QuadraVerb GT Service Manual

Revision 1.00

10/17/95

PREFACE

This document is intended to assist the service technician in the operation, maintenance and repair of the QuadraVerb GT guitar effects processor. This unit represents one of the building blocks of the complete ADAT system. Together with the QuadraVerb GT Reference Manual, this document provides a complete description of the functionality and serviceability of the QuadraVerb GT. Any comments or suggestions you may have pertaining to the document are welcome and encouraged.

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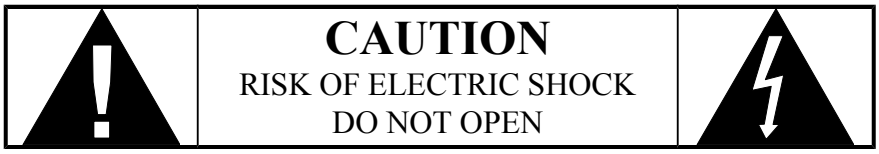
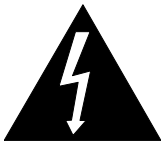
WARNINGS

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: Tadiran
Type: TL-5101
Rating 3.6V

REPAIR BY ANY PERSON OR ENTITY OTHER THAN AN AUTHORIZED ALESIS SERVICE CENTER WILL VOID THE ALESIS WARRANTY.

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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. Grounding the Plug. This product has a 3-wire grounding type of plug (a plug with a grounding pin) for safety purposes. This plug can only be used in a grounding power outlet. If the plug does not insert into the outlet you are using, the outlet probably is not a grounding type of power outlet. Contact your electrician to replace the obsolete outlet with a grounding type of outlet instead of defeating the safety feature of the grounding type of plug.

4. 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.

5. Foreign Objects and Liquids. Take care not to allow liquids to spill or objects to fall into any openings of the product.

6. Water or Moisture. The product should not be used near any water or in moisture.

7. Heat. Do not place the product near heat sources such as stoves, heat registers, radiators or other heat producing equipment.

8. 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.

9. 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.

10. Cleaning. The product should only be cleaned as the manufacturer recommends.

11. 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.

12. 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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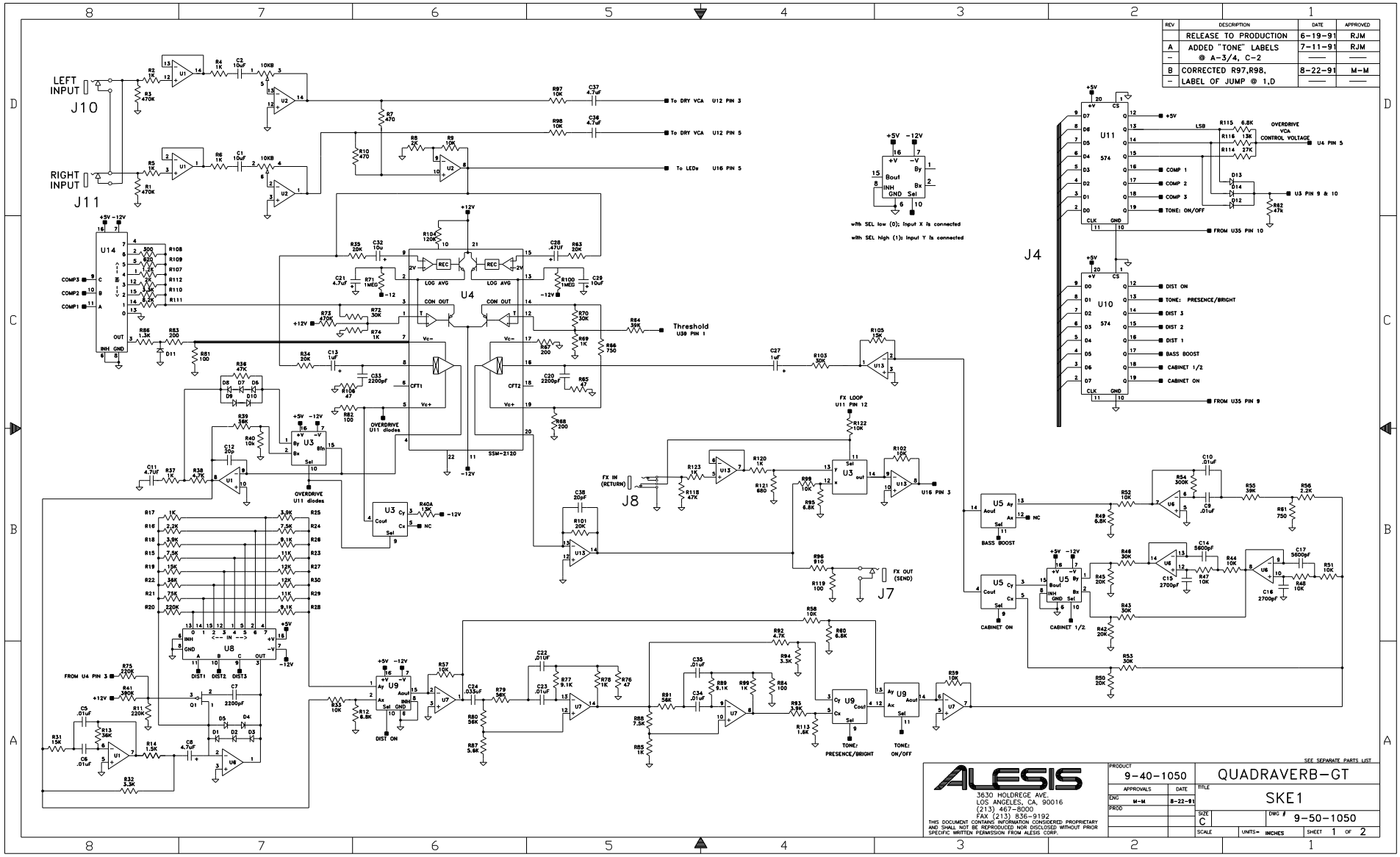
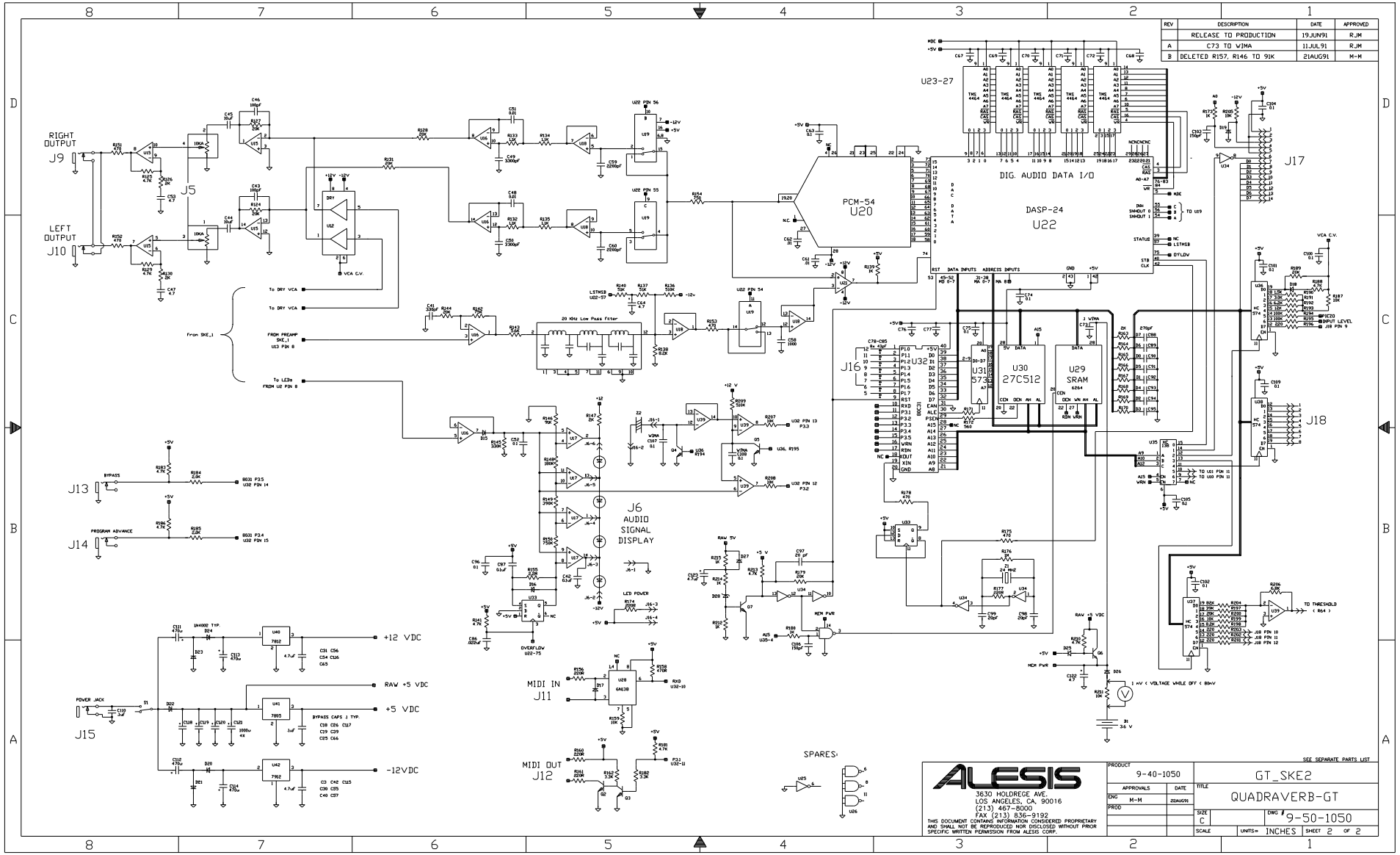
1.0 Schematics





