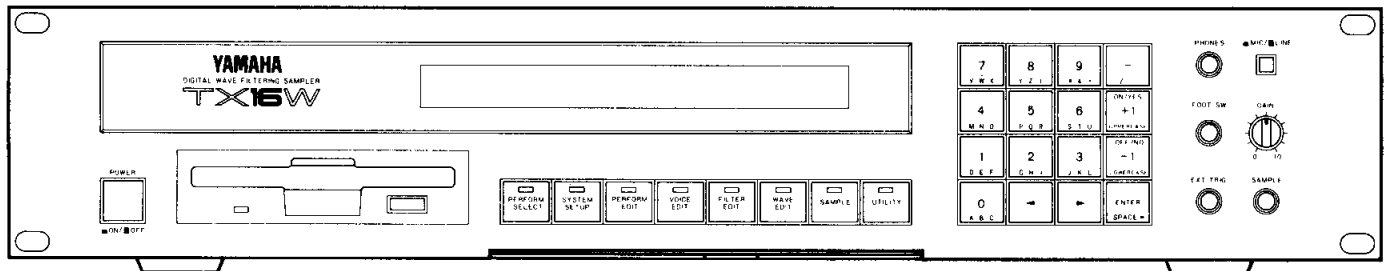


YAMAHA

TX16W

DIGITAL WAVE FILTERING SAMPLER

OPERATING MANUAL



IMPORTANT SAFETY AND INSTALLATION INSTRUCTIONS

INFORMATION RELATING TO POSSIBLE PERSONAL INJURY, ELECTRIC SHOCK, AND
FIRE HAZARD POSSIBILITIES HAS BEEN INCLUDED IN THIS LIST.

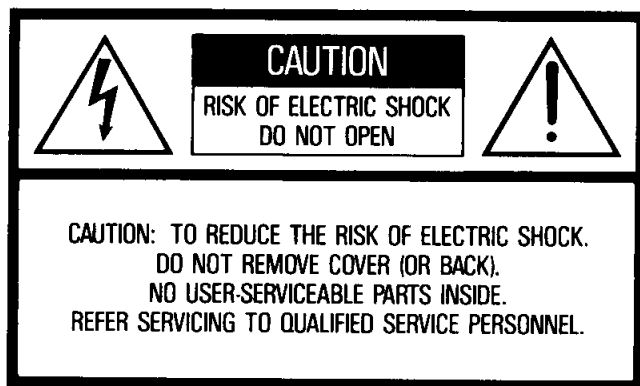
WARNING—When using electronic products, basic precautions should always be followed, including the following:

1. Read all Safety and Installation Instructions, Supplemental Marking and Special Message Section data, and any applicable assembly instructions **BEFORE** using this product.
2. Check unit weight specifications **BEFORE** you attempt to move this product.
3. Main power supply verification. Yamaha Digital Musical Instrument products are manufactured specifically for use with the main supply voltage used in the area where they are to be sold. The main supply voltage required by these products is printed on the name plate. For name plate location please refer to the graphic in the Special Message section. If any doubt exists please contact the nearest Yamaha Digital Musical Instrument retailer.
4. Some Yamaha Digital Musical Instrument products utilize external power supplies or adapters. Do **NOT** connect products of this type to any power supply or adapter other than the type described in the owners manual or as marked on the unit.
5. This product may be equipped with a plug having three prongs or a polarized line plug (one blade wider than the other). If you are unable to insert the plug into the outlet, contact an electrician to have the obsolete outlet replaced. Do **NOT** defeat the safety purpose of the plug. Yamaha products not having three prong or polarized line plugs incorporate construction methods and designs that do not require line plug polarization.
6. **WARNING**—Do **NOT** place objects on the power cord or place the unit in a position where any one could walk on, trip over, or roll anything over cords of any kind. An improper installation of this type can create the possibility of a fire hazard and/or personal injury.
7. Environment: Your Yamaha Digital Musical Instrument should be installed away from heat sources such as heat registers and/or other products that produce heat.
8. Ventilation: This product should be installed or positioned in a way that its placement or location does not interfere with proper ventilation.
9. Yamaha Digital Musical Instrument products are frequently incorporated into "Systems" which are assembled on carts, stands, or in racks. Utilize only those carts, stands, or racks that have been designed for this purpose and observe all safety precautions supplied with the products. Pay special attention to cautions that relate to proper assembly, heavier units being mounted at the lower levels, load limits, moving instructions, maximum usable height and ventilation.
10. Yamaha Digital Musical Instrument products, either alone or in combination with amplification, headphones, or speakers, may be capable of producing sound levels that could cause permanent hearing loss. Do **NOT** operate at high volume levels or at a level that is uncomfortable. If you experience any discomfort, ringing in the ears, or suspect any hearing loss, you should consult an audiologist.
11. Do **NOT** use this product near water or in wet environments. For example, near a swimming pool, spa, in the rain, or in a wet basement.
12. Care should be taken so that objects do not fall, and liquids are not spilled into the enclosure.
13. Yamaha Digital Musical Instrument products should be serviced by a qualified service person when:
 - a. The power supply/power adapter cord or plug has been damaged; or
 - b. Objects have fallen, or liquid has been spilled into the product; or
 - c. The unit has been exposed to rain; or
 - d. The product does not operate, exhibits a marked change in performance; or
 - e. The product has been dropped, or the enclosure of the product has been damaged.
14. When not in use, always turn your Yamaha Digital Musical Instrument equipment "OFF". The power supply cord should be unplugged from the outlet when the equipment is to be left unused for a long period of time. **NOTE:** In this case, some units may lose some user programmed data. Factory programmed memories will not be affected.
15. Electromagnetic Interference (RFI). Yamaha Digital Musical Instruments utilize digital (high frequency pulse) technology that may adversely affect Radio/TV reception. Please read FCC Information (end of the manual) for additional information.
16. Do **NOT** attempt to service this product beyond that described in the user maintenance section of the owners manual. All other servicing should be referred to qualified service personnel.

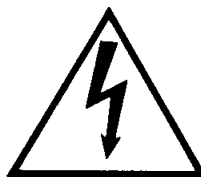
**PLEASE KEEP THIS MANUAL
FOR FUTURE REFERENCE!**

SUPPLEMENTAL MARKING INFORMATION SPECIAL MESSAGE SECTION

Yamaha Digital Musical Instrument Products will have either a label similar to the graphic shown below or a molded/stamped facsimile of the graphic on its enclosure. The explanation of these graphics appears on this page. Please observe all cautions indicated.



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



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

ELECTROMAGNETIC INTERFERENCE (RFI): Your Yamaha Digital Musical Instrument Product has been type tested and found to comply with all applicable regulations. However, if it is installed in the immediate proximity of other electronic devices, some form of interference may occur. For additional RFI information see FCC Information section located in this manual.

IMPORTANT NOTICE: This product has been tested and approved by independent safety testing laboratories in order that you may be sure that when it is properly installed and used in its normal and customary manner, all foreseeable risks have been eliminated. **DO NOT** modify this unit or commission others to do so unless specifically authorized by Yamaha. Product performance and/or safety standards may be diminished. Claims filed under the expressed warranty may be denied if the unit is/has been modified. Implied warranties may also be affected.

SPECIFICATIONS SUBJECT TO CHANGE: The information contained in this manual is believed to be correct at the time of printing. Yamaha reserves the right to change or modify specifications at any time without notice or obligation to update existing units.

NOTICE: Service charges incurred due to a lack of knowledge relating to how a function or effect works (when the unit is operating as designed), are not covered by the manufacturer's warranty. Please study this manual carefully before requesting service.

STATIC ELECTRICITY CAUTION: Some Yamaha Digital Musical Instrument products have modules that plug into the unit to perform various functions. The contents of a plug-in module can be altered/damaged by static electricity discharges. Static electricity build-ups are more likely to occur during cold winter months (or in areas with very dry climates) when the natural humidity is low. To avoid possible damage to the plug-in module, touch any metal object (a metal desk lamp, a door knob, etc.) before handling the module. If static electricity is a problem in your area, you may want to have your carpet treated with a substance that reduces static electricity build-up. See your local carpet retailer for professional advice that relates to your specific situation.

Model _____

Serial No. _____

Purchase Date _____

This information on safety is provided to comply with U.S.A. laws, but should be observed by users in all countries.

Thank you for purchasing the Yamaha TX16W Digital Wave Filtering Sampler. The TX16W is a rack-mountable 16-voice multi-timbral sampler with realtime-variable digital filters. Some of the many features of the TX16W are ...

- Up to 16 note polyphony.
- Up to 16 different voices, each receiving on their own MIDI channel.
- 32 key splits for each voice, each with a filter, EG and LFO.
- Dynamic digital filters for noise-free, realtime-variable processing of the signal while it is still in digital form.
- 1.5 Mbytes sampling memory, expandable to 6 Mbytes by adding EMM15 Expansion Memory Modules (sold separately).
- 2 mixed audio outputs, 8 independent outputs.
- Stereo sampling at 33.3 kHz, and mono sampling at 16.7 kHz, 33.3 kHz, and 50.0 kHz.
- 12-bit sampling resolution.
- 3.5" floppy disk drive for data storage.
- Illuminated 2-line 40 character LCD.

In order to make full use of the capabilities of the TX16W, please read this manual carefully.

Precautions	1	Filter Edit	15
Specifications	1	Wave Edit	18
Front/Rear Panel	2	Sample	21
Introducing the TX16W	4	Utility	23
Performance Select	6	Ideas and Suggestions	26
System Setup	7	Supplementary Information	
Performance Edit	9	Index	
Voice Edit	11		

PRECAUTIONS

- Avoid placing the TX16W in direct sunlight or close to a source of heat. Also, avoid locations where the unit is likely to be subjected to vibration, excessive dust, cold or moisture.
- Avoid rough handling, such as applying excessive force to the switches or dropping the unit. While the internal circuitry is of reliable integrated circuit design, the unit should be treated with care.
- Always grip the plug directly when removing it from an AC outlet. Removing the plug from the AC outlet by pulling the cord can result in damage to the cord and possibly a short circuit. It is also a good idea to disconnect the TX16W from the AC outlet if you don't plan to use it for an extended period of time.
- If necessary, clean the TX16W using a slightly damp cloth, and dry with a soft cloth. Never use solvents (such as benzine or thinner) since they can melt or discolor the finish.
- All computer circuitry, including that in the TX16W, is sensitive to voltage spikes. For this reason, the unit should be turned off and unplugged from the AC outlet in the event of an electrical storm. This precaution will avoid the chance that a high voltage spike caused by lightning will damage the unit.
- Computer circuitry is also sensitive to electromagnetic radiation. Be careful not to set it too close to equipment (such as a television set) that generates electromagnetic fields. Proximity to such equipment could cause malfunctions in the TX16W's digital circuitry and interfere with the operation of the other unit.
- When inserting a disk in the disk drive, make sure it is facing the correct way (label up).
- This unit contains no user servicable parts. Opening it or tampering with it can lead to electrical shock as well as damage to the unit, and will void the product warranty. Refer all servicing to qualified Yamaha personnel.

SPECIFICATIONS

Polyphony	16 note
Sampling Frequencies	33.3 kHz (stereo), 16.7 kHz, 33.3 kHz, 50.0 kHz (mono)
Memory Capacity	1.5 Mbytes wave memory, expandable to 6 Mbytes
Floppy Disk	2DD (720 Kbytes), MSX-DOS format
Keys	PERFORM SELECT, SYSTEM SETUP, PERFORM EDIT, VOICE EDIT, FILTER EDIT, WAVE EDIT, SAMPLE, UTILITY, NUMERIC KEY PAD, < >, +1/-1, ENTER
Controls	GAIN
Display	40-character 2-line Liquid Crystal Display, illuminated.
Terminals	PHONES, FOOT SW, EXT TRIG, SAMPLE, INDIVIDUAL OUT 1-8, MIXED OUT I/II, MIDI IN, MIDI OUT, MIDI THRU, EXT PORT
Power Consumption	25W
Power Requirements	U.S. and Canadian models: 120 V 50/60 Hz General model: 220 V/240 V 50Hz
Dimensions (D × W × H)	372 × 480 × 94.5 mm (14-5/8" × 18-7/8" × 3-11/16")
Weight	6.8kg (14 lb. 15 oz)
Included Items	MIDI Cable × 1, System Disk, Data Disk × 6, Stereo Adaptor (for stereo sampling input)

FRONT/REAR PANEL

FRONT PANEL

Disk Drive: A 3.5" 2DD 720 Kbyte floppy disk is used to store data. The LED indicates that the disk is being accessed. *When the LED is lit, do not attempt to remove the disk.*

LCD: An illuminated 40 character 2 line liquid crystal display.

MODE SELECT KEYS: These eight keys select the basic operational mode of the TX16W. An LED indicates the selected mode.

Pull-out reference cards: Two cards can be pulled out for quick reference.

NUMERIC KEY PAD: Set the value at the blinking cursor by entering a number and pressing ENTER. These keys are also used to enter alphabetical data (names).

◀ ▶ (cursor): These keys move the blinking triangular cursor in the LCD.

DATA ENTRY +/-: Use these keys to increase or decrease the data at the blinking cursor, or to set non-numerical values (on/off, etc.).

LINE/MIC: This is a 30dB input pad for the SAMPLE INPUT jack.

GAIN: This controls the level of the SAMPLE INPUT.

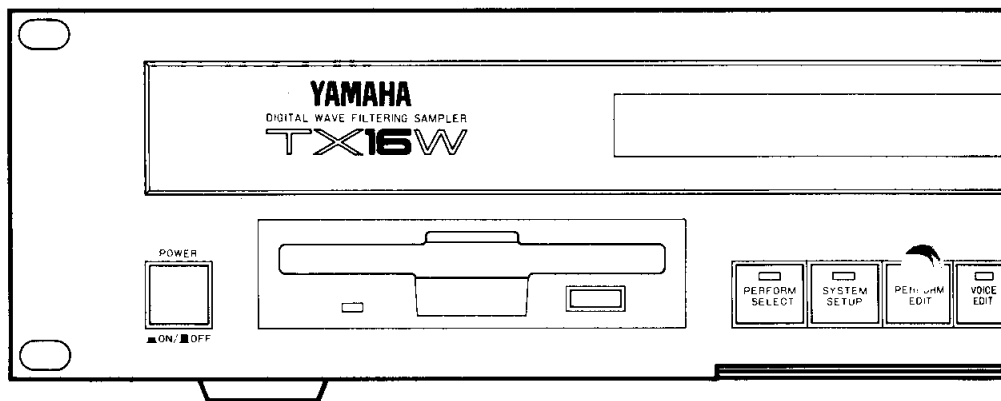
SAMPLE INPUT: Audio signals received at this stereo phone jack can be sampled and stored.

