCE

4.1 INTRODUCTION

This section contains maintenance information for both the RMX16 and the DMX15R and includes general maintenance procedures and trouble shooting information.

4.2 SERVICE INFORMATION AND WARRANTY

4.2.1 Each RMX16/DMX15R is warranted for a period of one year upon delivery to the original purchaser. Details of the warranty are given in Section 6 of this manual.

4.2.2 A factory service is available for the RMX16/DMX15R on request. Shipping information is given in the 'Operating Instructions Section' of this manual. If required an estimate can be provided to the customer prior to work being carried out.

4.2.2 Software updates are free of charge for a period of 12 montns from date of purchase. Updates will not be automatically sent out. It is up to individual customers to check that their software is up to date prior to the expiration of the guarantee period.

4.3 GENERAL MAINTENANCE

4.3.1 ACCESS

All printed circuit board assemblies can be accessed by removing the top cover plate, four DZUS fasteners hold the plate in place. To loosen the DZUS fasteners a 90 degree anti-clockwise rotation is all that is required so that the slot runs from left to right. For cleaning purposes it will also be necessary to remove the bottom plate. The bottom plate is also held on by four DZUS fasteners. The front panel is affixed by four M5 x 12mm countersunk socket head screws (black) and can be removed using a 3mm AF Allen key. The display board is held on to the front panel by nine M3 x 20mm countersunk socket head screws (black) together with nine 6mm plastic spacers, plastic wasners, shake proof washers and sixteen M3 nuts; the display board should be removed by unfastening the nuts on the rear of the board. The back panel is held on by four M5 x 12mm Pan Head Posidriv screws (+ shakeproofs). The fan, the blanking panel and the fan guard are also held on by four M5 x 12mm Pan Head Posidriv screws.

4.3.2 CLEANING

The RMX16/DMX15R should be cleaned periodically to remove dust, grease and other contaminants. The surface of all the printed circuit boards should be cleaned using dry air at low pressure (<20 psi). If grease is to be removed use Arklone F or Freon TF and remove grime with clean dry air at low pressure. Clean the front panel with a soft cloth dampened with a mild solution of detergent and water. DO NOT USE ARKLONE ON THE DISPLAY FILTER as this will cause damage.

4.4 TROUBLE SHOOTING

The following section has been written as a guide for fault finding in case of malfunction during service.   If the RMX16/DMX15R malfunctions whilst under warranty, contact the engineering department at A.M.S.   or   an   approved service organisation immediately.   If an attempt is made to service the unit whilst it is still under warranty without guidance or permission from one of the above bodies warranty may well be invalidated.

Before embarking on the checking procedures outlined below, ensure that all the power supplies are at their correct potential (see drawing in section 2.3.5 for supply test points) and that all the fuses are intact; also check the input wiring external to the DDL for shorts.

Possible causes are listed in order of probability and therefore should be checked in strict order.

SYMPTOM	POSSIBLE CAUSE
LOSS OF OUTPUT ON ONE CHANNEL	1. OUTPUT SHORT CIRCUIT: CHECK BOTH THE CABLE CONNECTED TO THE UNIT AND THE INTERNAL WIRING OF THE UNIT FOR THAT CHANNEL. 2. CHECK THE DAC CARD
LOSS OF OUTPUT ON BOTH CHANNELS WITH LEVEL LEDs ALSO NOT WORKING	1. INPUT SHORT CIRCUIT: CHECK BOTH THE CABLE CONNECTED TO THE UNIT AND THE INTERNAL WIRING OF THE UNIT. 2. CHECK THE INPUT CARD. 3. CHECK THE SAMPLER CARD.
LOSS OF OUTPUT ON BOTH CHANNELS WITH LEVEL LEDs OPERATIONAL	1. CHECK THE ADC CARD. 2. CHECK BOTH THE MEMORY CONTROL BOARDS.
INTERMITTENT OUTPUT ON BOTH CHANNELS	1. FAULTY RAM CARD. 2. FAULTY MEMORY CONTROL CARDS.
INTERMITTENT DISTORTION ON BOTH CHANNELS	1. FAULTY RAM CARD. 2. MULTIPLIER CARD.
CONSTANTLY DISTORTED OUTPUT ON BOTH CHANNELS	1. INPUT CARD. 2. SAMPLER CARD. 3. ADC CARD. 4. MULTIPLIER CARD.
CONSTANTLY DISTORTED OUTPUT ON ONE CHANNEL	1. DAC CARD.

TROUBLE SHOOTING (CONTINUED)

SYMPTOM	POSSIBLE CAUSE
FRONT PANEL LEDs NOT ILLUMINATED / INCORRECT PARAMETERS DISPLAYED	1. CHECK THE PROCESSOR CARD. 2. CHECK THE PROGRAM INTERFACE CARD. 3. CHECK THE FRONT PANEL BOARD.
REVERBERATION NOT IN AGREEMENT WITH DISPLAY PARAMETERS	1. PROCESSOR CARD. 2. PROGRAM INTERFACE CARD. 3. MEMORY CONTROL CARD - MCB 5B.

