

Alesis
MIDIVERB IV STEREO EFFECTS PROCESSOR
Service Manual V 1.00
6/13/95

PREFACE

This document is intended to assist the service technician in the operation, maintenance and repair of the MidiVerb IV Stereo Effects Processor. Together with the MidiVerb 4 Reference Manual, this document provides a complete description of the functionality and serviceability of the Midiverb IV. Any comments or suggestions you may have pertaining to the document are welcome and encouraged.

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WARNINGS

TO REDUCE THE RISK OF ELECTRIC SHOCK OR FIRE, DO NOT EXPOSE THIS PRODUCT TO WATER OR MOISTURE.



The arrowhead symbol on a lightning flash inside a triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the enclosed product which may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point inside a triangle is intended to alert the user to the presence of important operating, maintenance and servicing instructions in the literature which accompanies the product.

CAUTION

Danger of explosion if battery is incorrectly replaced.
Replace only with the same type or equivalent type
recommended by the equipment manufacturer.

Battery Manufacturer: Panasonic/Matsushita
Type: BR2325
Rating 3V, 5mA

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SAFETY SUGGESTIONS

Carefully read the applicable items of the operating instructions and these safety suggestions before using this product. Use extra care to follow the warnings written on the product itself and in the operating instructions. Keep the operating instructions and safety suggestions for reference in the future.

1. Power Source. The product should only be connected to a power supply which is described either in the operating instructions or in markings on the product.
2. Power Cord Protection. AC power supply cords should be placed such that no one is likely to step on the cords and such that nothing will be placed on or against them.
3. Periods of Non-use. If the product is not used for any significant period of time, the product's AC power supply cord should be unplugged from the AC outlet.
4. Foreign Objects and Liquids. Take care not to allow liquids to spill or objects to fall into any openings of the product.
5. Water or Moisture. The product should not be used near any water or in moisture.
6. Heat. Do not place the product near heat sources such as stoves, heat registers, radiators or other heat producing equipment.
7. Ventilation. When installing the product, make sure that the product has adequate ventilation. Improperly ventilating the product may cause overheating, which may damage the product.
8. Mounting. The product should only be used with a rack which the manufacturer recommends. The combination of the product and rack should be moved carefully. Quick movements, excessive force or uneven surfaces may overturn the combination which may damage the product and rack combination.
9. Cleaning. The product should only be cleaned as the manufacturer recommends.
10. Service. The user should only attempt the limited service or upkeep specifically described in the operating instructions for the user. For any other service required, the product should be taken to an authorized service center as described in the operating instructions.
11. Damage to the Product. Qualified service personnel should service the unit in certain situations including without limitation when:
 - a. Liquid has spilled or objects have fallen into the product,
 - b. The product is exposed to water or excessive moisture,
 - c. The AC power supply plug or cord is damaged,
 - d. The product shows an inappropriate change in performance or does not operate normally, or
 - e. The enclosure of the product has been damaged.

General Troubleshooting

While this manual assumes that the reader has a fundamental understanding of electronics and basic troubleshooting techniques, a review of some of the techniques used by our staff may help.

1. Visual Inspection - A short visual inspection of the unit under test will often yield results without the need of complex signal analysis (burnt, or loose components are a dead giveaway).
2. Self Test - Alesis products that utilize microprocessor control contain built in test software which exercises many of the units' primary circuit functions. Self test should always be done following any repair to ensure basic functionality.
3. Environmental Testing - Applying heat and cold (heat gun/freeze spray) will often reveal thermally intermittent components (Clock crystals, I.C.s, and capacitors are particularly prone to this type of failure).
4. Burn in Testing - Leaving a unit running overnight often reveals intermittent failures such as capacitors that begin to leak excess current after a significant amount of time.
5. Cable Checks - Wiggling cables can reveal intermittent failures such as loose cables or poorly soldered headers. Remember to check power supply cables as well.
6. Flexing the PC Board - Poor solder joints and broken traces can often be found by pressing the PC Board in various places.
7. Tapping Components - Sometimes tapping on a component (particularly crystals) will cause it to fail.
8. Power Down/up - Turning the unit off and back on rapidly several times may reveal odd reset and/or power supply failures.
9. Reset Threshold - A Variac (variable transformer) can be used to check reset threshold levels. This can be particularly useful in helping customers with low line problems.
10. Compressors - Using a compressor/limiter is often helpful when attempting to solve low level noise problems, as well as assisting with DAC adjustments.
11. Sweep Tests - Sweep generators are very useful in checking the frequency response envelopes of anti-aliasing filters.
12. Piggybacking - Piggybacking I.C.s is particularly useful when troubleshooting large sections of logic. This is especially true when working with older units.

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1.00 General Description

The MidiVerb IV is a continuation of the Alesis line of quality studio signal processors. As is the tradition at Alesis, much of unit's complex functions are incorporated into an LSI ASIC, reducing parts count and cost, as well as increasing reliability and serviceability. The MidiVerb IV pushes the concept of integration further than any previous processors, adding hardware to the ASIC that was previously discreet components.

2.00 Power Supply

The M4 power supply begins with the 9 Volt A.C. adapter (Alesis P3 type). Input from J8 is R.F. filtered by C35 before on/off switch SW1. From there it is split for the +12V, -12V, and +5V rails. The +12V rail consists of a voltage doubler (C11, C18, and D3, D5), a 7812 regulator, and a filter capacitor (C16). The -12V rail is a "mirror" of the +12V rail, consisting of voltage doubler (C12, C19, and D4, D6), a 7912 regulator, and a filter capacitor (C20). The +5V rail consists of a rectifier diode (D2), an input filter capacitor (C5), a 7805 regulator, an output filter capacitor (C10) and a multitude of 0.1 μ F bypass capacitors. Note that the raw +5V line used by the microprocessor reset, and the SRAM power supply, and is located at the input to the 7805 regulator. Likewise, the +12 V and -12V raw supply lines are available for use by the LCD.

2.10 Battery Backup

Battery backup is actually more complicated than it might first appear, as it depends on a good system reset (see section 5.10 for details) in order to function properly. The actual backup circuit consists of a battery (3V Lithium), a 10K resistor (R21) for checking standby current (see below), a "steering" diode (D8), a filter capacitor (C32), and a transistor/resistor/diode combination that acts as a steering diode, while maintaining a high enough supply voltage to prevent SRAM data corruption.

SRAM standby current should always be checked. While the unit is off, check the voltage across R21. If the voltage is higher than 80mV (specification, although a 1 to 20mV range is more normal) then a problem exists. Usually it indicates a bad (or simply wrong) SRAM, or a short, somewhere along the SRAM V^{CC} line.

WARNING: Danger of explosion exists if the battery is incorrectly replaced. Replace only with the same type or equivalent type recommended by the manufacturer.

Battery Manufacturer: Panasonic/Matsushita

Type: BR2325

Rating: 3V, 5mA

3.00 Analog Signal Paths

3.10 Input

The signal(s) from input jacks J3 (right) and J4 (left/mono) are current limited by R20, R26, and have their impedances set at 1M Ω (stereo), 500K Ω (mono) by resistors R12 and R27. These signals are then buffered by U8C and U8D respectively, before being sent to the input DigPots (U6B, U6A) via A.C. coupling capacitors C4 and C2. After a small gain stage (U8B, U8A) the signals are passed along to the ADC for further processing.

