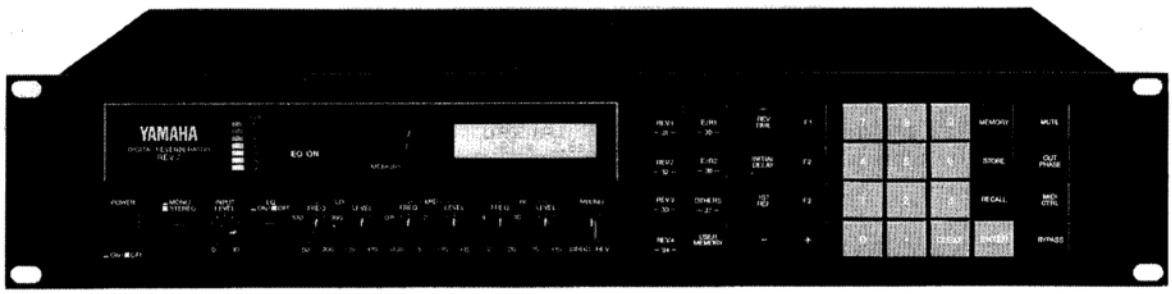
DIGITAL REVERBERATOR

REV7

SERVICE MANUAL

REV7



■CONTENTS

IMPORTANT NOTICE 1
BLOCK DIAGRAM 1
SPECIFICATIONS 2
DIMENSIONS 2
PANEL LAYOUT 3
ROOM SIZE CHART 4
MEMORY (ROM) CONTENTS AND CONTROLLABLE PARAMETERS 5
GENERAL INFORMATION ..... 6 ~ 12
EXPLANATION OF PARAMETERS 6
RECALL/EDIT/STORE 11
MIDI CONTROL 12
STEREO/MONO AND EQUALIZER 12
FUNCTIONAL BLOCK DIAGRAM AND SIGNAL FLOW 13
CIRCUIT DESCRIPTION ..... 14 ~ 18
UNIT LAYOUT 19
CHECKS AND ADJUSTMENTS 20/21
DIAGNOSTIC PROGRAMS ..... 22 ~ 24
IC PIN ASSIGNMENTS AND FUNCTIONS .. 25 ~ 26
MIDI IMPLEMENTATION CHART 27
CIRCUIT BOARDS ..... 28 ~ 32
PARTS LIST ..... 33 ~ 39
SCHEMATIC DIAGRAM 40/41

SINCE 1887 YAMAHA
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN
1.81K-415 Ⓘ Printed in Japan 85.10

■ SPECIFICATIONS

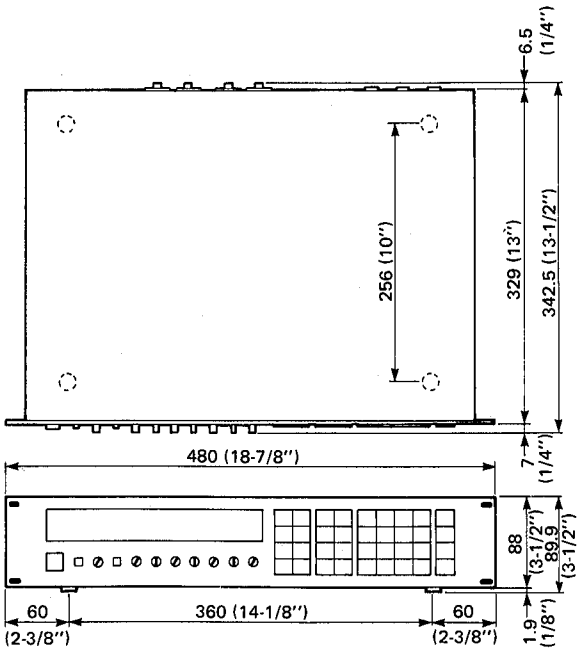
INPUTS	
Number of Channels	Electronically Balanced x 2 (Phone Jack) Electronically Balanced x 2 (XLR type)
Nominal Level	+4dB
Impedance	10Kohms
Level Control	Volume, Gain +10 dB — −90dB
Mono/Stereo SW.	Mono — Ch.L + R Activated. Stereo — Ch.L & R Activated.
Mixing	In Stereo mode, Ch. L & R are mixed and sent to A/D converter.
Parametric EQ	Low: 50～700Hz ±15dB, Mid: 350～7kHz ±15, High: 2k～20kHz ±15dB
Level Monitor	8 points LED (pre — A/D)
A/D CONVERSION	
Sampling Freq.	31.25kHz
Quantization	Linear 16 Bit
Band Width	20Hz to 12kHz
Number of Channels	1
SIGNAL PROCESSING	
Functions	
Factory Presets (30)	Reverb-1 — LARGE HALL Reverb-2 — SMALL HALL Reverb-3 — VOCAL PLATE Reverb-4 — PERCUSSION PLATE E/R - 1 —EARLY REFLECTION-1 E/R - 2 —EARLY REFLECTION-2 OTHERS — DELAY (Number 7) to LIVE REFERENCE (Number 30)
Reverb Time (RT)	0.3 to 10.0 sec, on Mid. band
Initial Delay	0.1 to 100.0 msec.
1st Reflection	Delay Time (0 to 100.0 msec) & Level (0～100%)
High Freq. RT (F1)	Mid. RT x (0.1～1.0)
Low Freq. RT (F2)	Mid. RT x (0.1～2.4)
Diffusion	Diffusion (10 steps)
D/A CONVERSION	
Number of Channels	2
Sampling Freq.	31.25 kHz
Quantization	Linear 16 Bit
Band Width	20 Hz to 12 kHz
OUTPUTS	
Number of Channels	Electronically Balanced x 2 (Phone Jack) Electronically Balanced x 2 (XLR type)
Nominal Level	+4dB
Impedance	600ohms
Maximum Level	+18dB
Mixing	Direct Signal, Reverb Signal
Bypass	ON/OFF
Out phase	Ch.R (Reverb Signal) can be alternated
Mute	ON/OFF

MEMORY	
Presets (ROM)	1～30
User Memory (RAM)	31～90 (Non Volatile) All parameters except Input Level and parametric EQ, can be memorized
MIDI CONTROL	MIDI Channel, Program Number
FRONT PANEL	
Display	16 character 2 lines LCD x 1 2 digits numeric LED for Memory No. 8 points level meter LED
Knobs	Input Level Volume Parametric EQ (Low, Mid, High)
Keys	Function Keys Numeric and +/− Keys Direct and BYPASS ON/OFF Keys MUTE, MIDI
ELECTRICAL CHARACTERISTICS	
Dynamic Range	Reverb : more than 78dB Delay : more than 84dB
Distortion	Direct Signal 0.03% Reverb Signal 0.1%
Band Width	Direct Signal 20 to 20kHz Reverb Signal 20 to 12kHz
Residual Noise Level	Reverb mode : less than −60dB Delay mode : less than −66dB
DIMENSIONS (W x H x D)	480 x 89.9 x 342.5mm (18-7/8" x 3-1/2" x 13-1/2")
WEIGHT	5.3 kg (11.7 lbs)
POWER REQUIREMENTS	U.S./Canadian Model 110V — 120V, 50/60Hz General Model 220V — 240V, 50/60Hz
POWER CONSUMPTION	25W
REMOTE CONTROL	REV 1 E/R 1 REV 2 E/R 2 REV 3 OTHERS REV 4 USER MEMORY

**NOTE: Since natural sounding reverberation is mixed with the direct sound, and hence does not constitute 100% of the sound, the effective dynamic range will nearly always exceed 90 dB.*

***When dB represents a specific voltage, 0dB is referenced to 0.775V RMS.*

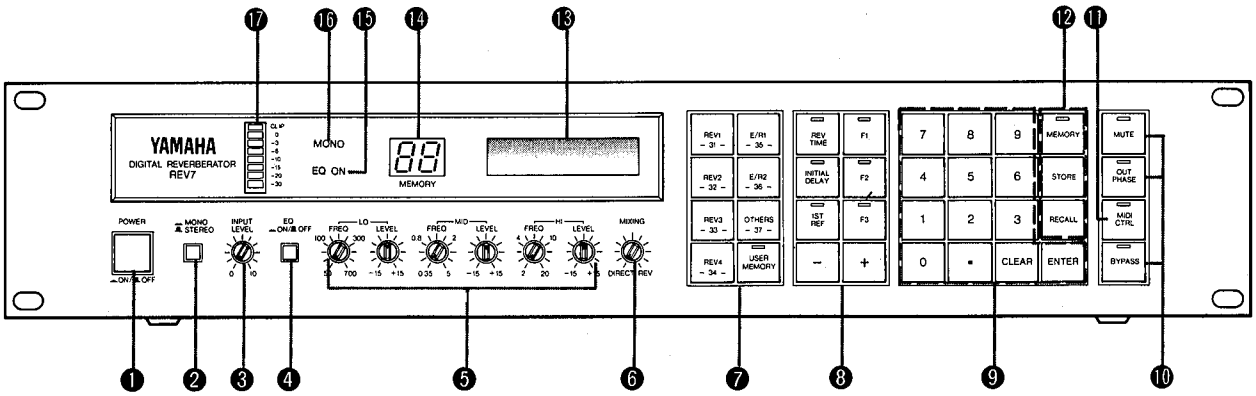
■ DIMENSIONS



Unit: mm (Inch)

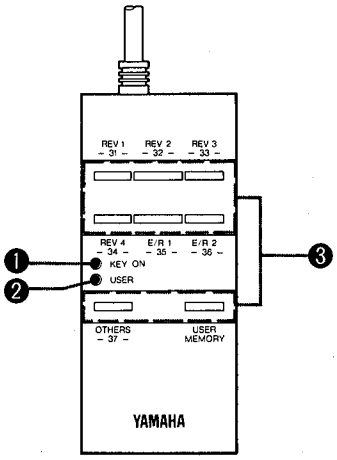
■PANEL LAYOUT

• FRONT PANEL



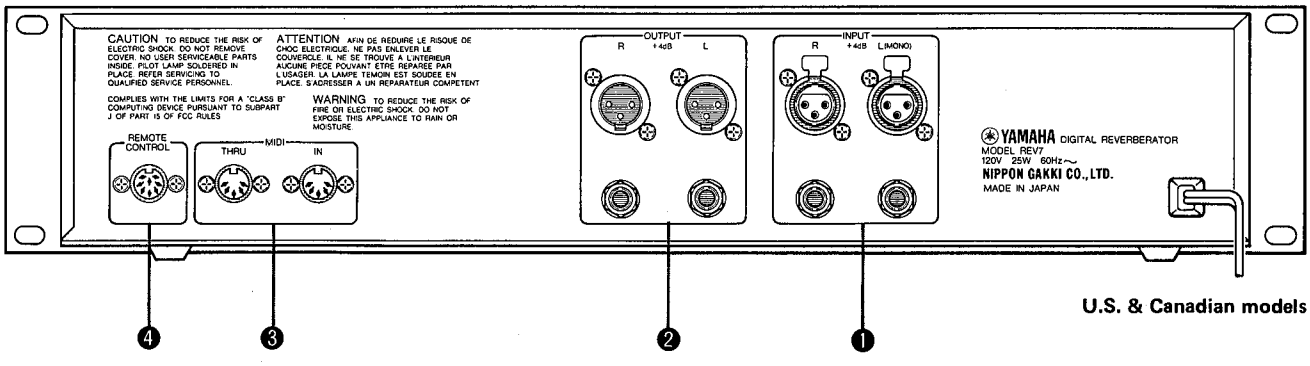
❶ POWER ON/OFF switch
❷ MONO/STEREO switch
❸ INPUT LEVEL control
❹ EQ ON/OFF switch
❺ EQUALIZER section
❻ MIXING control
❼ DIRECT RECALL keys
❽ PARAMETER SELECT and +/– keys
❾ NUMERIC/EDITING keys
❿ OUTPUT CONTROL keys
⓫ MIDI CTRL key
⓬ MEMORY keys
⓭ LCD
⓮ MEMORY NUMBER LED
⓯ EQ ON LED
⓰ MONO LED
⓱ INPUT LEVEL LED

• REMOTE CONTROL UNIT



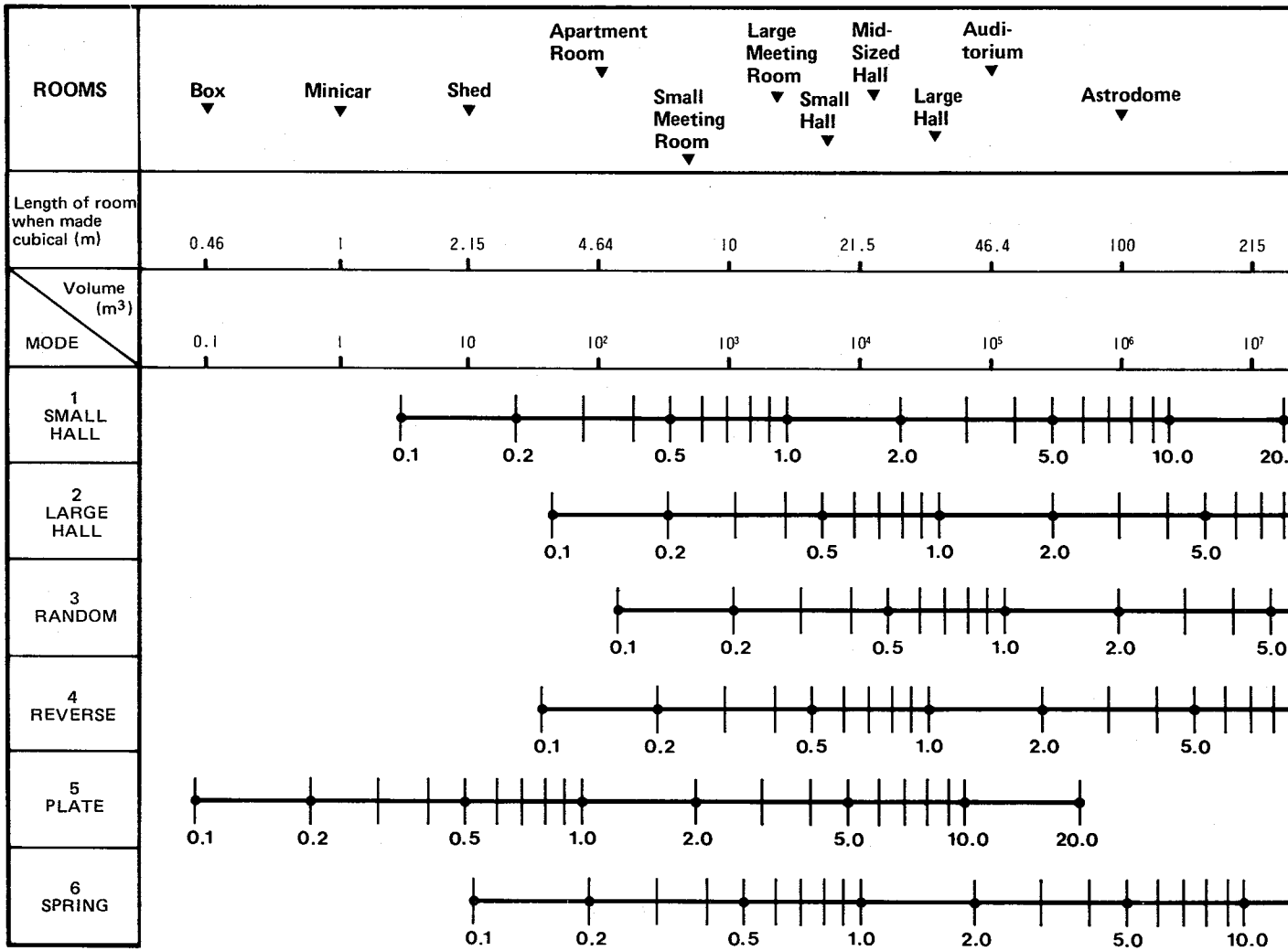
❶ KEY ON LED
❷ USER LED
❸ DIRECT RECALL keys

• REAR PANEL



U.S. & Canadian models

❶ INPUT connectors
❷ OUTPUT connectors
❸ MIDI IN, MIDI THRU connectors
❹ REMOTE CONTROL connector


ROOMS
Box
Minicar
Shed
Apartment Room
Small Meeting Room
Large Meeting Room
Small Hall
Mid-Sized Hall
Large Hall
Audi-torium
Astrodome
Length of room when made cubical (m)
0.46
1
2.15
4.64
10
21.5
46.4
100
215
Volume (m³)
MODE
0.1
1
10
10²
10³
10⁴
10⁵
10⁶
10⁷
1 SMALL HALL
0.1 0.2 0.5 1.0 2.0 5.0 10.0 20.
2 LARGE HALL
0.1 0.2 0.5 1.0 2.0 5.0
3 RANDOM
0.1 0.2 0.5 1.0 2.0 5.0
4 REVERSE
0.1 0.2 0.5 1.0 2.0 5.0
5 PLATE
0.1 0.2 0.5 1.0 2.0 5.0 10.0 20.0
6 SPRING
0.1 0.2 0.5 1.0 2.0 5.0 10.0

REV7

■MEMORY (ROM) CONTENTS AND CONTROLLABLE PARAMETERS

This chart lists all the programmable parameters of the REV7's 30 presets. It includes the complete value ranges of each parameter, for quick reference when editing. The EXPLANATION OF PARAMETERS chapter should be studied, for a full understanding of this chart.