If a multiplier card is suspect, select program 5 (the delay program). In this program only the multiplier card in slot EC9 is actually utilised. Thus each multiplier may be plugged into this slot, in turn, to determine which of the boards (if any) is faulty. This card exchange should obviously only be done with the unit switched off. When removing or replacing cards please take extreme care in ensuring that the cards are replaced in the correct slot with the correct orientation as listed overleaf.

board placement

    The list that follows indicates which board goes in which slot and the way the components face when the front panel is towards you:

SLOT		BOARD	DESCRIPTION	DIRECTION
EC1		DMX 1	INPUT CARD (RMX16 only)	RIGHT
EC2		DMX 15	SAMPLER CARD (RMX16 only)	RIGHT
EC3		DMX 14	ADC CARD (RMX16 only)	RIGHT
EC4		DMX 44	EXPONENT CONTROL CARD	RIGHT
EC5		DMX 20	DUAL DAC	RIGHT
EC6		DMX 32	MCB 5/A	LEFT
EC7	)	DMX 13	RAM CARD(S)	LEFT
EC8	)	"	"	LEFT
EC9	)	DMX 31	MULTIPLIER CARD(S)	LEFT
EC10	)	"	"	LEFT
EC11	)	"	"	LEFT
EC12		DMX 33	MCB 5/B	LEFT
EC13		NOT USED !	NOT USED !	NOT USED !
EC14		DMX 43	PROGRAM INTERFACE CARD	LEFT
EC15		NOT USED !	NOT USED !	NOT USED !
EC16		DMX 23	MICROPROCESSOR CARD	RIGHT

EC's 1 2 3 4 5   6 7 8   9 10 11 12 13 14 15 16
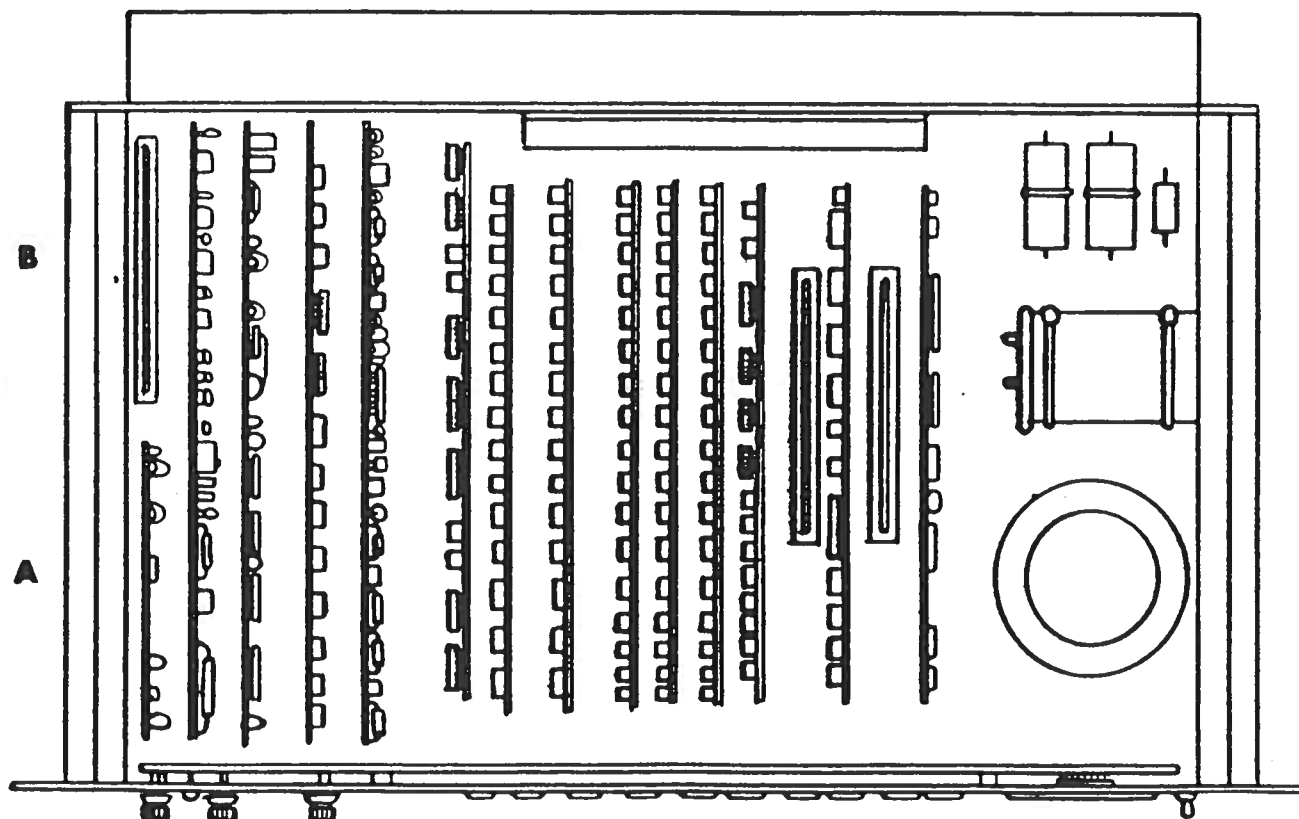
5 WARRANTY