3.20 Output

The differential outputs of the DAC (U12) are converted to a single ended mode via U7B and U7A and their surrounding circuitry. This circuitry also provides some low pass filtering. These signals are then A.C. coupled by C1 and C3 before being sent to the output DigPots. The output of the DigPots is buffered by U7D and U7C before being sent to the output jacks (J1 and J2). The output impedance of the unit is fixed at approximately 220Ω by resistors R15 and R19. C24 and C26 provide R.F. filtering for the outputs.


4.00 A-D/D-A

4.10 A-D

The A to D is a 128 times over sampling Philips 7360 high performance device. It is a stereo part utilizing high Sigma-Delta conversion techniques that eliminates the need for sample and holds, and extensive anti aliasing filters.

The right channel is input through R37, while R47 is a feedback for to the A to D's internal input buffer amplifier. R42 and R60 provide negative and positive inputs to the A to D's internal sigma delta modulator. C40 is a small filter cap placed between these inputs.

The left input is identical and uses R38, R49, R43, R38 and C41.

C8, C42, C9, and C43 are the bypass filters for the internal voltage reference. C35 along with R34 and R35 act as filters for the negative and positive internal DAC reference inputs.  log power is supplied through current limiters (R52, and R56) which help suppress current spikes. C44, C45, and C13 act as bypass filters for the analog supply. The digital supply is filtered by C16, C50, and R60.

R48 is a current reference and has a tolerance of 1% for precision.

The A to D's stereo output is transmitted from the *FROMADC* line to the M4 ASIC chip (U9).

4.20 D-A

The digital to analog converter is U12 which is an AKM 4318A DAC. Like the A to D, this D to A is a high performance over sampling stereo device. It can achieve an outstanding signal to noise ratio of 98 dB which is unprecedented in it's price range. Also, the over sampling nature significantly reduces output filter requirements.

The analog power filter consists of C16, and C48, while the digital is supplied via diodes D10 and D11, and is filtered by C14, and C47. It's bit clock, which is 3.0MHz, is derived from the 12MHz clock by the M4 ASIC U9.

The D to A outputs are routed through differential amplifiers to the unit's output jacks, via the analog output section (see sec. 3.20).

Note that this product is specifically designed to take advantage of the "A" version of the AKM device. This means that the unit is not compatible with the older AKM-4318 (no "A" suffix) part.

5.00 Digital Signal Paths

The 80C31 MPU (U14) controls all "user interface" functions of the M4. These functions range from handling the front panel buttons, to continuously updating algorithm information to the M4 ASIC (U9). Note that the 8031 data buss serves a dual purpose. This buss multiplexes between low order addresses (1st 8 bits), and data. A latch contained in the M4 ASIC is used to hold the low order address half, during 8031 read and write cycles. The EPROM (U2) is used to hold both program information, and algorithm data. The SRAM (U10) holds system variables, as well as user preset data. MIDI I/O is handled through the 8031's built in RXD (Read Serial Data), and TXD (Transmit Serial Data) ports. Front panel keypad decoding and DigPot control are handled through the 8031's built in I/O ports.

5.10 RESET

The 8031 reset circuit is perhaps the single most important circuit in the M4. When this circuit is functioning incorrectly, a complete lock-up of the machine, will occur.

On power up, the 2N4401 transistor is off (the raw supply hasn't raised up far enough yet to bias the transistor on, through R5, R8, and the zener divider network). The rest of the circuit is contained within the M4 ASIC. When the raw supply reaches approximately 7 volts, the transistor will turn on, causing the reset line to drop low. The opposite should occur on power down (transistor turns off at 7V threshold, reset line goes high during the discharge of the power rails) ensuring data integrity.

5.20 M4 ASIC

A full discussion of this device is beyond the scope of this manual, however a brief description of the important pins is necessary, and presented below.

| Pin #(s) | Function |
|-----------------|---|
| 53 | SRAMCE > <i>SRAM Chip Enable</i> - Enable line for 8031 SRAM. |
| 55 | PUPIN > <i>Power UP IN</i> - Conditioned raw +5V is used to determine the time at which the unit resets. Reset will not occur until the raw supply reaches approximately 7V. This is done to ensure that the regulated +5 is steady before machine operation can begin. |
| 56 | PUPOUT > <i>Power UP OUT</i> - Basically the reset out line. |
| 1-4, 61-64 | MICROAD0-7 > <i>MICROprocessor Address 0-7</i> - Because the 8031 data buss is multiplexed between data and low order addresses, a latch must be provided external to hold the low order half of the address during data transfers. This latch (which was a discreet component in earlier Alesis products) has now been incorporated into the M4 ASIC. (See also MICROALE, LSADDR0-7.) |
| 5, 6 | MICROAD12, 15 > <i>MICROprocessor Address 12,15</i> - These two address lines from the 8031 are used to decode memory mapped locations such as the LCD enable. |
| 7 | MICRORD > <i>MICROprocessor Read enable</i> - |
| 8 | MICROWR > <i>MICROprocessor WRite enable</i> - |

| Pin #(s) | Function |
|-----------------|--|
| 9 | MICROALE > <i>MICRO</i> processor Address Latch Enable - Used to enable the low order address buss latch. (See also MICROAD0-7, LSADDR0-7.) |
| 10-17 | LSADDR0-7 > <i>micro</i> processor Low order Stored ADDRESS 0-7 - These lines represent the low order address buss values during the time that the data/address bus is transferring data values. (See also MICROAD0-7, MICROALE.) |
| 43 | DSPSRAMOE > <i>DSP SRAM Output Enable</i> - Enables the output of the SRAM directly under the control of the M4 ASIC. |
| 44 | SRAMWR > <i>SRAM WRite enable</i> - Enables writing to the SRAM directly under the control of the M4 ASIC |
| 19 | M12CLK > <i>12 Mhz CLock</i> - |
| 20 | M3CLK > <i>3 Mhz CLock</i> - |
| 21 | LRCLK > <i>Left-Right CLock</i> - Used to determine which channel of the stereo DAC data is sent to. |
| 22 | DACDATA > <i>Digital-Analog Converter DATA</i> - |
| 23 | FROMADC > <i>FROM Analog-Digital Converter</i> - |
| 24-25, 28-42 | SRAMA0-16 > <i>SRAM Address 0-16</i> - Address buss of the SRAM directly under the control of the M4 ASIC. |
| 45-52 | SRAMD0-7 > <i>SRAM Data 0-7</i> - Data buss of the SRAM directly under the control of the M4 ASIC. |
| 59 | XTALIN > <i>XTAL IN</i> - 12MHz crystal oscillator. |
| 60 | XTALOUT > <i>XTAL OUT</i> - 12MHz crystal oscillator. |
| 54 | LCDEN > <i>LCD ENable</i> - Enables the LCD's internal data latch. |

6.00 The Front Panel

Care should be taken any time that the front panel must be disassembled. Some components (i.e. LCD glass and heat seal cable) are delicate, and will not stand up to a lot of abuse while disassembled. It should be noted that while the LCD assembly is accessible at this point, field disassembly of the LCD is NOT recommended, and front panel repairs in the field should be limited repairing keypad failures.

