

YAMAHA
MUSIC SYNTHESIZER

SY77



A New Sound For the '90s

- **AWM2** (second-generation 16-bit Advanced Wave Memory) offers unmatched sample playback quality.
- **AFM** (Advanced Frequency Modulation) provides a dramatic boost 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 sample 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, full-featured 16-track sequencer, and built-in drums turn the SY77 into a powerful production tool.
- Dual assignable stereo outputs.
- External storage using 3.5" floppy drive and data cards.
- Complete MIDI implementation.

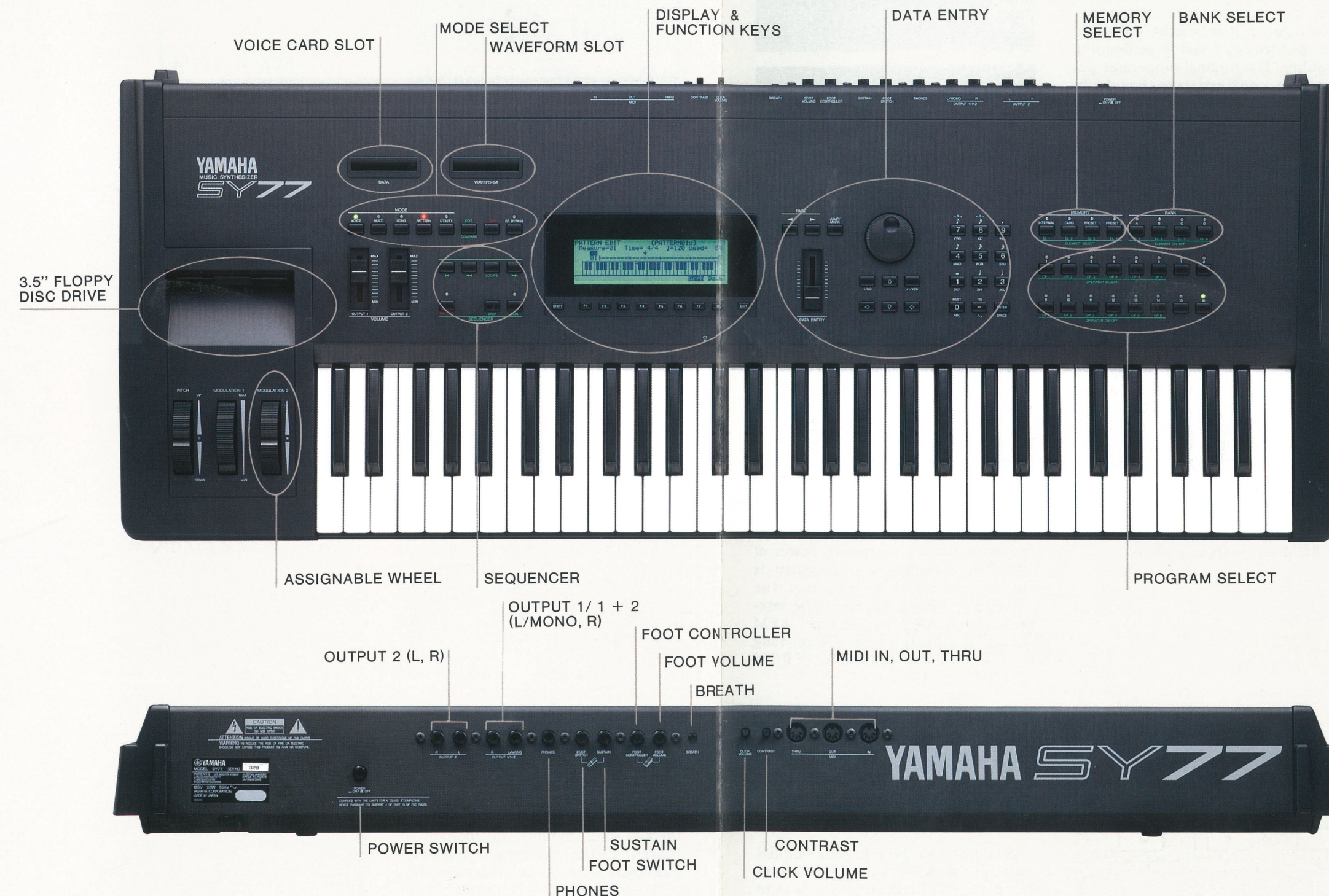
In just a few short years the music world has been totally rebuilt on a new foundation of important innovations: Yamaha FM synthesis, digital sampling technology, and MIDI, to name a few. In spite of the incredible range of synthesis capability available, today's artist is faced with somewhat of a dilemma. The choice is between an instrument that focuses on FM or similarly "synthesized" sound, and one that is designed primarily around digital sampling. Some instruments even offer sampling with a touch of synthesis, but none effectively combine the raw musical power of both technologies. None, that is, except the Yamaha SY77 Music Synthesizer.

