

YAMAHA



DIGITAL PROGRAMMABLE ALGORITHM SYNTHESIZER

Operating Manual

CONGRATULATIONS

Thank you for choosing the Yamaha DX7 Digital Programmable Algorithm Synthesizer. The DX7 employs unique and sophisticated FM digital tone generation technology combined with microcomputer control to permit creation of voices that are more "live" than voices available with any other system available.

We urge you to read this owner's manual thoroughly to ensure proper operation and maximum performance of the instrument.

FEATURES

- The DX7 has a 32-voice internal memory, while external cartridges can be plugged in to provide an extra 96 voices, making a total of 128 voices available to the performer for instant selection.
- Extensive microcomputer programming control makes it possible to edit existing voices to change their character, or produce entirely new voices. New voices can also be created "from scratch."
- Edited or new voices can be stored either in the instrument's internal memory, or in an optional external memory cartridge, so sounds you create can be saved for future use.

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PRECAUTIONS

LOCATION

Avoid placing your synthesizer in direct sunlight or close to a source of heat. It is also important to avoid locations in which the instrument is likely to be subjected to vibration, excessive dust, cold or moisture.

HANDLING

Avoid applying excessive force to the instruments's knobs and switches.

POWER CORD

Always grip the power plug directly when unplugging. Removing the power plug from the wall socket by pulling on the power cord can result in damage to or shorting of the power cord.

Be sure to unplug your synthesizer if you will not be using it for an extended period of time.

RELOCATION

When moving the synthesizer once it has been set up, be sure to disconnect all cords that connect to other equipment. This will help prevent accidental damage to or shorting of interconnection cables.

CONNECTION

Carefully follow the "CONNECTION" instructions given in this manual when setting up your synthesizer.

Connection errors can lead to serious damage to the instrument, amplifier, and speakers.

CLEANING

Do not use solvents such as benzine or thinner to clean your synthesizer as these may cause discoloration or staining of the instrument's exterior. Use a soft, dry cloth.

SAVE THIS MANUAL

After studying this manual thoroughly, it should be stored in a safe place for future reference.

LIGHTNING

In the event of an electrical storm, the instrument's power cord should be unplugged to eliminate the possibility of serious damage.

OTHER APPLIANCES

Use your synthesizer where its digital circuitry cannot be influenced by electromagnetic radiation from appliances such as televisions, radios, etc.

DX7 OUTLINE

As stated in the feature summary on page 1, the DX7 can be used to play pre-programmed voices, pre-programmed voices can be edited to alter their character, or completely new voices can be created from scratch. Newly created voices can be memorized for future use.

To accomplish all this, the DX7 has four main operating modes:

- **PLAY-MEMORY SELECT Mode**

This is the normal performance mode, and the mode in which pre-programmed voices can be selected.

- **FUNCTION Mode**

This mode permits setting parameters pertaining to the effect of the controllers (thumbwheel, foot controller, breath controller, key after touch) and is also used for loading and saving data.

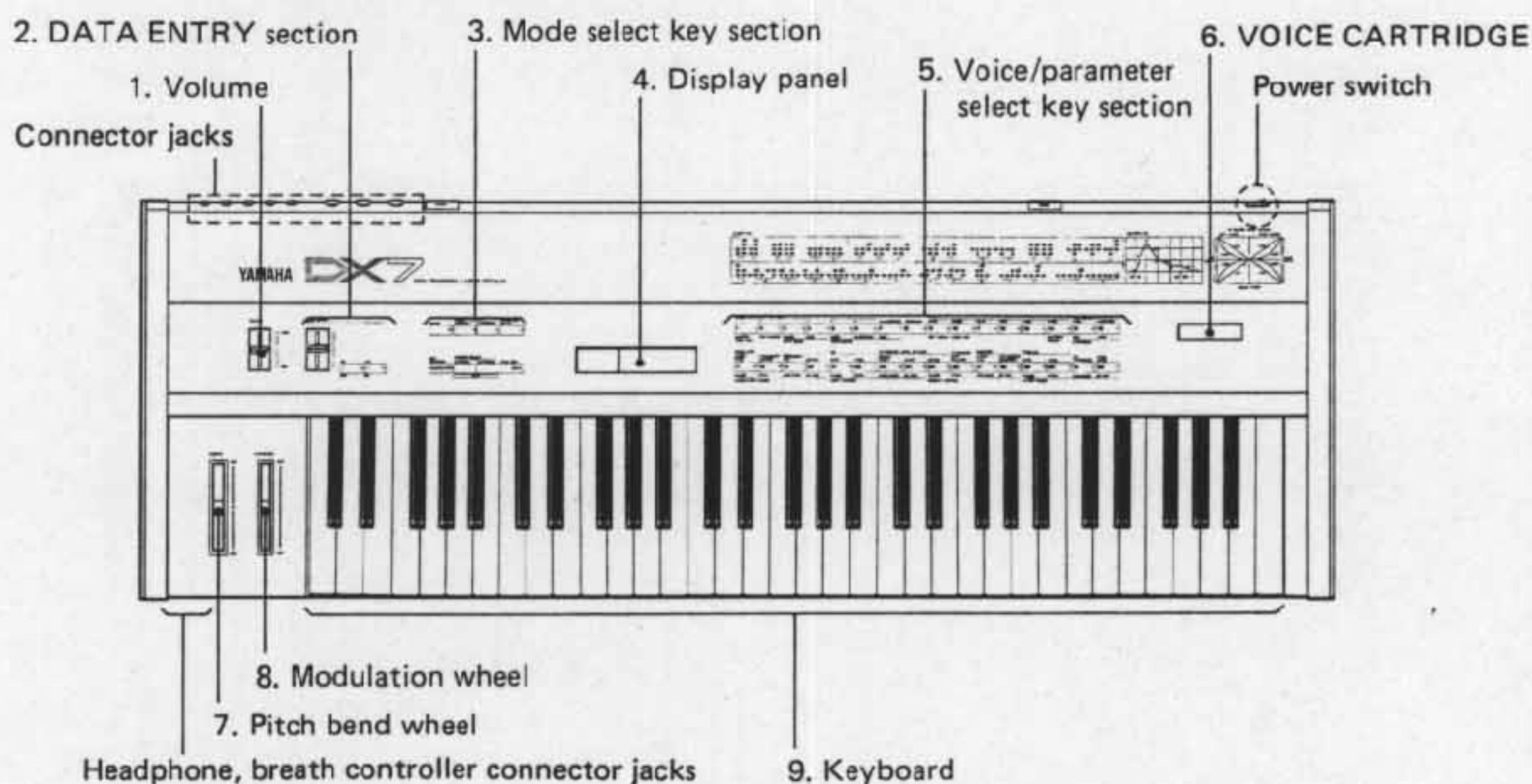
- **EDIT Mode**

This mode permits editing existing voice data to create new sounds as well as creation of entirely new voices.

- **STORE Mode**

Edited or newly created voices can be programmed into the memory in this mode.

All functions of the DX7 are performed in one of the above modes. Proper understanding of the functions of each mode is the key to successful operation of and performance with the DX7.

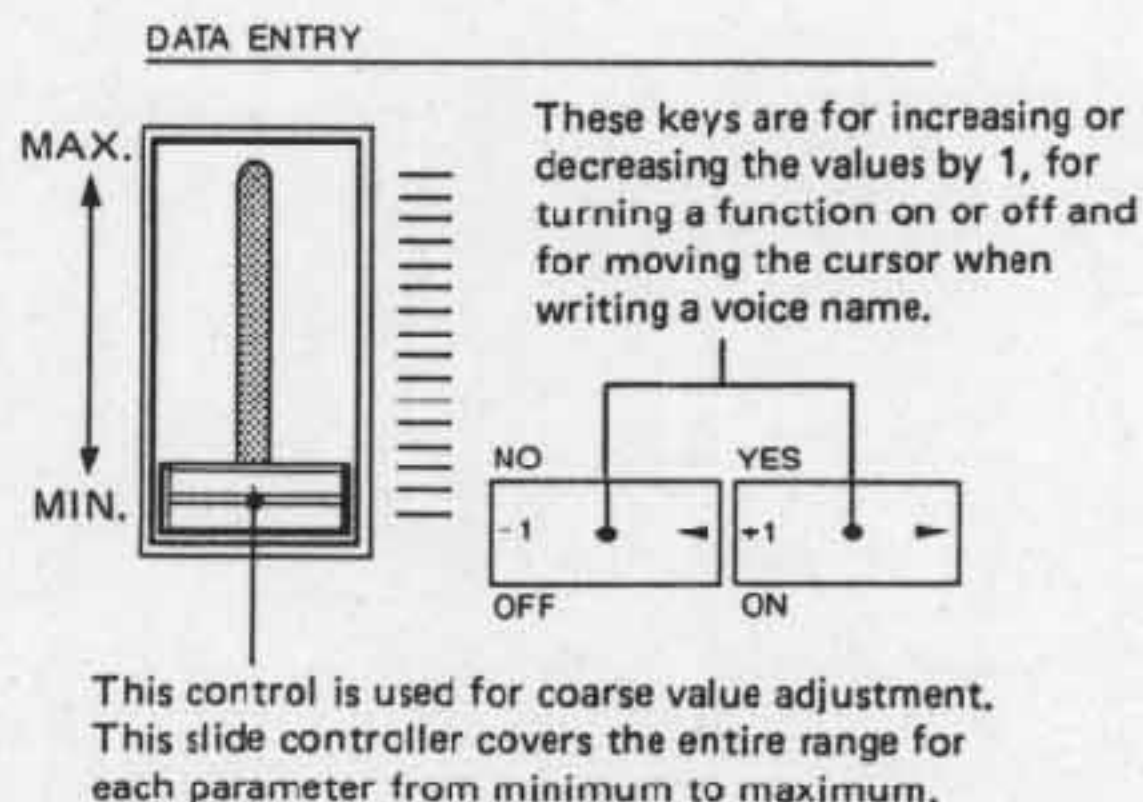


1 VOLUME

This controls the output level of the DX7 and at the same time controls the volume of the headphones.

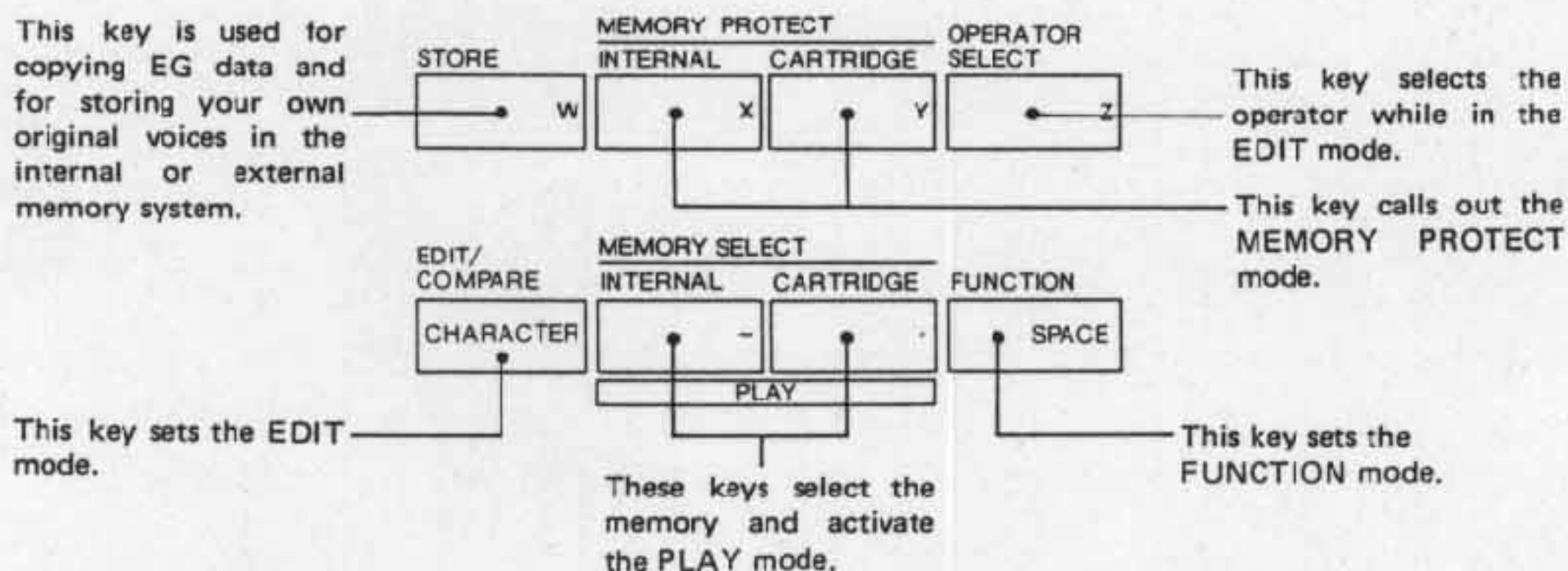
2 DATA ENTRY

This combination of keys and linear control is used to enter and modify data.



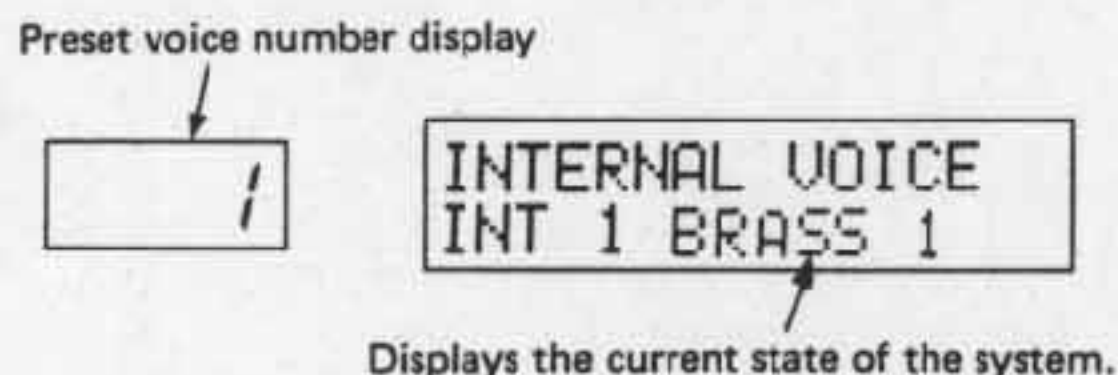
3 MODE SELECT KEY

Selects the operating mode, "operators" (these will be explained later) and memory protect functions.



4 DISPLAY PANEL

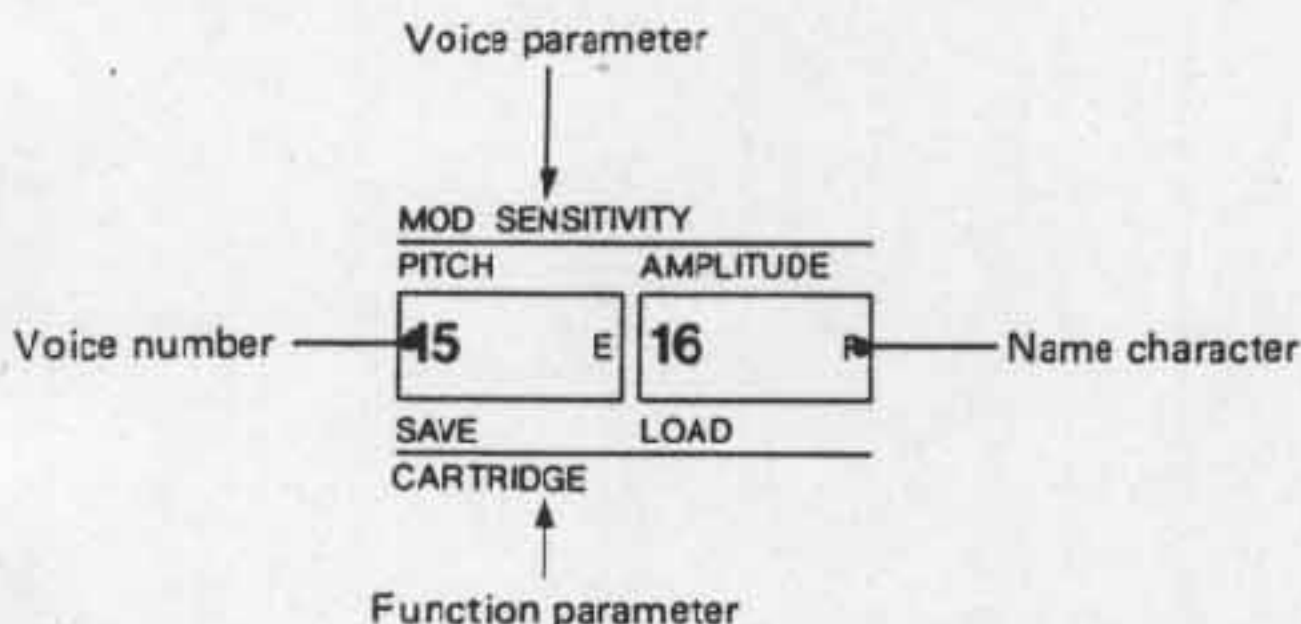
This Liquid Crystal Display panel displays the parameters in each mode and the name of the selected pre-programmed voice.



5 VOICE/PARAMETER SELECT KEY

These keys select either the voices in the instrument's internal memory or those in an external voice cartridge. The same keys are also used to select parameters in the FUNCTION or EDIT modes. One key can have a maximum of four different functions.

The function of these keys is determined by the MODE SELECT key.



6 VOICE CARTRIDGE

External voice cartridges can be plugged into the receptacle in the DX7 panel. The DX7 is supplied with two ROM (pre-programmed) voice cartridges, each containing 64 voices.

An optional RAM (user-programmable) voice cartridge can contain 32 voices.

7 PITCH BEND WHEEL

The pitch bend range is set in the FUNCTION mode. The pitch bend wheel then permits upward and downward pitch bend throughout the set range.

8 MODULATION WHEEL

The modulation depth range is set in the function mode. The modulation wheel then permits variation of modulation depth throughout the set range.

9 KEYBOARD

The DX7 has a 61-key keyboard with 16-voice polyphonic capability (a monophonic mode is also selectable).

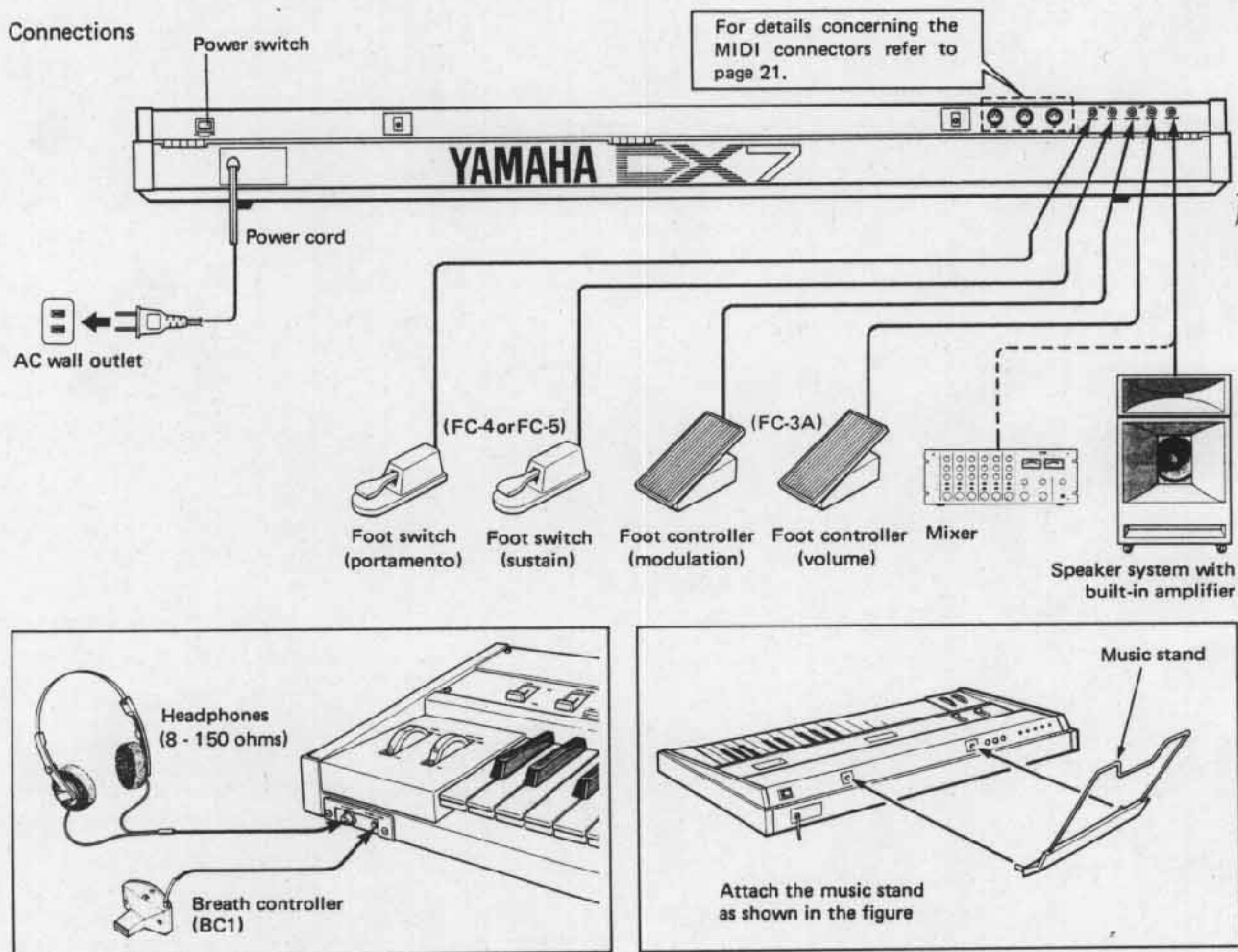
- Initial/After Touch response provided.

CONNECTIONS

● Setting Up and Applying Power

The DX7 does not have an internal power amplifier, therefore either headphones or an external amplifier/speaker system are required. A high-quality keyboard amplifier system is recommended.

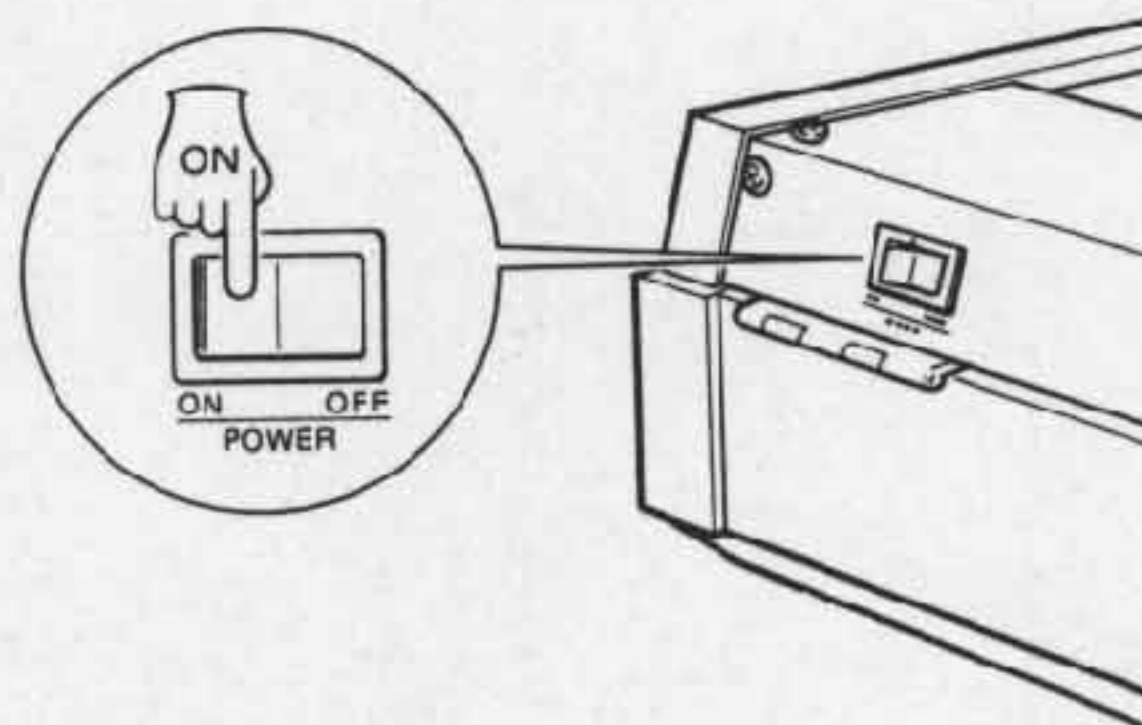
Hook up your DX7 as shown in the diagram below.



● Turn POWER ON

The DX7 power switch is located to the right of the rear panel (viewed from keyboard side). Turn the power switch ON only after all connections to other equipment (and to the AC supply) have been properly made. The display panel will appear as in the illustration below immediately after power is switched on.

After a few seconds, the same mode that was engaged before power was turned off is re-engaged. For example, if the PLAY mode was previously engaged, the PLAY mode will be re-engaged and the previously selected voice will be ready for performance. The same applies to the EDIT and FUNCTION modes.



* YAMAHA DX7 *
* SYNTHESIZER *

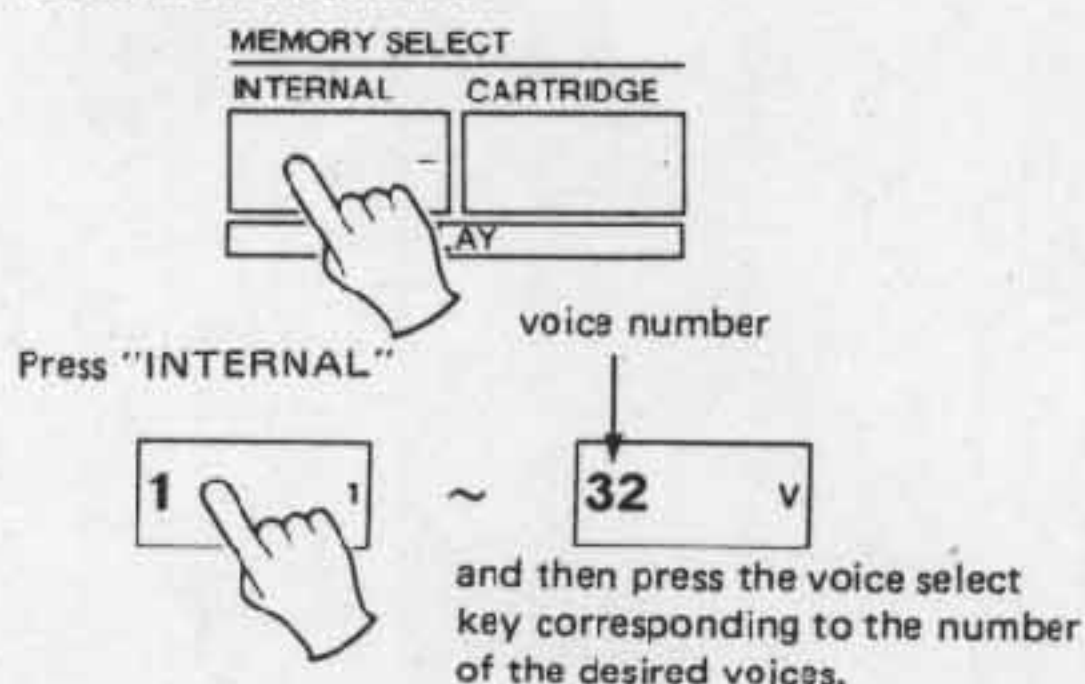
PLAY MODE

• Playing the Internal Voices

The DX7 has 32 internal voices, any one of which can be selected simply by pressing the **INTERNAL** key in the MEMORY SELECT group, and then by pressing the appropriate VOICE SELECT key.

