# Table of Contents

1. Specifications ........................................... 1-1
   1.1 General Specifications ................................... 1-1
   1.2 Hardware Specifications ................................. 1-2

2. General Construction ..................................... 2-1
   2.1 Basic Assemblies ......................................... 2-1
   2.2 Electronic Assemblies .................................... 2-2
   2.3 Components and General Operation .................... 2-3

3. Circuit Diagrams and Layouts .......................... 3-1
   3.1 Power Supply ............................................ 3-1
   3.2 Keyboard ................................................. 3-3
   3.3 Motor Diagrams .......................................... 3-5
   3.4 Solenoid and Switch Diagrams ......................... 3-7
   3.5 LCD ....................................................... 3-8
   3.6 Control PCB .............................................. 3-10

4. Adjustment and Measurements ........................... 4-1
   4.1 General Adjustment Procedure ......................... 4-1
   4.2 Self Printing Test ...................................... 4-1
   4.3 Setting Adjustment Mode ............................... 4-2
      4.3.1 Carrier Home Position Adjustment Mode .............. 4-2
      4.3.2 Selection Motor Home Position and Hammer Position Adjustment Mode 4-2
      4.3.3 Carrier and Platen Position Adjustment Mode ....... 4-2
   4.4 Adjustment Procedure .................................... 4-3
      4.4.1 Carrier Home Position Adjustment ................. 4-3
      4.4.2 Selection Motor Home Position Adjustment ......... 4-5
      4.4.3 Hammer Position Adjustment ....................... 4-7
      4.4.4 Carrier and Platen Position Adjustment .......... 4-8
      4.4.5 Correction Tape Lift and Ribbon Tape Position Adjustment 4-10
      4.4.6 Carrier Drive Tension Adjustment ................. 4-12
      4.4.7 Line Locator Adjustment ......................... 4-13

5. Disassembly and Reassembly ............................ 5-1
   5.1 Housing .................................................. 5-1
   5.2 Keyboard and Control PCB .............................. 5-4
   5.3 Chassis Frame and Platen ............................. 5-12
   5.4 LF (Line Feed) Motor and Carrier Drive ............. 5-14
   5.5 Cassette Base and Ribbon Drive ...................... 5-17
   5.6 Selection and Hammer .................................. 5-20
   5.7 Power Supply ........................................... 5-23
   5.8 Wire Routing ............................................ 5-25
6. Lubrication and Cleaning ..................................................... 6-1
   6.1 Lubrication ..................................................................... 6-1
   6.2 Cleaning ........................................................................ 6-4

7. Tools .................................................................................. 7-1

8. Troubleshooting .................................................................... 8-1
1. Specifications

1.1 General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Print mode</td>
<td>Printwheel (no rubber); all characters</td>
</tr>
<tr>
<td>Printing mechanism</td>
<td>Printwheel (no rubber); all characters</td>
</tr>
<tr>
<td>Number of characters</td>
<td>100 characters</td>
</tr>
<tr>
<td>Line spacing</td>
<td>Single-line spacing (6 LPI (lines per inch))</td>
</tr>
<tr>
<td></td>
<td>1-1/2-line spacing (4 LPI)</td>
</tr>
<tr>
<td></td>
<td>Double-line spacing (3 LPI)</td>
</tr>
<tr>
<td>Print pitch</td>
<td>Pica: 90 characters per line</td>
</tr>
<tr>
<td></td>
<td>Elite: 108 characters per line</td>
</tr>
<tr>
<td></td>
<td>Micro: 135 characters per line</td>
</tr>
<tr>
<td>Printing width</td>
<td>9.0&quot; (229.0 mm)</td>
</tr>
<tr>
<td>Paper width</td>
<td>13.0&quot; (330.0 mm)</td>
</tr>
<tr>
<td>Printing speed</td>
<td>11 CPS (characters per second)</td>
</tr>
<tr>
<td>Key buffer</td>
<td>30 characters (maximum)</td>
</tr>
<tr>
<td>Number of copies</td>
<td>1 original + 2 copies</td>
</tr>
<tr>
<td>Printing impression control</td>
<td>Low/medium/high, or adjustable (by engineer) using a short jumper (SW202) on the control PCB</td>
</tr>
<tr>
<td>Preset margins</td>
<td>Pica: Left - 10, right - 75</td>
</tr>
<tr>
<td>(factory settings)</td>
<td>Elite: Left - 12, right - 90</td>
</tr>
<tr>
<td></td>
<td>Micro: Left - 15, right - 113</td>
</tr>
<tr>
<td>Tab settings</td>
<td>16 tabs (can be set/released without selecting a position)</td>
</tr>
<tr>
<td>Correction memory</td>
<td>Full-line</td>
</tr>
<tr>
<td>Ribbon cassette</td>
<td>Correctable ribbon cassette (standard):</td>
</tr>
<tr>
<td></td>
<td>Approximately 50,000 characters/cassette;</td>
</tr>
<tr>
<td></td>
<td>0.31&quot; (8.0 mm) × approximately 169.5 yards (155.0 m)</td>
</tr>
<tr>
<td>Correction tape</td>
<td>Lift-off correction tape (standard):</td>
</tr>
<tr>
<td></td>
<td>Approximately 1,700 characters</td>
</tr>
</tbody>
</table>
1.2 Hardware Specifications

Power supply
Primary circuit voltage: 100V AC ±10% 50/60Hz
120V AC ±10% 50/60Hz
230V AC ±10% 50/60Hz
Secondary circuit voltage: +15V DC (+VH) unstable voltage (with DC 1.5A load)
+5V DC (+VC) stable voltage
Power consumption: Under rated load: Approximately 4W (standby)
Approximately 18W (operation)
Under no load: 2W (power off)

Fuses
Secondary circuit: 3.0A 250V (100/120/230V, AC 50/60Hz)
Built into transformer: Thermal fuse (+266°F (+130°C 12A))

Stepping motors
Carrier motor:
Step angle: 15° (24 steps/rotation (1/2 step/character))
Resistance per coil: 27 ohm/coil (Matsushita) 27SIN18E8NA
25 ohm/coil (NMB-MAT) PM25L-024-NAC3 (Changed in Sep. 2007)
Drive voltage: +VH
Selection motor:
Step angle: 15° (24 steps/rotation (2 steps/character))
Resistance per coil: 42 ohm/coil (Matsushita) 27SIN18E9ND
42 ohm/coil (NMB-MAT) PM25L-024-NAB7 (Changed in Sep. 2007)
Drive voltage: +VH
LF (line feed) motor:
Step angle: 15° (24 steps/rotation)
Resistance per coil: 45 ohm/coil (Matsushita) 27SIN18ECNW
42 ohm/coil (NMB-MAT) PM25L-024-NAC0 (Changed in Sep. 2007)
Drive voltage: +VH
Ribbon motor:
Step angle: 15° (24 steps/rotation)
Resistance per coil: 42 ohm/coil (Matsushita) 27SIN18E9NE
42 ohm/coil (NMB-MAT) PM25L-024-NAB8 (Changed in Sep. 2007)
Drive voltage: +VH

Keyboard
Keyboard style: Rubber contact switches (8 × 8 keyboard matrix)
Number of printing keys: 45 keys
Number of function keys: 17 keys
Key rollover system: 2-key rollover
Repeat function: Time delay method
LCD (liquid crystal display)

Type: The Epson (ECM-A0697) type LCD or JIC (MSBZ9129) type LCD is used; furthermore, different versions are provided for use with USA/Europe keyboards, Eastern Europe keyboards, and with Thailand keyboards.

Number of display characters: 20 characters × 2 lines (100 columns × 16 rows)

Drive duty: 1/16 duty

Character configuration: 5 columns × 8 rows (including the cursor)

Control PCB assembly

Original version:
CPU (IC201): Toshiba TMP90C141N (CMOS) is the 8-bit microprocessor
ROM (IC203): 512K bit or 1M bit EP ROM from SGS, Sony, National Semiconductor, etc.
   The ROM capacity depends on the spelling check function and on differences in the keyboard arrangements.
   4M bit mask ROM can also be used (contains the spelling check program and dictionary).
   ROM (IC204): 2M bit mask ROM (contains the spelling check dictionary).
Gate array (IC202): The NEC uPD65006CW-A19 or uPD65006CW-A22 is a semi-custom CMOS gate array in which each gate has been designed for this typewriter.
RAM (IC205): 256K bit or 1M bit CMOS static RAM (manufactured by NEC and others), or equivalent.

2nd (second) version:
CPU (IC201): NEC UPD78F1174 or UPD78F1178 is the 16-bit microprocessor.
   The CPU builds in FROM and RAM.
   The program is written in at FROM and memory does the store in RAM.
   UPD78F1174: 128K byte-FROM, 8K byte-RAM
   UPD78F1178: 512K byte-FROM, 30Kbyte-RAM
RAM (IC203): 128K bit CMOS static RAM (manufactured by Renesas and others), or equivalent.

