Roland
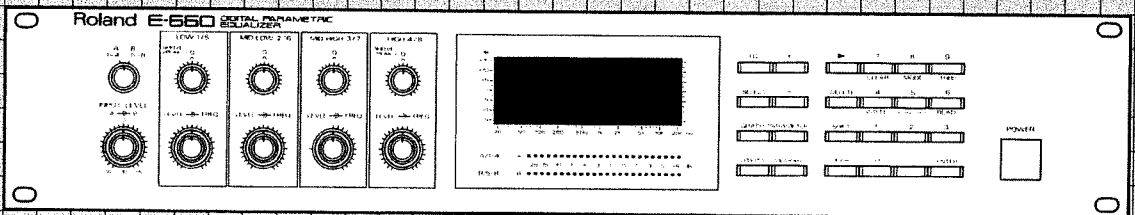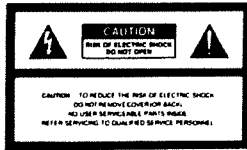
MIDI

DIGITAL PARAMETRIC EQUALIZER E-660

OWNER'S MANUAL

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of un-insulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

INSTRUCTIONS PERTAINING TO A RISK OF FIRE, ELECTRIC SHOCK OR INJURY TO PERSONS.

IMPORTANT SAFETY INSTRUCTIONS

WARNING When using electric products, basic precautions should always be followed, including the following;

1. Read all the instructions before using the product.

2. To reduce the risk of injury, close supervision is necessary when a product is used near children.

3. Do not use this product near water- for example, near a bathtub, washbowl, kitchen sink, in a wet basement, or near a swimming pool, or the like.

4. This product should be used only with a cart or stand that is recommended by the manufacture.

5. This product, either alone or in combination with an amplifier and headphones or speakers, may be capable of producing sound levels that could cause permanent hearing loss.
Do not operate for a long period of time at a high volume level or at a level that is uncomfortable. If you experience any hearing loss or ringing in the ears, you should consult an audiologist.

6. The product should be located so that its location or position does not interfere with its proper ventilation.

7. The product should be located away from heat sources such as radiators, heat registers or other products that produce heat.

8. The product should avoid using in where it may be effected by dust.

9. The product should be connected to a power supply only of the type described in the operating instructions or as marked on the product.

10. The power-supply cord of the product should be unplugged from the outlet when left unused for a long period of time.

11. Do not tread on the power-supply cord.

12. Do not pull the cord but hold the plug when unplugging.

13. When setting up with any other instruments, the procedure should be followed in accordance with instruction manual.

14. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

15. The product should be serviced by qualified service personnel when:

A: The power-supply cord or the plug has been damaged; or
B: Objects have fallen, or liquid has been spilled into the product; or
C: The product has been exposed to rain; or
D: The product does not appear to operate normally or exhibits a marked change in performance; or
E: The product has been dropped, or the enclosure damaged.

16. Do not attempt to service the product beyond that described in the user-maintenance instructions. All other servicing should be referred to qualified service personnel.

SAVE THESE INSTRUCTIONS

WARNING
THIS APPARATUS MUST BE EARTH GROUNDED.

The three conductors of the mains lead attached to this apparatus are identified with color as shown in the table below, together with the matching terminal on the UK type power plug. When connecting the mains lead to a plug, be sure to connect each conductor to the correct terminal, as indicated.
"This instruction applies to the product for United Kingdom."

MAINS LEADS		PLUG
Conductor	Color	Mark on the matching terminal
Live	Brown	Red or letter L
Neutral	Blue	Black or letter N
Grounding	Green-Yellow	Green, Green-Yellow, letter E or symbol

Bescheinigung des Herstellers /Importeurs

Hiermit wird bescheinigt, daß der/die/das
ROLAND DIGITAL PARAMETRIC EQUALIZER E-660
(Gerat, Typ Bezeichmung)

in Ubereinstimmung mit den Bestimmungen der
Amtsbl. Vfg 1046 / 1984
(Amtsblatterfugung)

funk-entstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerates angezeigt und die Berechtigung zur Überprufung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Roland Corporation Osaka / Japan
Name des Herstellers/Importeurs

RADIO AND TELEVISION INTERFERENCE

"Warning – This equipment has been verified to comply with the limits for a Class B computing device pursuant to Subpart J, of Part 15, of FCC rules. Operation with non certified or non verified equipment is likely to result in interference to radio and TV reception.

The equipment described in this manual generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with our instructions it may cause interference with radio and television reception.

This equipment has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J, of Part 15, of FCC Rules. These rules are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by the following measure.

• Disconnect other devices and their input/output cables one at a time. If the interference stops, it is caused by either the other device or its I/O cable.
These devices usually require Roland designated shielded I/O cables. For Roland devices, you can obtain the proper shielded cable from your dealer. For non Roland devices, contact the manufacturer or dealer for assistance.

If your equipment does cause interference to radio or television reception, you can try to correct the interference by using one or more of the following measures:
• Turn the TV or radio antenna until the interference stops.
• Move the equipment to one side or the other of the TV or radio.
• Move the equipment farther away from the TV or radio.
• Plug the equipment into an outlet that is on a different circuit than the TV or radio. (That is, make certain the equipment and the radio or television set are on circuits controlled by different circuit breakers or fuses.)
• Consider installing a rooftop television antenna with coax-al cable lead in between the antenna and TV.

If necessary, you should consult your dealer or an experienced radio-television technician for additional suggestions. You may find helpful the following booklet prepared by the Federal Communications Commission:
'How to Identify and Resolve Radio TV Interference Problems.'
This booklet is available from the US Government Printing Office, Washington, D.C. 20402.
Stock No. 004 000 00345 4

Thank you for purchasing the Roland Digital Parametric Equalizer E-660. Read this owner's manual carefully to make the best use of the unit.

FEATURES

● The E-660 adopts the 16 bit A/D, 18 bit equivalent D/A convertion system and 28 bit parallel arithmatic DSP (digital signal processor) LSI, to allow a dynamic range of 94 dB and total harmonic distortion of under 0.015%.

● Featuring Digital Input and Output (Coaxial/Optical) sockets, the E-660 can be set up with a DAT (digital audio tape recorder) or CD player. Sampling frequency of 48 or 44.1kHz is automatically selected depending on the type of device connected to the Digital In socket.

● Up to 99 different effect settings can be written into memory.

● Featuring MIDI connectors, the effect programs on the E-660 can be changed by Program Change messages sent from an external MIDI device.

CONTENTS

■ PANEL DESCRIPTION

Front Panel

Select Button
EQ Button
"-" Button
"+" Button

Delete Button
▶ Button
Write Button
Clear Button
A/B-AB Button
Mode Button
Read Button
Thru Button

Channel/Band Selector Switch   Display

Parameter Control Knobs   Level Indicators
- ● Q
- ● FREQ   A/1-4
- ● LEVEL   B/5-8   Indicator

Input Level Control Knobs A/B

Enter   Power
Button Switch

"+/-" Button
Shift Button

Memory Button
Parameter Button
Utility Button
Graph Button

Ten Key Pad
(0-9, decimal)

Rear Panel

Digital Output Socket (OPTICAL)

Digital Input Socket (OPTICAL)

Digital In Selector Switch

Digital Output Socket (COAXIAL)

Digital Input Socket (COAXIAL)

Balanced Output Sockets
(XLR Connectors)

Balanced Input Sockets
(XLR Connectors)

Receptacle

Unbalanced Input Sockets
(Standard phone)

Unbalanced Output Sockets
(Standard phone)

LCD Contrast Knob

MIDI IN Socket

MIDI OUT Socket

MIDI THRU Socket

■ IMPORTANT NOTES

◇Power◇

● The appropriate power supply for this unit is shown on its name plate.
Please make sure that the line voltage in your country meets the requirement.

● Make sure that the unit is turned off before connecting the power plug to the socket.

● Please be sure to connect the power cord to the AC Inlet on this unit before connecting the power plug to the socket.

● When disconnecting the power plug from the socket, do not pull the cord but hold the plug to avoid damaging the cord.

● Avoid damaging the power cord.

● If the unit not to be used for a long period of time, unplug the cord from the socket.

● It is normal for this unit to become hot while being operated.

● Check this unit with your local Roland dealer if you want to use it in a foreign country.

◇Connections◇

● Before setting up this unit with other devices, turn this unit and all the other units off.

● Pin connection of the XLR type connector is standardized to the 1st pin–Ground, the 2nd pin–Cold and the 3rd pin–Hot is this unit.

◇Location◇

● Avoid this using device in extreme heat, humidity or where it may be affected by dust or vibration.

● When this device is mounted on a rack with other devices, allow plenty of air space around the rack for cooling.

● Do not place or drop anything heavy on the main unit or its power cable.

◇Memory Backup◇

● The unit features a memory Back-up system that retains the data even when switched off. The battery that supports the back-up circuit should be replaced every five years. Call for the Roland service station for the battery replacement. (The first replacement may be required before five years, depending on how much time had passed before you purchased the unit.)

● Although we do everything we can to protect your data during repairs, some times, especially when working on the memory itself or on a related area, some of your important data may be lost. Keep a separate record of all the data that you consider important. This can be done by writing it down on a sheet of paper.

① OUTLINE OF THE E-660

1. Signal Flow Chart
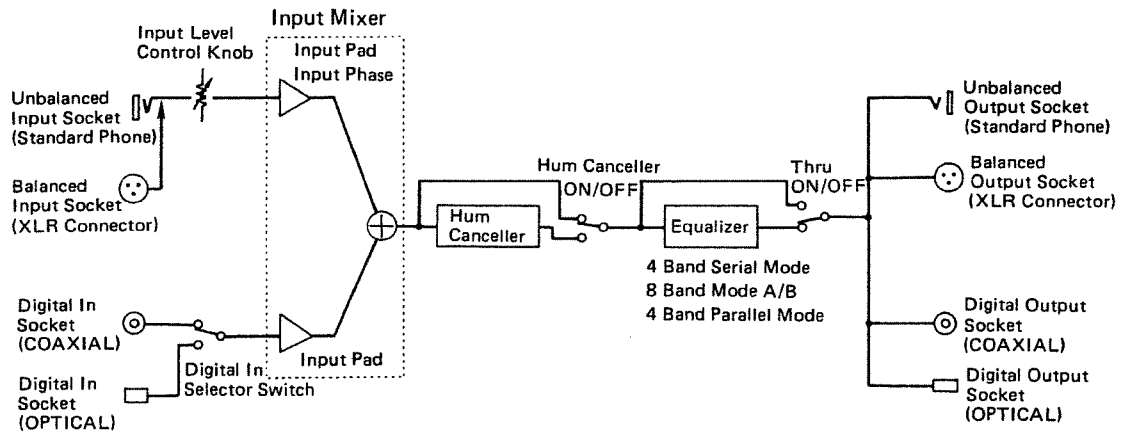
● Analog signals fed through the Analog Input sockets (Balanced/Unbalanced) are level-adjusted at the Input Level Knob then sent to the Input Mixer.

● Either of the digital signals fed through the Digital Input sockets (Coaxial/Optical) is selected at the Digital Input Selector Switch then sent to the Input Mixer.

● At the Input Mixer, the input signals fed through the Analog Input sockets and Digital Input sockets are level-adjusted then mixed. Signals fed through the Analog Input sockets can be select for Normal or Reverse Phase.

● The hum contents of the signals sent from the Input Mixer are removed at the Hum Canceller, then sent to the equalizer section, and finally output.

＊For about 6 seconds after the Digital In Selector Switch is changed, the muting circuits function, therefore no signal is output.

2. Equalizer Modes

The E-660 features Equalizer Modes as shown below:

● **4 Band Serial Mode**

Channel A o—— Pre-delay 0-500ms —— LOW (Shelving/Peaking) —— MID LOW —— MID HIGH —— HIGH (Shelving/Peaking) ——o Channel A

Channel B o—— Pre-delay 0-500ms —— LOW (Shelving/Peaking) —— MID LOW —— MID HIGH —— HIGH (Shelving/Peaking) ——o Channel B
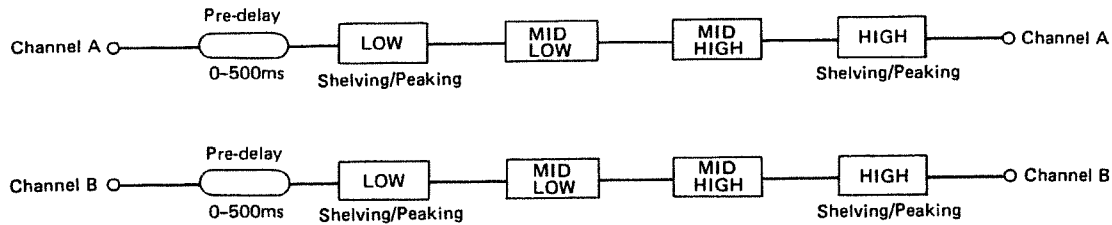
In this mode, the E-660 works as a 2 channel, 4 band equalizer, allowing you to set parameters separately for each channel.
The High and Low bands of each channel (A/B) can select Shelving or Peaking equalization.
The Pre-delay (maximum 500ms) can be set individually for each channel.

