

**JVC**

# System Keyboard **NS-70**

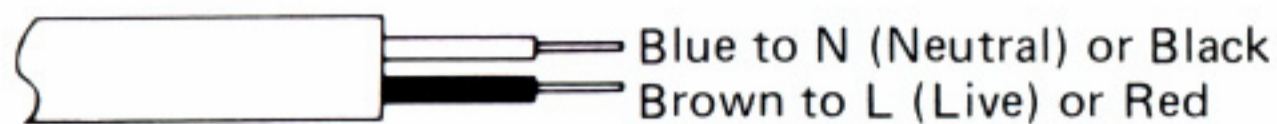


**OWNER'S MANUAL  
BEDIENUNGSANLEITUNG  
MANUEL DU PROPRIETAIRE  
MANUAL DEL USUARIO**

### IMPORTANT (in the United Kingdom)

#### Mains Supply (AC 240 V $\sim$ , 50 Hz only)

Do not make any connection to the Larger terminal coded E or coloured Green. The wires in the mains lead are coloured in accordance with following code:



If these colours do not correspond with the terminal identifications of your plug, connect as follows:

Blue wire to terminal coded N (Neutral) or coloured Black.

Brown wire to terminal L (Live) or coloured Red.

If in doubt – consult a qualified electrician.

**WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.**

Thank you for purchasing JVC's NS-70 System Keyboard. Before switching on, be sure to read the precautions below. To get full enjoyment from your NS-70, study this owner's manual. After reading, keep the manual handy for future reference.

## PRECAUTIONS

- Use only the power cord provided.
- Disconnect the power cord immediately in the event of an electrical storm.
- In the event repair is required, see your local dealer or JVC-authorized service agency. Do not attempt any internal adjustments or repairs.
- Avoid storing the instrument
  - under the direct rays of the sun;
  - near a heater, stove, fireplace or other heat source;
  - in extremely dusty environments or places subject to high vibrations.
- To clean the unit, use a dry cloth or one moistened with water or a neutral detergent.

When this unit is used with audio amplifier and speakers, to prevent damaging the speakers, keep the volume at normal playing level.

For the right combination of amplifier and speakers to be used, consult your JVC dealer.

## CAUTIONS

- For AC operation, use only the power cord provided to prevent danger.
- Disconnect the AC plug when not in use.
- To prevent electric shock, do not remove screws, covers or cabinet. No user-serviceable parts inside. Refer servicing to qualified service personnel.

### Voltage selector

The voltage selector is located on the rear of the instrument. Before connecting the power cord to an AC outlet, check that the correct voltage (120 V, 220 V or 240 V) for your area has been selected.

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### CONTROL PANEL (Attached Sheet)

\* For the following items (switches), refer to the separate volume "Control Panel" sheet

- Full PCM Stereo Rhythm
  - Rhythm Tempo, Beat Conductor, Rhythm Reverb, Manual Drums, Hand Clap, Tambourine, Start/Stop, Synchro Start and Intro/Fill-in
- Sustain, Phaser Speed & Stereo Reverb
- Touch Response
- Stereo Effect – Symphonic & Celeste
- Ultra Chord
- Magic Foot
- Solo To Lower, Solo To Arpeggio, Lower To Upper & Bass To Lower

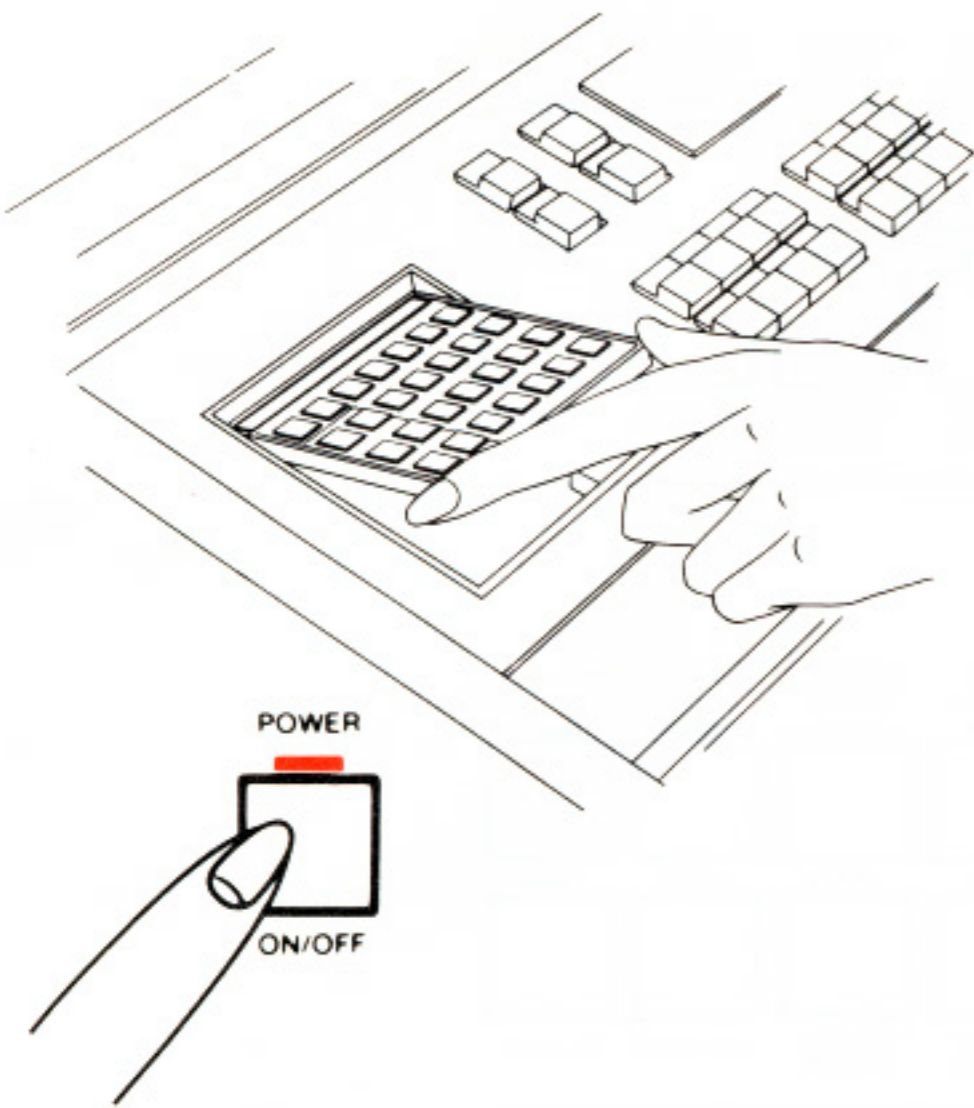
### SOUND CREATOR MANUAL (Separate Volume)

\* For the following items, refer to the separate "Sound Creator" manual.

- Guide for sound making using NS-70
- Parameter list
- Editing (Sound making)

\*The Pedal Keyboard Unit, Bench, Stand, Organ Expander Unit, Amplifier, Speakers and Speaker Stands on the front cover are all optional.

# PREPARATION



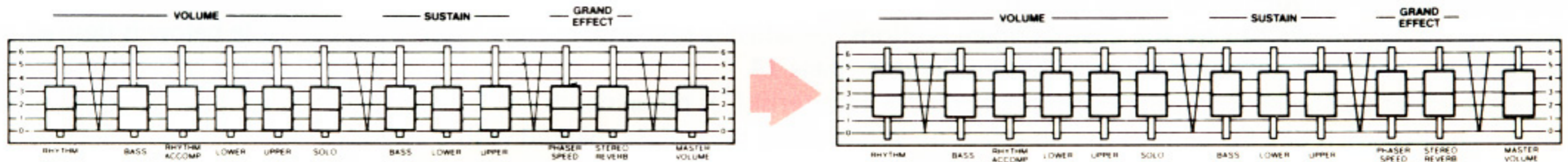
Since an amplifier and speakers are not incorporated in the NS-70, connect this unit to an audio system (amplifier, speakers) before use. Use the provided stereo pin cord to connect the AUX OUT terminals of this unit to the AUX IN (or LINE IN) terminals of the amplifier. (Be sure to make the correct (L) and (R) connections.)

- 1 Connect the power cord provided. (The AC STANDBY indicator lights.)
- 2 Insert the DIGITAL COMPOSER provided.
- 3 Press the POWER switch. Several seconds later, the LEDs begin running on the voice select switches until one of them is pressed. For each voice section, when any switch is pressed, the LED stops. Pressing the POWER switch again turns the power off.

## VOLUME

The volumes of the six channels of sound are controlled so that their balance can be checked at a glance. Use the MASTER VOLUME control to adjust the overall volume.

Before playing set all slide controls to the center positions.



## PRESET VOICES & CUSTOM VOICES

Two types of voices, preset and custom, are included;

(A) **Preset voices:** These are indicated above the voice select switches; they cannot be erased.

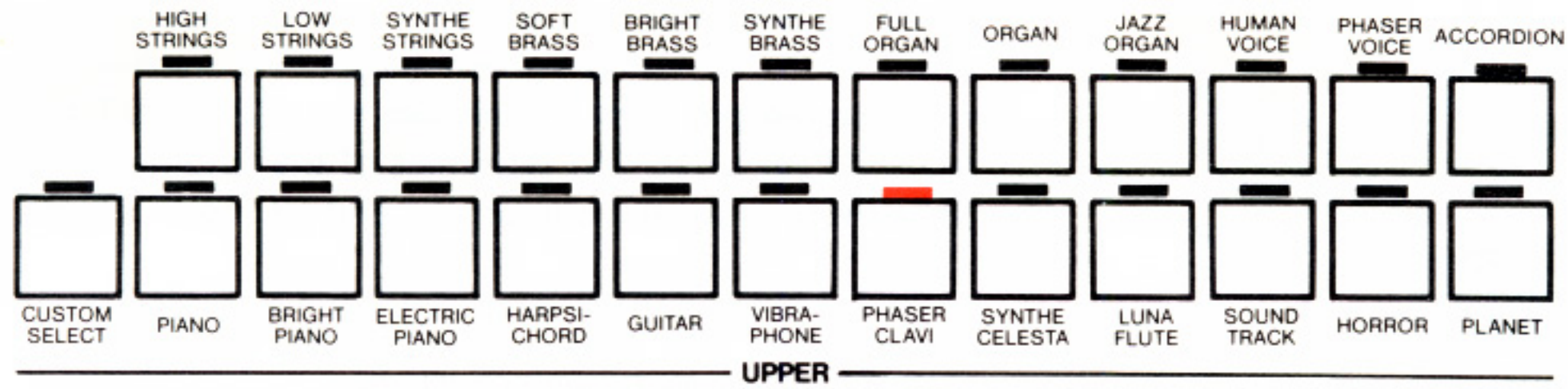
(B) **Custom voices:** Voices which are made as desired, as well as modified preset voices, can be stored in these switches. (See separate volume "Sound Creator".) By using the optionally available Voice Pack voices used by professional musicians can also be stored here. Press the CUSTOM switch located on the lower left side of each voice section to change from the preset voice to the custom voice. (See below)

The following five preset voice groups are available with the NS-70

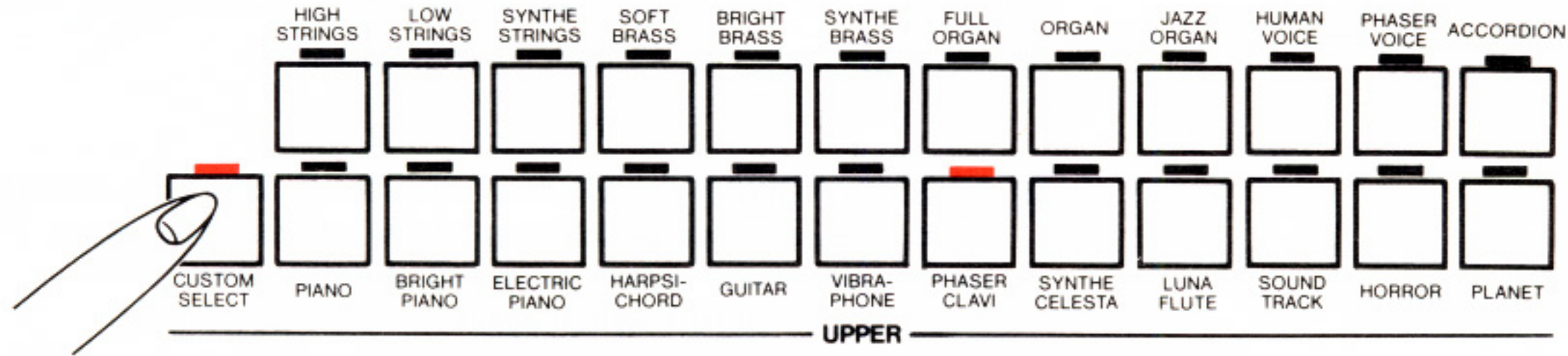
Voice group	No. of voices	No. of notes produced at a time	Keyboard to be played
SOLO/ARPEGGIO	15 preset + 15 custom	1	Normally upper manual, can be moved to lower manual (SOLO TO LOWER). Can also be transferred to play the Arpeggio patterns in the Fascinating Chord (SOLO TO ARPEGGIO).
UPPER	24 preset + 24 custom	8	Upper manual
LOWER	13 preset + 13 custom	8 (4)	Normally lower manual, can be moved to upper manual (LOWER TO UPPER). With Fascinating Chord on, the number of produced notes is four.
RHYTHM ACCOMP	7 preset + 7 custom	4	None, interlocked with Fascinating Chord
BASS	7 preset + 7 custom	1	Normally pedal keyboard, can be moved to lower manual (BASS TO LOWER)

## How to select a custom voice

For example, the PHASER CLAVI voice is selected for the upper manual in the figure below.



When the CUSTOM SELECT switch is pressed (LED lights) . . .



A voice (PHASER SYNTH) different from the indicated voice (PHASER CLAVI) will be produced; this is the "custom voice" and the indicated voice (PHASER CLAVI in this example) is the "preset voice".

For each preset voice indicated on the control panel, there is a custom voice as well.

- \* Voices may be modified and stored in these switches or transferred from a Voice Pack (optionally available in the future), and they may differ from those in the table below.
- \* When no voice is produced by the custom voice sections, or when a prepared custom voice from the table below is desired to be recalled, refer to the separate volume "Sound Creator" page 14.
- \* A phase effect can be added to the voices marked with an asterisk (\*); phase depth can be adjusted by the Phaser Speed control knob. The PHASER SPEED control has no effect on voices other than those marked with a asterisk.

## SOLO

PRESET		TRUMPET	TROMBONE	PAN FLUTE	JAZZ FLUTE	VIOLIN	CELLO	HAWAIIAN GUITAR
CUSTOM		5TH TRUMPET	HORN	RE-CORDER	FUNNY FLUTE	HUMAN VOICE	SYNTH CELESTA	BANJO
PRESET	CLARINET	SAXO-PHONE	HARMONICA	WHISTLE	ROCK GUITAR	SYNTH PERCUS	UFO	STORM
CUSTOM	OBOE	BASSOON	SYNTH LEAD 1	SYNTH LEAD 2	*PHASER GUITAR	METAL PER-CUSSION	VENUS	WAVE

## UPPER

PRESET	HIGH STRINGS	LOW STRINGS	SYNTH STRINGS	SOFT BRASS	BRIGHT BRASS	SYNTH BRASS	FULL ORGAN	ORGAN	JAZZ ORGAN	HUMAN VOICE	*PHASER VOICE	ACCORDION
CUSTOM	DUAL STRINGS	FAST STRINGS	SYNTH STRINGS	HARD BRASS	5TH BRASS	STRING BRASS	THEATER ORGAN	SYNTH ORGAN	PER-CUSSION ORGAN	HUMAN VOICE 2	*PHASER STRINGS	ACCORDION 2
PRESET	PIANO	BRIGHT PIANO	ELECTRIC PIANO	HARPSICHORD	GUITAR	VIBRA-PHONE	*PHASER CLAVI	SYNTH CELESTA	LUNA FLUTE	SOUND TRACK	HORROR	PLANET
CUSTOM	HONKY-TONK PIANO	SYNTH PIANO	HARP	SYNTH HARPSICHORD	SITAR	CLAVI-CHORD	*PHASER SYNTH	SYNTH LEAD	COSMIC	PIANO STRINGS	CAVE ECHO	CYGNUS

## LOWER

PRESET		HIGH STRINGS	LOW STRINGS	SOFT BRASS	SYNTH BRASS	FULL ORGAN	ORGAN
CUSTOM		DUAL STRINGS	SYNTH STRINGS	HARD BRASS	STRING BRASS	THEATER ORGAN	SYNTH ORGAN
PRESET	PIANO	ELECTRIC PIANO	GUITAR	HUMAN VOICE	BANDONEON	*PHASER CLAVI	SOUND TRACK
CUSTOM	HONKY-TONK PIANO	HARP	CLAVI-CHORD	SYNTH CELESTA	PIANO STRINGS	*PHASER STRINGS	PLANET

## RHYTHM ACCOMP

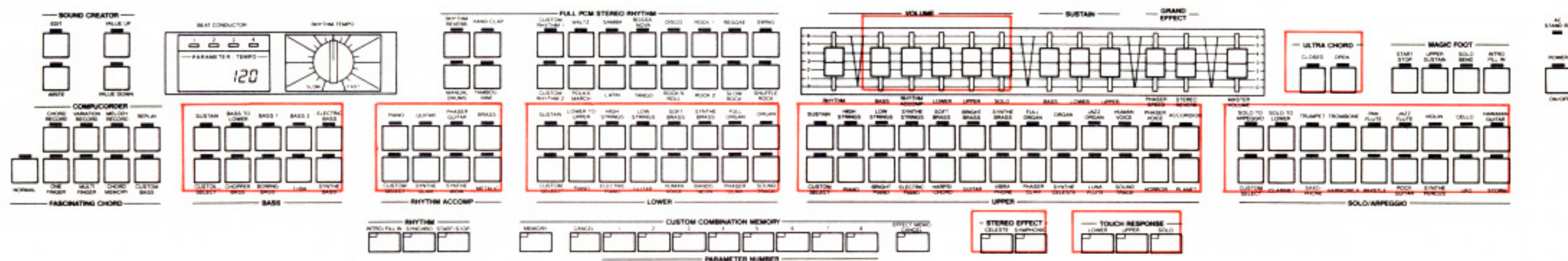
PRESET	PIANO	GUITAR	*PHASER GUITAR	BRASS
CUSTOM	ELECTRIC PIANO	ROCK GUITAR	*PHASER CLAVI	CONTINUOUS VOICE
PRESET		SYNTH CLAVI	SYNTH WOW	METALIC
CUSTOM		SYNTH HARPSICHORD	TRAIN	CONTINUOUS STRINGS

## BASS

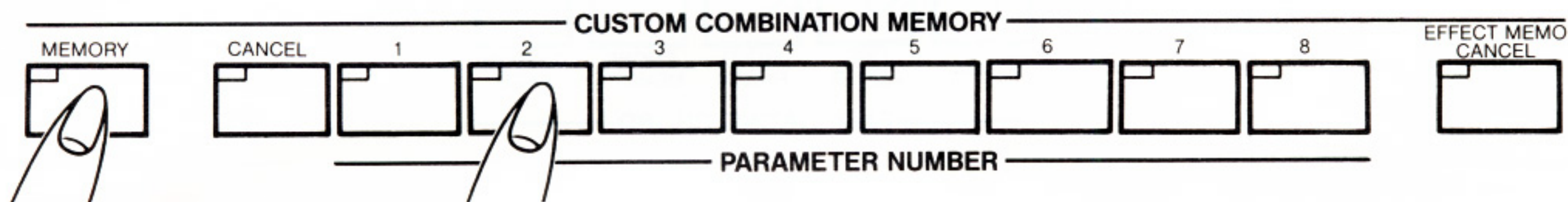
PRESET		BASS 1	BASS 2	ELECTRIC BASS
CUSTOM		BASS 3	ORGAN BASS	ELECTRIC BASS 2
PRESET	CHOPPER BASS	BOWING BASS	TUBA	SYNTH BASS
CUSTOM	CHOPPER BASS 2	STRING BASS	SYNTH BRASS	SYNTH BASS 2

# CUSTOM COMBINATION MEMORY

Each selection for SOLO, UPPER, LOWER, RHYTHM ACCOMP and BASS voices and their volume balance and up to eight different switch settings of Ultra Chord, Stereo Effect, Touch Response, etc. can be stored in memory. These settings can also be transferred to the optional Digital Memory Pack for storage.



## How to store

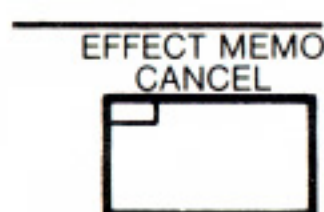


- 1) After each section above is set as desired, press one of Custom Combination Memory switches 1 to 8 while pressing the MEMORY switch; the setting is now stored in memory.
- 2) The stored setting can be recalled at any time by pressing its Custom Combination Memory switch. (The selected switch LED lights.)
- 3) To go back to the previous setting, press the CANCEL switch.

The following settings cannot be stored in the CUSTOM COMBINATION MEMORY:  
 Full PCM Stereo Rhythm, Rhythm Tempo, Rhythm volume, Stereo Reverb, Sustain control knob, Phaser Speed, Master volume, Compucorder, Magic Foot and Fascinating Chord.

- The recalled setting can be modified as desired; however, after releasing the setting by pressing the CANCEL switch, pressing the same numeric switch resumes the originally stored (before modification) setting condition.
- Data in the CUSTOM COMBINATION MEMORY remains stored for approx. two weeks after the NS-70's power has been turned off. To store the data for extended period of time, turn the power on every two weeks, or store the setting data and voice data into the optional Digital Memory Pack (NS-M10).
- After modifying the recalled setting, pressing one of the numeric (1 to 8) switches while pressing the MEMORY switch stores the modified setting condition.

## EFFECT MEMORY CANCEL switch



Press this switch when only voice setting data is desired to be recalled using the CUSTOM COMBINATION MEMORY. When this switch is pressed and the indicator lights, the volume level indicated by the VOLUME knob, and the effects which were set before the switch was pressed are maintained.

## The relationship between Custom Combination Memory and Volume

- The volume balance can be stored in the Custom Combination Memory; however, the volume level of the recalled setting may differ from the volume knob position on the VOLUME section. Therefore to resume the initial balance, it may be necessary to readjust individual volume knob positions.

# FASCINATING CHORD (AUTOMATIC ACCOMPANIMENT)

FASCINATING CHORD is a JVC original automatic accompaniment system using the latest computer technology.

① When automatic accompaniment is not necessary

② When you do not know how to play chords on a keyboard

When you can play complex chords on a keyboard

①

Press the NORMAL mode switch.

②

Press the ONE FINGER mode switch so that the LED lights.

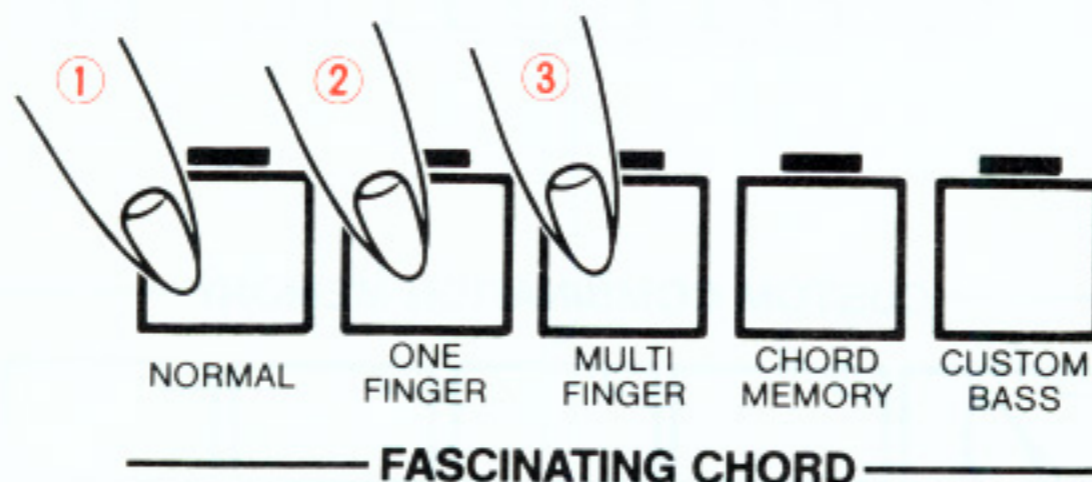
③

Press the MULTI FINGER mode switch so that the LED lights.

①

②

③



①

Play melody and accompaniment manually.

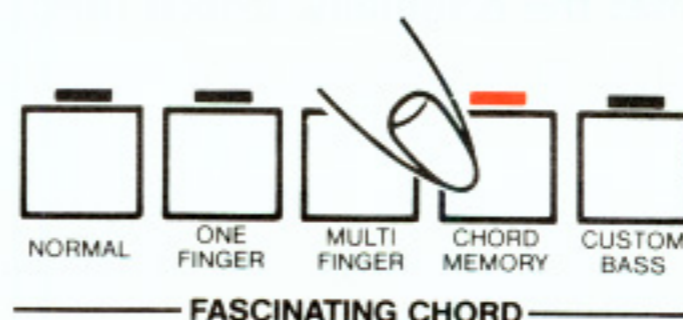
②

Start rhythm and play on the lower manual keys, and the Bass and Accompaniment sound will be produced automatically according to the rhythm selected. The Lower voices are produced only when the lower manual keys are pressed. When Arpeggio is desired, press the SOLO TO ARPEGGIO switch at the upper left of the SOLO/ARPEGGIO voice section. (For ONE FINGER or MULTI FINGER chord generation, see below.)

When the CHORD MEMORY function is used, the same accompaniment is repeated until the next time a lower manual key is pressed.

## CHORD MEMORY

Press the CHORD MEMORY switch so that the LED lights.

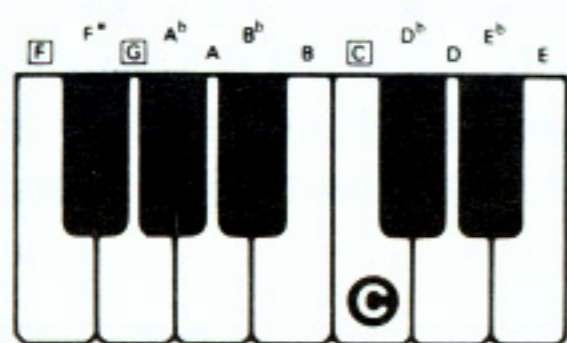


②

## ONE FINGER

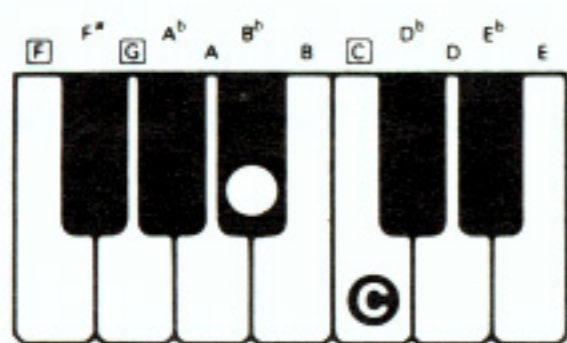
Major, minor, seventh and minor-seventh chords can be played with one to three fingers of the left hand.

**Major chords**  
Example: C



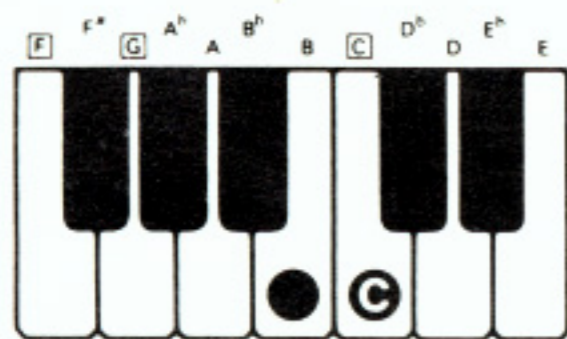
Press one of the C keys and the C major chord (Do-Mi-So harmony) is produced.

**Minor chords**  
Example: Cm



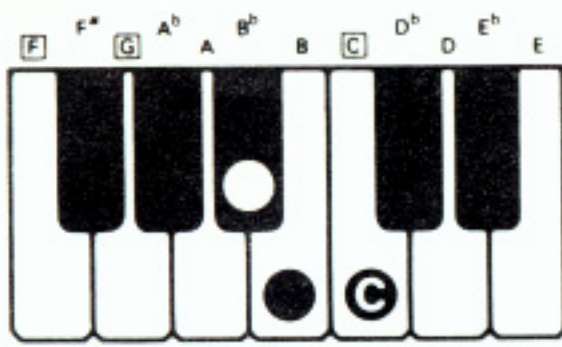
Press the C key together with any black key to the left of it.

**Sevenths**  
Example: C7



Press the C key together with any other white key to the left of it.

**Minor sevenths**  
Example: Cm7



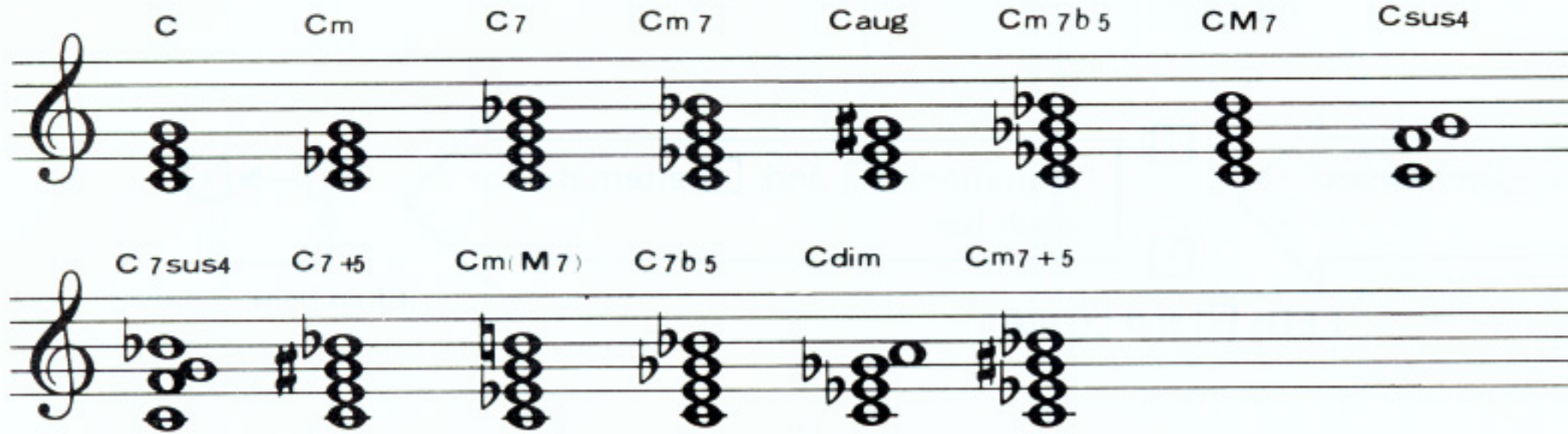
Press the C key together with any black key and any white key to the left. (all three keys together).