The SY77 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 the keyboard. 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 SY77's justifiable claim to sonic superiority for a considerable time to come.

Although a fresh new sound is the SY77's most important feature, it actually offers much more. Little things ... like 16-voice multi-timbre capability and a full-blown 16-track sequencer that turn the SY77 into a complete production workstation. 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 a built-in 3.5" floppy disk drive for voice and sequence data storage.

For now, the SY77 is simply the best there is. It ushers in the '90s with a long-awaited revolution in sound and expressive power. The SY77 is the sound of the '90s.

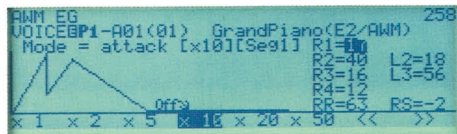
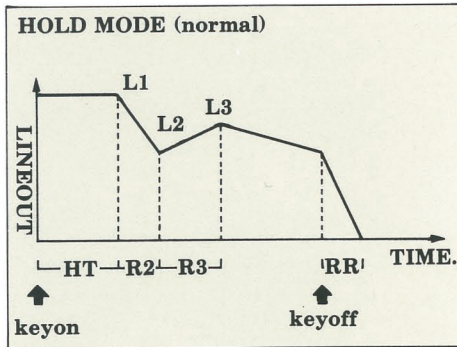




■ **AWM2 & AFM:**
The Basic Building Blocks

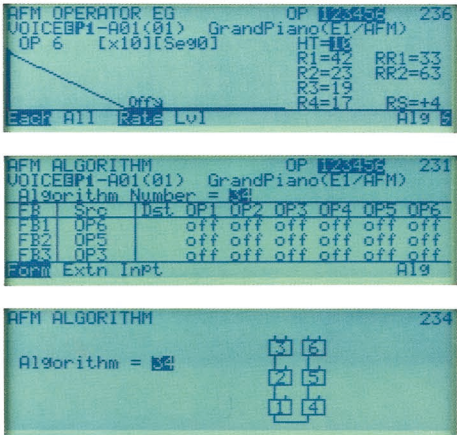
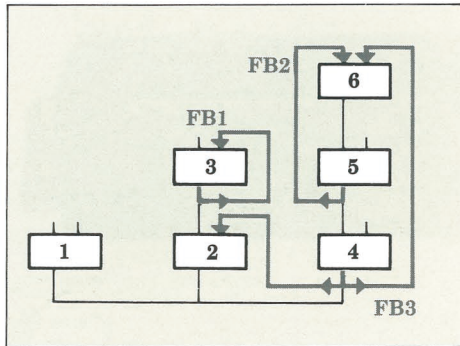
AWM2 — second-generation Advanced Wave Memory — takes the musical reproduction of digitally sampled sound to new levels of performance. Technically speaking, the system deals with 16-bit wave data sampled at 32 or 48 kilohertz, 24-bit internal signal processing, and high-resolution 22-bit digital-to-analog 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 SY77 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.



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 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 SY77'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.



