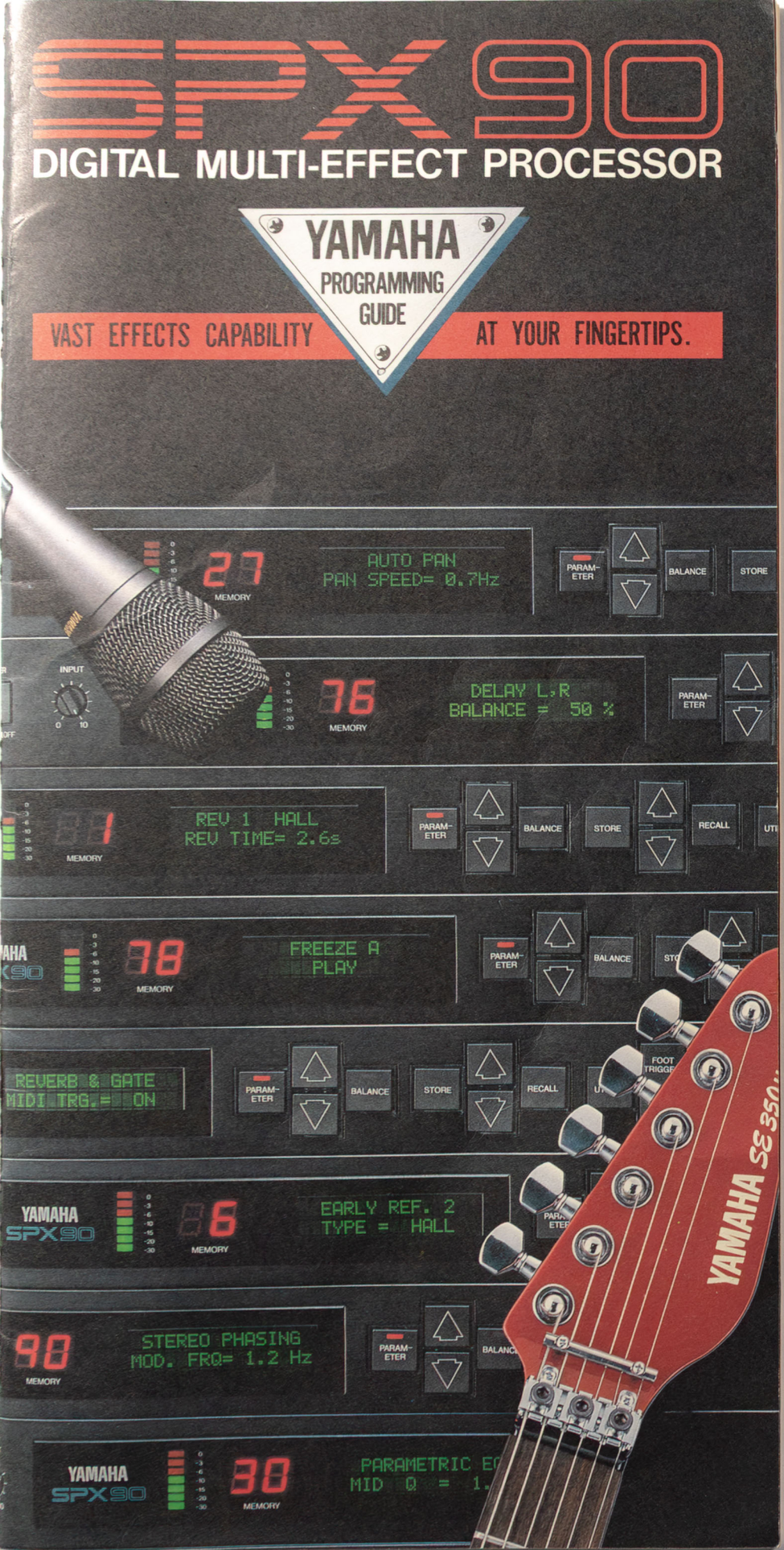
SPX90

DIGITAL MULTI-EFFECT PROCESSOR

YAMAHA

PROGRAMMING GUIDE

VAST EFFECTS CAPABILITY AT YOUR FINGERTIPS.



EFFECTS AS MUSICAL ELEMENTS

Extensions to Your Musical Vocabulary

Effects are the spice of music. The right one, properly used, can add tremendous taste and vitality to a single musical phrase or an entire composition. Creatively utilized effects qualify as musical elements in their own right. And, like all true musical elements, they have the power of expression. What would a vocal performance be without the beauty of vibrato, or an organ without the warmth of reverberation? However, the number of natural effects available to the musician—like vibrato and reverb—is quite small. Furthermore, their control is limited by the natural conditions which permit the effect in the first place. For example, the depth and speed of vocal vibrato is limited by the physical attributes of the singer, and the size of a concert hall or church cannot be readily changed to produce the desired reverberation. Yet, with more effects and more control over them we would have an expanded musical language and thus more freedom in musical expression.

The answer is in the most sophisticated music technology from Yamaha. Specifically, the SPX90 Digital Multi-Effect Processor. This compact, easy-to-operate unit gives you more effects, more control and more musical expression than has ever before been possible with a single device. It adds numerous new tools and techniques to the art of the music maker, expanding the language of music beyond previously impenetrable limits.

The SPX90: a musical instrument for the new age.

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OUTLINE:

What you'll be able to do with the SPX90

The SPX90 Digital Multi-effect Processor utilizes Yamaha's own advanced DSP (Digital Sound Processor) LSI technology to provide a rich variety of effects possibilities. It offers twelve types of effects functions, ranging from the most basic, Reverb and Delay, to Reverb & Gate, Pitch Change, and even Freeze (sampling). The SPX90 has 30 preset effects programs, each a high-quality effect with its own distinctive characteristics. By editing the parameters of the presets, you can create up to 60 more effects, each uniquely yours, and each with a title you've selected and store them into memory for instant recall.

The SPX90 also offers a variety of convenient remote control operations which allow you to use it anywhere it's needed: in the studio, at home, or on stage. For example, with the FC-5 footswitch (optional), you can make program selections, control the BYPASS function, and even use the footswitch as a trigger switch. And the RC7 optional remote control unit lets you directly recall frequently used programs. Then there's the SPX90's MIDI compatibility, now an indispensible feature for any effects processor. External MIDI control gives anyone the ability to select specific programs, trigger certain programs like Freeze and Gate Reverb, and even control pitch from a MIDI keyboard.

With all of these super functions in a single, compact unit, the Yamaha SPX90 has the potential for creating an unlimited assortment of musical expressions that only a digital effects processor can deliver in such superb sonic quality.

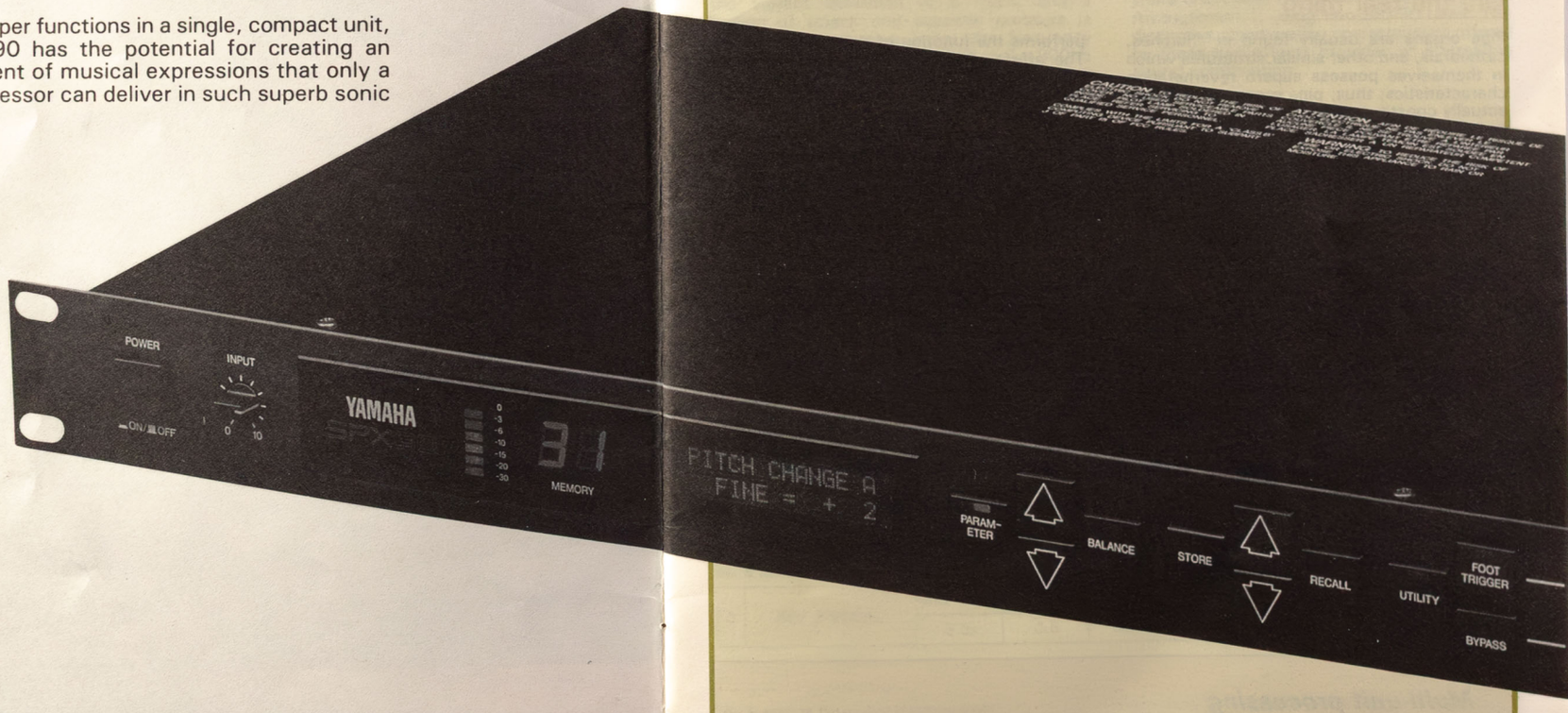
INTRODUCING

PROGRAM DATA FROM YAMAHA'S PROFESSIONALS

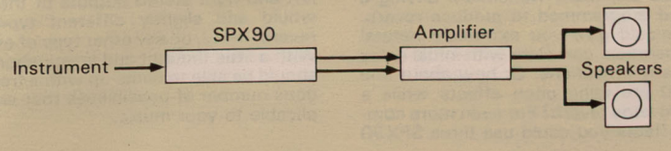
Now that we've told you a little about what you can do with the SPX90, it's time to tell you about the effect techniques and program data that our expert musicians and sound engineers have prepared for you.

By experimenting with the program data (parameters) of the preset programs and modifying them according to your needs, the number of effects variations you'll be able to create is virtually unlimited. After all, the SPX90 was developed to give you the opportunity to perfect your own music expressions with great precision.

In the following pages, we'll explain each of the SPX90's twelve types of programs, beginning with the preset REV (Reverb) programs, so that you'll be able to understand how they work, and eventually come up with some ideas of your own.



* Please note that the effects rendered by the data values (especially balance) may vary somewhat when recreated directly. They have been designed with the assumption that the SPX90 would be used as a component in a system setup (i.e. in combination with an instrument, an amplifier, and speakers).