REV	DESCRIPTION	DATE	APPROVED
	RELEASE TO PRODUCTION	19JUN91	RJM
A	C73 TO VJMA	11JUL91	RJM
B	DELETED R157, R146 TO 91K	21AUG91	M-M

2.0 Software History

Date	Version	Comments
07\08\91	1.00	First production release.
05\22\92	1.01	1) Adds global cabinet simulator controls. 2) Fixes erroneous setting of preamp parameters when a program using the sampling configuration is recalled. 3) Fixes distorted audio when a program using the reverb configuration has its reverb chorus speed, or depth modulated via MIDI.
	1.02	Never released.
10\28\92	1.03	New set of factory programs.

3.0 GT MIDI Implementation

System Exclusive Format

The Quadraverb-GT MIDI System Exclusive message format is as follows:

F0	System exclusive status
00 00 0E	Alesis manufacturer id#
07	Quadraverb-GT id#
cc	Opcode
dd	Data
:	
:	:
F7	End-Of-Exclusive

OPCODES:

01 - MIDI Editing

F0 00 00 0E 07 01<function#><page#>< value1>< value2>< value3>F7

<function#> = 1=reverb,2=delay,3=pitch,4=eq,7=config, 8=mix, 9=name/mod, 10=preamp

<page#> = 0..*n* where *n* is the maximum page # for the selected function
<value1-3> = new parameter value in the following format:

Data: B7 B6 B5 B4 B3 B2 B1 B0 (MSB)
A7 A6 A5 A4 A3 A2 A1 A0 (LSB)

Sent: 0 A7 A6 A5 A4 A3 A2 A1 <value1>
0 A0 B7 B6 B5 B4 B3 B2 <value2>
0 B1 B0 0 0 0 0 0 <value3>

All parameters to be edited must be sent in this format (12 MIDI bytes), regardless of the number of bits required to transmit the value of the parameter. When the QuadraVerb-GT receives this message, it will edit the specified parameter to the new value and display it. If the function and page selected does not exist in the current configuration, the command will be ignored. If the value received is out of range for the parameter selected, the range will be limited to a legal value. The function and page numbers for each parameter are shown in the next section.

02 - MIDI Data Dump F0 00 00 0E 07 02 <program#> <data> F7

<program#> = 0..99 selects individual programs
= 100 selects the edit buffer
= > 100 selects all 100 programs

<data> is in a packed format in order to optimize data transfer. Eight MIDI bytes are used to transmit each block of 7 QuadraVerb-GT data bytes. If the 7 data bytes are looked at as one 56-bit word, the format for transmission is eight 7-bit words beginning with the most significant bit of the first byte, as follows:

SEVEN QUADRAVERB-GT BYTES:

0: A7 A6 A5 A4 A3 A2 A1 A0
1: B7 B6 B5 B4 B3 B2 B1 B0
2: C7 C6 C5 C4 C3 C2 C1 C0
3: D7 D6 D5 D4 D3 D2 D1 D0
4: E7 E6 E5 E4 E3 E2 E1 E0
5: F7 F6 F5 F4 F3 F2 F1 F0
6: G7 G6 G5 G4 G3 G2 G1 G0

TRANSMITTED AS:

0: 0 A7 A6 A5 A4 A3 A2 A1
1: 0 A0 B7 B6 B5 B4 B3 B2
2: 0 B1 B0 C7 C6 C5 C4 C3
3: 0 C2 C1 C0 D7 D6 D5 D4
4: 0 D3 D2 D1 D0 E7 E6 E5
5: 0 E4 E3 E2 E1 E0 F7 F6
6: 0 F5 F4 F3 F2 F1 F0 G7
7: 0 G6 G5 G4 G3 G2 G1 G0

There are 147 bytes sent for a single data dump, which corresponds to 128 bytes of program data. There are 14,629 bytes sent for a 100 program dump, which corresponds to 12,800 bytes of program data. The location of each parameter within a program is shown in the next section.

When the QuadraVerb-GT receives a data dump message, the display reads:

LOADING MIDI DATA ...

Should the 's MIDI input buffer overflow, the display will read:

MIDI INPUT BUFFER OVERFLOW

This message will remain on the display until any button is pressed.

03 - MIDI Dump Request

F0 00 00 0E 07 03 <program#> F7

<program#> = 0..99 selects individual programs
= 100 selects the edit buffer
= > 100 selects all 100 programs

When this message is received, a MIDI data dump will be initiated, and the display will read:

MIDI DATA DUMP IN PROGRESS

Upon completion of the dump, the display will return to its previously displayed page.

INDIVIDUAL PARAMETER LOCATION FUNCTION AND PAGE VALUES

The following lists give the parameter locations and ranges for each of the effects in each of the configurations. The parameter associated with a particular function and page may be dependent on both the current configuration, and the current mode of the effect (e.g., chorus, phase, etc.). In conditions where a page relates to different parameters depending on the mode of the effect, the parameters are listed in tables under each mode. All parameters are offset binary values. This means that a signed parameter with a range of -99 to +99 in the display is actually stored as 0 for -99, 99 for 0, and 198 for +99.

REVERB (FUNCTION 1)

CONFIGURATION 0 (EQ-PCH-DL-REVERB):

page 0 (type)	0 (PLATE 1)	1 (ROOM 1)	2 (CHAMBER 1)	3 (HALL 1)	4 (REVERSE 1)
1	0-3 (INPUT 1)	0-3 (INPUT 1)	0-3 (INPUT 1)	0-3 (INPUT 1)	0-3 (INPUT 1)
2	0-1 (INPUT 2)	0-1 (INPUT 2)	0-1 (INPUT 2)	0-1 (INPUT 2)	0-1 (INPUT 2)
3	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
4	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)
5	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)
6	0-99 (DECAY)	0-99 (DECAY)	0-99 (DECAY)	0-99 (DECAY)	0-99 (REV TIME)
7	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)
8	0-8 (DENSITY)	0-8 (DENSITY)	0-8 (DENSITY)	0-60 (LOW DEC)	0-8 (DENSITY)
9	0-60 (LOW DEC)	0-60 (LOW DEC)	0-60 (LOW DEC)	0-60 (HIGH DEC)	0-60 (LOW DEC)
10	0-60 (HIGH DEC)	0-60 (HIGH DEC)	0-60 (HIGH DEC)	0-1 (GATE ON)	0-60 (HIGH DEC)
11	0-1 (GATE ON)	0-1 (GATE ON)	0-1 (GATE ON)	0-99 (GATE HLD)	
12	0-99 (GATE HLD)	0-99 (GATE HLD)	0-99 (GATE HLD)	0-99 (GATE REL)	
13	0-99 (GATE REL)	0-99 (GATE REL)	0-99 (GATE REL)	0-99 (GATE LEV)	
14	0-99 (GATE LEV)	0-99 (GATE LEV)	0-99 (GATE LEV)		

CONFIGURATION 1 (LEZLIE-DL-REVERB), 5 (RING-DL-REVERB), 6 (RESONATOR-DL-REV):

page 0 (type)	0 (PLATE 1)	1 (ROOM 1)	2 (CHAMBER 1)	3 (HALL 1)	4 (REVERSE 1)
1	0-2 (INPUT 1)	0-2 (INPUT 1)	0-2 (INPUT 1)	0-2 (INPUT 1)	0-2 (INPUT 1)

