YAMAHA

BLUE BOOK

CS1x
CONTROL SYNTHESIZER

YAMAHA

BLUE BOOK :CS1x
Advanced User Guide

YAMAHA

➤ Foreword

With the CS1x Yamaha have created a multi-faceted entry-level synth which to an attractive price offers endless possibilities for live performance and music production in general.

YAMAHA EUROPA is aiming to provide users with an extensive range of information regarding the use of the keyboard and software.

Our thanks go out to **Peter Krischker** and **Matthias Sauer**, the two **BLUE BOOK** authors who spent 3 months analysing the CS1x in every detail to give you, the user, all the real-world application tips, tricks and examples you need to help fully exploit all the possibilities the CS1x has to offer.

We would also like to thank YAMAHA Corporation Japan/SY Division for their support in realising the **BLUE BOOK**.

We are convinced that you will approve of this unprecedented guide, and are looking forward to any comments or suggestions you may have.

Gert Drögemüller

Product Manager for Synthesizer & Software

YAMAHA EUROPA

➤ About the Authors

Peter Krischker has worked for YAMAHA EUROPA as Sound Designer and Synthesizer Specialist for five years. In conjunction with other programmers he created the CS1x factory sounds, as well as its demo songs.

Matthias Sauer has programmed several synthesizer sound sets for YAMAHA EUROPA, and also writes for a well-known trade magazine.

➤ About BLUE BOOK CS1x

The CS1x brings colour into the current musical landscape. It's simply fun to be inspired by its intelligent Arpeggiator and fresh sounds, or the brilliant control possibilities of its knobs and Scenes. We wanted to pass our enthusiasm about this machine directly onto you. This is how the "BLUE BOOK" came about, a special kind of workbook that will give you an easy start into using the CS1x and provide an overview of this innovative synthesizer's countless possibilities.

The BLUE BOOK isn't aiming to be a manual. Rather, it will describe the most important steps needed to put the CS1x's potential into practice, unlike a manual which is merely concerned with documenting each and every function and parameter. The BLUE BOOK concept dictates that you should be able to read through it from beginning to end. Don't be deterred however by the broad subject range covered in this book; there are many sides to the CS1x. Nevertheless, to give you the quickest start possible, we recommend you skip straight to the sections of particular interest to you. If you require more in depth details about any particular function, you can always look these up in the manual.

Please consider the BLUE BOOK as a 'guide' to your practical work. It is possible to learn about the underlying foundations of CS1x sound and song programming 'from the ground up' so to speak. We have prepared many exercises and practical examples to help you understand each technique, function or problem you may encounter.

This practical guide is accompanied by two fbppy disks, each containing various sounds, sequences and other tools. If you don't already know how to transfer these sounds from your computer to the CS1x, please look at section "*Saving and managing Performances*" in the introduction.

The "*Tutorial Disk*" contains several fles with additional sound examples, short demos and other MIDI fles which we will reference in the text. A second diskette, "BLUE X-TRA" contains the User Bank Performances (Factory) and further factory sounds ("EXTRA Bank") which can be used to replace the User Bank. The BLUE BOOK Appendix contains a summary of all these fles.

Finally we would like to point you to section "*The little trouble shooter*" at the end of this book. This short checklist attempts to help with any problems you may encounter. We hope you have a lot of fun with the BLUE BOOK and your CS1x.

Peter Krischker / Matthias Sauer

Contents

⩇ Introduction

Now that you have unpacked your CS1x, placed it onto a firm surface and wired up and plugged everything in correctly, we would like to accompany you a little during this first contact with your new synthesizer. Naturally you will want to listen to the demo songs straight away to get a feel for the tonal possibilities of the CS1x.

First steps – Listening to the Preset sounds and Demos

Press the Performance and Multi keys simultaneously. You can now hear the first song "FRIDGE", all the other sequences will follow automatically. You can of course manually select each of these song examples via the numeric pad.

A total of **8 demos** are available. Although each sequence is primarily concerned with showing the CS1x in its best light, the sequences are still quite different: by tradition, the first four demos (0-3) set out to prove the song production abilities of the CS1x and it's possibilities as a stand-alone workstation, whilst the remaining songs deal with the CS1x's more outstanding features. Here is a quick description:

Knob Tech (4): Sequences that demonstrate real-time knob control for Dance & Techno productions.