EXTERNAL TRIGGER INPUT: An audio signal (or footswitch on/off) received here can trigger a specified note, or can be used to start sampling.

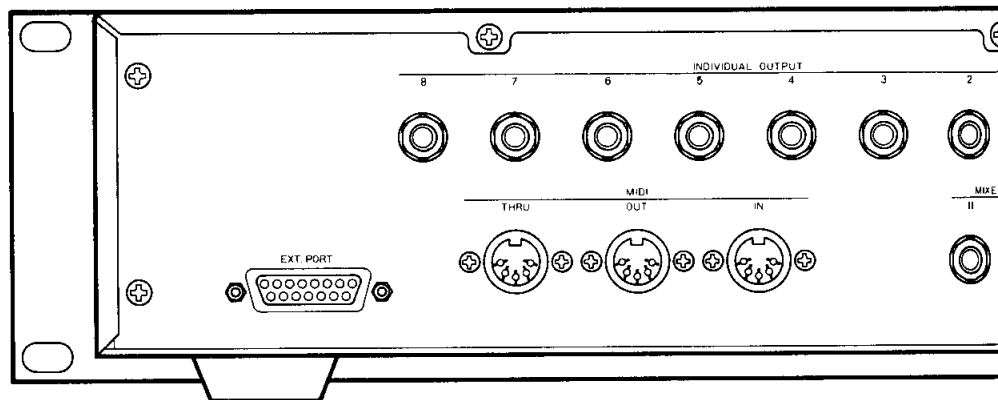
FOOT SWITCH: A foot switch can be used to start sampling.

PHONES: This stereo headphone jack carries the same signal as the rear panel mixed outputs.

FRONT PANEL



REAR PANEL



REAR PANEL

EXT.PORT: Future operating software will use this for high-speed data transmission.

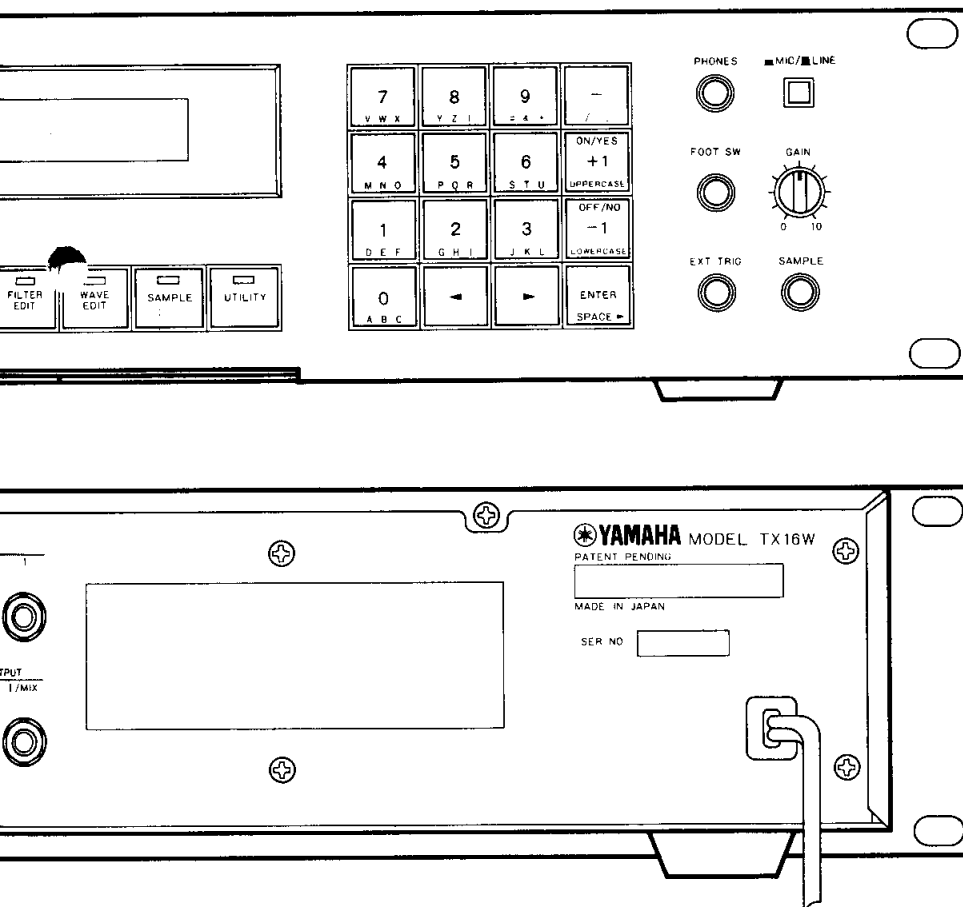
INDIVIDUAL OUTPUT 1-8: The sound from voices 1-8 can be sent from these outputs.

MIXED OUTPUT I, II: Each voice 1-16 can be sent from either or both of the mixed outputs.
(These are also used as stereo outputs.)

MIDI IN: MIDI signals received here will play the TX16W.

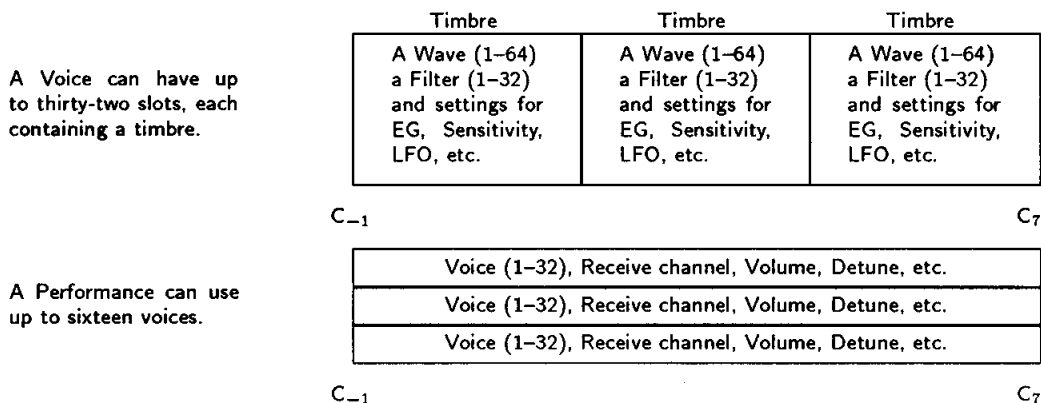
MIDI OUT: TX16W bulk data can be transmitted from this terminal to another TX16W or a data storage device.

MIDI THRU: All messages received at MIDI IN are retransmitted unchanged from this terminal.



INTRODUCING THE TX16W

Using the TX16W, you can sample a sound; trim, loop and store it as a *Wave*; create a *Timbre* by adding a filter to a wave and giving it a LFO and EG; arrange up to 32 of these Timbres across the keyboard to make a *Voice*, and combine up to 16 voices in a *Performance*.



Memory

The TX16W has the following internal memories:

- 32 Performance:** a combination of up to 16 *Voices*, each receiving on its own MIDI channel, and with settings for audio output, volume, detune and transpose.
- 32 Voice:** a 'keyboard layout' of up to 32 slots, with a *Timbre* number and fade setting for each slot.
- 64 Timbre:** a *Wave* number (1-64), *Filter* number (1-32), and settings for Tuning, Touch Response Curve, Amplitude EG, Pitch EG, Amplitude Modulation Sensitivity, Pitch Modulation Sensitivity, Touch Bias Sensitivity, Pitch Bend, and individual LFO.
- 32 Filter:** a Filter Table number (1-16) and settings for EG, LFO, Key Scaling, LFO Modulation Sensitivity and Bias Sensitivity.
- 64 Wave:** a piece of digitally recorded audio with a looping point.
- Setup:** settings determining how the TX16W will be controlled by MIDI messages.
- 16 Filter Table:** a 10 × 10 matrix of filter shapes to be used in a Filter Memory.

IMPORTANT: All data is in volatile memory—it will be lost when the power is turned off. If you want to keep data that you create, store it to the floppy disk.

NOTE: There is a chart of the TX16W's memories and edit buffers at the end of the manual.

Modes

Press the mode select keys to select the TX16W's eight modes.

PERFORM SELECT: Use the numeric key pad or the +1/-1 keys to select Performance Memories.

SYSTEM SETUP: Make System settings for the TX16W.

PERFORM EDIT: Create or edit a Performance.

VOICE EDIT: Create or edit a Voice.

FILTER EDIT: Create or edit a Filter.

WAVE EDIT: A sample can be trimmed, looped, or mixed with another sample.

SAMPLE: Record an audio signal from the SAMPLE INPUT.

UTILITY: Store data from the edit buffers into internal memory, save data on disk, transmit MIDI bulk data, and perform various other useful functions.

When you enter each mode, the lower line of the LCD will show the job menu. Press the corresponding numeric key to select the job you want.

NOTE: There is a chart of the TX16W's modes and operational procedures at the end of the manual.

System Program

The operating system program of the TX16W is loaded from disk when you turn the power on. It is a good idea to make a copy of the system disk (see Format, p.24) and put the original in a safe place.

Try It Out

You don't need to have a technical understanding of the TX16W to play it. A set of seven disks are included. Insert the System Disk and turn the power on. The system program and filter tables will be loaded, and the LCD will show 'READY !!! Hit function key'.

The system disk contains a demo setup. To load it, press UTILITY, then press 2. The LCD will show the LOAD Setup job with the cursor blinking at 'Go?'. Press YES twice, and wait for the blinking 'END' display. Then press PERFORM SELECT, play a connected MIDI keyboard, and let the TX16W speak for itself.

Play the Included Disks

Six data disks are included with the TX16W. Insert a disk, press UTILITY, then 2, then YES twice to load the entire disk into the TX16W. (This will take about 1 min 45 sec depending on the amount of data.) When the LCD blinks 'END', press PERFORM SELECT and play the sounds from a MIDI keyboard. (The disks were created with a standard 61-note keyboard in mind, and notes outside this range do not always have sounds assigned to them.) Performance Memories can be selected using the program select switches on your keyboard, or using the -1/+1 or numeric key pad on the TX16W. The contents of the six data disks are given at the end of this manual.

PERFORMANCE SELECT

You will normally play the TX16W in this mode. A Performance is a combination of up to 16 voices. To select Performances (1-32), use the numeric key pad and ENTER, or use the +1/-1 keys. The upper line of the LCD shows the Performance Name. The lower line shows the Voice Number (1-32) for each of the 16 instruments in the performance, and also indicates the audio output for each instrument; I or II (mixed output), Σ (both I and II), M (individual output-group A only), or a blank (output is off). The LCD can only display one group of 8 voices at once, so use the cursor keys to switch between group A and B.

```

PERFORMANCE 32 A < Performance Name >
M01 M02 M03 M32 M10 <-- <-- <--
  
```

```

PERFORMANCE 32 B < Performance Name >
I31 I20 I08 I11 I29 I17 I18 I19
  
```

Audio Output I, II, Σ (both), M (multiple)

and

Voice Number (1-32)

A long arrow <-- to the right of a voice number indicates that tone generators have been assigned (p.9) to make a polyphonic instrument of 2-16 notes. Short arrows < between voice numbers indicate that these voices are Alternately Assigned (p.9), and successive notes will alternately play each voice.

```

PERFORMANCE 32 A < Performance Name >
I01 <I02 <I03 <I04 I10 <-- <-- I32
  
```

For example in the LCD above, the first four voices have been Alternately Assigned. The next three voices have been Linked to make an instrument of 3-note polyphony.

A list of the performance memories on the six data disks included with the TX16W is given at the end of this manual.

SYSTEM SETUP

In this mode you can make various System settings for the TX16W. There are 7 jobs in System Setup mode. Repeatedly press SYSTEM SETUP to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-7 to select the corresponding job.

System setup menu select 1 -- 7
 1. Master volume 2. Master tune

3. MIDI switch 4. Control number assign
 5. Program change 6. Device number
 7. Protect

1. Master Volume This is the volume for the mixed outputs I and II, adjustable over a range of 0-99. When the cursor is at 'I/II', the numeric key pad will set both outputs simultaneously, and the +1/-1 keys will affect both outputs simultaneously.

2. Master Tuning This is the master tune for the entire TX16W, adjustable over a range of -64 to 63 (about a half-step up and down). The actual pitch will depend on the samples and their tuning.

3. MIDI switch You can specify how four types of incoming MIDI messages will be received. Use the < > to move the cursor, and use the +1/-1 keys to select the type of message and the setting for each.

Program Change: Performance memories can be selected by MIDI Program Change messages as follows. (See also Program Change, p.8).

off: Program changes will be ignored.

all: Program changes on any channel will select Performance Memories.

g1-g16: Program changes on this channel will select Performance Memories. (Individual voices cannot be selected via MIDI.)

Control Change, Aftertouch, Pitch Bend: Each of these can be set independently with the following choices.

off: Messages will be ignored.

norm: Messages will be received by each voice on its own channel as specified in PERFORMANCE EDIT 2 (p.9)

g1-g16: Messages received on the specified 'global' channel will affect all instruments in a performance. The Receive Channel setting you made for each instrument in PERFORMANCE EDIT will still be effective.

Note On/Off: You may specify whether all, odd, or even notes will be received. By using two TX16Ws together and setting one to 'odd' and the other to 'even', you can double the effective note-producing capacity to thirty-two simultaneous notes.

4. Control Number Assign By setting this Control Number table, you can re-assign incoming MIDI Control Change messages (Bn.xx.yy). When the blinking cursor is on the left, use the +1/-1 keys to select the incoming control number 0-31 and 64-121. When the blinking cursor is on the right, use +1/-1 to select the function that the incoming message will have. Following is a list of the standard MIDI control numbers transmitted by most keyboards.

1	Mod. wheel
2	Breath control
4	Foot control
6	Data entry
7	Volume control
64	Sustain switch
96	Increment switch
97	Decrement switch

Control Number Assign can be useful when your keyboard does not transmit the MIDI control number you need. For example, if you set '1 → Volume', incoming Modulation Wheel messages will control the volume. (Modulation Wheel is MIDI controller number 1.)

5. Program Change

This is where you determine how incoming Program Change messages will select Performance memories.

Table (on/off): When this is On, incoming Program Changes will select the Performance number as you specify in the Table below. When this is Off, incoming Program Change 0 will select Performance Memory 1, 1:2, 2:3, ... 31:32, 32:1, 65:2, ... 127:32

Src (0-127), Dst (1-32): The incoming Program Change message (Src) will select the TX16W Performance Memory (Dst).