E/R1 & E/R2 (Early Reflection)

Early reflections are the first soundwave reflections occurring immediately after the original sound (i.e. the first reverberations).
The SPX90's E/R programs create professional-quality effects for precisely controlling characteristics like the resonance, brilliance, feeling of presence, and vibrance of a sound signal. E/R effects are perfect for eliminating the acoustic gap between pure source sound and sounds as they are normally perceived. They are practical for adding what might be called "light reverb" when too much reverberation might cause the resultant sound to become muddy. Besides E/R1 and E/R2, the SPX90 has two more preset programs of this type: Gate Reverb and Reverse Gate, both of which make use of the same effect-producing qualities as E/R1 and E/R2.

The E/R-type preset progams

EARLY REF. 1: provides few sound reflections.
EARLY REF. 2: provides numerous sound reflections.
GATE REVERB: same as E/R2 with the gate reverb effect added.
REVERSE GATE: same as E/R2 with the reverse gate effect added.

Adding more acoustic resonance to the sound of your rhythm machine

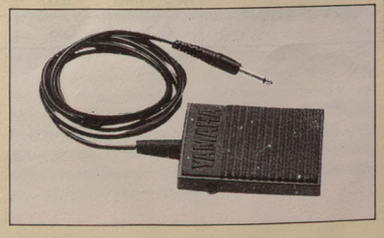
The parameter settings suggested below in Data Arrangement 6 are designed to make the snare voice of drum machines like the RX11 overflow with the vibrance typical of a live performance. This is accomplished by recreating the acoustical texture of the space in which the snare drum is supposedly being played. It preserves the snappy beat and tight rhythm of the snare while enhancing the naturalness of a performance. Adjusting the room size values will create the feeling of a larger or smaller room; adjusting the LIVENESS parameter can simulate a room that is acoustically dead to one that is full of reflective surfaces.

Data Arrangement 6

No. & name of the original preset program		Parameter name and suggested new settings						
5	EARLY REF. 1	TYPE	ROOM SIZE	LIVENESS	DELAY	LPF	BALANCE	OUT LVL
		HALL	2.3	5	22.0ms	9kHz	25%	100%

Use a footswitch for smooth program changes

Effects used on the live stage must almost always be triggered by the performers themselves. Naturally, it's a different story if you've had the time to coordinate everything with the stage engineering staff, but this is rare.
On the SPX90's control panel you'll find two convenient jacks: the MEMORY TRIGGER jack and the BYPASS jack. By connecting the FC-5 footswitch to the MEMORY TRIGGER jack, you can literally change programs with each step in an order that you've preset. You can trigger effects with an additional footswitch connected to the SPX90 through the BYPASS jack. This takes a lot of the worry and hastle out of on-stage effects-processor operation. Output levels are also stored in the SPX90's memory together with each program, so that you don't have to worry about differences in volume between solo and backup parts.



Generating a light, graceful echo-like effect

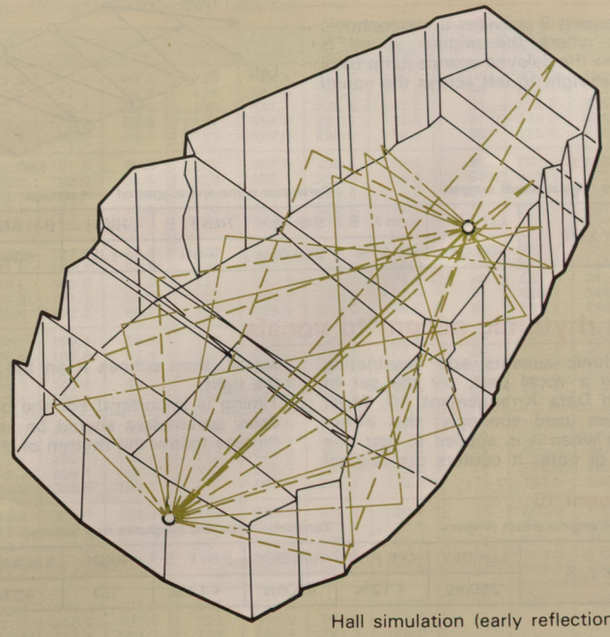
The parameter settings shown in Data Arrangement 7 represent a special example of E/R-type effects. Note that the EARLY REF. 2 preset is used as the original program, and that its Type parameter is set to "random" and its Room Size parameter, to maximum (20.0). These settings give the resultant effect a certain elegance, a light and gracefull rhythmic echo with a nuance so unique that you know it can be neither reverb nor delay. This effect is also conducive to bringing out the brilliance of long tones or giving accent echoes to sharply clear and crisp voices.

Data Arrangement 7

No. & name of the original preset program		Parameter name and suggested new settings						
6	EARLY REF. 2	TYPE	ROOM SIZE	LIVENESS	DELAY	LPF	BALANCE	OUT LVL
		RANDOM	20.0	10	0.1ms	THRU	25%	100%

More about Early Reflections

When a sound is produced in a room, the first thing a listener hears is the direct sound. This is rapidly followed by the first reflections of the direct sound from the various surfaces of the room: front wall, rear wall, side walls, ceiling, floor. These first reflections are then reflected again, and again, until we have the thick texture of reflections known as reverberation. The first few discrete reflections—before the reflections all blend into full reverberation—are the "early reflections." Obviously, the larger the room the greater the time between these early reflections. This is exactly what the E/R ROOM SIZE parameter does. By varying the time between the early reflections, the effect of varying room sizes is produced. Of course, the degree of absorption of the room surfaces also affects the early reflections. The higher the absorption the faster the early reflections decrease in level. In the SPX90 this is controlled by the LIVENESS parameter. By changing the rate of level decrease in the early reflections, the effect of more "live" or more "dead" rooms can be produced. Absorption is not always broadband, though. Some surfaces can absorb a great deal of the high frequencies while acting as an excellent reflector for low-frequency sound. This effect can be simulated with the SPX90 LPF (Low Pass Filter) parameter. Obviously, the SPX90 offers a wealth of parameters that let you easily simulate virtually any type of acoustic environment. Learning how these parameters affect the sound will greatly enhance your ability to program effective effects.



Hall simulation (early reflection pattern)

DELAY

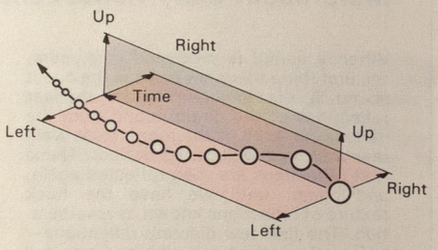
Digital delay has become one of the most popular and common effects; in addition to independently controllable left and right channel signal delays, the SPX90 features a unique circuit structure that permits the "crossing over" of the left and right channel signals through varied combinations of the in-phase and out-of-phase feedback values. Delay times can be set in increments of 0.1 msec. so that timing settings can be precisely adapted to the tempo of the music.

The Delay-type preset programs

DELAY L, R: features a dual delay effect with which even out of phase feedback is possible.

A delay where the sound takes off, dives, and flys away!

The stereo delay effect produced by Data Arrangement 8 is an adventure in a three-dimensional sound, a stereophonic fantasy where you can move sound from side to side and up and down as you please to create sonic images of your music flying about and vanishing into the air. The absolutely perfect effect when you want to add a fascinating touch to endings and breaks in songs.
The greatest feature of this set of data is its ingenious combination of in-phase and out-of-phase feedback settings.



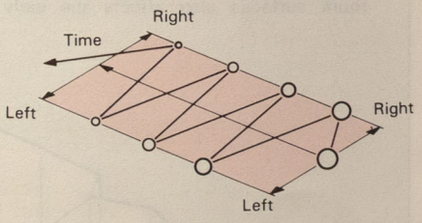
Data Arrangement 8

No. & name of the original preset program / Parameter name and suggested new settings

		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
7	DELAY L, R	249.5ms	−40%	250.5ms	+40%	1.0	50%	100%

Jumping between right and left

Data Arrangement 9 provides a stereophonic delay effect where the original sound is centered while the delayed sounds jump back and forth from right to left across the sound field.



Data Arrangement 9

No. & name of the original preset program / Parameter name and suggested new settings

		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
7	DELAY L, R	500.0ms	+37%	250.0ms	+0%	1.0	50%	100%

Adding a rhythmic accent to vocals

To add rhythmic accents and fascinating complexity to a vocal part, try the set of parameters in Data Arrangement 10. Most effective when used sparingly, this effect comes to life when it is applied to just one crucial word or note. It centers the original sound, then echoes it on the left and then the right.
Timing is important! For the best effect the delay parameters should be set so that the repeats follow the rhythm of the song.

Data Arrangement 10

No. & name of the original preset program / Parameter name and suggested new settings

		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
7	DELAY L, R	250ms	+12%	500ms	+12%	1.0	45%	100%

Adding depth to vocals

Data Arrangement 11 is a monaural effect for when you want to give depth to vocal parts. It can be used constantly from the beginning of a song to the end without becoming objectionable. By making proper use of reverb in combination with this set of parameters, you can effectively prevent monotonous flatness in your vocal effects.

Data Arrangement 11

No. & name of the original preset program / Parameter name and suggested new settings

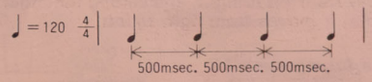
		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
7	DELAY L, R	250ms	+32%	250ms	+32%	1.0	10%	100%

Setting the delay time according to the tempo

Advances in the development of drum machines and sequencers have made it easy to keep proper rhythm. With such advances, setting the delay timing according to the tempo of a song in order to generate delay signals in precise coordination with timing has become a commonly used method in the recording industry.
The SPX90 can be used to set accurate delay times since delay timing values can be displayed on its LCD Program and Parameter Indicator. To generate a delay signal on every quarter-note beat of a song with a tempo of 120, just set the delay timing to 500 msec; to generate a delay signal on every eighth-note beat, set it to 250 msec.

How to determine the correct delay timing values

Example: Tempo 120 (♩ = 120):
60 seconds = 120 beats
1 second = 2 beats
0.5 second = 1 beat; in other words, there's an interval of 0.5 seconds between beats; therefore, set the delay timing to:
500 msec. for quater notes (4/4 time);
250 msec. for eighth notes;
125 msec. for sixteenth notes.



The following chart is a quick reference table for finding the correct delay timing values corresponding to various tempo values. (Please note that the parameter data introduced in this manual were designed assuming that the tempo would be ♩ = 120.)