NOTE | PARAMETER RANGE / PRESET VALUE

MEM No.	PROGRAM NAME	TYPE	CONTROLLABLE PARAMETERS & PRESET VALUE						
			REV TIME	INITIAL DELAY	1ST REF		F1	F2	F3
1	LARGE HALL	REV	REV TIME 0.3 ~ 10.0s 2.6s	INITIAL DELAY 0.1 ~ 100.0ms 30.0ms	1ST DELAY 0.1 ~ 100.0ms 10.0ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x 1.0 x 0.3	LOW x0.1 ~ x 2.4 x 1.2	DIFFUSION 0 ~ 10 5
2	SMALL HALL	REV	REV TIME 0.3 ~ 10.0s 2.0s	INITIAL DELAY 0.1 ~ 100.0ms 20.0ms	1ST DELAY 0.1 ~ 100.0ms 10.0ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x 1.0 x 0.4	LOW x0.1 ~ x 2.4 x 1.0	DIFFUSION 0 ~ 10 5
3	VOCAL PLATE	REV	REV TIME 0.3 ~ 10.0s 2.4s	INITIAL DELAY 0.1 ~ 100.0ms 45.0ms	1ST DELAY 0.1 ~ 100.0ms 10.0ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x 1.0 x 0.3	LOW x0.1 ~ x 2.4 x 1.0	DIFFUSION 0 ~ 10 5
4	PERCUSSION PLATE	REV	REV TIME 0.3 ~ 10.0s 2.0s	INITIAL DELAY 0.1 ~ 100.0ms 10.0ms	1ST DELAY 0.1 ~ 100.0ms 10.0ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x 1.0 x 0.5	LOW x0.1 ~ x 2.4 x 1.2	DIFFUSION 0 ~ 10 5
5	EARLY REFLECTION 1	E/R 1	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 10.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MODE 1 ~ 6 1	ROOM SIZE x0.1 ~ x20.0 x 2.0	DIFFUSION 0 ~ 10 5
6	EARLY REFLECTION 2	E/R 2	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 10.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MODE 1 ~ 6 1	ROOM SIZE x0.1 ~ x20.0 x 2.0	DIFFUSION 0 ~ 10 5
7	DELAY L, R	DELAY		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	Lch DELAY 0.1 ~ 900.0ms 100.0ms	Rch DELAY 0.1 ~ 900.0ms 200.0ms	LEVEL 0 ~ 100% 100%
8	STEREO ECHO	ECHO	F.B. GAIN 0 ~ 99% 60%	INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	Lch DELAY 0.1 ~ 450.0ms 170.0ms	Rch DELAY 0.1 ~ 450.0ms 178.0ms	HIGH x0 ~ x10 x 9
9	STEREO FLANGE	MOD.	F.B. GAIN 0 ~ 99% 35%	INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 2.5Hz	MOD DEPTH 0 ~ 100% 50%	DELAY TIME 0.1 ~ 100.0ms 1.2ms
10	REVERB FLANGE	MOD.	REV TIME 0.3 ~ 10.0s 2.5s	INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 1.1Hz	MOD DEPTH 0 ~ 100% 80%	DELAY TIME 0.1 ~ 30.0ms 1.2ms
11	CHORUS A	MOD.		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 0.2Hz	DM DEPTH 0 ~ 100% 50%	AM DEPTH 0 ~ 100% 40%
12	CHORUS B	MOD.		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 0.6Hz	DM DEPTH 0 ~ 100% 50%	AM DEPTH 0 ~ 100% 10%
13	STEREO PHASING	MOD.		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 1.1Hz	MOD DEPTH 0 ~ 100% 100%	DELAY TIME 0.1 ~ 8.0ms 3.0ms
14	TREMOLO	MOD.		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 6.0Hz	MOD DEPTH 0 ~ 100% 50%	
15	SYMPHONIC	MOD.		INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MOD FREQ. 0.1 ~ 20.0Hz 0.7Hz	MOD DEPTH 0 ~ 100% 50%	
16	SPRING	REV	REV TIME 0.3 ~ 10.0s 2.6s	INITIAL DELAY 0.1 ~ 100.0ms 25.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x1.0 x 0.2	LOW x0.1 ~ x 2.4 x 1.2	DIFFUSION 0 ~ 10 5
17	ECHO ROOM	REV	REV TIME 0.3 ~ 10.0s 3.2s	INITIAL DELAY 0.1 ~ 100.0ms 16.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x1.0 x 0.3	LOW x0.1 ~ x2.4 x 1.2	DIFFUSION 0 ~ 10 5
18	STRINGS	REV	REV TIME 0.3 ~ 10.0s 3.0s	INITIAL DELAY 0.1 ~ 100.0ms 13.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x 1.0 x 0.3	LOW x0.1 ~ x 2.4 x 1.0	DIFFUSION 0 ~ 10 5
19	ELECTRIC BASS A	E/R 1	LIVENESS 0 ~ 10 1	INITIAL DELAY 0.1 ~ 100.0ms 12.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 65%	MODE 1 ~ 6 5	ROOM SIZE x0.1 ~ x20.0 x 0.3	DIFFUSION 0 ~ 10 5
20	ELECTRIC BASS B	E/R 2	LIVENESS 0 ~ 10 3	INITIAL DELAY 0.1 ~ 100.0ms 12.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 68%	MODE 1 ~ 6 5	ROOM SIZE x0.1 ~ x20.0 x 0.4	DIFFUSION 0 ~ 10 7
21	KICK	E/R 1	LIVENESS 0 ~ 10 1	INITIAL DELAY 0.1 ~ 100.0ms 12.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 87%	MODE 1 ~ 6 5	ROOM SIZE x0.1 ~ x20.0 x0.3	DIFFUSION 0 ~ 10 7
22	SNARE	REV	REV TIME 0.3 ~ 10.0s 1.2	INITIAL DELAY 0.1 ~ 100.0ms 10.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x1.0 x 0.8	LOW x0.1 ~ x2.4 x 0.8	DIFFUSION 0 ~ 10 5
23	GATE REVERB	E/R 2	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 20.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MODE 1 ~ 6 3	ROOM SIZE x0.1 ~ x20.0 x 1.6	DIFFUSION 0 ~ 10 5
24	REVERSE GATE	E/R 2	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 25.0ms	1ST DELAY 0 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MODE 1 ~ 6 4	ROOM SIZE x0.1 ~ x20.0 x 2.4	DIFFUSION 0 ~ 10 5
25	PIANO	E/R 2	LIVENESS 0 ~ 10 3	INITIAL DELAY 0.1 ~ 100.0ms 12.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 72%	MODE 1 ~ 6 6	ROOM SIZE x0.1 ~ x20.0 x 1.0	DIFFUSION 0 ~ 10 6
26	ORGAN	E/R 1	LIVENESS 0 ~ 10 4	INITIAL DELAY 0.1 ~ 100.0ms 10.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 61%	MODE 1 ~ 6 1	ROOM SIZE x0.1 ~ 20.0 x 3.5	DIFFUSION 0 ~ 10 7
27	BRASS	E/R 1	LIVENESS 0 ~ 10 4	INITIAL DELAY 0.1 ~ 100.0ms 12.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 61%	MODE 1 ~ 6 3	ROOM SIZE x0.1 ~ x20.0 x 0.9	DIFFUSION 0 ~ 10 5
28	GUITAR	E/R 2	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 5.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 69%	MODE 1 ~ 6 6	ROOM SIZE x0.1 ~ 20.0 x 1.5	DIFFUSION 0 ~ 10 5
29	HANDCLAPS	REV	REV TIME 0.3 ~ 10.0s 0.4s	INITIAL DELAY 0.1 ~ 100.0ms 0.1ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	HIGH x0.1 ~ x1.0 x 0.1	LOW x0.1 ~ x2.4 x 2.0	DIFFUSION 0 ~ 10 5
30	LIVE REFERENCE	E/R 2	LIVENESS 0 ~ 10 5	INITIAL DELAY 0.1 ~ 100.0ms 20.0ms	1ST DELAY 0.1 ~ 100.0ms 0.1ms	1ST LEVEL 0 ~ 100% 0%	MODE 1 ~ 6 2	ROOM SIZE x0.1 ~ x20.0 x 2.5	DIFFUSION 0 ~ 10 5

The following abbreviations are used: REV TIME = REVERB TIME; HIGH = HIGH FREQUENCY REVERB TIME; LOW = LOW FREQUENCY REVERB TIME; Lch DELAY = LEFT CHANNEL DELAY TIME; Rch DELAY = RIGHT CHANNEL DELAY TIME; LEVEL = DELAY LEVEL; F.B. GAIN = FEEDBACK GAIN; HIGH = HIGH DUMP; MOD FREQ. = MODULATION FREQUENCY; MOD DEPTH = MODULATION DEPTH.

■GENERAL INFORMATION

• EXPLANATION OF PARAMETERS

The preset programs in the REV7 fall into the following types: REV (Reverb), E/R (Early Reflection), Delay, Echo, and MOD (Modulation Type, including Phase, Chorus, and Flange type effects). Each of these program types has a specific selection of programmable parameters.

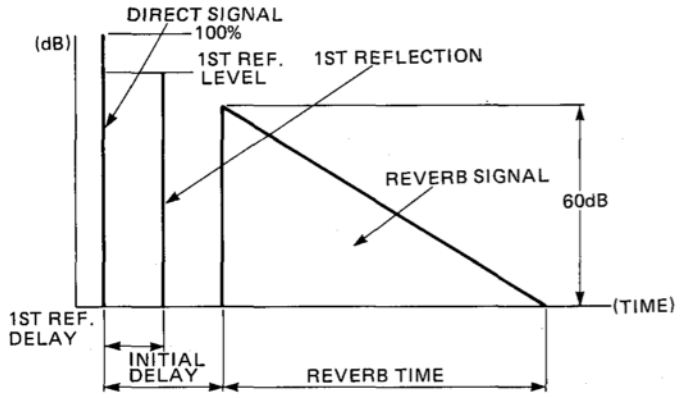
"Parameters" indicates the separate, individual functions that make up each effect. There are two types of parameters in the REV7: "invisible" parameters (non-programmable, fixed value parameters) and programmable parameters (the ones that you can edit, or modify). You can set the parameters of two different presets to the same values, and the resulting effect may not be the same, due to the non-programmable parameters.

Each preset has up to 7 programmable parameters. They are listed, with their preset values, in the MEMORY (ROM) CONTENTS CHART at the end of this manual. In this section we'll explain these parameters and list their individual value ranges. The front panel key which calls up each parameter will also be noted. These include R/T (Reverb Time—may be used for other parameters), INITIAL DELAY, 1ST REF (First Reflection: a double-action key for setting level and delay of first reflection), and Function Keys F1, F2, F3 (for a variety of functions, depending on preset selected).

All presets include the 1st Reflection feature, explained below. The level of the 1st Reflection is usually preset at zero, so that you can program in just the amount of 1st Reflection that you need.

REV TYPE

Reverberation effects. Presets 1 through 4, 16 through 18, 22, and 29.



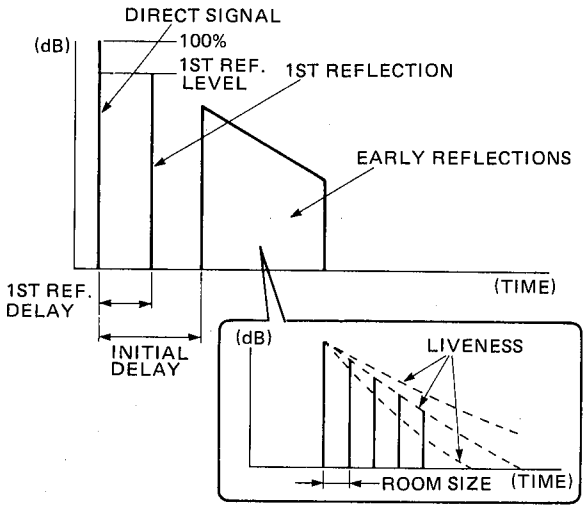
1. **REVERBERATION TIME (R/T). Range: 0.3 ~ 10.0 sec. Key: REV TIME.**
   The length of the time it takes for the level of reverberation at 1 kHz to decrease by 60 dB—virtually to silence. In a live setting, this depends on several factors: room size, room shape, type of reflective surfaces, among others.
2. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   For a listener in a concert hall, there is a time delay between the direct sound of the instrument, and the first of the many reflected sounds that together are known as reverberation. On the REV7, this is known as the INITIAL DELAY time.
3. **1ST REFLECTION Delay. Range: 0.1 ~ 100 msec.**
4. ***1ST REFLECTION Level. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.***
   A common phenomenon in a concert hall is a single reflection immediately after the direct sound. The 1ST REFLECTION feature enables you to accurately simulate this effect. Both the delay and the level of the reflection are adjustable. This is also useful for A.D.T. (Automatic Double Tracking) effects, or for "thickening" the sound of an instrument. The 1st Reflection is always a mono signal, and appears in the center of the stereo image. With all presets, the 1ST REF parameters are preset at the minimum (0% level, 0.1 msec delay time) so that you can program in exactly the amount of 1st Reflection you need.

NOTE: The 1ST REF key is a double action key. Each time you press this key, it alternates between "1ST DLY" and "1ST LEVEL" (as displayed on the LCD), allowing you to set the values of the delay and level of the first reflection.

5. **HI REVERB TIME. Range: 0.1 ~ 1.0 x MID R/T. Key: F1.**
6. **LOW REVERB TIME. Range: 0.1 ~ 2.4 x MID R/T. Key: F2.**
   Natural reverberation varies according to the frequency of the sound—the higher the frequency, the more the sound tends to be absorbed by walls, furnishings, and even by air. These two parameters permit you to alter the reverberation times of the high frequency and low frequency portions of the signal, as a proportion of the mid frequency reverb time.
7. **DIFFUSION. Range: 0 ~ 10. Key: F3.**
   Reverberation is caused by multiple reflections that increase rapidly in complexity, according to the shape of the hall and any furniture or fittings therein. This rate of increase is known as DIFFUSION on the REV7. Setting the Diffusion parameter at 0 gives a less complex, clearer reverb effect, as in a regularly shaped room with simple, flat reflective surfaces. As you increase the setting, the sound becomes fuller, richer, and more expansive, giving the impression of a room that is not necessarily bigger, but has an irregular shape and contains many corners and fittings to multiply reflections, as in a theater with proscenium, seats, orchestra pit, balconies, etc.

E / R1 AND E / R2 TYPE

"Early Reflection" effects. Presets 5, 6, 19 through 21, 23 through 28, and 30.



1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   The time delay between the direct sound of the instrument, and the first of the early reflections.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **LIVENESS. Range: 0 ~ 10. Key: REV TIME.**
   Refers to the rate at which the reflected sounds fade. Set this parameter at zero to simulate an acoustically "dead" room, with absorbent surfaces to "soak up" the reflected sounds. As you increase the setting, the room appears to contain more "live" surfaces, with the reflected sounds fading more slowly, as they reflect from wall to wall, until at the maximum setting the effect is of an intensely reflective environment, containing many highly polished surfaces (tiles, glass, etc).
5. **ROOM SIZE. Range: 0.1 ~ 10 x preset setting. Key: F2.**
   In the REV7, the ROOM SIZE parameter indicates the time gaps between the early reflections—directly proportional to the size of the room. The effect of this parameter also depends on which early reflection Mode has been selected. A Room Size Chart can be found later in this manual.
6. **DIFFUSION. Range: 0 ~ 10. Key: F3.**
   Same as for REV type presets.
7. **MODE. Range: 1 ~ 6. Key: F1.**
   This is a rather special case. All "Early Reflection" presets are switchable between 6 different Mode types. These are 1: SMALL HALL (a typical grouping of early reflections that would occur in a small performing environment), 2: LARGE HALL (a typical grouping of early reflections that would occur in a large performing environment), 3: RANDOM (an irregular series of reflections that could not occur naturally), 4: REVERSE (a series of reflections that increase in level, like the effect produced by playing a recorded echo backwards), 5: PLATE (a typical grouping of early reflections that would occur in a plate echo unit) and 6: SPRING (a typical grouping of early reflections that would occur in a spring reverberation unit). A slightly different early reflection for the left and right outputs creates a natural stereo effect.