● **8 Band Mode A/8 Band Mode B**

8 Band Mode A

Channel A o—— Pre-delay 0-500ms —— 1 (Shelving/Peaking) — 2 — 3 — 4 — 5 — 6 — 7 — 8 (Shelving/Peaking) ——o Channel A

Channel B o—— Pre-delay 0-500ms ——o Channel B

8 Band Mode B

Channel A o—— Pre-delay 0-500ms ——o Channel A

Channel B o—— Pre-delay 0-500ms —— 1 (Shelving/Peaking) — 2 — 3 — 4 — 5 — 6 — 7 — 8 (Shelving/Peaking) ——o Channel B
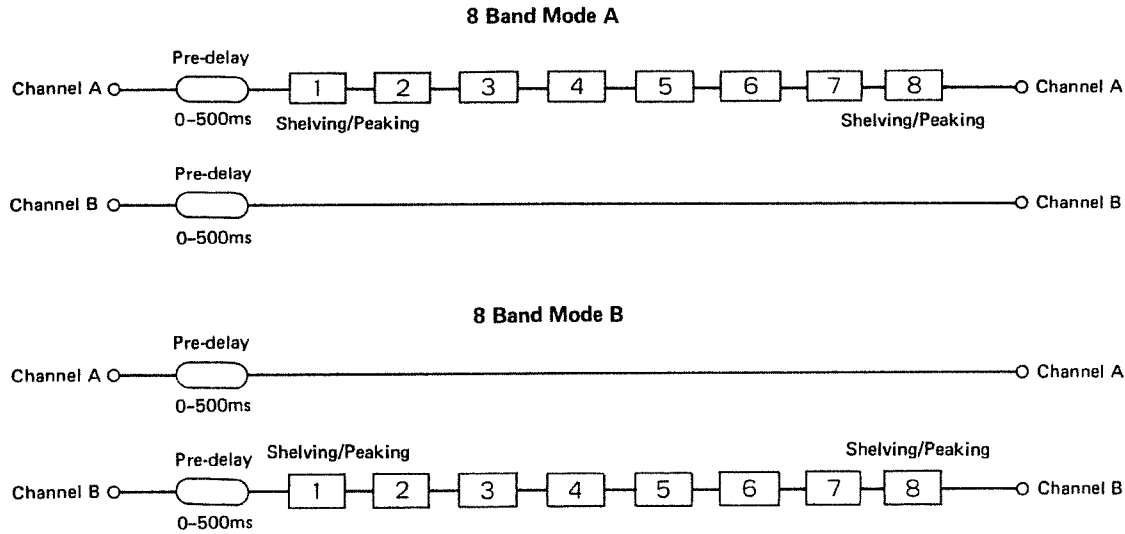
Only A or B channel works as an 8 band equalizer.
The bands 1 and 8 can select Shelving or Peaking equalization.
The Pre-delay (maximum 500ms) can be set individually for each channel.

● 4 Band Parallel Mode

Post-delay
0–99ms

	LOW
Channel A	MID LOW
Pre-delay	MID HIGH
0–500ms	HIGH	Channel A

	LOW
Channel B	MID LOW
Pre-delay	MID HIGH
0–500ms	HIGH	Channel B
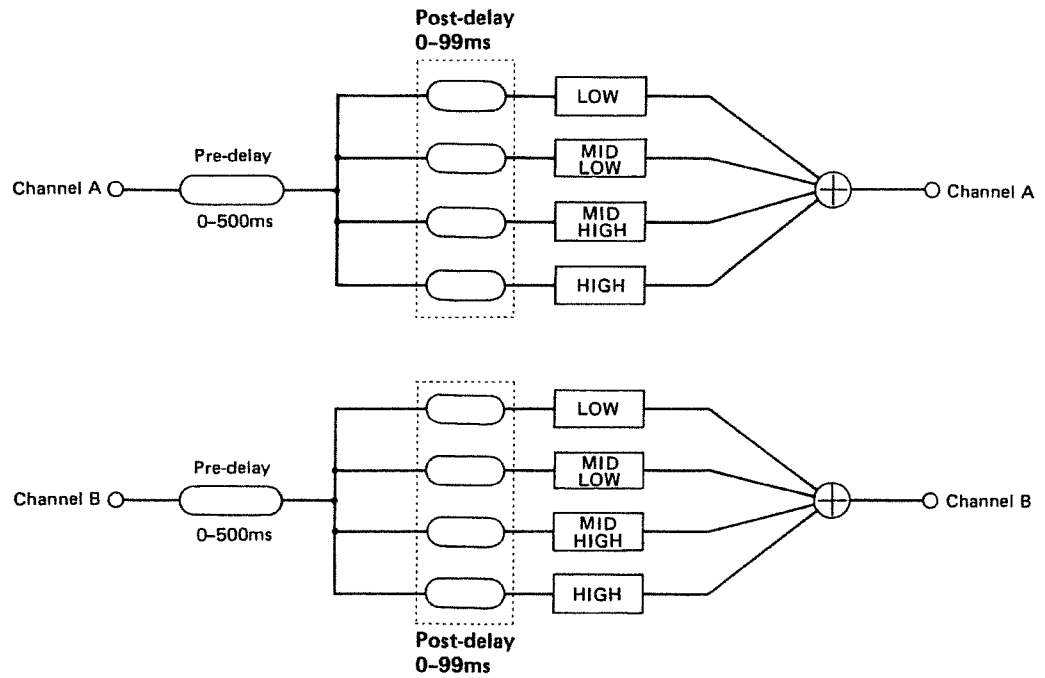
Post-delay
0–99ms

In this mode, the E–660 works as a 2 channel, 4 band, band–pass filter, allowing you to set parameters separately for each channel. The Pre–delay (maximum 500ms) and Post–delay (maximum 99ms) can be set individually for each channel.

7

[2] CONNECTIONS

● **Setup with a Mixer**
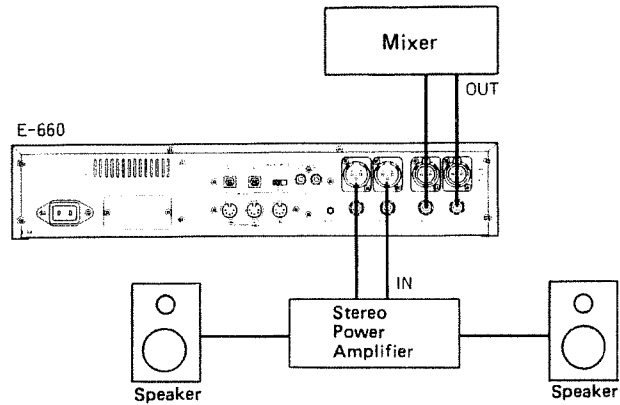
● **Setup with a CD (compact disk player), or DAT (digital audio tape-recorder) featuring a digital output.**

Connection using the Coaxial Cable   **Connection using the Optical Cable**
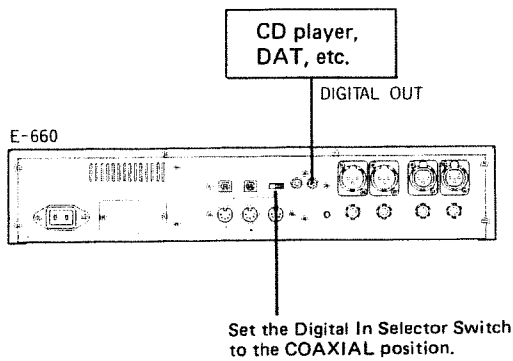
Set the Digital In Selector Switch
to the COAXIAL position.

Set the Digital In Selector Switch
to the OPTICAL position.

● **Cascading two E-660's**

Set the Digital In Selector Switch
to the COAXIAL position.
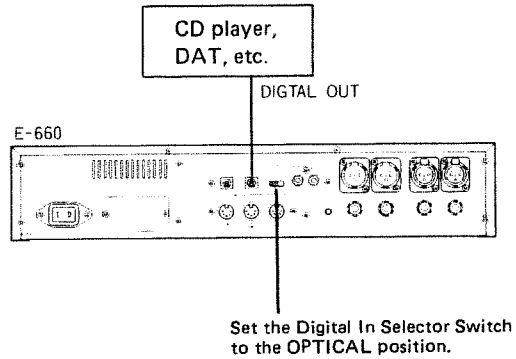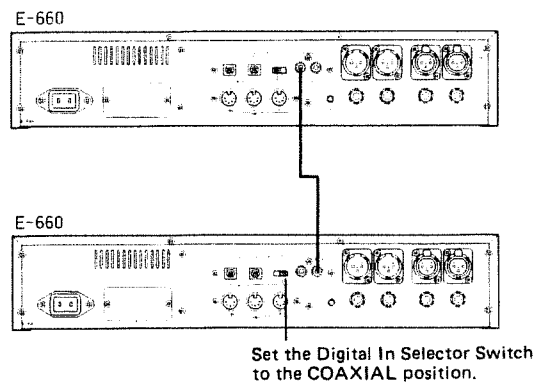
③ BASIC PROCEDURE

1. Power-up

When you have made all the necessary connections, switch the unit on.

```
Roland  E-660
Digital
Parametric
Equalizer
```

⬇

```
 LOW           4S  A
▶Q             2. 0 0
 Freq           5 0  Hz
 Level         0. 0  dB
```

✳At power-up, the E-660 shows the parameter setting display which was selected with the EQ Button before the E-660 was switched off.

✳For about six seconds after the unit is switched on, the muting circuits function, therefore, no signal is output.

The contrast of the Display can be controlled with the LCD Contrast Control Knob on the rear of the unit.

2. Adjusting the Input Level

● **When using Digital Equipment**

The input level of the signal fed through the Digital Input sockets can be controlled using the Input Pad in the Display.

PROCEDURE 1   Press the Utility Button until the Display responds as shown below.

```
┌─────────────────────────────────┐
│  I N P U T   P A D              │
│                                 │
│  ▶D I G I T A L   1 0 0   %     │
│  A N A L O G     1 0 0   %      │
└─────────────────────────────────┘
```

PROCEDURE 2   Using the Select Button, move the ▶ mark to "DIGITAL".

PROCEDURE 3   Specify the level value with the Ten Key Pad, and hit the Enter Button.

The Level Indicators indicate the higher level of the two signals, the input signal sent from the Input Mixer or the output signal of the equalizer. Adjust the input level so that the Level Indicator + 8dB (red) does not light.

(e. g.) Entering 60

Press the "6" key.

```
┌─────────────────────────────────┐
│  I N P U T   P A D              │
│                                 │
│  ▶D I G I T A L <    6 > %      │
│  A N A L O G     1 0 0   %      │
└─────────────────────────────────┘
```

Press "0" key.

```
┌─────────────────────────────────┐
│  I N P U T   P A D              │
│                                 │
│  ▶D I G I T A L <   6 0 > %     │
│  A N A L O G     1 0 0   %      │
└─────────────────────────────────┘
```

Press the Enter Button.

```
 INPUT  PAD


▶DIGITAL      60 %
 ANALOG      100 %
```
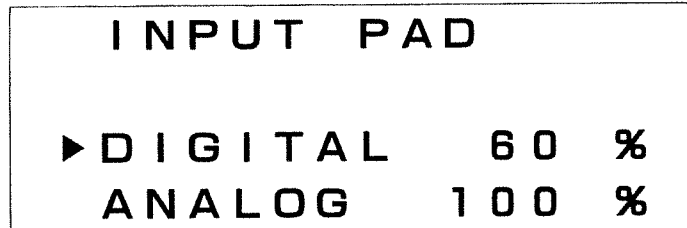
*If you specify any value exceeding 100, 100 will be entered instead.

*If you enter a wrong value, you can erase it using the Delete Button. To recall the previous value before you enter any value with the Ten Key Pad, erase all the numbers with the Delete Button, and press the Enter Button.

*Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

*You may hear click noise while adjusting the Input Pad in the Display, but there is nothing to worry about.

● **When using Analog Equipment**

The input level of the signals fed through the analog input sokcets can be controlled with the Input Level Knob. (Adjust the Input Pad, if necessary.)
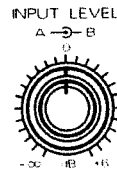
INPUT LEVEL
A ─◐─ B

PROCEDURE 1   Press the Utility Button until the Display responds as shown below.

```
 INPUT   PAD


▶DIGITAL     100 %
 ANALOG      100 %
```
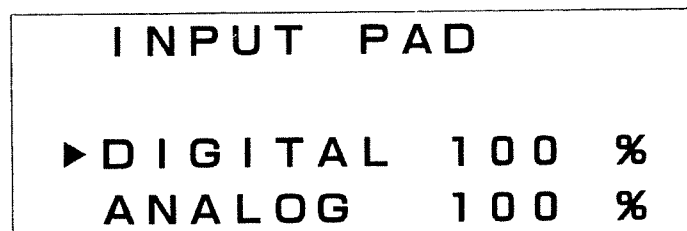
PROCEDURE 2   Using the Select Button, move the ▶ mark to "ANALOG".

PROCEDURE 3   Specify the level value with the Ten Key Pad, and hit the Enter Button.

The Level Indicators indicate the higher level of the two signals, the input signal sent from the Input Mixer or the output signal of the equalizer. Adjust the input level so that the Level Indicator + 8dB (red) does not light.

(e. g.) Entering 80

Press the "8" key.

```
┌─────────────────────────────┐
│     INPUT   PAD             │
│                             │
│   DIGITAL     60 %          │
│ ▶ANALOG  <    8 >%          │
└─────────────────────────────┘
```

Press the "0" key.

```
┌─────────────────────────────┐
│     INPUT   PAD             │
│                             │
│   DIGITAL     60 %          │
│ ▶ANALOG  <   80 >%          │
└─────────────────────────────┘
```

Press the Enter Button.

```
┌─────────────────────────────┐
│     INPUT   PAD             │
│                             │
│   DIGITAL     60 %          │
│ ▶ANALOG       80 %          │
└─────────────────────────────┘
```

*If you enter any value exceeding 100, 100 will be entered instead.

*If you enter a wrong value, you can erase it using the Delete Button. To recall the previous value before you enter any value with the Ten Key Pad, erase all the numbers with the Delete Button, and press the Enter Button.

*Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

3. Selecting an Equalizer Mode

This selects an equalizer mode which determines how to use the E-660.

PROCEDURE 1   While holding the Shift Button down, press the Mode Button.