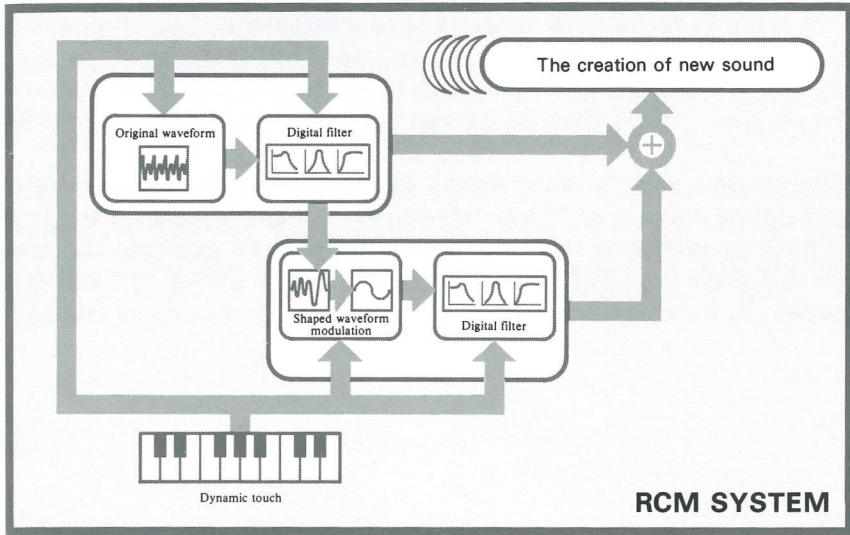
■ **RCM: The Fusion**

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 SY77 introduces a new term



that is at the core of an innovative concept in voice architecture. Each SY77 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:

SY77 VOICE MODES

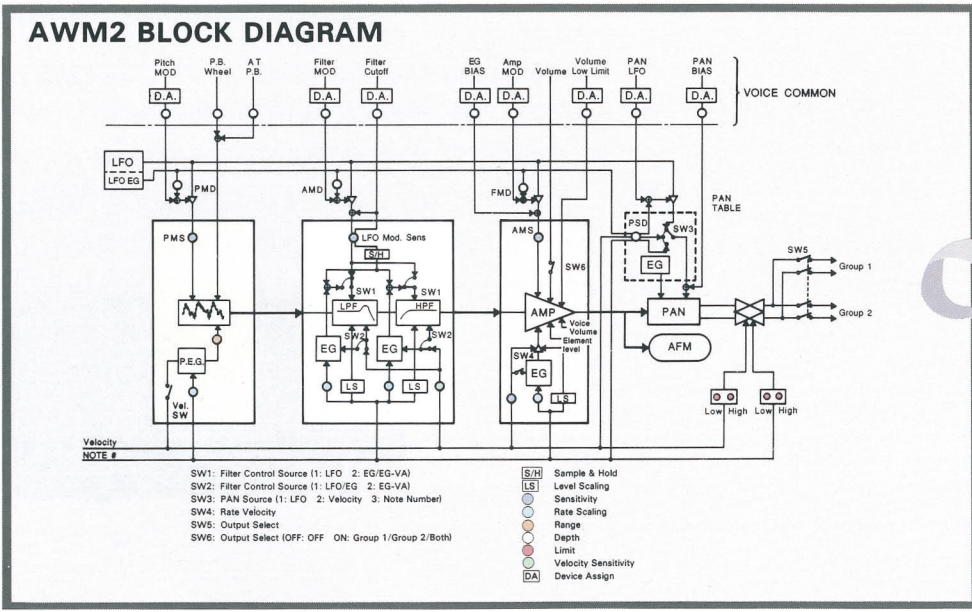
Name	Configuration
1. 1AFM mono	One AFM element
2. 2AFM mono	Two AFM elements
3. 4AFM mono	Four AFM elements
4. 1AFM poly	One AFM element
5. 2AFM poly	Two AFM elements
6. 1AWM poly	One AWM element
7. 2AWM poly	Two AWM elements
8. 4AWM poly	Four AWM elements
9. 1AFM & 1AWM	One AFM and one AWM element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

Voice modes 1 through 5 produce pure AFM output, modes 6 through 8 produce AWM2 output, and modes 9 and 10 can be used for RCM synthesis. Mode 11, a special "drum voice" mode, is particularly useful with the SY77's multi-timbre mode and internal sequencer — we'll look at these 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 sections of the keyboard for

exotic split keyboard setups.