Each VOICE SELECT key has a large numeral that corresponds to the voice number at its left edge.

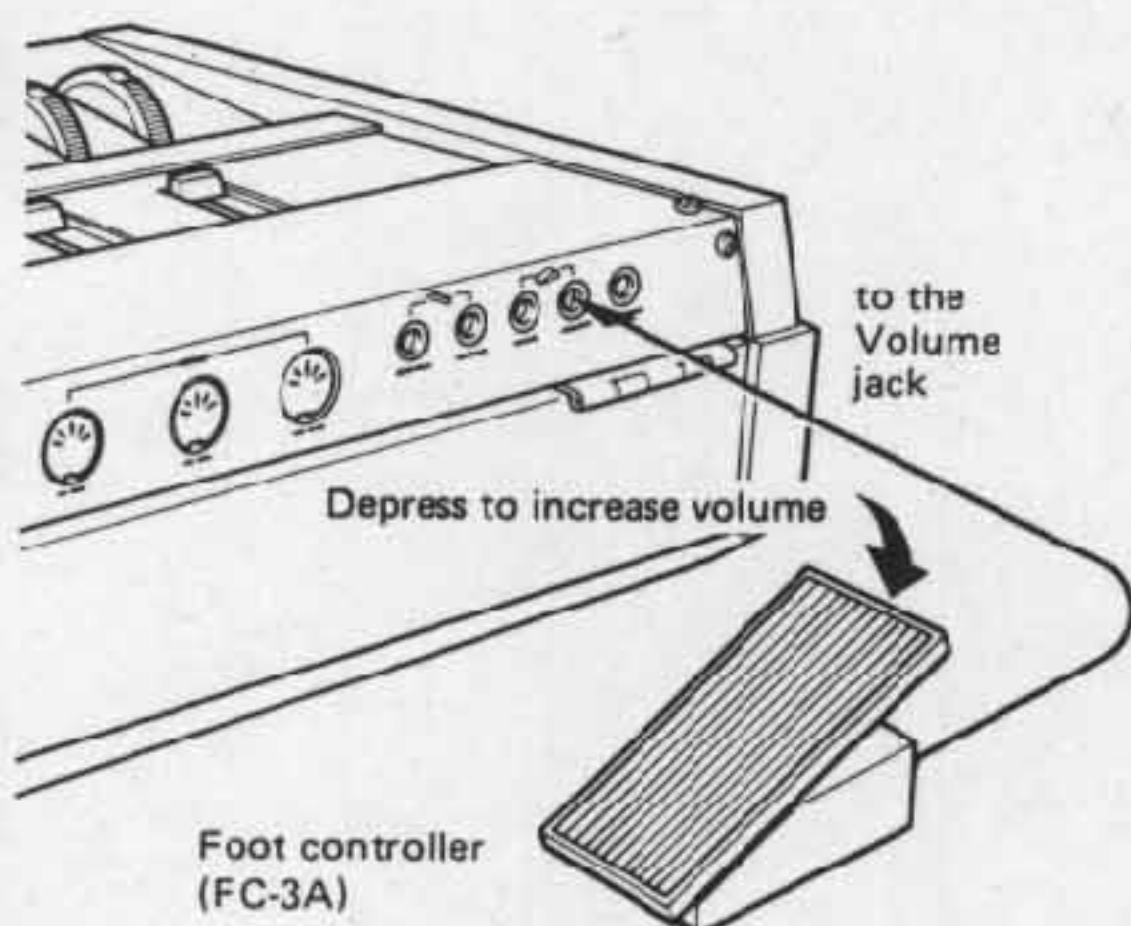
Select the internal voices



• Set the desired VOLUME level

With power to the DX7 and your amplifier system ON, gradually raise the volume control while playing a note on the keyboard until the desired volume level is reached. Set the volume control on your amplifier so the optimum volume is attained with the DX7 volume control set about "8".

Fine adjustment of volume while playing can be achieved using an optional FC-3A foot controller plugged into the VOLUME jack on the DX7 rear panel. Remember that the DX7 and amplifier volume controls should be set high enough that adequate volume control range is available using the foot controller.



• Playing the Cartridge Voices

An extra 64 voices can be added to the available selection simply by plugging in one of the supplied external voice cartridges.

Insert a cartridge as shown in the figure.

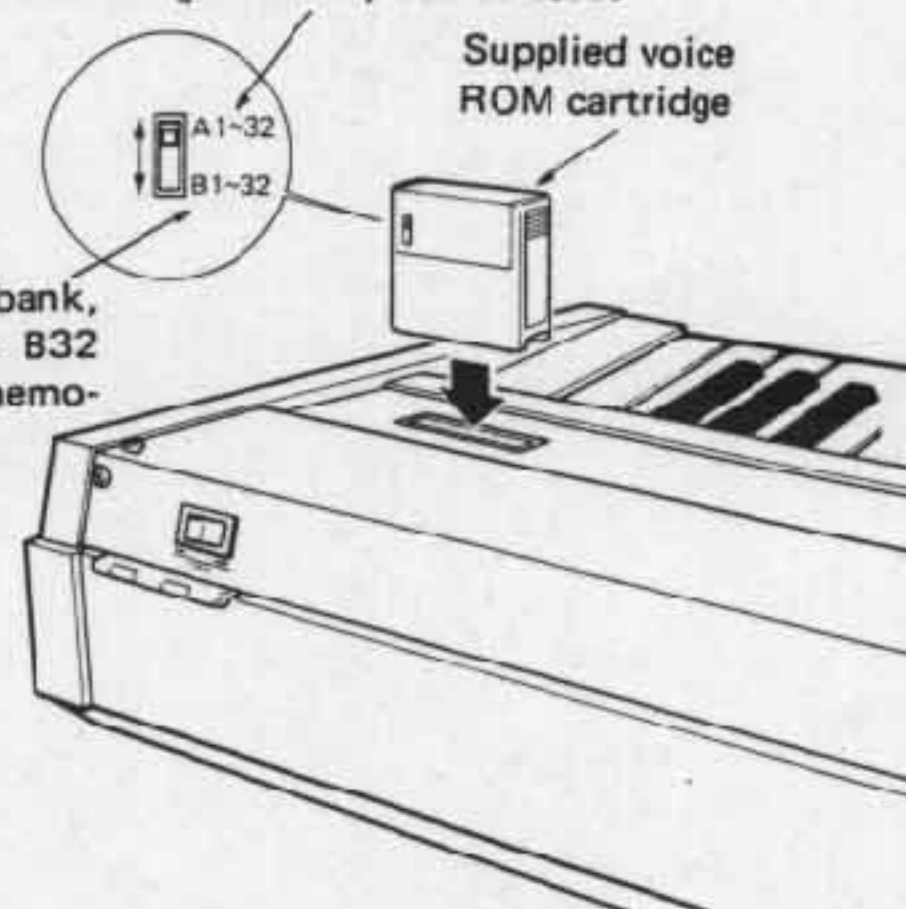
Select the cartridge voices by first pressing the **CARTRIDGE** key in the MEMORY SELECT group, and then select the desired voice by pressing the appropriate VOICE SELECT key, just as in internal voice selection.

Selection of cartridge voice groups A1 – A32 and B1 – B32 is accomplished using the selector switch on the cartridge.

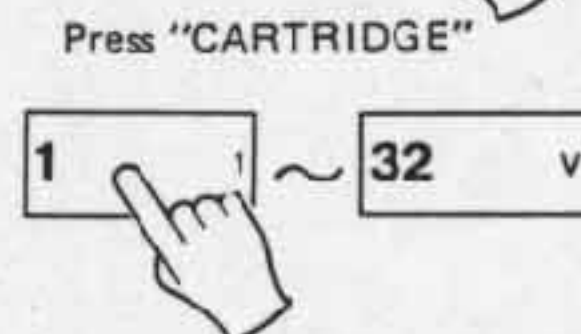
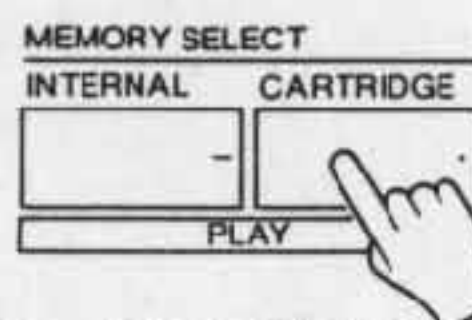
The A voice bank, voices A1 through A32 of the cartridge memory can be used.

Supplied voice ROM cartridge

The B voice bank, voices B1 through B32 of the cartridge memory can be used.



Select the cartridge voices



When data entry is initiated while in the PLAY mode, the parameter selected at the end of the FUNCTION mode can be controlled.

FUNCTION MODE

● FUNCTION Mode . . . Applying Effects

The FUNCTION mode permits tuning, pitch bend, modulation, and application of other effects while playing, as well as voice data load/save operations.

Press the **FUNCTION** key to enter the FUNCTION mode. Setting controller range parameters, etc., is carried out using the DATA ENTRY controls.

- Function parameters are memorized and maintained even when power to the DX is cut off. Unlike voice data, however, function parameters cannot be saved in internal or external memory.

OPERATOR ON-OFF/EG COPY				
1	2	3	4	5
1	2	3	4	5
MASTER TUNE ADJ	POLY/MONO	RANGE PITCH BEND	STEP	MODE PORTAM
OSCILLATOR				
MODE/ SYNC	FREQUENCY COARSE	FREQUENCY FINE	DETUNE	EG RATE
17	18	19	20	21
RANGE MODULATION WHEEL	PITCH	AMPLITUDE	EG BIAS	RANGE FOOT C

FUNCTION Mode Parameter

● MASTER TUNE

1

MASTER
TUNE ADJ

MASTER TUNE adjusts the overall tuning of the DX7 to match its pitch with other instruments. Pitch is variable over a 150 cent range. Press **MASTER TUNE** and then use the liner DATA ENTRY control for tuning.

● POLY/MONO

2

POLY/MONO

Determines whether the DX7 will function in the polyphonic or monophonic mode. Press the DATA ENTRY **[-1]** key for polyphonic operation, and the **[+1]** key for monophonic operation.

- The range of the portamento effect is different in the polyphonic and monophonic modes. Refer to the PORTAMENTO section below.

● PITCH BEND

3 4

RANGE STEP
PITCH BEND

Two keys are used to determine the effect of the PITCH BEND thumbwheel.

RANGE:

The range of pitch bend can be set from 0 to 12. 0 range is equivalent to no pitch bend. A setting of 12 permits pitch bend over a ± 1200 cent (2 octave) range. If the range is set at 7, then pitch bend will be possible over a ± 700 cent range (i.e. plus or minus one fifth).

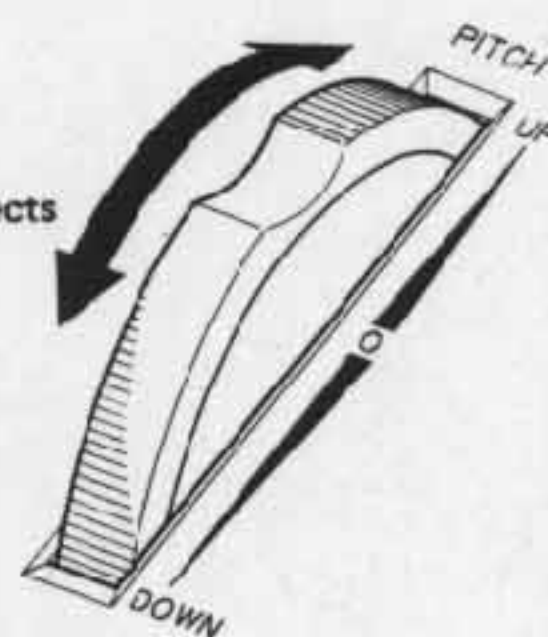
STEP:

The step parameter can be set from 0 to 12. A setting of 0 corresponds to 0-cent steps, and a setting of 12 corresponds to 1200-cent (1 octave) steps. If STEP is set to 0, then a perfectly smooth pitch bend will result. If STEP is set to 1, the pitch will bend in 100-cent (semitone) steps.

- Pitch bend will not function if RANGE is set to 0.

Pitch bend wheel

Add pitch bend effects



● PORTAMENTO

5 6 7

MODE GLISSANDO TIME
PORTAMENTO

The portamento effect varies according to whether the DX7 is in the polyphonic or monophonic mode.

MONOPHONIC MODE:

In this mode press the DATA ENTRY **[-1]** key to activate "FINGERED PORTA." In this mode portamento is applied only to legato notes.

Press the DATA ENTRY **[+1]** key to activate "FULL TIME PORTA." In this mode portamento is always applied.

POLYPHONIC MODE:

Press the DATA ENTRY **[-1]** key to activate "SUS-KEY P RETAIN." In this mode the pitch of keys released while the sustain pedal is on or of notes that have a long sustain time does not change. However, portamento is effected between two subsequently pressed keys.

Press the DATA ENTRY **[+1]** key to activate "SUS-KEY P FOLLOW." In this mode the pitch of a key released while the sustain pedal is held slides (portamento) to a previously pressed key. There is no change with continuously pressed keys.

GLISSANDO:

The glissando function is turned either ON or OFF. When it is OFF a normal portamento effect is produced.

TIME:

Adjusts the speed of the portamento/glissando effect from 0 to 99. A 0 setting results in no effect, while a setting of 99 produces the longest (slowest) portamento or glissando.

- The portamento/glissando effect can also be turned ON or OFF using an optional FC-4 or FC-5 foot pedal once the portamento/glissando function has been turned on using the front-panel controls.

Pressing the foot pedal turns the effect ON. The effect is OFF when the foot pedal is released.

- An FC-4 or FC-5 foot pedal can also be connected for sustain pedal control. In the monophonic mode, a key pressed while another key is held will take priority, and the sustain effect will apply to the new key. Releasing the pedal turns the sustain effect OFF.

• EDIT RECALL

9 9

EDIT RECALL

This function makes it possible to recall a voice that was previously being edited or created.

If, for example, the **PLAY** mode is accidentally or purposely entered while editing, the voice that was being edited can be recalled with this function.

If the **EDIT RECALL** key is pressed, the display shows "EDIT RECALL?". Pressing the **DATA ENTRY** **YES** key then causes the "ARE YOU SURE?" display. Verify by pressing the **YES** key again, and the voice previously being edited will be restored.

• VOICE INIT (Voice Initialize)

10 0

VOICE INIT

This function sets up the basic voice data for creating new voices. Press the **VOICE INIT** key and the display panel will read "VOICE INIT?". Press the **YES** key and the DX7 will respond with "ARE YOU SURE?". Verify by pressing the **YES** key second time. This sets up the basic voice data and activates the DX7 EDIT mode.

• CARTRIDGE FORMATTING

11 A

Since the format of a RAM cartridge used for other purposes such as DX1 performance memories, etc., will vary from that of a cartridge used for voice memory, make sure you observe the following procedure when storing or saving DX7 internal voices into such a cartridge.

Press "11" to select this function. The "CARTRIDGE FORM?" display will appear. Press **YES** and the instrument will respond with "ARE YOU SURE?". Press **YES** again and all 32 memorybank in the RAM cartridge are initialized to the basic voice data.

• BATTERY CHECK

14 D

BATTERY CHECK

A backup battery power supply is built into the DX7 so that voice data will be maintained even when power to the instrument is off. The state of the backup system can be checked by pressing the **BATTERY CHECK** key. The operational battery voltage range is from 2.2 volts to 3 volts. If the backup battery voltage drops below 2.2 volts, replacement of the backup system is necessary. The backup system consists of special batteries which can be replaced only by a Yamaha dealer. Contact your nearest Yamaha dealer when replacement becomes necessary.

• CARTRIDGE

15 E 16 F

SAVE LOAD

CARTRIDGE

SAVE:

32 voices contained in the internal memory system can be saved on an external programmable memory cartridge.

LOAD:

32 of the voices contained in an external voice cartridge can be loaded into the internal memory at a time.

- Refer to the **STORE/SAVE/LOAD** section on page 19 for detailed instructions.

• MODULATION WHEEL/FOOT CONTROLLER/BREATH CONTROLLER/AFTER TOUCH

17 G 18 H 19 I 20 J

RANGE PITCH AMPLITUDE EG BIAS

MODULATION WHEEL

21 K 22 L 23 M 24 N

RANGE PITCH AMPLITUDE EG BIAS

FOOT CONTROL

25 O 26 P 27 Q 28 R

RANGE PITCH AMPLITUDE EG BIAS

BREATH CONTROL

29 S 30 T 31 U 32 V

RANGE PITCH AMPLITUDE EG BIAS

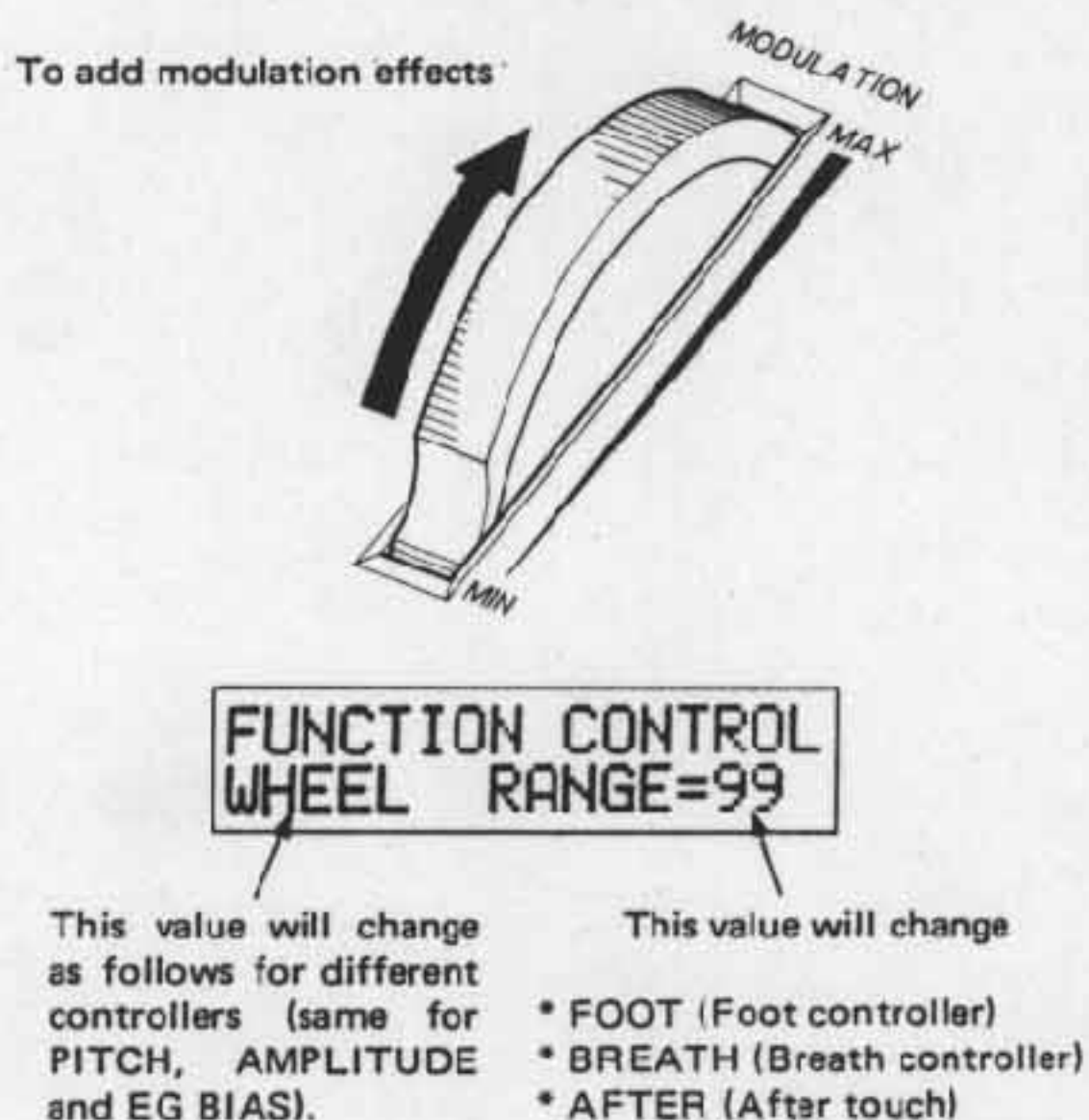
AFTER TOUCH

The modulation wheel, foot controller, breath controller or keyboard after touch can be used to control LFO modulation depth applied to pitch, amplitude or envelope producing controllable tremolo or vibrato effects while playing. Setting the **RANGE**, **AMPLITUDE** and **ENVELOPE GENERATOR BIAS** parameters for each controller is basically the same process, so we'll concentrate mainly on the **MODULATION WHEEL**.

1. MODULATION WHEEL

RANGE:

Range can be set from 0 to 99. No effect is produced with a 0 setting, and a setting of 99 produces maximum effect.



PITCH:

Determines whether LFO modulation is applied to pitch. Pitch is modulated if ON, and not modulated if OFF.

AMPLITUDE:

Determines whether LFO modulation is applied to amplitude. Amplitude is modulated if ON, and not modulated if OFF.

EG (ENVELOPE GENERATOR) BIAS:

When EG BIAS is ON, volume or brilliance (wow) variation effects can be added with the controllers by varying the level of each operator's envelope generator. MOD. SENSITIVITY (AMPLITUDE) is used to set the sensitivity (refer to page 14).

Applying EG BIAS to a modulator results in brilliance effects, while applied to a carrier it results in volume variation effects. In some cases, if the carrier sensitivity is maximum and the controller is set to its minimum, no sound will be produced.

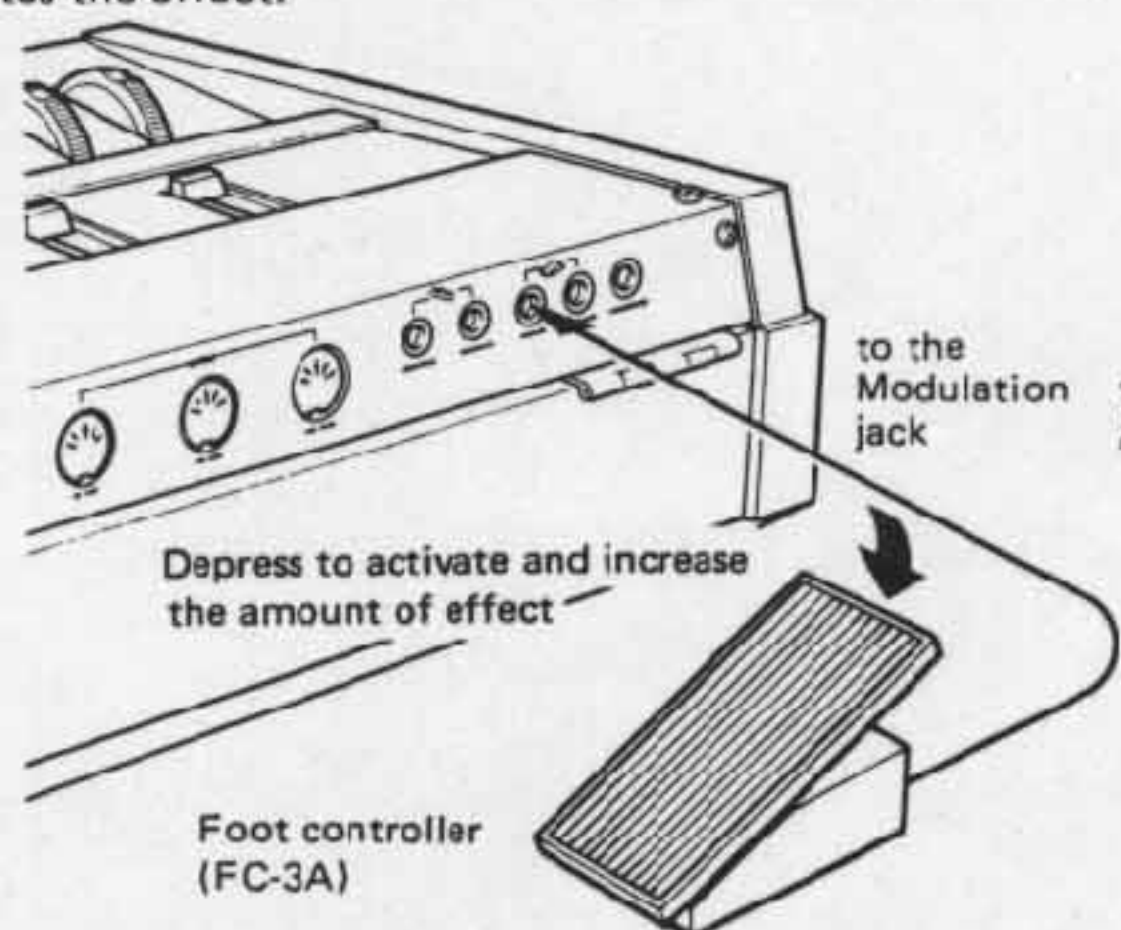
- These parameters will have no effect if the **PITCH MODULATION SENSITIVITY** or the **AMPLITUDE MODULATION SENSITIVITY** of the voice used are zero.

Refer to the **MODULATION SENSITIVITY** section on page 14 for details.

2. FOOT CONTROLLER

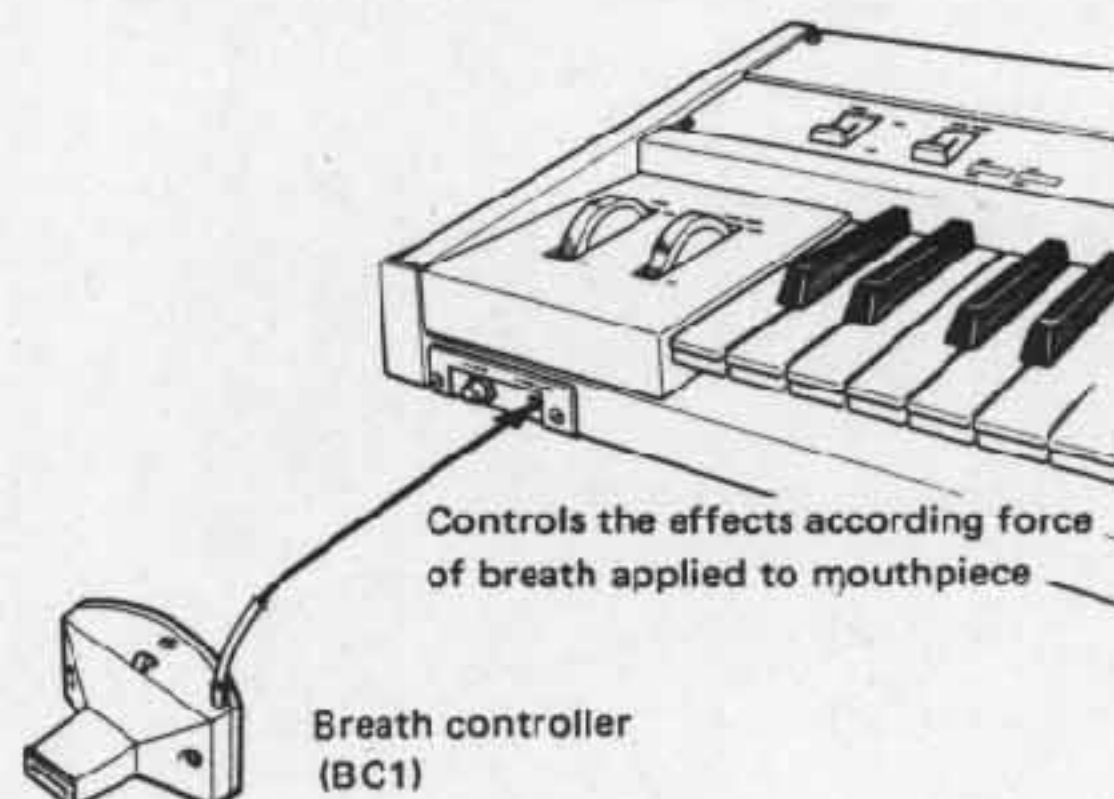
The LFO modulation effect programmed can be controlled using an optional FC-3A foot controller.