Prepares the PCBs of original version and 2nd version
This manual describes the control PCB of Toshiba CPU (TMP90C141N) at original version, and the control PCB of NEC CPU (UPD78F1174/1178) describes it at 2nd version.

Major specification:

<table>
<thead>
<tr>
<th></th>
<th>Original version</th>
<th>2nd version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control PCB Artwork No.</td>
<td>999-32300</td>
<td>999-35810</td>
</tr>
<tr>
<td>CPU (IC201)</td>
<td>Toshiba TMP90C141N</td>
<td>NEC UPD78F1174/1178</td>
</tr>
<tr>
<td>Control PCB size (W × D)</td>
<td>11 × 4.34&quot; (277 × 110mm)</td>
<td>7.49 × 4.34&quot; (190 × 110mm)</td>
</tr>
<tr>
<td>Effective production</td>
<td>Up to Aug. 2008</td>
<td>From Aug. 2008</td>
</tr>
</tbody>
</table>
**Battery**

<table>
<thead>
<tr>
<th>Type:</th>
<th>Model CR2032 lithium (Li/MnO$_2$) battery with tab (manufactured by Matsushita, Sanyo, Sony, etc.), or equivalent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage:</td>
<td>+3.0V (210 mAh)</td>
</tr>
<tr>
<td>Size:</td>
<td>0.85&quot; (21.5 mm) diameter × 0.15&quot; (3.8 mm)</td>
</tr>
<tr>
<td>Applications:</td>
<td>Store memory backup</td>
</tr>
<tr>
<td>Operational life:</td>
<td>Five years at operating temperature</td>
</tr>
</tbody>
</table>

**Replacement and disposal for the battery**

*Note:* Servicing to be performed only by manufacture’s qualified personal.

*Caution:* Do not incinerate.

**Environmental conditions**

<table>
<thead>
<tr>
<th>Operating temperature:</th>
<th>+41°F to +95°F (+5°C to +35°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage temperature:</td>
<td>-13°F to +140°F (-25°C to +60°C)</td>
</tr>
<tr>
<td>Relative humidity:</td>
<td>90% (+140°F (+60°C))</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>Width:</td>
<td>16.8&quot; (426 mm)</td>
</tr>
<tr>
<td>Height:</td>
<td>4.6&quot; (117 mm)</td>
</tr>
<tr>
<td>Depth:</td>
<td>14.8&quot; (376 mm)</td>
</tr>
<tr>
<td>Weight:</td>
<td>11.6 lbs (5.2 kg), including the keyboard cover</td>
</tr>
</tbody>
</table>

**Note:**
The nominal specs represent the design specs. All units should approximate these specs - some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable. In no case shall a unit fail to meet limit specs.
2. General Construction

2.1 Basic Assemblies

This typewriter consists of the following five major assemblies.

1) Chassis frame and platen
   This assembly consists of the carrier motor, the LF (line feed) motor, the carrier drive mechanism, and the platen.

2) Input circuit and control PCB
   This assembly consists of the transformer, input circuit, and the control PCB (printed circuit board).

3) Carrier
   This assembly consists of the ribbon feeder, lift mechanism (correction feeder), ribbon motor, hammer solenoid (printing mechanism), selection mechanism, and left end switch.

4) Keyboard
   This assembly consists of the keyboard panel, membrane sheet, keyboard support panel, and key tops.

5) Housing
   This assembly consists of the main cabinet, top cover, paper stand, cord cover, bottom cabinet, LCD cover, and LCD.
2.2 Electronic Assemblies

The basic configurations of the electronic assemblies are described below:

1) **Input circuit**
   This assembly supplies voltage through the power cord, transformer, and power switch.

2) **Control PCB (power supply smoothing circuit and drive circuit)**
   In the power supply smoothing circuit AC voltage is transformed into DC voltage. In the drive circuit, the ICs (such as the CPU and SRAM) and transistors drive and control the stepping motors, hammer solenoid, etc.
   The store data is stored in SRAM.
   The LCD displays text and information on functions.

3) **Keyboard**
   The keyboard assembly consists of the keyboard panel, membrane sheet (8 × 8 key matrix), keyboard support panel, and key tops.

4) **Actuator and left end switch**
   The carrier, platen, selection, and ribbon/correction tape mechanisms are driven by four stepping motors, while the hammer solenoid (printing mechanism) moves the hammer.
   The left end switch detects the carrier home position and reports it to the CPU.
2.3 Components and General Operation

Original version (Control PCB: Artwork No. 999-32300)

The control PCB includes the CPU (IC201), the gate array (IC202), the EP ROM (IC203) programmed with the data necessary for typewriter operation, the SRAM (IC205) that holds the store data, and their peripheral devices. If the unit is equipped with the spelling checker function, the control PCB is also equipped with a ROM (IC204). When the power is turned on and the initial operations are completed, the CPU (IC201) begins key scanning the keyboard through the gate array (IC202). If key input is deemed to have been made, the CPU (IC201) reads the data concerning the printing impression for that key, the step angle for the motor, etc., from ROM (IC203). The excitation phasing of the selection motor, carrier motor, ribbon motor and LF motor is controlled by this data, and the hammer solenoid is turned on.

Block diagram
The control PCB includes the CPU (IC201), the FROM built-in CPU (IC201) programmed with the data necessary for typewriter operation, the SRAM (IC203) that holds store data, and their peripheral devices. If the unit is equipped with the spelling checker function, the CPU (IC201) is equipped FROM in 512K byte.

When the power is turned on and the initial operations are completed, the CPU (IC201) begins key scanning the keyboard. If key input is deemed to have been made, the CPU (IC201) reads the data concerning the printing impression for that key, the step angle for the motor, etc., from FROM in CPU (IC201). The excitation phasing of the selection motor, carrier motor, ribbon motor and LF motor is controlled by this data, and the hammer solenoid is turned on.

Block diagram
3. Circuit Diagrams and Layouts

3.1 Power Supply

Power supply assembly diagram for Original version (Control PCB:Artwork No. 999-32300)

Connection diagram for Original version (Control PCB:Artwork No. 999-32300)
Power supply assembly diagram for 2nd version (Control PCB:Artwork No. 999-35810)

Connection diagram for 2nd version (Control PCB:Artwork No. 999-35810)
3.2 Keyboard

Keyboard layout

Keyboard contact layout (membrane sheet)
Keyboard contact diagram (keyboard matrix)
3.3 Motor Diagrams

Carrier motor

Original version (Control PCB: Artwork No. 999-32300) + Matsushita motor

2nd version (Control PCB: Artwork No. 999-35810) + NMB-MAT motor

Selection motor

Original version (Control PCB: Artwork No. 999-32300) + Matsushita motor

2nd version (Control PCB: Artwork No. 999-35810) + NMB-MAT motor
LF motor

Original version (Control PCB: Artwork No. 999-32300) + Matsushita motor

2nd version (Control PCB: Artwork No. 999-35810) + NMB-MAT motor

Ribbon motor

Original version (Control PCB: Artwork No. 999-32300) + Matsushita motor

2nd version (Control PCB: Artwork No. 999-35810) + NMB-MAT motor
3.4 Solenoid and Switch Diagrams

Hammer solenoid

Original version (Control PCB: Artwork No. 999-32300)

![Hammer solenoid diagram](image)

2nd version (Control PCB: Artwork No. 999-35810)

![Hammer solenoid diagram](image)

Left end switch

Original version (Control PCB: Artwork No. 999-32300)

![Left end switch diagram](image)

2nd version (Control PCB: Artwork No. 999-35810)

![Left end switch diagram](image)
3.5 LCD

LCD layout

Epson (ECM-A0697) type

JIC (MSBZ9129) type
LCD block diagram

Epson (ECM-A0697) type

JIC (MSBZ9129) type
3.6 Control PCB

Control PCB layout

Original version (Control PCB: Artwork No. 999-32300)
4. Adjustment and Measurements

4.1 General Adjustment Procedure

Unless specifically stated otherwise (unless not using adjustment mode), always turn the power switch off and unplug the unit before making adjustments.

4.2 Self Printing Test

This typewriter is equipped with a self printing test function. This function prints all of the characters and performs a line feed and return.

Self printing test method:
1) Turn the power switch off.

2) While holding down the margin release key, turn the power switch on. (Once the carrier begins moving, release the margin release key.)

3) After the initial operations are completed, the self printing test begins.

4) The self printing test is terminated by turning the power switch off.

Performing the self printing test while checking the LCD display for missing cells:
1) Turn the power switch off.

2) While holding down the margin release key and the tab key, turn the power switch on. (Once the carrier begins moving, release the margin release key and the tab key.)

3) After the initial operations are completed, the self printing test begins. The LCD display turns black. Any cells that do not turn black indicate a malfunction for that particular cell. If this happens, replace the entire LCD.

4) The self printing test is terminated by turning the power switch off.

Note:
Printing is performed with the preprogrammed pitch and line spacing. If the self printing function is used, the current settings for margins, tabs, pitch, line spacing, and impression are all cleared and the factory settings are restored.

