## SPECIFICATIONS

- **Power**: 9VDC (battery or AC adaptor)
- **Current Draw**: 2mA (no signal) to 12mA (max.) 9V
- **Headphone Impedance**: 80 to 100kΩ
- **P-BUS Impedance**: 10kΩ (IN/OUT)
- **ACC TRIG OUT Signal**: ±6V, 10μs-width
- **Dimensions**: 190(W) x 110(D) x 30(H) mm (including batteries)
- **Weight**: 450g / 1 lb. (including batteries)

## DISASSEMBLY

### Exposing PCBs
1. Remove 4 rotary knobs.
2. Remove 3 x 12mm P type screws on Bottom case.
3. Open Top case, first at the rear end, gently push rearwards (unlock), then open at the front end. Insert a cloth between panels to protect the rear surface of top panel from scratching. This allows troubleshooting for both PCBs while maintaining the unit operative from built-in drycells.

### Dismounting VOICING Board
1. Remove Battery compartment cover and remove the dry cells.
2. Unlatching Battery clips, raise Bottom case.

### LCD ASSEMBLY

Avoid unnecessary service to LCD Ass'y. When reassembling, make sure that the face (not rear) of Rear Polarizer touches LCD.

The correct layer makes display dark when the LCD and polarizer are placed crosswise.
CPU IC4

HD44790A44 is a 2K word by 4 bit one-chip CMOS microcomputer equipped with internal LCD drivers.

CPU HD44790A44 PIN FUNCTIONS

- **Input Port:** Main in Keypad switches and TEMPO CLOCK.
- **External Memory Data Bus (Input):** Rhythm patterns A/B, Song A/111.
- **External Memory Address Bus (Input):** Rhythm patterns.
- **R0 – R3:** Used as OUTPUT Port.
- **R0:** OUTPUT Port.
- **R1:** OUTPUT Port.
- **R2:** OUTPUT Port.
- **R3:** OUTPUT Port.
- **Q0:** OUTPUT Port.
- **Q1:** OUTPUT Port.
- **Q2:** OUTPUT Port.
- **Q3:** OUTPUT Port.
- **Q4:** OUTPUT Port.
- **Q5:** OUTPUT Port.
- **Q6:** OUTPUT Port.
- **Q7:** OUTPUT Port.
- **D0:** OUTPUT Port.
- **D1:** OUTPUT Port.
- **D2:** OUTPUT Port.
- **D3:** OUTPUT Port.
- **DSA–D8A:** Used as OUTPUT Port.

MEMORY BACKUP

IC2 µPD444C is a 1K-word by 4 bits static RAM. It is used in DR-110 for storing BANKs A/B, SONGs 1/11 and STEPs 12/16 data. (BANKs C/D containing factory-set rhythms are stored into CPU's internal ROM.) The RAM memory is backed up by built-in battery which bypasses power switch and connects to RAM's VCC, WE, and CS pins.

Switching Matrix (See Fig. below)

1. The CPU enters external interrupt routine on rising edge of INT CLK from IC2b, which also serves as part of CY Sound Generator, and reads in TEMPO CLK and key switches through ports D0–D3 and through R0–R3.

2. In reading the above, the CPU first turns on ports D0–D3 "H", cutting off D5A–D8A, D5B–D8B and D1B–D4B, disconnecting the diodes from IC3 NAND gates and the ports R0–R3. With an H being applied on one input pin, each gate of IC3 will turn its output to "L" when the other input pin is H (closing of STOP, START, or BANK or during H period of TEMPO CLK). Ports R0–R3 are pulled up internally and go low when their input IC3 outputs turn to L.

3. Next, the CPU IC1 sets port D0 to "L" which pulls one input of IC3 down to low, turning all IC3 outputs to "H", reverse biasing D1A–D4A which in turn isolate IC3 from the read-in ports. Each of ports R0–R3 can be connected to port D0 through closed contacts of CH, OH, SD or BD) and through D8B. Then the program returns to the main routine.

4. On the next rising edge of INT CLK, the program enters interrupt routine again and gates IC3.

5. Having read IC3 outputs, this time the program sets D1 to L and reads SHIFT, OP, CY, and AC switches through D0 ports.

The CPU repeats the same procedures for the remaining D ports and returns to 1, cycling TEMPO CLK, STOP, START and BANK readings at 2.2ms intervals.

During the power OFF, RET pin of IC1 CPU is kept L, maintaining all its input and output pins high impedance, isolating its circuits from peripheral circuits and thus retains all the data so far obtained. When the CPU is powered, it initializes internal circuits but still keeps some data intact.
The LCD operates dynamically in 1/4 duty cycles and 1/3 bias. Each segment readout when its COM terminal receives 2.25V(V31) and SEG terminal 5.4V (VCC). This voltage difference will provide the sharp edged, most visible readout. When the DC supply drops, Q17 increases resistance, further decreasing potential difference between COM and SEG terminals, which causes the readout to appear duller. This effectively functions as a battery indicator.

TRIG OUT

Ports D8–D15 of the CPU are normally at +6V and go to 0V for 1ms when triggering designated voice.

ACC TRIG — AC TRIG pulse passing O9 is lengthened and inverted to become positive 10ms-wide pulse and is routed to ACC TRIG OUT jack.

ACCENT — The AC TRIG pulse passing through Q18 conducts Q20 and Q21 until its fall time determined by the time constant, connecting ACCENT VR3 in parallel with audio signal path.