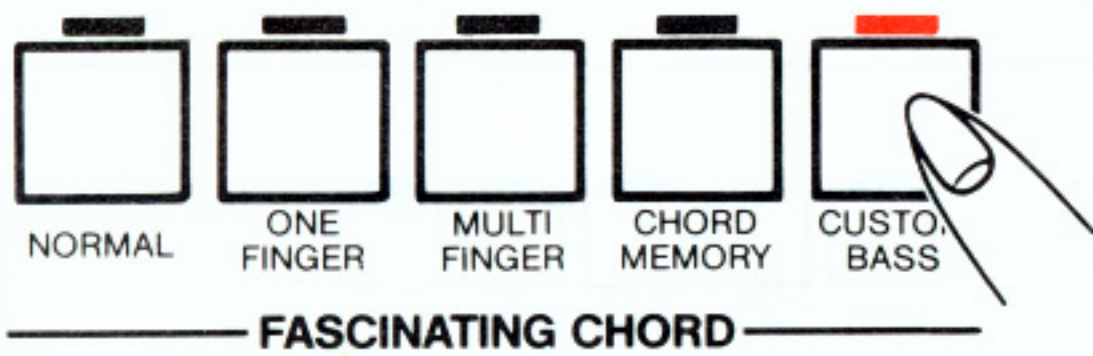
**MULTI FINGER**

Automatic accompaniment is possible with the chords played on the keyboard.

The following 14 chords can be played in any key.  
(14 types x 12 notes = 168 chords)



**CUSTOM BASS**



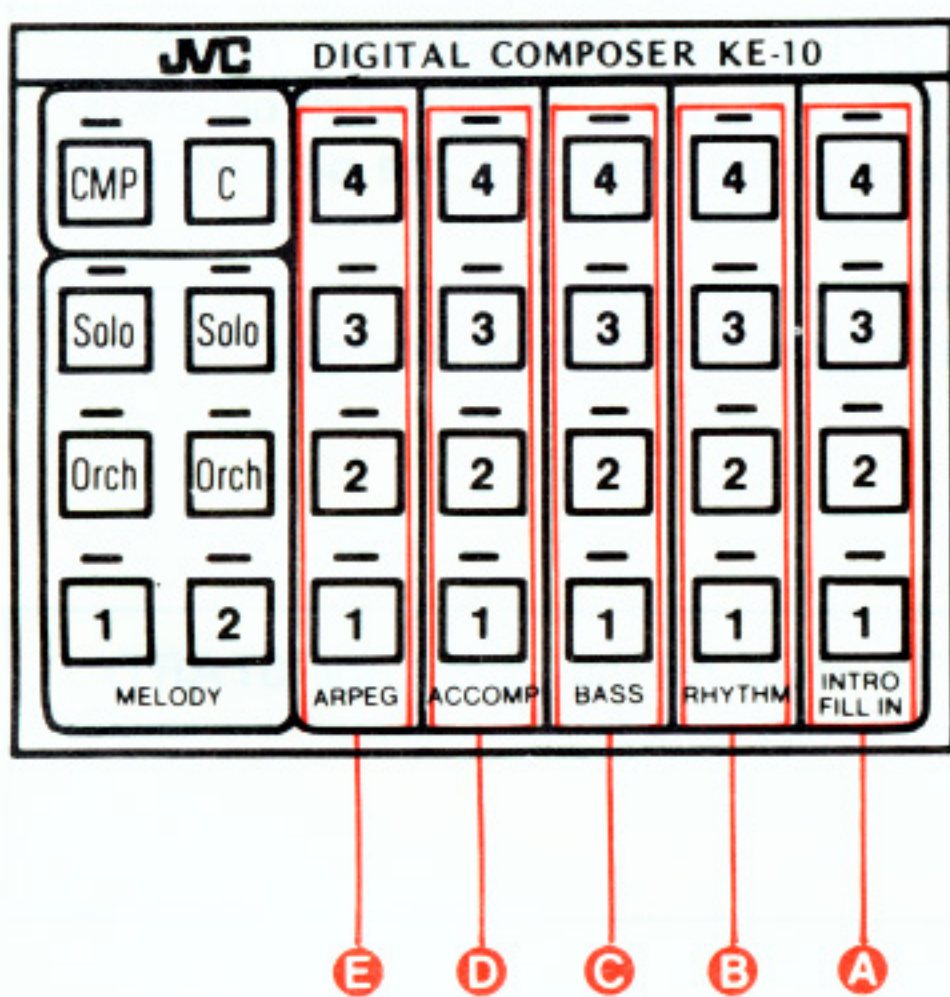
When the optional Pedal Keyboard is connected, pressing this switch cancels the bass sound even if the Fascinating Chord is used. The bass sound is produced according to notes played on the pedal keyboard.

**Hint for playing when you cannot follow the rhythm**

Set the CHORD MEMORY to off and SYNCHRO START to on. Rhythm and auto accompaniment play only when lower manual keys are pressed and stop when the keys are released. Rhythm and auto accompaniment re-start from the first beat when lower manual keys are pressed again.

**--To Give Variation to the Parts of FASCINATING CHORD (Automatic Accompaniment) --**

The FASCINATING CHORD consists of five components; rhythm (plus intro/fill-in), bass, accomp. (rhythm accompaniment), arpeggio and lower (continuous sound of lower manual). The intro/fill-in, rhythm, bass, accomp and arpeggio are provided with four variations for each of 14 rhythms. The desired variation can be selected by pressing the variation switches 1 2 3 4 of the DIGITAL COMPOSER.



**A INTRO/FILL-IN**

The intro/fill-in (with the variation pattern selected on the DIGITAL COMPOSER) is played only when the INTRO/FILL-IN switch is pressed.

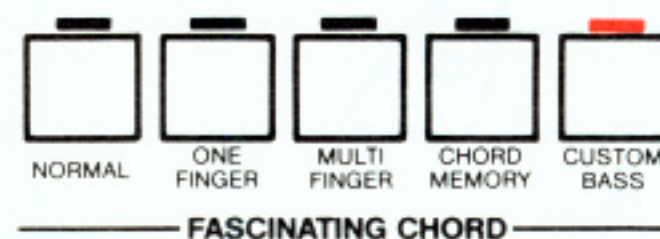


**B RHYTHM**

4 variations are preset for each basic rhythm. (14 x 4 = 56 preset rhythms)

**C BASS**

\* When the CUSTOM BASS switch is pressed, the bass sound is cancelled from the auto-accompaniment and replaced with the sound produced by the pedal keyboard.



**D ACCOMP**

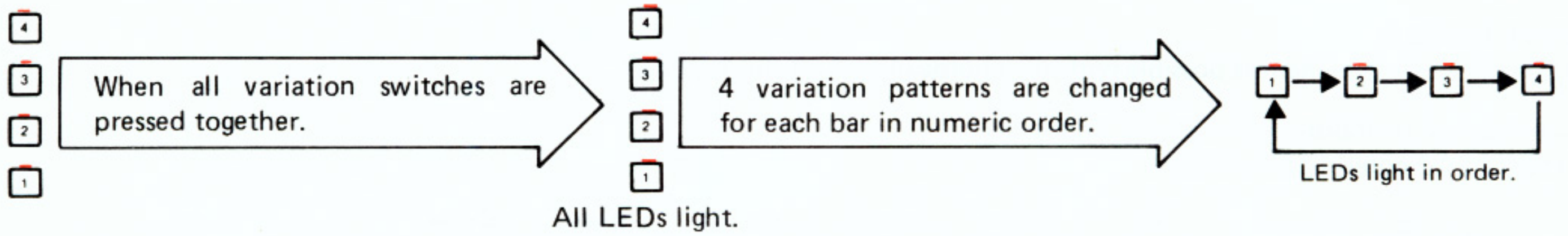
The voice selected by the RHYTHM ACCOMP switches is played along with the rhythm.

**E ARPEGGIO**

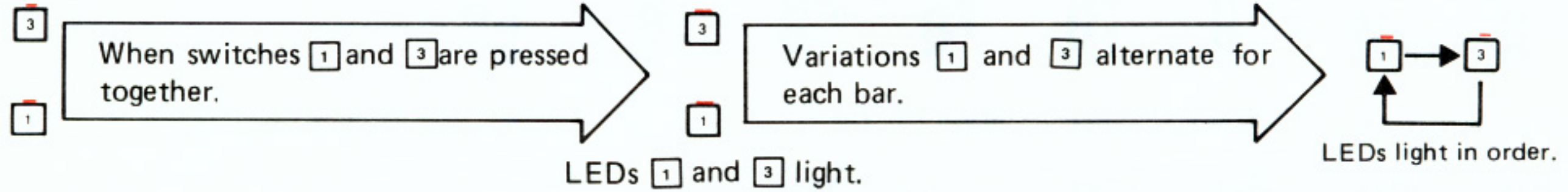
When the SOLO TO ARPEGGIO switch is pressed, the normal arpeggio sound is replaced with a voice selected from the SOLO SYNTH PRESETS and it is played with the 1 2 3 4 arpeggio patterns. In this case, adjust the arpeggio volume with the SOLO control of the VOLUMES. The Solo/Arpeggio voice will not be produced unless play is started with Fascinating Chord on, even when the Solo To Arpeggio LED is lit.

Variation patterns of the DIGITAL COMPOSER can be arranged to make a tune.

**Example 1**



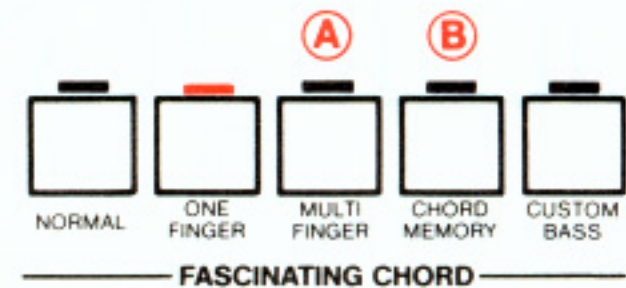
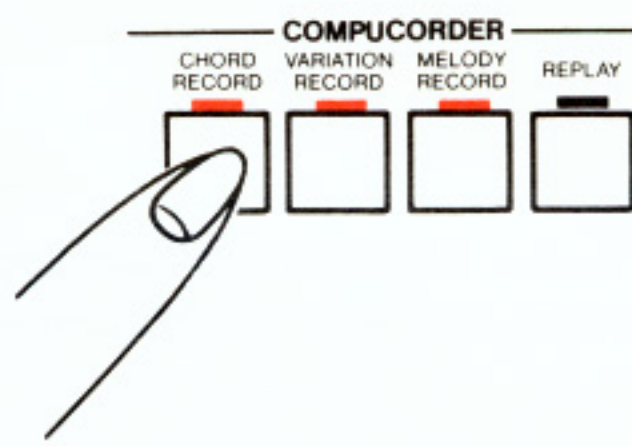
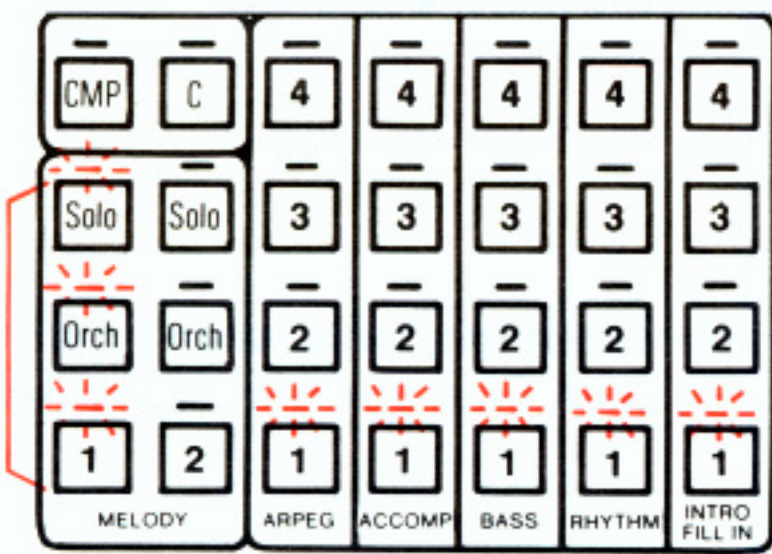
**Example 2**



**COMPUCORDER (TO ARRANGE AND STORE TUNES IN MEMORY)**

**1** To record a whole performance (chords, melody (monophonic) melody, accompaniment variations) as it is played;

(1) Press the chord record switch, the LEDs light or blink as shown.



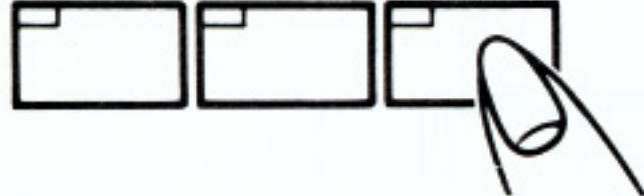
- A** Press the MULTI FINGER switch to play in the MULTI FINGER mode.
- B** When the CHORD MEMORY switch is pressed the accompaniment continues even after the left-hand keys are released.

\* If LEDs do not light as shown, switch the power OFF and try again.

(2) At this time, both **Orch** and **Solo** LEDs blink. With this condition, the recorded melody will be replayed using the voices of both the SOLO/ARPEGGIO and UPPER. To replay only with a voice of the UPPER, press the **Solo** switch before recording so that the LED goes off. To replay only with a voice of the SOLO/ARPEGGIO, press the **Orch** switch before recording so that the LED goes off. And when the **Orch** and **Solo** are pressed alternately during recording, the pattern is recorded as they are changed.

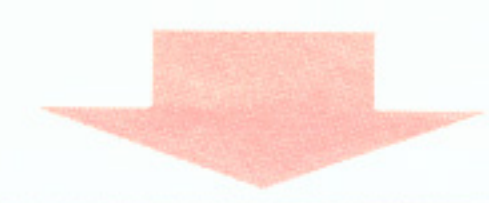
• Up to 128 bars (with minimum unit 1 chord/beat) and up to approx. 500 notes of melody per tune can be recorded.

**RHYTHM**  
INTRO/FILL IN SYNCHRO START/STOP



(3) Start rhythm to start recording. To start rhythm, press the START/STOP switch or use the SYNCHRO START function.





**A** Variations are recorded as switches are changed.

**B** Chords are recorded as they are played on the lower manual.

**C** Melody is recorded as it is played on the upper manual.  
(Only monophonic melody is recorded.)

If you cannot play chords and melody and change variations at the same time, start with chord recording alone and later proceed to record melody (operation **3** below) then change accompaniment variations (operation **4**).



**4**) Press the START/STOP switch to stop rhythm.

- If you do not change accompaniment variation switches **1** **2** **3** **4** when you record chords, variations **1** are recorded for all parts.
- All previously-recorded memories are cleared when the CHORD RECORD switch is pressed and rhythm is started. Thus, before proceeding to **3** recording melody alone and **4** recording accompaniment variations alone, make sure that the CHORD RECORD switch is off.

**2 To replay the recorded tune**

**1**) Press the REPLAY switch so that its LED lights.



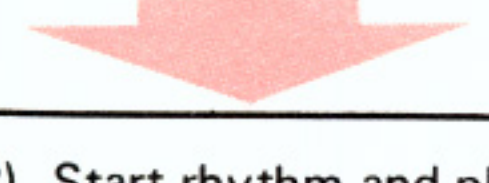
**2**) Press the START/STOP switch to start replay. You can play a supporting melody together with the replayed melody.

**3**) Press the START/STOP switch again to stop replay of accompaniment and melody.

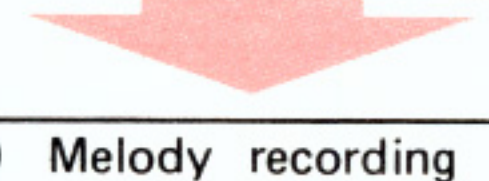
- When the pattern switch for rhythm, bass accomp or arpeggio is pressed to blink, it can be modified independently. When the pattern switches for two or more sections are pressed to blink, they can be modified simultaneously.

**3 To record melody alone**

**1**) Press the MELODY RECORD switch and the LEDs light as shown below.

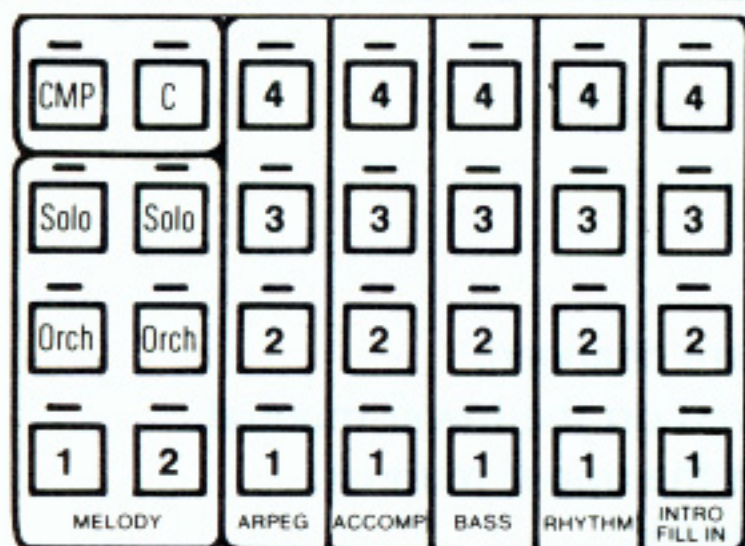


**2**) Start rhythm and play the melody on the upper manual.

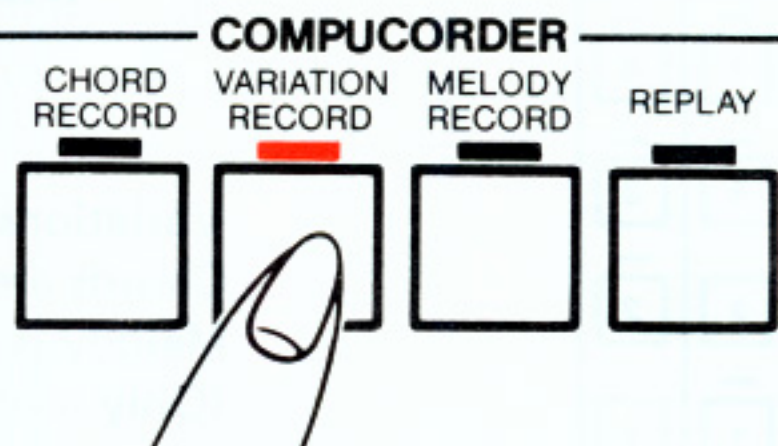


**3**) Melody recording automatically stops at the end of the number of bars for which chords have been recorded.

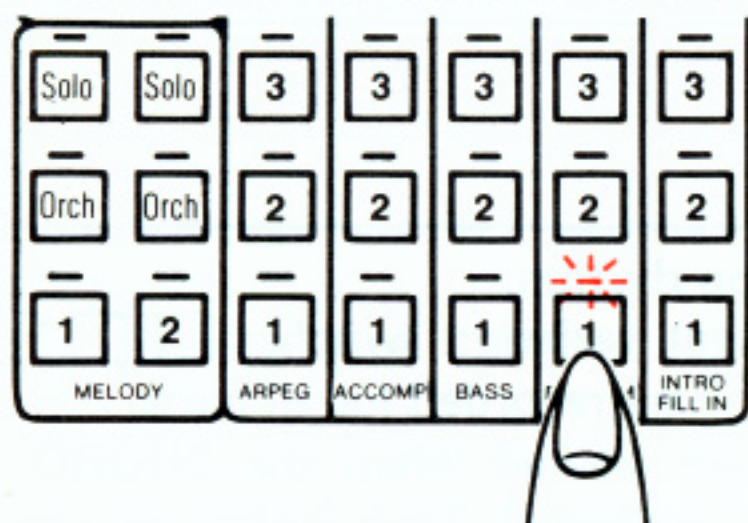
#### 4 To record variations alone



(1) Press the VARIATION RECORD switch.



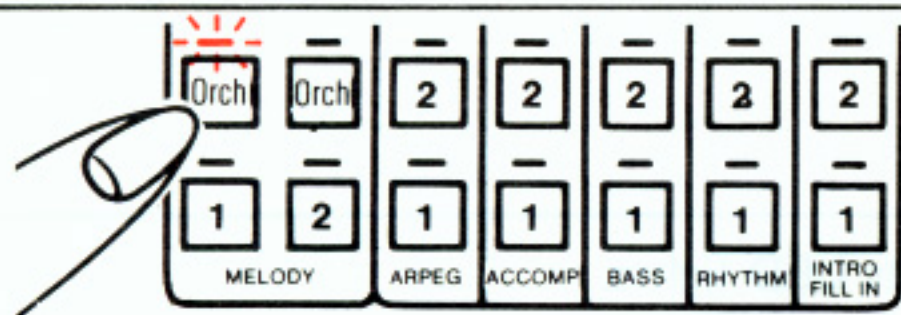
All variation switches on the Digital Composer go off.



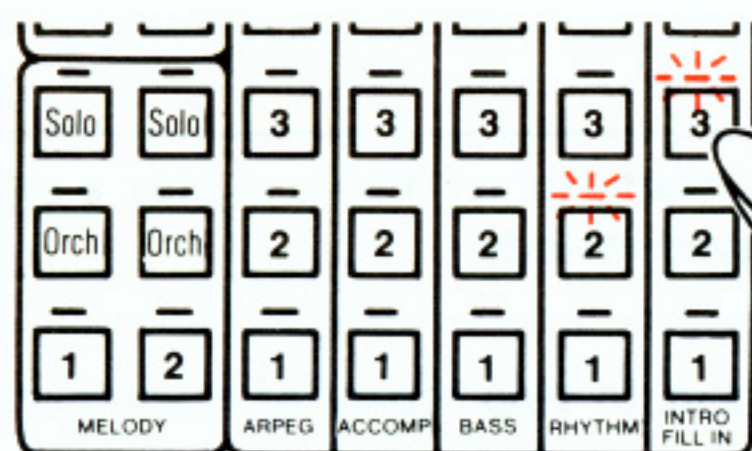
(2) To choose from the variations of RHYTHM (together with INTRO/FILL IN), BASS, ACCOMP and ARPEGGIO, press variation switches 1 2 3 or 4 as desired so that the LEDs blink.

If you do not want to change particular variation patterns as they were recorded in CHORD RECORD (operation 1), do not press the variation switch.

When a variation switch is pressed twice, the LED that was lit goes off and the part is muted.



(3) It is also possible to select the recorded melody to be played by the voices of UPPER alone, SOLO/ARPEGGIO alone, or both. Press either or both of the Orch (UPPER) and Solo (SOLO/ARPEGGIO) switches as desired.



(4) Start rhythm and change variation patterns by pressing required variation switches. Pattern sequences are recorded as they are pressed.



To insert intro/fill-in, press the INTRO/FILL IN switch while the selected INTRO/FILL IN variation switches 1 2 3 or 4 are blinking.

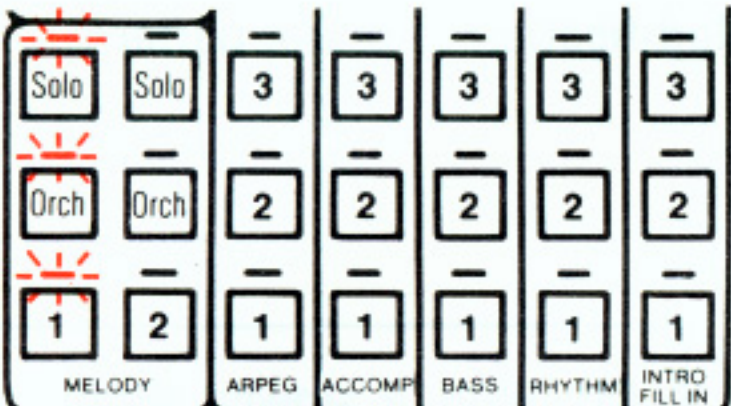
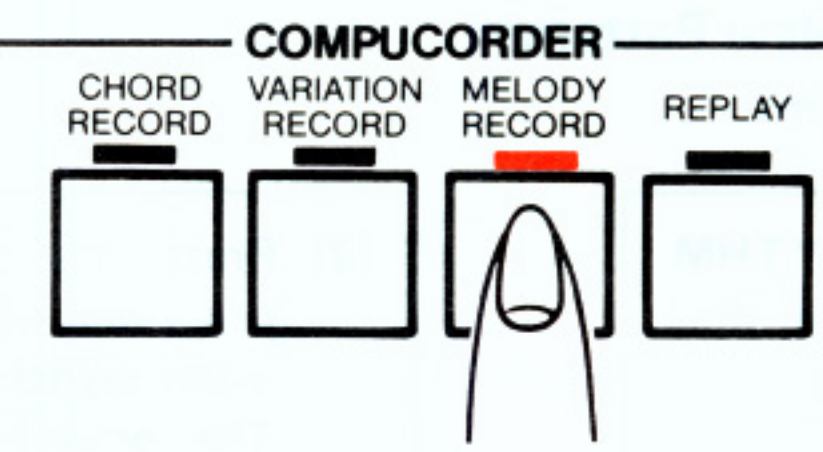


(5) Rhythm stops at the end of the number of bars for which chords have been recorded.

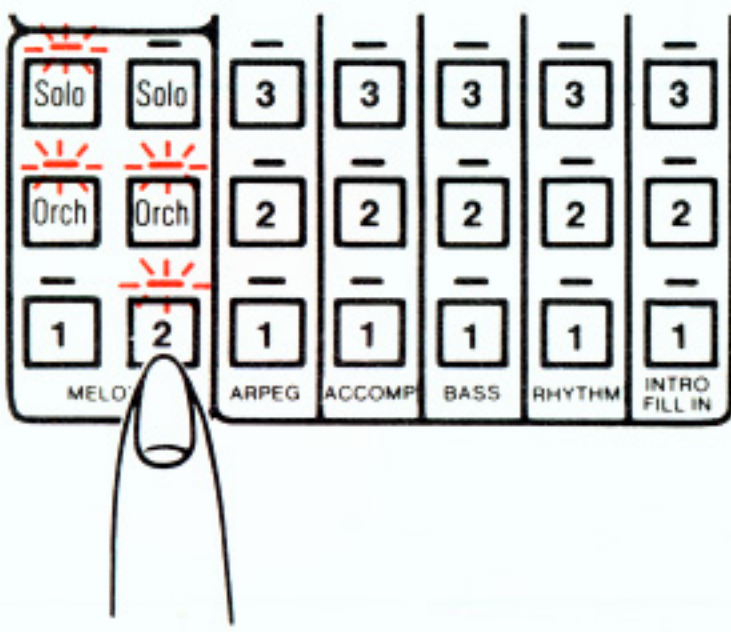
- If you do not change accompaniment variation switches 1 2 3 4 when you record chords, variations 1 are recorded for all parts.
- When the CHORD RECORD switch is pressed to start rhythm, all the previous recorded sections are cleared. Therefore, when only the melody (operation 3) or variation (operation 4) is desired to be stored, make sure that the CHORD RECORD switch is off (the LED is not lit) before starting rhythm.

**5 To record a new melody and clear the recorded melody**

(1) Press the MELODY RECORD switch; the LEDs light as shown.

(2) Press the Melody switch **2** on the Digital Composer; the LEDs light as shown. This time, the Melody **2** **Orch** (for Upper) LED blinks and the **Solo** (for Solo/Arpeggio) LED goes off. To record melody into Melody **2** with **Solo**, press the **Solo** switch so that the LED blinks. Since the **Solo** (Solo/Arpeggio) voices are monophonic, the previously recorded voice in the Melody **1** will be cancelled (cleared) automatically when the melody is recorded into Melody **2** with **Solo**. (However, variations can be modified after the melody has been recorded. See Operation **4**.)



(3) Press the START/STOP switch to start rhythm; the recorded accompaniment and the melody **1** are replayed. Over top of this, a new melody may be played on the upper manual.

(4) The rhythm stops at the end of the number of bars for which chords have been recorded; melody recording automatically stops.

- When the sound of any part is not required at the beginning of the tune (to record variation pattern "off" condition), press one of variation switches **1** **2** **3** **4** so that its LED blinks, then press the same switch so that the LED goes off, and start the rhythm.
- Any one of RHYTHM, BASS, ACCOMP and ARPEGGIO pattern sequences can be re-arranged by pressing a variation switch so that its LED blinks. When re-arranging more than one sequence, press variation switches so that more than one LED blinks.
- To record intro/fill-in the first bar of a tune, press the INTRO/FILL IN switch immediately after starting the rhythm (within the first half of the 1st bar, or within one beat when Waltz is selected). When the pattern sequence recording is started by pressing the INTRO/FILL IN switch alone, the intro/fill-in variation pattern will not be recorded for the 1st bar.

# CUSTOM RHYTHM (COMPOSITION OF RHYTHM AND FASCINATING CHORD)

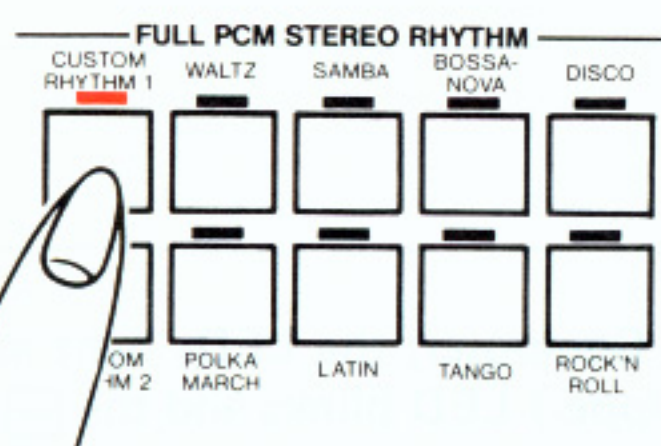
Original accompaniment patterns of FASCINATING CHORD, i.e. rhythm, intro/fill-in, rhythm accompaniment, bass and arpeggio, can be composed as desired and stored in the DIGITAL COMPOSER. Filled with these accompaniment patterns, sequences and melody memories, additional DIGITAL COMPOSER packs obtained from your JVC dealer, can be volumes in your music library.