6. Device Number

Set the channel (device number) on which the TX16W will receive System Exclusive data (off, 1-16, all). This setting also determines the transmission channel (see MIDI Dump, p.25). If 'all' has been selected, System Exclusive data will be transmitted on channel 1.

7. Protect

To store data into the TX16W or to receive bulk data via MIDI, Memory Protect must be Off. When power is turned on, Memory Protect will be Off.

PERFORMANCE EDIT

There are 9 jobs in Performance Edit mode. Repeatedly press PERFORMANCE EDIT to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-9 to select the corresponding job.

```
Perf edit menu      select 1 -- 9
1. Voice assign  2. Receive channel
```

```
3. Output  4. Volume  5. Detune  6. LFO
7. Note shift  8. Ext trigger  9. Name
```

Settings in Performance Edit mode are made independently for each Voice 1-16. The LCD can only display one group of 8 Voices at once, so move the cursor beyond the right/left edge of the LCD to display group A or B. ('A' or 'B' will be shown in the upper line of the LCD.)

```
Group A      Voice <CF Piano > Rch=omni
I01 I25 II16 II28 I28 <-- <-- <--
```

```
Group B      Voice <CF Piano > Rch=omni
I01 I15 II16 II28 I28 <-- <-- <--
```

Performance Edit Buffer

When you select a performance, the data is called into a place called the 'Performance Edit Buffer'. Changes you make in Performance Edit mode affect this buffer, and are not permanent until you Store the buffer into a Performance Memory (see p.23). You must store a Performance before you can save it to disk.

While editing a Performance, Voice or Filter, you will be hearing the data from the Performance, Voice and Filter *edit buffers*, and the wave data from the *internal* wave memories. (The wave edit buffers can be heard only in wave edit mode.)

1. Voice Assign

Press +1/-1 (or use the numeric key pad) to select a voice number (1-32) for each of the 16 voices in the Performance. You can turn a Voice on/off by pressing ENTER + ON/OFF. When a Voice is turned off, the Voice to the left will be given an extra note of simultaneous note capacity. In this way, you can have a single Voice that is capable of playing chords of up to 16 notes.

Group A/B Name of voice at cursor Receive channel of voice at cursor

```
Group A      Voice <CF Piano > Rch=omni
I01 I15 II16 II28 I28 <-- <-- <--
```

Audio output (I,II, ~~I~~M) and Voice number (1-32)

For example in the LCD above, voices 5-8 are acting as a single voice with 4-note polyphony.

2. Receive Channel / Alternative Assign

This determines the MIDI channel that each Voice will receive (1-16, omni). When 'omni' is selected, incoming notes of any channel will play the Voice.

You can also set Voices to Alternate Assign, which causes incoming note to alternate between Voices. Set the Receive Channel to the same number as the Voice at left, and press ENTER + ON/OFF to set Alternate Assign. A short arrow to the left of the channel number indicates that voices are Alternately Assigned.

Group A Receive channel (<-Altr assign)							
16	<16	<16	om	1	10	11	7

For example in the LCD above, voices 1-3 are Alternately Assigned. If three voices playing Strings, Brass and Piano were set to Alternate Assign, a three-note chord would include one note of each voice.

3. Output Assign

This determines the audio output of each voice; off, I, II, Σ (both I and II) or M (the individual 'multiple' output—selectable only for group A).

Multiple output is selected for all group A voices at once—press ENTER + ON/OFF.

4. Volume

The volume of each voice can be set from 0-99. MIDI Volume control messages (Bn.07.xx) will affect all voices evenly, preserving the 'balance' set here. (A bar display graphically indicates the volume of each voice.)

5. Detune

Each voice can be detuned independently over a range of -7 to 7. For example, two identical voices can be detuned to create a rich sound.

6. Performance LFO

Here you can set parameters for a Low Frequency Oscillator that will apply to all Voices in the Performance. This is independent of the individual Timbre LFOs. For example, you could use the Timbre LFOs to create fine nuances over each range of the keyboard, and use the Performance LFO for a more 'obvious' effect.

Wave: Select from sine, triangle, saw up, saw down, and square.

Speed: 0-99

Delay: A delay can be set between the time the key is pressed and the LFO begins.

Sync: When sync is On, each new note will make the LFO wave begin again from its zero phase point—i.e., make it 'start over' again.

Amd: The Performance LFO can directly (i.e., independently of MIDI controllers) control timbre volume as shown in the diagram on page 14.

Pmd: The Performance LFO can directly (i.e., independently of MIDI controllers) control timbre pitch as shown in the diagram on page 14.

7. MIDI Note Shift

Incoming notes can be shifted (transposed) for each voice over a range of -24 to +24 notes (two octaves down or up).

8. External Trigger

A footswitch or audio source connected to the front panel EXT TRIGGER jack can trigger a specified note.

Level: The threshold level of the trigger can be set 0-99. Higher settings will require a higher input level to trigger the note.

Key: This is the note to be played.

Gate: The length of the note 0-99 (maximum is about 1 second).

MIDI Ch: The triggered note will play the voices that are receiving this channel (1-16).

9. Performance Name

Each performance memory can be given a 20-character name. Use the numeric key pad to enter the characters printed on them. Each press will step through the four characters printed on each key. The UPPERCASE and LOWERCASE keys select capital or small letters. (The cursor on the upper line will point up or down to indicate this.) Pressing ENTER will leave a blank space and move to the right.

VOICE EDIT

A Voice is made up to 1-32 slots (i.e., *keyboard areas*), with a Timbre assigned to each slot. There are 13 (1-9 and e1-e4) jobs in Voice Edit mode. When you press the VOICE EDIT key, the LCD will show several selections at a time. Repeatedly press VOICE EDIT to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-9 to select the corresponding job (press ENTER and 1-4 to select e1-e4).

Voice edit menu select 1 -- 9 e1 -- e4
 1. Split 2. Wave 3. Filter 4. Pitch

5. Veloc 6. AEG 7. PEG 8. LFO 9. AMS
 e1. PMS e2. Veloc bias e3. Pitch bend
 e4. Name

Any time you are in Voice edit (or Filter edit) mode, you can jump to another slot by playing a key while pressing ENTER. The Timbre (or Filter) number for that slot will be shown in the upper left of the LCD. This allows you to easily make adjustments to a certain parameter for each Timbre.

Voice and Timbre Data

This mode is called Voice Edit mode, but only the settings you make in job 1 (Timbre number, Key Limits, and Fade setting for slots 1-32) are stored as a Voice Memory. Jobs 2-e5 edit individual Timbres. Settings you make in these jobs affect the timbre edit buffers. 32 Voices + 64 Timbres are saved and loaded as a single file (p.23). In jobs 2-e5, the number of the Timbre being edited is shown in the upper left of the LCD. The TX16W has 64 timbre edit buffers—one for each timbre memory.

Edit Buffers

While editing a Performance, Voice or Filter, you will be hearing the data from the Performance, Voice and Filter *edit buffers*, and the wave data from the *internal* wave memories. (The wave edit buffers can be heard only in wave edit mode.) These settings must be stored before they can be heard in the Performance Select mode.

1. Slot

Each voice may have up to 32 slots, with a Timbre in each slot. This job determines the location and width of each slot, and selects the Timbre for that slot. Slots may not overlap,¹ but may have gaps (i.e., empty spaces) between them. Slots can be faded over a range of 1-9, indicating the number of notes over which the fade takes place. (However the range will never be greater than 1/3 the number of keys in the slot, so for narrow slots the selectable range will be less than 9 keys.) When Fade is Off, every note in the Timbre for that slot will be at full volume.

Here you can also enter a 10-character Voice name. Enter characters as explained on p.10.

Timbre number (1-64) and name Fade (off, 1-9)

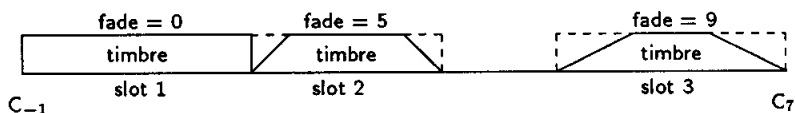
>Slot >Timbre >LoK >HiK >Fde >Voice name
 1 piano A4 G4 C4 off CF piano

Slot number (1-32) Key limits Voice name

To insert a new slot, first make space for it by moving the Hi Key or Lo Key of the surrounding slots by moving the cursor to LoK or HiK and playing

¹To do overlapping crossfades (i.e., to fade one sound into another sound as you play across the keyboard), you will have to use two voices of a Performance.

a note on the MIDI keyboard. (The note number will be interpreted using the Performance Edit MIDI Note Shift setting for that voice.) Then move the cursor to 'Slot' and press the ENTER key. A new slot will be created below the present slot. If there is space above the present slot, the +1 key will create a new slot above the present slot. Slots may have empty space between them, as shown in the diagram.



2. Wave Assign

Each Timbre can use one of the 64 waves (sampled sounds). Use +1/-1 or the <> keys to scroll through the Waves shown in the lower line of the LCD.

Timbre number Number and name of selected wave

Tim 32> Wave assign	64 <Piano C4 >
61 Vibr- 62 Harp-	63 Stri- 64 Pian-

Wave directory 1-64

3. Filter Assign

Each Timbre in the voice can use one of the 32 filters (p.15). Use +1/-1 or the <> keys to scroll through the filters shown in the lower line of the LCD.

4. Pitch

Each Timbre in the voice can be tuned independently.

Original Pitch Key: This key will sound the sample at its original pitch. Set using +1/-1 or directly from a MIDI keyboard.

Pitch: Fine tuning over a range of ±200 (approximately ±600 cents).

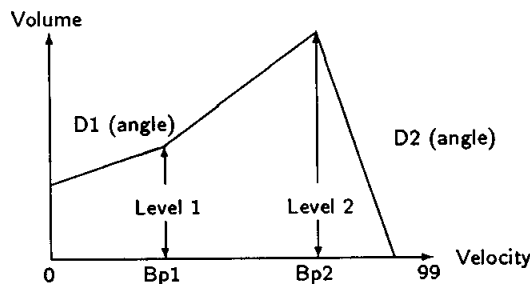
The lower line of the LCD will show the wave number and name.

5. Velocity Curve

Velocity Sensitivity for each Timbre can be programmed in a 6-parameter curve—two sets of Break Point, Level, and Depth. This means you can program a Timbre to become softer as you play harder. A Performance could contain two Voices programmed with opposite Touch Curves to create a velocity cross-fade effect.

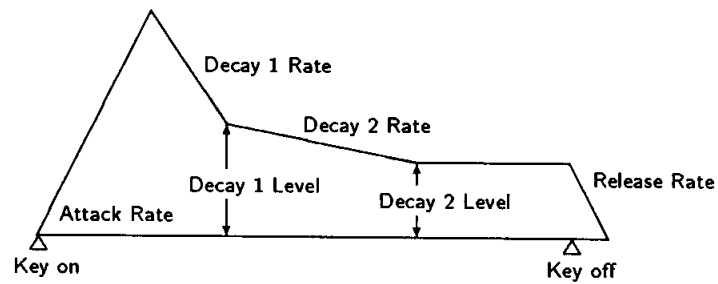
Bp (0-99) is the Break Point Velocity Level—the velocity at which the Timbre will have volume level L (0-99). The Break Point range of 0-99 corresponds to MIDI Note On velocity 1-127. Depth D (±50) is the slope leading to level L. When Sw is Off, the Velocity Curve will be ignored. Vol (0-99) is the overall volume of the Timbre. (Note that Bp1 cannot be set beyond Bp2.)

When setting a Velocity Curve, it may be helpful to draw the desired curve on paper, and then figure out the appropriate settings. Press ENTER to see a graphic display of the Velocity Curve.



6. Amplitude EG

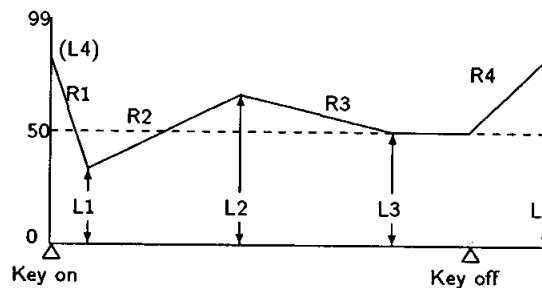
The Amplitude EG (envelope generator) determines how the volume of the Timbre changes over time. Each parameter has a range of 0–99. The rates are automatically scaled as the wave is transposed. I.e., high notes will have shorter envelopes than low notes.



7. Pitch EG

The Pitch EG (envelope generator) determines how the pitch of the Timbre changes over time. Each parameter (Level 1–4, Rate 1–4) has a range of 0–99. Level 50 is the 'normal' pitch. The Pitch EG has a total range of 8 octaves, but this full range will be usable only when playing in the center of the keyboard.

For example, if the pitch envelope was set as shown in the following diagram, the pitch would fall from level 4 to level 1, rise to level 2, fall to level 3, and remain there until the key was released. Then the pitch would rise back to level 4.



8. LFO

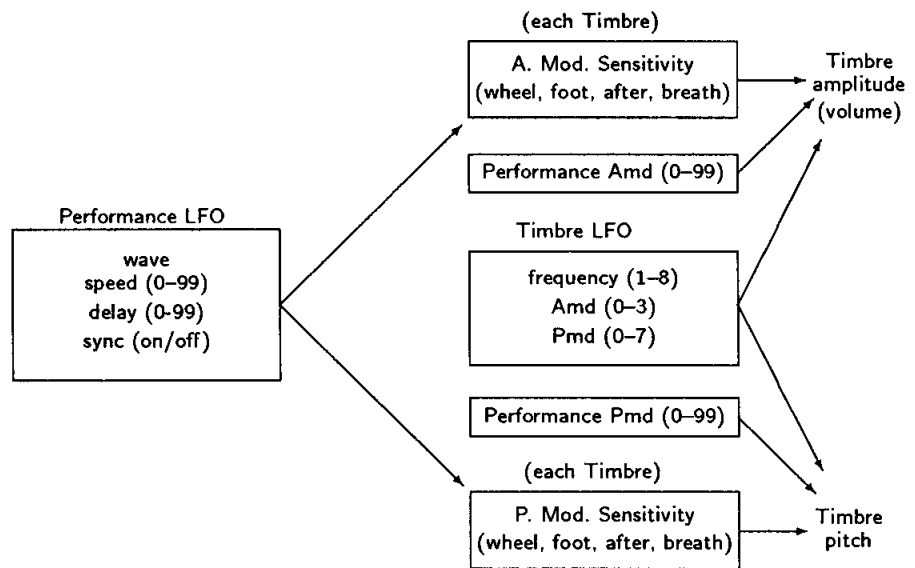
Each Timbre has its own Low Frequency Oscillator settings. (The LFO waveform is fixed at Triangle.) This is independent of the Performance LFO.

Speed: (1–8) The speed of the LFO.

Pmd: (0–7) Pitch Modulation Depth. This is unaffected by MIDI controllers.

Amd: (0–3) Amplitude Modulation Depth. This is unaffected by MIDI controllers.

The Timbre is affected by the Performance LFO and its own Timbre LFO as shown in the following diagram.



9. Amplitude Modulation Sensitivity

The amount of Amplitude Modulation from the Performance LFO that affects this Timbre can be controlled by MIDI control messages as shown in the preceding diagram. Set the sensitivity to Modulation Wheel, Foot Controller, Aftertouch, Breath Controller independently over a range of 0-99.

E1. Pitch Modulation Sensitivity

The amount of Pitch Modulation from the Performance LFO that affects this Timbre can be controlled by MIDI control messages as shown in the preceding diagram. Set the sensitivity to Modulation Wheel, Foot Controller, Aftertouch, Breath Controller independently over a range of 0-99.

E2. Velocity Bias Sensitivity

Velocity Bias allows you to use MIDI controllers to *increase* the Key On velocity *after* the note has been struck—i.e., change the sound as if the note had been played more strongly. Set the sensitivity to Modulation Wheel, Foot Controller, Aftertouch and Breath Controller independently over a range of 0-99. By moving these controllers on your keyboard, you can change the Key On velocity while the note is sounding.

The effect this will have depends on the velocity sensitivity setting. See Velocity Curve, p.12.

E3. Pitch Bend

This determines the effect of the Pitch Bend wheel on your keyboard. Range sets the width of the effect from 0 (no effect) to 12 (bend one octave up/down). The bend can be smooth (Step 0) or in steps of up to one octave (1-12). *When Step is set to 1-12, Range will automatically be set to 12.*

When a Pitch Bend places a note out of the TX16W's sound-producing range, it will be 'folded back' an octave.

E4. Timbre Name

You may enter a Timbre name of up to 10 characters as described on p.10.

FILTER EDIT

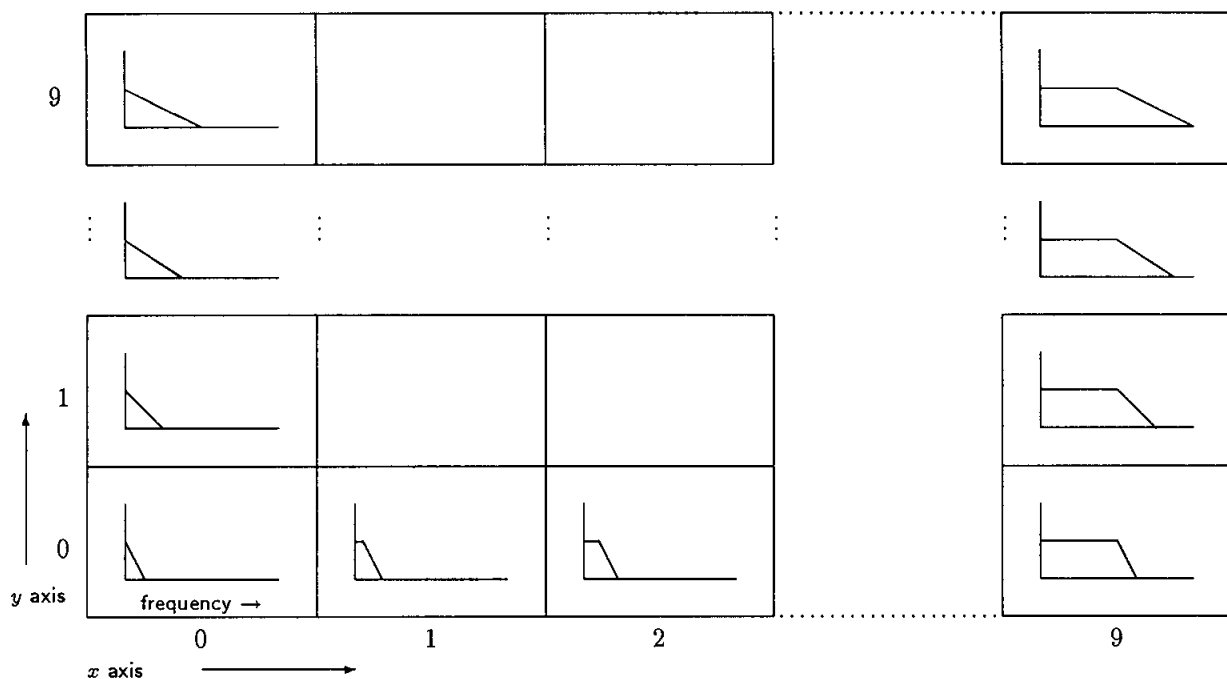
You can create and store 32 filters, which can be used in Timbres. There are 7 jobs in Filter Edit mode. Repeatedly press FILTER EDIT to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-7 to select the corresponding job.

Filter edit menu select 1 -- 7 1.Table 2.EG 3.LFO 4.Scaling
--

5. LFO Sense 6. Bias sense 7. Name

Any time you are in Filter edit (or Voice edit) mode, you can jump to another slot by playing a key while pressing ENTER. The Filter (or Timbre) number for that slot will be shown in the upper left of the LCD.

The TX16W filters are *Realtime Digital Filters* for noise-free processing of the signal while it is still in digital form. These digital filters are supplied on disk as 'Filter Tables' consisting of a 10 by 10 matrix of filter shapes. (The user cannot create Filter Tables.) For example, the filter table shown below is a basic Low-Pass filter with the Cutoff Frequency as the x -axis and the slope as the y -axis. One of the axes of the filter table can be modified in real time by the EG, LFO, or MIDI controllers over a range of 0-99. This is referred to as the Dynamic axis. You can set a fixed position (0-9) along the other axis. The system disk included 16 filter tables. Graphs of each table are given at the back of this manual.



Edit Buffers

While editing a Performance, Voice or Filter, you will be hearing the data from the Performance, Voice and Filter *edit buffers*, and the wave data from the *internal* wave memories. (The wave edit buffers can be heard only in wave edit mode.) These settings must be saved before they can be heard in the Performance Select mode.

1. Table

These are the basic parameters of the filter.

TBL: The TX16W can hold 16 Filter Tables. A Filter Table is a 'basic type' of filter, and consists of a 10 by 10 matrix of 'filter shapes'.

Frequency curves of the included Filter Tables are given at the end of this manual. A filter must be loaded from disk into TX16W memory before it can be used. See page 23.

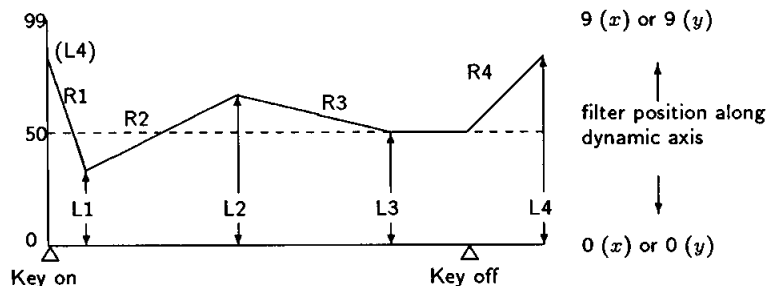
Dyn-axis: Filter 'movement' can be along *either* (not both) the *x*-axis or the *y*-axis. (The effect will depend on the filter table used, and will be displayed in the LCD—e.g., 'freq' or 'level'.) The filter envelope and filter LFO will move along this axis. The data for each axis is in 10 steps, but movement along the dynamic axis will be continuous—i.e., data is 'smoothed.'

Dyn: Set the position (0-99) along the selected axis (*x* or *y*) you selected to be the dynamic axis. This axis of the filter table will be affected by MIDI controllers as you specify in LFO Mod Sense and Bias Sensitivity (p.17).

Fix: Set the position (0-9) along the axis (*x* or *y*) that you selected to be the static axis.

2. Filter EG

The Envelope Generator determines how the effect of the filter will change (along the dynamic axis) over time. Each parameter (R1-4, L1-4) is adjustable 0-99.



3. Filter LFO

The filter has its own Low Frequency Oscillator to periodically move the sound along the dynamic axis you selected.

Wave: Choose from five waveforms; triangle, saw down, saw up, square and sine.

Speed: The LFO speed is adjustable 0-99.

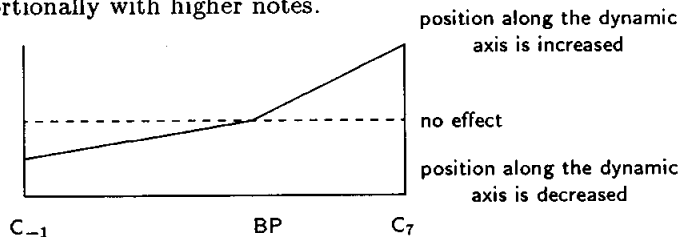
Delay: A delay 0-99 can be placed before the onset of the LFO.

Depth: The depth of the LFO effect is adjustable 0-99.

Sync: The Filter LFO can be made to start over at the beginning of each note—i.e., 'Key On' sync.

4. Key Scaling

The filter can be adjusted along its dynamic axis across the keyboard. Angles to the Left and Right of the Break Point are adjustable; 50 is flat, 0-49 is downward, 51-99 is upward. Enter the Break Point directly from a MIDI keyboard. For example, if the filter table was a Low-Pass filter with Cutoff Frequency as the dynamic axis, you may want to set the cutoff frequency to rise proportionally with higher notes.



- 5. LFO Mod Sense** This determines how incoming MIDI messages will regulate the amount of LFO modulation that affects the filter. Set sensitivity to Modulation Wheel, Foot Controller, Aftertouch and Breath Controller over a range of 0-99.
- 6. Bias Sensitivity** This determines how incoming MIDI messages will move the filter along its dynamic axis. Set sensitivity to Velocity, Modulation Wheel, Foot Controller, Aftertouch and Breath Controller over a range of ± 50 . Positive values allow the controller to increase the position along the dynamic axis. Negative values allow the controller to decrease the position along the dynamic axis.
- 7. Filter Name** You may give the filter a 10-character name. Enter the name as described on p.10

WAVE EDIT

A *Wave* is a piece of digitally recorded sound with a looping point. There are 7 jobs in Wave Edit mode. Repeatedly press WAVE EDIT to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-7 to select the corresponding job.

Wave edit menu	1 -- 7
1. Load to buffer	2. Trim 3. Loop

4. Loop cross fade	5. Reverse	6. Mix
7. Name		

You can play a connected MIDI keyboard to hear the results of your editing. Play A₄ to sound the sample at its original pitch.

Wave Edit Buffers

The TX16W has 16 wave edit buffers. Each holds independent wave data, and can be edited separately. It is often convenient to load (or sample) 16 waves into the edit buffer and then edit them. At any time in Wave Edit mode, the left-most position of the cursor (▷) will let you select a Wave Edit buffer 1-16.

The wave edit buffers can be heard only in wave edit mode, so an edited wave must be *stored* to internal memory before it can be used. (While editing a Performance, Voice or Filter, you will be hearing the data from the Performance, Voice and Filter *edit buffers*, and the wave data from the *internal* wave memories.)

Reload

Whenever you Trim, Loop, Reverse or Mix the wave (i.e., when you command 'Go') the data in the edit buffer is modified. If you made a mistake, or are not happy with the results of your editing, you can reload the edit buffer with the original data you Loaded (job 1) from memory or disk. Any time you are using Wave Edit jobs 2-6, the second cursor position from the left allows you to reload the edit buffer. Reload will not work if the wave data in the edit buffer got there by being sampled and has not been stored.

1. Load to buffer

Each time you sample a sound, the data is automatically put in the next wave edit buffer. This 'Load to buffer' job also lets you load wave data from internal memory (1-64) or from disk (1-99). *When you first enter this job and Load, all 16 wave edit buffers will be cleared.* You may continue loading up to 16 waves into the edit buffers.

Load single or pair W = length of wave Execute loading

LD	▷S/P	▷Wv1	W=1234	▷Wv2	W=1234	▷Ld
10	pair	D12<STRING-C>		I12<Piano C4>		Ok?

LD	▷S/P	▷Wv1	W=1234		▷Ld
10	sngl	D12<STRING-C>			Ok?

Buffer number 1-16 Wave number (Internal 1-64 or Disk 1-99) / Wave name

LD: This shows the buffer that will be loaded next. Each time you Load, the buffer number will increment.

S/P: Load a single wave or a pair of waves. When editing a stereo sample (or if you are going to Mix two waves), load two waves at once using PAIR load. You can monitor the wave pair in stereo from the I and II outputs.

Wv1/2: Select the wave to be loaded into the edit buffer. Press ENTER to select internal memory or disk.

W: This shows the width (length) of the selected sample in blocks.²

Ld: To load the selected data into the edit buffer, move the cursor here and press YES.

2. Trim

You can trim unwanted time off the start and end of the sample. 'W' indicates the length (in blocks) of the sample. Set the new Start point and End point, and play the MIDI keyboard to hear it. When you are satisfied with the trimmed sample, move the cursor to 'Go' and press YES.

You can Normalize the sample to make the loudest part of the sample occupy the full 12 bits of available dynamic range. Move the cursor to 'Norm' and press YES. This will take a few seconds, depending on the length of the sample. This function will give your samples a constant level. (Even so, of course, you should try to record the sample with as high a level as you can to get the best signal/noise ratio.)

3. Loop

Most sounds have a short but complex initial attack after which the sound settles to a predictable decay during which it changes more gradually. Once the sound reaches the steady state, you can loop it to conserve wave memory, and make further changes using the Amplitude and Filter envelopes.

Sw: Looping can be switched On/Off.

Stt>Fn: The beginning of the loop. 'Stt' shows block units, 'Fn' is a fine adjustment 0-63.

End>Fn: The end of the loop. 'End' shows block units, 'Fn' is a fine adjustment 0-63.

At: You can AutoSearch for a good looping point.³ When you move the cursor to 'At' and press +1 (or -1), the TX16W will search for the next (or previous) zero crossing point where the waveform has a similar slope. You may have to try several AutoSearches to find a good click-free point. (The first time you AutoSearch, the end point is also adjusted to the nearest zero crossing point.)