Maximum effect is produced by pressing the foot controller all the way down, while raising the controller fully eliminates the effect.



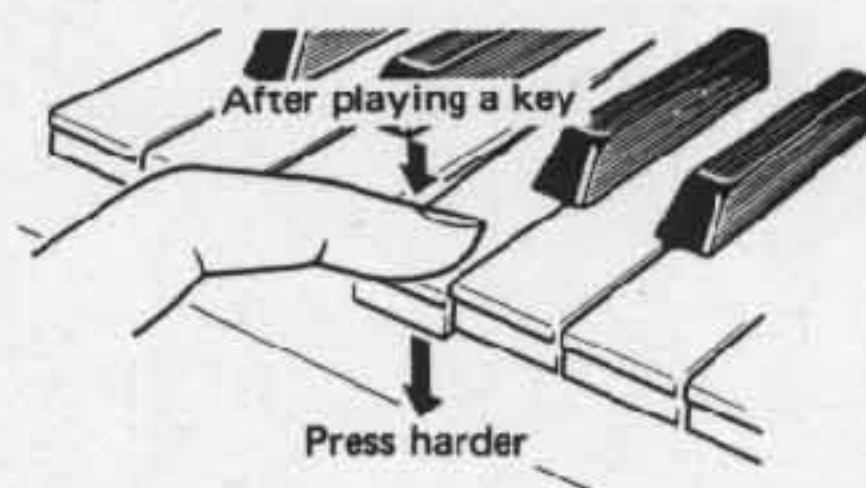
3. BREATH CONTROLLER

The LFO modulation effect programmed can be controlled using an optional BC1 breath controller. The effect is controlled by blowing into the BC1 mouthpiece. The effect will not be audible unless breath is applied to the controller.



4. AFTER TOUCH

This feature makes it possible to vary the degree of modulation by varying pressure on the keys. No effect is produced with normal key pressure, but the effect can be introduced by pressing harder on the key(s). The amount of pressure applied determines the depth of the effect.



FM TONE GENERATION

FM Tone Generation Understanding the Basics

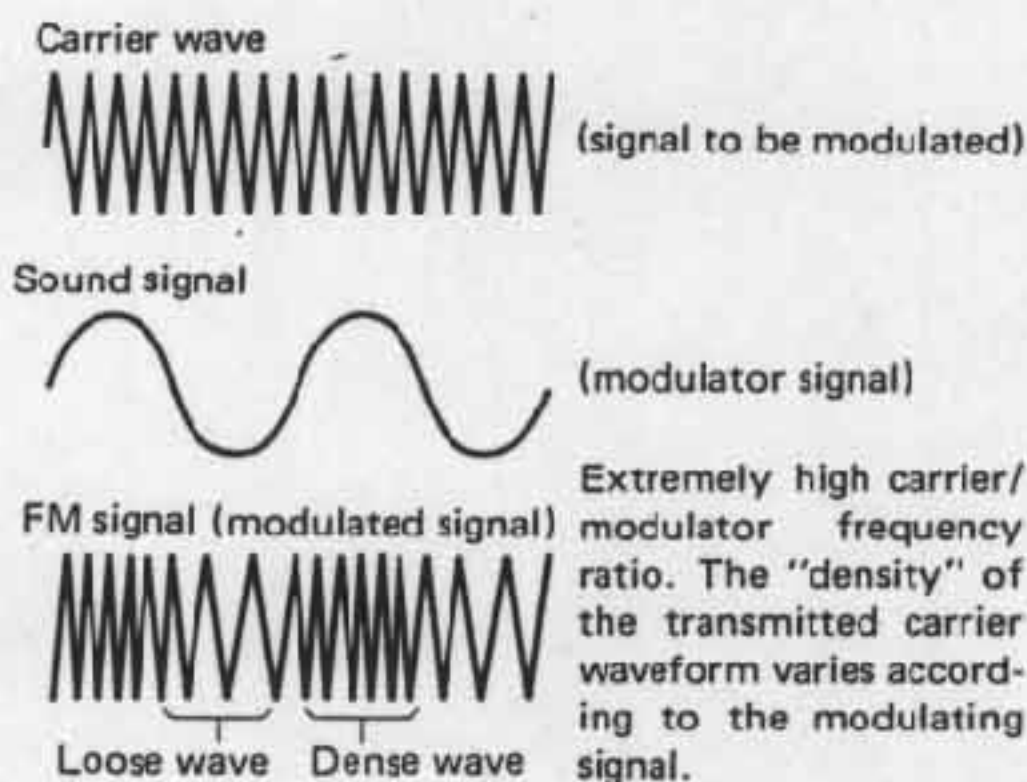
The DX7 is an entirely new type of synthesizer employing an entirely new FM digital tone generation system. This unique Yamaha system permits finer control over subtle musical nuances and vastly expanded voice creation potential compared to conventional synthesizers.

1. The Meaning of FM

FM stands for Frequency Modulation. FM radio broadcasts use the same principle. One signal—the modulator—modulates a second signal—the carrier.

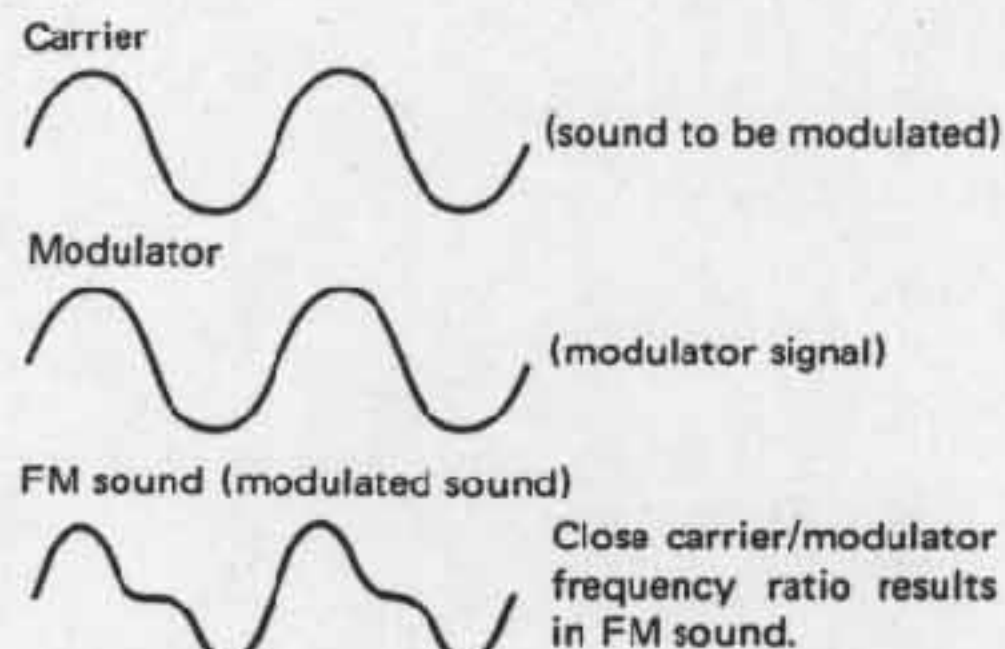
In FM radio the carrier is an extremely high "ratio" frequency and the modulator is the music signal to be broadcast. In effect, the carrier "carries" the modulator signal through the atmosphere to your receiving antenna.

FM broadcasting



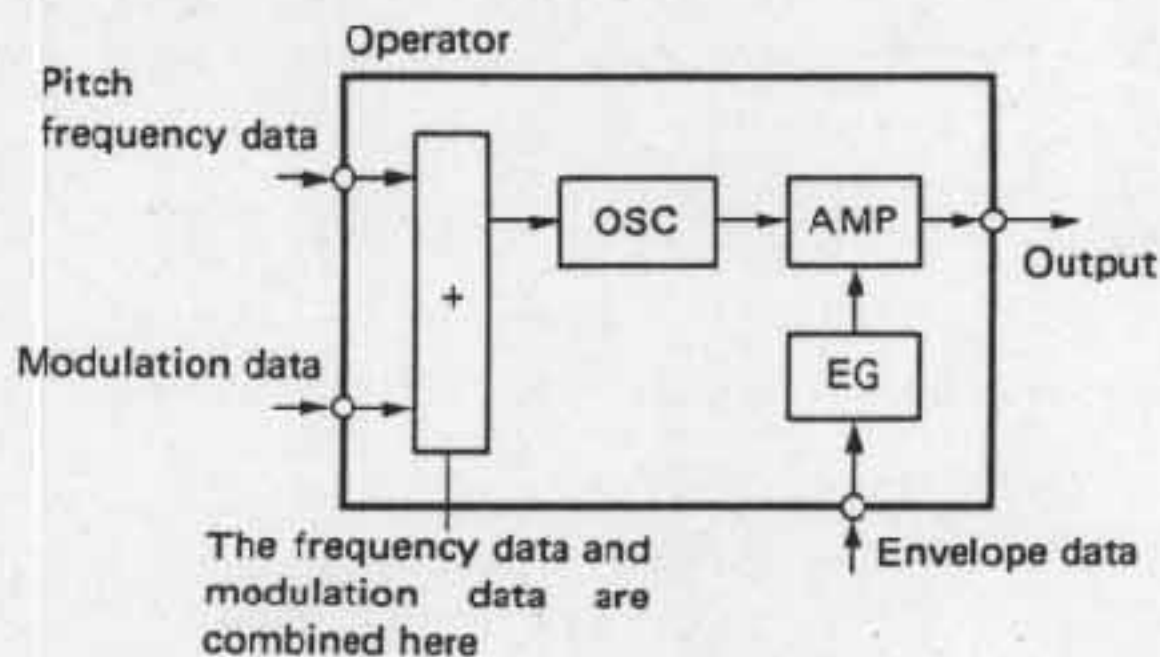
The FM tone generator system is similar in principle, but in this case both the carrier and modulator are audible signals, and their frequencies can be almost equal.

FM tone generation



2. FM Tone Generation In the DX7

In the DX7, the carrier signal determines the pitch of the note produced and modulator determines the shape of the waveform produced and therefore its timbre. This explanation may make it look like the carrier and modulator are two entirely separate things. In fact, they are one and the same. A special oscillator unit called an "operator" can be used as either a carrier or modulator in the DX7.



1) Pitch Frequency Data

Pitch frequency data from the DX7's microcomputer system determines the operator's oscillation frequency. When the operator is used as a carrier, this frequency is equivalent to the pitch of the note produced. When the operator is being used as a modulator, the ratio of its frequency to that of the carrier determines the timbre of the note produced.

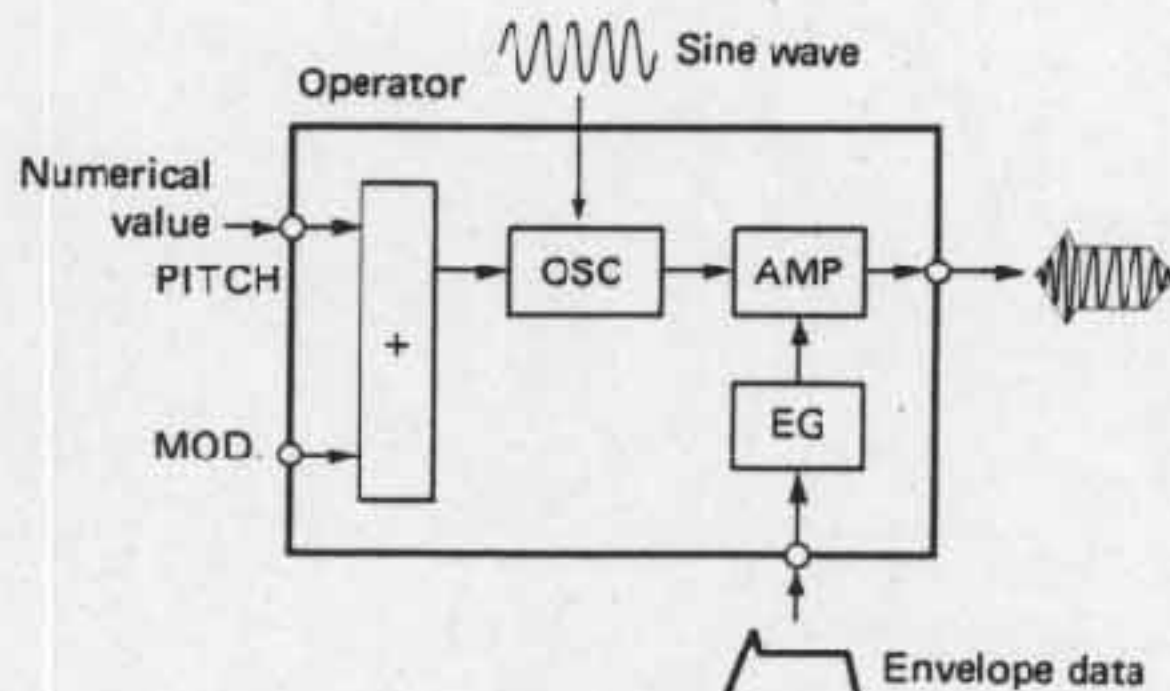
2) Modulation Data

This is the modulation data received from the previous operator's (modulator) output.

3) Envelope Data

When the operator is used as a carrier the envelope data determines the volume envelope of the note produced. When the operator is used as a modulator the envelope data determines the timbre envelope of the note produced.

For example, the pitch frequency data applied to an operator used as a carrier determines the frequency of the sine wave output from the operator. Inputting envelope data results in an output waveform similar to that shown in the figure.

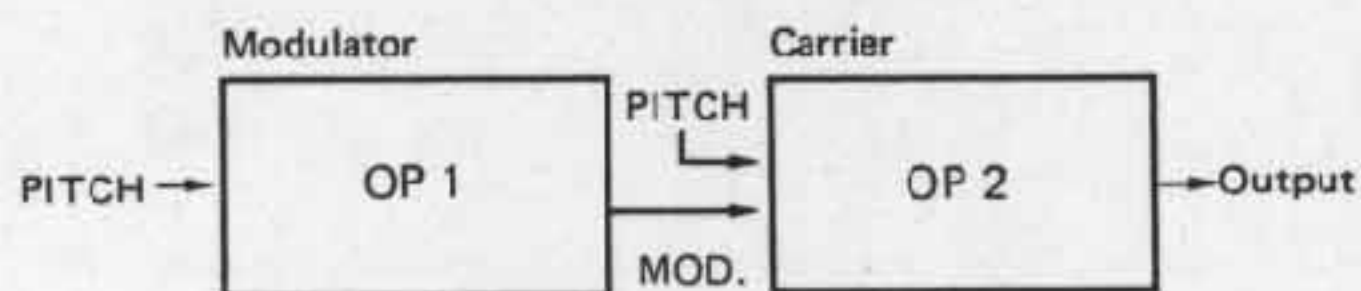


• Basic Operator Functions

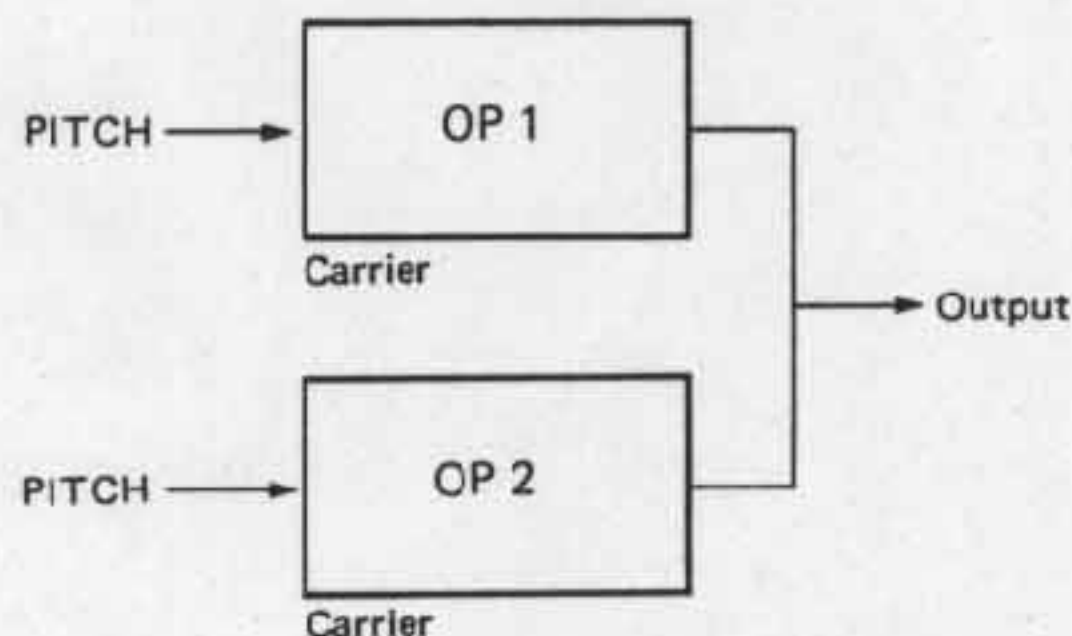
1) Relationship of Carrier to Modulator

An operator can be used as either a carrier or modulator. These two basic operator functions are the basis for the FM tone generation system. Two operators can be combined in two different ways.

1. Modulator and carrier combinations



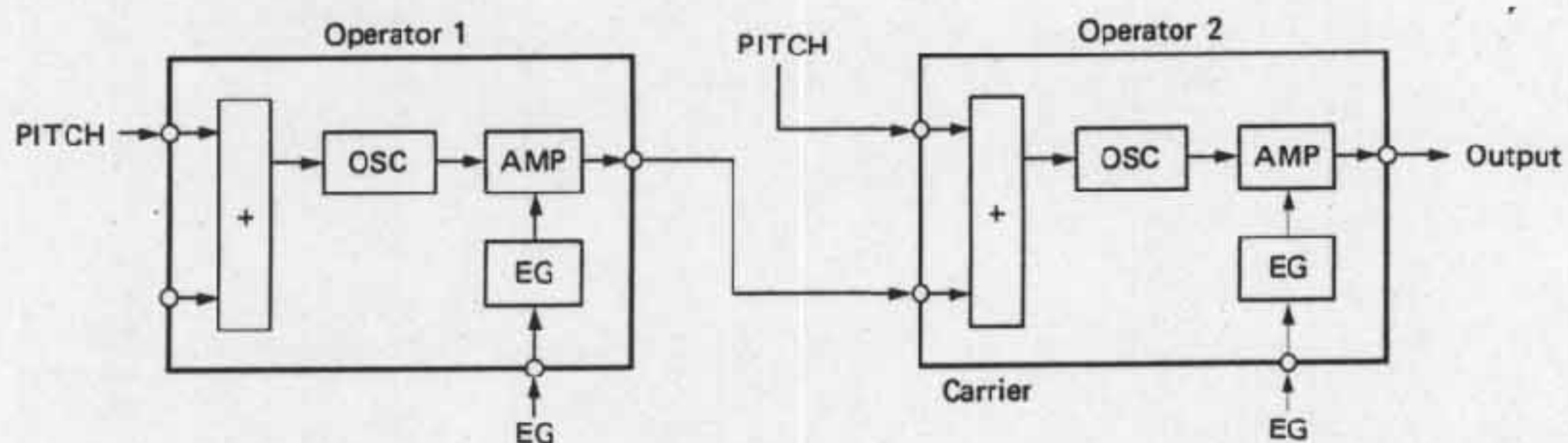
2. Carrier and carrier combinations



3) Modulator and Carrier

In the modulator/carrier configuration using two operators, shown in the figure, the operator on the left is the modulator and the operator on the right is the carrier. In the FM system, the last operator in a chain of two or more oper-

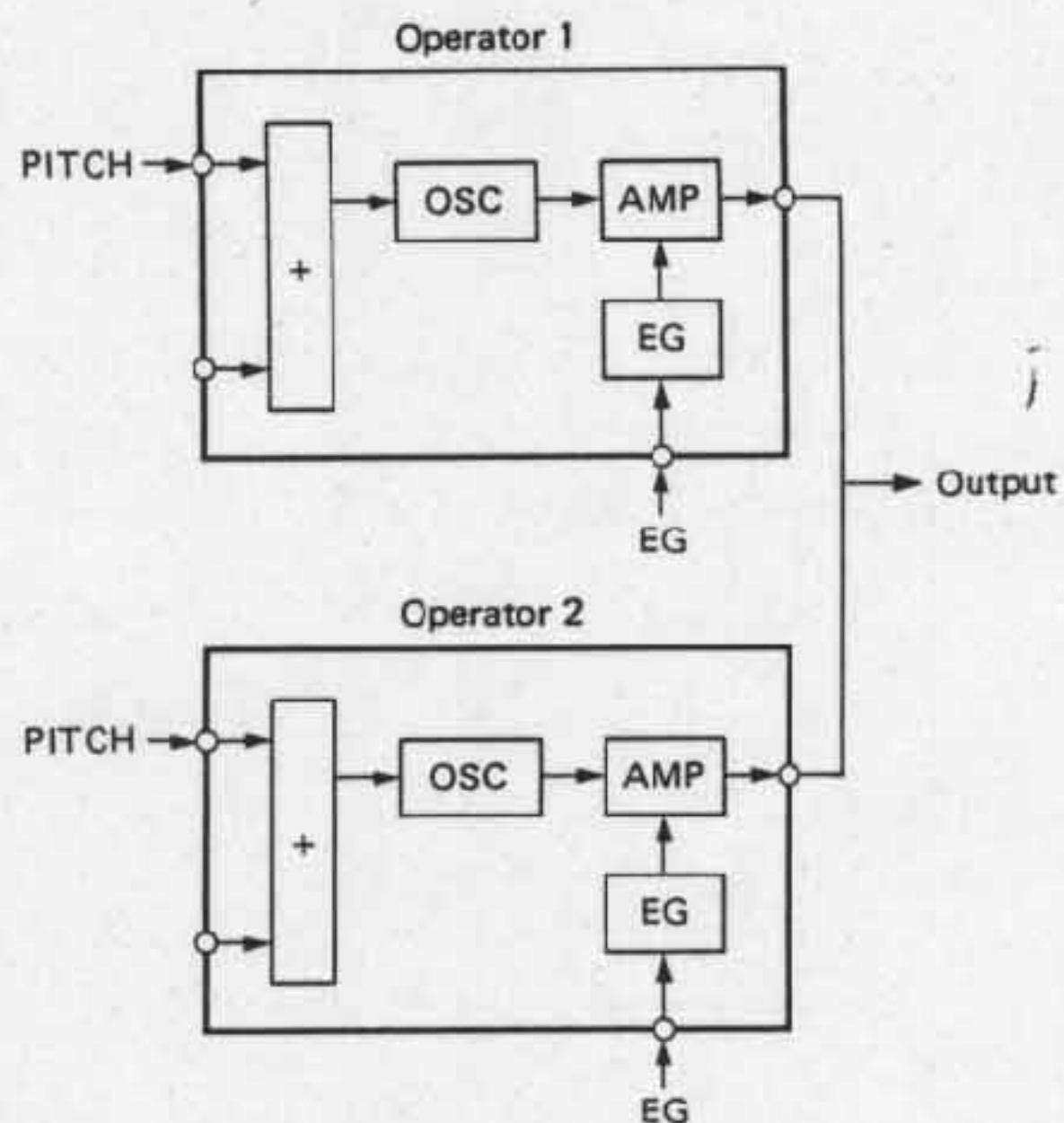
• Modulator and carrier combinations



2) Carrier and Carrier

This configuration results in a pure sine wave output from both operators. The combination of these waveforms can sound much like a conventional organ.

• Carrier and carrier combinations

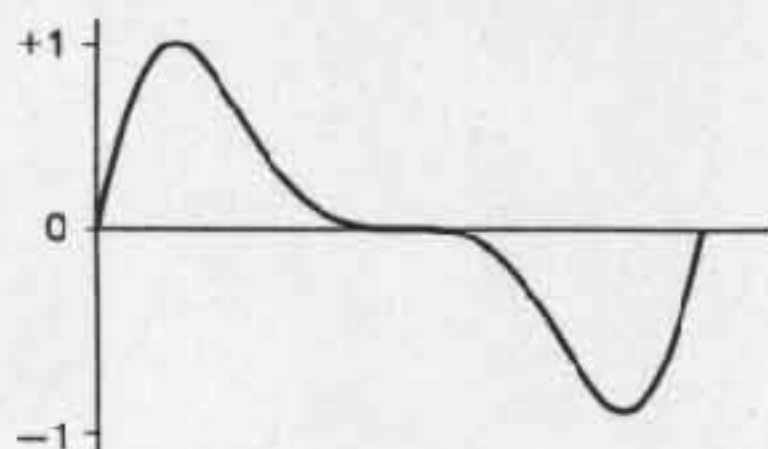


ators is the carrier. By varying the ratio of the modulator and carrier frequencies, and by varying the envelope of the modulator, an extremely broad range of highly complex waveforms (complex harmonic structure) can be created.