The front panel contains three key elements:

The LCD

The Keypad

Display LEDs

6.10 The Keypad

The 8031 accesses the keypad via a standard row-column polling matrix. The actual switches are composed of gold plated contact points on the PCB, and a carbon coating on the contact points of the rubber keypad. The 8031 constantly scans the keypad for button press by sending a low to each row, and checking for a corresponding low on any of the columns. Note that the data encoder is also scanned in this fashion, and not all encoder failures are necessarily caused by a bad encoder.

6.20 Display LEDs

Should one or more front panel LEDs go bad, they should be fairly easy to replace using the disassembly procedure outlined below. If all of the LEDs are dead, then the 74HC138 (U3) is probably bad and should be replaced first. Again this component is only accessible by disassembling the front panel.

6.30 Disassembly

Refer to diagram 1 which shows the locations of the critical elements of the front panel assembly. Remove the front panel assembly from the main chassis, and unplug the cables at J1 and J2. Detach the 4 metal clips from the extruded case. Remove the nylon retaining strip freeing the plastic frame assembly. Push the frame to the back of the front panel and it should be free to slide out of the side of the front panel.

To remove the PCB it will first be necessary to unsolder the ribbon cable connecting data encoder to the front panel PCB. There are PCB retaining clips built into the plastic frame. Gently push these away from the PCB, and lift the PCB away from the frame. When all six clips have been loosened, the board should be free to remove from the frame.

To remove the data encoder it is necessary to remove the knob first. In order to do this without tearing up the front panel, use the holes in the back of the frame to push the knob off with a small screwdriver (see diagram 2).

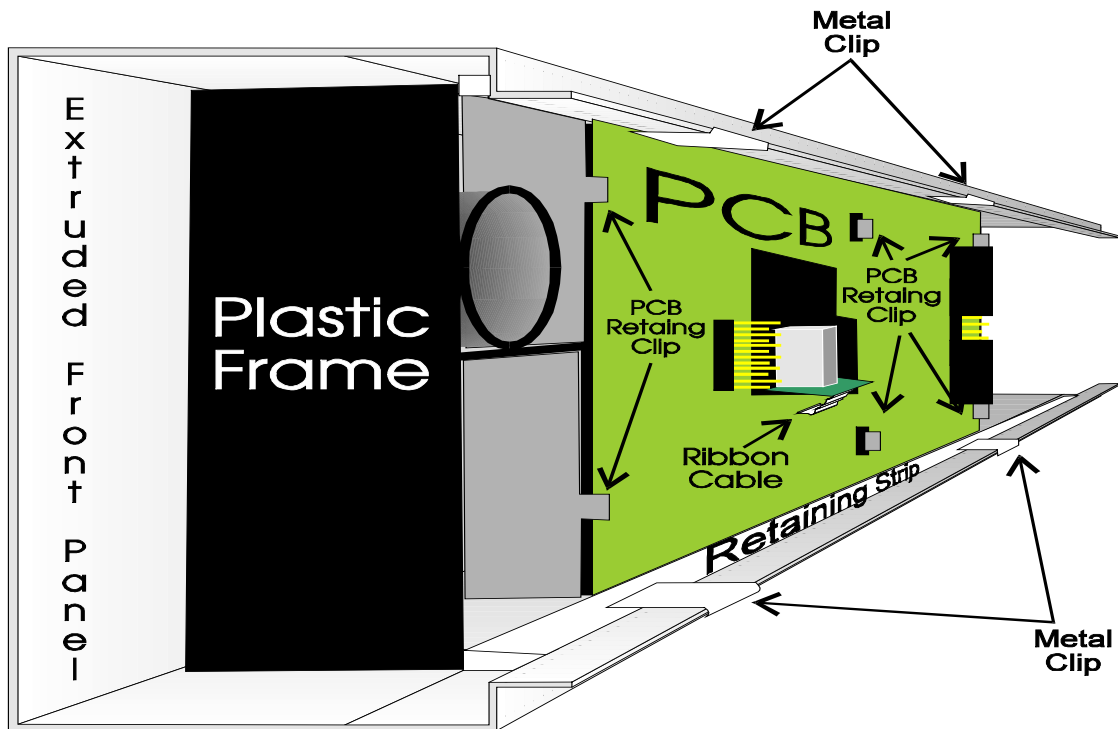


Diagram 1

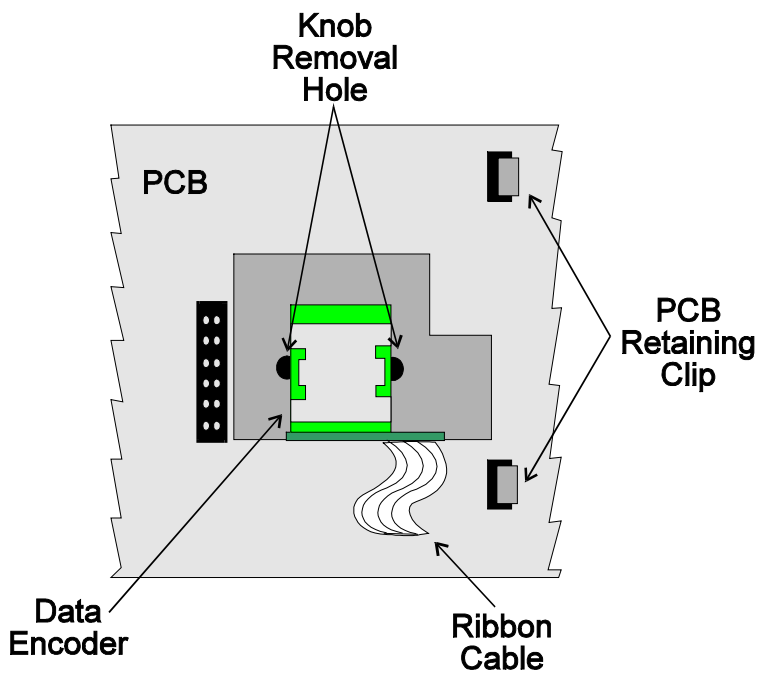


Diagram 2

7.00 Test Procedures

If possible, user data should be saved (an Alesis DataDisk is recommended for this task) prior to any servicing. This, of course, may not always be possible (i.e. dead power supply, bad reset signal, corrupt data, etc.). Saving user data may also be accomplished after unit functionality is restored (i.e. power supply, or reset line, is repaired), and prior to further servicing, and testing. The unit should always be reinitialized (power unit up while holding "PROGRAM" and "D" buttons down) after changing the EPROM, or SRAM.

7.10 Self Test

The built in test software, as in other Alesis products, provides basic diagnostics and tests to ensure unit functionality. A MIDI cable **MUST** be inserted between MIDI IN and OUT before initiating the test. To initiate the self test hold "A" and "D" while powering the unit up. The unit will then proceed to test the following:

- ✌ LEDs-All front panel LEDs are lit sequentially and immediately proceeds to the next test.
- ✌ ROM-CHECKSUM-Checks the ROM's checksum for accuracy and immediately proceeds to the next test.
- ✌ MIDI TEST-Checks MIDI I/O and immediately proceeds to the next test.
- ✌ RAM TEST-Checks internal memory for correct operation and immediately proceeds to the next test.
- ✌ SWITCHES/ENCODER-Pressing Individual front panel buttons causes their function to be displayed on the LCD. Rotating the DATA KNOB causes it's direction to be displayed. Power the unit down to exit the self test routines.