PROCEDURE 2   Select an Equalizer Mode using the " + " and " − " Buttons.

```
┌─────────────────────────────────┐
│   ┌───────────────────────┐     │
│   │  MODE                 │     │
│   │                       │     │
│   │  4 BAND   SERIAL      │     │
│   └───────────────────────┘     │
│   ┌───────────────────────┐     │
│   │  MODE                 │     │
│   │                       │     │
│   │  8 BAND   A − CH       │     │
│   └───────────────────────┘     │
│   ┌───────────────────────┐     │
│   │  MODE                 │     │
│   │                       │     │
│   │  8 BAND   B − CH       │     │
│   └───────────────────────┘     │
│   ┌───────────────────────┐     │
│   │  MODE                 │     │
│   │                       │     │
│   │  4 BAND   PARALLEL    │     │
│   └───────────────────────┘     │
└─────────────────────────────────┘
```
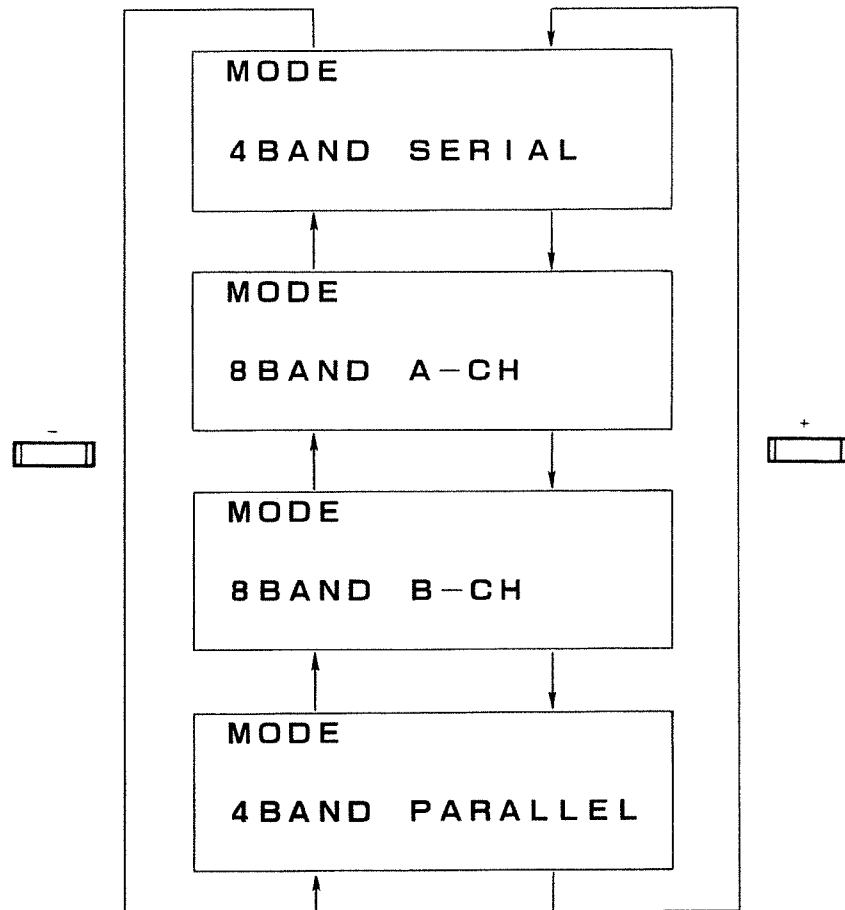
PROCEDURE 3   Press the EQ Button.

4. Equalizing

After selecting an Equalizer Mode, set the equalizer as follows: Press the EQ Button, and the Display shows the current equalizing condition. With the help of the Display, follow the equalizing procedure.

| Band | Equalizer Mode | Parameter Mode |

```
    LOW              4 S   A
  ▶ Q              2 . 0 0
    Freq             5 0   H z
    Level          0 . 0   d B
```

Parameters   Values
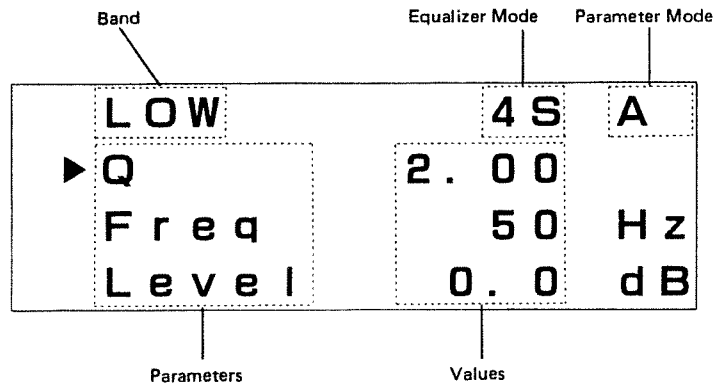
a. Channel/Band Selection

In the 4 Band Mode (Serial/Parallel), you can select channel (A or B to equalize) with the Channel/Band Selector Switch. In the 8 Band Mode, you can select bands (1–4 or 5–8) to equalize. The channel and band currently selected can be seen with the indicator at the lower left of the Display (A/1–4, B/5–8).

Switch	4 Band	8 Band
A/1–4	Channel A	Band 1–4
B/5–8	Channel B	Band 5–8

Channel/Band Selector Switch
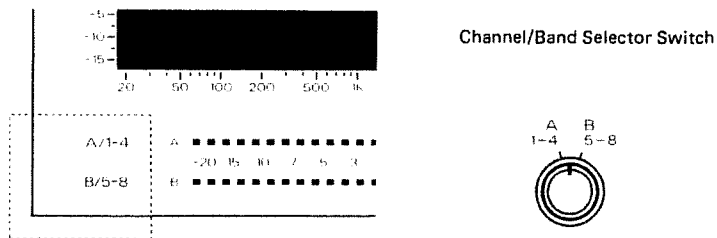
*When the parameter setting display (=after the EQ Button is pressed) or the graphic display is shown, the A/1–4 or B/5–8 Indicator changes according to the position of the Channel/Band Selector Switch. However, in any other display, the indication does not correspond to the switch position. To correct this, simply change the positions of the switch until they come to match.

b. Parameter Control

1) Parameter Control with the Parameter Control Knobs

Using the Parameter Control Knobs, the Q, frequency and level can be adjusted for each band. Moving a knob will change to the display of the corresponding band.

*Rotating the knob quickly may cause noise. Rotate it slowly.
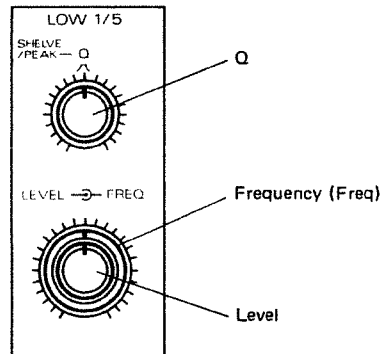
Q·········This curve controls the width of the frequency band.
Freq········This sets the center frequency where the level is changed.
Level········This sets the level of the specified frequency.

In the 4 Band Mode, each knob corresponds to the band as shown below:
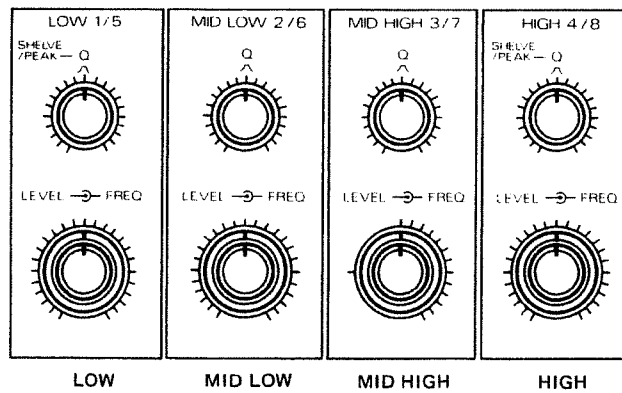
In the 8 Band Mode, each knob corresponds to the band as shown below:

LOW 1/5	MID LOW 2/6	MID HIGH 3/7	HIGH 4/8
SHELVE /PEAK — Q	Q	Q	SHELVE /PEAK — Q
LEVEL —Ə— FREQ	LEVEL —Ə— FREQ	LEVEL —Ə— FREQ	LEVEL —Ə— FREQ
Band 1 Band 5	Band 2 Band 6	Band 3 Band 7	Band 4 Band 8
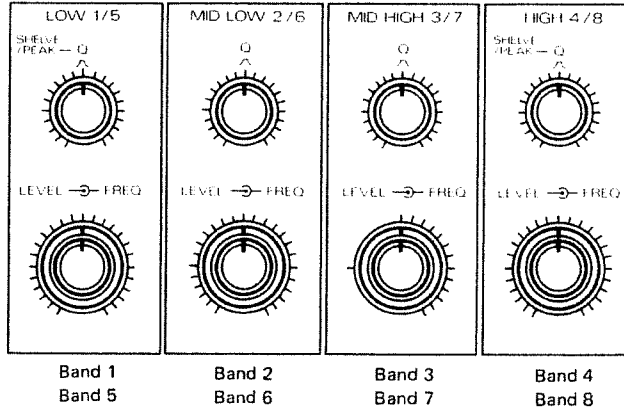
The variable ranges of the parameters which can be adjusted by Parameter Control knobs are as shown below:

8 Band	1, 2	3, 4	5, 6	7, 8
4 Band Serial 4 Band Parallel	LOW	MID LOW	MID HIGH	HIGH
Q	0.3 – 9.9	0.3 – 9.9	0.3 – 9.9	0.3 – 9.9
Frequency	30 Hz – 960 Hz	200 Hz – 6400 Hz	500 Hz – 16000 Hz	800 Hz – 20000 Hz
Level	–12 dB – +12 dB	–12 dB – +12 dB	–12 dB – +12 dB	–12dB– +12 dB

*When you have changed the display with the EQ Button or called an effect from memory (see page 27), the positions of the Parameter Control Knobs are not related to the actual values. Moving a knob even slightly cancels the current value and renew it with the position of the knob.

2) Value Entry with the Ten Key Pad

The value of each parameter can also be entered with the Ten Key Pad.

PROCEDURE 1   **Press the EQ Button until the band display you want is called.**

PROCEDURE 2   **Press the Select Button until the ▶ mark moves to the parameter to be set.**

Shift this using the Select Button

```
   L O W          4 S   A
▶  Q            2 . 0 0
   F r e q         5 0   H z
   L e v e l     0 . 0   d B
```

PROCEDURE 3   **Specify the value with the Ten Key Pad and press the Enter Button.**

✻ Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

✻ " + " or " − " can be specified using the " +/− " Button.

✻ If you enter a wrong value, you can erase it using the Delete Button. To recall the previous value before you enter any value with the Ten Key Pad, erase all the numbers with the Delete Button, and press the Enter Button.

✻ " + " and " − " marks cannot be erased with the Delete Button.

✻ If you press the "0" or Decimal Key first for a frequency value, it will be ignored, since it does not start with a zero or decimal.

✻ If a decimal has already been entered for the Q or Level value, pressing the Decimal Key will have no effect.

☆**Note on Ten Key Pad Entry**

● If you do not press the Enter Button after specifying a value with the Ten Key Pad, you cannot go to the next procedure.

● If you assign any value exceeding the variable range and press the Enter Button, a value within the range will be entered, instead.

● To correct a wrong number you have entered, use the Delete Button. Pressing the Delete Button erases a number.

● If you press the Enter Button after erasing all the numbers, the previous value (before you enter the value with the Ten Key Pad) will be retrieved.

c. Shelving/Peaking Selection

● In the 4 Band Serial Mode, the LOW and HIGH bands can be selected as Shelving or Peaking equalization.

● In the 8 Band Mode, the bands 1 and 8 can be selected as Shelving or Peaking equalization.

*In the 4 Band Parallel Mode, the Shelving type cannot be used.

Shelving and Peaking have the following characteristics:

•Peaking
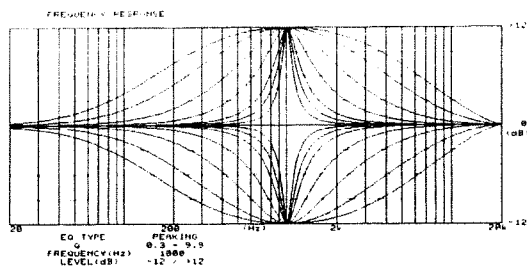
•Shelving
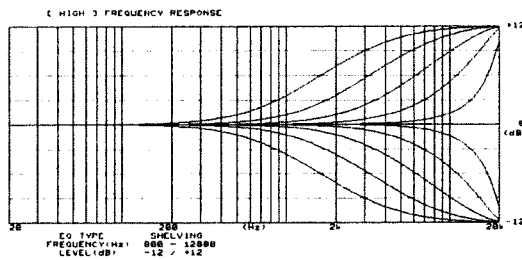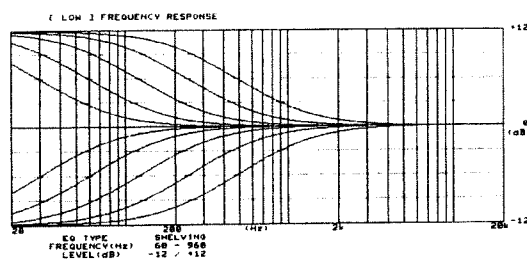
PROCEDURE   **Press the relevant Q Control Knob. (Pressing the knob alternately select the Shelving and Peaking.)**

LOW 1/5	MID LOW 2/6	MID HIGH 3/7	HIGH 4/8
SHELVE /PEAK — Q	Q	Q	SHELVE /PEAK — Q
LEVEL —⊙— FREQ	LEVEL —⊙— FREQ	LEVEL —⊙— FREQ	LEVEL —⊙— FREQ

4 Band Serial Mode	LOW	HIGH
8 Band Mode	1	8
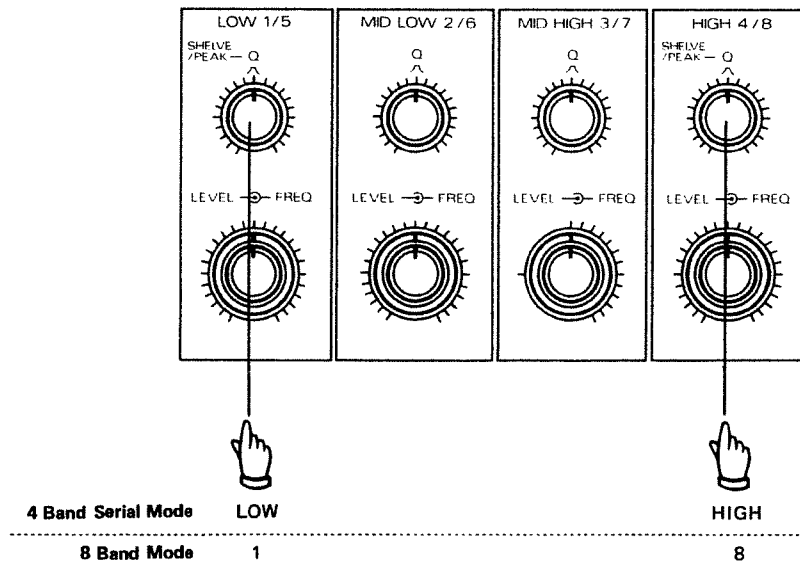
＊Pressing the knob will automatically display the corresponding band.

＊When Shelving is selected, the Q value you have set becomes invalid.

Peaking Display

```
  LOW          4 S  A
▶ Q          2 . 0 0
  Freq         5 0  Hz
  Level      0 . 0  dB
```

Shelving Display

```
  LOW          4 S  A
  Shelving
▶ Freq         5 0  Hz
  Level      0 . 0  dB
```

Shelving

d. Setting the Parameter Mode (in the 4 Band Modes)

In the 4 Band mode (Serial or Parallel), you can set the Parameter mode which determines how the settings you have made actually affect the output sounds.

