dbx Equipped Direct Drive Cassette Deck with Peak Hold FL Meters, Solenoid Controls and Dolby Noise Reduction

RS-M270X
(Silver Face)
(Black Face)

This is the Service Manual for the following areas.
- For all European areas except United Kingdom.
- For United Kingdom.
- For Australia.

RS-M85 MECHANISM SERIES

Specifications

Track system: 4-track 2-channel stereo recording and playback
Tape speed: 4.8 cm/s
Wow and flutter: 0.035% (WRMS), ±0.1% (DIN)
Frequency response: Metal tape: 20 - 20,000 Hz
CrO2 tape: 20 - 19,000 Hz
Normal tape: 20 - 17,000 Hz
Dynamic range: 110 dB (at 1 kHz)
Max. input level: 10 dB or more improved with dbx in (at 1 kHz)
Signal-to-noise ratio: dbx in: 92 dB
Dolby NR in: 68 dB (above 5 kHz)
Dolby NR out: 58 dB (signal level = max. recording level, CrO2 type tape)
Fast forward and rewind time: Approx. 85 seconds with C-60 cassette tape

Inputs:
- MIC: sensitivity 0.25mV, input impedance 100kΩ
- LINE: sensitivity 60mV, input impedance 47kΩ

Outputs:
- LINE: output level 400mV, output impedance 2.5kΩ or less, load impedance 22kΩ
- HEADPHONES: output level 125mV, load impedance 8Ω

Bias frequency: 85 kHz
Motor: 2-motor system
- 1-FG servo controlled direct-drive DC motor
- 1-DC motor for reel-table drive
Heads: 2-head system
- 1-SX (Sendust Extra) head for record/playback
- 1-sendust/ferrite double-gap head for erase
Power requirement: AC: 110/125/220/240V, 50-60Hz
 presets power voltage 240V for Australia and United Kingdom
Power consumption: 30 W
Dimensions: 43.0 cm(W) x 9.8 cm(H) x 35.0 cm(D)
Weight: 6.2 kg

Specifications are subject to change without notice.
- The term dbx is a registered trademark of dbx Inc.
- 'Dolby' and the double-D symbol are trademarks of Dolby Laboratories.

Technics
Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan
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LOCATION OF CONTROLS AND COMPONENTS

- Tape Counter and Reset Button (tape counter)
- Cassette Holder
- Eject Button (eject)
- Power Switch [power (push on)]
- Headphones Jack (phones)
- Record Button with Record Indication Lamp
  [rec (○)]
- Rewind Button (rew) (REW)
- Stop Button [stop (■)]
- Playback Button with Playback Indication Lamp
  [PLAY (▶)]
- Fast Forward Button [FF (▶)]
- Pause Button with Pause Indication Lamp
  [pause (■)]
- Record Muting Button [rec mute (○)]
- Line Output Jacks (LINE OUT) (R-L)
- Line Input Jacks (LINE IN) (R-L)
- Fluorescent Meter
  Noise Reduction Selector Switch
  (Noise Reduction
  (Dolby NR • out • tape • disc))
- Input Level Controls
  (input level) (L → R)
- Microphone Jacks
  [mic (left • right)]
- Timer Start Switch (timer rec (□))
  ( □ off □ on)
- Input Selector (input select)
  (□ • line • mic)
- dbx Display Lamp (dBx)
- Output Level Control (output level)
- Tape Selector
  [tape select (normal • Fe-Cr • CrO2 • Metal)]
- Voltage Selector
  (VOLTAGE SELECTOR)
- Power Cord
- Remote-Control Connector
  (REMOTE CONTROL)
DISASSEMBLY INSTRUCTIONS

Fig. 1

(A) The head azimuth can be adjusted by removing the cassette lid.

Fig. 2

K (G) (H)

Fig. 3

(F) (E)

Fig. 4

J (I) (L) (M) (N)

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Procedure</th>
<th>To remove</th>
<th>Remove</th>
<th>Shown in fig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Case cover</td>
<td>• 4 screws (A)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1 → 2</td>
<td>Front panel</td>
<td>• Cassette lid (B)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 2 volume knobs (C)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 3 red screws (D)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 3 black screws (E)</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Bottom cover</td>
<td>• 7 red screws (F)</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1 → 2 → 4</td>
<td>Mechanism</td>
<td>• 2 red screws (G)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 1 red screw (H)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 4 red screws (I)</td>
<td>3, 4</td>
</tr>
<tr>
<td>5</td>
<td>1 → 2 → 5</td>
<td>FL meter</td>
<td>• 1 meter holder (J)</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>1 → 6</td>
<td>dbx circuit board</td>
<td>• 4 screws (K)</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>1 → 2 → 5 → 7</td>
<td>Control key switch circuit board</td>
<td>• 2 screws (L)</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>1 → 2 → 3 → 6 → 8</td>
<td>Main amp. circuit board</td>
<td>• 2 knobs (M)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 2 push button (N)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 2 nuts (O)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 2 screws (P)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Rotary selector (Q)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 6 screws (R)</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>1 → 2 → 4 → 9</td>
<td>Capstan motor circuit board</td>
<td>• 3 screws (S)</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 3 screws (T)</td>
<td>9</td>
</tr>
</tbody>
</table>
MEASUREMENT AND ADJUSTMENT METHODS
(WITHOUT dbx SYSTEM)