There are two methods of composition: **1** Composition of entirely new patterns, and **2** Modification of preset patterns.

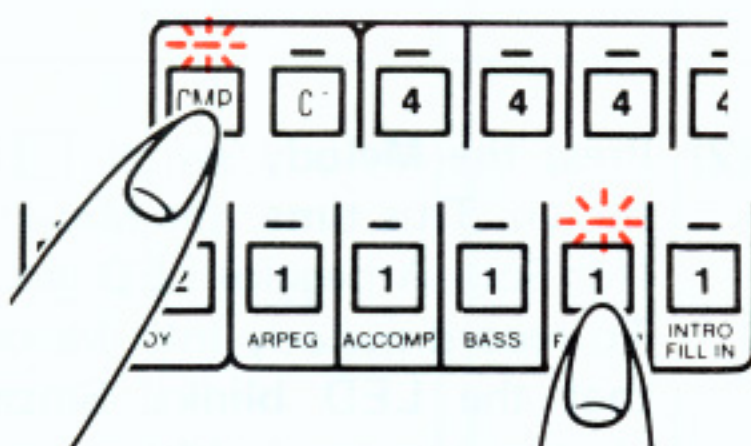
## 1 Creation of Entirely New Patterns

### A Creation of rhythm patterns

(1) Select CUSTOM RHYTHM 1 (or 2). Make sure that rhythm is not running.

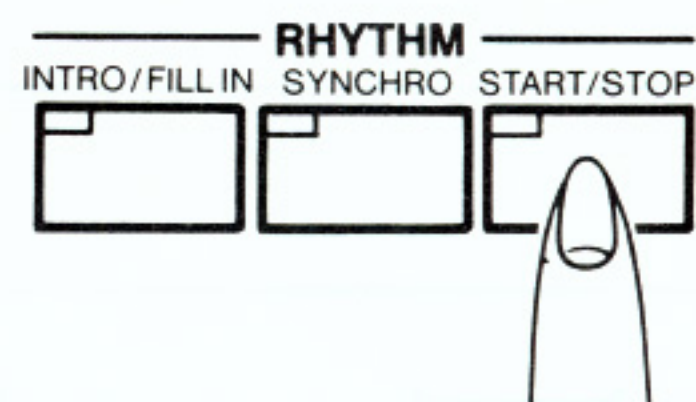


(2) Press the **[CMP]** switch then press one of RHYTHM variation switches **[1]** **[2]** **[3]** **[4]**. The green **[CMP]** LED and the red LED of the selected variation switch blink.



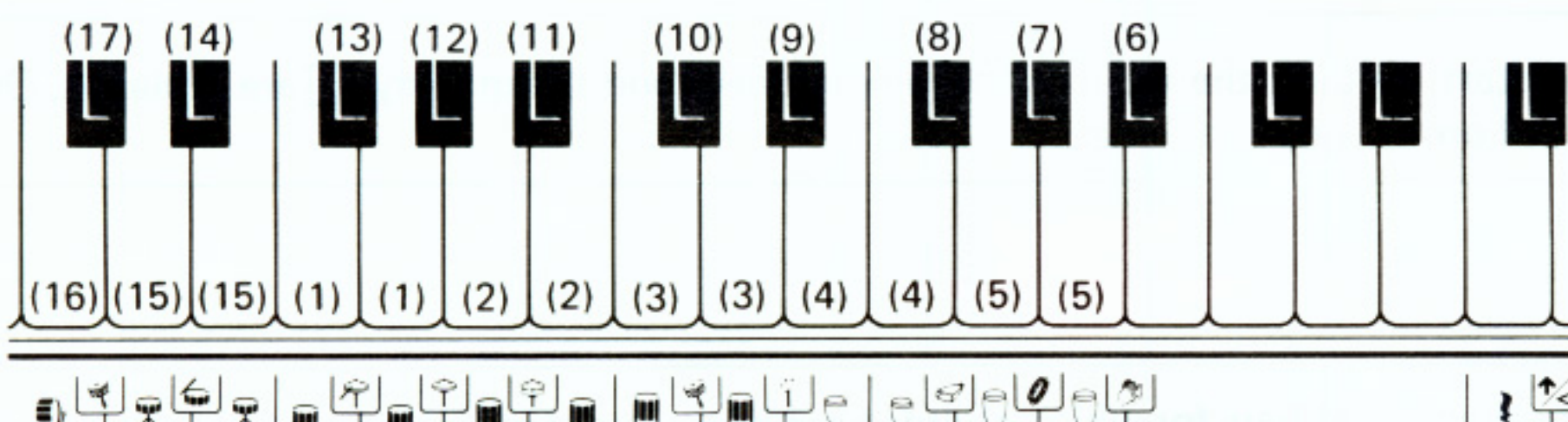
Press the **[C]** switch to clear old data of tune previously recorded.

(3) With a slower tempo, start rhythm.



(4) With the tone keeping time, compose a rhythm by hitting the keys that correspond to the desired percussion instruments. Percussion sounds are recorded in one-bar patterns.

Each key on the left two octaves on the lower manual produces percussion sounds as shown below.



#### Note:

Only one percussion sound can be produced from each channel at any one time.

CH1	*	(1) HT:	High tom-tom
	*	(2) MT:	Middle tom-tom
	*	(3) LT:	Low tom-tom
	*	(4) SC:	Small conga
		(5) LC:	Large conga
CH2		(6) HC:	Hand clap
		(7) TB:	Tambourine
CH3		(8) CB:	Cowbell
	*	(9) CY:	Cymbal
CH4		(10) CA:	Cabasa
		(11) OH:	Open high-hat
	*	(12) CHH-2:	Closed high-hat (2)
	*	(13) CHH-1:	Closed high-hat (1)
CH5		(14) RS:	Rim shot
	*	(15) SD:	Snare drum
CH6	*	(16) BD:	Bass drum
		(17) CA:	Cabasa

#### Accent ( **↑<** ) key ( **F#<sub>3</sub>** ):

When composing an original rhythm variation pattern, accent can be given to instruments marked with an asterisk (\*) by pressing this key together with the key for the instrument.

#### Rest ( **}** ) key ( **F<sub>3</sub>** ):

Use to mute the sound of percussion instruments (when composing RHYTHM), notes (when composing BASS or ARPEGGIO) or accompaniment voices (when composing ACCOMP).

- Percussion is reproduced through six channels and only one instrument per channel can be played at a time. When, for example, cymbal and cowbell are input together, only one will be recorded. When they are input one after another, the sustain of the cymbal is cut the moment the cowbell is played.

(5) Each percussion instrument can be recorded separately and superimposed while the one-bar cycles are repeated. The minimum beat unit is and notes shorter than this are converted to this unit. A faster rhythm can easily be input by slowing down the tempo.

(6) Sounds input by mistake or those you don't like can be cleared after recording, without stopping rhythm.

① To clear everything and restart from the very beginning:

② To clear only some notes of a certain instrument:

①

②

①

②

①

②

Keep the rhythm running and add new instruments.

(7) Stop rhythm when you have completed the composition.

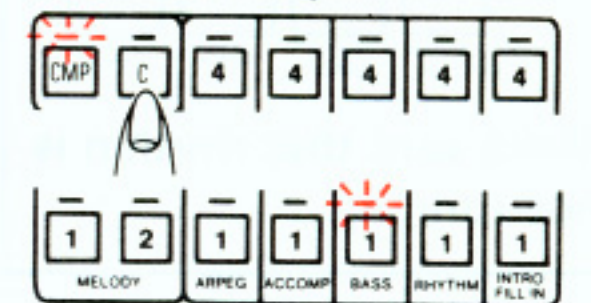
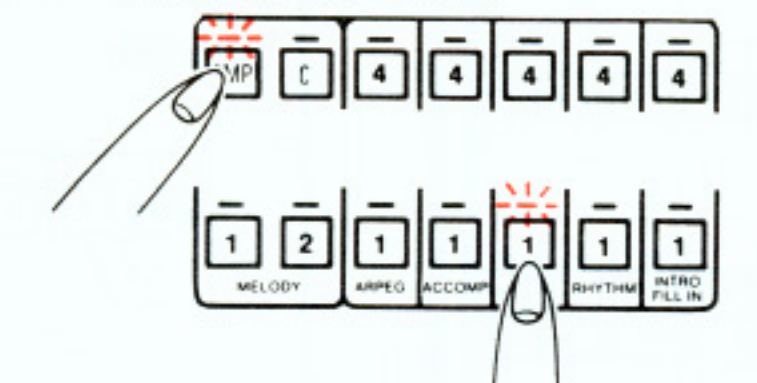
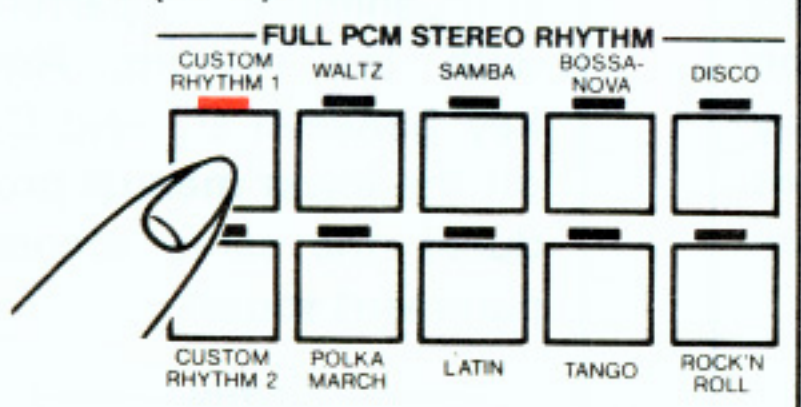
- Accent can be added to the tom-tom, cymbal, closed high-hat, snare drum or bass drum rhythm voice. Add accent by pressing the keys for each percussion instrument while pressing the accent key (  $\blacktriangleleft$  F #<sub>3</sub> ) while recording.
- Cabasa can be played with two keys, the lowest C # and C #<sub>2</sub>, one octave above. To delete the cabasa sound, use the same key with which it was composed.
- The INTRO/FILL IN variation patterns can be created in the same way as the RHYTHM patterns.

**B Composition of BASS patterns**

(1) Select CUSTOM RHYTHM 1 (or 2).

(2) Press the **CMP** switch then press one of BASS variation switches **1 2 3 4**, The green **CMP** LED and red LED of the selected variation switch both blink.

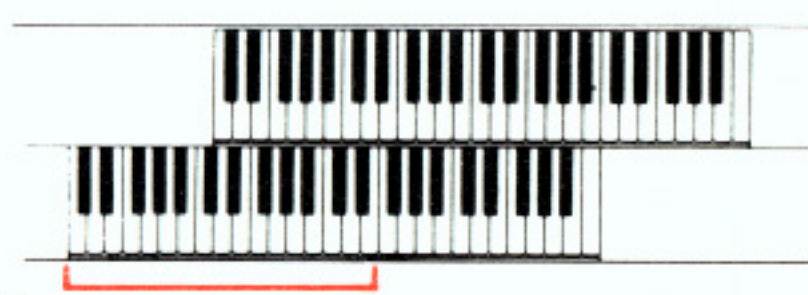
(3) Press the **C** switch to clear the bass variation pattern which has been previously recorded for the selected variation switch.



Make sure that rhythm is not running.

The previously recorded bass pattern has now been cleared.

(4) Press the START/STOP switch to start rhythm and play bass pattern with the rhythm. On the lower keyboards the keys between C<sub>1</sub> and E<sub>3</sub>, are used for playing bass.



Bass composition range

**Note:**

When composing bass, always play patterns in the key of C major.

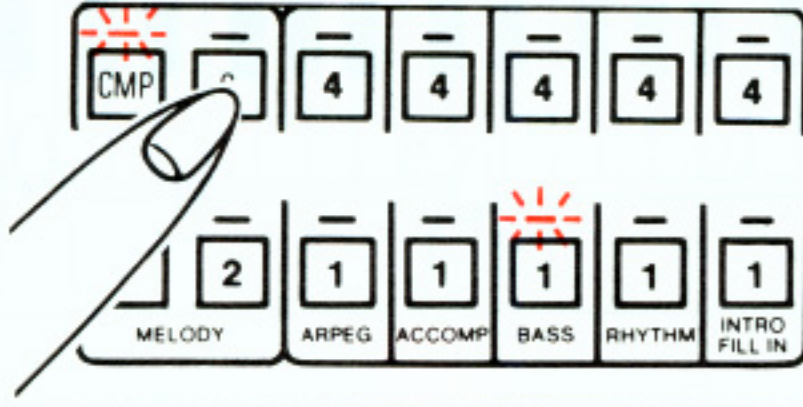
(5) Two methods are possible for changing the recorded bass pattern.

① To clear everything and restart from the very beginning:

② To clear only some notes:

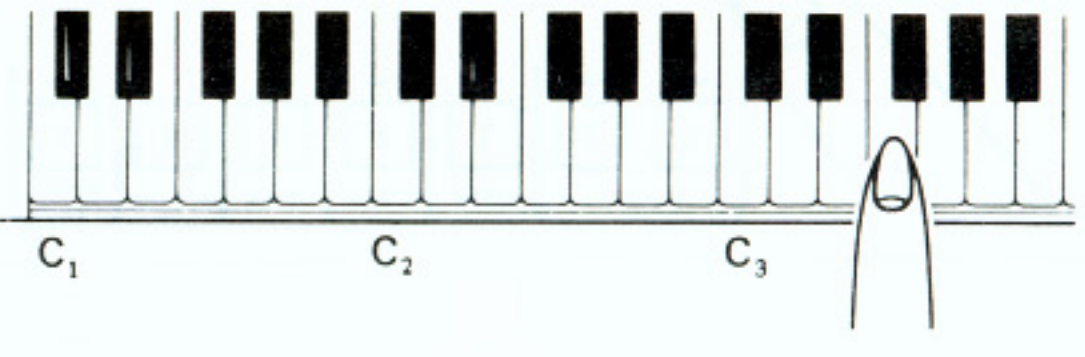
Check that the rhythm is running and that the green **CMP** LED is blinking. (If not, go back to (1).)

Press the **C** switch.



Play new bass pattern.

Press the rest key (  $\text{R}$  ) for the period you want to clear the bass notes.

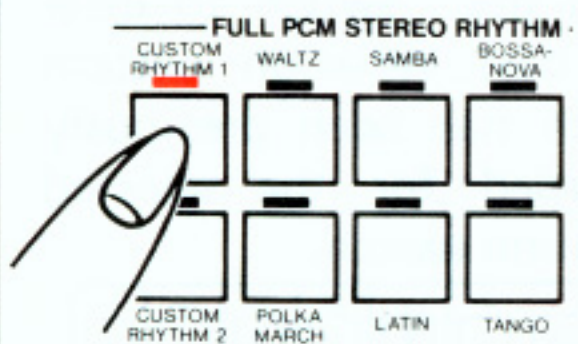


Add new notes to the blank space.

(6) Stop rhythm when you have completed the composition.

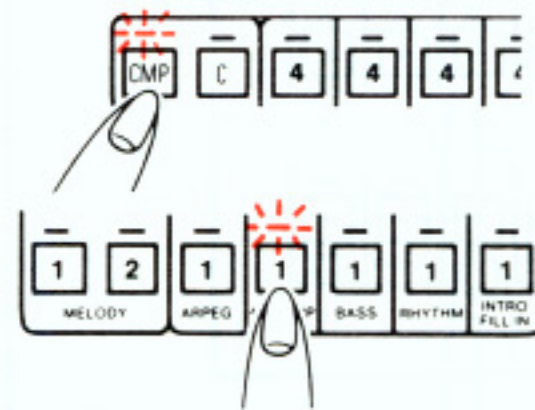
### C Composition of ACCOMP patterns

(1) Press CUSTOM RHYTHM 1 (or 2).

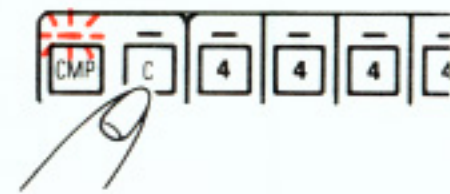


Make sure that rhythm is not running.

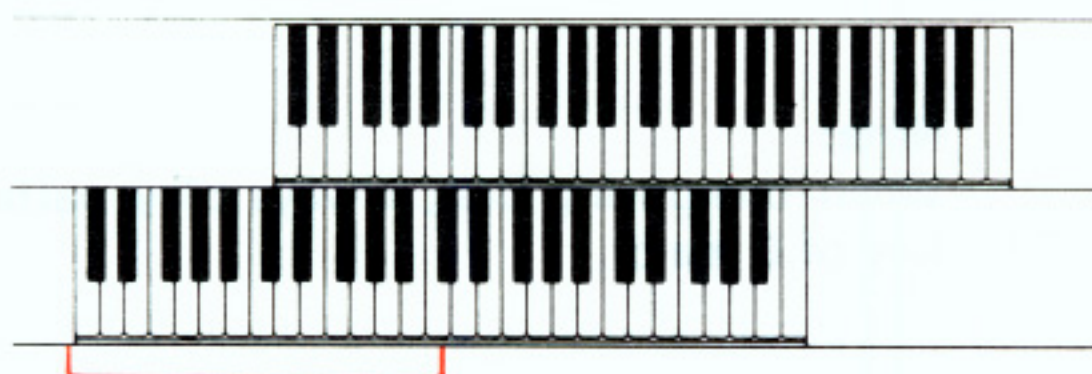
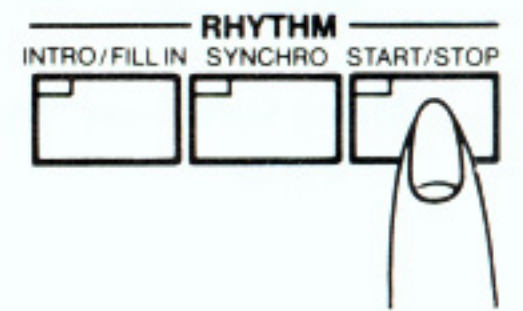
(2) Press the **CMP** switch then press one of ACCOMP variation switches 1 2 3 4. The green **CMP** LED and the selected variation switch both blink.



(3) Press the **C** switch to clear the accompaniment pattern which has been previously recorded by the selected variation switch. The previously recorded accompaniment pattern has now been cleared.



(4) Press the START/STOP switch to start rhythm and play rhythm accompaniment pattern with the rhythm. Any key between C<sub>1</sub> and C<sub>3</sub> on the lower manual produces the same accompaniment sound.



\* Accompaniment composition range

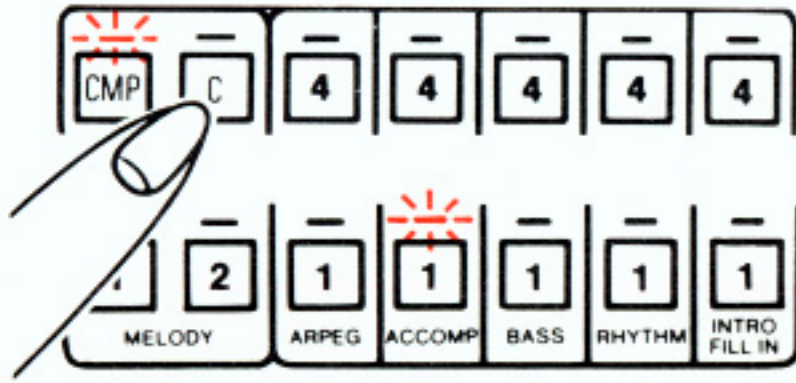
(5) Two methods are possible for changing the recorded rhythm accompaniment pattern.

① To clear everything and restart from the very beginning:


② To clear only some beats:

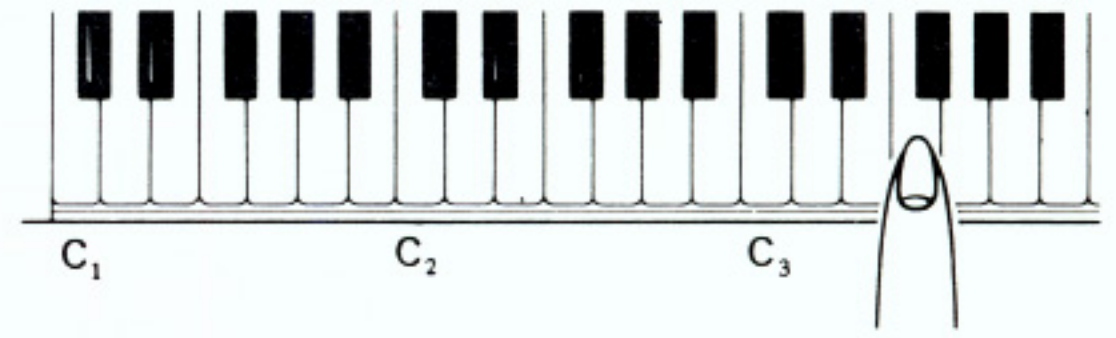
Check that the rhythm is running and green **CMP** LED blinks. (If not, go back to (1).)

Press the **C** switch.



Play new accompaniment pattern.

Press the rest key (  ) for the period you want to clear the sound.



Add new notes to the blank space.

(6) Stop rhythm when you have completed the composition.

**Creation of ARPEGGIO patterns**

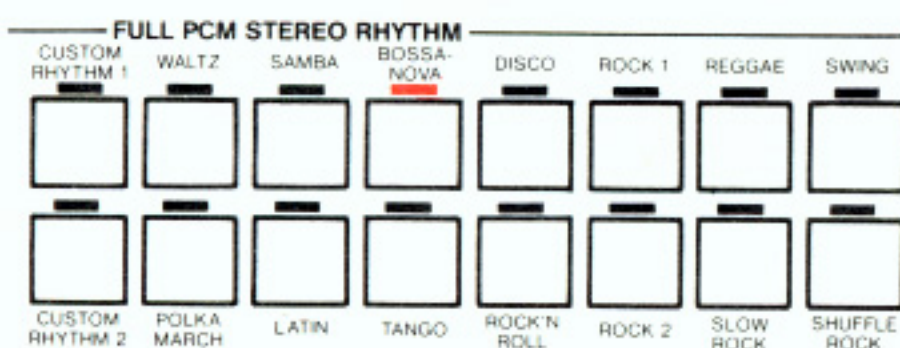
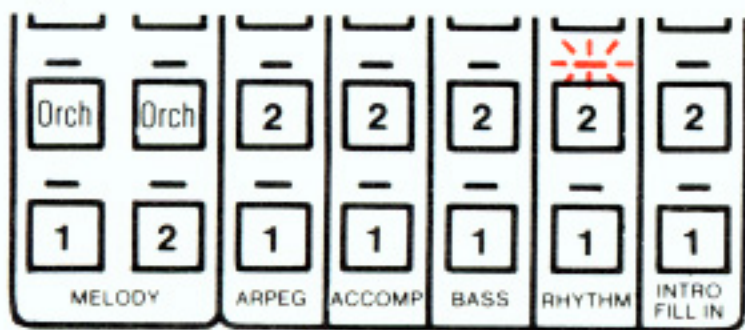
The ARPEGGIO pattern are composed in the same way as are the BASS patterns. See pages 12 to 13.

**Modification of Preset Patterns**

First transfer (copy) the preset pattern to be modified then modify it. All patterns of rhythm, intro/fill-in, bass, rhythm accompaniment and arpeggio are transferred by the same method.

**Example** To transfer BOSSA NOVA variation ② to CUSTOM RHYTHM 1 variation ④ :

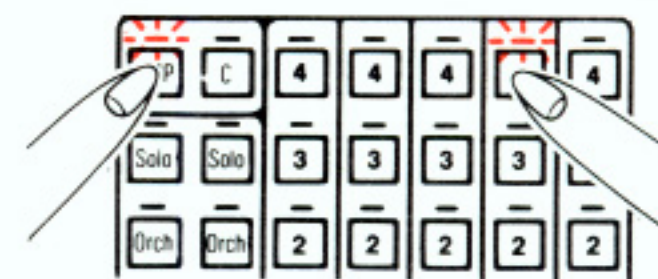
(1) Press the FULL PCM STEREO RHYTHM switch of the desired rhythm style, BOSSA NOVA in this example, and the variation switch of the pattern to be modified, ② in this example. Make sure that rhythm is not running.




(2) To transfer BOSSA NOVA ② to CUSTOM RHYTHM 1 ④, press the **CMP** switch (the green LED lights) and press variation switch ④ (red LED blinks). The BOSSA NOVA LED goes off and CUSTOM RHYTHM 1's LED automatically lights.

**Note:**

When creating a 3-beat pattern, be sure to press the WALTZ switch of the Full PCM Stereo Rhythm and then press the **CMP** switch and the desired rhythm pattern switch.

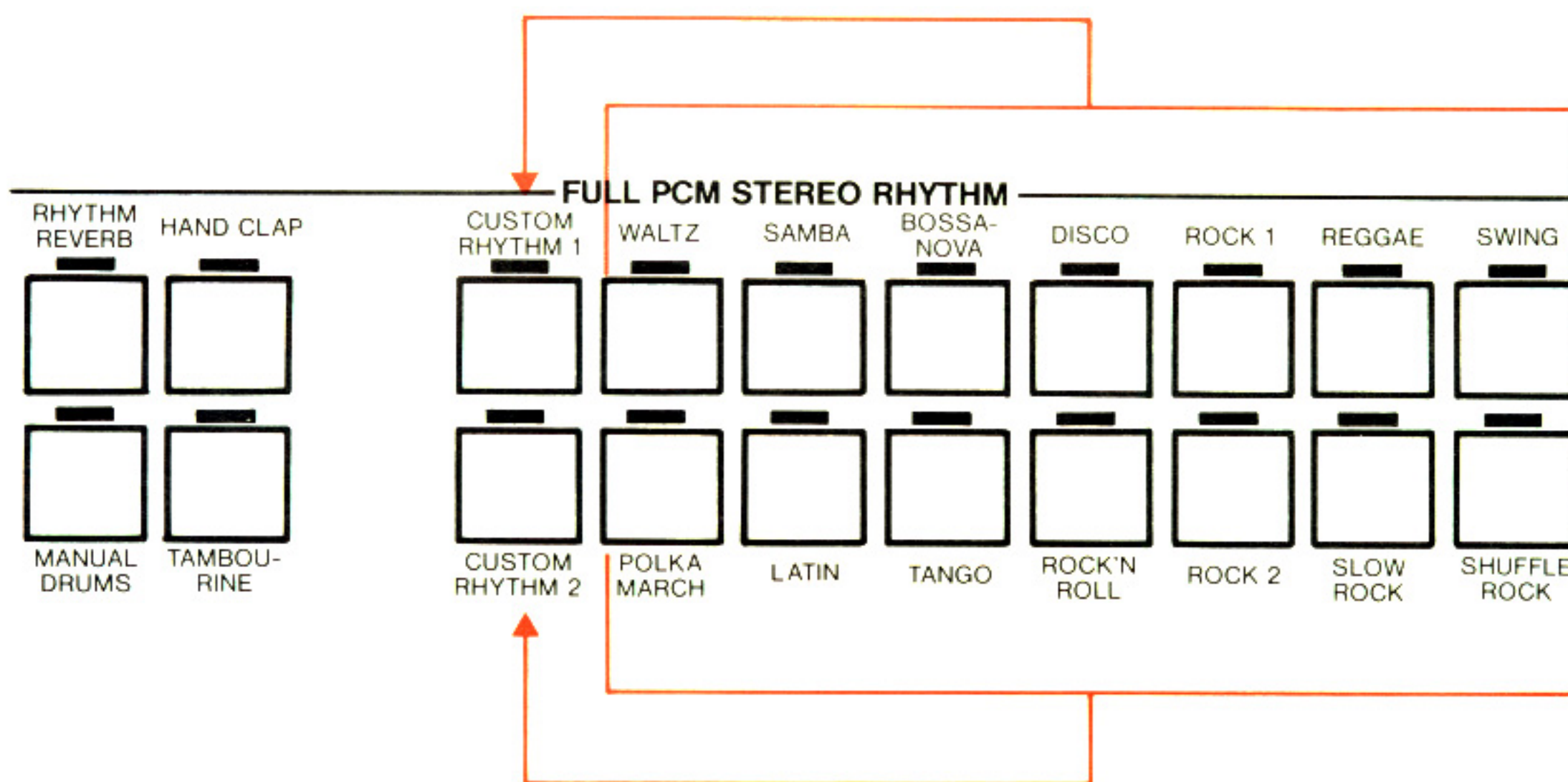


(3) Press the START/STOP switch to start rhythm: CUSTOM RHYTHM  produces the same rhythm variation pattern as BOSSA NOVA variation . (With rhythms composed in two-bar cycles, only the first bar is transferred.)

(4) After clearing undesired notes using the rest key (  ) add new notes to create an original pattern. When finished, stop rhythm by pressing the Start/Stop key.

**Note:**

Variation patterns of the seven rhythms in the upper row can be transferred to CUSTOM RHYTHM 1, and those in the lower row, to CUSTOM RHYTHM 2.



- The  switch operation is possible only during composition (with green  LED lit and red LED of the selected variation switch blinking).
- The  switch is not effective when the rhythm is running.



# CONNECTION TERMINALS & PITCH CONTROLS

**AUX IN/AUX OUT terminals**  
 To connect a stereo system or tape deck, use a CN-160 Connection cord (stereo phono plugs – stereo phono plugs) provided.

**CN-160**

To connect a monaural radio cassette recorder, etc., use a CN-132 Connection cord (stereo phono plugs – mono miniplug).

**CN-132**

To connect a mono keyboard amp or guitar amp, use a CN-132 connection cord together with an AP-100 Plug Adapter (mono miniplug – mono standard phone plug).

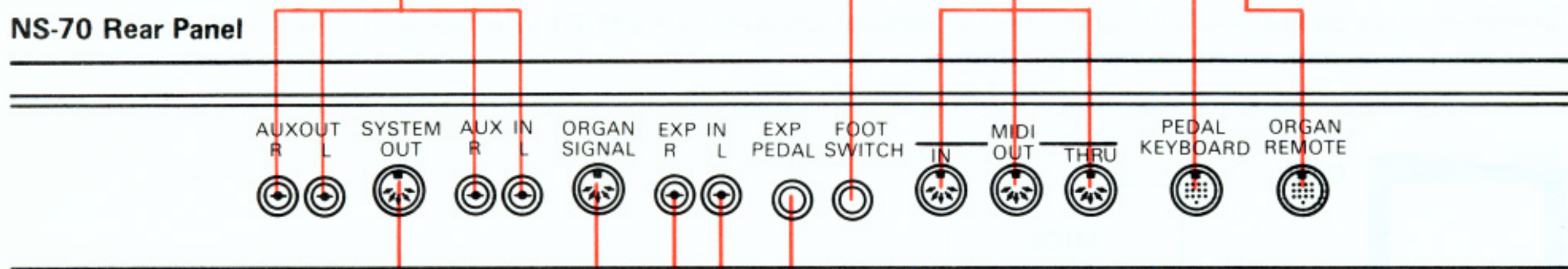
**AP-100**

**FOOT SWITCH connector**  
 When the Foot Switch is connected to this, intro/fill-in, bend, orchestra sustain or start/stop can be operated by foot. This is also used for connecting the Pedal Keyboard (NS-P10/20).