Sample for self printing
As to the first line printed out by self printing test, the version of program (or ROM), i.e. (V-*.**) and the jumper terminal location (SP02 of 0100:SW202) for the impression are shown. The 2nd version PCB (control PCB:Artwork No.:999-35810) prints an keyboard arrangement. (Impression adjustment refers to 4.4.4 "Carrier and Platen Position Adjustment").

Ex. 2nd version (Control PCB:Artwork No.:999-35810) for USA (American)
4.3 Setting Adjustment Mode

Adjustment mode is used to adjust the carrier and selection home positions and to adjust the carrier and platen positions.

Entering adjustment mode:
1) Hold down the code key and the margin release key and turn the power switch on.
2) Release the keys. The typewriter is now in adjustment mode.
3) Adjustment mode can be terminated by turning the power switch off.

4.3.1 Carrier Home Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.
2) The left end of the rail slide can be moved closer to the mark on the front guide rail. Each time the relocation key is pressed, the carrier moves one step to the left. Each time the mode key is pressed, the carrier moves one step to the right. Each time the back space key is pressed, the carrier moves two steps to the left. Each time the space bar is pressed, the carrier moves two steps to the right.
3) Press the express key to activate the carrier motor.
4) The carrier home position can be confirmed by pressing the return key. If the carrier home position is not set correctly, the typewriter will beep.

4.3.2 Selection Motor Home Position and Hammer Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.
2) While holding down the code key, press the express key to activate the selection motor. (Do not turn the motor on for more than a minute, as doing so places a strain on the PCB.)
3) The position of the hammer and the printwheel spokes can be checked using the characters to the left and the right. Pressing the index key causes the selection motor to turn clockwise (to the right) one character. Pressing the reverse index key causes the selection motor to turn counterclockwise (to the left) one character.

4.3.3 Carrier and Platen Position Adjustment Mode

1) Confirm that the typewriter is in adjustment mode.
2) The printing impression can be lowered in order to determine the positional relationship between the carrier and platen. Press the margin left/right key to reduce the printing impression. Press the tab set/clear key to increase the printing impression. Press the margin release key to return the printing impression to the original level. When this mode is left, the printing impression returns to the factory (initial) setting.
4.4 Adjustment Procedure

4.4.1 Carrier Home Position Adjustment

Check: While in adjustment mode, press the return key and make sure that the beeper does not sound when the typewriter checks the carrier home position.

Adjustment:
1) After turning the power switch off, move the left edge of the rail slide (1) close to the right marking on the front guide rail markings (2-A).

2) Enter adjustment mode. (Refer to 4.3.1 "Carrier Home Position Adjustment Mode".)

3) Press the space bar, back space key, relocation key, and tab set/clear key to move the carrier so that the left edge of the rail slide (1) is as close as possible to the right marking on the front guide rail markings (2-A).

4) Press the express key to activate the carrier motor.

5) Set the carrier to the position just before the left end switch is turned off:
   If the beeper is sounding, loosen the adjustment screw (2-B) until the beeper stops.
   If the beeper is not sounding, tighten the adjustment screw (2-B) up to the position where the beeper starts sounding. Finally, fix the screw's position with the locking nut (2-C).

Confirmation: Press the return key to confirm the carrier home position. The carrier home position is set correctly if the beeper does not sound. If the beeper sounds intermittently, return to step 3 of the adjustment procedure.

Possible symptoms: The margin scale and the starting printing position do not match.
4.4.2 Selection Motor Home Position Adjustment

Check: When the selection motor is activated, the centerline of the hammer and the centerline of the wheel set pin must be lined up.

Adjustment:

1) Loosen the two screws (1) and then hand-tighten the selection motor screws so that the top one is at the right end of the upper oval (2-A) and the bottom one is at the left end of the lower oval (2-B).

2) Enter adjustment mode.
   While holding down the code key, press the express key to activate the selection motor. (Refer to 4.3.2 "Selection Motor Home Position and Hammer Position Adjustment Mode").

3) Line up the two round selection gear holes (3-A and 3-B), and then with those holes lined up with the square hole (4-A) in the selection plate, slide the gears onto the selection plate shaft (4-B) and engage them with the selection motor gear (4-C). Finally, fix the selection gears (3) in place with the selection gear stopper.

4) Mount the printwheel (6) on the selection gear (3) so that the wheel set pin (3-C) latches onto the printwheel guide slot. Turn the selection gear (3) so that the centerline of the wheel set pin (3-C) is directly lined up with the center of the hammer "V" notch (7).

5) Loosen the two screws (1), move the selection motor (2) as indicated by the arrow and fix the printwheel in place so that the period ("." on the keyboard for the USA) is lined up with the center of the "V" notch.
   Press the index key and the reverse index key to check the spokes to the left and right on the printwheel (6).
   If the printwheel cannot be fixed in place in a position where it moves the same amount to the left and the right (one character = two steps), return to step 3 and re-assemble the assembly.

Confirmation: After the power has been turned on and the initial operations have been completed, make sure that the period ("." on the keyboard for the USA) comes to the center position.

Possible symptoms: "||" or an incorrect character is printed.
This can cause the printwheel spokes to be bent or damaged.
Positioning for hand-tightening the selection motor and positioning for inserting the selection gears onto the selection gear shaft

Printwheel, hammer, and selection gear adjustment position
4.4.3 Hammer Position Adjustment

Check: The centerline of the hammer and the centerline of the spoke (printwheel) must match.

Adjustment:

1) Enter adjustment mode. While holding down the code key, press the express key to activate the selection motor. (Refer to 4.3.2 "Selection Motor Home Position and Hammer Position Adjustment Mode").

2) Loosen the two screws (2) holding the hammer bracket (1-A) in place.

3) Slide the hammer bracket (1-A) left or right so that the centerline of the hammer (1-B) is lined up with the centerline of the spoke (printwheel) (3-A).

Note: Fix the hammer (1-B) in a position so that if you gently move the spoke (printwheel) (3-A) with your finger, the spoke moves the same amount to the left and right.

Confirmation: Move the selection motor one character (two steps) at a time (refer to 4.3.2 "Selection Motor Home Position and Hammer Position Adjustment Mode") and make sure that the centerline of each spoke on the printwheel (3-A) matches the centerline of the hammer (1-B).

Possible Symptoms: "||" or an incorrect character is printed. This can cause the printwheel spokes to be bent or damaged.
4.4.4 Carrier and Platen Position Adjustment

Check: There must be no missing parts of characters when printing, and the intensity of the top and bottom halves of printed characters must be equal.

Adjustment:
1) Enter adjustment mode. (Refer to 4.3.3 "Carrier and Platen Position Adjustment Mode"). (Adjust the printing impression so that characters are printed faintly on the paper (so that they can be checked).)
2) Print vertical lines and underlines (or any characters with width or height.)
3) Insert a flathead screwdriver into the rail slide hole (1-A) and adjust the rail slide (2) position so that there are no missing parts of characters and so that the top and bottom halves of the characters are printed with even intensity.
   If the top halves of characters are faint: Move the rail slide (2) up.
   If the bottom halves of characters are faint: Move the rail slide (2) down.
4) Confirm that all characters are printed and that the intensity of the top and bottom halves of the characters is even.
5) Turn the power switch off and leave adjustment mode.
   The printing impression is returned to the factory (initial) setting. If the printing impression is not appropriate, change the short pin connection for SW202 on the control PCB. The printing impression can be changed through the software.
   Short pin  Open  SP01  SP02  SP03  SP04
   Printing impression  Weak  <-  Standard  ->  Heavy
   (The photos are setting that SP01 short-circuits.)

Note:
If the intensity of the top and bottom halves of characters can not be made even, move the adjustment plates (3) located on the left and right sides of the carrier box.
   If the top halves of characters are faint: Move the adjustment plates (3) down.
   If the bottom halves of characters are faint: Move the adjustment plates (3) up.

Confirmation: Perform the self printing test or print vertical lines and confirm that the intensity of the top and bottom halves of characters is even.

Possible symptoms: Missing parts of characters, loss of detail, incomplete correction.
The bottom half of the character strikes the platen first, and the top half of the character is faint or missing.

The character strikes the platen squarely, and prints correctly.

The top half of the character strikes the platen first, and the bottom half of the character is faint or missing.
4.4.5 Correction Tape Lift and Ribbon Tape Position Adjustment

Check: When a character is printed, the character that is transferred must leave a space of 0.03 to 0.05 inches (0.8 to 1.2 mm) from the top of the ribbon tape (1) and a space of 0.04 to 0.08 inches (1.0 to 2.0 mm) from the bottom of the ribbon tape (1). In addition, when a correction is made, the top part of vertical lines lifted off (corrected) with the correction tape (2) must be within 0.04 to 0.06 inches (1.0 to 1.5 mm) from the top and the bottom part of underlines must be 0.06 to 0.08 inches (1.5 to 2.0 mm) from the bottom.