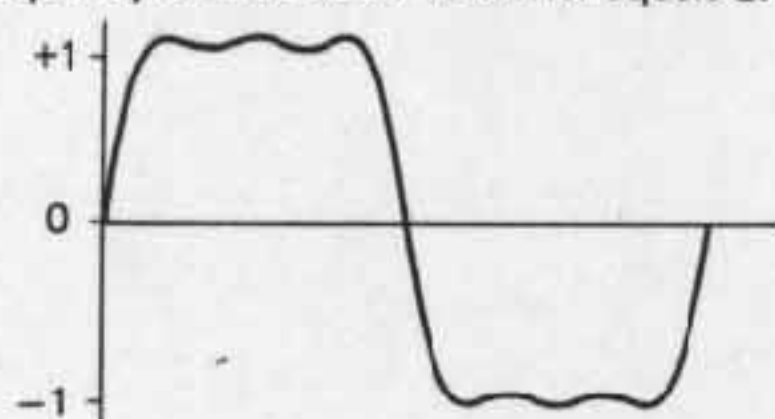
Examples of output waveforms

• Modulator and carrier combinations

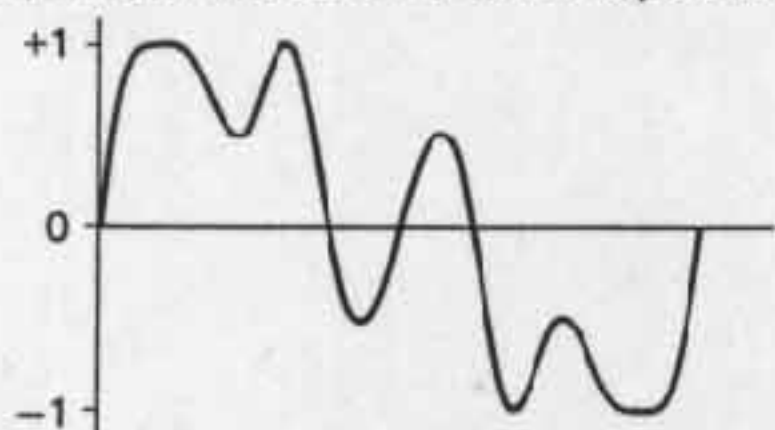
Frequency ratio of modulator to carrier equals 1:1



Frequency of modulator to carrier equals 2:1

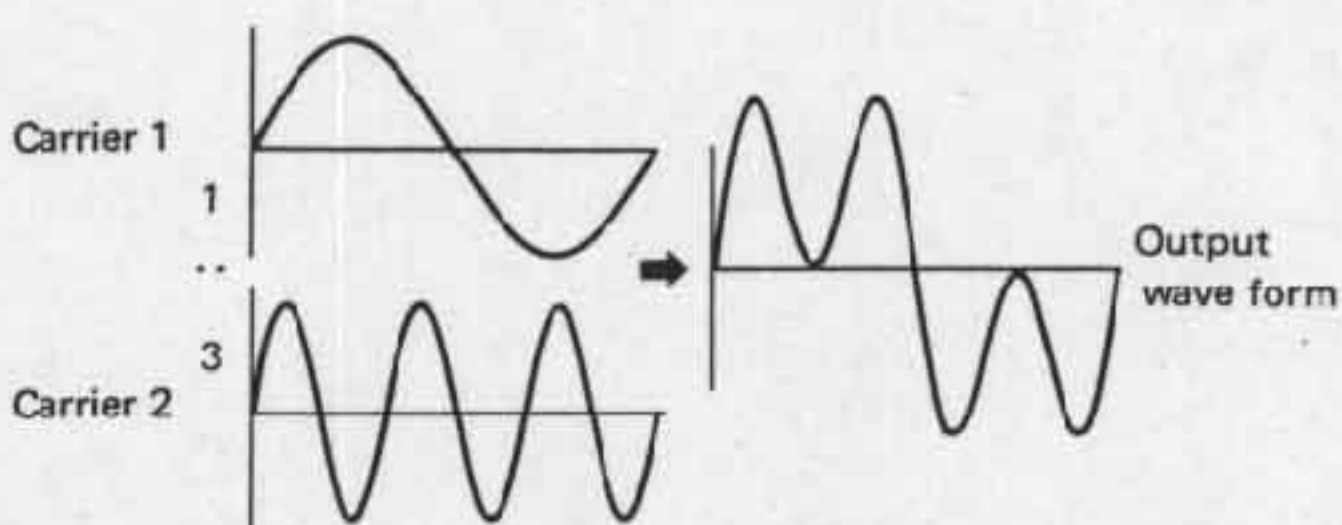
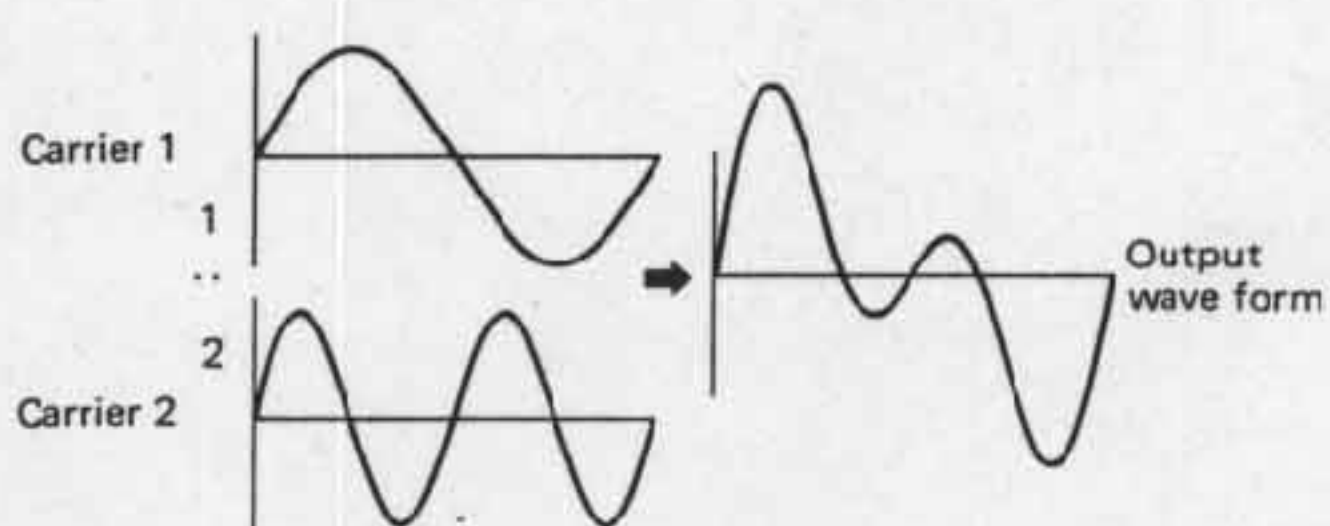
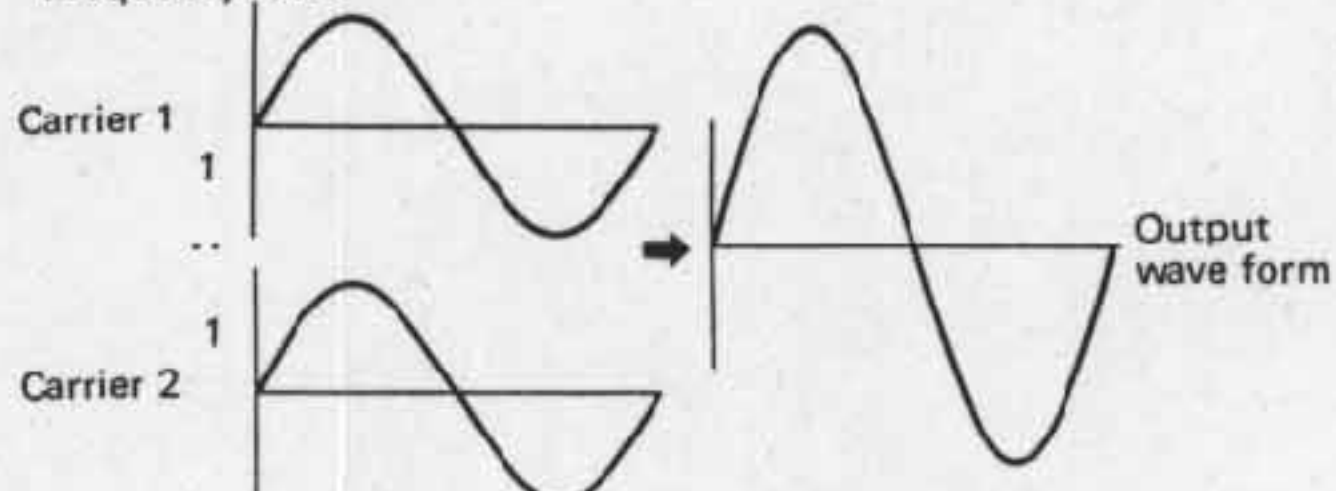


Frequency of modulator to carrier equals 3:1



• Carrier and carrier combinations

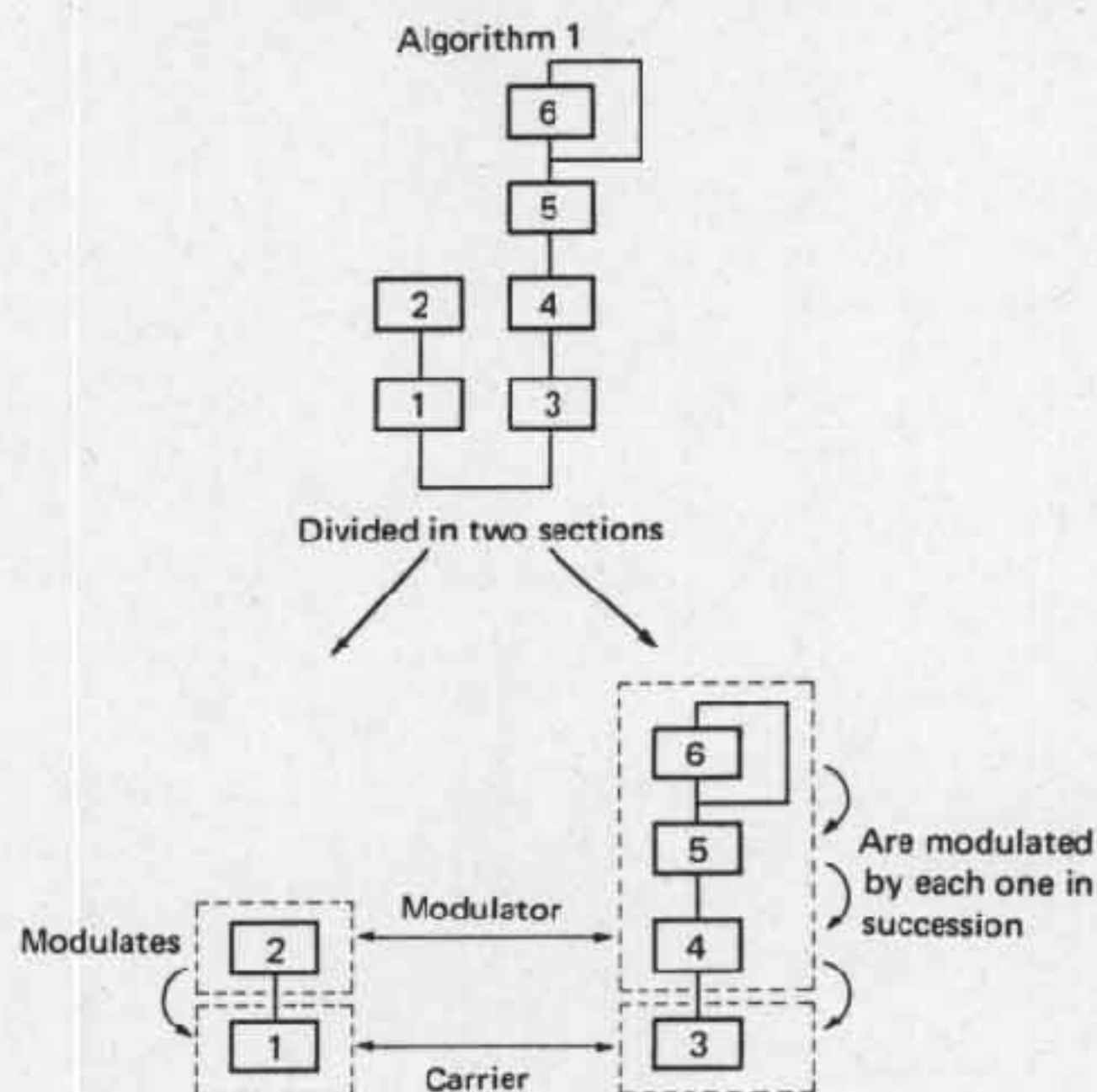
Frequency ratio



3. Algorithms Combining Several Operators

The DX7 has a total of six operators. The way in which these operators are combined is known as an "algorithm." The DX7 has 32 different pre-programmed algorithms. The 32 algorithms are displayed graphically along the top of the control panel above the selector keys. Taking algorithm number one as an example, the lowest two operators—1 and 3—are carriers. The four operators above the carriers will function as modulators. The output of operator 6 is fed back (feedback) to its input.

The above is a brief description of the internal workings of the FM tone generator system. By varying the pitch frequency, modulation and envelope data it is possible to edit pre-programmed voices or to create entirely new voices.



EDIT MODE

• EDIT MODE Creating Voices

The EDIT mode can be used to edit pre-programmed voices or to create entirely new voices. Press the **EDIT/COMPARE** function key to enter the EDIT mode.

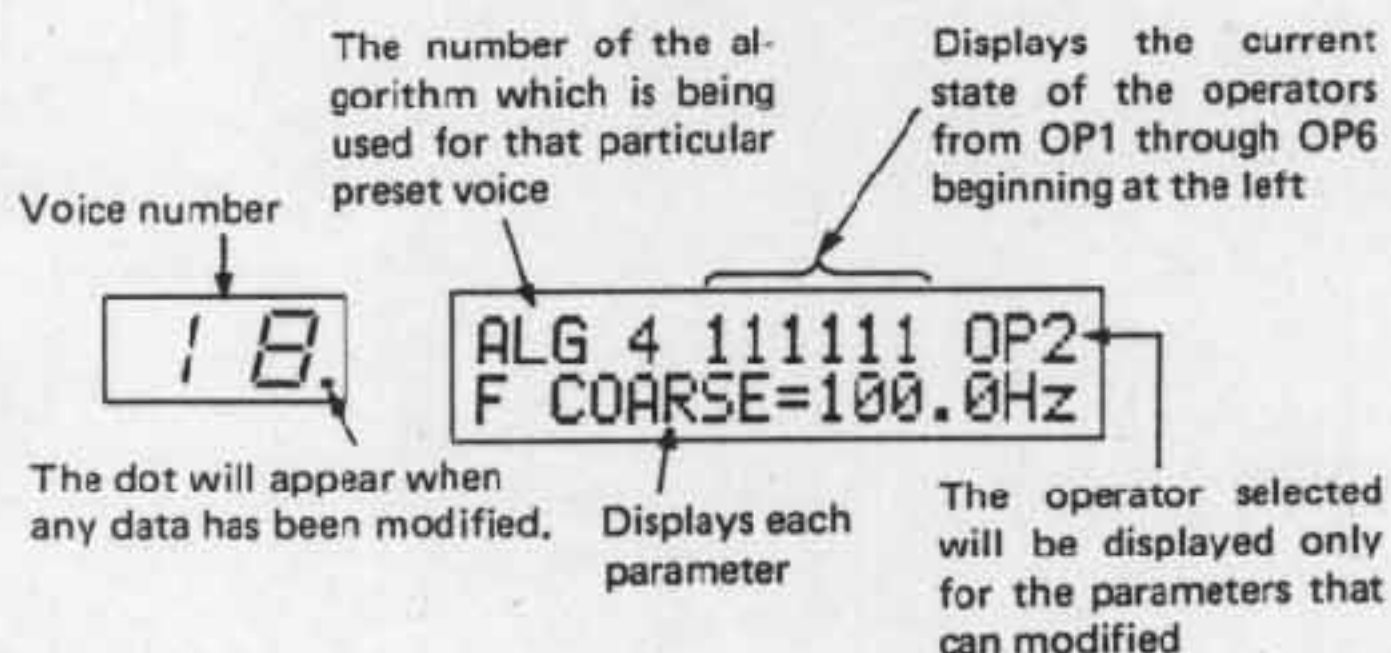
EDIT mode Parameter

OPERATOR ON-OFF/EG COPY					
1	2	3	4	5	
1	2	3	4	5	
MASTER TUNE ADJ	POLY/MONO	RANGE PITCH BEND	STEP	MODE PORTA	
OSCILLATOR					EG
MODE/ SYNC	FREQUENCY COARSE	FREQUENCY FINE	DETUNE	RATE	
17	18	19	20	21	
RANGE MODULATION WHEEL	PITCH	AMPLITUDE	EG BIAS	RANGI FOOT	

Setting and modifying parameters is carried out using the DATA ENTRY controls just as in the FUNCTION mode. A small dot will appear next to the voice number in the display if any data is modified. The original voice can be recalled at any time while editing by pressing the **EDIT/COMPARE** key again. The preset number will flash indicating that you are hearing the original voice. To continue editing press the **EDIT/COMPARE** button again.

Now for an explanation of the DX7's functions and operation.

• The indicators display for EDIT mode



• OPERATOR ON-OFF/EG COPY

OPERATOR ON-OFF/EG COPY					
1	2	3	4	5	6
1	2	3	4	5	6

In the EDIT mode these keys permit turning any of the operators on or off, and copying the EG data of any operator to any other operator (EG COPY).

OPERATOR ON-OFF:

Pressing keys **1** through **6** will result in the corresponding operator being turned OFF, indicated by a "0" in the appropriate location on the display panel (the group of six 1's and/or 0's corresponds to operators 1 through 6). Press the key again to turn the operator back on-indicated by a "1" on the display.

1: Signifies that the operator is activated

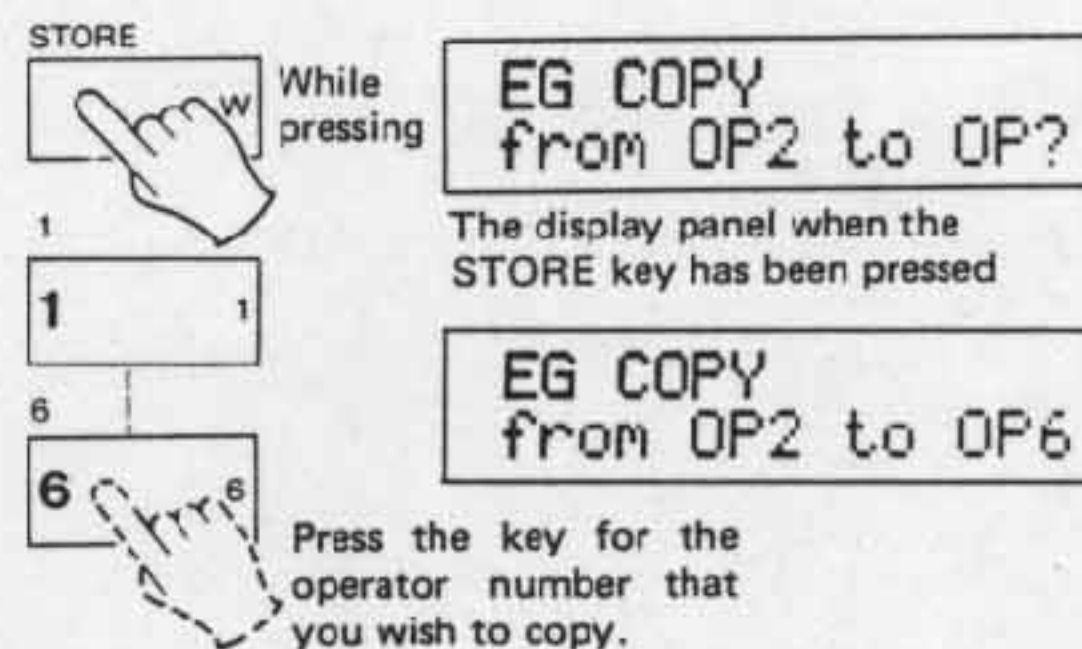
0: Signifies that the operator is disabled

ALG 4 111000 OP2
RATE SCALING = 0

- No sound will be produced if the carrier operators have all been disabled.

EG COPY:

This function copies the EG data from one operator to another. While holding the selector **STORE** key, press the number of the operator from which you want to copy EG data.



• ALGORITHM

ALGORITHM
7

This value will change.
ALG 4 111111
ALGORITHM SELECT

This key permits selection of one of the 32 algorithms. Press the DATA ENTRY **+1** key to increment (advance) the number of the selected algorithm, and the **-1** key to decrement the algorithm number. The slide control can be used for large variations.

• FEEDBACK

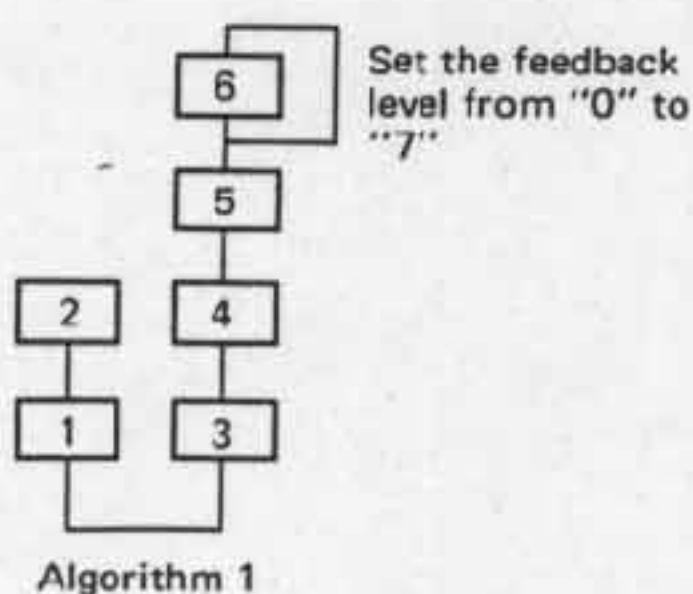
FEEDBACK

8 8

One operator in each of the 32 algorithms has its output fed back to its input. This is the feedback operator. The amount of feedback applied can be adjusted over a range of 0 to 7. By increasing the FEEDBACK level the harmonics are increased, resulting in the generation of noise-like sounds.

ALG 4 111111
FEEDBACK = 7

This value will change



• LFO

LFO											
WAVE		SPEED		DELAY		PMD		AMD		SYNC	
9	9	10	0	11	A	12	B	13	C	14	D

The Low Frequency Oscillator produces low-frequency sine, saw-tooth or square waves, or a SAMPLE/HOLD waveform. The LFO waveform can be used to apply vibrato, tremolo or "wow" effects to the voices. The amount of LFO modulation applied can be controlled using the modulation wheel, foot controller, breath controller or keyboard after touch once appropriate WAVE, SPEED, DELAY and KEY SYNC parameters are set.

(Refer to page 26)

WAVE:

This selects the waveform output by the LFO. Any of the six waveforms shown below can be selected.

ALG 4 111111
LFO WAVE=TRIANGL

This display will change

- TRIANGL : (Triangular wave)
- SAW DWN : (Number 1 sawtooth waveform)
- SAW UP : (Number 2 sawtooth waveform)
- SQUARE : Square wave
- SINE : Sine wave
- S/HOLD : Sample and hold

ALG 4 111111
LFO SPEED = 35

ALG 4 111111
LFO DELAY = 0

This display will change

SPEED:

The speed (frequency) of the LFO can be set from 0 to 99. 0 is the slowest LFO speed while 99 is the fastest.

DELAY:

This creates a delay between initial key closure and application of LFO modulation. A setting of 0 results in no delay—LFO modulation begins the instant a key is pressed—and a setting of 99 creates the longest delay.

PMD (Pitch Modulation Depth):

Varies, over a 0 to 99 range, the depth of LFO modulation applied to pitch. A 0 setting produces no pitch modulation, and a setting of 99 produces maximum modulation.

The PMD function is separate from the effect of the controllers, and can be used to apply vibrato effects that are entirely independent of the controller settings.

AMD (Amplitude Modulation Depth):

Varies, over a 0 to 99 range, the depth of LFO modulation applied to amplitude. A 0 setting produces no amplitude modulation, and a setting of 99 produces maximum modulation.

The AMD function is separate from the effect of the controllers, and can be used to apply tremolo effects that are entirely independent of the controller settings.

SYNC (Synchronize):

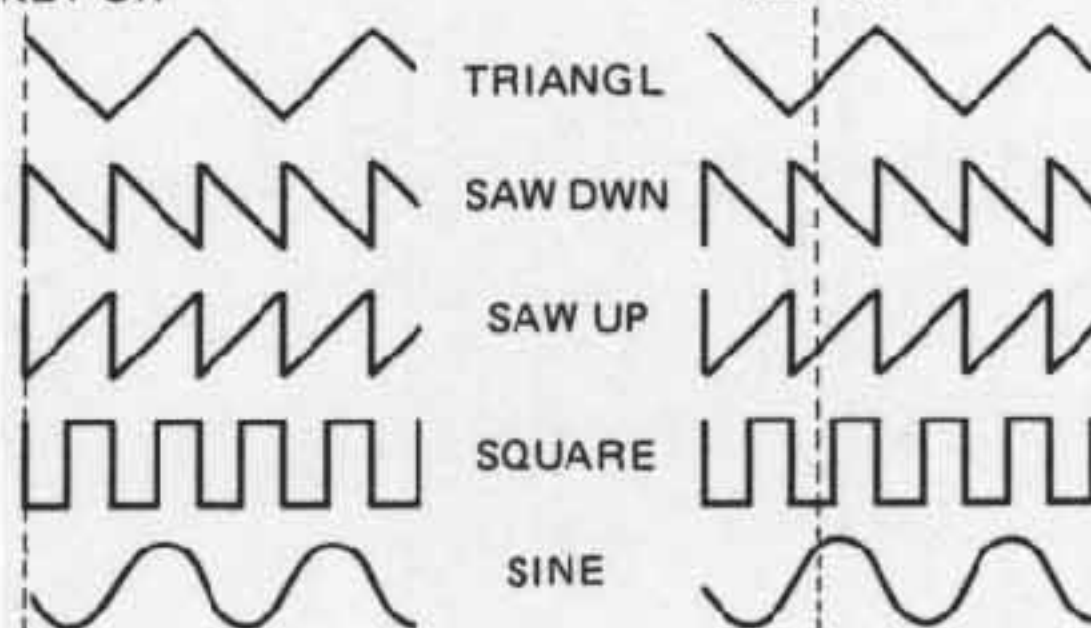
Pressing the SYNC key alternately turns the SYNC function ON and OFF. When SYNC is ON LFO modulation begins at the same point in the LFO waveform when a key is pressed. With SYNC OFF LFO modulation begins at a random point in the LFO waveform since the LFO is free running in this mode.

ALG 4 111111
LFO KEY SYNC=OFF

This display will change

When KEY SYNC ON
KEY ON

When KEY SYNC OFF
KEY ON



• MOD. SENSITIVITY (Modulation Sensitivity)

MOD SENSITIVITY	
PITCH	AMPLITUDE
15 E	16 F

This adjusts the sensitivity (depth) of pitch and amplitude modulation. This parameter must be greater than 0 before any amplitude or pitch modulation can be applied.

Be sure to check this parameter before using the modulation wheel or other controllers.

ALG 4 111111	ALG 4 111111 OP2
P MOD SENS. = 1	A MOD SENS. = 0

This display will change

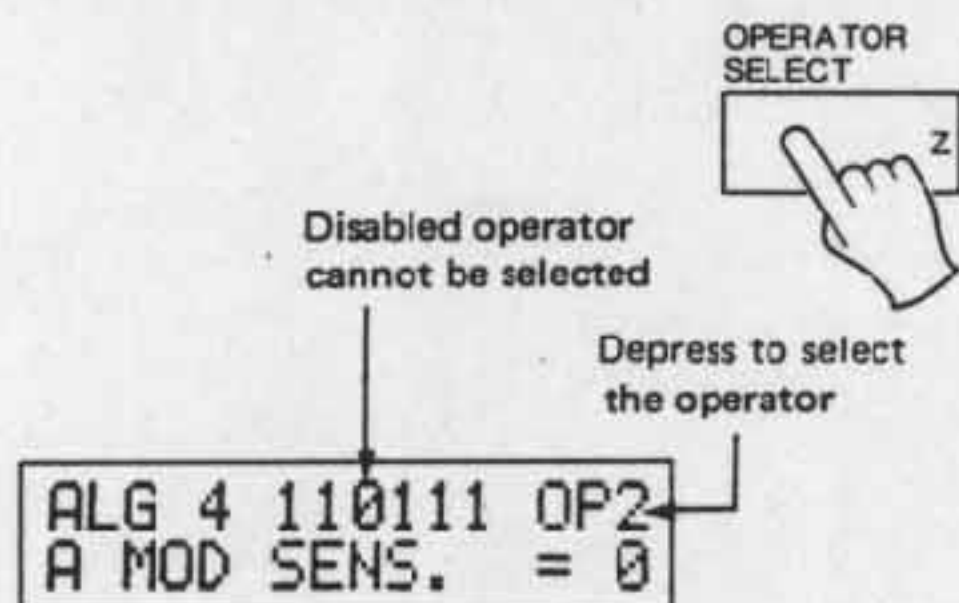
PITCH:

Sensitivity to pitch modulation is variable from 0 to 7. This value sets the modulation sensitivity for all operators. Applying pitch modulation results in vibrato type effects.