A/B

The parameter settings of channel A control channel A and those of channel B control channel B. Therefore, an independent frequency characteristic is obtained in each channel. In other words, this is a normal mode.

AB

The parameter settings of one channel control both channels. Therefore, both channel will have the same frequency characteristic. You can select which parameter settings should control the channels by using the Channel/Band Selector Switch.

*The Parameter Mode, A/B or AB, can be selected only in the parameter setting display which is called by pressing the EQ Button.

PROCEDURE

Press the A/B–AB Button while holding the Shift Button down.

The display called here varies depending on the position of the Channel/Band Selector Switch.

Channel/Band Selector Switch

```
                          A Side ──────► Display   "A"
         A/B  ◄
                          B Side ──────► Display   "B"


                          A Side ──────► Display   "AB"
         AB   ◄
                          B Side ──────► Display   "BA"
```
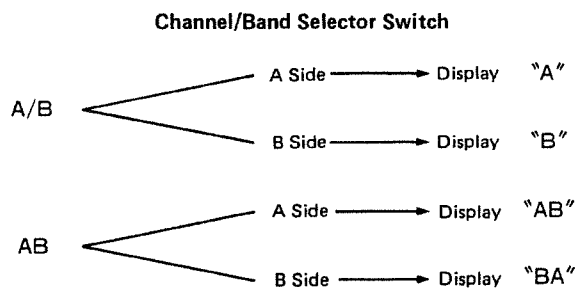
e. Delay

The Pre-delay in each channel, A and B, can be set.
In the 4 Band Parallel mode, the Post-delay of each band can also
be set.

1) Setting the Pre-delay

The Pre-delay (up to 500ms) can be set.

PROCEDURE 1   **Press the Parameter Button until the pre-delay setting display is
called.**

Delay Time of Channel A

```
┌─────────────────────────────────────┐
│                                      │
│      P r e   D e l a y               │
│                                      │
│                                      │
│    ▶ A — c h      2 0   m s          │
│      B — c h      3 0   m s          │
│                                      │
└─────────────────────────────────────┘
```

Delay Time of Channel B
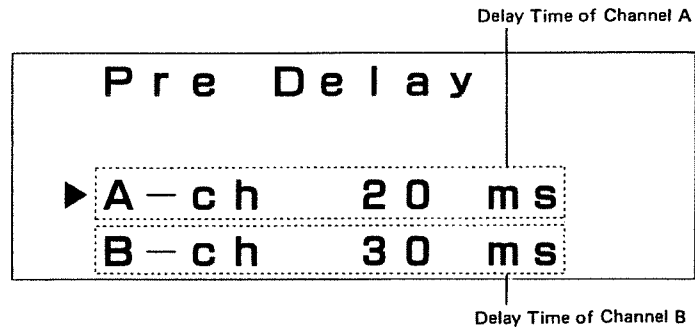
PROCEDURE 2   **Move the ▶ mark to the channel where you wish to set the Pre-
delay, using the Select Button.**

PROCEDURE 3   **Specify the delay time with the Ten Key Pad, then press the Enter
Button.**
**✳Untill the value is entered, you cannot proceed to another parameter.
Be sure to press the Enter Button.**

✳If you assign any value exceeding 500, 500 will be entered instead.

The delay time can also be set with the "+" and "−" buttons.

Pressing the "+" button increases the value, while "−" button
decreases the value. Holding the button down quickens the
changes.

```
  +
┌─────┐   ↑
│     │   │ Increase
└─────┘

  −
┌─────┐   │
│     │   │ Decrease
└─────┘   ↓
```
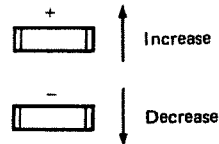
2) Setting the Post-delay (in the 4 Band Parallel Mode)

The Post-delay (up to 99ms) can be set for each band.

PROCEDURE 1   Press the Parameter Button until the post-delay setting display for channel A is called.

```
                    Bands      Values

   A - c h     ▶ L O    1 0    m s
                 M L    1 0    m s
   P o s t       M H    1 0    m s
   D e l a y     H I    1 0    m s
```

PROCEDURE 2   Move the ▶ mark to the band where the Post-delay is to be set using the Select Button.

PROCEDURE 3   Specify the value with the Ten Key Pad and press the Enter Button. (The value can also be entered with the "+" and "−" Buttons.)

*Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

PROCEDURE 4   Repeat steps 2 and 3 as many times as necessary.

PROCEDURE 5   Press the Parameter Button to change to the post-delay setting display for channel B.

```
                    Bands      Values

   B - c h     ▶ L O    1 0    m s
                 M L    1 0    m s
   P o s t       M H    1 0    m s
   D e l a y     H I    1 0    m s
```

PROCEDURE 6   Repeat steps 2 to 4.

5. Thru Function

The input signal can be output without being processed through the equalizer. This is called the Thru function.

*The Hum Canceller function can be used independently from the ON/ OFF function.

PROCEDURE

Press the Thru Button while holding the Shift Button down.

Pressing the Thru Button alternately turns on or off the Thru function. (When the Thru function is on, the indicator is lit.)
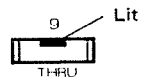
4 MEMORY

1. Structure of Memory

● Up to 99 different equalizer effects you have programmed can be stored in the E-660's memory.

The parameters which can be written in memory are as follows:

Equalizer Mode
Parameter Mode
Parameter Values
Pre-delay value
Post-delay value
ON/OFF of the Thru Function

● The E-660's memory has 1 to 99 memory numbers where the equalizer programs you have set are written.

● If you write a new data at a certain memory number, the existing data will be moved to memory number "0", and therefore can be called by assigning memory number 0.

2. Writing

PROCEDURE 1 Press the Memory Button.

Memory Number

```
▶MEMORY  NO.  1

NAME :
```
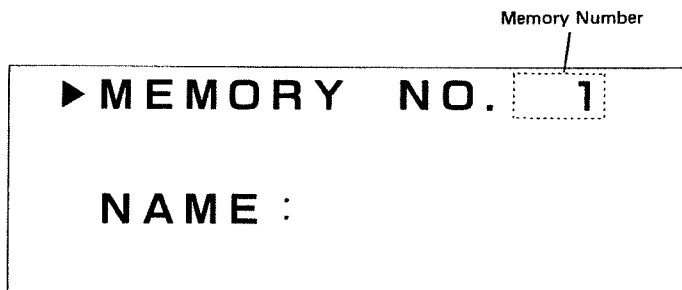
PROCEDURE 2 With the Ten Key Pad, specify the destination memory number where the current setting is be to written, then press the Enter Button. (You can also enter the memory number with " + " or " − " Button.)

∗Untill the value is entered, you cannot go to the next procedure. Be sure to press the Enter Button.

The memory number you have selected flashes.

Flash

```
▶MEMORY  NO.  5

NAME :
```
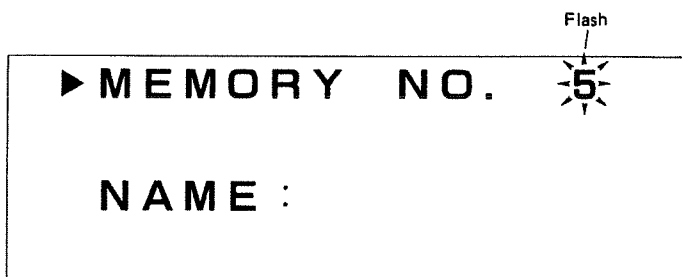
PROCEDURE 3 While holding the Shift Button down, press the Write Button. The memory number stops flashing and the equalizer setting is written in the memory number.

3. Naming

You can name each memory number using up to 8 letters.

PROCEDURE 1   **Press the Memory Button.**

PROCEDURE 2   **Press the Select Button.**

```
┌─────────────────────────────────────┐
│                                      │
│     MEMORY  NO.    1                 │
│                                      │
│   ►NAME<SET   1        >             │
│              ▬                       │
│                                      │
└─────────────────────────────────────┘
                       ↑
                     Cursor
```

PROCEDURE 3   **Move the cursor to the position where you wish to write a letter by pressing the ► Button.**

PROCEDURE 4   **Select a letter with the "+" or "−" Button.**

The available letters are as shown below:

```
┌─────────────────────────────────────────────────┐
│     ⊔A───────Z 0−9 ! " # $ % & ' * + − . / : ; = ? │
│     ‿   ‿‿‿‿   ‿‿‿                                 │
│   Space  Letters  Numbers                         │
└─────────────────────────────────────────────────┘

              +
           ┌──────┐
           └──────┘  ───────────►
                                    −
              ◄───────────  ┌──────┐
                            └──────┘
```
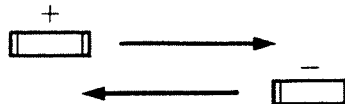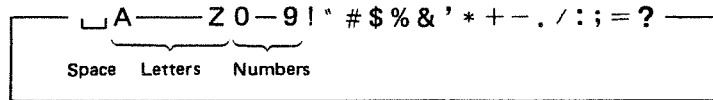
PROCEDURE 5   **Repeat steps 3 to 4 as many times as necessary.**

PROCEDURE 6   **Press the Enter or Select Button.**

4. Calling a Memory Number

Any memory number written in memory can be called.

PROCEDURE 1   Press the Memory Button.

```
┌─────────────────────────────────────┐
│                                      │
│   ▶ MEMORY    NO.    1               │
│                                      │
│   NAME : SET    1                    │
│                                      │
│                                      │
└─────────────────────────────────────┘
```
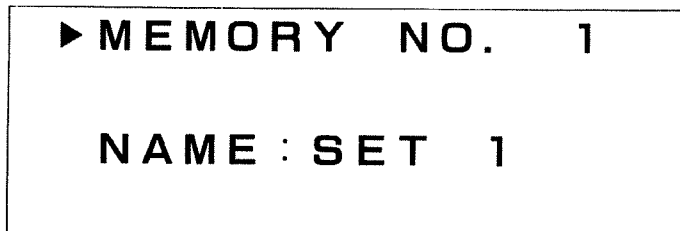
PROCEDURE 2   With the Ten Key Pad, specify the memory number you wish to call, then press the Enter Button. (You can also enter the memory number with " + " or " − " Button.)

*Untill the value is entered, you cannot go to the next procedure. Be sure to press the Enter Button.

The memory number you have selected flashes.

PROCEDURE 3   While holding the Shift Button down, press the Read Button. The memory number stop flashing and the memory number you have selected is called.

*If you do not wish to change parameters of the memory you have called, retain the memory selecting display.
In this way, the value will remain intact even by rotating the Parameter Control Knobs.

● **To call Memory Number "0"**

PROCEDURE 1   Press "0" key then the Enter Button.

*Untill the value is entered, you cannot go to the next procedure. Be
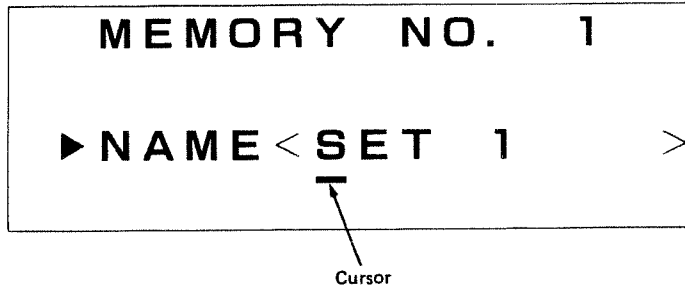sure to press the Enter Button.

*Memory number 0 cannot be entered with the "+" or "−" button.

Flash

$$\blacktriangleright M E M O R Y \quad N O. \quad \dot{0}$$

$$N A M E : B A C K \quad U P$$
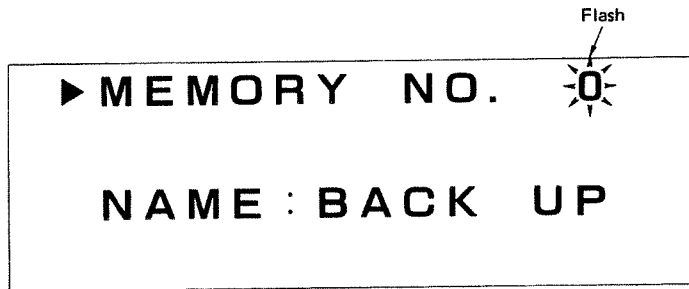
PROCEDURE 2   While holding the Shift Button down, press the Read Button to call
memory number "0".

*To retain the equalizer setting of memory number 0, select another
memory number and write it there.

*Memory number 0 is the location for temporary storage. Equalizer set-
ting cannot be written into memory number 0 and cannot alter it name.

⑤ GRAPHIC DISPLAY

When the 4 Band Serial or 8 Band Equalizer Mode is selected, the frequency characteristic curve can be seen in the graphic display. Also, you can proceed equalizing with the aid of the graphic display.

PROCEDURE   **Press the Graph Button.**
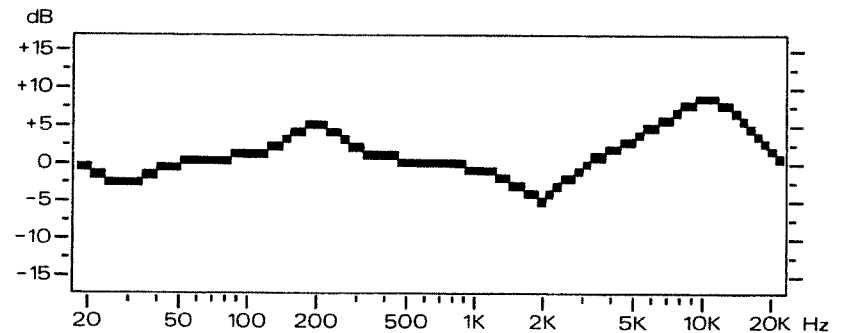
The A/1−4 (B/5−8) indicator goes out. (When the indicator is dark, the previous curve is graphically shown in the Display.) After a short while, the indicator lights up and the characteristic curve is displayed graphically. (4 Band Serial Mode: Approx.10 seconds, 8 Band Mode: Approx. 20 seconds) .

● In the 4 Band Serial mode, the curve of each band can be seen by changing the position of the Channel/Band Selector Switch.