• CIRCUIT BOARDS AND ADJUSTMENT PARTS LOCATION

Fig. 1
MEASUREMENT AND ADJUSTMENT METHODS

NOTES: Keep good condition, set switches and controls in the following positions, unless otherwise specified.
- Make sure heads are clean.
- Make sure capstan and pressure roller are clean.
- Judgeable room temperature: 20 ± 5°C (68 ± 9°F)
- NR switch: OUT
- Tape selector: Normal
- Input selector: Line in
- Input level controls: Maximum
- Output level control: Maximum

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT &amp; ADJUSTMENT</th>
</tr>
</thead>
</table>
| Takeup tension | 1. Mount cassette torque meter on UNIT.  
2. Place UNIT into playback mode and read takeup torque.  
3. Measure several times and determine the mean value.  

   **Standard value: 35 ± 5 g-cm**  
4. If measured value is not within standard, adjust VR201 (Shown in fig. 1). |

<table>
<thead>
<tr>
<th>Head azimuth adjustment</th>
<th>L-CH/R-CH output balance adjustment</th>
</tr>
</thead>
</table>
| Condition:  
Playback mode  
Equipment:  
VTVM  
Oscilloscope  
Test tape (azimuth)  
... QZZCFM | 1. Make connections as shown in fig. 2.  
2. Playback the 8 kHz signal from the test tape (QZZCFM).  
Adjust screw (B) in fig. 3 for maximum output L-CH and R-CH levels.  
When the output levels of L-CH and R-CH are not at maximum at the same time, readjust as follows.  
3. Turn the screw (B) shown in fig. 3 to find angles A and C (points where peak output levels for left and right channels are obtained). Then, locate the angle B between angles A and C, i.e., z point where L-CH and R-CH output levels come together at maximum (Refer to figs. 3 and 4). |

<table>
<thead>
<tr>
<th>L-CH/R-CH phase adjustment</th>
<th>Tape speed accuracy</th>
</tr>
</thead>
</table>
| Condition:  
Playback mode  
Equipment:  
Digital electronic counter  
Test tape — QZZCWAT | 1. Test equipment connection is shown in fig. 7.  
2. Playback test tape (QZZCWAT 3,000 Hz), and supply playback signal to digital electronic counter.  
3. Measure this frequency.  
4. On the basis of 3,000 Hz, determine value by following formula:  
   Tape speed accuracy  
=  \[ \frac{f - 3,000}{3,000} \times 100 \% \]  
where, \( f = \) measured value  
5. Take measurement at middle section of tape.  

   **Standard value: ± 0.5%**  
6. If measured value is not within standard, adjust VR301. |

Tape speed fluctuation  
Make measurements in same manner as above (beginning, middle and end of tape), and determine the difference between maximum and minimum values and calculate as follows:  
Tape speed fluctuation  
=  \[ \frac{f_1 - f_2}{3,000} \times 100 \% \]  
\( f_1 = \) maximum value, \( f_2 = \) minimum value  

   **Standard value: Less than 0.3%**
**Playback frequency response**

Condition:
- Playback mode
- Tape selector ... Normal position

Equipment:
- VTVM
- Oscilloscope
- Test tape ... QZZCFM

1. Test equipment connection is shown in fig. 2.
2. Place UNIT into playback mode.
3. Playback the frequency response test tape (QZZCFM).
4. Measure output level at 12.5 kHz, 8 kHz, 4 kHz, 1 kHz, 250 Hz, 125 Hz, and 63 Hz, and compare each output level with the standard frequency 315 Hz, at LINE OUT.
5. Make measurement for both channels.
6. Make sure that the measured value is within the range specified in the frequency response chart.

**Adjustment method**

If the measured value decreases at high frequency range, as shown in fig. 9, P.C.B. connection points (A) (L-CH) and (A') (R-CH) should be shorted (See fig. 11).

**Compensation**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>4 kHz</th>
<th>6 kHz</th>
<th>8 kHz</th>
<th>10 kHz</th>
<th>12.5 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around</td>
<td>+0.1 dB</td>
<td>+0.2 dB</td>
<td>+0.5 dB</td>
<td>+1.0 dB</td>
<td>+1.5 dB</td>
</tr>
</tbody>
</table>

If the measured value increases at middle frequency range, as shown in fig. 10, P.C.B. connection points (B) (L-CH) and (B') (R-CH) should be shorted (See fig. 11).