AMPLITUDE:

Sensitivity to amplitude modulation is variable from 0 to 3. Amplitude modulation sensitivity is set independently for each operator. Applying amplitude modulation to a modulator creates "wow" effects, while applied to a carrier it results in tremolo effects.

Operators are selected using the **OPERATOR SELECT** key. Pressing the **OPERATOR SELECT** key successively selects the operators in order from 1 to 6. The number of the selected operator is displayed in the upper right hand corner of the display panel. Operators that are turned OFF will be "skipped" and the number of the next active operator will be displayed.



• OSCILLATOR

OSCILLATOR			
MODE/ SYNC	FREQUENCY COARSE	FREQUENCY FINE	DETUNE
17 G	18 H	19 I	20 J

These keys set the pitch data for each operator.

ALG 4 111111 OP2	ALG 4 111111 OP2
FREQUENCY(RATIO)	FIXED FREQ.(Hz)

MODE/SYNC:

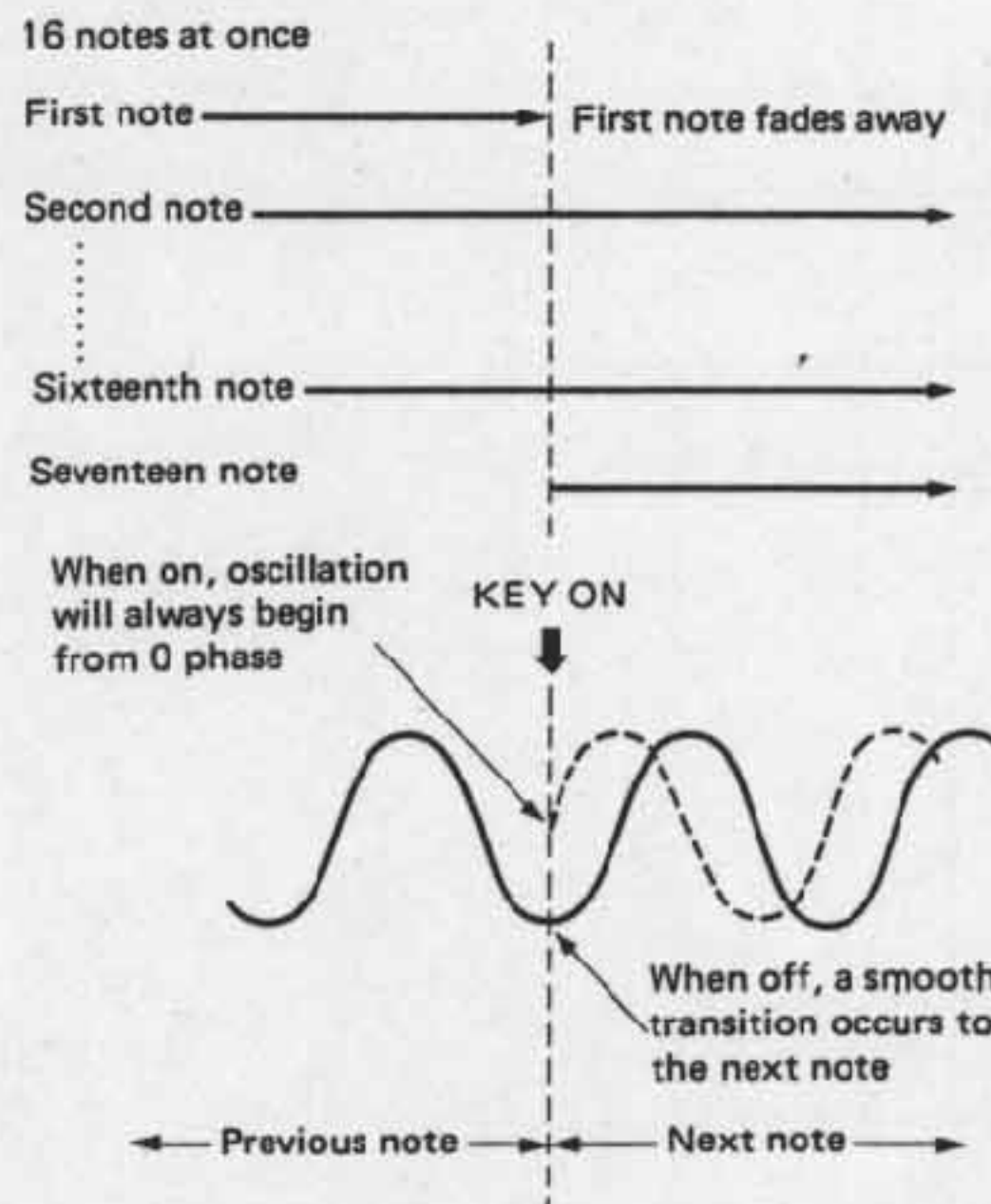
Pressing this key alternately switches to MODE and SYNC.

MODE:

Pressing the DATA ENTRY **-1** key sets the operators to the FREQUENCY (RATIO) mode, in which operator pitch is scaled to the keyboard as normal. Pressing the **+1** key sets the FIXED FREQ (HZ) mode in which a fixed frequency is produced no matter what key is pressed. The frequency is set using the **FREQUENCY COARSE** and **FREQUENCY FINE** functions in both modes.

SYNC (Synchronize):

When the SYNC function is ON, all oscillator begin operation from the same phase angle (0 degrees). With SYNC OFF the phase angle at which an operator begins oscillation is carried over smoothly from the preceding note. In the polyphonic mode, for example, maximum simultaneous output is 16 notes. If a 17th key is pressed the first note makes a smooth transition to the 17th note.

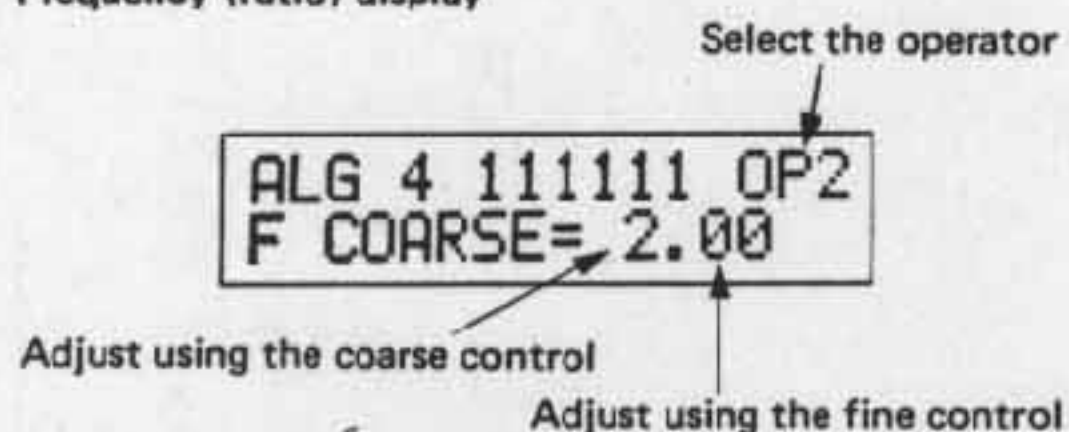


FREQUENCY COARSE/FREQUENCY FINE:

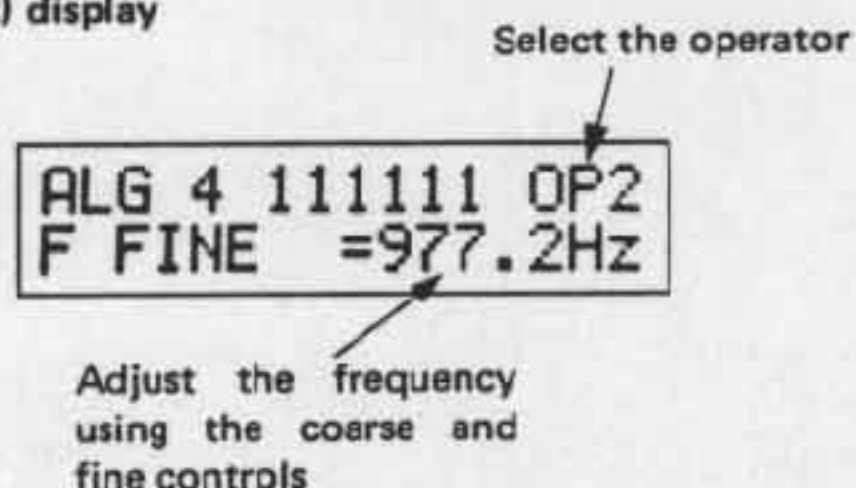
If MODE is set to FREQUENCY (RATIO) the operators are set to a standard frequency of 1.00 (8 feet) when the PITCH COARSE key is pressed. The frequency can then be varied from by one half (0.5 times) to 32 times. FINE adjustment is possible over a range of from 1 to 1.99 times. If the frequency is increased by 2 times, for example, the pitch will increase by one octave.

If MODE is set to FIXED FREQ (HZ), COARSE adjustment is possible in four steps—1, 10, 100 and 1000. FINE adjustment is possible from 1 to 9.772 times.

Frequency (ratio) display

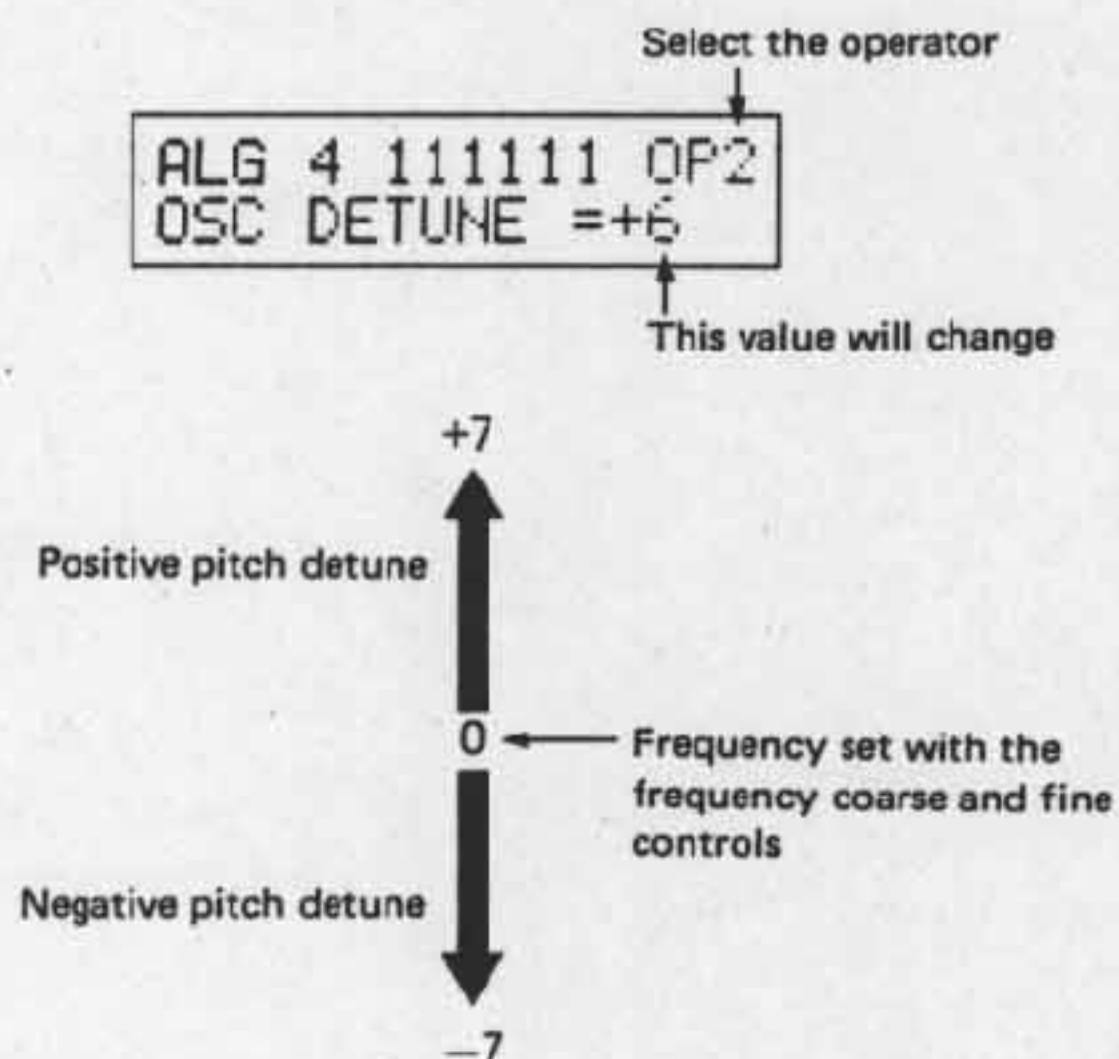


Fixed (Hz) display

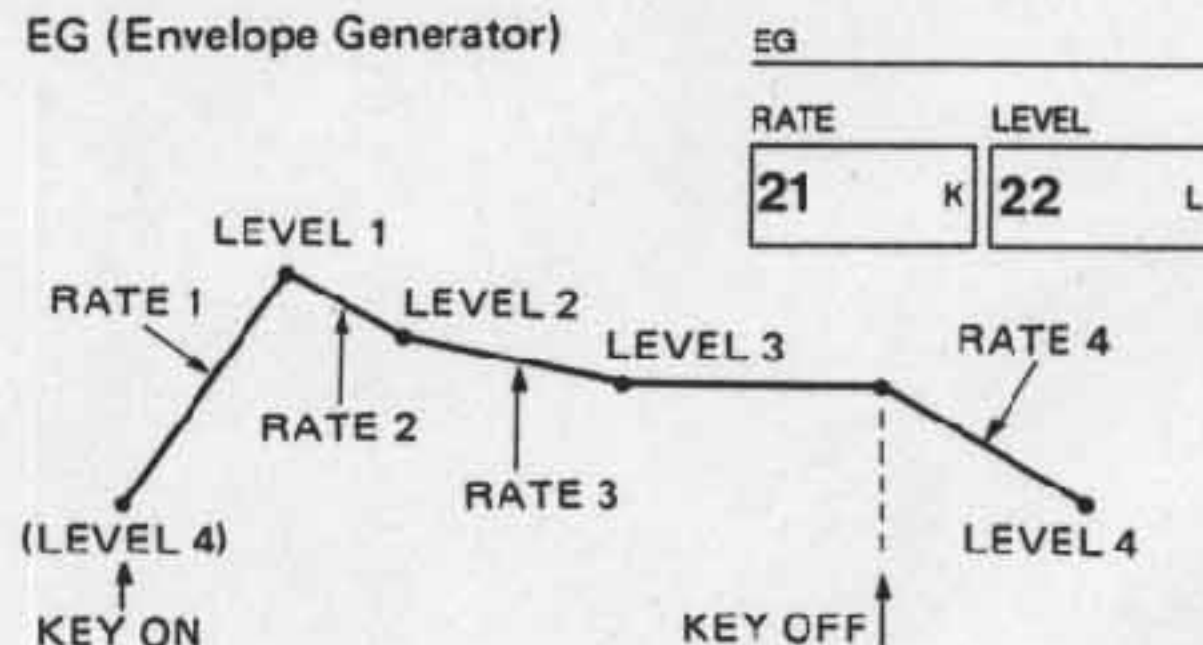


DETUNE:

The operator frequencies as determined by the FREQUENCY COARSE and FREQUENCY FINE controls can be detuned over a -7 to +7 range.

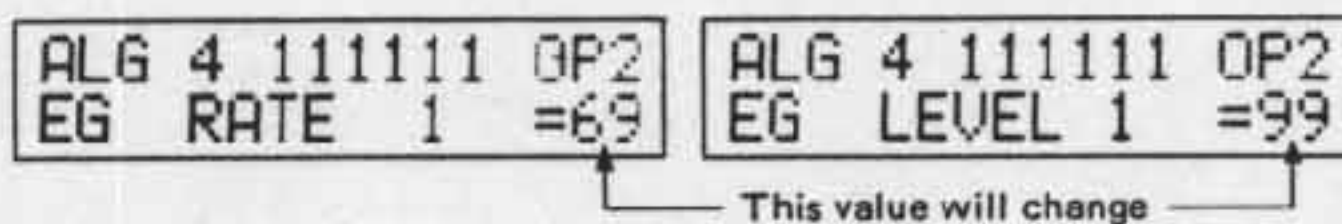
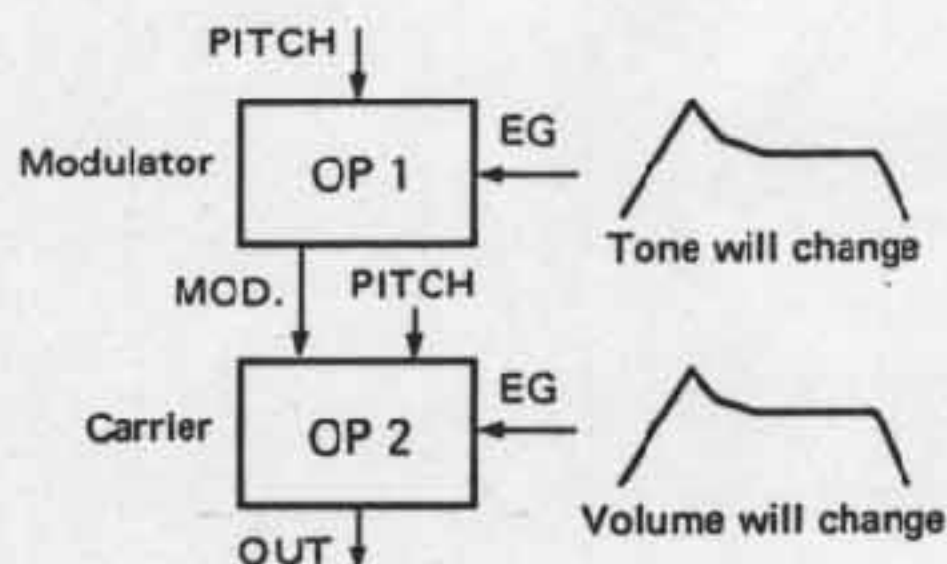


• EG (Envelope Generator)



The envelope generator determines how the amplitude (volume) or timbre (tone) of a note will vary over time. Envelope modulation of a modulator results in time-based timbre variations, while envelope modulation of a carrier produces amplitude variations.

The parameters which determine the "shape" of the envelope are RATE 1 through RATE 4 and LEVEL 1 through LEVEL 4. The RATE parameters determine how long it takes the envelope to reach one LEVEL from another. The envelope applied to each operator can be set individually, permitting an essentially infinite range of envelope combinations.



RATE:

Pressing the **RATE** key successively selects RATE parameters 1 through 4. Each RATE parameters can be set from 0 to 99. A 0 setting produces the longest (slowest) RATE, and a 99 setting produces the fastest RATE.

LEVEL:

Pressing the **LEVEL** key successively selects LEVEL parameters 1 through 4. Each LEVEL parameter can be set from 0 to 99. 0 is no output, while 99 is maximum level.

- Normally LEVEL 4 will be set at "0". In this case LEVEL 1 should be greater than "50" to ensure proper EG operation.

● KEYBOARD LEVEL SCALING

KEYBOARD LEVEL SCALING

BREAK POINT	CURVE	DEPTH
23 M	24 N	25 O

Permits raising or lowering the EG levels for keys to the left and right of any key specified as the "Break Point". This is basically a highly advanced version of the keyboard follower function found on some conventional synthesizers, permitting much finer scaling control.

ALG 4 111111 OP2	ALG 4 111111 OP2
BREAK POINT=A -1	R KEY SCALE=+EXP

This value will change

BREAK POINT:

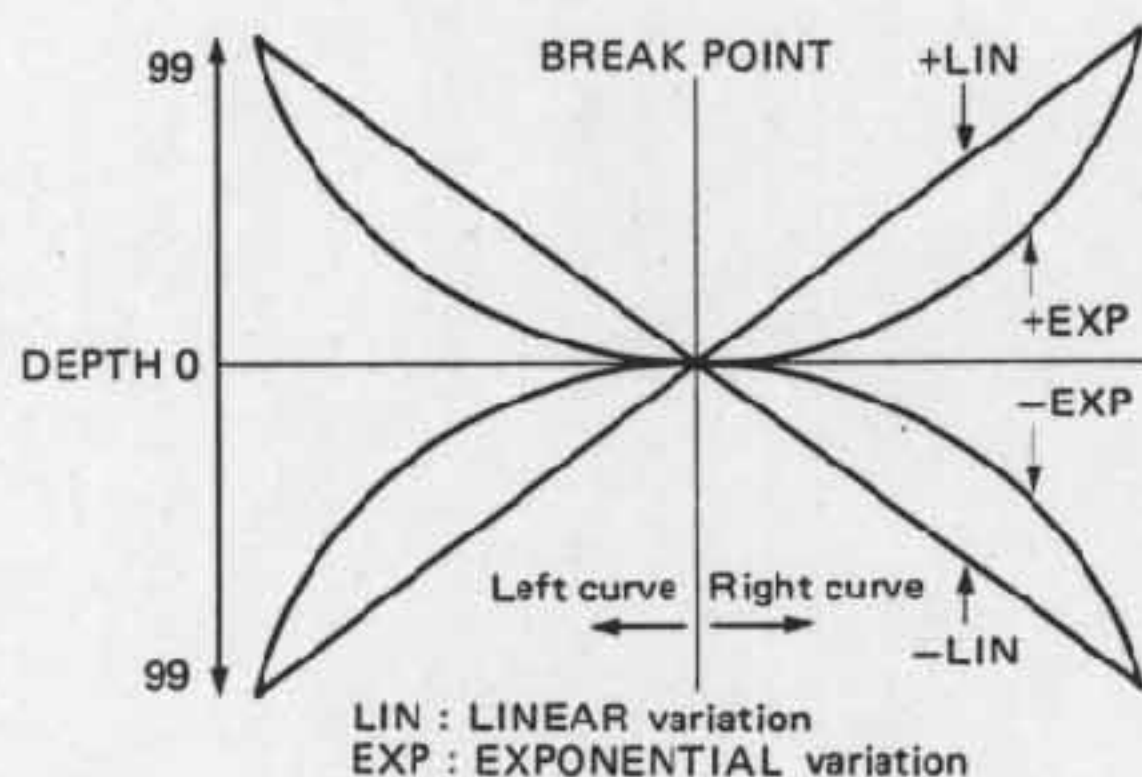
The **BREAK POINT** key—the reference key for the scaling function—can be specified anywhere between A-1 and C8.

CURVE:

Permits variation of the scaling curve to the left and right of the BREAK POINT key. Pressing the **CURVE** key alternates between R KEY SCALING and L KEY SCALING displays. Four different curves are available, as shown in the figure.

DEPTH:

Varies the depth of each curve over a 0 to 99 range. A 0 setting results in a flat (no variation) curve, and a 99 setting produces maximum scaling depth.



● KEYBOARD RATE SCALING

KEYBOARD RATE SCALING

26 P

The EG for each operator can be set for a long bass decay and short treble decay—as in an acoustic piano. RATE can be set from 0 to 7.

● OPERATOR

OPERATOR

OUTPUT LEVEL	KEY VELOCITY SENSITIVITY
27 Q	28 R

Permits setting the output level and touch response effect of each operator.

ALG 4 111111 OP2	OUTPUT LEVEL =85
------------------	------------------

This value will change

OUTPUT LEVEL:

Controls overall EG level, like the EG DEPTH controls in conventional synthesizers. OUTPUT LEVEL can be set between 0 and 99.

For example, if a specific operator is found to be unnecessary once a voice has been created, its output level can be set to 0.

- Since the OPERATOR ON-OFF function operates only in the EDIT mode and OPERATOR ON-OFF data is not stored in memory, the OUTPUT LEVEL of all unnecessary operators should be set to 0.

KEYBOARD LEVEL SCALING depth is also set to "0". Setting a large DEPTH value and either the +LIN or +EXP curve will result in output from the operator even if the operator's output level is set to "0".

In order to maintain the same total output level regardless of which algorithm is selected, the OUTPUT LEVEL of each carrier operator is initially set to 1/2 or 1/6 depending on the configuration of the algorithm. For example, the OUTPUT LEVEL of operators 1 through 3 of algorithm 1 are set to 1/2, while operators 1 through 6 of algorithm 32 are set to 1/6.

KEY VELOCITY SENSITIVITY:

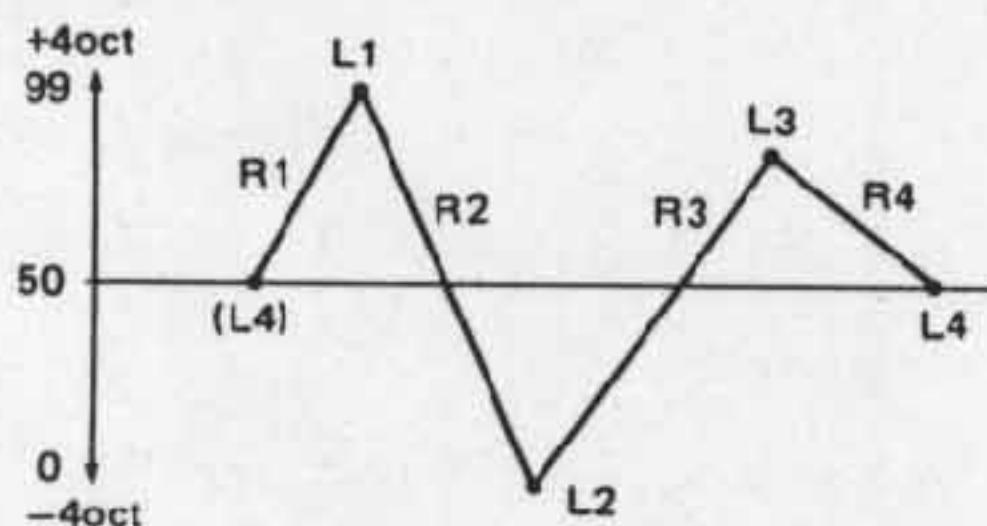
Permits adjustment of key touch response. That is, how the velocity with which the keys are played affects the sound. Since touch response can be applied to carriers or modulators, variations in timbre as well as level can be produced. Sensitivity can be set from 0 to 7. No touch response will be produced with a 0 setting, while a setting of 7 produces maximum response.

● PITCH EG

PITCH EG

RATE	LEVEL
29	30

PITCH EG permits variation of pitch by ± 4 octaves either side of standard pitch (50). The RATE and LEVEL parameters of the PITCH EG can be set just as in the other DX7 envelope generators.



ALG 4 111111
P EG RATE 1 =84

ALG 4 111111
P EG LEVEL 1 =50

This value will change

RATE:

Pressing the **RATE** key successively selects RATE parameters 1 through 4. Each RATE parameters can be set from 0 to 99. A 0 setting produces the longest (slowest) RATE, and a 99 setting produces the fastest RATE.

LEVEL:

Pressing the **LEVEL** key successively selects LEVEL parameters 1 through 4. Each LEVEL parameter can be set from 0 to 99.