2-14 same as configuration 0

CONFIGURATION 2 (GRAPHIC EQ-DELAY), 3 (5BAND EQ-PCH-DLY), 7 (SAMPLING):
Not used

CONFIGURATION 4 (3 BAND EQ-REVERB):

page 0 (type)	0 (PLATE 2)	1 (ROOM 2)	2 (CHAMBER 2)	3 (HALL 2)	4 (REVERSE 2)
1	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)
2	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)	1-140 (PREDLY)
3	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)	1-198 (PRE MIX)
4	0-99 (DECAY)	0-99 (DECAY)	0-99 (DECAY)	0-99 (DECAY)	0-99 (REV TIME)
5	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)	0-8 (DIFFUSION)
6	0-8 (DENSITY)	0-8 (DENSITY)	0-8 (DENSITY)	0-60 (LOW DEC)	0-8 (DENSITY)
7	0-60 (LOW DEC)	0-60 (LOW DEC)	0-60 (LOW DEC)	0-60 (HIGH DEC)	0-60 (LOW DEC)
8	0-60 (HIGH DEC)	0-60 (HIGH DEC)	0-60 (HIGH DEC)	0-1 (GATE ON)	0-60 (HIGH DEC)
9	0-1 (GATE ON)	0-1 (GATE ON)	0-1 (GATE ON)	0-99 (GATE HLD)	
10	0-99 (GATE HLD)	0-99 (GATE HLD)	0-99 (GATE HLD)	0-99 (GATE REL)	
11	0-99 (GATE REL)	0-99 (GATE REL)	0-99 (GATE REL)	0-99 (GATE LEV)	
12	0-99 (GATE LEV)	0-99 (GATE LEV)	0-99 (GATE LEV)		

DELAY (FUNCTION 2)

CONFIGURATION 0 (EQ-PCH-DL-REVERB):
page

0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)
1	0-1 (INPUT 1)	0-1 (INPUT 1)	0-1 (INPUT 1)
2	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
3	1-775 (DELAY)	1-375 (L DELAY)	1-375 (DELAY)
4	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)
5		1-375 (R DELAY)	
6		0-99 (R FEEDB)	

CONFIGURATION 1 (LEZLIE-DL-REVERB):
page

0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)
1	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
2	1-800 (DELAY)	1-400 (L DELAY)	1-400 (DELAY)
3	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)
4		1-400 (R DELAY)	
5		0-99 (R FEEDB)	

CONFIGURATION 2 (GRAPHIC EQ-DELAY):
page

0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)
1	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)
2	1-1500 (DELAY)	1-750 (L DELAY)	1-750 (DELAY)
3	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)
4		1-750 (R DELAY)	
5		0-99 (R FEEDB)	

CONFIGURATION 3 (5BAND EQ-PCH-DLY):
page

0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)	3 (MULTI TAP)
1	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)
2	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
3	1-1470 (DELAY)	1-705 (L DELAY)	1-705 (DELAY)	1-8 (TAP NUMBER)
4	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)	1-Z* (TAP x** DELAY)
5		1-705 (R DELAY)		0-99 (TAP x** VOLUME)
6		0-99 (R FEEDB)		0-198 (TAP x PANNING)
7				0-99 (TAP x FEEDBACK)
8				0-99 (MASTER FEEDBACK)

* Sum off Z for all 8 taps less or equal to 1470
** x = Number of currently selected tap

CONFIGURATION 4 (3 BAND EQ-REVERB):
Not used

CONFIGURATION 5 (RING-DL-REVERB):

page 0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)
1	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
2	1-800 (DELAY)	1-400 (L DELAY)	1-400 (DELAY)
3	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)
4		1-400 (R DELAY)	
5		0-99 (R FEEDB)	

CONFIGURATION 6 (RESONATOR-DL-REV):

page 0 (type)	0 (MONO)	1 (STEREO)	2 (PING-PONG)
1	0-198 (IN MIX)	0-198 (IN MIX)	0-198 (IN MIX)
2	1-720 (DELAY)	1-320 (L DELAY)	1-320 (DELAY)
3	0-99 (FEEDB)	0-99 (L FEEDB)	0-99 (FEEDB)
4		1-320 (R DELAY)	
5		0-99 (R FEEDB)	

CONFIGURATION 7 (SAMPLING):

page	
0	0-2 (SAMPLE PLAYBACK)
1	0-150 (SAMPLE START)
2	5-155 (SAMPLE LENGTH)
3	0-1 (AUDIO TRIG)
4	0-2 (MIDI TRIG)
5	0-127 (MIDI LOW LIMIT)
6	0-127 (BASE NOTE)
7	0-127 (MIDI HIGH LIMIT)

PITCH (FUNCTION 3)

CONFIGURATION 0 (EQ-PCH-DL-REVERB) & 3 (5BAND EQ-PCH-DLY):

page 0 (type)	0 (M CHORUS)	1 (S CHORUS)	2 (M FLANGE)	3 (S FLANGE)	4 (DETUNE)	5 (PHASER)
1	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)	0-1 (INPUT)
2	0-1 (WAVE)	0-1 (WAVE)	0-98 (SPEED)	0-98 (SPEED)	0-198 (TUNE)	0-98 (SPEED)
3	0-98 (SPEED)	0-98 (SPEED)	0-98 (DEPTH)	0-98 (DEPTH)	0-98 (DEPTH)	
4	0-98 (DEPTH)	0-98 (DEPTH)	0-99 (FBACK)	0-99 (FBACK)		
5	0-99 (FBACK)	0-99 (FBACK)	0-1 (TRIGGER)	0-1 (TRIGGER)		

CONFIGURATION 1 (LEZLIE-DL-REVERB):

page	
0	0-99 (SEPARATION)
1	0-1 (MOTOR)
2	0-1 (SPEED)

CONFIGURATION 2 (GRAPHIC EQ-DELAY):
Not used

CONFIGURATION 4 (3 BAND EQ-REVERB):

page 0 (type)	0 (CHORUS OFF)	1 (CHORUS ON)
1		0-1 (WAVE)
2		0-98 (SPEED)
3		0-98 (DEPTH)

CONFIGURATION 5 (RING-DL-REVERB):

page	
0	1-300 (SPECTRUM SHIFT)
1	0-198 (RING OUT MIX)
2	0-198 (DEL/REB MIX INPUT)

CONFIGURATION 6 (RESONATOR-DL-REV), & 7 (SAMPLING):
Not used

EQ (FUNCTION 4)

CONFIGURATION 0 (EQ-PCH-DL-REVERB):

page		
0	0-6 (EQ PRESET) *	
1 (type)	0 (3 BAND EQ)	1 (RESONATORS+EQ)
2	20-999 (LOW FREQUENCY)	0-60 (RES 1 TUNE)
3	0-560 (LOW BOOST/CUT)	0-99 (RES 1 DCY)
4	200-9999 (MID FREQUENCY)	0-99 (RES 1 AMP)
5	20-255 (MID BANDWIDTH)	0-60 (RES 2 TUNE)
6	0-560 (MID BOOST/CUT)	0-99 (RES 2 DCY)
7	2000-18000 (HIGH FREQUENCY)	0-99 (RES 2 AMP)
8	0-560 (HIGH BOOST/CUT)	200-9999 (MID FREQUENCY)
9		20-255 (MID BANDWIDTH)
10		0-560 (MID BOOST/CUT)

* Changing preset may change the EQ type to 3 BAND EQ or RESONATOR+EQ

CONFIGURATION 1 (LEZLIE-DL-REVERB):

page	
0	0-26 (HIGH ROTOR LEVEL)

CONFIGURATION 2 (GRAPHIC EQ-DELAY):

page	
0	0-6 (EQ PRESET)
1	0-28 (16Hz)
2	0-28 (32Hz)
3	0-28 (62Hz)
4	0-28 (126Hz)
5	0-28 (250Hz)
6	0-28 (500Hz)
7	0-28 (1KHz)
8	0-28 (2KHz)
9	0-28 (4KHz)
10	0-28 (8KHz)
11	0-28 (16KHz)

CONFIGURATION 3 (5BAND EQ-PCH-DLY):

page		
0	0-6 (EQ PRESET) *	
1 (type)	0 (5 BAND EQ)	1 (5 RESONATOR/3 EQ)
2	20-999 (LOW FREQUENCY)	0-4 (RESO NUMBER)
3	0-560 (LOW BOOST/CUT)	0-60 (RES x TUNE) **
4	20-500 (LOW MID FREQUENCY)	0-99 (RES x DCY) **
5	20-255 (LOW MID BANDWIDTH)	0-99 (RES x AMP) **
6	0-560 (LOW MID BOOST/CUT)	20-999 (LOW FREQUENCY)
7	200-9999 (MID FREQUENCY)	0-560 (LOW BOOST/CUT)
8	20-255 (MID BANDWIDTH)	200-9999 (MID FREQUENCY)
9	0-560 (MID BOOST/CUT)	20-255 (MID BANDWIDTH)
10	2000-18000 (HIGH MID FREQUENCY)	0-560 (MID BOOST/CUT)
11	20-255 (HIGH MID BANDWIDTH)	2000-18000 (HIGH FREQUENCY)
12	0-560 (HIGH MID BOOST/CUT)	0-560 (HIGH BOOST/CUT)
13	2000-18000 (HIGH FREQUENCY)	
14	0-560 (HIGH BOOST/CUT)	