(programmed by Peter Krischker, YE)

Analuner (5): Synthesizer sounds of the 70's and 80's. If you appreciate classic vintage sounds you must take a listen to this demo.

(programmed by Johannes Waehneldt, YE).

Arp Tech (6): Here you will hear one of the CS1x highlights, the Arpeggiator. Unusual sequences and likewise sounds.

(programmed by Johannes Waehneldt, YE).

Transit (7): We finish on a few sequences that again demonstrate the real-time control and modulation possibilities of the CS1x.

(programmed by Johannes Waehneldt, YE).

The factory preset sounds chosen for the CS1x clearly emphasise its synthesizer character. If you are at all unsure to what uses a particular sound may be applied, let yourself be guided by the **sound's category** (Sq=Sequencer, Ba=Bass, Pf=Piano etc. – more about this can be found in the manual).

Try this out at all cost: The CS1x **Arpeggiator** already shines brightly with the first 12 Performances. Press any key and listen how the Arpeggiator translates the note. To understand this better, switch the Arpeggiator off (key bearing the same name, to the top left of the LC-Display). Also, try using the unique **Scene switches** (just above the two wheels) with the preset sounds straight away; first press one, than the other, and finally both simultaneously, and use the Mod wheel, too. It's best to aquaint yourself with the CS1x **Control knobs** right from the start. Take particular note of the different Assign 1/2 settings (=Knob3/6). These will no doubt give you plenty of ideas for your own sounds.

If you're inclined to head straight for the more traditional piano, organ or string sounds, don't panic – here, too the CS1x is at home. After all, it contains all the **GM/XG sounds**. If you have not yet come across these sounds, why not press the MULTI key. You can now try out the most important XG voices using the PROGRAM keys (bottom left of the LC-Display) in your own time. Be advised however that all sounds initially utilise only a reverb effect.

More **conventional sounds**, complete with Layer and effect settings can be found in the Preset bank's last few memories (beginning with P078). By the way, several of the Blue Book sections will look at the factory sounds in more depth.

At a glance

Techno and Dance have heralded the comeback of analogue synthesizers more then any other music style. Whilst trying out some of its Presets you will already have come across some of the many exemplary analogue type sounds the CS1x has to offer. Without a doubt, the range of sounds available is pretty good! It's even better however to be able to shape Performances to get the required result, or program one from scratch.

Starting out is never easy. That is why we would like to begin with an easy to understand tutorial which covers the most important components of the classic synthesizer, the "Analogue Workshop". Let us introduce you to the wonderful world of synthesizer programming with the CS1x. As an extra special treat, a complete sound bank ("TUTORIALPFM.MID") with detailed sound examples awaits you inside. We thought it best to save you from the tedious task of manually punching in data. You will be able to concentrate fully on the material at hand and replicate each given example directly on your CS1x.

It doesn't really matter whether you have already worked with various analogue synthesizers, or if you have never even heard of this feature – the integrated CS1x **Arpeggiator** will simply knock your socks off: compared to earlier Arpeggiators, the CS1x raises the stakes with complete arrangement structures, including Filter, Pan position modulation and the like. Enough to awaken any musician's playing instinct.

However, to use this feature effectively you should fully familiarise yourself with all its possibilities and the required procedures. The next chapter of the Blue Book will take you through all the steps you need to consider when using the Arpeggiator function. That's why an intuitive user interface is so important, so that you don't get lost in a myriad of menus. The CS1x is totally deserving of its "**Control Synthesizer**" title in this respect. Its six controllers add particular weight to this claim: The Sound Control Knobs can be assigned to aid performance in many different ways using the Utility mode (see the chapter about song production basics, section "*Who is controlling Who?*"). Worthy of attention also are the two Scene switches that are used to 'freeze' two complete controller positions which can then be 'morphed' into each other. You will find useful examples of this in

chapter "*Performance Mode – Practical Knowledge*", where we also deal with subjects relevant to 'live' musicians. In short, the entire user interface is praise worthy. For example, the EDIT key has finally been eliminated; the EDIT mode is automatically activated the minute you call up any parameter.

Modern synthesizers however have to offer more than excellent sounds and a high degree of user-friendliness; they also need to excel as a stand-alone sound source for song production.

The CS1x dispenses with an "on-board" sequencer. Instead it rightly concentrates on its **multi-timbral abilities**, i.e. the ability to simultaneously control as many sounds as possible. This is an area in particular where the CS1x has a lot to offer.