**MIDI IN/OUT/THROUGH terminals**  
 (see next page)

**PEDAL KEYBOARD terminal**  
 Connect the optional Pedal Keyboard Unit NS-P10/P20 using this terminal.

**ORGAN REMOTE terminal**  
 Connect the remote control unit of the Organ Expander NS-T90 to this terminal.



**SYSTEM OUT terminal**  
 Use this terminal when the optional Tone Cabinet for stage play is used. (Available in the future.)

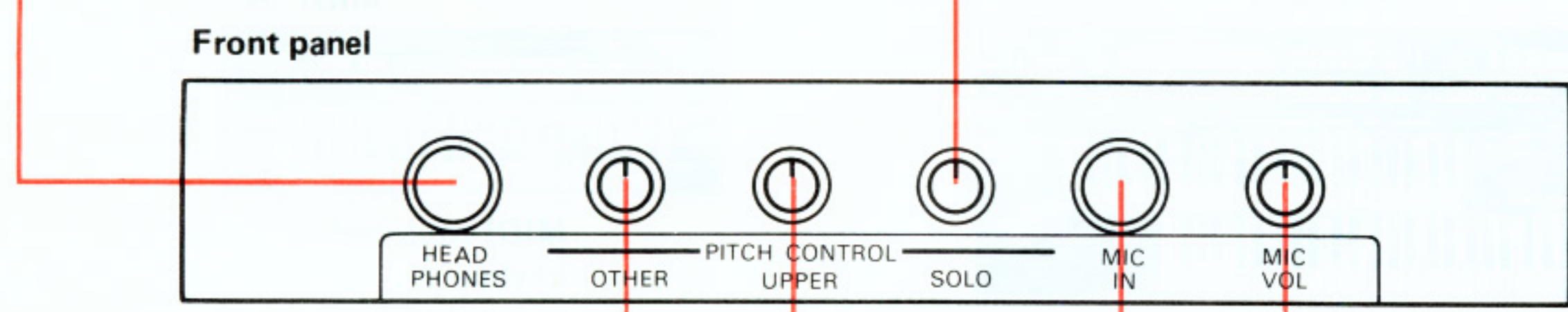
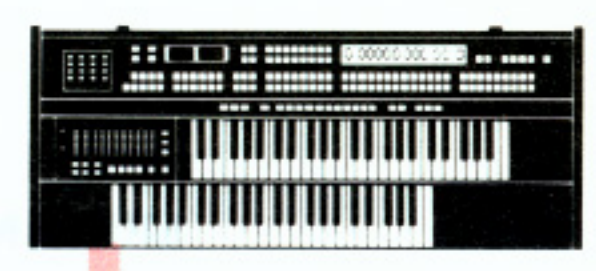
**EXP PEDAL connector**  
 By using the KX-20 Expression Pedal, the master volume can be controlled by foot. This is also used to connect the Pedal Keyboard Unit (NS-P10/20).

**ORGAN SIGNAL terminal**  
 When the optional Organ Expander (NS-T90) is used, connect the ORGAN SIGNAL terminal of the Organ Expander Unit to this terminal.

**EXP IN terminals (R/L)**  
 These terminals are used in a similar manner to the AUX IN terminals; however, the volume level of the sound input can be varied by attaching the optional Expression Pedal to these terminals.

**Headphone jack**  
 The sound of the NS-70 can be monitored using headphones plugged into this jack. In this case, connection to an amplifier and speakers is unnecessary.

**SOLO PITCH control**  
 Adjusts the pitch of the SOLO/ARPEGGIO voice.



**OTHER PITCH control**  
 Adjusts the pitch of other sections. (LOWER, BASS, ACCOMP).

**UPPER PITCH control**  
 Adjusts the pitch of the UPPER voice.

**MIC IN jack/MIC VOL control**  
 Connect a mono microphone or electric guitar and adjust the volume with the control. The Stereo Reverb effects can also be used for the voice or guitar.

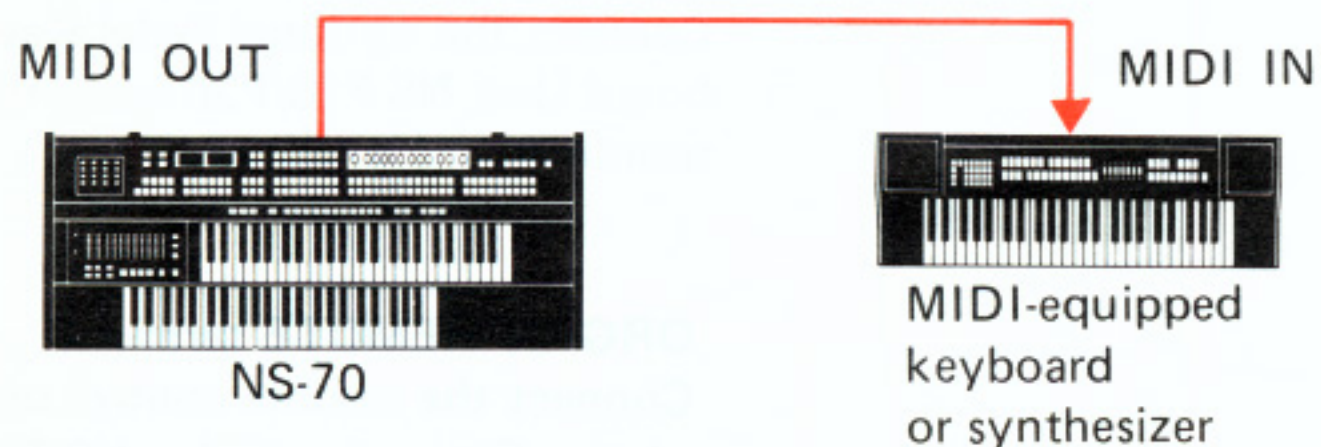


# MIDI (MUSICAL INSTRUMENT DIGITAL INTERFACE)

MIDI stands for Musical Instrument Digital Interface. It is an international standard for the transmission and reception of information by means of digital signal between musical instruments or between musical instruments and computers. Using this connection, when another MIDI-equipped synthesizer, electric piano or keyboard, etc. is connected, the other instrument can be controlled through the NS-70. When a computer is connected using a MIDI interface unit, musical entertainment can be greatly expanded.

(1)

Playing a MIDI-equipped keyboard instrument by playing the NS-70.

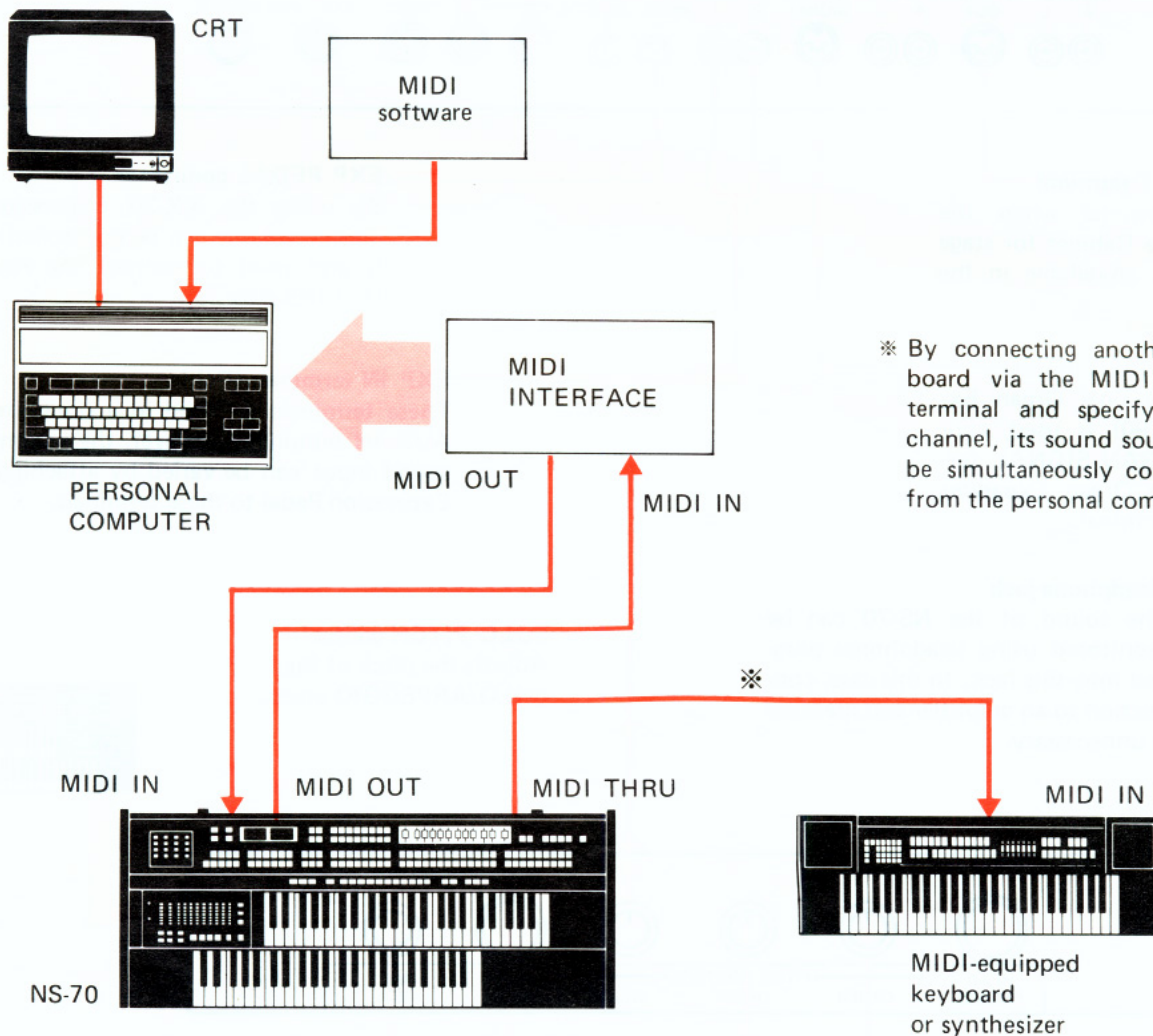


Playing the NS-70 by playing another MIDI-equipped keyboard:



(2)

For more sophisticated music composing/editing, connect a personal computer via a MIDI interface unit. The sound sources in the NS-70 can be controlled while monitoring on the CRT display.



※ By connecting another keyboard via the MIDI THRU terminal and specifying the channel, its sound source can be simultaneously controlled from the personal computer.

The NS-70 is an electronic orchestra incorporating several preset sound sources sections and each of them are assigned independent channel numbers. By specifying the channel numbers on the personal computer, music can be edited for each sound source.

## NS-70 MIDI Implementation Chart

○ : Available  
X : Not available

FUNCTION	TRANSMITTED			RECOGNIZED					REMARKS	
	UPPER	LOWER	PEDAL	UPPER	LOWER	ARPEGGIO	PEDAL	RHYTHM		
<b>BASIC CHANNEL</b> default changed	1 X	2 X	15 X	1 1 ~ 16	2 1 ~ 16	*14 X	*15 1 ~ 16	16 X	*shows Normal mode only	
<b>MODE</b> default messages altered	X X X	X X X	X X X	3 X X	3 X X	3 X X	3 X X	3 X X		
<b>NOTE NUMBER</b> true voice	48 ~ 96	36 ~ 84	36 ~ 60	1 ~ 127 36 ~ 108	1 ~ 127 36 ~ 108	1 ~ 127 36 ~ 108	1 ~ 127 36 ~ 108	36 ~ 58 36 ~ 58		
<b>VELOCITY</b> note on note off	1 ~ 127 0	1 ~ 127 0	96 0	1 ~ 127 80(H) Vel. 0	1 ~ 127 80(H) Vel. 0	1 ~ 127 80(H) Vel. 0	1 ~ 127 80(H) Vel. 0	1 ~ 127 80(H) Vel. 0		
<b>AFTER TOUCH</b> key's ch's	X X	X X	X X	X X	X X	X X	X X	X X		
<b>PITCH BENDER</b>	X	X	X	X	X	X	X	X		
<b>CONTROL CHANGE</b>	SUSTAIN ON 64 127 SOLO OFF 64 0 BEND ON 65 127 OFF 65 0 FILL-IN ON 68 127 OFF 68 0	64 127 64 0 64 127 64 0 64 127 64 0	64 127 64 0 64 127 64 0 64 127 64 0	64 127 64 0 64 127 64 0 64 127 64 0	64 127 64 0 64 127 64 0 64 127 64 0	64 127 64 0 64 127 64 0 64 127 64 0		64 127 64 0 64 127 64 0 64 127 64 0		
<b>PROGRAM CHANGE</b> true no.	X	X	X	X	X	X	X	X		
<b>SYSTEM EXCLUSIVE</b>	○	X	X	○	X	X	X	X	Basic CH 1	
<b>SYSTEM COMMON</b> song position song select tune	X X X	X X X	X X X	X X X	X X X	X X X	X X X	X X X		
<b>SYSTEM REAL TIME</b> clock command	○ F8(H) ○ FA(H) FC(H)			○ F8(H) ○ FA(H) FC(H)					F8. FA. FC only	
<b>AUX MESSAGES</b> local on/off all note off active sense reset	X X X X	X X X X	X X X X	X ○ X X	X ○ X X	X ○ X X	X ○ X X	X ○ X X	(133 ~ 127), 00	
<b>NOTE</b>										

MODE 1 : OMNI ON, POLY MODE 2 : OMNI ON, MONO  
MODE 3 : OMNI OFF, POLY MODE 4 : OMNI OFF, MONO

## TROUBLESHOOTING

### No arpeggio or accompaniment sound.

- The arpeggio and accompaniment are produced only when the FASCINATING CHORD has been set to "ONE FINGER" or "MULTI FINGER" and the rhythm has been started.

### No microphone sound.

- After connecting a microphone or electric musical instrument to the MIC IN jack, it is necessary to adjust the MIC VOL control.

### Automatic accompaniment does not stop.

- When the CHORD MEMORY switch is on, the accompaniment continues even after the lower manual keys are released. Press the START/STOP switch to stop the accompaniment.

### Automatic accompaniment and rhythm stops automatically.

- When the SYNCHRO START is on and CHORD MEMORY is off, the FASCINATING CHORD and rhythm are played only while lower manual keys are depressed. They stop automatically when the keys are released.

### Bass and arpeggio are out of tune with the chord being played.

- When a complex chord is played in the MULTI FINGER mode, the chord sound is produced as fingered but the bass and arpeggio are produced after being processed by the microcomputer, which converts the played chord into one of 14 basic chords and thus they may sometimes differ from the chord actually played.

### Sound replayed by COMPUCORDER is different from that recorded.

- As above, sound is recorded in the COMPUCORDER after being processed by the microcomputer. The replayed chord could be different from that intended when recording.

### Sound is distorted.

- This sometimes happens when the volume setting on the NS-70 is too high.

### ULTRA CHORD does not function.

- ULTRA CHORD functions when an accompaniment chord is played on the lower manual. However, ULTRA CHORD is possible in REPLAY (COMPUCORDER) where the accompaniment is played automatically.

#### **No accompaniment sound.**

- Accompaniment sound will not be heard if none of variation switches [1] [2] [3] [4] are pressed (with no LED lit) on the DIGITAL COMPOSER; or if CUSTOM RHYTHM 1 or 2 is selected and there is no accompaniment variation pattern stored in it, or if the VOLUME controls are set to the lowest positions.

#### **Bass sound is too long or short.**

- Adjust it using the BASS SUSTAIN knob on the VOLUME controls.

#### **Consumes power when not in use**

- This unit consumes power even when the POWER switch is turned off. Be sure to unplug the power cord when the unit is not in use for an extended period of time.

##### **Note:**

To protect data stored in the CUSTOM COMBINATION MEMORY, be sure to turn the power on once every two weeks.

#### **Power is on, but no sound is heard**

- For several seconds after the POWER switch is pressed, sound cannot be produced even if the keys are pressed, since the internal micro-computer first checks all functions automatically.
- Check the setting of the VOLUME slide controls. Sound is not produced when these volume controls are at the lowest positions.

#### **CUSTOM COMBINATION MEMORY switch is on but no sound is heard**

- As CUSTOM COMBINATION MEMORY is empty at first, it can only be used after some information has been stored.

#### **Volume balance does not correspond the knob position**

- The volume balances for each voice can also be stored in the CUSTOM COMBINATION MEMORY; however, the volume level of the recalled setting may differ from the volume knob position as shown in VOLUME section.

#### **Phaser effect does not function**

- Two types of voices are supplied: those with, and those without the phaser effect. By controlling the PHASER SPEED knob, phaser speed can be varied for voices with the Phaser effect.

#### **Reverb effect does not function**

- Some voices (bass voices and some of rhythm accomp voices) may not respond with varying reverb levels even through the STEREO REVERB knob is being manipulated. Also, during sound creation, reverb may not be added to a voice even though the STEREO REVERB knob is being manipulated. In this case, change the Reverb parameter of the Effect section to set the amount of reverb to the desired level.

#### **Custom bass does not function**

- When the pedal keyboard is not connected, the CUSTOM BASS switch will not function. (This switch sends bass sound to the pedal keys when Fascinating Chord is used.)

#### **LOWER TO UPPER does not function**

- When FASCINATING CHORD is used (with the ONE FINGER or MULTI FINGER switch set to ON), the LOWER TO UPPER switch will not function even if the LED is lit.

#### **Lower voices go off when REPLAY is switched on/off.**

- When Replay is pressed on or off while pressing one of the lower manual keys, the desired sound may not be produced. In this case, press it again or press the REPLAY switch after releasing the lower manual key.

#### **ULTRA CHORD is switched on but does not function when replaying.**

- On replay, the ULTRA CHORD affects the replaying sound when the [Orch] switch on the DIGITAL COMPOSER is on, and affects the voice played by the keyboard when the Melody [1] or [2] is off.

#### **TOUCH RESPONSE does not function on the Lower manual.**

- Touch Response does not function when FASCINATING CHORD is used or when replaying, it functions only in the Normal condition.

#### **Sound played on the pedal keyboard is not produced.**

- When the (optional NS-P10/20) Pedal Keyboard Unit is not connected, the pedal keyboard sound is not produced even if the NORMAL or CUSTOM BASS LED is lit.

#### **BASS, ACCOMP patterns of the CUSTOM RHYTHM cannot be modified.**

- When a pattern is created by continuously pressing one or more lower manual keys, the continuous note condition will be stored for one bar. Similarly, if the rest key is pressed while continuously pressing the lower manual keys, only the rest signal will be applied, resulting in one bar of silence.

# SPECIFICATIONS

<b>Number of keys</b>	Upper: 49, Lower: 49
<b>Touch Sense</b>	Lower, Upper, Solo
<b>Voices</b>	
Solo/Arpeggio	15 preset + 15 Custom Solo To Arpeggio Solo To Lower Custom Select
Upper	24 preset + 14 Custom Sustain Custom Select
Lower	13 preset + 13 Custom Sustain Lower To Upper Custom Select
Rhythm Accomp	7 preset + 7 Custom Custom Select
Bass	7 preset + 7 Custom Sustain Bass To Lower Custom Select
<b>Volumes</b>	Master Volume, Solo, Upper, Lower, Rhythm Accomp, Bass, Rhythm
<b>Grand Effect</b>	Stereo Reverb, Phaser Speed
<b>Sustain (Level)</b>	Upper, Lower, Bass
<b>Touch Response</b>	Solo, Upper, Lower
<b>Stereo Effect</b>	Symphonic, Celeste
<b>Ultra Chord</b>	Open, Closed
<b>Magic Foot</b>	Intro/fill-in, Solo Bend, Upper Sustain, Start/stop
<b>Custom Combination</b>	
<b>Memory</b>	1 to 8, Memory Cancel, Effect Memory Cancel
<b>Full PCM Stereo</b>	
<b>Rhythm</b>	14 presets x 4 Variations 2 Custom x 4 Variations Rhythm Reverb, Manual Drums, Hand Clap, Tambourine Beat Conductor, Rhythm Tempo, Digital Display, Number, Value, Start/Stop, Synchro Start Intro/Fill-in x 4 Variations
<b>Fascinating Chord</b>	Normal, One Finger, Multi Finger Chord Memory, Custom Bass Auto Bass x 4 Variations Auto Accomp x 4 Variations Auto Arpeggio x 4 Variations
<b>Compucorder</b>	Chord Record, Variation Record, Melody Record, Replay

<b>Digital Composer</b>	Compose, Clear, Melody 1/2, Solo, Orchestra (Upper), Each Variation Switch 1 to 4
<b>Sound Creator</b>	Edit, Write, Value Up, Value Down
<b>Connection Terminals</b>	AC IN, Voltage Selector, AUX OUT (L/R), System Out, AUX IN (L/R), EXP IN (L/R), Organ Signal, Expression Pedal, Foot Switch, MIDI IN, MIDI OUT, MIDI THRU, Pedal Keyboard, Organ Remote, Headphone, Microphone
<b>Others</b>	Power Switch, AC Standby LED, Pitch Controls (Solo, Upper, Lower), MIC Volume.
<b>Power supply</b>	AC 120/220/240 V switchable, 50/60 Hz
<b>Weight</b>	30.0 kg
<b>Dimensions</b>	1223(W) x 217(H) x 492(D) mm
<b>Power consumption</b>	32 W
<b>Accessories</b>	Digital Composer (KE-10), AC cord, Owner's Manual, Sound Creator Manual, Stereo Pin Cords

Design and specifications subject to change without notice.

## OPTIONS

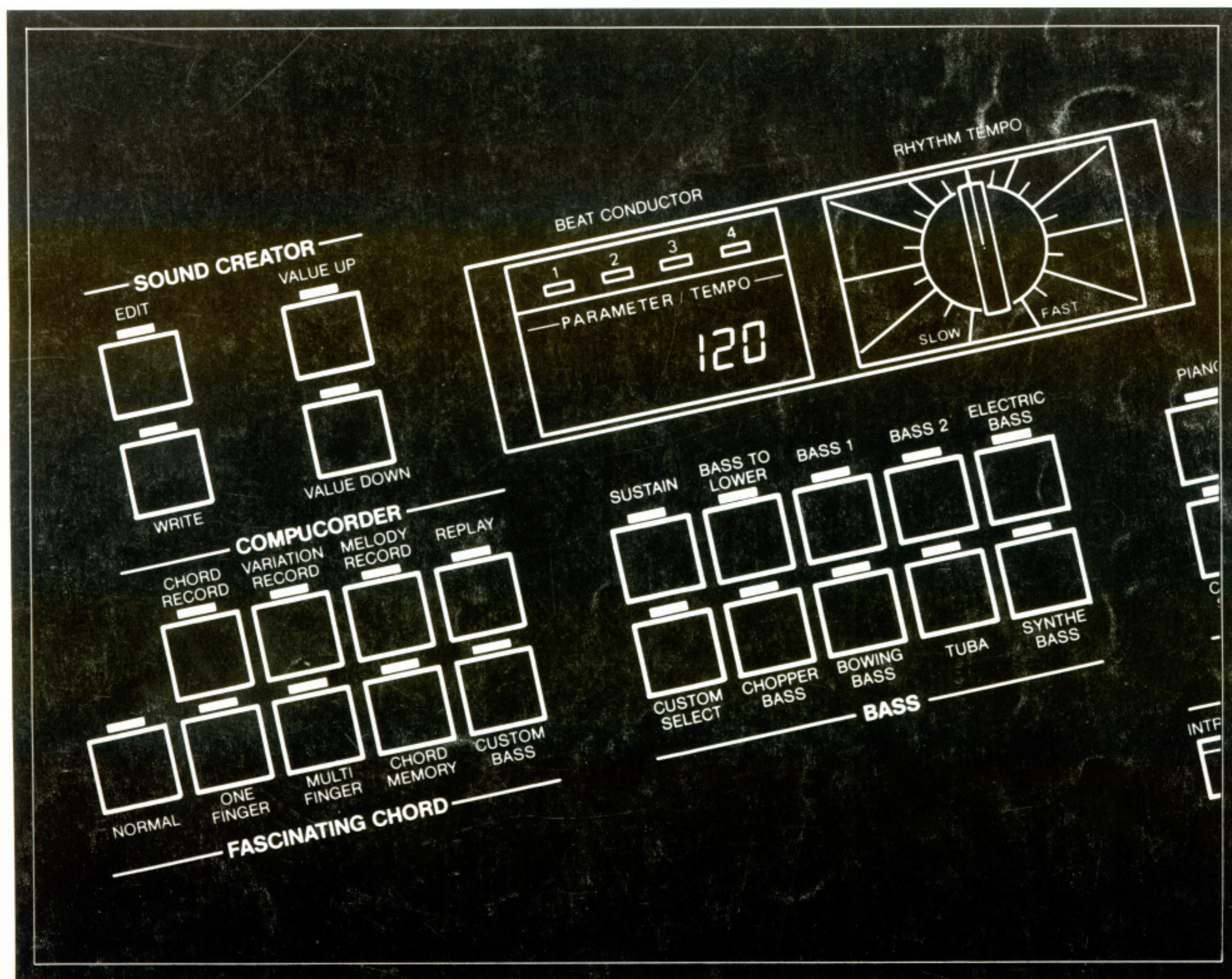
- **NS-M10 Digital Memory Pack**  
Custom voices which are made as desired, and the settings stored in the Custom Combination Memory can be stored in this pack.
- **KE-10 Digital Composer Pack** (One unit is provided with the NS-70)  
Your own play recorded on the Compucorder, and the rhythm or auto-accompaniment patterns which are made and stored in the Custom Rhythm, can be transferred and stored in this pack.
- **NS-P10 13-Key Pedal Keyboard Unit**  
One-octave pedal keyboard unit for connection to the NS-70.
- **NS-P20 25-Key Pedal Keyboard Unit**  
Two-octave pedal keyboard unit with matching bench, for use with the NS-70.
- **NS-B20 Exclusive Bench** for the NS-Series System Keyboard.
- **NS-S10 Exclusive Stand** for NS-Series System Keyboard.
- **NS-T90 Full-Coupler Organ Expander Unit.**  
By combining 9 digital drawbars a more authentic organ sound is obtained.  
The remote control unit included in this set can be placed on the side top panel of the NS-70.

# JVC

## System Keyboard NS-70

# THE SOUND CREATOR MANUAL

HANDBUCH ZUM KLANGPROGRAMMIERER  
MANUEL DU CREATEUR DE SONS  
MANUAL DEL CREADOR DE SONIDOS



Discover new sounds and original voices using the NS-70's Sound Creator.  
Entdecken Sie revolutionäre Klänge und neuartige Instrumentstimmen mit dem NS-70 Klangprogrammierer.

Dévoouvrez de nouveaux sons et des voix originales avec le créateur de sons du NS-70.

Descubra nuevos y originales sonidos utilizando el Creador de Sonidos del NS-70.

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## THE JOY OF SYNTHESIZERS

You CAN play a synthesizer. How do we know? Well, there are many people with little or no idea of the workings of an internal combustion engine who nevertheless make excellent motorists.

This little guide is intended to show you that with just a little information on the basic components of a synthesizer and how they work, you will be well on your way to discovering the joy of synthesizing.

### What is a synthesizer?

Basically, a synthesizer is an electronic device with which one can make sounds. It has three basic parts: a sound generator, a volume changer, and a tone changer. The sound generator is an oscillator, something that creates sound by moving, or oscillating. A fluorescent light is an oscillator: when the room is very quiet, if you get close enough you can hear a slight hum. This hum is produced by the light actually going on and off 120 times a second; more technically speaking we say it has a frequency of 60\* cycles per second, also called Hertz. In fact, 60 Hz is very close to the B<sup>b</sup> note two octaves below middle C, which has a frequency of 58.55 Hz. So far then, it seems the fluorescent light is a very crude synthesizer: it is an oscillator fixed at a single frequency, (60 Hz), or, in musical terms, close to the pitch B<sup>b</sup> two octaves below middle C.

If we could then hook up a microphone to pick up the sound of the fluorescent light, and run the microphone through an amplifier, we would have two thirds of a synthesizer: an oscillator generating a sound, and an amplifier which makes the sound louder.

Finally, if, instead of running the amplifier directly through a speaker, we could first attach a graphic equalizer, we would have the basic makings of a synthesizer: an oscillator, an amplifier and a filter.

(\*This example is based on countries using 60 Hz AC.)

### How does the synthesizer work?

Using our 'fluorescent light synthesizer' we are able to synthesize. We are, however, quite limited in the scope of our ability: we have a single frequency, 60 Hz, which we can change by making louder, and by emphasizing different aspects of its tone using a graphic equalizer.

Using a keyboard synthesizer we have much more creative power. First, we can choose different pitches if we like: pressing different keyboard keys tells the oscillator to oscillate at different rates and thus to produce different frequencies. In other words, we're not limited to only (approximately) B<sup>b</sup>. Nor are we simply dealing with a 'passive' amplifier. The synthesizer amplifier, VCA (Voltage-Controlled Amplifier), will carry out more complicated tasks than merely giving any sound that passes through it more volume. The VCA, for example, can be told to make any sound become slowly louder, reach a peak volume, and then quickly vanish. This is known as envelope generation. An envelope is the description of the behaviour of the volume or tone of a sound, over time.

Instead of, but not unlike, a graphic equalizer, the synthesizer has something called a VCF, (Voltage-Controlled Filter), which contains several sub-components that help to shape the sound. Obviously, its main components are filters: these block or let pass certain parts of the sound that is sent through. Like the VCA, the VCF is more than just a passive control, it carries out complicated instructions. Using the VCF we can control the tone of the sound over time so that, for example, we can make a sound start out with a soft, muffled tone, quickly change to a high, bright tone and then back to a muffled tone. In other words, the VCF can be used to generate a tone envelope.

Another part of the VCF is the resonance circuit. This device can radically change the tone, and even the quality of any sound. If we'd had a resonance control on our fluorescent synthesizer, we could have changed the sound of that light from a low hum into a high, thin, "twisting" whine.

