YAMAHA®

AUTHORIZED PRODUCT MANUAL

TX81Z

FM TONE GENERATOR

YAMAHA

TX81Z

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OWNER'S MANUAL

INTRODUCTION

Thank you for purchasing the Yamaha TX81Z FM Tone Generator. The TX81Z is an 8-note polyphonic FM tone generator that can act as up to 8 independent instruments. It can be used in many ways, both simple and complex. First, you will probably want to try out the preset voices. The simple instructions on the next page tell you how. Then, to get an idea of the full range of possibilities, read "How Does the TX81Z Work?". Detailed explanations of each mode follow. The chapter entitled "Ideas and Suggestions" has some interesting ways to use the TX81Z. Various supplementary reference materials are also included.

CONTENTS

FEATURES

*Produces up to 8 different voices simultaneously, making it ideal for use with a MIDI sequence recorder.

*Voices and all memory parameters can be edited from the front panel. No separate programming device or computer is necessary.

*New LSI tone generator chip can perform FM synthesis using a total of 8 different waveforms.

*"Pseudo-reverb" effect programmable for each voice.

*Either Fixed or Ratio frequencies are selectable for each operator.

*Two independent LFOs and a Vibrato Generator.

*While voice and function data is compatible with DX21/27/27S/100 voice data, the sound quality has been upgraded, and the resolution of the EGs has been improved.

*128 ROM factory preset voices.

*32 user-programmable voice memories.

*24 user-programmable performance memories.

*13 Microtonal Scales (2 user-programmable and 11 preset).

*Pan, Single Note Chord, and Transposed Delay effects.

*Save and load TX81Z memory data to and from a cassette.

*Transmit and receive TX81Z memory data via MIDI.

*Program Change Table for re-directing program change messages.

*Alternate Voice Assign lets you play a different voice with each successive note.

SIMPLE PLAYING INSTRUCTIONS

CONNECTIONS

Connect the MIDI OUT of your keyboard to the TX MIDI IN, and connect the audio output of the TX to an amp/speaker system as shown. Set the transmission channel of your keyboard to channel 1 (see the owner's manual for your keyboard).
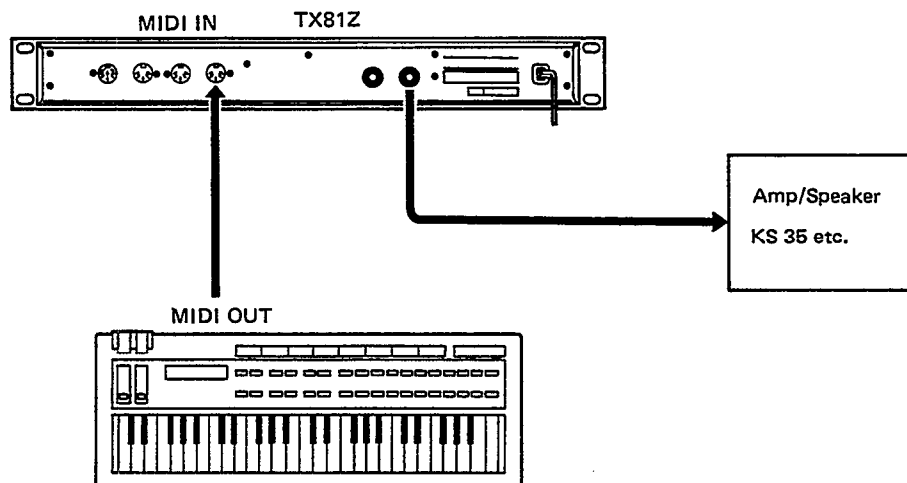
When you turn the TX81Z power on, it will flash each LED, display "*YAMAHA TX81Z* <Good morning!!>" for a few seconds (this greeting can be changed, see p.46), and then display whatever function was selected when the power was turned off. Press SINGLE/PERFORMANCE to make the display read "PLAY SINGLE". (You may have to press it twice,)

Press once or twice


```
PLAY SINGLE
A01   GrandPiano
```

ADJUST VOLUME

Playing the keyboard should produce sound. Adjust the TX81Z output volume by pressing the MASTER VOLUME keys. The LCD will show a bar graph indicating the volume. (To adjust volume, the CURSOR LED must be off.)

LED is off   MASTER VOLUME


```
Master Volume
██████████      75
```
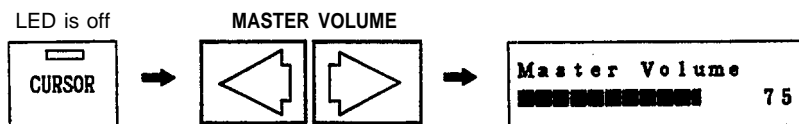
If no sound

*Perhaps the TX81Z MIDI Receive Channel does not match the Transmit Channel of your keyboard. Press UTILITY to get the "UTILITY MODE" display. Use the PARAMETER keys to get the "Midi Control?" display and press "YES" to get "Basic Rcv.Ch=xx". Use the DATA ENTRY keys to set the channel to match the MIDI output channel of your keyboard (or set it to "omni" so it will receive all channels).

*It is possible that the voice is set so that its volume is regulated by a controller such as Foot Controller or Breath Controller. If your keyboard has a volume control slider or a Foot Controller, try moving them up to max position.

SELECT VOICES

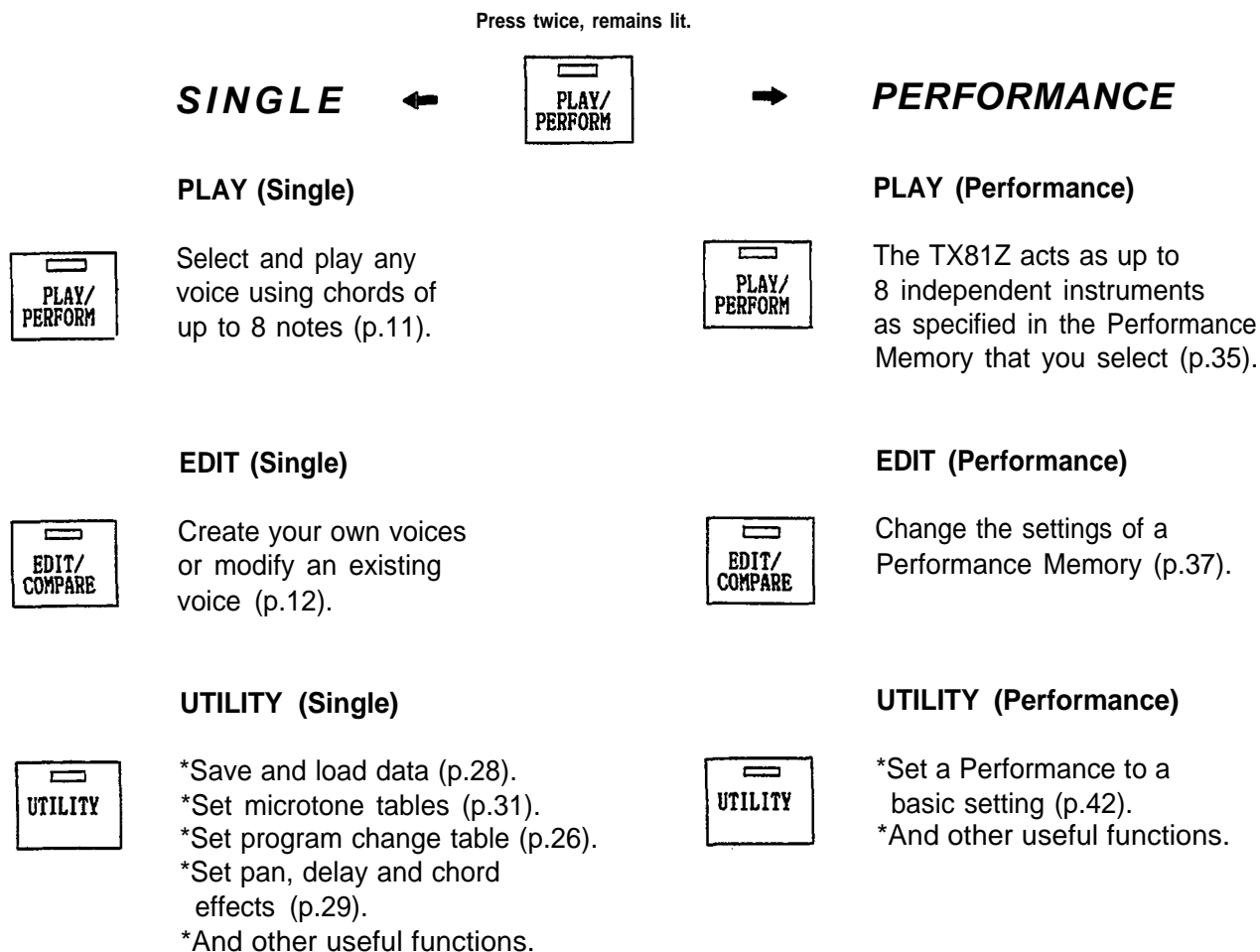The TX81Z has 5 banks of 32 voices. Banks A-D contain factory preset voices. (When the unit is shipped, bank "I" contains selected voices from bank A-D.) Use the PARAMETER keys to select banks I, A, B, C, D. Use the DATA ENTRY keys to select voices 1-32 in each bank.

TX81Z PRESET VOICENAMES

	BANK A		BANK B		BANK C		BANK D
1	GrandPiano	1	Trumpet81Z	1	NylonGuit	1	BaadBreath
2	Uprt Piano	2	Full Brass	2	Guitar # 1	2	VocalNuts
3	Deep Grd	3	FlugelHorn	3	TwelveStrg	3	KrstlChoir
4	HonkeyTonk	4	ChorusBras	4	Funky Pick	4	Metalimba
5	Elec Grand	5	French Horn	5	AllThatJaz	5	WaterGlass
6	Fuzz Piano	6	AtackBrass	6	HeavyMetal	6	BowedBell
7	SkoolPiano	7	SpitBoneBC	7	Old Banjo	7	> >WOW< <
8	Thump Pno	8	Horns BC	8	Zither	8	Fuzzy Koto
9	LoTine81Z	9	MelloTenor	9	ElecBass 1	9	Spc Midiot
10	HiTine81Z	10	RaspAlto	10	SqncrBass	10	Gurgle
11	ElectroPno	11	Flute	11	SynFunkBas	11	Hole in 1
12	NewElectro	12	Pan Floot	12	ElecBass 2	12	Birds
13	DynomiteEP	13	Basson	13	AnalogBass	13	MalibuNite
14	DynoWurlie	14	Oboe	14	Jaco Bass	14	Helicopter
15	Wood Piano	15	Clarinet	15	LatelyBass	15	Flight Sim
16	Reed Piano	16	Harmonica	16	Monoph Bass	16	Brthbells
17	PercOrgan	17	DoubleBass	17	StadiumSol	17	Storm Wind
18	1 6 8 4 2 F	18	BowCello	18	TrumptSolo	18	Alarm Call
19	PumpOrgan	19	BoxCello	19	BCSexyPhon	19	Racing Car
20	<6 Tease>	20	SoloViolin	20	Lyrisyn	20	Whistling
21	Farcheeza	21	HiString 1	21	WarmSquare	21	Space Talk
22	Small Pipe	22	LowString	22	Sync Lead	22	Space Vibe
23	Big Church	23	Pizzicato	23	MellowSqar	23	Timpani
24	AnalogOrgn	24	Harp	24	Jazz Flute	24	FM Hi-Hats
25	Thin Clav	25	ReverbStrg	25	Heavy Lead	25	Bass Drum
26	EZ Clav	26	SynString	26	Java Jive	26	Tube Bells
27	Fuzz Clavi	27	Voices	27	Xylophone	27	Noise Shot
28	LiteHarpsi	28	HarmoPad	28	GreatVibes	28	Snare 1
29	Rich Harpsi	29	FanfarTpts	29	Sitar	29	Snare 2
30	Celeste	30	HiString 2	30	Bell Pad	30	Hand Drum
31	BriteCelst	31	PercFlute	31	PlasticHit	31	Synballs
32	Squeezebox	32	BreathOrgn	32	DigiAnnie	32	Efem Toms

HOW DOES THE TX81Z WORK?

The TX81Z has two main modes. Each main mode has three "sub-modes".

Press twice, remains lit.

SINGLE ← [PLAY/PERFORM] ➡ *PERFORMANCE*

PLAY (Single)

[PLAY/PERFORM]

Select and play any voice using chords of up to 8 notes (p.11).

PLAY (Performance)

[PLAY/PERFORM]

The TX81Z acts as up to 8 independent instruments as specified in the Performance Memory that you select (p.35).

EDIT (Single)

[EDIT/COMPARE]

Create your own voices or modify an existing voice (p.12).

EDIT (Performance)

[EDIT/COMPARE]

Change the settings of a Performance Memory (p.37).

UTILITY (Single)

[UTILITY]

*Save and load data (p.28).
*Set microtone tables (p.31).
*Set program change table (p.26).
*Set pan, delay and chord effects (p.29).
*And other useful functions.

UTILITY (Performance)

[UTILITY]

*Set a Performance to a basic setting (p.42).
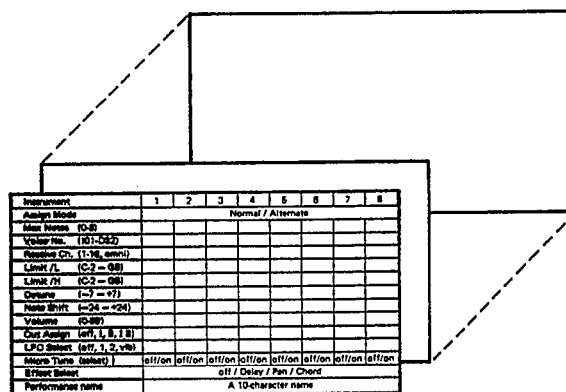*And other useful functions.

Here are the main memory areas inside the TX81Z.

Voice Memory (p.11)

There are 5 voice memory banks, each with 32 voices. Banks A-D are preset, and cannot be changed. Bank I is for you to store your own voices in.

Performance Memory (p.35)

Each performance memory can set the TX81Z to act
as up to 8 independent instruments, each controlled
on a different channel.

Instrument		1	2	3	4	5	6	7	8
Assign Mode		Normal / Alternate							
Max Notes (0-8)									
Voice No. (101-D22)									
Receive Ch. (1-16, omni)									
Limit /L (C-2 ~ G8)									
Limit /H (C-2 ~ G8)									
Octave (-7 ~ +7)									
Note Shift (-24 ~ +24)									
Volume (0-99)									
Out Assign (off, I, II, I II)									
LFO Select (off, 1, 2, vib)									
Micro Tune (select)		off/on	off/on	off/on	off/on	off/on	off/on	off/on	off/on
Effect Select		off / Delay / Pan / Chord							
Performance name		A 10-character name							

Effect Memory (p.29)

Each performance can use one of the three effects.

Effect 1 (Delay)

Delay Time	
Pitch Shift	
Feedback	
Effect Level	

Effect 2 (Pan)

Direction	
Pan Speed	

Effect 3 (Chord)

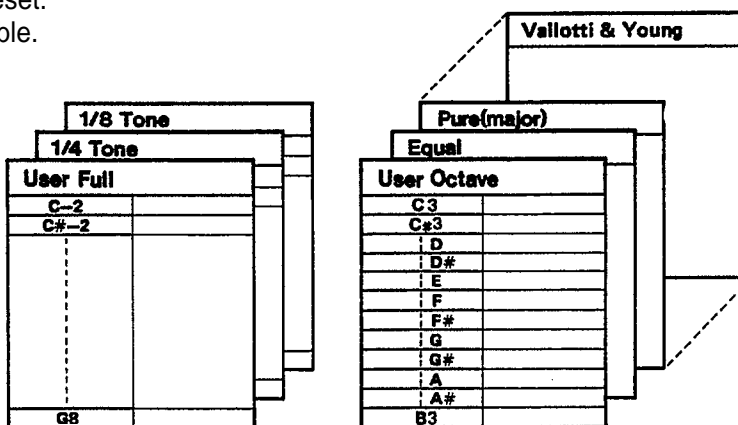| Key on note	C	C#	D	D#	E	F	F#	G	G#	A	A#	B
Chord note												

Program Change Table (p.26)

Incoming program change messages can select any-
thing you want; voices or performance memories.

Program Change Table

Incoming	Selected
1	B19
2	PF24
3	I07
⋮	⋮
127	A32
128	C14

Microtune Tables (p.31)

You can use non-standard scales. 11 scales are preset.
The Octave and Full Settings are user programmable.

Vallotti & Young
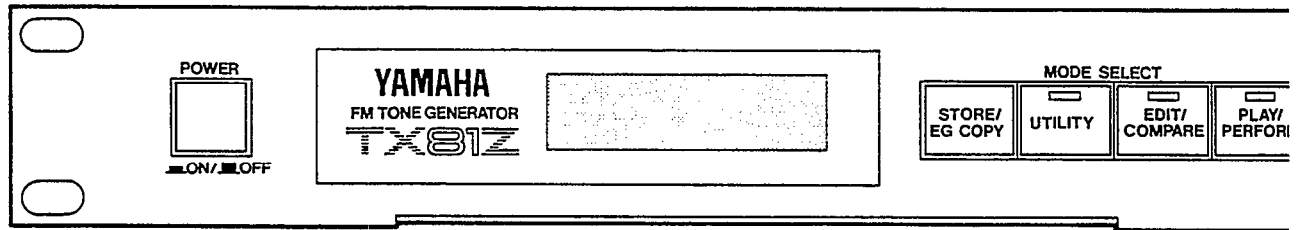
1/8 Tone

1/4 Tone

Pure(major)

Equal

User Full

C-2	
C#-2	
⋮	
G8	

User Octave

C3	
C#3	
D	
D#	
E	
F	
F#	
G	
G#	
A	
A#	
B3	

FRONT/REAR PANEL

FRONT PANEL

LCD
A two-row 16-character Liquid Crystal Display, back-lit for high visibility.

OPERATION GUIDE
A pull-out card lists the main operations of the TX81Z.

STORE/EG COPY
In PLAY/PERFORM mode, this is used to store voices or performances.
In SINGLE EDIT mode, it copies an Envelope setting from one operator to another.

UTILITY
This enters UTILITY mode, where you can save and load data, set up effects and microtonal scales, and perform various other useful functions.

EDIT/COMPARE
In SINGLE mode, this enters SINGLE EDIT mode, and selects the edited voice or the original voice. The blinking EDIT/COMPARE LED indicates that the original voice is selected. In PERFORMANCE mode, this enters PERFORMANCE EDIT mode.

PLAY/PERFORM
When already in PLAY mode, this selects SINGLE or PERFORMANCE mode. If you have been in UTILITY or EDIT, this will returns you to PLAY mode. The LED blinks to indicate an incoming note.
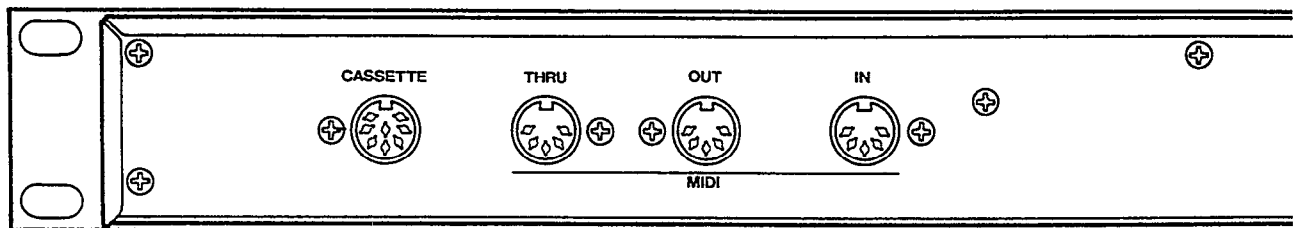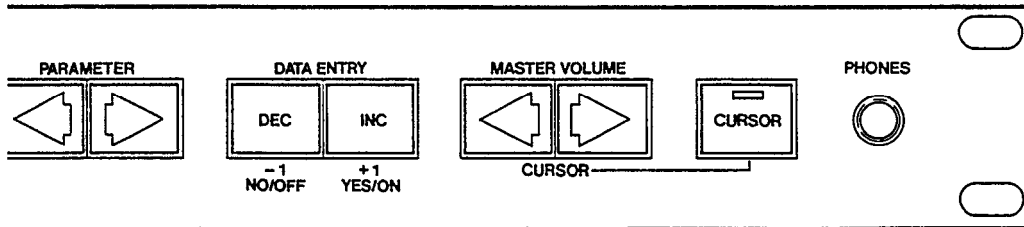

REAR PANEL

CASSETTE
Use the included cassette cable to connect this to a data cassette recorder for saving and loading TX81Z data.

MIDI THRU
All messages received at MIDI IN are re-transmitted unchanged from this terminal.

MIDI OUT
TX81Z bulk data can be sent from this terminal.

PARAMETER
In PLAY SINGLE mode, these select voice memory banks I, A, B, C, D.
In EDIT and UTILITY modes, they step through the parameters or jobs.

DATA ENTRY
In PLAY SINGLE mode, these select voices 1-32.
In PLAY PERFORMANCE mode, these select performances 1-24.
In EDIT and UTILITY modes, they are used to change settings or answer "No/Yes".

MASTER VOLUME/CURSOR
When the CURSOR LED is off, these keys control the master volume of the entire unit. When the CURSOR LED is on, these keys move the blinking cursor.

CURSOR
This selects the function of the MASTER VOLUME/CURSOR keys.

PHONES
A jack for standard stereo headphones. (The volume is controlled by MASTER VOLUME. See above.) Using this jack will not affect the rear panel outputs. If output II is not plugged in, the phones will have a mono signal of both outputs mixed.
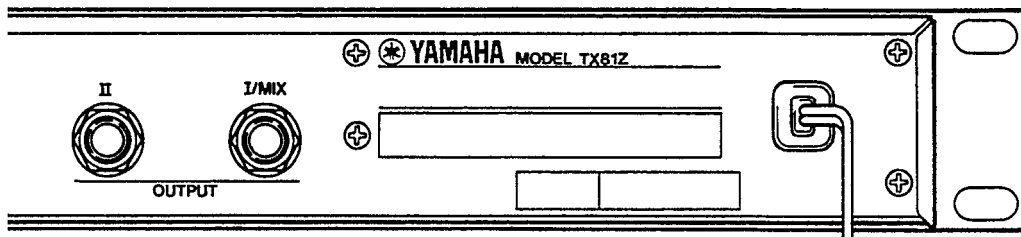
MIDI IN
MIDI messages coming into this terminal will make the TX81Z produce sound, and TX81Z bulk data can also be received here.

OUTPUT I, II
Sound produced by the TX81Z is sent from here to an external mixer or amp. If only output I is used, it will transmit the combined signal from both outputs.

SINGLE MODE

In this mode, the TX81Z will act as a single, 8-note polyphonic instrument. Single mode also allows you to create or edit voices.

PLAY SINGLE

Use the PARAMETER keys to select voice banks I, A, B, C, D, and use the DATA ENTRY keys to select voices 1-32.

```
PLAY SINGLE
A01  GrandPiano
```

Bank I, A-D Voice number and name

The 128 factory preset voices are listed on p.4. If the Program Change Conversion table (p.26) is initialized, incoming MIDI Program Changes 1-32 will select bank I 1-32 (internal user memories), 33-64 will select from bank A, and so on.
When the TX81Z is shipped, the internal user memories I01-I32 contain selected voices from banks A-D.

