



# Service Manual

**lexicon**

## SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this instrument. Failure to comply with these precautions, or with specific warnings elsewhere in these instructions violates safety standards of design manufacture and intended use of the instrument. Lexicon assumes no liability for the customer's failure to comply with these requirements.

### GROUND THE INSTRUMENT

To minimize shock hazard the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

### DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

### KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

### DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

### DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument.

### DANGEROUS PROCEDURE WARNINGS

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

## WARNING

Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing and adjusting.

### SAFETY SYMBOLS

General definitions of safety symbols used on equipment or in manuals.



Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.



Indicates dangerous voltage. (Terminals fed from the interior by voltage exceeding 1000 volts must be so marked.)

## WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like which, if not correctly performed or adhered to, could result in injury or death to personnel.

## CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

### NOTE:

The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like which is essential to highlight.



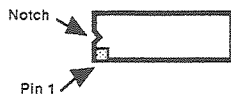
## CAUTION

### Electrostatic Discharge (ESD) Precautions

The following practices minimize possible damage to ICs resulting from electrostatic discharge or improper insertion.

- Keep parts in original containers until ready for use.
- Avoid having plastic, vinyl or styrofoam in the work area.
- Wear an anti-static wrist-strap.
- Discharge personal static before handling devices.
- Remove and insert boards with care.
- When removing boards, handle only by non-conductive surfaces and never touch open-edge connectors except at a static-free workstation.\*
- Minimize handling of ICs.
- Handle each IC by its body.
- Do not slide ICs or boards over any surface.
- Insert ICs with the proper orientation, and watch for bent pins on ICs.
- Use anti-static containers for handling and transport.

\*To make a plastic-laminated workbench anti-static, wash with a solution of Lux liquid detergent, and allow to dry without rinsing.



### CAUTION

ICs inserted backwards will be destroyed. Incorrect insertion of ICs is also likely to cause damage to the board.



# Safety Suggestions

**Read Instructions** Read all safety and operating instructions before operating the unit.

**Retain Instructions** Keep the safety and operating instructions for future reference.

**Heed Warnings** Adhere to all warnings on the unit and in the operating instructions.

**Follow Instructions** Follow operating and use instructions.

**Heat** Keep the unit away from heat sources such as radiators, heat registers, stoves, etc., including amplifiers which produce heat.

**Ventilation** Make sure that the location or position of the unit does not interfere with its proper ventilation. For example, the unit should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a cabinet which impedes the flow of air through the ventilation openings.

**Wall or Ceiling Mounting** Do not mount the unit to a wall or ceiling except as recommended by the manufacturer.

**Power Sources** Connect the unit only to a power supply of the type described in the operating instructions, or as marked on the unit.

**Grounding or Polarization\*** Take precautions not to defeat the grounding or polarization of the unit's power cord.

\*Not applicable in Canada.

**Power Cord Protection** Route power supply cords so that they are not likely to be walked on or pinched by items placed on or against them, paying particular attention to cords at plugs, convenience receptacles, and the point at which they exit from the unit.

**Nonuse Periods** Unplug the power cord of the unit from the outlet when the unit is to be left unused for a long period of time.

**Water and Moisture** Do not use the unit near water — for example, near a sink, in a wet basement, near a swimming pool, near an open window, etc.

**Object and liquid entry** Do not allow objects to fall or liquids to be spilled into the enclosure through openings.

**Cleaning** The unit should be cleaned only as recommended by the manufacturer.

**Servicing** Do not attempt any service beyond that described in the operating instructions. Refer all other service needs to qualified service personnel.

**Damage requiring service** The unit should be serviced by qualified service personnel when:

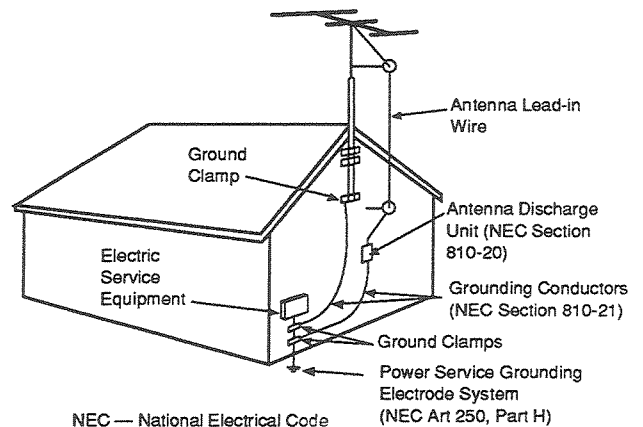
the power supply cord or the plug has been damaged, objects have fallen, or liquid has been spilled into the unit,

the unit has been exposed to rain,

the unit does not appear to operate normally or exhibits a marked change in performance,

the unit has been dropped, or the enclosure damaged.

**Outdoor Antenna Grounding** If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code, ANSI/NFPA No. 70-1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna-discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode. See figure below.