**Compensation**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>700 Hz</th>
<th>1 kHz</th>
<th>2 kHz</th>
<th>4 kHz</th>
<th>10 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around</td>
<td>-0.1 dB</td>
<td>-0.2 dB</td>
<td>-0.5 dB</td>
<td>-0.6 dB</td>
<td>-0.8 dB</td>
</tr>
</tbody>
</table>

---

**Playback gain**

Condition:
- Playback mode
- Tape selector ... Normal position

Equipment:
- VTVM
- Oscilloscope
- Test tape ... QZZCFM

1. Test equipment connection is shown in fig. 2.
2. Playback standard recording level portion on test tape (QZZCFM 315 Hz), and using VTVM measure the output level at LINE OUT.
3. Make measurement for both channels.

**Standard value:** 0.4 V ± 1 dB (around 0.42 V: at test points TP3 (L-CH) and TP4 (R-CH))

**Adjustment**

1. If measured value is not within standard, adjust VR1 (L-CH), VR2 (R-CH) (See fig. 1 on page 3).
2. After adjustment, check “Playback frequency response” again.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT &amp; ADJUSTMENT</th>
</tr>
</thead>
</table>
| 1. Bias leakage | 1. Test equipment connection is shown in fig. 12.  
Condition:  
- Record mode  
- Input level controls ... MAX  
- Tape selector ... Metal position  
Equipment:  
- VTVM  
- Oscilloscope |
| 2. Press the record and playback buttons.  
3. Adjust tape coils L1 (L-Ch), L2 (R-Ch), so that measured value becomes minimum.  
4. Make adjustment for both channels. |
| 2. Erase current | 1. Test equipment connection is shown in fig. 13.  
2. Press the record and playback button, then measure voltage at test point 9.  
3. Determine erase current with the following formula:  
\[
\text{Erase current (A)} = \frac{\text{Voltage across both ends of RL67}}{1 (\Omega)}
\]  
4. If measured value is not within standard, adjust VR11. |
| Condition:  
- Record mode  
- Tape selector ... Metal position  
Equipment:  
- VTVM  
- Oscilloscope |
| 3. Overall frequency response | 1. Before measuring and adjusting, make sure of the playback frequency response (For the method of measurement, please refer to the playback frequency response).  
2. Test tape QZZCRA to be supplied after July 1980 has higher recording sensitivity in the middle and high frequency range. |
| Condition:  
- Record/playback mode  
- Tape selector  
- Normal position  
- CrO₂ position  
- Fe-Cr position  
- Metal position  
- Input level controls ... MAX  
Equipment:  
- VTVM  
- AF oscillator  
- ATT  
- Oscilloscope  
- Resistor (600Ω)  
- Test tape (reference blank tape)  
  - QZZCRA for Normal  
  - QZZCRK for CrO₂  
  - QZZCRY for Fe-Cr  
  - QZZCRZ for Metal |
| Note 1:  
This chart indicates the standard values for the new type of QZZCRA when in use.  
This chart indicates the standard values for the former type of QZZCRA when in use.  
The new type of QZZCRA is marked as shown in fig. 15. |
| Note 2:  
Overall frequency response adjustment by recording bias current  
On RS-M270, overall frequency response is adjusted with tape selector set at Normal.  
Recording equalizer is fixed.  
1. Make connections as shown in fig. 16.  
2. Input a 1kHz, -24 dB signal through LINE IN.  
Place the set in record mode.  
3. Fine adjust the attenuator to obtain 0.4 V LINE OUT output.  
- Make sure that the input signal level is -24 ± 4 dB with 0.4 V output voltage. |
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT &amp; ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>Set the tape selector to Normal, and load the test tape (QZZCR A).</td>
</tr>
<tr>
<td>5.</td>
<td>Adjust the attenuator to reduce the input signal level by 20 dB.</td>
</tr>
<tr>
<td>6.</td>
<td>Adjust the AF oscillator to generate 30 Hz, 40 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 4 kHz, 8 kHz, 10 kHz and 13 kHz signals, and record these signals on the test tape.</td>
</tr>
<tr>
<td>7.</td>
<td>Playback the signals recorded in step 6, and check if the frequency response curve is within the limits shown in the overall frequency response chart for Normal tapes (fig. 14). (If the curve is within the charted specifications, proceed to steps 8, 9 and 10.) If the curve is not within the charted specifications, adjust as follows:</td>
</tr>
</tbody>
</table>

**Adjustment A:**
When the curve exceeds the overall frequency response chart specifications (fig. 14) as shown in fig. 17.

![Fig. 17](image)

1) Increase bias current by turning VR9 (L-CH) and VR10 (R-CH). (See fig. 1 on page 3.)
2) Repeat steps 6 and 7 to confirm. (Proceed to steps 8, 9 and 10 if the curve is now within the charted specifications in fig. 14.)
3) If the curve still exceeds the specifications (fig. 14), increase bias current further and repeat steps 6 and 7.

**Adjustment B:**
When the curve falls below the overall frequency response chart specifications (fig. 14) as shown in fig. 18.

![Fig. 18](image)

1) Reduce bias current by turning VR9 (L-CH) and VR10 (R-CH).
2) Repeat steps 6 and 7 to confirm. (Proceed to steps 8, 9 and 10 if the curve is now within the charted specifications in fig. 14.)
3) If the curve still falls below the charted specifications (fig. 14), reduce bias current further and repeat steps 6 and 7.

8. Switch the tape selector to CrO₂, change test tape to QZZCRX, and record 30 Hz, 40 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 4 kHz, 8 kHz, 10 kHz and 14 kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for CrO₂ tapes (fig. 19).

9. Switch the tape selector to Fe-Cr, change test tape to QZZCPRY, and record 30 Hz, 40 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 4 kHz, 8 kHz, 10 kHz and 14 kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for Fe-Cr tapes (fig. 19).

10. Switch the tape selector to Metal, change test tape to QZZCRZ, and record 30 Hz, 40 Hz, 100 Hz, 200 Hz, 500 Hz, 1 kHz, 4 kHz, 8 kHz, 10 kHz and 14 kHz signals. Then, playback the signals and check if the curve is within the limits shown in the overall frequency response chart for Metal tapes (fig. 19).

11. Confirm that bias currents are approximately as follows when the tape selector is set at different positions.

- Read voltage on VTVM and calculate bias current by following formula:
  \[
  \text{Bias current (A)} = \frac{\text{Value read on VTVM (V)}}{10 \text{ (Ω)}}
  \]

- around 355μA (Normal position)
- around 360μA (Fe-Cr position)
- around 440μA (CrO₂ position)
- around 700μA (Metal position)

: measured at TP1 (L-CH) and TP2 (R-CH)
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT &amp; ADJUSTMENT</th>
</tr>
</thead>
</table>
| **1.** Overall gain | **1.** Test equipment connection is shown in fig. 20.  
**Condition:**  
- Record/playback mode  
- Input level controls ... MAX  
- Standard input level:  
  - MIC: ... $-72 \pm 4$ dB  
  - LINE IN: ... $-24 \pm 4$ dB  
**Equipment:**  
- VTVM  
- AF oscillator  
- ATT  
- Oscilloscope  
- Resistor (600\(\Omega\))  
- Test tape (reference blank tape)  
  → Q2Z606 for Normal  
  **2.** Place UNIT into record mode, and tape selector to Normal position.  
  **3.** Supply 1 kHz signal (−24 dB) from AF oscillator, through ATT to LINE IN.  
  **4.** Adjust ATT until monitor level at LINE OUT becomes 0.4 V.  
  **5.** Using test tape, make recording.  
  **6.** Playback recorded tape, and make sure the value at LINE OUT on VTVM becomes 0.4 V.  
  **7.** If measured value is not 0.4 V, adjust VR5 (L-CH), VR6 (R-CH) (See fig. 1).  
  **8.** Repeat from step 2. |
| **2.** Fluorescent meter | **1.** Test equipment connection is shown in fig. 20.  
**Condition:**  
- Record mode  
- Input level controls ... MAX  
- Output level control ... MAX  
- Tape selector ... Normal position  
**Equipment:**  
- VTVM  
- ATT  
- Oscilloscope  
- Resistor (600\(\Omega\))  
  **2.** As shown in fig. 21, connecting the base of Q28 and ground stops the oscillation of the astable multivibrator comprising Q28 and Q29.  
  **3.** Supply 1 kHz signal (−24 dB) to the LINE IN jack, then press the record button.  
  **4.** Adjust the ATT so that the output level at LINE OUT jack becomes 0.4 V (The input level at this condition is termed the standard input level).  
  **5.** Adjustment at “−20 dB”  
  - A. Adjust the ATT so that input level is −20 dB below standard recording level.  
  - B. Adjust VR13 so that the −20 dB segment lights up in the −20 ± 0.8 dB range (L-CH ONLY) (See fig. 22).  
  **6.** Adjustment at “0 dB”  
  - A. Adjust the ATT so that the output level at LINE OUT jack becomes 0.4 V. (The input level at this condition is termed the standard input level.)  
  - B. Adjust VR12 so that the +1 dB segment lights up in the 0 ± 0.2 dB range of the standard input level (See fig. 23).  
  **7.** Repeat twice between steps 5 and 6 above.  
  **8.** Adjust ATT and check that all segments light up when an input signal level is increased to 10 dB higher than the standard input level (See fig. 24). |
| **3.** Dolby NR circuit | **1.** Test equipment connection is shown in fig. 25.  
**Condition:**  
- Record mode  
- NR switch ... Dolby IN/OUT  
- Input level controls ... MAX  
**Equipment:**  
- VTVM  
- ATT  
- Oscilloscope  
- Resistor (600\(\Omega\))  
  **2.** Place UNIT into record mode, set the NR switch to OUT position and supply to LINE IN to obtain −35 dB (17.5 mV) at TP5 (L-CH), TP6 (R-CH) (frequency 5kHz).  
  **3.** Confirm that the value at Dolby IN position is 8.2 ± 2 dB greater than the value at Dolby OUT position of NR switch. |
OUTLINE OF dbx SYSTEM

In 1971, the dbx company of Massachusetts, U.S.A., succeeded in developing a logarithmic compression/expansion system for audio signals which extends across an extremely wide amplitude range and results in a very low distortion rate.

In this system, the dynamic range of the input signal is compressed to 1/2 its original level (measured in decibels), and then recorded. The recorded signal is then expanded (2x) prior to playback, in order to restore it to the original level. By this process, a dynamic range exceeding 100dB can be easily obtained by using an ordinary tape recorder.

This system is referred to as a decilinear noise reduction system, but is generally called the "dbx system", the name being derived from the dbx company.

• The features of the dbx system

1. A significant noise reduction (approximately 30dB or more) is obtained over the entire audible frequency range.

<table>
<thead>
<tr>
<th>Noise reduction mode</th>
<th>S/N ratio RS-M270X</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise reduction “OUT”</td>
<td>58dB</td>
<td>CrO₂ tape, peak level</td>
</tr>
<tr>
<td>Dolby NR “IN”</td>
<td>66dB</td>
<td>CrO₂ tape, peak level</td>
</tr>
<tr>
<td>dbx “IN”</td>
<td>92dB</td>
<td>CrO₂ tape, peak level</td>
</tr>
</tbody>
</table>

2. A great improvement in the dynamic range makes it possible to extend the range to 110dB (at 1kHz, CrO₂ tape).

3. The direct logarithmic method of compression and expansion protects against problems caused by level mismatching.

4. Even if phase distortion occurs in the signal transmission system, precise operation is maintained by means of the RMS level detector.

5. A low distortion rate is maintained throughout the frequency range.
   • Improvement of high frequency response. The dbx system solves the problem of deteriorated high frequency at higher input levels which is an inherent fault of cassette tape equipment. The response at approx. 8,000Hz at 10dB input is improved as much as 14dB. As a result, flatter response is obtained at both low and high input levels.

• Remarkable dynamic range of 110dB

About dynamic range:

The dynamic range refers to the output range of an audio transmission system, extending from the lowest recognizable level to the highest possible level produced. Dynamic range is one of the values used to express the degree of fidelity of an audio transmission system.
ENCODER

- The portion of the dbx system with compresses the volume level of the input signal by 1/2 (measured in decibels), before sending it to the recording system, is called the encoder.

1 INPUT BANDPASS FILTER (27Hz—20kHz)
To prevent pulse noise or other types of interference from causing erroneous operation of the dbx system, all signals outside the 27Hz—20kHz audio band range are eliminated here.

2 PRE-EMPHASIS
The high frequency range, where hiss noise is prominent, is emphasized here during recording. The end result is that, although the dbx system is effective in reducing noise across entire frequency band, noise in the high frequency range is reduced still more by this pre-emphasis circuitry.

3 VCA (voltage-controlled amplifier/attenuator)
This is an extremely important circuitry in the construction of the dbx system. In response to the incoming DC control voltage, the VCA varies the degree of amplification logarithmically in the same manner as the direct current, resulting in compression and expansion of the input signal's dynamic range.

4 RMS DETECTOR (RMS: root mean square)
This is an important element in the composition of the dbx system, because its circuitry generates a DC voltage (the voltage that controls the degree of amplification in the VCA) in proportion to the size of the input signal. It does this by detecting the root mean square value of the input signal, and then converting it to a DC voltage in proportion to the logarithm of the detected level. Errovereous operation due to phase shift is prevented by monitoring of the voltage level derived from the root mean square value.

5 WEIGHTING
To prevent the saturation level of the tape deck in high frequencies, this increases the RMS DETECTOR high frequency sensitivity and decreases the VCA high frequency gain. As a result, the linearity of the tape deck is enhanced in the high frequency range.

6 RMS FILTER (27Hz to 10kHz)
This filter cuts any signal other than 27Hz to 10Hz that mixes in input signals to prevent the RMS DETECTOR from malfunctioning. Those to be cut include an FM tuner STEREO PILOT signal, tape deck bias leakage, and record player motor rotational noise. In addition, the signal in the frequency range 27Hz to 10kHz passing through the BAND PASS FILTER is comparatively small in level variations when handled by the tape deck.
This ensures correct complementarity in the operation of the RMS DETECTOR and VCA during Encoding and Decoding.

ENCODER

- Compressing the dynamic range to 1/2 before recording, and then expanding it by 2x before playback produces the remarkable dynamic range of the dbx system.
- The dynamic range of cassette tape with a saturation level of +10dB and a noise level of ~45dB (such as Technics CQ6 position tape) is 55dB. Any sounds with a level greater than +10dB will result in considerable distortion, and any sounds less than ~45dB will be inaudible due to the effect of noise, making high-fidelity reproduction impossible.
- The dbx system, however, linearly compresses the input level by a ratio of 1/2 in decibels prior to recording it onto the tape. A +20dB sound is thus compressed to +10dB, a ~20dB sound is compressed to ~10dB, and a ~90dB sound is compressed to ~45dB.
- As a result, a signal with a dynamic range extending from ~90dB to +20dB (a 110dB dynamic range) can be contained within a range which extends from ~45dB to +10dB (a 55dB dynamic range). Recording onto a cassette tape with a 55dB dynamic range is then possible.
- Prior to playback, the exact opposite process occurs and the sound levels are expanded. The +10dB sound is restored to its original level of +20dB, the ~10dB sound is restored to ~20dB, and the ~45dB sound is restored to ~90dB.
- Therefore, the basic principle of the dbx system, as described above, is to compress the 110dB dynamic range by 1/2 to 55dB prior to recording, and then expand it (by 2x) prior to playback.

The BLOCK DIAGRAM OF dbx SYSTEM
MEASUREMENT AND ADJUSTMENT METHODS (FOR dbx SYSTEM)

- TROUBLESHOOTING CHART FOR dbx SYSTEM

The troubleshooting chart for the dbx system is shown in Fig. 1. Please follow the sequence of this chart for checking and repairing the dbx system.

The figures shown in each block indicate the page on which the checking method, adjustment or measurement is explained.
**ADJUSTMENT PARTS LOCATION OF dbx SYSTEM**

- ADJUSTMENT PARTS LOCATION OF dbx SYSTEM

**dbx SYSTEM CHECKING METHOD**

**NOTES:** Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Input selector: Line in
- Input level controls: Maximum
- Output level control: Maximum

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CHECKING METHOD</th>
</tr>
</thead>
</table>
| **Check for expansion/ compression** | Condition:  
Stop/record mode  
Input level controls: MAX  
Output level control: MAX  
Noise reduction selector: -dbx tape  
Equipment:  
VTVM  
AT  
RESISTOR (600Ω)  
Fig. 7 |
| **Check for compression** | Condition:  
Stop/record mode  
Input level controls: MAX  
Output level control: MAX  
Noise reduction selector: -dbx tape  
Equipment:  
VTVM  
AT  
RESISTOR (600Ω)  
Fig. 8 |
| **Check for standard level of dbx** | Condition:  
Stop/record mode  
Input level controls: MAX  
Output level control: MAX  
Noise reduction selector: -dbx tape  
Equipment:  
VTVM  
AT  
RESISTOR (600Ω)  
Fig. 9 |
| **Check for output signal distortion factor** | Condition:  
Stop/record mode  
Input level controls: MAX  
Noise reduction selector: -dbx tape  
Equipment:  
VTVM  
AT  
RESISTOR (600Ω)  
Distant meter  
Fig. 10 |

---

**SIGNAL WAVE FORMS AT INDIVIDUAL SECTIONS OF THE RMS DETECTOR CIRCUIT & VCA CIRCUIT (FOR OPERATION CHECK OF dbx SYSTEM)**

Figures 4 and 5 show the signal waveforms at pins of the major ICs when an input signal (1kHz, 300mV) shown in Fig. 3 is applied to the input terminals TP603 (L-CH) and TP604 (R-CH) of the dbx system.

**Measurement Method and condition**

1. Make the connections as shown in fig. 6, and apply 1kHz, -27dB signal from LINE IN, and set the noise reduction selector to dbx tape position.
2. Set the unit to record mode, adjust AT to so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.
**SYSTEM CHECKING METHOD**

**NOTES:** Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- **Input selector:** Line in
- **Input level controls:** Maximum
- **Output level controls:** Maximum

### ITEM: CHECKING METHOD

#### 1. Check for expansion/compression

**Condition:**
- Stop/record mode
- Input level controls — MAX
- Output level controls — MAX
- Noise reduction selector — disc/DBX tape
- **Equipment:**
  - VTVM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600Ω)

**Procedure:**
1. Make the connections as shown in fig. 7 and apply 1kHz — 27dB signal from LINE IN, and set the noise reduction selector to disc position.
2. Adjust ATT, increase input signal level by 10dB, and make sure the reading for VTVM increases by 20dB ± 1dB.
3. Adjust ATT, decrease the input signal level, and make sure that the reading for VTVM decreases by 20dB ± 1dB.

#### 2. Check for compression

**Condition:**
1. Make the connections as shown in fig. 8 and apply 1kHz — 27dB signal from LINE IN, and set the noise reduction selector to dbx tape position.
2. Set the unit to record mode.
3. Adjust ATT, increase input signal level by 10dB, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) increases by 5dB ± 1dB.
4. Adjust ATT, decrease the input signal level by 10dB, and make sure that the reading for VTVM at TP605 (L-CH) and TP606 (R-CH) decreases by 5dB ± 1dB.