With a setting of 50 as standard, a setting of 99 permits +4 octaves pitch variation while a setting of 0 permits -4 octaves pitch variation.

Set LEVEL 1 through LEVEL 4 to 50 to defeat the PITCH EG function.

● KEY TRANSPOSE

KEY TRANSPOSE

31 u

Transposes pitch over a ± 2 octave range in semitone steps with C3 as standard. Press the **KEY TRANSPOSE**, and then the keyboard key corresponding to the desired amount of transposition according to the illustration on page 18. To transpose up one octave, for example, press the **KEY TRANSPOSE** key and then press C4 on the keyboard.

● VOICE NAME

VOICE NAME

32 v

Name for original voices can be specified using up to ten characters. Characters are chosen from those printed in small type to the right of the MODE SELECT and VOICE/ PARAMETER SELECT keys. The available characters are 1 through 0, A through Z, -, a period and a space. When the **VOICE NAME** key is pressed, a cursor appears over the first character of the current voice name. Input the new name by pressing the buttons with the appropriate characters printed to the right of the button while holding the **CHARACTER** button.

While pressing the **EDIT/COMPARE** key,

press either **-1** or **+1** key

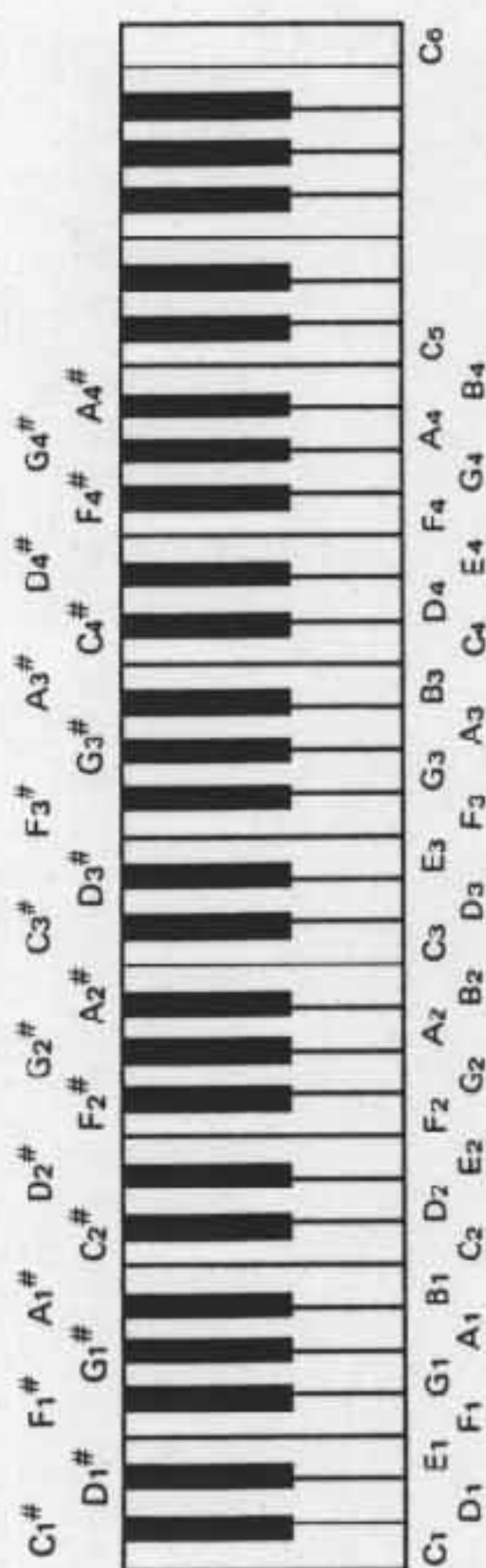
OFF ON

ALG 4 111111
NAME= ABCDEFGHIJ

cursor can be moved

KEY TRANSPOSE

• KEY TRANSPOSE



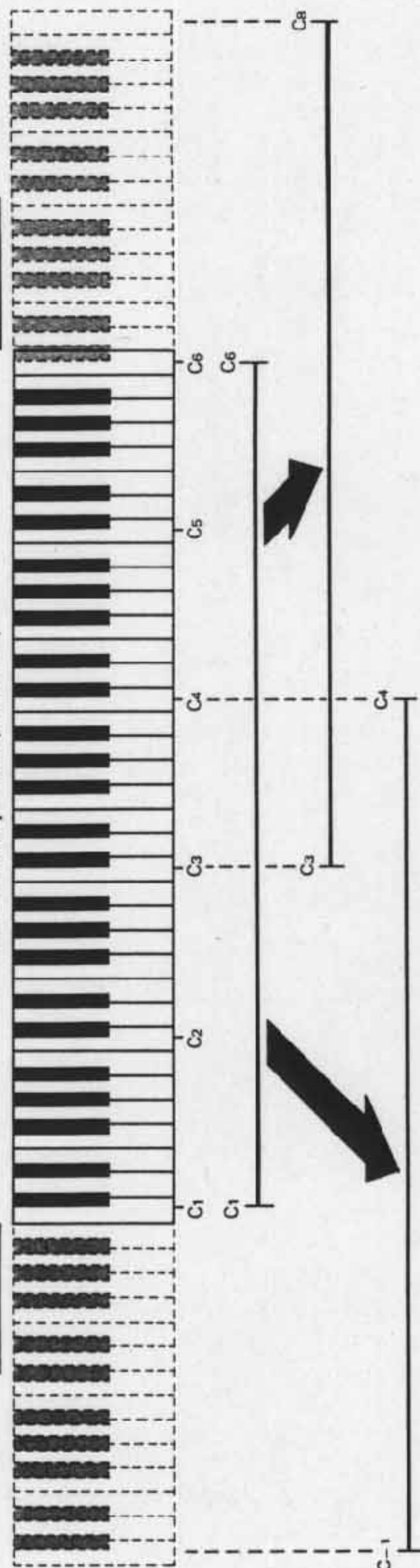
Press the key that you wish to transpose.

C5 through C6 are all C5

You can transpose in semitones for -2 octaves

You can transpose in semitones for +2 octaves

The DX7's keyboard (C1 to C6)

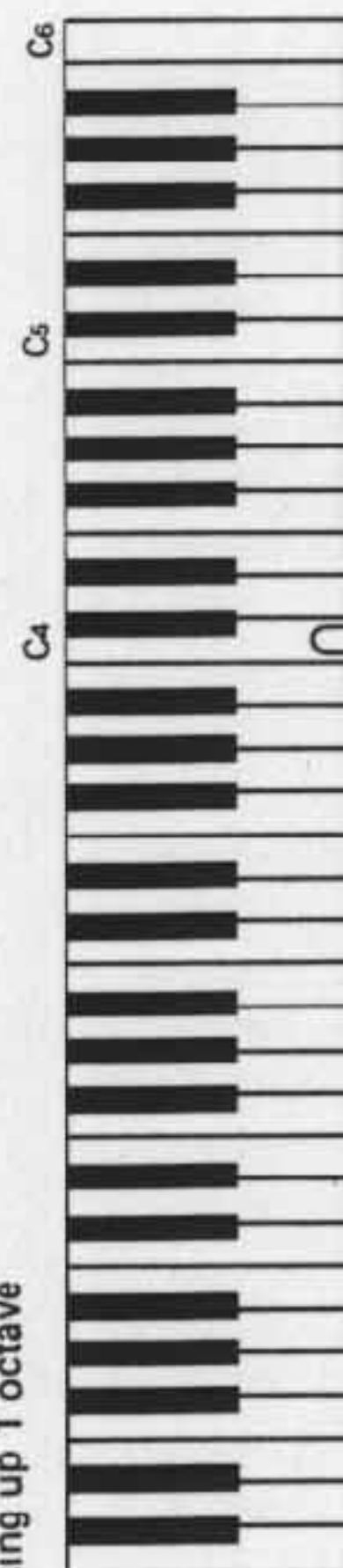


* For example, when transposing up 1 octave

KEY TRANSPOSE

31

After pressing



Play C4

The display when transposing up 1 octave

ALG 4 111111
MIDDLE C = C 4

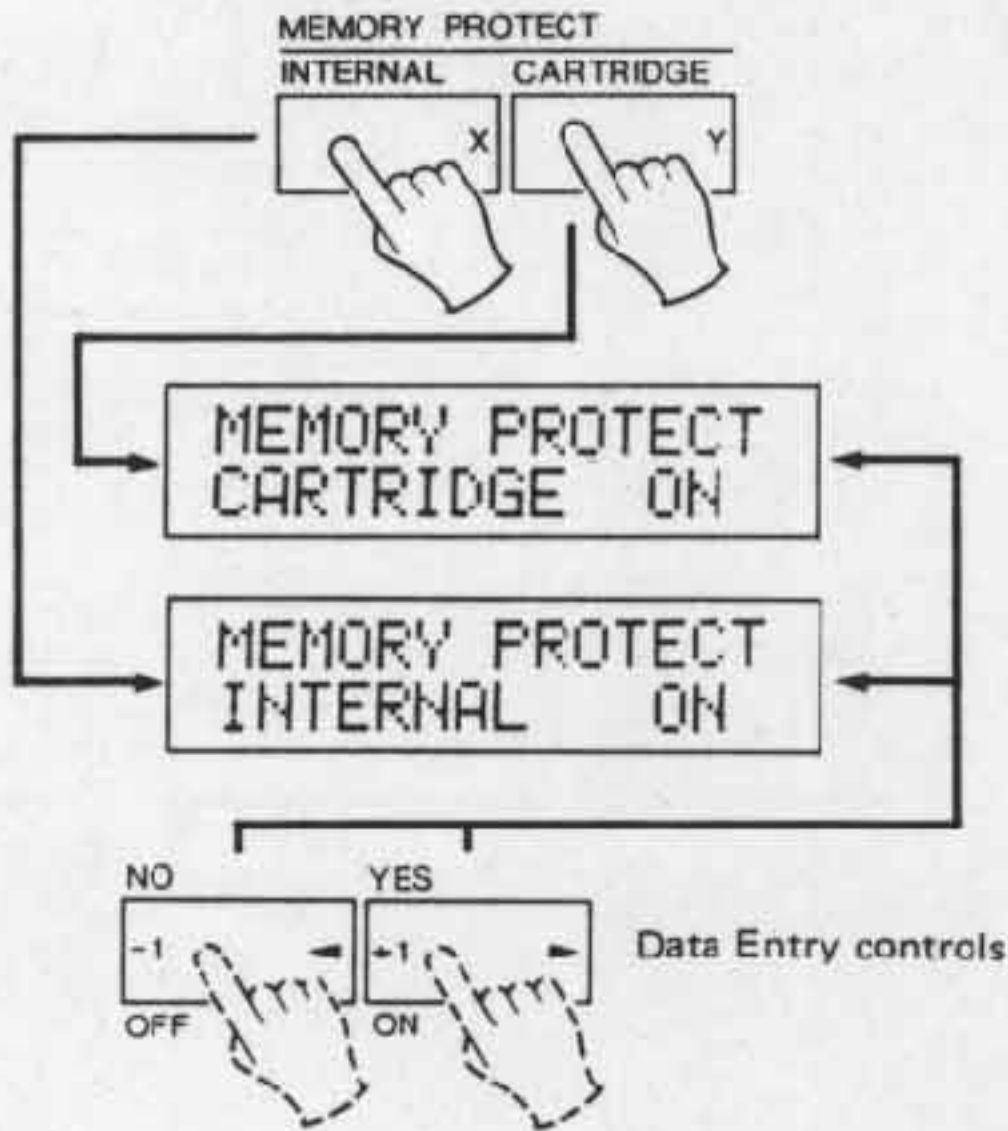
STORE/SAVE/LOAD

STORE/SAVE/LOAD . . . Storing the Voice Data

With the DX7, voices you create can be stored in the internal memory or an external memory cartridge. You can also save all the internal voices in a cartridge. In addition, you can load all the voices in a cartridge into the internal memory.

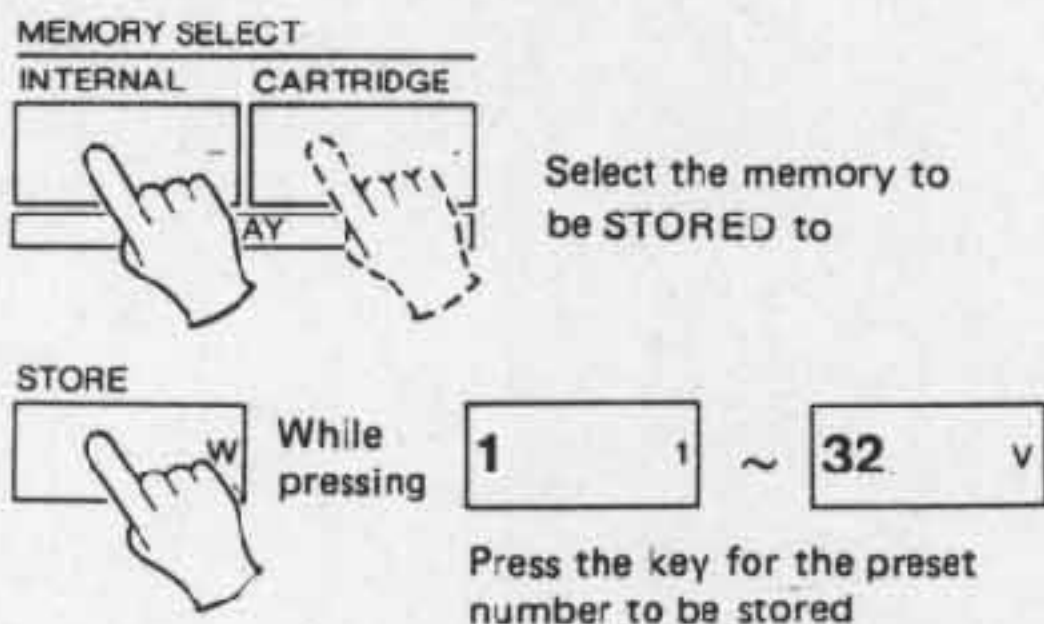
1. Memory Protect . . . Protecting Your Work

The DX7's internal MEMORY PROTECTION function will prevent any accidental erasure of the INTERNAL or CARTRIDGE voice data. In addition, the voice cartridge itself has a protection switch so that the data is doubly protected. You will first have to turn the DX7 MEMORY PROTECT OFF in order to STORE/SAVE/LOAD the voice data. Also, do not forget to turn the MEMORY PROTECT function back ON after the STORE/SAVE/LOAD operation.



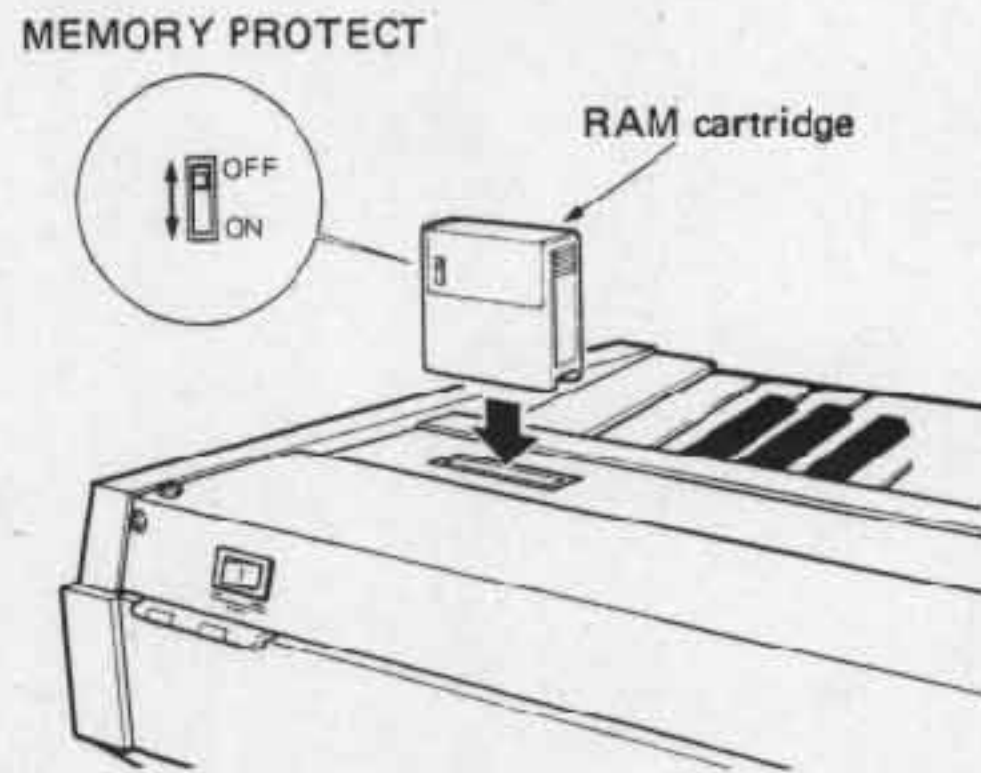
2. Storing Newly Created Voices

Newly created original sounds can be erased by selecting other preset voices or disconnecting the power supply. Please store any voice data that you wish to keep in the internal memory or in a voice cartridge.



• The Voice Cartridge Protection Switch

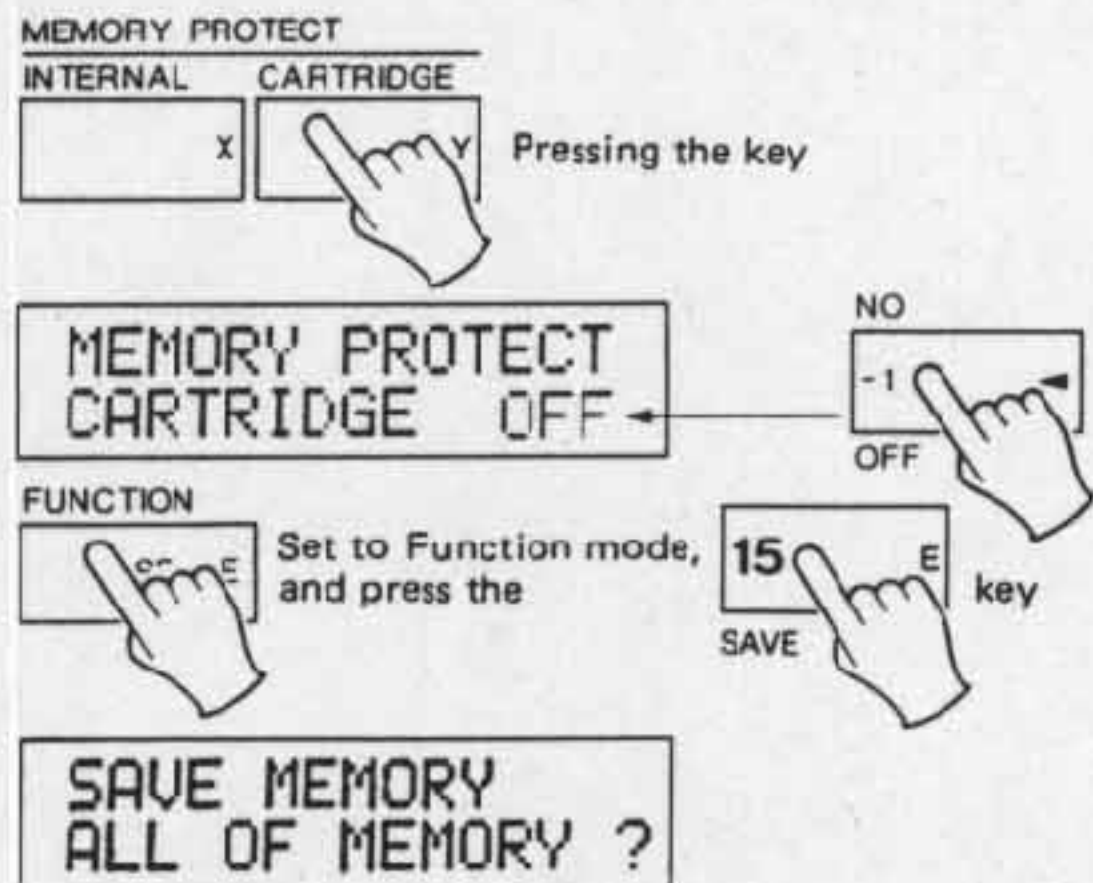
This switch is used for protecting the voice data contained in the cartridge, even if the CARTRIDGE PROTECTION function of the DX7 is turned off. The only time this protection switch should be turned off is when you wish to store or save voices in the cartridge. In all other cases this PROTECTION switch should be turned on.



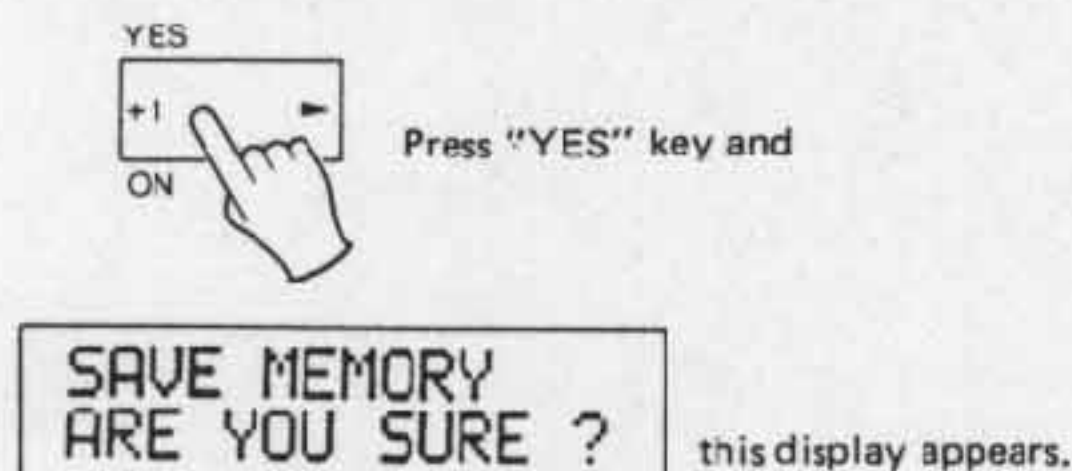
Note: If you save contents of the DX7's internal memory or newly-created sounds in a cartridge that is already full, the previous cartridge contents of that particular preset number will be erased from the memory and the new voice data will replace it. Be sure to save new voice data in preset numbers that are empty or that are no longer needed.

3. Saving Internal Voice Data

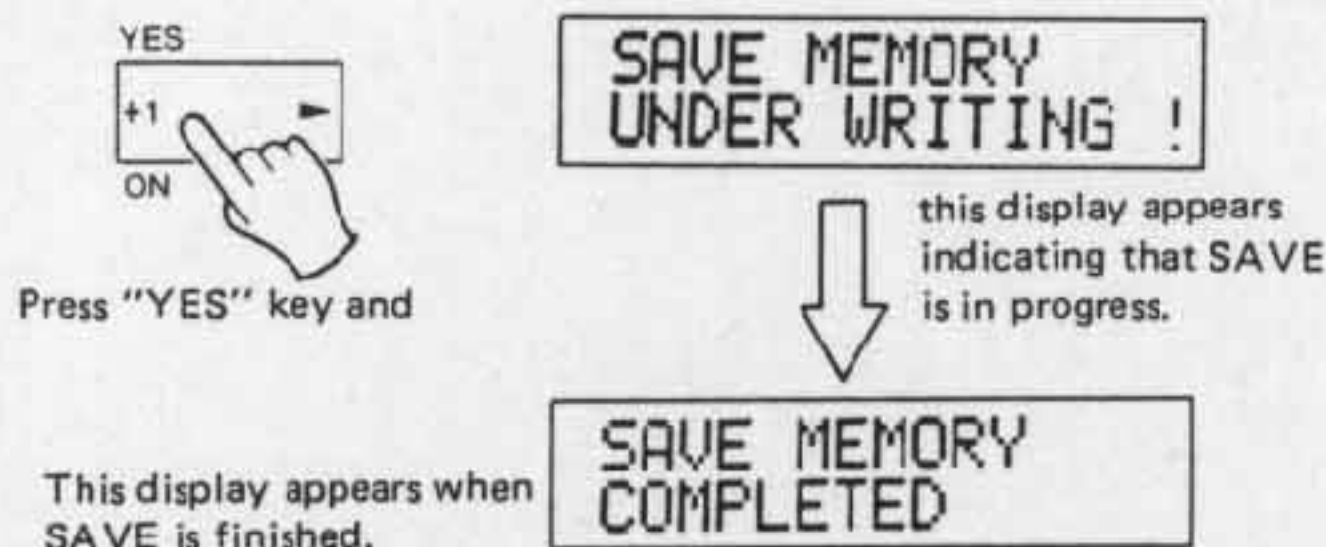
You can save the entire data contents of the internal memory in a separately available blank cartridge. This will open up the internal memory for original voices and will allow you to increase the number of voices available. If you should decide that all of the voice data contained in the cartridge is unwanted, the entire contents of the internal memory can be transferred to the cartridge. You'll then have an entirely new voice cartridge. For this procedure, turn the protection switch of the cartridge off.



Asking if you want to SAVE all data (if MEMORY PROTECT is ON at this time, the "MEMORY PROTECTED" display appears and SAVE will not function).



The internal microcomputer asks "SAVE MEMORY, ARE YOU SURE?" to prevent accidental erasure of important voice data in the RAM cartridge. Check to see that the RAM cartridge inserted in the instrument does not contain important voice data, then press **YES** once more. The "UNDER WRITING" display appears and the save operation begins (if the PROTECT switch on the RAM cartridge is ON at this time, a "WRITE ERROR" message will be displayed and the save operation will be terminated). When the SAVE operation is finished, the "COMPLETED" message will appear. MEMORY PROTECT should now be turned ON.

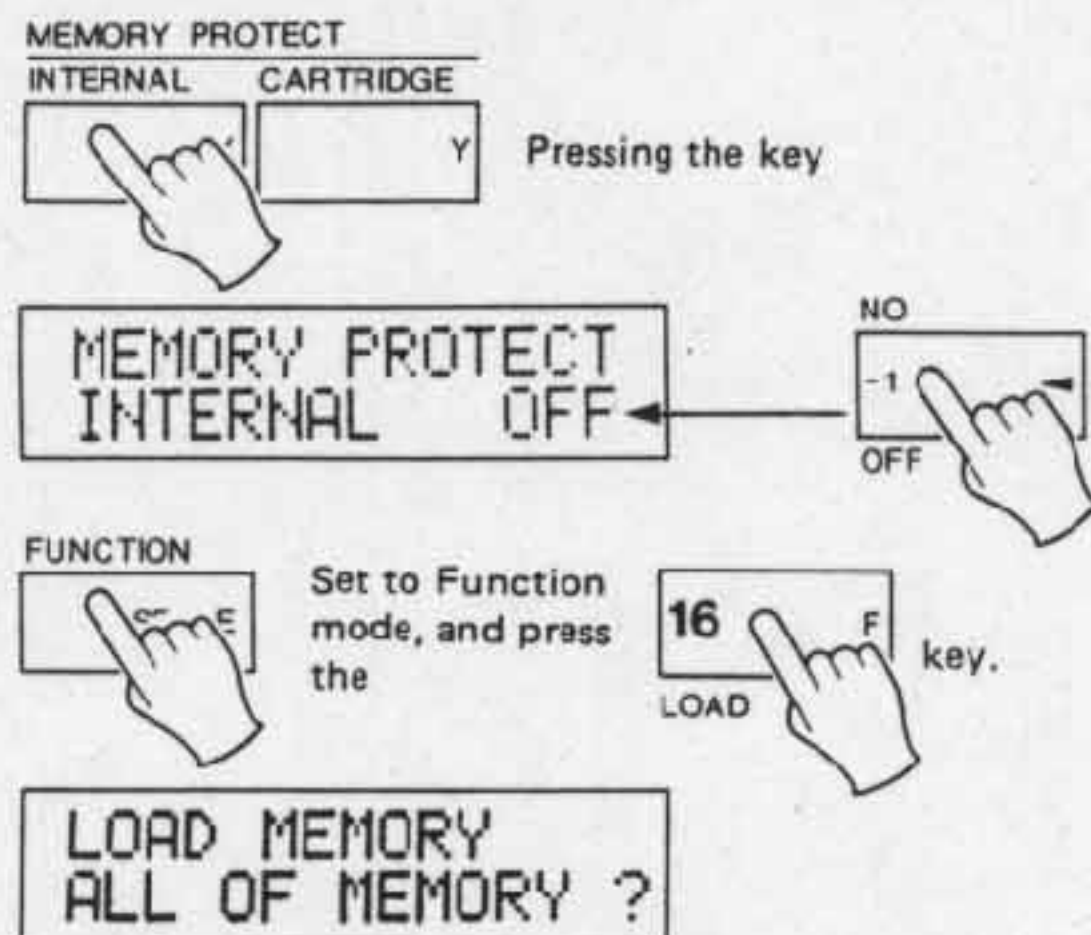


Note: If a "FOARMAT CONFLICT", "ID CONFLICT", or "READ PROTECT" message is displayed during a STORE or SAVE operation using a RAM cartridge, it means the cartridge must be formatted. For details, please refer to the Cartridge Formatting section on page 7.