STORE VOICE

You can store the currently selected voice (edited or not) in the Internal user memory (Bank I). While in PLAY SINGLE mode, press and hold the STORE key. The LCD will ask

```
STORE/
EG COPY
```
➡
```
PLAY SINGLE
Mem Str A01→    ?
```

so continue holding STORE and use the DATA ENTRY keys to select the store destination (I01-I32).

```
STORE
```
+
```
DEC/INC
```
➡
```
PLAY SINGLE
Mem Str A01→I32?
```
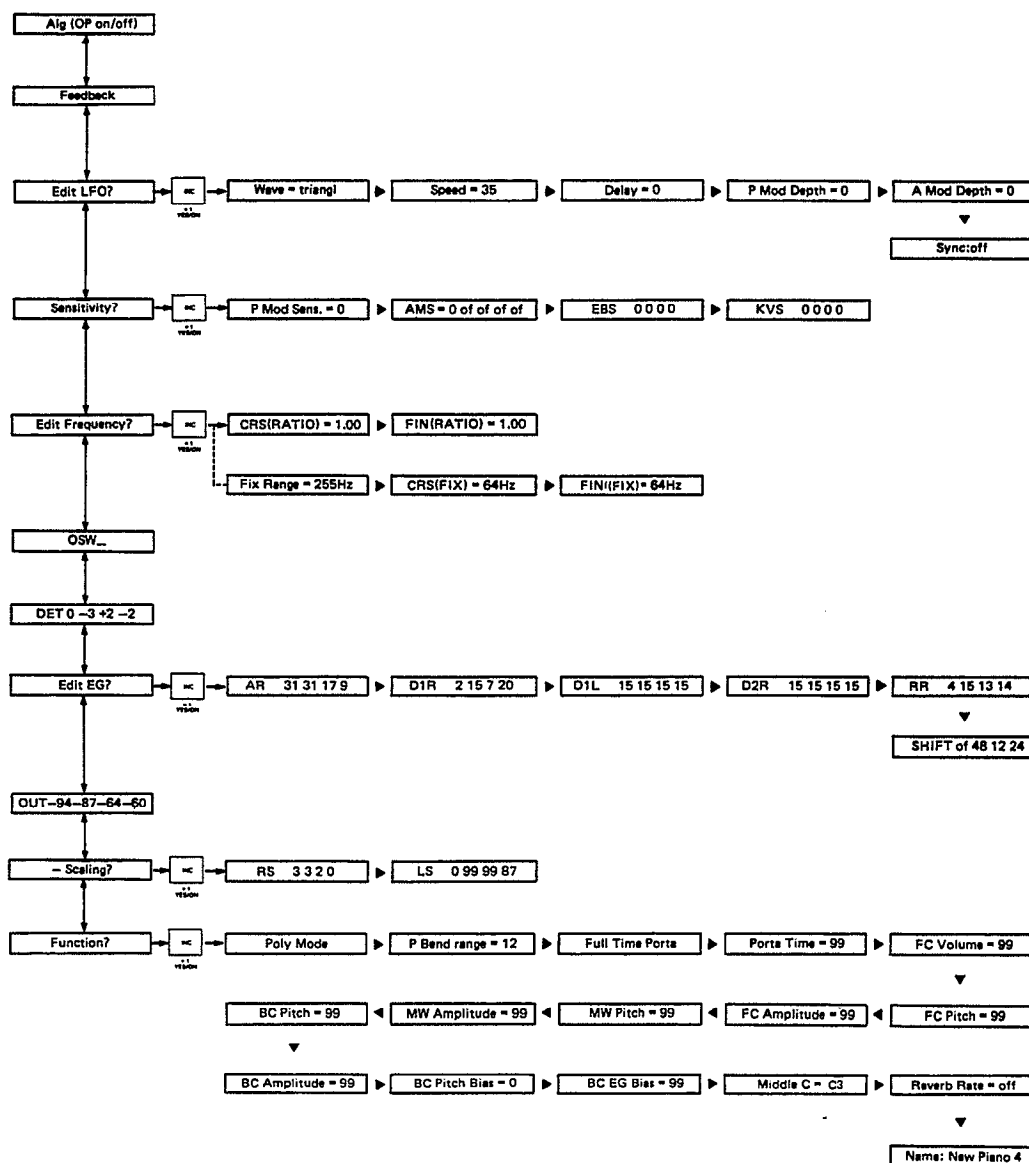
Select destination

When the LCD shows the destination you want, release STORE and press YES. The voice will be stored into the selected memory. (You can quit without storing by pressing NO.)

SINGLE EDIT

This is where you create your own voices, or edit the preset voices. In this section we assume you already know something about FM synthesis. If you are new to FM, please turn to p.83 and read "What's FM?" before continuing.

EDITING PROCEDURE

In SINGLE mode, press EDIT/COMPARE. The EDIT LED will light, and the LCD will show the previously edited parameter. Use the PARAMETER keys to move through the parameters, Use the DATA ENTRY keys to change the data value. When the LCD shows several parameters at once, use the CURSOR keys to move the blinking cursor to the parameter you want to set. (The CURSOR LED will automatically come on when you enter EDIT mode.) Some parameters are in groups, and when the LCD shows "xxxxxx ?" you can press YES to edit the parameters inside the group.

```
Alg (OP on/off)
      |
   Feedback
      |
  Edit LFO? → ≪ → Wave = triangl ► Speed = 35 ► Delay = 0 ► P Mod Depth = 0 ► A Mod Depth = 0
                                                                                      ▼
                                                                                   Sync:off
      |
  Sensitivity? → ≪ → P Mod Sens. = 0 ► AMS = 0 of of of of ► EBS  0 0 0 0 ► KVS  0 0 0 0
      |
  Edit Frequency? → ≪ → CRS(RATIO) = 1.00 ► FIN(RATIO) = 1.00
                          Fix Range = 255Hz ► CRS(FIX) = 64Hz ► FIN(FIX) = 64Hz
      |
    OSW _
      |
  DET 0 −3 +2 −2
      |
   Edit EG? → ≪ → AR  31 31 17 9 ► D1R  2 15 7 20 ► D1L  15 15 15 15 ► D2R  15 15 15 15 ► RR  4 15 13 14
                                                                                              ▼
                                                                                      SHIFT of 48 12 24
      |
 OUT−94−87−64−60
      |
   − Scaling? → ≪ → RS  3 3 2 0 ► LS  0 99 99 87
      |
   Function? → ≪ → Poly Mode ► P Bend range = 12 ► Full Time Porta ► Porta Time = 99 ► FC Volume = 99
                                                                                              ▼
                  BC Pitch = 99 ◄ MW Amplitude = 99 ◄ MW Pitch = 99 ◄ FC Amplitude = 99 ◄ FC Pitch = 99
                      ▼
                  BC Amplitude = 99 ► BC Pitch Bias = 0 ► BC EG Bias = 99 ► Middle C = C3 ► Reverb Rate = off
                                                                                              ▼
                                                                                      Name: New Piano 4
```

−12−

COMPARE

When you first enter SINGLE EDIT mode, the LCD will show an "E" in the upper left corner, indicating "Edit". As soon as you modify the data, this will change to "e".

Original data unchanged

```
E1111   ALG8
Feedback (OP4) =  3
```

Modifications have been made

```
e111  ALG8
Feedback (OP4) =  4
```

While editing a voice, you can compare it with the original voice. Press EDIT/COMPARE. The LED will begin blinking, and the LCD will show a "c" in the upper left corner, indicating "Compare". Use the PARAMETER keys to look through the parameters. When the Compare LED is flashing, you will not be able to modify the data. To return to edit mode, press EDIT/COMPARE once more.

Compare original voice

```
c1111   ALG8
Feedback (OP4) =  3
```

Algorithm

This is where you select the Algorithm, or "arrangement" of operators.

Operator 1-4 on/off

```
e1101          4→3→
ALG=5          2→1→
```

1-8

In addition to the algorithm number, the LCD shows a graphic representation of the actual algorithm structure. The arrows indicate the modulator → carrier connection. (See also the pull-out reference card under the LCD.)
By moving the cursor to the "1111" area and pressing DEC/INC, you can turn each operator on (1) or off (0). When editing, it is often useful to hear only a certain combination of operators at once. Obviously, if all carriers are turned off, there will be no sound.

Feedback

In any algorithm, operator 4 can be set to modulate itself on a scale of 0 (no feedback) to 7.

```
e1111   ALG5
Feedback (OP4) =  3
```

0-7

Edit LFO?

The LFO is a Low Frequency Oscillator that sends a continuously changing control signal. Its effect depends on the Sensitivity (p.16) and Voice Function (p.21) settings, and can affect the output level of the operators or the overall pitch of the voice. As you can see from the diagram below, the Voice Function settings determine how the MIDI Controllers (Modulation Wheel, Foot Controller, Breath Controller) will regulate the LFO signal going to the operators, and the Sensitivity settings determine how the operators will react to the LFO signal.
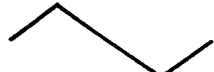
As you can see, the modulation you set in the LFO does NOT go DIRECTLY to the operators. The final effect will depend on the LFO Settings, the Voice Function settings, the Sensitivity settings, AND the position of the MIDI controllers (Modulation Wheel, Foot Controller, Breath Controller) on your keyboard.
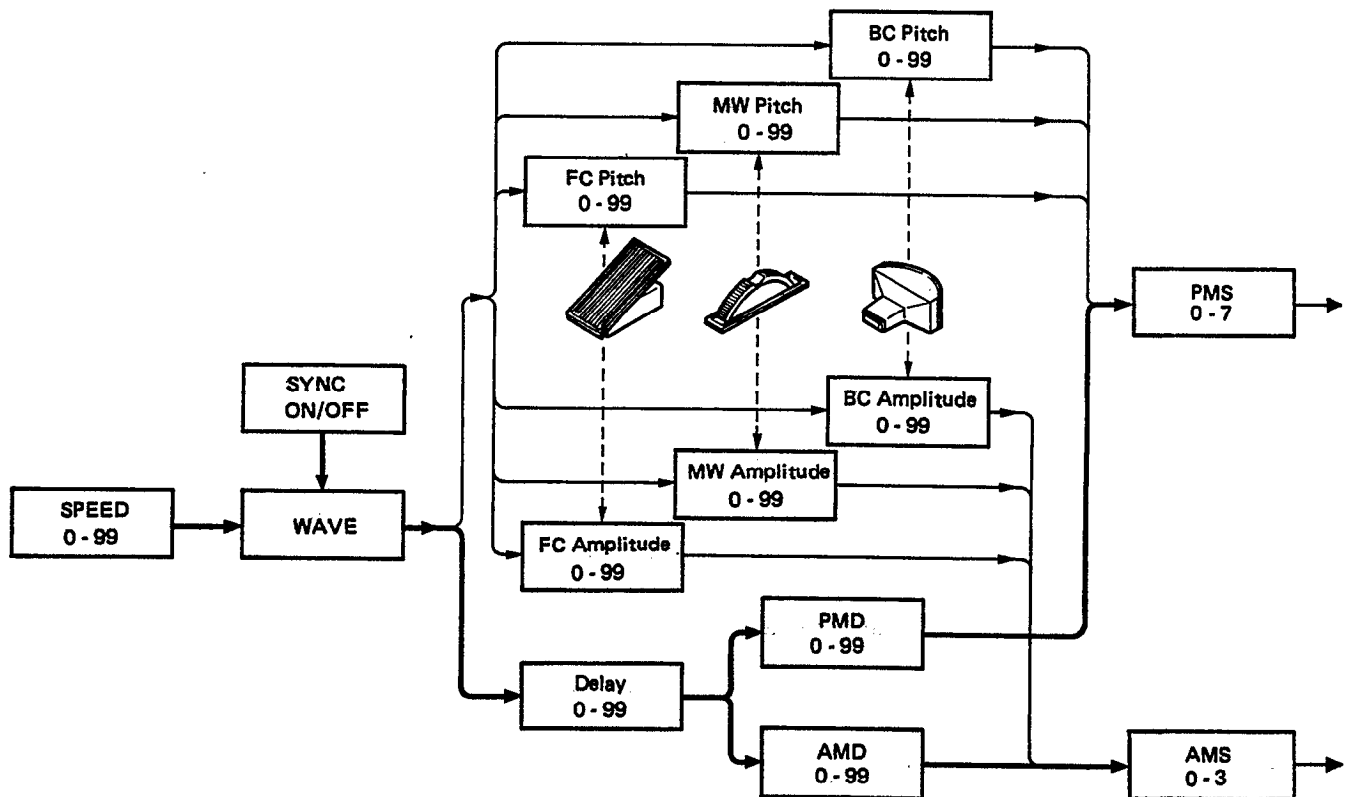
This "modulation matrix" may seem complex, but it gives you total expressive control over your instrument. Answer YES to this display and use the PARAMETER keys to select the six LFO parameters.

–14–
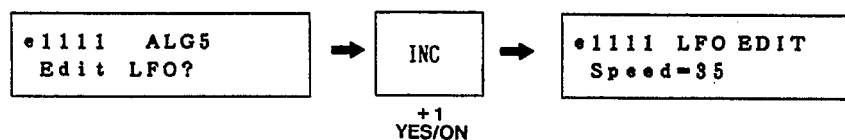
Wave (saw up, square, triangle, S/Hold)

saw up **(saw tooth wave)**	
square **(square wave)**	
triangle **(triangle wave)**	
S/Hold **(sample & hold)**	

The first three waveshapes are probably familiar to you. S/Hold stands for Sample And Hold. At periodic intervals determined by the LFO Speed, a random number is sampled, and the LFO is held at that random value until the next sample. This is especially useful in creating sound effects.

Speed (0-99) — At a setting of 1, the LFO will take about 150 seconds to complete one cycle (0.007Hz), and at a setting of 99 the LFO will make about 50 cycles every second (50Hz).

Delay (0-99) — In many acoustic instruments, the vibrato begins a short time after the note begins sounding. This can be simulated using the LFO Delay, which is adjustable from 0 (no delay) to 99 (about 15 seconds delay).

Pitch Modulation Depth (0-99) — This controls the amount of Pitch Modulation that will be present regardless of the Function Settings. When this value is above 0, the LFO will always produce some Pitch Modulation, regardless of the position of the Foot Controller, Mod Wheel or Breath Controller, provided that P. Mod Sens is not zero.

Amplitude Modulation Depth (0-99) — This controls the amount of Amplitude Modulation that will be present regardless of the Function settings. When this value is above 0, the LFO will always send some Amplitude Modulation to the operators, regardless of the position of the Foot Controller, Modulation Wheel or Breath Controller, provided that at least one operators has an AMS value greater than zero.

Sync (on/off) — When Sync is on, each note will reset the LFO wave to its beginning. For example, the Saw Up wave would begin again from the lowest position at the beginning of the note. When sync is off, the LFO wave will keep repeating regularly, regardless of notes being played.
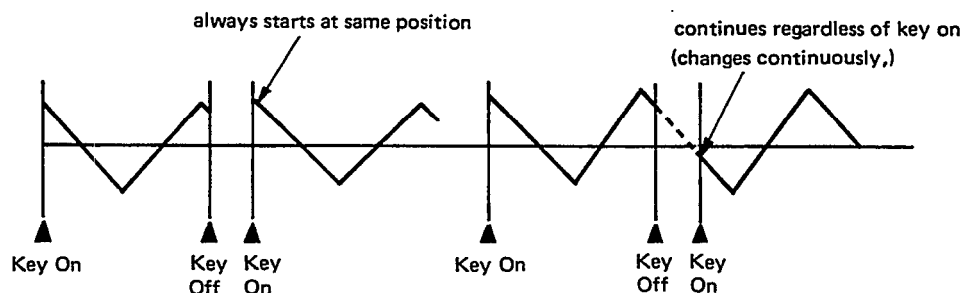
Sensitivity?

This is where you set the sensitivity of the voice to LFO Pitch Modulation, and set the sensitivity of each operator to incoming LFO and other control signals. Answer YES and use the PARAMETER keys to select the four Sensitivity parameters.

```
┌─────────────────────┐        ┌──────┐        ┌─────────────────────┐
│ ●1111   ALG5        │        │      │        │ ●1111 SENS EDIT     │
│   Sensitivity?      │   ➡    │ INC‹ │   ➡    │ P Mod Sens.  = 7    │
└─────────────────────┘        └──────┘        └─────────────────────┘
                                  +1
                                YES/ON
```
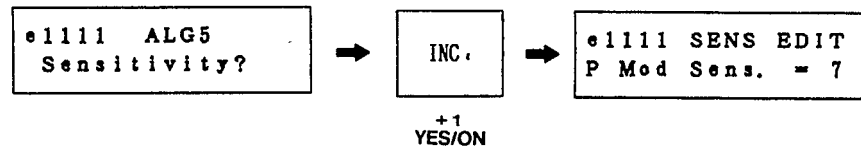
P Mod Sens. (0-7)

This determines the Pitch Modulation Sensitivity of the entire voice. If it is 0, there will be no pitch modulation.

AMS (0-3, on/off for each operator)

The overall Amplitude Modulation Sensitivity of the operators is adjustable from 0-3, and each operator can be set to react to LFO Amplitude Modulation (on) or not (off). For example, if the carrier operators were sensitive to LFO amplitude modulation, the LFO would affect the volume of the voice (tremolo). If the modulator operators were sensitive to LFO amplitude modulation, the LFO would affect the tone of the voice (wah-wah).

EBS (0-7 for each operator)

This sets the EG (envelope generator) Bias Sensitivity of each operator. EG Bias is a control signal that directly affects the output level of an operator. (It has nothing to do with the LFO.) There is a Voice Function parameter (p.22) that lets a Breath Controller control EG Bias.
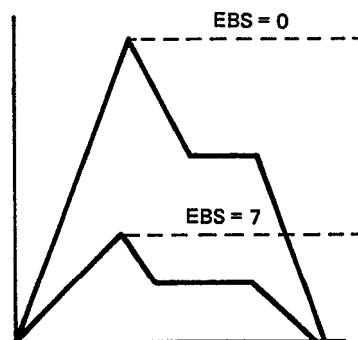
If a carrier has EBS, the EG Bias signal will affect the volume of the voice. If a modulator has EBS, the EG Bias signal will affect the tone of the voice. When programming wind instruments, it is effective to set the carriers to an EBS of 7, so that the volume will depend totally on how hard you blow into the Breath Controller. Set the modulators to a lower value of sensitivity, so that the tone will become somewhat sharper as you blow harder.

KVS (0-7 for each operator)

This sets the Key Velocity Sensitivity of each operator. Each MIDI Note On message has a Velocity byte that tells how hard the keyboard was struck. If an operator has KVS, it will adjust its output level according to the velocity of the note. If a carrier has KVS, strongly played notes will be louder. If a modulator has KVS, strongly played notes will have a sharper tone. Extremely high KVS settings will make the voice difficult to control, and you will need to play quite strongly to get any sound at all.

Edit Frequency?

This is where you set the frequency of each operator. Each operator can be set to Ratio or Fixed mode. In Ratio mode, the frequency will depend on the key you play. In Fixed mode, the frequency will be the same no matter which key you play. This can be useful for special effects, or for creating "formants" (fixed characteristics of spectral emphasis found in human voices and some instruments).

```
●1111 ALG5          ➡    ┌─────┐    ➡    ●1111 FREQ.   OP1
Edit Frequency?          │ INC │         CRS (RATIO) = 1.00
                         └─────┘
                           +1
                         YES/ON
```
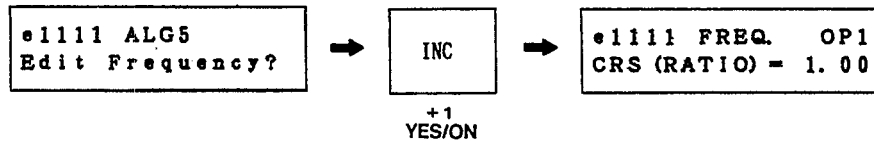
Answer YES to this display, and use the PARAMETER keys to select the coarse (CRS) and fine (FIN) frequency adjustment for each operator 1-4. By moving the cursor to (xxx), you can set the oscillator mode to RATIO or FIX.

```
●1111 FREQ.   OP1      ●1111 FREQ.    OP1      ... OP2 ... OP3 ... OP4
CRS (RATIO) = 1.00     FIN (RATIO) = 1.00
```
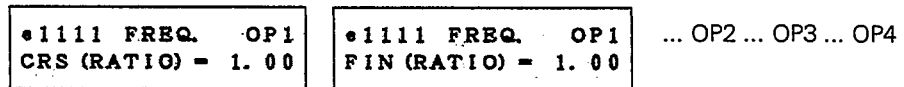
If Fixed Mode is selected, you can set the Fixed Frequency Range (see below).

```
●1111 FREQ.   OP1      ●1111 FREQ.    OP1      ●1111 FREQ.    OP1   etc.
Fix Range =255Hz       CRS (FIX) =   192Hz     FIN (FIX) =   192Hz
```
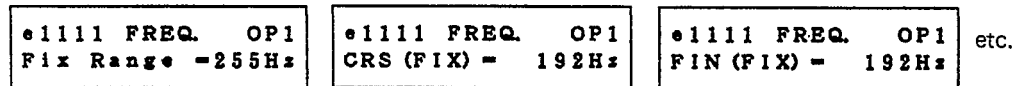
Ratio (0.50-27.57)

The "standard" ratio is 1.00. Ie. when a operator is set to 1.00 frequency ratio, it will produce a 440Hz tone for an A3 note (standard pitch). A ratio of 2.00 would be an octave higher, and 4.00 would be two octaves higher.

*Fix Frequency
(8Hz-32,640Hz)*

The fixed frequency is variable over a wide range. (However, due to hardware limitations, the very highest frequencies will not actually be output.) Fixed Frequency is divided into the ranges shown below.

Select (Hz)	Fix Range (Hz)	One Fine Step (Hz)
255	8-255	1
510	16-510	2
1K	32-1020	4
2K	64-2040	8
4K	128-4080	16
8K	256-8160	32
16K	512-16320	64
32K	1024-32640	128

Oscillator Wave

The TX81Z is the first Yamaha synthesizer to offer FM synthesis with 7 new waveforms in addition to sine waves.

Each operator can be independently set to one of the following 8 waveforms. The selected waveform will be graphically indicated in the LCD.

```
●11114   ⌁   ⌁   ⌁
OSW  W5  W2  W6  W7
```

W1: W5:

W2: W6:

W3: W7:

W4: W8:
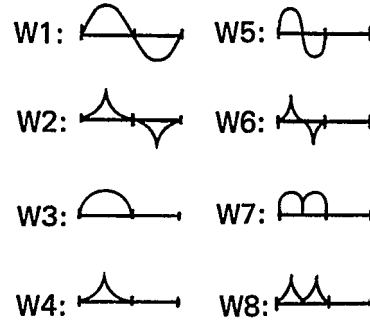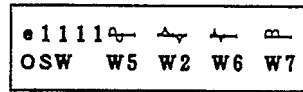
These new waveforms can be used as both carriers and modulators. Sine waves are pure tones. The seven additional waveforms have additional harmonics already in them. This allows for complex waveforms to be created from fewer operators. For ideas on how to use the new waveforms, examine the preset voices. The harmonic content of each waveform is described on p.50.

Detune

```
●1111  1   2   3   4
DET   +3   0  −3  +1
            └──┬──┘
             −3 — +3
```
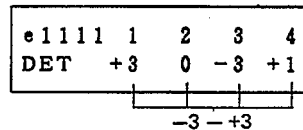
The frequency of each operator can be moved slightly higher or lower. By detuning two carriers in opposite directions, you can create a detune-chorus effect. By detuning a modulator and carrier, you can create slightly irregular, "natural-sounding" harmonic structures. The exact amount of detune will differ by the note number. At C3 the range is ± 2.6 cents.

Edit EG?

Answer YES to this display and use the PARAMETER keys to select the six EG parameters. Each display shows the settings for operators 1-4.

```
●1111   ALG5
Edit EG?
```
➡
```
INC
+1
YES/ON
```
➡
```
●1111  1   2   3   4
AR    31   0  15   7
```
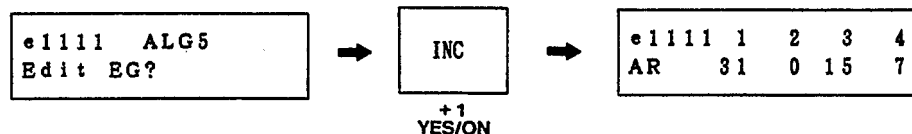
The Envelope Generator (EG) determines how the operator output level changes over time. TX81Z EGs have 4 rate (speed) parameters and 1 level parameter. In addition, you can "shift" the range of the entire envelope by a specified amount, so that there will be some operator output even when a note is not being pressed.

−18−
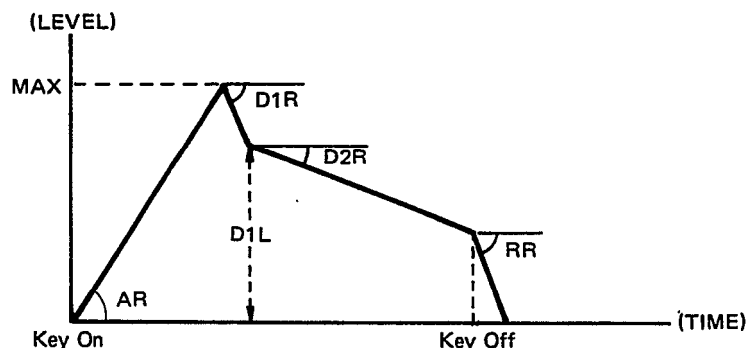
AR (0-31)   Attack Rate determines how quickly the level will rise up to maximum level. When AR is 0, the rate is slowest and when AR is 31, the attack is fastest,

D1R (0-31)   1st Decay Rate determines how quickly the level will decay from maximum to the 1st Decay Level. Obviously, if the 1st Decay Level is 15 (max), the 1st Decay Rate will have no effect.