7.20 Further Testing.

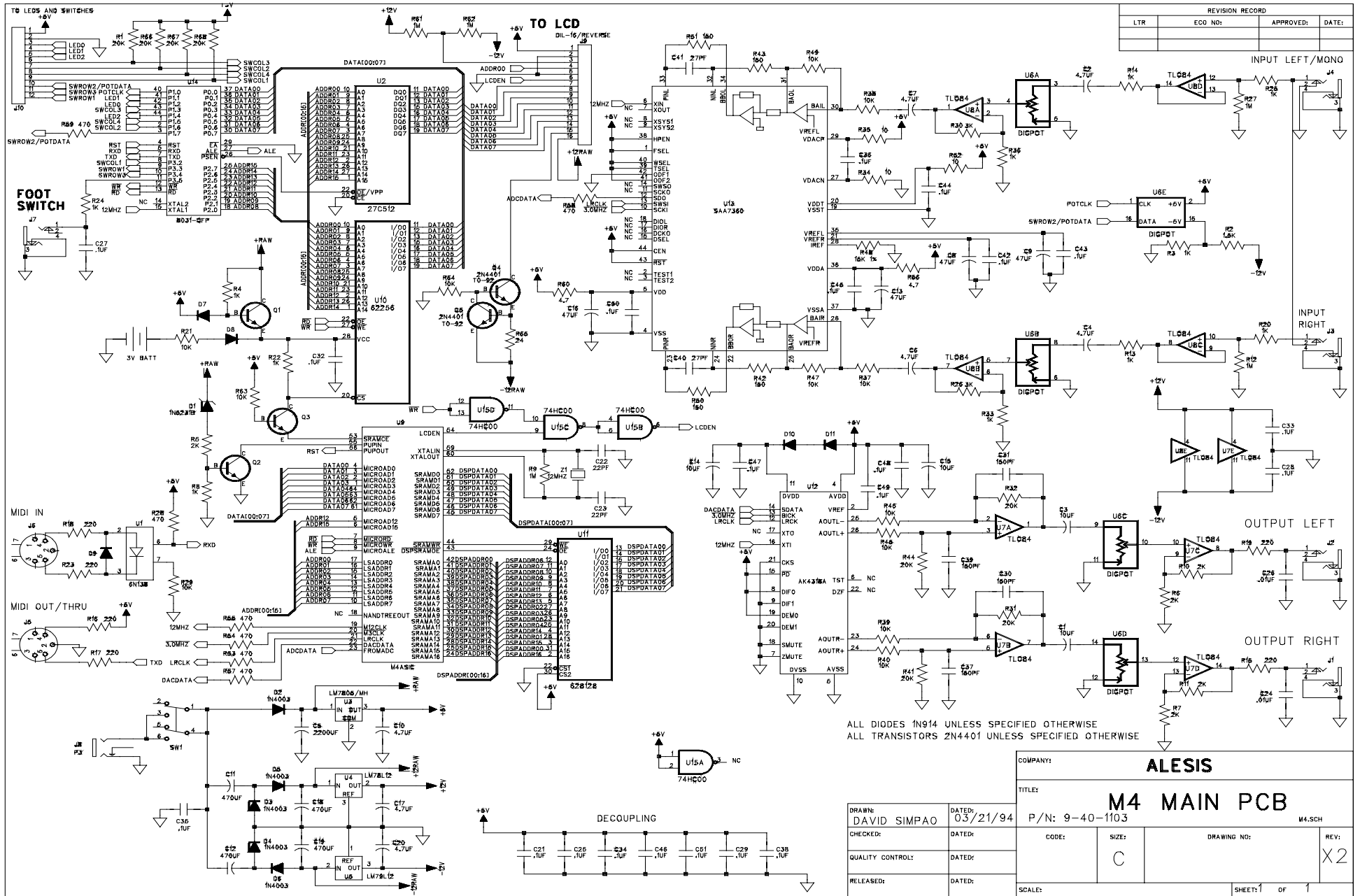
- 📀 Use a clean audio source (CDs preferred) and set up the unit according to the user's manual.
- 📀 Listen to the wet (effects) output for any distortion.
- 📀 Use the Data Knob to change the input and output levels through their full range to ensure the correct operation of the DigPots.
- 📀 To ensure that the shaft encoder is functioning properly all programs should be listened to briefly.
- 📀 Turn the input level all the way down, and the output level all the up.
- 📀 Listen for excessive noise in the noise floor.
- 📀 Send and receive all user programs via MIDI to ensure MIDI operation.
- 📀 As a final check it's a good idea to physically shake the unit so that no loose parts remain inside the unit.

8.00 Troubleshooting

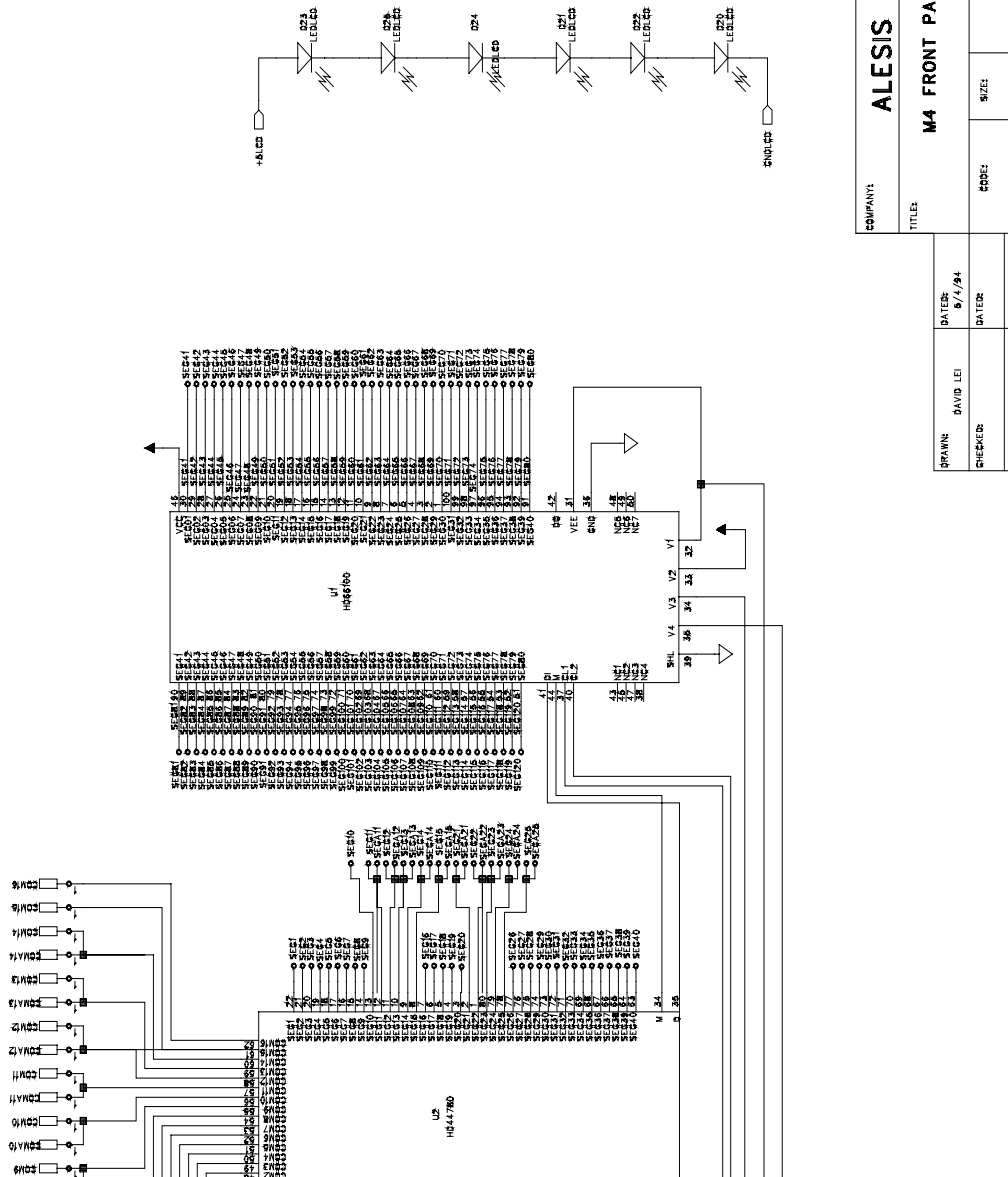
This chart is presented in the interest of helping technicians new to our product line. It is not intended as a substitute for genuine troubleshooting.