● When a Parameter Control Knob is moved, the indicator goes out, then lights up after a while with the equalized curve graphically shown in the Display.

6 Other Useful Functions

1. Input Phase

The phase of the analog signal fed through the Balanced or Unbalanced Input socket can be set for each channel.

PROCEDURE 1 Press the Utility Button until the Display responds as shown below:

Phase of Channel A

```
┌─────────────────────────────────┐
│   I N P U T   P H A S E          │
│                                  │
│  ▶ A − c h      N O R            │
│    B − c h      N O R            │
└─────────────────────────────────┘
```

Phase of Channel B
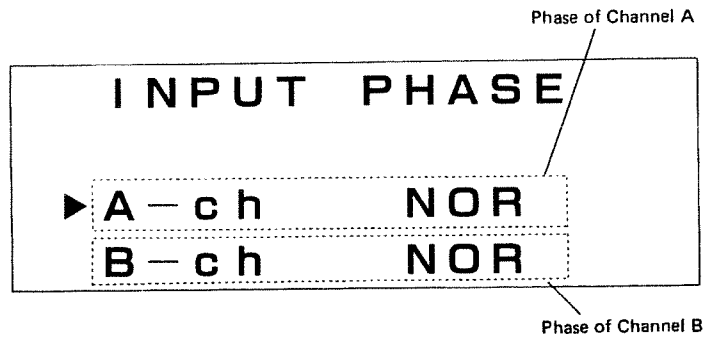
PROCEDURE 2 Using the Select Button, move the ▶ mark to the channel where you wish to change the phase.

PROCEDURE 3 Using the " + " or " − " Button, selects Normal or Reversed phase.

NOR: Noraml Phase
REV: Reversed Phase

2. Hum Canceller

This function can remove the hum noise of the specified frequency (the center frequency + its even number multiples)

PROCEDURE 1   **Press the Utility Button until the Hum Canceller ON/OFF selecting display appears.**

Hum Canceller ON/OFF of Channel A

```
HUM  CANCELER

▶ A−ch        ON
   B−ch        OFF
```

Hum Canceller ON/OFF of Channel B
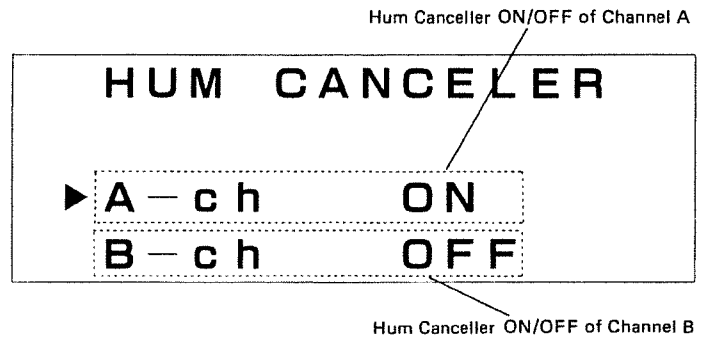
PROCEDURE 2   **Using the Select Button, move the ▶ mark to the channel where you wish to remove hum noise.**

PROCEDURE 3   **Using "+" or "−" Button, select ON.**

PROCEDURE 4   **Press the Utility Button to call the Hum Canceller setting display.**

Frequency
(Base frequency +
fine adjustment)

```
HUM  CANCELER

▶ Freq   50  +0.0
   Ratio  50
```

Ratio
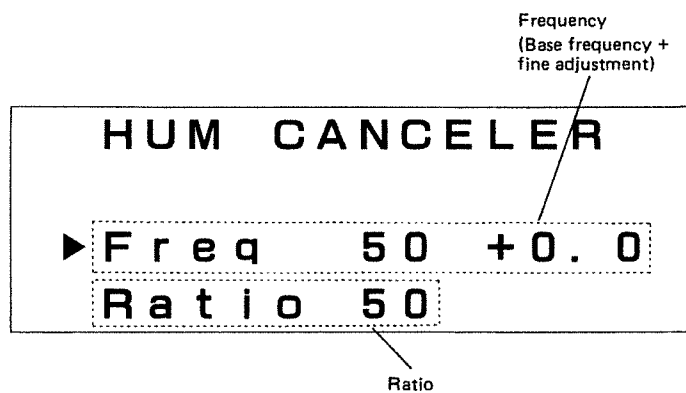
PROCEDURE 5   Using the Select Button, move the ▶ mark to the "Freq" position.

PROCEDURE 6   Set the center frequency (variable range from 30 to 90Hz) with the Ten Key Pad, and press the Enter Button.

    ＊Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

PROCEDURE 7   Finely adjust the frequency (variable range form −0.9 to +0.9) so that the hum noise is quietest.

PROCEDURE 8   Using the Select Button, move the ▶ mark to the "Ratio" position.

PROCEDURE 9   Specify the ratio for hum cancelling (variable range from 10 to 99) and press the Enter Button. (The value can also be entered with the "+" and "−" Buttons.)

    ＊Untill the value is entered, you cannot proceed to another parameter. Be sure to press the Enter Button.

    ＊Raising the Ratio value will remove the hum noise better, but will affect the original signal more drastically.

    ＊If the hum noise is not removed sufficiently even after the fine adjustment of the frequency, change the value of the center frequency.

    ＊When the value of the center frequency is changed, the value of the fine adjustment is automatically set to (0.0).

3. Digital I/O

The signal fed through the Digital In socket can be monitored.

PROCEDURE
Press the Utility Button until the Digital I/O setting display appears.

Enphasis ON/OFF

```
DIGITAL  I/O

EMPHASIS  ON
SAMPLING  48kHz
```

Sampling Frequency
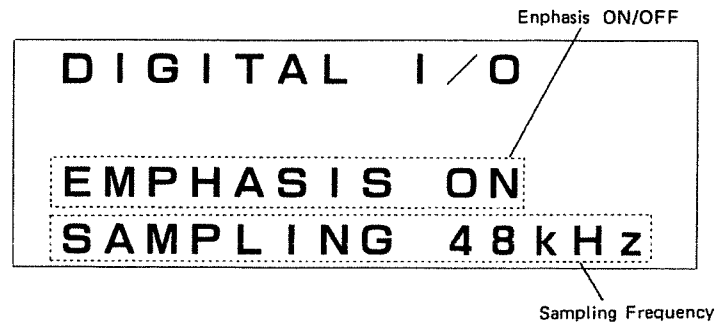
● When any signal is fed through the Digital In socket, the Display responds as follows:

• A "∗" mark is shown at the right of "EMPHASIS ON/OFF".

• The Emphasis On or Off of the input signal is shown and the signal is output from the Digital Out socket.

• The sampling frequency (44.1 or 48 kHz) of the input signal is shown.

• If the input signal includes Copy Protect data, "COPY PROHIBITED" is shown.

● When no signal is fed through the Digital In socket, the Display responds as follows:

• The sampling frequency is always 48kHz.

When analog input signal (fed through the Balanced or Unbalanced socket) is output from the Digital Output socket after procesed in the E–660, the Emphasis On or Off can be selected with the " + " or " − " Button.

4. Initialization

You can retrieve the default values (=before equalized) of the parameters. All bands are default to peaking.
The default values of the parameters are shown below:

· **4 Band Mode (Serial/Parallel)**

		LOW	MID LOW	MID HIGH	HIGH
A	Q	2.0	2.0	2.0	2.0
	Frequency	100 Hz	500 Hz	2000 Hz	10000 Hz
	Level	0 dB	0 dB	0 dB	0 dB
B	Q	2.0	2.0	2.0	2.0
	Frequency	100 Hz	500 Hz	2000 Hz	10000 Hz
	Level	0 dB	0 dB	0 dB	0 dB

· **8 Band Mode**

	1	2	3	4	5	6	7	8
Q	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Fre-quency	50 Hz	100 Hz	200 Hz	500 Hz	1000 Hz	2000 Hz	5000 Hz	10000 Hz
Level	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB	0 dB

PROCEDURE **While holding the Shift Button down, press the Clear Button.**

⑦ Changing Memory Numbers via MIDI

Memory numbers on the E-660 can be changed by operating an external MIDI device (e.g. a synthesizer) connected to the E-660. You may make equalizer settings for the synthesizer patches, and write them into memory numbers. In this way, equalizer settings can be changed along with patches on the synthesizer.

* Do not connect a non-MIDI device to E-660. MIDI Connectors look exactly like DIN SYNC connectors, but they are totally different things.

MIDI IN

MIDI OUT

| MIDI Device |
| D-10 |
| D-20, etc. |

| MIDI Device |
| D-10 |
| D-20, etc. |
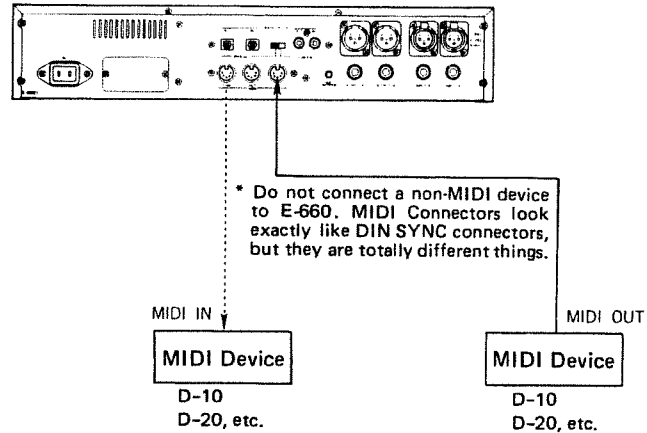
To change memory numbers on the E-660 with MIDI messages (Program Change), the following settings are required:

● MIDI Channel/OMNI Mode

● Program Change Number assignment to memory numbers

1. Setting the MIDI Channel and OMNI Mode

(Refer to "Guide Book for MIDI")

Set the MIDI channel of the E-660 to the same number as the MIDI device connected to it. If you wish the E-660 to receive MIDI messages on all channels regardless of the transmit channel set on the external device, set the OMNI Mode to ON.

PROCEDURE 1   **Press the Utility Button until the MIDI setting display appears.**

MIDI Channel

```
M I D I                        /
                              /
▶ C H A N N E L          1
  O M N I              O N
```
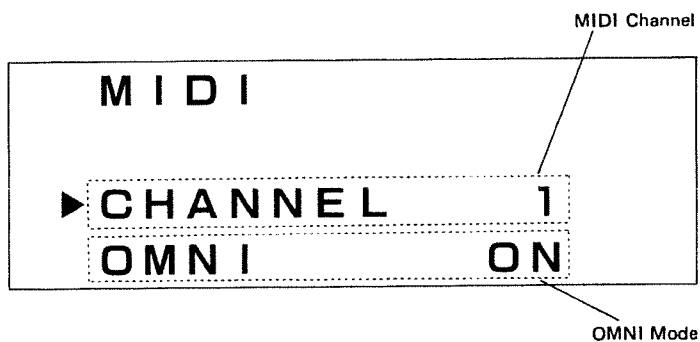
OMNI Mode

PROCEDURE 2   **To set the MIDI channel, move the ▶ mark to the "CHANNEL" position with the Select Button. To set the OMNI Mode, move the ▶ mark to "OMNI".**

PROCEDURE 3   **Set the desired MIDI channel or OMNI Mode using either of the " + " or " − " Button.**

MIDI Channel: Variable range 1-16
OMNI Mode: OFF/ON

＊**When setting the OMNI Mode, each time you press the button, ON and OFF are alternately selected.**

2. Setting the Program Change

To change memory numbers on the E-660 with the Program Change messages sent from an external MIDI device, you should assign a Program Change number to each memory number.

PROCEDURE 1   Press the Utility Button until the following display appears.

```
┌─────────────────────────────────┐
│  M I D I    P G M    T A B L E   │
│                                  │
│  P G M      1 : M E M      1     │
│          └──────┘      └───────┘ │
│              ╱              ╲     │
└─────────────╱────────────────╲───┘
   Program Change Number     Memory Number
```
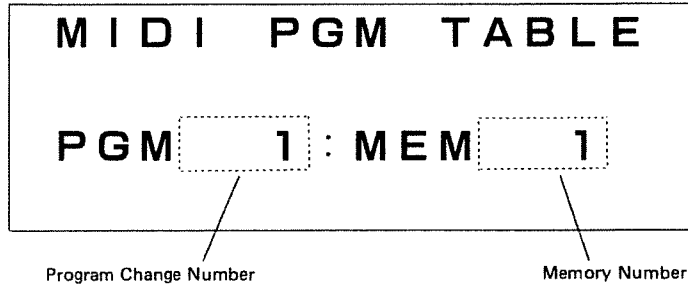
PROCEDURE 2   Using the "+" or "−" Button, select a Program Change number. (The Display shows the memory number which is currently assigned to the selected Program Change number.)

Program Change Number

```
        ┌── 1 ─ 2 ─ 3 ─ ····· ─ 128 ──┐
        └──────────────────────────────┘

              +
           ┌──────┐
           └──────┘  ────────▶
                                  −
                      ◀────── ┌──────┐
                              └──────┘
```
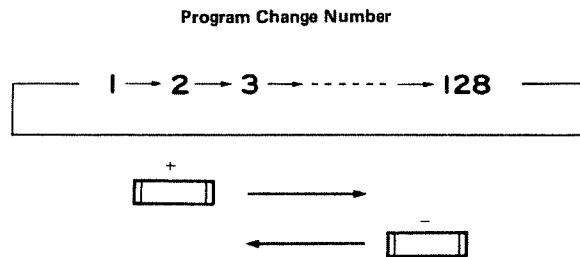
*To quicken the change of numbers, hold the button (+, or −) down.

PROCEDURE 3   Using the Ten Key Pad, specify the memory number to be assigned to the Program Change number you have selected, then press the Enter Button.

*Untill the value is entered, you cannot go to the next procedure. Be sure to press the Enter Button.

PROCEDURE 4   Repeat 2 to 3 steps as many times as necessary.

8 DATA TRANSFER

The data (the equalizer settings of all the memory numbers or the Program Change number assignment) stored in the E-660 can be transferred to another MIDI device. The following example shows data transfer between two E-660's.