D1L (0-15)   1st Decay Level is the point where the 2nd Decay Rate begins.

D2R (Q-31)   2nd Decay Rate determines how quickly the level will decay from the 1st Decay Level down to 0. If the 2nd Decay Rate is set to 0, the sound will continue as long as the note is held.

RR (1-15)   Release Rate determines how quickly the level will decay from the level at the time the note is released down to 0.

SHFT (off, 48, 24, 12)   EG Shift sets the range of the envelope. When "off" is selected, the EG will change the operator output level over a range of 0 to -96dB (the full range). However, when 12, 24 or 48 is selected, the EG range is "compressed" to the specified range. For example if EG Shift is 24, the EG will change the operator output level over a range of 0 to -24dB, and the operator output level will be at -24dB even before the note is pressed. (EG shift of operator 1 is fixed at "off".)
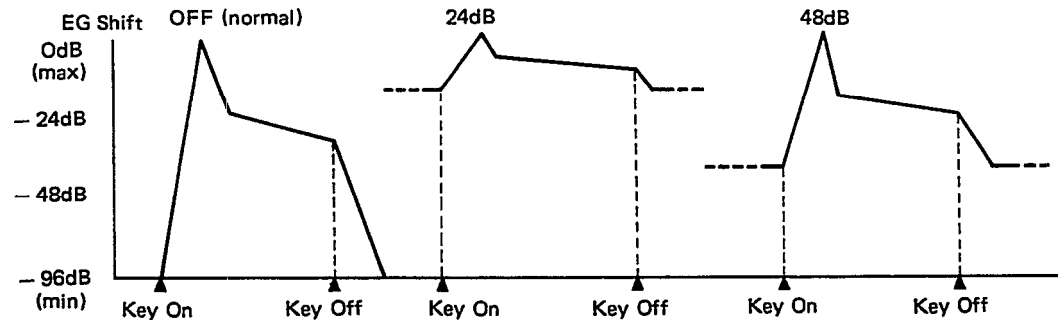
This can be used to limit the EG range of a modulator for very subtle changes in tone, or to create an instantaneous attack. You can use it on a carrier for effects that will sound even when a key is not being pressed. The EGS setting will not affect the time the envelope takes, even though the "distance" of the level change may be different (ie. "rates" are automatically compensated).

EG Copy   When trying to imitate an acoustic instrument sound, it is usually a good idea to first program the carrier envelope (volume envelope) and copy it to the modulating operators. (Of course you will need to make fine adjustments later by ear.) Usually, as the volume of a sound increases (or decreases), the tone also gets brighter (or softer).
Copying envelopes is easily done. Anytime you are in SINGLE EDIT mode, press and hold STORE/EG COPY. The LCD will ask which operator you want to copy the envelope from.
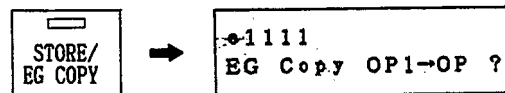
Continue holding STORE/EG COPY and use the DATA ENTRY keys to select the source operator. Use the CURSOR keys to move the blinking cursor and use the DATA ENTRY keys to select the destination operator. Release STORE/EG COPY and answer YES. The envelope (AR, D1R, D1L, D2R, RR) will be copied. (If you change your mind, answer NO.)

Operator Output Level

This sets the output level of each operator.

```
e1111  1   2   3   4
OUT    99  75  57  78
```
0-99
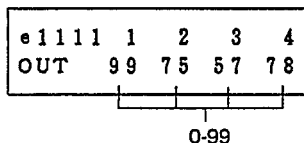
The output level of a carrier will affect the volume, and the output level of a modulator will affect the tone. Setting modulator output levels too high may lead to distortion. Sometimes this may be desirable when creating sound.
What the human ear interprets as loudness is closely related to timbral complexity (tone), and raising the level of a modulator will often increase the "loudness" as well.

Scaling?

Answer YES to this display and use the PARAMETER keys to select the two scaling parameters.

```
e1111   ALG5
Scaling?
```
➡ INC ➡
+1
YES/ON
```
e1111  1   2   3   4
RS     3   0   1   2
```
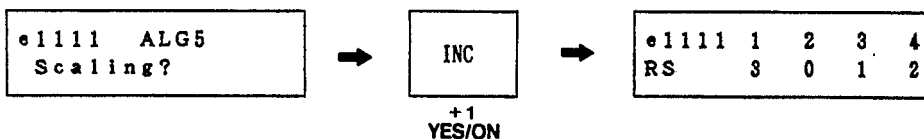
Rate Scaling (0-3)

On an acoustic instrument, high notes usually have a faster attack and decay than low notes. Rate Scaling simulates this. When RS is 0, the envelope will be the same time length for all notes. When RS is 3, high notes will have a shorter envelope.
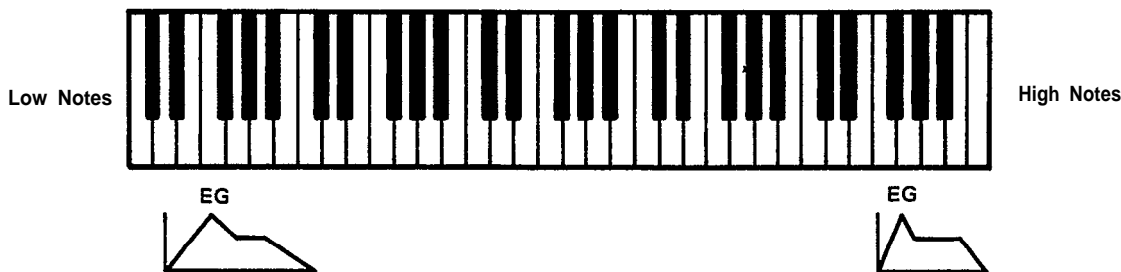
Level Scaling (0-99)

High notes on an acoustic instrument tend to have a less complex tone than low notes. You can use Level Scaling to simulate this by decreasing the output level of a modulator as you play up the keyboard. (Level Scaling operates on a curve starting from about C1.) When LS is 0, the operator output level will be the same for all notes. When LS is 99, the output level will have dropped to 0 by the time you get to G6.

Function?

This is where you set how the TX81Z will be controlled by incoming MIDI messages. Answer YES to the "?" display and use the PARAMETER keys to select the sixteen Function parameters.

```
┌─────────────────┐         ┌─────┐         ┌─────────────────┐
│ e1111   ALG5    │    ➡    │ INC │    ➡    │ e1111 FUNCTION  │
│   Function?     │         └─────┘         │   Poly Mode     │
└─────────────────┘            +1           └─────────────────┘
                             YES/ON
```
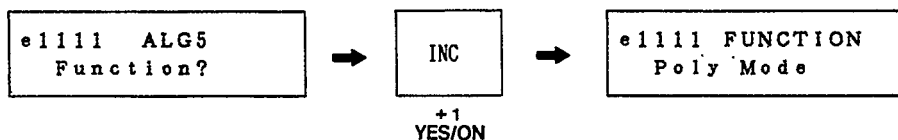
Poly Mode (Poly/Mono)

Poly Mode: In SINGLE mode, the TX81Z will play up to 8 notes simultane-
ously, and in PERFORMANCE mode, each instrument will play as many
notes as permitted in the "Max Notes" setting for that instrument (p.38).

Mono Mode: Only the most recent note you press will be sounded. This can be
desirable when playing solos. Also, Mono Mode gives you a choice of porta-
mento (see below). A Max Notes (p.38) setting of 1 is not quite the same as
Mono mode. In Mono, a note played before the previous one is released will
not re-trigger the envelope. ie. the decay will continue from the previous
note. However in Poly mode, each note starts its envelope from the be-
ginning even if the previous note has not been released. Thus, if you want to
have only one note sounding at a time, but want each note to re-trigger the
envelope, use Poly mode and set Max Notes (p.38) to 1.

> **─ Note ─**
> If you play a note in Mono Mode without releasing the previous note, and
> then release the second note, the sound will "jump back" to the previous
> note. In SINGLE mode, up to 8 of these previous notes will be remembered
> (as long as you continue pressing them), and in PERFORMANCE mode, up
> to 5 notes will be remembered.

P Bend Range (0-12)

This determines the range (in semitones) of the pitch bend effect. When set to
12, the pitch bend wheel on your keyboard will have a maximum effect of one
octave up or down. When set to 0, the pitch bender will have no effect.

*Full Time Portamento/
Fingered Portamento*

There are two modes of Portamento (the "glide" between notes), but you have
a choice only in Mono Mode. If Poly Mode is selected, this will always be "Full
Time Portamento". With Fingered Portamento, portamento is applied only if
you press a note before releasing the previous one. With Full Time Portamento,
portamento is applied between all notes. Full Time Portamento can be turned
on or off by a portamento footswitch connected to your keyboard, but Fingered
Portamento cannot be switched off. If you don't want to have Portamento,
set the Portamento Time to 0 (see below). When power is turned on, porta-
mento will be on. (And when a Performance is selected, portamento will be on
for each instrument in the performance.) To turn portamento off, you will
need to send a Portamento Off message (Bn.41.00)

Portamento Time (0-99)

This sets the speed of the "glide" effect between notes. When Portamento Time
is at 99, a three-octave glide will take about 30 seconds. When Portamento
Time is at 0, there will be no glide. If you don't want a voice to have porta-
mento, set the Portamento Time to 0.

FC Volume (0-99) — This allows you to use the Foot Controller connected to your keyboard to control the volume of the TX81Z voice. When FC Volume is at 99, the volume of the TX voice is regulated completely by the Foot Controller, ie. when the Foot Controller pedal is at minimum position, there will be no sound. When FC Volume is at some middle value such as 50, there will be some sound even when the Foot Controller pedal is at minimum.

FC Pitch   (0-99)
FC Amplitude   (0-99)
MW Pitch   (0-99)
MW Amplitude   (0-99)
BC Pitch   (0-99)
BC Amplitude   (0-99)

These six parameters allow you to regulate the amount of LFO modulation using an external controller connected (or built in) to your keyboard. The diagram below explains how LFO modulation is controlled. Each parameter can be set between 0 and 99. When it is set to 0, the position of the controller will have no effect on the amount of LFO modulation,
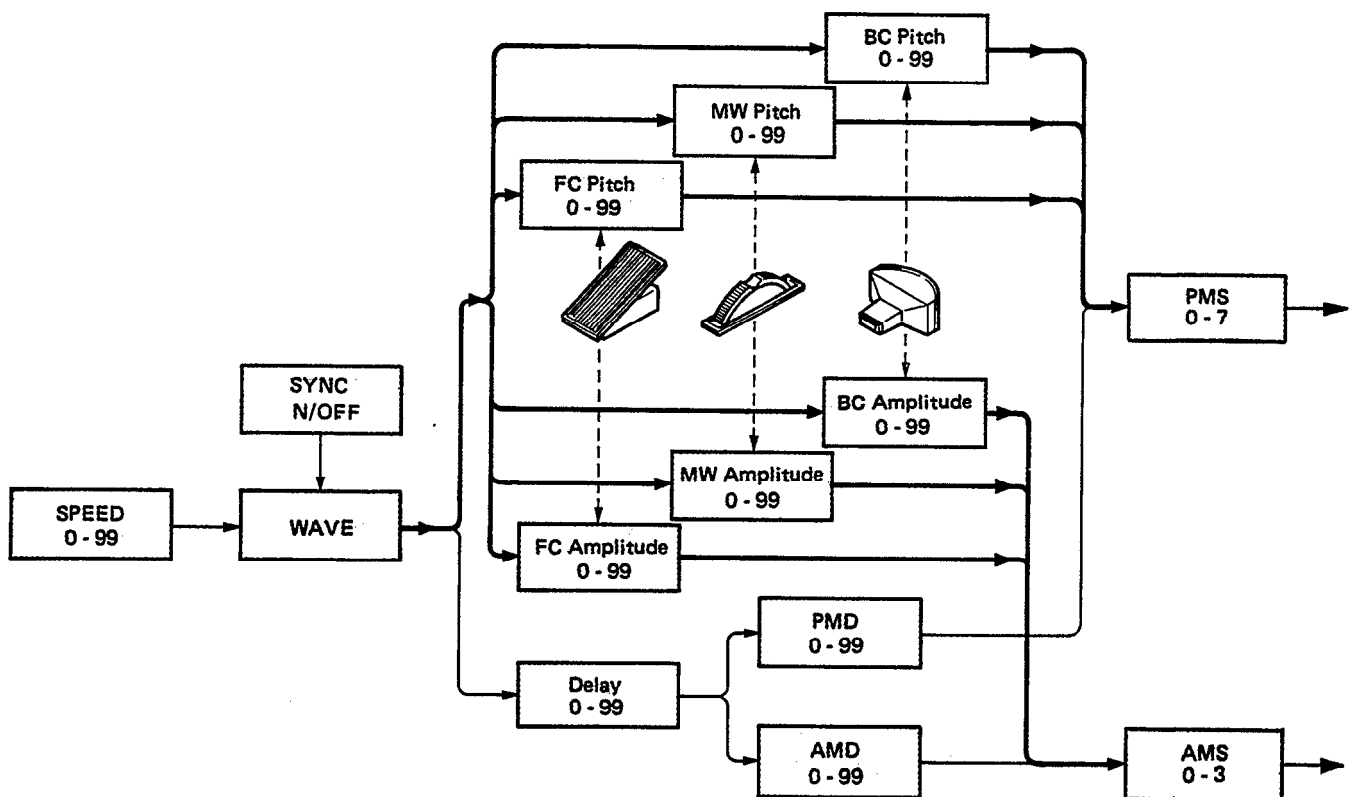
BC Pitch Bias (–50- +50) — This allows you to directly control the pitch using a Breath Controller. (This is a "pitch-bending" effect, and has nothing to do with the LFO.) When BC Pitch Bias is set at 0 (the normal value), blowing into the Breath Controller will not affect the pitch. Settings of above 0 will result in the pitch rising when you blow, and settings of below 0 will result in the pitch falling. The further away from 0, the greater the effect.

BC EG Bias (0-99) — This allows you to directly control the output level of the operators using a Breath Controller. The amount of control will depend on the EG Bias Sensitivity for each operator (see p.16) as well as the BC EG Bias setting.

Middle C (C1-C5) — The voice can be transposed up or down 2 octaves in steps of a semitone. The display indicates the note actually sounded when the middle C key (MIDI Note Number 3C) is pressed.

Rev. Rate (off, 1-7)

This is a "pseudo-reverb" effect created by slowing the EG release rates after a certain point. It depends on the OP1 EG. (OP1 on/off or OP1 output level does not matter.) When the EG level of OP1 descends to -18dB, this "pseudo-reverb" is triggered, and the Release Rates of all operators will be slowed down to the Reverb Rate, producing a lingering effect characteristic of reverb.
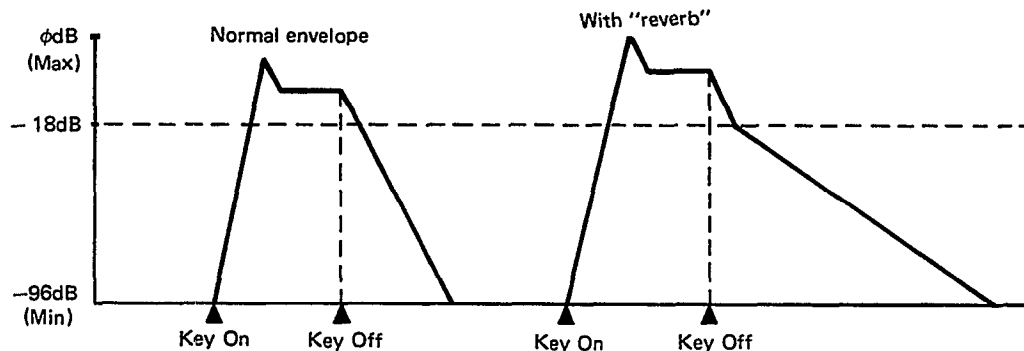
Rev. Rate	Effect
off	No effect
1	EG-Release Rate = 1 (long "reverb")
¿	¿
7	EG-Release Rate = 7 (short "reverb")

Note that if the OP1 EG Attack Rate is 0, the sound may linger for quite a while after the note is released. Also, if the EG Release Rate is already less than the Reverb Rate, there will be no effect. This "pseudo-reverb" must be programmed with the other voice parameters in mind.

Name (10 characters)

You can name your newly created voice (or rename a preset voice). Use the CURSOR keys to move the blinking cursor, and use the DATA ENTRY keys to step through the characters shown below.

```
Space ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9
: ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
[ ¥ ] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z
{ | } → ←
```

SINGLE UTILITY

This is where you save and load data to external devices, and perform various other useful functions. These settings are not part of a Performance Memory. They are set for the entire TX81Z. To enter Utility mode, press UTILITY while in PLAY SINGLE or EDIT SINGLE mode.

```
┌─────────┐              ┌──────────────────────┐
│  ▭      │      ➡       │ UTILITY MODE         │
│ UTILITY │              │ Master Tune =   0    │
└─────────┘              └──────────────────────┘
```

Select parameters using the PARAMETER keys. If the LCD shows "xxxx ?" you can press YES and use the PARAMETER keys to select the sub-parameters.
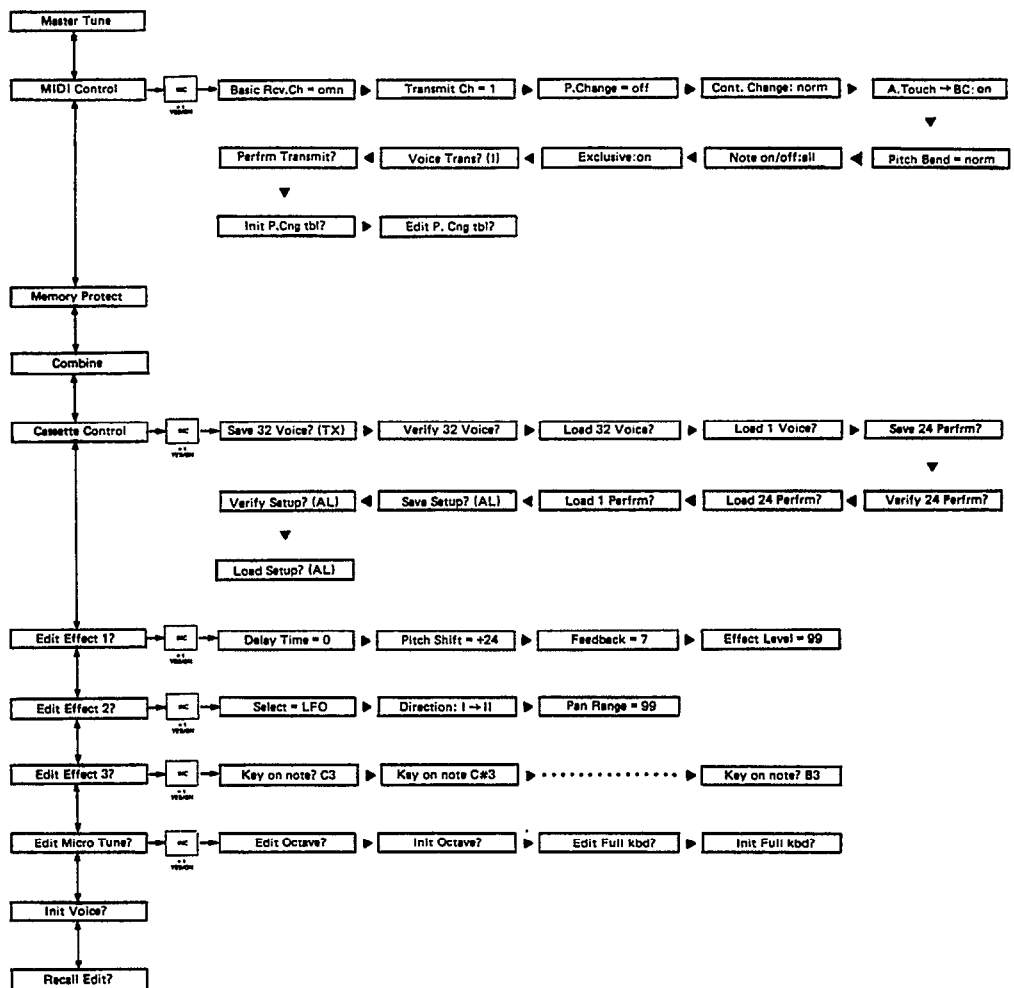
This is the master tune for the entire TX81Z.

Master Tune

Use it to tune the TX81Z to other instruments. The tuning range is one semi-tone (100 cents) below and above standard pitch (A3=440Hz).

```
┌──────────────────────┐
│ UTILITY MODE         │
│ Master Tune =    0   │
└──────────────────────┘
           │
        −64 − +63
```
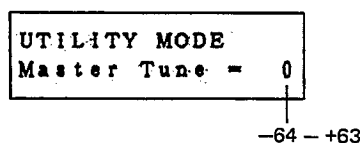
Midi Control?

Answer YES and use the PARAMETER keys to select the following parameters.

```
UTILITY MODE          INC          UT  MIDI CONTROL
Midi Control?                       Basic Rcv. ch= 1
                      +1
                     YES/ON
```
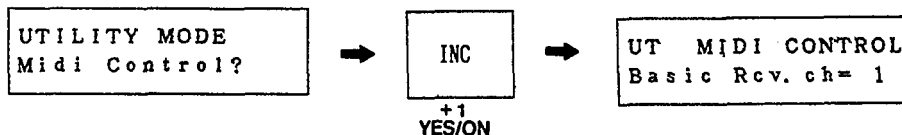
Receive Channel
(1-16, omni)

This is the MIDI channel on which the TX81Z will receive System Exclusive data and Program Changes. In SINGLE mode, this is the channel you will play. When this is set to "omn", all channels will be received.

Transmit Channel (1-16)

This is the MIDI channel on which TX81Z data (bulk voice data, etc.) will be transmitted. When transmitting data to another TX81Z, this must match the receive channel of the other device (unless the receiver is set to "omni").

Note on/off
(all, even, odd)

All: All note numbers are received (the normal mode).
Even: Even   "
Odd: Odd   "

By using two TX81Zs together and setting one to Even and the other to Odd, you can effectively raise the simultaneous-note capacity to 16 notes.

P. Change (off, corn, ind)

This determines how the TX81Z will react to Program Change messages.

Off: Ignore program change messages.

Common: Look up the corresponding Voice Number (I01-D32) or Performance Number (PF1-24) in the Program Change Table (p.26).

Individual: Each instrument receives program changes separately and looks up its Voice Number from the table. If already in Performance mode and the table entry is a Performance Number, it is ignored.

Cont. Change
(off, norm, G1-G16)

Off: Control Change messages (MIDI messages Bn.xx.yy) will be ignored. This includes messages such as Modulation Wheel, Breath Controller, etc. Sustain pedal on/off will always be received.
Norm: Control change messages are received normally by each channel.
G1-16: You can specify a "Global MIDI Channel" for control change messages. In PERFORMANCE mode when a control change arrives on this channel, it will affect all instruments regardless of their channel setting. For example, if a MIDI guitar transmitted Note On messages with a different channel for each string, a Modulation Wheel on the guitar could control all channels simultaneously.

A. Touch →BC
(off, on)

Normally the TX81Z does not receive Aftertouch messages (Dn.xx), but when this is set "on", incoming Aftertouch messages will be treated as Breath Controller (Bn.02.xx) messages. See Control Change, above.

Pitch Bend *(off, norm, G1-G16)*	Off: Pitch Bend messages (MIDI messages En.xx.yy) will be ignored. Norm: Pitch Bend messages are received normally by each channel. G1-16: You can specify a "Global MIDI Channel" for pitch bend messages. In PERFORMANCE mode when a pitch bend message arrives on this channel, it will affect all instruments regardless of their channel setting. For example, if a MIDI guitar transmitted Note On messages with a different channel for each string, a MIDI pitch bend arm on the guitar could control all channels simultaneously.
Exclusive (on, off)	When this is Off, all System Exclusive messages (bulk data) will be ignored, and the TX81Z will not transmit bulk data. (The functions voice, Performance and Setup Transmit will be skipped.)
Voice Transmit?	If you answer YES, the 32 voices in bank I will be transmitted from MIDI OUT. To transmit the 32 voices from another bank (I, A, B, C, D) press NO to select the bank, and YES to transmit it.