## What are waves?

To go any deeper, we need to know about waves, and wave forms. Again, let's go back to the fluorescent light. Earlier we said it has a frequency of 60 Hz, or 60 cycles per second. A cycle is one full oscillation of a wave. That is, starting from a central position, "0", reaching a peak, going back down through the central position again, reaching a minimum (inverse or negative peak) and then coming back to the central position, as in Fig. 1.

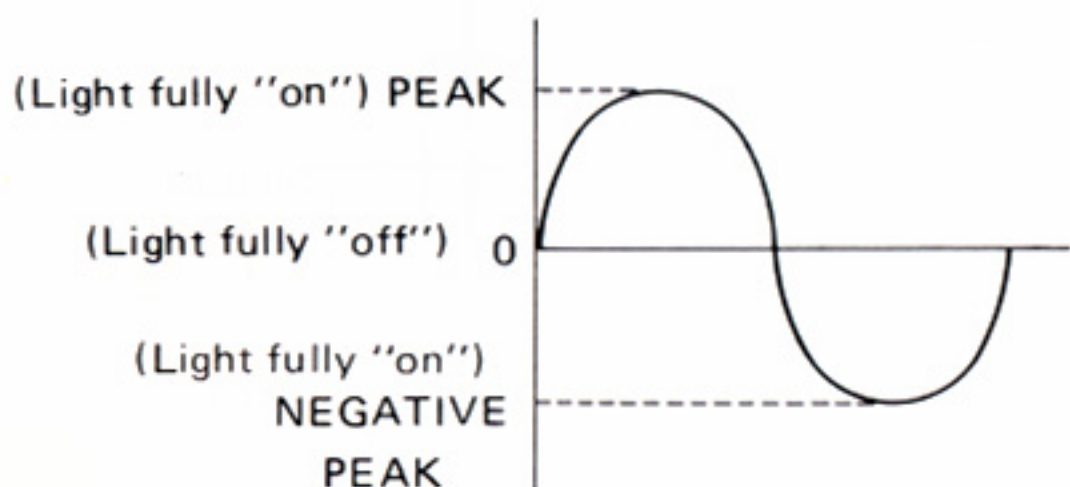


Fig. 1 A full cycle (Sine wave)

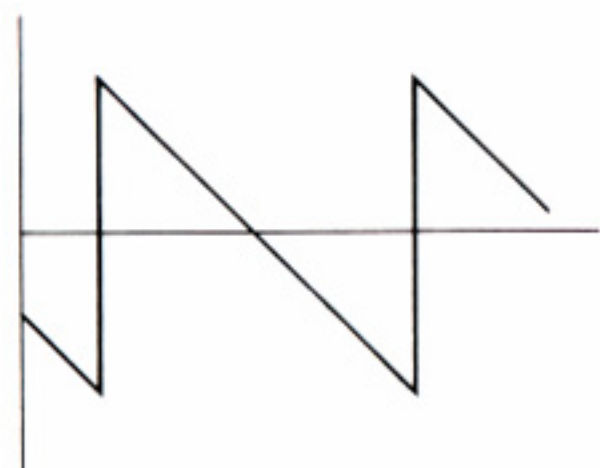


Fig. 2 Sawtooth wave

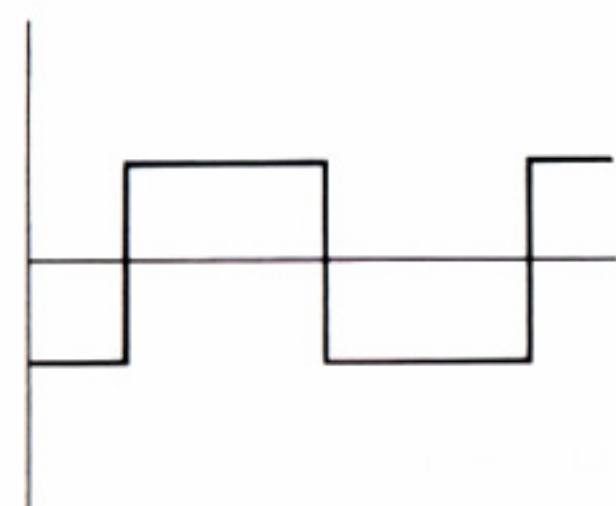
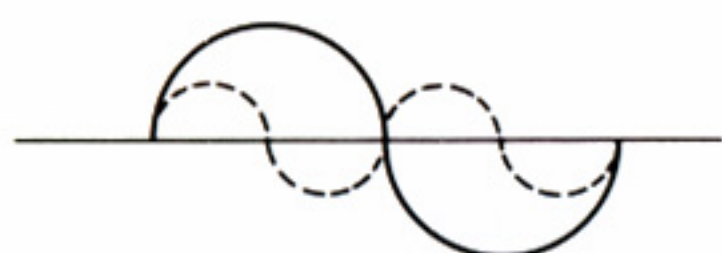


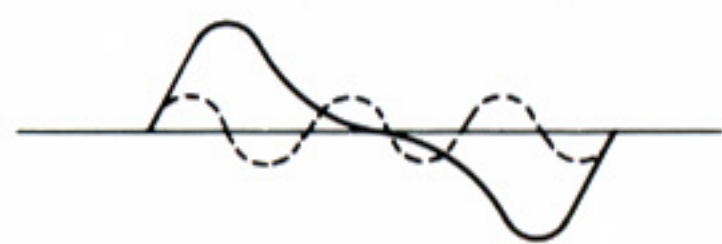
Fig. 3 Square wave

## Fundamental and Harmonic Frequencies

It is not necessary to go into great depth to understand these terms, the following explanation will do, and it will help you to understand what the VCF component can do.



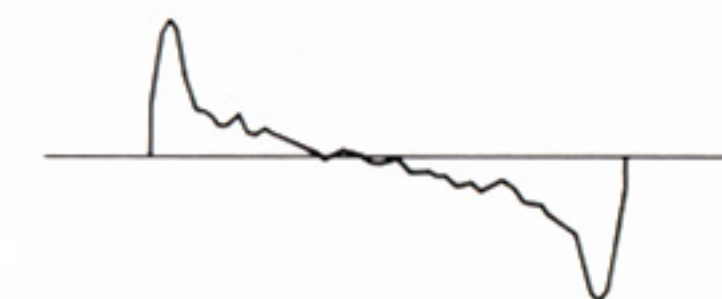
(a) Fundamental



(b) + harmonic 1



(c) + harmonic 2



(d) = the waveform of an actual instrument.

Fig. 4.

The fluorescent light, with its 60 cycles per second, is actually going on and off 120 times per second (one cycle = 2 "on"s). If it were possible to change the frequency of the light, by slowing it down enough, a strobe light, or flashbulb effect would result. Conversely, by increasing the rate, the light would become stronger and brighter as there would be shorter dark periods separating the flashes of light.

Making the fluorescent light frequency faster or slower would also change its musical pitch higher or lower respectively. A frequency low enough to cause the flashbulb effect would not produce a constant tone, but a series of clicks instead. As the light is made brighter, so would the pitch become higher as well.

**Waveforms** — There are different kinds of wave forms. Fig. 1 shows a sine wave, with evenly curved peaks and valleys.

Sine waves are the basis of all sound. When different sine waves are added together, more complicated waves result. Two such complicated waveforms are the Sawtooth, and the square waves, figures 2, and 3, respectively. These are the basic shapes of all acoustic instrument waves. The sawtooth wave is characteristic of strings and brass instruments while the square wave is the basic shape produced by wood-winds and reeds.

This principle allows us to recreate more faithfully the sounds of actual instruments. By adding a group of sine waves together — a fundamental, and a number of harmonics — we can very accurately approximate an instrument's waveform, and of course, its sound.

The **fundamental** is the 'main frequency', the one that tells you the pitch: There are other 'sub-frequencies' that accompany the fundamental, and these vary in description and number and from instrument to instrument. These are called **harmonic** frequencies. Think of the fundamental as the melody, and the harmonics as harmonies.

To continue this analogy, think of how different harmonies can change the way we hear a melody. The same melody can sound like any number of different songs if the harmonies are changed.

Now, instead of harmonies and melodies, think of two instruments, playing the same note. Harmonics help you to tell these instruments, a violin and a clarinet, for example, apart. Or, whatever the melody, a violin will always 'sing' it using its own distinctive violin-style harmonies that are quite different from those 'used' by the clarinet.

Imagine, if you could tamper with these harmonies, as though they were a group of back-up singers each with a different part, and you could tell them how to sing these parts — or even **not** to sing. This is exactly what you can do using the VCF. You can increase the number of different back-up singers, or decrease them, you can tell some of them to sing louder than they are supposed to, you can even teach them to sing their parts in strange ways. To put it slightly more technically, you use the VCF to filter out certain harmonic frequencies, or let more of them through, and to change the strength of some of them, as well as their behavior.

## Note:

When we speak of 'back-up singers' representing harmonic frequencies, remember that we are talking about music played one note at a time (monophonically). While, of course, the same principles govern polyphonic instrument voices, in this explanation we are illustrating what makes two (or any number of) different instruments playing the same note recognizable. Another way of looking at it is to look at it. (See Figs. 5 and 6.)



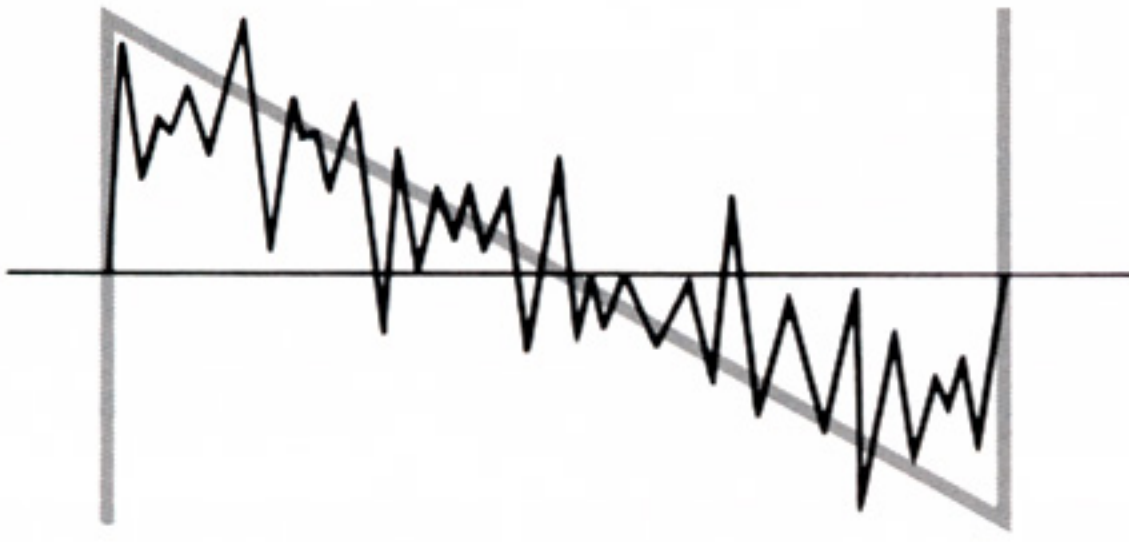


Fig. 5 Violin

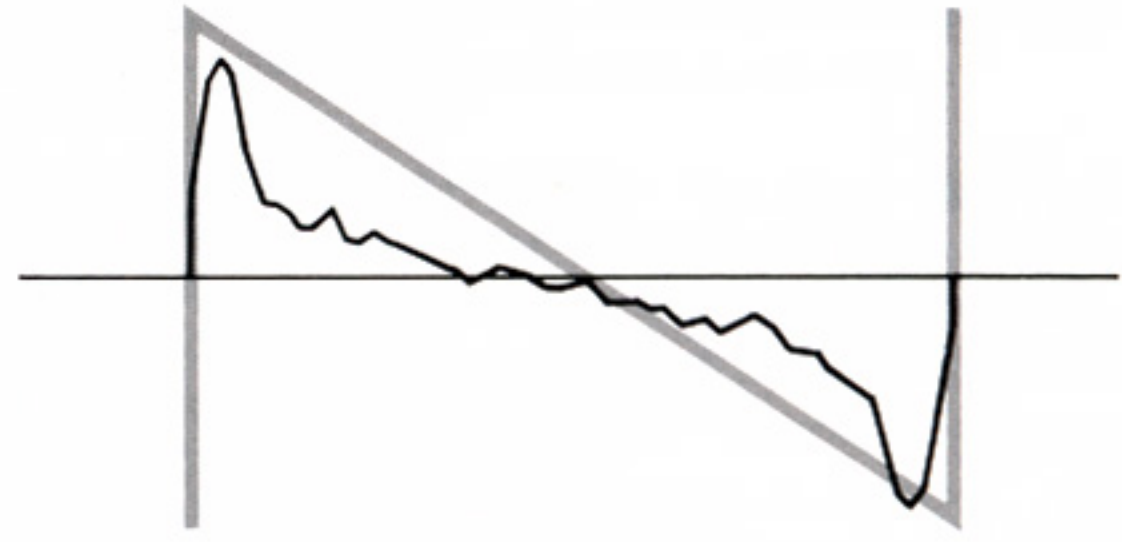


Fig. 6 Trumpet

Figure 5 shows a violin playing a note, and figure 6 depicts a trumpet playing the same note. While in any one second period you would be able to count the same number of cycles, on each graph, notice the different shapes of the waves. Both are sawtooth waves, or at least, could be made using a very good synthesizer and starting with a sawtooth wave, but the harmonic content of each instrument's wave is different.

### Summary

A synthesizer incorporates three main blocks: a sound generator called a DCO, Digitally Controlled Oscillator; a volume changer called a VCA, Voltage Controlled Amplifier; and a tone changer called a VCF, Voltage Controlled Filter. The DCO generates a wave. You determine its frequency, or pitch, by pressing a key. The wave goes through the VCA which controls the size of the wave, (the volume), and the volume envelope, (the changes in the behavior of volume over time). Finally, the wave passes through the VCF which determines the tonal color and behavior of the wave through manipulation of the harmonic frequencies.

## SOUND CREATION USING THE NS-70

Sound has three major elements:

- **Pitch:** The frequency of a note is the number of wave cycles per second. The musical scale is divided by pitches (A, B, C, D, E, F, G).
- **Volume:** The size of the waves (loudness).
- **Timbre** (unique tonal characteristics): The combination of fundamental and harmonic frequencies plus the shape of the wave. Timbre, for example, helps you tell the difference between a violin and a flute playing the same note.

### DCO

The DCO, Digitally-Controlled Oscillator, is the synthesizer's primary sound generator. There are two basic sound sources; the Sawtooth wave, and the Square wave. The DCO generates these waves, and pressing the keyboard keys determines their frequencies, or "pitches". Middle "C" is a pitch; it has a frequency of 261.6 Hz (cycles per second) – press this key and the wave you have selected will go up and down 261.6 times in one second, producing the note 'Middle C'.

Two DCOs are provided with the NS-70; DCO1 and DCO2. When these are used simultaneously, the resulting sound will be more dense. When they are used simultaneously with a one-octave difference between them, the sound will have a wider image. In addition to the waveforms prepared in the DCOs, there is a sound source called noise; this is an irregularly-shaped waveform which produces a "sh" sound. This can be mixed with the flute or sax voice to simulate breath sounds or, it can be used alone to produce the sound of wind and other sound effects.

## VCA & ENVELOPE GENERATOR

This block controls the sound level, or volume. In sound synthesizing, the behaviour of volume over time is important because it varies from instrument to instrument. For example, the changes undergone by the volumes of organ, piano and strings are very different:

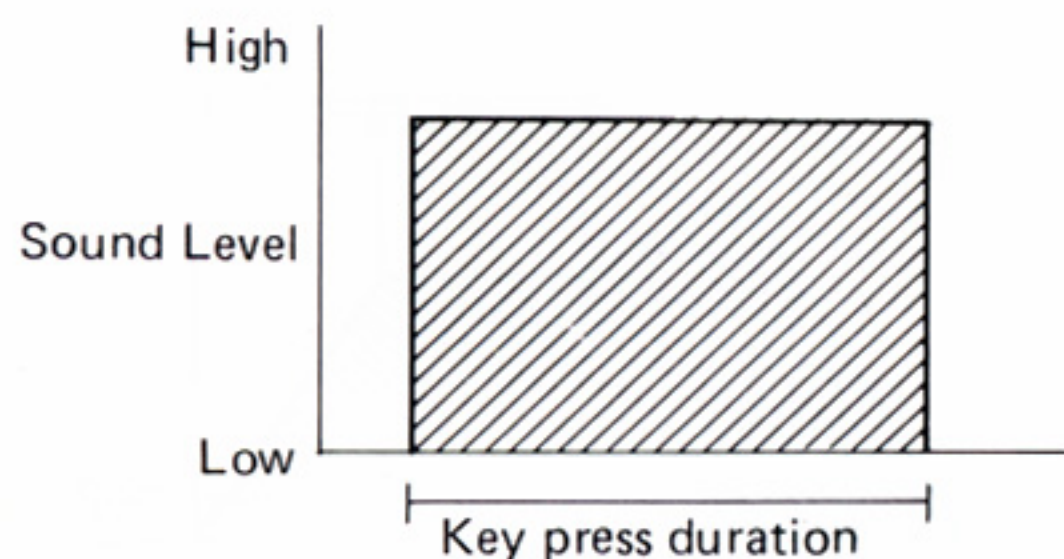


Fig. 7 Organ

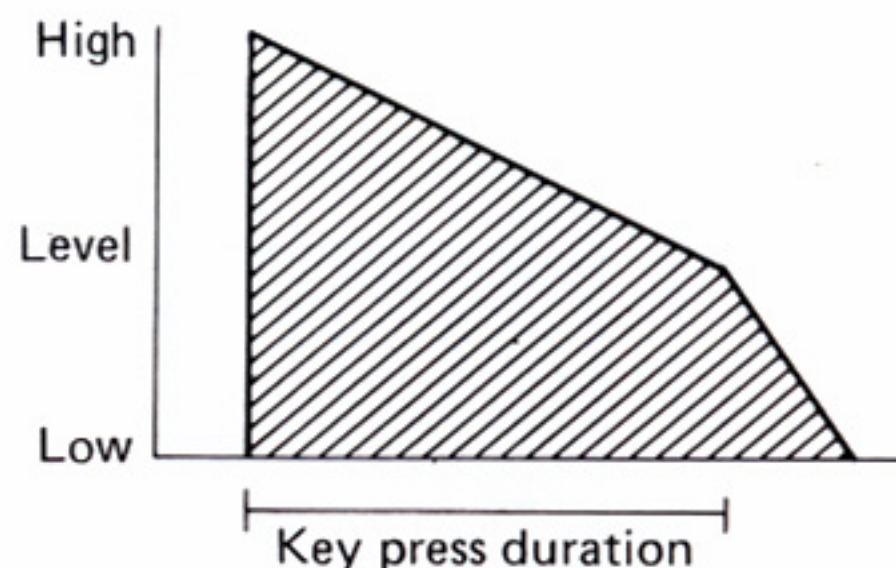


Fig. 8. Piano

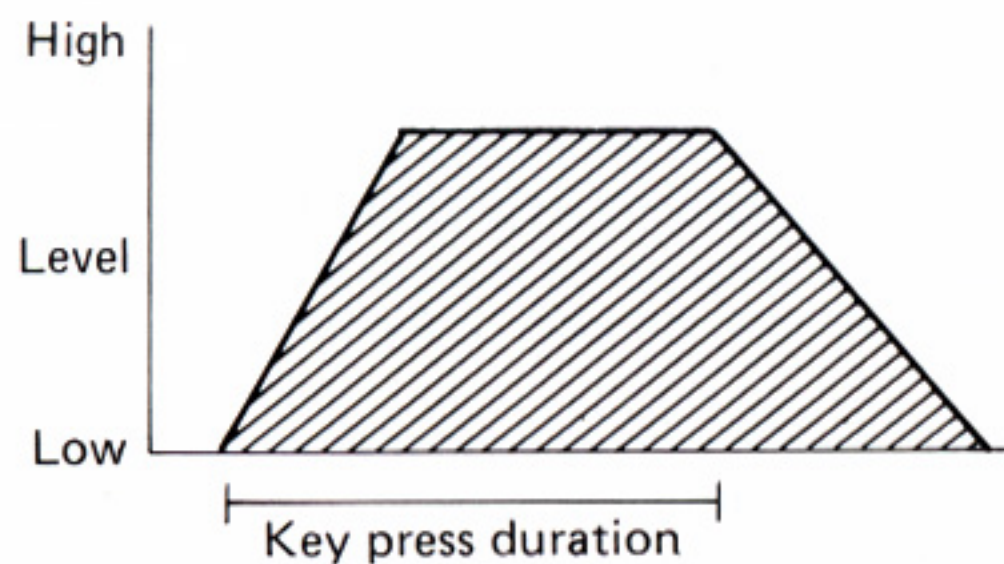


Fig. 9. Strings

- **Organ:** The sound hits its peak volume when the key is pressed, and continues at the same level until the key is released which immediately cuts the sound off. (Fig. 7)
- **Piano:** After reaching its peak when the key is first pressed, the sound slowly decays until it disappears. If the note is held long enough the key release will have no effect; if the key is released quickly, the decay will be abruptly interrupted, and the sound cut off. (Fig. 8)
- **Strings:** The note is not produced immediately upon hitting the key, but gradually and continually reaches its peak and stays at this level while the key is being pressed. When the key is released, the tone gradually decays. (Fig. 9)

The graphic representations or "shapes" of these volume level behaviours are called envelopes; these are produced by the Envelope Generator (EG) function.

### EG (Envelope Generator)

The shapes of volume produced by the EG can be divided into the five following stages:

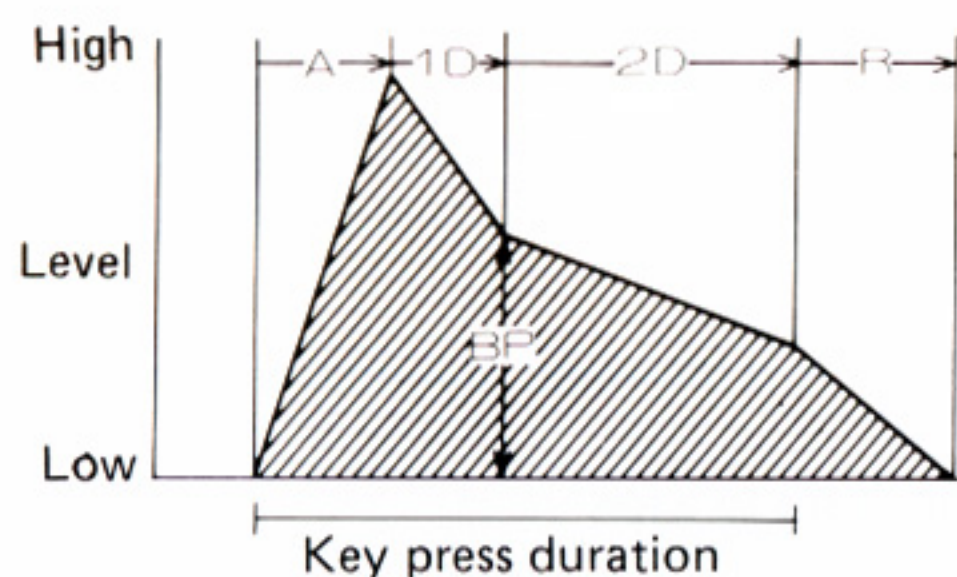


Fig. 10 Envelope Stages

- **Attack** (section A in the figure)  
This is the length of time until the sound is heard after a key is pressed. The more the Attack value is increased, the later the sound is heard.
- **1st decay** (section 1D in the figure)  
This is the length of time between the sound level peak and the break point.
- **Break point** (level BP in the figure)  
This is a sound level transition point, occurring where the 1st decay level decrease is replaced by the 2nd decay decrease. The more the value is increased, the more smoothly the sound decays, and the more the value is decreased, the more rapidly the sound decays.
- **2nd decay** (section 2D in the figure)  
This is the length of time until the sound reaches its lowest audible level after the break point, while the key is still pressed. When this is set to the maximum value "31", the sound will be sustained continuously at the break point level.
- **Release**  
This describes the abruptness with which the sound vanishes after the key is released. The more the value is increased, the more slowly the sound vanishes.

The shape of envelope follows these five stages. Why two kinds of decay? The characteristics of actual piano, for example, are as follows: sound decays rapidly after the key is hit, then vanishes slowly while the key is still depressed. With the NS-70, the envelope can be shaped more closely to the actual piano sound by using two decays and break point as shown in Fig. 11.

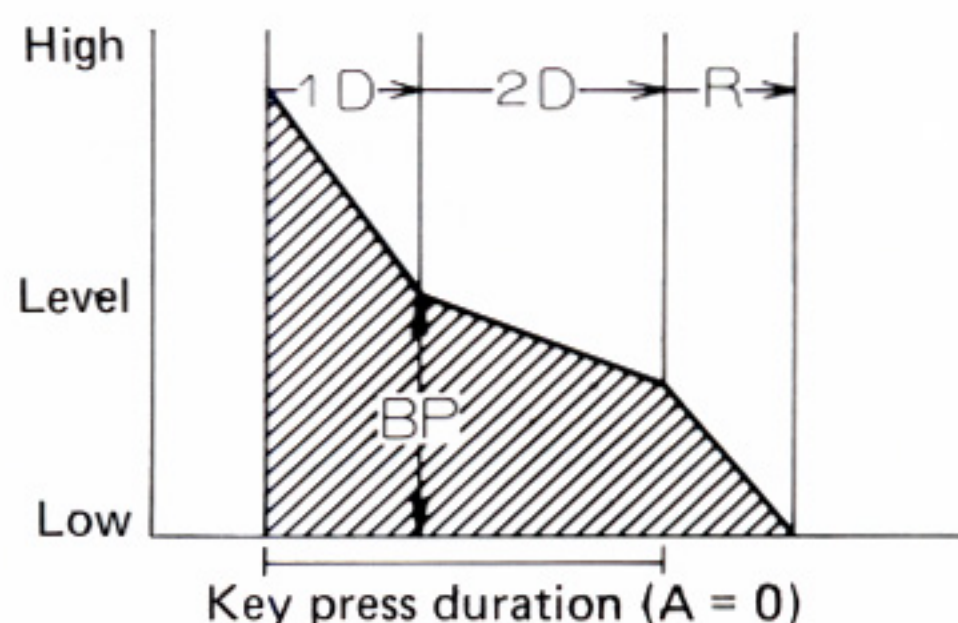
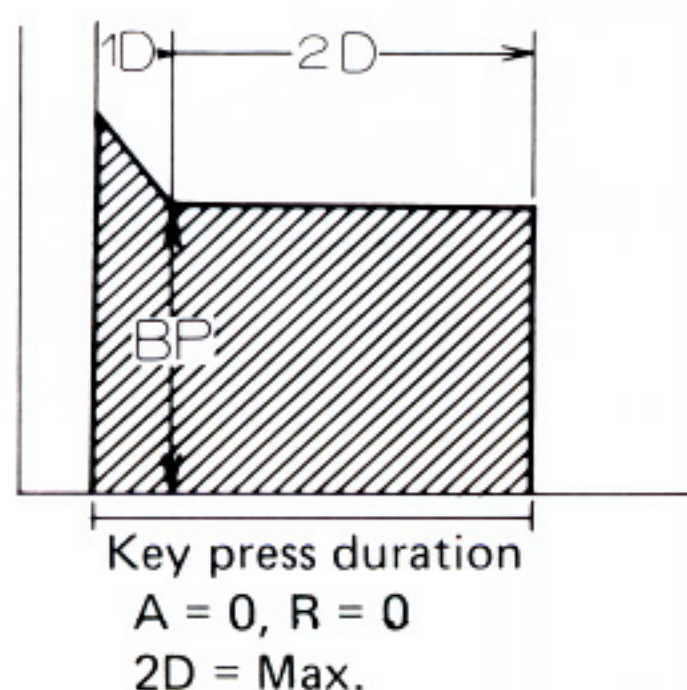


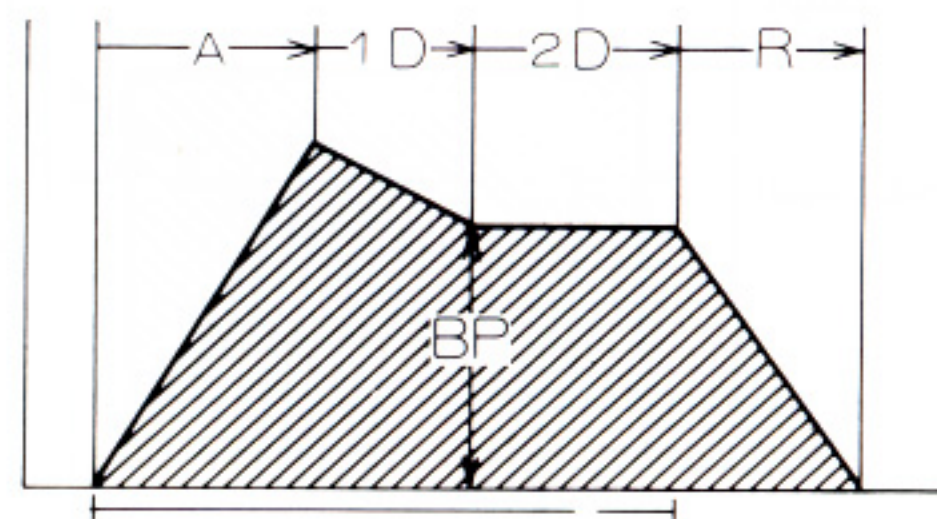
Fig. 11. Piano

In the same way, organ, and string tones can also be made to sound more authentic.



**Fig. 12. Jazz Organ**

Recreating the percussive characteristic of jazz organ is accomplished through envelope generation.



**Fig. 13. Strings**

As in the case of Jazz Organ, a more true-to-life sound is created by causing the volume to decay to a slightly lower continuous level after a sharp attack. (Of course, unlike the organ, strings have a slow post-release decay.)

A data list is provided giving the concrete values of attack, 1st decay, 2nd decay and release, for each of the preset voices of the NS-70.

As well as controlling the sound level, the VCA block also includes a function called "special percussive mode" which makes percussive tones sound more natural. When this function is switched ON, the following two circuits are activated:

- **1st decay keep**

When the key is released in the middle of the 1st decay, the sound does not transit to the release stage until after the level has dropped to the break point. This function makes staccato sounds, for example, seem more natural.