Tempo : Delay Timing Quick Reference Table (unit: ms)

Tempo	1/4 note	1/8 note	1/16 note	Tempo	1/4 note	1/8 note	1/16 note	Tempo	1/4 note	1/8 note	1/16 note
170	352.9	176.5	88.2	135	444.4	222.2	111.1	100	600.0	300.0	150.0
169	355.0	177.5	88.8	134	447.8	223.9	111.9	99	606.1	303.0	151.5
168	357.1	178.6	89.3	133	451.1	225.6	112.8	98	612.2	306.1	153.1
167	359.2	179.6	89.8	132	454.5	227.3	113.6	97	618.5	309.3	154.6
166	361.4	180.7	90.4	131	458.0	229.0	114.5	96	625.0	312.5	156.3
165	363.6	181.8	90.9	130	461.5	230.8	115.4	95	631.6	315.8	157.9
164	365.9	182.9	91.5	129	465.1	232.6	116.3	94	638.3	319.1	159.6
163	368.1	184.0	92.0	128	468.8	234.4	117.2	93	645.1	322.6	161.3
162	370.4	185.2	92.6	127	472.4	236.2	118.1	92	652.2	326.1	163.0
161	372.7	186.3	93.2	126	476.2	238.1	119.0	91	659.3	329.7	164.8
160	375.0	187.5	93.8	125	480.0	240.0	120.0	90	666.7	333.3	166.7
159	377.4	188.7	94.3	124	483.9	241.9	121.0	89	674.2	337.0	168.5
158	379.8	189.9	94.9	123	487.8	243.9	121.9	88	681.8	340.9	170.5
157	382.2	191.1	95.5	122	491.8	245.9	122.9	87	689.7	344.8	172.4
156	384.6	192.3	96.2	121	495.9	247.9	124.0	86	697.7	348.8	174.4
155	387.1	193.5	96.8	120	500.0	250.0	125.0	85	705.9	352.9	176.5
154	389.6	194.8	97.4	119	504.2	232.1	126.0	84	714.3	357.1	178.6
153	392.2	196.1	98.0	118	508.5	254.2	127.1	83	722.9	361.4	180.7
152	394.7	197.4	98.7	117	512.8	256.4	128.2	82	731.7	365.8	183.0
151	397.4	198.7	99.3	116	517.2	258.6	129.3	81	740.7	370.4	185.2
150	400.0	200.0	100.0	115	521.8	260.9	130.4	80	750.0	375.0	187.5
149	402.7	201.3	100.7	114	526.3	263.2	131.6	79	759.5	379.8	189.9
148	405.4	202.7	101.4	113	531.0	265.5	132.7	78	769.2	384.6	192.3
147	408.2	204.1	102.0	112	535.7	267.9	133.9	77	779.2	389.6	194.8
146	411.0	205.5	102.7	111	540.5	270.3	135.1	76	789.5	394.7	197.4
145	413.8	206.9	103.4	110	545.5	272.7	136.4	75	800.0	400.0	200.0
144	416.7	208.3	104.2	109	550.5	275.2	137.6	74	810.8	405.4	202.7
143	419.6	209.8	104.9	108	555.5	277.8	138.9	73	821.9	410.9	205.5
142	422.5	211.3	105.6	107	560.7	280.4	140.2	72	833.3	416.7	208.3
141	425.6	212.8	106.4	106	566.0	283.0	141.5	71	845.1	422.5	211.3
140	428.6	214.3	107.1	105	571.4	285.7	142.9	70	857.1	428.6	214.3
139	431.7	215.8	107.9	104	576.9	288.5	144.2				
138	434.8	217.4	108.7	103	582.5	291.3	145.6				
137	437.9	219.0	109.5	102	588.2	294.1	147.1				
136	441.1	220.6	110.3	101	594.0	297.0	148.5				

ECHO

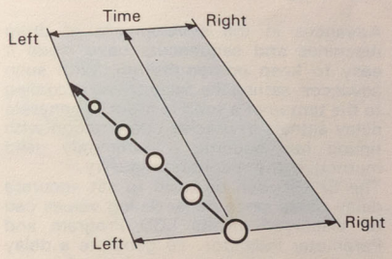
The SPX90's echo effect capability produces stereo echo effects by means of separate delay units for the left and right channels. In other words, what previously required two monaural echo machines can now be accomplished with one SPX90. You can set the delay times for the right and left channenls independently and the possible feedback gain combinations are virtually infinite.

The Echo-type preset programs

STEREO ECHO: echo effect with independently variable delay time and feedback settings for the left and right output channels.

The movement of sound images from side to side

The parameter values presented in Data Arrangement 12 are effective for improving the sound from sources such as piano or drums, the decay times of which are short. With this effect, the sound image will move across the sound field in the set direction, growing gradually weaker as it goes. This is achieved by setting the left channel feedback gain a little higher than the right channel feedback gain with the delay timing for both channels set at the same value. By reversing the feedback gain settings, making the right gain stronger than the left, the panning direction is also reversed.
Using two SPX90s, the sound images can be made to criss-cross one another by setting the panning direction of one SPX90 so that sound moves from left to right, and setting the other so that it moves from right to left.

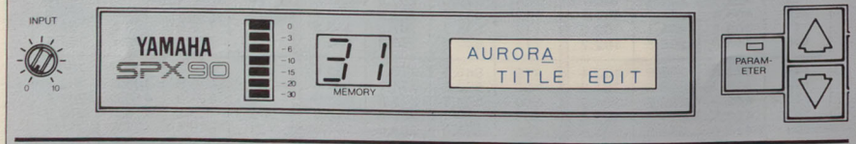


Data Arrangement 12

No.	No. & name of the original preset program	Parameter name and suggested new settings						
		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
8	STEREO ECHO	250.0ms	+70%	250.0ms	+43%	0.5	50%	100%

Use the 60 User Memory locations effectively!

Please use the 60 available User Memory locations effectively by placing your programs wisely. One good technique is to arrange your programs in the order of their frequency of use or in the order that they will be used during a performance. Another good idea is to group your programs according to type. In any case, don't think that you can store programs into memory in a haphazard way just because you've got so many memory locations available. If you do, you'll soon have difficulty remembering where certain programs are stored. Storing programs in a well organized manner is a requisite for quick, trouble-free recalling. Programs you might want to call up often with the RC7 optional remote control unit should be stored in memory locations 31 to 37 because these seven, in addition to presets 1 to 7, can be called up directly with the remote control.



Take the time to choose good names for your programs, too.

Making a small chorus sound like a large chorus

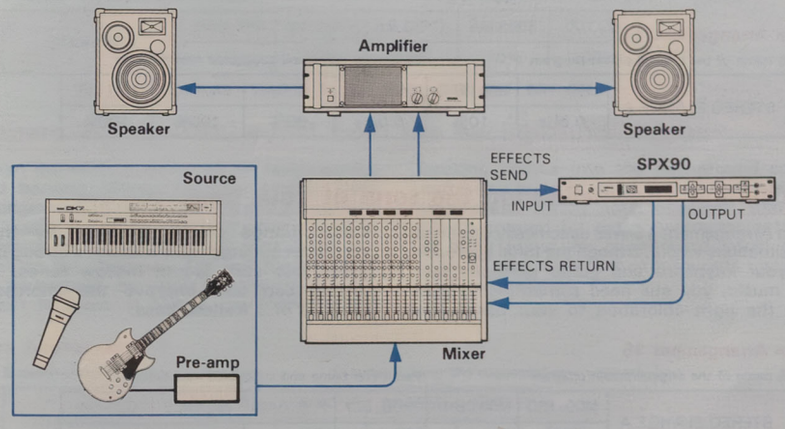
Data Arrangement 13 can create the feeling of a large chorus when the number of singers is actually quite small.
By outputting an echo signal with just a slight delay time from the left and right channels, you can create the minute time deviation that naturally occurs when a large number of people are singing in a chorus.
If the settings suggested below prove to be insufficient for your purposes, just increase the Delay and Feedback values a little.

Data Arrangement 13

No.	No. & name of the original preset program	Parameter name and suggested new settings						
		Lch DLY	Lch F. B	Rch DLY	Rch F. B	HIGH	BALANCE	OUT LVL
8	STEREO ECHO	10.0ms	+0%	20.0ms	+0%	1.0	50%	100%

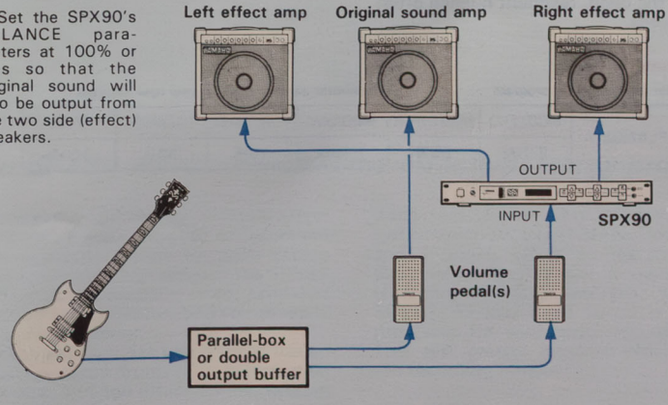
Upgrading your sound "outlet"

The most basic setup in which the SPX90 is used is when an instrument is connected to the SPX90 and the SPX90 is connected to an amplifier. If, however, you want to make full use of the SPX90's potential, the kind of setup illustrated below is ideal.



If there's no mixing console available, you could use three instrument amps instead. For example, if you're a guitar player, you can create great sound by using three guitar amps as shown below. With this setup the original sound and the effected sound are mixed when they are output through the speakers, and appropriate equalizing can be achieved at each amp. The use of the volume pedals lets you additionally control balance as required during performance.

* Set the SPX90's BALANCE parameters at 100% or less so that the original sound will also be output from the two side (effect) speakers.



MOD (Modulation)

The SPX90's modulation effects are ideal for adding color to the character of just about any musical instrument from keyboard, guitar, and bass to drums. One of their most natural uses would be to combine the chorus effect with an electric piano. Other standard applications include guitar with Stereo Phasing and bass with Flanging.
In the SPX90 there are seven preset modulation effect programs, some of which were independently developed by Yamaha and are unique to the SPX90.

The MOD-type preset programs

STEREO FLANGE A and STEREO FLANGE B: provide wide effects possibilities ranging from soft flanging to a swirling metallic sound; the time delay from the initial direct sound to the beginning of the flange effect can also be set.
CHORUS A and CHORUS B: effective for tricks like making a six-string guitar sound like a twelve-string.
STEREO PHASING: for providing a background sound with tonal life or variation; also good for creating the effect achieved with rotating speakers.
TREMOLO: provides greater depth and color.
SYMPHONIC: an original Yamaha effect of a new dimension.

Metallic flange with a strong pulsating effect

The parameter values suggested in Data Arrangement 14 provide a hard metallic flange effect. The high resonance of this set of parameters should prove to be a highly expressive tool.

Data Arrangement 14

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	MOD.DEPTH	MOD.DLY	F. B. GAIN	BALANCE	OUT LVL
9	STEREO FLANGE A	0.8Hz	10%	6.0ms	90%	100%	100%

Softening and mellowing the tone of your bass

Data Arrangement 15 was specifically designed for situations where, althogh the tonal approach of your keyboard and guitar perfectly suit the music, you still need something to give just the right coloration to your bass. The stereo flange effect provided by these parameter settings will transform a strong bass sound into soft, warm, mellow tones. The setting can also improve the impressive qualities of a fretless bass.

Data Arrangement 15

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	MOD.DEPTH	MOD. DLY	F. B. GAIN	BALANCE	OUT LVL
9	STEREO FLANGE A	2.0Hz	16%	9.4ms	24%	50%	100%

Add coloration to the sound of your toms

The parameter settings suggested below in Data Arrangement 16 constitute a flange effect specifically arranged for the toms. They let you produce the deep, resonant nuance often heard on records.

Data Arrangement 16

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	MOD.DEPTH	MOD.DLY	F. B. GAIN	BALANCE	OUT LVL
9	STEREO FLANGE A	2.1Hz	65%	1.0ms	75%	50%	100%

Swirling stereo chorus

The parameter settings shown in Data Arrangement 17 represent a stereo chorus with slightly quickened pulsations. Going beyond the mere addition of an effect (chorus) to the original sound, this arrangement brings the two together into an intimately combined sound entity. One way to bring forth the beauty of this data arrangement is to use a tight piano sound as a source. It's also well suited for use with a guitar played arpeggio. Turning up the source's treble a little can be helpful for preserving the freshness of the sound.