### ITEM: CHECKING METHOD

#### 1. Check for standard level of dbx

**Condition:**
- Stop/record mode
- Input level controls — MAX
- Noise reduction selector — disc/DBX tape
- **Equipment:**
  - VTVM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600Ω)

**Procedure:**
1. Make the connections as shown in fig. 8 and apply 1kHz — 27dB signal from LINE IN, and set the noise reduction selector to dbx tape position.
2. Set the unit to record mode, adjust ATT so that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5dB.
3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5dB.

#### 2. Check for standard level of dbx in dbx Decode mode

**Condition:**
1. Make the connections as shown in fig. 8 and apply 1kHz — 27dB signal from LINE IN, and set the noise reduction selector to dbx tape position, and check as follows:
2. Set the noise reduction selector to disc position and adjust ATT so that the signal level at TP605 (L-CH) and TP606 (R-CH) becomes 300mV.
3. Make sure that the signal level at TP605 (L-CH) and TP606 (R-CH) is 300mV ± 0.5dB.

### ITEM: CHECKING METHOD

#### 1. Check for output signal distortion factor (Check for distortion factor of VCA)

**Condition:**
- Stop/record mode
- Input level controls — MAX
- Noise reduction selector — disc/DBX tape
- **Equipment:**
  - VTVM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600Ω)
  - Distortion meter

**Procedure:**
1. Make the connections as shown in fig. 9 and apply 1kHz — 27dB signal from LINE IN, and check as follows:
2. Set the noise reduction selector to disc position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.
3. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.2%
4. Next, adjust ATT to raise the output signal level by 5dB and measure the distortion of output factor at TP605 (L-CH) and TP606 (R-CH). Make sure that the distortion is less than 0.8%
5. Adjust ATT to set the output signal level at a level of 5dB lower than the dbx reference level (300mV), and measure the output signal distortion at TP605 (L-CH) and TP606 (R-CH) to check that it is less than 0.3%.

#### 2. Check for output signal distortion factor in dbx Encode mode

**Condition:**
1. The connection is the same as above, as is the input signal
2. Set the noise reduction selector to dbx tape position, and the unit to record mode.
3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300mV.
4. Measure the distortion factor of output signal at TP605 (L-CH) and TP606 (R-CH), and make sure that the distortion factor is less than 0.25%.

### ADJUSTMENT OF dbx SYSTEM

**NOTES:** When adjusting the circuit of the dbx system, be sure to perform the adjustments in the following order:
1. Adjustment of RMS detector
2. Adjustment of dbx standard level
3. Adjustment of output signal distortion factor

Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- **Input selector:** Line in
- **Input level controls:** Maximum

#### ADJUSTMENT

**Procedure:**
1. Make the connections as shown in fig. 10, and set the noise reduction selector to disc position.
2. Apply 50Hz — 27dB signal from LINE IN.
3. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300mV.
4. Measure the output signal at TP303 (L-CH) and TP304 (R-CH) shown in fig. 2) is at 100Hz sine wave.
5. If the output signal is not equal to the specifications shown in fig. 11, adjust VR603 (L-CH) and VR604 (R-CH) to make it equal.

**NOTE:**
- The voltage of the output signal after adjustment is about 0.8 to 1.1mVrms.
**Adjustment**

1. **Standard level adjustment in dbx Encode mode**
   1. Make the connection as shown in fig. 12 and apply 1 kHz - 27 dB signal from LINE IN and set the noise reduction selector to dbx tape position.
   2. Set up to record mode, adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV.
   3. Adjust VR607 (L-CH) and VR606 (R-CH) so that the output signal level at TP605 (L-CH) and TP606 (R-CH) becomes 300 mV ± 0.5 dB.

2. **Standard level adjustment in dbx Decode mode**
   1. Make the connection as shown in fig. 12 and apply 1 kHz - 27 dB signal from LINE IN and perform the following adjustments.
   2. Set the noise reduction selector to dbx position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300 mV.
   3. Adjust VR605 (L-CH) and VR603 (R-CH) so that the output signal level at TP605 (L-CH) and TP606 (R-CH) becomes 300 mV ± 0.5 dB.

3. **Adjustment of output signal distortion factor**
   1. Make the connection as shown in fig. 13 and apply 1 kHz - 27 dB signal from LINE IN and perform the following adjustments.
   2. Set the noise reduction selector to dbx position, and adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) becomes 300 mV.
   3. Adjust VR605 (L-CH) and VR602 (R-CH) so that the output signal distortion at TP605 (L-CH) and TP606 (R-CH) is minimized.
   4. Adjust ATT so that the signal level at TP603 (L-CH) and TP604 (R-CH) is 300 mV ± 0.5 dB.
   5. Adjust VR603 (L-CH) and VR606 (R-CH) so that output signal distortion at TP605 (L-CH) and TP606 (R-CH) is minimized.
   6. Repeat adjustments 2 through 5 until the distortion factor is minimized.