* Changing preset may change the EQ type to 5 BAND EQ or 5 RESONATOR/3 EQ
** x is the current resonator number

CONFIGURATION 4 (3 BAND EQ-REVERB):

page	
0	0-6 (EQ PRESET)
1	20-999 (LOW FREQUENCY)
2	0-560 (LOW BOOST/CUT)
3	200-9999 (MID FREQUENCY)
4	20-255 (MID BANDWIDTH)
5	0-560 (MID BOOST/CUT)
6	2000-18000 (HIGH FREQUENCY)
7	0-560 (HIGH BOOST/CUT)

CONFIGURATION 6 (RESONATOR-DL-REV):

page	
0	0-1 (RESONATOR GATE MODE)
1	0-99 (RESONATOR DECAY)
2	0-60 (RESONATOR 1 TUNE)
3	0-60 (RESONATOR 2 TUNE)
4	0-60 (RESONATOR 3 TUNE)
5	0-60 (RESONATOR 4 TUNE)
6	0-60 (RESONATOR 5 TUNE)

CONFIGURATION (FUNCTION 7)

page
0 0-7 (CONFIGURATION)
- 0: EQ>PCH>DL>REVERB
- 1: LEZLIE>DL>REVERB
- 2: GRAPHIC EQ>DELAY
- 3: 5BAND EQ>PCH>DLY
- 4: 3 BAND EQ>REVERB
- 5: RING>DL>REVERB
- 6: RESONATOR>DL>REV
- 7: SAMPLING

MIX (FUNCTION 8)

CONFIGURATION 0 (EQ-PCH-DL-REVERB):

page		
0	0-99 (DIRECT LEVEL)	
1	0-99 (MASTER FX LEVEL)	
2 (type)	0 (PRE-EQ)	1 (POST-EQ)
3	0-99 (PREAMP LEVEL)	0-99 (EQ LEVEL)
4	0-99 (PITCH LEVEL)	0-99 (PITCH LEVEL)
5	0-99 (DELAY LEVEL)	0-99 (DELAY LEVEL)
6	0-99 (REVERB LEVEL)	0-99 (REVERB LEVEL)
7	0-1 (MODULATION)	0-1 (MODULATION)
8	0-99 (MOD DEPTH)	0-99 (MOD DEPTH)
9	0-98 (MOD SPEED)	0-98 (MOD SPEED)

CONFIGURATION 1 (LEZLIE-DL-REVERB):

page	
0	0-99 (DIRECT LEVEL)
1	0-99 (MASTER FX LEVEL)
2	0-99 (LEZLIE LEVEL)
3	0-99 (DELAY LEVEL)
4	0-99 (REVERB LEVEL)

CONFIGURATION 2 (GRAPHIC EQ-DELAY):

page	
0	0-99 (DIRECT LEVEL)
1	0-99 (MASTER FX LEVEL)
2	0-99 (EQ LEVEL)
3	0-99 (DELAY LEVEL)

CONFIGURATION 3 (5BAND EQ-PCH-DLY):

page		
0	0-99 (DIRECT LEVEL)	
1	0-99 (MASTER FX LEVEL)	
2 (type)	0 (PRE-EQ)	1 (POST-EQ)
3	0-99 (PREAMP LEVEL)	0-99 (EQ LEVEL)
4	0-99 (PITCH LEVEL)	0-99 (PITCH LEVEL)
5	0-99 (DELAY LEVEL)	0-99 (DELAY LEVEL)
6	0-1 (MODULATION)	0-1 (MODULATION)
7	0-99 (MOD DEPTH)	0-99 (MOD DEPTH)
8	0-98 (MOD SPEED)	0-98 (MOD SPEED)

CONFIGURATION 4 (3 BAND EQ-REVERB):

page		
0	0-99 (DIRECT LEVEL)	
1	0-99 (MASTER FX LEVEL)	
2 (type)	0 (PRE-EQ)	1 (POST-EQ)
3	0-99 (PREAMP LEVEL)	0-99 (EQ LEVEL)
4	0-99 (REVERB LEVEL)	0-99 (REVERB LEVEL)

CONFIGURATION 5 (RING-DL-REVERB):

page	
0	0-99 (DIRECT LEVEL)
1	0-99 (MASTER FX LEVEL)
2	0-99 (PREAMP LEVEL)
3	0-99 (RING MOD. LEVEL)
4	0-99 (DELAY LEVEL)
5	0-99 (REVERB LEVEL)

CONFIGURATION 6 (RESONATOR-DL-REV):

page	
0	0-99 (DIRECT LEVEL)
1	0-99 (MASTER FX LEVEL)
2	0-99 (PREAMP LEVEL)
3	0-99 (RESONATOR LEVEL)
4	0-99 (DELAY LEVEL)
5	0-99 (REVERB LEVEL)

CONFIGURATION 7 (SAMPLING):

page	
0	0-99 (DIRECT LEVEL)
1	0-99 (PREAMP LEVEL)
2	0-99 (PLAYBACK LEVEL)

MOD (FUNCTION 9)

CONFIGURATION 0-6:

page	
0	32-127 (1st DIGIT NAME)
1	32-127 (2nd DIGIT NAME)
2	32-127 (3rd DIGIT NAME)
3	32-127 (4th DIGIT NAME)
4	32-127 (5th DIGIT NAME)
5	32-127 (6th DIGIT NAME)
6	32-127 (7th DIGIT NAME)
7	32-127 (8th DIGIT NAME)
8	32-127 (9th DIGIT NAME)
9	32-127 (10th DIGIT NAME)
10	32-127 (11th DIGIT NAME)
11	32-127 (12th DIGIT NAME)
12	32-127 (13th DIGIT NAME)
13	32-127 (14th DIGIT NAME)
14	0-126 (MOD 1 SOURCE)
15	0-? * (MOD 1 TARGET)
16	0-198 (MOD 1 AMPLITUDE)
17	0-126 (MOD 2 SOURCE)
18	0-? * (MOD 2 TARGET)
19	0-198 (MOD 2 AMPLITUDE)
20	0-126 (MOD 3 SOURCE)
21	0-? * (MOD 3 TARGET)
22	0-198 (MOD 3 AMPLITUDE)
23	0-126 (MOD 4 SOURCE)
24	0-? * (MOD 4 TARGET)
25	0-198 (MOD 4 AMPLITUDE)
26	0-126 (MOD 5 SOURCE)
27	0-? * (MOD 5 TARGET)
28	0-198 (MOD 5 AMPLITUDE)
29	0-126 (MOD 6 SOURCE)
30	0-? * (MOD 6 TARGET)
31	0-198 (MOD 6 AMPLITUDE)
32	0-126 (MOD 7 SOURCE)
33	0-? * (MOD 7 TARGET)
34	0-198 (MOD 7 AMPLITUDE)
35	0-126 (MOD 8 SOURCE)
36	0-? * (MOD 8 TARGET)
37	0-198 (MOD 8 AMPLITUDE)

CONFIGURATION 7 (SAMPLING):

page	
0	32-127 (1st DIGIT NAME)
1	32-127 (2nd DIGIT NAME)
2	32-127 (3rd DIGIT NAME)
3	32-127 (4th DIGIT NAME)
4	32-127 (5th DIGIT NAME)
5	32-127 (6th DIGIT NAME)
6	32-127 (7th DIGIT NAME)
7	32-127 (8th DIGIT NAME)
8	32-127 (9th DIGIT NAME)
9	32-127 (10th DIGIT NAME)
10	32-127 (11th DIGIT NAME)
11	32-127 (12th DIGIT NAME)
12	32-127 (13th DIGIT NAME)
13	32-127 (14th DIGIT NAME)

* Modulation target values are dependent on the current configuration and mode of a program. The most significant nibble determines the function being modulated as follows:

0XH: REVERB MOD
1XH: DELAY MOD
2XH: PITCH MOD
3XH: EQ MOD
4XH: MIX MOD
5XH: MULTI-TAP MOD (Configuration 3 only)
6XH: " " " " " " " " "
7XH: PREAMP MOD

The possible modulation targets within each of the above is as follows:

REVERB CONFIGURATION 0,1,4,5,6 (nothing in 2, 3, & 7):