Transmitter

OUT

Receiver

IN
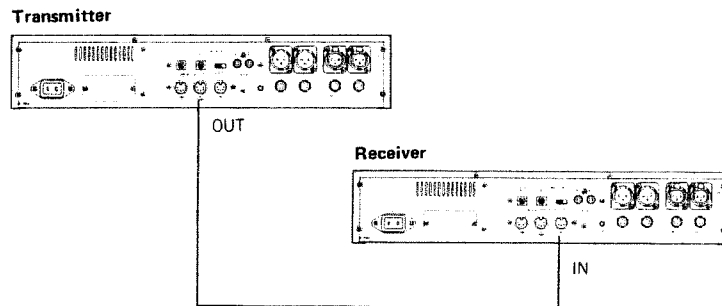
PROCEDURE 1   Set the MIDI channel on the transmitter to the same number as that on the receiver.

PROCEDURE 2   Press the Utility Button until the MIDI Bulk Dump display appears.

```
MIDI  BULK  DUMP


  + : MEMORY
  - : PGM  TABLE
```
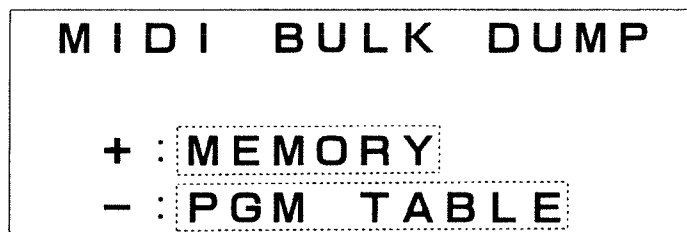
PROCEDURE 3   Press either the "+" or "−" Button to excute data transfer.

Pressing the "+" Button will transfer all the memory numbers.
(During the data transfer, "✻" is shown in the Display, and "OK" is shown when the data transfer is completed.)

✻The data transfer takes about 10 seconds.

Pressing the "−" Button will transfer the assignment of the Program Change number and the memory numbers.
(During the data transfer, "✻" is shown in the Display, and "OK" is shown when the data transfer is completed.)

■ SPECIFICATIONS

[Analog]

● Input

Input Sockets: 2 Channel (Balanced/Un-balanced)
Balanced (Input Level/Impedance): + 4dBm (Max. +18dBm)/10kΩ
Unbalanced (Input Level/Impedance): + 4dBm (Max. +18dBm) /25kΩ

● Output

Output Sockets: 2 Channel (Balanced/Unbalanced)
Balanced (Output Level/Impedance): + 4dBm (Max. +18dBm)/100Ω
Unbalanced (Output Level/Impedance): +4dBm (Max. +18dBm)/100Ω

[Digital]

● Digital Audio Interface

CD Player/DAT compatible, 20 bit
Optical and Coaxial (CP-340 standard)

● ADA Converter
AD: 16 bit linear
DA: 18 bit equivalent (Digital compounding)

● Sampling Frequency
48kHz/44.1kHz (Automatic selection)

[General Features]

● Frequency Characteristic
20Hz to 20kHz (+0/-3dB)

● SN Ratio
More than 80dB (IHF-A at rated input)

● Dynamic Range
More than 94dB

● Total Harmonic Distortion
Less than 0.015% (1kHz at rated input)

● CMRR
More than 75dB (1kHz)

● Channel Separation
More than 85dB (1kHz)

[Hum Canceller]

● Center Frequency for Hum Canceller
30 to 90 Hz

[Equalizer]

● Pre-delay Time
0 to 500ms

● Post-delay Time
0 to 99ms

● EQ Modes
4 Band Serial (2 channel)
4 Band Parallel (2 channel)
8 Band Serial (2 channel)

● EQ Types

LOW	Peaking/Shelving
MID LOW	Peaking
MID HIGH	Peaking
HIGH	Peaking/Shelving

1	Peaking/Shelving
2	Peaking
3/4	Peaking
5/6	Peaking
7	Peaking
8	Peaking/Shelving

● Center Frequency

LOW	(1/2)	30 to 960Hz
MID LOW	(3/4)	200 to 6400 Hz
MID HIGH	(5/6)	500 to 16000Hz
HIGH	(7/8)	800 to 20000Hz

● Level
0 to 12dB

● Q
0.3 to 9.9

● Memory Numbers
99 Memory Numbers

● MIDI Sockets
IN/THRU/OUT

● Graphic Display
96 x 32 dots (LCD back-lit)

● **Power Consumption**
30W

● **Dimensions**
483 (W) X 91 (H) X 421 (D) mm / 19" X
3-9/16" X 16-9/16"

● **Weight**
8kg / 17lb 11oz

● **Accessories**
Owner's Manual
Power Cord
Guide Book for MIDI

〈**Front Panel**〉

Channel/Band Selector Switch
Input Level Control Knob (A/B)
Parameter Control Knobs (Q/FREQ/
LEVEL)

Display

EQ Button
+ Button
Select Button
- Button
Graph Button
Parameter Button
Utility Button
Memory Button
▶ Button
7/Clear (Ten Key/Button)
8/Mode (Ten Key/Button)
9/Thru (Ten Key/Button)
Delete Button
4/Write Button (Ten Key/Button)
5/〈A/B-AB〉 (Ten Key/Button)
5/Read (Ten Key/Button)
Shift Button
1 Key
2 Key
3 Key
+/- Button
0 Key
Decimal (.) Key
Enter Button

● **Rear Panel**
Balanced Input Sockets A/B (XLR Con-
nectors)
Balanced Output Sockets (XLR Connec-
tors)
Unbalanced Input Sockets A/B
Unbalanced Output Sockets
LCD Contrast Control Knob
Digital Input Sockets (Coaxial/Optical)
Digital Output Sockets (Coaxial/Optical)
MIDI Sockets (IN/OUT/THRU)
Receptacle

*Specifications are subject to change without
notice.

Fixing to the 19" Rack.

Use 5mm screws.

M-5 (Washer)

M-5 (Screw)   19" Rack Stay
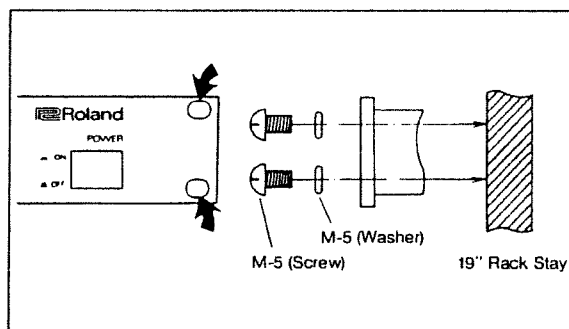
E-660 BLOCK DIAGRAM
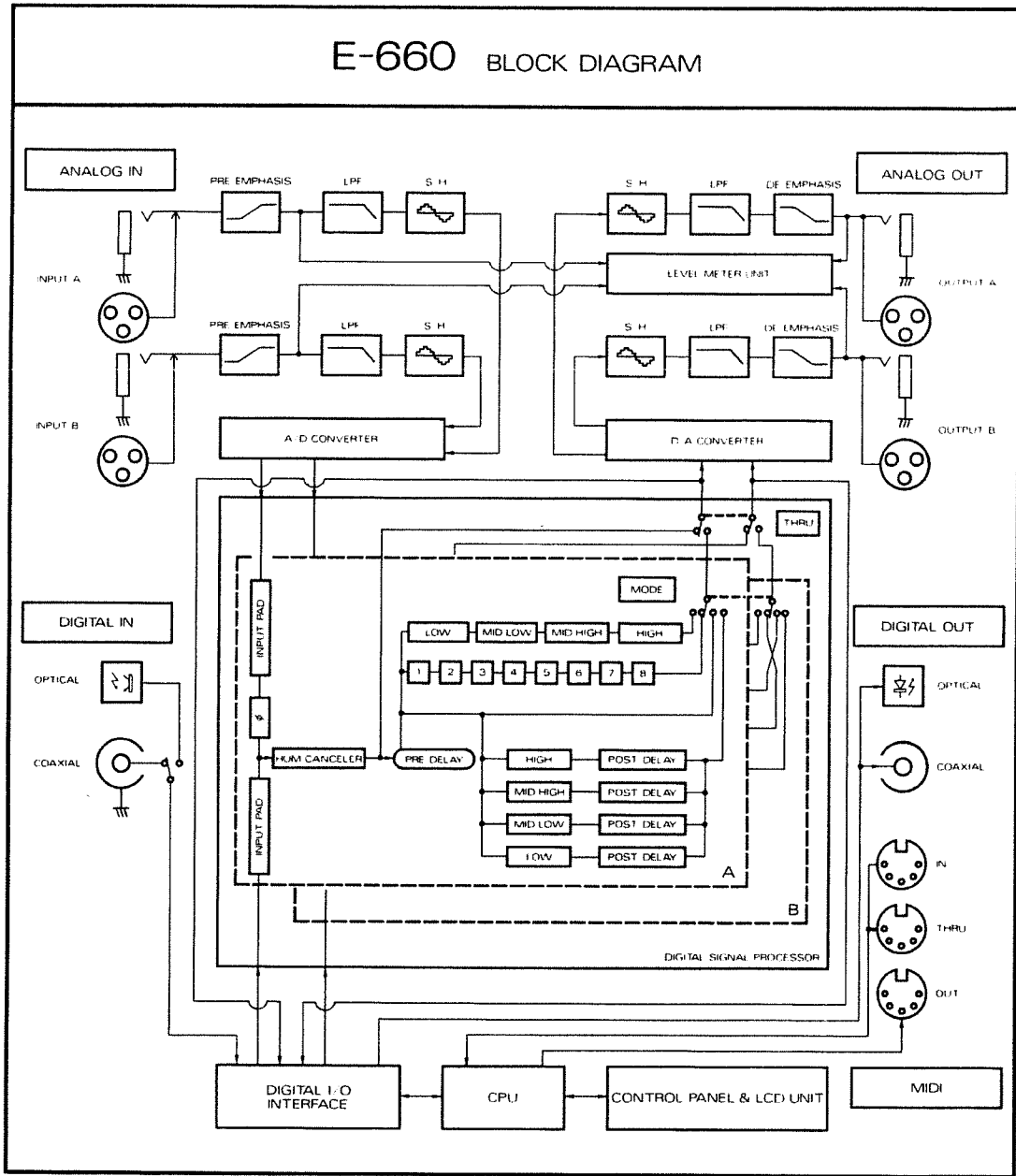
	LOW. 1	2	MID LOW. 3. 4	MID HIGH. 5. 6	7	HIGH. 8
EQ TYPE	SHELVING/PEAKING	PEAKING	PEAKING	PEAKING	PEAKING	SHELVING/PEAKING
Q	0.3 - 9.9		0.3 - 9.9	0.3 - 9.9		0.3 - 9.9
FREQUENCY(Hz)	30 - 960		200 - 6400	500 - 16000		800 - 20000
LEVEL(dB)	−12 - +12		−12 - +12	−12 - +12		−12 - +12
PRE-DELAY TIME(mS)	0 - 500		POST-DELAY TIME(4 BANDS PARALLEL) (mS)			0 - 99

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Parametric Equalizer Characteristic

•Peaking

FREQUENCY RESPONSE

EQ TYPE	PEAKING
Q	2.0
FREQUENCY(Hz)	1000
LEVEL(dB)	-12 ~ +12

FREQUENCY RESPONSE

EQ TYPE	PEAKING
Q	0.3 ~ 9.9
FREQUENCY(Hz)	1000
LEVEL(dB)	-12 / +12

[LOW]/[MID LOW] FREQUENCY RESPONSE

EQ TYPE	PEAKING
Q	2.0
FREQUENCY(Hz)	30 / 960(LOW)
FREQUENCY(Hz)	200 / 6400(MID LOW)
LEVEL(dB)	-12 / +12

[MID HIGH]/[HIGH] FREQUENCY RESPONSE

EQ TYPE	PEAKING
Q	2.0
FREQUENCY(Hz)	500 / 16000(MID HIGH)
FREQUENCY(Hz)	800 / 20000(HIGH)
LEVEL(dB)	-12 / +12

•Shelving

[LOW] FREQUENCY RESPONSE


```
EQ TYPE        :   SHELVING
FREQUENCY(Hz)  :   60 - 960
LEVEL(dB)      :   -12 / +12
```

[HIGH] FREQUENCY RESPONSE


```
EQ TYPE        :   SHELVING
FREQUENCY(Hz)  :   800 - 12800
LEVEL(dB)      :   -12 / +12
```

[LOW]/[HIGH] FREQUENCY RESPONSE


```
EQ TYPE        :   SHELVING
FREQUENCY(Hz)  :   400 / 1600
LEVEL(dB)      :   -12 ~ +12
```

Roland Exclusive Messages

1. Data Format for Exclusive Messages

Roland's MIDI implementation uses the following data format for all exclusive messages (type IV):

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
CMD	Command ID
[BODY]	Maindata
F7H	End of exclusive

≠ MIDI status : F0H, F7H

An exclusive message must be flanked by a pair of status codes, starting with a Manufactures ID immediately after F0H (MIDI version1.0).

≠ Manufactures ID : 41H

The Manufactures ID identifies the manufacturer of a MIDI instrument that triggeres an exclusive message. Value 41H represents Roland's Manufactures ID.

≠ Device ID : DEV

The Device ID contains a unique value that identifies the individual device in the multiple implementation of MIDI instruments. It is usually set to 00H - 0FH, a value smaller by one than that of a basic channel, but value 00H - 1FH may be used for a device with multiple basic channels.

≠ Model ID : MDL

The Model ID contains a value that uniquely identifies one model from another. Different models, however, may share an identical Model-ID if they handle similar data.

The Model-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Model-IDs, each representing a unique model :

```
01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H
```

≠ Command ID : CMD

The Command-ID indicates the function of an exclusive message. The Command-ID format may contain 00H in one or more places to provide an extended data field. The following are examples of valid Command IDs , each representing a unique function :

```
01H
02H
03H
00H, 01H
00H, 02H
00H, 00H, 01H
```

≠ Main data : BODY

This field contains a message to be exchanged across an interface. The exact data size and contents will vary with the Model-ID and Command-ID.

2. Address- mapped Data Transfer

Address mapping is a technique for transferring messages conforming to the data format given in Section 1. It assigns a series of memory-resident records--waveform and tone data, switch status, and parameters, for example--to specific locations in a machine-dependent address space, thereby allowing access to data residing at the address a message specifies.

Address-mapped data transfer is therefore independent of models and data categories. This technique allows use of two different transfer procedures : one-way transfer and handshake transfer.

≠ One way transfer procedure (See Section3 for details)

This procedure is suited for the transfer of a small amount of data. It sends out an exclusive message completely independent of a receiving device status.