| Observed Problem | Possible Cause | Possible Solution |
|---|----------------------------------|--|
| No power, unit is "DEAD". | Faulty power supply. | Replace and retest. |
| | Faulty +5V rectifier diode (D2). | Test diode, replace if necessary. |
| | Faulty bypass capacitor. | Check for burnt or hot capacitors. Replace if necessary. |
| Lights up, but no display or function. | Faulty 8031. | Replace and retest. |
| | Faulty SRAM. | Replace, reinitialize memory (Power unit up while holding "A" and "D") and retest. |
| | Unit "crashed". | Reinitialize memory and retest. (Power unit up while holding "A" and "D") |
| | Faulty M4 ASIC. | Replace and retest. |
| | Faulty LCD Module. | Test with known good front panel. Replace if necessary. |
| Unit locked up (display works but unit doesn't function). | Loose front panel cable. | Reseat cable and retest. |
| | Faulty 8031. | Replace and retest. |
| Garbled LCD display. | Unit "crashed". | Reinitialize memory and retest. (Power unit up while holding "A" and "D") |
| | Faulty SRAM. | Reinitialize memory and retest. (Power unit up while holding "A" and "D") |
| | Faulty LCD Module. | Test with known good front panel. Replace if necessary. |
| | Faulty 8031. | Replace and retest. |
| No audio. | Faulty M4 ASIC. | Replace and retest. |
| | Faulty ADC. | Troubleshoot and repair as necessary. |
| | Faulty DAC. | Troubleshoot and repair as necessary. |
| | Faulty DIGPOT. | Troubleshoot and repair as necessary. |
| No effects (wet) output. | Faulty M4 ASIC. | Replace and retest. |
| | Faulty 8031. | Replace and retest. |
| | Faulty DIGPOT. | Troubleshoot and repair as necessary. |
| Distorted output. | Input levels set too high. | Reduce input levels and retest. |
| | Faulty ADC. | Troubleshoot and repair as necessary. |
| | Faulty DAC. | Troubleshoot and repair as necessary. |
| | Faulty or wrong power supply. | Replace and retest. |
| | Power supply circuitry bad. | Check regulator outputs and troubleshoot as necessary. |
| | Faulty op-amp. | Troubleshoot and repair as necessary. |
| Noisy audio. | Faulty M4 ASIC. | Replace and retest. |
| | Faulty ADC. | Troubleshoot and repair as necessary. |
| | Faulty DAC. | Troubleshoot and repair as necessary. |
| No MIDI in. | Faulty opto-isolator. | Replace and retest. |
| | Faulty 8031. | Replace and retest. |
| No MIDI out. | Faulty 8031. | Replace and retest. |