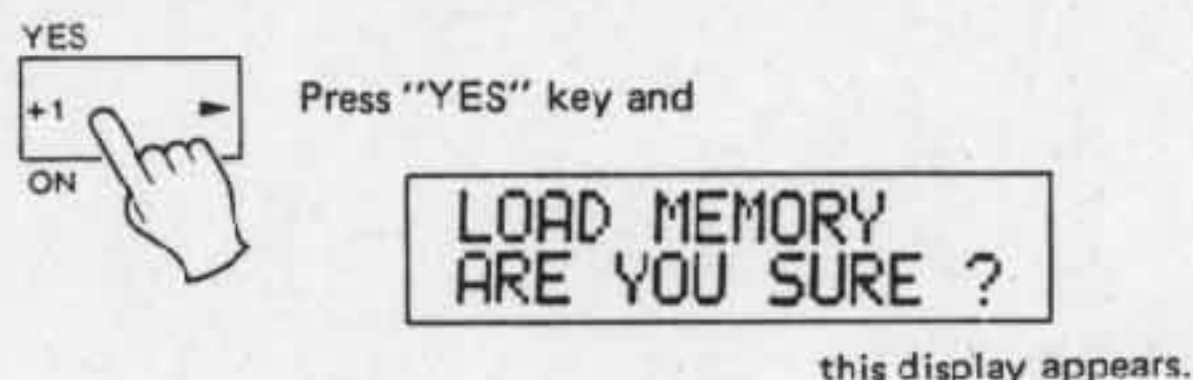
4. Loading Cartridge Data

You can load all the contents of a cartridge into the internal memory of the DX7. First, insert the cartridge that contains the voice data that you wish to load.

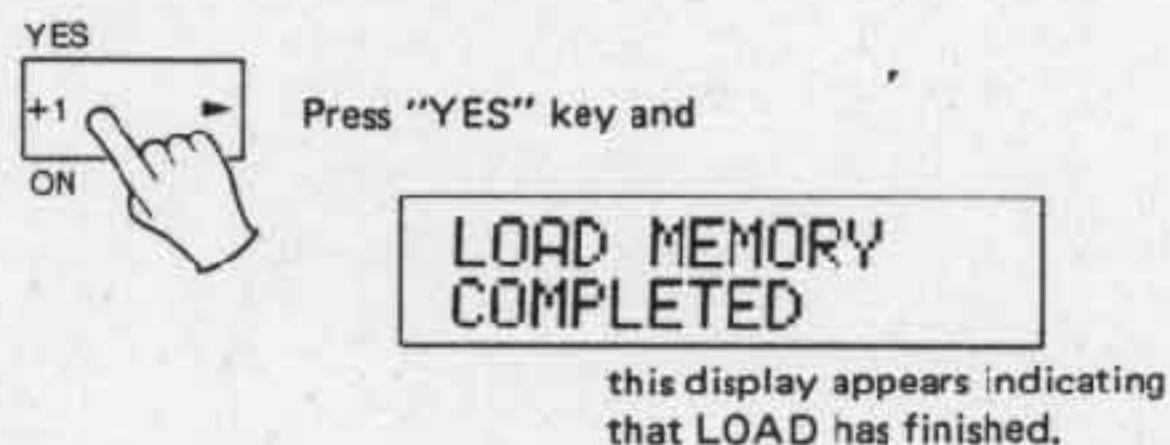
Turn the protection switch of the internal memory off.



Asking if you want to LOAD all data (if MEMORY PROTECT is ON at this time, the "MEMORY PROTECTED" display appears and LOAD will not function).



The microcomputer asks "LOAD MEMORY, ARE YOU SURE?" to prevent accidental erasure of important voice data in the instrument's internal memory. If it's OK to LOAD, press **YES** a second time and wait for the "COMPLETED" display. MEMORY PROTECT should then be turned ON.



● Let's keep records of voices for future reference.

At the end of this manual you will find a voice data list. Use this list to record the values of every parameter used. Make copies of this list and use them to record the parameters of any new voices you create yourself. This will be useful to restore voices that have been erased, and will serve as an excellent guide for creating new voices.

MIDI

MIDI (Musical Instrument Digital Interface)

The MIDI terminal is for external control of electronic musical instruments. Any instrument equipped with a MIDI terminal can be connected using the MIDI cable and used for transmitting data to or from the instrument.

MIDI can be used for the following types of data transmission and control:

• Real-Time Control

This is used for controlling more than one electronic musical instrument at once using a sequencer to form a musical ensemble. It can also be used to control a second electronic musical instrument via the keyboard of the main instrument.

1. Key pitch ON/OFF, etc.
2. Pitch bend, modulation wheel, sustain switch, etc.
3. Voice number.

• Connecting the MIDI Cable

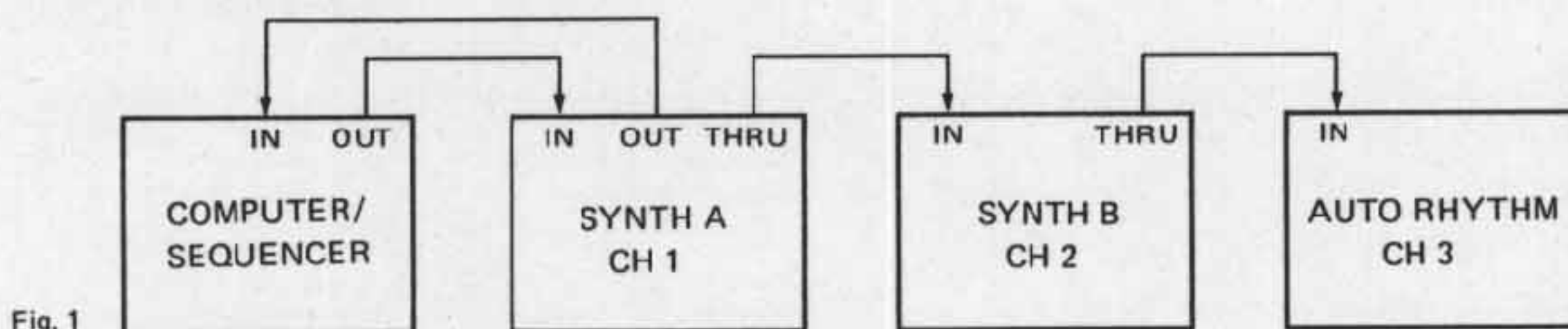


Fig. 1

As can be seen in figure 1, the data output from the sequencer is transmitted via a single MIDI cable and input to synthesizer A, where it is sent to the next instrument to be controlled via the THRU terminal. In this case, the sequencer is outputting multi-channel data. Therefore, the desired channel number on the receiving side must be selected accordingly. Both the sending side and the receiving channel numbers will have to be specified with the system shown in figure 2.

• System Information

Certain types of data can be transferred between certain groups of instruments of the same manufacturer.

The following types of data can be exchanged using the YAMAHA DX7 and/or DX9.

1. Data for one voice or for all voices.
2. The data for a single parameter within a certain voice.
3. The data for a single parameter within the FUNCTIONS.

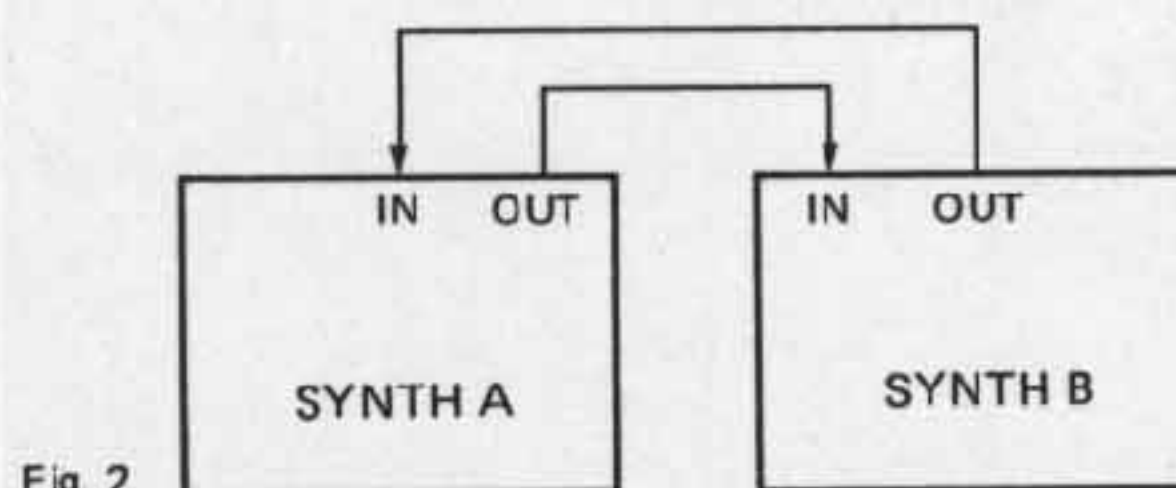
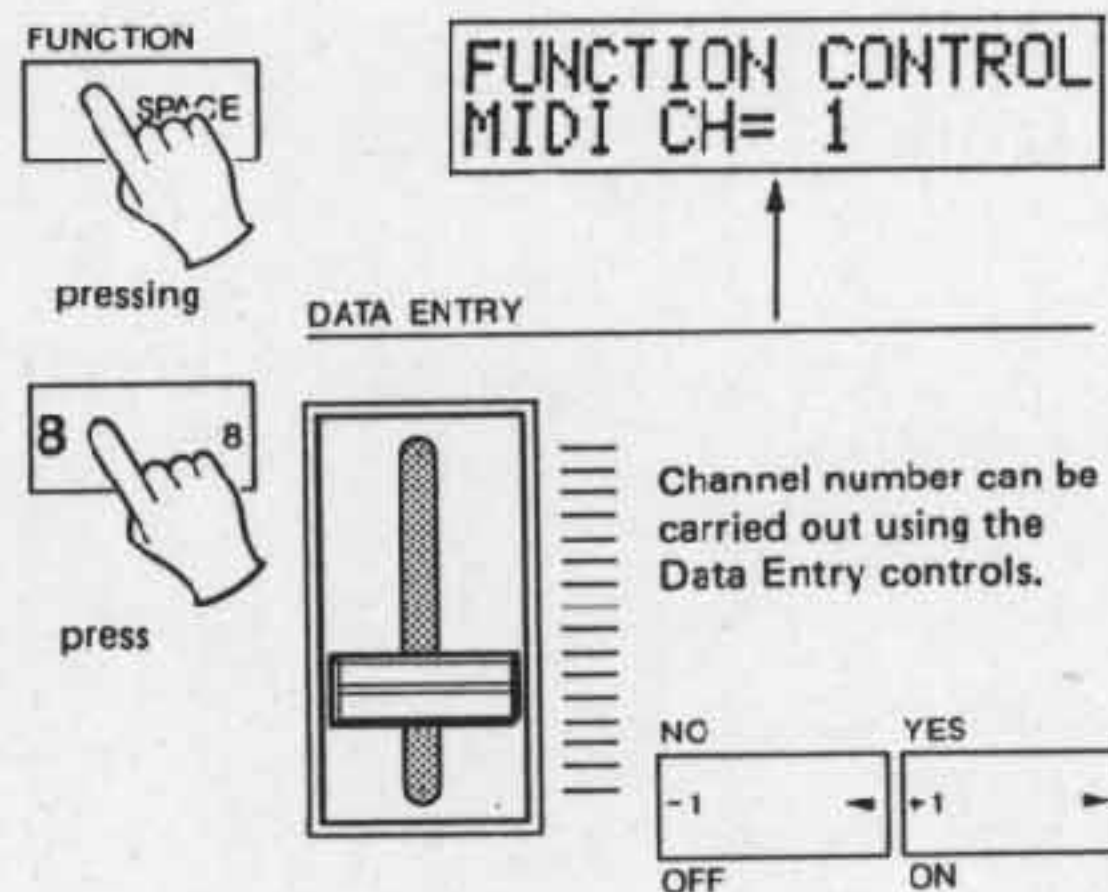


Fig. 2

• Selecting the Receiving Channel

While the unit is in the FUNCTION mode, pressing **8** will produce the display shown in the figure. The selection of the MIDI receiving channel number can be carried out using the DATA ENTRY controls. Select system information YES/NO for both the receiver and the transmitter. Pressing **8** again will produce the display "SYS INFO UNAVAIL". Press **-** to change this to "AVAIL", and the instrument will enter the system information transmit/receive mode.



USING MIDI.

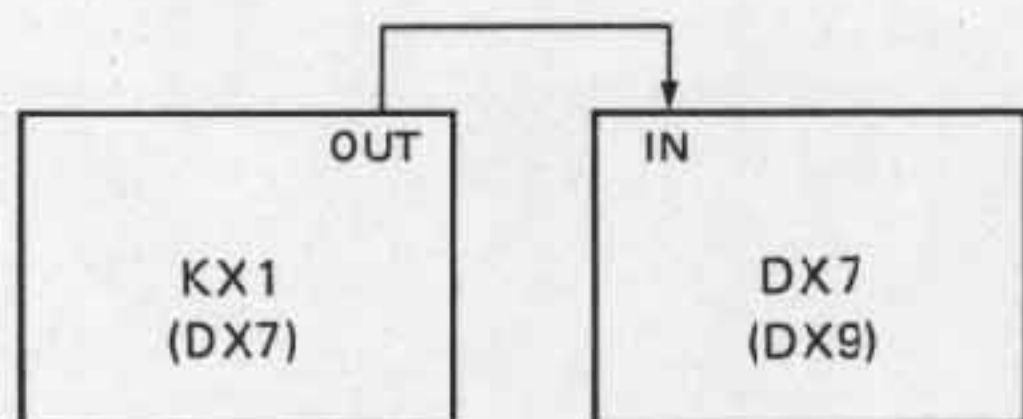
● Real-Time Control

1. Sequencer Controlled Automatic Performance

With the system shown in figure 1, let us use the DX7 as synthesizer A, and the DX9 as synthesizer B. Specify the DX7 receiving channel as 1, and the DX9 receiving channel as 2. This will enable automatic performance under sequencer control.

2. Remote Control Performance

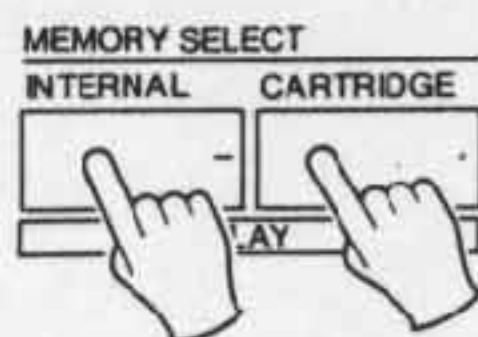
Hooking up the remote keyboard KX1 to a DX7 as shown in the figure, will enable you to remotely control the DX7 from the KX1 keyboard. In addition, by connecting a DX7 and a DX9, the DX9 can be controlled from the DX7 keyboard. The DX7's send channel number should also be specified as 1.



● Transmit System Information

1. Transmit Single Voice Data

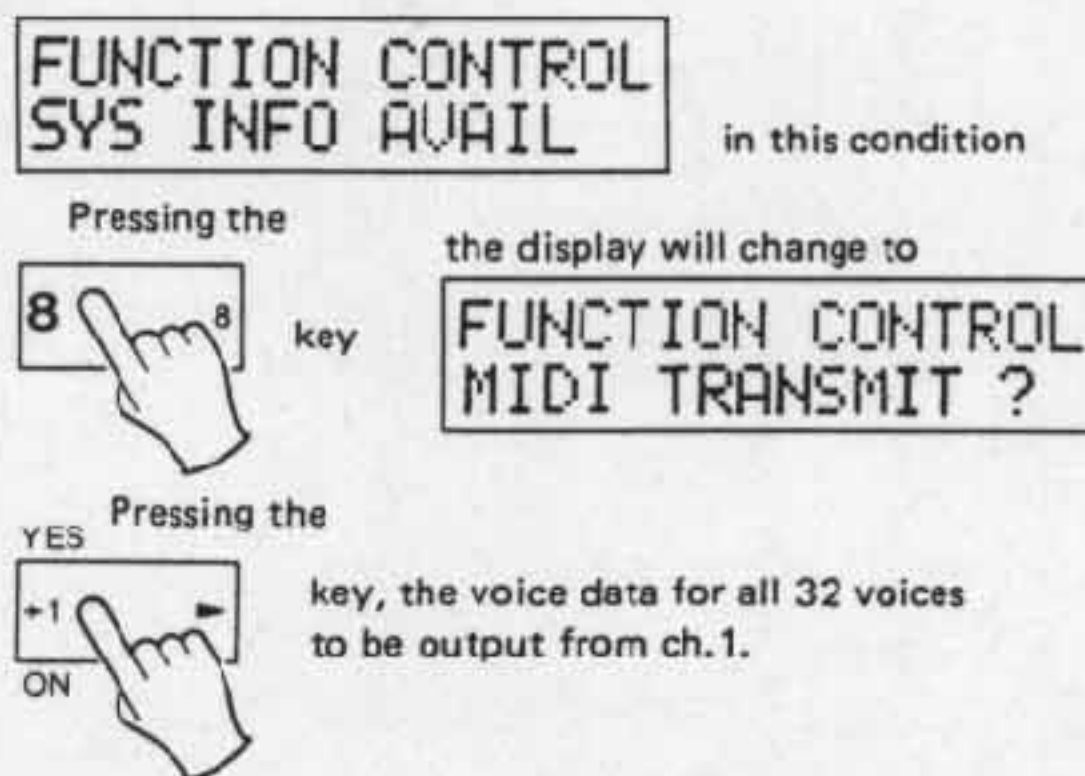
When the display appears as shown in the figure, press either **INTERNAL** or **CARTRIDGE**. Then press the voice number key for the voice you wish to send. The corresponding voice data will be output from MIDI OUT.



Press the voice number key for the voice you wish to send.

2. Transmit Voice Data for All 32 Voices

Press **8** when the display appears as shown in the upper area of the figure. The display will change to that shown in lower area of the figure. Pressing **+1** will cause the voice data for all 32 voices to be output from MIDI OUT.



3. Transmit Voice or FUNCTION Parameters

When the display reads "SYS INFO AVAIL", press either **EDIT** or **FUNCTION**. Pressing the key corresponding to the parameter that you wish to transmit will output the data for that parameter from MIDI OUT.

Note: For all of the above, the transmit channel number of the DX7 is 1.

● Receiving System Information

Select the same number for both the receive and the transmit channels. When the display reads "SYS INFO AVAIL", the instrument will be ready to receive system information.

1. Receiving Single Voice Data

First, Set the INTERNAL MEMORY PROTECT to OFF. When single voice data is received, the panel displays the message "INTERNAL VOICE" and the received voice name, the first character of which will flash.

2. Receiving the Voice Data for All 32 Voices

Switching the PROTECT off for the INTERNAL memory, will cause the voice data for all 32 voices to be memorized into the internal memory.

3. Receiving Voice or FUNCTION Parameters

When receiving this information, the unit will vary the data for that particular parameter.

LET'S ACTUALLY CREATE A VOICE

EDIT OPERATION

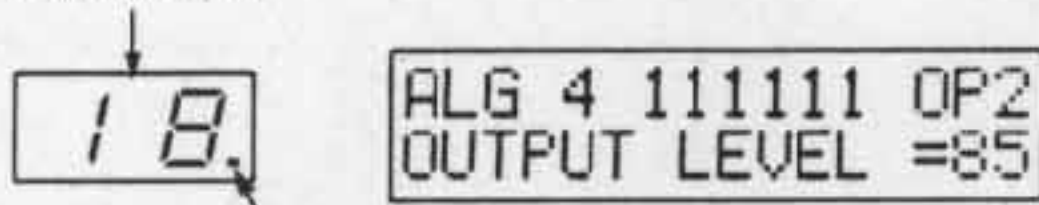
Using the EDIT mode of the DX7, you can modify the pre-programmed voices or even create your own original voices.

1. Modifying a pre-programmed voice

- 1) First, select the pre-programmed voice you wish to modify. Select either the internal or cartridge memory, and then the preset number 1 to 32.
- 2) Enter the EDIT mode by pressing the **EDIT** key.
- 3) Select the parameters you wish to modify and change their values.

A small dot will appear next to the display voice number when there is a data modification.

Voice number



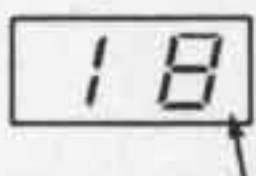
The dot will appear when any data has been modified.

When you wish to hear what the original voice sounded like, press the **EDIT/COMPARE** key once again. The voice number will flash and the sound of the original voice will be reproduced (during this procedure, you can not modify data). Pressing the **EDIT/COMPARE** key will cause the DX7 to revert to the original voice. When you wish to continue your efforts in voice creation, press the **EDIT/COMPARE** key again. In this manner, you can compare your sound with that of the original voice in order to see how your voice is progressing.

EDIT/
COMPARE



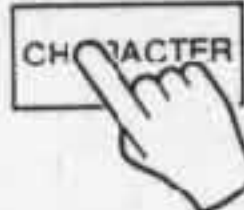
You wish to hear the original voice, press the key again.



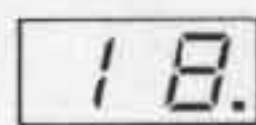
the voice number will flash

ALG 4 111111 OP2
OUTPUT LEVEL =99

EDIT/
COMPARE



You wish to continue editing
press the key again



ALG 4 111111 OP2
OUTPUT LEVEL =85

- 4) Store the edited voice in the internal memory. See the STORE/SAVE/LOAD section on page 19, and carry out the store procedures using it as a reference.

2. Creating an Original Voice.

To create an entirely new voice, you can use one of the pre-programmed voices as the "raw material" for modification. However, the feed-back and LFO parameters can complicate the procedure and make things quite difficult. Therefore, it is advisable to use the "basic" voice parameters when beginning voice creation from scratch. We'll create a CLARINET sound to exemplify this procedure.

- 1) Press the **FUNCTION** key to set the DX7 to the **FUNCTION** mode.

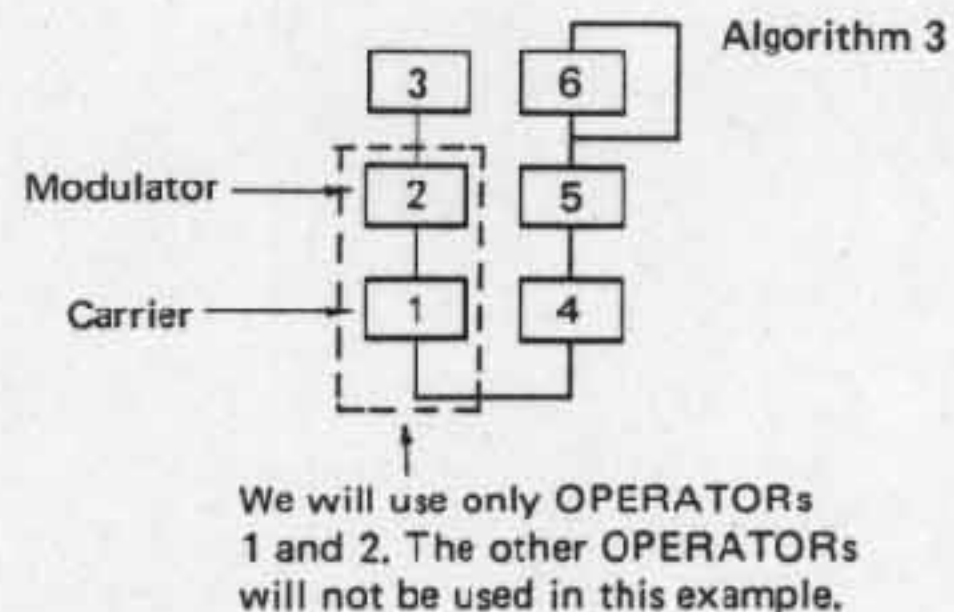
Press **VOICE INIT** key. Next press the **YES** key. The display will then show "ARE YOU SURE?". Pressing the **YES** key once again will cause the voice data to be set to the basic settings, and the DX7 will exit the **FUNCTION** mode and enter the **EDIT** mode. It is now ready to create new sounds.

2) Selecting the Algorithm

Choose one algorithm out of the 32 available. For example, we'll select Algorithm 3. Press the **ALGORITHM** key. Set the **DATA ENTRY** section to 3.

Set the respective values at the
DATA ENTRY section.

ALG 3 111111
ALGORITHM SELECT



- 3) Disable all **OPERATORS** that are not immediately necessary.

The carrier parameters should be defined first. The carriers for algorithm 3 are **OPERATORS** 1 and 4. As we will only be using **OPERATORS** 1 and 2 for this example, **OPERATOR** 1 will act as the sole carrier. First, set the output level of **OPERATOR** 1 to any value. Press the **OPERATOR OUTPUT LEVEL** key. Set **OPERATOR** 1 to 99. Set **OPERATOR** 2 to 70. The unused **OPERATORS** 3 through 6 should be set to 0. Pressing the **OPERATOR SELECT** key, select the **OPERATORS**. Disable all **OPERATORS** not immediately necessary.

Press the **OPERATOR ON-OFF** keys 2 through 6. OPERATORS 2 through 6 are now disabled.

4) Determining the CARRIER FREQUENCY.

When attempting to create the sound of a clarinet, the CARRIER versus MODULATOR frequency ratio should be set to 1:2. Press the **FREQUENCY FINE** and **FREQUENCY COARSE** keys, and set the pitch to 1.00.