**Power Lines** An outside antenna should be located away from power lines.



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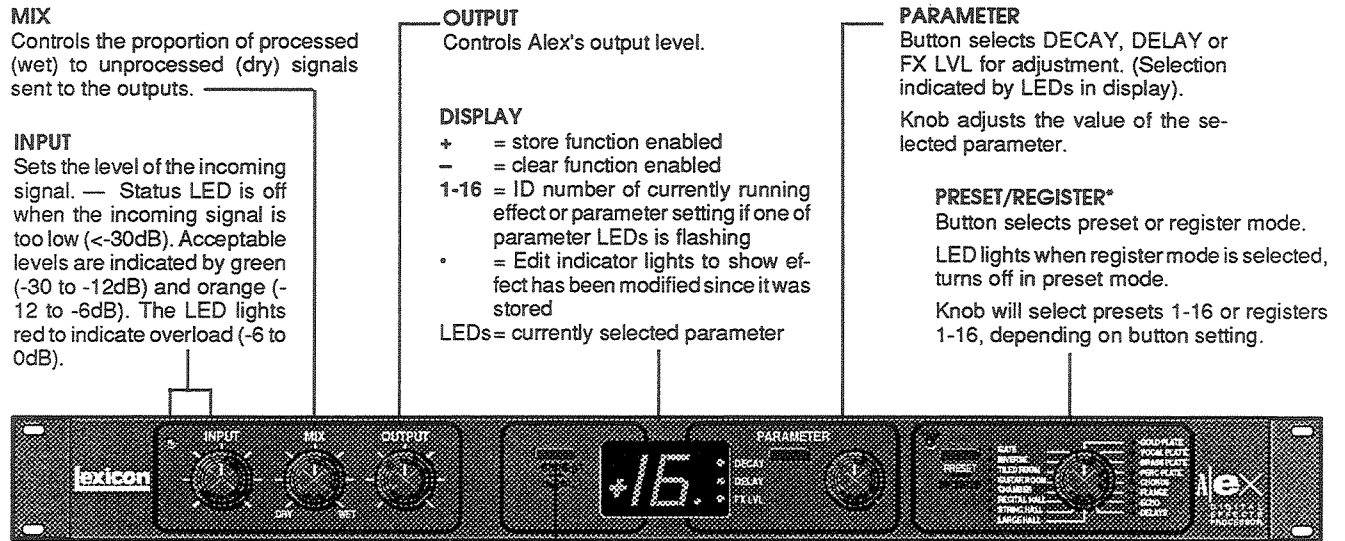
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# 1 Controls and Connectors

## The Front Panel



**MIX**  
Controls the proportion of processed (wet) to unprocessed (dry) signals sent to the outputs.

**INPUT**  
Sets the level of the incoming signal. — Status LED is off when the incoming signal is too low (<-30dB). Acceptable levels are indicated by green (-30 to -12dB) and orange (-12 to -6dB). The LED lights red to indicate overload (-6 to 0dB).

**OUTPUT**  
Controls Alex's output level.

**DISPLAY**  
+ = store function enabled  
- = clear function enabled  
1-16 = ID number of currently running effect or parameter setting if one of parameter LEDs is flashing  
• = Edit indicator lights to show effect has been modified since it was stored  
LEDs = currently selected parameter

**PARAMETER**  
Button selects DECAY, DELAY or FX LVL for adjustment. (Selection indicated by LEDs in display).

Knob adjusts the value of the selected parameter.

### PRESET/REGISTER\*

Button selects preset or register mode. LED lights when register mode is selected, turns off in preset mode.

Knob will select presets 1-16 or registers 1-16, depending on button setting.

### STORE (+)/CLEAR (-)

The STORE/CLEAR button selects Alex's readiness to store an effect or to clear a register. These states are indicated by a + (store) or - (clear) symbol in the display.

\* Note that using a footswitch will cause a discrepancy between the PRESET/REGISTER knob setting and the actual register that is running. When the front panel knob is turned to a different position, the display will update to the new knob position.

To store or clear the currently running effect...

1. Briefly press STORE/CLEAR to display "+" or "-", depending on whether you want to store or clear a register.
2. Press and hold STORE/CLEAR. If you were in preset mode, the register LED will go on, indicating that Alex has automatically switched to register mode — selecting whatever register is being pointed to by the PRESET REGISTER knob. The + or - symbol in the display will flash, indicating that the store or clear function is armed.
3. Releasing STORE/CLEAR with a flashing + displayed, will store the currently running effect into the register indicated on the display, overwriting the effect previously stored there. The display will flash briefly to indicate the store operation was successful.

Releasing STORE/CLEAR with a flashing - displayed, will clear the contents of the displayed register. The display will flash briefly to indicate the clear was successful. (The ID number of cleared registers flash when selected with the PRESET/REGISTER knob.)

To restore a cleared register, simply repeat the clear operation.

Store and clear operations are executed on release of the STORE/CLEAR button. If you want to store to or clear a different register than the one displayed, turn the PRESET/REGISTER knob to the register number you want *before* releasing STORE/CLEAR.

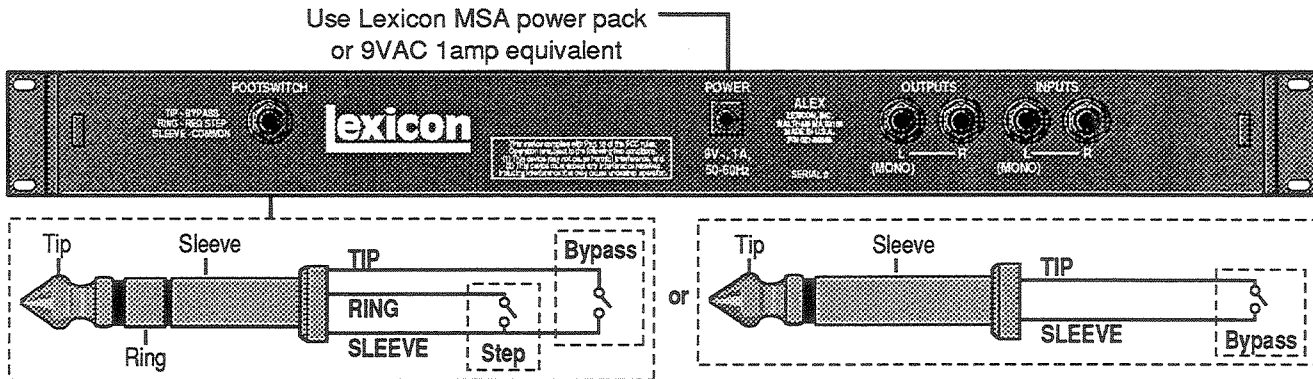
## Storing and Clearing Registers



## The Rear Panel

Audio connections to Alex are unbalanced and should be made with high quality shielded cables with 1/4" tip-sleeve phone jacks at the Alex end.