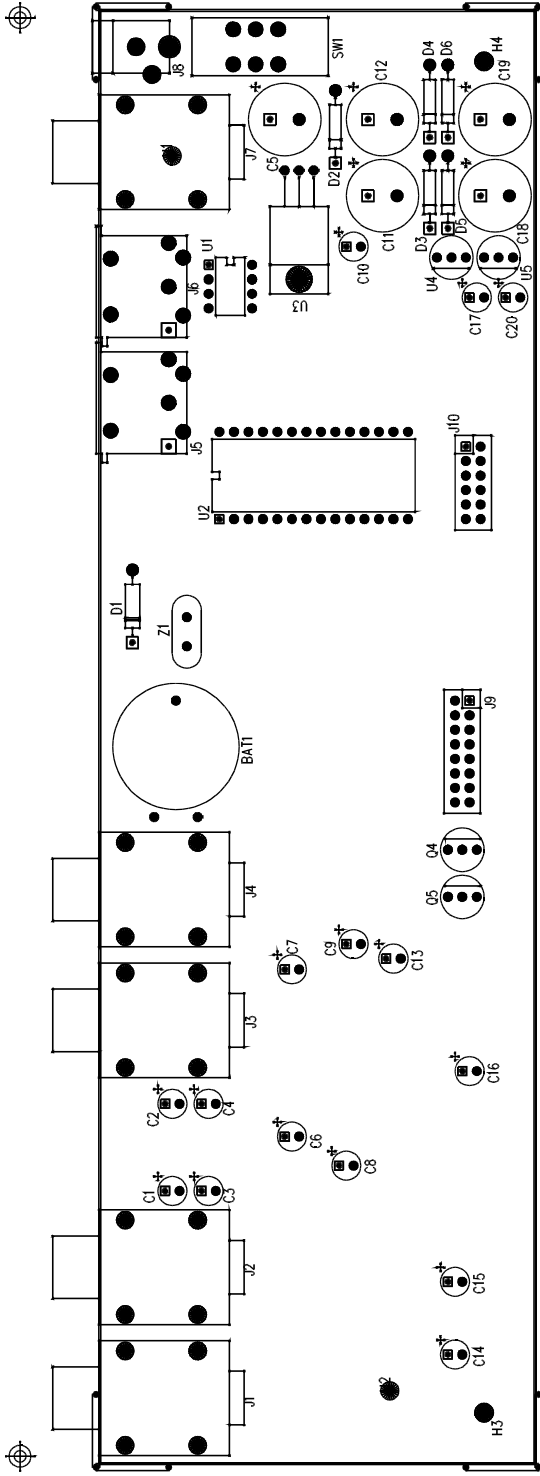
9.00 Schematics



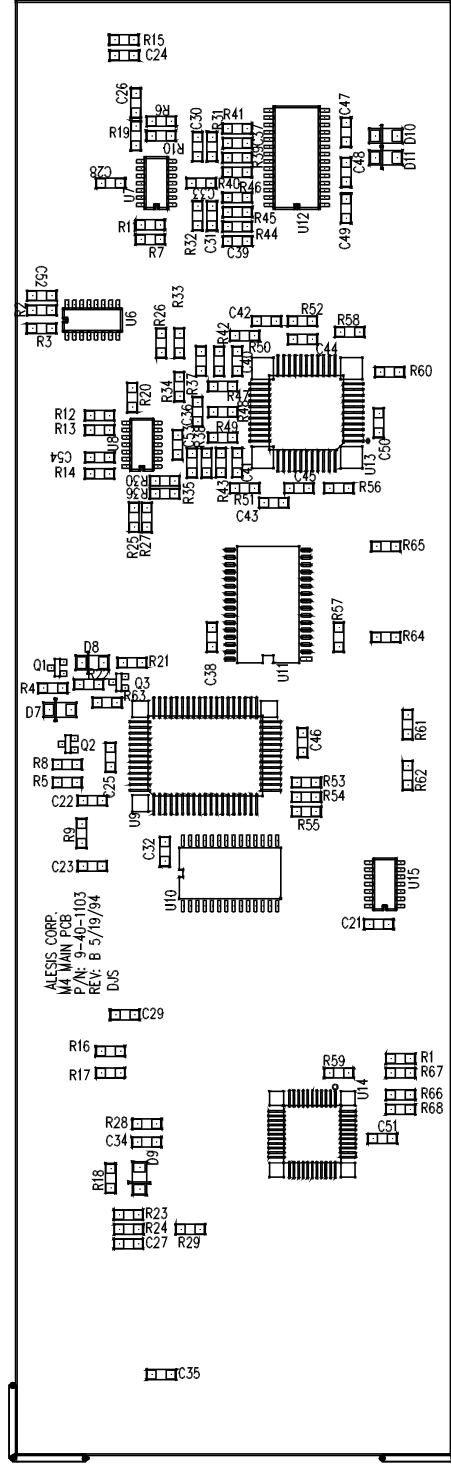
| REV/RSN RECORD | | APPROVED | DATE |
|----------------|--------|----------|------|
| LTR | ECR NR | | |
| | | | |
| | | | |



| | | | |
|--------------------------|--------------|---------------------------|---------------|
| COMPANY: ALESIS | | TITLE: M4 FRONT PANEL PCB | |
| DRAWN: DAVID LEI | DATE: 9/1/94 | CODE: C | SIZE: X |
| CHECKED: QUALITY CONTROL | DATE: | DRWING NR: | REV: REV.A |
| RELEASED: | DATE: | SCALE: 1:1 | SHEET: 1 OF 1 |



A/W 09-40-1103 "TOPTRACE" REV.B



A/W 09-40-1103 "BOTTRACE" REV.B

10.00 Software History

V1.02, 02/17/95, Checksum \$1B39

NOTE: If you are upgrading from V1.00, V1.02 will force a hard reset when you first install it. (i.e., your User Programs will be re-initialized). A hard reset is necessary because some of the Configurations have changed and are no longer compatible with older versions.

If you are upgrading from V1.01, V1.02 will not force a hard reset.

- Fixed a bug which was causing the MIDI Channel to be off by 1 after cycling the power.
- Fixed a problem which caused Pitch Shifter to be inaccurate when shifting down. Also, improved the sound quality. Because of the above changes, some of the Pitch Shifter programs changed slightly.
- Fixed problems with Compare Mode so it behaves consistently. Now it works as described in the manual.
- Now entering/exiting Compare Mode doesn't cause the audio to crackle.
- Improved MIDI Modulation for the LEZLIE>ROOM Configuration.
- Added support for the Cascade pixel on the new LCD glass.
- Added an LCD Test.
- In Test Mode, to continue after a Test fails you now press Output (before it was Input+Output).

V1.01, 12/14/94, Checksum \$16B0

NOTE: If you are upgrading from V1.00, V1.01 will force a hard reset when you first install it. (i.e., your User Programs will be re-initialized). A hard reset is necessary because some of the Configurations have changed and are no longer compatible with older versions.

- The REVERSE REVERB Configuration has been renamed to NONLINEAR. It is the same as the old Configuration except now it has a Dir (Reverb Direction) parameter which can be forward or reverse. Also, the sound quality has been improved somewhat and the range for the Time parameter is longer. The Time parameter is now in mSEC, rather than generic 0-99.
- Because of the above changes to the NONLINEAR Configuration, all of the reverse reverb Programs have slightly changed. Also, Preset 28 "Shimmer" has been changed to "ReMiX".
- Now, if PChg (Util Mode) is set to "On" then incoming MIDI program changes select the Program from the current bank. (Before they would select only User Programs.)
- MIDI Bank Select is now supported. Controller 00 Value 0 selects the Preset Bank; Controller 00 Value 1-127 selects the User Bank. Controller 32 is ignored.
- Tap tempo from footswitch is improved so it doesn't bypass right away.
- Tap tempo from footswitch now changes the Configuration name to lowercase to indicate that the Program has been edited.
- Tap tempo from audio thresholds changed to improve response.
- The MULTI TAP DELAY Configuration now has a MFdbk (Master Feedback) parameter. Mod#X is routed to modulate it.
- Now the audio doesn't crackle on program changes.
- Now if you bypass while Dry Defeat is enabled, the outputs are muted.
- Preset 00 "Bypass" now uses a STEREO PITCH SHFT configuration with levels at 0. The old program didn't work when Dry Defeat was enabled.
- Preset 08 "TapeEcho" changed the delay time to 400mS.
- Renamed User 109 from "90212Chr" to "90210Chr".

- Renamed User 106 from "Model147" to "Model122".
- Now to finish the Switch/Encoder Test you press Page+A (it used to be Input+Output).

V1.00, 11/19/94, Checksum \$77C8

- First Production Release.

11.00 MIDI Implementation

System Exclusive Format

Software Version 1.02

February 17, 1995

OVERVIEW

All MidiVerb 4 system exclusive messages have the following format:

| | |
|----------------|-------------------------|
| \$F0 | System Exclusive status |
| \$00 \$00 \$0E | Alesis manufacturer ID |
| \$11 | MidiVerb 4 ID |
| nn | Channel |
| cc | Opcode |
| dd | Data |
| : | : |
| : | : |
| \$F7 | End of Exclusive |

THE CHANNEL BYTE

For messages originating from the MidiVerb 4 the system exclusive channel will always be the same as the standard MIDI channel, and can be adjusted by the user via the global utility functions. If the user has enabled Omni mode the MidiVerb 4 will respond to system exclusive messages on ANY channel and transmit on channel 1, just as it does for ordinary channel messages (note, controller, program change, etc.) when Omni mode is enabled.

If a transmitting device such as a computer does not know the MIDI channel of a MidiVerb 4 it can use transmit the MIDI universal system exclusive inquiry message with the channel byte set to \$7F (ALL CALL). The MidiVerb 4 will respond with a universal system exclusive identity message with the channel byte set to the current MIDI channel (0-15). This is the recommended technique for closed loop systems as it allows software programs to confirm the MidiVerb 4's software version and revision while it finds the channel.

THE OPCODE BYTE

Opcodes are divided into two categories: Requests and Dumps. The values for Request opcodes are closely related to their corresponding Dump opcodes -- they are simply the Dump opcode with bit 6 set.