> **Note**
>
> This data can be received by another TX81Z (or any data storage device) if its Memory Protect (p.27) is Off, its Exclusive (p.26) is On, and its Receive Channel (p.25) matches the Transmit Channel (p.25).
> A disk-type MIDI data storage device such as the MDF1 is handy for storing TX81Z data.

Performance Transmit?	If you answer YES, the 24 performance memories will be transmitted from MIDI OUT. (See the note to Voice Transmit, above.)
Setup Transmit?	Press NO to select AL, SY, EF, MC and then press YES to transmit the selected data from MIDI OUT. (See the note to Voice Transmit, above.) AL All data described below (PC+EF+MC) except System data. SY System data. The settings for Combine, Memory Protect, Receive Channel, Transmit Channel, P. Change, Cont. Change, and Exclusive. PC Program Change Table (p.26). EF Data for the three effects (p.29). MC The two user-programmable scales (p.31).
Init P. Ch. Tbl.	When you press YES, the Program Change Table (see below) will be initialized as follows.

Incoming Program Change	will select
PGM 1	I01
PGM 2	I02
≀	≀
PGM 32	I32
PGM 33	A01
≀	≀
PGM 128	C32

Edit P. Ch. Tbl.

There is a Program Change Table in TX81Z memory that can be used to "redirect" incoming Program Change messages. When a program change (on the Receive Channel, p.25) is received, this table is consulted, and the corresponding Voice or Performance is selected. To edit the table, answer YES, and use the PARAMETER keys to step through PGM 1 – PGM 128. Use the DATA ENTRY keys to select a Voice number I01-D32 or a Performance number PF01-PF24.

Memory Protect (off, on)

When this is On, you will not be able to store voices or performances nor will the TX receive 32 Voice or 24 Performance bulk data.

```
UTILITY MODE
Mem Protect:on
```
on/off
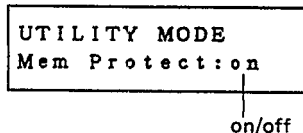
Memory Protect is reset to On when the power is turned on, and after bulk data is received via MIDI or loaded from cassette. Memory Protect is also accessible from Performance Utility mode.

Combine (off, on)

Each voice memory includes Voice Function data (see p.21) that specifies how the voice will respond to MIDI control messages. When Combine is On, each newly selected voice uses its own Voice Function data. By setting Combine Off, you can preserve the current function settings. ie. newly selected voices will use the current settings.

When power is turned on. Combine will be set On.

```
UTILITY MODE
 Combine  :on
```
on/off
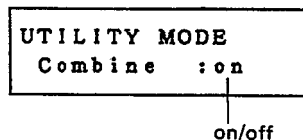
Combine off/on affects the following functions.

- Pitch Bend Range
- Portamento Time
- FC Volume
- FC/MW/BC Pitch and Amplitude
- BC Pitch Bias
- BC EG Bias
- Poly/Mono
- Portamento Mode

–27–

Cassette Control?

This is where you save and load data to and from a cassette. Answer YES and use the PARAMETER keys to select the jobs.

```
┌─────────────────────┐        ┌─────┐        ┌─────────────────────┐
│ UTILITY MODE        │   ➡    │ INC │   ➡    │ UT  CASS CONTROL    │
│ Cass.  Control ?    │        │     │        │ Save32Voice? (TX)   │
└─────────────────────┘        └─────┘        └─────────────────────┘
                                 +1
                               YES/ON
```
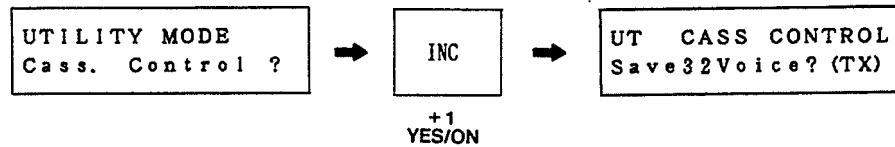
Connect a cassette recorder as shown. It is best to use a cassette recorder and tape especially designed for personal computer data storage. Also try to use the same recorder for both saving and loading. Using the cassette cable included with the TX81Z, connect the white plug to the earphone jack, and the red plug to the microphone jack. If you change your mind while saving, verifying or loading, press NO to quit.
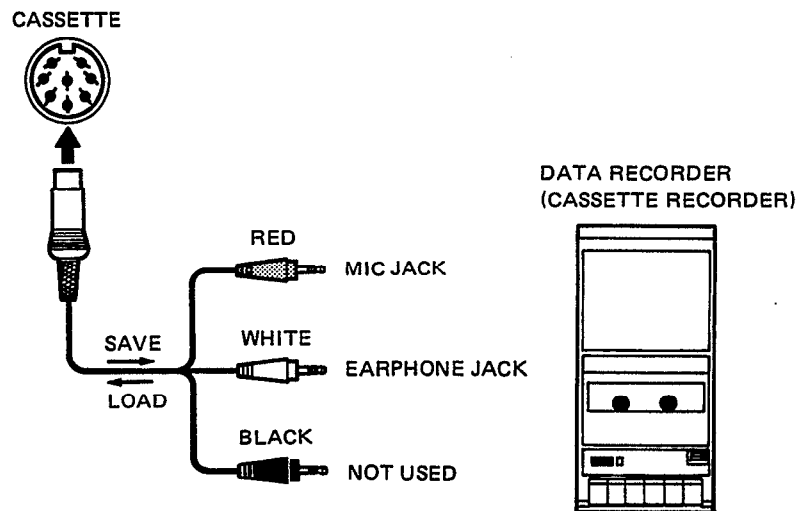
Save 32 Voice? (TX, DX)

This will save the 32 voices from the internal memory (bank I) to a cassette tape. You can save the data in TX format or DX format. If you will be re-loading the voice data to a DX100/21/27, press NO to select DX format. (The TX81Z has some parameters that the DX100/21/27 does not, and these will be deleted.)
Press YES, and the LCD will show "Save ready?". Start RECORD on the tape recorder and press YES again.
The LCD will show "INT 01 to Tape" and display the voice number 1-32 that it is currently saving. When saving is complete, the TX81Z will go on to the next job "Verify 32 Voice?".

Verify 32 Voice?

You can check to see whether data was correctly saved to tape. Press YES, and the LCD will read "Verify ready?". Rewind the tape to the beginning of the data, press YES and start the cassette playback. If the data on tape matches the data in the TX81Z, the LCD will show "Verify Completed". If not, the LCD will show "ERR".

Load 32 Voice?

This loads 32 voices from tape into the TX81Z voice memory bank I. Make sure that Memory Protect (p.27) is off, and press YES. The LCD will show "Load all ready?" so press YES again and start the tape playback. The LCD will show "Tape to INT 1" and display the voice number 1-32 currently being loaded. When finished, it will display "Load Completed". If the data from tape is incorrect, it will display "ERR".

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Load 1 Voice?

You can choose any voice (1-32) to load from tape into the voice edit buffer of the TX81Z. Press YES. The LCD will show "Tape ?? to BUFF?" so and use the PARAMETER keys to select the tape data (1-32) you want. Then press YES again and start the cassette playback. The LCD will show "Search Tape xx" and wait for the selected voice data. When the data arrives, the LCD will show "Load Completed". The voice data will be in the edit buffer, so you will need to Store it into a TX81Z voice memory (see p.11). In "Load 1 Voice" mode, you may fast-forward or rewind the tape to get to the voice data you want. (This will not work for any other tape load mode.)

Save 24 Perfrm?
Verify 24 Perfm?
Load 24 Perfm?
Load 1 Perfm?

These jobs let you save and load performance data to and from cassette tape. Operation is the same as saving and loading voices, as explained above.

Save Setup?
Verify Setup?
Load Setup?

These jobs let you save and load setup data to and from cassette tape. Press NO to select AL, SY, EF or MC. Operation is the same as saving and loading voices, as explained above.

      AL Program Change Table, Effect and Micro Tune data (PC+EF+MC).
      SY System data. The settings for Combine, Memory Protect, Receive Channel, Transmit Channel, P.Change, Cont.Change, and Exclusive.
      PC Program Change Table (p.26).
      EF Data for the three effects (p.29).
      MC The two user-programmable scales (p.31).

During Load, Verify or Load 1, the format number of the data being read will be shown in the upper right of the LCD. Data of an undesired format will be skipped.

Edit Effect 1? (Delay)

This is a transposed delay effect. You can use it while setting the effect or in a performance (the first active instrument will be used). Press YES, and use the PARAMETER keys to select the four Delay parameters.
This Delay effect is made by producing additional notes with reduced velocity until the velocity reaches 18. If the voice is not velocity sensitive (p.16), each echo will be the same "volume" as the original note, even though the velocity is being decreased. You can take advantage of this to control the number of re-peats by how hard you play the note. (Especially effective when used with some Pitch Shift.) Up to four delay notes can be sounding simultaneously. When the fifth delay note is played, the first delay note will stop.

```
┌─────────────────┐         ┌─────┐         ┌─────────────────┐
│ UTILITY MODE    │   ➡    │ INC │   ➡    │ UT   EDIT EFFECT1│
│ Edit Effect  1 ?│         │     │         │ Delay Time=0.20s│
└─────────────────┘         └─────┘         └─────────────────┘
```

Delay Time (0.01-1.28s)

This is the time between echoes, displayed in seconds.

Pitch Shift? (−24 – +24)

You can transpose each delayed note up or down by semitones. −24 is two oc-taves down, and +24 is two octaves up. However, the TX81Z note range is limited to about 8 octaves, and notes falling outside of this range will be "folded back."

Feedback (0-7)

This regulates how the Velocity of each echo is decreased, and indirectly deter-mines the number of echoes. If you play a note strongly (high velocity), there will be more repeats before the velocity drops to 18.

Effect Level (0-99) This determines the Velocity of the first echo. When set to 99, the first echo will have the same velocity as the note you play. As with Feedback, this will indirectly determine the number of echoes.

Edit Effect 2 (Pan) This effect automatically moves the sound between outputs I and II. You can use it while setting the effect or in a performance when 2 instruments are active. Press YES, and use the PARAMETER keys to select the three Pan parameters.

This pan effect is produced by varying the balance of two instruments assigned to outputs I and II. Thus, to create a natural panning effect, both instruments should be using the same voice.

When Pan is used in PLAY SINGLE mode, the TX81Z will automatically act as two identical instruments (one assigned to output I, the other to output II), each playing up to four notes.

When Pan is used in a performance, you need to make sure that at least two instruments are assigned to different outputs. (It is possible to use Pan on all eight instruments if each is assigned to either output I or II)

```
UTILITY MODE              UT   EDIT EFFECT2
Edit Effect  2 ?   ➡  INC  ➡  Select =LFO
```
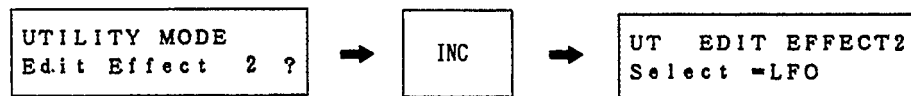
Select (LFO, Velocity, Note) This determines the source of the movement.

LFO: The sound will be panned back and forth at the LFO speed (p.14).

Velocity: Notes with low velocity (softly played) will be panned toward output I, and notes with high velocity (strongly played) will be panned toward output II. (This will be reversed if you select "Direction: II-I".)

Note: Low notes (to the left of the keyboard) will be panned toward output I, and high notes toward output II. (This will be reversed if you select "Direction: II-I.)

Direction (I-II, II-I) This determines the direction of the panning movement, from output I ➔ II or the reverse.

Range (0-99) This determines the range of the pan effect. At low settings the sound will barely move, and at high settings the sound will be panned completely to one or the other output.

Edit Effect 3 (Chord) This effect allows you to produce up to four simultaneous notes for each note you play, You can use it while editing the effect or in a performance (the first active instrument will be used). Press YES, then press PARAMETER to select the Key on note.

```
UTILITY MODE              UT   EDIT EFFECT3
Edit Effect  3 ?   ➡  INC  ➡  Key on note?  C3
```
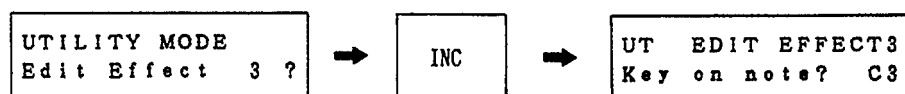
Press YES and the chord notes currently selected for that note will be displayed.

–30–

```
┌──────────┐       ┌────────────────────┐
│          │       │ UT  Chord   . C3   │
│   INC    │  ➡   │ C#2/ E2/F#2/ D3    │
│          │       │                    │
└──────────┘       └────────────────────┘
```
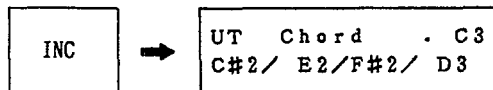
Now press up to four notes on the keyboard. When you release all the notes, the new chord notes will be displayed. If less than four notes are pressed, a "*" fills the empty space. In this way, you can specify up to 12 notes and a four-note chord for each. You can also use DEC/INC to specify the chord notes within a ±2 octave range. The blinking cursor will appear when you press DEC/INC.

Micro Tune?

The TX81Z has 13 microtonal scales (11 preset and 2 user-programmable), one of which can be selected for use in a performance (p.41). This is where you edit the two user-programmable scales. Press YES and use the PARAMETER keys to select the four jobs.

```
┌────────────────────┐       ┌──────────┐       ┌────────────────────┐
│ UTILITY MODE       │       │          │       │ UT   MICRO TUNE    │
│ Edit Micro Tune?   │  ➡   │   INC    │  ➡   │ Edit Octave ?      │
└────────────────────┘       └──────────┘       └────────────────────┘
```
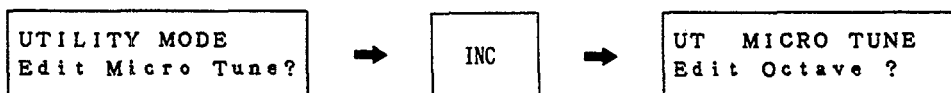
Edit Octave?

Here you can edit the 12 notes of the user-programmable octave. The tuning of each note will be repeated in steps of 1200 cents (one octave) up and down the keyboard. Press YES. Use the PARAMETER keys to select C3-B3 and use DEC/INC to change the tuning for each note. As you change the tuning, the absolute pitch is calculated and displayed in steps of 100/64 cent (about 1.56 cents) ranging from 0 (C#-1+0) to 6143 (C7+32). This covers the entire range of the TX81Z's sound-producing capability.

```
┌────────────────────┐
│ UT   MICRO   OCT.  │
│  C3:  C7 +32  6112 │
└────────────────────┘
     │         │
   Played    Sounded
```
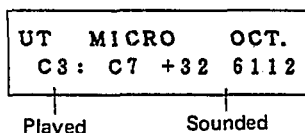
Init Octave?

Here you can initialize the user-programmable octave to one of the 11 preset scales. When creating your own scale, it may be faster to start with one of these preset scales. Press YES and use the PARAMETER keys to select preset scales 1-11. You can play the keyboard to hear the currently selected scale. Press YES again to initialize to the selected scale. (Press NO to escape.) For Pure, Mean Tone and Pythagorean scales, you can also choose the tonic (first note) of the scale. Move the cursor to the "key" area and select C-B using the PARA-METER keys. (No matter what tonic you select, A3 will always be 440Hz.)

1:	Equal	7:	Kirnberger
2:	Pure (major)	8:	Vallotti & Young
3:	Pure (minor)	9:	1/4 Shift eql
4:	Mean tone	10:	1/4 Tone
5:	Pythagorean	11:	1/8 Tone
6:	Werckmeister		

For the tuning details of scales 1 to 8, see the data tables on page 49. 1/4 Shifted Equal Temperament (scale 9) is the normal scale shifted up 50 cents. When 1/4 Tone (scale 10) is used, each key produces an interval of 50 cents (ie. play 24 keys to move one octave). When 1/8 Tone (scale 11) is used, each key produces an interval of 25 cents (ie. play 48 keys to move one octave). When 1/4 tone or 1/8 tone are used, the C2 key (key number 48) will produce the pitch of normal C3.

Edit Full Kbd?

Here you can edit the tuning of each note in the scale from C#-1 to C7 (the full range of the TX81Z's sound producing capability. As explained in "Edit Octave", use the PARAMETER keys to select the note and use DEC/INC to change the tuning for each note. You can also select a note by playing it on the keyboard and pressing a PARAMETER key.

Init Full Kbd?

Here you can initialize the user-programmable full scale to one of the 11 preset scales as described in "lnit Octave".

Init Voice?

This will set the voice data in the edit buffer to the settings shown below.

```
UTILITY MODE
Init Voice?
```

When creating a voice from scratch, it is often useful to start from this "basic setting" rather than having to reset all the parameters by hand. Press YES. The LCD will ask "Are you sure?", press YES again. The edit buffer will be set to the voice data shown below, and you will automatically enter Edit Mode (p.12).

INITIAL VOICE-DATA

ALG	=	1	(Mode)	=	RATIO	Poly Mode		
Feedback	=	0	OSW	=	W1 (sine)	P Bend Range	=	4
Wave	=	triangl	DET	=	0	Full Time Porta		
Speed	=	35	AR	=	31	Porta Time	=	0
Delay	=	0	D1R	=	31	FC Volume	=	40
P Mod Depth	=	0	D1L	=	15	FC Pitch	=	0
A Mod Depth	=	0	D2R	=	0	FC Amplitude	=	0
Sync	=	off	RR	=	15	MW Pitch	=	50
P Mod Sens.	=	6	SHFT	=	off	MW Ampli	=	0
AMS	=	0	OUT	=	90 OP1	BC Pitch	=	0
AME	=	off			0 2	BC Amplitude	=	0
EBS	=	0			0 3	BCP Bias	=	0
KVS	=	0			0 4	BC EG Bias	=	0
(Frequency)	=	1.00	RS	=	0	Middle C	=	C3
			LS	=	0	Reverb Rate	=	o f f
						Name	=	INIT
								VOICE

Recall Edit?

This recalls the last edited voice into the edit buffer. For example, if you are editing a voice and accidently select a voice memory, the voice data from memory will be loaded into the edit buffer and your edited settings will be lost. By using this "Recall Edit" function, you can restore the data you were editing.

```
UTILITY MODE
Recall Edit?
```

Press YES. The LCD will ask "Are you sure?" so press YES again. The data you were editing will be loaded into the edit buffer, and you will automatically enter Edit Mode (p.12).

PERFORMANCE MODE

In performance mode, you can use the TX81Z as up to eight independent instruments, and preset the maximum number notes, note limit, reception channel, voice number, etc. for each instrument. The TX81Z will remember up to 24 of these "Performances". Data (voice numbers, performance parameters etc.) for each instrument is shown in the lower line of the LCD. However, the LCD has space to display only four instruments at once, so use the CURSOR keys to move the blinking cursor to instruments 5-8.

PLAY PERFORMANCE

Using the DATA ENTRY keys, select performances 1-24. The upper line of the LCD will show the Performance Name, and the lower line will show the voice numbers for each instrument. (Move the cursor to the right to see the voice numbers for instruments 5-8). If the "Max Notes" setting of an instrument is 0, the voice number will show a "*" indicating an inactive instrument. The PARAMETER keys do not function in PLAY PERFORMANCE mode.

Performance number and name

```
┌─────────────────────┐      ┌─────────────────────┐
│ PF24 MyPerfName     │      │ PF24 MyPerfName▸    │
│ A04/B32/I05/A17→    │      │ ◂C01/ * / * /B31    │
└─────────────────────┘      └─────────────────────┘
```
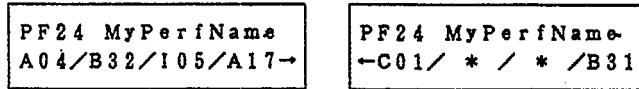
Instruments 1-4   Instruments 5-8

CURSOR

Each Performance Memory (1-24) contains the following data.

Instrument		1	2	3	4	5	6	7	8
Assign Mode		Normal / Alternate							
Max Notes (0-8)									
Voice No. (I01-D32)									
Receive Ch. (1-16, omni)									
Limit/L (C-2–G8)									
Limit/H (C-2–G8)									
Inst Detune (–7 – +7)									
Note Shift (–24 – +24)									
Volume (0-99)									
Out Assign (off, I, II, I II)									
LFO Select (off, 1, 2, vib)									
Micro Tune (select)		off/on	off/on	off/on	off/on	off/on	off/on	off/on	off/on
Effect Select		off / Delay / Pan / Chord							
Performance name									

There is a blank Performance Memory chart on p.63 that you may copy and use as a memo for your own settings.

STORE PERFORMANCE

You can store the currently selected performance (edited or not) in any performance memory 1-24. While in PLAY PERFORMANCE mode, press and hold the STORE key. The LCD will ask
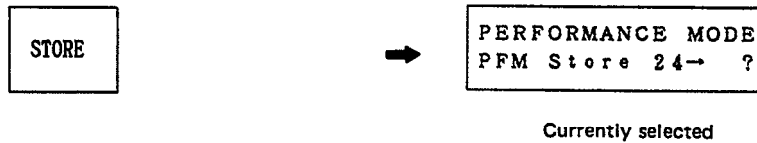
STORE	➡	`PERFORMANCE MODE` `PFM Store 24→  ?`

Currently selected

so continue holding STORE and use the DATA ENTRY keys to select the store destination (1-24).

STORE	+	DEC	INC	➡	`PERFORMANCE MODE` `PFM Store 24→24?`

Select destination
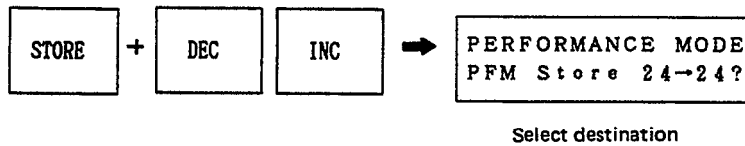
When the LCD shows the destination you want, release STORE and press YES. The performance will be stored into the selected memory. (You can quit without storing by pressing NO.)

Note

When the TX81Z is shipped, performance memories 1-24 contain the data listed on pages 51-62. Before storing your own performances, you may wish to save this data. See Save 24 Performance, p.29.

PERFORMANCE EDIT

In PERFORMANCE mode, press EDIT/COMPARE. The LED will light, and the LCD will show the previously edited parameter. When you first enter Edit Performance mode, the upper left character of the LCD will be a "P", but as soon as you make a change, this will change to "p", indicating that the performance data has been modified.

Original data unchanged

```
PERFORMANCE EDIT
Assign Mode=norm
```

Modifications have been made

```
pERFORMANCE EDIT
Assign Mode=altr
```

EDITING PROCEDURE

Use the PARAMETER keys to move through the parameters. Most Performance Parameters have independent settings for instruments 1-8. The LCD has space to show only four instruments at once, so an arrow "↱" on the lower line indicates that there is more data to be seen. Move the cursor to set the data for instruments 5-8. (The CURSOR LED will automatically come on when you enter EDIT mode.) Use the DATA ENTRY keys to change the data value at the blinking cursor.

```
CURSOR
```

```
P. ED RECEIVE CH
  1/ * / * / 16→
```

```
P. ED RECEIVE CH
← 7/omn/ 12/  5
```

Instruments   1   2   3   4   5   6   7   8
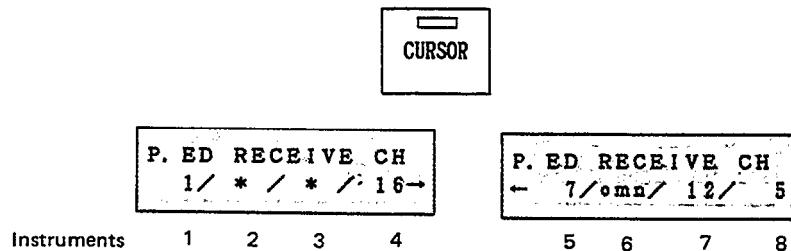
If the Max Notes setting (p.38) of an instrument is 0, that instrument is inactive, and its data will be indicated by a "*". (You can not edit an inactive instrument.) In the example above, instruments 2 and 3 are inactive.
Unlike Voice Edit mode, this mode has no Compare (p.13) function.

THE PERFORMANCE EDIT BUFFER

When you select a Performance Memory, the data is loaded into the Performance Edit Buffer, and this data tells the TX81Z how to behave. Changes you make in Edit mode affect this buffer, and are not permanent until Stored into one of the Performance Memories 1-24. (See Store Performance p.36.)