- **2nd decay & release keyboard follow**

The length of release can be varied on the upper and lower notes. The higher the note, the shorter the release. This function makes the piano voice sound more like a real piano.

## VCF

This block controls the timbre (the tonal characteristics that enable us to tell one instrument from another). The various timbre-controlling components of the VCF are described below.

- **Cut-off**

Cut-off High: More of the higher frequencies are passed. (Violin, Harpsichord)

Cut-off Low: Most of the higher frequencies are blocked. (Flute, Piano)

This function can be regarded as a powerful version of a graphic equalizer. When it is increased, the tone becomes bright and sharp (treble), and when it is decreased, the sound becomes softer (bass).

With this function, the violin tone can be made to resemble a flute if the cut-off is set to a low value.

- **Resonance**

A key tool for use in the modification of sound, this VCF component is a means of making sounds that run the gamut from normal to bizarre. A low resonance value will not have much affect, whereas a high resonance will change a voice by making it very sharp and "thin."

- **Keyboard track**

This function affords more realistic reproduction of certain instruments. When keyboard track is on, the higher octave notes will have more strength than they do normally, while the lower notes will remain unaffected. The degree to which keyboard track is applied is controlled in three steps; the more the value is increased, the greater the difference between high and low octaves.

The VCF also determines envelope.

The volume envelope describes the varying sound levels during different stages. (The sound is continuously maintained at a certain level, or gradually diminishes, etc.)

The tone envelope on the other hand, describes how the sound changes between soft (bass) tones and bright (treble) ones. (The same tone is kept continuously maintained, or gradually softens, etc.)

All voices do not have this varying envelope of tone quality, and the degree of the application of effect can be adjusted. When a voice is not given this envelope effect, its tone stays at the level determined by the cut-off control. The envelope of tone quality is clearly effective in making the Brass and Sound Track voices more authentic sounding.

- **Brass**

When the key is pressed, the brass voice, soft and slightly muffled at first, quickly becomes bright and sharp. As the volume decays, so does the tone and the note ends as it began; soft and slightly muffled. These transitions make the tone sound like real brass.

The VCF envelope (Fig. 14) and VCA envelope (Fig. 15) have very similar shapes.

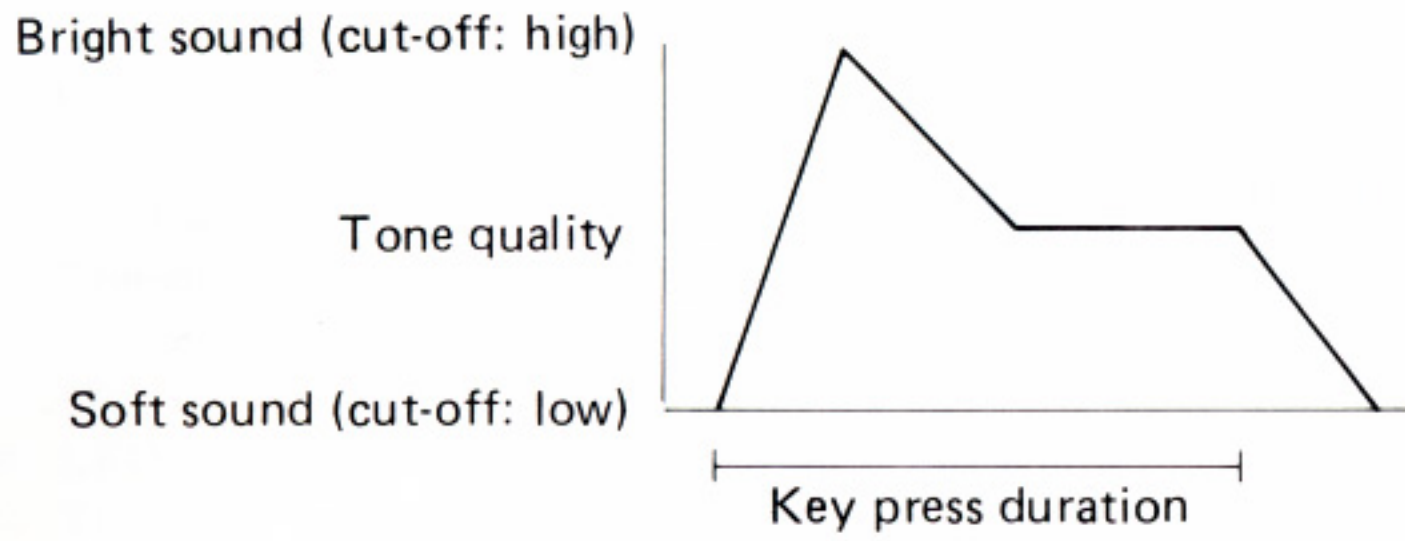


Fig. 14 Tone-quality envelope (VCF)

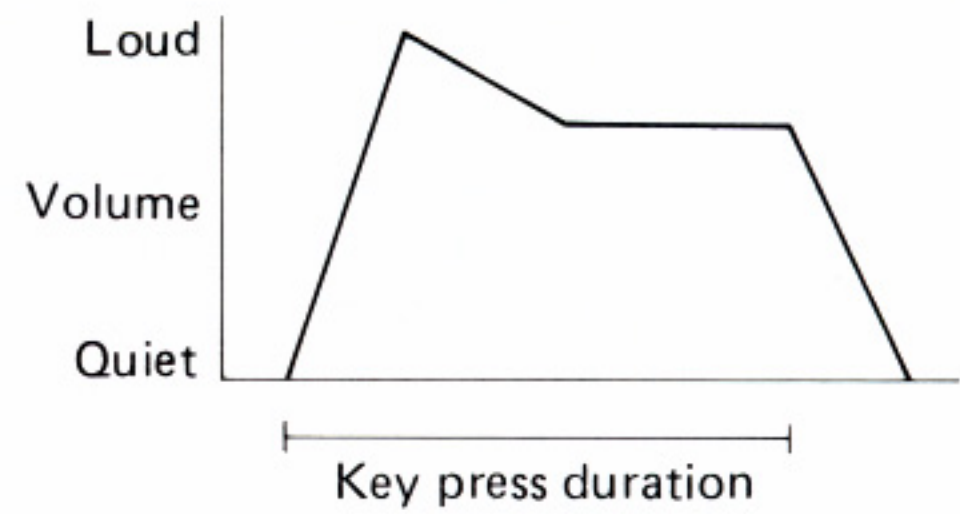


Fig. 15 Volume envelope (VCA)

● **Sound Track**

When the key is pressed, first a soft tone is produced which slowly becomes solid and stays at a continuous level. When the key is released, the tone grows increasingly softer. In this case, the tone envelope (Fig. 16) and volume envelope (Fig. 17) have different shapes because of the different attack lengths.

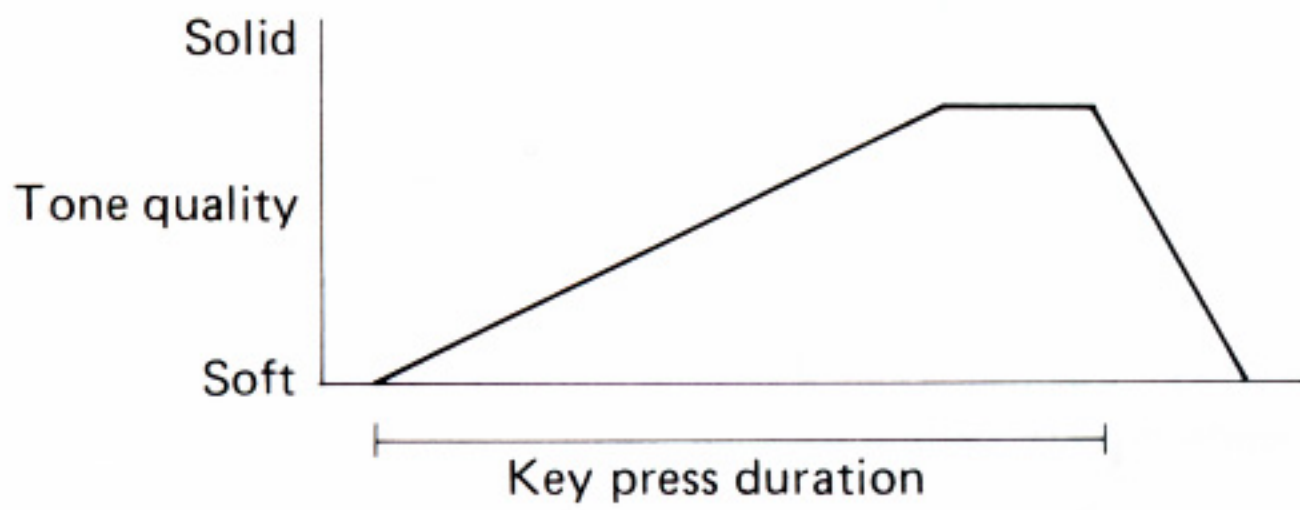


Fig. 16 Tone-quality envelope (VCF)

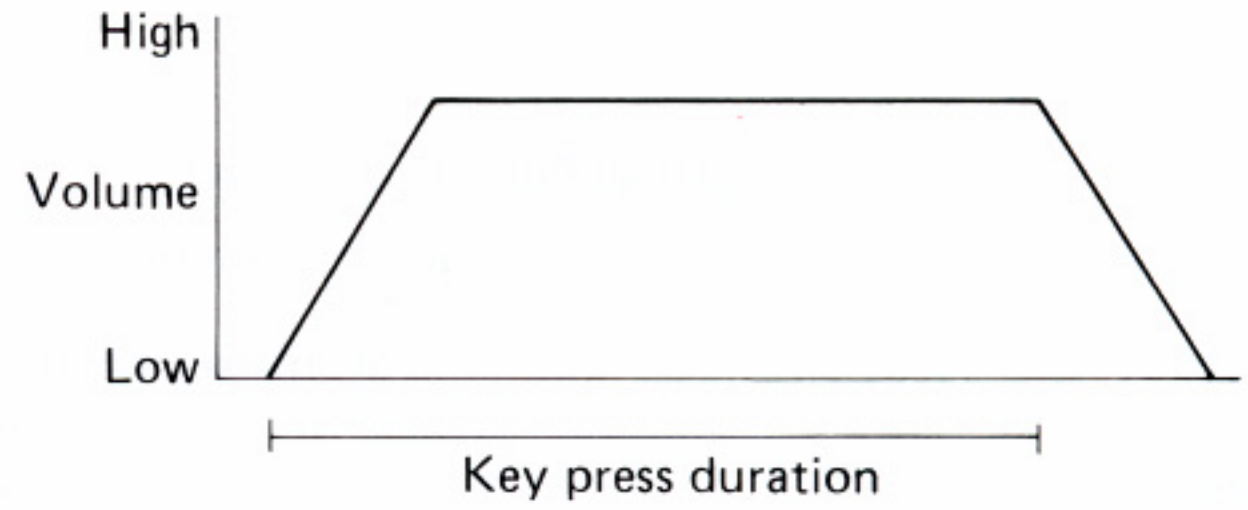


Fig. 17 Volume envelope (VCA)

While the volume envelope comprises five stages; attack, 1st decay, break point, 2nd decay, and release, the tone envelope has only the following four:

- **Attack**
- **Decay** } (re-grouped from the 1st decay, break point and 2nd decay)
- **Sustain** }
- **Release**
- **Attack** (section A in the figure)  
The length of time until the tone reaches its bright tonal peak (as determined by the cut-off level) after a key is pressed.
- **Decay** (section D in the figure)  
The length of time between the tonal peak and the level that is continuously maintained while the key is pressed. (The period of decrease from the cut-off level.)
- **Sustain** (section S in the figure)  
The tone quality which is continuously maintained while the key is pressed.
- **Release** (section R in the figure)  
The length of time until the tone quality reaches its lowest level of softness after the key is released (depending on the release time of the VCA envelope).

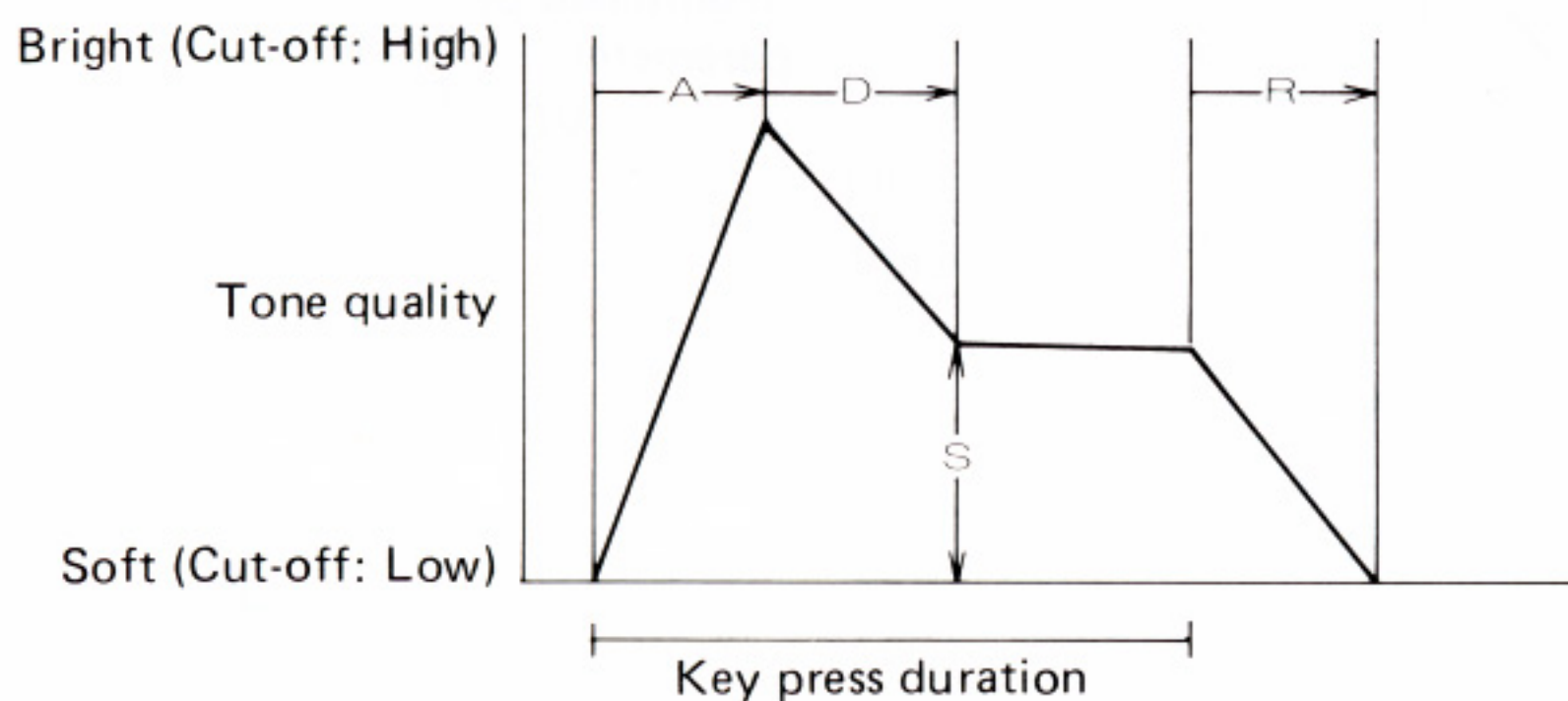


Fig. 18

As described so far, the tone quality can be modified to vary between bass and treble according to the shape of envelope generated by the EG (by creating a rising and falling cut-off level.)

When the EG function is augmented by increasing the **resonance**, anything from howling to wah-wah sounds can be generated. When the resonance is raised on a brass voice, for example, it will sound less like an "acoustic" instrument and more like a "machine".

### Polarity

The polarity function is provided only with the tone quality (VCF) EG.

An envelope can be reversed as shown in Fig. 20.

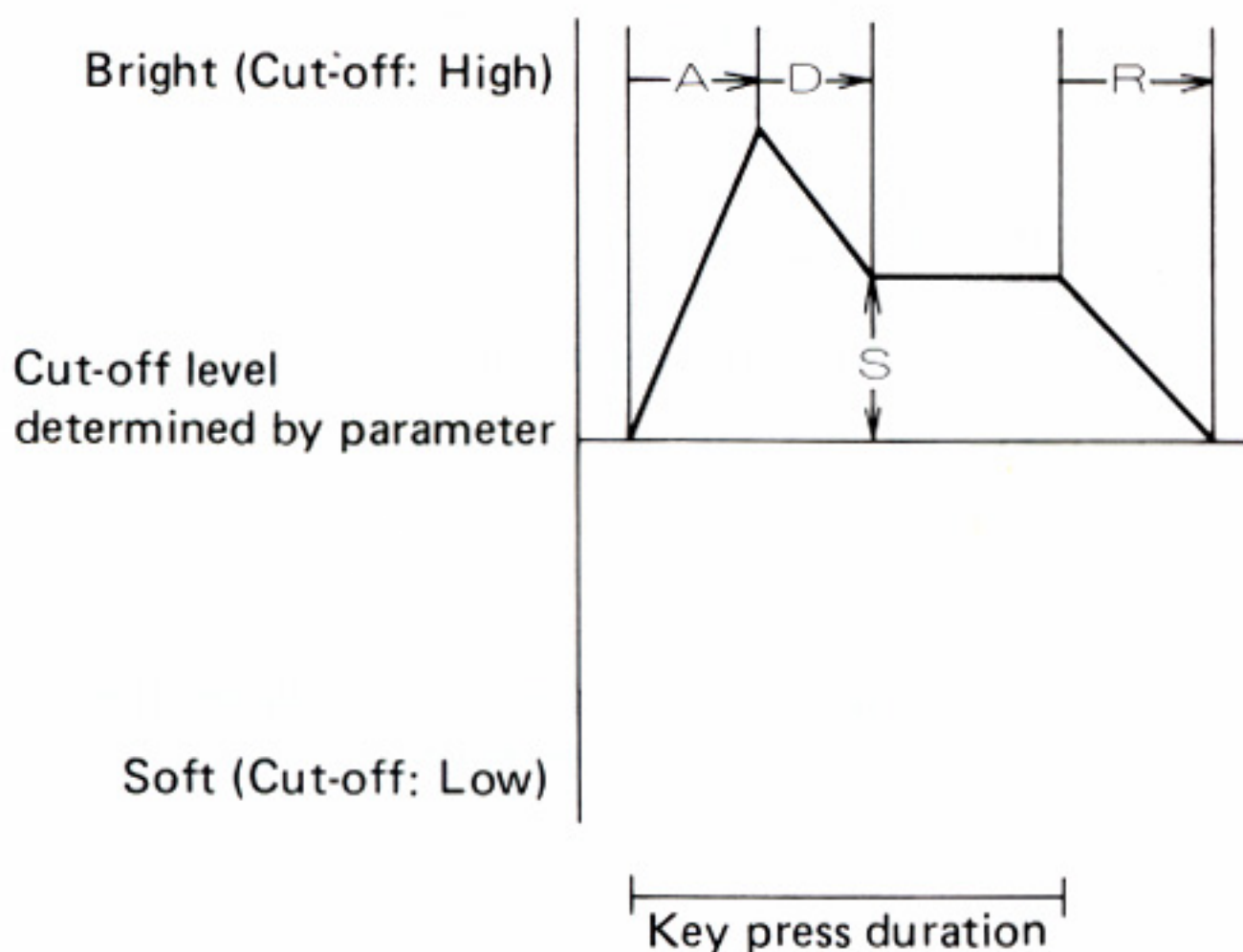


Fig. 19 Positive Polarity (Normal)

Cut-off level determined by cut-off parameter Key press duration

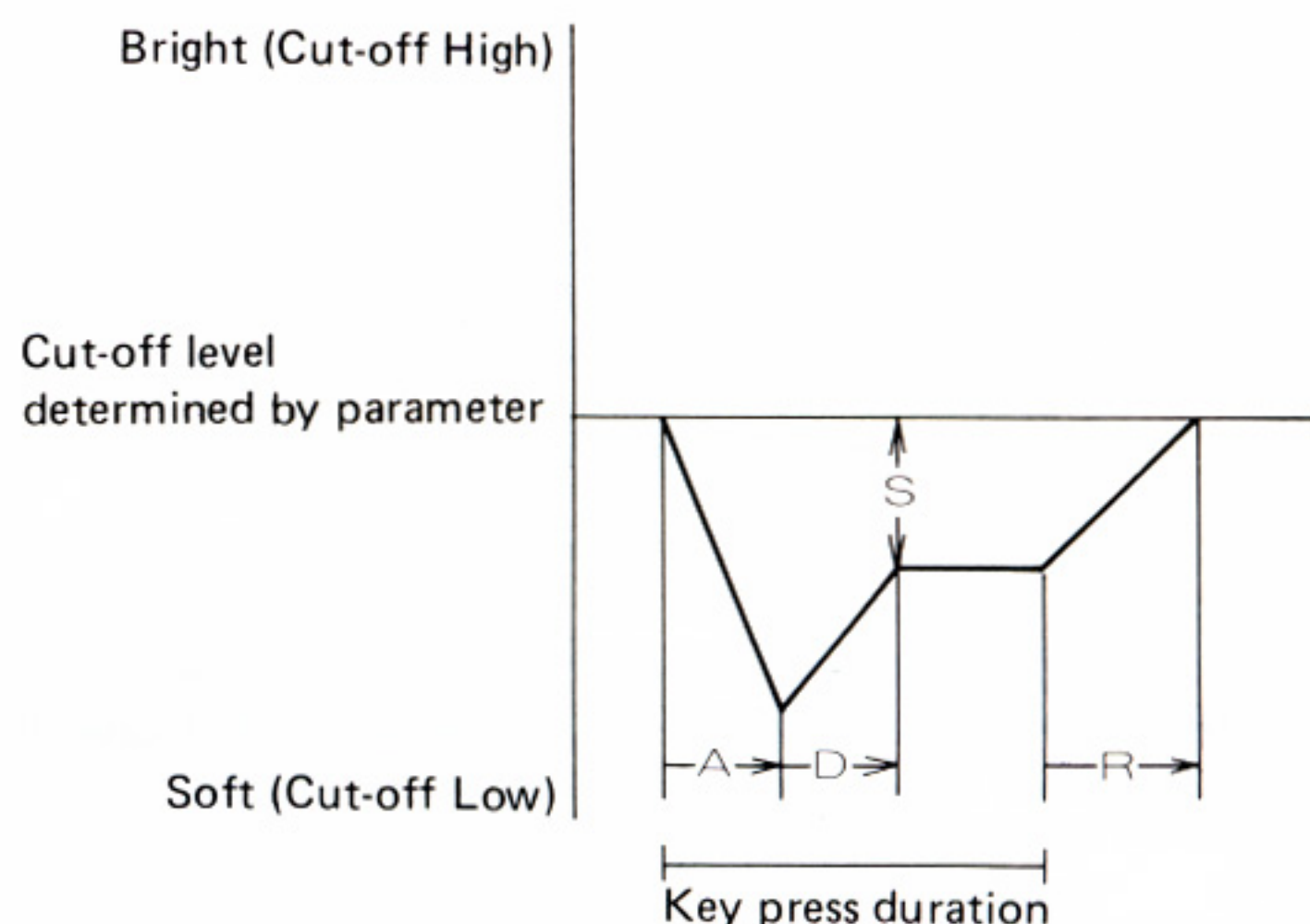


Fig. 20 Reversed Polarity

The reversing of polarity produces the "mirror image" of the changing stages of tone quality. The EG functions in reverse are as follows:

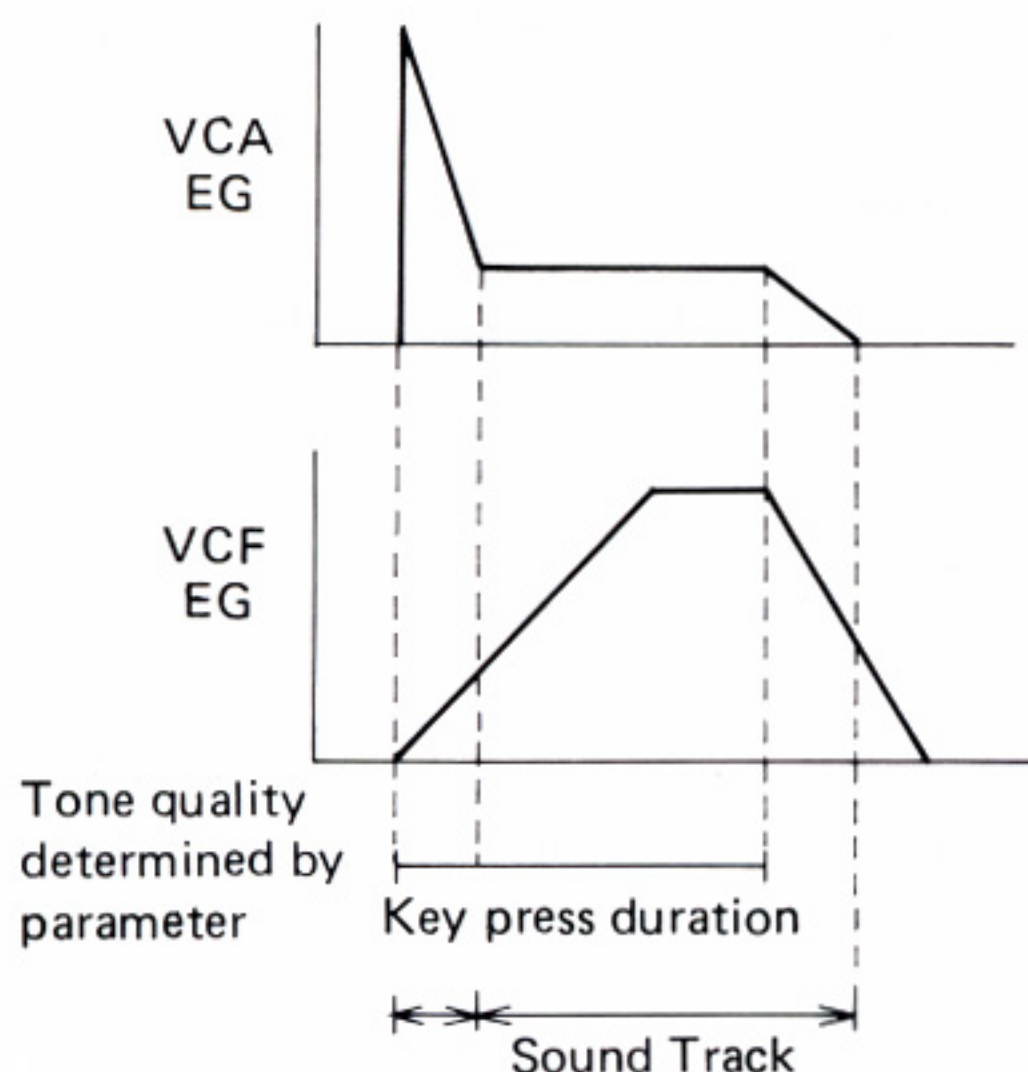
- **Attack**  
The length of time until the tone reaches its "softness minimum" (as determined by the cut-off level) after the key is pressed.
- **Decay**  
The length of time between the softness minimum and the continuously-maintained tone quality. (The period of increase of the cut-off level.)
- **Sustain**  
The tone quality which is maintained continuously while the key is depressed.
- **Release**  
The length of time during which the tone quality becomes bright after the key is released.

The reverse-phase envelope is most effective in the creation of sound effects.

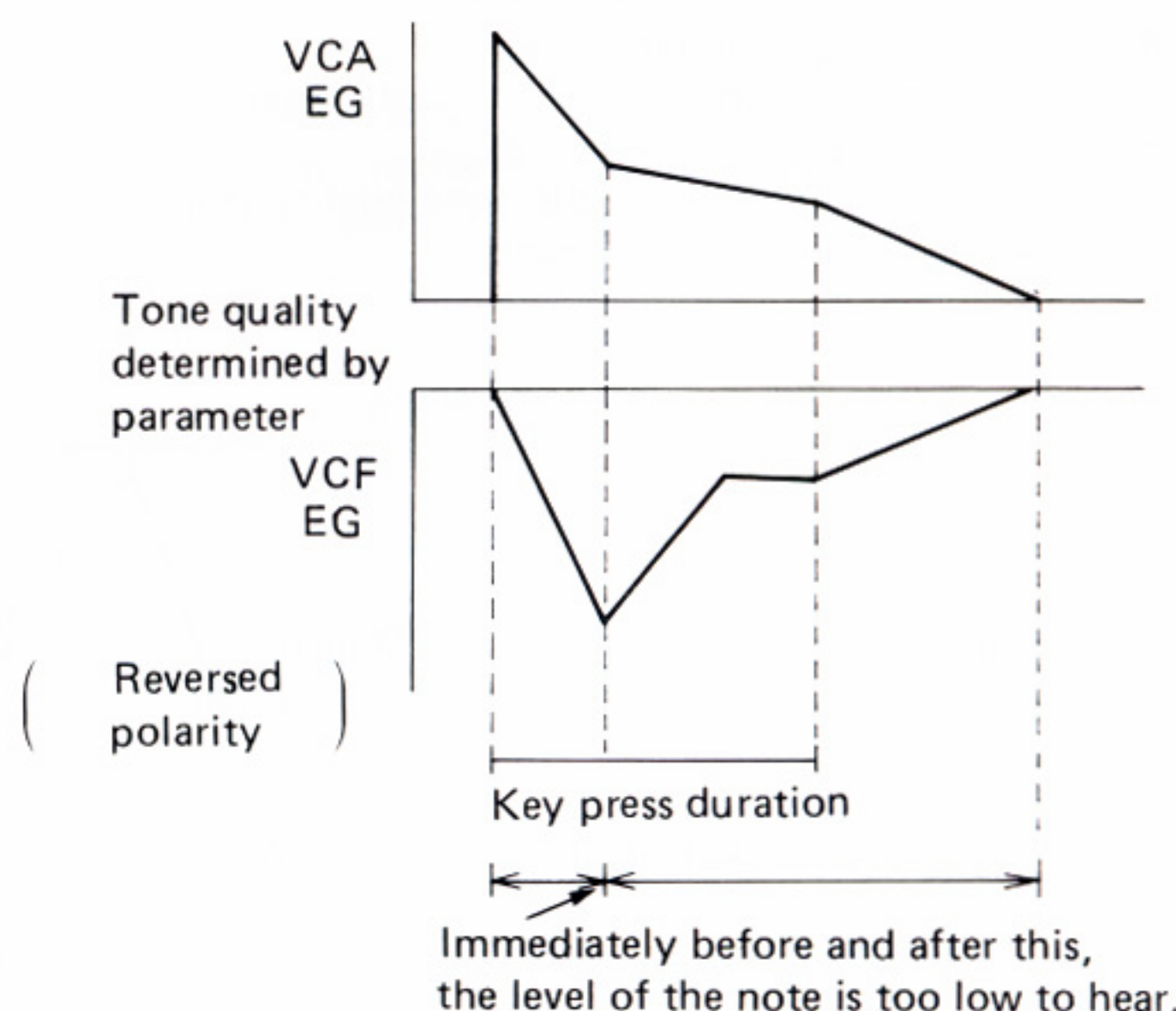
As it is shown by Fig. 20, the cut-off level should be set relatively higher when the reverse-phase envelope is used, or the sound may not be produced.