5.1 LIMITED LIABILITY

EDENDECK LIMITED, TRADING AS ADVANCED MUSIC SYSTEMS AND HEREIN AFTER KNOWN AS THE MANUFACTURER, GUARANTEES THIS EQUIPMENT FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR A PERIOD OF ONE YEAR. THIS GUARANTEE EXTENDS TO THE ORIGINAL PURCHASER ONLY AND DOES NOT APPLY TO FUSES OR ANY PRODUCT OR PARTS SUBJECTED TO MISUSE, NEGLECT, ACCIDENT OR ABNORMAL CONDITIONS OF OPERATION. THE GUARANTEE BEGINS ON THE DATE OF DELIVERY TO THE ACTUAL PURCHASER OR TO HIS AUTHORISED AGENT OR CARRIER.

IN THE EVENT OF FAILURE OF A PRODUCT COVERED BY THIS GUARANTEE, THE MANUFACTURER OR THEIR CERTIFIED REPRESENTATIVES WILL REPAIR AND CALIBRATE EQUIPMENT RETURNED PREPAID TO AN AUTHORISED SERVICE FACILITY WITHIN ONE YEAR OF THE ORIGINAL PURCHASE AND PROVIDED THAT THE GUARANTORS EXAMINATION DISCLOSES TO HIS SATISFACTION THAT THE PRODUCT WAS DEFECTIVE, EQUIPMENT UNDER THIS GUARANTEE WILL BE REPAIRED OR REPLACED WITHOUT CHARGE. ANY FAULT THAT HAS BEEN CAUSED BY MISUSE; NEGLECT; ACCIDENT, ACT OF GOD, WAR OR CIVIL INSURRECTION; ALTERATION OR REPAIR BY UNAUTHORISED PERSONNEL; OPERATION FROM AN INCORRECT POWER SOURCE OR ABNORMAL CONDITIONS OF OPERATION, WILL NOT FALL UNDER THIS GUARANTEE. HOWEVER AN ESTIMATE OF THE COST OF THE REPAIR WORK WILL BE SUBMITTED BEFORE WORK IS STARTED.

THE MANUFACTURER SHALL NOT BE RESPONSIBLE FOR ANY LOSS OR DAMAGE, DIRECT OR CONSEQUENTIAL, RESULTING FROM MACHINE FAILURE OR THE INABILITY OF THE PRODUCT TO PERFORM.

THE MANUFACTURER SHALL NOT BE RESPONSIBLE FOR ANY DAMAGE OR LOSS DURING SHIPMENT TO OR FROM THE FACTORY OR ITS DESIGNATED SERVICE FACILITY.

THIS GUARANTEE IS IN LIEU OF ALL OTHER GUARANTEES, EXPRESSED OR IMPLIED, AND OF ANY OTHER LIABILITIES ON THE MANUFACTURERS PART.

THE MANUFACTURER DOES NOT AUTHORISE ANYONE TO MAKE ANY GUARANTEE OR ASSUME ANY LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE ABOVE.

THE MANUFACTURER RESERVES THE RIGHT TO MAKE CHANGES OR IMPROVEMENTS IN THE DESIGN AND CONSTRUCTION OF THIS UNIT WITHOUT OBLIGATION TO MAKE SUCH CHANGES OR IMPROVEMENTS IN THE PURCHASER'S UNIT.

5.2 WHAT TO DO IF A FAULT IS FOUND

If a fault develops in the unit, notify Advanced Music Systems or their nearest service facility giving full details of the difficulty. On receipt of this information service or shipping instructions will be forwarded to you. No equipment should be returned under the warranty without prior consent from Advanced Music Systems or their Authorised Representative.

5.3 SHIPPING INFORMATION

Authorised returns should be prepaid and must be insured. All AMS products are packaged in specially designed containers for the best possible protection. If the unit is returned the original container should be used. If this is not possible, a new container can be obtained from Advanced Music Systems; please specify the model number when requesting a new container.

If the specially designed container is not used ensure that a suitable rigid container of adequate size is used, wrap the instrument in paper and surround it with a good thickness of shock absorbing material.

System modules being returned for repair/exchange should be wrapped in polythene, surrounded by shock absorbing material and placed in either a thick 'jiffy' type container (single boards only) or in a strong rigid container.

5.4 CLAIM FOR DAMAGE DURING TRANSIT

The instrument should be thoroughly inspected immediately upon delivery to the purchaser. If the instrument is damaged in any way a claim should be filed with the carrier immediately. A quotation to repair shipment damage can be obtained from Advanced Music Systems or their Certified Representative. Final claims and negotiations with the carrier must be completed by the customer.

5.5 APPLICATIONS PROBLEMS

Advanced Music Systems will be happy to answer all applications questions to enhance your use of this equipment. Please address all correspondence to:

        ADVANCED MUSIC SYSTEMS.
        WALLSTREAMS LANE,
        WORSTHORNE VILLAGE,
        BURNLEY,
        LANCASHIRE,
        ENGLAND.