Assign Mode

This sets the key assign mode.

```
PERFORMANCE EDIT
Assign Mode=norm
```
norm/altr
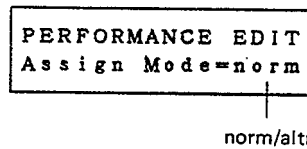
In Normal mode, incoming MIDI Note On messages will play the instrument that has a matching Reception Channel (p.39). Alternate mode is rather special. Only those incoming notes that match the Reception Channel of instrument 1 will be played, and each successive note will be sounded by the next instrument. Thus, every eighth note will be sounded by the same instrument. Setting the 8 instruments to voices that are slightly different can be quite effective.

Max Notes

This sets the maximum number of notes that an instrument can produce.

```
P. ED MAX NOTES
   4/   0/  1/  1→
```
0-8
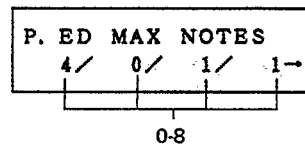
The TX81Z can produce up to 8 notes at once. These 8 notes must be divided among the 8 instruments. ie. the total Max Notes settings of the 8 instruments can not exceed 8. If one instrument is to play chords of up to 8 notes, the Max Notes setting for the other 7 instruments must be 0. Any combination is possible. If Max Notes is set to 0, that instrument will be inactive. When editing other Performance Parameters, a "*" will appear in place of that instrument's data, and you will not be able to edit it.
A Max Notes setting of 1 is not exactly the same as setting the voice to Mono mode. See p.21.

Voice No.

Select the voice number for each instrument.

```
P. ED Grand Piano
A01/ * /I32/C07→
```
I01-D32
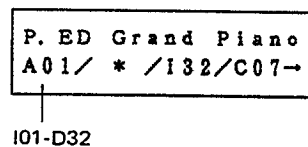
Use the DATA ENTRY keys to select voices I01-D32. The upper line of the LCD will show the Voice Name for the instrument indicated by the blinking cursor.

Receive Ch.

Select the MID I reception channel for each instrument.

```
┌─────────────────────┐
│ P. ED  RECEIVE  CH   │
│  12/  16/omn/   4→   │
└─────────────────────┘
```
1-16, omni
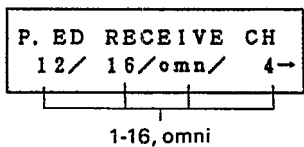
When set to "omni", messages on any channel (1-16) will be received.

Limit /L

Incoming notes below this limit will be ignored.

```
┌─────────────────────┐
│ P. ED  LIMIT/L       │
│  C2/F#5/  G6/G#0→    │
└─────────────────────┘
```
C-2 — G8
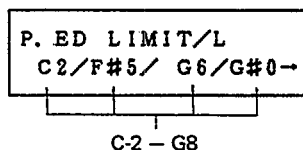
Limit /H

Incoming notes above this limit will be ignored.

```
┌─────────────────────┐
│ P. ED  LIMIT/H       │
│  G8/F#5/  G8/G#0→    │
└─────────────────────┘
```
C-2 — G8
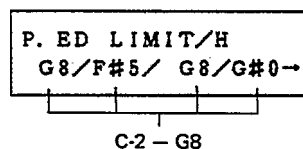
You can use the Low and High note limits to create a "split" effect. One instrument could play notes below C3, and another instrument (set to a different voice) play notes above D#3. It is possible to set the Low limit above the High limit, in which case the instrument would play notes at the ends of the keyboard and not in the middle range.

Detune

Each instrument can be tuned independently.

```
┌─────────────────────┐
│ P. ED  INST  DETUNE  │
│   0/-  7/+  7/+  3→  │
└─────────────────────┘
```
−7 — +7
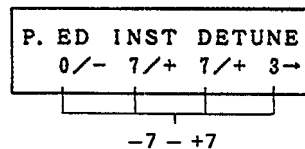
Note Shift

Each instrument can be transposed independently in steps of a semitone. A setting of −24 is two octaves down, and +24 is two octaves up.

```
┌─────────────────────┐
│ P. ED  NOTE  SHIFT   │
│   0/+24/-24/+  6→    │
└─────────────────────┘
```
−24 — +24
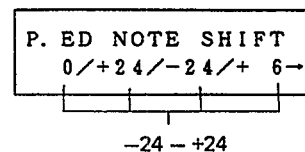
Volume

The volume of each instrument can be set independently. A vertical bar beside each number graphically indicates the volume.

```
┌─────────────────────┐
│ P. ED ■       ■     │
│ VOL 9 0■5 0■9 9■2 4 ▄→│
└─────────────────────┘
         └──┴──┴──┘
            0-99
```
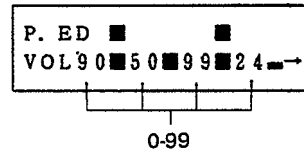
---- Note ----
When an instrument receives a MIDI Control Change Bn.07.xx (volume), this setting will be defeated, ie. MIDI will set the volume regardless of this setting. If you want to set the volume of an instrument so that MIDI will control the volume within a setting, set the operator output levels of the carriers (p.20) in the voice data.

Out Assign

The output of each instrument can be assigned to either or both of the rear panel outputs.

```
┌─────────────────────┐
│ P. ED OUT ASSIGN    │
│   I／  II／  ·II／  I→│
└─────────────────────┘
    └───┴────┴───┘
      off, I, II, I II
```
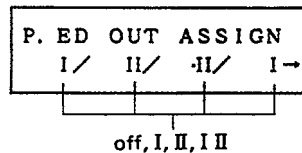
LFO Select

This selects the source of LFO modulation for each instrument.
When "off" is selected, the instrument will use neither Amplitude modulation nor Pitch modulation.
When "vib" is selected, the instrument will use the LFO settings from its own currently selected voice memory, but there will be no Amplitude modulation.
(Thus, if you need only Pitch modulation, each instrument can have its own independent LFO.)
If an instrument is to use Amplitude modulation, it must share the LFO of either the first or second instrument in the performance. The display will indicate the instrument number (1-8) who's LFO will be used. If only one instrument is active, "---" will be displayed instead of the second instrument number.
In the display below, instrument 1 is inactive (its Max Notes setting is 0), so instrument 2 is the "first" instrument. Set as shown, instrument 2 will use its own LFO (with Amplitude modulation), instrument 3 will use its own LFO (without Amplitude modulation), and instrument 4 will use the LFO of in-strument 3 (with Amplitude modulation).
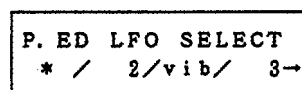
```
┌─────────────────────┐
│ P. ED LFO SELECT    │
│  * ／  2／vib／  3→  │
└─────────────────────┘

   off, (first), (second), vib
```

Micro Tune

The TX81Z has 13 Micro Tuning Tables (see p.49) in its memory; 11 are preset (see p.31) and the other two (one Octave and one Full) can be edited. You can select one of these 13 tables for use in a performance, and specify whether or not (on/off) each instrument 1-8 will use the selected Microtone Table. When Micro Tune is on, that instrument will produce the pitch indicated by the data in the selected Microtuning Table. When Micro Tune is off, that instrument will play the normal (tempered) scale. In the example below, instruments 2 and 3 will use the preset 1 scale.

```
        Oct. / Full / 1-11 / C-B

   ┌────────────────────────┐
   │ P. ED  MICTUN=1  Eb │
   │ off/ on/ on/off→ │
   └────────────────────────┘
        └──┬──┴──┬──┴──┬──┘
              on/off
```

Effect Select

Each performance can use one of the three effects (see p.29). When the Delay or Chord effect is selected, only the first active instrument will be used. Pan will only affect instruments assigned to output I or II (not both).

```
   ┌────────────────────────┐
   │ PERFORMANCE  EDIT │
   │ Effect  Sel=off │
   └────────────────────────┘
              │
        off/Delay/Pan/Chord
```

Performance Name

You can give a Performance Memory a 10-character name. Use the CURSOR keys to move the blinking cursor, and use the DATA ENTRY keys to select the character. A list of the available characters is given on p.23.

```
   ┌────────────────────────┐
   │ PERFORMANCE  EDIT │
   │ Name:MyPerfName │
   └────────────────────────┘
```

PERFORMANCE UTILITY

While in PERFORMANCE mode, press UTILITY and use the PARAMETER keys to select the job you want.

```
┌──────┐        ┌─────────────────────┐
│ ▭    │   ➡    │ P. UTILITY  Singl   │
│UTILITY│       │ Init Perfrm?        │
└──────┘        └─────────────────────┘
```

Voice Edit

This lets you edit one of the voices in the currently selected performance. You will jump to SINGLE Edit mode (p.12) when you press YES.

```
┌─────────────────────┐
│ P. UT VOICE EDIT?   │
│ A14/117/C02/C08→     │
└─────────────────────┘
```

Init Perfrm?

This lets you initialize the Performance Buffer to one of the standard settings shown on pages 43-45.

```
┌─────────────────────┐
│ P. UTILITY  Singl   │
│ Init Perfrm?        │
└─────────────────────┘
             │
   Singl/dual/split/mono 8/poly 4
```

Press NO to select the initialization setting you want. When the LCD shows the desired setting, press YES. You will be asked "Are you sure?" so press YES again.

Performance name	SINGLE							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	(Normal)/ Alternate							
Max Notes (0-8)	8	0	0	0	0	0	0	0
Voice No. (I01-D32)	I01	I01	I01	I01	I01	I01	I01	I01
Receive Ch. (1-16, omni)	1	2	3	4	5	6	7	8
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8
Detune (−7 – +7)	0	0	0	0	0	0	0	0
Note Shift (−24 – +24)	0	0	0	0	0	0	0	0
Volume (0-99)	99	99	99	99	99	99	99	99
Out Assign (off,I,II,I II)	I II	I II	I II	I II	I II	I II	I II	I II
LFO Select (off,1,2,vib)	1	2	vib	vib	vib	vib	vib	vib
Micro Tune (select) Oct.	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on
Effect Select	(off)/ Delay / Pan / Chord							

Performance name	DUAL							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	(Normal)/ Alternate							
Max Notes (0-8)	4	4	0	0	0	0	0	0
Voice No. (I01-D32)	I01	I01	I01	I01	I01	I01	I01	I01
Receive Ch. (1-16, omni)	1	1	3	4	5	6	7	8
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8
Detune (−7 – +7)	0	+2	0	0	0	0	0	0
Note Shift (−24 – +24)	0	0	0	0	0	0	0	0
Volume (0-99)	99	99	99	99	99	99	99	99
Out Assign (I,II,I+II)	I II	I II	I II	I II	I II	I II	I II	I II
LFO Select (off,1,2,vib)	1	2	vib	vib	vib	vib	vib	vib
Micro Tune (select) Oct.	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on
Effect Select	(off)/ Delay / Pan / Chord							

Performance name	SPLIT							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	(Normal) / Alternate							
Max Notes (0-8)	4	4	0	0	0	0	0	0
Voice No. (I01-D32)	I01	I01	I01	I01	I01	I01	I01	I01
Receive Ch. (1-16, omni)	1	1	3	4	5	6	7	8
Limit/L (C-2 – G8)	C-3	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)	G8	B2	G8	G8	G8	G8	G8	G8
Detune (–7 – +7)	0	0	0	0	0	0	0	0
Note Shift (–24 – +24)	0	0	0	0	0	0	0	0
Volume (0-99)	99	99	99	99	99	99	99	99
Out Assign (I,II,I+II)	I II	I II	I II	I II	I II	I II	I II	I II
LFO Select (off,1,2,vib)	1	2	vib	vib	vib	vib	vib	vib
Micro Tune (select)	Oct.	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on
Effect Select	(off)/ Delay / Pan / Chord							

Performance name	MONO8							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	(Normal)/ Alternate							
Max Notes (0-8)	1	1	1	1	1	1	1	1
Voice No. (I01-D32)	I01	I02	I03	I04	I05	I06	I07	I08
Receive Ch. (1-16, omni)	1	2	3	4	5	6	7	8
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8
Detune (–7 – +7)	0	0	0	0	0	0	0	0
Note Shift (–24 – +24)	0	0	0	0	0	0	0	0
Volume (0-99)	99	99	99	99	99	99	99	99
Out Assign (I, II, I+II)	I II	I II	I II	I II	I II	I II	I II	I II
LFO Select (1,2, vib)	1	2	vib	vib	vib	vib	vib	vib
Micro Tune (select) Oct.	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on
Effect Select	(off) / Delay / Pan / Chord							

Performance name		POLY4							
Instrument		1	2	3	4	5	6	7	8
Assign Mode		(Normal)/ Alternate							
Max Notes (0-8)		2	2	2	2	0	0	0	0
Voice No. (I01-D32)		I01	I02	I03	I04	I05	I06	I07	I08
Receive Ch. (1-16, omni)		1	2	3	4	5	6	7	8
Limit /L (C-2 – G8)		C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)		G8	G8	G8	G8	G8	G8	G8	G8
Detune (–7 – +7)		0	0	0	0	0	0	0	0
Not Shift (–24 – +24)		0	0	0	0	0	0	0	0
Volume (0-99)		99	99	99	99	99	99	99	99
Out Assign (I, II, I+II)		I II	I II	I II	I II	I II	I II	I II	I II
LPO Select (1, 2, vib)		1	2	vib	vib	vib	vib	vib	vib
Micro Tune (select)	Oct.	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on	(off)/on
Effect Select		(off) / Delay / Pan / Chord							

Memory Protect

This is the very same function described in SINGLE UTILITY (p.27).

```
P. UTILITY
Mem Protection
```
off/on
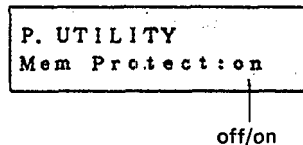
When Memory Protect is on, you will not be able to store a Voice or Performance, and incoming MIDI bulk data will be ignored.

OTHER FUNCTIONS

Greeting Message

When you turn the TX81Z power on, it displays a greeting message, initially set to "<Good morning!!>". You can change this by turning the power on while pressing STORE. Use the CURSOR keys to move the blinking cursor and use DEC/INC to select characters. (The character table is on p.23.) When you are finished, press PARAMETER, EDIT or PLAY to return to normal operation.
The next time you turn the power on, your new message will be displayed.

Minimum Volume

The Master Volume control (p.3) controls the volume of the entire TX81Z. When it is set to 0, there will be no sound, If the Master Volume is less than 30, it will automatically be reset to 30 when the power is turned on.

MIDI Note Indicator

When a MIDI Note On message arrives while in PLAY mode (single or performance), the PLAY LED will blink. This is irrespective of the Receive Channel setting, and the LED will blink even if the note was not actually sounded.
However, if Key Number (p.25) is set to Odd or Even, only corresponding notes will make the LED blink.

Note Range

The TX81Z can produce notes in the range from C#–1 to C7. Incoming notes beyond this range will be "folded back" to the nearest octave.

Battery Backup

The TX81Z internal RAM memory (voice memory bank I, 24 performance memories, effects 1-3, etc.) is backed up by a battery to retain data even when the power is turned off. The life of this battery is approximately 5 years. Have it replaced by an authorized Yamaha technician within 5 years of purchase. (Don't forget to save the internal data to a storage device such as cassette before having the battery changed.)

IDEAS AND SUGGESTIONS

The TX81Z can be used in any number of ways. Here are some ideas.

PERCUSSION

Double the RX rhythm machine sounds with TX sounds.

Most rhythm machines can be set to transmit a specified MIDI note number when a percussive voice is sounded. You can use the TX81Z to produce 8 percussive sounds, and set the High and Low note limits to the same note, so that each TX instrument can be played only by a single note number. For example, a Yamaha RX rhythm machine can send an E2 Note On message when the snare drum sounds. This could play a TX percussive voice, producing a unique blend. (The Fixed Frequency mode is especially useful when programming percussive voices. See p.17.) Or you could simply play the TX81Z percussive voices from a keyboard. Bass Drum on C, Snare on Eb-F (it's easier to play a drum roll when you have several keys), Crash Cymbal on F#, etc.

> ─ Note ─
> Rhythm machines send a Note Off message quickly after the Note On message. If this interval is too short, the TX may not have time to sound. Try setting the Release Rate to a lower value.

HEAVY MONOPHONIC

If your solo is going to be monophonic, how about playing 8 TX instruments in unison? Set each instrument to receive the same MIDI channel, and assign different voices (and different detunings) to each. Setting a slightly different Portamento Time (or Pitch Bend Range) for each instrument is also effective. This will give you the thickest, richest, most powerful solo sound you ever heard; one that will "out-analog" the analog synthesizers(!).

HUMAN EXPRESSION

In a variation of the above, use several different voices to synthesize a different component of an acoustic instrument sound, in essence using the TX as a single 32-operator FM synthesizer. For example, a saxophone sound consists of many different elements, one of which is the breathy wind-noise. An entire TX instrument could be devoted producing this wind-noise. By appropriate settings of the Voice Functions, each component can be controlled independently by Foot Controller, Breath Controller, Modulation Wheel and Key Velocity.

MICROTONAL DETUNE BY AREA

A microtonal scale can be selected for use with specified instruments in a Performance. Set up the TX81Z as two 4-note polyphonic instruments, and set one of them to use the user-programmable Full Keyboard microtonal scale. Set the microtonal scale so that it is identical to the equal tempered (normal) scale, and detune just the notes where you want the detuned chorus effect.

DX21/27/100 COMPATIBILITY

The TX81Z uses the same 4-operator, 8-algorithm FM synthesis as the DX21, DX27 and DX100, and voice data can be transmitted and received between them. However, the TX81Z has a number of features that the DX21/27/100 does not.

*The Frequency CRS(RATIO) adjustment (p.17) is equivalent to the values programmable in the DX21/27/100. The FIN(RATIO) adjustment is additional precision available in the TX81Z. Also, the DX21/27/100 operators have no FIX mode.

*The DX21/27/100 operators produce only sinewaves. When a TX81Z voice that uses non-sinewave operators (p.18) is loaded into a DX21/27/100, it will not sound the same.

*EG RR. The Envelope Generator Release Rate on the DX21/27/100 can be set to 0, whereas the TX81Z EG-RR minimum setting is 1. When voice data is received from a DX21/27/100, any EG release rates of 0 are set to 1.

*EG-EG Shift is not a parameter on the DX21/27/100, and will be ignored when you load data from the TX81Z.

*Parameters which the TX81Z does not have (PEG, chorus) will be set to Off or 0.

*The TX81Z BC Pitch Bias of −50 to +50 (p.22) corresponds to the DX27/100 BC Pitch Bias of 0-99. However, the curve is different, (Exponential, not linear.)

MICRO TUNING DATA TABLE

KEY (CENT)	Equal	Pure C (major)	Pure A (minor)	Mean Tone C	Pythago-rean C	Werck-meister	Kirnberger	Vallotti & Young
*C	0	0.000	0.000	0.0000	0.000	0.000	0.000	0.000
*C#	100	70.673	70.673	76.0490	113.685	90.225	90.225	94.135
*D	200	203.910	182.404	193.1569	203.910	192.180	193.157	196.090
*D#	300	315.641	315.641	310.2647	294.135	294.135	294.135	298.045
*E	400	386.314	384.314	386.3137	407.820	390.225	386.314	392.180
*F	500	498.045	498.045	503.4216	498.045	498.045	498.045	501.955
*F#	600	568.718	568.718	579.4706	611.730	588.270	590.224	592.180
*G	700	701.955	701.955	696.5784	701.955	696.090	696.578	698.045
*G#	800	772.628	772.628	772.6274	815.640	792.180	792.180	796.090
*A	900	884.359	884.359	889.7353	905.865	888.270	889.735	894.135
*A#	1000	1017.596	1017.596	1006.8432	996.090	996.090	996.090	1000.000
*B	1100	1088.269	1088.269	1082.8921	1109.775	1092.180	1088.269	1090.225
*C	1200	1200.000	1200.000	1200.0000	1200.000	1200.000	1200.000	1200.000
*C-C#	100	70.673	70.673	76.0490	113.685	90.225	90.225	94.135
*C#-D	100	133.237	111.731	117.1079	90.225	101.955	102.932	101.955
*D-D#	100	111.731	133.237	117.1078	90.225	101.955	100.978	101.955
*D#-E	100	70.673	70.673	76.0490	113.685	96.090	92.179	94.135
*E-F	100	111.731	111.731	117.1079	90.225	107.820	111.731	109.775
*F-F#	100	70.673	70.673	76.0490	113.685	90.225	92.179	90.225
*F#-G	100	133.237	133.237	117.1078	90.225	107.820	106.354	105.865
*G-G#	100	70.673	70.673	76.0490	113.685	96.090	95.602	98.045
*G#-A	100	111.731	111.731	117.1079	90.225	96.090	97.555	98.045
*A-A#	100	133.237	133.237	117.1079	90.225	107.820	106.355	105.865
*A#-B	100	70.673	70.673	76.0489	113.685	96.090	92.179	90.225
*B-C	100	111.731	111.731	117.1079	90.225	107.820	111.731	109.775
*C-C	1200	1200.000	1200.000	1200.0000	1200.000	1200.000	1200.000	1200.000

This table shows the theoretical values. Actual data in the TX81Z is in steps of approximately 1.56 cents.

WAVEFORM HARMONIC CONTENT

In addition to sinewaves (pure tones), the TX81Z operators can use 7 more complex waveforms, These waveforms are not modeled after any "real" instrument, but are mathematical transformations of sinewaves.
Here is the harmonic content of each waveform. The amplitude (volume) of each harmonic partial is given as a percentage of the fundamental.

W1
Sine wave. Only fundamental.

1	2	3	4	5	6	7	8	9	10	11	12
100	0	0	0	0	0	0	0	0	0	0	0
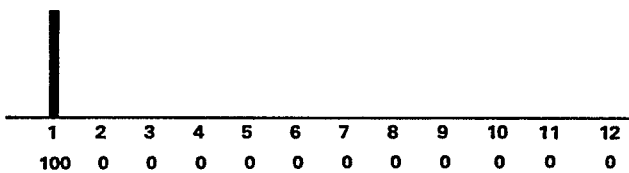
W2
Odd partials somewhat like a square wave

1	2	3	4	5	6	7	8	9	10	11	12
100	0	19	9	3	0	1	0	0	0	0	0

W3
Even partials.

1	2	3	4	5	6	7	8	9	10	11	12
100	39	0	8	0	4	0	2	0	1	0	1

W4
Partials 2, 3, 5, 7, ...

1	2	3	4	5	6	7	8	9	10	11	12
100	55	18	0	3	0	1	0	0	0	0	0
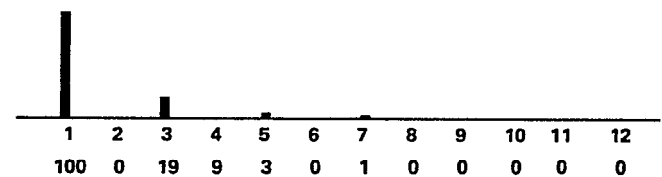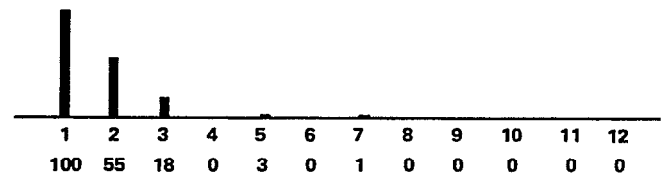
W5
Partials 2, 3, 5, 7, 9 . . . . (stronger partials than W4)
Second partial is stronger than fundamental.

1	2	3	4	5	6	7	8	9	10	11	12
100	109	56	0	15	0	6	0	4	0	2	0
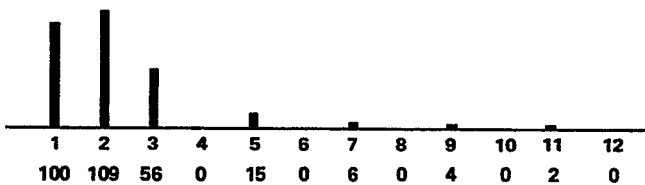
W6
Partials 2, 3, 5, 6, 7, 9, 10, 11, . . . (no 4, 8, ...)
Second partial is stronger than fundamental.