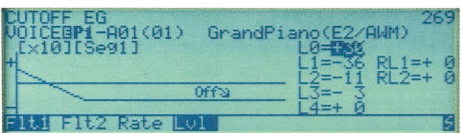
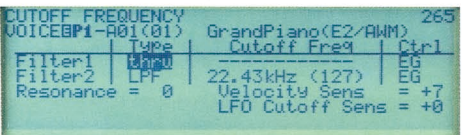
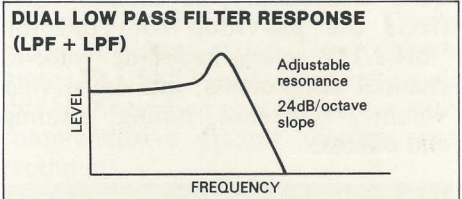
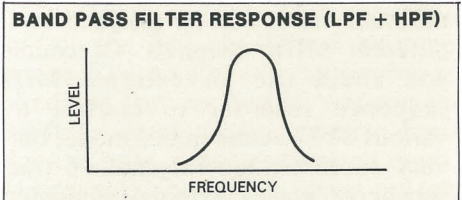
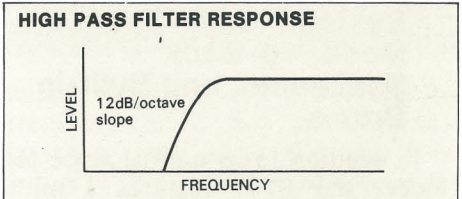
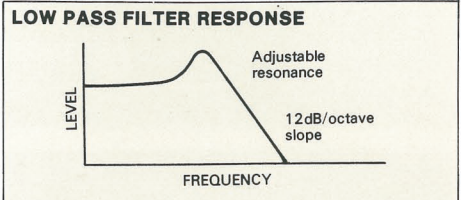
Other important voice and element features include element detuning capability, element transposition, output assignment to the SY77's group 1 and/or group 2 outputs, random pitch, portamento for AFM elements, microtuning, dynamic panning, effect selection and controller assignments. Each element also has a versatile digital convolution filter system that is so important that it deserves to be highlighted on its own ...



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

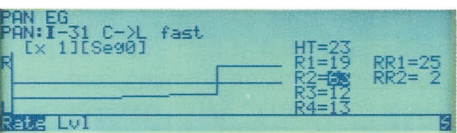
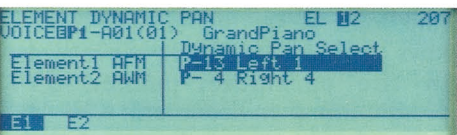
Two advanced digital convolution filters are available to each SY77 voice element. The term "convolution" refers to a sophisticated mathematical technique that is applied in the filters, achieving unprecedented performance and versatility. One of the filters is a low-pass type, and the other is switchable 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 will 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 SY77 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.



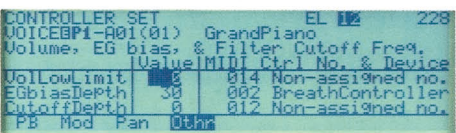
■ **Dynamic Panning for Lively Stereo**

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.



■ **Playability That Lets Your Feelings Show**

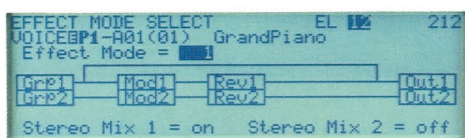
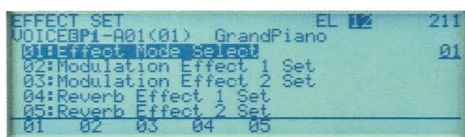
The most stunning sound in the world doesn't mean a thing if you can't make it say what you feel. The SY77 puts you directly in touch with your sound via sophisticated keyboard dynamics control. Key velocity and after-touch pressure can be assigned to control pitch, filtering, AWM2 modulation level and/or 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 hard you play the keys. There's also an extra assignable center-detented wheel and several assignable controllers in addition to the pitch and modulation wheels.



■ **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 SY77 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.

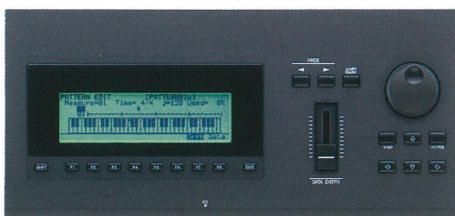


REVERB EFFECTS

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 Bath 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

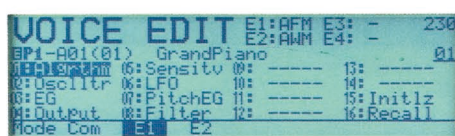
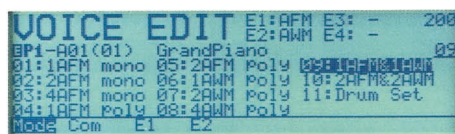
01	Chorus	03	Symphonic
02	Flange	04	Tremolo



Comprehensive Display and Data Entry Controls for Intuitive Programming

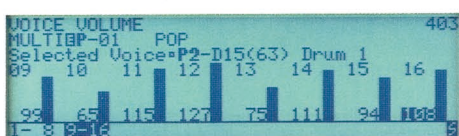
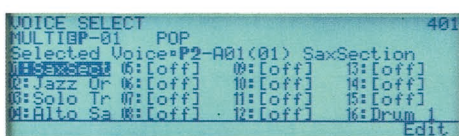
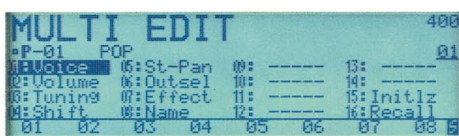
An instrument of the SY77's complexity would be very confusing if it weren't for Yamaha's excellent user interface. Its large 240 x 64 dot backlit liquid crystal display panel simplifies operation by making several parameters visible at the same time. Titles are displayed in large bold type to differentiate 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 SY77 programming environment.

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

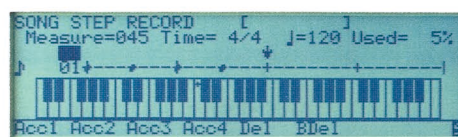
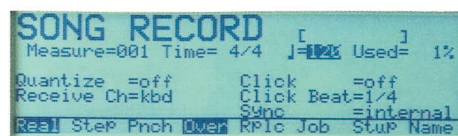


A Complete Production System: Multi-timbre Mode, 16-track Sequencer, and Built-in Drums

In addition to its normal voice play mode, the SY77 features a multi-timbre mode in which up to 16 different voices can be assigned to 16 different MIDI channels. Of course, you could use an external MIDI sequence recorder to control the various SY77 voices in this mode, but a very sophisticated internal 16-track sequencer makes external equipment quite unnecessary, 16 memory locations are provided for complete "MULTI" setups including voice-to-channel assignments, individual voice volume, note shift, tuning, panning, and effects.



The SY77 even supplies a range of high-quality AWM2 drum and percussion samples that can be assigned to 61 different keys 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. Rivalling some of the best separate sequencers in versatility, the SY77's 16-track sequencer offers all the functions and features you need for serious music production, and directly drives the SY77 multi-timbre setups. You can record in real-time to capture the spontaneity of a perfor-



mance, using the step-write mode for precisely-timed fast or complex passages, and using the punch-in feature to "fix" a portion of a previously recorded track.

Quantization either after recording or "on the fly" can tighten up loose timing. There's also an extensive range of editing features that let you control the finest details: individual note duration, velocity, note position and more. Measures can be copied, erased and left blank, deleted and filled with the subsequent measures, or inserted. Tracks can be mixed and erased. There's much more. The SY77 makes controlling all this sophistication an easy matter with comprehensive graphic displays and prompts.

Dual Stereo Outputs

For versatile mixing and real-time control, the SY77 has two pairs of stereo outputs — GROUP 1 and GROUP 2 — each with its own front-panel group fader. Elements can be assigned to either or both groups. By using the output assignments parameters in combination with panning, it is therefore possible to have each element in a four-element voice to appear separately at a different output. Since different effects can also be combined on each group output, the group faders can be used to very the effect complement in real time.

External Storage: 3.5" Floppy Drive and Data Cards

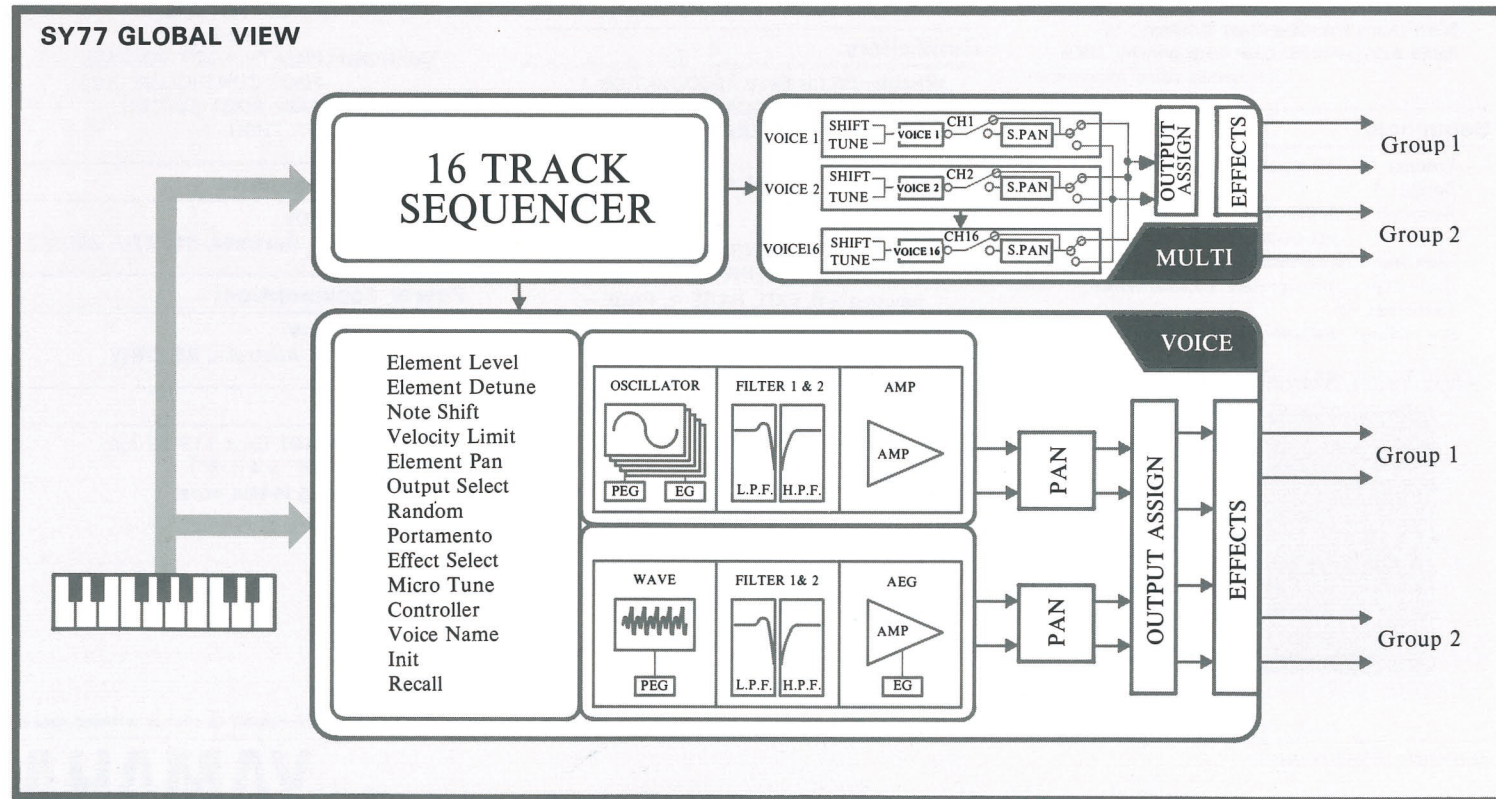
For convenient mass data storage the SY77 features a built-in 3.5" floppy disk drive that can be used to store both synthesizer and sequencer data. Floppy disks are a convenient way to store and

transport data. A "backup" function is provided so you can easily make backup copies of important data or data you want to share with others.

Synthesizer data can also be saved to compact Yamaha MDC64 type data cards. A single card holds up to 64 kilobytes of data.

Complete MIDI Implementation

Since the SY77 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.



SY77 Voice List

Preset 1				
#	Bank A	Bank B	Bank C	Bank D
1	Grand Piano	Dyna Grand	Mute Trmpt	Tutti Orch
2	Arianne	MW2 Grand	Flugel Horn	Trad E.Pno
3	Dyno E.Pno	8ba Piano	Big Band	Full E.Pno
4	Alto Sax	Rock Piano	Brass1 Sct	Bop Organ
5	Bras Choral	Chorus Pno	1980 Brass	Warm Organ
6	Folk 1 Gtr	Big Chord EP	Star Brass	Deep Organ
7	Triton	Ice Piano	Anna Brass	Pan Flute
8	French Horn	Dark E.Pno	Brash Brass	MW2 Feedbck
9	MW2 Tack Pno	Wet Clavi	Soft Brass	Distort 5th
10	Wood Bass	Tight Clavi	Digi Swp Brs	Thumb Bass
11	Chamber Str	Celesta	Brass2 Sct	Sync Bass
12	Jazz Organ	Harpsichrd	Soft Sax	Full String
13	Nasty Saw	Full Organ	Tenor Sax	Wide String
14	Metamomics	Pipe Organ	Flute	Convo Strgs
15	Itopia	Solo Trmpt	Clarinet	Oh Choir
16	Wild Sing	Dual Trmpt	Reed Piper	Orchestra