Connection Diagram
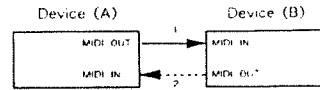
Connectionat point2 is essential for "Request data" procedures. (See Section3.)

≠ Handshake transfer procedure (See Section4 for details)

This procedure initiates a predetermined transfer sequence (handshaking) across the interface before data transfer takes place. Handshaking ensures that reliability and transfer speed are high enough to handle a large amount of data.

Connection Diagram
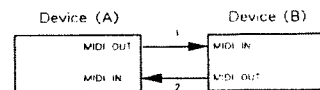
Connectionat points1 and 2 is essential.

Notes on the above two procedures

* There are separate Command-IDs for different transfer procedures.
* DevicesA and B cannot exchange data unless they use the same transfer procedure, share identical Device ID and Model ID, and are ready for communication.

3. One way Transfer Procedure

This procedure sends out data all the way until it stops when the messages are so short that answerbacks need not be checked.

For long messages, however, the receiving device must acquire each message in time with the transfer sequence, which inserts intervals of at least 20milliseconds in between.

Types of Messages

Message	Command ID
Request data 1	RQ1 (11H)
Data set 1	DT1 (12H)

≠ Request data # 1 : RQ1 (11H)

This message is sent out when there is a need to acquire data from a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of data required.

On receiving an RQ1 message, the remote device checks its memory for the data address and size that satisfy the request.

If it finds them and is ready for communication, the device will transmit a "Data set 1 (DT1)" message, which contains the requested data. Otherwise, the device will send out nothing.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
11H	Command ID
aaH	Address MSB
:	:
	LSB
ssH	Size MSB
:	:
	LSB
sum	Check sum
F7H	End of exclusive

* The size of the requested data does not indicate the number of bytes that will make up a DT1 message, but represents the address fields where the requested data resides.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The same number of bytes comprises address and size data, which, however, vary with the Model- ID.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Data set 1 : DT1 (12H)

This message corresponds to the actual data transfer process. Because every byte in the data is assigned a unique address, a DT1 message can convey the starting address of one or more data as well as a series of data formatted in an address dependent order.

The MIDI standards inhibit non-real time messages from interrupting an exclusive one. This fact is inconvenient for the devices that support a "soft-through" mechanism. To maintain compatibility with such devices, Roland has limited the DT1 to 256 bytes so that an excessively long message is sent out in separate segments.

Byte	Description
F0H	Exclusive
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
12H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ddH	Data
⋮	⋮
⋮	⋮
sum	Check sum
F7H	End of exclusive

* A DT1 message is capable of providing only the valid data among those specified by an RQ1 message.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The number of bytes comprising address data varies from one Model-ID to another.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Example of Message Transactions

● Device A sending data to Device B
Transfer of a DT1 message is all that takes place.
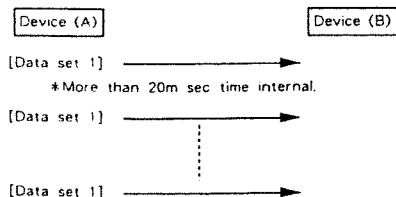
● Device B requesting data from Device A
Device B sends an RQ1 message to Device A. Checking the message, Device A sends a DT1 message back to Device B.
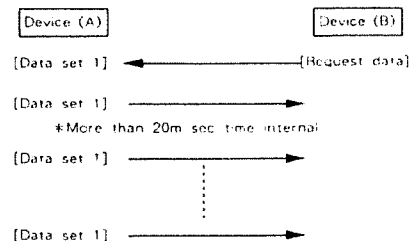
4. Handshake - Transfer Procedure

Handshaking is an interactive process where two devices exchange error checking signals before a message transaction takes place, thereby increasing data reliability. Unlike one-way transfer that inserts a pause between message transactions, handshake transfer allows much speedier transactions because data transfer starts once the receiving device returns a ready signal.

When it comes to handling large amounts of data sampler waveforms and synthesizer tones over the entire range, for example across a MIDI interface, handshaking transfer is more efficient than one-way transfer.

Types of Messages

Message	Command ID
Want to send data	WSD (40H)
Request data	RQD (41H)
Data set	DAT (42H)
Acknowledge	ACK (43H)
End of data	EOD (45H)
Communication error	ERR (4EH)
Rejection	RJC (4FH)

Want to send data : WSD (40H)

This message is sent out when data must be sent to a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of the data to be sent.

On receiving a WSD message, the remote device checks its memory for the specified data address and size which will satisfy the request. If it finds them and is ready for communication, the device will return an "Acknowledge (ACK)" message.
Otherwise, it will return a "Rejection (RJC)" message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
40H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ssH	Size MSB
⋮	⋮
	LSB
sum	Check sum
F7H	End of exclusive

* The size of the data to be sent does not indicate the number of bytes that make up a "Data set (DAT)" message, but represents the address fields where the data should reside.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The same number of bytes comprises address and size data, which, however, vary with the Model-ID.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

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± **Request data : RQD (41H)**

This message is sent out when there is a need to acquire data from a device at the other end of the interface. It contains data for the address and size that specify designation and length, respectively, of data required.

On receiving an RQD message, the remote device checks its memory for the data address and size which satisfy the request. If it finds them and is ready for communication, the device will transmit a "Data set (DAT)" message, which contains the requested data. Otherwise, it will return a "Rejection (RJC)" message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
41H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ssH	Size MSB
⋮	⋮
	LSB
sum	Check sum
F7H	End of exclusive

* The size of the requested data does not indicate the number of bytes that make up a "Data set (DAT)" message, but represents the address fields where the requested data resides.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The same number of bytes comprises address and size data, which, however, vary with the Model ID.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Data set : DAT (42H)

This message corresponds to the actual data transfer process. Because every byte in the data is assigned a unique address, the message can convey the starting address of one or more data as well as a series of data formatted in an address-dependent order.

Although the MIDI standards inhibit non-real time messages from interrupting an exclusive one, some devices support a "soft through" mechanism for such interrupts. To maintain compatibility with such devices, Roland has limited the DAT to 256 bytes so that an excessively long message is sent out in separate segments.

| Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
42H	Command ID
aaH	Address MSB
⋮	⋮
	LSB
ddH	Data
⋮	⋮
sum	Check sum
F7H	End of exclusive

* A DAT message is capable of providing only the valid data among those specified by an RQD or WSD message.
* Some models are subject to limitations in data format used for a single transaction. Requested data, for example, may have a limit in length or must be divided into predetermined address fields before it is exchanged across the interface.
* The number of bytes comprising address data varies from one model ID to another.
* The error checking process uses a checksum that provides a bit pattern where the least significant 7 bits are zero when values for an address, size, and that checksum are summed.

Acknowledge : ACK (43H)

This message is sent out when no error was detected on reception of a WSD, DAT, "End of data (EOD)", or some other message and a requested setup or action is complete. Unless it receives an ACK message, the device at the other end will not proceed to the next operation.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
43H	Command ID
F7H	End of exclusive

End of data : EOD (45H)

This message is sent out to inform a remote device of the end of a message. Communication, however, will not come to an end unless the remote device returns an ACK message even though an EOD message was transmitted.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
45H	Command ID
F7H	End of exclusive

Communications error : ERR (4EH)

This message warns the remote device of a communications fault encountered during message transmission due, for example, to a checksum error. An ERR message may be replaced with a "Rejection (RJC)" one, which terminates the current message transaction in midstream.

When it receives an ERR message, the sending device may either attempt to send out the last message a second time or terminate communication by sending out an RJC message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
4EH	Command ID
F7H	End of exclusive

Rejection : RJC (4FH)

This message is sent out when there is a need to terminate communication by overriding the current message. An RJC message will be triggered when :

· a WSD or RQD message has specified an illegal data address or size.

· the device is not ready for communication.

· an illegal number of addresses or data has been detected.

· data transfer has been terminated by an operator.

· a communications error has occurred.

An ERR message may be sent out by a device on either side of the interface . Communication must be terminated immediately when either side triggers an ERR message.

Byte	Description
F0H	Exclusive status
41H	Manufactures ID (Roland)
DEV	Device ID
MDL	Model ID
4FH	Command ID
F7H	End of exclusive

Example of Message Transactions

● Data transfer from device (A) to device (B).

```
        Device (A)                        Device (B)

[Want to send data] ──────────▶
                    ◀────────── [Acknowledge]
[Data set]          ──────────▶
                    ◀────────── [Acknowledge]
[Data set]          ──────────▶
                    ◀────────── [Acknowledge]
                         ⋮
[End of data]       ──────────▶
                    ◀────────── [Acknowledge]
```
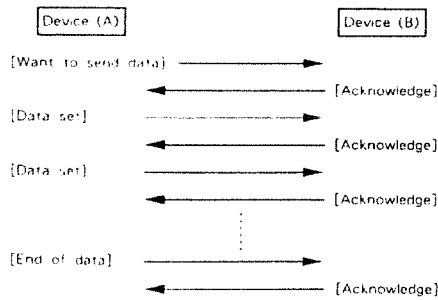
● Device (A) requests and receives data from device (B).

```
        Device (A)                        Device (B)

[Request data]   ──────────▶
                 ◀────────── [Data set]
[Acknowledge]    ──────────▶
                 ◀────────── [Data set]
[Acknowledge]    ──────────▶
                      ⋮
                 ◀────────── [End of data]
[Acknowledge]    ──────────▶
```
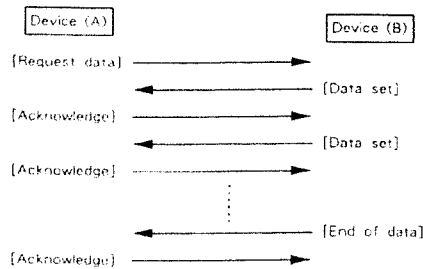
● Error occurs while device (A) is receiving data from device (B)

1) Data transfer from device (A) to device (B).

```
        Device (A)                        Device (B)
                         ⋮
                    ◀────────── [Data set]
[Acknowledge]       ──────────▶
(Error) ×           ◀────────── [Data set]
[Communication error] ────────▶
                    ◀────────── [Data set]
                              (the same data
[Acknowledge]       ──────────▶  as above)
                         ⋮
```
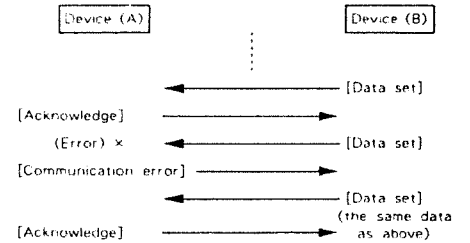
2) Device (B) rejects the data re-transmitted, and quits data transfer

```
        Device (A)                        Device (B)
                         ⋮
                    ◀────────── [Data set]
[Acknowledge]       ──────────▶
(Error) ×           ◀────────── [Data set]
[Communication error] ────────▶
(Quit)              ◀────────── [Rejection]
```
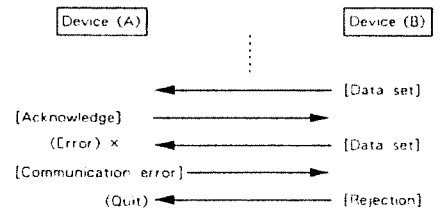
3) Device (A) immediately quits data transfer.

```
        Device (A)                        Device (B)
                         ⋮
                    ◀────────── [Data set]
[Acknowledge]       ──────────▶
(Error) ×           ◀────────── [Data set]
[Rejection]         ──────────▶  (Quit)
```
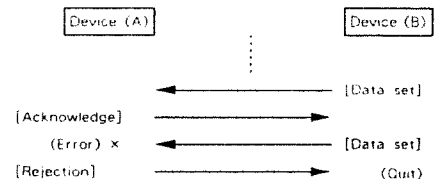
1. RECOGNIZED RECEIVE DATA

Status	Second	Third	Description
1100 nnnn	0ppp pppp		Program Change ppppppp = 0 – 127
1011 nnnn	0111 1100	0000 0000	OMNI OFF
1011 nnnn	0111 1101	0000 0000	OMNI ON
1111 0000	... ...	1111 0111	System exclusive

2. RECOGNIZED EXCLUSIVE MESSAGE

Exclusive message is based on following structure

Byte		Description	
a	1111 0000	Exclusive status	
b	0100 0001	Roland ID #	
c	0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #	
d	0010 0100	Model-ID # (E-660)	
e	0001 0010	Command-ID # (DT1)	
f	0aaa aaaa	Address MSB	*2-1
g	0bbb bbbb	Address LSB	
j	0ccc cccc	Data	*2-1
:			
k	0ddd dddd	Checksum	*2-2
l	1111 0111	End of System Exclusive	

*2-1   Only following addresses are permittted. Each data on the address has its suitable length of data. If the length is not suitable, the Exclusive Message will be ignored.

Address	Data	
00 00	8bytes	Temporary Parameter A-ch LOW or Band1
00 08	8bytes	Temporary Parameter A-ch MID LOW or Band3
00 10	8bytes	Temporary Parameter A-ch MID HIGH or Band6
00 18	8bytes	Temporary Parameter A-ch HIGH or Band8
00 20	8bytes	Temporary Parameter B-ch LOW or Band2
00 28	8bytes	Temporary Parameter B-ch MID LOW or Band4
00 30	8bytes	Temporary Parameter B-ch MID HIGH or Band5
00 38	8bytes	Temporary Parameter B-ch HIGH or Band7
00 40	4bytes	Temporary Parameter Pre Delay
00 44	4bytes	Temporary Parameter A-ch Post Delay
00 48	4bytes	Temporary Parameter B-ch Post Delay
00 4c	2bytes	INPUT PAD
00 4e	2bytes	INPUT PHASE
00 50	2bytes	HUM CANCELER ON/OFF
00 52	3bytes	HUM CANCELER PARAMETER
00 56	1byte	MODE
00 57	1byte	A·1-4 / B·5-8
00 58	1byte	THRU
00 59	1byte	CLEAR
01 00	78bytes	MEMORY NO. 1
02 00	78bytes	MEMORY NO. 2
03 00	78bytes	MEMORY NO. 3
:		
63 00	78bytes	MEMORY NO. 99

64 00	8bytes	NAME OF MEMORY NO. 1
64 08	8bytes	NAME OF MEMORY NO. 2
64 10	8bytes	NAME OF MEMORY NO. 3
:		
6a 10	8bytes	NAME OF MEMORY NO. 99
6a 18	64bytes	PROGRAM CHANGE TABLE 1-64
6a 58	64bytes	PROGRAM CHANGE TABLE 65-128

*2-2   Summed value of the all bytes between Command-ID and EOX must be 00H (7bits). Command-ID and EOX are not included.