Data Arrangement 17

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	DM DEPTH	AM DEPTH	BALANCE	OUT LVL
11	CHORUS A	2.7Hz	22%	30%	55%	100%

Stereo chorus with depth

Compared to the effect produced by the previous data arrangement, the parameter settings of this one (Data Arrangement 18) render a pleasantly refreshing depth of tone. They give life to the source sound and create beautiful stereophonic spatial clarity. Perfect for softly colored source sounds of for when you want to accentuate the softer tones while preserving the fresh crispness of an original sound.

Data Arrangement 18

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	DM DEPTH	AM DEPTH	BALANCE	OUT LVL
11	CHORUS A	1.4Hz	22%	45%	70%	100%

Separating the lead vocal from the background chorus

When the voice qualities of the lead vocalist and backing chorus are very similar, Data arrangement 19 can be used to add an interesting variation to the back chorus sound in order to set it apart from the lead vocals.
It treats the chorus as if it was the sound of an instrument by applying the Symphonic effect to them. It blends the sound of the backing chorus into the background sound and helps bring forward the presence of the lead vocal. Please note, however, that the effect created by these parameter settings is more fitting for background vocal pads ("oo's" and "ah's") than for words requiring clear enunciation.

Data Arrangement 19

No. & name of the original preset program — Parameter name and suggested new settings

		MOD. FRQ	MOD.DEPTH	BALANCE	OUT LVL
15	SYMPHONIC	0.7Hz	30%	50%	100%

The SPX90 solves troublesome effects-patching problems

Because the SPX90 is a multi-effect processor, there's no need to reconnect input and output lines for each source when recording. Just connect the SPX90 to the mixing console's effect send and effect return connectors and you're ready to handle anything.
For example, suppose you want to use an E/R effect on the drums to be recorded on track one, a flange effect on the bass on track two, some other effects on the instruments on tracks three, four, etc., and a reverb effect on the mixdown: even when you've got a complicated recording schedule like this, with the SPX90, all you need to do is change programs for each track: no patching! This will greatly improve efficiency in the recording studio.

GATE

Gate effect programs are not used for coloration, but for controlling signal levels. The ADR-Noise Gate effect cuts all signals below a set level and only lets those through that are higher than the set level. Used not only as a simple noise gate, this effect facilitates many special effects including the ability to precisely control the enveloping of a source sound.
The Compressor effect is used for cutting all signals above a certain level in order to maintain an even volume level as well as to freely control attack.
Both of these programs comprise parameters that permit high quality signal level processing. Capabilities such as those offered by these parameters bring the most natural sound possible to the ears of your audience.

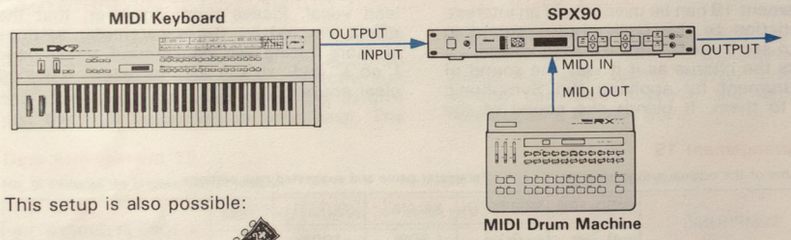
The GATE-type preset programs

ADR-NOISE GATE: can be used to cut unnecessary signals which exceed a certain level, or to cut all noise during quiet passages.

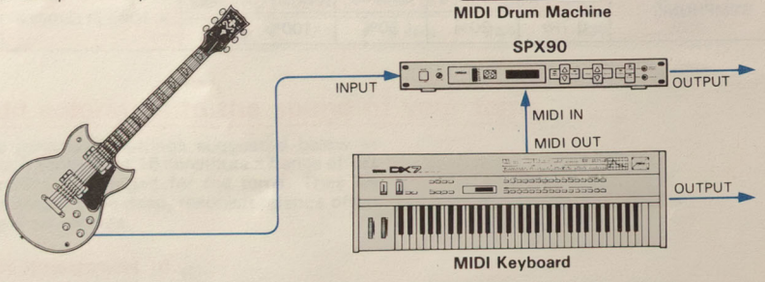
COMPRESSOR: can be used to reduce the level of the attack portion of a music signal by controlling the peak level, or to prevent distortion due to excessively high input levels.

Source timing control by means of MIDI note data

One application of Data Arrangement 20 is to conduct what might be considered the MIDI synchronization of the sound source and the rhythm. To use it, set up the SPX90 in combination with a MIDI drum machine, such as the RX11, as shown in the diagram below.
Rhythm-synchronized triggering is possible because the note data signals of the MIDI drum machine are in themselves the rhythm. By passing through or shutting off the audio signals from the source with a gate, the timing of the source signals can be matched with the rhythm output from the MIDI drum machine. It might be more appropriate to think of this effect as a technique rather than an effect.
Additional interesting effects can be achieved by applying this effect to a continuous source sound, or to a tape recording of birds singing or traffic noise.



This setup is also possible:



Data Arrangement 20

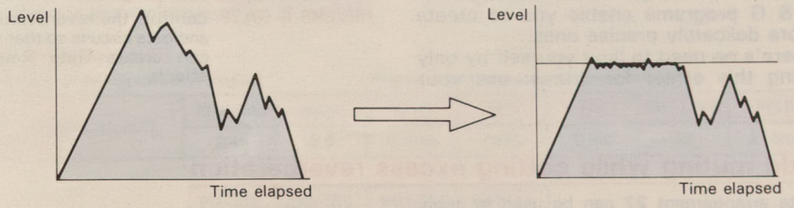
No. & name of the original preset program — Parameter name and suggested new settings

		TRG. LEVEL	TRG. DLY	TRG. MSK	ATTACK	DECAY	DECAY LVL	HOLD
18	ADR-NOISE GATE	100	– 10ms	5ms	5ms	38ms	100%	80ms

RELEASE	MIDI TRG.	BALANCE	OUT LVL
5ms	ON	100%	100%

Preventing volume fluctuations due to differences in picking strength on bass guitars

Annoying fluctuations in volume often occur due to variations in picking strength when playing quick phrases on the bass guitar. Data Arrangement 21 is effective for solving such problems by leveling out (averaging) differences in sound signal strength.
This Data Arrangement can also be applied to vocal music.



Guitar output levels are averaged and leveled out (i.e. compressed to within a predetermined range); this permits more effective use of amplifier and mixer volume controls without having to worry about extreme differences in volume occurring.

Data Arrangement 21

No. & name of the original preset program — Parameter name and suggested new settings

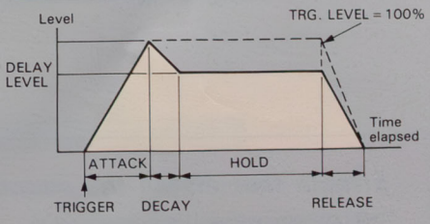
		TRG. LEVEL	TRG. DLY	TRG. MSK	ATTACK	HOLD	HOLD LEVEL	RELEASE
19	COMPRESSOR	84	– 25ms	5ms	32ms	28ms	60%	1000ms

MIDI TRG.	BALANCE	OUT LVL
OFF	100%	100%

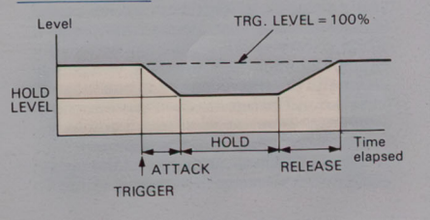
ADR-NOISE GATE and COMPRESSOR effects

While these effects are quite similar, each has distinctly different applications. ADR-NOISE GATE can actually turn the output signal on and off or shape the signal with envelope generator type parameters: attack, decay, hold (sustain) and release. It can therefore be used as a noise gate, shutting off all signals below a preset threshold level, or to completely change the envelope—and therefore the sound—of a signal. COMPRESSOR, on the other hand, is most suited to traditional compression type effects: increasing the sustain of a guitar, for example, or smoothing out the overall level of a vocal or bass performance. Although you could use COMPRESSOR for extreme sound modification, the ADR-NOISE GATE program gives you more control for this type of application.

ADR-NOISE GATE



COMPRESSOR



R&G (Reverb & Gate)

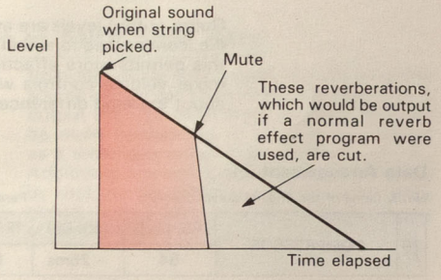
Reverb & Gate programs are a hybrid of the Reverb-type and Gate-type programs. Those amazing-sounding R & G effects so popular on the recent music scene can all be rendered perfectly with a single SPX90 Digital Multi-effect Processor. While the Gate Reverb preset program belonging to the E/R type of effect programs lets you produce speedy gate reverb effects, the R & G programs enable you to create more delicately precise ones.
There's no need to limit yourself by only using this effect for drums: use your imagination and be creative! We're sure you'll discover many fascinating applications for this effect. Remember, you can even trigger R & G programs from a keyboard with the MIDI Note ON/OFF signal when the MIDI TRG. parameter is set to ON.

The R & G-type preset progams

REVERB & GATE: controls the reverberation and gate circuits so that you can create Gate Reverb effects.

Add muting while cutting excess reverberation

Data arrangement 22 can be used to apply reverb to a rhythm guitar part in such a way that excessive reverb which might ruin the clarity of the sound will be cut out. The result produced by these settings is the rough, unruly effect associated with the London Sound. You can cut excess reverberations at precisely the right moment (e. g. when the picked strings are muted), to create the eccentric "noise-art" effect. Since the level at which this effect should be triggered varies greatly depending on pickup output levels and your guitarist's picking strength, don't forget to set the trigger level appropriately so as to avoid any unnaturalness.



Data Arrangement 22

No. & name of the original preset program / Parameter name and suggested new settings

		REV TIME	HIGH	DELAY	HPF	LPF	TRG. LEVEL	HOLD
20	REVERB & GATE	1.0s	1.0	0.1ms	THRU	THRU	61	95ms

RELEASE	MIDI TRG.	BALANCE	OUT LVL
5ms	OFF	100%	100%

The Gate Reverb effect that's perfect for powerful music

Data Arrangements 23 and 24 were prepared to provide you with something suitable for music that is more powerful than that for which the preset Gate Reverb program was meant. If we suppose that the preset was designed for pop music, then we would have to conclude that these parameter settings were conceived with rock music in mind. Arrangement 23 provides the slightly longer effect of the two.
Choose the set of parameters that is most fitting for the tempo of your music; both go well whether applied to a snare drum, bass drum, or toms.
If you want to strengthen the attack, you can achieve an even lighter gate reverb effect by slightly boosting the 2—3 kHz range of the frequency response with an equalizer.

Data Arrangement 23

No. & name of the original preset program / Parameter name and suggested new settings

		REV TIME	HIGH	DELAY	HPF	LPF	TRG. LEVEL	HOLD
20	REVERB & GATE	2.4s	0.8	0.1ms	THRU	THRU	75	216ms

RELEASE	MIDI TRG.	BALANCE	OUT LVL
5ms	OFF	50%	100%

Data Arrangement 24

No. & name of the original preset program / Parameter name and suggested new settings

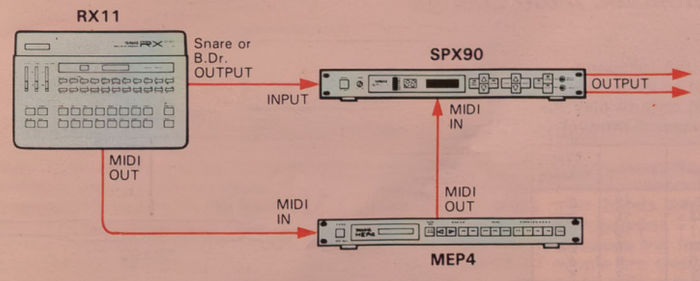
		REV TIME	HIGH	DELAY	HPF	LPF	TRG. LEVEL	HOLD
20	REVERB & GATE	2.2s	0.9	0.1ms	THRU	THRU	75	162ms

RELEASE	MIDI TRG.	BALANCE	OUT LVL
5ms	OFF	50%	100%

Effects that match the sound field

The SPX90, conveniently compact in a single unit, is just the right size so that you can pack it with your other sound equipment and instruments and take it along to the rehearsal studio or to your concert location. But one thing you should be careful of: effects edited in one location often sound different when reproduced in another or when using different amplifiers, speakers, or other sound equipment. This is because different buildings (and sound equipment) all have their own distinctive acoustical characteristics which will result in the same effect sounding differently. Therefore, whenever you're going to use a program at a location other than the one for which (or where) it was originally edited, you must take time to readjust your parameters for the new location. To get really professional sounding results, use the same equipment and sound sources that will be used for the actual performance at the new location.

Using the MEP4 for selective REVERB & GATE application



The MEP4 is Yamaha's versatile MIDI Event Processor. With it you can modify an input MIDI signal to produce virtually any type of MIDI output. You can change a pitch control signal to a modulation signal, change the channel number of the incoming signal, delay the MIDI signal, change key numbers, etc, etc. This type of capability offers some interesting possibilities for using the SPX90. Suppose, for example, we want to apply the SPX90 REVERB & GATE effect to only the snare and kick drum voices from a Yamaha RX11 Digital Rhythm Programmer. Since the RX11 actually transmits MIDI key numbers corresponding to each drum voice played, all we have to do is program the MEP4 to pass only the snare and kick drum key number while rejecting all others. The "filtered" MIDI output of the MEP4 is then used to trigger the SPX90 REVERB & GATE effect. Voila! What at first sounded like an extremely complex problem becomes a snap, thanks to the magic of MIDI event processing and the SPX90.

PITCH (Pitch Change)

Pitch effect programs are for changing the pitch of the sound source, whether it be vocal or instrumental. You can alter the pitch in semi-tone increments over a range of plus/minus one octave from the base tone and make fine pitch adjustments in one-cent (1/100th of a semi-tone) increments/decrements.
Applications are quite versatile: in addition to orthodox uses such as correcting pitch, synthesizing chords from a single original tone, or performing with the "octave method," you can also do things like create the illusion of a single vocalist singing three parts simultaneously, or strengthen harmonic overtones (i. e. add a subtle lower fourth or fifth to a bass tone) to create sounds rich in resonant warmth and depth.
As a matter of fact, the deep far-out sounding voices of space creatures and evil characters portrayed in movies and cartoons are often made by altering the pitch of the human voice with this type of effect.

The PITCH-type preset programs

PITCH CHANGE A: has a feedback function and permits the generation of an echo accompanying pitch changes; also allows pitch control with a MIDI signal.
PITCH CHANGE B: allows the setting of two pitches to produce tri-tone effects.
PITCH CHANGE C: allows the setting of two pitches, one on each channel, to create tri-tone chords with a feeling of spatial breadth.
PITCH CHANGE D: is basically the same as PITCH CHANGE A except that its algorithm is different.

Note: If the tones resulting from programmed pitch shifts are audibly off-pitch (from the actual scale), use the FINE parameter to adjust their pitch. Since the SPX90 is a digital device, it will only produce exact notes, regardless of the scaling of the source instrument.

Pitch rises suddenly for a transposed echo effect

Data arrangement 25 makes the source pitch rise in a quick succesion of semi-tones, until it becomes inaudible. The effect produced is especially well matched to percussive sound sources, and should be used sparingly to give an uncommon touch to only a certain, carefully selected portion of a song.

Data Arrangement 25

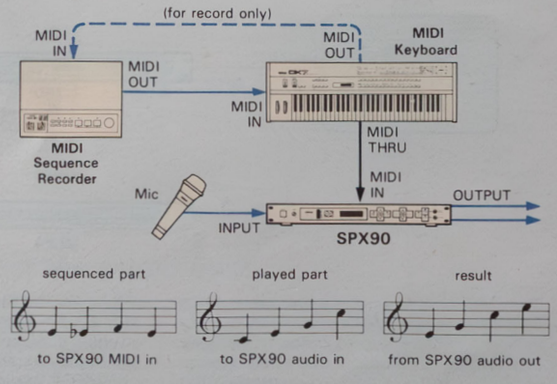
No. & name of the original preset program / Parameter name and suggested new settings

		PITCH	FINE	DELAY	F. B. GAIN	BASE KEY	BALANCE	OUT LVL
23	PITCH CHANGE A	+1	0	120.0ms	60%	OFF	45%	100%

Automatic pitch change

Use the following chart to determine what note to play for the correct interval.

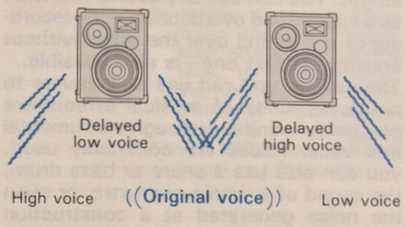
Interval	Display	Note Pressed
−8va	−12	C
M7	−11	C#
m7	−10	D
M6	−9	D#
m6	−8	E
P5	−7	F
TT	−6	F#
P4	−5	G
M3	−4	G#
m3	−3	A
M2	−2	A#
m2	−1	B
unison	0	C
m2	+1	C#
M2	+2	D
m3	+3	D#
M3	+4	E
P4	+5	F
TT	+6	F#
P5	+7	G
m6	+8	G#
M6	+9	A
m7	+10	A#
M7	+11	B
+8va	+12	C



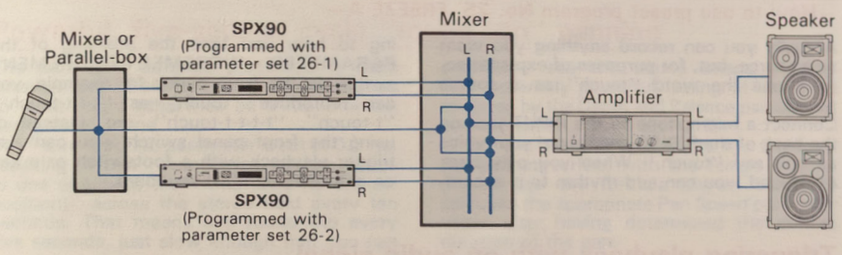
The SPX90 pitch change programs can be used to create perfect harmony parts if a little preparation and a sequencer are used. To create a harmony part for a C-chord arpeggio, for example, you would record the notes (MIDI key numbers) corresponding to the appropriate intervals for the harmony part on the sequencer. The playback MIDI output from the sequencer is then fed to the SPX90 to set the proper harmony intervals for the part you will play.

A special effect for vocals using two SPX90s

The two sets of parameters shown in Data Arrangement 26 are for producing an especially interesting vocal effect called "snowflaking." This technique is employed by many professionals working with expensive specialized equipment in some of the worlds most advanced studios. The same effect can be created using two SPX90s as illustrated in the diagram. One SPX90 is programmed according to Parameter Set 1 (of Data Arrangement 26-1) to add additional voices, one lower and one higher, to the original voice; the other SPX90 is programmed with Parameter Set 2 (of Data Arrangement 26-2) to delay another set of higher and lower voices by several micro-seconds.



Setup Diagram



Data Arrangement 26

No. & name of the original preset program / Parameter name and suggested new settings

		L PITCH	L FINE	L DLY	R PITCH	R FINE	R DLY	BALANCE
23	PITCH CHANGE C	+0	+15	0.1ms	+0	−15	0.1ms	100%
23	PITCH CHANGE C	L PITCH	L FINE	L DLY	R PITCH	R FINE	R DLY	BALANCE
		+0	−15	45.0ms	+0	+15	45.0ms	100%

OUT LVL	
100%	Data 26-1
OUT LVL	
100%	Data 26-2

Add a feeling of depth and number to hand claps

Hand claps gain depth as the number of people clapping their hands increases. If you want to add such a feeling to the hand claps in a song, but your band has only a few members, use Data Arrangement 27. With it you can create the illusion of having three times as many people clapping their hands as there really are.
Natural hand clapping manifests differences in pitch, volume, and tone depending on the sizes and shapes of the hands and how they are clapped together. In addition, there are also timing differences between when one person claps their hands and another claps theirs. Data Arrangement 27 does all of this artifically to produce the feeling that a large number of people are clapping from a source sound made by only a few. This is achieved by adding clapping sounds of different pitches and by shifting the timing of their generation according to the time delay parameter settings.

Data Arrangement 27

No. & name of the original preset program / Parameter name and suggested new settings

		L PITCH	L FINE	L DLY	R PITCH	R FINE	R DLY	BANALNCE
23	PITCH CHANGE C	+5	+0	10.0ms	−5	+0	15.0ms	40%

OUT LVL
100%

FREEZE

The SPX90's Freeze programs are sampling effects for "recording" sounds of up to 500-milliseconds (1/2 second) in length. You can use any sound you wish as a source, and overdubbing—the recording of one sound over the other without erasing the first one—is also possible.
The sounds you can use as a source to create all kinds of musical effects are practically infinite. Although instrumental and vocal voices are commonly used, you can also use a snare or bass drum, the sound of a whole orchestra, or even the noise generated at a construction site or at the roadside as a source.

The FREEZE-type preset programs

FREEZE A: lets you play back a certain segment of a recorded sound by indicating with parameters the point during the sound's duration at which you wish to initate and stop the sound's reproduction; playback can also be triggered via an audio signal.

FREEZE B: features loop-playback and permits the alteration of the recorded sound's pitch; recorded sounds can also be used as a sound source for MIDI keyboards.

Note: Use the FINE parameter to adjust the audible pitch of pitch-changed sounds should the resultant tone be off-pitch.

Record a word, give it some rhythm, and use it as an effect

—How to use preset program No. 25, FREEZE A—

Actually you can record anything you want as a source, but, for purposes of explanation, we'll use the word "touch" as a source sound.
Connect a microphone to the INPUT jack on the back of the SPX90 and record your voice as you say "touch." When you play back the sound, you can add rhythm to it according to how you time the pressing of the PARAMETER INCREMENT/DECREMENT switch on the front panel; for example, you can reproduce "touch" as "t-t-t-touch", "t-touch", "t-t-t-t-touch", etc. Instead of using the front panel switch, you can also trigger playback with a footswitch or a key on a connected MIDI keyboard.

Triggering playback with an audio signal

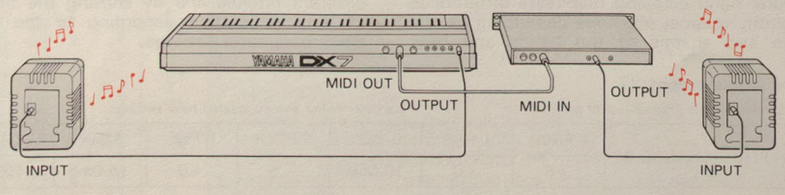
—Another suggested use for preset program No. 25, FREEZE A—

One effect popular with many sound engineers is a technique using a mixed sound comprising the sound of a real snare drum combined with that of a drum machine. The combined sound is produced by synchronizing the generation of the drum machine sound with the playing of the genuine instrument. One of the FREEZE A preset program's major features is the INPUT TRG. This function, lets you create this effect on the SPX90.
First, record the drum machine's snare voice with the SPX90, then set up a microphone for triggering the effect near the real snare drum, connect the mike to the SPX90, and set the INPUT TRG. parameter to on. Each time the snare drum is played, the resulting audio signal will trigger the simultaneous reproduction of the recorded drum machine sound.
You can also mix the sounds of the real snare and the drum machine-produced snare by using the same microphone for pickup and effect-triggering. Set the parameters to achieve the sound you like best.

Using recorded sounds as the sound source for a MIDI keybaord

—How to use preset program No. 26, FREEZE B—

With FREEZE B you can use a sampled sound as the source sound for reproduction with a MIDI keyboard. This feature is especially convenient when you want to reproduce two voices simultaneously but you're keyboard only has the capability to produce one at a time. As an example, let's suppose you want to reproduce a combination of piano and strings. Sample one voice with the SPX90, for purpose of example, the piano. By connecting the SPX90 to your keyboard and using the keyboard to trigger the sampled voice, you can generate both voices simply by playing the keyboard (in our example, the keyboard generates the string voice). As you will soon hear, this effect program lets you apply the SPX90 as an easy-to-use sampling synthesizer that produces voices rich in tonal quality.



PAN

The PAN effect programs were designed to automatically provide the effect achieved by rotating the pan control on a mixing console from left to right or vice-versa. Even professionals often have to use the pan control to create this effect because it's so difficult to find a satisfactory program for automatic panning.
The SPX90's two preset automatic panning effect programs will move your sound images in exactly the right direction at exactly the right time and speed, all according to how you set the parameters. You will be able to move your sound images between the left and right channels both periodically and dimensionally.

The PAN-type preset programs

AUTO PAN: provides the effect of continuous movement, also back and forth, across the stereo field.

TRIGGERED PAN: moves the sound image when triggered; trigger level, attack time, panning time, panning direction, etc., are some of the controllable parameters available; can be triggered via MIDI Note ON/OFF signal or a footswitch.

Powerful, five-second cycle "round-trip" panning

The parameter settings presented in Data Arrangement 28 are for adding a little variation to what might otherwise be a monotonous background sound.
The Panning Speed parameter is set at 0.2 Hz, resulting in two "round trips (sound moves in one direction, then returns to its original position)" across the stereo field every ten seconds. That means one round trip every five seconds, just slow enough that you can practically see the sound image moving. The extremely powerful feeling of motion is rendered by the Depth and Balance parameters, both of which are set at 100%
When you want to coordinate the timing of the panning effect with the tempo of your music, use the formula shown below to calculate the appropriate Pan Speed parameter value after having determined the desired duration of the pan.

$$\text{PAN SPEED (Hz)} = \frac{1}{\text{Pan duration (seconds)}}$$

Data Arrangement 28

No. & name of the original preset program / Parameter name and suggested new settings

		PAN SPEED	DIRECTION	DEPTH	BALANCE	OUT LVL
27	AUTO PAN	0.2Hz	L↔R	100%	100%	100%

Triggering the pan effect via footswitch

The Triggered Pan preset can be activated by any of three methods: automatically when the input level exceeds a certain set level, via a MIDI signal (MIDI Note ON/OFF signal), or by means of a footswitch. In the case of the last method, you must watch your timing so that you can trigger the effect at just the right moment. For example, you can accentuate a certain portion or phrase of a song by turning the footswitch on just at the right instant. The parameter settings suggested in Data Arrangement 29 move the sound image rather rapidly between the right and left channels.

Data Arrangement 29

No. & name of the original preset program / Parameter name and suggested new settings

		TRG. LEVEL	TRG. DLY	TRG. MSK	ATTACK	PANNING	RELEASE	DIRECTION
28	TRIGGERED PAN	100	– 10ms	1000ms	260ms	525ms	840ms	L→R

L/R BALANCE	MIDI TRG.	BALANCE	OUT LVL
30%	OFF	100%	100%

VIB (Delay Vibrato)

When vocalists want to add delicate, dramatic emphasis to a performance, one technique often used is to waver the tone of the voice. This technique is vibrato, and it is also employed in instrumental music to achieve the same sort of expressiveness. The SPX90's VIB-type programs yield the same effect electronically. With the Delay Vibrato programs, you can set the effect's trigger level, how long it will take for the effect to reach its maximum depth, the speed of vibration, and the depth (i. e. strength) of the vibrato. Thus you are able to tailor the vibrato to best fit the instruments used and the character of your music.

The VIB-type preset programs

DELAY VIBRATO: lets you apply a light vibrato effect to a signal below a set level for a set duration; can also be triggered from an external MIDI control source:

A light, casual vibrato effect

The parameter settings suggested in Data Arrangement 30 are for applying a vibrato effect in correlation to the strength of the touch of the person playing an instrument and are especially practical for voices that fade away slowly. The effect is triggered immediately when the instrument is played lightly, and after the input signal has fallen below a certain level when the instrument is played loudly. This effect is perfect for adding a natural, distinctively "vocal" vibrato effect to the guitar, piano, violin, or keyboard instrument.

Data Arrangement 30

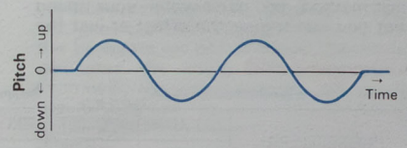
No. & name of the original preset program — Parameter name and suggested new settings

		TRG. LEVEL	VIB DLY	VIB RISE	VIB FRQ	VIB DEPTH	MIDI TRG.	BALANCE
29	DELAY VIBRATO	60	1ms	260ms	5.2Hz	56%	OFF	100%

OUT LVL
100%

VIBRATO—The beautiful out-of-tune effect

Next to reverberation and echo, vibrato is perhaps the oldest and most frequently used effect in music. Singers use it. String players use it. Wind players use it. For acoustic instruments—including voice—it is the most accessible and naturally beautiful effect there is. But what is it? Simply, vibrato is a periodic variation in pitch, centered around the desired note. It is interesting that with vibrato you never actually "hit" the note you're singing or playing, you just pass through it.



Vibrato basically has only two parameters: speed and depth. Speed (or frequency) refers to how rapidly the pitch varies, and depth to how much it varies. In the SPX90, however, you have a few more parameters to play with. DELAY, for example, lets you program the vibrato effect to begin a certain length of time after a note is played. Singers do this quite frequently—applying vibrato only towards the end of a note. Also, vibrato is usually applied gently, starting out quite shallow and gradually building up to full depth. The SPX90 VIBRATO RISE TIME parameter lets you simulate this effect.

Despite the fact that vibrato is basically an "out of tune" effect, it adds tremendous depth and richness to all music.

PEQ (Parametric EQ.)

PEQ-type programs allow you to perform middle and high band equalization, an effect indispensable for effectively varying sound expressions. The parameters can set the center frequencies, the amount of gain, and the bandwidth of the middle and high bands.

The SPX90's PEQ effect capability also features a high-pass and low-pass filter for appropriately dealing with signals below or above the cutoff frequencies. In addition, all sounds, from originals to equalized ones, can be delayed.

The PEQ-type preset programs

PARAMETRIC EQ: gives significant control over the frequency response of a sound.

Telephone voices

The tonal quality of a voice on the telephone differs from the real voice. This is because of the telephone's narrow frequency response band which peaks at 2—3 kHz. The parameters in Data Arrangement 31 reproduce this same narrow frequency response range. Thus, by using the SPX90's Parametric EQ program, you can recreate the frequency characteristics of the telephone to produce a "telephone voice." Try this effect out on the words in a song to give special emphasis. Watch the input levels to avoid distortion, both frequency ranges are boosted by 15dB!

Data Arrangement 31

No. & name of the original preset program — Parameter name and suggested new settings

		HPF	MID FRQ	MID GAIN	MID Q	HI FRQ	HI GAIN	HI Q
30	PARAMETRIC EQ.	1.0kHz	2.2kHz	+15dB	0.9	2.5kHz	+15dB	1.0

LPF	DLY	BALANCE	OUT LVL
4.5kHz	0.1ms	100%	100%

Bring your backing chorus into harmony

The parameter settings introduced in Data Arrangement 32 will accentuate the high frequency response range of a backing chorus to remove the cloudiness and lighten the weightiness caused by divergent voice qualities. The result will be clear, refreshing harmony.

Data Arrangement 32

No. & name of the original preset program — Parameter name and suggested new settings

		HPF	MID FRQ	MDI GAIN	MID Q	HI FRQ	HI GAIN	HI Q
30	PARAMETRIC EQ.	630Hz	4.0kHz	+5dB	1.0	8.0kHz	+14dB	4.8

LPF	DLY	BALANCE	OUT LVL
THRU	5.0ms	100%	100%

PRESET PROGRAMS (ROM CONTENTS)