Go: Move the cursor here and press YES to set the loop point. The length (in block units) of the sample will be briefly displayed. Data after the 'End' point will be discarded.

4. Loop cross fade

You can Crossfade the beginning of the loop with the end of the loop. A sufficiently long Crossfade will make any loop click-free. (Of course, this will change the character of the original sound). The crossfade can be no longer than the loop itself.

Set the length of the crossfade, move the cursor to 'Go' and press YES.

5. Reverse

A section of the wave can be reversed (flipped end-for-end).

RvSP: Reverse Starting Point.

RvEP: Reverse End Point.

Whl: To reverse the Whole length, move the cursor here and press YES.

Mir: To reverse half the length (Mirror), move the cursor here and press YES.

W: The total width (length) of the sample is displayed.

L: The length to be reversed is displayed.

²One block is sixty-four 12-bit words of memory.

³Caution for long samples—the looping point must be within 2047 blocks of the start and end points.

For example, if the Start and End points are 100 and 300 for the following wave data,

ab	cd	ef	gh
0	100	200	300
			400

reversing 'Whl' would produce 'ab fe dc gh', and reversing 'Mir' would produce 'ab cd dc gh' ('ef' is discarded).

You could make a note of the looping point, and Mirror Reverse the wave at the halfway point for a click-free wave. If the end point was 300, this would loop as follows: 'ab cd dc cd dc cd ...'

6. Mix

This job works only with two waves that were *pair* loaded. (You can also mix two waves that were stereo sampled, although this would not be very meaningful.) Select the buffer number of the first wave before entering this job. In the example below, the waves in buffers 4 and 5 were loaded as a pair. Switch between the two LCDs (one for each wave) by pressing ENTER.

```
>>Mix Wave1 >Lv1 >Mlp >Zlp >Ofst W= 700
04 Piano C4 99 350 500 200 Crs= 500
```

```
**Mix Wave2 >Lv1 >Mlp >Zlp >Go W= 650
05 StringC4 65 340 100 Ok? Crs= 500
```

Lv: The overall level of each wave (0-99).

Mlp: The point where the wave will be at Maximum Level.

Zlp: The point where the wave will be at Zero Level.

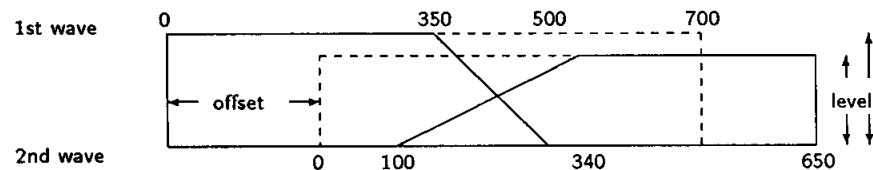
Ofst: The second wave can be given a time offset.

Go: Move the cursor here and press YES to execute.

W: The length of each wave is displayed.

Crs: The overlapping length of the two waves is displayed.

The diagram below shows how two waves could be Mixed as shown in the above two LCDs.



For example, you could use Mix to make a sound with two or more attacks, or to make a Piano attack fade into a String sustain.

The resulting single wave will be in the buffer number originally occupied by wave 1. The buffer originally occupied by wave 2 will be empty.

7. Wave Name

You can give each wave an 8-character name. Enter the name as explained on p.10. Only upper-case characters can be selected.

SAMPLE

There are 3 jobs in Sample mode. When you press the SAMPLE key, the LCD will show the job menu. Press the numeric key pad 1-3 to select the corresponding job.

Sampling menu	select 1 -- 3
1. Frequency	2. Level 3. Record

1. Frequency

This is where you make settings for sampling frequency and length, and specify the triggering method.

Frequency: You have the choice of

- 33k stereo sampling⁴ (7.9 seconds)
- 33k mono sampling (7.9 seconds)
- 50k mono sampling (5.2 seconds)
- 16k mono sampling (16.3 seconds)

Note that these lengths are the maximum times for a *single* sample.⁵ Even with the standard 1.5Mbyte of wave memory, the TX16W can accommodate several such samples.

Length: The maximum available sampling time for the frequency you have selected will be displayed in blocks (and seconds). If you don't need this long a sampling time, reduce the length so you won't waste time (and memory) waiting for sampling to end. The remaining sampling time will depend on how much memory has already been used.⁶ In any mode, you can check the amount of remaining wave memory by simultaneously pressing the ENTER and '-' keys.

The left cursor position allows you to select the sample length in blocks. The right cursor position allows you to select the sample length in 10-msec steps.

Trigger: This determines when the recording of the sample will begin. Sampling will begin ...

auto: when the level of the signal coming into the front panel SAMPLE jack reaches the trigger point specified by Level Set (see below).

yes key: when the front panel YES switch is pressed.

foot sw: when the footswitch is pressed.

external: when a trigger signal (analog or footswitch) comes into the front panel EXT TRIG jack.

input - foot: when the level of the signal coming into the front panel SAMPLE jack is above the trigger point *and* the footswitch is pressed.

ext - foot: when a trigger signal comes into the front panel EXT TRIG jack *and* the footswitch is pressed.

⁴The resulting stereo wave sample will be stored in two Wave Edit buffers, labeled SAMPLE L and SAMPLE R. Edit these separately, but if you wish to preserve the original phase relationships between the two samples, be sure to Trim and Loop them at exactly the same points.

⁵A single sample is limited to 4093 blocks of wave memory.

⁶If you have been trimming or loading samples, the wave memory occupied by sample data may become discontinuous. If there is not enough continuous data area, the TX16W will ask you to wait a while, and will rearrange the existing sample data. (I.e., 'garbage collection.')

2. Level Set

This lets you adjust the level of the signal to be sampled. The LCD will act as a bar graph level meter. Adjust the front panel GAIN control and the MIC/LINE switch so that the signal is as high as possible without clipping (a * mark indicates clipping). You can use the < > keys to set the trigger point. When finished, press ENTER to enter the Record job described below.

3. Record

This is where you actually record the sample. The LCD will indicate the level of the input signal, and recording will begin as you specified in Trigger (see above). The LCD will show 'START', and when finished, 'sample picked, to resample press enter'. If you made a mistake, you can press ENTER and try again. Press NO to exit the job without recording a sample.

Immediately after recording a sample, you can press numeric key 5 to hear it. Play A₄ to sound the sample at its original pitch.

UTILITY

In Utility mode you can Store data to internal memory, Save and Load to and from disk, Format new disks, and Transmit data from MIDI.

There are 7 jobs in Utility mode. Repeatedly press UTILITY to see the entire job menu. No matter which jobs are being displayed, press the numeric key pad 1-7 to enter the corresponding job.

Utility menu select 1 -- 7 1. Store 2. Disk load 3. Disk save

4. Format 5. Init 6. Disk copy
7. MIDI dump

1. Store

You can store data from the edit buffer into internal memory. (Internal memory protect must be Off. See p.8.) Select the type of data, source and destination, move the cursor to 'Go' and press YES. If you are sure, press YES again, and the data will be stored.

>Job >From ed buf >To internal >Go? wave 12 Piano C4 32 Piano C5

perf: The Performance data from the edit buffer

voice: All or one of the Voices from 32 edit buffers

timbre: All or one of the Timbres from 64 edit buffers

wave: The Wave data from 16 edit buffers

fil: All or one of the Filters from 32 edit buffers

2. Disk Load

You can load data from disk into internal memory. (Internal memory protect p.8 must be off.) Select the type of data, disk filename and destination, move the cursor to 'Go' and press YES. If you are sure, press YES again, and the data will be loaded into memory.

The following data can be loaded from (and saved to, see below) disk. Filter Tables and Waves are saved and loaded as individual files. 32 Filters, 32 Voices + 64 Timbres, and 32 Performances are saved and loaded as single files.

FTBL: Filter table data (load one by one into filter table memories 1-16)

fil: 32 filters

wave: Wave data (load one by one into wave memories 1-64)

v+t: 32 voices + 64 timbres

perf: 32 performances

setup: This loads the entire memory of the TX16W as a single job—see Save Setup below.

The Setup Load job can be aborted by continuously pressing the NO key.

3. Disk Save

You can save data from internal memory to disk. (The protect slider on the disk must be off.) Select the type of data, the source, and the disk filename. Move the cursor to 'Go' and press YES. If you are sure, press YES again, and the data will be saved to disk. When finished, the LCD will show 'END'.

When you select 'Save Setup,' move the cursor to 'Go' and press YES, you will be asked whether or not to 'save all files.' If you press YES, the entire TX16W memory will be saved to disk—Performance, Voice, Filter, Wave, etc. If you press NO, only the System Setup parameters (see p.7) will be saved to disk.

A setup file created by 'save all files' will contain the filenames of the required data, and can be used to load your entire setup automatically. You will be prompted to insert additional disks if required.

The Save Setup job can be aborted by continuously pressing the NO key.

4. Format

New disks (2DD type) must be formatted before they can be used with the TX16W. *This will erase all data on the disk.* Select the job using the +1/-1 keys.

Save system program: This will copy the operating system program of the TX16W onto disk. *The TX16W will not work without its system program, so be sure to make a copy of it, and keep the original in a safe place.*

Format: This will make a formatted blank disk that you can use to store TX16W data.

Unused disk memory: You can check the available space on a disk, displayed in blocks of wave memory. A newly formatted disk has a capacity of about 7500 blocks.

After selecting the job, move the cursor to 'Go' and press YES.

5. Init

This allows you to Initialize data in the various edit buffers.

Job: This is the type of data to be initialized.

setup: Master Tune=0, Master Volumes=99, Control Numbers and Program Change Table assigned normally, Program Change Table turned off, Device Number=all, MIDI Switch Program Change=G1, MIDI Switches=norm.

pf1: Performance memory, single voice 16 notes.

pf2: Performance memory, dual voice 8 notes.

prcl: This loads the recall buffer data back into the performance edit buffer.

vc1: Voice memory, single slot (voicename 'init voice').

vc2: Voice memory, 8 slots by octave (voicename 'init oct v').

tim: 'Organ' envelopes, standard velocity curve, no modulation sensitivity.

wave: Wave data will be erased.

fil: Table thru, x axis dynamic, organ envelope, standard LFO settings.

FTBL: The filter table will be erased. Filter tables occupy wave memory, and you can conserve wave memory by erasing unneeded Filter Tables.

Mem: For most jobs, you can select whether to initialize the Edit Buffer, an Internal memory, or a Disk memory.

Number: Select the number of the edit buffer, internal memory or disk memory to be initialized.

6. Disk Copy

You can copy the contents of an entire disk to another disk. (The new disk must be formatted first.) Select the type of data to be copied, move the cursor to 'Go', press YES and follow the prompts in the LCD.

There must be enough free memory in the TX16W to accommodate all the files you wish to copy. If not, you will get an error message. In this case, you can either make room by initializing TX16W waves or filter tables, or copy only part of the data at a time.

7. MIDI Dump

You can transmit bulk data to be received by another TX16W. Select the type of data and the memory number, move the cursor to 'Go' and press YES. The transmission channel is determined by the Device Number setting (See p.8).

The TX16W sends and receives System Exclusive messages for front panel switches, parameter changes, and bulk data of various types. Computer programmers writing editing software for the TX16W may contact Yamaha for details. When transmitting Wave data as a MIDI bulk data message, the TX16W transmits a handshake signal in accordance with the official MIDI Sample Dump Format.

IDEAS AND SUGGESTIONS

- It is usually easier to make a high-quality recording of the sound you want to sample, and then sample from tape. If you have a digital tape recorder or a 30 ips half-track analog tape machine, the loss will be negligible.
- Remember that the room sound will be transposed up and down along as part of the sample. This can sound quite annoying. Record your samples in as quiet a place as possible. (When sampling a drum kit, remember that the other drums will usually rattle or resonate.)
- If the sample is being recorded in an acoustically live room, remember that the reverb time will also be shortened or lengthened as the sample is transposed.
- Noise or hum in the recording chain can become very obvious when transposed.
- You can get cleaner samples by using a good equalizer to filter out unwanted frequencies before sampling. These unwanted frequencies (low or high) can sound very unpleasant when transposed.
- For best signal/noise ratio, the sound should be sampled as loudly as possible without clipping. For most sounds, the loudest part will be a very brief attack, and the remainder of the sound will be much lower in volume. *This is where you will hear the noise.* So, by using a limiter to remove the initial attack, you can record the sample at a higher level. Use the Amplitude EG (explained in VOICE EDIT mode) to restore the desired attack when you use the wave in a voice. I.e., compress the entire sample and create dynamics artificially.
- If the sampled sound has vibrato, remember that this vibrato will be slowed down or sped up as the sample is transposed. Also, it will be very difficult to get a good loop if the original sound has vibrato. In most cases, it is probably best to sample the sound *without* vibrato, and use the timbre LFO to add vibrato.
- How about sampling an entire chord? An octave unison can be used anywhere, and a fifth or fourth is often musically useful.
- Many sounds (especially the human voice) are identifiable because of a fixed frequency range of emphasis (a *formant*) that stays the same no matter which note is played or sung. When transposed very far, this will sound unnatural. Good voice samples require a separate sample for every few keys (multi-sampling).
- Play a car crash from your keyboard—program separate keyboard ranges for the squealing tires, metallic smash, and tinkle of broken glass.
- Simple white noise (sample the hiss between stations from a FM radio) can be put through filters and envelopes to create a wide variety of percussive sounds. A single noise sample wave could be used with 32 different filters and envelopes to create 32 totally different sounds.
- Use the TX16W as a Percussion Tone Generator—different percussive sounds on each key, each with its own wave, filter, and envelope.