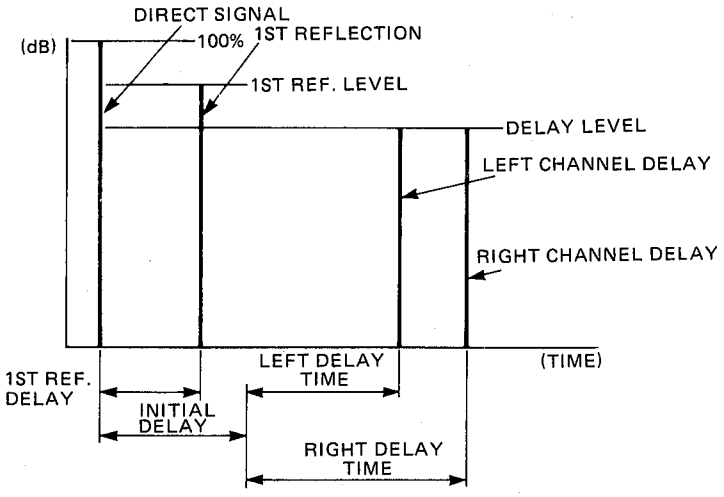
   Although the name of each mode suggests a typical environment or effect, note that only the first group of reflections are generated, and they are not multiplied to produce the sound you might expect. Also, each of the E/R type presets has "invisible" parameters that further affect the sound, so the best course is to actually listen to the presets and their different modes, to get the full effect of each mode and appreciate the enormous creativity they provide.

   An Early Reflection Mode Chart can be found later in this manual.

The REV7 produces 18 early reflections for each channel. It is possible to add a 1st reflection to these early reflections, in the center of the stereo image.

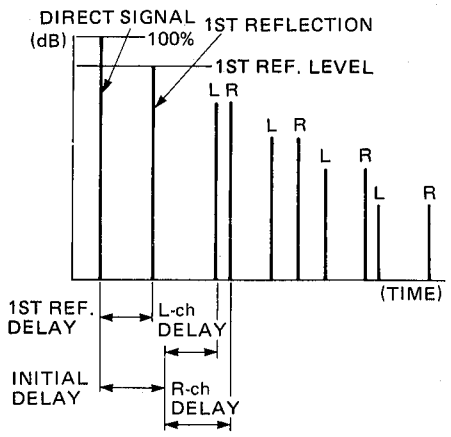
*For the REVERB type effects, 3 early reflections are programmed for each channel.

DELAY TYPE



1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   Allows you to program in an additional delay time which equally affects both output channels. This brings the total possible delay time up to 1 full second.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **LEFT CHANNEL DELAY TIME. Range: 0.1 ~ 900 msec. Key: F1.**
5. **RIGHT CHANNEL DELAY TIME. Range: 0.1 ~ 900 msec. Key: F2.**
   Permits highly accurate independent setting of the left and right delays. Note that the Initial Delay time is added onto these delay times.
6. **DELAY LEVEL. Range: 0 ~ 100% of direct signal level. Key: F3.**
   Permits simultaneous setting of left and right delay level, as a proportion of direct signal level.

ECHO TYPE

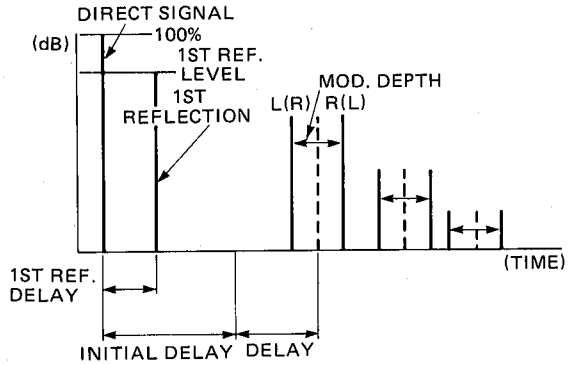


1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   Allows you to program in an additional delay time which equally affects both output channels. The first echo will not appear until this delay time and the echo delay time have elapsed.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **LEFT CHANNEL DELAY TIME. Range: 0.1 ~ 450 msec. Key: F1.**
5. **RIGHT CHANNEL DELAY TIME. Range: 0.1 ~ 450 msec. Key: F2.**
   Permits highly accurate independent setting of the left and right delays. After this delay time has elapsed (plus the Initial Delay time) the first echo will appear. Subsequent echoes will appear at the same time interval, the number of echoes depending on how the Feedback Gain parameter is set.
6. **FEEDBACK GAIN. Range: 0 ~ 99%. Key: REV TIME.**
   This parameter permits adjustment of the number of echoes that follow the direct signal, from zero to a virtually infinite repeat at the maximum setting. The overall decay time of the effect is proportional to the Feedback Gain setting.
7. **HIGH DAMP. Range: 0 ~ 10. Key: F3.**
   This effect is produced by inserting a low-pass filter in the REV7 feedback loop. This causes a gradual suppression of the high frequency content at each echo. Effectively, this means that the high frequency reverb time becomes shorter in relation to the midrange reverb time. A bright, unfiltered direct signal blended with a more muted echo can often create an authentic and pleasing acoustic effect.

MOD TYPE

"Modulation" effects. Presets 9 through 15. We'll explain the programmable parameters for each preset of this type.

• STEREO FLANGE

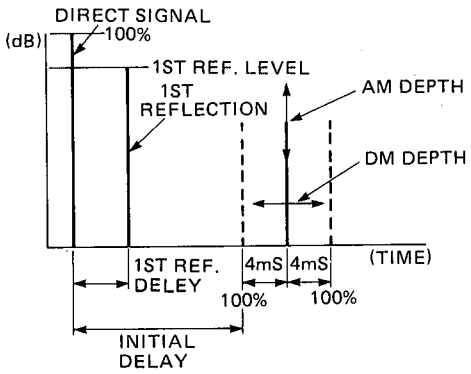


1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   Allows you to program in an additional delay time. The flanged signal will not appear until this delay time has elapsed.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **DELAY. Range: 0.1 ~ 100 msec. Key: F3.**
   This sets the basic delay time of the flange effect. This delay time is then modulated periodically by the LFO (a Low Frequency Oscillator, with adjustable frequency, built in to the REV7 specifically for varying delay times periodically in order to produce a variety of modulation effects). This also sets the delay time between each repeat.
5. **MODULATION DEPTH. Range: 0 ~ 100%. Key: F2.**
   This sets the amount by which the LFO varies the delay time. At the maximum setting, the delay time is varied by +/– 4 msec.
6. **MODULATION FREQUENCY. Range: 0.1 ~ 20 Hz. Key: F1.**
   Sets the speed of the LFO, and hence the rate at which the delay time is modulated.
7. **FEEDBACK GAIN. Range: 0 ~ 99%. Key: REV TIME.**
   Sets the amount of flange signal which is fed back into the circuit for further modulation. This controls the complexity of the effect, the number of repeats, and its overall decay time.

• REVERB FLANGE

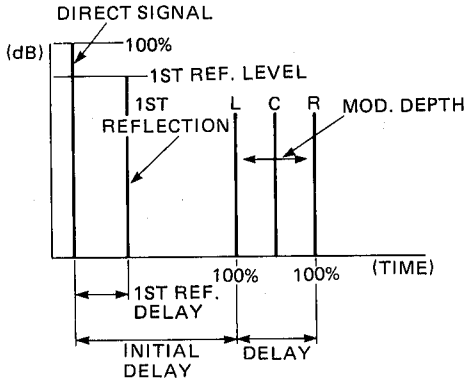
Identical to the STEREO FLANGE Preset, except for the FEEDBACK GAIN parameter, which is replaced by a REVERB TIME parameter, range 0.3 ~ 10 secs, called by pressing the REV TIME key. The feedback gain of this preset is fixed at 30%.

• CHORUS A AND CHORUS B



1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   Allows you to program in an additional delay time. The chorus signal will not appear until this delay time has elapsed.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **AMPLITUDE MODULATION DEPTH. Range: 0 ~ 100%. Key: F3.**
   This sets the amount by which the LFO varies the amplitude (level) of the input signal.
5. **DELAY MODULATION DEPTH. Range: 0 ~ 100%. Key: F2.**
   This sets the amount by which the LFO varies the delay time. At the maximum setting, the delay time is varied by +/– 4 msec.
6. **MODULATION FREQUENCY. Range: 0.1 ~ 20 Hz. Key: F1.**
   Sets the speed of the LFO, and hence the rate at which the delay time and amplitude are modulated.

• STEREO PHASING



1. **INITIAL DELAY. Range: 0.1 ~ 100 msec. Key: INITIAL DELAY.**
   Allows you to program in an additional delay time. The phased signal will not appear until this delay time has elapsed.
2. **1ST REFLECTION DELAY. Range: 0.1 ~ 100 msec. Key: 1ST REF.**
3. **1ST REFLECTION LEVEL. Range: 0 ~ 100% of direct signal level. Key: 1ST REF.**
   Same as for REV type presets.
4. **DELAY. Range: 0.1 ~ 8 msec. Key: F3.**
   This sets the basic delay time of the phasing effect. The delay time of the left and right channels remains fixed at this setting, while the center signal's delay time is modulated periodically by the LFO.
5. **MODULATION DEPTH. Range: 0 ~ 100%. Key: F2.**
   This sets the amount by which the LFO varies the delay time of the center signal. At the maximum setting, the delay time is varied by +/– 4 msec.
6. **MODULATION FREQUENCY. Range: 0.1 ~ 20 Hz. Key: F1.**
   Sets the speed of the LFO, and hence the rate at which the center signal's delay time is modulated.

• TREMOLO

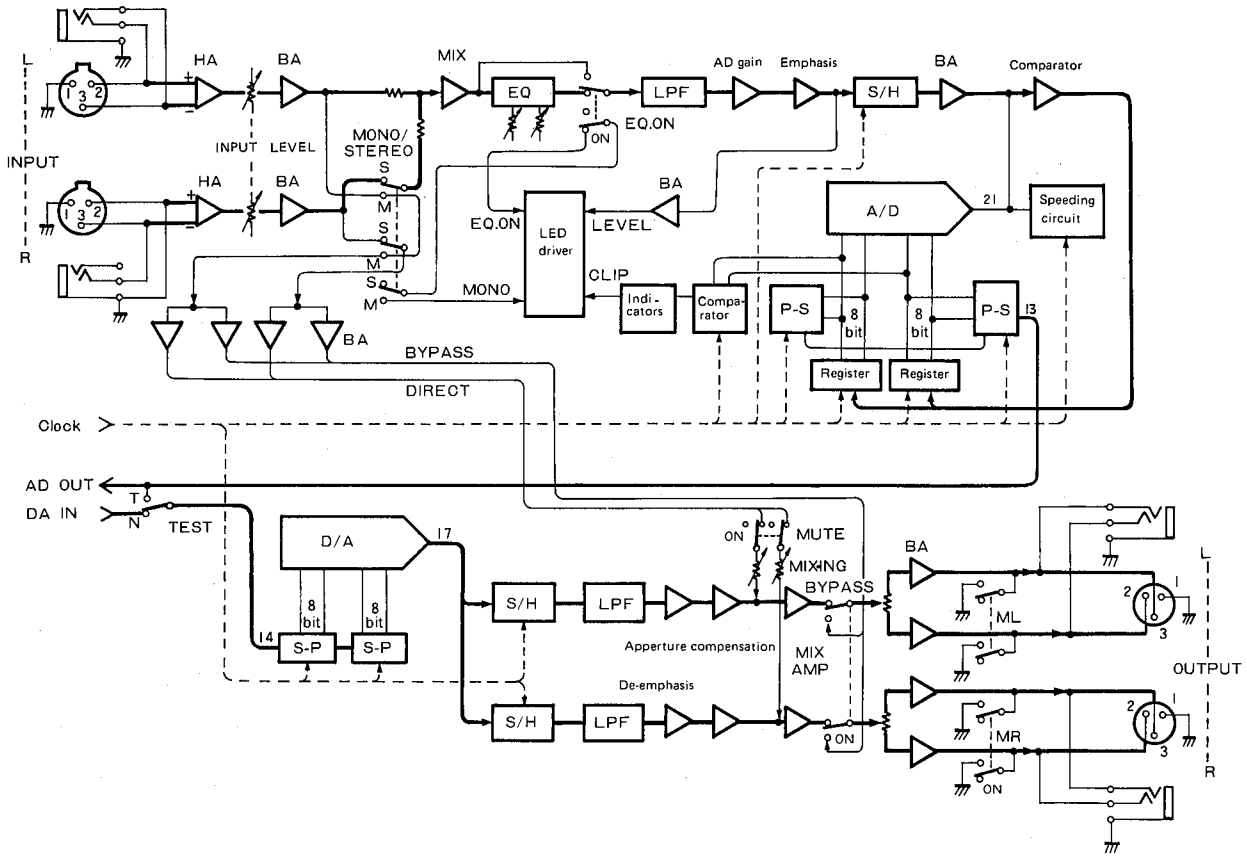
The programmable parameters for this preset are identical to those for the Stereo Flange preset, omitting FEEDBACK GAIN and DELAY.

• SYMPHONIC

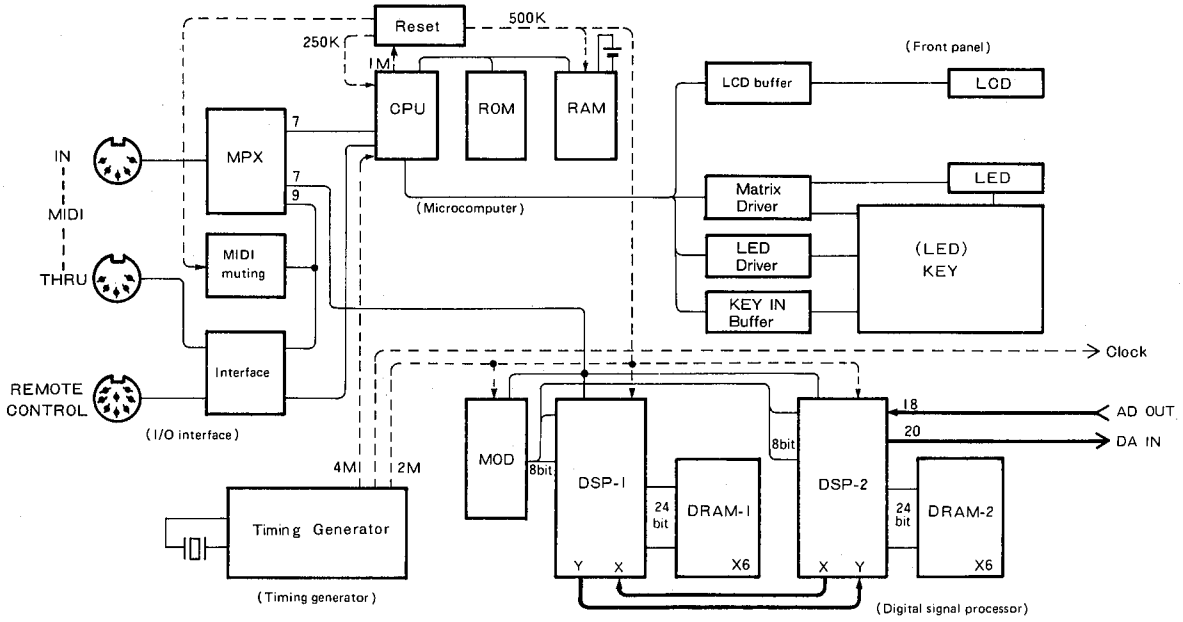
The programmable parameters for this preset are identical to those for the Stereo Flange preset, omitting FEEDBACK GAIN and DELAY.

■FUNCTIONAL BLOCK DIAGRAM AND SIGNAL FLOW

• ANALOG SECTION



• DIGITAL SECTION



■CIRCUIT DESCRIPTION

The REV7 provides a wide variety of high-quality reverberation effects by incorporating a new digital signal processor in its digital section, as well as the evolutional versions of the many proven circuits used in our REV1, YDD2600, D1500, and R1000 reverberators/delay lines. The REV7's hardware is roughly divided into the analog and digital sections, as illustrated in the signal flow chart. The following describes each block function:

1. Analog Section – No. 1 (INPUT to AD OUT)

1-1 INPUT

The INPUT block has two input jacks (L and R) using three-pin XLR connectors or 1/4" TRS jacks. In the Stereo mode it provides two input and two output channels. When the MONO mode is selected with the MONO/STEREO switch, it accepts only the left channel signal and feeds it to both output channels (one IN, two OUTs).

1-2 HA (HEAD AMPLIFIERS)

The head amplifiers are used to switch between balanced and unbalanced signal sources.

1-3 INPUT LEVEL CONTROL

This control adjusts the input signal level. It should be adjusted while monitoring the INPUT LEVEL meter. If all of the eight LEDs in the level meter continue to be on, input signal clipping will occur. Position "8" on the volume control scale causes a unity gain; position "10" causes a gain approximately 12 dB higher than the unity gain.

1-4 BUFFER/MIXING AMPLIFIER

The signal from the INPUT LEVEL control couples to this buffer, whose output branches to the following mixing amplifier.

1-5 EQ (EQUALIZER)

Setting the EQ ON/OFF switch to ON activates the equalizer circuit (EQ ON indicator comes on). If the switch is set to OFF, the signal bypasses the equalizer and couples to the following low pass filter (LPF).

The EQ is a three-band parametric equalizer, whose output is subject to the reverberation process.

1-6 LOW PASS FILTER (LPF)

The LC type LPF cuts off the high frequency components (12 kHz and above) contained in the reverberation signal to prevent generation of noise or distortion in the following sample hold circuit, A/D converter, or D/A converter.

1-7 EMPHASIS CIRCUIT

The output of the AD converter's gain dispersion adjusting network couples to the emphasis circuit, where the high frequency response above 1 kHz is emphasized so that the response at 10 kHz is 8 dB above the normal level.