Alex produces stereo effects from either mono or stereo sources. With mono sources the dry signal appears in mono at both output connectors along with the stereo effects. For instruments and sources with stereo outputs, use both inputs. We recommend using the outputs in stereo whenever possible, but if mono output is required, you can use either output connector. The left and right signals are summed internally when only one output is used.



## Footswitches

Footswitches connected via the rear-panel footswitch jack allow you to perform register step and/or bypass functions. Two footswitches can be wired to a tip-ring-sleeve connector, or a single, mono connector can be used. (With a single connector, insert half-way in for register step, all the way in for bypass.) A stereo Y-connector allows two identical single switches to be used.

When shipped, Alex is configured to use push on/push off type switches. You can change this configuration to allow the use of momentary contact switches by performing the following procedure:

1. Power up Alex while holding in both the STORE/CLEAR and the PARAMETER buttons. (This will put the unit into Diagnostic mode with a "d" displayed.)
2. Press STORE/CLEAR, then turn the PRESET/REGISTER knob until the display reads "0" (push on/push off) or "1" (momentary contact).
3. Press STORE/CLEAR to enter the change. The display will show "+", and then the number you have selected.
4. Power the unit off, then on again to restore normal operation with the selected configuration.

1. Turn Alex's INPUT and OUTPUT controls all the way down (fully counter-clockwise).
2. Set the instrument output or effects send being input to Alex to a nominal level. With an instrument, this should be your loudest playing level; with a console, adjust the output or effects send to produce the highest level possible with the least amount of noise.
3. While sending audio to Alex, gradually turn up the INPUT control until the Input Status Indicator lights orange. Continue to advance INPUT until the LED shows red on only the loudest peaks. If the LED shows red continuously, turn the INPUT control down.
4. If Alex is using a console's sends and returns, set the MIX control fully clockwise (100% wet). If you are using an instrument amplifier, start with MIX set halfway up.
5. Gradually increase the setting of the OUTPUT control until the audio level from the amplifier or mixer is approximately the same as when Alex is bypassed.

## Setting Audio Levels

Under normal conditions Alex requires minimal maintenance. Use a soft, lint-free cloth slightly dampened with warm water and a mild detergent to clean the exterior surfaces of the unit.

**Do not use alcohol, benzene or acetone-based cleaners or any strong commercial cleaners.**

Avoid using abrasive materials such as steel wool or metal polish. If the unit is exposed to a dusty environment, a vacuum or *low-pressure* blower may be used to remove dust from the unit's exterior.

## Periodic Maintenance

When ordering parts, identify each part by type, value and Lexicon Part Number. Replacement parts can be ordered from:

Lexicon, Inc.  
100 Beaver Street  
Waltham MA 02154  
Telephone: 617-736-0300  
Fax: 617-891-0340

ATT: Customer Service

## Ordering Parts

## **Returning units for service**

**Before returning a unit, for warranty or non-warranty service, consult with Lexicon to determine the extent of the problem, and to obtain Return Authorization. No equipment will be accepted without Return Authorization from Lexicon.**

If you choose to return an Alex to Lexicon for service, Lexicon assumes no responsibility for the unit in shipment from customer to the factory, whether the unit is in or out of warranty. All shipments must be well packed (using the original packing materials if possible), properly insured, and consigned to a reliable shipping agent.

When returning a unit for service, please include the following information:

- Name
- Company name
- Street address
- City, State, Zip Code, Country
- Telephone number (including Area Code)
- Serial number of unit
- Description of the problem
- Preferred method of return shipment
- Return Authorization #, both inside and outside of package

Please enclose a brief note describing conversations with Lexicon personnel and give the name and telephone number of the person directly responsible for maintaining the unit.

**Do not include accessories such as manuals, cables, footswitches, etc. with the unit, unless specifically requested to do so by Lexicon Service personnel.**

**Audio Inputs (2)**

*Level* -30dBu minimum  
*Impedance* stereo/50 k $\Omega$  unbalanced  
mono/25 k $\Omega$  unbalanced

**Audio Outputs (2)**

*Level* -2dBu nominal  
+8dBu maximum  
*Impedance* 600 $\Omega$  unbalanced  
*Muting* reduces transients during power on/off

**Footswitch**

T/R/S phone jack for bypass and register step

**Frequency response**

*Wet* 20Hz-15kHz, +1dB to -3dB  
*Dry* 20Hz-20kHz,  $\pm$ 0.5dB

**THD+N**

*Wet* <0.05% @ 1kHz  
*Dry* <0.025% @ 1kHz

**Dynamic Range**

85dB, typical,  
20Hz-20kHz bandwidth

**Conversion**

16 bit linear PCM encoding; 31.25kHz sampling rate

**Power Requirements**

9VAC, 1A wall transformer provided

**Dimensions**

19"W x 1.75"H x 4"D  
(483 x 45 x 102mm)

**Weight**

2 lbs 11 oz (1.22 kg)

**Environment**

*Operating Temperature* 32° to 104°F (0° to 40° C)  
*Storage* -30° to 75° C  
*Relative Humidity* 95% non-condensing

*Specifications subject to change without notice.*





**Initial Inspection**

Inspect the unit for any obvious signs of physical damage. Verify that the front panel PARAMETER knob operates smoothly and correctly. (Refer to the Alex Owner's Manual for detailed explanations of functionality.) Verify that all screws and rear panel jacks are secure, and inspect the AC power supply for any signs of physical damage.

**Power Up**

AC Current/Display Initialization:

1. Connect the 9V AC adaptor to the isolated variable output of the Variac.
2. Connect the 9V AC adaptor to the Alex power input.
3. Verify AC current draw is <0.12 Amps.

On normal power up, Alex will run the following diagnostic tests:

<u>Display Indication</u>	<u>Test</u>
A	ROM Test
B	SRAM Test
C	WCS Test (writable control store)
E	Interrupt Test
L	Unit loading program

4. Verify that, when turned, the PRESET/REGISTER knob causes the correct program numbers to be displayed. (See table below.)

<u>Preset/Register Knob Position</u>	<u>Display Reading</u>
1 Large Hall	1
2 String Hall	2
3 Recital Hall	3
4 Chamber	4
5 Guitar Room	5
6 Tiled Room	6
7 Inverse	7
8 Gate	8
9 Gold Plate	9
10 Vocal Plate	10
11 Brass Plate	11
12 Perc Plate	12
13 Chorus	13
14 Flange	14
15 Echo	15
16 Delays	16

5. Verify that the DECAY LED (in the PARAMETER section of the front panel) is lit.

## Functional Tests

### Buttons/LEDs

1. Apply power to Alex.
2. Press the STORE/CLEAR button four (4) times.
3. Verify that the "+" and "-" signs on the display toggle each time the button is pressed.
4. Press the PARAMETER button three (3) times.
5. Verify that the DECAY, DELAY and FX LVL LEDs light in sequence. (Each LED will flash for approximately 2 seconds after the button is pressed, and then remain lit until the PARAMETER button is pressed again.
6. Press the PRESET/REGISTER button twice.
7. Verify that the REG LED toggles (on/off) each time the button is pressed.

### Encoders/Display

1. Press STORE/CLEAR until the display shows "+". Turn the PARAMETER knob counterclockwise until the display reads "+ 1".  
Note: If the PARAMETER knob is not adjusted within 2 seconds, the display will change to correspond to whatever number is currently pointed to by the PRESET/REGISTER knob.
2. Turn the PARAMETER knob clockwise one position at a time.
3. Verify that the display increments from 1-16 as the knob is turned clockwise.
4. Verify that all segments on the display are functioning.
5. Turn the PRESET/REGISTER knob clockwise one position at a time.
6. Verify that the displayed number corresponds to the knob position. Test all 16 positions.



### Diagnostics

Alex Diagnostics provide a straightforward set of tests which are useful for testing the performance of the unit, and for troubleshooting. To invoke Alex Diagnostics, power up the unit while holding down both the STORE/CLEAR and PARAMETER buttons. The display will show "d" to indicate that the unit is in diagnostic mode. Pressing the PRESET/REGISTER button displays the position of the PRESET/REGISTER knob in hexadecimal. (See table below.) To select a particular test, turn the PRESET/REGISTER knob until the number of the desired test is displayed, then press the PRESET/REGISTER button.

IF Noise - Ask  
if the noise  
is constant or  
increases with  
input.  
2/15  
units build before  
S/N K0194-15791  
have REV 8 Board and  
should not have LED  
X-talk problems.

Knob Position	Test #	Test Name
1 Large Hall	0	Footswitch Selection (Mechanically Latched Switches)
2 String Hall	1	Footswitch Selection (Momentary Switches)
3 Recital Hall	2	SRAM (Static RAM)
4 Chamber	3	WCS (Writable Control Store)
5 Guitar Room	4	Interrupt
6 Tiled Room	5	ROM (Read Only Memory)
7 Inverse	6	DRAM (Dynamic RAM)
8 Gate	7	Diagnostic Loop
9 Gold Plate	8	Direct Audio
10 Vocal Plate	9	Warm Start
11 Brass Plate	A	EEPROM (Electrical Erasable Programmable ROM)
12 Perc Plate	b	Not Used
13 Chorus	C	Not Used
14 Flange	d	Not Used
15 Echo	E	Not Used
16 Delays	F	EEPROM Initialize Enable

An error condition in any test (except for the DRAM test) is indicated by illumination of the display minus symbol (-) for approximately 1 second. A pass condition is indicated by an approximately 1 second illumination of the plus symbol (+). The DRAM test will display "+" or "-" (pass or fail) continuously until the PRESET/REGISTER button is pressed.

### Power Up Diagnostics

On normal power up, Alex automatically runs the following sequence of diagnostic tests:

Test	Power Up Display	Diagnostic mode Test #
ROM	A	5
SRAM	B	2
WCS	C	3
Interrupt	E	4

If a failure occurs, the appropriate letter (A,B,C,E) representing the failed test will be displayed. Depending on the extent of the failure, it may be possible to force the unit into normal operating mode by simultaneously pressing the STORE/CLEAR and PARAMETER buttons for about 1/2 second.

A description of each test follows. Note that the number or letter in parentheses preceding each test name is the displayed ID of the test in diagnostic mode.

## Diagnostic Test Descriptions

### (0) Footswitch Selection (Mechanically Latched Switches)

This setting is reserved for user selection of footswitch type. This setting alters the functionality of the footswitch input so that one or two mechanically latched footswitches can be used to control the unit's Register Step and Bypass functions. This is the default setting and Alex is shipped from the factory in this mode.

### (1) Footswitch Selection (Momentary Switches)

This setting is reserved for user selection of footswitch type. This function alters the functionality of the footswitch input so that one or two momentary footswitches can be used to control the unit's Register Step and Bypass functions.

### (2) Static RAM Test

The Static RAM test is a standard memory test that writes 55 (hex) into all memory locations, then reads them back to verify data correctness. The procedure is repeated with AA, FF and 00, then left with 00's when the test is complete. Any problems with the Static RAM (U7) should be detected by this test.

### (3) WCS Test

The WCS test simultaneously tests the Z80 processor (U10) communications between the Lexichip (U13) and its Writable Control Store. The test itself is a standard memory test that writes 55 (hex) into all memory locations then reads them back to verify data correctness. The procedure is repeated with AA, FF and 00, then left with 00's when the test is complete. Any problems with the Lexichip WCS (RAM) or communication between the Z80 Processor and the Lexichip should be detected by this test.

### (4) Interrupt Test

The Interrupt test checks the rate at which interrupts are received on the INT/ line. Based on a 31.25kHz sampling rate, the INT/ line at the output of the Interrupt circuit should be running at 487Hz or one pulse every 2.05ms. Any problems with the INT/ line, such as incorrect frequency or the signal being stuck in a high (+5V) or low (0V) state, should be detected by this test.

### (5) ROM Test

The ROM test performs a checksum on the entire Read Only Memory (U6) and compares the total with a predetermined stored value.

**(6) Audio DRAM Test**

Units contain either 4464 or 44256 DRAMs. Diagnostic tests for each type are provided by the Audio DRAM test. Which of these is run is determined by W2.

**NOTE: When 44256 DRAMs are present, a jumper must be installed at W2, or the test will fail.**

**4464 DRAM test (approximately 13 seconds)**

This test puts the Lexichip (U13) into a mode that allows the Z80 processor (U10) to read and write to the 4464 DRAMs (U16,18,21,24) through the Lexichip. To actually test the DRAMs, the Z80 processor performs two tests: a data test and an address test. During the data test, the Z80 processor writes hex "AAAA" (1010101010101010) into all of the memory locations then reads them back to check them. It repeats the process with hex "5555" (0101010101010101). For the address test, the Z80 processor writes a count into memory (i.e. 0000000000000001, 0000000000000010, 0000000000000011), then reads it back. A failure in this test is usually attributed to a missing or shorted address, data, or control line on the DRAM or a defective DRAM.

This test takes about 13 seconds. When the test is complete, a displayed "+" indicates successful testing; "-" will be displayed if a failure occurs. To exit the test, press the PRESET/REGISTER button.

**44256 DRAM (approximately 50 seconds)**

This test puts the Lexichip (U13) into a mode that allows the Z80 processor (U10) to read and write to the 44256 DRAMs (U14,19,20,23) through the Lexichip. This test is otherwise identical to the 4464 DRAM test, but it takes approximately 50 seconds to run. To exit the test, press the PRESET/REGISTER button.

**(7) Diagnostic Loop Test**

The Diagnostic Loop test is provided for burn-in. This test repeatedly runs the DRAM, SRAM, WCS, Interrupt and ROM tests. If a failure occurs, "-" will be displayed. Press STORE/CLEAR to display the code of the failed test. (Refer to the table on page 3-4 for test name and code information.)

**(8) Direct Audio Test**

The Direct Audio test uses the audio DRAM and sets the audio path through the unit for 100% wet signal without any effects, enabling elimination of major functional sections of the system when troubleshooting distortion noise, gain, crosstalk and frequency response problems. Success of this test determines only that the input and output circuitry of the system are operating properly and that the +5VA and -5VA supplies are probably good. If the input and output circuitry is OK, there may be a faulty DRAM or Lexichip that was not detected by other tests.

Vortex  
update  
Power  
(A/B, REG)

**(9) Warm Start**

Performing this function immediately after initializing the EEPROM will write the 16 factory presets to the 16 corresponding registers, followed by a system reset into normal operating mode. If the initialization is not performed, the system will still reset, but will not write the presets to the registers.

**(A) EEPROM Test**

This test calculates the Electrical Erasable Programmable Read Only Memory (U5) checksum and compares it to a stored value. A failure in this test might indicate a missing or shorted EEPROM control line. Other possibilities include a defective output register (U3), a defective input register (U1), or a defective EEPROM.

**(b) (C) (d) (E) Not used****(F) EEPROM Initialize Enable**

Performing this function enables the EEPROM for initialization so that Warm Start can write the 16 factory presets into the 16 user registers.

**WARNING**

**This test will permanently erase any customized effects stored by the user.**

Connect the 1/4" to 1/4" stereo phone plug cable between the Marshall footswitch and the rear panel footswitch jack on Alex.

## Verifying Footswitch Functionality

1. Power Alex off, then on again.
2. Wait 5 seconds, then verify that the display is correctly indicating the position of the PRESET/REGISTER knob.
3. Press the PRESET/REGISTER button, and verify that the REG LED is lit and that "+ 1" is indicated on the display.
4. Press the footswitch register step switch (labeled Reverb) four (4) times, and verify that the display increments to the next value each time the footswitch is pressed.
5. Press the PRESET/REGISTER button.
6. Press the footswitch bypass switch (labeled Boost). This should cause "P" to appear on the display.
7. Press the footswitch bypass switch again, and verify that the display stops displaying "P" and returns to its previous display.
8. Disconnect the footswitch cable from Alex.

NOTE: If "P" remains on the display after the footswitch cable is disconnected, power cycle the unit.

If the PRESET/REGISTER LED lights after the footswitch cable is disconnected, press the PRESET REGISTER button to turn the LED off.

## Listening Tests Setup

1. Using the two audio cables for the headphone amp, connect Alex rear panel left and right outputs to the left and right inputs of the headphone amplifier.
2. Using the two audio cables for the sine wave audio oscillator, connect Alex rear panel left and right inputs to the Y-connector, then connect the Y-connector to the output of the sine wave audio oscillator.
3. Set the headphone amplifier volume control to its lowest level.
4. Power on Alex, the low distortion sine wave audio oscillator, and the headphone amplifier.
5. Input a 220Hz sine wave at -35dBV to the Alex inputs.
6. Turn the Alex PRESET/REGISTER knob to select 1 Large Hall.
7. Set all Alex front panel potentiometers fully clockwise.
8. Put on the headphones.
9. Set the headphone amplifier volume control to a comfortable listening level.