SUPPLEMENTARY INFORMATION

- **Explanation of Filter Table Data**
- **Filter Table Data**
- **Data Disk Contents**
- **DBS Series Disks for the TX16W**
- **Internal/Edit Buffer Memory**
- **Operational Flow Chart**
- **MIDI Implementation Chart**

TX16W DIGITAL WAVE FILTERING SAMPLER

EXPLANATION OF FILTER TABLE DATA

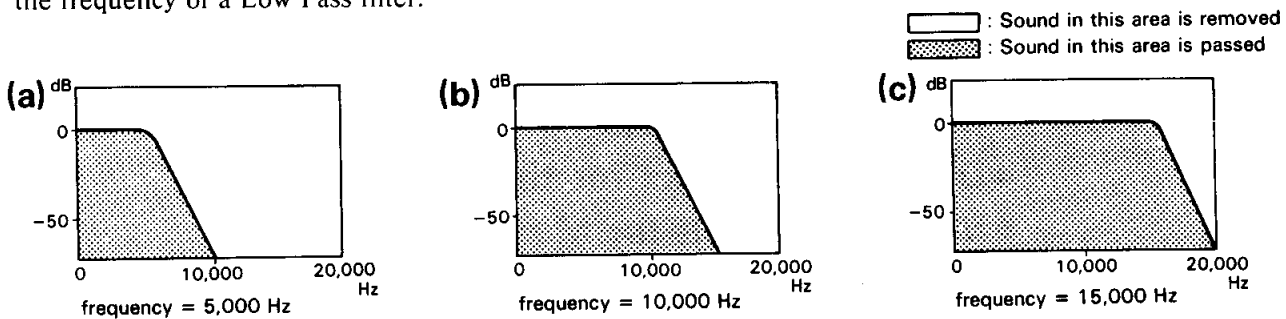
A Filter is a device which decreases the volume of (i.e., "filters out") specified frequency areas, and passes the rest of the sound.

The distance below the 0dB mark shows how much the filter cuts each frequency area. The filter shown in "a" starts cutting at 5,000 Hz and passes nothing above 10,000 Hz. Such a filter would be called a "Low Pass" filter (LPF). The filter shown in "i" is the opposite — a "High Pass" filter (HPF). The filter shown in "f" passes only a specified range or band — a "Band Pass" filter.



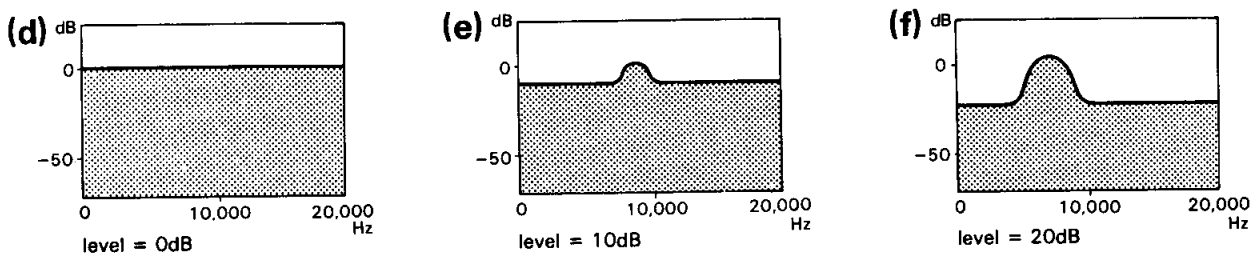
Each filter table has two parameters (out of "freq, level, slope") that you can change to affect the shape of the filter.

freq: The Frequency determines the area affected by the filter. The graphs below show the result of changing the frequency of a Low Pass filter.

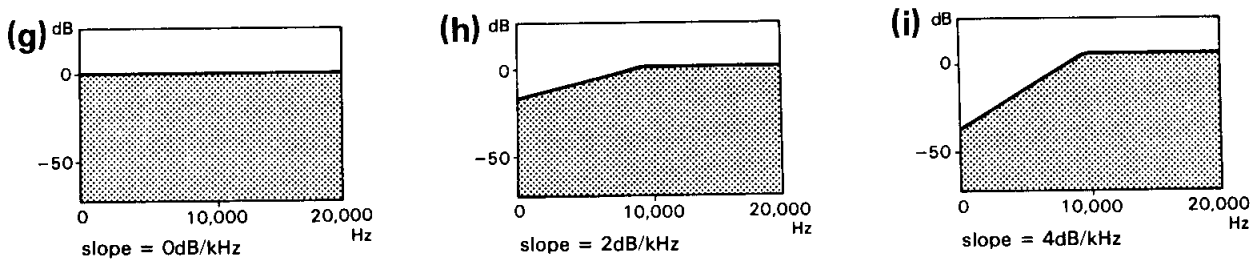


Since the "brightness" of a sound generally depends on the amount of high frequencies present, increasing the frequency of a Low Pass filter in this way would make the sound become brighter.

level: The Level regulates the amount of effect that the filter will have. When the level is 0 (flat across 0dB) the filter has no effect. The graphs below show the result of changing the level of a Band Pass filter.



slope: The Slope is the "steepness" of the change. When the slope is 0 (flat across 0dB) the filter has no effect. The graphs below show the result of changing the slope of a High Pass filter.



Graphs for the 16 filter tables included on the TX16W system disk are shown in the owner's manual, with a short description of the filter, and the two variable parameters with their ranges.

Q-LPF, Q-HPF: Ordinary Low Pass and High Pass filters (already explained above) simply remove frequencies on one side, but these filters remove some of the sound on the other side as well, leaving a narrow "resonance peak" of emphasis. (Resonance is often abbreviated "Q".)

NRW-BPF, WIDE-BPF: Band Pass filters let only a specified range or "band" of frequencies pass. Narrow and wide BPFs are provided.

LOW-LPF, HIGH-LPF, LOW-HPF, HIGH-HPF: Low Pass and High Pass filters, each with two types (low and high) to cover different frequency ranges.

HPF-LPF: The level setting for this filter (and BPF-BEF, below) is adjustable from -10dB to 10dB . At settings between -10dB and 0dB it removes sound below the frequency point, and at settings between 0dB and $+10\text{dB}$ it removes sound above the frequency point. (The graph in the owner's manual shows the filter shape when the level is -10dB .)

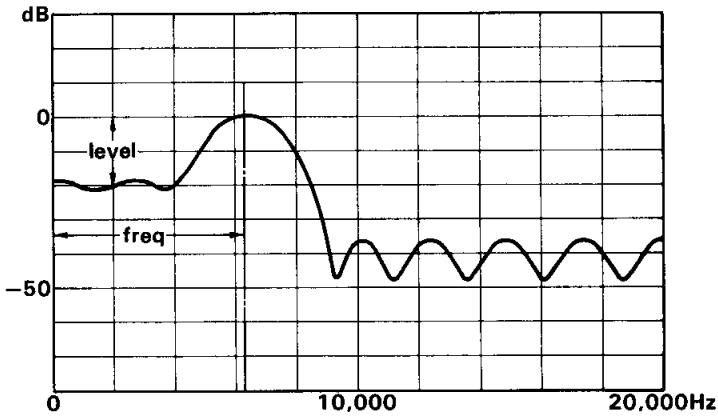
BPF-BEF: The level setting for this filter can adjusted from -10dB to 10dB . At setting between -10dB and 0dB it removes sound on both sides of the specified frequency area or "band" (i.e., Band Pass). At settings between 0dB and 10dB it removes sound from the specified frequency area (i.e., Band Eliminate).

DIP: This filter removes a very narrow area of frequencies, allowing the rest to pass unchanged.

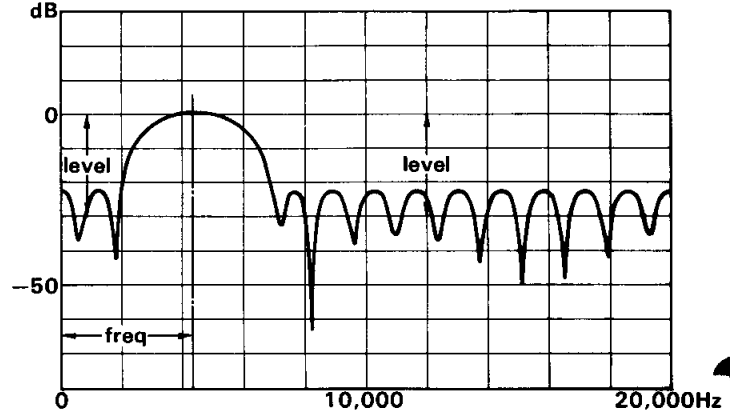
PEAK: This filter passes a narrow range of frequencies, cutting all the rest. (Think of it as an extra-narrow Band Pass filter.)

LOSL-LPF, HISL-LPF, LOSL-HPF, HISL-HPF: Low Pass and High Pass filters with variable slope, each with two types (low and high) to cover different frequency ranges.

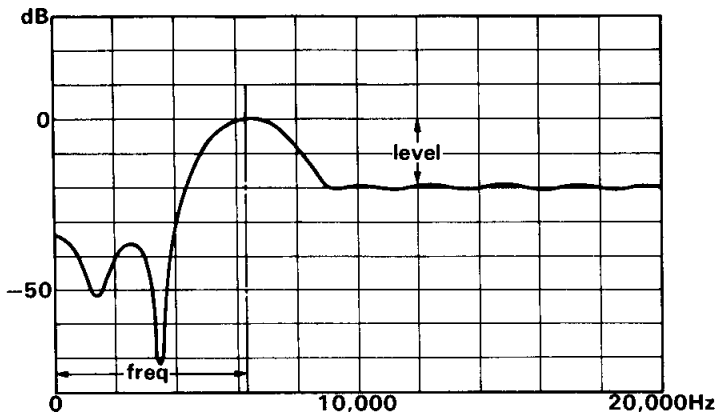
FILTER TABLE DATA



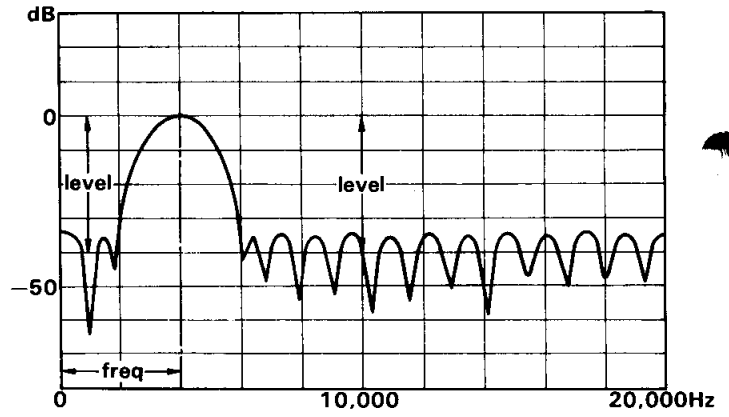
Q_LPF
 Low pass filter with resonance
 $2000\text{Hz} \leq \text{freq} \leq 12000\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



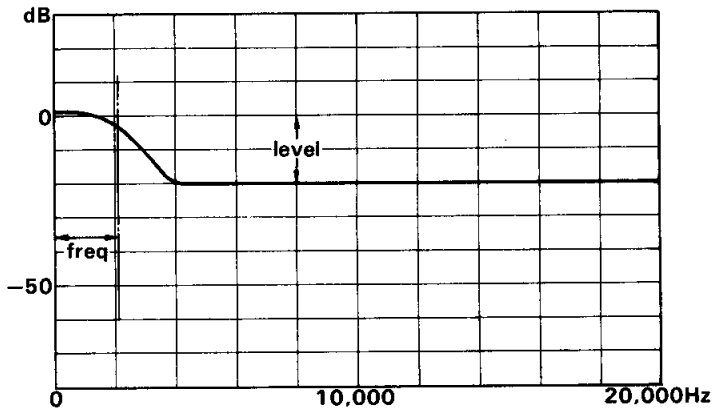
NRRW_BPF
 Wide band pass filter
 $3000\text{Hz} \leq \text{freq} \leq 5500\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 30\text{dB}$



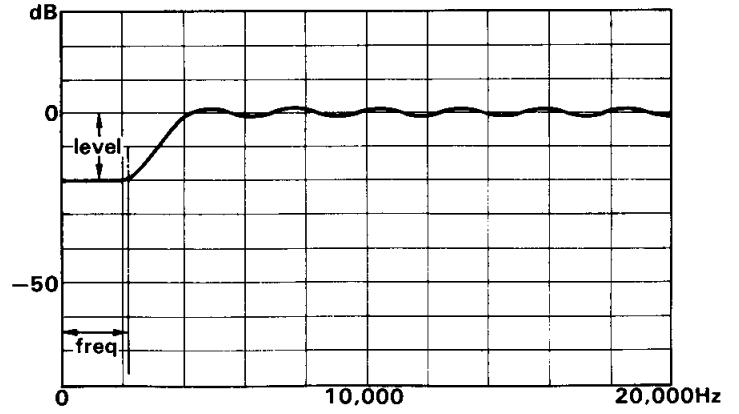
Q_HPF
 High pass filter with resonance
 $2000\text{Hz} \leq \text{freq} \leq 12000\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



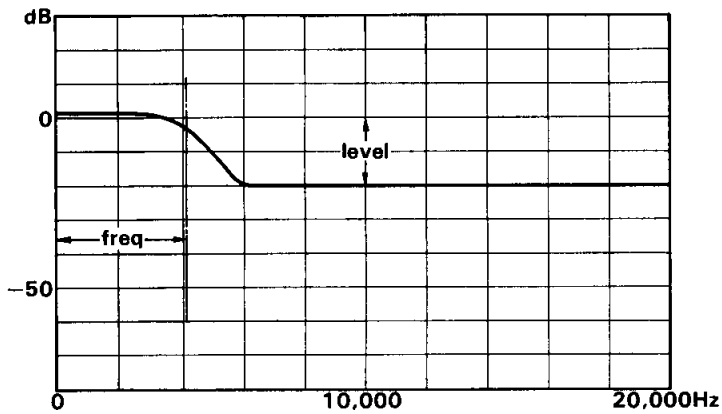
WIDE_BPF
 Narrow band pass filter
 $3000\text{Hz} \leq \text{freq} \leq 5500\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 40\text{dB}$



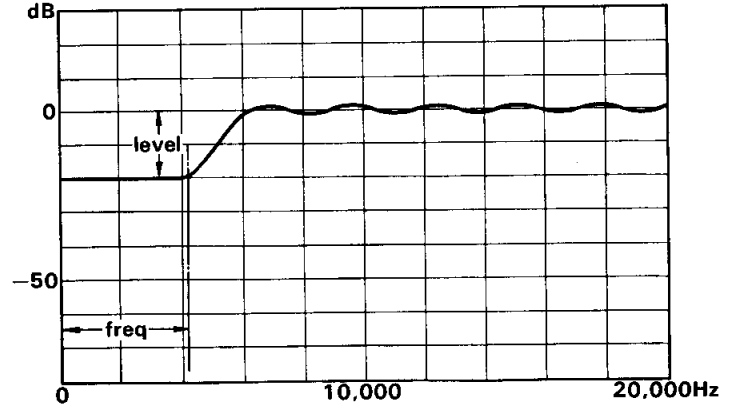
LOW_LPF
 Low pass filter (low frequency range)
 $300\text{Hz} \leq \text{freq} \leq 3300\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