Adjustment:

1) Print vertical lines and underlines (or any characters with width or height.)
   Move the screw (3-A) holding the ribbon base stopper on the right side of the carrier box up and down, adjusting the position so that printed characters are printed within the range specified for ribbon tape.
   If the top of the character is missing and there is no space at the top of the ribbon:
   Move the ribbon base stopper (3-B) up.
   If the bottom of the character is missing and there is no space at the bottom of the ribbon:
   Move the ribbon base stopper (3-B) down.

2) Move the screw (4-A) holding the lift slide plate on the ribbon cassette base back and forth, adjusting the position so that corrected characters are corrected within the range specified for correction tape (2).
   If the top of the character is missing and there is no space at the top of the ribbon:
   Move the lift slide plate (4-B) towards you.
   If the bottom of the character is missing and there is no space at the bottom of the ribbon:
   Move the lift slide plate (4-B) towards the platen.

3) After making the necessary adjustments, print vertical lines and underlines, and make corrections. Confirm that the tops of the vertical lines and the bottoms of the underlines are within the prescribed distance from the edges of the tapes.

Confirmation: Make sure that printed characters are not missing any parts, and that when corrections are made, the entire character is removed completely.
Also, with the ribbon cassette base (4) raised to the highest position, make sure that the teeth of the correct feed ratchet gear (3-C) are engaged about halfway with the ribbon cassette base hook (4-C) and the ratchet hook (3-D).

Possible symptoms: Missing parts of characters, or corrected characters that do not disappear or only partly disappear.
### 4.4.6 Carrier Drive Tension Adjustment

**Check:**

The tension on the belt tension spring (1) must be applied evenly to the entire drive belt (2).

**Adjustment:**

1. After loosening the screw (3-A), hook the belt tension spring (1) onto the idle pulley bracket (3) and the left slide frame (4).

2. After moving the carrier to the right edge, move it to the left approximately 0.2 inches (5.0 mm) to 0.8 inches (20.0 mm). (This causes the tension of the belt tension spring (1) to be applied evenly to the entire drive belt (2).)

3. Loosen the screw (3-A) and fix the idle pulley bracket (3) in place.

**Possible symptoms:**

Incorrect adjustment can cause the carrier motor to "step out", can cause characters to be shifted horizontally, and can cause problems with corrections.
4.4.7 Line Locator Adjustment

Check: The front plate (1) must be mounted with no gaps. The gap between the platen (2) and the line locator (3) must be between 0.01 to 0.02 inches (0.3 to 0.6 mm).

Adjustment: 1) Loosen the left and right screws (3-A) for the line locator (3) and adjust the gap between the platen (2) and the line locator (3) so that it is 0.01 to 0.02 inches (0.3 to 0.6 mm). In addition, the bottom lines of characters must be roughly parallel with the dotted line on the line locator.

2) Tighten the left and right screws (3-A) and fix the line locator (3) in place.

Possible symptoms: Shifting of printed characters due to the paper being only loosely held in place. Problems with movement due to the pressure of the paper and the platen. (Carrier motor "step out" or problems with the carrier home position.)
5. Disassembly and Reassembly

5.1 Housing

Removal

1) After confirming that the power switch is off, unplug the power supply cord (1) from the outlet.

2) Remove the keyboard cover (2).

3) Pull the platen knob (3) straight off.

4) Remove the top cover (5) and the cord cover (6) from the main cabinet (4).

5) Remove the paper stand (7) from the top cover (5).

6) After removing the left and right paper bail springs (8), remove the paper bail assembly (9) from the main cabinet (4).

7) Push from the rear of the main cabinet (4) so that the LCD cover hooks (10-A) releases. Although the LCD cover hooks (10-A) are released, the LCD cable (11) is still attached, so lift the LCD cover (10) carefully.

8) Disconnect the LCD cable (11) from the LCD (12).

9) Remove the two screws (13) and then removes the LCD (12) from the LCD cover (10).

10) Remove the LCD cable (11) from the hole (4-A) in the main cabinet. Remove the three screws (14) and then remove the main cabinet (4) from the bottom cabinet (15).

11) Remove the three screws (16) and then removes the PCB cover (17) from the bottom cabinet (15).

12) Remove the handle (18) from the bottom cabinet (15).

13) If necessary, remove the function sheet (19-A) and the LCD cover sheet (19-B).

Only Original version (Control PCB:Artwork No. 999-32300):

14) If necessary, pull the ferrite core (20) from the LCD cable (11).

Note:
The ferrite core disappeared from the LCD cable by having changed into double-sides PCB (2nd version control PCB:Artwork No. 999-35810).
Reassembly

Reverse the procedure described on the previous page.

Note:
Do not bend the LCD cable (11) when plugging it into the connector. Make sure that the connectors and the LCD cable (11) are both oriented in the same direction before attempting to connect it.
When attaching the main cabinet (4) to the bottom cabinet (15), be careful not to pinch the power cord and lead wires between the hooks or the cabinets. (Refer to 5.8 "Wire Routing".)
If the function sheet (19-A) or the LCD cover sheet (19-B) are removed (peeled off), use new ones when reassembling the unit.

Readjustment

None.
5.2 Keyboard and Control PCB

Removal

Keyboard:
1) Remove the housing. (Refer to 5.1 "Housing").
Make sure that the PCB cover has been removed.

Only Original version (Control PCB:Artwork No. 999-32300):
2) Remove the left and right FG wires (2) from the keyboard (1).

Note:
By change for double-sides PCB (2nd version control PCB:Artwork No. 999-35810), the FG wires (2) was eliminated from the frame.

3) Unplug the two flat cables (3-A) for the keyboard (1) from the control PCB (4).

4) After unhooking the two hooks (5-A) at the top of the keyboard (1), free the keyboard assembly (1) from the two bottom hooks (5-B).

5) Remove the screw (7) for the keyboard support panel (6).

6) Free the 12 hooks for the keyboard support panel (6).

7) Remove the keyboard support panel (6) and the membrane sheet (3).

8) Remove the two LEDs (8) (power = green, shift = red) and the contact rubber (9) from the keyboard panel (10).

9) Removing each key top (11) makes it possible to remove the corresponding contact spring (12) and the key spring (13). Remove the sub spring (15) for the space bar (14).

10) Remove the crank shafts (18, 19) from the space bar (14), left shift key (16), and the return key (17).
Control PCB:
1) Following steps 1 and 3 above, remove the housing and the keyboard assembly. (Refer to the previous page.)

2) Disconnect the eight connectors for the power supply (CN201), selection motor (CN202), ribbon motor (CN203), carrier motor (CN204), LF motor (CN205), hammer solenoid (CN206), left end switch (CN207), and the LCD cable (CN210) from the control PCB (4). Lift (release) the connector housing (4-A) for the connector (CN210) before disconnecting the LCD cable (21). To disconnect the connector on the LCD, simply pull out the cable.

Note for only Original version (Control PCB:Artwork No. 999-32300):
When removing the LCD cable (21), be careful not to lose the ferrite core (22). The ferrite core disappeared from the LCD cable by having changed into double-sides PCB (2nd version control PCB:Artwork No. 999-35810.)

3) Remove the three screws (20) holding the control PCB to the bottom cabinet (5), free the hooks (5-C), and remove the control PCB (4).

Change for control PCB
The Control PCB had to be redesigned because of the major two devices, i.e. CPU, Toshiba made TMP90C141N and Gate Array, NEC made uPD65006CW-A22 on which the production has been discontinued.

The new CPU is replaced with NEC made uPD78F1174 or uPD78F1178, and the relative programming was totally changed. (All the programming is written in the FROM of the CPU, and the current ROM programmed each keyboard is no longer available) Also, The control PCB is changed from single-sided one to double-sided one, and the new one is smaller size than the current one, i.e. 88mm (3.5 inches) smaller width.

According to the changed size of the control PCB, the boss is added to mount the PCB on to the bottom cabinet and the heat sink (cooling plate) may be reformed, and the cable of the power switch has to be extended as well.

It is not possible to fix the new control PCB on to the old bottom cabinet and the initial power supply unit. (And the lead wires for initial power switch is short in order to connect a connector.)

The shield plate disappeared from the bottom cabinet by having changed into double-sides PCB. In addition, FG wires was eliminated by the frame, too.

<table>
<thead>
<tr>
<th>Bottom cabinet &amp; Power supply unit</th>
<th>Control PCB (Artwork No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single-sided PCB(999-32300)</td>
</tr>
<tr>
<td>Initial unit (Up to July 2008)</td>
<td>O</td>
</tr>
<tr>
<td>New unit (From Aug. 2008)</td>
<td>O</td>
</tr>
</tbody>
</table>

O: Possible to mount, X: Not possible to

This manual describes the Toshiba CPU (TMP90C141N) at original version, and the NEC CPU (UPD78F1174/1178) describes it at 2nd version.