        OR TELEPHONE: 0282 36943
                TELEX: 63108

EQUIPMENT QUALITY

The following page should be torn out and returned to :

       THE QUALITY ASSURANCE DEPARTMENT.
       ADVANCED MUSIC SYSTEMS,
       WALLSTREAMS LANE,
       WORSTHORNE,
       NR. BURNLEY,
       LANCASHIRE,
       ENGLAND.

       It has been included so that you may comment on the
equipment you have just purchased. The inherent problem with
this type of customer feedback is that one generally tends to
receive data only if the customer has a complaint to make. At
A.M.S. we would like to hear comments from everyone who has
purchased one of our units whether their comments be good or
bad. Only with a broad cross section of replies can we make a
proper response to your suggestions.

QUALITY CHARACTERISTICS

---
1 Was shipping damage evident ?
  YES| | NO| | Describe:

---
2 Was shipment complete ?
  YES| | NO| | Describe:

---
3 Were adjustments or replacements
  necessary for satisfactory performance ?
  YES| | NO| | Describe:

---
4 General Appearance ?

Additional Comments ?

```
================================================================
|EQUIPMENT |          Rmx16                                    |
----------------------------------------------------------------
|SERIAL NO.|2895    |ACCEPTANCE TESTED BY:  Gpm                 |
----------------------------------------------------------------
                    |FINAL INSPECTION  BY:   Nm                 |
                    ============================================

================================================================
|Q.A. or CUSTOMER ENGINEER :                                    |
----------------------------------------------------------------
|SITE LOCATION :                                                |
|                                        TEL:                   |
================================================================
```

DDL MODIFICATIONS FOR USE WITH DMX15R

On the DDL rear panel next to the output sockets will be found two blanking plates. Remove one of these plates and replace it with the 25 way D-Type connector supplied. The D-Type is connected to the transmitter card. The D-Type should be offered to the back panel from the inside of the unit.

The transmitter card assembly (dmx 48/A) is wired so that a stereo DDL uses the channel 'B' signal to drive the DMX15R reverberation system. If it is required to drive the reverberation system from channel 'A' (or mono DDL) then:

(i) In early versions of the transmitter card, the wire which connects to pin 11 of the 74LS00 (the only one on the board) should be connected to pin 12.

(ii) In later versions a wire link is provided and clearly marked on the board surface. Simply remove the existing wire link and replace it with a link for channel 'A'.

The transmitter card should now be plugged into a spare RAM card slot with the components facing the same way as existing RAM cards.

The DDL may now be connected to the DMX15R using the cable provided.

If old version rear panels are in use (ie. the extruded aluminium type rather than the box section type) a different method of connection is necessary.

NOTE: DDL use is completely unaffected by the addition of the DMX15R.

BOARD EDGE CONNECTOR DETAILS

    With component side facing and the edge connectors on the left the following applies:

AA:

FACING _____ Component side on edge connector A

AB:

REAR _____ Solder side on edge connector A

BA:

FACING _____ Component side on edge connector B

BB:

REAR _____ Solder side on edge connector B

N.B. OMIT FIRST LETTER FOR SINGLE
     SPACE CONNECTOR.
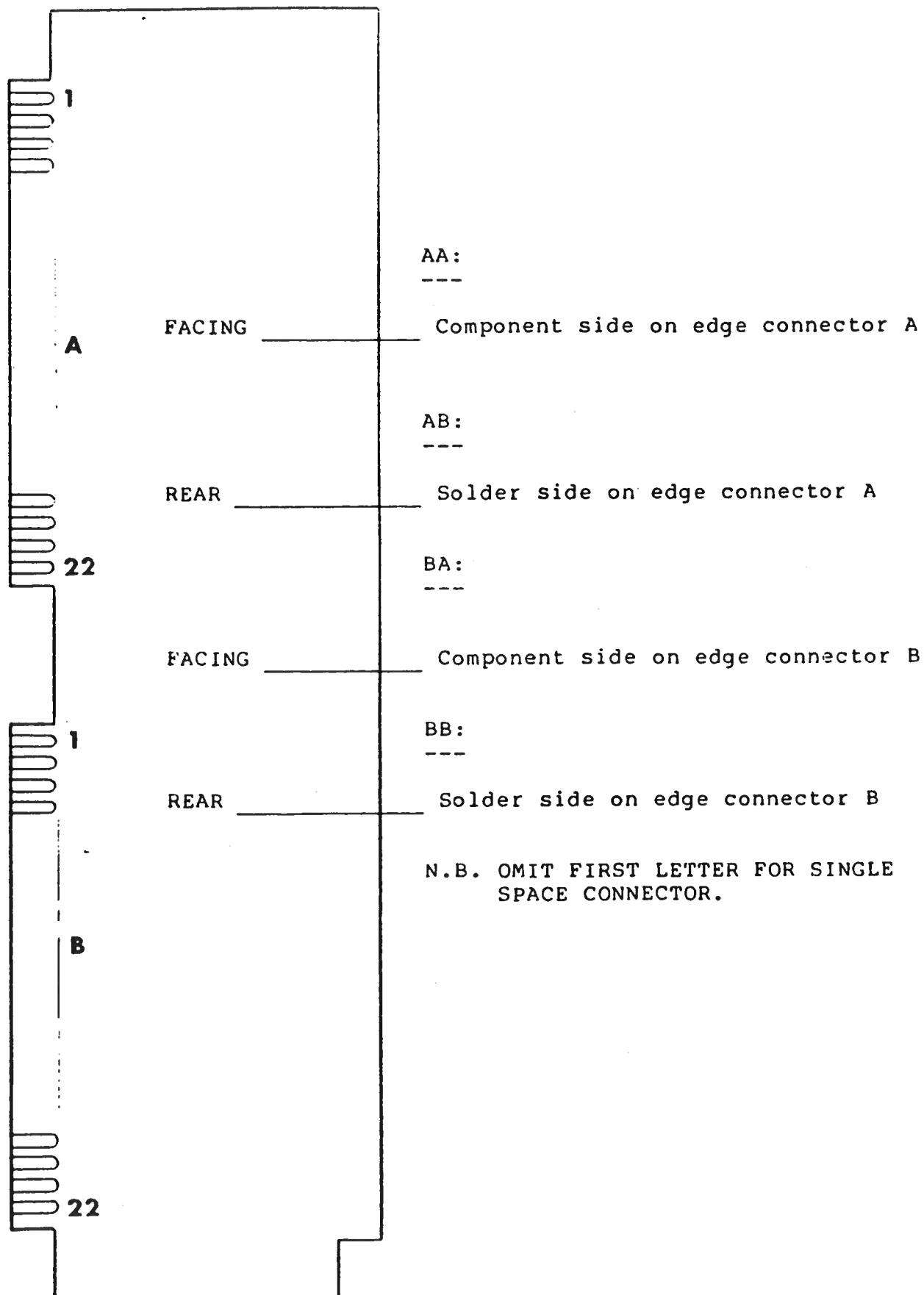
PROGRAM DESCRIPTIONS - SOFTWARE VERSION REV 2.0

Program 1:   Plate B1
----------- .

     This is a program with high diffusion, similar to that
produced by plate reverberators.   Percussive sounds are rapidly
smoothed with this program. Colouration is medium and decay even
as with standard plate reverberators.

     Decay times of up to five seconds are useful for normal use,
and above for special effects.   Indicated decay times are accurate
to about 5 seconds, but it should be noted that perceived decay
time will depend greatly on the frequency spectrum of the input
program material referred to the filter settings.

     Predelay of up to 300 milliseconds is selectable.

     Control of high and low frequency decay times is available
with this program as in most programs, as specified below. These
figures apply to the final, reverberant phase of the decay of each
program, but early reflections are also affected in certain
programs, so the figures should be used as a guide only - the
final setting should be selected by ear.

Nominal high frequency decay control characteristics:

       Setting   Half decay time frequency

          0   18kHz (flat)
         -1   15kHz
         -2   10kHz
         -3   8kHz
         -4   6.5kHz
         -5   5kHz
         -6   3.5kHz
         -7   2kHz
         -8   1.5kHz
         -9   1kHz

Low frequency decay control characteristics:

The low frequency filter control affects the decay time of the
reverberant phase of the programs at a frequency of 350Hz, varying
nominally from a quarter of the indicated time at a setting of -9
to four times at +9.   Program material content varies the
subjective effect of this control considerably - again it is best
set by ear.

Program 2: Ambience

  This program is for general purpose use with an effect somewhere between a hall and a plate. It is useful for increasing reverberation time on material with existing reverberation, or producing unobtrusive reverberation on dry material.

  It differs from a hall in that dimensional elements are deliberately minimised, and differs from a plate in its lower colouration.

  Predelay to 200mS is selectable, and low and high frequency profiles can be modified as in program 1.

  Two special features of the program are that a setting of 9.9 on the decay control gives a very long decay time indeed, and if the filters are set to their zero positions, the decay continues with all original harmonic information without air absorption simulation. This allows voices to be added into the sound one at a time to create a 'choir' effect.

(Caution: Since internal multiplying parameters are unity in this condition, after a long period of time in this condition - several minutes, or tens of minutes - the output dynamic range may limit due to very small input DC offset voltages building up. The overflow LED will illuminate to show this. The condition is simply cleared by returning the decay setting to zero momentarily. In any case the effect is available for ample time for all useful purposes without problem)

Program 3: Room A1

  This program is designed to replicate a 'live' room with all the attendant colourations. Decay times should be kept short for most realism (to 1 or 2 seconds), and a high degree of high frequency damping sounds best (say -7,-8).

  Low frequency equalisation is not provided for this program.

  Colouration is made deliberately high to simulate standing waves in real rooms. All types of material are suitable for this program.

  Predelay to 300 milliseconds is selectable.

Program 4: Hall C1

  This hall program has strong initial reflections thus defining the size of the hall distinctly, giving high presence, making it very useful for vocals, for example.