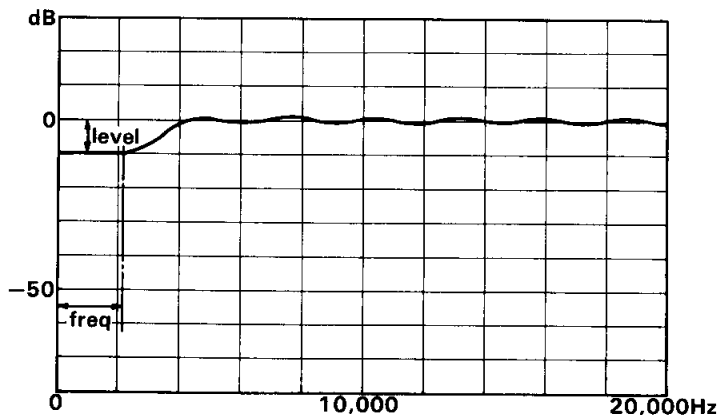
LOW_HPF
 High pass filter (low frequency range)
 $300\text{Hz} \leq \text{freq} \leq 3300\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



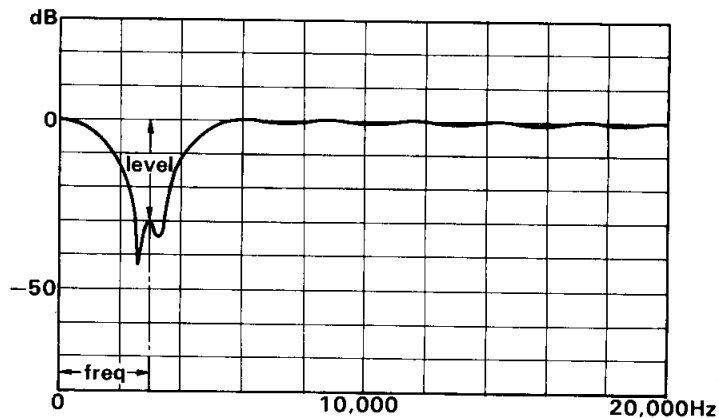
HIGH_LPF
 Low pass filter (high frequency range)
 $2100\text{Hz} \leq \text{freq} \leq 5100\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



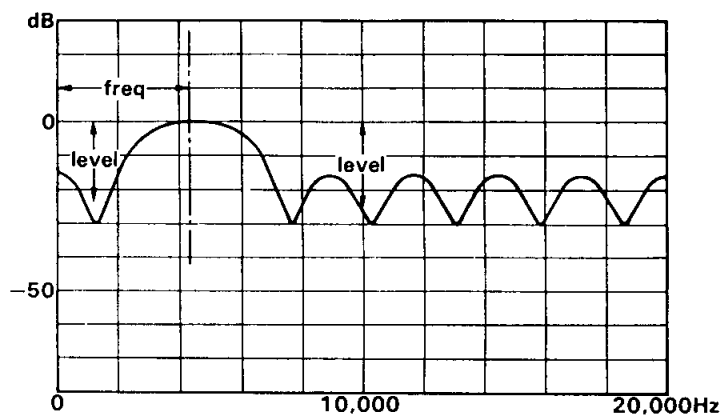
HIGH_HPF
 High pass filter (high frequency range)
 $2100\text{Hz} \leq \text{freq} \leq 5100\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



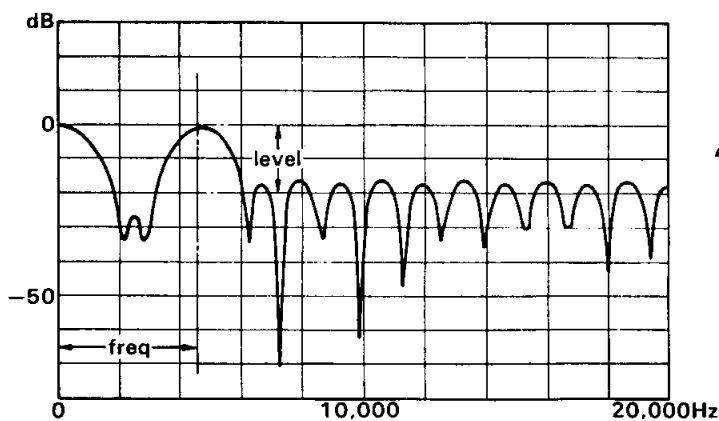
HPF_LPF
 High pass changing to a low pass filter
 $300\text{Hz} \leq \text{freq} \leq 3300\text{Hz}$
 $-10\text{dB} \leq \text{level} \leq 10\text{dB}$



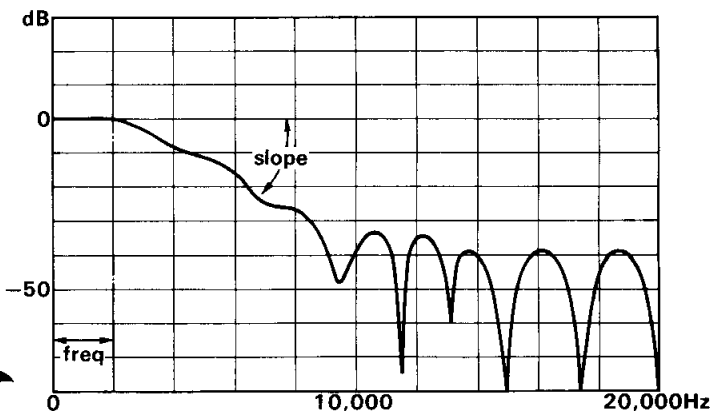
DIP
 Dip (notch) filter
 $3000\text{Hz} \leq \text{freq} \leq 5500\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 30\text{dB}$



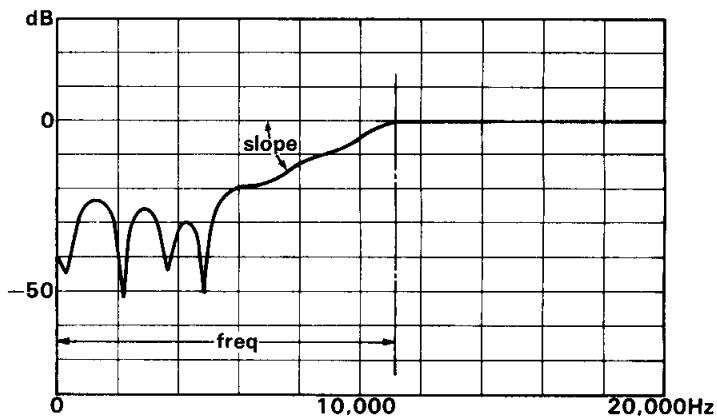
BPF_BEF
 Band pass changing to a band eliminate filter
 $3000\text{Hz} \leq \text{freq} \leq 5500\text{Hz}$
 $-25\text{dB} \leq \text{level} \leq 25\text{dB}$



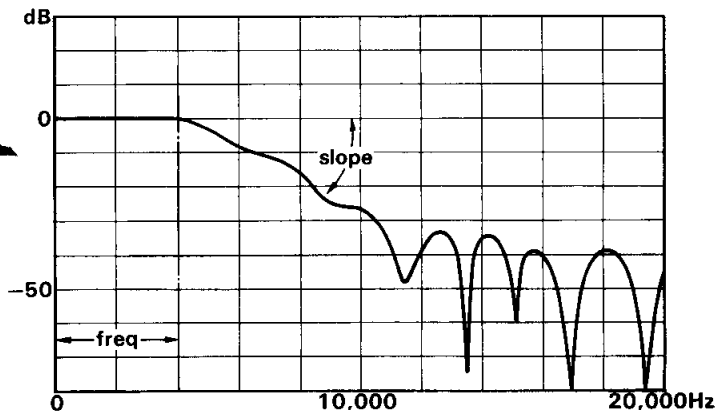
PEAK
 Peak filter
 $3300\text{Hz} \leq \text{freq} \leq 6300\text{Hz}$
 $0\text{dB} \leq \text{level} \leq 20\text{dB}$



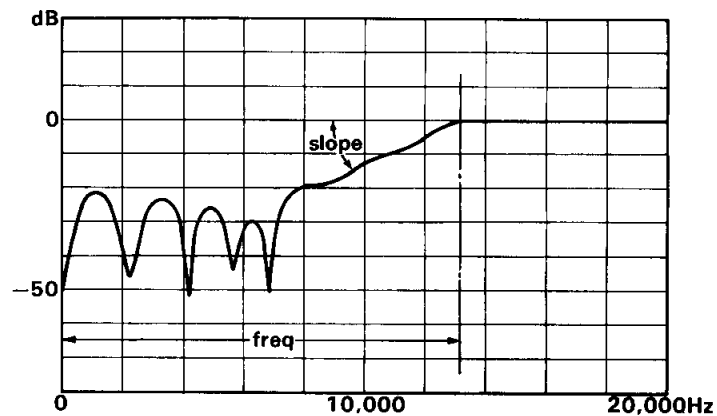
LOSL_LPF
 Sloping low pass filter (low frequency range)
 $300\text{Hz} \leq \text{freq} \leq 3300\text{Hz}$
 $0\text{dB/kHz} \leq \text{slope} \leq 4\text{dB/kHz}$



LOSL_HPF
 Sloping high pass filter (low frequency range)
 $11300\text{Hz} \leq \text{freq} \leq 14300\text{Hz}$
 $0\text{dB/kHz} \leq \text{slope} \leq 4\text{dB/kHz}$



HISL_LPF
 Sloping low pass filter (high frequency range)
 $2100\text{Hz} \leq \text{freq} \leq 5100\text{Hz}$
 $0\text{dB/kHz} \leq \text{slope} \leq 4\text{dB/kHz}$



HISL_HPF
 Sloping high pass filter (high frequency range)
 $13100\text{Hz} \leq \text{freq} \leq 16100\text{Hz}$
 $0\text{dB/kHz} \leq \text{slope} \leq 4\text{dB/kHz}$

DATA DISK CONTENTS

The six included data disks have the following performance data. The data has been programmed with a 61-note keyboard. For some performance memories, keys outside this range will not produce sound.

SDL1-PIANO

1. YAMAHA Grand Piano
2. Chorus Piano
3. Honkey Tonk Piano
4. Sophisticated Piano
5. Surrounding Piano
6. A.Piano & E.Piano
7. A.Piano & Oct-Up EP
8. A.Piano & Stereo EP
9. E.Piano & Stereo AP
10. Claviano
11. Symphonic Claviano
12. Nylon String Piano
13. Filtered Piano
14. Banjo Piano
15. Banjo & A.Piano
16. Banjo & E.Piano
17. Melancholy Piano 1
18. Melancholy Piano 2
19. Melancholy Piano 3
20. Shimmering Piano
21. Raygun Piano
22. Going-Up Piano
23. Going-Down Piano
24. Alternate AP & EP
25. Brilliant Piano
26. Muted Oct Claviano
27. Alternate
28. Mix-Piano

SDL2-STRINGS

1. Strings Section
2. Chorus Strings
3. Vibrato Strings
4. Great Strings
5. Slow Attack Strings
6. Percussive Strings
7. Pitch EG Strings
8. Pitch EG & Slow 1
9. Pitch EG & Slow 2
10. Pitch EG & Slow 3
11. Filtered Strings
12. Phase-Shifted String
13. Oct Strings
14. Oct Slow Strings
15. Tape Sampler/4 voices
16. Great Tape Sampler
17. p-f-cres. Hit String
18. Going-Up Strings
19. Going-Down Strings
20. Strings Hit/2 voices

SDL3-BRASS

1. Brass Ensemble
2. Chorus Brass
3. Unison 1
4. Chorus Unison 1
5. Vibrato Unison 1
6. Unison 2
7. Chorus Unison 2
8. Vibrato Unison 2
9. Unison 3
10. Chorus Unison 3
11. Vibrato Unison 3
12. f-p-cres Unison
13. Powered Brass
14. #11th Sounds
15. Brass Hit
16. Auto Bend
17. Delay-Chorus Brass
18. Moving Brass
19. Brass Shot !
20. f-b-cres. Brass

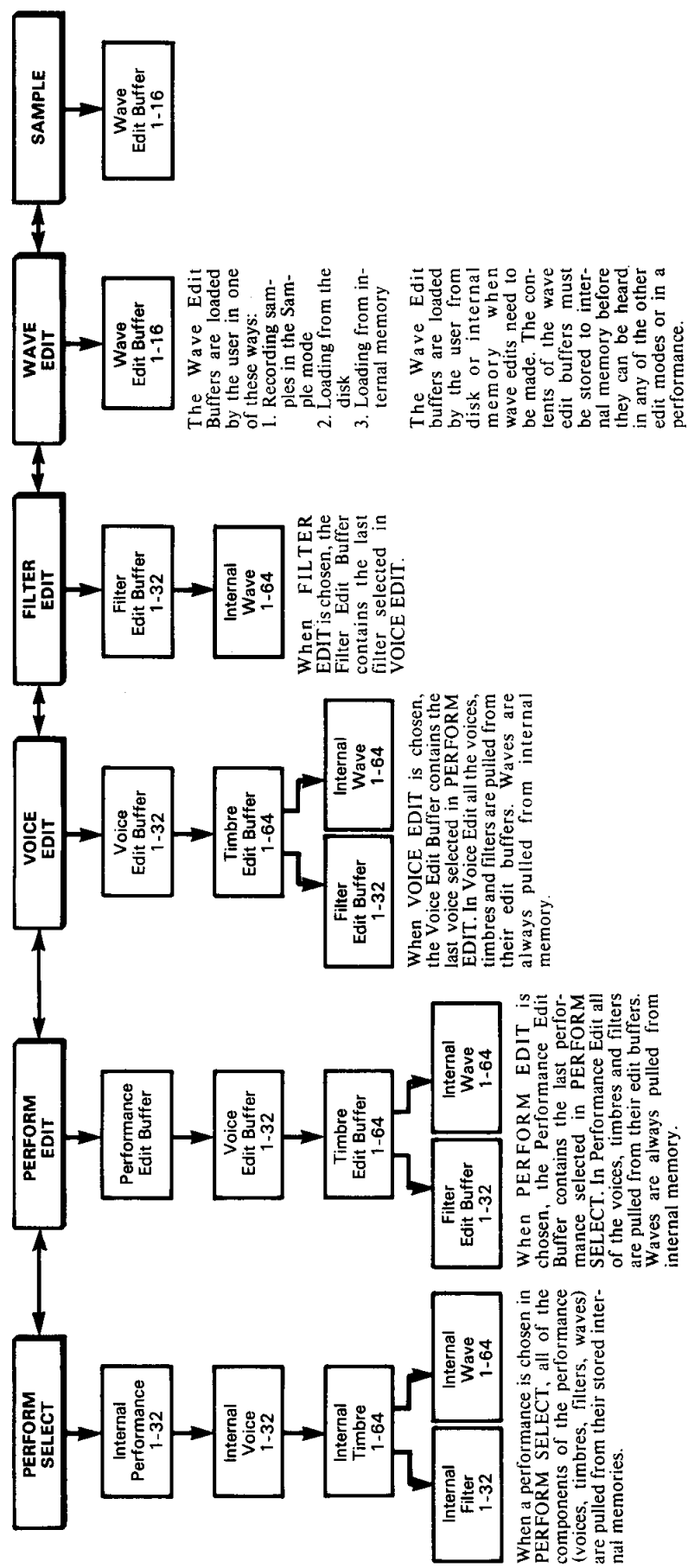
DBS SERIES DISKS FOR THE TX16W

Here are some of the TX16W library disks available from Yamaha.