1	2	3	4	5	6	7	8	9	10	11	12
100	116	66	0	34	25	6	0	3	4	1	0
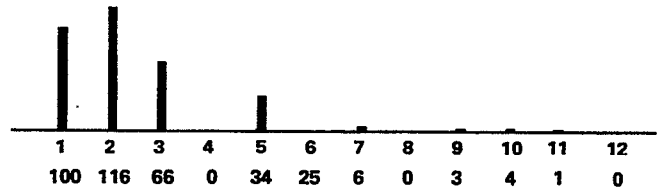
W7
Partials 3, 4, 5, 7, 8, 9, . . . (no 2, 6, 10, . . .)

1	2	3	4	5	6	7	8	9	10	11	12
100	0	56	50	15	0	6	9	4	0	2	4
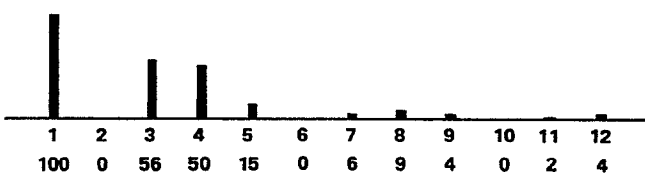
W8
Partials 3, 4, 5, 7, 8, 11, ... (no 2, 6, 8, 10 . . . .)

1	2	3	4	5	6	7	8	9	10	11	12
100	0	66	74	34	0	6	0	3	0	1	0
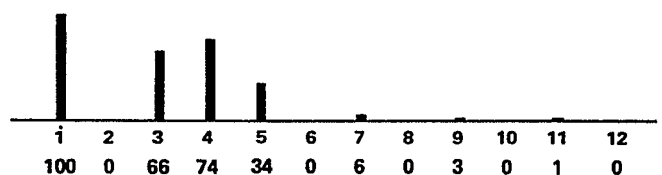
PERFORMANCE DATA

Performance No. 1

Performance name	Acustic Guit								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Nylon Guit
Assign Mode	Alternate								2 Nylon Guit
Max Notes (0-8)	1	1	1	1	1	1	1	1	3 Nylon Guit
Voice No. (I01-D32)	C01	C01	C01	C01	C01	C01	C01	C01	4 Nylon Guit
Receive Ch. (1-16), omni)	1	1	1	1	1	1	1	1	5 Nylon Guit
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2	6 Nylon Guit
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8	7 Nylon Guit
Detune (−7 − +7)	0	−2	+ 2	−1	+ 1	−3	+ 1	−2	8 Nylon Guit
Note Shift (−24 − +24)	0	0	0	0	0	0	0	0	
Volume (0-99)	99	99	99	99	99	99	99	99	
Out Assign (off, I, II, I II)	I, II	I, II	I, II	I, II	I, II	I, II	I, II	I, II	
LFO Select (off, 1, 2, vib)	1	1	1	1	1	1	1	1	
Micro Tune (select)	off	off	off	off	off	off	off	off	
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 2

Performance name	Hollo Flute								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 PercFlute
Assign Mode	Normal								2 PanFloot
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B31	B12							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C2 – G8)	C-2	C-2							6
Limit /H (C2 – G8)	G8	G8							7
Detune (−7 − +7)	− 4	+ 4							8
Note Shift (−24 − +24)	0	−12							
Volume (0-99)	67	99							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)									
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 3

Performance name	Bass/Sax								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Rasp Alto
Assign Mode	Normal								2 Jaco Bass
Max Notes (0-8)	6	2							3
Voice No. (I01-D32)	B10	C14							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C#3	C-2							6
Limit /H (C-2 – G8)	G8	C3							7
Detune (−7 – +7)	0	0							8
Note Shift (−24 – +24)	−24	+12							
Volume (0-99)	90	90							
Out Assign (off, I, II, I II)	I, II	I, II							
LFO Select (off, 1, 2 vib)	1	2							
Micro Tune (select)		off	off						
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 4

Performance name	Fanfare Brs								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Trumpet81Z
Assign Mode	Normal								2 AtackBrass
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B01	B06							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 – +7)	−1	+2							8
Note Shift (−24 – +24)	0	0							
Volume (0-99)	69	99							
Out Assign (off, I, II, I II)	I, II	I, II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)									
Effect Select	Chord								

EFFECT 3	C3	G2, C3, E2	F#3	A#2, C#3, D#3, F#3
Chord	C#3	F2, C#3, G#2, A#2	G3	B2, D3, G3
	D3	G2, B2, D3	G#3	C3, G#3, D#3, F3
	D#3	G2, A#2, D#3	A3	C3, F3, A3
	E3	G2, C3, E3	A#3	D3, G3, A#3, F3
	F3	A2, C3, D3, F3	B3	D3, F3, B3, G3

Performance No. 5

Performance name	Chorus EP								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 DynomiteEP
Assign Mode	Normal								2
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	A13	A13							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 +7)	+3	−3							8
Note Shift (−24 – +24)	0	0							
Volume (0-99)	99	99							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Pan								

EFFECT 2	Select	LFO
Pan	Direction	I→II
	Range	25

Performance No. 6

Performance name	Wind Band								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Flute
Assign Mode	Alternate								2 Clarinet
Max Notes (0-8)	1	1	1	1	1	1	1	1	3 Oboe
Voice No. (I01-D32)	B11	B15	B14	B05	B04	B03	B01	B02	4 FrenchHorn
Receive Ch. (1-16, omni)	1	1	1	1	1	1	1	1	5 ChorusBras
Limit /L (C-2 – G8)	C2	C2	C2	C2	C2	C2	C2	C2	6 FlugelHorn
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8	7 Trumpet81Z
Detune (−7 – +7)	0	−2	−1	+1	3	−3	−1	+1	8 FullBrass
Note Shift (−24 – +24)	−12	0	−12	0	0	0	0	0	
Volume (0-99)	94	92	95	99	92	99	84	99	
Out Assign (off, I, II, I II)	I	II	I	II	I	II	I	II	
LFO Select (off, 1, 2, vib)	1	2	vib	vib	vib	vib	vib	vib	
Micro Tune (select)	off	off	off	off	off	off	off	off	
Effect Select	Off								

Performance No. 7

Performance name	Hi Strings								Voice Name	
Instrument	1	2	3	4	5	6	7	8	1	HiString 2
Assign Mode	Normal								2	HiString 2
Max Notes (0-8)	4	4							3	
Voice No. (I01-D32)	B30	B30							4	
Receive Ch. (1-16, omni)	1	1							5	
Limit /L (C-2 – G8)	C-2	C-2							6	
Limit /H (C-2 – G8)	G8	G8							7	
Detune (−7 – +7)	−3	+3							8	
Note Shift (−24 – +24)										
Volume (0-99)	99	99								
Out Assign (off, I, II, I II)	I	II								
LFO Select (off, 1, 2, vib)	1	2								
Micro Tune (select)	off	off								
Effect Select	Off									

Performance No. 8

Performance name	Big Tim Lead								Voice Name	
Instrument	1	2	3	4	5	6	7	8	1	Sync Lead
Assign Mode	Normal								2	Sync Lead
Max Notes (0-8)	1	1	1	1	1	1	1	1	3	Sync Lead
Voice No. (I01-D32)	C22	C22	C22	C22	C25	C25	C25	C25	4	Sync Lead
Receive Ch. (1-16, omni)	1	1	1	1	1	1	1	1	5	Heavy Lead
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2	6	Heavy Lead
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8	7	Heavy Lead
Detune (−7 – +7)	+4	−4	+2	−2	−5	+5	−6	+6	8	Heavy Lead
Note Shift (−24 – +24)	−12	0	0	0	−12	0	0	0		
Volume (0-99)	77	82	82	82	77	82	82	82		
Out Assign (off, I, II, I II)	I	II	I	II	II	I	II	I		
LFO Select (off, 1, 2, vib)	1	1	1	1	1	1	1	1		
Micro Tune (select)	off	off	off	off	off	off	off	off		
Effect Select	Off									

Performance No. 9

Performance name	Pluck Delay								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Pizzicato
Assign Mode	Normal								2 Harp
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B23	B24							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C2 – G8)	G8	G8							7
Detune (–7 – +7)	–2	+2							8
Note Shift (–24 – +24)	+24	0							
Volume (0-9)	85	91							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)									
Effect Select	Delay								

EFFECT1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 10

Performance name	Elec Choir								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 BaadBreath
Assign Mode	Normal								2 KrstChoir
Max Notes (0-8)	2	3	3						3 Voices
Voice No. (I01-D32)	D01	D03	D04						4
Receive Ch. (1-16, omni)	1	1	1						5
Limit /L (C-2 – G8)	C-2	C-2	C-2						6
Limit /H (C-2 – G8)	G8	G8	G8						7
Detune (–7 – +7)	0	–5	7						8
Note Shift (–24 – +24)	0	0	0						
Volume (0-99)	99	50	91						
Out Assign (off, I, II, I II)	I II	I II	I II						
LFO Select (off, 1, 2, vib)	1	2	vib						
Micro Tune (select)	on	on	off						
Effect Select	Pan								

EFFECT 2	Select	LFO
Pan	Direction	I → I I
	Range	25

Performance No. 11

Performance name	Bs → Gtr → Flt							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	Normal							
Max Notes (0-8)	1	5	2					
Voice No. (I01-D32)	C14	C05	C24					
Receive Ch. (1-16, omni)	1	1	1					
Limit /L (C-2 – G8)	C-2	C#3	G4					
Limit /H (C-2 – G8)	C3	F#4	G8					
Detune (−7 – +7)	0	0	0					
Note Shift (−24 – +24)	+12	0	0					
Volume (0-99)	61	99	98					
Out Assign (off, I, II, I II)	I II	I	II					
LFO Select (off, 1, 2, vib)	1	2	vib					
Micro Tune (select)	off	off	off					
Effect Select	Off							

Voice Name
1 Jaco Bass
2 AllThatJaz
3 Jazz Flute
4
5
6
7
8

Performance No. 12

Performance name	Honky Grand							
Instrument	1	2	3	4	5	6	7	8
Assign Mode	Alternate							
Max Notes (0-8)	1	1	1	1	1	1	1	1
Voice No. (I01-D32)	A02	A02	A02	A02	A02	A02	A02	A02
Receive Ch. (1-16, omni)	1	1	1	1	1	1	1	1
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8
Detune (−7 – +7)	0	+4	− 4	+7	−7	+2	− 2	+5
Note Shift (−24 – +24)	+12	+12	+12	+12	+12	+12	+12	+12
Volume (0-99)	90	90	90	90	90	90	90	90
Out Assign (off, I, II, I II)	I II	I II	I II	I II	I II	I II	I II	I II
LFO Select (off, 1, 2, vib)	1	1	1	1	1	1	1	1
Micro Tune (select)	off	off	off	off	off	off	off	off
Effect Select	Pan							

Voice Name
1 Uprt Piano
2
3
4
5
6
7
8

EFFECT2 Pan	Select	LFO
	Direction	I → I I
	Range	25

Performance No. 13

Performance name	Syn Strings								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 SynString
Assign Mode	Normal								2 SynString
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B26	B26							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 – +7)	−4	+4							8
Note Shift (−24 – +24)	0	0							
Volume (0-99)	92	92							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Off								

Performance No. 14

Performance name	Ice Cream								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Celeste
Assign Mode	Normal								2 BriteCelst
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	A30	A31							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 – +7)	−3	+3							8
Note Shift (−24 – +24)	0	0							
Volume (0-99)	90	90							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Pan								

EFFECT 2	Select	LFO
Pan	Direction	I → II
	Range	25

Performance No. 15

Performance name	Thin Clav								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Thin Clav
Assign Mode	Normal								2
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	A25	A25							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 − +7)	−3	+2							8
Note Shift (−24 − +24)	0	0							
Volume (0-99)	88	88							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Off								

Performance No. 16

Performance name	Amazon Flt								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Flute
Assign Mode	Normal								2 BreathOrgn
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B11	B32							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 − +7)	−2	+3							8
Note Shift (−24 − +24)	−12	0							
Volume (0-99)	99	99							
Out Assign (off, I, II, I II)	I, II	I, II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	on	on							
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 17

Performance name	Rubber Band								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 PlasticHit
Assign Mode	Normal								2 DynomiteEP
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	C31	A13							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 – +7)	− 2	+2							8
Note Shift (−24 – +24)	0	0							
Volume (0-99)	91	99							
Out Assign (off, I, II, I II)	I, II	I, II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECTLEVEL	73

Performance No. 18

Performance name	Great Strg								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 BowCello
Assign Mode	Alternate								2 BoxCello
Max Notes (0-8)	1	1	1	1	1	1	1	1	3 DoubleBass
Voice No. (I01-D32)	B18	B19	B17	B18	B19	B17	B18	B19	4 BowCello
Receive Ch. (1-16, omni)	1	1	1	1	1	1	1	1	5 BoxCello
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2	C-2	C-2	C-2	C-2	6 DoubleBass
Limit /H (C-2 – G8)	G8	G8	G8	G8	G8	G8	G8	G8	7 BowCello
Detune (−7 – +7)	0	− 2	+2	−1	+1	−3	+3	− 2	8 BoxCello
Note Shift (−24 – +24)	0	0	0	0	0	0	0	0	
Volume (0-99)	97	96	90	94	93	90	91	89	
Out Assign (off, I, II, I II)	I, II	I, II	I, II	I, II	I, II	I, II	I, II	I, II	
LFO Select (off, 1, 2, vib)	1	2	vib	1	2	vib	1	2	
Micro Tune (select)	off	off	off	off	off	off	off	off	
Effect Select	Off								

Performance No. 19

Performance name	Vocal Hit								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Vocal Nuts
Assign Mode	Normal								2 Vocal Nuts
Max Notes (0-8)									3 Vocal Nuts
Voice No. (I01-D32)	D02	D02	D02	D02					4 Vocal Nuts
Receive Ch. (1-16, omni)	1	1	1	1					5
Limit /L (C-2 – G8)	C-2	C-2	C-2	C-2					6
Limit /H (C-2 – G8)	G8	G8	G8	G8					7
Detune (−7 – +7)	+3	−3	+5	−5					8
Note Shift (−24 – +24)	0	0	+12	0					
Volume (0-99)	99	99	99	99					
Out Assign (off, I, II, I II)	I, II	I	II	I, II					
LFO Select (off, 1, 2, vib)	1	1	1	1					
Micro Tune (select)	off	off	off	off					
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 20

Performance name	Slapn Dyno								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 ElecBass 1
Assign Mode	Normal								2 ElecBass 1
Max Notes (0-8)	1	1	6						3 DynomiteEP
Voice No. (I01-D32)	C09	C09	A13						4
Receive Ch. (1-16, omni)	1	1	1						5
Limit /L (C-2 – G8)	C-2	C-2	C#3						6
Limit /H (C-2 – G8)	C3	C3	G8						7
Detune (−7 – +7)	+3	−3	0						8
Note Shift (−24 – +24)	+12	+12	0						
Volume (0-99)	99	99	99						
Out Assign (off, I, II, I II)	I	II	I, II						
LFO Select (off, 1, 2, vib)	1	1	vib						
Micro Tune (select)	off	off	off						
Effect Select	Off								

Performance No. 21

Performance name	Voice & Guitar								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Guitar #1
Assign Mode	Normal								2 BaadBreath
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	C02	D01							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 − +7)	+5	0							8
Note Shift (−24 − +24)	0	−12							
Volume (0-99)	82	95							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Off								

Performance No. 22

Performance name	Chorus Bras								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 ChorusBras
Assign Mode	Normal								2 ChorusBras
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	B04	B04							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 – G8)	C-2	C-2							6
Limit /H (C-2 – G8)	G8	G8							7
Detune (−7 − +7)	−4	+4							8
Note Shift (−24 − +24)	0	0							
Volume (0-99)	95	95							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Off								

Performance No. 23

Performance name	Koto Choir								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Fuzzy Koto
Assign Mode	Normal								2 Voices
Max Notes (0-8)	4	4							3
Voice No. (I01-D32)	D08	B27							4
Receive Ch. (1-16, omni)	1	1							5
Limit /L (C-2 − G8)	C-2	C-2							6
Limit /H (C-2 − G8)	G8	G8							7
Detune (−7 − +7)	0	0							8
Note Shift (−24 − +24)	0	0							
Volume (0-99)	99	99							
Out Assign (off, I, II, I II)	I	II							
LFO Select (off, 1, 2, vib)	1	2							
Micro Tune (select)	off	off							
Effect Select	Delay								

EFFECT 1	DELAY TIME	0.09
Delay	PITCH SHIFT	0
	FEEDBACK	0
	EFFECT LEVEL	73

Performance No. 24

Performance name	Percolator								Voice Name
Instrument	1	2	3	4	5	6	7	8	1 Tube Bells
Assign Mode	Normal								2 Noise Shot
Max Notes (0-8)	2	2	2	2					3 Hand Drum
Voice No. (I01-D32)	D26	D27	D30	D24					4 FM Hi-Hats
Receive Ch. (1-16, omni)	1	1	1	1					5
Limit /L (C-2 − G8)	C-2	C-2	C4	B5					6
Limit /H (C-2 − G8)	B1	B3	A#5	C6					7
Detune (−7 − +7)	0	0	0	0					8
Note Shift (−24 − +24)	+12	0	+5	−24					
Volume (0-99)	79	97	99	97					
Out Assign (off, I, II, I II)	I	II	II	I					
LFO Select (off, 1, 2, vib)	1	2	vib	vib					
Micro Tune (select)	off	off	off	off					
Effect Select	Off								

PERFORMANCE MEMO CHART

Performance name									
Instrument		1	2	3	4	5	6	7	8
Assign Mode		Normal / Alternate							
Max Notes (0-8)									
Voice No. (I01-D32)									
Receive Ch. (1-16, omni)									
Limit /L (C-2 – G8)									
Limit /H (C-2 – G8)									
Detune (−7 – +7)									
Note Shift (−24 – +24)									
Volume (0-99)									
Out Assign (off, I, II, I II)									
LFO Select (off, 1, 2, vib)									
Micro Tune (select)		off/on	off/on	off/on	off/on	off/on	off/on	off/on	off/on
Effect Select		off / Delay / Pan / Chord							

Performance name									
Instrument		1	2	3	4	5	6	7	8
Assign Mode		Normal / Alternate							
Max Notes (0-8)									
Voice No. (I01-D32)									
Receive Ch. (1-16, omni)									
Limit /L (C-2 – G8)									
Limit /H (C-2 – G8)									
Detune (−7 – +7)									
Note Shift (−24 – +24)									
Volume (0-99)									
Out Assign (off, I, II, I II)									
LFO Select (off, 1, 2, vib)									
Micro Tune (select)		off/on	off/on	off/on	off/on	off/on	off/on	off/on	off/on
Effect Select		off / Delay / Pan / Chord							

VOICE DATA LIST

VOICE NO./ NAME

ALGORITHM				
FEEDBACK				
FREQUENCY				
OSC. WAVE				
DETUNE				
OUT LEVEL				

EG				
AR				
D1R				
D1L				
D2R				
RR				
EG SHIFT	OFF			

SCALING				
RATE				
LEVEL				

SENSITIVITY				
PITCH				
AMPLITUDE (0-3) (ON/OFF)				
EG BIAS				
KEY VELOCITY				

LFO	
WAVE	
SPEED	
DELAY	
P MOD DEPTH	
A MOD DEPTH	
SYNC	

| FUNCTION	
MODE	
P BEND RANGE	
PORTAMENTO	
PORTAMENTO TIME	
FC VOLUME	
FC PITCH	
FC AMPLITUDE	
MW PITCH	
MW AMPLITUDE	
BC PITCH	
BC AMPLITUDE	
PC PITCH BIAS	
BC EG BIAS	
MIDDLE C	
REVERB RATE	

MIDI RECEPTION/TRANSMISSION

The TX81Z responds to MIDI messages as shown in the diagram on p.66. For System Exclusive messages see p.67. BCH indicates Basic Rcv. Ch. (p.25) and RCH indicates the receive channel for an individual instrument (p.39). G1-G16 indicates the Global Channel for Controller (p.25) or Pitch Bend (p.26).

*In the case of Control Change "Pan" (Bn.0A.xx), data values of 0 ~ 42 = output I, 43 ~ 85 = output I + II and 86 ~ 127 = output II.

*System Common messages F1h-F7h and System Realtime messages F8h-FDh and FFh are ignored.

*Once an Active Sensing message FEh is received, the TX81Z will expect a continuing stream of MIDI messages. If no messages come for a period of about 300 msec, it clears the MIDI input buffer and turns off any notes that are currently sounding.
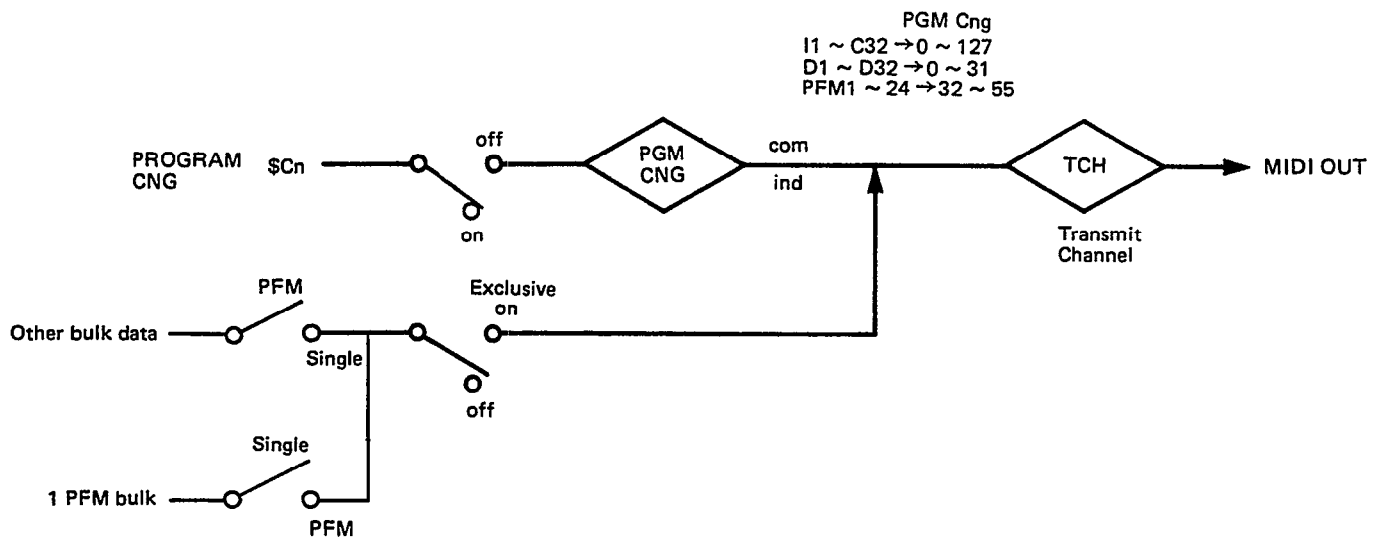
*In PLAY mode when a voice or performance is selected using the front panel keys, the TX81Z will send a program change message. I01-C32 (0-127), D01-D32 (0-31), PF01-PF24 (32-55).

BCH ..... Basic RCV. CH
RCH ..... Receive Ch

Mem. protect

Exclusive

$F\phi$, $43, $0n, $\phi4   32 Voice bulk (VMEM)

$F\phi$, $43, $0n, $7E   32 PFM Bulk (PMEM)
(LM .. 8976 PM)

BCH

OFF

ON

All other System Exclusive Bulk Data,
Parameter Changes and Dump Requests

$FE   (Active Sensing)

SINGLE

Note on/off

BCH?

$80   (Note Off)

PFM

RCH?

$90   (Note On)

Single

Cont. CNG

norm, G1 ~ G16

RCH?

$Bn, $01   (Modulation Wheel)

$Bn, $02   (Breath Controller)
[$Dn (After Touch: Selectabl)]

$Bn, $04   (Foot Controller)

PFM

Cont. CNG

norm

RCH?

$Bn, $05   (Portamento Time)

$Bn, $07   (Main Volume)

$n

Gn?

=n

$Bn, $41   (Portamento On/Off)

$Bn, $0A   (Pan)

Single

BCH

$Bn, $7B   (All Note Off)

PFM

RCH

$Bn, $40   (Sustain On/Off)

MIDI IN

PLAY

P. CNG

com

BCH

com

PCNG TBL

I, A ~ D

PF

$Cn   (Program Change)

ind

ind

Single

PFM

RCH

·com·

PCNG TBL

I, A ~ D

PF

$Cn   (Program Change)

Single

P. Bend

norm
G1 ~ G16

BCH

$En   (Pitch Bend)

PFM

P. Bend

norm

RCH

$n

G1 ~ G16

Gn?