For 'topping up' material already recorded in halls, a more neutral program such as Ambience is recommended, to avoid two possibly conflicting sets of early information.

Control of both high and low frequency profiles is provided as in program 1 above.

Program 5: Delay Program

This program gives very high quality delays of up to 810 milliseconds. The delay required is set by selection of predelay. The decay time control then acts as a feedback control, zero decay time giving a single repeat echo whilst above zero regenerative echo effects may be obtained. When used for this function the decay time control is not calibrated. Since the feedback is achieved digitally, no degradation of the repeated sound occurs, and the effect is quite remarkable for its clarity.

This delay appears on output 2 only. Output 1 is 'straight through' the Analog-to-Digital-and-back-again chain.

Short delays may be used for 'automatic double tracking' or 'doubling' (up to about 40-50 mS), longer delays to simulate tape echo, and very long delays coupled with a high degree of feedback allow a musician to effectively 'play along' with himself by laying a new bar on top of previous slowly decaying bars to build up a very full sound.

Program 6: Plate A1

This alternative plate simulation to program 1 is provided to help cover the wide range of different favourite sounds of plates which occur due to differing manufacturers, set-up characteristics and simple ageing. The choice is personal, as is each individual's interpretation of the 'ideal' plate.

Pre-delay of 300mS is available.

Control of both high and low frequency equalisation is available.

Program 7: Hall B3

This program is similar to Hall C1, but has lower energy initial reflections.

Pre-delay to 200mS is available.

Control of both high and low frequency equalisation is available.

Program 8: Nonlin 1

This program is for special effects or loudness enhancement, in which the sound does not decay for the first period of time set by the decay control, then very rapidly dies away. The decay values are not calibrated in this mode, but values may be used for reference.

A predelay before the reverberation begins is also selectable.

The program has two outputs - one having discrete reflections (2), the other having a more diffused character (1). Either output may be used - the discrete output is good at short decay times for multiplying percussive sounds like handclaps - the smoother program at short decay times for a certain type of room simulation.

Program 9: Reverse 1

This is another special effects program with two outputs of separate character as in 'Nonlin' above.

Dependent on the setting of the decay control, the reverberating sound builds up for a period of time and then suddenly stops - the reverse of natural reverberation. Again, decay settings are not calibrated but may be used for reference.

A predelay is selectable before the start of the reverb build-up.

RMX16 REMOTE - OPERATING INSTRUCTIONS

SWITCH ON

    If the unit is switched on without being connected to the
RMX16 (or the RMX16 is not switched on) then the following
message will be displayed:

                    CONNECT RMX16 !
                    -

    The REMOTE should then be connected to the mainframe (or the
mainframe should be switched on).

THE KEYS

========

KEY OPERATION

    Looking at the remote you will find that there are two keys
for entry of each variable parameter. For each parameter one key
has the arrow pointing upwards, indicating that the nudge will
increase the value, and the other has the arrow pointing
downwards indicating that the nudge will decrease the value of
the parameter selected.

    When a key is first selected the existing parameter(s) are
displayed unchanged. Further pressing of the key will then
increment or decrement the parameter depending on which of the
two keys is selected.

    Nudging can be accomplished continuously by simply holding
the relevant key down.

STATUS

    Once the remote has been connected to the mainframe switch
on both units. If at this point the remote is not displaying
sensible data press the STATUS key (you may have to do this a
number of times if the remote was switched on before the
mainframe). On pressing STATUS the name of the program, the decay
time and the filter settings for the temporary store will be
displayed.

            for example: PLATE A1 2.0 0-5
                                -

ID

On pressing the ID key the current software version installed in the mainframe will be diplayed.

for example: RMX 16:REV   1.6

SAVE

On pressing the SAVE key the store location currently being addressed will be displayed.

for example: SAVE STORE NO=10

To save the data (at present in the temporary store) in store location 19 simply increment until the display reads:

SAVE STORE NO=19

then press ENTER.

RECALL

On pressing the RECALL key the store location currently being addressed will be displayed.

for example: RECALL STR.NO=19

To actually recall the data stored in store 19 the ENTER key must be pressed.

CLEAR

Pressing the CLEAR key followed by the ENTER key will initiate the clear cycle start; the display will read:

CLR CYCLE START

To actually start the clear cycle a further two ENTER key strokes are required. On pressing the ENTER key for the second time the display will read:

CLR ALL? YES=ENT

If the enter key is pressed again the display will read:

Y=ENT, ABORT=CLR

If the ENTER key is pressed again ALL of the store locations from 10 to 99 will be cleared and the display will read:

STORES CLEARED
-

The currently accessed store location will be 1.

As indicated in the last message before the stores are cleared, pressing the CLEAR key will stop the clear cycle. This may be accomplished at any time during the clear cycle. If the CLEAR key is pressed instead of the enter key the display will read:

CLEAR CANCELLED
-

Once clear has been cancelled pressing the ENTER key alone will have no effect.

STORE

On first pressing the STORE key the display will change to:

for example: NEW STORE NO.=10
                 -

A further pressing of one of the STORE keys will either increment or decrement the new store value depending on which of the STORE keys was operated. If the 'up arrow' key was pressed once the display would read:

NEW STORE NO.=11
-

PROG

On first pressing the PROG key the display will change to:

for example: PROG. 1:PLATE A1
                 -

A further pressing of one of the PROG keys will either increment or decrement the program value depending on which of the PROG keys was operated. In this case if the 'up arrow' key was pressed once the display would now read:

PROG. 2:PLATE B1
-

PREDEL

On first pressing the PREDEL key the display will change to:

for example: PREDELAY = 55ms
                 -

A further pressing of one of the PREDEL keys will either increment or decrement the predelay value depending on which of the PREDEL keys was operated. If the 'up arrow' key was pressed once the display would read:

PREDELAY = 65ms
_

Note that pre-delay is incremented in 10mS steps.

LO FILT

On first pressing the LO FILT key the display will change to:

for example: LO FILTER = +2
                             _

A further pressing of one of the LO FILT keys will either increment or decrement the low filter value depending on which of the LO FILT keys was operated. If the 'up arrow' key was pressed once the display would read:

LO FILTER = +3
           _

If, because of the program selected, there is no low filter available then the following will be displayed:

LO FILTER = NONE
           _

HI FILT

On first pressing the HI FILT key the display will change to:

for example: HI FILTER = -2
                             _

A further pressing of one of the HI FILT keys will either increment or decrement the high filter value depending on which of the HI FILT keys was operated. If the 'up arrow' key was pressed once the display would read:

HI FILTER = -1
           _

If, because of the program selected, there is no high filter available then the following will be displayed:

HI FILTER = NONE
           _

DECAY

On first pressing the DECAY key the display will change to:

for example: DECAY TIME= 2.0s
                      ⎽

A further pressing of one of the DECAY keys will either increment or decrement the decay time value depending on which of the DECAY keys was operated. If the 'up arrow' key was pressed once the display would read:

DECAY TIME= 2.1s
⎽

Note that the decay time is incremented in 0.1s steps.

BATTERY LIFE

DO NOT USE PRIMARY CELLS (alkaline or any other none-rechargeable cell) WITHIN THE REMOTE UNIT WITHOUT PRIOR CONSULTATION WITH A.M.S. OR THEIR AUTHORISED REPRESENTATIVE. DAMAGE TO THE UNIT WILL BE SEVERE IF PRIMARY CELLS ARE PUT ON CHARGE.

If the REMOTE is subjected to very heavy usage the trickle charge from the RMX16 mainframe may not be sufficient to maintain the cells in a fully charged state. If it is felt that the REMOTE is likely to be used under such circumstances a charger is available from A.M.S. or their authorised representative which will fully charge the cells overnight.

BATTERY LOW

When battery charge is running low a BATTERY LOW warning message will be given on the display. This message is generated on every tenth keystroke, it does not affect data storage or handling.

THE BATTERY LOW MESSAGE MUST NOT BE IGNORED SINCE LOSS OF DATA WILL OCCUR IF THE BATTERY VOLTAGE IS ALLOWED TO DROP TOO FAR.

If the BATTERY LOW message is displayed either leave the REMOTE connected to the mainframe, but switched off, for 48 hours (the mainframe must be powered continuously during this period) or preferably place the unit on charge (using the DMX1048 battery charger) overnight.

PROGRAM INDEX — REVISION 3.0 SOFTWARE

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N.B.

After installation of the new EPROMS, the number 1 key on
the keypad must be held down whilest the unit is switched
on.

This is to clear all the user definable stores.

PROGRAM DESCRIPTIONS - SOFTWARE VERSION REV 3.0

Program 1: **Ambience**

        This program is a very useful and flexible general purpose program with an effect somewhere between a hall and a plate. It is useful for increasing reverberation time on material with existing reverberation, or producing unobtrusive reverberation on dry material.

        It differs from a hall in that dimensional elements are deliberately minimised, and differs from a plate in its lower colouration.

        Predelay to 200mS is selectable, and low and high frequency profiles can be modified as in program 4.

        Two special features of the program are that a setting of 9.9 on the decay control gives an infinite decay time, and if the filters are set to their zero positions, the decay continues with all original harmonic information without air absorption simulation. This allows voices to be added into the sound one at a time to create a 'choir' effect. This can also be descibed as a 'freeze' setting and can be initiated by selecting 'pot' on the decay control and rapidly turning from minimum (0.0) to maximum (9.9) settings as the sound you wish to 'freeze' occurs.

        (Caution: Since internal multiplying parameters are unity in this mode, after a long period of time in this condition — several minutes, or tens of minutes — the output dynamic range may limit due to very small input DC offset voltages building up. The overflow LED will illuminate to show this. The condition is simply cleared by returning the decay setting to zero momentarily. In any case the effect is available for ample time for all useful purposes without problem).

Program 2: **Room A1**

        This program is designed to replicate a 'live' room with all the attendant colourations. Decay times should be kept short for most realism (to 1 or 2 seconds), and a high degree of high frequency damping sounds best (say -7,-8).