Target	PLATE	ROOM	CHAMBER	HALL	REVERSE
00H	IN MIX	IN MIX	IN MIX	IN MIX	IN MIX
01H	PREDLY	PREDLY	PREDLY	PREDLY	PREDLY
02H	PRE MIX	PRE MIX	PRE MIX	PRE MIX	PRE MIX
03H	DECAY	DECAY	DECAY	DECAY	REV TIME
04H	DIFFUSION	DIFFUSION	DIFFUSION	DIFFUSION	DIFFUSION
05H	DENSITY	DENSITY	DENSITY	LOW DEC	DENSITY
06H	LOW DEC	LOW DEC	LOW DEC	HIGH DEC	LOW DEC
07H	HIGH DEC	HIGH DEC	HIGH DEC	HIGH DEC	

DELAY CONFIGURATION 0,1 (nothing in 4 & 7):

Target	MONO	STEREO	PING-PONG
10H	IN MIX	IN MIX	IN MIX
11H	DELAY	L DELAY	DELAY
12H	FEEDB	L FEEDB	FEEDB
13H		R DELAY	
14H		R FEEDB	

CONFIGURATION 3 (5BAND EQ-PCH-DLY):

Target	MONO	STEREO	PING-PONG	MULTI-TAP
10H	IN MIX	IN MIX	IN MIX	IN MIX
11H	DELAY	L DELAY	DELAY	TAP 1 DELAY
12H	FEEDB	L FEEDB	FEEDB	TAP 2 DELAY
13H		R DELAY		TAP 3 DELAY
14H		R FEEDB		TAP 4 DELAY
15H				TAP 5 DELAY
16H				TAP 6 DELAY
17H				TAP 7 DELAY
18H				TAP 8 DELAY
50H				TAP 1 VOLUME
51H				TAP 2 VOLUME
52H				TAP 3 VOLUME
53H				TAP 4 VOLUME
54H				TAP 5 VOLUME
55H				TAP 6 VOLUME
56H				TAP 7 VOLUME
57H				TAP 8 VOLUME
58H				TAP 1 PANNING
59H				TAP 2 PANNING
5AH				TAP 3 PANNING
5BH				TAP 4 PANNING
5CH				TAP 5 PANNING
5DH				TAP 6 PANNING
5EH				TAP 7 PANNING
5FH				TAP 8 PANNING
60H				TAP 1 FEEDBACK
61H				TAP 2 FEEDBACK
62H				TAP 3 FEEDBACK
63H				TAP 4 FEEDBACK
64H				TAP 5 FEEDBACK
65H				TAP 6 FEEDBACK
66H				TAP 7 FEEDBACK
67H				TAP 8 FEEDBACK
68H				MASTER FEEDBACK

CONFIGURATION 2,5,6:

Target	MONO	STEREO	PING-PONG
10H	DELAY	L DELAY	DELAY
11H	FEEDB	L FEEDB	FEEDB
12H		R DELAY	
13H		R FEEDB	

PITCH CONFIGURATION 0 & 3 (nothing in 2 & 7):

Target	M CHORUS	S CHORUS	M FLANGE	S FLANGE	DETUNE	PHASER
20H	SPEED	SPEED	SPEED	SPEED	DETUNE	SPEED
21H	DEPTH	DEPTH	DEPTH	DEPTH	DEPTH	
22H	FBACK	FBACK	FBACK	FBACK		

CONFIGURATION 1 (LEZLIE-DL-REVERB):

Target	
20H	SEPARATION
21H	MOTOR
22H	SPEED

CONFIGURATION 4 (3 BAND EQ-REVERB):
Target
20H SPEED
21H DEPTH

CONFIGURATION 5 (RING-DL-REVERB):
Target
20H SPECTRUM SHIFT
21H RING OUTPUT MIX
22H DEL/REV IN MIX

CONFIGURATION 6 (RESONATOR-DL-REV):
Target
20H RESONATOR DECAY

EQ CONFIGURATION 0 (EQ-PCH-DL-REVERB):
Target

(EQ mode)	3 BAND EQ	RESONATORS+EQ
30H	LOW EQ FREQUENCY	RES 1 DECAY
31H	LOW EQ BOOST/CUT	RES 1 AMP
32H	MID EQ FREQUENCY	RES 2 DECAY
33H	MID EQ BANDWIDTH	RES 2 AMP
34H	MID EQ BOOST/CUT	MID EQ FREQUENCY
35H	HIGH EQ FREQUENCY	MID EQ BANDWIDTH
36H	HIGH EQBOOST/CUT	MID EQ BOOST/CUT

CONFIGURATION 1 (LEZLIE-DL-REVERB):
Target
30H HIGH ROTOR LEVEL

CONFIGURATION 2 (GRAPHIC EQ-DELAY):
Target
30H 16Hz
31H 32Hz
32H 62Hz
33H 126Hz
34H 250Hz
35H 500Hz
36H 1KHz
37H 2KHz
38H 4KHz
39H 8KHz
3AH 16KHz

CONFIGURATION 3 (5BAND EQ-PCH-DLY):

Target (EQ mode)	5 BAND EQ	5 RESONATOR/3 EQ
30H	LOW EQ FREQUENCY	RES 1 DECAY
31H	LOW EQ BOOST/CUT	RES 1 AMP
32H	LOW EQMID FREQUENCY	RES 2 DECAY
33H	LOW EQ MID BANDWIDTH	RES 2 AMP
34H	LOW EQ MID BOOST/CUT	RES 3 DECAY
35H	MID EQ FREQUENCY	RES 3 AMP
36H	MID EQ BANDWIDTH	RES 4 DECAY
37H	MID EQ BOOST/CUT	RES 4 AMP
38H	HIGH MID EQ FREQUENCY	RES 5 DECAY
39H	HIGH MID EQ BANDWIDTH	LOW EQ FREQUENCY
3AH	HIGH MID EQ BOOST/CUT	LOW EQ BOOST/CUT
3BH	HIGH EQ FREQUENCY	MID EQ FREQUENCY
3CH	HIGH EQ BOOST/CUT	MID EQ BANDWIDTH
3DH		MID EQ BOOST/CUT
3EH		HIGH EQ FREQUENCY
3FH		HIGH EQ BOOST/CUT

CONFIGURATION 4 (3 BAND EQ-REVERB):

Target	
30H	LOW EQ FREQUENCY
31H	LOW EQ BOOST/CUT
32H	MID EQ FREQUENCY
33H	MID EQ BANDWIDTH
34H	MID EQ BOOST/CUT
35H	HIGH EQ FREQUENCY
36H	HIGH EQBOOST/CUT

CONFIGURATION 6 (RESONATOR-DL-REV):
Not used

CONFIGURATION 5 & 7:
Not used

MIX CONFIGURATION 0 (EQ-PCH-DL-REVERB):

Target	PRE-EQ	POST-EQ
40H	DIRECT LEVEL	DIRECT LEVEL
41H	FX LEVEL	FX LEVEL
42H	PREAMP LEVEL	EQ LEVEL
43H	PITCH LEVEL	PITCH LEVEL
44H	DELAY LEVEL	DELAY LEVEL
45H	REVERB LEVEL	REVERB LEVEL
46H	MOD DEPTH	MOD DEPTH
47H	MOD SPEED	MOD SPEED

CONFIGURATION 1 (LEZLIE-DL-REVERB):

Target	
40H	DIRECT LEVEL
41H	FX LEVEL
42H	LEZLIE LEVEL
43H	DELAY LEVEL
44H	REVERB LEVEL

CONFIGURATION 2 (GRAPHIC EQ-DELAY):

Target	
40H	DIRECT LEVEL
41H	FX LEVEL
42H	EQ LEVEL
43H	DELAY LEVEL

CONFIGURATION 3 (5BAND EQ-PCH-DLY):

Target	PRE-EQ	POST-EQ
40H	DIRECT LEVEL	DIRECT LEVEL
41H	FX LEVEL	FX LEVEL
42H	PREAMP LEVEL	EQ LEVEL
43H	PITCH LEVEL	PITCH LEVEL
44H	DELAY LEVEL	DELAY LEVEL
45H	MOD DEPTH	MOD DEPTH
46H	MOD SPEED	MOD SPEED

CONFIGURATION 4 (3 BAND EQ-REVERB):

Target	PRE-EQ	POST-EQ
40H	DIRECT LEVEL	DIRECT LEVEL
41H	FX LEVEL	FX LEVEL
42H	PREAMP LEVEL	EQ LEVEL
43H	REVERB LEVEL	REVERB LEVEL

CONFIGURATION 5 (RING-DL-REVERB):

Target	
40H	DIRECT LEVEL
41H	FX LEVEL
42H	PREAMP LEVEL
43H	RING LEVEL
44H	DELAY LEVEL
45H	REVERB LEVEL

CONFIGURATION 6 (RESONATOR-DL-REV):