=n

SINGLE

BCH

$Bn, $7E   (Mono On)

PFM

$Bn, $7F   (Poly On)

SYSTEM EXCLUSIVE DATA FORMAT

Reading this section will not necessarily help you use the TX81Z. This data is provided to comply with the MIDI Specification, and will be helpful to those who write computer programs to process TX81Z data.
The TX81Z has three types of System Exclusive message; Parameter Change messages, Bulk Data messages and Dump Request messages.

PARAMETER CHANGE MESSAGES

These messages change the value of a parameter in TX81Z memory, There are 8 subgroups of Parameter Changes; VCED, ACED, PCED, Remote Switch, Micro Tuning, Program Change, Effect data and System data.

VCED, ACED, PCED and Remote Switch parameter change messages have the following format.

```
11110000   F0h   Exclusive
01000011   43h   I.D. number (Yamaha)
0001nnnn   1nh   Basic receive channel
0ggggghh   ggggg = Group number, hh = Subgroup number
0ppppppp   ppppppp = Parameter number
0ddddddd   ddddddd = Data
11110111   F7h   End Of Exclusive
```

*VCED (Voice parameters compatible with DX21/27/100)
ggggg = 00100 (4), hh = 10 (2)
See p.71 for parameter numbers and data.

*ACED (Additional voice parameters for TX81Z)
ggggg = 00100 (4), hh = 11 (3)
See p.73 for parameter numbers and data.

*PCED (Performance parameters)
ggggg = 00100 (4), hh = 11 (3)
See p.74 for parameter numbers and data.

*Remote Switch (The same effect as pressing a switch on the TX81Z front panel, ie. "remote control".)
ggggg = 00100 (4), hh = 11 (3), ddddddd = 0 (off), 7F (on)
See p.75 for switch numbers.

System Parameter Change (basic receive channel settings, etc.) and Effect Parameter Change (data for delay, pan and chord) messages have the following format.

```
11110000    F0h    Exclusive
01000011    43h    I.D. number (Yamaha)
0001nnnn    1nh    Basic receive channel
0ggggghh    ggggg = 00100 (4), hh = 00 (0)
0ppppppp    ppppppp = 1111011 (123) = System Parameter
                      1111100 (124) = Effect Parameter
0kkkkkkk    kkkkkkk = Parameter number
```

```
0ddddddd    ddddddd = data
11110111    F7h   End of Exclusive
```

Micro Tune parameter change messages have the following format.

```
11110000    F0h   Exclusive
d1000011    43h   I.D. number (Yamaha)
0001nnnn    1nh   Basic receive channel
0ggggghh    ggggg = 00100 (4), hh = 00
0ppppppp    ppppppp = 1111101 (125) OCT
                      1111110 (126) FULL
0kkkkkkk    kkkkkk = key number
0hhhhhhh    hhhhhhh = note C #-1 to C7 (13-108)
0lllllll    lllllll = data fine tuning 0 to +31, −31 to −1 (0-32,33-63)
11110111    F7h End Of Exclusive
```

Program Change Table parameter change messages have the following format. The data is 0-184d, indicating the TX81Z memory to be selected in response to the incoming program change number. 0-31 (I1-I32), 32-63 (A1-A32), 64-95 (B1-B32), 96-127 (C1-C32), 128-160 (D1-D32), 161-184 (PF1-PF24)

```
11110000    F0h   Exclusive
01000011    43h   I.D. number (Yamaha)
0001nnnn    1nh   Basic receive channel
0gggggghh   ggggg = 00100 (4), hh = 00
0ppppppp    ppppppp = 1111111 (127)
0kkkkkkk    kkkkkk = program change number
0hhhhhhh    hhhhhhh = data (high)
0lllllll    lllllll = data (low)
11110111    F7h End Of Exclusive
```

BULK DATA MESSAGES

The TX81Z receives and transmits 10 types of bulk data message. Each has the format F0 (System Exclusive), 43 (Yamaha ID number), 0n (bulk data on channel n), data size (high), data size (low), data, checksum (twos complement of the lower 7 bits of the sum of all databytes), F7 (EOX). Some bulk data messages have a 10-character ASCII header. These characters are considered to be part of the data.

*Voice (SCED)
> Additional voice parameters for the TX81Z. f = 126 (7Eh) "LM .. 8986-AE", data size = 23 + 10 = 33 (0021h)
> F0. 43. 0n. 7E. 00. 21. "LM .. 8976AE". (ACED data). checksum. F7

*1 Voice (VCED)
> Voice parameters for the TX81Z. f = 4, data size = 93 (005dh), total size = 93 + 8 = 101 (5Dh)
> F0. 43. 0n. 03.00.5D. (VCED data). checksum. F7

―― Note ――
These two bulk data messages are transmitted when a voice is selected while in PLAY SINGLE mode, or when you "Init Voice" or "Recall Edit".
If ACED is received alone, the VCED edit buffer will be unaffected,
If VCED is received alone, the ACED edit buffer will be initialized.

*32 Voice (VMEM)
  This message includes both ACED and VCED parameters for 32 voices.
  f = 4, data size = 128 x 32 = 4096 (1000h), total size = 4096 + 8 = 4104
  FO. 43. 0n. 04. 10.00. (VMEM data). checksum. F7

*1 Performance (PCED)
  The contents of the performance edit buffer.
  f = 126 (7Eh) "LM .. 8976PE", data size = 120 (0078h), total size = 120 +8= 128
  F0. 43. 0n. 7E. 00. 78. "LM .. 8976PE". (data). checksum. F7

*32 Performance (PMEM)
  Data for 24 internal performance memories + 8 initial performances.
  f = 126 "LM .. 8976PM". data size = 10 + (76 x 32) = 2442 (098Ah)
  total size = 2442 + 8 = 2450
  F0. 43. 0n. 7E. 13. 0A. "LM .. 8976PM", (data). checksum. F7

*System (SYS)
  TX81Z system data (basic receive channel, etc.)
  f = 126 "LM .. 8976S0", data size = 10 + 27 = 37, total size = 37 + 8 = 45
  FO. 43. 0n. 7E. 00. 25. "LM .. 8976S0", (data). checksum. F7

*Program Change Table (SYS)
  Selected memory numbers I1-PF24 for each incoming program change.
  f = 126 "LM .. 8976S1", data size = 10 + 128 x 2 = 266 (010Ah), total size = 266 + 8 = 274
  F0. 43. 0n. 7E. 02. 0A. "LM .. 8976S1", (data), checksum. F7

*Effect Data (SYS)
  Data for the three effects (delay, pan, chord)
  f = 126 "LM .. 8976S2", data size = 10 + 55 = 65 (0041h), total size = 65 + 8 = 73
  F0. 43. 0n. 7E. 00. 41. "LM .. 8976S2", (data) checksum. F7

*Micro Tune Octave
  Contents of the user octave micro tune memory.
  f = 126 "LM .. MCRTE0", data size = 24 + 10 = 34 (0022h), total size = 34 + 8 = 42
  F0. 43. 0n. 7E. 00. 22. "LM .. MCRTE0", (data). checksum. F7

*Micro Tune Full Kbd
  Contents of the user full keyboard micro tune memory.
  f = 126 "LM .. MCRTE1", data size = 256 + 10 = 266 (010Ah), total size = 274
  F0. 43. 0n. 7E. 00. 22. "LM .. MCRTE1", (data). checksum. F7

DUMP REQUEST MESSAGES

When the TX81Z receives one of these messages with a channel number "n" that matches its Basic Receive channel, it will transmit the requested data as described above in Bulk Data.

VCED	F0. 43. 2n. 03. F7
VMEM	F0. 43. 2n. 04. F7
ACED + VCED	F0. 43. 2n. 7E. "LM .. 8976AE". F7
PCED	F0. 43. 2n. 7E. "LM .. 8976PE". F7
PMEM	F0. 43. 2n. 7E. "LM .. 8976PM". F7
System Setup	F0. 43. 2n. 7E. "LM .. 8976Sx". F7 (X = 0, 1, 2)
Micro Tune	F0. 43. 2n. 7E. "LM .. MCRTEx". F7 (X = 0, 1)

Voice Edit Parameters (VCED)

Parameter number	Parameter	LCD	Data	
0	Attack Rate	AR	0-31	
1	Decay 1 Rate	D1R	0-31	
2	Decay 2 Rate	D2R	0-31	
3	Release Rate	RR	1-15	
4	Decay 1 Level	D1L	0-15	
5	Level Scaling	LS	0-99	
6	Rate Scaling	RS	0-3	OP. 4
7	EG Bias Sensitivity	EBS	0-7	
8	Amplitude Modulation Enable	AME	0-1	
9	Key Velocity Sensitivity	KVS	0-7	
10	Operator Output Level	OUT	0-99	
11	Frequency	CRS	0-63	
12	Detune	DET	0-6 (Center = 3)	
13 |				OP. 3
26 |				OP. 2
39 |				OP. 1
52	Algorithm	ALG	0-7	
53	Feedback	Feedback	0-7	
54	LFO Speed	Speed	0-99	
55	LFO Delay	Delay	0-99	
56	Pitch Modulation Depth	P Mod Depth	0-99	
57	Amplitude Modulation Depth	A Mod Depth	0-99	
58	LFO Sync	Sync	0-1	
59	LFO Wave	Wave	0-3	
60	Pitch Modulation Sensitivity	P Mod Sens	0-7	
61	Amplitude Modulation Sensitivity	AMS	0-3	
62	Transpose	Middle C =	0-48 (Center = 24)	
63	Poly/Mono	Poly Mode	0-1	
64	Pitch Bend Range	P Bend Range	0-12	
65	Portamento Mode	Full Time Porta	0-1	
66	Portamento Time	Porta Time	0-99	
67	Foot Control Volume	FC Volume	0-99	
68	Sustain	—	0-1	
69	Portamento	—	0-1	
70	Chorus	—	0-1 (Set 0)	
71	Modulation Wheel Pitch	MW Pitch	0-99	
72	Modulation Wheel Amplitude	MW Amplitude	0-99	
73	Breath Control Pitch	BC Pitch	0-99	
74	Breath Control Amplitude	BC Amplitude	0-99	

Parameter number	Parameter	LCD	Data
75	Breath Control Pitch Bias	BC Pitch Bias	0-99 (Center = 50)
76	Breath Control EG Bias	BC EG Bias	0-99
77	Voice name char 1	—	32-127
78	Voice name char 2	—	32-127
79	Voice name char 3	—	32-127
80	Voice name char 4	—	32-127
81	Voice name char 5	—	32-127
82	Voice name char 6	—	32-127
83	Voice name char 7	—	32-127
84	Voice name char 8	—	32-127
85	Voice name char 9	—	32-127
86	Voice name char 10	—	32-127
(Parameters 87-92 not used in the TX81Z.)			
93	Operator 4-1 On/Off (bits 0-3)		0-15 (OP. on = 1)

Voice Edit Additional Parameters (ACED)

Parameter number	Parameter	LCD	Data
0	Fixed Frequency	FIX	0-1
1	Fixed Frequency Range	Fix Range	1-7 0(250Hz) 7(32kHz)
2	Frequency Range Fine	FIN (RATIO)	0-15 OP. 4
3	Operator Waveform	OSW	0-7
4	EG Shift	SHFT	0-3 0(96dB), 1(48dB, 2(24dB), 3(12dB)
5 I			OP. 3
10 I			OP. 2
15 I			OP. 1
20	Reverb Rate	Reverb Rate	0-7 0(off), 7(fast)
21	Foot Controller Pitch	FC Pitch	0-99
22	Foot Controller Amplitude	FC Amplitude	0-99

Performance Edit Parameters (PCED)

Parameter number	Parameter	LCD	Data
0	Maximum Notes	MAX NOTES	0-8 INST 1
1	Voice Number MSB	—	0-1 ⎤ 0-159
2	Voice Number	I01-D32	0-127 ⎦
3	Receive Channel	RECEIVE CH	0-16 omni = 16
4	Low Note Limit	LIMIT/L	0-127 0(C-2)-127(G8)
5	High Note Limit	LIMIT/H	0-127 0(C-2)-127(G8)
6	Instrument Detune	INST DETUNE	0-14 center = 7
7	Note Shift	NOTE SHIFT	0-48 center = 24
8	Volume	VOL	0-99
9	Output Assign	OUT ASSIGN	0-3 0(off), 1(I), 2(II), 3(I II)
10	LFO Select	LFO SELECT	0-3 0(off), 1 (inst1), 2(inst2), 3(vib)
11	Micro Tune Enable	off/on	0-1
12 |			INST 2
24 |			INST 3
36 ~			INST 4
48 |			INST 5
60 |			INST 6
72 |			INST 7
84 |			INST 8
96	Micro Tune Table	MICTUN	0-12
97	Assign Mode	Assign Mode	0-1 0(norm), 1 (altr)
98	Effect Select	Effect Sel	0-3
99	Key (for Micro Tune)	—	0-11 (C-B)
100	Performance Name Character 1	—	32-127 (ASCII)
101	Performance Name Character 2	—	32-127 (ASCII)
—			
109	Performance Name Character 10	—	32-127 (ASCII)

Remote Switch Parameters

Parameter number	Parameter	Data
64	POWER ON (reset)	0 (switch off), 127 (switch on)
65	STORE	
66	UTILITY	
67	EDIT	
68	PLAY	
69	PARAMETER −1	
70	PARAMETER +1	
71	DATA ENTRY −1	
72	DATA ENTRY +1	
73	MASTER VOLUME −1	
74	MASTER VOLUME +1	
75	CURSOR	

Voice Bulk Data Format (VMEM)

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0	0	0			AR			0-31	
1	0	0	0			D1R			0-31	
2	0	0	0			D2R			0-31	
3	0	0	0	0		RR			0-15	
4	0	0	0	0		D1L			0-15	OP.4
5	0				LS				0-99	
6	0	AME		EBS			KVS		0-1, 0-7, 0-7	
7	0			OUT					0-99	
8	0	0		F					0-63	
9	0	0	0	RS			DBT		0-3, 0-6	
10 ~ ~										OP.2
20 ~ ~										OP.3
30 ~ ~										OP.1
40	0	SY		FBL			ALG		0-1, 0-7, 0-7	
41	0				LFS				0-99	
42	0				LFD				0-99	
43	0				PMD				0-99	
44	0				AMD				0-99	
45	0		PMS		AMS		LFW		0-7, 0-3, 0-3	
46	0	0		TRPS					0-48	
47	0	0	0	0		PBR			0-12	
48	0	0	0	CH	MO	SU	PO	PM	0-1, 0-1, 0-1, 0-1, 0-1	
49	0				PORT				0-99	
50	0				FC VOL				0-99	
51	0				MW PITCH				0-99	
52	0				MW AMPLI				0-99	
53	0				BC PITCH				0-99	
54	0				BC AMPLI				0-99	
55	0				BC P BIAS				0-99	
56	0				BC E BIAS				0-99	
57	0				VOICE NAME 1				32-127 (ASCII)	
58	0				VOICE NAME 2					
59	0				VOICE NAME 3					
60	0				VOICE NAME 4					
61	0				VOICE NAME 5					
62	0				VOICE NAME 6					
63	0				VOICE NAME 7					
64	0				VOICE NAME 8					
65	0				VOICE NAME 9					
66	0				VOICE NAME 10				32-127 (ASCII)	
67	0				PR1				0-99 PEG (DX21 only)	
68	0				PR2				0-99 Set 99	
69	0				PR3				0-99	
70	0				PL1				0-99 Set 50	
71	0				PL2				0-99	
72	0				PL3				0-99	

Additional Voice Bulk Data Format

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0 · · · 67 · 72			same as OPM VMEM PEG PR1 (not used)　　Set 99 PEG PL3　　　　　　Set 50							
73	0	0	EGSFT —		FIX	— FIXRG —				OP . 4
74	0	—	OPW	—	— FINE —					
75 ·										OP . 2
77 ·										OP . 3
79 ·										OP . 1
81	0	0	0	0	0	— REV —				
82	0	— FC PITCH —								
83	0	— FC AMPLI —								

Effect Bulk Data Format

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0	— EF1T —							0-127	effect 1 time 0.01s ~ 1.28s
1	0	0	— EF1P —						0-48	effect 1 pitch center = 24
2	0	0	0	0	0	— EF1F —			0-7	effect 1 feedback
3	0		EF1L						0-99	effect 1 level
4	0	0	0	0	0	0	0	EF2D	0-1	effect 2 direction 0 (I → II), 1 (II → I)
5	0	0	0	0	0	0	EF2S	—	0-3	effect 2 select 0 (LFO), 1 (velocity) 2 (note)
6	0	— EF2R —							0-99	effect 2 range
7	0	0	— CHORD —						0-49	effect 3 chord note center = 25, not used = 49
8 9 10										KEY C3
11 12 13 14										KEY C3#
· ·										
51 52 53 54										KEY B3

−75−

Performance Bulk Data Format (PMEM)

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0	OUT ASGN		MSB	—— NUM of NOTE —					INST1
1	0				VOICE NO					
2	0	LFOS			RCV CII					
3	0				LIMIT/L					
4	0				LIMIT/H					
5	0	0	0	0	—— DETUNE ——				0 ~ 14 (7 center)	
6	0	MTE			NOTE SHIFT					
7	0				VOLUME					
8 .										INST2
16 .										INST3
24 .										INST4
32 .										INST5
40 .										INST6
48 .										INST7
56 .										INST8
64	0	0	0	0	—— MTBL ——					
65	0	— KEY —			— EFSEL — ASMODE					
66	0	PFM NAME 1								
67	0	PFM NAME 2								
. . .					. . .					
75	0	PEM NAME 10								

Micro Tune Octave Bulk Data Format

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0				MS BYTE of MCT				13-108	
	0				LS BYTE of MCT				0-63	C
1										C#
2										
.										
11										B

Micro Tune Full Bulk Data Format

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0				MS BYTE of MCT				13-108	
	0				LS BYTE of MCT				0-63	C-2 (0)
1										C#-2 (1)
2										
.										
127										G8 (127)

Program Change Table Bulk Data Format

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0	0	0	0	0	0	0	MSB	0-1	MSB of number
	0			NUMBER (without MSB)					0-127	PGM1
1										PGM2
.										
127										PGM127

(Note)

```
        NUMBER
         0-31    :    I1-I32
        32-63    :    A1-A32
        64-95    :    B1-B32
        96-127   :    C1-C32
       128-159   :    D1-D32
       160-183   :    PFM1-PFM24
```

System Setup Bulk Data Format (SYS)

address	b7	b6	b5	b4	b3	b2	b1	b0	data	comment
0	0				TUNE				0-172	master tune center = 64
1	0	0	0			MIDBCH			0-16	basic rev ch 16:omni
2	0	0	0	0		MIDTCH			0-15	trans ch
3	0	0	0	0	0	0	PCINF		0-2	p. cng SW
4	0	0	0			COINF			0-17	cont.cng SW 1:norm 2-17 (G1 ~ G16)
5	0	0	0			PBSW			0-17	p. bend SW 1:norm 2-17 (G1 ~ G16)
6	0	0	0	0	0	0	NOTESW		0-2	note on/off 0:all, 1:odd, 2:even
7	0	0	0	0	0	0	0	SYSAVL	0-1	exclusive on/off
8	0	0	0	0	0	0	0	MLOCK	0-1	mem.protect
9	0	0	0	0	0	0	0	CMBIN	0-1	combine
10	0	0	0	0	0	0	0	AT	0-1	after touch
11	0				ID1				32-127	ID (ascii)
12	0				ID2					
13	0				ID3					
.										
.										
.										
26	0				ID16					

SPECIFICATIONS

Switches . . . . POWER, STORE/EG COPY, UTILITY, EDIT/COMPARE, PLAY/PERFORM, PARAMETER UP, PARAMETER DOWN, DEC, INC, CURSOR LEFT, CURSOR RIGHT, CURSOR

Display . . . . 16 character x 2 row backlit LCD

Terminals . . . . CASSETTE, MIDI THRU, MIDI OUT, MIDI IN, OUTPUT I/II, PHONES

Power Requirements
(US and Canadian model) . . . . AC 110-120V, 50/60Hz
(General model) . . . . AC 220-240V, 50/60Hz

Power Consumption 8W

Dimensions . . . . 480 x 282 x 45.2 mm (WxDxH) (18-15/16" x 11-1/8" x 1-3/4")

Weight . . . . 3.4 kg (7 lbs. 8 oz.)

Model TX81Z   MIDI Implementation Chart   Version : 1.0

Function ...	Transmitted	Recognized	Remarks
Basic Default	1-16	1 - 16	memorized
Channel Changed	1-16	1 - 16	
Mode Default Messages	x	1, 2, 3, 4 POLY, MONO(M=1)	memorized
Altered	XXXXXXXXXXXXXX	x	
Note	x	0 - 127	
Number : True voice	XXXXXXXXXXXXX	13 - 108	
Velocity Note ON	x	o v=1-127	
Note OFF	x	x	
After Key's	x	x	
Touch Ch's	x	o X1	(Breath control)
Pitch Bender	x	o 0-12 semi X2	7 bit resolution
Control 1	x	o X1	Modulation wheel
2	x	o X1	Breath control
4	x	o X1	Foot control
5	x	o X1	Portamento time (single mode only)
Change			
7		o X1	Volume
10	x	o X1	Pan(I,I+II,II) (performance mode only)
64	x	o	Sustain
65	x	o X1	Portamento
Prog	o 0 - 127 X3	o 0 - 127	if pgm cng sw is
Change : True #	XXXXXXXXXXXXXX	0 - 183	on.(assignable)
System Exclusive	o X4	o X4	Voice parameters
System : Song Pos	x	x	
: Song Sel	x	x	
Common : Tune	x	x	
System :Clock	x	x	
Real Time :Commands	x	x	
Aux : Local ON/OFF	x	x	
: All Notes OFF	x	o (123,126,127)	
Mes- : Active Sense	x	o	
sages: Reset	x	x	

Notes: X1 = receive if cont. change switch is on.
       X2 = receive if pitch bend sw is on.
       X3 = transmit if program change switch is on
            and system exclusive switch is off.
       X4 = transmit/receive if system exclusive switch is on.

Mode 1 : OMNI ON, POLY   Mode 2 : OMNI ON, MONO   o : Yes
Mode 3 : OMNI OFF, POLY   Mode 4 : OMNI OFF, MONO   x : No

WHAT'S MIDI?

Musical Instrument Digital Interface (MIDI) is a way for keyboards, synthesizers, sequencers, rhythm machines, and computers to communicate with each other. Devices that have a MIDI jack can be connected together to send and receive information. Since most musical instrument manufacturers have agreed on MIDI, you can connect devices of various manufacturers.

Each piece of information is called a MIDI MESSAGE. Each MIDI message is made up of 1 to 3 bytes (numbers); a Status Byte and 0, 1 or 2 Data Bytes.

The typical MIDI message is in the following form.

Sn. xx. yy

S = Status (8-E)
n = Channel number (0-F indicates channel 1-16)
xx = First data byte (00-7F)
yy = Second data byte (00-7F)

Let's look at a sample 3-byte MIDI message.


```
93. 3C. 15
```
Status (Note On)   Channel #4   Note #   Velocity
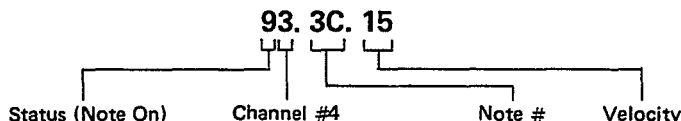
For example, if a DX7 synthesizer receives this message, it does the following.

1. Checks the channel number to see if it is acceptable. If the DX7 has been set to receive that channel, it goes on to the next step. If not, the message is ignored. In the example above, the channel number is 4. (We count 0-F as 1 to 16.)

2. Checks the status. In this case, the status is Note On, so the DX7 knows to expect two more data bytes; note number (what note) and velocity (how hard it was hit).

3. Reads the data bytes and produces the correct note with the correct velocity. (Keep in mind that all this takes a very short time. It takes about 1/1000 of a second to send a MIDI message. To us, it seems as though sound is produced at the same time the key is pressed.)

Some MIDI messages have only two bytes; a status byte and a data byte.
For example,

C3. 05

is a Program Change message on channel 4, telling the receiving device to switch to program number 6.

MIDI messages with a status byte from F0 to FF have no channel number. They are called System Messages, and are received by all devices regardless of their channel setting.

For an explanation of each type of message, see the MIDI Format Table on the next page.