3. Address mapping of parameters

Address of parameter

| 00 00 | Temporary parameter A-ch LOW or Band1 | (8bytes) |

0000 0aaa	Q MSB	*3-1
0bbb bbbb	Q LSB	
0ccc cccc	Frequency MSB	*3-2
0ddd dddd	Frequency	
0eee eeee	Frequency LSB	
0000 000f	SIGN OF LEVEL	*3-3
0ggg gggg	ABSOLUTE LEVEL	*3-4
0000 000h	Shelving/Peaking	*3-5

| 00 08 | Temporary parameter A-ch MID LOW or Band3 | (8bytes) |

0000 0aaa	Q MSB	*3-1
0bbb bbbb	Q LSB	
0ccc cccc	Frequency MSB	*3-2
0ddd dddd	Frequency	
0eee eeee	Frequency LSB	
0000 000f	SIGN OF LEVEL	*3-3
0ggg gggg	ABSOLUTE LEVEL	*3-4
0000 0000	dummy	

| 00 10 | Temporary parameter A-ch MID HIGH or Band6 | (8bytes) |

0000 0aaa	Q MSB	*3-1
0bbb bbbb	Q LSB	
0ccc cccc	Frequency MSB	*3-2
0ddd dddd	Frequency	
0eee eeee	Frequency LSB	
0000 000f	SIGN OF LEVEL	*3-3
0ggg gggg	ABSOLUTE LEVEL	*3-4
0000 0000	dummy	

| 00 18 | Temporary parameter A-ch HIGH or Band8 | (8bytes) |

0000 0aaa	Q MSB	*3-1
0bbb bbbb	Q LSB	
0ccc cccc	Frequency MSB	*3-2
0ddd dddd	Frequency	
0eee eeee	Frequency LSB	
0000 000f	SIGN OF LEVEL	*3-3
0ggg gggg	ABSOLUTE LEVEL	*3-4
0000 000h	Shelving/Peaking	*3-5

```
00 20  | Temporary  parameter B-ch LOW or Band2  ( 8bytes )

       | 0000 0aaa | Q MSB                        *3-1
       | 0bbb bbbb | Q LSB
       | 0ccc cccc | Frequency MSB                *3-2
       | 0ddd dddd | Frequency
       | 0eee eeee | Frequency LSB
       | 0000 000f | SIGN OF LEVEL                *3-3
       | 0ggg gggg | ABSOLUTE LEVEL               *3-4
       | 0000 000h | Shelving/Peaking             *3-5


00 28  | Temporary  parameter B-ch MID LOW or Band4  ( 8bytes )

       | 0000 0aaa | Q MSB                        *3-1
       | 0bbb bbbb | Q LSB
       | 0ccc cccc | Frequency MSB                *3-2
       | 0ddd dddd | Frequency
       | 0eee eeee | Frequency LSB
       | 0000 000f | SIGN OF LEVEL                *3-3
       | 0ggg gggg | ABSOLUTE LEVEL               *3-4
       | 0000 0000 | dummy


00 30  | Temporary  parameter B-ch MID HIGH or Band5  ( 8bytes )

       | 0000 0aaa | Q MSB                        *3-1
       | 0bbb bbbb | Q LSB
       | 0ccc cccc | Frequency MSB                *3-2
       | 0ddd dddd | Frequency
       | 0eee eeee | Frequency LSB
       | 0000 000f | SIGN OF LEVEL                *3-3
       | 0ggg gggg | ABSOLUTE LEVEL               *3-4
       | 0000 0000 | dummy


00 38  | Temporary  parameter B-ch HIGH or Band7  ( 8bytes )

       | 0000 0aaa | Q MSB                        *3-1
       | 0bbb bbbb | Q LSB
       | 0ccc cccc | Frequency MSB                *3-2
       | 0ddd dddd | Frequency
       | 0eee eeee | Frequency LSB
       | 0000 000f | SIGN OF LEVEL                *3-3
       | 0ggg gggg | ABSOLUTE LEVEL               *3-4
       | 0000 000h | Shelving/Peaking             *3-5
```

*3-1 'aaabbbbbbb' is a value between 30 and 990. The Q is 1/100 of the value.

*3-2 'cccccccdddddddeeeeeee' is a value in the range of the band.

*3-3 If f=0 then the Level is positive. If f=1 then negative.

*3-4 'ggggggg' is a value between 0 and 120. The absolute Level is 1/10 of the value.

*3-5 'h=0' means 'Peaking' and 'h=1' means 'Shelving'. When the 8bands mode, band #2 and band #7 can choose only 'Peaking'.

```
00 40  | Temporary  parameter Pre Delay  ( 4bytes )

       | 0000 00aa | A-ch
       | 0bbb bbbb | A-ch           aabbbbbbb = 0-500
       | 0000 00cc | B-ch
       | 0ddd dddd | B-ch           ccddddddd = 0-500


00 44  | Temporary  parameter A-ch Post Delay  ( 4bytes )

       | 0aaa aaaa | LOW            aaaaaaa = 0-99
```

```
       | 0bbb bbbb | MID LOW        bbbbbbb = 0-99
       | 0ccc cccc | MID HIGH       ccccccc = 0-99
       | 0ddd dddd | HIGH           ddddddd = 0-99


00 48  | Temporary  parameter B-ch Post Delay  ( 4bytes )

       | 0aaa aaaa | LOW            aaaaaaa = 0-99
       | 0bbb bbbb | MID LOW        bbbbbbb = 0-99
       | 0ccc cccc | MID HIGH       ccccccc = 0-99
       | 0ddd dddd | HIGH           ddddddd = 0-99


00 4c  | INPUT PAD  ( 2bytes )

       | 0aaa aaaa | Digital        aaaaaaa = 0-100
       | 0bbb bbbb | Analog         bbbbbbb = 0-100


00 4e  | INPUT PHASE  ( 2bytes )

       | 0000 000a | A-ch           0:NOR , 1:REV
       | 0000 000b | B-ch           0:NOR , 1:REV


00 50  | HUMCANCELER ON/OFF  ( 2bytes )

       | 0000 000a | A-ch           0:OFF , 1:ON
       | 0000 000b | B-ch           0:OFF , 1:ON


00 52  | HUMCANCELER PARAMETER  ( 3bytes )

       | 0aaa aaaa | Frequency       aaaaaaa = 30-90
       | 000b cccc | Frequency Adjust  *3-6
       | 0ddd dddd | Ratio           ddddddd = 10-99
```

*3-6 If b=0 then the value is positive. If b=1 then negative. 'ccccc' is a value between 0 and 9.

```
00 56  | MODE  ( 1byte )

       | 0000 a0bb |         *3-7
```

*3-7 If a=0 then the mode is 'AB'. If a=1 then the mode is A/B. 'bb' means as follows.

```
       bb=00 then 4band serial.
       bb=01 then 8band A.
       bb=10 then 4band parallel.
       bb=11 then 8band B.


00 57  | A·1-4 / B·5-8  ( 1byte )

       | 0000 000a |        0:A·1-4 , 1:B·5-8


00 58  | THRU  ( 1byte )

       | 0000 000a |        0:NOMAL , 1:THRU


00 59  | CLEAR  ( 1byte )

       | 0000 0000 |        dummy


01 00  | MEMORY NO.1  ( 78bytes )

       | 0000 0aaa | Q MSB        A-ch LOW      *3-1
```

```
| 0bbb bbbb | Q LSB        ( Band1 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 000h | Shelving/Peaking       *3-5

| 0000 0aaa | Q MSB      A-ch MID LOW  *3-1
| 0bbb bbbb | Q LSB        ( Band3 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 0000 | dummy

| 0000 0aaa | Q MSB      A-ch MID HIGH *3-1
| 0bbb bbbb | Q LSB        ( Band6 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 0000 | dummy

| 0000 0aaa | Q MSB      A-ch HIGH     *3-1
| 0bbb bbbb | Q LSB        ( Band8 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 000h | Shelving/Peaking       *3-5

| 0000 0aaa | Q MSB      B-ch LOW      *3-1
| 0bbb bbbb | Q LSB        ( Band2 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 000h | Shelving/Peaking       *3-5

| 0000 0aaa | Q MSB      B-ch MID LOW  *3-1
| 0bbb bbbb | Q LSB        ( Band4 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 0000 | dummy

| 0000 0aaa | Q MSB      B-ch MID HIGH *3-1
| 0bbb bbbb | Q LSB        ( Band5 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 0000 | dummy

| 0000 0aaa | Q MSB      B-ch HIGH     *3-1
| 0bbb bbbb | Q LSB        ( Band7 )
| 0ccc cccc | Frequency MSB          *3-2
| 0ddd dddd | Frequency
| 0eee eeee | Frequency LSB
```

```
| 0000 000f | SIGN OF LEVEL          *3-3
| 0ggg gggg | ABSOLUTE LEVEL         *3-4
| 0000 000h | Shelving/Peaking       *3-5

| 0000 00aa | A-ch Pre Delay
| 0bbb bbbb | A-ch Pre Delay  aabbbbbbb = 0-500
| 0000 00cc | B-ch Pre Delay
| 0ddd dddd | B-ch Pre Delay  ccddddddd = 0-500

| 0aaa aaaa | A-ch Post Delay  LOW       aaaaaaa = 0-99
| 0bbb bbbb | A-ch Post Delay  MID LOW   bbbbbbb = 0-99
| 0ccc cccc | A-ch Post Delay  MID HIGH  ccccccc = 0-99
| 0ddd dddd | A-ch Post Delay  HIGH      ddddddd = 0-99

| 0aaa aaaa | B-ch Post Delay  LOW       aaaaaaa = 0-99
| 0bbb bbbb | B-ch Post Delay  MID LOW   bbbbbbb = 0-99
| 0ccc cccc | B-ch Post Dealy  MID HIGH  ccccccc = 0-99
| 0ddd dddd | B-ch Post Delay  HIGH      ddddddd = 0-99

| 0000 a0bb | MODE             *3-7

| 0000 000a | A·1-4 / B·5-8    0:A·1-4 , 1:B·5-8


02 00 | MEMORY NO.2  ( 78bytes )

03 00 | MEMORY NO.3  ( 78bytes )

04 00 | MEMORY NO.4  ( 78bytes )

           :

63 00 | MEMORY NO.99  ( 78bytes )


64 00 | NAME OF MEMORY NO.1  ( 8bytes )

      | 00aa aaaa |  0-52  *3-8
      | 00bb bbbb |  0-52
      | 00cc cccc |  0-52
      | 00dd dddd |  0-52
      | 00ee eeee |  0-52
      | 00ff ffff |  0-52
      | 00gg gggg |  0-52
      | 00hh hhhh |  0-52
```

```
*3-8   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
       A B C D E F G H I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y  Z

27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
 0  1  2  3  4  5  6  7  8  9  !  "  #  $  %  &  '  *  +  -  .  /  :

50 51 52
 ;  =  ?
```

```
64 08 | NAME OF MEMORY NO.2  ( 8bytes )

64 10 | NAME OF MEMORY NO.3  ( 8bytes )

           :

6a 10 | NAME OF MEMORY NO.99  ( 8bytes )

6a 18 | PROGRAM CHANGE TABLE 1-64  ( 64bytes )

      | 0aaa aaaa |  0-98  *3-9
```

```
                    | 0aaa aaaa |  0-98
                    | 0aaa aaaa |  0-98
                          :
                    | 0aaa aaaa |  0-98

         6a 58  | PROGRAM CHANGE TABLE 65-128  ( 64bytes )

                    | 0aaa aaaa |  0-98    *3-9
                    | 0aaa aaaa |  0-98
                    | 0aaa aaaa |  0-98
                          :
                    | 0aaa aaaa |  0-98
```

*3-9   aaaaaaa+1 = MEMORY NUMBER

4.   TRANSMITTED EXCLUSIVE MESSAGE
--   ----------------------------

```
          Byte               Description
       ---------    ------------------------------------
       a 1111 0000    Exclusive status
       b 0100 0001    Roland ID #
       c 0000 nnnn    Device-ID # = MIDI basic channel
                      where nnnn + 1 = channel #
       d 0010 0100    Model-ID # ( E-660 )
       e 0001 0010    Command-ID # ( DT1 )
       f 0aaa aaaa    Address MSB          *4-1
       g 0bbb bbbb    Address LSB
       j 0ccc cccc    Data                 *4-1
            :
       k 0ddd dddd    Checksum
       l 1111 0111    End of System Exclusive
```

*4-1   Address   Data

```
       01 00    78bytes    MEMORY NO. 1
       02 00    78bytes    MEMORY NO. 2
       03 00    78bytes    MEMORY NO. 3
          :
       63 00    78bytes    MEMORY NO. 99

       64 00    8bytes     NAME OF MEMORY NO. 1
       64 08    8bytes     NAME OF MEMORY NO. 2
       64 10    8bytes     NAME OF MEMORY NO. 3
          :
       6a 10    8bytes     NAME OF MEMORY NO. 99

       6a 18    64bytes    PROGRAM CHANGE TABLE 1-64
       6a 58    64bytes    PROGRAM CHANGE TABLE 65-128
```

MIDI Implementation Chart

Function ···		Transmitted	Recognized	Remarks
Basic Channel	Default	×	1 – 16	memorized
	Changed	×	1 – 16	
Mode	Default	×	1, 3	memorized
	Messages	×	OMNI ON/OFF	
	Altered	*********		
Note Number		×	×	
	True voice	*********	×	
Velocity	Note ON	×	×	
	Note OFF	×	×	
After Touch	Key's	×	×	
	Ch's	×	×	
Pitch Bender		×	×	
Control Change		×	×	
Prog Change		×	○	
	True #	*********		
System Exclusive		○	○	parameters
System Common	Song pos	×	×	
	Song sel	×	×	
	Tune	×	×	
System Real Time	Clock	×	×	
	Command	×	×	
Aux Messages	Local ON/OFF	×	×	
	All Notes OFF	×	×	
	Active Sense	×	×	
	Reset	×	×	
Notes				

Mode 1 : OMNI ON, POLY   Mode 3 : OMNI OFF, POLY   ○ : Yes
Mode 2 : OMNI ON, MONO   Mode 4 : OMNI OFF, MONO   × : No

≈Roland®
11010

E-660

270102820 0   '88-9-A3-21

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