        Low frequency equalisation is not provided for this program.

        Colouration is made deliberately high to simulate standing waves in real rooms. All types of material are suitable for this program.

        Predelay to 300 milliseconds is selectable.

Program 3:   **Hall C1**

        This hall program has strong initial reflections thus defining
the size of the hall distinctly, giving high presence, making it very
useful for vocals, for example.

        For 'topping up' material already recorded in halls, a more
neutral program such as Ambience is recommended, to avoid two
possibly conflicting sets of early information.

        Control of both high and low frequency profiles is provided as
in program 1 above.

Program 4:   **Plate A1**

        This is a program with high diffusion, similar to that
produced by plate reverberators. Percussive sounds are rapidly
smoothed with this program. Colouration is medium and decay even as
with standard plate reverberators.

        Decay times of up to five seconds are useful for normal use,
and above for special effects. Indicated decay times are accurate to
about 5 seconds, but it should be noted that perceived decay time
will depend greatly on the frequency spectrum of the input program
material referred to the filter settings.

        Predelay of up to 300 milliseconds is selectable.

        Control of high and low frequency decay times is available
with this program as in most programs, as specified below. These
figures apply to the final, reverberant phase of the decay of each
program, but early reflections are also affected in certain programs,
so the figures should be used as a guide only — the final setting
should be selected by ear.

Nominal high frequency decay control characteristics:

Setting	Half decay time frequency
0	18kHz (flat)
-1	15kHz
-2	10kHz
-3	8kHz
-4	6.5kHz
-5	5kHz
-6	3.5kHz
-7	2kHz
-8	1.5kHz
-9	1kHz

Low frequency decay control characteristics:

The low frequency filter control affects the decay time of the reverberant phase of the programs at a frequency of 350Hz, varying nominally from a quarter of the indicated time at a setting of -9 to four times at +9. Program material content varies the subjective effect of this control considerably - again it is best set by ear.

Program 5: **Hall B3**

This program is similar to Hall C1, but has lower energy initial reflections.

Pre-delay to 200mS is available.

Control of both high and low frequency equalisation is available.

Program 6: **Chorus**

This is a five voice program which is very useful for 'filling out' voices and certain instruments.

The five voices are panned across the stereo image and are separated from each other by randomised delays operating on each voice. In addition, a basic separation is also selectable to bring the voices 'closer together' or to spread out' the image in time and space.

The program is controlled as follows:

The PREDELAY control affects the separation of the voices, as described above. Because of the short delay nature of this program, the nudge controls increment in steps of 1mS instead of the normal 10mS. The maximum value selectable is 50mS, which over the five voices gives a total spread of 250mS.

At settings below about 6mS, useful phasing/flanging/tunnelling effects are available.

The 'depth' of the randomising and pitch changing effect is controlled by the DECAY control.

High frequency filtering of all voices is available.

Phase cancellation and addition are very strong in this program by design, which can mean that slight adjustment of the input level control may be necessary dependent on program material to avoid overflow conditions.

(Note: Since the control microprocessor is also responsible for refreshing the front panel display, slight disturbances in the intensity of the LEDs may be apparent at high settings of the decay control when the observer is close to the unit. This is not a fault condition.)

Program 7: **Echo**

        This program provides two high quality, completely independent
and programmable outputs from a single input.   Control of delay time
is via PREDELAY, of feedback level (regeneration) via the DECAY
control and high and low filtering can be selected in the delay path
in the normal way.

        To select which output to program, the 'A' or 'B' buttons should
be depressed on the keypad as appropriate.   The program title will
reflect this selection, displayiong ECHO A or ECHO B accordingly.

        To allow greatest flexibility in generating effects with this
program, the maximum delays selectable on each output have been set
differently - either 650mS + 150mS or 1.2 Seconds/400mS for the 1.6
second option.

        This program can be used to great effect for double/triple
tracking, longer delays simulate tape echo, and very long delays with
a high degree of feedback allow a musician to effectively 'play
along' with himself by laying a new bar on top of previous slowly
decaying bars to build up a very full sound. Since the regeneration
is accomplished in the digital domain, a very clean effect is
generated.

Program 8: **Nonlin 2**

        This is an unusual program for special effects or loudness
enhancement, in which the sound decays only very slightly for a
period of time (set by the decay control), and then dies away very
rapidly.   It is especially useful on drums, and at small settings of
decay produces a very good room effect.   The decay values are not
calibrated in this mode, but values may be used for reference.   The
output is in stereo, unlike NONLIN 1, and in addition filtering at
high frequencies is available.

Program 9: **Reverse 1**

        This is another special effects program with two outputs of
separate character. One output has discrete reflections (output 2),
the other has a more diffused character (output 1). Either output may
be used but it should be noted that this feature is designed to offer
maximum flexibility, and it is not intended that both variations are
used together as a stereo pair.

        Dependent on the setting of the decay control, the
reverberating sound builds up for a period of time and then suddenly
stops - the reverse of natural reverberation. Again, decay settings
are not calibrated but may be used for reference.

        A predelay is selectable before the start of the reverb build-
up.

END