Target	
40H	DIRECT LEVEL
41H	FX LEVEL
42H	PREAMP LEVEL
43H	RESONATOR LEVEL
44H	DELAY LEVEL
45H	REVERB LEVEL

CONFIGURATION 7 (SAMPLING):
Not used

PREAMP CONFIGURATION 0, 1, 2, 3, 4, 5, 6:

Target	
70H	PREAMP OUT LEVEL

CONFIGURATION 7 (SAMPLING):
Not used

PRE-AMP (FUNCTION 10)

CONFIGURATION 0-6:

page	
0	0-7 (COMPRESSION)
1	0-7 (OVERDRIVE)
2	0-8 (DISTORTION)
3	0-2 (PREAMP TONE)
4	0-1 (BASS BOOST)
5	0-2 (CAB SIMULATOR)
6	0-1 (EFFECT LOOP)
7	0-17 (NOISE GATE)
8	0-99 (PREAMP OUTPUT LEVEL)

CONFIGURATION 7 (SAMPLING):

page	
0	0-7 (COMPRESSION)
1	0-7 (OVERDRIVE)
2	0-8 (DISTORTION)
3	0-2 (PREAMP TONE)
4	0-1 (BASS BOOST)
5	0-2 (CAB SIMULATOR)
6	0-1 (EFFECT LOOP)
7	0-17 (NOISE GATE)

PARAMETER ADDRESSES WITHIN PROGRAMS

00 LOW EQ FREQ MSB / RES* 1 TUNE
01 LOW EQ FREQ LSB / RES* 1 DECAY /16Hz
02 LOW EQ AMP MSB / RES* 1 AMP / 32Hz
03 LOW EQ AMP LSB / RES* 2 TUNE / 62Hz
04 MID EQ FREQ MSB /126Hz
05 MID EQ FREQ LSB / 250Hz
06 MID EQ BANDWIDTH / 500Hz
07 MID EQ AMP MSB / 1KHz
08 MID EQ AMP LSB / 2KHz
09 HIGH EQ FREQ MSB / RES* 2 DECAY / 4KHz
0A HIGH EQ FREQ LSB / RES* 2 AMP / 8KHz
0B HIGH EQ AMP MSB / 16KHz
0C HIGH EQ AMP LSB
0D LEZLIE HIGH ROTOR LEVEL / TAP 1 DELAY MSB
0E LOW MID EQ FREQ MSB / RES **1 TUNE
0F LOW MID EQ FREQ LSB / RES** 1 DECAY
10 LOW MID EQ BANDWIDTH / RES** 2 TUNE
11 LOW MID EQ AMP MSB / RES** 2 DECAY
12 LOW MID EQ AMP LSB / RES** 3 TUNE
13 HIGH MID EQ FREQ MSB / RES** 3 DECAY
14 HIGH MID EQ FREQ LSB / RES** 4 TUNE
15 HIGH MID EQ BANDWIDTH / RES** 4 DECAY
16 HIGH MID EQ AMP MSB / RES** 5 TUNE
17 HIGH MID EQ AMP LSB / RES** 5 DECAY
18 SAMPLE START / TAP 1 DELAY LSB
19 SAMPLE LENGTH / TAP 1 VOLUME
1A PITCH MODE
1B PITCH INPUT (0) / RES** 4 AMP (1-7)
1C LFO WAVEFORM (0) / EQ PRESET NUMBER (1-7)
1D LFO SPEED
1E LFO DEPTH / RES*** DECAY
1F SAMPLE PLAYBACK MODE / TAP 1 PAN
20 PITCH FEEDBACK
21 DETUNE AMOUNT / SAMPLE PITCH
22 LEZLIE SEPARATION / TAP 1 FEEDBACK
23 LEZLIE MOTOR / SAMPLE REC AUDIO TRIG / TAP 2 DELAY MSB
24 LEZLIE SPEED / SAMPLE MIDI TRIG / TAP 2 DELAY LSB
25 TRIGGER FLANGE / RES*** MIDI GATE
26 SAMPLE MIDI BASE NOTE / TAP 2 VOLUME
27 DELAY MODE
28 DELAY INPUT (0) / RES** 5 AMP (1-7)
29 DELAY INPUT MIX
2A DELAY MSB / LEFT DELAY MSB / TAP 2 PAN
2B DELAY LSB / LEFT DELAY LSB /TAP 2 FEEDBACK
2C FEEDBACK / LEFT FEEDBACK / TAP 3 DELAY MSB
2D RIGHT DELAY MSB / TAP 3 DELAY LSB
2E RIGHT DELAY LSB / TAP 3 VOLUME
2F RIGHT FEEDBACK / TAP 3 PAN
30 SAMPLE LOW MIDI NOTE / TAP 3 FEEDBACK
31 SAMPLE HIGH MIDI NOTE / TAP 4 DELAY MSB
32 REVERB MODE / TAP 4 DELAY LSB
33 TAP 4 VOLUME
34 REVERB INPUT 1 / TAP 4 PAN
35 REVERB INPUT 2 / TAP 4 FEEDBACK
36 REVERB INPUT MIX / TAP 5 DELAY MSB
37 REVERB PREDELAY / TAP 5 DELAY LSB
38 REVERB PREDELAY MIX / TAP 5 VOLUME
39 REVERB DECAY / TAP 5 PAN
3A REVERB DIFFUSION / TAP 5 FEEDBACK
3B REVERB LOW DECAY / TAP 6 DELAY MSB
3C REVERB HIGH DECAY / TAP 6 DELAY LSB
3D REVERB DENSITY / TAP 6 VOLUME
3E REVERB GATE / TAP 6 PAN
3F REVERB GATE HOLD / TAP 6 FEEDBACK
40 REVERB GATE RELEASE / TAP 7 DELAY MSB
41 REVERB GATED LEVEL / TAP 7 DELAY LSB
42 RING MOD SHIFT MSB / TAP 7 VOLUME
43 RING MOD SHIFT LSB / TAP 7 PAN
44 CONFIGURATION
45 PRE-POST EQ (0) / DIRECT LEVEL (1-7)
46 PREAMP LEVEL / EQ LEVEL
47 MASTER EFFECTS LEVEL
48 PITCH LEVEL / LEZLIE LEVEL / RING MOD LEV
49 DELAY LEVEL
4A REVERB LEVEL / RES** 1 AMP
4B RES*** PITCH 1 / TAP 8 DELAY MSB
4C RES*** PITCH 2 / TAP 8 DELAY LSB
4D RES*** PITCH 3 / TAP 8 VOLUME
4E RES*** PITCH 4 / TAP 8 PAN
4F RES*** PITCH 5 / TAP 8 FEEDBACK
50 MOD 1 SOURCE
51 MOD 1 TARGET
52 MOD 1 AMPLITUDE
53 MOD 2 SOURCE
54 MOD 2 TARGET
55 MOD 2 AMPLITUDE
56 MOD 3 SOURCE
57 MOD 3 TARGET
58 MOD 3 AMPLITUDE
59 MOD 4 SOURCE
5A MOD 4 TARGET
5B MOD 4 AMPLITUDE
5C MOD 5 SOURCE
5D MOD 5 TARGET
5E MOD 5 AMPLITUDE
5F MOD 6 SOURCE
60 MOD 6 TARGET
61 MOD 6 AMPLITUDE
62 MOD 7 SOURCE
63 MOD 7 TARGET
64 MOD 7 AMPLITUDE
65 MOD 8 SOURCE
66 MOD 8 TARGET
67 MOD 8 AMPLITUDE
68 MULTITAP MASTER FEEDBACK
69 MULTITAP NUMBER
6A 1ST DIGIT NAME
6B 2ND DIGIT NAME
6C 3RD DIGIT NAME
6D 4TH DIGIT NAME
6E 5TH DIGIT NAME
6F 6TH DIGIT NAME
70 7TH DIGIT NAME
71 8TH DIGIT NAME
72 9TH DIGIT NAME
73 10TH DIGIT NAME
74 11TH DIGIT NAME
75 12TH DIGIT NAME
76 13TH DIGIT NAME
77 14TH DIGIT NAME
78 RING MOD OUTPUT MIX / RES** 2 AMP
79 RING MOD DEL/REV MIX / RES** 3 AMP
7A PAN SPEED
7B PAN DEPTH
7C EQ-MODE (7)/COMPRESSION (4-6) / DISTORTION (30)
7D MIX MODULATION (6-7) / EFFECT LOOP (5) / BASS BOOST (4) / AM
TONE (3-2) / CAB (1-0)
7E OVERDRIVE (7-5) / NOISE GATE (4-0)
7F PREAMP OUTPUT LEVEL