HAND CLAP — For Hand Clap two trigger pulses of different timing are provided to simulate reverbation effect.

NOISE GENERATOR

IC3 and IC4 are configured to function as a quasi-random impulse generator, a generation of a succession of random signals which are distributed over a wide frequency spectrum. On power-up, Power-ON Reset circuit turns pin 1 of IC3 N as a data "1". Because the shift register will not operate when its all D pins are at 0.

NOTE: Intermittent DC supply such as loose AC adaptor or battery connection or quick turning OFF-ON of the power switch may upset Power-ON Reset when a transient of DC voltage is shorter than the time constant of RESET circuit. The resultant will be loss of noise sound.

TEST PROGRAM

The CPU is equipped with TEST program for checking LCD and Switch Reading functions. To enter the test program, press and hold START and STOP buttons and turn the power switch ON.

LCD CHECK — All readouts will be displayed in slightly dull black because LCD drivers are being overloaded.

Check for lack of segment against the illustration and table in LCD section of the Circuit Description.

SWITCH READING — Press all key switches one by one in any order. Letters "OK" will appear upon pressing the last key, indicating all the keys pressed have been read by the CPU.

CY SOUND GENERATOR

Four generators oscillate at different frequencies which are determined based on analysis of live symbolic sounds. Interrelations between frequencies are so critical that slight deviation of one frequency can cause loss or distortion. To let the generators stay in a specific frequency, C1, C4, C12 and C13 should be less than 5% tolerances.

VOICE GENERATORS

The voice generators are categorized into two groups: Damping oscillator for drum sound and a combination of Swing type VCA and Envelope generator for metallic sounds. 
CHANGE INFORMATION (VOICING BOARD)
* Q11: from 2SC2603F to 2SC945K, 2SC1815BL or 2SC2603G
* R77: from 120 to 180ohms.
Reason – Shortening SD decay time.
* IC5: from TL082CP to NJM4558B0
Reason – TL082CP would cause the filter to oscillate
* D13: from 1S9133 to S5600G (higher forward current type)
Reason – Plugging a high voltage/current AC adaptor of reverse polarity
may destroy 1S9133.
* Q13: from LM3886N+1 to M51501L (incompatible) with PCB relaid out.
Reason – IC procurement problem.

SN 371100-up
**PARTS LIST**

<table>
<thead>
<tr>
<th>CASE</th>
<th>PCB</th>
<th>KNOB</th>
<th>LCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2201062900 Top Case</td>
<td>7313203000 CPU Board (pcb 2291084200)</td>
<td>2247029600 Slide blue</td>
<td>15029411 LCD 9201</td>
</tr>
<tr>
<td>2201063000 Bottom Case</td>
<td>7313204009 Voicing Board (pcb 2291084302)</td>
<td>2247028800 Rotary black (orange line)</td>
<td>13439237 Rubber Connector</td>
</tr>
<tr>
<td>2202066600 Display Window Cover black</td>
<td></td>
<td>2247028800 Rotary black (orange line)</td>
<td>13439237 Rubber Connector</td>
</tr>
<tr>
<td>2202066500 Display Window Cover clear</td>
<td></td>
<td>2247028800 Rotary black (orange line)</td>
<td>13439237 Rubber Connector</td>
</tr>
<tr>
<td>2202068400 Battery Cover</td>
<td>7313203000 CPU Board (pcb 2291084200)</td>
<td>2247029600 Slide blue</td>
<td>15029411 LCD 9201</td>
</tr>
</tbody>
</table>

**IC**

- 15179122 HD447890A64P 2K x 4bit CMOS CPU with LCD driver
- 15179305 IC444C 1K x 4bit static RAM
- 151591400H BD14006BP 1B-bit static shift register
- 151591404H BD14011BP quadraple 2-input NAND gate
- 151591409T TC40690BP hex inverter
- 151591707H BD14070BP quadraple exclusive-OR gate
- 151891012 BD45530U OF cond(pcb 2291084302-UP) or (L022CP...use JNM brand as a replacement.)
- 15199521 NC15010 power amp(pcb 2291084302-UP) or (incompatible)
- 15199517 EX-3668-1 power amp up to 2291084300

**TRANSISTOR**

- 15119125 2SA1115-F
- 15119602 2SB674-C
- 15119607 2SB642-R
- 15129137 2SC2603-F
- 15129143 2SC945-K (or 2SC1815-BL)

**DIODE**

- 15019125 1SS-133
- 150192090T SS500G
- 15019530 RD6.8E6-2
- 15019138 DAN 201 diode array
- 15019139 DAP 201 diode array

**SWITCH**

- 13159329 SSS-522(slide) power
- 12479715 Rubber switch (push) with button

**JACK**

- 13449401 SC-8026 ACC TRIG OUT
- 13449411 HSL 0924-01-040 PHONES
- 1349125 HFL 0520-01-110 OUTPUT (F-RBS)
- 13449706 HNC 0470-01-230 DC 9V

**POTENTIOMETER**

- 13279716 K121L0Z03-20KB BALANCE
- 13279717 K121L0Z03-50KA VOLUME
- 13279718 K121L0Z03-1MC TEMPO, ACCENT

**OTHERS**

- 2225021700 Shield Cover
- 2345014200 Battery clip (+/-) – – – – – – – – – –
- 2345014300 Battery clip (+) – – – – – – – – – –
- 2345014400 Battery clip (-) – – – – – – – – – –
- 2343099100 Flat Cable 18P, 45mm

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**Roland**

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