### Special Voices Using two EGs

- **Piano Strings**  
After the initial piano attack, the sound changes to resemble the continuous Sound Track voice.



- **Planet**  
When a key is pressed, the note is heard and then immediately fades out; if the key is still pressed, after a silent pause, the sound fades back in, almost like an echo.



Other than the special sounds above, there are many voices whose volume and tone envelopes are quite similar; among these are Clavichord, Guitar, and Human Voice.

## Other Blocks

There are two blocks which add effects to voices generated using the **DCO**, **VCA** and **VCF** blocks. They are the **LFO** and **EFFECT** blocks.

**LFO**: Used to apply vibrato, and tone modulation.

**EFFECT**: Used to apply stereo effect, ensemble, and other effects.

### ■ LFO

The Low-Frequency Oscillator provides cyclic sound undulation, which can be applied to both the **DCO** and the **VCF**.

#### ● LFO applied to **DCO** (for pitch modulation)

The pitch can be varied, using a frequency determined by the **LFO**, to produce vibrato. This effect is most useful when applied to voices such as violin and human voice. The degree of the effect is controlled by the **VIBRATO** control in the **DCO** block. (Set to "0" when the effect is not used.)

#### ● LFO applied to **VCF** for tone quality modulation)

The tone quality (determined by the cut-off level) varies with the frequency determined by **LFO**, between bright and soft sounds. The soft undulation of a flute and the undulating reverberation of a vibraphone are obtained by applying the **LFO** effect to **VCF** (tone quality).

The degree of the effect is controlled by the **MODULATION** control in the **VCF** block. (Set to "0" when the effect is not used.)

#### ● FREQUENCY

Determines the frequency rate of undulation obtained with the **VIBRATO** or **MODULATION** control. The undulation speed becomes slower when the setting is low and faster as it is raised.

#### ● DELAY

Determines the length of time until the **LFO** effect is applied after the key is pressed. For instance, with the violin voice, vibrato is applied only a while after the sound is generated by pressing a key. This length can be varied using the **DELAY** control.

When the control is set to "0", the effect is applied at the instant the sound is generated. The more the **DELAY** value, the longer the wait before vibrato is applied.

### ■ EFFECTS

Six kinds of effect are provided for professional sound enhancement.

#### ● Stereo Effect

Sounds are stereophonically expanded and given a deeper, more rich texture.

#### ● Reverb

Related to echo, this effect causes sounds to linger slightly after they would have normally ceased.

#### ● High-Pass Filter

While blocking low frequencies, this component allows high-frequency signals to pass through. Used to give more realism to light voices such as Piano.

#### ● Ensemble 1

As the name suggests, this effect expands one sound into a group of sounds.

#### ● Ensemble 2

Related to Ensemble 1, this version has the mid and low frequencies filtered out for a much lighter effect, especially useful with Strings.

#### ● Phaser

A whooshing, undulating effect.

The NS-70 is provided with 8 combinations of these 6 effects and the degree to which each effect is applied has been preset in 8 combinations. When an effect is to be used, it is necessary to select one of the 8 combinations shown below.

	Stereo Effect	Reverb	Other Effects
0	OFF	OFF	OFF
1	Medium	Small	OFF
2	Large	Medium	OFF
3	Large	Large	OFF
4	Small	Small	High-pass filter
5	(Included in Ensemble)	Large	Ensemble 1
6	(Included in Ensemble)	Large	Ensemble 2
7	Medium	Small	Phaser

# PARAMETER LIST

The elements which comprise a voice are called "parameters". The condition of the parameter (how much of the effect is applied) is represented by its "value".

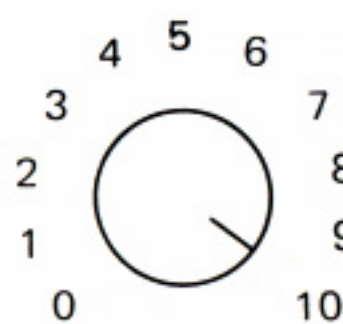
(On the NS-70, parameters are selected using the CUSTOM COMBINATION MEMORY switches. Only numbers from 1 to 8 are used.)

Block	Parameter		Value			Description
	No.	Name	Small	Large	Contents	
DCO1	11	Octave	1	3	1=Low (16'), 2=Mid (8'), 3=High (4')	<ul style="list-style-type: none"> <li>• Determines the octave of the 1st sound source (DCO1). Three octaves are selectable: 16', 8' or 4'.</li> <li>• Determines the status of the square wave.</li> <li>• Determines the status of the sawtooth wave.</li> </ul>
	12	Square wave	0	1	0=OFF, 1=ON	
	13	Sawtooth wave	0	1	0=OFF, 1=ON	
DCO2	14	Octave	1	3	1=Low (16'), 2=Mid (8'), 3=High (4')	<ul style="list-style-type: none"> <li>• Determines the octave of the 2nd sound source (DCO2). Three octaves are selectable: 16', 8' or 4'.</li> <li>• Determines the status of the square wave.</li> <li>• Shifts the DCO2 pitches slightly with respect to the DCO1 pitches to create a thicker sounding, undulating voice. Ideal for use with accordion, etc.</li> <li>• Shifts the DCO2 pitches by half steps. Produces the organ registration that creates fifth-note sound or "fat fifth" interval (Fifth Brass). When the 4' octave is selected and the interval is set to "12", a 2' octave can be obtained.</li> <li>* DCO2 level is lower than DCO1 level.</li> </ul>
	15	Square wave	0	1	0=OFF, 1=ON	
	16	Detune	0	4	0=OFF, 1=Small to 4=Large	
DCO	17	Interval	1	12	0=DCO1 same as DCO2 12=DCO2 one octave higher than DCO1.	
	18	Pulse width	0	7	0=Wider pulse width 7=Narrower width	<ul style="list-style-type: none"> <li>• Varies width of square wave.</li> </ul>
NOISE GENERATOR	21	Vibrato	0	31	0=OFF, 1=Small to 15=Large	<ul style="list-style-type: none"> <li>• Adjusts the degree of vibrato.</li> <li>* Vibrato affects only the SOLO and UPPER sections.</li> </ul>
	22	VCF mode	1	2	1=VCF IN, 2=VCF OUT	<ul style="list-style-type: none"> <li>• When using VCF OUT, only noise can bypass the VCF. Set to VCF OUT when noise is used to enhance a soft sound such as Jazz Flute.</li> <li>* Sections other than SOLO have only VCF IN functions (VCF OUT functions are not provided).</li> </ul>
NOISE GENERATOR	23	Level	0	31	0=OFF, 1=Small to 31=Large	<ul style="list-style-type: none"> <li>• Adjusts the noise level.</li> </ul>
	24	Attack	0	31	0=Fast to 31=Slow	<ul style="list-style-type: none"> <li>• Determines the response speed of the voice.</li> <li>• Determines the volume decay time till the break point.</li> <li>• Determines the lowest volume level after 1st decay.</li> <li>• Determines the time till the sound goes off after break point. The maximum setting "31" produces continuous sound.</li> <li>• Determines the abruptness with which the sound ceases after key release.</li> <li>• When "1" (ON) is selected, percussive voices, such as piano, will be produced more naturally.</li> </ul>
25	1st decay	0	31	0=Fast to 31=Slow		
26	Break point	0	31	0=Small to 31=Large		
27	2nd decay	0	31	0=Fast to 31=Slow		
28	Release	0	31	0 = Fast to 31=Slow		
VCA EG	31	Special percussive mode	0	1	0=OFF, 1=1st decay keep, 2nd decay & release keyboard follow	
VCF	32	Cut-off	0	99	0=Low to 99=High	<ul style="list-style-type: none"> <li>• Determines the tone brightness level.</li> <li>• Determines the strength of the highest, brightest tones.</li> <li>• Varies the tone strength between lower and higher octaves. The more the value is raised, the stronger will be the higher-octave notes: at "3" (= FULL) the high-pitch notes will sound as strong as the lower notes.</li> </ul>
	33	Resonance	0	15	0=Low to 15=High	
	34	Keyboard track	0	3	0=OFF, 1=1/4, 2=1/2, 3=Full	
VCF EG	35	Polarity	1	2	1=In-phase, 2=Reversed phase	<ul style="list-style-type: none"> <li>• When "2" is selected, the envelope shape generated by the EG is reversed.</li> <li>• Adjusts the EG envelope size.</li> <li>• Determines the peak brightness of the tone.</li> <li>• Determines the time till the tone brightness drops to the level determined by SUSTAIN.</li> <li>• Determines the level at which tone brightness is continuously maintained while the key is pressed.</li> <li>• Determines how long the tone will linger after the key is released.</li> </ul>
	36	EG level	0	31	0=OFF, 1=Small to 31=Large	
	37	Attack	0	31	0=Fast to 31=Slow	
	38	Decay	0	31	0=Fast to 31=Slow	
	41	Sustain	0	31	0=Small to 31=Large	
VCF	42	Release	0	31	0=Fast to 31=Slow	
VCF	43	Modulation level	0	15	0=OFF, 1=Small to 15=Large	<ul style="list-style-type: none"> <li>• Determines the degree to which the LFO ("46") will cause the tone to undulate.</li> </ul>

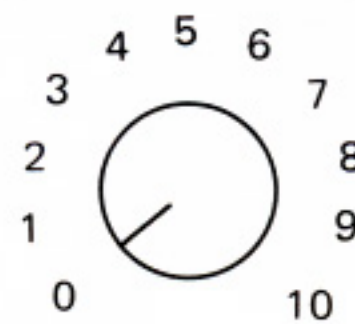
Block	Parameter		Value			Description																																				
	No.	Name	Small	Large	Contents																																					
Voice	44	Level	0	31	0=OFF, 1=Small to 31=Large	<ul style="list-style-type: none"> <li>Some synthesizer voices are louder than others, just as a violin, for example, is louder than a flute. This is partially the result of different cut-off levels, and should be taken into consideration when playing; you may want to increase or decrease certain cut-off levels to minimize such discrepancies.</li> </ul>																																				
Effect	45	Effect	0	7	<table border="1"> <thead> <tr> <th></th> <th>Stereo effect</th> <th>Reverb</th> <th>Other effects</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>1</td> <td>Mid</td> <td>S</td> <td>OFF</td> </tr> <tr> <td>2</td> <td>L</td> <td>Mid</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>L</td> <td>L</td> <td>OFF</td> </tr> <tr> <td>4</td> <td>S</td> <td>S</td> <td>HPF</td> </tr> <tr> <td>5 (incl. Ens.)</td> <td>L</td> <td>L</td> <td>Ens. 1</td> </tr> <tr> <td>6</td> <td>Ens.</td> <td>L</td> <td>Ens. 2</td> </tr> <tr> <td>7</td> <td>Mid</td> <td>S</td> <td>Phaser</td> </tr> </tbody> </table>		Stereo effect	Reverb	Other effects	0	OFF	OFF	OFF	1	Mid	S	OFF	2	L	Mid	OFF	3	L	L	OFF	4	S	S	HPF	5 (incl. Ens.)	L	L	Ens. 1	6	Ens.	L	Ens. 2	7	Mid	S	Phaser	<ul style="list-style-type: none"> <li>8 effects are provided by combining various factors. Effect No. 4, high-pass filter, is used for percussive voices such as piano. Since the piano sound has a low cut-off and brake-point level, the volume level is lower than other voices. To compensate for this, Effect No. 4 is added to piano to increase the volume and reduce the difference between instruments. Be careful when this effect is used with continuous sounds, as it may cause distortion by overly increasing the volume level.</li> </ul>
	Stereo effect	Reverb	Other effects																																							
0	OFF	OFF	OFF																																							
1	Mid	S	OFF																																							
2	L	Mid	OFF																																							
3	L	L	OFF																																							
4	S	S	HPF																																							
5 (incl. Ens.)	L	L	Ens. 1																																							
6	Ens.	L	Ens. 2																																							
7	Mid	S	Phaser																																							
LFO	46	Frequency	1	16	1=Slow, to 16=Fast	<ul style="list-style-type: none"> <li>Determines the vibrato undulation rate and controls VCF modulation.</li> <li>Determines the time it takes after a key is pressed until the modulation or vibrato is applied.</li> <li>* LFO delay affects only the SOLO and UPPER sections.</li> </ul>																																				
	47	Delay	0	7	0=OFF, 1=Fast to 3=Large																																					
Touch	48	VCA intensity	0	3	0=OFF, 1=Small to 3=Large	<ul style="list-style-type: none"> <li>The sound volume is varied depending on how hard the key is pressed, making more detailed musical expression possible. Raising the value results in a greater difference between light and heavy touches of the keys.</li> <li>The tone can also be varied depending on how hard the keys are pressed. Heavily pressing down on the keys will produce a sharp, bright sound, whereas when the key is pressed gently a soft, slightly muffled tone is produced. This provides an effective means of creating a more realistic brass voice, for example.</li> <li>* The touch function does not affect the BASS and ACCOMP sections.</li> </ul>																																				
Sensitivity	51	VCF intensity	0	2	0=OFF, 1=Small, 2=Large																																					

### Parameters

Think of the volume control on a stereo. When this control is turned completely clockwise, the sound is as loud as the machine will put out, and the notch is pointing at "10". Turn it back completely counterclockwise, to "0", and no sound is produced. In this case, the increments from "0" to "10" represent the parameters of volume.

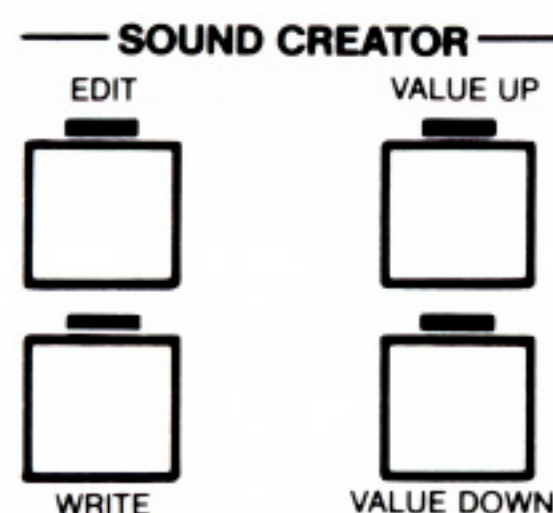


Maximum Volume



No volume.

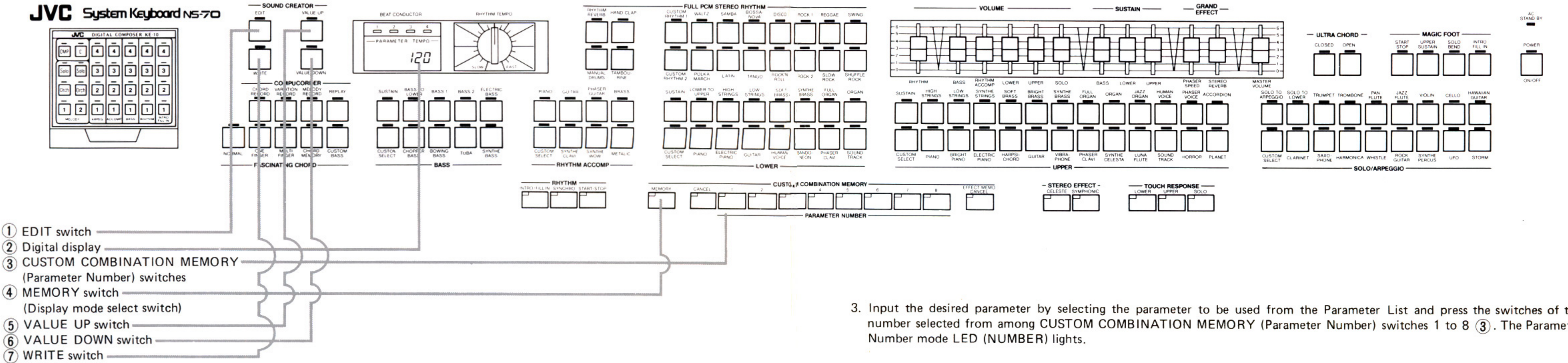
On the NS-70, instead of twisting a knob, you change parameter values using the value up/down switches.





# EDITING (SOUND MAKING)

With the NS-70, PRESET or CUSTOM voices can be modified and new voices created by increasing or decreasing the value of parameters that comprise each sound.

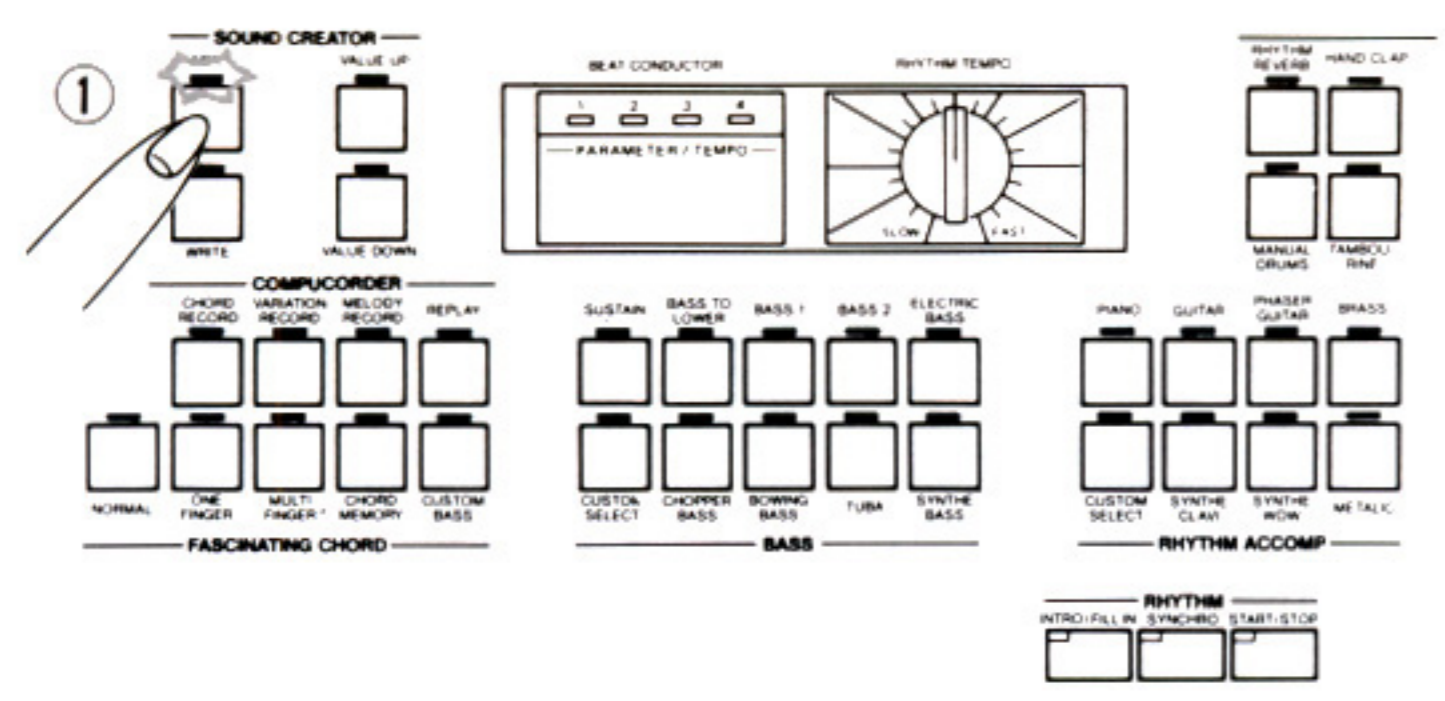


- ① EDIT switch
- ② Digital display
- ③ CUSTOM COMBINATION MEMORY (Parameter Number) switches
- ④ MEMORY switch (Display mode select switch)
- ⑤ VALUE UP switch
- ⑥ VALUE DOWN switch
- ⑦ WRITE switch

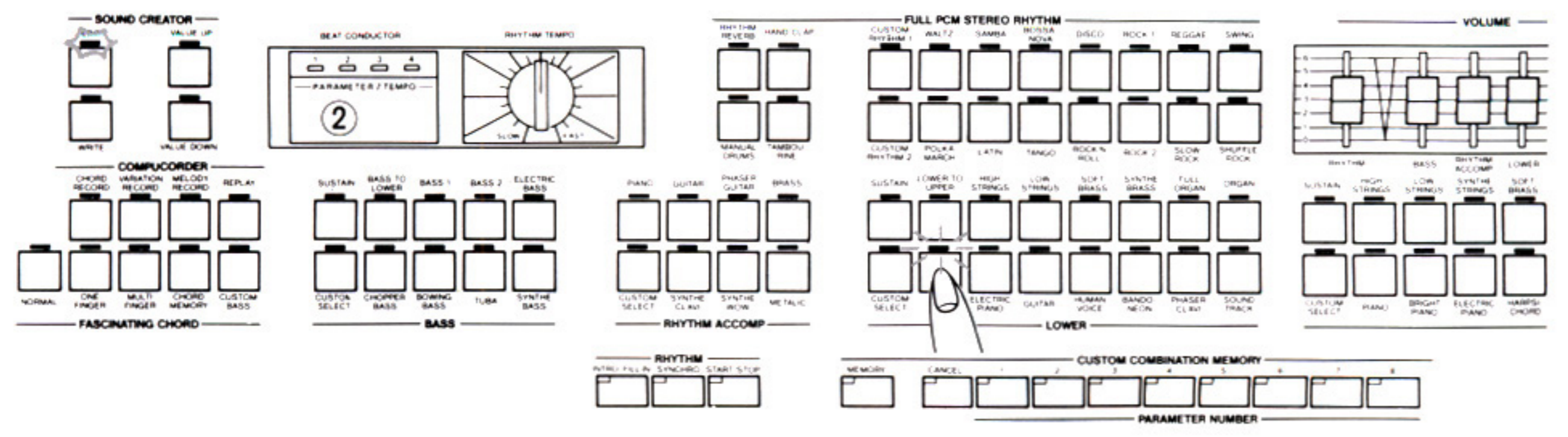
3. Input the desired parameter by selecting the parameter to be used from the Parameter List and press the switches of the number selected from among CUSTOM COMBINATION MEMORY (Parameter Number) switches 1 to 8 ③. The Parameter Number mode LED (NUMBER) lights.

## Editing Procedure

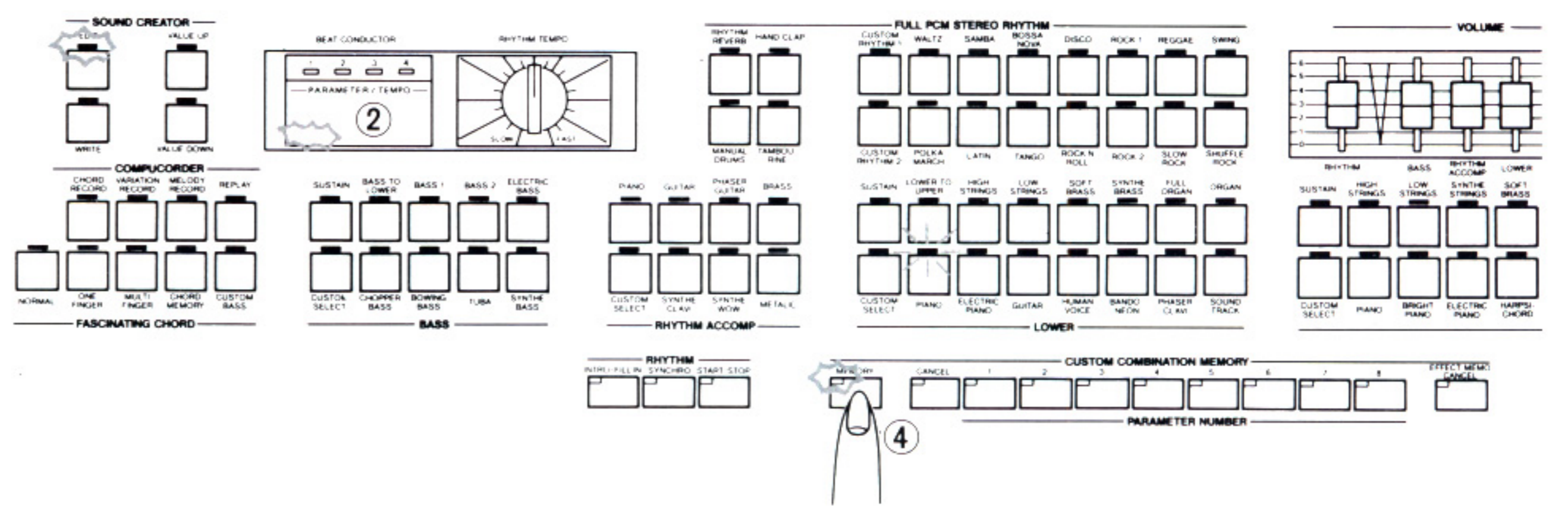
1 Press EDIT switch ①; its LED lights.



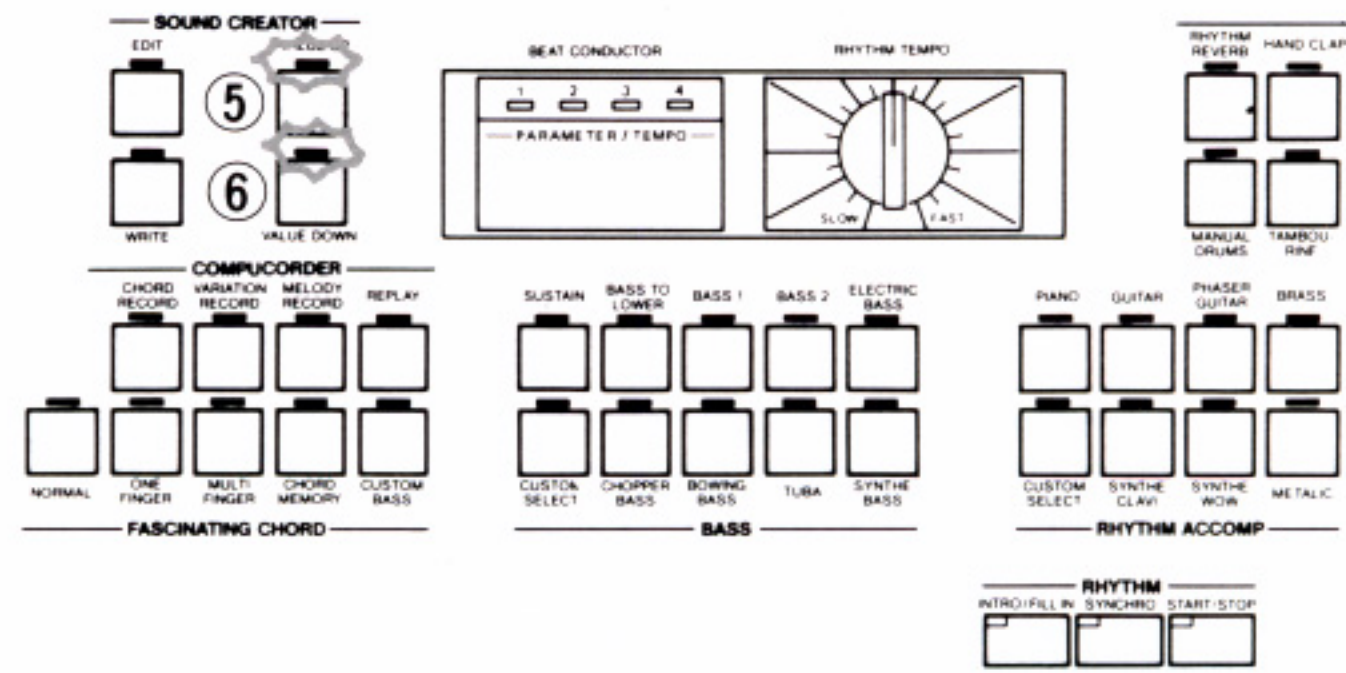
2. Press the switch of the voice to be edited; its LED blinks. At the same time, Display ② goes off.



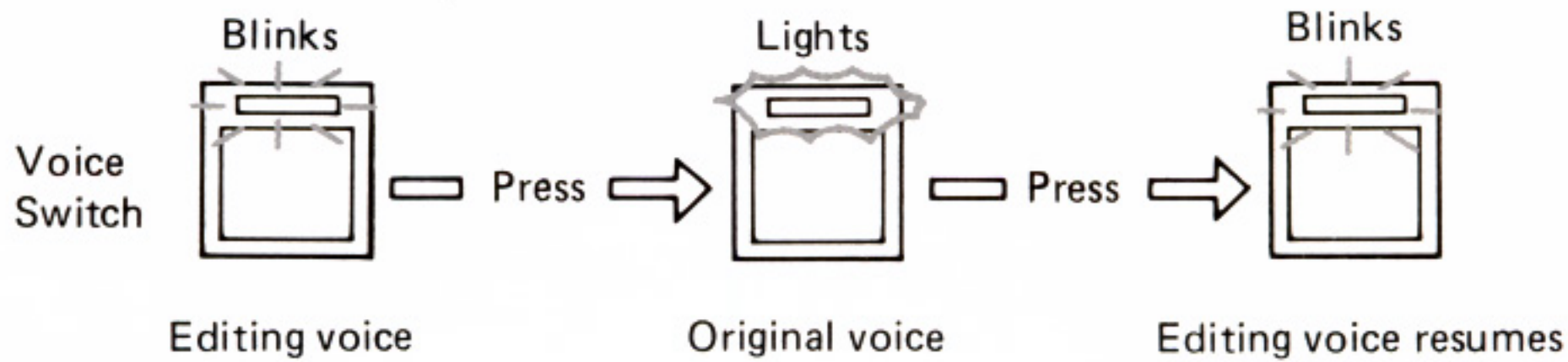
4. To check the present value of the selected parameter, press MEMORY switch ④. Display ② changes from the parameter number display mode to the parameter value display mode, and the Parameter Value Mode LED (VALUE) lights.