This emphasis compensates for the degradation of the high frequency response occurring in the following sample hold circuit. It is also referred to as pre-emphasis.

1-8 SAMPLE HOLD (S/H) CIRCUIT

The inverting type S/H network is used to sample the analog signal for the following A/D converter, the sampling rate is 31.25 kHz.

1-9 A/D CONVERTER

The A/D converter consists of a current-output type D/A converter, successive comparison register, comparator, shift register, and some other components. It quantizes the sampled signal to convert the input analog signal into serial digital data.

When an ADST clock is input to the converter, the reverberation signal is compared with the reference level beginning with the MSB. If the signal level exceeds the reference level, the resulting data bit is set to one. The comparison sequence is repeated 16 times to complete a single data item.

When the LSB of the input is compared, the converter accepts the ADLD clock to output the resulting data to the shift register, where it is converted into serial data and coupled to the digital section via the AD OUT. The A/D converter repeats this conversion sequence at high speed (see Figure 3).

Two test switches are provided between the AD OUT and DA IN. Setting this switch to the TEST position allows checking only the analog section.

2. Analog Section – No. 2 (DA IN to OUTPUT)

2-1 D/A CONVERTER

The digitally coded signal output of the digital section returns to the DA IN terminal, through which it is coupled to the D/A converter circuit. The analog signal output of the D/A converter is still in the form of sampling voltage. The signal is serially time-shared into the L and R channel signals at the D/A output (see Figure 3).

2-2 SAMPLE HOLD (S/H) CIRCUIT

A buffer amplifier is provided in front of the S/H circuit to reduce the signal amplitude (max. ±10 V at the D/A output) into approx. ±2 V at the output of the S/H circuit. The S/H circuit serves to convert the sampling voltage into staircase voltage and eliminates gridges occurring at the rising and falling edges of the staircase signal (see Figure 1).

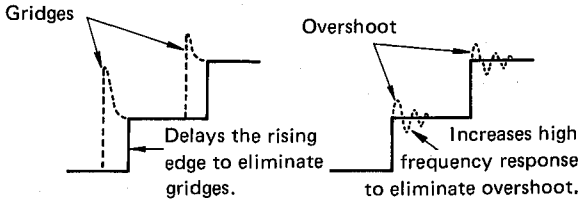
2-3 LOW PASS FILTER (LPF)

This LPF eliminates the high frequency components from the staircase signal to convert it into a smooth analog waveform.

2-4 DE-EMPHASIS CIRCUIT

The de-emphasis circuit reduces the high frequency response which was emphasized in the pre-emphasis circuit. The amplifier following the de-emphasis network provides apperture compensation which compensates for the high frequency response which was slightly deteriorated in the S/H circuit (see Figure 2).

Figure 1 Degridging **Figure 2 Apperture compensation**



2-5 MIXING AMPLIFIER

The "direct" and reverberation signals are applied to the mixing amplifier through a MIXING control, where they are mixed at a ratio of 1 : 1 at the output of the first buffer.
The BYPASS switch, when activated, feeds only the "direct" component of the signal to the output. The MUTE switch is used to totally mute off both "direct" and reverberation signals.

2-6 OUTPUT

The signal branches into two paths at the following buffer amplifier for unbalanced/balanced signal conversion and feeds to the stereo output connectors. A three-pin XLR connector and stereo phone jack are provided for the L and R channel outputs each.

2-7 LED DRIVER

To drive the LEDs for the INPUT LEVEL meter, the analog signal level is picked up at the pre-emphasis circuit. Only the signal clip is detected in the A/D converter section.

2-8 MUTING CIRCUIT

The muting circuit is automatically activated at the time of power on (for 3 sec.) and off (immediately) to suppress annoying "pop" noise.

3. Digital Section

The digital section is roughly divided into an I/O interface, timing generator, microcomputer, front panel, and digital signal processor.

3-1 I/O INTERFACE

- The I/O interface interfaces the MIDI IN/MIDI THRU, and Remote Control jacks to the microcomputer section. The filters provided near each jack prevent radio frequency interference.
- The MIDI muting circuit prevents the MIDI THRU signal from malfunctioning at the time of power on and off.
- The multiplexer comprises of IC143 and 144 switches between the MIDI, CPU, and DSP. Pins 3, 4, 5, 6 and 10, 11, 12, 13 of IC143 and 144 serve as inputs, while pins 7 and 9 of the same ICs serve as outputs.

3-2 TIMING GENERATOR

The timing generator consists of IC159, 164, 169, and 173. A time-base oscillation of 4 MHz is obtained by an oscillator using a ceramic resonator, whose output is frequency divided into 2 MHz, 1 MHz, and 31.25 kHz to provide the system clocks (see Figure 4).

3-3 MICROCOMPUTER

- The microcomputer section uses a CMOS microprocessor, HD6303R, for its CPU. It controls the system under microprogram control according to the MIDI signal or front panel switch status.
- The 16 KB EPROM contains preset programs Nos. 1 through 30, digital signal processing program, test program, and some other control programs.
- The 8 KB CMOS static RAM can store user programs Nos. 31 through 90. It is backed up by a Lithium battery.

3-4 FRONT PANEL SECTION

- The front panel section senses the MIDI signal and front panel switch status, encodes them into a digitally coded signal by using a matrix, and transfers it to the CPU.
- The LEDs are dynamically driven by periodic clock pulses.
- The LCD is controlled by the CPU to provide information display via buffers.

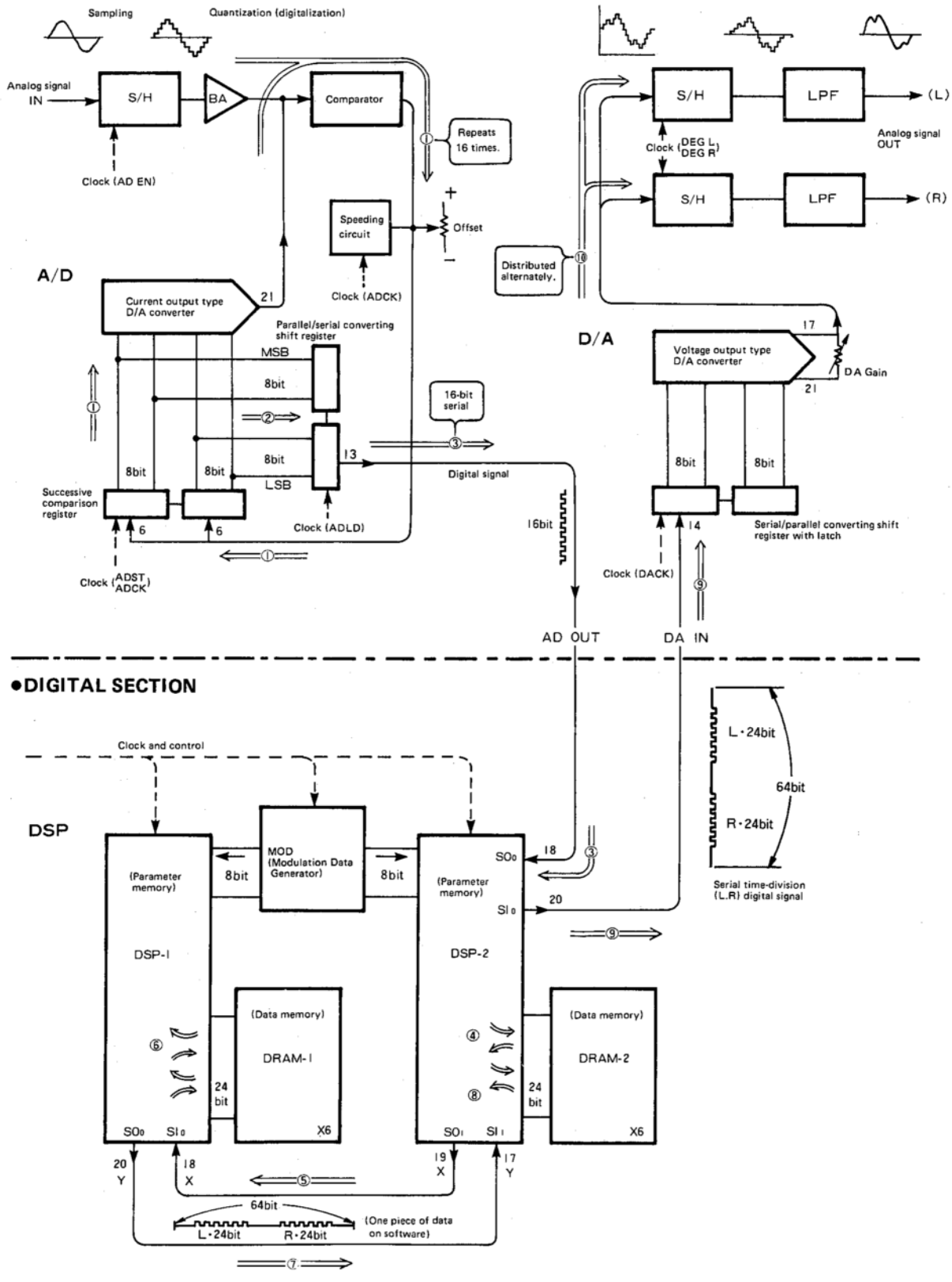
3-5 DIGITAL SIGNAL PROCESSOR

- The digital signal processor consists of a newly developed DSP (digital signal processor chip), modulation data generator (MOD), and 16K word x 4 bit DRAM. It provides various effects on the reverberation signal by modifying the digital reverberation signal. Six DRAM chips are used in parallel to allow access to 24 bits at a time. The DSP internally contains delay, APF, LPF and other circuits. It DSP signal is modulated from the MOD under the control of the CPU.
- The reverberation signal from the analog section is coupled from the AD OUT to pin 18 of the DSP-2, where it is modified by parameter data read from ROM or RAM. The resulting signal is output through pin 19 and coupled to pin 18 (X) of DSP-1, where it is further modified. The processed signal goes out through pin 20 (Y) and again couples to pin 17 (Y) of DSP-2, where it is again subject to processing.
  The resulting reverberation signal goes out through pin 20 in the form of time-shared (L and R channels) serial digital data and is transferred to the analog section (see Figure 3).

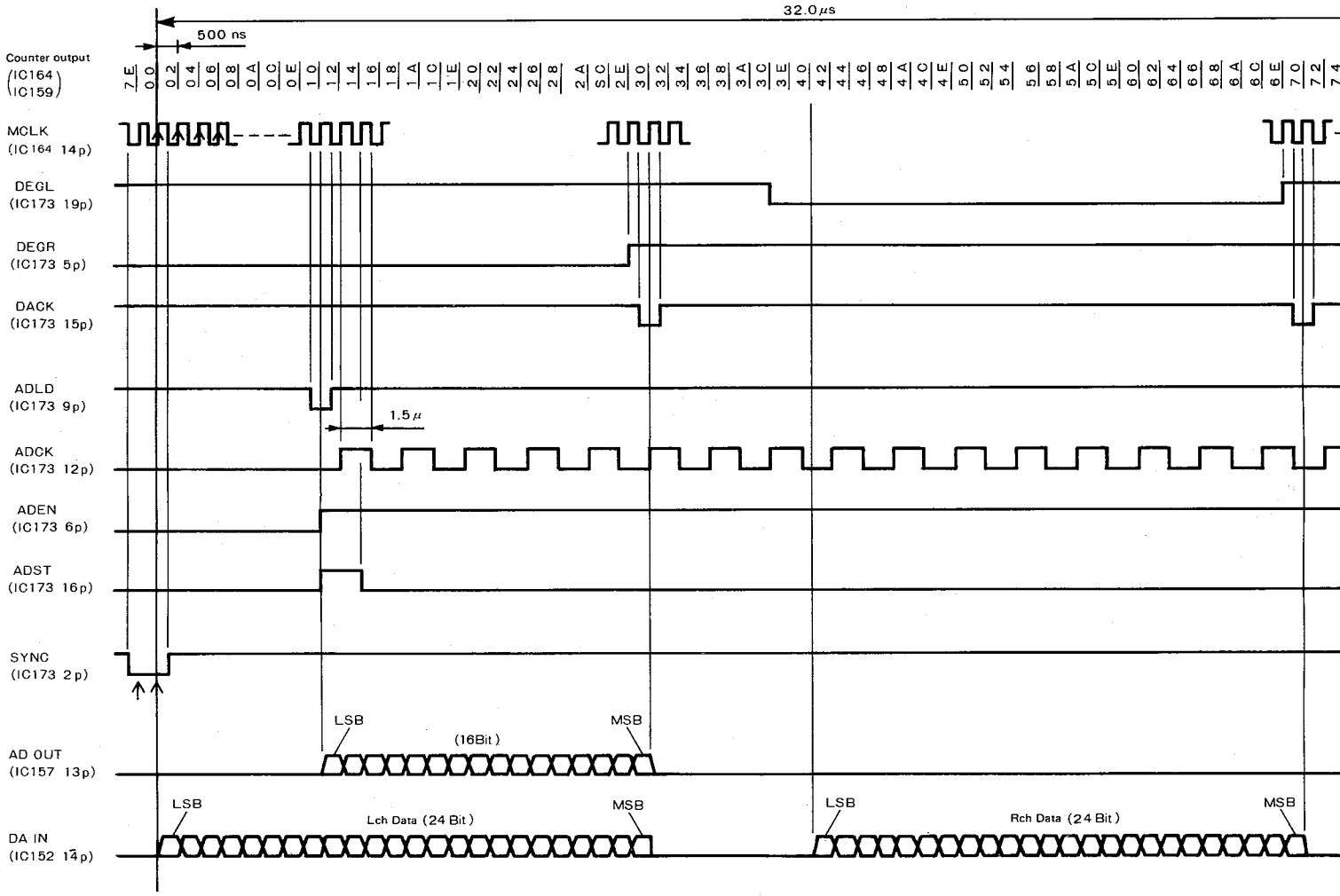
3-6 MIDI

- MIDI is an abbreviation of Musical Instrument Digital Interface. It specifies the standards for data interface between musical instruments and was enacted at the MIDI Standard Committee. The MIDI software uses an 8-bit digital code for interfacing up to 256 of information. The information pieces numbered 128 through 255 out of the 256 are called status. Information pieces numbered 0 through 127 output following the status information represent numeric data.
  numeric data.
  The MIDI hardware, connector pin assignments, coding, and transfer rate are all specified in the Standards.
- Since the REV7 simply receives signals from external devices and modifies them and does not generate signals by itself, it does not need the MIDI OUT connector, and only has a MIDI IN and MIDI THRU connectors. Five-pin DIN connectors are used for these connectors.
  The MIDI IN connector accepts MIDI signal from an external device, and the MIDI THRU connector feeds out the signal applied to the MIDI IN connector as it is.
  The MIDI data handled by the REV7 includes OMNI ON/OFF, transmit/receive channel specification data, program number update, and some others (see the table on page 27).

Figure 3 Interface between analog and digital sections



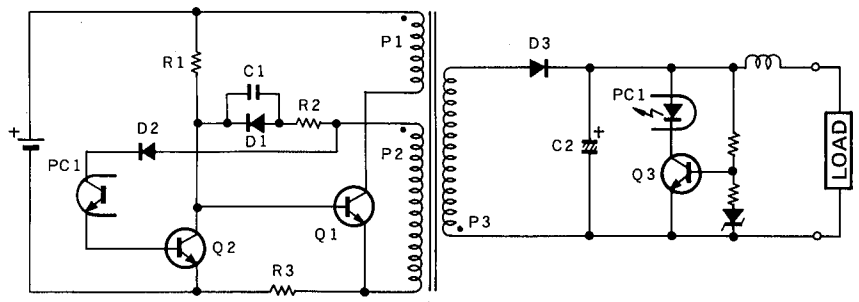
REV7


32.0μs
500 ns
Counter output
(IC164
IC159)
7E 00 02 04 06 08 0A 0C 0E 10 12 14 16 18 1A 1C 1E 20 22 24 26 28 2A 2C 2E 30 32 34 36 38 3A 3C 3E 40 42 44 46 48 4A 4C 4E 50 52 54 56 58 5A 5C 5E 60 62 64 66 68 6A 6C 6E 70 72 74
MCLK
(IC164 14p)
DEGL
(IC173 19p)
DEGR
(IC173 5p)
DACK
(IC173 15p)
ADLD
(IC173 9p)
1.5μ
ADCK
(IC173 12p)
ADEN
(IC173 6p)
ADST
(IC173 16p)
SYNC
(IC173 2p)
LSB
(16Bit)
MSB
AD OUT
(IC157 13p)
LSB
Lch Data (24 Bit)
MSB
LSB
Rch Data (24 Bit)
MSB
DA IN
(IC152 14p)

4. Power Supply Circuit

The power supply for the REV7 uses an RCC (ringing choke converter) type switching regulator. It is an improved version of the compact, high-efficiency regulated power supply used in our MSX computers. The switching frequency is set at 150 kHz after considering noise, stability, and efficiency.

Figure 5 Basic power supply circuit

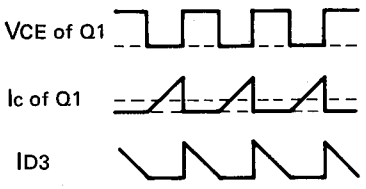


- Figure 5 shows the basic power supply circuit, wherein the primary coils (P1, P2) are wound to cause positive feedback. The oscillation output of transistor Q1 causes the secondary voltage to develop across the secondary coil.