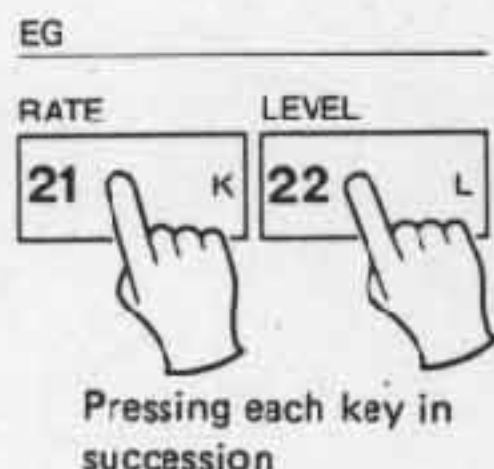
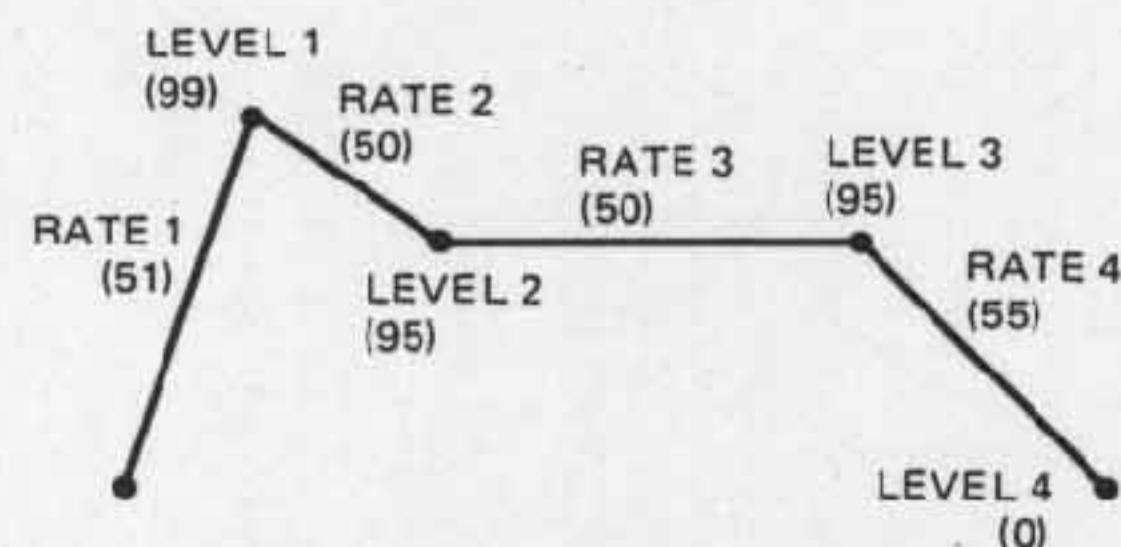
5) Determining the amount of DETUNE.

In our attempt to create the sound of a clarinet, only OPERATOR 1 will be functioning as a carrier and therefore DETUNE should be set to 0. Press the **DETUNE** key. Set the value of "OSC DETUNE" to 0.

6) Setting the ENVELOPE GENERATOR.

First, we'll set the ENVELOPE GENERATOR of the carrier. For example, we'll set the parameters to the following values:

Pressing each key in succession will cause the values to advance from 1 to 4.



ALG 4 111111 OP1
EG RATE 1 =51

ALG 4 111111 OP1
EG LEVEL 1 =99

With the DX7 set in this mode, play on the keyboard and listen to the sound produced. The sound produced will be a pure sine wave from the carrier only. Now set the envelope of the carrier for an appropriate sound. Next, we'll set up the modulator data.

7) Using the modulator

In this attempt to create the sound of a clarinet, OPERATOR 2 will be functioning as the sole modulator. Press the **OPERATOR 2** key. OPERATOR 2 is now engaged.

8) Setting the MODULATOR FREQUENCY

Set the MODULATION FREQUENCY to 2.00 using the **FREQUENCY COARSE** and **FREQUENCY FINE** keys.

Set the DETUNE for OPERATOR 2 to 0. Set the "OSC DETUNE" to 0 using the **DETUNE** key.

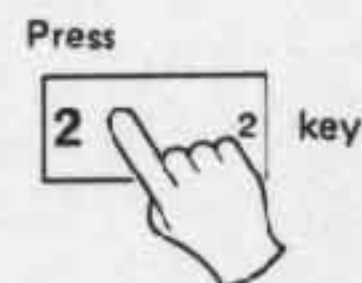
9) Setting the MODULATOR ENVELOPE GENERATOR.

To create the sound of a clarinet, the parameters of the modulator's envelope generator should be identical to the parameters of the carrier's envelope generator. This process can be carried out in a few seconds by using the COPY function. Using the COPY function, copy the OPERATOR 1 envelope generator data to OPERATOR 2. Set the display to "OP 1" by pressing the **OPERATOR SELECT** key.

While pressing the **STORE** key, press this key. The display will show the number of the operator that was selected with the **OPERATOR SELECT** key. This signifies that the envelope generator parameters, keyboard level scaling and keyboard rate scaling parameters of OPERATOR 1 are being copied to OPERATOR 2.



While pressing the



EG COPY
from OP1 to OP?

Display will show the OP number that was selected with the OPERATOR SELECT key.

EG COPY
from OP1 to OP2

This signifies that the EG data of OP1 are being copied to OP2.

10) Adjusting Tone

At this point, listen to the sound. The sound produced will probably be a little harsh. In this case, lower the OUTPUT LEVEL of OPERATOR 2 by pressing on the **OPERATOR SELECT** key. While pressing on the **OPERATOR OUTPUT LEVEL** key, lower the value of the output level using the DATA ENTRY slide control. With an output level setting of 61, the sound produced will approach that of an actual clarinet. Let's set the output level of OPERATOR 2 to 61. Later on, with more careful control of the envelope generators of OPERATORS 1 and 2, you can tailor the sound more precisely for your requirements.

11) Adding Modulation

Let's add a vibrato effect to the clarinet sound produced. Set the modulation controls so that the MODULATION wheel can be used to add a subtle touch of vibrato.

1. Set the LFO Waveform.

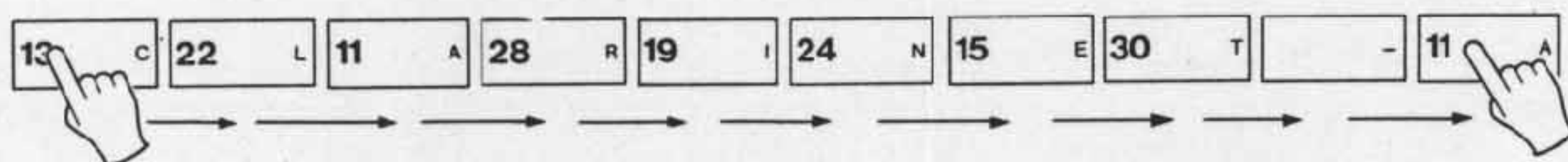
Pressing the **LFO WAVE** key, set the wave form to "TRIANGLE".

2. Set the LFO Speed.
Pressing the **[SPEED]** key, set the LFO's speed to "28". This will produce a moderately slow vibrato.
3. Set the LFO DELAY.
Pressing the **[DELAY]** key, set the LFO DELAY to "36". The vibrato effect will begin a few seconds after a key is played.
4. The modulation controls should be set so that the vibrato effect will be controlled solely by the Modulation wheel. Pressing the **[PMD]** key, set the "LFO PM DEPTH" to "0". Pressing the **[AMD]** key, set the "LFO AM DEPTH" to "0". The setting for both OPERATORS 1 and 2 should be "0".
5. Set the MODULATION SENSITIVITY.
Pressing the **[PITCH]** key, set the "P MOD SENS" to "1". This means that the pitch will be modulated slightly by the LFO.
Pressing the **[AMPLITUDE]** key, set the "A MOD SENS" to "0". The settings for both OPERATORS 1 and 2 should be "0".
6. Control the Vibrato Effect with the Modulation Wheel.
Pressing the **[FUNCTION]** keys, set the DX7 to the FUNCTION mode.

7. Set the Modulation Wheel RANGE.
Pressing the **[MODULATION WHEEL RANGE]** key, set the RANGE to "33". This produces a slight amount of vibrato.
8. Turn PITCH ON, AMPLITUDE OFF.
Pressing the **[PITCH]** key, set the PITCH to "ON". This signifies that the modulation wheel controls the LFO modulation of the pitch.
Pressing the **[AMPLITUDE]** key, set the AMPLITUDE to "OFF".
9. Set the EG (Envelope Generator) BIAS to OFF.
Pressing the **[EG BIAS]** key, set the EG BIAS to "OFF".
Now, by manipulating the MODULATION WHEEL, you should be able to control the amount of vibrato on the clarinet while playing.

12) Naming the New Voice

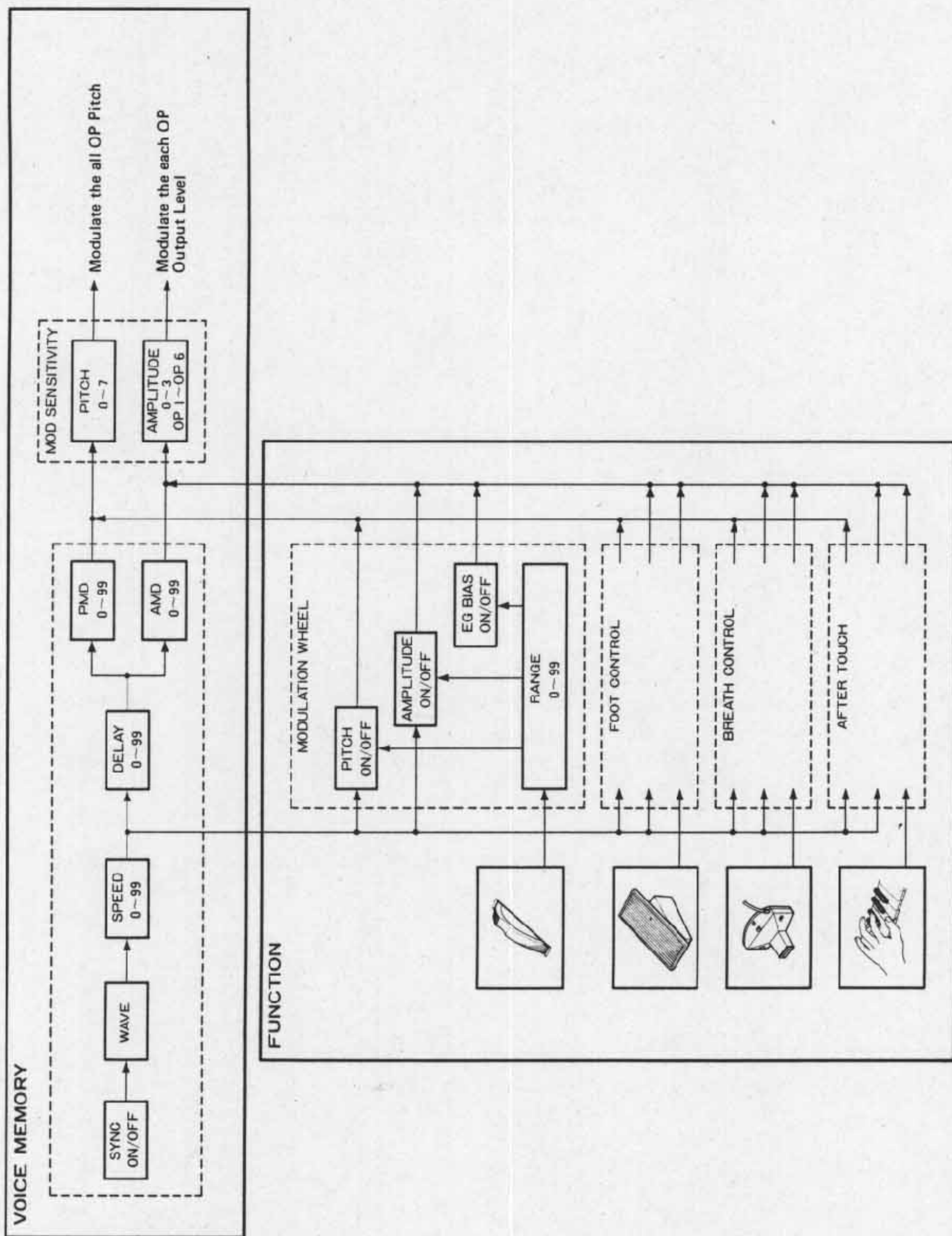
Nearly any name can be given to a VOICE, as long as it is within ten characters in length. As the sound produced here is close to that of an actual clarinet, let us call this VOICE: "CLARINET-A". Pressing the **[EDIT/COMPARE]** key, set the DX7 back to the EDIT mode. While pressing the **[NAME]** key, press the character keys in succession as shown in the figure. The cursor will move every time you write in a new character.



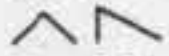
3) Saving Your Original Voice In Memory.

Refer to the STORE/SAVE/LOAD section on page 19.

LFO BLOCKDIAGRAM



SPECIFICATIONS

Keyboard	61 keys, C ₁ ~ C ₈ (Initial & After touch sensitive)
Sound Source	FM Tone Generator: 6 operators, 32 algorithms
Simultaneous Output Notes	POLY mode: 16 notes MONO mode: 1 note
Internal RAM Memory	32 Bank (32 Memory)
External ROM Memory	32 Bank x 2 (64 Memory)
External RAM Memory	32 Bank (32 Memory)
Mode Selectors	STORE, MEMORY PROTECT (INTERNAL, CARTRIDGE), OPERATOR SELECT, EDIT/ COMPARE, PLAY-MEMORY SELECT (INTERNAL, CAR- TRIDGE), FUNCTION
Controls	VOLUME, DATA ENTRY [lever, switch: YES (ON)/NO (OFF)], PITCH WHEEL, MODULATION WHEEL, OPERATOR ON-OFF, EG COPY
Voice Parameters	
ALGORITHM	1 ~ 32
FEED BACK	0 ~ 7
LFO WAVE	 S/H
SPEED	0 ~ 99
DELAY	0 ~ 99
PITCH MODULATION	
DEPTH	0 ~ 99
AMPLITUDE MODULA- TION DEPTH	0 ~ 99
SYNC	ON/OFF
PITCH MODULATION	
SENSITIVITY	0 ~ 7
AMPLITUDE MODULA- TION SENSITIVITY	0 ~ 3
OSCILLATOR MODE	RATIO/FIXED (HZ)
SYNC	ON/OFF
FREQUENCY	
COARSE	0.5 ~ 31
FREQUENCY	
FINE	(FREQ COARSE) x 1.0 ~ 1.99
DETUNE	-7 ~ +7
EG RATE (1 ~ 4)	0 ~ 99
LEVEL (1 ~ 4)	0 ~ 99
KEYBOARD LEVEL SCALING	
BREAK POINT	A-1 ~ C8
CURVE (L/R)	± LIN/± EXP
DEPTH (L/R)	0 ~ 99
KEYBOARD RATE SCALING	0 ~ 7
OPERATOR OUTPUT LEVEL	0 ~ 99
KEY VELOCITY SENSI- TIVITY	0 ~ 7
PITCH EG RATE (1 ~ 4)	0 ~ 99
LEVEL (1 ~ 4)	0 ~ 99
KEY TRANSPOSE	±2 octaves
VOICE NAME	within 10 characters

Function Parameters	
MASTER TUNE	±75 cents
POLY/MONO	
PITCH BEND RANGE	0 ~ 12
STEP	0 ~ 12
PORTAMENTO MODE	
POLY	RETAIN/FOLLOW
MONO	FULL TIME/FINGERED
GLISSANDO	ON/OFF
TIME	0 ~ 99
MODULATION WHEEL	
RANGE	0 ~ 99
PITCH	ON/OFF
AMPLITUDE	ON/OFF
EG BIAS	ON/OFF
FOOT CONTROL	
RANGE	0 ~ 99
PITCH	ON/OFF
AMPLITUDE	ON/OFF
EG BIAS	ON/OFF
BREATH CONTROL	
RANGE	0 ~ 99
PITCH	ON/OFF
AMPLITUDE	ON/OFF
EG BIAS	ON/OFF
AFTER TOUCH	
RANGE	0 ~ 99
PITCH	ON/OFF
AMPLITUDE	ON/OFF
EG BIAS	ON/OFF
EDIT RECALL	
VOICE INITIALIZE	
CARTRIDGE FORMATTING	
BATTERY CHECK	
CARTRIDGE SAVE/LOAD	
MIDI CHANNEL	1 ~ 16
SYSTEM INFORMA- TION	AVAILABLE/UNAVAILABLE
MIDI TRANSMIT	
Connecting Terminal	OUTPUT (600 Ω: UNBALANCED) PHONES (8-150 Ω)
Control Terminal	FOOT SWITCH (SUSTAIN, PORTAMENTO), FOOT CONTROL (VOLUME, MODULATION) BREATH CONTROL MIDI (IN, OUT, THRU)
Others	LCD DISPLAY CARTRIDGE INTERFACE
Dimensions/Weight	101.8W x 10.2H x 32.9D cm (40" x 4" x 13")/ 14.2 kg (31.2 lbs)
Power Consumption	40 W
Accessories	ROM Cartridge x 2 (64 voices x 2), Music Stand

* Specifications and design are subject to change without notice for improvement.

VOICE DATA LIST

This table shows all the data of the first sound (BRASS 1) in the internal memory. The upper part of each select button is the Voice parameter and the lower part is the Function parameter. The Voice parameter is memorized as the table indicates. The Function parameter can be changed as you desire.

YAMAHA **DX7** **VOICE DATA LIST**

DATE/PRESET No.: /

VOICE NAME: BRASS 1

PROGRAMMER :

DATE/PRESET No.:

VOICE NAME: BRASS 1

PROGRAMMER:

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

OP

6

5

4

3

2

1

22

7

SINE

37

0

5

0

3

0

0

0

ALGO-RITHM

FEED-BACK

WAVE

SPEED

DELAY

PMD

AMD

SYNC

PITCH

AMPLI-TUDE

PITCH BEND

PITCH RANGE

STEP

PORAMENTO

GLISS-ANDO

MODE

POLY/MONO

TIME

7

0

POLY

0

0

0

[illegible]

MODE : R(RATIO), H(Hz)

/

PROGRAMMER :

POLY/ MONO	PITCH BEND		PORTAMENTO		
	RANGE	STEP	MODE	GLISS- ANDO	TIME

Op	6	5	4	3	2	1
----	---	---	---	---	---	---

MIDI DATA FORMAT

1. Transmission Data

1-1. Channel informaton

1001nnnn Key ON & Channel number (n=0; ch1)
 0kkkkkkk Key number (k=36; C₁ ~ k=96; C₆)
 0vvvvvvv Key velocity (v=0; Key OFF, v=1; ppp ~ v=127; fff)

 1011nnnn Control change & Channel number (n=0; ch1)
 0ccccccc Control number
 0vvvvvvv Control value

C	Parameter	V
1	Modulation wheel	0 ~ 127
2	Breath controller	0 ~ 127
4	Foot controller	0 ~ 127
6	Data entry knob	0 ~ 127
64	Sustain foot switch	0 ; OFF, 127 ; ON
65	Portamento foot switch	0 ; OFF, 127 ; ON
96	Data entry +1	127 ; ON only
97	Data entry -1	127 ; ON only

1100nnnn Program change & Channel number (n=0 ; ch1) (transmitted when it is unavailable)
 0ppppppp Program number (p=0:INT1 ~ p=31:INT32, p=32:CRT1 ~ p=63:CRT32)
 1101nnnn After touch & Channel number (n=0;ch1)
 0vvvvvvv Touch value (0 ~ 127)

 1110nnnn Pitch bender & Channel number (n=0 ; ch1)
 0vvvvvvv Pitch bender value LS byte
 0vvvvvvv Pitch bender value MS byte (0 ~ 64 ~ 127)

MS byte	LS byte
0 ~ 64	0
65 ~ 127	2 (MS byte-64)

1-2-2. Bulk data of 1 voice

11110000 Status byte
 0iiiiiii Identification number (i=67; YAMAHA)
 Sub status (s=0) & Channel number (n=0 ; ch1)
 0ssnnnn Format number (f=0 ; 1 voice)
 0bbbbbbb Byte count MS byte (b=155 ; 1 voice)
 0bbbbbbb Byte count LS byte
 0ddddddd Data 1st byte
 }
 0ddddddd Data 155th byte
 0eeeeeee Check Sum (add 155th byte and make the 2's complement)
 11110111 EOX

1-2-3. Bulk data of 32 voices

11110000 Status byte
 0iiiiiii Identification number (i=67 ; YAMAHA)
 0ssnnnn Sub status (s=0) & Channel number (n=0 ; ch1)
 0ffffff Format number (f=9 ; 32 voices)
 0bbbbbbb Byte count MS byte (b=4096 ; 32 voices)
 0bbbbbbb Byte count LS byte
 0ddddddd Data 1st byte
 }
 0ddddddd Data 4096th byte
 0eeeeeee Check Sum (add 4096th byte and make the 2's complement)
 11110111 EOX

1-2-4. Parameter change

11110000 Status byte
 0iiiiiii Identification number (i=67 ; YAMAHA)
 0ssnnnn Sub status (s=1) & Channel number (n=0 ; ch1)
 0ggggggp Parameter group number (g=0 ; DX common Voice parameter, g=2 ; DX7 Function parameter)
 0ppppppp Parameter number
 0ddddddd Data
 11110111 EOX

1-2. System exclusive information

1-2-1. MIDI active sensing

11111110 Status byte

This message usually requests transmission every 80msec (except for the period of transmitting/receiving the bulk dump).

g=0 : DX 共通 Voice parameter

P	Parameter	d
0	OP6 EG RATE 1	0 ~ 99
1	" RATE 2	"
2	" RATE 3	"
3	" RATE 4	"
4	" LEVEL 1	"
5	" LEVEL 2	"
6	" LEVEL 3	"
7	" LEVEL 4	"
8	OP6 KEY BOARD LEVEL SCALE BREAK POINT	"
9	" LEFT DEPTH	"
10	" RIGHT DEPTH	"
11	" LEFT CURVE	0 ~ 3
12	" RIGHT CURVE	"
13	OP6 KEY BOARD RATE SCALLING	0 ~ 7
14	OP6 MOD SENSITIVITY AMPLITUDE	0 ~ 3
15	OP6 OPERATOR KEY VELOCITY SENSITIVITY	0 ~ 7
16	OP6 OPERATOR OUTPUT LEVEL	0 ~ 99
17	OP6 OSCILLATOR MODE	0 ~ 1
18	OP6 OSCILLATOR FREQUENCY COARSE	0 ~ 31
19	" FINE	0 ~ 99
20	DETUNE	0 ~ 14
21	OP5 ~ OP1	
125		
126		
127		
128		
129	" RATE 4	"
130	" LEVEL 1	"
131	" LEVEL 2	"
132	" LEVEL 3	"
133	" LEVEL 4	"
134	ALGORITHM SELECT	0 ~ 31
135	FEED BACK	0 ~ 7
136	OSCILLATOR SYNC	0 ~ 1
137	LFO SPEED	0 ~ 99
138	" DELAY	"
139	" PMD	"
140	" AMD	"

P	Parameter	d
141	LFO SYNC	0 ~ 1
142	" WAVE	0 ~ 4
143	MOD SENSITIVITY PITCH	0 ~ 7
144	TRANPOSE	0 ~ 48
145	VOICE NAME 1	ASCII
154	VOICE NAME 10	ASCII
155	OPERATOR ON/OFF	D ₆ D ₅ D ₄ D ₃ D ₂ D ₁ D ₀
	0=OFF, 1=ON	0 OP1 OP2 OP3 OP4 OP5 OP6

g=2 : DX7 Function parameter

P	Parameter	d
64	MONO/POLY MODE CHANGE	0 ~ 1
65	PITCH BEND RANGE	0 ~ 12
66	" STEP	0 ~ 12
67	PORTAMENT MODE	0 ~ 1
68	" GLISSAND	0 ~ 1
69	" TIME	0 ~ 99
70	MODULATION WHEEL RANGE	0 ~ 99
71	" ASSIGN	0 ~ 7
72	FOOT CONTROLLER RANGE	0 ~ 99
73	" ASSIGN	0 ~ 7
74	BREATH CONTROLLER RANGE	0 ~ 99
75	" ASSIGN	0 ~ 7
76	AFTER TOUCH RANGE	0 ~ 99
77	" ASSIGN	0 ~ 7

2. Reception Data

2-1. Channel information

This message can be received when the channel number of reception data accords with the channel number of the DX7.

1000nnnn Key OFF & Channel number

(n=0 ; ch1 ~ n=15 ; ch16)

0kkkkkkk Key number (k=0, 1 ; C₂[#] ~ k=127 ; G₈)

0vvvvvvvv Key velocity (v : ignored)

1001nnnn Key ON & Channel number

(n=0 ; ch1 ~ n=15 ; ch16)

0kkkkkkk Key number (k=0, 1 ; C₂[#] ~ k=127 ; G₈)

0vvvvvvvv Key velocity

(v=0 ; Key OFF, v=1 ; ppp ~ v=127 ; fff)

1011nnnn Control change & channel number

(n=0 ; ch1 ~ n=15 ; ch16)

0ccccccc Control number

0vvvvvvvv Control value

c	Parameter	v
1	Modulation wheel	0 ~ 127
2	Breath controller	0 ~ 127
4	Foot controller	0 ~ 127
5	Portamento time	0 ~ 127
6	Data entry knob (MASTER TUNE only)	0 ~ 127
7	Volume (LS 4 bit are ignored.)	0 ~ 127
64	Sustain foot switch	0 ; OFF, 127 ; ON
65	Portamento foot switch	0 ; OFF, 127 ; ON
96	Data entry +1	127 ; ON only
97	Data entry -1	127 ; ON only
125	OMNI all key off	ignored
126	MONO all key off	1
127	POLY all key off	ignored

1100nnnn Program change & Channel number

(n=0 ; ch1 ~ n=15 ; ch16)

0pppppppp Program number (p=0:INT1 ~ p=31:INT32

p=32:CRT1 ~ p=63:CRT32)

1110nnnn Pitch bender & Channel number

(n=0 ; ch1 ~ n=15 ; ch16)

0vvvvvvvv Pitch bender value LS byte (ignored)

0vvvvvvvv Pitch bender value MS byte (0 ~ 64 ~ 127)

2-2. System exclusive information

2-2-1. MIDI active clock

This message usually requests reception regardless of MIDI channel number. When this clock is suspended longer than 666 msec (except for receiving the bulk data), the on-going sound turned OFF.

2-2-2. Bulk data of 1 voice

This message requests reception with the same format as transmission when MIDI channel numbers are corresponded, system information is available, and Memory protect is off.

2-2-3. Bulk data of 32 voices

This message requests reception with the same format as transmission when MIDI channel numbers are corresponded, system information is available, and Memory protect is off.

2-2-4. Parameter change

Voice parameter and function parameter request reception with the same format as transmission when MIDI channel numbers are corresponded, system information is available, and Memory protect is off.

2-2-5.

This message requests the performance data of the DX1 A-side.

11110000 Status byte

0 i i i i i i Identification number (i=67:YAMAHA)

0 s s s n n n n Sub status (s=0) & Channel number

(n=0:ch1 ~ n=15:ch16)

0 f f f f f f f Format number (f=2:1 performance)

0 b b b b b b b Byte count MS byte

0 b b b b b b b Byte count LS byte (b=94:1 performance)

0 d d d d d d d Data 1st byte

}

}

0 d d d d d d d Data 94th byte

0 e e e e e e e Check sum (add 94th byte and make the complement on 2)

11110111 EOX

SINCE 1887  **YAMAHA**
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN