RS-M24 MECHANISM SERIES

Specifications

Track system: 4-track 2-channel stereo recording and playback
Tape speed: 4.8 cm/s (1-7/8 ips.)
Wow and flutter: 0.045% (WRMS), ±0.13% (DIN)
Frequency response: Metal tape: 20 – 18,000 Hz
30 – 17,000 Hz ± 3 dB
CrO₂/Fe-Cr tape: 20 – 18,000 Hz
30 – 16,000 Hz ± 3 dB
Normal tape: 20 – 17,000 Hz
30 – 15,000 Hz ± 3 dB
Signal-to-noise ratio: Dolby NR in: 67 dB (above 5 kHz)
Dolby NR out: 57 dB (signal level = max. recording level, Fe-Cr/CrO₂ type tape)
Fast forward and rewind time: Approx. 90 seconds with C-60 cassette tape
Inputs: MIC: sensitivity 0.25 mV, input impedance 7.6 kΩ
applicable microphone impedance 400 Ω – 10 kΩ

Outputs: LINE; sensitivity 60 mV, input impedance 98 kΩ
LINE; output level 700 mV, output impedance
2.5 kΩ or less load impedance 22 kΩ over
HEADPHONE; output level 125 mV, load impedance 8/125Ω
Bias frequency: 75 kHz
Motor: Electrical control DC governor motor
Heads: 2-head system;
1-MX head for record/playback
1-sendust/ferrite double-gap head for erasure
Power requirements: AC: 110/125/220/240 V, 50-60 Hz
(240V: only for Australia)
Power consumption: 17 W
Dimensions: 43.0 cm(W) × 11.9 cm(H) × 27.0 cm(D)
Weight: 16-7/8”(W) × 4-3/4”(H) × 10-5/8”(D)
6 kg (13 lbs 3 oz)

Specifications are subject to change without notice.
* ‘Dolby’ and the double-D symbol are trademarks of Dolby Laboratories.
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</tr>
</tbody>
</table>

### LOCATION OF CONTROLS AND COMPONENTS

![Diagram of controls and components](image)

1. Power switch (power)
2. Cassette holder
3. Tape selector indicators (normal/CrO2/Metal/Fe-Cr)
4. Tape counter and Reset button (tape counter)
5. Microphone indicator (mic)
6. Dolby noise reduction indicator (Dolby NR)
7. Recording indicator (rec)
8. Recording level setting indicator (level sensor read-out)
9. FL (fluorescent level) meters
10. Headphones jack (phones)
11. Eject button (▲ eject)
12. Record button (● rec)
13. Rewind/Review button (◄◄ rew/rev)
14. Fast forward/Cue button (►► ff/cue)
15. Play button (► play)
16. Stop button (■ stop)
17. Pause button (II pause)
18. Record muting button (rec mute)
19. Dolby noise-reduction switch (Dolby NR)
20. Recording level variation button (level fine adjust [down/up])
21. Recording level detection indicator (search)
22. Recording level automatic setting button (autorec sensor [autorec level sensor])
23. Recording level setting complete indicator (level set)
24. Microphone jacks (L mic R)
25. Output level control (OUTPUT LEVEL)
26. Remote-control connector (REMOTE CONTROL)
27. Line output jacks (LINE OUT) (R・L)
28. Line input jacks (LINE IN) (R・L)
29. Tape selector (tape select [Metal/CrO2/normal]/[manual] [Fe-Cr/Metal])
30. Voltage selector (VOLTAGE SELECTOR)

(For Asia, Latin America, Middle East and Africa areas.)
# DISASSEMBLY INSTRUCTIONS

![Fig. 1](image1)  
![Fig. 2](image2)  
![Fig. 3](image3)  
![Fig. 4](image4)  
![Fig. 5](image5)  
![Fig. 6](image6)

<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 ..........</td>
<td>(A)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Bottom cover</td>
<td>• 4 red screws ......</td>
<td>(B)</td>
</tr>
<tr>
<td>3</td>
<td>1→3</td>
<td>Front panel</td>
<td>• Cassette lid ......</td>
<td>(C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 11 screws ..........</td>
<td>(D)</td>
</tr>
<tr>
<td>4</td>
<td>1→4</td>
<td>FL meter and FL meter circuit board</td>
<td>• 4 screws ..........</td>
<td>(E)</td>
</tr>
<tr>
<td>5</td>
<td>1→5</td>
<td>Equalizer circuit board</td>
<td>• 1 screw ..........</td>
<td>(F)</td>
</tr>
<tr>
<td>6</td>
<td>1→6</td>
<td>Power supply and digital volume control circuit board</td>
<td>• 3 red screws ......</td>
<td>(G)</td>
</tr>
<tr>
<td>7</td>
<td>1→4→7</td>
<td>Digital volume scaler circuit board</td>
<td>• 1 screw ..........</td>
<td>(H)</td>
</tr>
<tr>
<td>8</td>
<td>1→2→5→8</td>
<td>Main amp circuit board</td>
<td>• 2 red screws ......</td>
<td>(I)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 6 solder points ...</td>
<td>(J)</td>
</tr>
<tr>
<td>9</td>
<td>1→3→9</td>
<td>Mechanism unit</td>
<td>• 4 screws ..........</td>
<td>(K)</td>
</tr>
<tr>
<td>10</td>
<td>1→3→9→10</td>
<td>Operation button assembly</td>
<td>• Cassette holder ..</td>
<td>(L)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 2 screws ..........</td>
<td>(M)</td>
</tr>
</tbody>
</table>
DISASSEMBLY NOTES (MECHANISM UNIT)

- Precautions for removal of the motor
  When removing the motor, follow the procedure given below.
  1. Remove screw (A), and then detach flywheel retainer (M44) by pulling it in the direction of the arrow as in fig. 1.
  2. After removing screws (B), detach takeup belt (M78) and capstan belt (M76), and then sub chassis assembly (M72) can be removed. (fig. 1, 2)
  3. When screws (C) is removed after detaching fast forward belt (M77), motor assembly (M71) can be removed. (fig. 2)

Fast Forward Belt (M77) Screw (C)

Sub Chassis Assembly (M72) Fig. 2

- Head base plate (M57) and upper base plate (M83) removing procedure
  1. With screw (D) removed, head base plate pressure spring (M66) can be detached.
     In this case, take care not to lose steel ball (M65). (fig. 3)
  2. With head release spring (M68) removed, head base plate (M57) can be detached. (fig. 3, 4)
     In this case, take care not to lose steel ball (M65) and roller (M64). (fig. 4)
  3. After removing pressure roller release spring (M25), remove pressure roller assembly (M40). (fig. 4)
  4. Remove screw (E), and then upper base plate (M83) can be detached. (fig. 4)
• Mechanism section

1. For repair, measurement or adjustment with the mechanism removed from the unit be sure to ground the lower base plate of the mechanism.
2. For grounding, connect a extension cord to the mechanism's lower base plate and the lug terminal from earth plate-A (fig. 5).
3. Without grounding, the amplifier does not operate properly.

Fig. 5

ASSEMBLY INSTRUCTIONS

• Belt mounting

Check that each belt is free of damage or grease on the surface, after that, set the belt as illustrated, and mount it on the lower base plate (M84) after that, set the takeup belt (M78) on the fast forward connection pulley assembly (M82) (fig. 1).

Fig. 1

• Positioning the takeup reel table assembly

When installing the takeup reel table assembly, be sure to mount the auto-stop friction hub (shown in fig. 3), as illustrated in fig. 2.
If the takeup reel table is positioned incorrectly at any place other than that shown in fig. 2, the auto-stop mechanism remains operative at all times.

Fig. 2

• Mounting the operation button assembly

Before mounting the operation button assembly on the mechanism body, be sure to lift the main control lever in the direction of the arrow using a screwdriver, as shown in fig. 4, until it locks in place.
If it is not mounted in this manner, the hub of the playback button assembly during playback catches on the main control lever, making it impossible to release playback mode.