MIDI FORMAT TABLE

| Binär	Dezimal	Hex.	Binär	Dezimal	Hex.	Binär	Dezimal	Hex.	Binär	Dezimal	Hex.
0 0 0 0 0 0 0 0	0	0	0 1 0 0 0 0 0 0	64	40	1 0 0 0 0 0 0 0	128	80	1 1 0 0 0 0 0 0	192	C0
0 0 0 0 0 0 0 1	1	1	0 1 0 0 0 0 0 1	65	41	1 0 0 0 0 0 0 1	129	81	1 1 0 0 0 0 0 1	193	C1
0 0 0 0 0 0 1 0	2	2	0 1 0 0 0 0 1 0	66	42	1 0 0 0 0 0 1 0	130	82	1 1 0 0 0 0 1 0	194	C2
0 0 0 0 0 0 1 1	3	3	0 1 0 0 0 0 1 1	67	43	1 0 0 0 0 0 1 1	131	83	1 1 0 0 0 0 1 1	195	C3
0 0 0 0 0 1 0 0	4	4	0 1 0 0 0 1 0 0	68	44	1 0 0 0 0 1 0 0	132	84	1 1 0 0 0 1 0 0	196	C4
0 0 0 0 0 1 0 1	5	5	0 1 0 0 0 1 0 1	69	45	1 0 0 0 0 1 0 1	133	85	1 1 0 0 0 1 0 1	197	C5
0 0 0 0 0 1 1 0	6	6	0 1 0 0 0 1 1 0	70	46	1 0 0 0 0 1 1 0	134	86	1 1 0 0 0 1 1 0	198	C6
0 0 0 0 0 1 1 1	7	7	0 1 0 0 0 1 1 1	71	47	1 0 0 0 0 1 1 1	135	87	1 1 0 0 0 1 1 1	199	C7
0 0 0 0 1 0 0 0	8	8	0 1 0 0 1 0 0 0	72	48	1 0 0 0 1 0 0 0	136	88	1 1 0 0 1 0 0 0	200	C8
0 0 0 0 1 0 0 1	9	9	0 1 0 0 1 0 0 1	73	49	1 0 0 0 1 0 0 1	137	89	1 1 0 0 1 0 0 1	201	C9
0 0 0 0 1 0 1 0	10	A	0 1 0 0 1 0 1 0	74	4A	1 0 0 0 1 0 1 0	138	8A	1 1 0 0 1 0 1 0	202	CA
0 0 0 0 1 0 1 1	11	B	0 1 0 0 1 0 1 1	75	4B	1 0 0 0 1 0 1 1	139	8B	1 1 0 0 1 0 1 1	203	CB
0 0 0 0 1 1 0 0	12	C	0 1 0 0 1 1 0 0	76	4C	1 0 0 0 1 1 0 0	140	8C	1 1 0 0 1 1 0 0	204	CC
0 0 0 0 1 1 0 1	13	D	0 1 0 0 1 1 0 1	77	4D	1 0 0 0 1 1 0 1	141	8D	1 1 0 0 1 1 0 1	205	CD
0 0 0 0 1 1 1 0	14	E	0 1 0 0 1 1 1 0	78	4E	1 0 0 0 1 1 1 0	142	8E	1 1 0 0 1 1 1 0	206	CE
0 0 0 0 1 1 1 1	15	F	0 1 0 0 1 1 1 1	79	4F	1 0 0 0 1 1 1 1	143	8F	1 1 0 0 1 1 1 1	207	CF
0 0 0 1 0 0 0 0	16	10	0 1 0 1 0 0 0 0	80	50	1 0 0 1 0 0 0 0	144	90	1 1 0 1 0 0 0 0	208	C0
0 0 0 1 0 0 0 1	17	11	0 1 0 1 0 0 0 1	81	51	1 0 0 1 0 0 0 1	145	91	1 1 0 1 0 0 0 1	209	D1
0 0 0 1 0 0 1 0	18	12	0 1 0 1 0 0 1 0	82	52	1 0 0 1 0 0 1 0	146	92	1 1 0 1 0 0 1 0	210	D2
0 0 0 1 0 0 1 1	19	13	0 1 0 1 0 0 1 1	83	53	1 0 0 1 0 0 1 1	147	93	1 1 0 1 0 0 1 1	211	D3
0 0 0 1 0 1 0 0	20	14	0 1 0 1 0 1 0 0	84	54	1 0 0 1 0 1 0 0	148	94	1 1 0 1 0 1 0 0	212	D4
0 0 0 1 0 1 0 1	21	15	0 1 0 1 0 1 0 1	85	55	1 0 0 1 0 1 0 1	149	95	1 1 0 1 0 1 0 1	213	D5
0 0 0 1 0 1 1 0	22	16	0 1 0 1 0 1 1 0	86	56	1 0 0 1 0 1 1 0	150	96	1 1 0 1 0 1 1 0	214	D6
0 0 0 1 0 1 1 1	23	17	0 1 0 1 0 1 1 1	87	57	1 0 0 1 0 1 1 1	151	97	1 1 0 1 0 1 1 1	215	D7
0 0 0 1 1 0 0 0	24	18	0 1 0 1 1 0 0 0	88	58	1 0 0 1 1 0 0 0	152	98	1 1 0 1 1 0 0 0	216	D8
0 0 0 1 1 0 0 1	25	19	0 1 0 1 1 0 0 1	89	59	1 0 0 1 1 0 0 1	153	99	1 1 0 1 1 0 0 1	217	D9
0 0 0 1 1 0 1 0	26	1A	0 1 0 1 1 0 1 0	90	5A	1 0 0 1 1 0 1 0	154	9A	1 1 0 1 1 0 1 0	218	DA
0 0 0 1 1 0 1 1	27	1B	0 1 0 1 1 0 1 1	91	5B	1 0 0 1 1 0 1 1	155	9B	1 1 0 1 1 0 1 1	219	DB
0 0 0 1 1 1 0 0	28	1C	0 1 0 1 1 1 0 0	92	5C	1 0 0 1 1 1 0 0	156	9C	1 1 0 1 1 1 0 0	220	DC
0 0 0 1 1 1 0 1	29	1D	0 1 0 1 1 1 0 1	93	5D	1 0 0 1 1 1 0 1	157	9D	1 1 0 1 1 1 0 1	221	CD
0 0 0 1 1 1 1 0	30	1E	0 1 0 1 1 1 1 0	94	5E	1 0 0 1 1 1 1 0	158	9E	1 1 0 1 1 1 1 0	222	DE
0 0 0 1 1 1 1 1	31	1F	0 1 0 1 1 1 1 1	95	5F	1 0 0 1 1 1 1 1	159	9F	1 1 0 1 1 1 1 1	223	DF
0 0 1 0 0 0 0 0	32	20	0 1 1 0 0 0 0 0	96	60	1 0 1 0 0 0 0 0	160	A0	1 1 1 0 0 0 0 0	224	E0
0 0 1 0 0 0 0 1	33	21	0 1 1 0 0 0 0 1	97	61	1 0 1 0 0 0 0 1	161	A1	1 1 1 0 0 0 0 1	225	E1
0 0 1 0 0 0 1 0	34	22	0 1 1 0 0 0 1 0	98	62	1 0 1 0 0 0 1 0	162	A2	1 1 1 0 0 0 1 0	226	E2
0 0 1 0 0 0 1 1	35	23	0 1 1 0 0 0 1 1	99	63	1 0 1 0 0 0 1 1	163	A3	1 1 1 0 0 0 1 1	227	E3
0 0 1 0 0 1 0 0	36	24	0 1 1 0 0 1 0 0	100	64	1 0 1 0 0 1 0 0	164	A4	1 1 1 0 0 1 0 0	228	E4
0 0 1 0 0 1 0 1	37	25	0 1 1 0 0 1 0 1	101	65	1 0 1 0 0 1 0 1	165	A5	1 1 1 0 0 1 0 1	229	E5
0 0 1 0 0 1 1 0	38	26	0 1 1 0 0 1 1 0	102	66	1 0 1 0 0 1 1 0	166	A6	1 1 1 0 0 1 1 0	230	E6
0 0 1 0 0 1 1 1	39	27	0 1 1 0 0 1 1 1	103	67	1 0 1 0 0 1 1 1	167	A7	1 1 1 0 0 1 1 1	231	E7
0 0 1 0 1 0 0 0	40	28	0 1 1 0 1 0 0 0	104	68	1 0 1 0 1 0 0 0	168	A8	1 1 1 0 1 0 0 0	232	E8
0 0 1 0 1 0 0 1	41	29	0 1 1 0 1 0 0 1	105	69	1 0 1 0 1 0 0 1	169	A9	1 1 1 0 1 0 0 1	233	E9
0 0 1 0 1 0 1 0	42	2A	0 1 1 0 1 0 1 0	106	6A	1 0 1 0 1 0 1 0	170	AA	1 1 1 0 1 0 1 0	234	EA
0 0 1 0 1 0 1 1	43	2B	0 1 1 0 1 0 1 1	107	6B	1 0 1 0 1 0 1 1	171	AB	1 1 1 0 1 0 1 1	235	EB
0 0 1 0 1 1 0 0	44	2C	0 1 1 0 1 1 0 0	108	6C	1 0 1 0 1 1 0 0	172	AC	1 1 1 0 1 1 0 0	236	EC
0 0 1 0 1 1 0 1	45	2D	0 1 1 0 1 1 0 1	109	6D	1 0 1 0 1 1 0 1	173	AD	1 1 1 0 1 1 0 1	237	ED
0 0 1 0 1 1 1 0	46	2E	0 1 1 0 1 1 1 0	110	6E	1 0 1 0 1 1 1 0	174	AE	1 1 1 0 1 1 1 0	238	EE
0 0 1 0 1 1 1 1	47	2F	0 1 1 0 1 1 1 1	111	6F	1 0 1 0 1 1 1 1	175	AF	1 1 1 0 1 1 1 1	239	EF
0 0 1 1 0 0 0 0	48	30	0 1 1 1 0 0 0 0	112	70	1 0 1 1 0 0 0 0	176	B0	1 1 1 1 0 0 0 0	240	F0
0 0 1 1 0 0 0 1	49	31	0 1 1 1 0 0 0 1	113	71	1 0 1 1 0 0 0 1	177	B1	1 1 1 1 0 0 0 1	241	F1
0 0 1 1 0 0 1 0	50	32	0 1 1 1 0 0 1 0	114	72	1 0 1 1 0 0 1 0	178	B2	1 1 1 1 0 0 1 0	242	F2
0 0 1 1 0 0 1 1	51	33	0 1 1 1 0 0 1 1	115	73	1 0 1 1 0 0 1 1	179	B3	1 1 1 1 0 0 1 1	243	F3
0 0 1 1 0 1 0 0	52	34	0 1 1 1 0 1 0 0	116	74	1 0 1 1 0 1 0 0	180	B4	1 1 1 1 0 1 0 0	244	F4
0 0 1 1 0 1 0 1	53	35	0 1 1 1 0 1 0 1	117	75	1 0 1 1 0 1 0 1	181	B5	1 1 1 1 0 1 0 1	245	F5
0 0 1 1 0 1 1 0	54	36	0 1 1 1 0 1 1 0	118	76	1 0 1 1 0 1 1 0	182	B6	1 1 1 1 0 1 1 0	246	F6
0 0 1 1 0 1 1 1	55	37	0 1 1 1 0 1 1 1	119	77	1 0 1 1 0 1 1 1	183	B7	1 1 1 1 0 1 1 1	247	F7
0 0 1 1 1 0 0 0	56	38	0 1 1 1 1 0 0 0	120	78	1 0 1 1 1 0 0 0	184	B8	1 1 1 1 1 0 0 0	248	F8
0 0 1 1 1 0 0 1	57	39	0 1 1 1 1 0 0 1	121	79	1 0 1 1 1 0 0 1	185	B9	1 1 1 1 1 0 0 1	249	F9
0 0 1 1 1 0 1 0	58	3A	0 1 1 1 1 0 1 0	122	7A	1 0 1 1 1 0 1 0	186	BA	1 1 1 1 1 0 1 0	250	FA
0 0 1 1 1 0 1 1	59	3B	0 1 1 1 1 0 1 1	123	7B	1 0 1 1 1 0 1 1	187	BB	1 1 1 1 1 0 1 1	251	FB
0 0 1 1 1 1 0 0	60	3C	0 1 1 1 1 1 0 0	124	7C	1 0 1 1 1 1 0 0	188	BC	1 1 1 1 1 1 0 0	252	FC
0 0 1 1 1 1 0 1	61	3D	0 1 1 1 1 1 0 1	125	7D	1 0 1 1 1 1 0 1	189	BD	1 1 1 1 1 1 0 1	253	FD
0 0 1 1 1 1 1 0	62	3E	0 1 1 1 1 1 1 0	126	7E	1 0 1 1 1 1 1 0	190	BE	1 1 1 1 1 1 1 0	254	FE
0 0 1 1 1 1 1 1	63	3F	0 1 1 1 1 1 1 1	127	7F	1 0 1 1 1 1 1 1	191	BF	1 1 1 1 1 1 1 1	255	FF

MIDI MESSAGES

8n Note Off:	The note number indicates which key was released, and velocity indicates how quickly it was released. Very few keyboards have Release Velocity Sensitivity.
9n Note On:	The note number indicates which key was pressed, and velocity indicates how hard it was hit. On keyboards which do not have a velocity sensitive keyboard, a medium value of 40 is sent. A Note On message with a velocity of 0 is the same as a Note Off message.
An Polyphonic Aftertouch:	The note number indicates which key is being pressed, and pressure indicates how hard that key is being pressed. (i.e., each key can send independent after-touch messages;)
Bn Control Change:	The control number indicates which controller is being moved, and the data indicates the position of the controller. Continuous controllers (slider or wheel-type controllers) carry data in the range of 00-7F. Switch-type controllers (eg. sustain pedal) carry either 00 (off) or 7F (on). Control changes 7A-7F are called Mode Messages, and usually carry a fixed data byte. They tell the receiving tone generator how to behave. The way in which these message are interpreted will depend on the device. (See the MIDI Implementation Chart for your tone generator or synthesizer.)
Cn Program Change:	This tells the receiving device to switch programs (memories).
Dn Channel Aftertouch:	Also called "Common After-touch", this is found on the DX7. It indicates the strongest pressure on any part of the keyboard, ie, the "common" value.
En Pitch Wheel:	To provide finer resolution, this data is sent in two bytes, first the Least Significant Byte (LSB) and then the Most Significant Byte (MSB). Yamaha tone generators and synthesizers ignore the LSB.
F0 System Exclusive:	After F0 must come an identification number which has been assigned to each manufacturer. Yamaha's number is 43. What comes between this message and F7 (End of Exclusive) is completely up to each manufacturer (but each byte must be from 00 to 7F). Yamaha uses System Exclusive messages to transmit voice data, sequence data, rhythm pattern data, bulk memory data of all kinds, and many other useful things. See the System Exclusive format chart for your device.
F7 End Of Exclusive: *(EOX)*	This marks the end of a System Exclusive message.
F2,F3,F8,FA,FB,FC,FF:	Song Position Pointer, Song Select, Timing Clock, Start, Stop, Continue, System Reset are all for controlling sequencers and rhythm machines. See the MIDI Implementation Chart for your device.
FE Active Sensing:	If there are no MIDI messages that have to be sent, one of these is sent just to let the receiving devices know that there is still someone out there. If there have not been any MIDI messages for longer that 300 msec, the receiving device assumes that some error has taken place (e.g., a MIDI cable was pulled out by mistake) and will stop all notes.
F1, F4, F5, F9, FD:	These are unused, and reserved for future expansion.

WHAT'S FM?

A complete discussion of FM Synthesis is beyond the scope of this manual. Here we will cover the basic ideas of FM, and briefly explain each TX81Z voice parameter. For a more detailed study, see "FM Theory & Applications: By Musicians for Musicians", by Dr. John Chowning and David Bristow, published 1986 by Yamaha Music Foundation.

FREQUENCY MODULATION

FM stands for Frequency Modulation. In FM, one waveform modulates another waveform, creating a new, complex waveform, as shown below. So, to do FM synthesis, we need two oscillators. The upper one is called the "Modulator" and the lower one (which goes directly to the output of the synthesizer) is called the "Carrier". The complexity or "brightness" of the resulting waveform will depend on the output level of the Modulator.

Modulator

Modulator Output Level   0   40   80

Carrier.

Resulting Sound
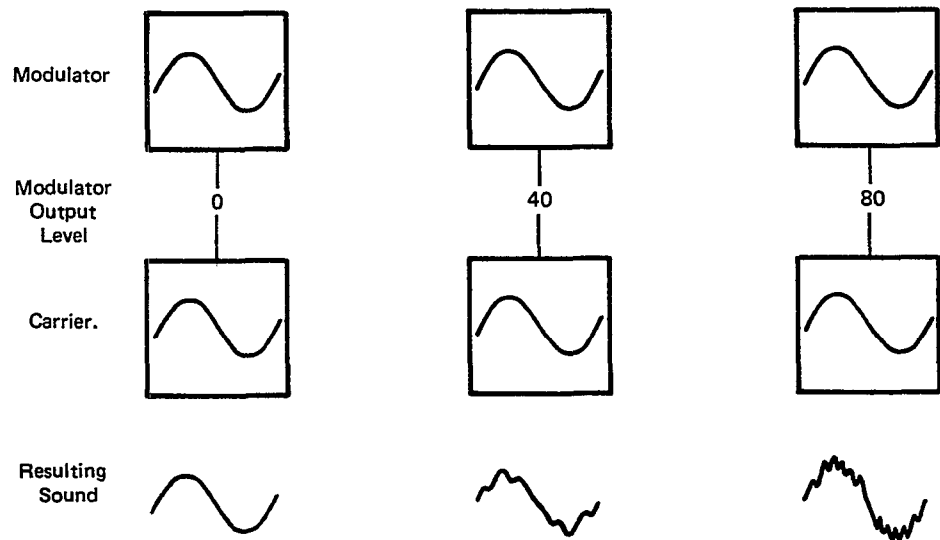
EG (Envelope Generator)

By varying the output level of the modulator, we can produce all kinds of sounds. However, sounds in the real world usually change as time goes by. This "shape in time" is called the Envelope. A synthesizer simulates this using an Envelope Generator to change the output level of each operator. If the output level of the modulator changes, the tone will change. If the output level of the carrier changes, the volume will change.

Piano envelope   Organ envelope

Key On   Key Off   Key On   Key Off
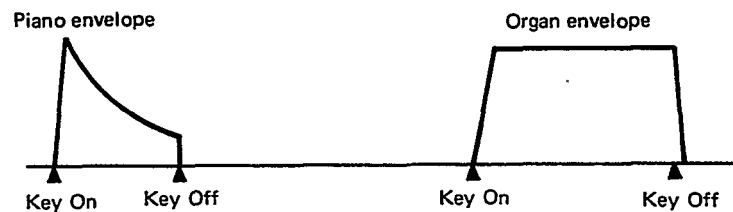
OPERATOR

In Yamaha FM synthesizers, each oscillator has its own Envelope Generator (EG) to vary its output level over time. This "package" of oscillator + EG is called an Operator. An operator can be either a modulator or carrier. The only difference is how it is used.

ALGORITHM   To do simple FM, you need only two operators, but the TX81Z has four, and these four operators can be arranged in 8 different ways. Each arrangement is called an Algorithm. The eight algorithms are shown on the pull-out operation guide under the TX81Z LCD display. Take a look at them. Algorithm 1 has only one carrier. The other three operators are all used as modulators. In algorithm 6, one modulator modulates three carriers. Algorithm 8 has four carriers and no modulators.

FEEDBACK   In the algorithm chart, you will also notice that operator 4 has its output connected to its input. This means that it can modulate itself, a bit like having an additional operator.

RATIO FREQUENCY   The basic frequency of each operator can be set independently. When an operator is in Ratio mode, it will produce a frequency corresponding to the key that was pressed. If the frequency ratio of the carrier:modulator is 1:1, the resulting sound will contain all the harmonic partials. For example, if the fundamental (the "basic pitch") is 100Hz, harmonics of 200Hz, 300Hz, 400Hz ... will be generated. If the frequency ratio is 1:2, the odd-numbered harmonic partials will be generated (100Hz, 300Hz, 500Hz ...), creating a hollow, reedy sound. Irregular ratios (such as 1:1.37) will generate non-harmonic spectra typical of clashing, metallic sounds.

FIXED FREQUENCY   An operator can also be set to Fixed mode, when it will produce the same frequency regardless of what key is pressed. In Fixed mode, the frequency is displayed in Hz (cycles per second) or KHz (1000 cycles per second). If the carrier is in Ratio mode and the modulator is in Fixed, the harmonic structure of the sound will change depending on the key you press, since the carrier: modulator ratio will change note by note.

WAVE   Until the TX81Z, the FM operators in Yamaha's previous synthesizers produced only sine waves (a pure tone). However, the TX81Z operators give you a choice of 8 different waveforms (sine and 7 others) for each operator. FM synthesis with non-sinewave operators is still a relatively unexplored field.
It may help you to look through the factory preset voices to see how they use the different waveforms.

LFO   The LFO (Low Frequency Oscillator) produces a slow (about 0.007Hz to 50Hz) vibration that can be used to create vibrato, tremolo or other effects. If the LFO is affecting the output level of a carrier, the result will be Tremolo (rapid variance in volume), and if it is affecting the output level of a modulator, the result will be periodic changes in tone. The LFO can also control the pitch of the entire voice, producing Vibrato (rapid variance in pitch).

SENSITIVITY   Acoustic instruments produce different sounds when played softly or loudly. Not only the loudness, but also the tone changes. A softly played note is usually softer in tone as well. FM synthesis provides an easy way to simulate this. Each operator can be "Velocity Sensitive", and adjust its output level according to how hard a key was struck (key velocity). If a carrier is velocity sensitive, the volume will depend on the key velocity. If a modulator is velocity sensitive, the tone will depend on the key velocity.

DETUNE   The harmonic structure of actual acoustic sounds is usually somewhat "irregular". This makes them sound interesting and lifelike. By slightly De-tuning each operator, you can create this type of naturally irregular harmonic structure.

SCALING   The tonal characteristics of an instrument generally change from note to note. For example, high notes on a piano have a simpler harmonic structure than the bass notes. By Scaling the output level of a modulator to decrease as you play up the keyboard, you can simulate this. High notes on many instruments also have a shorter envelope. You can simulate this by using Rate Scaling.

LEARNING FM   It is rather time-consuming to create a voice from the initial setting, since you
SYNTHESIS   would have to set most (or all) of the 92 parameters that make up each voice. The best way to learn is to get inside the factory preset voices and see how they work. Turn each operator off one by one, and see how each operator affects the sound. Make small changes in operator output level or EG rates. Try starting from a preset voice that is fairly close to what you have in mind, and edit it to your liking.

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SERVICE

The TX81Z is supported by Yamaha's worldwide network of factory trained and qualified dealer service personnel. In the event of a problem, contact your nearest Yamaha dealer.

FCC INFORMATION (for United States Customers Only)

While the following statement is provided to comply with FCC regulations in the United States, the corrective measures listed are applicable worldwide.

"WARNING — This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.), certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception."

The TX81Z and its accessories have been tested and certified to be in compliance with the limits established for this class of equipment pursuant to FCC Rules Part 15, Subpart J. These limits were established to provide a reasonable measure of protection against such interference; however, this does not guarantee that interference will not occur. If the TX81Z equipment is suspected of causing interference with other electronic equipment, verification can be made by turning off the TX81Z.
If the interference continues, then the TX81Z is not the source of the interference. If the TX81Z does appear to be the source of the interference, you should try to correct the situation by one or more of the following measures.

● Relocate either the TX81Z and its accessories or the electronic equipment that is being affected by the interference.

● Utilize power outlets for the TX81Z and the equipment being affected that are on different branch circuits (utilizing different circuit breakers or fuses), or install AC line filters.

● In the case of radio interference, relocate the antenna. If the antenna cable is 300 ohm ribbon lead, have it changed to 75 ohm coaxial cable (utilizing the necessary transformer/adaptors at either end, as required to match the cable).

If these corrective measures do not produce satisfactory results, please contact a Yamaha Retailer authorized to sell this product for suggestions and/or corrective measures. If you cannot locate a Yamaha Retailer authorized to sell this product in your general area, please contact the Yamaha International Corporation. MMC Service Division, 6600 Orangethorpe Avenue, Buena Park, CA 90620, USA.

If for any reason you should need additional information relating to radio and TV interference, you may find a booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio/TV Interference Problems." This booklet, Stock #004-000-00345-4, is available from the U.S. Government Printing Office, Washington D.C. 20402.