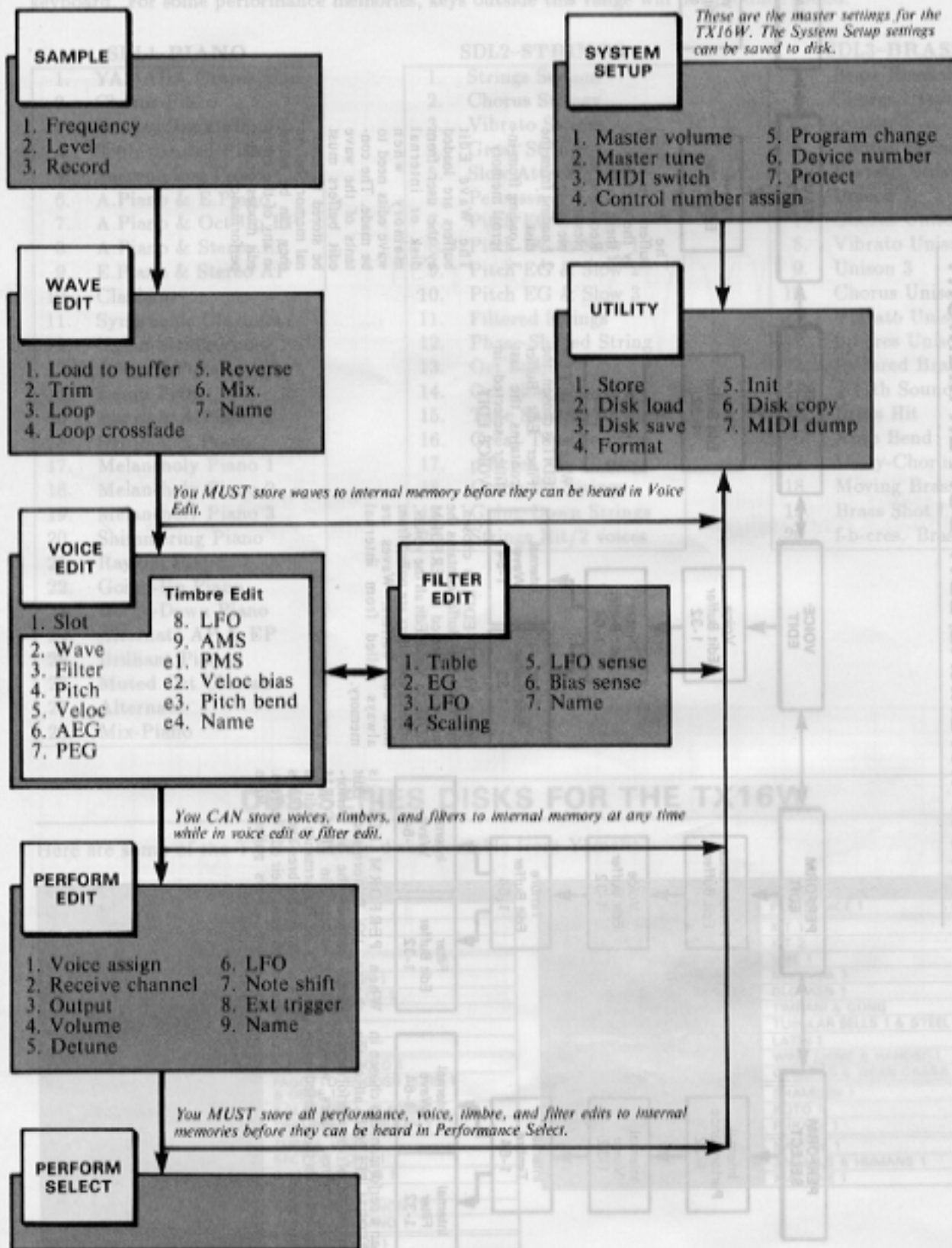
No.	GROUP NAME	TITLE
101	KEYBOARD 1	PIANO 2
102	KEYBOARD 2	HARPSICHORD 1
103	KEYBOARD 3	CELESTA 1
201	STRINGS 2	UNISON 1
202	STRINGS 3	VIOLA & VIOLIN 1
203	STRINGS 4	C BASS & CELLO 1
204	STRINGS 5	TREMOLO 1
205	STRINGS 6	PIZZICATO 1
206	STRINGS 7	HIT STRINGS 1
301	WOODWIND 1	FLUTE & PICCOLO 1
302	WOODWIND 2	FAGOTTO, ENGLISH HORN 1 & OBOE 1
303	WOODWIND 3	B CLARINET & CLARINET
304	BRASS 2	TROMBONE & TRUMPET 1
305	BRASS 3	TUBA & HORN 1
306	BRASS 4	SECTION HORN 1
307	BRASS 5	CHORD SECTION 1
308	SAX 1	FOUR SAXES 1
309	SAX 2	BARTONE & TENOR 1
310	SAX 3	ALTO & SOPRANO 1
401	GUITAR 2	E GUITAR LEAD 1
402	GUITAR 3	E GUITAR CHORD 1
403	GUITAR 4	A GUITAR LEAD 1
404	HARP 1	SCALE 1
405	HARP 2	PHRASE 1

No.	GROUP NAME	TITLE
501	CHOR 2	POPS VOICE 1
601	DRUM 1	KIT 1
602	DRUM 2	KIT 2
603	TUNED PERCUSSION 1	VIBE 1
604	TUNED PERCUSSION 2	MARIMBA 1
605	TUNED PERCUSSION 3	GLOCKEN 1
606	TUNED PERCUSSION 4	TIMPANI & GONG
607	TUNED PERCUSSION 5	TUBULAR BELLS 1 & STEEL DRUMS 1
608	PERCUSSION 1	LATIN 1
609	PERCUSSION 2	WIND CHIME & HANDBELL
610	PERCUSSION 3	CYMBALS & GRAN CASSA
701	ETHNIC 1	SHAMISEN 1
702	ETHNIC 2	KOTO 1
703	ETHNIC 3	PHRASE 1
801	SOUND EFFECT 1	NATURE 1
802	SOUND EFFECT 2	ANIMALS & HUMANS 1
803	SOUND EFFECT 3	MACHINE 1

TX16W INTERNAL/EDIT BUFFER MEMORY



OPERATIONAL FLOW CHART



SAMPLE

1. Frequency
2. Level
3. Record

SYSTEM SETUP

1. Master volume
2. Master tune
3. MIDI switch
4. Control number assign
5. Program change
6. Device number
7. Protect

These are the master settings for the TX16W. The System Setup settings can be saved to disk.

WAVE EDIT

1. Load to buffer
2. Trim
3. Loop
4. Loop crossfade
5. Reverse
6. Mix
7. Name

You MUST store waves to internal memory before they can be heard in Voice Edit.

VOICE EDIT

1. Slot
2. Wave
3. Filter
4. Pitch
5. Veloc
6. AEG
7. PEG
8. LFO
9. AMS
- e1. PMS
- e2. Veloc bias
- e3. Pitch bend
- e4. Name

FILTER EDIT

1. Table
2. EG
3. LFO
4. Scaling
5. LFO sense
6. Bias sense
7. Name

You CAN store voices, timbres, and filters to internal memory at any time while in voice edit or filter edit.

PERFORM EDIT

1. Voice assign
2. Receive channel
3. Output
4. Volume
5. Detune
6. LFO
7. Note shift
8. Ext trigger
9. Name

You MUST store all performance, voice, timbre, and filter edits to internal memories before they can be heard in Performance Select.

PERFORM SELECT

[Digital Wave Filtering Sampler]

Date : 10/24, 1987

Model TX16W MIDI Implementation Chart Version : 1.0

Function	Transmitted	Recognized	Remarks
Basic Default	x	1, OMNI on	
Channel Changed	x	1-16, OMNI on/off	
Mode Default	x	1	
Mode Messages	x	x	
Mode Altered	*****	x	
Note Number	x	0 - 127	
Note True voice	*****	13 - 108	
Velocity Note ON	x	o v=1-127	
Velocity Note OFF	x	x	
After Key's	x	x	
Touch Ch's	x	o	
Pitch Bender	x	o 0-12semi *1	9 bit resolution
Control 1	x	o *2	Modulation wheel
Control 2	x	o *2	Breath control
Control 4	x	o *2	Foot control
Control 7	x	o *2	Volume
Change 64	x	o *2	Sustain
Change 96	x	o *2	Data entry +1
Change 97	x	o *2	Data entry -1
Prog Change	x	o 0 - 127 *3	
Prog True #	*****	0 - 31	
System Exclusive	o	*4	o *4
System Song Pos	x	x	
System Song Sel	x	x	
Common Tune	x	x	
System Clock	x	x	
Real Time Commands	x	x	
Aux Local ON/OFF	x	x	
Aux All Notes OFF	x	x	
Mes- Active Sense	x	o	
sages: Reset	x	x	
Notes: *1 = receive if pitch bend switch is on.			
*2 = receive if control change sw is on. Ctrl # is redefinable.			
*3 = receive if program change switch is on. For program #0 - 127, performance 1 - 32 is assigned.			
*4 = wave data based on Sample Dump Standard and voice data.			
Mode 1	OMNI ON, POLY	Mode 2	OMNI ON, MONO
Mode 3	OMNI OFF, POLY	Mode 4	OMNI OFF, MONO
		o	Yes
		x	No

INDEX

- Aftertouch 7
- Alternate assign 6, 9
- Amplitude EG 13
- Amplitude modulation sensitivity 14
- Audio output 9

- Bias sensitivity 17
- Buffer (wave edit) 18

- Control number: assign 7; table 7
- Copy disk 25
- Cross fade (loop) 19
- Crossfading voices 11

- DATA DISK CONTENTS 29
- Detune 10
- Device number 8
- Disk: copy 25; load 23; save 24
- Dump (MIDI) 25

- EG: amplitude 12; filter 16; pitch 12
- Exclusive data 8, 25
- External trigger 10

- Fade: loop cross 19; slots 11
- FILTER EDIT 15
- FILTER TABLE DATA 27
- Filter: EG 16; LFO 16; assign 12; name 17; table 15
- Format 24
- Frequency 21
- FRONT/REAR PANEL 2

- Garbage collection 21
- Global channel 7

- Handshake message 25

- IDEAS AND SUGGESTIONS 26
- Initialize 24
- INTRODUCING THE TX16W 4

- Key on velocity 14
- Key scaling 16

- Level set 22
- LFO 13: filter 16; performance 10; mod sensitivity 17
- Load: disk 23; to buffer 18;
- Loop cross fade 19

- Master tuning 7
- Master volume 7
- Memory 4
- MIDI: dump 25; note shift 10; switch 7
- Mirror reverse wave 20

- Mix 20
- Modes 4

- Name: filter 17; performance 10; wave 20
- Note on/off 7

- Output assign 9

- PERFORMANCE EDIT 9
- PERFORMANCE SELECT 6
- Performance: LFO 10; name 10
- Pitch 12; EG 13; bend 7, 14; modulation sensitivity 14
- Program change 7, 8: table 8
- Protect 8

- Receive channel 9
- Record 22
- Reload 18
- Reverse 19; loop (wave) 20

- SAMPLE 21
- Sample dump format 25
- Sampling frequency 21
- Sampling level 22
- Save (disk) 24
- Sensitivity 14, 15
- Slot 4, 11
- SPECIFICATIONS 1
- Stereo sampling 21
- Store 23
- System exclusive data 8, 25
- System program 5, 24
- SYSTEM SETUP 7

- Table: control number 7; filter 15; program change 8

- Timbre 4; name 14
- Trigger (external) 10
- Trim 19
- Try it out 5
- Tuning: master 7; timbre 12; voice 10

- UTILITY 23

- VOICE EDIT 11
- Velocity: bias sensitivity 14; curve 12;
- Voice and timbre data 11
- Voice assign 9
- Volume: master 7; voice 10; timbre 12

- Wave assign 12
- WAVE EDIT 18
- Wave edit buffers 18
- Wave memory (arranging) 21
- Wave name 20

FCC INFORMATION (USA)

While the following statements are provided to comply with FCC Regulations in the United States, the corrective measures listed below are applicable worldwide.

This series of Yamaha professional music equipment uses frequencies that appear in the radio frequency range and if installed in the immediate proximity of some types of audio or video devices (within three meters), interference may occur. This series of Yamaha professional music equipment has been type tested and found to comply with the specifications set for a class B computing device in accordance with those specifications listed in subpart J of part 15 of the FCC rules. These rules are designed to provide a reasonable measure of protection against such interference. However, this does not guarantee that interference will not occur. If your professional music equipment should be suspected of causing interference with other electronic devices, verification can be made by turning your professional music equipment off and on. If the interference continues when your equipment is off, the equipment is not the source of interference. If your equipment does appear to be the source of the interference, you should try to correct the situation by using one or more of the following measures:

Relocate either the equipment or the electronic device that is being affected by the interference. Utilize power outlets for the professional music equipment and the device being affected that are on different branch (circuit breaker or fuse) circuits, or install AC line filters.

In the case of radio or TV interference, relocate the antenna or, if the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable.

If these corrective measures do not produce satisfactory results, please contact your authorized Yamaha professional products dealer for suggestions and/or corrective measures.

If you cannot locate a franchised Yamaha professional products dealer in your general area contact the professional products Service Department, Yamaha Music Corporation, 6600 Orangethorpe Ave., Buena Park, CA 90620, U.S.A.

If for any reason, you should need additional information relating to radio or 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 is available from the U.S. Government Printing Office, Washington D.C. 20402 — Stock No. 004-000-00345-4.

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