Fig. 4
• How to install the flywheel retainer

1. Insert the thrust retainer into the hole (A) of the flywheel retainer as shown in fig. 5.
2. Hold the thrust retainer with the thumb as shown in fig. 6.
3. Engage the parts (B) and (C) of the flywheel retainer with the lower base plate as shown in fig. 7.
4. Shift down the flywheel retainer, supported at points (D), in the direction of the arrow as illustrated fig. 8.
5. Attach the screw (A) in the position as shown in fig. 1 on page 3.
OPERATING PRINCIPLE OF AUTOMATIC INPUT CHANGEOVER MECHANISM

This unit uses an automatic input changeover mechanism.
Automatic input changeover of this unit is built-in the MIC jack.
With the microphone plug inserted into the microphone jack, the mechanism automatically changes an input source from LINE IN to the MIC.

The automatic input changeover mechanism is simplified as shown in fig. 1.
With the microphone unplugged, the contact is positioned as shown in fig. 1, where an input source is at the LINE IN.
Inserting the microphone plug into the jack causes an automatic contact changeover (shown in fig. 2).
The input source is changed from the LINE IN to the MIC, turning on the transistor (Q5) to cause the LED (D620) to light up, thus indicating that the input has been changed from the LINE IN to the MIC.

NOTE:
Even the microphone plug is inserted into the jack of a single channel alone, an input source at both channels is changed to the microphone, and the microphone display LED (D620) lights up.
TECHNICAL INFORMATION
OF AUTO-REC SENSOR

The recording input control of this unit is of a digital control attenuator system based on the electronic circuitry. An ordinary tape deck using a manual variable resistor system monitors the peak level of input signal by a level meter for correct recording level setting.

In contrast, however, this unit is equipped with a function that can set the recording level automatically with a single touch of a button. Furthermore, fine adjustment is possible to any required recording level.

INPUT/OUTPUT CHARACTERISTICS OF AUTO-REC SENSOR

<table>
<thead>
<tr>
<th>LEVEL METER DISPLAY</th>
<th>OUTPUT LEVEL (LINE OUT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+2 dB</td>
<td>0.9 V (-1 dB)</td>
</tr>
<tr>
<td>0 dB</td>
<td>0.7 V (-3 dB)</td>
</tr>
<tr>
<td>-2 dB</td>
<td>0.56 V (-5 dB)</td>
</tr>
<tr>
<td>-4 dB</td>
<td>0.45 V (-7 dB)</td>
</tr>
<tr>
<td>-6 dB</td>
<td>0.36 V (-9 dB)</td>
</tr>
<tr>
<td>-8 dB</td>
<td>0.28 V (-11 dB)</td>
</tr>
<tr>
<td>-10 dB</td>
<td>0.23 V (-13 dB)</td>
</tr>
<tr>
<td>-12 dB</td>
<td>0.18 V (-15 dB)</td>
</tr>
<tr>
<td>-20 dB</td>
<td>0.07 V (-23 dB)</td>
</tr>
</tbody>
</table>

LEVEL SENSOR DISPLAY NUMBER

<table>
<thead>
<tr>
<th>LEVEL SENSOR DISPLAY NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

AMOUNT OF ATTENUATION (dB)

| 0 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 ∞ |

Working input operation range

Fig. 1 shows the record monitor output level at LINE OUT after operation of the Auto-Rec Sensor, with 1 kHz sine wave signal applied to LINE IN.

As shown in fig. 1, when the input level is less than the standard input level of LINE IN –24 dB, the output level decrease in proportion to the input. Also, the input applied is over +6 dB (2 V), no signal is generated on the output side. This is because the digital volume level is minimized by the Auto-Rec Sensor when the input is excessive.

Also, the Auto-Rec Sensor in the working input operation range is adjusted so that the amount of attenuation is automatically increased by 2 dB every time the input signal level increases by 2 dB, compared with the standard level as shown in fig. 1. For example, when –8 dB input signal, 16 dB higher than the standard recording level, is applied to LINE IN, it is automatically attenuated by 16 dB by the auto record level setting circuit. This causes the output level at LINE OUT to become 0.7 V (-3 dB). Displayed on the LEVEL SENSOR READ-OUT at this time is 7.