RES* = Resonator parameters in QUAD and 3 BAND EQ-REVERB modes
RES** = Resonator parameters in 5 BAND EQ-PITCH-DELAY mode
RES*** = Resonator parameters in RESONATOR-DELAY-REVERB mode

4.0 GT Service Parts List

GROUP	DESCRIPTION	PART #	QTY	POSITION	PCB	MANUFACTURER	NOTES
ASS	PCB, GT MAIN ASSY	8-20-0024	1	MAIN BOARD ASSEMBLY			
ASS	PCB, GT LED ASSY	8-20-0025	1	FRONT PANEL (LED) BOARD ASSEMBLY			
CAB	14 PIN DIL 14IN (3 CON)	4-18-1414	1	(3RD CONN 90mm FROM END)			
CAB	12 PIN SIL 03IN	4-19-0312	2	FRONT PANEL - J16,18			
CAB	06 PIN SIL 06IN	4-19-0606	1	LED PCB - J6			
CAB	12 PIN SIL CUSTOM 3/6IN	4-19-0612	1	POT PCB - J1,J5			
CAP	0.47 MF ELEC 50V	1-07-1474	1	C28	MAIN		
CAP	10 MF ELEC 25V	1-09-0100	6	C1,2,29,32,44,45	MAIN		
CAP	1.0 MF ELEC 25V	1-09-0105	2	C13,27	MAIN		
CAP	4.7 MF ELEC 25V	1-09-0475	22	C3,4,8,11,21,30,31,36,37,40,47,53-57,64, 65,115,116,122,123	MAIN		
CAP	470 MF ELEC 25V	1-09-0477	4	C111-114	MAIN		
CAP	1000 MF ELEC 25V	1-09-1000	4	C118-121	MAIN		
CER	100 PF CERDISC	1-02-0101	2	C43,46	MAIN		
CER	0.01 MF CERDISC	1-02-0103	1	C62	MAIN		
CER	0.1 MF CERDISC	1-02-0104	30	C18,19,25,26,39,42,52,61,63,66-72,74-77, 87,96,100-102,104,105,109,110,117	MAIN		
CER	150 PF CERDISC	1-02-0151	2	C103,106	MAIN		
CER	180 PF CERDISC	1-02-0181	8	C88-95	MAIN		
CER	20 PF CERDISC	1-02-0200	5	C12,38,97-99	MAIN		
CER	2200 PF CERDISC	1-02-0222	3	C7,20,33	MAIN		
CER	43 PF CERDISC	1-02-0430	8	C78-85	MAIN		
FIL	1000 PF FILM	1-20-0102	1	C58	MAIN	WIMA	
FIL	0.01 MF FILM	1-20-0103	10	C5,6,9,10,22,23,34,35,48,51	MAIN	WIMA	
FIL	0.1 MF FILM	1-20-0104	3	C73,107,108	MAIN	WIMA	
FIL	2200 PF FILM	1-20-0222	2	C59,60	MAIN	WIMA	
FIL	0.022 MF FILM	1-20-0223	1	C86	MAIN	WIMA	
FIL	2700 PF FILM	1-20-0272	2	C15,16	MAIN	WIMA	
FIL	330 PF FILM	1-20-0331	1	C41	MAIN	WIMA	
FIL	3300 PF FILM	1-20-0332	2	C49,50	MAIN	WIMA	
FIL	0.033 MF FILM	1-20-0333	1	C24	MAIN	WIMA	
FIL	5600 PF FILM	1-20-0562	2	C14,17	MAIN	WIMA	
HDR	14 PIN DIL 0.1 SPC	4-14-0014	2	J4,17		PT/MN	
HDR	06 PIN SIL 0.1 SPC	4-15-0006	1	LED PCB		PT/MN	
HDR	06 PIN SIL SHROUDED	4-15-0007	2	J1,J5	MAIN		0.1 SHROUD
HDR	12 PIN SIL SHROUDED	4-15-0012	4	J16,J18,F/P PCB (2)		KP/MN	0.1 SHROUD
HDR	12 PIN SIL RA SHROUDED	4-15-0013	1	POT PCB	POT		0.1 SHROUD
HDR	06 PIN SIL RA 0.1 SPC	4-15-1006	1	J6	MAIN		
HDW	6-32x1/4 PP BLK UNC	5-00-0003	18	TOP (7), BOT (7), R/PANEL (4)			
HDW	6-32x1/4 PF BLK UNC	5-00-0004	4	FRONT PANEL			
HDW	BEZEL SCREW	5-00-0012	4	W/BEZEL (4 PER)			
HDW	6-32x1/4 PP ZNC UNC	5-00-0016	13	TOP PCB (7), BOT PCB (6)			
HDW	#6 INT STAR WASHER	5-01-0002	3	HEATSINK STANDOFFS			
HDW	NYLON SPACER 0.095	5-01-0007	6	FRONT PCB (4), LED PCB (2)			
HDW	7/16 STAR WASHER	5-01-0008	7	IN (2), OUT (2), ADV, BYP, SND			
GROUP	DESCRIPTION	PART #	QTY	POSITION	PCB	MANUFACTURER	NOTES

HDW	NYLON WASHER 0.050	5-01-0050	1	3RD STANDOFF ON SINK			
HDW	6-32x1/2 STANDOFF	5-02-0003	4	HEATSINK (3), FRONT PANEL			
HDW	6-32x1 STANDOFF	5-02-0004	2	INDENTED PCB			
HDW	6-32 KEP NUT	5-02-6320	11	PCB, LED PCB (4), FRONT PCB (6)			
HDW	ANGLE BRACKET F/P	5-07-0001	3		MAIN		
HDW	HEAT SINK	9-03-1022	1				
HDW	SOLDER LUG (PCB MNT)	9-03-1036	7	CLIFF JACKS EXCEPT "RECEIVE"			
HDW	SWITCH BOOT	9-11-1013	1				
HDW	CABLE BRACKET	9-13-1012	1				
HDW	RUBBER STRIP 5 IN	9-23-1006	2	LCD TOP/BOT			
IC	2N5460 JFET TRANS	2-05-5460	1	Q1	MAIN	MOT	
IC	7805 +5 V TO220	2-11-7805	1	U42	MAIN	NAT ONLY	
IC	7812 +12 V TO220	2-11-7812	1	U40	MAIN	NAT ONLY	
IC	7912 -12 V TO220	2-11-7912	1	U41	MAIN	NAT ONLY	
IC	74HC138 DEMUX	2-14-0138	1	U35	MAIN	TI/NAT	
IC	74HC573 3-STATE LATCH	2-14-0573	1	U31	MAIN	TI/NAT	
IC	74HC574 OCTAL FF	2-14-0574	5	U10,11,36-38	MAIN	TI/NAT	
IC	74HC00 QUAD 2-IN NAND	2-14-7400	1	U43	MAIN	TI/NAT	
IC	74HCU04 HEX INVERTER	2-14-7403	1	U34	MAIN	TI/NAT	
IC	74HC74 DUAL D FF	2-14-7474	1	U33	MAIN	TI/NAT	
IC	64Kx4 DRAM 100nS	2-16-4464	5	U22,23,24,25,26	MAIN	TI/SAM/FUJI/NEC/HYUND	
IC	32Kx8 SRAM 120nS	2-17-0257	1	U29	MAIN	SONY	CXK58257AP-12L
IC	27C512 EPROM 200nS	2-19-0512	1	U30 (VER 1.00)	MAIN	TI/NAT/SIG	
IC	80C31 MPU	2-20-8031	1	U32	MAIN	INTEL/SIG	
IC	TLO84 QUAD OP AMP	2-21-0084	9	U1,2,6,7,13,15,16,18,39	MAIN	TI	
IC	SSM2120 DUAL VCA	2-21-2120	1	U4	MAIN	SSM	
IC	CEM3381 VCA	2-21-3381	1	U12	MAIN	CURTISS	
IC	LM311 ANALOG COMP	2-22-0311	1	U21	MAIN	NAT/TI	
IC	LM339 QUAD COMP	2-22-0339	1	U17	MAIN	NAT/TI	
IC	4051 ANALOG SWITCH	2-23-4051	2	U8,14	MAIN	ST/HARRIS/RCA/SIG	
IC	4053 ANALOG SWITCH	2-23-4053	4	U3,5,9,19	MAIN	ST/HARRIS/RCA/SIG	
IC	6N138 OPTO-ISO	2-24-0138	1	U28	MAIN	HP	
IC	PCM54 DAC	2-25-0054	1	U20	MAIN	BURR-BROWN	
IC	ZAK 24 ASIC	2-27-0005	1	U22	MAIN	AMI	
IC	20K LOW PASS FILTER	7-20-0001	1		MAIN		
JAC	5 PIN DIN JACK	4-00-0001	2	J11,12	MAIN		
JAC	4 PIN DIN JACK (P4)	4-00-0004	1	J15	MAIN		
JAC	1/4 CLIFF (MONO)	4-02-0001	8	J2,3,7-10,13,14	MAIN		
LCD	LCD MODULE	9-44-1111	1	FRONT PANEL			
ME	1N4148 SIGNAL DIODE	2-00-4148	22	D1-19,25-27	MAIN	MOT	
ME	1N4003 POWER DIODE	2-01-4003	5	Q20-24	MAIN	MOT	
ME	1N5231B ZENER	2-02-5231	1	Q28	MAIN	MOT ONLY	
ME	2N4401 NPN TRANS	2-03-4401	6	Q2-7	MAIN	MOT/NAT/HARRIS	
ME	LED (GRN) T1	3-00-0001	3	POT PCB	POT		
ME	LED (RED) T1	3-02-0001	13	POT PCB, KEY PCB	PT,KY		
ME	DPDT SWITCH (ALPHA)	6-02-0001	1	S1	MAIN		
ME	PIEZO	7-00-0001	1		KEY		
GROUP	**DESCRIPTION**	**PART #**	**QTY**	**POSITION**	**PCB**	**MANUFACTURER**	**NOTES**
ME	24 MHz XTAL	7-01-0006	1	Z1	MAIN		
ME	LITHIUM BAT (PANA 3V)	7-05-0003	1	B1	MAIN	PANASONIC	

MTL	SIDE PANEL	9-03-1003	2				
MTL	COVER PANEL	9-03-1005	2				
MTL	FRONT PANEL, GT	9-03-1061	1				
MTL	REAR PANEL	9-03-1062	1				
PCB	PCB, QV KEYPAD	9-40-1020	1	REV B			
PCB	PCB, MAIN PANEL REV A	9-40-1053	1	REV A			
PCB	PCB, LED	9-40-1064	1	REV A (PART OF 9-40-1053)			
PCB	PCB, POT	9-40-1065	1	REV A (PART OF 9-40-1053)			
PLS	STANDARD KNOB	9-11-1001	2				
PLS	LCD BEZEL (REV B)	9-11-1015	1				
PLS	POWER BUTTON	9-11-1016	1				
PLS	LED BUTTON	9-11-1017	12				
PLS	PLAIN BUTTON	9-11-1018	4				
PLS	SWITCH XTENDER	9-11-1019	1				
POT	10KA DUAL POT	0-09-1001	1		POT		
POT	10KB DUAL POT	0-09-1004	1		POT		
RES	100 1/8W 5%	0-00-0101	4	81,82,84,119	MAIN		
RES	1K 1/8W 5%	0-00-0102	19	R2,4-6,17,37,69,74,78,85,90,120,123,139, 173,180,212,214,215	MAIN		
RES	10K 1/8W 5%	0-00-0103	23	R9,33,40,44,47,48,51,52,57-59,97-99,102, 122,159,187,199,205,207,208,211	MAIN		
RES	100K 1/8W 5%	0-00-0104	2	R194,195	MAIN		
RES	1M 1/8W 5%	0-00-0105	3	R71,100,176	MAIN		
RES	1.1K 1/8W 5%	0-00-0112	4	R132-135	MAIN		
RES	11K 1/8W 5%	0-00-0113	2	R23,29	MAIN		
RES	1.2K 1/8W 5%	0-00-0122	1	R107	MAIN		
RES	12K 1/8W 5%	0-00-0123	3	R27,30,193	MAIN		
RES	120K 1/8W 5%	0-00-0124	1	R104	MAIN		
RES	1.3K 1/8W 5%	0-00-0132	1	R86	MAIN		
RES	13K 1/8W 5%	0-00-0133	2	R116,40A	MAIN		
RES	1.5K 1/8W 5%	0-00-0152	2	R14,190	MAIN		
RES	15K 1/8W 5%	0-00-0153	3	R19,31,105	MAIN		
RES	1.6K 1/8W 5%	0-00-0162	1	R113	MAIN		
RES	1.8K 1/8W 5%	0-00-0182	8	R163-170	MAIN		
RES	180K 1/8W 5%	0-00-0184	1	R148	MAIN		
RES	200 1/8W 5%	0-00-0201	3	R67,68,83	MAIN		
RES	2K 1/8W 5%	0-00-0202	7	R8,112,126,130,147,184,185	MAIN		
RES	20K 1/8W 5%	0-00-0203	15	R34,35,42,45,50,63,101,124,127,128,131,144 ,179,189,200	MAIN		
RES	220 1/8W 5%	0-00-0221	10	R156,157,160,161,174,177,196,201-203	MAIN		
RES	2.2K 1/8W 5%	0-00-0222	2	R16,56	MAIN		
RES	220K 1/8W 5%	0-00-0224	3	R11,20,75	MAIN		
RES	2.2M 1/8W 5%	0-00-0225	1	R155	MAIN		
RES	27K 1/8W 5%	0-00-0273	1	R114	MAIN		
RES	300 1/8W 5%	0-00-0301	1	R108	MAIN		
RES	3K 1/8W 5%	0-00-0302	1	R191	MAIN		
GROUP	**DESCRIPTION**	**PART #**	**QTY**	**POSITION**	**PCB**	**MANUFACTURER**	**NOTES**
RES	30K 1/8W 5%	0-00-0303	6	R43,46,53,70,72,103	MAIN		
RES	300K 1/8W 5%	0-00-0304	1	R54	MAIN		
RES	3.3K 1/8W 5%	0-00-0332	5	R32,94,110,162,182	MAIN		

RES	330K 1/8W 5%	0-00-0334	1	R145	MAIN		
RES	36K 1/8W 5%	0-00-0363	3	R13,22,39	MAIN		
RES	3.9K 1/8W 5%	0-00-0392	3	R18,25,93	MAIN		
RES	39K 1/8W 5%	0-00-0393	3	R55,64,197	MAIN		
RES	390K 1/8W 5%	0-00-0394	2	R41,149	MAIN		
RES	47 1/8W 5%	0-00-0470	3	R65,76,106	MAIN		
RES	470 1/8W 5%	0-00-0471	8	R7,10,151,152,153,158,175,178	MAIN		
RES	4.7K 1/8W 5%	0-00-0472	11	R38,92,125,129,141,181,183,186,188, 210,213	MAIN		
RES	47K 1/8W 5%	0-00-0473	3	R36,62,118	MAIN		
RES	470K 1/8W 5%	0-00-0474	3	R1,3,73	MAIN		
RES	51K 1/8W 5%	0-00-0513	2	R137,140	MAIN		
RES	510K 1/8W 5%	0-00-0514	2	R136,209	MAIN		
RES	560 1/8W 5%	0-00-0561	2	R171,172	MAIN		
RES	5.6K 1/8W 5%	0-00-0562	2	R87,143	MAIN		
RES	56K 1/8W 5%	0-00-0563	3	R79,80,91	MAIN		
RES	620 1/8W 5%	0-00-0621	1	R109	MAIN		
RES	6.2K 1/8W 5%	0-00-0623	1	R192	MAIN		
RES	680 1/8W 5%	0-00-0681	1	R121	MAIN		
RES	6.8K 1/8W 5%	0-00-0682	6	R12,49,60,95,115,206	MAIN		
RES	750 1/8W 5%	0-00-0751	3	R61,66,154	MAIN		
RES	7.5K 1/8W 5%	0-00-0752	3	R15,24,88	MAIN		
RES	75K 1/8W 5%	0-00-0753	2	R21,142	MAIN		
RES	750K 1/8W 5%	0-00-0754	1	R150	MAIN		
RES	8.2K 1/8W 5%	0-00-0822	3	R111,138,198	MAIN		
RES	82K 1/8W 5%	0-00-0823	1	R204	MAIN		
RES	910 1/8W 5%	0-00-0911	1	R96	MAIN		
RES	9.1K 1/8W 5%	0-00-0912	4	R26,28,77,89	MAIN		
RES	91K 1/8W 5%	0-00-0913	1	R146	MAIN		
RUB	KEYPAD	9-23-1005	1				
SOC	18 PIN DIP 0.3	4-04-0018	5	U22-26	MAIN		
SOC	22 PIN DIP 0.3	4-04-0022	1	U4	MAIN		
SOC	28 PIN DIP 0.6	4-06-0028	3	U20,29,30	MAIN		
SOC	40 PIN DIP 0.6	4-06-0040	1	U32	MAIN		
SOC	84 PIN ASIC SOCKET	4-12-0084	1	U22	MAIN		

Service Manual History

10/17/95	V1.00	First release.

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