<table>
<thead>
<tr>
<th>Major specification</th>
<th>Original version</th>
<th>2nd version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control PCB Artwork No.</td>
<td>999-32300</td>
<td>999-35810</td>
</tr>
<tr>
<td>CPU (IC201)</td>
<td>Toshiba TMP90C141N</td>
<td>NEC UPD78F1174/1178</td>
</tr>
<tr>
<td>Control PCB size (W × D)</td>
<td>11 × 4.34&quot; (277 × 110mm)</td>
<td>7.49 × 4.34&quot; (190 × 110mm)</td>
</tr>
<tr>
<td>Effective production</td>
<td>Up to Aug. 2008</td>
<td>From Aug. 2008</td>
</tr>
</tbody>
</table>

Note:
The screw position of 2nd version PCB changes to the right bottom from the right upper for original version PCB.
Part code (number) for program (or ROM)

The part code (number) for the program (or ROM) including version number is printed on the label as illustrated below.

```
Abbreviation for General
Model Name

XXX-XXX
Q1234567

Abbreviation for Arrangement

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Arrangement</th>
<th>Abbreviation</th>
<th>Arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>USA</td>
<td>HI</td>
<td>Hispano</td>
</tr>
<tr>
<td>GR2</td>
<td>German 2</td>
<td>DM</td>
<td>Danish</td>
</tr>
<tr>
<td>HI3</td>
<td>Hispano 3</td>
<td>DM2</td>
<td>Danish 2</td>
</tr>
<tr>
<td>NS2</td>
<td>New Spanish 2</td>
<td>NC</td>
<td>New Canadian French</td>
</tr>
<tr>
<td>BF</td>
<td>Belgian</td>
<td>GL</td>
<td>Greek Latin</td>
</tr>
<tr>
<td>IT</td>
<td>Italian</td>
<td>HU</td>
<td>Hungarian</td>
</tr>
<tr>
<td>FR</td>
<td>French</td>
<td>YU</td>
<td>Yugoslavian (Croatian)</td>
</tr>
<tr>
<td>UK</td>
<td>English</td>
<td>PL</td>
<td>Polish</td>
</tr>
<tr>
<td>SF2</td>
<td>Swiss French 2</td>
<td>CE</td>
<td>Czech</td>
</tr>
<tr>
<td>SG2</td>
<td>Swiss German 2</td>
<td>SO</td>
<td>Slovak</td>
</tr>
<tr>
<td>HO2</td>
<td>Dutch 2</td>
<td>T/K</td>
<td>English/Thai</td>
</tr>
<tr>
<td>PO</td>
<td>Portuguese</td>
<td>FS2</td>
<td>Finish Swedish 2</td>
</tr>
<tr>
<td>PO2</td>
<td>Portuguese 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Reassembly

Reverse the procedure described on the previous page.

Lift the connector housing (4-A).

Plug the LCD cable (21) straight into the connector.

Push the connector housing back into its original position.

Note:
Do not bend the flat cables (3-A, 21) when plugging them into their connectors. Make sure that the connectors and the flat cables (3-A, 21) are both oriented in the same direction before attempting to connect them.

Readjustment

None.
2nd version (Control PCB: Artwork No. 999-35810)
Using the spelling check function (if applicable)

The American and Spanish dictionaries can be used with the Spain and Hispano keyboards.
The American and French dictionaries can be used with the France and Canada-France keyboards.
The American and German dictionaries can be used with the Germany keyboard.
The American dictionary can be used with the USA and UK keyboards.

Note:
As for 2nd version PCB (Control PCB:Artwork No. 999-35810), the spelling check function is only the factory option.
The 2nd version PCB cannot get the spelling check function later.
The 2nd version PCB (Control PCB:Artwork No. 999-35810) with spelling check does a marking in "A2".

Only spelling check for Original version (Control PCB:Artwork No. 999-32300)

Case 1
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC uPD65006CW-A19, and the EP ROM (IC203) is suited for the previous keyboard specifications and is not compatible with the spelling check function (Ver. 1.0*):

Conversion work
Replace the gate array (IC202) with the NEC uPD65006CW-A22, replace the EP ROM (IC203) with one that is suited for the previous keyboard specifications and is compatible with the spelling check function (Ver. 2.0*), solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the gate array (IC202) with the NEC uPD65006CW-A22, replace the EP ROM (IC203) with a 4M bit mask ROM (Ver. 3.0*) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

Case 2
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC uPD65006CW-A22, and the EP ROM (IC203) is suited for the previous keyboard specifications and is not compatible with the spelling check function (Ver. 1.0*):
Conversion work
Replace the EP ROM (IC203) with one that is suited for the previous keyboard specifications and is compatible with the spelling check function (Ver. 2.0*), solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the EP ROM (IC203) with a 4M bit mask ROM (Ver. 3.0*) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

Case 3
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC uPD65006CW-A22, and the EP ROM (IC203) is suited for the previous keyboard specifications and is compatible with the spelling check function (Ver. 2.0*):

Conversion work
Solder IC204 in the IC socket, and install the mask ROM.

Or,
Replace the EP ROM (IC203) with a 4M bit mask ROM (Ver. 3.0*) that is suited for the previous keyboard specifications. Remove the jumper wire from J207 and J209, and connect the jumper wire to J206 and J208.

Case 4
When the control PCB artwork number is 999-32300, the gate array (IC202) is the NEC uPD65006CW-A22, and IC203 is a 4M bit mask ROM (Ver. 3.0*) suited for the previous keyboard specifications:

Conversion work
None needed.

1) Remove the housing, keyboard (1), and remove the control PCB (4) from the bottom cabinet (5).

2) On the bottom side of the control PCB (4), remove the solder from the ICs to be replaced (IC202 and/or IC203), and then install the ICs as described in the conversion work for case 1, 2 or 3. Be sure to match the pin numbers on the PCB with the pin numbers on the ICs.

3) Reverse the above procedure and re-assemble the typewriter. (Apply the spelling check labels to the front of the keys as shown in the key illustration in the operating instruction.)

Original version (Control PCB:Artwork No. 999-32300):
5.3 Chassis Frame and Platen

Removal

Chassis frame:
1) Remove the housing and the keyboard. Disconnect the connectors from the control PCB. (Refer to 5.2 "Keyboard and Control PCB".)

2) Remove the lead wires from the bottom cabinet (1). In order to remove the chassis frame (2) from the groove in the bottom cabinet (1), lift the frame (2) forwards about 0.8 inches (20 mm), and then pull the frame out and away.

Platen and feed rollers:
1) Remove the housing. (Refer to 5.1 "Housing".)

2) Remove the paper release spring (3).

3) Remove the platen journal pin (4-A) from the hole (2-A) in the side frame L. Turn the platen journal pin (4-A) 90° forward, line up the groove (2-B) in side frame L with the protrusion (4-B) on the platen journal, and then remove the platen journal (4) from side frame L (2-B).

4) Tilt the platen (5) up and to the left and pull it out.

5) Remove the paper release lever (6) from the right shaft of the platen (5).

6) Remove the two E-rings (7) from the left shaft of the platen (5).

7) Pull the platen gear (8), platen washer (9), platen arc washer (10) and platen journal (4) from the left shaft of the platen (5).

8) Remove the paper pan (11) on the left and right protrusions (2-C) of the center frame.

9) Push the four feed rollers (12) out from the bottom of the paper pan (11) and remove them.

10) Lift the right side of the paper release arm (13) slightly, slide it to the left, and then remove it from the protrusion (2-D) on the center frame.

11) Normally, there is no need to peel off the deflector sheet (14) on the bottom of the paper pan. Be careful not to scratch the deflector sheet (14) when the paper pan (11) has been removed.

Reassembly

Reverse the procedure described above.

Note:
Refer to 5.8 "Wire Routing" for details on the routing of the lead wires. When the carrier is moved, make sure that the lead wire bundle in the carrier cable guide moves smoothly and does not catch on any of the other components. Be sure to install the platen washer (9) and the platen arc washer (10) so that they are in that order from the outside in, between the platen gear (8) and the platen journal (4).

Readjustment

None.
5.4 LF (Line Feed) Motor and Carrier Drive

Removal

**LF (line feed) motor:**
1) Remove the chassis frame and platen. (Refer to 5.3 "Chassis Frame and Platen").
2) Remove the LF motor spring (1).
3) Remove the LF middle gear (2).
4) Remove the LF motor plate screw (3).
5) Remove the two screws (6) holding the LF motor (4) to the LF motor plate (5) and then remove the LF motor (4).

**Carrier drive:**
1) Remove the chassis frame. (Refer to 5.3 "Chassis Frame and Platen").
2) Remove the screw (8) holding the belt clamp (9) from the hole in the center frame (7-A).
3) Remove the left and right carrier stoppers (10). Remove the main shaft bracket screw (11) and then remove the main shaft bracket (12). Pull the main shaft (13) out of the hole in the side frame (7-B).
4) The carrier can now be removed from the frame (7).
5) Remove the carrier motor spring (14).
6) Remove the carrier motor bracket screw (15).
7) Remove the two screws (18) holding the carrier motor (16) to the motor bracket (17), and then remove the carrier motor (16).
8) Remove the belt tension spring (19).
9) Remove the screw (20), and then remove the idle pulley bracket assembly (21).
10) Remove the E-ring (22) and then remove the idle pulley (23).
11) Pull the drive pulley shaft (24) out from the back of the frame (7); the drive pulley (25), drive pulley cap (26), and the drive belt (27) can now be removed.

Only Original version (Control PCB:Artwork No. 999-32300):
12) Remove the two screws (28) holding the left and right FG wires (29).

Note:
By change for double-sides PCB (2nd version control PCB:Artwork No. 999-35810), the FG wires (29) was eliminated by the carrier guide rail (33).

13) Unless it is necessary to readjust the adjustment screw (30) and nut (31), do not loosen or remove them. In addition, do not remove the nut (32) attaching the side frame to the center frame.
When removing the carrier without removing the platen, it is possible to remove the carrier guide rail (33) and then remove the carrier from the frame (7) by following the procedure described in steps 2 through 4 above. Remove the two screws (34) from the carrier guide rail (33).
Reassembly

Reverse the procedure described on the previous page.

Readjustment

The carrier drive belt tension adjustment will be necessary.  (Refer to 4.4.6 "Carrier Drive Tension Adjustment".)
The carrier home position adjustment will be necessary.  (Refer to 4.4.1 "Carrier Home Position Adjustment".)
Make sure that the carrier motor gear and the LF motor gears are not loose.
When the side frame, center frame, and carrier guide rail have been removed, place them on a flat, stable surface and make sure that they are not bent or warped.

Change for LF and Carrier motors

The production for the motors was just discontinued by Matsushita (Panasonic) Manufacturing Co., Ltd. so that these motors were replaced with NMB-MAT (Minebea Motor Manufacturing Corporation).

<table>
<thead>
<tr>
<th>No.</th>
<th>Parts (Effect production)</th>
<th>Old (Parts No.)</th>
<th>New (Parts No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>LF motor (From September 2007)</td>
<td>Matsushita 27SIN18ECNW</td>
<td>NMB-MAT PM25L-024-NAC0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(150-63010)</td>
<td>(980-10650)</td>
</tr>
<tr>
<td>6</td>
<td>LF motor screws (From September 2007)</td>
<td>M3.0 × 4 for pan head</td>
<td>M2.6 × 5 for pan head</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(011-00010)</td>
<td>(N00-00426)</td>
</tr>
<tr>
<td>16</td>
<td>Carrier motor (From September 2007)</td>
<td>Matsushita 27SIN18E8NA</td>
<td>NMB-MAT PM25L-024-NAC3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(150-61010)</td>
<td>(980-10640)</td>
</tr>
<tr>
<td>18</td>
<td>Carrier motor screw (From September 2007)</td>
<td>M3.0 × 4 for pan head</td>
<td>M2.6 × 5 for pan head</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(011-00010)</td>
<td>(820-90230)</td>
</tr>
</tbody>
</table>
5.5 Cassette Base and Ribbon Drive

Removal

1) Remove the ribbon cassette and the correction tape.

2) Remove the carrier from the chassis frame. (Refer to 5.4 "LF Motor and Carrier Drive").

3) Remove the ribbon cassette base spring (2) from the carrier box (1).

4) Remove the two screws (5) holding the ratchet hook (3) and the ribbon base stopper (4) in place.

5) Use a long, thin rod through the hole (6-A) in the ribbon cassette base to slide the lift pin (7) to the right. Remove the lift pin (7) from the notch in the correct cam (8) and then lift up the ribbon cassette base (6).

6) Slide the ribbon cassette base (6) to the left and remove the ribbon cassette base (6) from the front hole in the carrier box (1-A).

7) Remove the E-ring (10) holding the correction tape holder (9) in place.

8) Remove the E-ring (12) holding the correction feed ratchet (11) in place.

9) Remove the correction brake spring (13), and then remove the ribbon cassette base (6) from the correction brake rack (14).

10) Remove the ribbon cassette base (6) screw (15), and then remove the lift slide plate (16). Remove the E-ring (17) from the lift pin (7), and then remove the lift pin spring (18) and the lift pin (7) from the lift slide plate (16).

11) Remove the screw (20) for the gear holding base (19). Remove the gear holding base (19) from the carrier box (1).

12) Once the E-ring (22) on the right end of the ribbon drive shaft (21) is removed, the correct cam (8), the two drive ratchets (23), the ribbon drive gear (24) and the drive bevel gear (25) can be removed.

Note:
Although the two drive ratchets (23) are identical, the orientation with which they are mounted affects the release direction of the cam and gear (8 and 24). (Be careful about the orientation during reassembly.)

13) Remove the E-ring (26) on the bottom of the gear holding base (19) and then remove the ribbon bevel gear (27) and the ribbon bevel gear pin (28).

14) Pull the ribbon gear (29) out of the hole in the gear holding base (19). Pull the ribbon feed pole (30) out of the ribbon gear (29) and then remove the ribbon feed pole spring (31).

15) Remove the cam stopper (32) from the carrier box (1).

16) Cut the unit band (33) on the bottom of the carrier box (1) and remove the carrier cable guide (34). The lead wires for the ribbon motor, selection motor, hammer solenoid, and left end switch can now be unbundled.

17) Remove the screw (35) on the front of the carrier box (1) and then remove the rail slide (36).
18) Do not remove the cassette holding spring (37) unless necessary, as removing and reinstalling it will make it loose.

**Reassembly**

Reverse the procedure described on the previous page. Fix the ratchet hook (3) in place roughly at the center of the oval hole. With the ribbon cassette base (6) up as high as it will go, engage the hook on the ribbon cassette base (6) and the ratchet hook (3) approximately halfway with the teeth on the correct feed ratchet gear (11). Hand-tighten the lift slide plate (16) and the rail slide (36) at approximately the center of the oval hole. Because the carrier box is an assembly, be aware that repeated re-attachment of the gear holding base (19), etc., will cause the screws to lose their gripping ability. If the drive ratchets (23) are re-attached with the wrong orientation, the correct cam (8) and the drive bevel gear (25) will turn in either direction. In this case, reverse the orientation of the drive ratchets and then attach the ribbon drive gear (24).

**Readjustment**

Ribbon tape position adjustment will be necessary. (Refer to 4.4.5 "Correction Tape Lift and Ribbon Tape Position Adjustment".)
Correction tape lift adjustment will be necessary. (Refer to 4.4.5 "Correction Tape Lift and Ribbon Tape Position Adjustment".)
Rail slide position adjustment will be necessary. (Refer to 4.4.4 "Carrier and Platen Position Adjustment".)
5.6 Selection and Hammer

Removal

1) Remove the cassette base and the ribbon drive mechanism. (Refer to 5.5 "Cassette Base and Ribbon Drive"). Make sure that the tie has been cut and that the carrier cable guide has been removed.

2) Remove the wheel release spring (1).

3) Remove the left and right screws (2) from the carrier box and then remove the carrier metal (3).

4) Remove the two screws (4) and then remove the adjust plate (5). Remove the selection plate complete (7) from the carrier box (6).

5) Remove the two screws (8) and then removes the line locator (9).

6) Remove the two screws (10) and then removes the front plate (11). The front plate spring (12) and the push disks A and B (13-A and 13-B) are normally not removed.

7) Remove the two screws (14) from the left side of the carrier box and then remove the ribbon motor (15).

8) Use radio pinchers to pull the front protrusion (6-A) on the carrier box, pulling the left end switch (16) out of the carrier box. Be careful not to break the protrusion (6-A).

9) Remove the two screws (17) and remove the selection motor (18) from the selection plate complete (7).

10) Remove the wheel set hook (20) from the wheel hook screw (19).

Note:
Original and new (March '94) parts (19 and 20) are not mutually interchangeable.

11) Remove the selection gear stopper (21) from the selection plate complete (7). Pull the selection gears A (22) and B (23) off of the selection plate pin (7-A). Unhook the hook of selection gear A (22) from selection gear B (23). Remove the backlash spring (24) from selection gear A (22).

12) Remove the two screws (26) holding the hammer bracket in place (25) and then remove the hammer solenoid assembly from the selection plate complete (7).

13) Remove the release pin (27) from the selection plate complete (7), and then remove the wheel release lever (28).

14) Remove the E-ring (29). Remove the compression spring (30) and the hammer solenoid (31) from the hammer bracket (25).

15) Remove the E-ring (32), the hammer shaft (33), the hammer complete (34), the torsion spring (35), and the washer (36).
Reassembly

Reverse the procedure described on the previous page.

Note:
Attach the adjust plate (5) in roughly the center of the oval hole. If this position is not correct, it will not be possible to perform the rail slide adjustment properly. In addition, hand-tighten the selection motor at the right end of the upper oval hole and at the left end of the lower oval hole. Because the carrier box is an assembly, be aware that repeated re-attachment of the carrier metal (3) and the adjust plate (5), etc., will cause the screws to lose their gripping ability. Match up the paired holes on selection gears A (22) and B (23) and then insert them onto the selection pin (7-A) with the positioning determined by the square hole on the selection plate complete (7).

Readjustment

Line locator adjustment will be necessary. (Refer to 4.4.7 "Line Locator Adjustment").
Selection motor home position adjustment will be necessary. (Refer to 4.4.2 "Selection Motor Home Position Adjustment").
Hammer home position adjustment will be necessary. (Refer to 4.4.3 "Hammer Position Adjustment").
Carrier and platen position adjustment will be necessary. (Refer to 4.4.4 "Carrier and Platen Position Adjustment").
Rail slide position adjustment will be necessary. (Refer to 4.4.4 "Carrier and Platen Position Adjustment").
Make sure that the ribbon motor gear and the selection motor gear are not loose.

Change for Ribbon and Selection motors
The production for the motors was just discontinued by Matsushita (Panasonic) Manufacturing Co., Ltd. so that these motors were replaced with NMB-MAT (Minebea Motor Manufacturing Corporation).

<table>
<thead>
<tr>
<th>No.</th>
<th>Parts (Effect production)</th>
<th>Old (Parts No.)</th>
<th>New (Parts No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Ribbon motor screws (From September 2007)</td>
<td>M3.0 × 5 (G00-81090)</td>
<td>M2.6 × 5 (N00-00426)</td>
</tr>
<tr>
<td>15</td>
<td>Ribbon motor (From September 2007)</td>
<td>Matsushita 27SIN18E9NE (150-51110)</td>
<td>NMB-MAT PM25L-024-NAB8 (980-10660)</td>
</tr>
<tr>
<td>17</td>
<td>Selection motor screw (From September 2007)</td>
<td>M3.0 × 5 (551-10040)</td>
<td>M2.6 × 5 (N00-00426)</td>
</tr>
<tr>
<td>18</td>
<td>Selection motor (From September 2007)</td>
<td>Matsushita 27SIN18E9ND (150-53310)</td>
<td>NMB-MAT PM25L-024-NAB7 (980-10670)</td>
</tr>
</tbody>
</table>
5.7 Power Supply

Removal

1) Remove the housing and the keyboard. Disconnect the connector for the power supply (CN201) from the control PCB. (Refer to 5.2 "Keyboard and Control PCB".)

2) Remove the power supply cord (2-A) from the protrusions (1-A) on the bottom cabinet.

3) Remove the screw (3) holding the switch cover (4) in place, and then remove the switch cover. Remove the power switch (2-B) from the bottom cabinet (1). Remove the lead wires (2-C) from the bottom cabinet (1) as well.

4) Remove the two screws (5). Remove the transformer (2-D) from the bottom cabinet (1).

   Note:
   Do not remove the unit band for 230V (6-A), cord tube for 120V (6-B), or ferrite core (6-C) unless necessary.

Reassembly

Reverse the procedure described above.

Note:
Refer to 5.8 "Wire Routing" for details on the routing of the power supply cord and the lead wires. If the unit band (6-A) or the cord tube (6-B) is cut, use new ones when reassembling the unit.

Readjustment

None.
### 5.8 Wire Routing

**Bottom cabinet**

<table>
<thead>
<tr>
<th>No.</th>
<th>Lead wires</th>
<th>Connector for lead wires side</th>
<th>Connector for control PCB side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply cord and power switch</td>
<td>White (2 pins)</td>
<td>White (CN201)</td>
</tr>
<tr>
<td>2</td>
<td>Carrier motor</td>
<td>Yellow/Matsushita motor (6 pins)</td>
<td>Yellow (CN204)</td>
</tr>
<tr>
<td>3</td>
<td>LF motor</td>
<td>White (6 pins)</td>
<td>White (CN205)</td>
</tr>
</tbody>
</table>

**Original version (Control PCB:Artwork No. 999-32300)**

![Original schematic diagram]

**2nd version (Control PCB:Artwork No. 999-35810)**

![2nd version schematic diagram]
### LCD

<table>
<thead>
<tr>
<th>No.</th>
<th>Flexible flat cable</th>
<th>FFC side</th>
<th>Connector for control PCB side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LCD</td>
<td>Contact point (14 pins)</td>
<td>White (CN210)</td>
</tr>
</tbody>
</table>

### Carrier

<table>
<thead>
<tr>
<th>No.</th>
<th>Lead wires</th>
<th>Connector for lead wires side</th>
<th>Connector for control PCB side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selection motor</td>
<td>White (6 pins)</td>
<td>White (CN202)</td>
</tr>
<tr>
<td>2</td>
<td>Hammer solenoid</td>
<td>Red (2 pins)</td>
<td>Red (CN206)</td>
</tr>
<tr>
<td>3</td>
<td>Ribbon motor</td>
<td>Red (6 pins)</td>
<td>Red (CN203)</td>
</tr>
<tr>
<td>4</td>
<td>Left end switch</td>
<td>White (2 pins)</td>
<td>White (CN207)</td>
</tr>
</tbody>
</table>

Bottom view
Top view

Original version (Control PCB: Artwork No. 999-32300)

Note:
When setting the lead wire bundle in the bottom cabinet, do so with the carrier positioned at the right end.

2nd version (Control PCB: Artwork No. 999-35810)
# 6. Lubrication and Cleaning

## 6.1 Lubrication

Proper lubrication is essential in order to maintain trouble-free operation. Lubricants and the locations where they are to be applied are shown below.

<table>
<thead>
<tr>
<th>Number</th>
<th>Type of lubricant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sumico Sumitec #331</td>
</tr>
<tr>
<td></td>
<td>Mobil Mobilit SHC 15</td>
</tr>
<tr>
<td></td>
<td>Mobil Mobilit SHC 460</td>
</tr>
<tr>
<td></td>
<td>Dow Corning Molykote EM-60L</td>
</tr>
<tr>
<td>2</td>
<td>Mobil Gargoyle Arctic SHC 226</td>
</tr>
<tr>
<td>3</td>
<td>Sumico Sumitec HD Grease #2</td>
</tr>
<tr>
<td></td>
<td>Dow Corning Molykote BR2 Plus Grease #2</td>
</tr>
</tbody>
</table>

LF motor
Carrier drive

Hammer solenoid
6.2 Cleaning

Notes on cleaning:
* Thinner or other cleaning liquids that contain organic solvents or chlorine-based compounds can damage the housing and metal components.

* Dropping pins or paper clips inside of the unit can short circuit electronic components and interfere with moving parts.

* In order to prevent the rusting of internal components and short-circuiting of electronic components, the inside of the typewriter should only be wiped with a clean, dry cloth.

* When cleaning the inside of the typewriter, always be sure to turn off the power first in order to prevent personal injury and damage to the mechanical and electronic components.

The following components should be removed for cleaning:

* Platen
  Remove the platen. Dampen a clean cloth with alcohol and wipe away dust and debris on the surface of the platen. After cleaning the platen, do not use the typewriter until the alcohol has evaporated.

* Printwheel
  Remove the printwheel from the carrier. Dampen a clean cloth with alcohol and wipe the spokes of the printwheel. After cleaning the printwheel, do not use the typewriter until the alcohol has evaporated.

* Keyboard
  Dampen a clean cloth with alcohol and wipe the key tops. If necessary, remove the key tops from the keyboard panel. After cleaning the key tops, do not use the typewriter until the alcohol has evaporated.

* Housing
  Remove the housing. Dampen a clean cloth with alcohol and ammonia and wipe the housing. After cleaning the housing, do not use the typewriter until the alcohol and ammonia have evaporated.
7. Tools

The following tools are required:

1) Needle nose pliers
2) Phillips screwdrivers (large and small)
3) Standard screwdrivers (large and small)
4) Wrenches (5.5 mm, 6.0 mm, 7.0 mm)
5) Nut drivers (5.5 mm, 6.0 mm, 7.0 mm)
6) Wire cutter (Nippers)
7) Soldering iron and solder
8) Spring hook
9) Precision (Jeweler's) screwdrivers
10) Multimeter (Tester)
11) Oscilloscope
12) Ruler
13) Calipers
14) Gap gauge (Thickness (Feeler) gauge)
15) Tweezers
16) E-rings (2.0 mm, 2.5 mm, 3.0 mm, 4.0 mm, 6.0 mm)
   (During re-assembly, new E-rings should be used, since they become loose after being removed two or three times.)
# 8. Troubleshooting

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Possible Cause</th>
<th>Solution</th>
<th>Ref. in Manual</th>
</tr>
</thead>
</table>
| **1. Power supply**  
Even though the power is on, the typewriter does not operate and the LED does not light. | * Either the power supply cord is not plugged in properly, or the connector (CN201) is not connected.  
* The power switch or transformer has failed.  
* The fuse (F201) is blown.  
* The control PCB has failed.  
* The LED or connectors (CN208 and CN209) has failed.  