- When the primary power is applied, a starting current flows into the base of the transistor (Q1) through a starting resistor (R1) to turn Q1 on. Since the primary coils (P1, P2) are wound to cause positive feedback, the starting current causes Q1 to start oscillation. The oscillation amplitude increases to the switching level. When the current increases to a certain level, the VCE of Q1 increases due to decreased Ib HFE. This causes the voltage across the transformer to begin decreasing. The resulting reduction of Ib turns Q1 off quickly.
  This causes the secondary winding (P3) of the transformer to be energized in the reverse direction. The generated energy is stored in a capacitor (C2) via an output rectifier diode (D3) and supplied to the load.
  When the current through D3 is reduced to zero, a flyback voltage occurs across P3 and then P2, turning Q1 on. This sequence is repeated to supply the secondary power (of which voltage is determined by the ratio of on to off intervals of Q1) to the load.

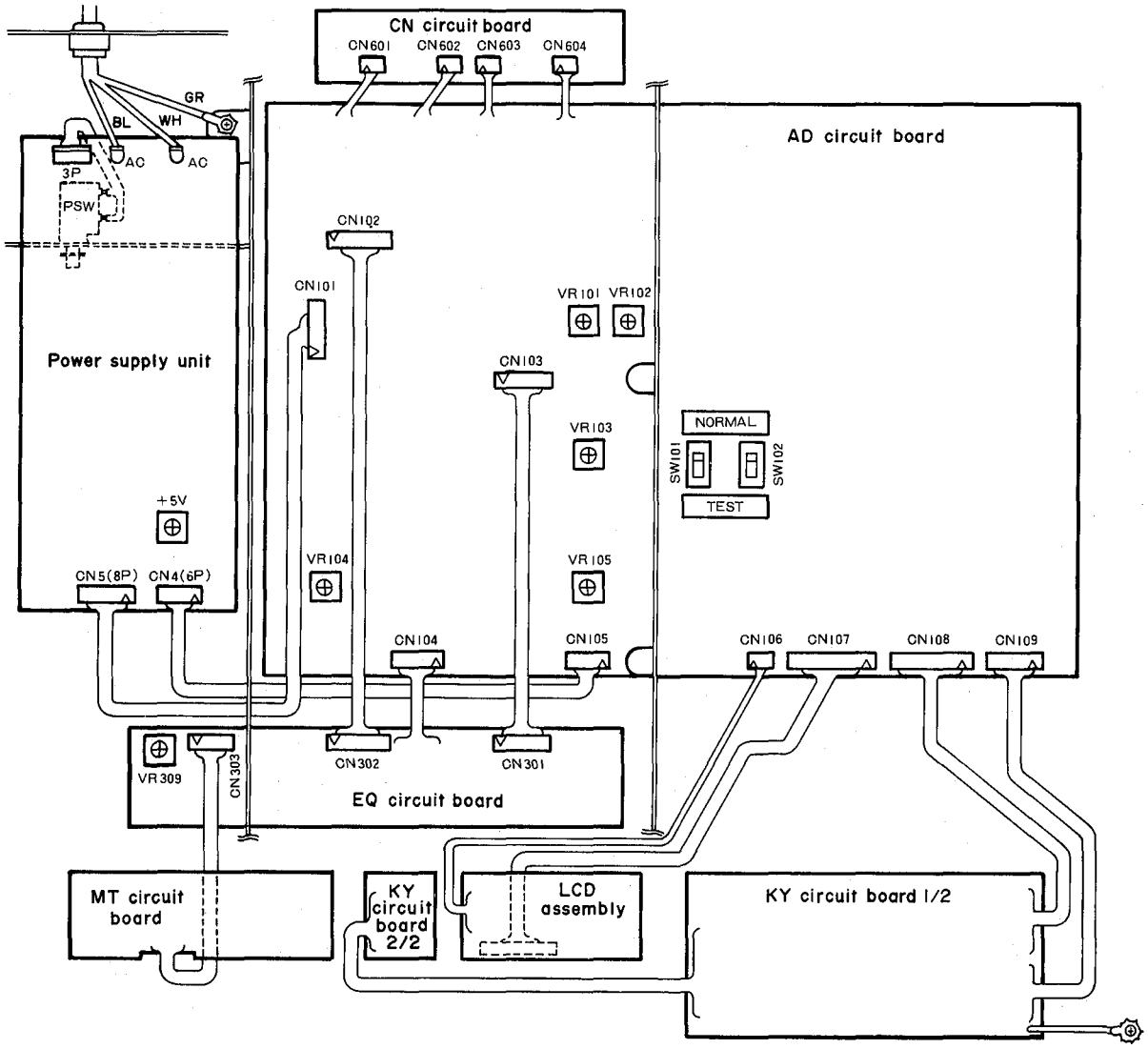
The photocoupler (PC1) and transistor (Q2) are used to stabilize the supply voltage. If the load is increased, the secondary voltage drops. This causes the resistance of the photocoupler to be increased, bringing down the base potential of Q2. This increases the base potential of Q1 and extends Q1's turn-on time period.
If the load is reduced, the circuit works just opposite to the above sequence to reduce Q1's turn-on time.
The secondary voltage sensing circuit comprised of PC1, Q3, and some other components is called comparator or error amplifier.

Figure 6 Voltage waveforms



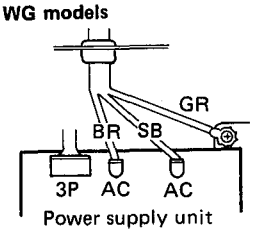
■UNIT LAYOUT

U.S. & Canadian models



Note 1.) This unit layout shows the U.S. and Canadian specifications.
Note 2.) For the departures of wirings between destinations, refer to the figures at left.
Note 3.) After completing inspection, make sure the SW101 and SW102 are set at NORMAL.

General & WG models



Adjustment Pots:

VR101 ..... L OUT balance adjustment
VR102 ..... R OUT balance adjustment
VR103 ..... D/A gain adjustment
VR104 ..... A/D gain adjustment
VR105 ..... A/D offset adjustment
VR309 ..... Meter sensitivity adjustment

■CHECKS AND ADJUSTMENTS

1. Preparation

1-1 PREPARATORY SETTINGS

- Unless otherwise specified, the front panel controls and switches should be set to the following positions:

INPUT LEVEL	Max.
LO FREQ.	Min.
LO LEVEL	Center
MID FREQ.	Min.
MID LEVEL	Center
HI FREQ.	Min.
HI LEVEL	Center
MIXING	Max. (Reverb)
MONO/STEREO SW	STEREO
EQ. ON/OFF SW	OFF

- The slide switches SW101 and SW102 on the AD board should be set at TEST position.
- For output loading, connect resistors (300 ohms + 300 ohms) in series to the XLR connector or PHONE jack on both channels. (Whether the XLR or PHONE jack is to be used will be specified in each check and adjustment item.)

1-2 TEST EQUIPMENT REQUIRED

- AF signal generator, voltmeter, distortion meter, oscilloscope, load resistors. (300 ohms + 300 ohms)
- For distortion measurement, use a low-pass filter with the cut-off frequency of 80 kHz and −6 dB/Oct slope.
- For noise level measurement, use a low-pass filter with the cut-off frequency of 12.7 kHz and −6 dB/Oct slope.
- The AF signal generator should have an output impedance of 600 ohms or less.
- The test equipment should have an input impedance of 1M ohms or higher.

2. Checks

2-1 GAIN CHECK

2-1-1 Overall gain (Reverberation signal)

When a −8 dB/1 kHz signal is applied to the INPUT (XLR) connector on each channel, an output level of +4dB ± 1.5dB should be obtained at the OUTPUT connectors (XLR).

2-1-2 Bypass circuit

With the measurement condition set up as described in section 2-1-1, set the BYPASS switch to ON, and verify that an output level of +4dB ± 2dB is obtained at the OUTPUT on each channel (set the BYPASS switch back to OFF after completing this check).

2-1-3 Mute circuit (Direct signal)

With the measurement condition set up as described in section 2-1, set the MIXING control to far left position (DIRECT side), and verify that an output level of +4dB ± 2dB is obtained at the OUTPUT on each channel. Also make sure that this signal output is removed from the OUTPUT when the MUTE switch is set to ON. (When completing these checks, set the MIXING control to far right position, and MUTE switch to OFF.)

2-1-4 MONO mode

With the measurement condition set up as describ- switch to MONO, and verify that an output level of +4dB ± 2dB is obtained at the OUTPUT on each channel. Also make sure that the MONO LED on the front panel comes on.

2-2 FREQUENCY RESPONSE

2-2-1 Reverberation signal

With an input signal of approx. −10 dB applied to the INPUT connector (PHONE jack) on each channel, verify that the frequency response at the OUTPUT connectors (PHONE jacks) meets the following specifications with respect to the reference level at 1 kHz:

20Hz ~ 11kHz	12kHz	20kHz
+1 ~ −2	+1 ~ −5	——

(dB)

2-2-2 Direct signal

With the measurement condition set up as described in section 2-2-1, set the MIXING control to far left position (DIRECT side), and verify that the frequency response at each OUTPUT jack meets the following specification with respect to the reference level at 1 kHz (after completing this check, set the MIXING control back to far right position:

20Hz ~ 20kHz
+1 ~ −3

(dB)

2-3 DISTORTION

2-3-1 Distortion at maximum output level

With the measurement condition set up as described in section 2-1-1, verify that the distortion at the outputs does not exceed 0.1%

2-3-2 Distortion at non-distortion output level

With a 1 kHz signal applied to the INPUT connector (XLR) on each channel, increase the signal level to just before distortion is observed in the output waveform at the OUTPUT connector (XLR) (use the monitor output of the distortion meter for this observation), and verify that the distortion at that point does not exceed 0.01%

Also make sure that the CLIP indicator (red) at the top of the level meter comes on just before the distorted waveform appears on the oscilloscope screen, and goes off when the level is reduced.

2-4 MAXIMUM OUTPUT LEVEL

With the measurement condition set up as described in section 2-1, apply a 1 kHz signal to the INPUT connector (XLR) on each channel, and verify that an output level of +18 dB is obtained at each OUTPUT connector with distortion not exceeding 1%.

2-5 EQUALIZER

Apply a pink noise to the INPUT (PHONE jack) connector on each channel (or may be either channel), and set the EQ. ON/OFF switch to ON to output the noise through the speaker. With the LO LEVEL control set to MAX, turn the LO FREQ. control from MIN to MAX, and make sure that the emphasized noise frequency band moves as the control is turned (see the Table on page 12). Do the similar check also for the MID and HI frequency bands.

(For the high frequency band, however, it is not possible to check the equalizer effect above 12 kHz as a low pass filter to cut off the frequencies above 12 kHz is provided.)

2-6 MUTING CIRCUIT

Verify that the output signal is muted off for a few seconds after the unit is turned on, and immediately after it is turned off, to suppress pop noise.

2-7 MUTE SWITCH (REV SIDE)

After completing the checkouts from 2-1 through 2-6, set SW101 and SW102 on the AD board to the NORMAL position. Apply a –8 dB/1 kHz signal to the INPUT connector (XLR) on each channel, select the "DELAY" (MEMORY No. 7) for preset, and verify that an output level of +4dB ± 1.5dB is obtained at the OUTPUT connector (XLR) on each channel. Then set the MUTE switch to ON, and make sure that the signal output is removed from the connectors. (After completing the check, set the MUTE switch back to OFF.)

3. Adjustments

3-1 METER SENSITIVITY ADJUSTMENT

With the measurement condition set up as described in section 1-1, set the switches SW101 and SW102 on the AD board to the TEST position. Apply a 1 kHz test signal to the INPUT connector (XLR) on each channel, and adjust the input level until an output level of +10 dB is obtained at the left channel output connector (XLR). Then adjust VR309 on the EQ board until LED "0" and all other LEDs below "0" come on. Make sure that all the LEDs on the level meter remain off when the input signal is removed.

3-2 BALANCE ADJUSTMENT

With the measurement condition set up as described in section 1-1, set the MONO/STEREO switch to MONO, and apply a +8.5 dB/1 kHz test signal to the INPUT connector (XLR) on the left channel. Connect an oscilloscope across the mid point of the load resistors (300 ohms + 300 ohms) at the left channel output (XLR) and the ground, and adjust VR101 until the output signal amplitude is minimized. Similarily, adjust VR102 until the output signal amplitude across the mid point of the load resistors at the right channel output (XLR) and ground is minimized.

3-3 A/D GAIN ADJUSTMENT

With TP122 shorted to TP124 (OUTPUT L) and TP125 shorted to TP127 (OUTPUT R), apply a +8.5 dB/1 kHz test signal to the left channel INPUT connector (XLR) under the measurement condition set up as described in section 3-2. Adjust VR104 until the output signal at TP123 is slightly distorted, then adjust VR105 until the distortion is symmetrical around the horizontal axis (use the monitor output of the distortion meter for waveform observation).

Then adjust VR104 to the point where distortion is just removed from the signal waveform at TP123.

3-4 D/A GAIN ADJUSTMENT

With the measurement condition set up as described in section 3-3, adjust the output signal level at TP123 to +18.5dB ± 0.2dB with VR103. (After completing this adjustment, set the MONO/STEREO switch to STEREO.

3-5 A/D OFFSET ADJUSTMENT AND NOISE LEVEL

With the measurement condition set up as described in section 1-1, set switches SW101 and SW102 on the AD board to the NORMAL position. Open the INPUT connectors (both XLR and PHONE jacks) on both channeis, and feed the output at the OUTPUT R connector (XLR) to the speaker.

While alternately setting the OUT PHASE switch on and off, adjust VR105 until click noise from the speaker is minimized. After this, verify that the noise level at the OUTPUT connector on each channel does not exceed –66 dB. If this specification is not met, adjust VR105 to smallest span possible until the noise level falls into the specified level. If VR105 is readjusted, repeat the click noise check using the OUT PHASE switch again, and verify that the click noise level is still close to the minimum level. The adjustment described in this section should be done approximately 5 minutes after the unit is turned on.

4. Power Supply Circuit Adjustment and Some Notes

- The +5 VDC line should be adjusted with a pot within the power unit. When adjusting, be sure to load the line and connect a voltmeter across pin 6 (+) and pin 1 (–) of the connector CN4.
- Precision measurement of in-circuit voltages is difficult with the voltmeter. Use an oscilloscope for this purpose. Be sure to float the G line of the oscilloscope so that it will not be shorted to the primary circuit of the power supply.
- Be sure to load the DC power outputs whenever testing them with the unit powered on. Otherwise, the abnormally increased switching frequency will damage the circuit in a few minutes.
- A high voltage develops in the primary circuit of the power supply. Execise the utmost care when servicing.

5. Other Precautions

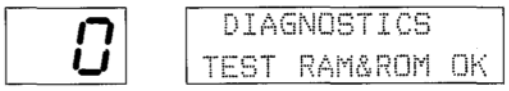
- Do not touch the 4-gang low-pass filter's slugs as they are factory adjusted. (see the LPF Characteristics on page 24).
- Compact, precision parts are used for controls and switches. When replacing one, be sure to use a soldering iron specifically designed for semiconductor devices.
- A 3 V Lithium battery is used in the reserve power for RAM back-up. The battery life is about 3 to 5 years. If the RAM operation exhibits unstable symptom, replace the battery with a new one (CR2032 or equivalent). When replacing the battery, the contents of the user memory evaporate. Be sure to record the necessary data in a written form, and re-enter them after battery replacement is completed.

■DIAGNOSTIC PROGRAMS

The REV7 contains test programs for functional checks. The following describes the details of these test programs. Check sum test on ROM, read-after-write test on S-RAM, and DSP and MOD control circuit check are automatically done on the main program when power is switched on.

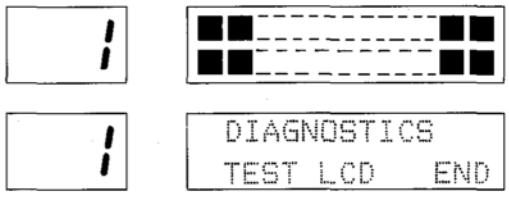
• STARTING TEST PROGRAMS

To start up test programs, switch on the unit while holding down the REV1 and MUTE keys. Release the keys when the information on the LCD changes (approx. 1 sec. later).



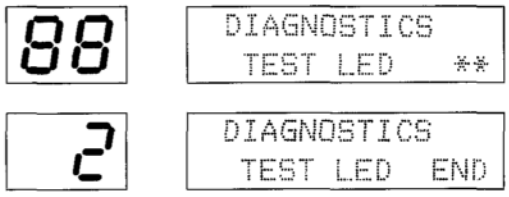
1 Test Program # 1 ..... LCD check

Press the MEMORY key (omissible if the MEMORY LED is already on; same for all the following tests), numeric key "1", then RECALL key. The screen will be filled with black squares, which flash five times before being replaced with an END message (approx. 5 sec.). Visually check that all square dots appear. This test can be repeated.