## Potentiometer Smoothness

1. Individually adjust Alex INPUT, MIX, and OUTPUT potentiometers over their entire range.
2. Verify that no pop, click or scratchiness is heard while turning the controls.

## Quick Listen

1. Set all Alex front panel potentiometers fully clockwise.
2. Vary the frequency on the oscillator, and verify that no pop, click, buzz, or other audio artifact is heard.

## Shock Test

1. Lift each corner of Alex off the bench four inches (4"), then drop it.  
**NOTE: To prevent damaging the unit, keep one corner of the unit touching the bench at all times.**
2. Verify that no audio, display, or LED intermittence is caused by this action.

## Input Level Status LED

1. Remove the headphones.
2. Set the headphone amplifier volume control to its lowest level.
3. Set Alex INPUT to its lowest level (fully counter clockwise).
4. Increase the oscillator level to -15dBV.
5. Slowly increase Alex INPUT over its entire range.
6. Verify that the Input Level Status LED (in the upper left corner of the Alex front panel) lights green, then orange, then red as INPUT is turned clockwise.
7. Remove audio cables and power cable from Alex.

## Disassembly/ Reassembly

### Disassembling the Unit

To disassemble the unit, use the following procedure:

1. Remove seven screws from the housing: one (1) from the rear panel, three (3) from the top, and three (3) from the bottom.
2. Carefully remove the unit's end caps, swinging them out by the rack ears.
3. Remove five (5) plastic nuts from the jacks on the rear panel.
4. Hold the front panel, and carefully remove the cover.
5. To disattach the circuit board from the front panel:
  - Pull off the five (5) knobs on the front panel
  - Remove the five (5) nuts and washers from the front panel.
  - Hold the unit face down, and carefully separate the circuit board assembly from the front panel.

NOTE: The buttons are loose and can fall out.

  - Carefully remove the buttons from the rear of the front panel.

### Reassembling the Unit

To reinstall the front panel and circuit board assembly:

1. Hold the front panel face down, and reinsert the buttons.
  2. Continue to hold the front panel face down so as not to loosen the buttons. From the rear, carefully position the circuit board and insert it into the front panel. Replace the nut and washer on one potentiometer at each end and hand tighten.
  3. Replace the remaining potentiometer nuts and washers. Check for alignment, then tighten all nuts. Do not overtighten.
  4. Replace the cover, being careful to align the jacks, and the power connector with the holes in the rear of the cover.
  5. Replace the five (5) plastic nuts on the jacks. Be careful not to overtighten these, as the nuts can strip the threads of the jacks.
  6. Replace the single screw in the rear of the unit, but do not tighten it.
  7. Install the two end caps by hooking the rear tab of each into each end of the cover.
  8. Holding the end caps in place, install the six (6) remaining screws. Tighten the rear-panel screws which are next to the power connector.
- NOTE: The end cap screws are longer than the others. Be sure to use these on the end caps, where they are needed to insure proper security of the end caps — not in the center bottom of the unit where a long screw will make contact with the circuit board.

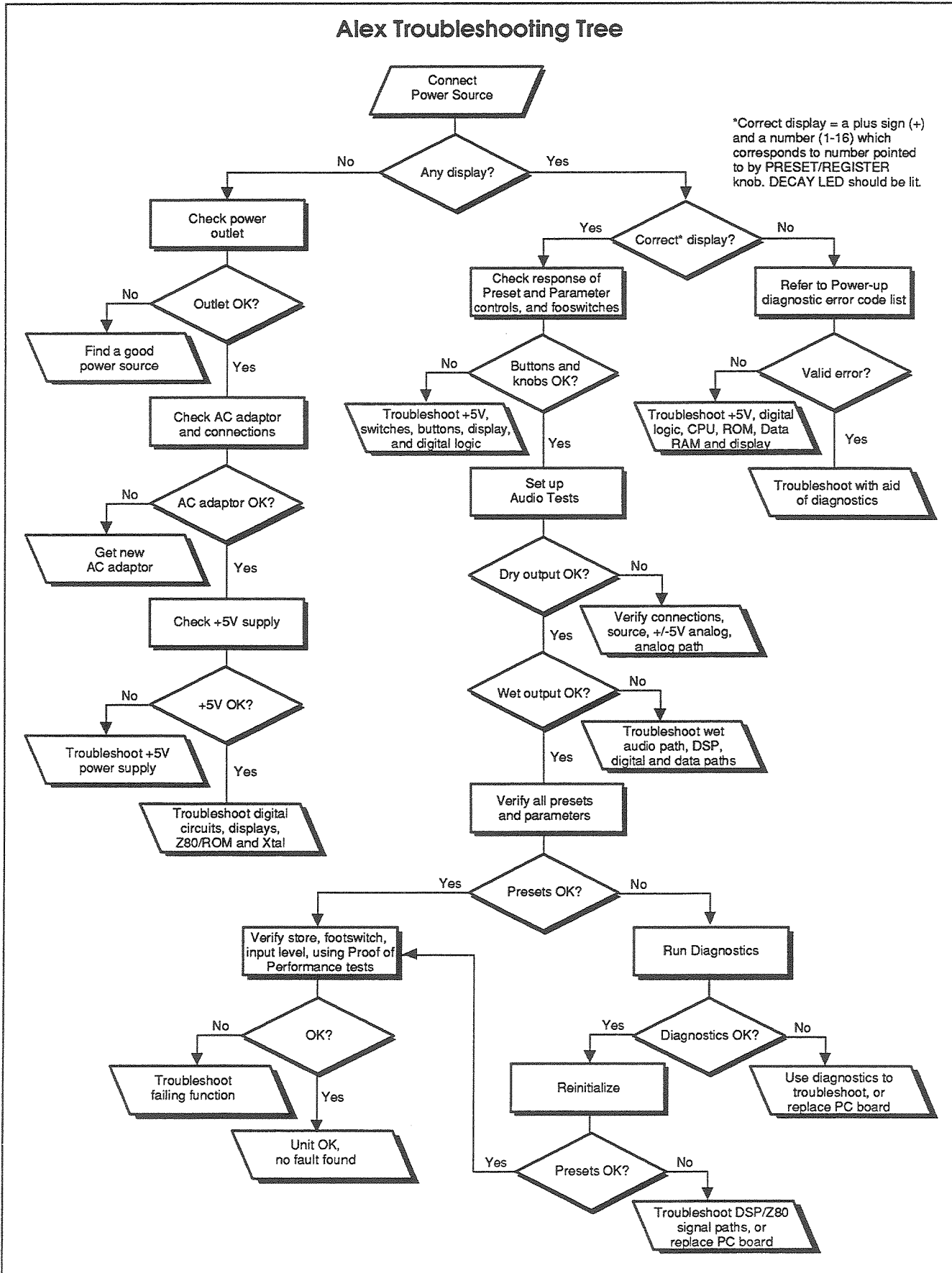
### Removal and Installation of Components

