

# YAMAHA

TONE GENERATOR

# TG77



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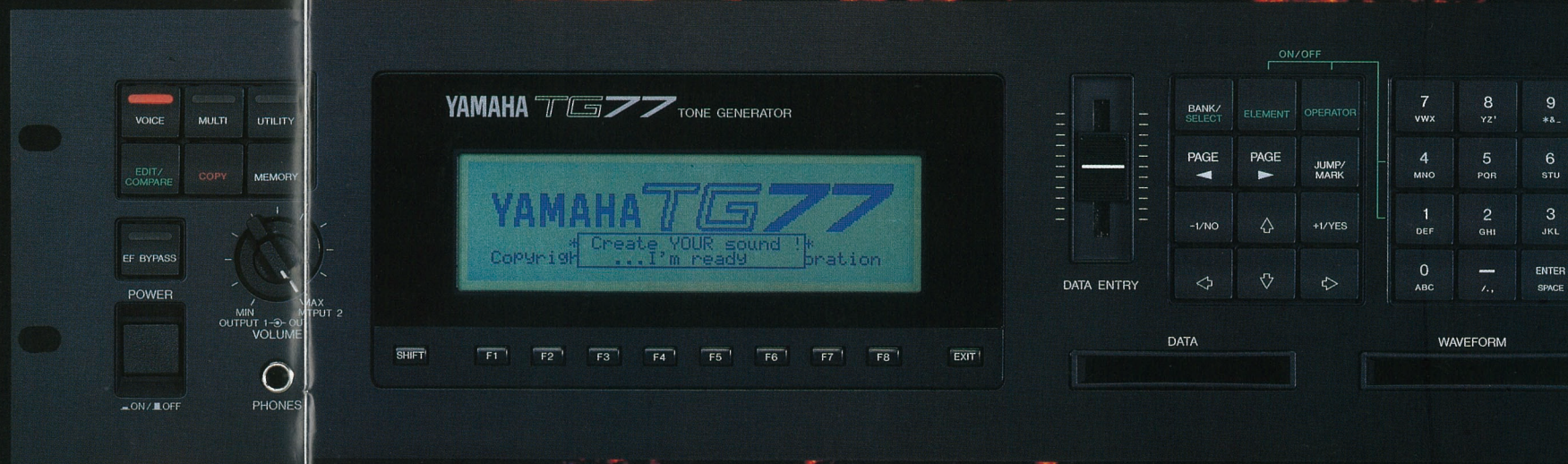
# The 90's Sound in Rack-mount Form

The Yamaha SY77 Music Synthesizer has had a huge impact on the music world, effectively defining the sound of the 90's. Now, for artists who want the same unmatched sound and unlimited creative editing capability in compact rack-mount form, Yamaha offers the TG77 Tone Generator.

The TG77 incorporates two of the most advanced tone generation systems available — AFM (Advanced Frequency Modulation) and AWM2 (second-generation Advanced Wave Memory) — both with unprecedented EG-controllable digital convolution filters. The true power of the instrument lies not in the fact that these extraordinary tone generators are packaged in the same box, but that they are truly *interactive*. Of course you can have straightforward AFM or AWM2 voices. You can even layer AFM and AWM2 sounds or split them across different note ranges. But when AWM2 samples are actually used to modulate AFM sounds, all preconceptions concerning the state of current-day synthesis fall away and you face a totally new, unimaginably vast world of musical sound. This is RCM (Realtime Convolution & Modulation) synthesis — the TG77's justifiable claim to sonic superiority for a considerable time to come.

Although a fresh new sound is the TG77's most important feature, it actually offers much more ... like 16-voice multi-timbre capability and individual outputs that make it the perfect nucleus for a sophisticated MIDI music production studio. Then there's a comprehensive 240 x 64 dot backlit LCD panel that makes control and programming smooth and simple with both text and graphic displays, and data card compatibility for convenient long-term voice data storage.

The TG77 makes the most advanced sound and expressive power of the 90's available one compact and very versatile rack-mount unit.



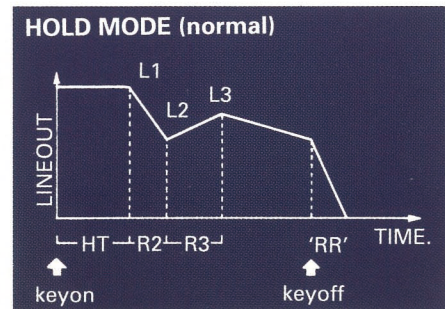
- AWM2 (second-generation 16-bit Advanced Wave Memory) offers unmatched sample playback quality.
- AFM (Advanced Frequency Modulation) provides a dramatic advance in FM sound quality and programming versatility.
- RCM (Realtime Convolution & Modulation) achieves a new fusion of sample realism and the expressive power of FM.
- Versatile 1, 2, or 4-element voice architecture and complex envelope generators for extensive layering capability.
- Advanced digital filters for all-new dynamic timbre control.
- Multiple complex programmable envelope generators.
- Dynamic panning for enhanced sonic animation.
- Programmable aftertouch and assignable controllers.
- Four internal digital signal processors add essential ambience.
- Comprehensive display and data entry controls for intuitive programming.
- A multi-timbre mode, built-in drums, and 8 assignable individual outputs turn the TG77 into a powerful production tool.
- Dual assignable stereo outputs.
- External storage using data cards.
- Complete MIDI implementation.



**AWM2 & AFM: The Basic Building Blocks**

**AWM2** — second-generation Advanced Wave Memory — takes the musical reproduction of digitally sampled sound to new levels of performance. Technically speaking, the system deals with 16-bit wave data sampled at 32 or 48 kilohertz, 24-bit internal signal processing, and high-resolution 22-bit digital-to-analog converters. In terms of sound, the result rivals and often surpasses the quality of the finest compact disc players, giving you unprecedented clarity and realism in the reproduction of acoustic instruments and other natural timbres.

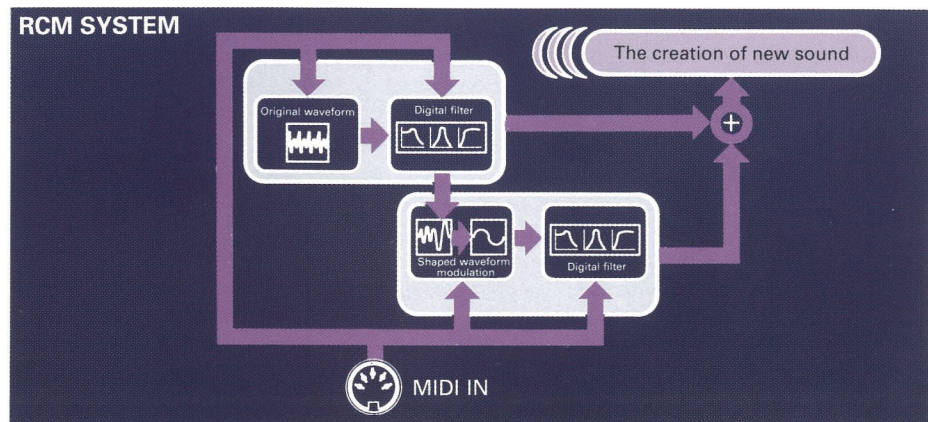
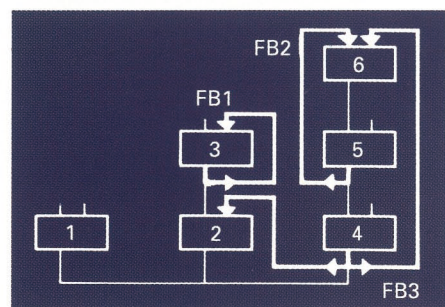
Unlike many sampled-waveform instruments, however, you're by no means "stuck" with the sampled sound. An extraordinarily versatile digital filter system lets you shape the sound in real time for extended expressive control, and the AWM2 waveforms can be layered and blended with the AFM tone generator output in a variety of ways. The TG77 packs a very impressive 4 megabytes of sampled waveform ROM, so you have a choice of 112 individual waveforms built in. External wave cards provide virtually unlimited potential for expansion.



```

AWM EG      OP1:Cosmo  ELLM 258
VOICE=P1-A01(01) SP1:Cosmo (E1/AFM)
Mode = E1/AFM Lx 1[1]Se9[1]
R1=22 R2=63 L2=63
R3=63 L3=63
R4=0   RR=0
RS=24  RS+=0
SS=24  SS+=0
  
```

**AFM** — Advanced Frequency Modulation — represents the first truly significant metamorphosis of FM tone generation technology since the first DX7 synthesizers shook the foundations of the music industry back in 1983. The basic principles remain the same, but several important refinements achieve dramatically enhanced sonic performance and programming versatility. The original 6-operator 32-algorithm configuration has been expanded to include 45 different algorithms, each with up to three user programmable and independent feedback loops. And while the original operators functioned only with simple sine waves, the new system allows any of 16 different preset waveforms to be assigned to each operator. Then, for a real sonic quantum leap, RCM synthesis (described below) means that complex AWM2 waveforms can be used to modulate any of the operators so that the spectral output of the FM system is, at last, truly unlimited. Add to all this a new set of enhanced FM parameters, six-segment envelope generators for each operator with adjustable envelope delays and segment looping capability, four-breakpoint rate scaling, plus the unprecedented real-time timbral control provided by the



TG77's digital filters, and you have an FM synthesis system that would be a breakthrough even without its companion AWM2 tone generator and RCM synthesis capability.

```

AFM OP EG      OP1:Cosmo  ELLM 236
VOICE=P1-A01(01) SP1:Cosmo (E1/AFM)
OP 1 Lx 1[1]Se9[1]
HT=0
R1=20 RR1=27
R2=63 RR2=63
R3=63
R4=63 RS+=0
R5=24 R5+=0
R6=24 R6+=0
R7=24 R7+=0
R8=24 R8+=0
  
```

```

AFM ALGORITHM OP1:Cosmo  ELLM 231
Algorithm Number = 42
OP 1 Lx 1[1]Se9[1]
HT=0
R1=20 RR1=27
R2=63 RR2=63
R3=63
R4=63 RS+=0
R5=24 R5+=0
R6=24 R6+=0
R7=24 R7+=0
R8=24 R8+=0
  
```

```

AFM ALGORITHM 234
Algorithm = 42
  
```

**RCM: The Fusion**

**RCM** — Realtime Convolution & Modulation — breaks all previous synthesized sound barriers by allowing AWM2 samples to be used as part of an AFM algorithm, adding further harmonic content to the already complex AWM2 waveform. The AWM2 sample can be filtered and enveloped prior to modulation, then the raw AFM output can be further filtered prior to panning, effect processing and final output.

Not only does this make it possible to create waveforms of unequalled complexity and diversity, but the entire process is totally controllable. The result is a fusion of sample realism with the extraordinary expressive power of FM. The potential of this system is further enhanced by the fact the "straight" AWM2 output can be mixed with the AWM2-modulated AFM output. It's likely to be a long, long time before all the possibilities of RCM are fully explored.

**A New Concept in Voice Architecture**

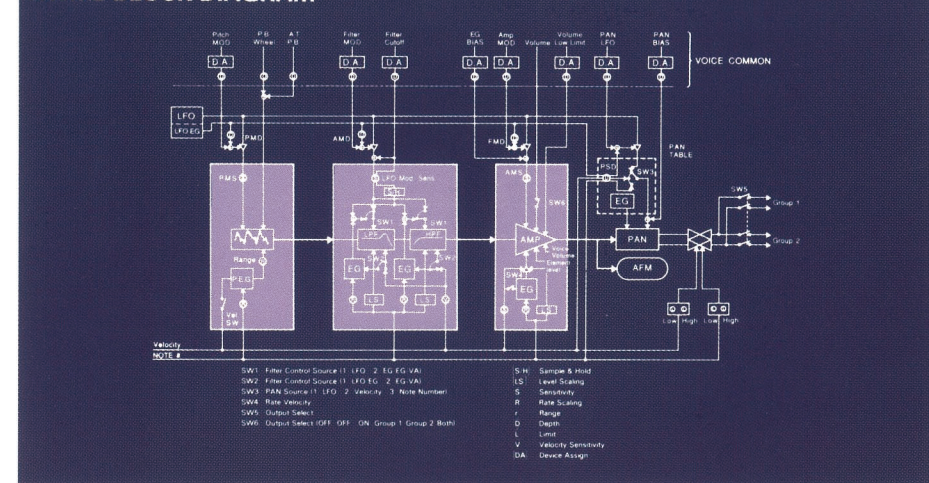
In addition to the relatively familiar language of AFM and AWM2 synthesis, the TG77 introduces a new term that is at the core of an innovative concept in voice architecture. Each TG77 voice is composed of one, two or four "elements." Each element can be assigned either an AWM2 or AFM waveform, so you can have a number of voice configurations:

Voice modes 1 through 5 produce pure AFM output, modes 6 through 8 produce AWM2 output, and modes 9

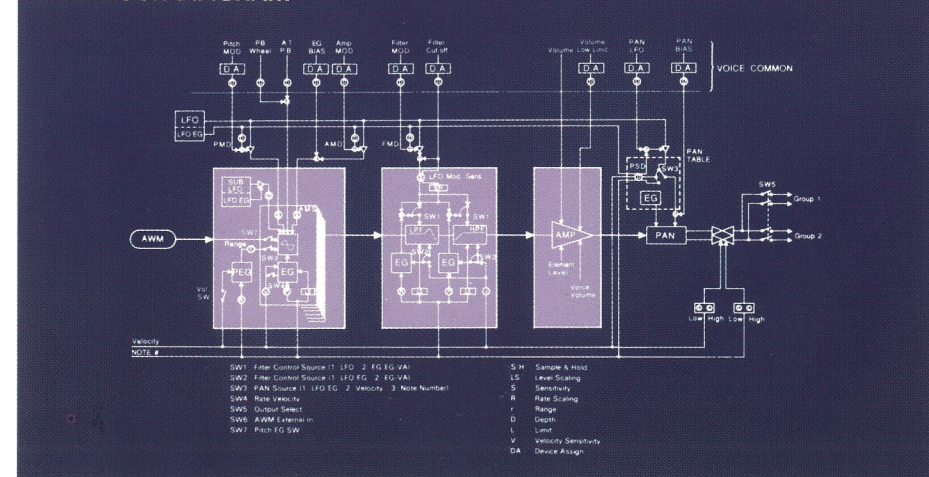
**TG77 VOICE MODES**

Name	Configuration
1. 1AFM mono	One AFM element
2. 2AFM mono	Two AFM elements
3. 4AFM mono	Four AFM elements
4. 1AFM poly	One AFM element
5. 2AFM poly	Two AFM elements
6. 1AWM poly	One AWM element
7. 2AWM poly	Two AWM elements
8. 4AWM poly	Four AWM elements
9. 1AFM&1AWM	One AFM and one AWM element
10. 2AFM&2AWM	Two AFM and two AWM elements
11. Drum set	Sixty-one AWM samples

**AWM2 BLOCK DIAGRAM**



**AFM BLOCK DIAGRAM**



and 10 can be used for RCM synthesis. Mode 11, a special "drum voice" mode, is particularly useful with the TG77's multi-timbre mode — we'll look at this later on.

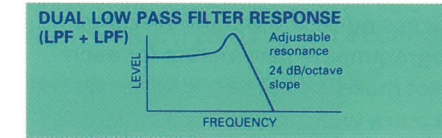
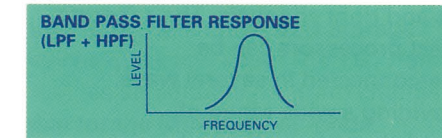
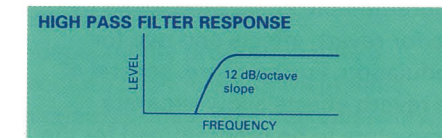
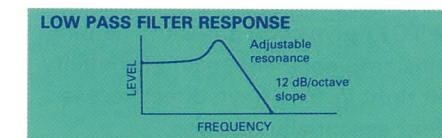
AWM2 elements have a 5-segment amplitude envelope generator so you could, for example, patch an AWM2 piano attack to a fat AFM synth-brass type sustain, or create any number of unique sonic hybrids. In addition to "layering" the elements in this way, individual elements can be assigned to different note ranges for exotic split keyboard setups.

Other important voice and element features include element detuning capability, element transposition, output assignment to the TG77's eight individual outputs as well as the group 1 and/or group 2 stereo outputs, random pitch, portamento for AFM elements, microtuning, dynamic panning, effect selection and controller assignments. Each element also has a versatile digital convolution filter system that is so important that it deserves to be highlighted on its own ...

**A Advanced Digital Filters for All-new Dynamic Timbre Control**

Two advanced digital convolution filters are available to each TG77 voice element. The term "convolution" refers to a sophisticated mathematical technique that is applied in the filters, achieving unprecedented performance and versatility. One of the filters is a low-pass type, and the other is switchable for either low-pass or high-pass response. Each has its own 6-segment envelope generator so that a virtually unlimited range of dynamic filtering patterns can be produced. Low-pass and high-pass filters can be combined to create a bandpass response, or both filters can be set for low-pass operation — each with a rolloff slope of 12-dB/octave — to produce a steep 24-dB/octave low-pass curve. For those of you who miss the distinct musical personality of analog synthesizer type filters, the TG77 filters even have a resonance parameter that allows you to boost their cutoff-frequency peak all the way into oscillation if you like.

To sum up, in a four-element voice with two filters per element, you have a total of eight filters working all at once.



```

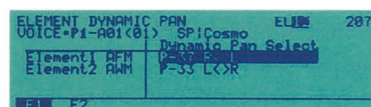
CUTOFF FREQUENCY OP1:Cosmo  ELLM 249
VOICE=P1-A01(01) SP1:Cosmo (E1/AFM)
Filter1 type 5.693kHz (100) LFO
Filter2 type LFO
Resonance = 0 LFO Cutoff Sens = +2
L1=+0 RL1+=0
L2=+0 RL2+=0
L3=+0 RL3+=0
L4=+0 RL4+=0
  
```

```

CUTOFF EG OP1:Cosmo  ELLM 253
VOICE=P1-A01(01) SP1:Cosmo (E1/AFM)
Lx 1[1]Se9[1]
L1=+0 RL1+=0
L2=+0 RL2+=0
L3=+0 RL3+=0
L4=+0 RL4+=0
  
```

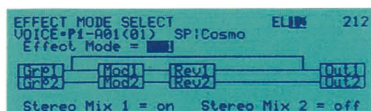
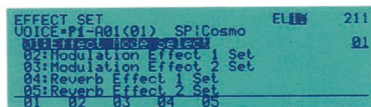
## Dynamic Panning for Lively Stereo

Dynamic panning with individual pan envelope generators for each element allows the output from each element to be moved across the stereo sound field in many ways — from simple sweeps to startlingly complex motions. Panning can also be controlled via velocity, note number or LFO control. So you can start panning right away, a bank of 64 preset pan memories is provided in addition to 32 programmable locations for your own pan patterns. Dynamic panning can add an exciting new dimension to any type of music.



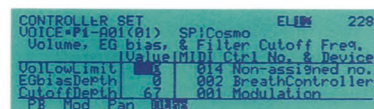
## Built-in Effects Add Essential Ambience

Yamaha is already firmly established as the leader in digital signal processing for professional music and production applications. The TG77 gives you a healthy helping of this ambience-enhancing capability built right in. You have direct access to four essentially discrete programmable effect processors — two for reverb effects and two for modulation. Furthermore, several of the reverb effects allow separate parameters to be programmed for the left and right channels. The separate effect processors can be interconnected in several ways, providing a wide range of sophisticated parallel and series processing configurations. A range of programmable parameters for each effect make it easy to give your sound the extra warmth and "spaciousness" that it deserves.



## Playability That Lets Your Feelings Show

The most stunning sound in the world doesn't mean a thing if you can't you can make it say what you feel. The TG77 puts you directly in touch with your sound via sophisticated dynamics control. MIDI note velocity and after-touch pressure data can be assigned to control pitch, filtering, AWM2 modulation level and/or a range of AFM parameters. What's more, you have a choice of controlling the assigned parameters in a positive or negative direction, according to your personal expressive needs. Velocity switching brings different elements into play depending on how loud you play the notes.



### REVERB EFFECTS

01	Reverb Hall	21	Feedback Reverse
02	Reverb Room	22	Single Delay & Reverb
03	Reverb Plate	23	Delay L, R & Reverb
04	Reverb Church	24	Tunnel Reverb
05	Reverb Club	25	Tone Control
06	Reverb Stage	26	Single Delay + Tone Control 1
07	Reverb Balb Room	27	Delay L, R + Tone Control 1
08	Reverb Metal	28	Tone Control 2
09	Single Delay	29	Single Delay + Tone Control 2
10	Delay L, R	30	Delay L, R + Tone Control 2
11	Stereo Echo	31	Distortion + Reverb
12	Doubler 1	32	Distortion + Single Delay
13	Doubler 2	33	Distortion + Delay L, R
14	Ping-Pong Echo	34	Distortion
15	Pan Reflection	35	Ind. Delay
16	Early Reflection	36	Ind. Tone Control
17	Gate Reverb	37	Ind. Distortion
18	Reverse Gate	38	Ind. Reverb
19	Feedback Early Reflection	39	Ind. Delay & Reverb
20	Feedback Gate	40	Ind. Reverb & Delay

### MODULATION EFFECTS

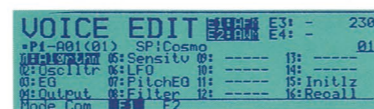
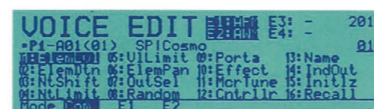
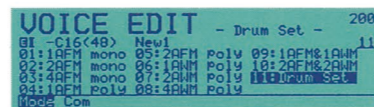
01	Chorus	03	Symphonic
02	Flange	04	Tremolo



## Comprehensive Display and Data Entry Controls for Intuitive Programming

An instrument of the TG77's complexity would be very confusing if it weren't for Yamaha's excellent user interface. Its large 240 x 64 dot backlit liquid crystal display panel simplifies operation by making several parameters visible at the same time. Titles are displayed in large bold type to differentiate them from parameters, and names are spelled in full wherever possible to minimize the frustration of trying to decipher a screen full of abbreviations. There are also a number of flow diagrams and bar graphs that are displayed in graphic form for instant recognition. Further, a well-thought-out hierarchy of directory pages leads you to the function you're looking for, and a unique "jump" number system allows direct switching between related functions. A set of "smart" function keys also make it easy to move around in the parameter-packed TG77 programming environment.

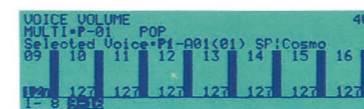
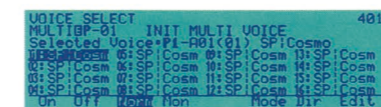
For data entry you have a choice of increment and decrement, buttons, a numeric keypad, and a data entry slider for fast absolute value changes.



## Multi-timbre Mode and Built-in Drums

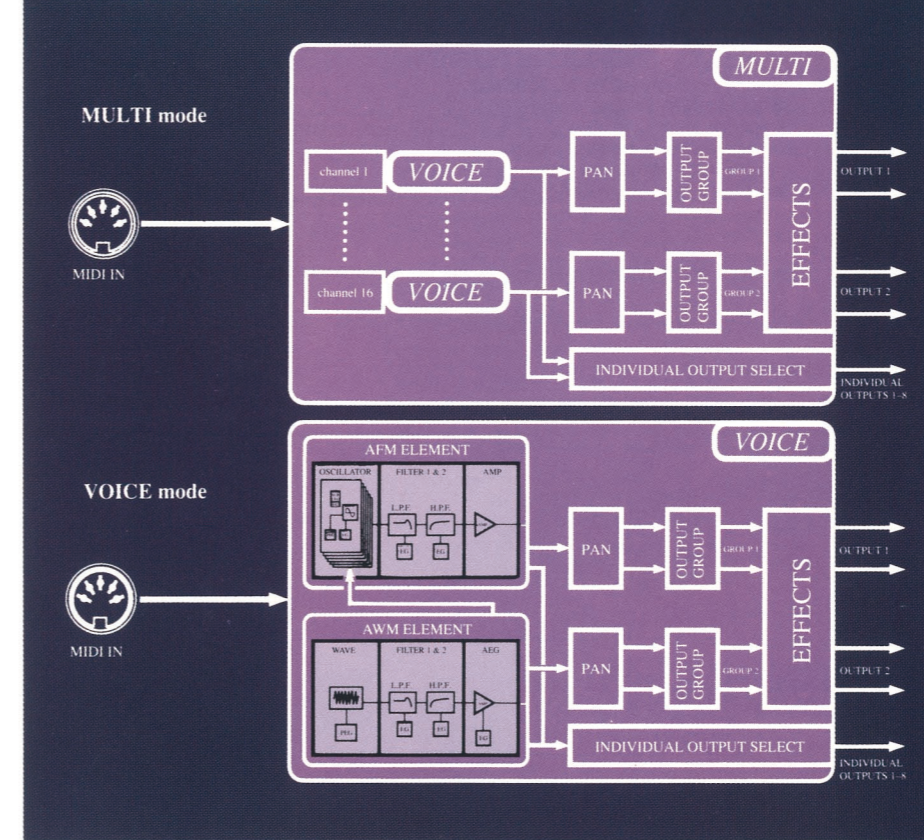
In addition to its normal voice play mode, the TG77 features a multi-timbre mode in which up to 16 different voices can be assigned to 16 different MIDI channels. You can use an external MIDI sequence recorder or music computer to control the various

TG77 voices in this mode, achieving sophisticated music production capability with a minimum amount of equipment. 16 memory locations are provided for complete "MULTI" setups including voice-to-channel assignments, individual voice volume, note shift, tuning, panning, and effects. What's more, individual voices can be assigned to 8 individual outputs as well as dual stereo outputs, which can be fed to a mixing console for further creative control.



The TG77 even supplies a range of high-quality AWM2 drum and percussion samples that can be assigned to 61 different notes and handled as a single voice — so you don't need an external drum machine. Your "drum set" doesn't have to consist only of drum samples, though. Any waveform can be used in a drum voice, and any drum waveform can be used in normal voice programming.

### TG77 GLOBAL VIEW



## Individual & Dual Stereo Outputs

To allow individual handling of elements or voices, the TG77 has 8 individual outputs in addition to two pairs of stereo outputs — GROUP 1 and GROUP 2. Elements can be assigned to individual outputs as well as either or both groups. It is a simple matter, for example, to have each element in a four-element voice to appear separately at a different output. The individual outputs are also a great advantage when using the TG77 Multi-timbre mode, allowing separate voices in a setup to be processed via different channels of a mixing console.

## External Data Card Storage

For convenient storage and transportation of TG77 data, voices and waveforms can be saved to and loaded from compact Yamaha MDC64 type data cards. A single card holds up to 64 voices.

## Complete MIDI Implementation

Since the TG77 may be asked to perform in any MIDI system, it has been provided with a complete set of MIDI parameters for maximum compatibility and versatility. Receive and transmit channels are independently programmable, a program change assignment table maximizes voice selection versatility, and a range of bulk dump functions make data transfers to bulk storage devices quick and easy. The TG77 also provides an editable program change table for the Multi-timbre mode, allowing individual selection of voices within a MULTI setup via MIDI control.

## TG77 Voice List

PRESET 1				
#	Bank A	Bank B	Bank C	Bank D
1	SP Cosmo	BR Plucky	ME St.Mick	ST Ripper
2	SP Metroid	BR BigBand	ME Blade	ST Violins
3	SP Diamond	BR 1980	ME Forest	ST Section
4	SP Sqrpad	BR Trmpets	ME Gargoyl	ST SynStrg
5	SP Arienne	BR ModSyn	ME Pikloop	ST Chamber
6	SP Sawpad	BR Ensembl	ME Aquavox	BA Frtless
7	SP Darkpad	BR FrHorn	ME Alps	BA Starred
8	SP Mystery	BR Soul	ME Cycles	BA HardOne
9	SP Padfaze	BR FM Bite	WN Bluharp	BA VC1
10	SP Twilite	EP IceRing	WN Tenor	BA VC2
11	SP Annepad	EP Synbord	WN Clarino	BA VC3
12	AP Ivory	EP GS77	WN AltoSax	BA Rox
13	AP CP77	EP Knocker	WN Moothie	BA Woodbas
14	AP Bright	EP Beltine	WN Saxion	BA Round
15	AP Hammer	EP Dynamod	WN Flute	BA Erix
16	AP Grand	EP Urbane	WN Ohboy	BA FMFrls

PRESET 2				
#	Bank A	Bank B	Bank C	Bank D
1	SC Neworld	KY Bosh	OR YC45D	SE Goto>1
2	SC Stratos	KY Wahclav	OR Pipes	SE Xpander
3	SC Ripples	KY Wires	OR Jazzman	SE Inferno
4	SC Digitak	KY Tradclv	OR Combo	SE Them!!!
5	SC Hone	KY Thumper	PC Marimba	OR Gassman
6	SC Spaces	PL Modclav	PC OzHamer	BR ZapBras
7	SC Sybaby	PL Sitar	PC Tobago	BR BrasOrc
8	SC Icedrop	PL Harp	PC Vibes	PL Stairwy
9	SC Wired	PL Saratog	PC Glass	ST Widestg
10	SL Gnome	PL Steel	PC Island	ST Symflow
11	SL SawMono	PL Twelve	PC GrtWall	ST Quartet
12	SL SqrMono	PL Shonuff	CH Itopia	ST Tutti
13	SL Pro77	PL MutGtr	CH GaChoir	ME Voyager
14	SL Nester	PL Guitar	CH Chamber	ME Galaxia
15	SL Eazy	PL Shami	CH Spirit	DR Both
16	SL Lips	PL Koto	CH ChorMst	DR Group2

## TG77 Specifications

### Tone generator:

Realtime Convolution and Modulation (RCM)

**AWM2:** 16 bit linear waveform data, maximum 48 kHz sampling frequency

**AFM:** 6 operators, 45 algorithms, 3 feedback loops, 16 waveforms, modulation from AWM output

**Filter:** Time variant IIR (infinite impulse response) digital filters, 2 filters for each element (maximum of 8 filters per voice)

**Maximum simultaneous notes:**

16 notes AWM + 16 notes AFM

**Maximum simultaneous timbres:** 16

**Note assignment:** Last note priority, DVA (dynamic voice allocation), SVA (static voice allocation)

### DSP effects:

(reverb effect + modulation effect) × 2

Reverb effects: 40 types

Modulation effects: 4 types

### Memory:

**Preset memory:** 128 voices, 16 multis

**Internal memory:** 64 voices, 16 multis

**Waveform memory:** 2 Mwords (4 Mbytes), 112 sounds

**Card slots:** parameter data × 1, waveform data × 1

### Controllers:

**Switches:** Power on/off, VOICE, MULTI, UTILITY, EDIT/COMPARE, COPY, MEMORY, EF.BYPASS, SHIFT, function keys F1-F8, EXIT, BANK/SELECT, ELEMENT, OPERATOR, PAGE ◀, PAGE ▶, JUMP/MARK, -/NO, +/YES, cursor Δ ▽ ◀ ▶, numeric keypad 0-9, minus (-), ENTER

**Rotary controls:** VOLUME (dual concentric, OUTPUT 1/OUTPUT 2), LCD contrast (on rear panel)

### Sliders:

DATA ENTRY

### Display:

**LCD:** 240 × 64 pixels (with backlight)

**LED:** red × 4

### Terminals:

**Audio output:** OUTPUT 1/1+2 (L/MONO, R), OUTPUT 2 (L, R), PHONES, INDIVIDUAL OUTPUT 1-8

**MIDI:** IN, OUT, THRU

### Power requirements:

**US and Canadian models:** 120V

**General model:** 220-240V

### Power consumption:

**US and Canadian models:** 28W

**General model:** 28W

### Dimensions:

**3U:** 480(W) × 132(H) × 390(D) mm (18-7/8 × 5-1/4 × 15-1/4 inches)

### Included items:

MIDI cable (3 m) × 1

### Weight:

8 kg (17 lb 10 oz)

### Output levels:

measured with a single note (AFM)

1 kHz sine wave, all terminals connected, and volume at maximum

### Individual outputs:

+5 dBm (10 kΩ)

### Headphone:

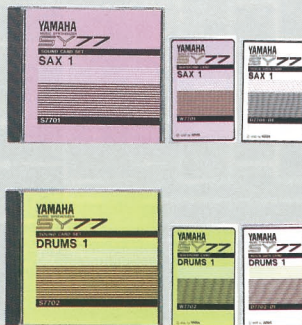
+5 dBm (150 Ω)

### Stereo outputs:

-1 dBm (10 kΩ)

### Optional Sound Card Sets and Voice Data Cards

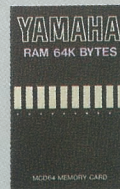
Yamaha offers a range of pre-programmed voices for the SY77 and the TG77 in the form of Sound Card Sets and Voice Data Cards. Sound Card Sets include a waveform card which features a set of precision wave samples that you can incorporate into your own voices or use with the finely-crafted voices provided on the accompanying voice card. Voice Data Cards make use of the TG77's internal waveforms to give you an extensive palette of new musical colors.



The Yamaha Voice Library will continue to grow as new releases are made available.



### Optional Memory Card



**MCD64**  
•64 kB Memory Card

Specifications and appearance are subject to change without notice.

For details please contact:

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