Preset 2				
#	Bank A	Bank B	Bank C	Bank D
1	Sax Section	Violin	Shamisen	Brass Orch
2	Folk 2 Gtr	Pizzicato	Koto	Milleniuml
3	Humbucker	Contrabass	Sitar	Catharsis
4	Single Coil	Air Cello	Steel Drum	Methyl Mist
5	12st Guitar	Silk String	Harp	Voyager
6	Gut Guitar	Obie Strgs	Accordion	Inferno
7	Mute E.Gtr	Sizle Strgs	Harmonica	Valkyrie
8	Jazz Guitar	Ah Choir	Harpomatic	Syren Song
9	Pick Bass	Spirits	Revi Clavi	Anna Sweep
10	Fretless B	Chor Meist	Forest	Syncan Syn
11	Finger Bass	Vibes	Satin Bell	Anna Pad
12	Syn Bass	Marimba	Mr.Lucky	Goshl
13	Plastic Bs	Pluck Echo	Mini Lead!	Debonair
14	Mini Bass	Bah Mallet	Keytar	Hidden Ring
15	Boppa Bass	Oz Hammer	Solo Flight	Drum 1
16	Breath Bass	Ice Chime	Wayfarer	Drum2

SY77 Specifications

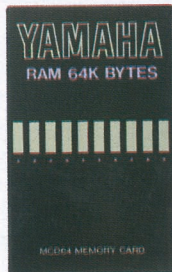
Tone generator:

Realtime Convolution and Modulation (RCM)
AWM2: 16 bit linear waveform data, 32/48kHz 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)

Sequencer:

Tracks: 16 (15 tracks + 1 pattern track)
Songs: 1
Resolution: 1/96 of a quarter note (for internal clock)
Maximum simultaneous notes: 32
Capacity: approximately 16,000 notes
Patterns: 99
Recording: realtime/step/punch in

Optional Memory Card



MCD64
 ●64kb
 Memory Card

Keyboard:

61 notes, key velocity sensitivity, channel aftertouch

Memory:

Preset memory: 128 voices, 16 multis
Internal memory: 64 voices, 16 multis
Waveform memory: 2 Mwords (4 Mbytes), 112 sounds
Card slots: synthesizer data x 1, waveform data x 1
Disk: 3.5" floppy disk drive (713 kbyte formatted)

Controllers:

Wheels: PITCH Bend, MODULATION 1, MODULATION 2
Slider: OUTPUT 1, OUTPUT 2, DATA ENTRY
Knobs: LCD contrast, click volume
Dial: data entry dial
Panel switches:
 MODE x 5, EDIT/COMPARE, COPY, EF.BYPASS, SEQUENCER x 7, SHIFT, function x 8, EXIT, PAGE +, PAGE -, JUMP/MARK, cursor x 4, -1/NO, +1/YES, numeric keypad 0-9, ENTER, MEMORY x 4, BANK x 4, program select x 16,

DSP effects

(reverb effect + modulation effect) x 2
Reverb effects: 40 types
Modulation effects: 4 types

Display:

LCD: 240 x 64 pixels (with backlight)
LED: red x 11, red/green x 21

Terminals:

Audio output: OUTPUT 1/ 1 + 2 (L/MONO, R)
 OUTPUT 2 (L, R)
 PHONES
Controller: BREATH, FOOT VOLUME, FOOT CONTROLLER, SUS-TAIN, FOOT SWITCH
MIDI: IN, OUT, THRU

Power requirements:

UL, CSA: 120V
Europe, WG, Australia, BS: 220-240 V

Power consumption:

UL, CSA: 28W
Europe, WG, Australia, BS: 28W

Dimensions:

1046 (W) x 407 (D) x 119 (H) mm
 (41-1/8" x 16" x 4-5/8")
Weight: 17kg (44lbs 4ozs)

Specifications are subject to change without notice.

For details please contact:

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