* The ROM (control PCB: 999-32300) is not installed. | **Plug in the cord or connect the connector.**  
**Replace.**  
**Replace.**  
**Replace.**  
**Replace.**  
**Install the ROM.** | **3.1, 5.7**  
**3.1, 5.7**  
**3.1, 3.6, 5.2**  
**3.2, 3.6, 5.2**  
**3.6, 5.2** |
| **2. Initial operation**  
When the power is first turned on, the typewriter does not perform the initial operations. | * The connector (CN202 - CN210) is not connected.  
* The motor has failed.  
* The LCD cable is not connected.  
* The LCD has failed.  
* IC (CPU, ROM, gate array, etc.) or Reset IC has failed.  
* The control PCB has failed. | **Connect the connector.**  
**Replace.**  
**Connect the connector.**  
**Replace.**  
**Replace.**  
**Replace.**  
**Replace.** | **3.2-3.6, 5.2**  
**3.3, 5.4, 5.6**  
**3.5, 3.6, 5.1, 5.2**  
**3.5, 5.1, 5.2**  
**3.6, 5.2** |
| **3. Beeper**  
The beeper does not sound. | * The beeper (BZ201) has failed.  
* IC (CPU, ROM, gate array, etc.) or Reset IC has failed.  
* The control PCB has failed. | **Replace.**  
**Replace.**  
**Replace.** | **3.6, 5.2**  
**3.6, 5.2**  
**3.6, 5.2** |
| **4. Carrier**  
The carrier does not move or is out of adjustment. | * The connector (CN204) is not connected.  
* The carrier motor has failed.  
* IC (CPU, ROM, gate array, etc.) or TRA201 has failed.  
* The control PCB has failed.  
* The carrier belt tension may be improperly adjusted.  
* The belt tension/carrier motor spring has failed.  
* The adjustment screw may not be adjusted properly, or the left end switch has failed. | **Connect the connector.**  
**Replace.**  
**Replace.**  
**Replace.**  
**Replace.**  
**Adjust the carrier belt tension.**  
**Reassemble or replace.**  
**Adjust or replace.** | **3.3, 3.6, 5.4**  
**3.3, 5.4**  
**3.6, 5.2**  
**3.6, 5.2**  
**3.6, 5.2**  
**4.4.6, 5.4**  
**4.4.6, 5.4**  
**3.4, 4.4.1, 5.4, 5.6** |
<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Possible Cause</th>
<th>Solution</th>
<th>Ref. in Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5. Platen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The platen does not feed paper forward, or does not feed it forward evenly.</td>
<td>* The connector (CN208 or CN209) is not connected.</td>
<td>Connect the connector.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The connector (CN205) is not connected.</td>
<td></td>
<td>3.3, 3.6, 5.4</td>
</tr>
<tr>
<td></td>
<td>* The LF motor has failed.</td>
<td>Replace.</td>
<td>3.3, 5.4</td>
</tr>
<tr>
<td></td>
<td>* IC (CPU, ROM, gate array, etc.), TRA202 (control PCB: 999-32300) or TR216-219 (control PCB: 999-35810) has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reassemble or replace.</td>
<td>5.4</td>
</tr>
<tr>
<td></td>
<td>* The control PCB has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The LF motor spring has failed.</td>
<td>Replace.</td>
<td>4.4.7, 5.3</td>
</tr>
<tr>
<td></td>
<td>* A foreign object, such as a label or a paper clip is caught between the platen and the paper pan.</td>
<td>Adjust the line locator.</td>
<td></td>
</tr>
<tr>
<td><strong>6. Printing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printed characters do not appear at all on the paper.</td>
<td>* The connector (CN206, CN208, or CN209) is not connected.</td>
<td>Connect the connector.</td>
<td>3.2, 3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The hammer solenoid has failed.</td>
<td>Replace.</td>
<td>3.3, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The ribbon has been used up or has broken.</td>
<td>Replace.</td>
<td>Ref. to operating instructions</td>
</tr>
<tr>
<td></td>
<td>* IC (CPU, ROM, gate array, etc.), TR201/TR203 (control PCB:999-32300), TR204/TR207 (control PCB:999-35810) has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The control PCB has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td>Some characters are not printed.</td>
<td>* The printwheel is not set properly, or is not installed. (The front plate is positioned incorrectly.)</td>
<td>Reassemble, replace, or press the CODE+W key.</td>
<td>Ref. to operating instructions</td>
</tr>
<tr>
<td></td>
<td>* Spokes on the printwheel are broken.</td>
<td>Replace.</td>
<td>Ref. to operating instructions</td>
</tr>
<tr>
<td></td>
<td>* The membrane sheet has failed or is not installed.</td>
<td>Reassemble.</td>
<td>3.2, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The contact spring has failed.</td>
<td>Replace.</td>
<td>5.2</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Possible Cause</td>
<td>Solution</td>
<td>Ref. in Manual</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>6. Printing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The characters that are printed do not correspond to the keys that are pressed.</td>
<td>* The printwheel is not set properly, or is not installed. (The front plate is positioned incorrectly.)</td>
<td>Reassemble, replace, or press the CODE+W key. Adjust the positions.</td>
<td>Ref. to operating instructions 4.4.2, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The home position for the selection motor is not set correctly.</td>
<td>Adjust the setting.</td>
<td>3.3, 4.4.2, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The hammer position is incorrect.</td>
<td>Adjust the positions.</td>
<td>3.4, 4.4.3, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The wrong ROM (control PCB:999-32300), program (CPU for control PCB:999-35810), country setting, or printwheel is being used.</td>
<td>Reassemble, adjust, or replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td>The top and bottom halves of characters differ in intensity or are missing altogether.</td>
<td>* The ribbon base stopper, adjustment plate, or rail slide is positioned incorrectly.</td>
<td>Adjust the positions.</td>
<td>4.4.4, 4.4.5, 5.5, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The ribbon cassette is used up.</td>
<td>Replace.</td>
<td>Ref. to operating instructions</td>
</tr>
<tr>
<td><strong>7. Correction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When making corrections, either the ribbon cassette base does not lift up or the correction is not made.</td>
<td>The connector (CN203) is not connected. The correction tape is not installed.</td>
<td>Connect the connector. Install the correction tape.</td>
<td>3.3, 3.6, 5.6</td>
</tr>
<tr>
<td></td>
<td>* Either the hammer position or the home position for the selection motor is incorrect.</td>
<td>Adjust the positions.</td>
<td>4.4.2, 4.4.3, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The correct cam, lift pin, or drive ratchet has failed.</td>
<td>Replace.</td>
<td>4.4.5, 5.5</td>
</tr>
<tr>
<td></td>
<td>* The ribbon base stopper, adjustment plate, or rail slide is positioned incorrectly.</td>
<td>Adjust the positions.</td>
<td>4.4.4, 4.4.5, 5.5, 5.6</td>
</tr>
<tr>
<td></td>
<td>* The ribbon motor has failed.</td>
<td>Replace.</td>
<td>3.3, 5.6</td>
</tr>
<tr>
<td></td>
<td>* IC (CPU, ROM, gate array, etc.) or TRA203 has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td></td>
<td>* The control PCB has failed.</td>
<td>Replace.</td>
<td>3.6, 5.2</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Possible Cause</td>
<td>Solution</td>
<td>Ref. in Manual</td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>8. Ribbon</strong>&lt;br&gt;The ribbon does not feed properly.</td>
<td>* The ribbon drive gear, drive ratchet, drive bevel gear, ribbon bevel gear, ribbon gear, or ribbon feed pole has failed.&lt;br&gt;* The rail slide is not positioned correctly.&lt;br&gt;* The ribbon base stopper is not positioned correctly.&lt;br&gt;* The ribbon packing has not been removed.&lt;br&gt;* The ribbon has been used up.&lt;br&gt;* The ribbon cassette has failed.&lt;br&gt;* The connector (CN203) is not connected.&lt;br&gt;* The ribbon motor has failed. IC (CPU, ROM, gate array, etc.), TRA203 (control PCB:999-32300) or TR212-215 (control PCB:999-35810) has failed.&lt;br&gt;* The control PCB has failed.</td>
<td>Reassemble or replace.&lt;br&gt;Adjust the position.&lt;br&gt;Adjust the position.&lt;br&gt;Remove the ribbon packing.&lt;br&gt;Replace.&lt;br&gt;Replace.&lt;br&gt;Connect the connector.&lt;br&gt;Replace.&lt;br&gt;Replace.</td>
<td>5.5, 4.4.4, 5.5, 4.4.5, 5.5, Ref. to operating instructions, 3.3, 5.2</td>
</tr>
<tr>
<td><strong>9. LCD</strong>&lt;br&gt;The LCD does not display anything.</td>
<td>* The connector (CN208 -CN210) is not connected.&lt;br&gt;* The LCD cable is not connected to the LCD.&lt;br&gt;* The LCD cable has failed.&lt;br&gt;* The LCD has failed.&lt;br&gt;* One of IC (CPU, ROM, gate array, etc.), R228 or R229 has failed.&lt;br&gt;* The control PCB has failed.</td>
<td>Connect the connector.&lt;br&gt;Connect the LCD cable.&lt;br&gt;Replace.&lt;br&gt;Replace.&lt;br&gt;Replace.&lt;br&gt;Replace.</td>
<td>3.5, 3.6, 5.1, 5.2, 3.5, 3.6, 5.1, 5.2, 3.5, 5.1, 5.2, 3.6, 5.2, 3.6, 5.2</td>
</tr>
</tbody>
</table>