The output level after setting the recording level by the Auto-Rec Sensor, is in the range of 0.7 V – 0.9 V (Level meter display: 0 dB – +2 dB) as shown in fig. 1.
MEASUREMENT AND ADJUSTMENT METHODS

- Circuit boards and adjustment parts location

Fig. 1
- Screw (A) (for head position adjustment)
- Microphone jack circuit board

Fig. 2
- Rec-mute circuit board
- Recording level control SW circuit board
NOTES 1: Tape selector

This unit employs an auto tape select mechanism. This mechanism, as shown in fig. 3, automatically selects the circuits for metal/CrO₂/normal modes by using the tape detection holes provided above the cassette tape half. However, another type of test tape is not provided with these tape detection holes. Therefore, when it is necessary to change over the electric circuit to metal/CrO₂/normal/Fe-Cr mode for the measurement and adjustment, take the following measures according to the types of the test tapes.

Setting it to the metal tape mode:
- When the tape used is provided with metal tape mode detection hole, set the tape selector located at the back of the set to auto position (fig. 4).
- When the tape used is not provided with the metal tape detection hole, set the tape selector to metal-manual position (fig. 5).

Setting it to the normal tape mode:
- Set the tape selector located at the back of the set to auto position (fig. 4).

Setting it to the Fe-Cr tape mode:
- Set the tape selector located at the back of the set to Fe-Cr manual position (fig. 6).

Setting it to the CrO₂ tape mode:
- When the tape used is provided with CrO₂ tape mode detection hole, set the tape selector located at the back of the set to auto position (fig. 4).
- When the tape used is not provided with the CrO₂ tape detection hole, set the tape selector to auto position as shown in fig. 4, and pull out the 6 pin socket-⑧, and short-circuit the terminal of the 6 pin post-⑨ as shown in fig. 7, then the circuit is set to CrO₂ mode.

NOTES 2: 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)
- Dolby NR switch: OUT
- Tape selector: Auto position
- Output level control: Maximum
- Level fine adjust: Maximum
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MEASUREMENT &amp; ADJUSTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Head position adjustment</strong></td>
<td><em>(The head adjusting plate is provided to adjust the tape touch of the head in cue or review mode.)</em>&lt;br&gt;1. Press the playback button and pause button.&lt;br&gt;2. Measure the space between the pinch roller and the capstan.&lt;br&gt;<strong>Standard value</strong>: 0.5±0.3mm&lt;br&gt;3. If the measured value is not within the standard value, untighten screw (A), and slide the head adjusting plate in the direction of arrow (B) for adjustment (Fig. 8).</td>
</tr>
<tr>
<td><strong>Head azimuth adjustment</strong></td>
<td><strong>Record/playback head azimuth adjustment</strong>&lt;br&gt;1. Test equipment connection is shown in fig. 9.&lt;br&gt;2. Playback azimuth tape (QZZCFM 8kHz).&lt;br&gt;3. Adjust record/playback head angle adjustment screw (B) in fig. 10 so that output level at LINE OUT becomes maximum.&lt;br&gt;4. Measure both channels, and adjust levels for equal output.&lt;br&gt;5. After adjustment lock head adjustment screw with lacquer.&lt;br&gt;&lt;br&gt;<strong>Erase head azimuth adjustment</strong>&lt;br&gt;1. Test equipment connection is the same above but use the tape path viewer (QZZCRD) instead of test tape (QZZCFM).&lt;br&gt;2. Playback this tape.&lt;br&gt;3. Adjust screw (C) shown in fig. 11 so that the tape may not get curled or malformed by tape guide of the erase head.&lt;br&gt;4. After adjustment, lock head adjust screw with lacquer.</td>
</tr>
</tbody>
</table>
| **Tape speed**           | **Tape speed accuracy**<br>1. Test equipment connection is shown in fig. 12.<br>2. Playback test tape (QZZCWAT 3,000Hz), and supply playback signal to frequency counter.<br>3. Measure this frequency.<br>4. On the basis of 3,000Hz, determine value by following formula:<br>
   \[
   \text{Tape speed accuracy} = \left(\frac{f - 3,000}{3,000}\right) \times 100 \% \quad \text{where,} \; f = \text{measured value}
   \]
5. Take measurement at middle section of tape.<br>**Standard value**: ±1.5%<br><br>**Adjustment method**<br>1. Playback the test tape (middle).<br>2. Adjust so that frequency becomes 3,000Hz.<br>3. Tape speed adjustment VR shown in fig. 1.<br><br>**Note**: Please use non metal type screwdriver when you adjust tape speed accuracy on this unit. |
| **Playback frequency response** | **Tape speed fluctuation**<br>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:<br>
   \[
   \text{Tape speed fluctuation} = \left(\frac{f_1 - f_2}{3,000}\right) \times 100 \% \quad f_1 = \text{maximum value}, \; f_2 = \text{minimum value}
   \]
**Standard value**: Less than 1%<br><br>1. Test equipment connection is shown in fig. 9.<br>2. Place UNIT into playback mode.<br>3. Playback the frequency response test tape (QZZCFM).<br>4. Measure output level at 315Hz, 12.5kHz, 8kHz, 4kHz, 1kHz, 250Hz, 125Hz and 63Hz and compare each output level with the standard frequency 315Hz, at LINE OUT.<br>5. Make measurement for both channels. |
6. Make sure that the measured value is within the range specified in the frequency response chart (Fig. 13).