MEM. No.	PROGRAM NAME	TYPE	PRM. No.	PARAMETER	PRESET VALUE	RANGE
1	REV 1 HALL	REV	1	REV TIME	2.6s	0.3 ~ 99.0s
			2	HIGH	0.6	0.1 ~ 1.0
			3	DELAY	30.0ms	0.1 ~ 50.0ms
			4	HPF	THRU	THRU, 32Hz ~ 1.0kHz
			5	LPF	8.0kHz	1.0kHz ~ 11kHz, THRU
2	REV 2 ROOM	REV	1	REV TIME	1.5s	0.3 ~ 99.0s
			2	HIGH	0.7	0.1 ~ 1.0
			3	DELAY	20.0ms	0.1 ~ 50.0ms
			4	HPF	THRU	THRU, 32Hz ~ 1.0kHz
			5	LPF	8.0kHz	1.0kHz ~ 11kHz, THRU
3	REV 3 VOCAL	REV	1	REV TIME	2.4s	0.3 ~ 99.0s
			2	HIGH	0.5	0.1 ~ 1.0
			3	DELAY	45.0ms	0.1 ~ 50.0ms
			4	HPF	80Hz	THRU, 32Hz ~ 1.0kHz
			5	LPF	8.0kHz	1.0kHz ~ 11kHz, THRU
4	REV 4 PLATE	REV	1	REV TIME	1.8s	0.3 ~ 99.0s
			2	HIGH	0.7	0.1 ~ 1.0
			3	DELAY	10.0ms	0.1 ~ 50.0ms
			4	HPF	40Hz	THRU, 32Hz ~ 1.0kHz
			5	LPF	10kHz	1.0kHz ~ 11kHz, THRU
5	EARLY REF. 1	E/R 1	1	TYPE	HALL	HALL/RANDOM/REVERSE PLATE
			2	ROOM SIZE	2.0	0.1 ~ 20.0
			3	LIVENESS	5	0 ~ 10
			4	DLY	10.0ms	0.1 ~ 400.0ms
			5	LPF	THRU	1.0kHz ~ 11kHz, THRU
6	EARLY REF. 2	E/R 2	1	TYPE	HALL	HALL/RANDOM/REVERSE PLATE
			2	ROOM SIZE	2.0	0.1 ~ 20.0
			3	LIVENESS	5	0 ~ 10
			4	DLY	10.0ms	0.1 ~ 400.0ms
			5	LPF	THRU	1.0kHz ~ 11kHz, THRU
7	DELAY L, R	DELAY	1	Lch DLY	100.0ms	0.1 ~ 500.0ms
			2	Lch F.B	+0%	−99 ~ +99%
			3	Rch DLY	200.0ms	0.1 ~ 500.0ms
			4	Rch F.B	+0%	−99 ~ +99%
			5	HIGH	1.0	0.1 ~ 1.0
8	STEREO ECHO	ECHO	1	Lch DLY	170.0ms	0.1 ~ 250.0ms
			2	Lch F.B	+60%	−99 ~ +99%
			3	Rch DLY	178.0ms	0.1 ~ 250.0ms
			4	Rch F.B	+58%	−99 ~ +99%
			5	HIGH	0.9	0.1 ~ 1.0
9	STEREO FLANGE A	MOD.	1	MOD. FRQ	2.5Hz	0.1 ~ 20.0Hz
			2	MOD. DEPTH	50%	0 ~ 100%
			3	MOD. DLY	1.2ms	0.1 ~ 100.0ms
			4	F.B GAIN	35%	0 ~ 99%
10	STEREO FLANGE B	MOD.	1	MOD. FRQ	0.5Hz	0.1 ~ 20.0Hz
			2	MOD. DEPTH	90%	0 ~ 100%
			3	MOD. DLY	1.0ms	0.1 ~ 100.0ms
			4	F.B GAIN	40%	0 ~ 99%
11	CHORUS A	MOD.	1	MOD. FRQ	0.2Hz	0.1 ~ 20.0Hz
			2	DM DEPTH	50%	0 ~ 100%
			3	AM DEPTH	40%	0 ~ 100%
12	CHORUS B	MOD.	1	MOD. FRQ	0.6Hz	0.1 ~ 20.0Hz
			2	DM DEPTH	50%	0 ~ 100%
			3	AM DEPTH	10%	0 ~ 100%
13	STEREO PHASING	MOD.	1	MOD. FRQ	1.1Hz	0.1 ~ 20.0Hz
			2	MOD. DEPTH	100%	0 ~ 100%
			3	MOD. DLY	3.0ms	0.1 ~ 8.0ms
14	TREMOLO	MOD.	1	MOD. FRQ	6.0Hz	0.1 ~ 20.0Hz
			2	MOD. DEPTH	50%	0 ~ 100%
15	SYMPHONIC	MOD.	1	MOD. FRQ	0.7Hz	0.1 ~ 20.0Hz
			2	MOD. DEPTH	50%	0 ~ 100%
16	GATE REVERB	E/R 2	1	TYPE	RANDOM	HALL/RANDOM/REVERSE PLATE
			2	ROOM SIZE	2.0	0.1 ~ 20.0
			3	LIVENESS	5	0 ~ 10
			4	DELAY	20.0ms	0.1 ~ 400.0ms
			5	LPF	6.3kHz	1.0kHz ~ 11kHz, THRU
17	REVERSE GATE	E/R 2	1	TYPE	REVERSE	HALL/RANDOM/REVERSE PLATE
			2	ROOM SIZE	3.3	0.1 ~ 20.0
			3	LIVENESS	5	0 ~ 10
			4	DELAY	25.0ms	0.1 ~ 400.0ms
			5	LPF	THRU	1.0kHz ~ 11kHz, THRU
18	ADR·NOISE GATE	GATE	1	TRG. LEVEL	65	1 ~ 100
			2	TRG. DLY	−7ms	−100 ~ +100ms
			3	TRG. MSK	5ms	5 ~ 32000ms
			4	ATTACK	5ms	5 ~ 32000ms
			5	DECAY	5ms	5 ~ 32000ms
			6	DECAY LVL	100%	0 ~ 100%
			7	HOLD	90ms	1 ~ 30000ms
			8	RELEASE	5ms	5 ~ 32000ms
			9	MIDI TRG.	OFF	OFF,ON

MEM. No.	PROGRAM NAME	TYPE	PRM. No.	PARAMETER	PRESET VALUE	RANGE
19	COMPRESSOR	GATE	1	TRG. LEVEL	89	1 ~ 100
			2	TRG. DLY	−25ms	−100 ~ +100ms
			3	TRG. MSK	420ms	5 ~ 32000ms
			4	ATTACK	22ms	5 ~ 32000ms
			5	HOLD	28ms	1 ~ 30000ms
			6	HOLD LEVEL	1%	0 ~ 100%
			7	RELEASE	525ms	5 ~ 32000ms
			8	MIDI TRG.	OFF	OFF,ON
20	REVERB & GATE	R&G	1	REV TIME	2.0s	0.3 ~ 99.0s
			2	HIGH	0.6	0.1 ~ 1.0
			3	DELAY	10.0ms	0.1 ~ 50.0ms
			4	HPF	THRU	THRU, 31Hz ~ 1.0kHz
			5	LPF	THRU	1.0kHz ~ 11kHz, THRU
			6	TRG. LEVEL	65	1 ~ 100
			7	HOLD	150ms	1 ~ 30000ms
			8	RELEASE	5ms	5 ~ 32000ms
			9	MIDI TRG.	OFF	OFF,ON
21	PITCH CHANGE A	PITCH	1	PITCH	+0	−12 ~ +12
			2	FINE	+0	−100 ~ +100
			3	DELAY	0.1ms	0.1 ~ 400.0ms
			4	F.B GAIN	0%	0 ~ 99%
			5	BASE KEY	C3	OFF, C1 ~ C6
22	PITCH CHANGE B	PITCH	1	1 PITCH	+0	−12 ~ +12
			2	1 FINE	+8	−100 ~ +100
			3	1 DLY	0.1ms	0.1 ~ 400.0ms
			4	2 PITCH	+0	−12 ~ +12
			5	2 FINE	−8	−100 ~ +100
			6	2 DLY	20.0ms	0.1 ~ 400.0ms
23	PITCH CHANGE C	PITCH	1	L PITCH	+0	−12 ~ +12
			2	L FINE	+8	−100 ~ +100
			3	L DLY	0.1ms	0.1 ~ 200.0ms
			4	R PITCH	+0	−12 ~ +12
			5	R FINE	−8	−100 ~ +100
			6	R DLY	0.1ms	0.1 ~ 200.0ms
24	PITCH CHANGE D	PITCH	1	PITCH	+0	−12 ~ +12
			2	FINE	+0	−100 ~ +100
			3	DELAY	0.1ms	0.1 ~ 400.0ms
			4	F.B GAIN	0%	0 ~ 99%
			5	BASE KEY	C3	OFF, C1 ~ C6
25	FREEZE A	FREEZE	1	REC MODE	AUTO	MANUAL/AUTO
			2	TRG. DLY	−5ms	−500 ~ +500ms
			3	RECORD	–	–
			4	OVER DUB	–	–
			5	PLAY	–	–
			6	START	0	0 ~ 500
			7	END	500	0 ~ 500
			8	INPUT TRG.	OFF	OFF,ON
26	FREEZE B	FREEZE	1	REC MODE	MANUAL	MANUAL/AUTO
			2	TRG. DLY	−50ms	−500 ~ +500ms
			3	RECORD	–	–
			4	OVER DUB	–	–
			5	PLAY	–	–
			6	PITCH	+0	−12 ~ +12
			7	FINE	+0	−100 ~ +100
			8	BASE KEY	C3	OFF, C1 ~ C6
27	AUTO PAN	PAN	1	PAN SPEED	0.7Hz	0.1 ~ 20.0Hz
			2	DIRECTION	L → R	L → R, L ← R, L ↔ R
			3	DEPTH	75%	0 ~ 100%
28	TRIGGERED PAN	PAN	1	TRG. LEVEL	65	1 ~ 100
			2	TRG. DLY	−10ms	−100 ~ +100ms
			3	TRG. MSK	1000ms	5 ~ 32000ms
			4	ATTACK	22ms	5 ~ 32000ms
			5	PANNING	525ms	5 ~ 32000ms
			6	RELEASE	840ms	5 ~ 32000ms
			7	DIRECTION	L → R	L → R, L ← R
			8	L/R BALANCE	30%	0 ~ 100%
			9	MIDI TRG.	OFF	OFF,ON
29	DELAY VIBRATO	VIB	1	TRG. LEVEL	100	1 ~ 100
			2	VIB DLY	400ms	1 ~ 30000ms
			3	VIB RISE	1400ms	5 ~ 32000ms
			4	VIB FRQ	7.0Hz	0.1 ~ 20.0Hz
			5	VIB DEPTH	40%	0 ~ 100%
			6	MIDI TRG.	ON	OFF,ON
30	PARAMETRIC EQ.	PEQ	1	HPF	THRU	THRU, 32Hz ~ 1.0kHz
			2	MID FRQ	500Hz	315Hz ~ 4.0kHz
			3	MID GAIN	+0dB	−15 ~ +15dB
			4	MID Q	1.0	0.5 ~ 5.0
			5	HI FRQ	2.0kHz	800Hz ~ 8.0kHz
			6	HI GAIN	+0dB	−15 ~ +15dB
			7	HI Q	1.0	0.5 ~ 5.0
			8	LPF	THRU	1.0kHz ~ 11kHz, THRU
			9	DLY	0.1ms	0.1 ~ 400.0ms

* Output balance and level of all programs can be memorized.
BALANCE, preset value: 100% (except Mem No. 9: 50% No. 10: 75%) range:
0 ~ 100% LEVEL, preset value: 100%, range: 0 ~ 100%

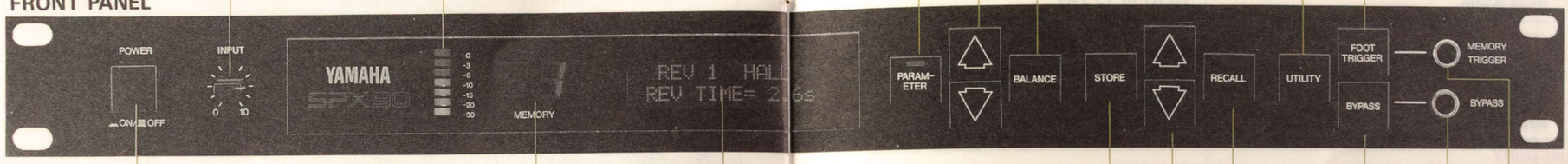
SPX90 PANEL LAYOUT

Input Level Control
Regulates the level of input signal. While watching the INPUT LEVEL meter, set the INPUT LEVEL control. The SPX90's 7-segment LED meter will keep you informed of optimum level and potential overload distortion. In this way, you can balance the output of the instrument to the input of the SPX90. Maximum gain of about 10dB is attainable.

Input Level Meter
This easy-to-read LED level meter is a visual aid to setting appropriate input levels. The LED's upper red segments will light continuously at overload levels.

Parameter Key
Selects successive effect parameters. Pressing this key sequentially calls the programmable parameters within a currently selected effect program. Once the desired parameter has been selected, the PARAMETER INCREMENT/DECREMENT keys are used to change the value of that parameter, thereby modifying the effect.