5. While pressing a key and listening to the sound produced, vary the value by pressing VALUE UP/DOWN switches (5) (6) until the desired sound is obtained.  
When procedure 4. is omitted, Display ② can be returned from the parameter number display mode to the parameter value display mode by pressing either of UP/DOWN switches ⑤ ⑥ once.



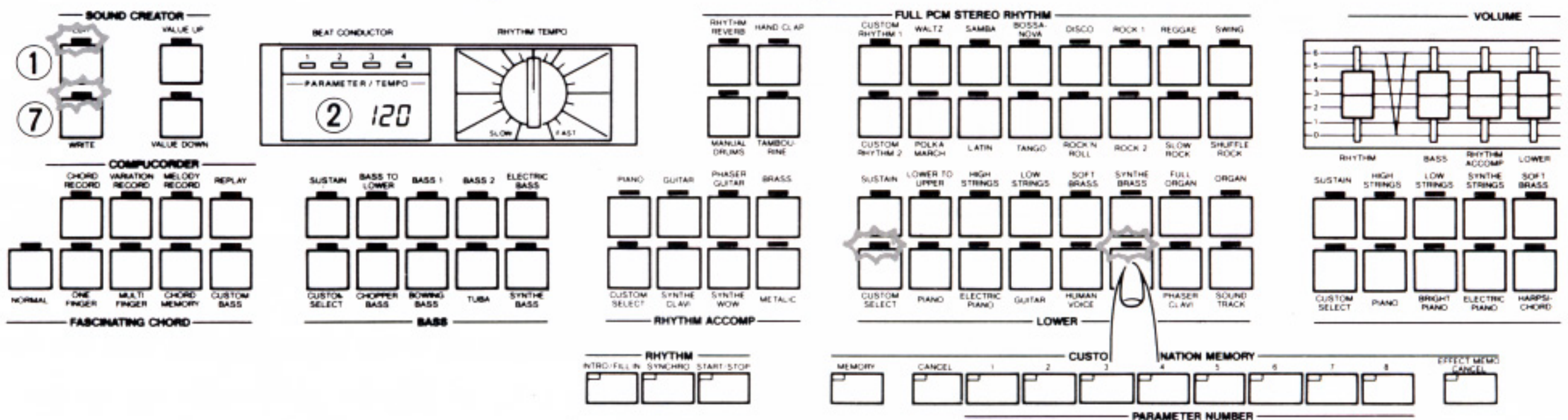
6. To input another parameter after a value has been set, press one of COMBINATION MEMORY switches 1 to 8.
7. To check a parameter number while setting a value, press MEMORY switch ④ to change display ② from the parameter value display mode to the number display mode. Pressing the MEMORY switch again retrieves the value display mode.
- **To recall the original voice**  
During editing, the original voice (sound before editing) can be recalled by pressing the switch of the voice being edited so that the blinking LED lights. When this voice switch is pressed again, the editing condition will be resumed.  
N.B. During the editing process, the voice being edited is the only one in its section (UPPER, LOWER, BASS, etc.) whose LED is blinking and is the only voice that will be heard. Pressing other switches in the same section will not activate their voices.



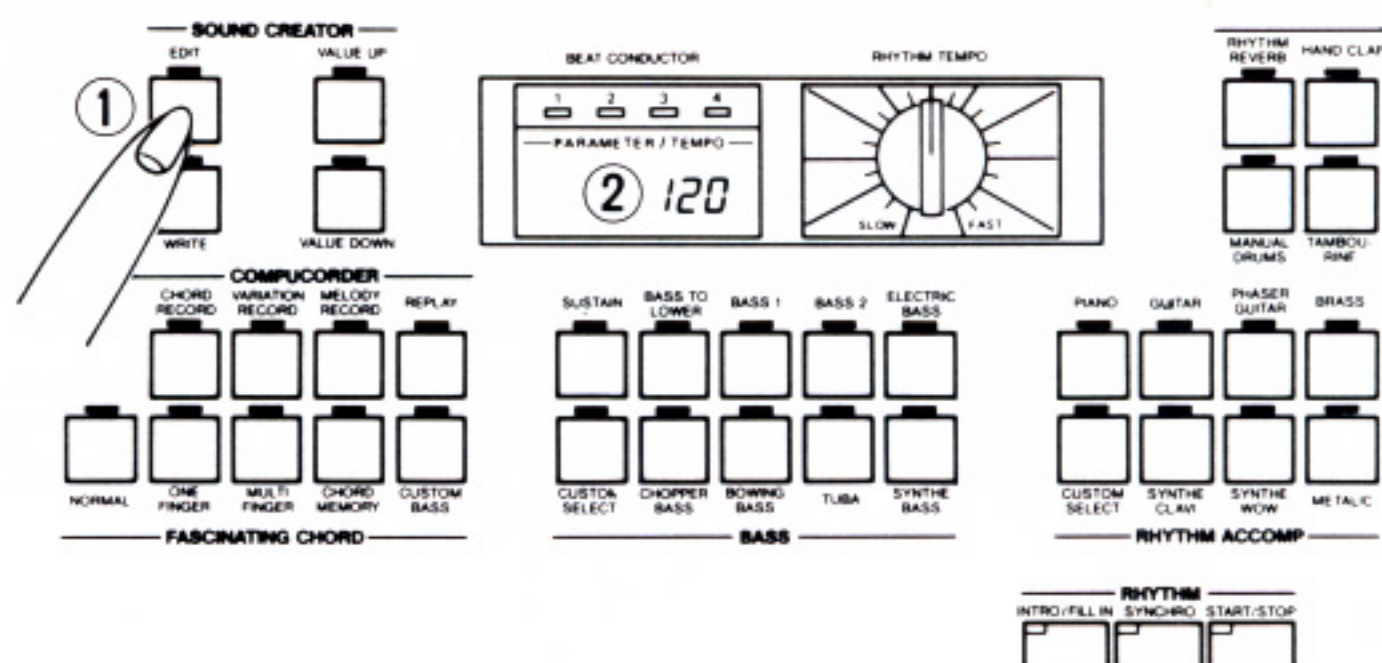
## Writing of Edited Data

The memory of a CUSTOM VOICE can be cleared and an edited (newly created) voice stored in its place.

1. Select the voice to be replaced.
2. While pressing WRITE switch ⑦, press the switch of the voice to be stored. The selected voice LED lights and the newly created voice is now stored there. EDIT LED ① goes off and Display ② resumes the tempo display mode.



- **To finish editing without storing the voice**  
Press EDIT switch ① so that the LED goes off. The Display ② returns to the tempo display mode, the condition before editing is resumed, and the voice being edited is cleared.



- Effective parameters of each section

There are parameters which are effective only in one of the sections; SOLO, UPPER, LOWER, ACCOMP or BASS. In some cases, the same tone may not be obtained when a voice is transferred from one section to another.

- Combination Memory Mode Status after Voice Creation

When entering into the Edit mode from the Combination Memory mode with edited data stored in one of the Custom Voices, the EDIT LED goes off and the COMBINATION MEMORY switch LEDs showing the condition before editing light. At this time, the voice switch LEDs of the previous assignment are not lit but the data-stored switch LED is. (This will tell you whether or not the switch has stored the data.)

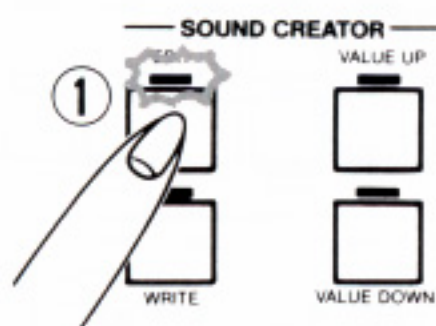
However, when the conditions on the control panel are not stored in the Combination Memory and the COMBINATION MEMORY switch is pressed again, the setting condition before sound creating will be recalled.

When entering into the edit mode from the cancel mode, the same phenomenon will occur.

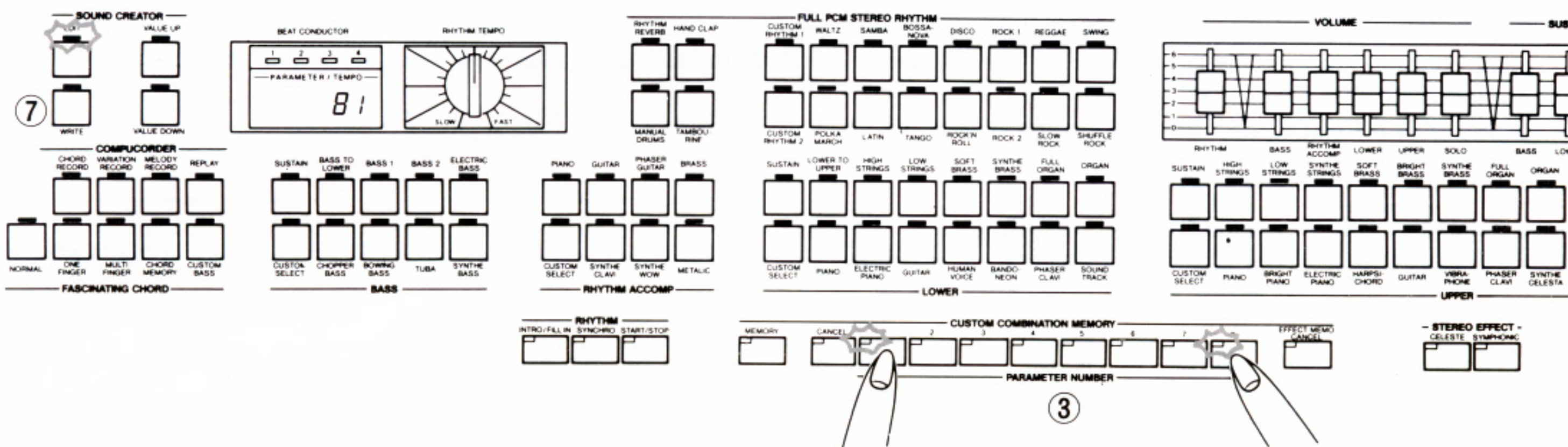
## Recalling an Internal Custom Voice

Even after storing a newly created voice in place of an internal CUSTOM VOICE, the latter can be retrieved. (This will completely erase the newly-created voice, however; to use that voice again, it must be re-created using the editing procedure.)

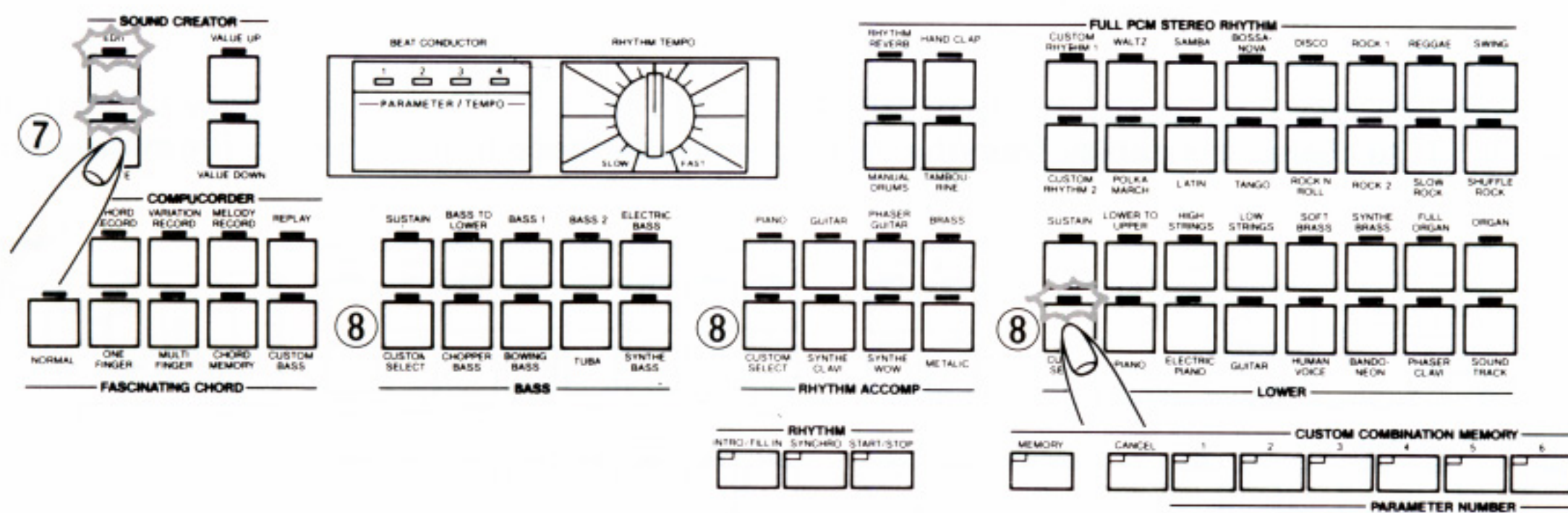
1. Press EDIT switch ①.



2. Input "81" using number switches ③.



3. While pressing WRITE switch ⑦, press CUSTOM VOICE switch ⑧ in the section of the voice to be recalled. The blinking CUSTOM VOICE switch LED lights and all Custom Voices in the section are recalled.



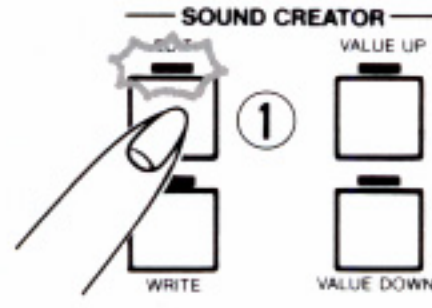
4. When finished, press the EDIT switch ① so that the EDIT LED goes off.

The NS-70's power must be switched "on" once every two weeks, to prevent loss of custom voice data. Data may also be safely stored using an optional Digital Memory Pack (NS-M10).

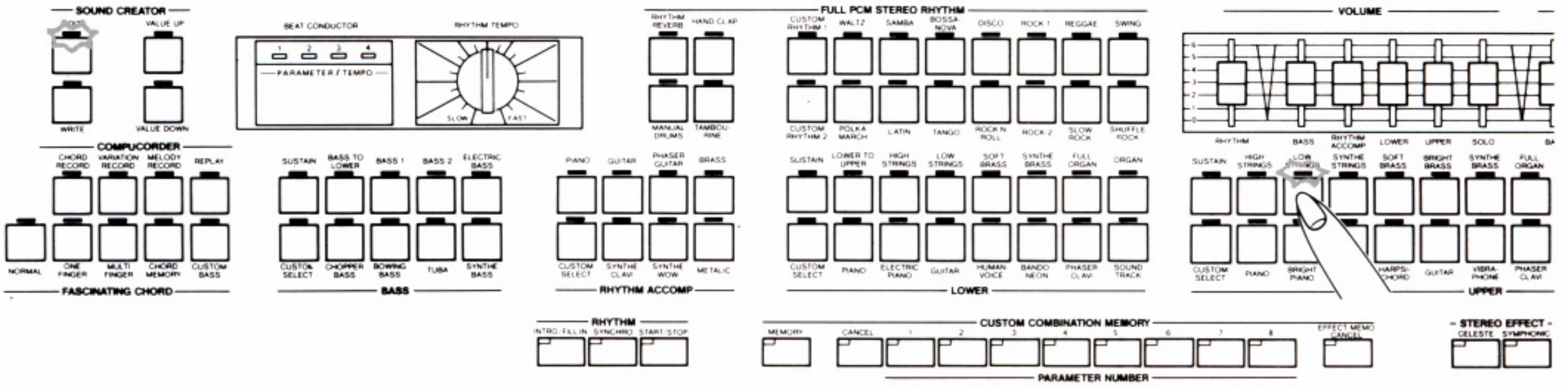
## Modification Procedure: An Example

To make the attack (the speed with which a sound reaches its peak volume and/or highest tone when a key is pressed) of the LOW STRINGS on the UPPER section faster:

1. Press EDIT switch ①.

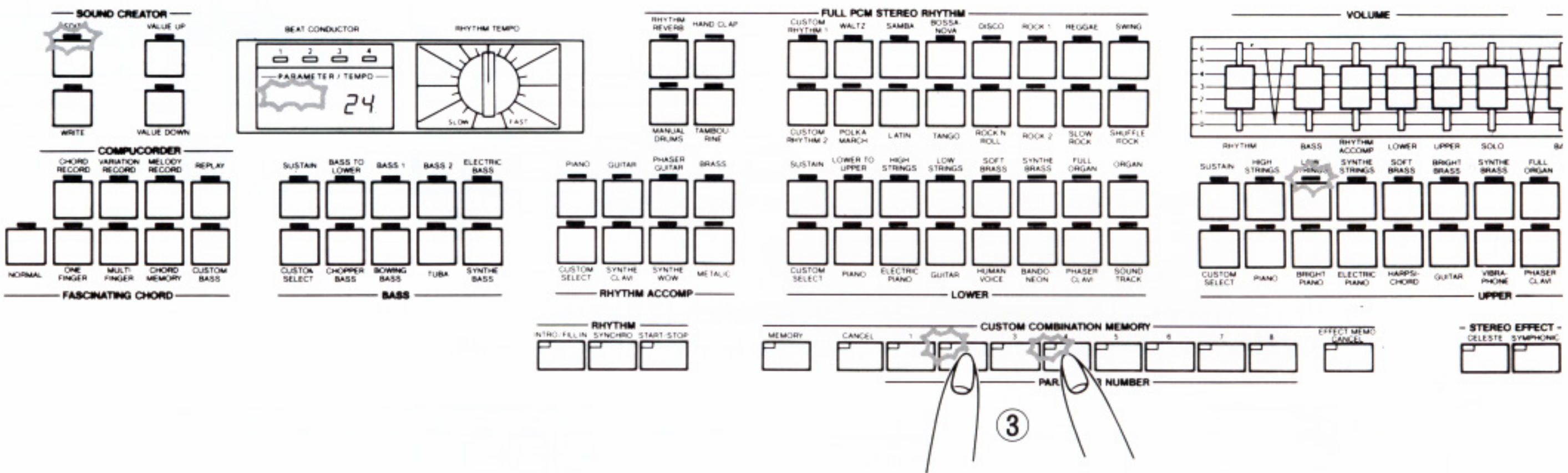


2. Press the LOW STRINGS switch in the UPPER section.

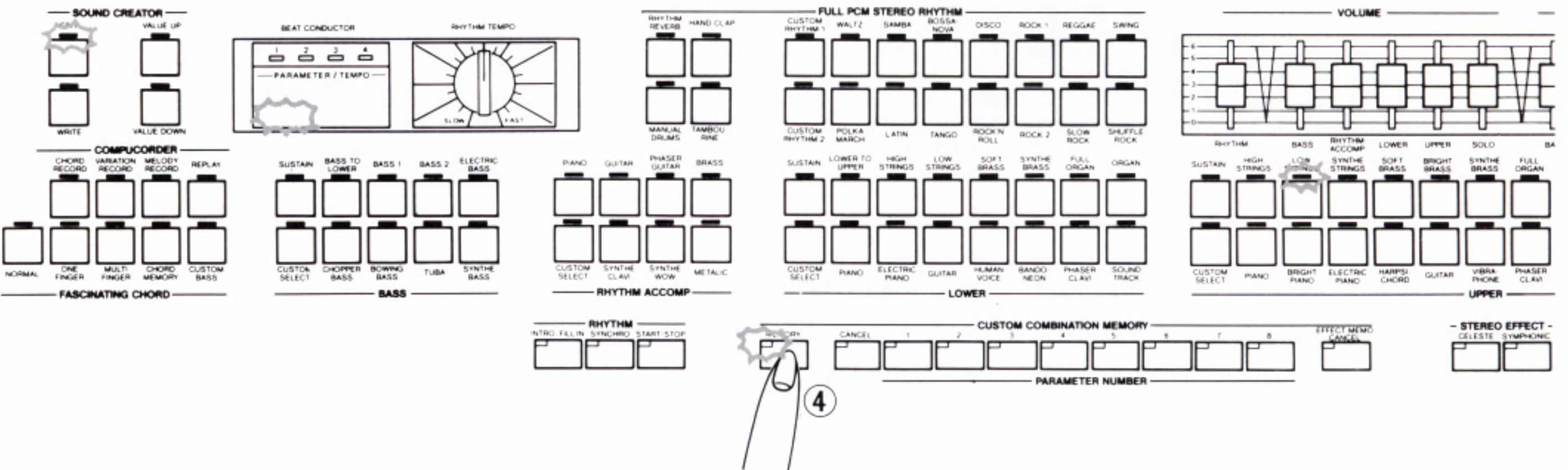


3. Search for ATTACK on the Parameter List. (Actually, there are two: VCA ATTACK, which controls the rise of sound to peak volume, number "24", and VCF ATTACK, which controls the rate of change from low (bass) tone to high (treble) tone, number "37".)

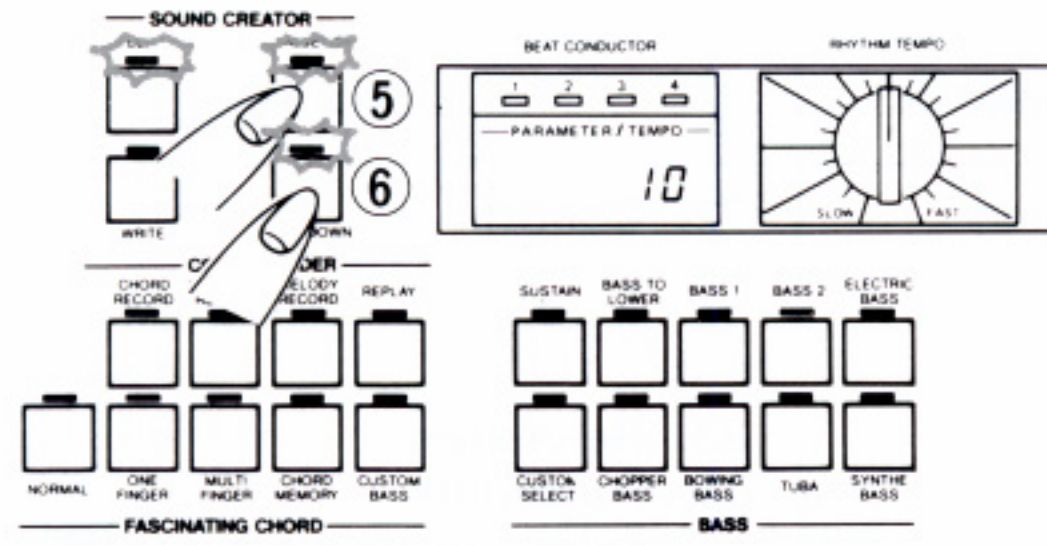
4. Input VCA ATTACK, number "24", using COMBINATION MEMORY switches ③.



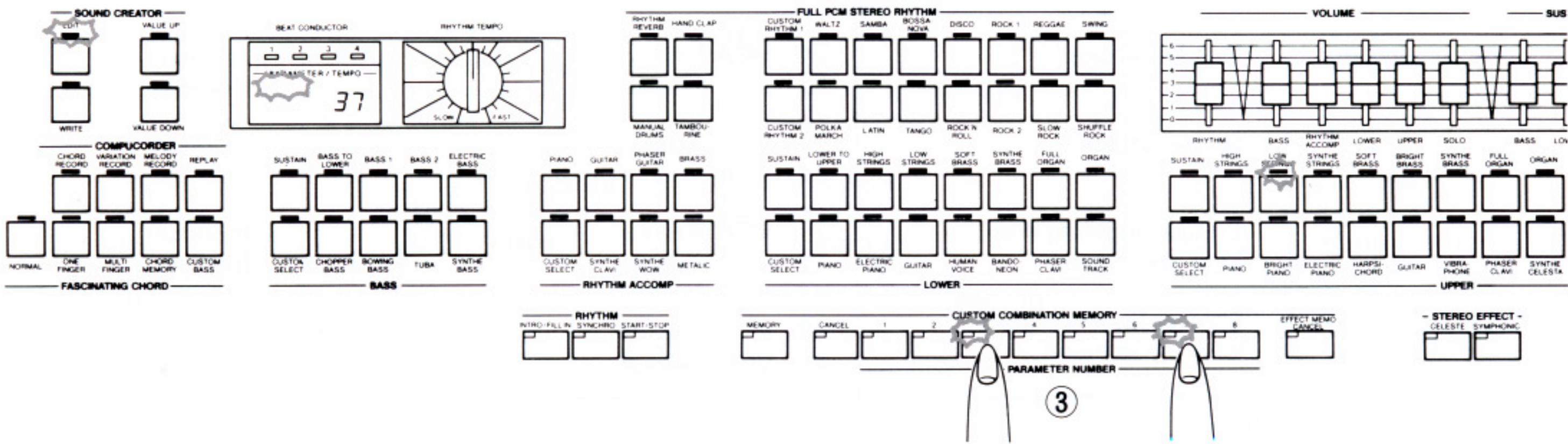
5. Press MEMORY switch ④ to change the display from the parameter display mode to the value display mode.



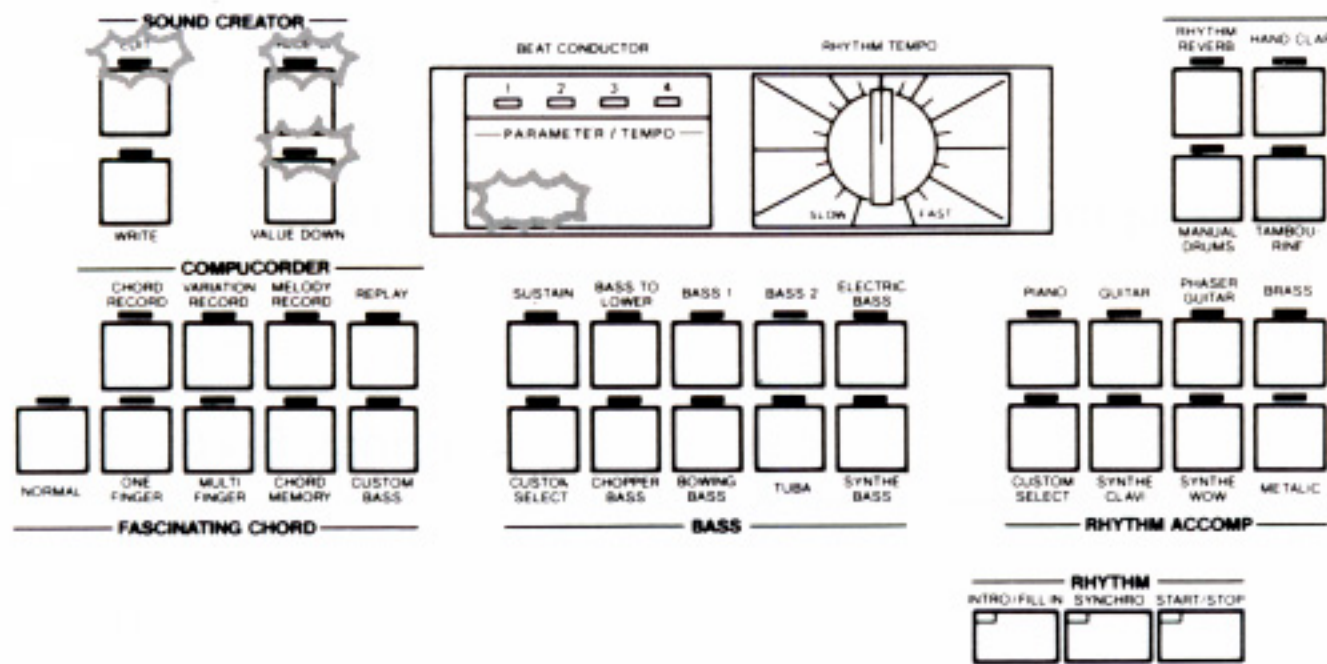
6. While listening to the sound by pressing a key, lower the value to the desired level with VALUE DOWN switch ⑥.  
(If lowered too much, the value can be raised using VALUE UP switch ⑤.)



7. Input VCF ATTACK, number "37", using COMBINATION MEMORY switches ③.



8. Adjust the value with the VALUE UP/DOWN switches while listening to the sound. (See 6)






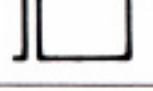
A voice modified in this way can be stored using one of the CUSTOM VOICE switches. Newly-modified voices can be recalled and used in the same way as other voices, even while playing. (See "Writing of Edited Data" on page 13.)

# HINTS FOR SOUND MAKING

Up to this point we have described the various methods of sound creation and modification; some concrete examples of the same – including the parameter to be changed – are described as follows.

	Required sound	Parameter	Value
Tone Color	Stronger, brighter sound	32. Cut-off	Increase
	Softer sound	32. Cut-off	Decrease
	Thinner, “bizarre” sound	33. Resonance 18. Pulsewidth (when square wave is used)	Increase Increase
	Thicker, straight-forward sound	33. Resonance 18. Pulsewidth (when square wave is used)	Decrease Decrease
Tone Generation	Quicker attack	24. VCA Attack 37. VCF Attack	Decrease Decrease
	Slower attack	24. VCA Attack 37. VCF Attack	Increase Increase
	Longer lingering after keys are released	28. VCA Release 42. VCF Release	Increase Increase
	Shorter lingering after keys are released	28. VCA Release 42. VCF Release	Decrease Decrease

The following are examples of voices made using the waveforms generated by the DCO.

Waveform	Example of Voices
Sawtooth wave (  )	Strings, Brass, Piano, etc.
Square wave Pulse width 0 (  ) Wide	Clarinet, Vibraphone, Guitar
(  )	Saxophone, Human Voice, Oboe, Accordion
7 (  ) Narrow	Harpsichord, Clavichord

# TROUBLESHOOTING DURING SOUND MAKING

Trouble	Parameters to be checked	Check if . . .	Remedy
No sound	44. Voice Level 12. DC01 Square 13. DC01 Saw 15. DC02 Square  32. Cut-off 35. VCF Polarity 36. VCF EG level 24. VCA Attack 37. VCF Attack	If it is "0"  } If they are "OFF"  If it is too small } If EG level is too High with reversed polarity  } If they are too large	Increase.  Set to "ON".  Increase. Decrease EG. Decrease.
Sound too quiet	44. Voice Level 32. Cut-off	If it is too low If it is too low	Increase. Increase.
Static noise	31. Noise Level	If it is too high	Set to "0".
Sound vanishes while keys are depressed	26. VCA Break point 27. VCA 2nd Decay 35. VCF Polarity	If it is too low If it is "0" If it is reversed	Increase. Increase. Return to normal.
Notes do not coincide with keys	17. DC02 Interval	If it is set to other than "0"	Set to "0".

\*Since the BASS voice is set at lower frequency and higher volume than other sections, the sound may be loose or distorted when the Effect 3, 5, 6 or 7 is used.