2 Test Program # 2 ..... LED display check

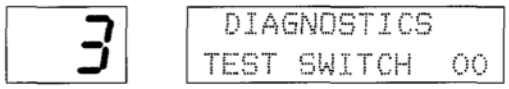
Press the MEMORY key, numeric key "2", and then RECALL key. Verify that the LED dispaly first changes from 0 through 99, then goes off, shows "88", and finally stops with data "2" (approx. 10 sec.). This test can be repeated.



3 Test Program # 3 ..... Switch check

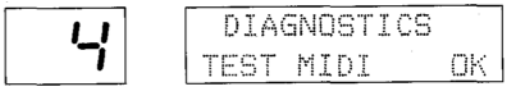
Press the MEMORY key, numeric key "3", then RECALL key. Press the REV1, REV2, through BYPASS keys in the order from top to bottom, and from left to right, and verify that the number appearing on the LCD changes from 01 through 35 and ends up with "OK".

* If a defective switch is found or the order of switch operation is incorrect, the message "NG" will appear. If "NG" appears, repeat Test # 3 again.



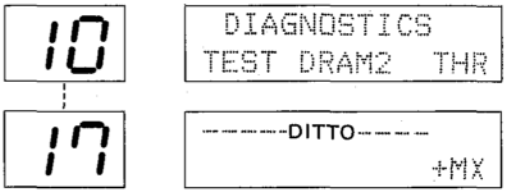
4 Test Program # 4 ..... MIDI input/output check

Short the MIDI IN jack to MIDI THRU jack with a cable. Press the MEMORY key, numeric key "4", then RECALL key. If MIDI I/O operation is faulty or MIDI connection is defective, the message "NG" will appear.



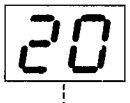
5 Test Programs # 10 ~ 17, 20 ~ 27 ..... DRAM check

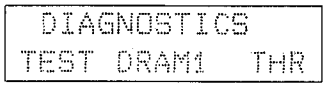
Press the MEMORY key, a numeric key, then RECALL key. The numeric key should be pressed in the sequence of 10 to 17, and 20 to 27 each time the execution of the corresponding program is completed. Connect the oscilloscope to the OUTPUT connectors of the unit and check the waveforms. Signal resolution is reduced for this test. Sequentially execute the tests and identify the defective DRAM chip from the test result.

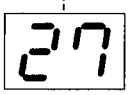


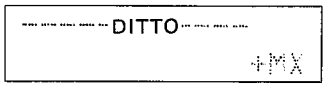
(16 corresponds to –MAX,
17 corresponds to +MAX.)

LED display	LCD display	Check data output (DRAM)				
		MSB			LSB	
10	THR	IC I36	I40	I32	I41	(with in DRAM)
11	O4B	I40	I32	I41	I37	
12	O8B	I32	I41	I37	I33	
13	12B	I41	I37	I33	0000	
14	16B	0000	0000	0000	0000	(all zero)
15	20B	0111	1111	1111	1111	(7FFFFF)
16	−MX	1000	0000	0000	0000	(800000)
17	+MX	Max. positive voltage output at D/A output				





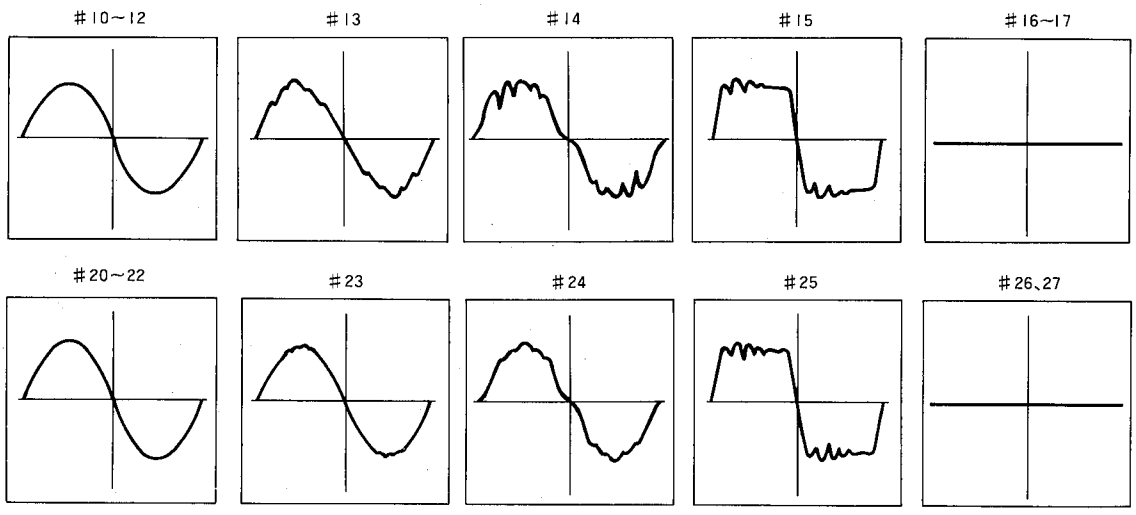




(26 corresponds to −MAX, 27 corresponds to +MAX.)

LED display	LCD display	Check data output (DRAM)				
		MSB			LSB	
20	THR	IC I34	I38	I30	I39	(with in DRAM)
21	O4B	I38	I30	I39	I35	
22	O8B	I30	I39	I35	I31	
23	12B	I39	I35	I31	0000	
24	16B	0000	0000	0000	0000	(all zero)
25	20B	0111	1111	1111	1111	(7FFFFF)
26	−MX	1000	0000	0000	0000	(800000)
27	+MX	Max. positive voltage output at D/A output.				

When Test Program # 5 is executed with a sine wave signal applied to the INPUT of the unit, the following signal waveforms are obtained at the OUTPUT. The signals # 10 and # 20 sound smooth, while the signals # 15 and # 25 sound rather sharp, when they are fed to the speaker.



• Returning from Test Program to Normal Operation Mode

Press the MEMORY key, numeric key "9", letter key "0", and finally RECALL key. The previous memory number will be recalled on the LED display (Memory No. 1 in the following example):

• Self Test when Power Switched On

When the REV7 is switched on, it automatically performs self test on the main program in the following sequence. If no error is detected, the unit proceeds with normal operations (self test takes approx. 2 sec.).

If an error is detected, the error number appears on the LED display. Test program stops at the error point, so the suspected circuit must be checked first.

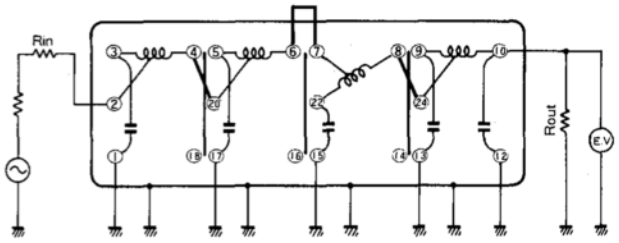
Error No.	Self Check Function
E 0	• CPU ROM check: Performs check sum test on the program ROM (EPROM).
E 1	• CPU's internal RAM check: Performs read-after-write check on CPU's internal RAM (locations 080H to 0FFH), using data FF and 00.
E 2	• CPU's external RAM check: Performs read-after write check on CPU's external RAM (S-RAM) locations 4000H to 4FFFH, using data FF, AA, and 00.

The display momentarily shows the ROM version number and date at the time of power on.

• Reference: LPF Characteristics

The following shows the internal connections and characteristics of the low-pass filter (VA024200) used in the REV7:

Pin Connections (Bottom View)



Electrical Characteristics

Input impedance		5.6k Ω
Output impedance		5.6k Ω
Cut-off frequency (−3dB)		12.2kHz
Attenuation	15.5kHz	Min. 50dB
	20~100kHz	Min.70dB
Insertion loss (at 1 kHz)		Max. 1.0dB
Distortion (at 1 kHz)		0.005%

Distortion measurement condition:
Distortion meter input voltage: 1 V
400 Hz HPF : ON
30 kHz LPF : ON
Reference level: E.V.M. reading of 0.775 V at 1 kHz is defined as 0 dB.

* The LPF should be handled with care as it uses very thin internal leads.

■IC PIN ASSIGNMENTS AND FUNCTIONS

YM3804 Digital Signal Processor (DSP)

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	MDAT 15	I/O	I/O pins connected to memory data bus	64	V S S	—	Ground (0 V)
2	MDAT 14	I/O		63	MDAT 16	I/O	I/O pins connected to memory's data bus
3	MDAT 13	I/O		62	MDAT 17	I/O	
4	MDAT 12	I/O		61	MDAT 18	I/O	
5	MDAT 11	I/O		60	MDAT 19	I/O	
6	MDAT 10	I/O		69	MDAT 20	I/O	
7	MDAT 9	I/O		68	MDAT 21	I/O	
8	MDAT 8	I/O		67	MDAT 22	I/O	
9	MDAT 7	I/O		66	MDAT 23	I/O	
10	MDAT 6	I/O		65	M O D 0	I	Inputs to accept modulation signal from MOD
11	MDAT 5	I/O		64	M O D 1	I	
12	MDAT 4	I/O		63	M O D 2	I	
13	MDAT 3	I/O		62	M O D 3	I	
14	MDAT 2	I/O		61	M O D 4	I	
15	MDAT 1	I/O		60	M O D 5	I	
16	MDAT 0	I/O		49	M O D 6	I	
17	S I 1	I	Serial data input	48	M O D 7	I	
18	S I 0	I		47	$\overline{\text{I C}}$	I	Initial Clear signal input
19	S O 1	O	Serial data output	46	$\overline{\text{C S}}$	I	Chip Select input
20	S O 0	O		45	C L K	I	Master Clock input
21	X M D	I	*Synchronous/asynchronous select signal* input for serial interfaces CDI and CDO	44	SYNCW	I	System sync. signal input
22	X C L K	I	Data send/receive clock input used when serial interface is placed in asynchronous mode	43	TEST 1	I	Chip test input (+5 V)
23	$\overline{\text{T O}}$	O	Time Out output	42	TEST R	I	
24	$\overline{\text{C R S}}$	I	CDI data counter reset input	41	MADR 0	O	Outputs connected to memory's *address bus*
25	C D O	O	Serial data output used for connecting serial interfaces in cascade	40	MADR 1	O	
26	C D I	I	Serial interface input	39	MADR 2	O	
27	T M 1	O	General-purpose timing signal output	38	MADR 3	O	
28	$\overline{\text{R E F}}$	O	Memory control signal output	37	MADR 4	O	
29	$\overline{\text{O E}}$	O		36	MADR 5	O	
30	$\overline{\text{W E}}$	O		35	MADR 6	O	
31	$\overline{\text{C A S}}$	O		34	MADR 7	O	
32	$\overline{\text{R A S}}$	O		33	V D D	—	Power supply input (+5 V)

YM3807 Modulation Data Generator (MOD)

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	NC	I	Initial Clear signal input (presently not used)	24	VSS	—	GND
2	TEST 0	I	Chip test inputs	23	MDSO 1	O	Serial waveform data outputs
3	TEST 1	I		22	MDSO 0	O	
4	MD 7	O	8-bit parallel multiplexed outputs for waveform data	21	MDSI 1	I	Data inputs to MOD's internal adder
5	MD 6	O		20	MDSI 0	I	
6	MD 5	O		19	CDI	I	Serial interface input
7	MD 4	O		18	CDO	O	Serial data output used to connect serial interfaces in cascade
8	MD 3	O		17	XCLK	I	Data send/receive clock input for asynchronous mode
9	MD 2	O		16	XMD	I	Synchronous (L)/asynchronous (H) select input for serial interfaces CDI and CDO
10	MD 1	O		15	$\overline{CRS}$	I	Reset input to reset the serial input CDI data counter
11	MD 0	O		14	SYNCW	I	System sync. signal input
12	VDD	—	+5 V	13	CLK	I	Master clock input

MB81416-12 Dynamic RAM (DRAM)

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	$\overline{OE}$	I	Control signal input	18	Vss	I/O	GND
2	IO 1	I/O	Data bus I/O	17	IO 4	—	Data bus I/O
3	IO 2	I/O		16	$\overline{CAS}$	I/O	Control signal input
4	$\overline{WE}$	I	Control signal inputs	15	IO 3	I	Data bus I/O
5	$\overline{RAS}$	I		14	A 0		
6	A 6	I		13	A 1	I	Address bus inputs
7	A 5	I	Address bus inputs	12	A 2	I	
8	A 4	I		11	A 3	I	
9	Vcc	—	+5 V	10	A 7	I	

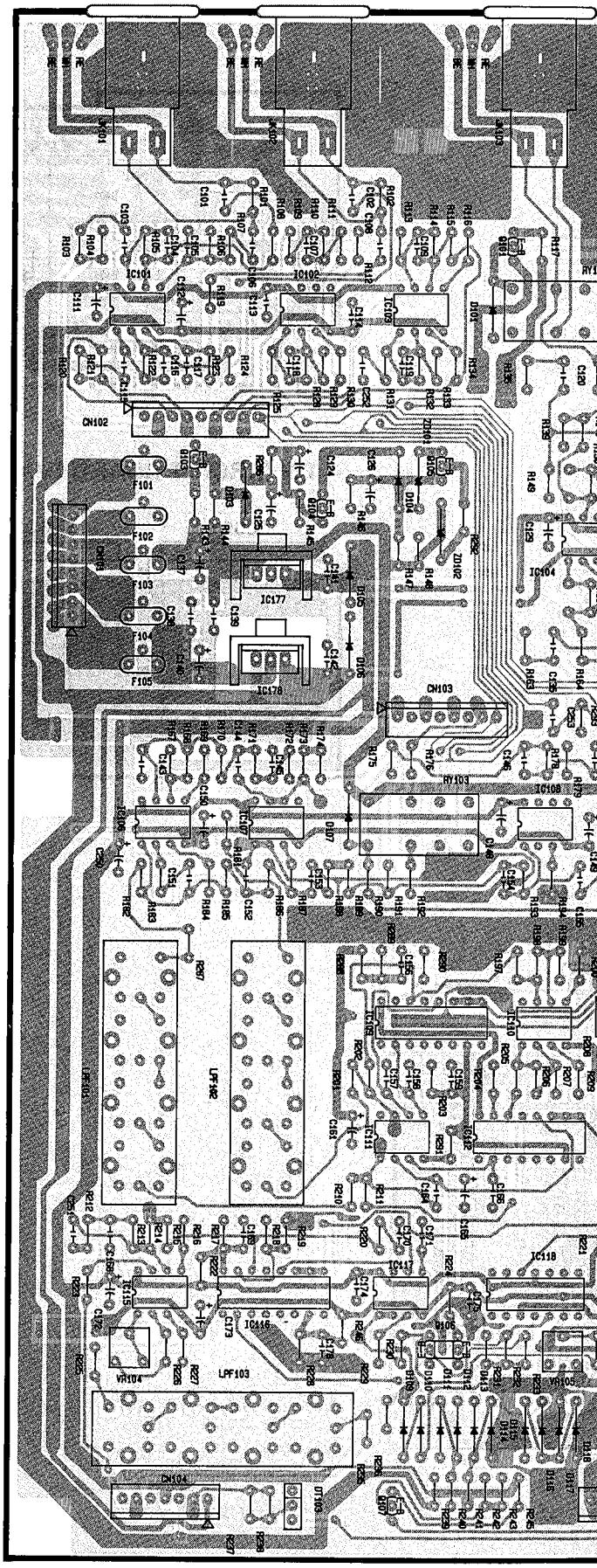
[Digital Reverberator] Date : 4/23, 1985
Model REV7 MIDI Implementation Chart Version : 1.0

Function ...		Recognized	Remarks
Basic	Default	1 - 16	memorized
Channel	Changed	1 - 16	
Mode	Default	OMNI OFF/OMNI ON	memorized
	Messages	x	
	Altered	x	
Note Number		x	
	True voice	x	
Velocity	Note ON	x	
	Note OFF	x	
After Touch	Key's	x	
	Ch's	x	
Pitch Bender		x	
Control Change		x	
Prog Change		o 0 - 127 *1	
	True #		
System Exclusive		x	
System Common	Song Pos	x	
	Song Sel	x	
	Tune	x	
System Real Time	Clock	x	
	Commands	x	
Aux Mes- sages	Local ON/OFF	x	
	All Notes OFF	x	
	Active Sense	x	
	Reset	x	
Notes		*1 For program 1 - 128, memory #1 - #90 is selected.	

Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO o : Yes
Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO x : No

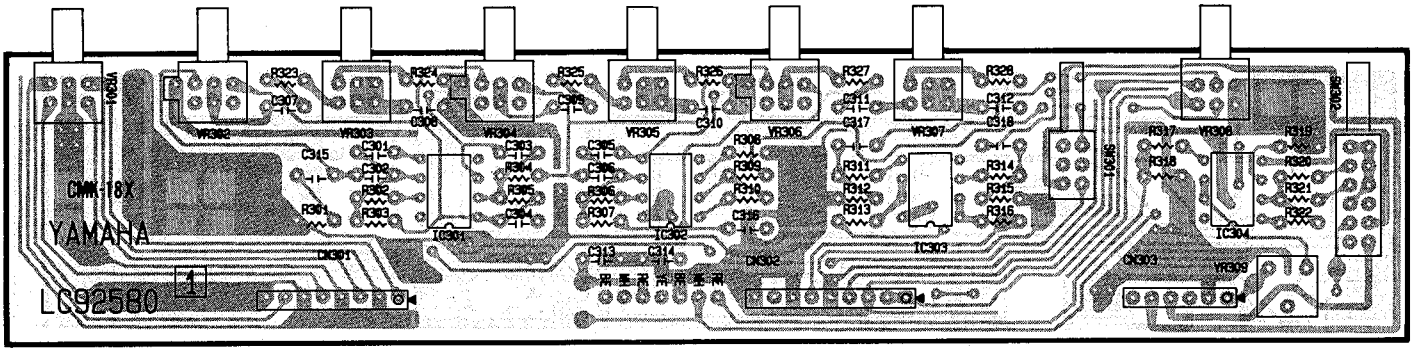
■CIRCUIT BOARDS

- AD CIRCUIT BOARD (VA038500)

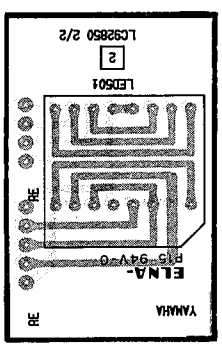


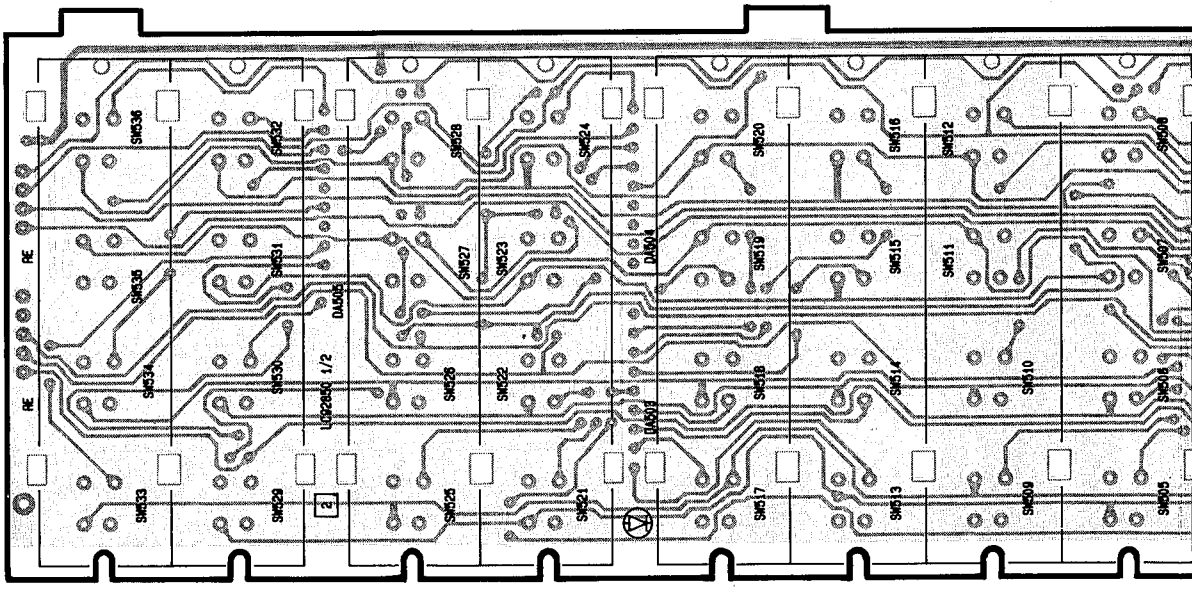
REV7

- EQ CIRCUIT BOARD (VA038600)

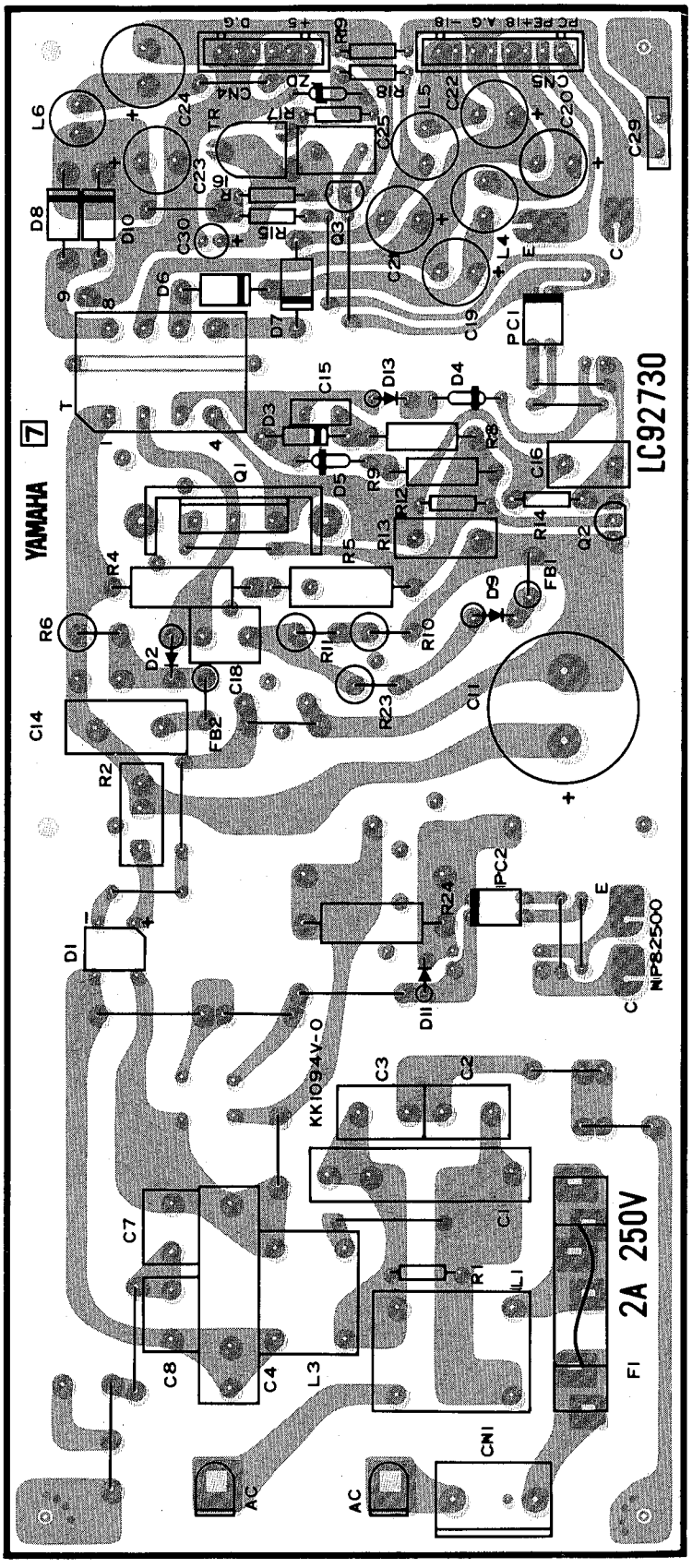


- KY CIRCUIT BOARD (VA038700)





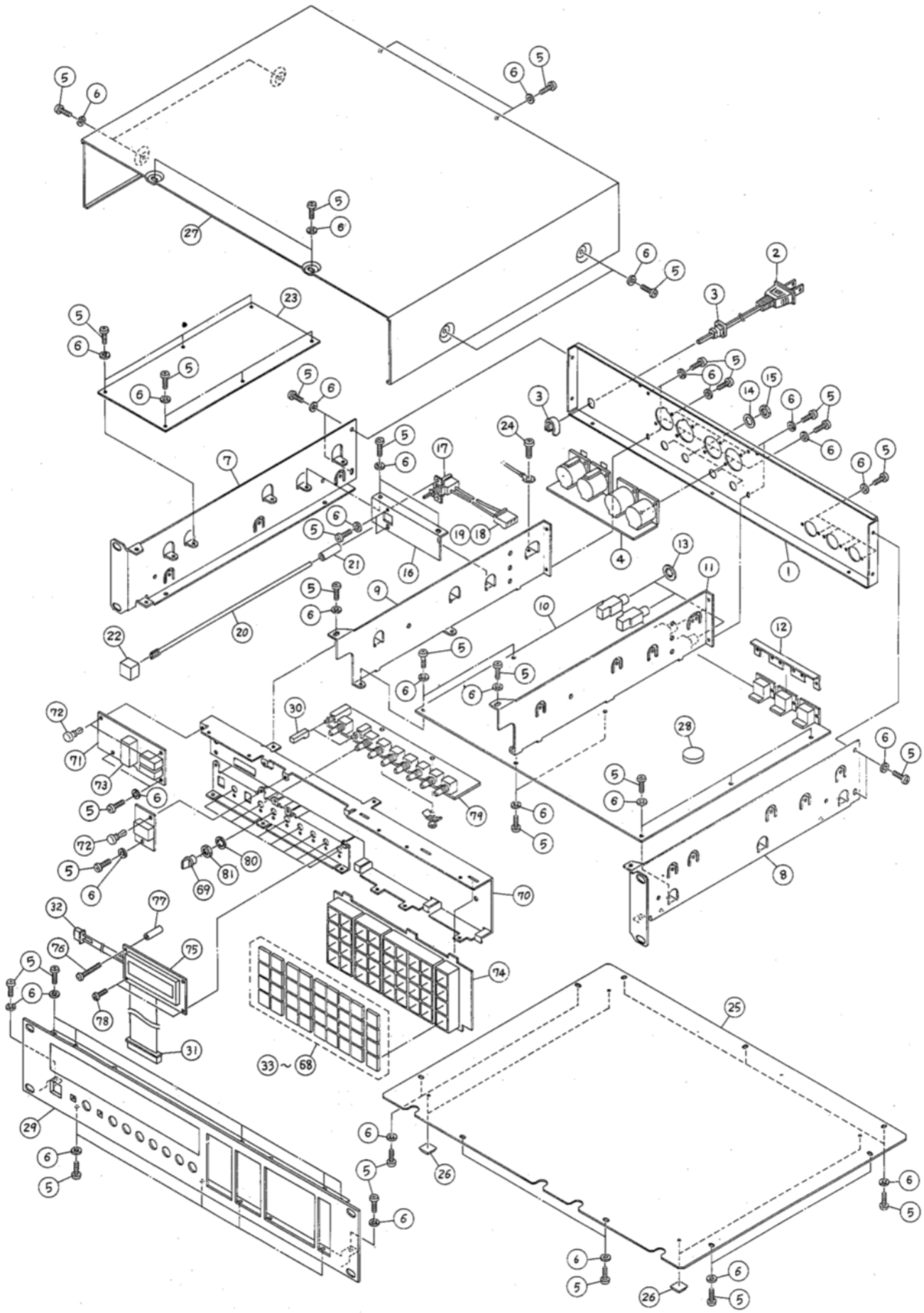
- POWER SUPPLY CIRCUIT BOARD (U.S.: NP825000 / Canadian: NP826000 / General & WG: NP824000)



REV7

PARTS LIST

■OVERALL ASSEMBLY



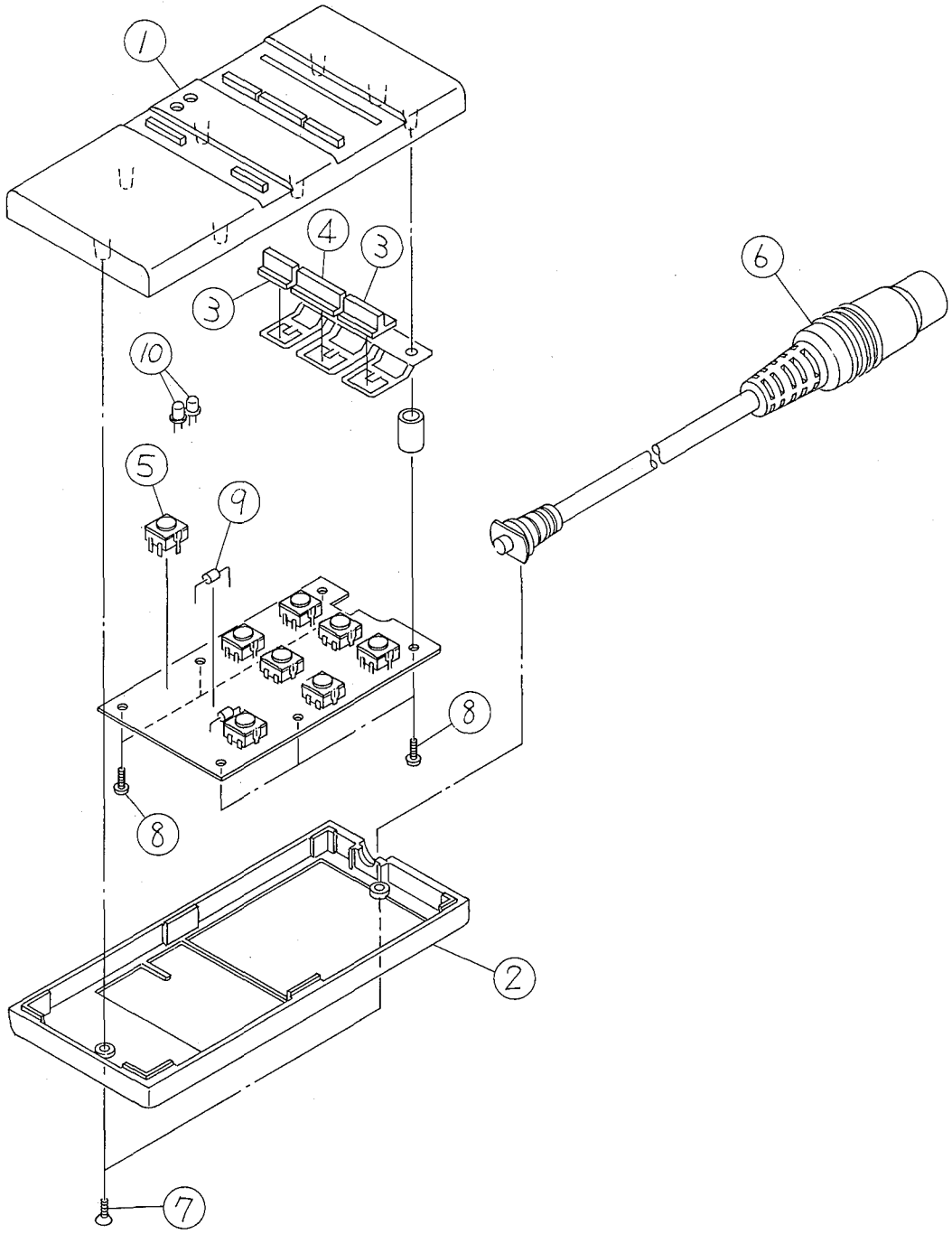
	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※	1	VA 02 73 00	Rear Panel		リアパネル			J	
※	〃	VA 02 74 00	〃		〃			U,C	
※	〃	VA 02 75 00	〃		〃			G,WG	
	2	MG 00 18 20	Power Cord	7A 3.0m	電源コード			J	
	〃	MG 00 02 70	〃	10A 3.3m	〃			U,C	
	〃	MG 00 04 50	〃	6A 3.5m	〃			G,WG	
	3	CB 80 68 50	Cord Stopper	SR-6N3-4	コードストッパー			U,C	
	〃	CB 03 28 40	〃	SR-5N-4	〃			G,WG	
※	4	VA 03 89 00	CN Circuit Board	#92770	CNシート	Refer to Page 39			
	5	ED 33 00 86	Bind Head Screw	3×8 Bl	バインド小ネジ				
	6	EV 41 30 39	Toothed Lock Washer	A3 Bl	歯付座金				
※	7	VA 02 84 00	Side Cover	Left	サイドカバー				
※	8	VA 02 85 00	〃	Right	〃				
※	9	VA 02 76 00	Stay(A)		ステー(A)				
※	10	VA 03 85 00	AD Circuit Board	#92570	ADシート	Refer to Page 37			
※	11	VA 02 77 00	Stay(B)		ステー(B)				
※	12	VA 04 71 00	Holder,DIN Socket		DINソケットホルダー				
	13	EV 41 00 96	Toothed Lock Washer	A9S Ye	歯付座金				
	14	LX 20 00 10	Plain Washer	9S Cr	特殊平座金				
	15	LX 20 00 60	Hexagonal Nut	9S Ni	特殊六角ナット				
※	16	VA 04 70 00	Angle Bracket		P.SW アングル				
	17	KA 80 36 10	Power Switch		電源スイッチ				
	18	LB 00 80 30	Housing	3P	スポックスハウジング	5196-03			
	19	LB 10 10 00	Terminal		スポックスターミナル	5194T			
※	20	VA 04 69 00	Rod		ロッド				
※	21	VA 02 97 00	Rod Holder		ロッドホルダー				
	22	CB 81 23 80	Push Button		プッシュボタン				
※	23	NP 82 30 00	Power Supply Unit		電源ユニット	Refer to Page 39		J	
※	〃	NP 82 50 00	〃		〃			U	
※	〃	NP 82 60 00	〃		〃			C	
※	〃	NP 82 40 00	〃		〃			G,WG	
	24	ED 34 00 66	Bind Head Screw	4×6 Bl	バインド小ネジ				
※	25	VA 02 80 00	Bottom Cover		ボトムカバー				
	26	CB 83 43 50	Foot		脚				
※	27	VA 02 86 00	Top Cover		トップカバー				
	28	PC 90 00 40	Lithium Battery,3V	CR2032T	リチウム電池				
※	29	NX 80 16 40	Front Panel Assembly		フロントパネル Ass'y				
※	30	VA 02 94 00	Knob		プッシュスイッチノブ	MONO/STEREO,EQ			
※	31	VA 02 38 00	Wire Harness		線材 Ass'y				
※	32	VA 03 53 00	〃	L=300 2P	〃				
※	33	VA 00 07 00	Key Top		キートップ	REV1 -31-			
※	34	VA 04 32 00	〃		〃	REV2 -32-			
※	35	VA 04 33 00	〃		〃	REV3 -33-			
※	36	VA 04 34 00	〃		〃	REV4 -34-			
※	37	VA 04 35 00	〃		〃	E/R1 -35-			
※	38	VA 04 36 00	〃		〃	E/R2 -36-			
※	39	VA 04 37 00	〃		〃	OTHERS -37-			
※	40	VA 04 38 00	〃		〃	USER MEMORY			
※	41	VA 04 39 00	〃		〃	REV TIME			
※	42	VA 04 40 00	〃		〃	INITIAL DELAY			
※	43	VA 04 41 00	〃		〃	1ST REF			
※	44	VA 00 09 00	〃		〃	—			
※	45	VA 04 42 00	〃		〃	F1			