Adjustment method
1. If the measured value decreases at high frequency range, as shown in fig. 14, P.C.B. connection points (A) (L-CH) and (A) (R-CH) should be shorted (Fig. 18).
   Compensation value
   
<table>
<thead>
<tr>
<th>4kHz</th>
<th>6kHz</th>
<th>8kHz</th>
<th>10kHz</th>
<th>12.5kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around +0.1dB</td>
<td>around +0.2dB</td>
<td>around +0.5dB</td>
<td>around +0.8dB</td>
<td>around +1.2dB</td>
</tr>
</tbody>
</table>

2. If the measured value increases at high frequency range, as shown in fig. 15, P.C.B. connection points (A) (L-CH) and (A) (R-CH) should be opened (Fig. 18).
   Compensation value
   
<table>
<thead>
<tr>
<th>4kHz</th>
<th>6kHz</th>
<th>8kHz</th>
<th>10kHz</th>
<th>12.5kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around -0.1dB</td>
<td>around -0.2dB</td>
<td>around -0.5dB</td>
<td>around -0.8dB</td>
<td>around -1.2dB</td>
</tr>
</tbody>
</table>

3. If the measured value decreases at middle frequency range, as shown in fig. 16, P.C.B. connection points (B) (L-CH) and (B) (R-CH) should be opened (Fig. 18).
   Compensation value
   
<table>
<thead>
<tr>
<th>700Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>10kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around +0.1dB</td>
<td>around +0.2dB</td>
<td>around +0.5dB</td>
<td>around +0.6dB</td>
<td>around +0.8dB</td>
</tr>
</tbody>
</table>

4. If the measured value increases at middle frequency range, as shown in fig. 17, P.C.B. connection points (B) (L-CH) and (B) (R-CH) should be shorted (Fig. 18).
   Compensation value
   
<table>
<thead>
<tr>
<th>700Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>10kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>around -0.1dB</td>
<td>around -0.2dB</td>
<td>around -0.5dB</td>
<td>around -0.6dB</td>
<td>around -0.8dB</td>
</tr>
</tbody>
</table>

Fig. 18

Playback gain
Condition:
- Playback mode
- Normal tape mode
- Output level control → MAX
Equipment:
- VTVM
- Oscilloscope
- Test tape → QZZCFM

1. Test equipment connection is shown in fig. 9.
2. Playback standard recording level portion on test tape (QZZCFM 315Hz), and using VTVM measure the output level at LINE OUT.
3. Make measurement for both channels.
   Standard value: around 0.7V

Adjustment
1. If measured value is not standard, adjust VR1 (L-CH), VR2 (R-CH) (See fig. 1).
2. After adjustment, check “Playback frequency response” again.
1. Test equipment connection is shown in fig. 19.
2. Place UNIT into record mode and measure voltage at test point 7.
3. Determine current with the following formula:
   \[ \text{Current (A) = Voltage across both ends of \( R_{201} \)} \]
4. If measured value is not within standard, adjust \( R_{203} \).

**Standard value:** 95 ± 5 mA (Tape selector — Metal)

---

1. Test equipment connection is shown in fig. 21.
2. Set UNIT into record mode, and normal tape mode.
3. Read voltage on VTVM and calculate bias current by following formula:
   \[ \text{Bias current (A) = Value read on VTVM (V)} \times (100) \]
4. If measured value is not within standard, adjust \( R_{202} \) (L-Ch), and \( R_{203} \) (R-Ch).
5. Set the tape selector to each position.
6. Note that the measured value is within standard.

**Standard value:** around 360 \( \mu \)A (Normal tape mode)

---

**Note 1:**
Before measuring and adjusting, make sure (one of the playback frequency response for the method of measurement, please refer to the playback frequency response).

**Note 2:**
Test tape QZQ2R to be supplied after July 1980 has higher recording sensitivity in the middle and high frequency range.

- This chart indicates the standard values for the new type of QZQ2R when in use.
- This chart indicates the standard values for the new type of QZQ2R when in use.

**Former type**
**New type**

---

**Overall gain**
1. Test equipment connection is shown in fig. 22.
2. Place UNIT into record mode, and normal tape mode.
3. Supply 1 kHz audio (10 dB) from AF oscillator, through ATT to LINE IN.
4. Adjust ATT until gain level is -20 dB below readout and high frequency at 1 kHz.

**Equipment:**
- VTVM
- AF oscillator
- ATT
- Resistor (600 \( \Omega \))

**Overall frequency response chart (Normal)**

---

**Dolby B**
1. Place tacetape (with Dolby B mark)
2. Place UNIT into record mode, and normal tape mode.
3. Supply 1 kHz audio (10 dB) from AF oscillator, through ATT to LINE IN.
4. Adjust ATT until gain level is -20 dB below readout and high frequency at 1 kHz.

**Equipment:**
- VTVM
- AF oscillator
- ATT
- Resistor (600 \( \Omega \))

**Overall frequency response chart (Fe-Cr, Co-Cr, Metal)**

---

**Digital control**
1. Set UNIT into each tape mode.
2. Measure as same as manner from 1st to 3rd.
3. Make sure that the measured value is within standard.

**Note:**
For the measurement of bias current measurement, refer to **Bias current adjustments** on page 12.

**Fluorescent meter**
1. Test equipment connection is shown in fig. 22.
2. Set the bias current to 0.7 V.
3. Supply 1 kHz audio (10 dB) from AF oscillator, through ATT to LINE IN.
4. Adjust ATT until gain level is -20 dB below readout and high frequency at 1 kHz.

**Equipment:**
- VTVM
- AF oscillator
- ATT
- Resistor (600 \( \Omega \))
### Measurement & Adjustment

1. Test equipment connection is shown in fig. 22.
2. Place the test tape (Q22CRA) in the cassette holder.
3. Set UNIT into record mode and normal tape mode.
4. Supply 1 kHz signal from AF oscillator through ATT to LINE IN.
5. Adjust ATT so that input level is −20 dB below standard recording level (standard recording level = 0 VU).
6. At this time, LINE OUT level indicates 0.7 V.
7. Record each frequency 50 Hz, 70 Hz, 600 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 10 kHz (14 kHz for CrO2, Fe-Cr).
8. Playback and express in db the difference between playback output level of each frequency based on playback output level of 1 kHz.
9. Make sure that the measured value is within the range specified in the overall frequency response chart shown in fig. 24.
10. Change test tape to FeCr (Q22CR1), CrO2 (Q22CRA), and Metal (Q22CRA).
11. Set UNIT into each tape mode.
12. Measure as same as manner from step (3) to step (8).
13. Make sure that the measured value is within the specified range in the overall frequency response chart for FeCr, CrO2, and Metal tape shown in fig. 25.

#### Adjustment — Using bias current

1. When the frequency response between the middle and high-frequency range becomes higher than the standard value, as shown by the solid line in fig. 26, increases the bias current by turning VR03 (L-CH), VR02 (R-CH).
2. When it becomes lower, as shown by dotted line, reduce the bias current by turning VR03 (L-CH), VR02 (R-CH).

### Overall Gain

**Condition:**
- Record/playback mode
- Normal tape mode
- Level line adjust — MAX
- Output level control — MAX
- Standard input level: MIC — 2.5 ± 0.5 dB
- LINE IN — 2.5 ± 0.5 dB

- Equipment:
  - VTM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600 Ω)

- Test tape: Reference blank tape

For the method of bias current measurement, refer to "Bias current adjustment" on page 12.

### Digital Input Level Controller

**Condition:**
- Record mode
- Level line adjust
- Indication number "3" and "15"

- Equipment:
  - VTM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600 Ω)
  - DC voltmeter

For the method of bias current measurement, refer to "Bias current adjustment" on page 12.

### Dolby NR Circuit

**Condition:**
- Record mode
- Dolby NR switch — IN/OUT
- Level line adjust — MAX

**Equipment:**
- VTM
- AF oscillator
- ATT
- Oscilloscope
- Resistor (600 Ω)

**Notes:**
- The adjustment of this circuit is performed by applying about 125 V, 26 dB higher than the standard recording level (−24 ± 3 dB), and the input signal of about 0.3 V, 2.8 dB higher than the standard recording level to LINE IN.

### Dolby NR Circuit

**Condition:**
- Dolby NR switch — IN/OUT
- Supply to LINE IN to obtain −34 ± 3 dB at TP9 (L-CH), TP10 (R-CH) (frequency 5 kHz).

**Notes:**
- Confirm that the value at IN position is 8.1 ± 2.5 dB greater than the value at OUT position of Dolby NR switch.

### Overall Gain

**Condition:**
- Record/playback mode
- Normal tape mode
- Level line adjust — MAX
- Output level control — MAX
- Standard input level: MIC — 2.5 ± 0.5 dB
- LINE IN — 2.5 ± 0.5 dB

- Equipment:
  - VTM
  - AF oscillator
  - ATT
  - Oscilloscope
  - Resistor (600 Ω)

- Test tape: Reference blank tape

For the method of bias current measurement, refer to "Bias current adjustment" on page 12.

### Digital Input Level Controller

**Condition:**
- Record mode
- Level line adjust
- Indication number "3" and "15"

**Equipment:**
- VTM
- AF oscillator
- ATT
- Oscilloscope
- Resistor (600 Ω)
- DC voltmeter

**Notes:**
- The adjustment of this circuit is performed by applying about 125 V, 26 dB higher than the standard recording level (−24 ± 3 dB), and the input signal of about 0.3 V, 2.8 dB higher than the standard recording level to LINE IN.
- Normally, the output of the oscillator is adjusted so that the output from the attenuator is 1 V when the attenuator is set to 0 dB.
- However, this does not generate an output higher than 1 V and requires the output of the oscillator to be increased by 10 dB.
- In this case, the output level from the attenuator is around 3.2 V (fig. 32).

**Test equipment connection is shown in fig. 33.

1. Place the test tape in the cassette holder.
2. Press the test button and then the button.
3. Push the level line adjust button so that the level sensor read-out display is "15".
4. Supply 1 kHz signal from AF oscillator, through ATT to LINE IN.
5. Adjust ATT until monitor level at LINE OUT level becomes 0.7 V.
6. The attenuation of ATT at this time is the standard recording level.

Since the output level of the AF oscillator has been increased by 10 dB, the attenuation of ATT is set at around 34 dB.

**Notes:**
- Apply 1 kHz signal around 1.25 V, 26 dB higher than the standard recording level to LINE IN.
- (Apply it simultaneously to LEFT and RIGHT channels.)
- Push the level line adjust button so that the level sensor read-out display is "15".
- Connect the DC voltmeter or oscilloscope (DC display) to TP11 (fig. 34).

**Notes:**
- Slowly turn VR02 clockwise and stop it when the DC voltmeter displays change from L (10 V) to H (about 50 V).
- Next, apply 1 kHz signal around 0.08 V, 2.8 dB higher than the standard recording level, to LINE IN.
- Push the level line adjust button so that the level sensor read-out display is "15".
- Slowly turn VR02 counter-clockwise and stop it when the potential of TP11 changes from L to H.
- Repeat steps (6) to (9) above several times.
ELECTRICAL PARTS LOCATION

NOTE: A indicates that only parts specified by the manufacturer be used for safety.

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<th>Ref. No.</th>
<th>Part No.</th>
<th>Part Name &amp; Description</th>
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<td>Group Head</td>
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ELECTRICAL PART

- **Notes:**
  - A: For Asia, Latin America, Middle East and Africa areas.
  - B: For Australia.
  - C: For PX.