Only one of the Request opcodes has a data byte -- the Single Program request. The data byte specifies which User Program (0-127) it is requesting.

| Dump Opcode | Request Opcode | Function Description | Dump Message Size (in bytes) |
|-------------|----------------|----------------------|------------------------------|
| \$00 | \$40 | System Info | 22 |
| \$01 | \$41 | Program Table | 264 |
| \$02 | \$42 | Edit Buffer | 50 |
| \$03 | \$43 | All User Programs | 5384 |
| \$04 | \$44 | Single Program | 51 |
| \$05 | None | Store Program | 9 |

SYSTEM INFO DATA

The System Info data is as follows:

| | |
|-----------------------------|---------------------------|
| Input Volume Stereo | 0-100 |
| Input Volume Ch 1 | 0-100 |
| Input Volume Ch 2 | 0-100 |
| Output Volume Stereo | 0-100 |
| Output Volume Ch 1 | 0-100 |
| Output Volume Ch 2 | 0-100 |
| Mod X | see Modulator Definitions |
| Mod X Amplitude High Nibble | see Modulator Amplitude |
| Mod X Amplitude Low Nibble | : |
| Mod Y | see Modulator Definitions |
| Mod Y Amplitude High Nibble | see Modulator Amplitude |
| Mod Y Amplitude Low Nibble | : |
| Footswitch Mode | see Footswitch Modes |
| System Status Byte | see System Status Byte |

Modulator Definitions

| | |
|-----|----------------|
| 0 | Pitch Bend |
| 1 | Aftertouch |
| 2 | Note Number |
| 3 | Velocity |
| 4 | Controller 0 |
| : | : |
| 123 | Controller 119 |

Modulator Amplitude

The modulation amplitude is nibblized with the high nibble being sent first. The value is in offset binary, so the values 0 to 98 represent amplitudes -99 to -1, the value 99 represents amplitude 00, and the values 100 to 198 represent amplitudes 1 to 99.

Footswitch Modes

| | |
|---|------------|
| 0 | Advance |
| 1 | Bypass |
| 2 | Controller |

System Status Byte

| | |
|-------|------------------------|
| Bit 0 | Thru (0 = Off, 1 = On) |
| Bit 1 | Omni |
| Bit 2 | Bypassed |
| Bit 3 | Cascade |
| Bit 4 | Comparing |
| Bit 5 | DON'T ALTER |
| Bit 6 | Edited |
| Bit 7 | 0 |

PROGRAM TABLE DATA

The Program Change Table data consists of 256 transmitted bytes. This results in 128 actual bytes, since the data is nibblized and transmitted as follows:

| | |
|----------|--|
| 0000dddd | first byte contains high nibble (bits 4-7) |
| 0000dddd | second byte contains low nibble (bits 0-3) |

Values 0-127 correspond to Preset Programs 00-127; values 128-255 correspond to User Programs 00-127.

EDIT BUFFER DATA

The Edit Buffer data consists of one Program Data Block, defined below.

Program Data Block

| | |
|---------------|-----------------------------------|
| Reserved | Always zero |
| Configuration | 0-31 |
| 8-Byte Name | |
| 16 Parameters | nibblized so transmit as 32 bytes |

ALL USER PROGRAMS DATA

The All User Programs data consists of 128 Program Data Blocks, defined above.

SINGLE PROGRAM DATA

The Single Program data is defined as follows:

| | |
|--------------------|-----------------------------|
| Program number | 0-127 (selects User 00-127) |
| Program Data Block | |

STORE PROGRAM DATA

This message has no corresponding request and contains a single byte of data. It instructs the MidiVerb 4 to store the current contents of the Edit Buffer into a specified User memory location. The data byte contains the User Program number 0-127.

NOTES

When you send MIDI Sysex "All" from the MidiVerb 4's Util Mode this sends four messages total: System Info, Program Table, Edit Buffer, and All User Programs.

12.00 Service Parts List

| Group | Partno | Description | QNTY | PCB | Ref.Designator | Comment |
|-------|-----------|---|------|------|-------------------------------|-----------------------------|
| ASY | M4 | PROCESSOR MIDIVERB 4 | 1 | | | |
| ASY | 9-79-0100 | ASSY PCB MAIN M4 | 1 | | | |
| ASY | 9-96-1246 | ASIC POT 4 CHANNEL DIGITAL M4 (TESTED) | 1 | MAIN | U6 | |
| ASY | 9-79-0112 | ASSY PCB PANEL FRONT M4 | 1 | FP | PCB ASSY | |
| CAB | 4-18-1003 | CABLE DIL 12-PIN 90MM .1 CTR M-F M4 | 1 | | | |
| CAB | 4-18-1675 | CABLE DIL 16-PIN 210MM .1 CTR M-F M4 | 1 | | | |
| CAB | 4-19-1403 | CABLE 3-LEAD 20MM STRIPPED & TINNED | 1 | F/P | ENCODER CABLE | |
| CAB | 4-19-1417 | CABLE 2-PIN SIL 12.2MM | 1 | | | |
| CAB | 4-19-1418 | CABLE 2-PIN SIL 35MM | 1 | | | |
| CAP | 1-08-0101 | CAP 10 MF ELEC 16V | 11 | MAIN | C1-4, 6-7, 10, 14, 15, 17, 20 | |
| CAP | 1-08-0228 | CAP 2200 MF ELEC 16V | 1 | MAIN | C5 | |
| CAP | 1-08-0474 | CAP 47 MF ELEC 16V | 4 | MAIN | C8, 9, 13, 16 | |
| CAP | 1-09-0221 | CAP 220 MF ELEC 25V | 4 | MAIN | C11, 12, 18, 19 | |
| DIO | 2-01-4003 | DIODE POWER 1N4003 | 5 | MAIN | D2-6 | |
| DIO | 2-02-5231 | DIODE ZENER 1N5231B | 1 | MAIN | D1 | |
| HDR | 4-14-0012 | HEADER 12-PIN DIL XR | 1 | F/P | J1 | |
| HDR | 4-14-0116 | HEADER 16-PIN DIL 0.1 SHROUDED | 1 | F/P | J2 | |
| HDW | 5-00-0020 | SCREW M-3 x 7mm PHIL SLOT | 9 | | | |
| HDW | 5-00-0016 | SCREW 6-32 x 1/4 PP ZNC | 1 | | | HOLDS REGULATOR 7805 TO PCB |
| HDW | 5-02-6320 | NUT KEP 6-32 | 1 | | | HOLDS REGULATOR 7805 TO PCB |
| IC | 2-31-0060 | IC SOFTWARE (VER 1.03) EPROM M4 | 1 | MAIN | U2 | |
| IC | 2-27-0032 | ASIC POT 4 CHANNEL DIGITAL M4 | 1 | | | |
| IC | 2-11-7805 | REG 7805 +5V TO220 NATIONA | 1 | MAIN | U3 | |
| IC | 2-13-7812 | REG 78L12 +12V TO92 NATION | 1 | MAIN | U4 | |
| IC | 2-13-7912 | REG 79L12 -12V TO92 NATION | 1 | MAIN | U5 | |
| IC | 2-24-0138 | IC 6N138 OPTO ISO HEWLETT | 1 | MAIN | U1 | |
| JAC | 4-02-0001 | JACK 1/4 MONO CLIFF | 5 | MAIN | J1-4, 7 | |
| JAC | 4-00-0001 | JACK 5-PIN DIN (MIDI) | 2 | MAIN | J5, J6 | |
| JAC | 4-16-0002 | JACK 3.5MM BARREL (P3) | 1 | MAIN | J8 | |
| LED | 3-02-0012 | LED GRN T1 HP HLMP1540 | 5 | F/P | D1-5 | |
| LED | 3-02-0010 | LED HIGH INTENSITY (GL3UR8) | 1 | F/P | D6 | |
| LED | 3-02-0016 | LED BACKLIGHT (GRN) Q2 | 6 | F/P | D20-25 | |
| LIT | 7-51-1031 | MANUAL REFERENCE M4 | 1 | | | |
| LIT | 7-51-1137 | CHART USER PROGRAM M4 | 1 | | | |
| LIT | 7-52-0004 | CHART PROGRAM M4 | 1 | | | |
| ME | 7-05-0003 | BATTERY 3V LITHIUM PANASONIC | 1 | MAIN | BAT1 | |
| ME | 7-01-0009 | CRYSTAL 12 MHz | 1 | MAIN | Z1 | |
| MIS | 9-00-1011 | ENCODER DATA (ALPS EC11B 15mm w/o SWITCH) | 1 | FP | U8 | |
| MIS | 9-13-1010 | STRIP PE 300MM LG. M4 | 2 | | | |
| MIS | 9-23-1014 | STRIP FOAM (F/P) 7 x 185mm | 4 | | | |
| MIS | 9-23-1017 | STRIP FOAM (SIDE) 7x95mm D4 | 4 | | | |
| MTL | 9-03-1060 | CASE TOP 150MM D4 | 1 | | | |
| MTL | 9-03-1105 | CASE BOTTOM M4 | 1 | | | |
| MTL | 9-03-1138 | PANEL FRONT M4 | 1 | | | |
| MTL | 9-03-1165 | CLIP STRIP RETAINER | 4 | | | |
| MTL | 9-58-1007 | PANEL SIDE/RACK EAR 150mm | 2 | | | |