※New Parts（新規部品）

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※	46	VA 04 43 00	Key Top		キートップ	F2			
※	47	VA 04 44 00	〃		〃	F3			
※	48	VA 04 47 00	〃		〃	+			
※	49	VA 00 08 00	〃		〃	7			
※	50	VA 04 46 00	〃		〃	4			
※	51	VA 04 48 00	〃		〃	1			
※	52	VA 04 49 00	〃		〃	0			
※	53	VA 04 50 00	〃		〃	8			
※	54	VA 04 51 00	〃		〃	5			
※	55	VA 04 52 00	〃		〃	2			
※	56	VA 04 53 00	〃		〃	■			
※	57	VA 04 54 00	〃		〃	9			
※	58	VA 04 55 00	〃		〃	6			
※	59	VA 04 56 00	〃		〃	3			
※	60	VA 04 57 00	〃		〃	CLEAR			
※	61	VA 04 58 00	〃		〃	MEMORY			
※	62	VA 04 59 00	〃		〃	STORE			
※	63	VA 04 60 00	〃		〃	RECALL			
※	64	VA 04 61 00	〃		〃	ENTER			
※	65	VA 04 62 00	〃		〃	MUTE			
※	66	VA 04 63 00	〃		〃	OUT PHASE			
※	67	VA 04 64 00	〃		〃	MIDI CTRL			
※	68	VA 04 66 00	〃		〃	BYPASS			
※	69	VA 02 93 00	Knob		ツマミ				
※	70	VA 02 83 00	Front Sub Panel		フロントサブパネル				
※	71	VA 03 88 00	MT Circuit Board	#92590	MTシート	Refer to Page 39			
	72	CB 06 88 80	Plastic Rivet		プラスチックリベット				
※	73	VA 06 17 00	LED Cover		LEDカバー				
※	74	VA 03 87 00	KY Circuit Board	#92850	KYシート	Refer to Page 38			
※	75	VA 02 63 00	LCD Module		LCDモジュール				
	76	EA 02 62 56	Pan Head Screw	2.6×25 Ye	ナベ小ネジ				
※	77	VA 02 98 00	Spacer		スペーサー				
	78	EA 32 60 56	Pan Head Screw	2.6×5 Bl	ナベ小ネジ				
※	79	VA 03 86 00	EQ Circuit Board	#92580	EQシート	Refer to Page 38			
	80	EV 41 00 76	Toothed Lock Washer	A7S Ye	歯付座金				
	81	EZ 30 70 10	Hexagonal Nut	7S Bl	特殊六角ナット				

※New Parts（新規部品）

■REMOTE CONTROL UNIT



	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		VA 06 43 00	Remote Control Unit		リモートコントローラー				
※	1	XX 80 71 20	Upper Case		上ケース				
※	2	XX 80 71 30	Bottom Case		下ケース				
※	3	XX 80 71 40	Key Top A	S	キートップA				
※	4	XX 80 71 50	Key Top B	L	キートップB	REV2 E/R1 -32-, -35-			
※	5	XX 80 71 60	MT Switch		MTスイッチ				
※	6	XX 80 71 10	8P Plug Cord		8Pプラグコード				
	7	EM 32 61 06	Oval Head Tapping Screw	2.6×10 Bl	丸皿タッピングネジ				
	8	Ei 02 00 60	Bind Head Tapping Screw	2×6 Ye	バインドタッピングネジ				
	9	iF 00 00 40	Diode	1S1555	ダイオード				
	10	iF 00 79 50	LED	TLR226	LED				

■CIRCUIT BOARDS AND ELECTRICAL PARTS

	Ref. No.	Part No.	Description	部品名		Remarks	Common Model	Markets	ランク
※		***VA 03 85 00***	***AD Circuit Board***	***#92570***	A D シート				
		Fi 36 32 20	Electro Magnetic Interference	0.0022μF	エミフィル				
		Fi 36 42 20	〃	0.022μF 50V	〃				
		GE 90 13 40	〃	BNX002-01	〃				
		HZ 00 47 40	Module Resistor	4.7kΩ×8	モジュール抵抗	RMLS8-472K			
		HZ 00 46 60	〃	10kΩ×8	〃	RMLS8-103J			
		iA 10 15 21	Transistor	2SA1015 (Y)	トランジスタ				
		iC 18 15 20	〃	2SC1815 (Y)	〃				
		iZ 00 02 00	Dual Transistor	2SC1815 (O,Y)	デュアルトランジスタ				
※		VA 02 46 00	Digital Transistor	DTC143×F	デジタルトランジスタ	DTC143XF			
		iF 00 00 40	Diode	1S1555	ダイオード				
		iH 00 07 20	〃	W03B	〃				
		iF 00 21 40	Zener Diode	RD5.6EB2	ツェナーダイオード				
		iG 09 35 00	IC	HD6303RP	I C	8 bit CPU			
		iG 05 20 00	〃	μPD4503BC	〃	Hex 3-stage Buffer			
		iG 10 45 00	〃	HD14549BP	〃	Register			
		iG 10 46 00	〃	HD14559BP	〃	Register			
※		XA 01 30 01	〃	M5238P	〃	Operational Amp.			
		iG 04 25 00	〃	NJM4556D	〃	Operational Amp.			
		iG 00 13 90	〃	NJM4558DV	〃	Dual Operational Amp.			
		iG 04 00 00	〃	NJM4560ED	〃	〃			
		iG 14 74 00	〃	NJM7815A	〃	15V 1A Regulator			
		iG 14 75 00	〃	NJM7915A	〃	15V 1A Regulator			
		iR 00 04 00	〃	TC74HC04P	〃	Hex Inverter			
		iR 00 14 00	〃	TC74HC14	〃	Hex Schmitt Inverter			
		iR 00 74 00	〃	TC74HC74	〃	Dual D F-Flop			
※		iR 01 23 00	〃	TC74HC123	〃	Multivibrator			
		iR 01 38 00	〃	TC74HC138	〃	3-8 Line Decoder			
		iR 01 39 00	〃	TC74HC139	〃	Dual 2-4 Line Decoder			
		iR 01 53 00	〃	TC74HC153	〃	Dual 4-ch Multiplexer			
		iR 01 63 00	〃	TC74HC163	〃	Sync.BIN.Counter			
		iR 01 66 00	〃	TC74HC166	〃	8 bit Shift Register			
		iR 02 45 00	〃	TC74HC245	〃	8 bus Tranceiver			
		iR 02 73 00	〃	TC74HC273	〃	Octal D F-Flop			
		iR 03 73 00	〃	TC74HC373	〃	Octal D Latch			
※		iR 05 95 00	〃	TC74HC595	〃	8 bit Shift Register			
※		iR 06 88 50	〃	SN74HC688N	〃	8 bit Equality Comparator			
		iG 05 51 00	〃	TC4053BP	〃	Multiplexer/Demultiplexer			
		iG 14 85 00	〃	TC5565PL-12,15	〃	64K S-RAM			
		iG 12 73 00	〃	TD62003P	〃	Darlington Driver			
		iG 13 87 00	〃	TD62506P	〃	Common Collector			
※		XA 01 40 01	〃	PCM53JP-I	〃	A/D Converter			
		iG 11 91 00	〃	PCM53JP-V	〃	D/A Converter			
※		iG 14 42 00	〃	BA612	〃	Transistor Array			
※		XA 06 90 01	〃	TBP28L22N	〃	256K BP-ROM			
		iG 12 23 20	〃	MBM4416P-12	〃	64K D-RAM			
※		XA 04 30 01	〃	XA043A0	〃	EP ROM V1.0			
		iG 13 80 00	〃	NEL-D32-46	〃	Inverter			
		iG 12 43 00	〃	PST518A	〃	Reset			
		iG 08 67 00	〃	μPC319C	〃	Comparater			
※		iT 38 04 00	〃	YM3804	〃	DSP			
※		iT 38 07 00	〃	YM3807	〃	MOD			
		iK 00 04 70	Photo Conductor	TLP-552	フォトカプラー				

※New Parts（新規部品）

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		VA 02 42 00	Low Pass Filter	PFB-4	ローパスフィルター				
※		VA 02 47 00	Trimmer Potentiometer	B1kΩ	ソリッドボリューム				
※		VA 02 49 00	〃	B20kΩ	〃				
		KA 40 12 70	Slide Switch	SSS-212	スライドスイッチ				
		KC 00 19 00	Relay	RY-12W	リレー				
		PC 90 00 40	Lithium Battery,3V	CR2032T	リチウム電池				
		QU 00 48 00	Ceramic Oscillator	4MHz	セラロック				
		LB 30 20 70	Phone Jack	Stereo	ホーンジャック	INPUT,OUTPUT			
		LB 50 05 90	DIN Socket	5P	DINソケット	MIDI IN,THRU			
		LB 60 58 20	〃	8P	〃	REMOTE CONTROL			
※		VA 02 45 00	IC Socket	64P	ICソケット				
		LB 60 39 00	〃	24P	〃				
		LB 60 60 50	〃	28P	〃				
		LB 91 80 30	Connector Base Pin	3P	コネクタベースピン	XH			
		LB 91 80 60	〃	6P	〃	〃			
		LB 91 80 70	〃	7P	〃	〃			
		LB 91 80 80	〃	8P	〃	〃			
		LB 91 81 20	〃	12P	〃	〃			
		LB 91 81 40	〃	14P	〃	〃			
		CB 10 15 80	Connector Housing	7P	コネクタハウジング				
		BB 00 58 20	Contact Pin		コンタクトピン				
※		VA 04 68 00	Suport Pin		サポートピン				
		ED 33 00 66	Bind Head Screw	3×6	バインド小ネジ				
		EV 10 20 36	Hexagonal Nut	M3	六角ナット				
※		***VA 03 86 00***	***EQ Circuit Board***	***＃92580***	EQシート				
		iG 00 13 90	IC	NJM4558DV	IC	Dual Operational Amp.			
※		VA 02 50 00	Rotary Potentiometer	B10kΩ×2	ロータリーボリューム	MIXING			
※		VA 02 52 00	〃	A10kΩ×2	〃	INPUT LEVEL			
※		VA 02 53 00	〃	C100kΩ×2	〃	EQ FRED			
※		VA 02 54 00	〃	W20kΩ	〃	EQ LEVEL			
※		VA 02 48 00	Trimmer Potentiometer	B10kΩ	ソリッドボリューム				
※		VA 02 55 00	Push Switch		プッシュスイッチ	EQ ON/OFF			
※		VA 02 56 00	〃		〃	MONO/STEREO			
		LB 91 80 60	Connector Base Pin	6P	コネクタベースピン	XH			
		LB 91 80 80	〃	8P	〃	〃			
		LB 91 80 90	〃	9P	〃	〃			
		CB 10 15 80	Connector Housing	7P	コネクタハウジング	〃			
		BB 00 58 20	Contact Pin		コンタクトピン				
※		***VA 03 87 00***	***KY Circuit Board***	***＃92850***	KYシート				
		iF 00 76 40	Diode Array	DAN401	ダイオードアレイ				
※		VA 02 67 00	〃	DAN801	〃				
※		VA 26 23 00	LED	LN242RP	LED				
※		VA 02 60 00	LED Display	7 Segment	LEDディスプレイ	LN524RKS			
※		VA 30 27 00	LED Cover		LEDカバー				
		KA 90 65 30	Tact Switch	EVQ-Q8R13K	タクトスイッチ				
※		VA 00 10 00	Switch Escutcheon		スイッチエスカッション				
		CB 10 15 90	Connector Housing	8P	コネクタハウジング	XH			
		CB 10 16 30	〃	12P	〃	〃			
		BB 00 58 20	Contact Pin		コンタクトピン				
		LA 00 36 90	Ground Lug	4φ	歯付アースラグ				

※New Parts（新規部品）

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		***VA 03 88 00***	***MT Circuit Board***	***#92590***	MTシート				
※		VA 02 61 00	LED	LT9230D	LED	MONO,EQ ON			
※		VA 03 91 00	LED Display	SX-25-J,8 Seg.	LEDディスプレイ	INPUT LEVEL METER			
		iG 13 66 00	IC	IR2E19	IC	LED Driver			
※		VA 02 90 00	LED Spacer		LEDスペーサー				
		CB 10 15 70	Connector Housing	6P	コネクタハウジング	XH			
		BB 00 58 20	Contact Pin		コンタクトピン				
※		***VA 03 89 00***	***CN Circuit Board***	***#92770***	CNシート				
		LB 30 23 20	Connector	XLB-3-31-PCV	キャノンソケット	INPUT			
		LB 30 23 40	〃	XLB-3-32-PCV	〃	OUTPUT			
※		***NP 82 30 00***	***Power Supply Unit***		電源ユニット			J	
※		***NP 82 50 00***	〃		〃			U	
※		***NP 82 60 00***	〃		〃			C	
※		***NP 82 40 00***	〃		〃			G,WG	
	L1	GX 80 01 00	Choke Coil	20MH	チョークコイル	NFR05E203A			
※	L2	GX 80 01 90	〃	8MH	〃	PLA8021A			
	L4,5	XX 80 42 30	〃	150μH	〃	FL9H151K-30			
※	L6	GX 80 01 80	〃	20μH	〃	FL7H200K-35			
	VR1	HT 57 05 40	Trimmer Potentiometer	B1kΩ	ソリッドボリューム	RVF08P			
	Q1	iC 25 55 00	Transistor	2SC2555	トランジスタ			J,U,C	
	〃	iC 27 92 00	〃	2SC2792	〃			G,WG	
※	Q2	iX 80 13 70	〃	2SD1207	〃				
	Q3	iC 26 34 00	〃	2SC2634(R,S,T)	〃				
※	D1	iX 80 13 80	Diode	DF04M	ダイオード			J,U,C	
※	〃	iX 80 13 90	〃	DF06M	〃			G,WG	
	D2	iH 00 17 40	〃	ERB4406	〃				
	D3	iX 55 16 00	〃	ERB4302	〃				
	D4,5	iF 00 13 80	〃	1SS84	〃				
	D6,7	iX 55 15 90	〃	15DF2	〃				
※	D8	iX 80 14 00	〃	S2K20H	〃				
	D9	iH 00 17 40	〃	ERB4406	〃				
※	D10	iX 80 14 00	〃	S2K20H	〃				
	D11	iF 00 00 40	〃	1S1555	〃			J,U,C	
※	D12	iX 80 13 90	〃	DF06M	〃			G,WG	
	ZD1	iF 00 14 70	Zener Diode	RD6.2EB2	ツェナーダイオード				
	PC1,2	iK 00 04 80	Photocoupler	PC-817	フォトカプラー			J,U,C	
	〃	iK 00 04 90	〃	PC-511	〃			G,WG	
※	FB1,2	BX 80 00 40	Ferrite Bead		フェライトビーズ	BP53BH3510090BAA			
	F1	KB 00 03 40	Fuse	1.5A 250V	ヒューズ			J	
	〃	KB 00 03 50	〃	2.0A 250V	〃			U,C	
	〃	KB 00 06 80	〃	1.25A 250V	〃			G,WG	
※	T1	GX 80 01 60	Power Transformer	TYA010	電源トランス			J,U,C	
※	〃	GX 80 01 70	〃	TYA011	〃			G,WG	
		LB 20 15 30	Fuse Clip		ヒューズホルダーピン				
		EA 23 01 06	Pan Head Screw	3×10	ナベ小ネジ				
		EV 12 03 00	Hexagonal Nut	M3	六角ナット				
	CN1	VA 03 03 00	Connector Base Pin	3P	コネクタベースピン	XH			
	CN4	VA 03 06 00	〃	6P	〃	〃			
	CN5	VA 03 08 00	〃	8P	〃	〃			

※New Parts（新規部品）