From time to time, it may be necessary to replace pots, jacks, the display, or other components. When desoldering, be careful not to overheat the board, use all caution to prevent damage to the circuit board, traces and pads.

When installing pots, jacks or displays, make sure that they are mechanically flush with the circuit board prior to soldering in place. If not properly aligned, stress can be placed on the new components and the board — resulting in early failure of the board and/or component.

### Alex Troubleshooting Tree

\*Correct display = a plus sign (+) and a number (1-16) which corresponds to number pointed to by PRESET/REGISTER knob. DECAY LED should be lit.



# 4 Parts List

## MAIN BOARD

PART NO.	DESCRIPTION	QTY	REFERENCE
<b>POTENTIOMETERS</b>			
200-09545	POT,RTY,PC,50KAX2,6MMFL,16,17L	2.00	R42,65
200-09546	POT,RTY,PC,10KBX2,6MMFL,16,17L	1.00	R52
<b>RESISTORS</b>			
202-00505	RES,CF,5%,1/4W,10 OHM	2.00	R34,72
202-00514	RES,CF,5%,1/4W,100 OHM	3.00	R32,33,71
202-00520	RES,CF,5%,1/4W,270 OHM	11.00	R4,7,8,11-18
202-00521	RES,CF,5%,1/4W,330 OHM	2.00	R67,69
202-00529	RES,CF,5%,1/4W,1K OHM	4.00	R5,9,25,28
202-00533	RES,CF,5%,1/4W,2K OHM	8.00	R6,10,19,30,36,38,39,44
202-00541	RES,CF,5%,1/4W,4.3K OHM	2.00	R64,66
202-00542	RES,CF,5%,1/4W,4.7K OHM	2.00	R2,3
202-00549	RES,CF,5%,1/4W,10K OHM	3.00	R26,29,45
202-00556	RES,CF,5%,1/4W,22K OHM	1.00	R23
202-00563	RES,CF,5%,1/4W,47K OHM	1.00	R27
202-00580	RES,CF,5%,1/4W,1M OHM	1.00	R24
202-01228	RES,CF,5%,1/4W,620 OHM	3.00	R1,35,37
203-00456	RES,MF,1%,1/8W,1.00K OHM	1.00	R20
203-00459	RES,MF,1%,1/8W,2.00K OHM	6.00	R40,41,43,49,54,57
203-00471	RES,MF,1%,1/8W,10.0K OHM	2.00	R61,63
203-00474	RES,MF,1%,1/8W,11.0K OHM	1.00	R22
203-02010	RES,MF,1%,1/8W,4.87K OHM	2.00	R53,58
203-02352	RES,MF,1%,1/8W,24.9K OHM	1.00	R21
203-02611	RES,MF,1%,1/8W,5.62K OHM	4.00	R46,48,55,56
203-02658	RES,MF,1%,1/8W,340 OHM	2.00	R62,68
203-08191	RES,MF,1%,1/8W,2.21K OHM	6.00	R47,50,51,59,60,70
205-02212	RES,NET,SIP,2%,BUS EL,47KX9	2.00	RP1,2
205-03531	RES,NET,SIP,2%,BUS EL,10KX5	1.00	RP3
205-09499	RES,NET,SIP,2%,ISOL EL,100X4	3.00	RP4-6
<b>CAPACITORS</b>			
240-00608	CAP,ELEC,2.2uF,50V,RAD	3.00	C17,20,21
240-00611	CAP,ELEC,22uF,16V,RAD	2.00	C47,48
240-06096	CAP,ELEC,10uF,25V,RAD,NON-POL	5.00	C55,58,63,82,83
240-06611	CAP,ELEC,1000uF,25V,RAD	2.00	C39,41
240-09541	CAP,ELEC,3300uF,16V,RAD	1.00	C29
241-00654	CAP,TANT,22uF,16V,RAD	1.00	C24
244-01151	CAP,PP,1000pF,2.5%	1.00	C53
244-06883	CAP,MYL,.01uF,5%,RAD	3.00	C64,69,72
245-00590	CAP,CER,150pF,500V,10%,Y5P	4.00	C46,51,73,76
245-01258	CAP,CER,470pF,50V,10%,Z5P	3.00	C33,67,80
245-03609	CAP,CER,.1uF,50V,Z5U,AX	39.00	C1-4,7,8,11-16,19,22,25,26,28,30, C34-36,42-45,49,50,52,54,56,57,60, C65,68,70,71,74,78,81
245-03610	CAP,CER,.01uF,100V,Z5U,AX	2.00	C38,40
245-03867	CAP,CER,10pF,100V,COG,10%,AX	3.00	C18,23,84
245-03869	CAP,CER,100pF,100V,COG,10%,AX	2.00	C5,6
245-07344	CAP,CER,470pF,100V,COG,10%,AX	2.00	C61,66
245-07544	CAP,CER,18pF,100V,COG,10%,AX	3.00	C59,77,79