**Checking Procedure for Problems**

**Notes:** Find defective parts according to the circuit operation checking method given below, and use the results for your reference. Remember to adjust after repair. Keep good condition, set switches and controls in the following positions, unless otherwise specified.

- Input selector: Line in
- Tone level controls: Maximum

**Checking Method**

1. **Operation check of regulated power supply circuit in dbx circuit**
   - Equipment: DC volt meter
   - Oscilloscope

2. **Check of 9V voltage**
   1. Make the connection as shown in fig. 14 and make sure that the emitter voltage of Q445 is 9V ± 0.5V.
   2. Check of 9V voltage
   - Make the connection as shown in fig. 14 and make sure that the emitter voltage of Q447 is around 9V.
3. Check control circuit in dbx circuit
   Equipment:
   • DC voltmeter

THE END
### Circuit Board Diagram

#### Equivalent Circuit

**IC1, 2 NE845B**

**IC4 AN670**

#### REPLACEMENT PARTS LIST

**Important safety notice:**
Components identified by □ are special components mounted for safety. When replacing any of these components, use only manufacturer's specified replacement parts.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS**

- RS-M270X
- RS-M270X

---

**NOTES:**

- ERO: Carbon
- ERC: Metal oxide
- ERS: Ceramic
- ERS: Wirewound
- EW: Metal film
- EX: Polypropylene
- FAC: Film
- FG: Can
- FC: Glass
- FE: Paper
- FE: Teflon
- FG: Glass
- F: Polypropylene

---

**CAPACITORS**

- G: Glass
- H: Film
- H: Polypropylene
- H: Polyethylene
- H: Polyester

---

**RESISTORS**

- □: Special safety component

---

**TRANSISTORS**

- □: Special safety component

---

**ELECTRODES**

- □: Special safety component

---

**DIODES**

- □: Special safety component

---

**MALL ELEMENTS**

- □: Special safety component

---

**INTEGRAL CIRCUIT**

- □: Special safety component

---

**For all European areas**
IC201 (AN6251) equivalent circuit

Relationship of each operation mode with input/output

* Doesn't become "L" immediately even if playback button pushed; becoming "L" after a slight delay.
### MECHANICAL PARTS LOCATION

![Mechanical Parts Diagram]

### REPLACEMENT PARTS LIST

<table>
<thead>
<tr>
<th>Ref No.</th>
<th>Part No.</th>
<th>Part Name &amp; Description</th>
<th>Ref No.</th>
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<th>Part Name &amp; Description</th>
<th>Ref No.</th>
<th>Part No.</th>
<th>Part Name &amp; Description</th>
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</thead>
<tbody>
<tr>
<td>M1</td>
<td>QN2535</td>
<td>Head Base Plate</td>
<td>M2</td>
<td>QN2535</td>
<td>Screw 12-14-6</td>
<td>M3</td>
<td>QN2535</td>
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<td>M25</td>
<td>QN2535</td>
<td>Screw 12-14-6</td>
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</tbody>
</table>

### SPECIFICATION

- **Pressure of pressure roller**: 400 ± 50 g
- **Max and min max**: 0.5% 
- **Test (load)**: QZ00201
- **Specification**: QZ00201

### NOTES

- Replacements for parts are listed in order from top to bottom, left to right.
- The diagram includes various mechanical components and their respective part numbers.

---

**Diagram Information**

- **Dimensions**: 1179.0x830.0
- **Page**: 1

---

**Textual Content**

- **Replacement Parts List**
- **Specs**
- **Notes**
** Service Manual **

** Supplement-1 **

RS-M270X (Silver Face) (Black Face)

** DOLBY SYSTEM **

** RS-M85 MECHANISM SERIES **

- For [ ] mark areas, use this manual together with the service manual for model No. RS-M270X (Original) order No. ARD81030031C8-24.
- For [ ] mark areas, use this manual together with the service manual for model No. RS-M270X (Original) order No. ARD81020019C7-24.

** PARTS COMPARISON TABLE:**

Please revise the original parts list in the Service Manual (RS-M270X) to conform to the changes shown herein.

If new part numbers are shown, be sure to use them when ordering parts.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part Name &amp; Description</th>
<th>Former Type</th>
<th>New Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M35</td>
<td>Idler Assembly</td>
<td>QXi0101</td>
<td>QXi0118</td>
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<tr>
<td>M77</td>
<td>Record Spring</td>
<td>QBT1713</td>
<td>QBT1273</td>
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<td>Poly Washer</td>
<td>QBW2013</td>
<td>QBW2049</td>
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<tr>
<td>M112</td>
<td>Cushion (Added)</td>
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<td>QBW2026</td>
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</tbody>
</table>

** MECHANICAL PARTS LOCATION (ADDITION) **

*The term dbx is a registered trademark of dbx Inc.*

** Dolby ** and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.

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