Service Parts List (continued)

| | | | | | |
|-----|-----------|-----------------------------------|----|------|--|
| MTL | 9-03-1036 | LUG SOLDER PCB MNT | 5 | MAIN | |
| PLS | 9-15-0087 | KNOB DATA M4 | 1 | | |
| PLS | 9-15-0089 | BEZEL FRONT PANEL B M4 | 1 | | |
| PLS | 9-15-0091 | BEZEL DISPLAY M4 | 1 | | |
| PLS | 9-15-1078 | BUTTON POWER Q2/S4/M4 | 1 | | |
| PLS | 9-15-1117 | EXTENDER SWITCH Q2 | 1 | | |
| PLS | 9-23-1055 | KEYPAD RUBBER M4 | 1 | | |
| PLS | 9-15-0088 | BEZEL FRONT PANEL A M4 | 1 | | |
| RES | 0-00-0302 | RES 3K OHM 1/8W 5% | 2 | MAIN | |
| SMC | 1-50-0220 | CAP 22 PF NPO 1206 | 2 | MAIN | C22, 23 |
| SMC | 1-50-0270 | CAP 27 PF NPO 1206 | 2 | MAIN | C40, 41 |
| SMC | 1-50-1500 | CAP 150 PF NPO 1206 | 4 | MAIN | C30, 31, 37, 39 |
| SMC | 1-51-0104 | CAP 0.1 MF X7R 1206 | 24 | MAIN | C21, 25, 27-29, 32-36, 38, 42-45, 46-54 |
| SMC | 1-51-0105 | CAP 0.01 MF X7R 1206 | 2 | MAIN | C24, 26 |
| SMC | 1-51-0104 | CAP 0.1 MF X7R 1206 | 1 | FP | C1 |
| SMI | 2-27-0031 | ASIC DIG FX M4 | 1 | MAIN | U9 |
| SMI | 2-67-5168 | IC 8K x 8 SRAM (LH5168N-10L) | 1 | MAIN | U10 |
| SMI | 2-67-6228 | IC HM628128LFP-10 SRAM SMD | 1 | MAIN | U11 |
| SMI | 2-70-8032 | IC 80C31 PQFP SMD | 1 | MAIN | U14 |
| SMI | 2-75-4319 | IC AK4318A DUAL 18-BIT DAC | 1 | MAIN | U12 |
| SMI | 2-75-7360 | IC SAA7360 ADC PQFP-44 SMD | 1 | MAIN | U13 |
| SMI | 2-64-7400 | IC 74HC00 QUAD 2-IN POS-NAND GATE | 1 | MAIN | U15 |
| SMI | 2-71-0084 | IC TL084 QUAD OPAMP SMD | 2 | MAIN | U7-8 |
| SMI | 2-64-0138 | IC 74HC138 DEMUX/DEC SMD | 1 | FP | U3 |
| SMM | 2-50-4148 | DIODE SIGNAL 1N4148 SMD | 5 | MAIN | D7-D11 |
| SMM | 2-51-4401 | TRANS 2N4401 NPN SMD | 3 | MAIN | Q1-3 |
| SMM | 2-50-4148 | DIODE SIGNAL 1N4148 SMD | 12 | FP | D9-19, 26 |
| SMR | 0-10-0047 | RES 4.7 OHM 1/8W 5% 1206 | 2 | MAIN | R56, R60 |
| SMR | 0-10-0100 | RES 10 OHM 1/8W 5% 1206 | 3 | MAIN | R34, 35, 52 |
| SMR | 0-10-0102 | RES 1K OHM 1/8W 5% 1206 | 11 | MAIN | R3, 4, 8, 13, 14, 20, 22, 24, 25, 33, 36 |
| SMR | 0-10-0103 | RES 10K OHM 1/8W 5% 1206 | 12 | MAIN | R21, 29, 37-40, 45-47, 49, 63, 64 |
| SMR | 0-10-0105 | RES 1M OHM 1/8W 5% 1206 | 5 | MAIN | R9, 12, 27, 61, 62 |
| SMR | 0-10-0151 | RES 150 OHM 1/8W 5% 1206 | 4 | MAIN | R42, 43, 50, 51 |
| SMR | 0-10-0152 | RES 1.5K OHM 1/8W 5% 1206 | 1 | MAIN | R2 |
| SMR | 0-10-0202 | RES 2K OHM 1/8W 5% 1206 | 5 | MAIN | R5-7, 10, 11 |
| SMR | 0-10-0203 | RES 20K OHM 1/8W 5% 1206 | 8 | MAIN | R1, 31, 32, 41, 44, 66-68 |
| SMR | 0-10-0221 | RES 220 OHM 1/8W 5% 1206 | 6 | MAIN | R15-19, 23 |
| SMR | 0-10-0240 | RES 24 OHM 1/8W 5% 1206 | 1 | MAIN | R65 |
| SMR | 0-10-0471 | RES 470 OHM 1/8W 5% 1206 | 7 | MAIN | R28, 53-55, 57-59 |
| SMR | 0-10-0512 | RES 5.1K OHM 1/8W 5% 1206 | 2 | MAIN | R26, 30 |
| SMR | 0-11-0153 | RES 15K OHM 1/8W 1% 1206 | 1 | MAIN | R48 |
| SMR | 0-10-0221 | RES 220 OHM 1/8W 5% 1206 | 1 | FP | R7 |
| SMR | 0-10-0622 | RES 6.2K OHM 1/8W 5% 1206 | 1 | FP | R5 |
| SMR | 0-10-0682 | RES 6.8K OHM 1/8W 5% 1206 | 4 | FP | R1-4 |
| SMR | 0-10-0903 | RES 91K OHM 1/8W 5% 1206 | 1 | FP | R6 |
| SWT | 6-02-0002 | SWITCH DPDT | 1 | MAIN | SW1 |
| TRN | 2-03-4401 | TRANS 2N4401 NPN | 2 | MAIN | Q4, Q5 |

13.00 Service Manual History

6/13/95 V1.00 1st Release.

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