FRONT PANEL

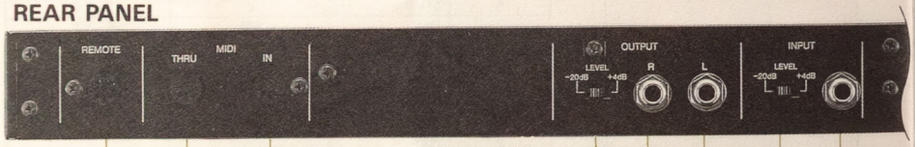


Power ON/OFF Switch
When the power is turned ON, the program which was selected immediately before the power was last turned OFF will be re-selected.

Memory Number LED
This LED display shows the number of the currently selected program. Memory numbers 1 through 30 contain factory-preset effects. Memory numbers 31 through 90 can be used to store edited versions of the preset effects.

LCD Program and Parameter Indicator
High-contrast Liquid Crystal Display indicates effect name and parameter data value.

REAR PANEL



MIDI IN Terminal
Permits SPX90 effect programs to be automatically selected via a MIDI signal. When the Freeze or Gate program is selected, the effect can be triggered via MIDI, also the pitch will be controlled at the Pitch change program.

Output Level Selector (−20dB, +4dB)
Facilitates source/line level (sensitivity) matching.

MIDI THRU Terminal
Re-transmits MIDI data received at the MIDI IN terminal to subsequent MIDI instruments.

Remote Control Connector
Permits remote access to SPX90 effect programs. The optional remote control unit permits direct access to programs 1 through 7 and 31 through 37, while all other preset programs may be accessed sequentially.

Output Jack (L and R)
These standard mono 1/4" phone jacks deliver the direct and effect signals to subsequent mixing or amplification equipment.

Input Level Selector (−20dB, +4dB)
Permits source/line level (sensitivity) matching.

Input Jack
This standard unbalanced mono 1/4" phone jack accepts the input signal to SPX90.

Parameter Increment/Decrement Keys
These keys are used to change the value of a selected parameter. Press the increment key (up arrow) to increase the value, or the decrement key (down arrow) to decrease the value.

Utility Key
Multi-purpose key accesses MIDI control functions, facilitates program title editing and sets footswitch memory control range.

Balance/Output Level Key
Adjusts proportion of effect signal to direct signal. Pressing this key alternately causes the current balance and output level values to be displayed on the LCD. The Parameter Increment/Decrement keys are then used to adjust the displayed values.

Foot Trigger Key
When this key is pressed and its LED is ON, the footswitch connected to the MEMORY TRIGGER jack functions as a foot trigger for the GATE and FREEZE programs, rather than for memory selection.

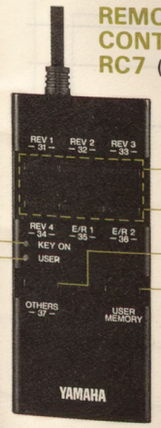
Store Key
Stores any edited preset effect in a selected RAM memory position (31 — 90).

Memory Increment/Decrement Keys
These keys select any desired memory number to call a specific program or store an edited program in the user memory area. The selected memory number is shown on the MEMORY NUMBER display. When a new memory number is called, the MEMORY number display will flash until either the STORE or RECALL function is activated.

Recall Key
Press this key to recall the program that resides in the selected memory number.

Bypass Key
When this key is pressed, the effect signal is shut off and only the direct signal will be output. Direct signal level is affected by the INPUT LEVEL control setting.

REMOTE CONTROLLER RC7 (optional)



Preset keys.

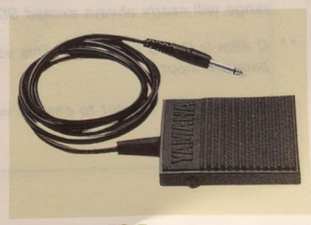
This LED lights whenever a remote control key is pressed.

It is possible to call user programs when this LED is lighted.

When this key is pressed, the USER LED will light and it becomes possible to select user programs 31 through 37.

Bypass Footswitch Jack
Facilitates foot control of the BYPASS function. A Yamaha FC-5 Footswitch is recommended.

Memory/Trigger Footswitch Jack
Facilitates remote memory selection via optional footswitch. The range of memory locations to be recalled by the footswitch can be set with a Utility program. When the foot trigger function is ON, the footswitch connected to this jack acts as the trigger footswitch rather than memory control. Use of a Yamaha FC5 Foot Controller is recommended.



Footswitch FC-5 (optional)

SPX90 SPECIFICATIONS

INPUT	
Number of Channels	Unbalanced x 1 (Phone Jack)
Nominal Level	−20 dBm/+4 dBm, Selectable
Impedance	10 k-ohms
Level Control	Volume, Max. Gain +12 dB
Level Monitor	7 points LED
A/D CONVERSION	
Number of Channels	1
Sampling Freq.	31.25 kHz
Quantization	Linear 16 Bit
Band Width	20 Hz to 12 kHz
D/A CONVERSION	
Number of Channels	2
Sampling Freq.	31.25 kHz
Quantization	Linear 16 Bit
Band Width	20 Hz to 12 kHz
OUTPUT	
Number of Channels	Unbalanced x 2 (Phone Jack)
Nominal Level	−20 dBm/+4 dBm, Selectable
Impedance	600 ohms
Mixing	Direct Signal, Effect Signal
Bypass	ON/OFF
MEMORY	
Presets (ROM)	1~30
User Memory (RAM)	31~90 (Non Volatile)
	All parameters except Input Level, can be memorized.
MIDI CONTROL	MIDI Channel (1 to 16, OMNI), (4 banks), Program Number (1 to 128) Note on/off is recognized only for Programs 18~21, 24~26, 28~29
FRONT PANEL	
Display	16 character 2 lines LCD x 1, 2 digits numeric LED for Memory No., 7 points level meter LED
Knob	Input Level Volume
Keys	Parameter/Balance/Data Increment/ Data Decrement, Memory Store/ Recall/Memory Increment/Memory Decrement, Utility/Foot Trigger/ Bypass
PERFORMANCE SPECIFICATIONS	
Dynamic Range	Reverb: more than 75 dB
	Delay : more than 81 dB
Distortion	Bypassed Signal: less than 0.01%
	Effect Signal : less than 0.03%
Band Width	Bypassed Signal: 20 Hz to 20 kHz
	Effect Signal : 20 Hz to 12 kHz
POWER SUPPLY	
U. S. & Canadian Models	110V−120V, 60 Hz
General Model	220V−240V, 50/60 Hz
POWER CONSUMPTION	
U. S. & Canadian Models	20W
General Model	20W
DIMENSIONS (W x H x D)	480mm x 45.2mm x 285mm (18-7/8'' x 1-3/4'' x 11-1/4'')
WEIGHT	3.2 kg (7 lbs)
OPTIONAL REMOTE CONTROL (model RC7)	PRESET PROGRAM 1~30, USER MEMORY 31~37

* *NOTE: Since natural sounding reverberation is mixed with the direct sound, and hence does not constitute 100% of the sound, the effective dynamic range will nearly always exceed 90 dB.*

** *0 dBm is 0.775 volts RMS. This value represents voltage across a high impedance input.*

Specifications subject to change without notice.

USER PROGRAMMING TABLE

Program No. Type

Program Title

Parameter	New Value

Remarks

Program No. Type

Program Title

Parameter	New Value

Remarks

Program No. Type

Program Title

Parameter	New Value

Remarks

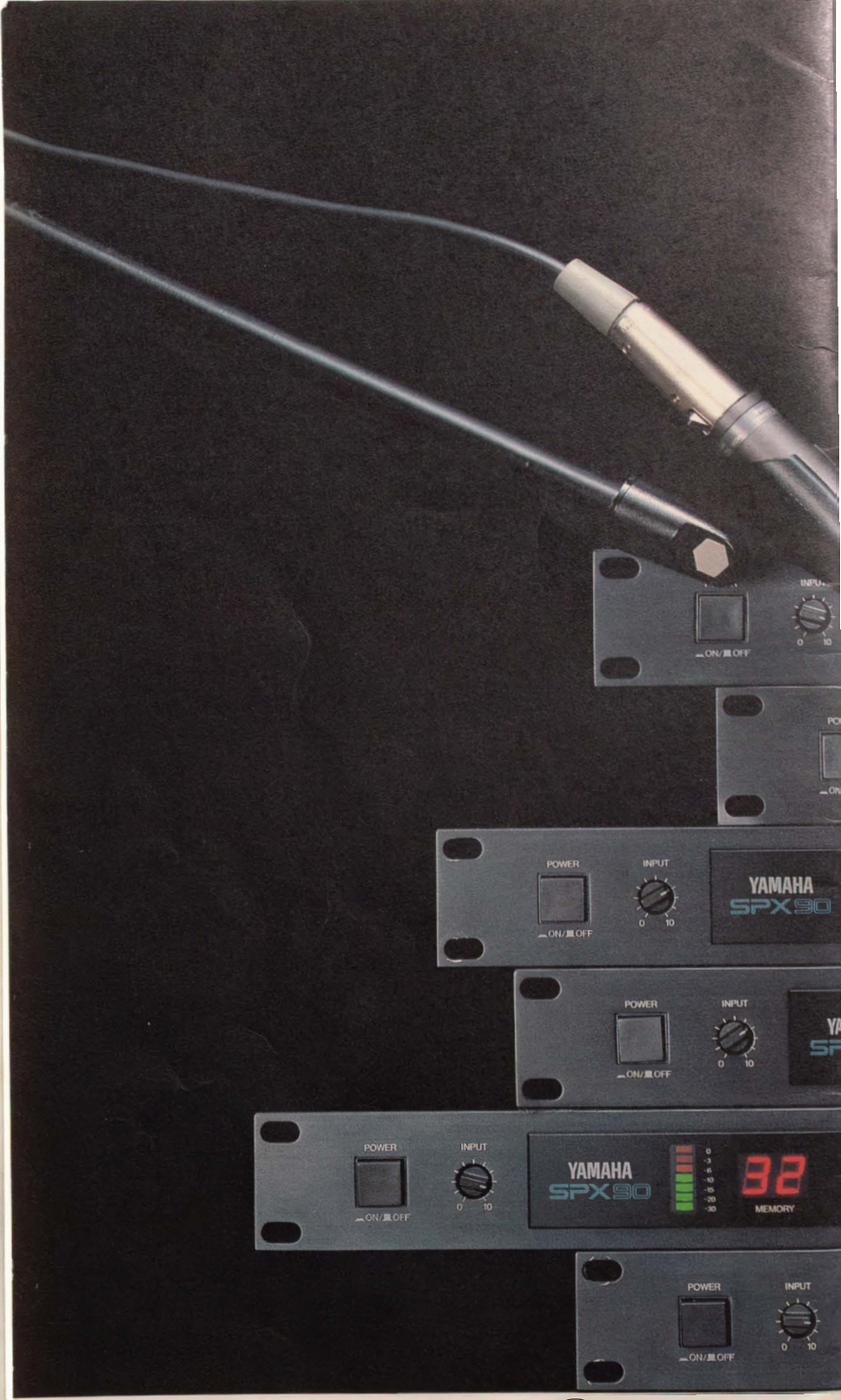
Program No. Type

Program Title

Parameter	New Value

Remarks

DATA MEMO



For details please contact:

SINCE 1887 YAMAHA

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN

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