PART NO.	DESCRIPTION	QTY	REFERENCE
DIODES			
300-01029	DIODE,1N914 AND 4148	2.00	D2,3
300-01030	DIODE,1N4004 AND 4005	3.00	D4-6
TRANSISTORS			
310-01007	TRANSISTOR,2N3904	1.00	Q3
310-01646	TRANSISTOR,2N4403	2.00	Q1,2
INTEGRATED CIRCUITS			
330-01293	IC,DIGITAL,74LS374	2.00	U3,4
330-04275	IC,DIGITAL,74HCT139	1.00	U8
330-04573	IC,DIGITAL,74HCT393	1.00	U11
330-04589	IC,DIGITAL,74HCT14	1.00	U9
330-06204	IC,DIGITAL,LEXICHIP 1	1.00	U13
330-06878	IC,DIGITAL,74HCT541	2.00	U1,2
330-06879	IC,DIGITAL,74HCT574	2.00	U17,22
330-07537	IC,DIGITAL,74AC08	1.00	U12
340-00725	IC,LINEAR,LM311	1.00	U28
340-00742	IC,LINEAR,7805 (LM 340 T-5)	2.00	U15,26
340-01525	IC,LINEAR,7905,-5V REG	1.00	U27
340-01566	IC,LINEAR,LF353,DUAL OP AMP	2.00	U31,33
340-06036	IC,LINEAR,uPC4570,DUAL OP AMP	3.00	U29,34,37
346-06896	IC,SS SWITCH,74HC4053	2.00	U30,32
350-04282	IC,SRAM,4364,8KX8,150NS,LPS	1.00	U7
350-04434	IC,DRAM,64KX4,12ONS	4.00	U16,18,21,24
350-09081	IC,EEPROM,93C46,1K BIT,SER	1.00	U5
350-09540	IC,ROM,27256,ALEX,V1.00	1.00	U6
355-06038	DAC,PCM54HP	1.00	U25
365-04834	IC,uPROC,Z80B,CMOS,6MHZ	1.00	U10
380-09525	MOD,LPF,LC,5P,16KHz	3.00	U35,36,38
CRYSTALS			
390-06647	CRYSTAL,16.000 MHZ,.01%	1.00	Y1
DISPLAYS/INDICATORS			
430-07325	LED,RED,T1,LITON	1.00	D1
430-07337	LED,T1,RED/GRN	1.00	D7
SWITCHES			
452-09555	SW,RTY,BCD,16POS,17.5MM	2.00	S1,3
453-09550	SW,PBM,1PIT,6MM,SQ,PCRA,130GF	3.00	S2,4,5
CONNECTORS			
510-06042	CONN,DC POWER,PC,DJ005,2.5MM	1.00	J3
510-09553	1/4"PHONE JACK,PCRA,3C,SW,OF	1.00	J1
510-09554	1/4"PHONE JACK,PCR,2C,SW,OF	4.00	J5-8
SOCKETS			
520-06184	IC SCKT,PLCC,84 PIN	1.00	U13
HARDWARE			
620-09556	LUG,SOLDER,.5ID,.72OD/FL	3.00	J1,5,6
620-09648	LUG,SOLDER,.5IDX.72OD/FL.25TAB	2.00	J7,8
640-01701	SCRW,4-40X1/4,PNH,PH,ZN	2.00	U15, GND BRKT
BRACKETS			
701-09640	BRACKET,KEystone,#621,4-40	1.00	GND BRKT
HEAT SINKS			
704-09508	HEAT SINK,TO-220,THERM,7019B	1.00	U15

**DISPLAY BOARD**

PART NO.	DESCRIPTION	QTY	REFERENCE
<b>DISPLAYS/INDICATORS</b>			
430-07325	LED,RED,T1,LITON	3.00	D1-3
430-09549	LED,DSPLY,7-SEG,RED,1.5DIG,.56	1.00	DISP1
<b>CONNECTORS</b>			
510-09551	CONN,POST,100X025,HDR,3MC,RA	1.00	J2
510-09552	CONN,POST,100X025,HDR,7MC,RA	1.00	J1

**MECHANICAL PARTS**

PART NO.	DESCRIPTION	QTY	REFERENCE
<b>KNOBS/BUTTONS</b>			
550-09610	BUTTON,.16X.61,BLK	3.00	
550-09570	KNOB,17.5MM,6MM/FL,BLK/WHT/LN	5.00	
<b>HARDWARE</b>			
641-09557	SCRW,TAP,SW,4-40X1/4,TH,PD,BZ	3.00	COVER (2), GND BRKT (1)
641-09653	SCRW,TAP,SW,4-40X1/2,TH,PD,BZ	4.00	END CAPS
644-09567	WSHR,INT,STAR,7MM,ZN	2.00	S1,3 MAIN BD
<b>MECHANICALS</b>			
700-09532	COVER,ALEX	1.00	
702-09563	PANEL,FRONT,ALEX,BLK	1.00	
702-09564	PANEL,SIDE CASTING,ALEX,BLK	2.00	
703-09537	LENS,DISPLAY,ALEX	1.00	
720-09539	TAPE,FOAM,.032X.25X7	4.00	
<b>ACCESSORIES</b>			
470-09650	XFORMER,PLUG-IN,120V,9VAC,10mm	1.00	
<b>ASSEMBLED BOARD</b>			
022-09506	MAIN BD/DISPLAY BD ASSY		



# 5 Schematics

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