No less than 32 voices are available for all types of song production. This applies not only to the Multi mode, the Performance mode can be used multi-timbrally, too, and can therefore also be used for song production. What we are talking about here is the **parallel Multi mode**, where a Performance is the foundation on which a further 12 Parts (individual sounds or drum kits) can be built – an impressive 'first'. An alternative to this approach can be found in the Multi mode, which corresponds to the **XG mode**, itself an extension of GM (General MIDI).

If you want to deal with any questions arising from all this, take a look at chapter "*Song Production – The Basics*". It explains (amongst other things) all about the XG standard, examines the advantages and disadvantages of the Performance and Multi modes in depth, and looks at how song and Multi settings can be controlled in real-time using Controller or System Exclusive messages.

If you are eager to get going however and wish to produce good songs with the minimum of technical fuss, read chapter "*Song Production – An Easy Start*".

We recommend you read the chapter following if you prefer to use the more conventional way of changing **Multi settings** at the keyboard. The magic phrase for this alternative is "Dump Request", a System Exclusive message that allows the sequencer to request a dump from the CS1x that contains all the Multi settings – a very important feature!

Any final hurdles you encounter should be resolved in the following chapters. These contain many tips and tricks for song production and many other practical examples.

Now that you are familiar with the contents of the `Blue Book`, we would touch upon some global subjects that you should definitely know about – Performance structure and management.

Sound Organisation

The CS1x sound structure requires explanation. So let's take a quick look.

The CS1x contains two Performance Banks with 128 memory locations each: the **PRESET bank** (ROM) and the **USER bank** (RAM). The latter can be overwritten with a third bank, the **EXTRA bank** (Additions). You can load the EXTRA bank from the supplied disk as a SMF ("EXTRAPF.MID") and then transfer it to the CS1x (see *Sound Overview* in the Appendix). If necessary, consult section "*Performance Bulk Dump*".

A Performance is made up of **four Layers**. You can assign two entirely different kinds of voices to these:

- *XG Voices, which are contained in 44 banks and organised into 480 Programmes (DATA LIST, pages 6 – 9). The TG300B Voices offer a special selection of XG voices (DATA LIST, page 10/11), which in practice however is mostly irrelevant.*

- *"Voices for Performances" (DATA LIST, page 12/13); which from now on will be referred to as* `Material Voices`.

We should like to elaborate on these "Material Voices".

All **930 Material Voices** – with the exception of the drum sets – are organised into 12 banks (Pre 0-11). You will see from the table "*Voices for Performances*" that each bank is utilised to different extents. This is because the Material Voices are the result of the programming of PRESET, USER and EXTRA Performances. Therefore: the Material Voices are identical to the Layers of these Performances. Take a look at this extract from the table below:

Table: Preset Performances, Layers and Material Voices

Preset Performances	Layer 1 = Preset 0	Layer 2 = Preset 1	Layer 3 = Preset 2	Layer 4 = Preset 3
001 Dr:um Trax1	Dr:umTrx1 A			
002 Sq:SinArp	Sq:SnArp1 A	Sq:SnArp1 B		
003 Sq:Kirmes	Sq:Kirmes A	Sq:Kirmes B	Sq:Kirmes C	
004 Sq:Classic	Sq:Classic A	Sq:Classic B		

Layers 1-4 of the Preset Performances make up Material Voice Banks Pre 00 to 03. Only bank Pre 00 is fully assigned. Quite logical really, as each Performance contains at least one Layer. In contrast, Bank 03 is hardly used at all, as Performances rarely use all 4 Layers.

This principle also applies to the **USER Performances**: Here Layers 1 – 4 are banks Pre 04 to 07 respectively. Finally, the user-loadable **EXTRA Performances** rely on the Additions, i.e. banks Pre 08 to 11.

If this is all getting far too theoretical for you, here's a little exercise that you can try.

✗PERIMENT:

Select Performance P-047 (BA:Bassline) and call up Parameter **Bank** and **Program**, one after another. The display will show "PRE0" and "Ba:Baslne A#47". A quick glance to table "*Voice for Performances*" confirms that you are dealing with Material Voice "Pre 00 – PGM 47". Now select Programs #48, #49, #50 etc. and compare the display with the Voice table. Everything clear now?

You have just gained a better insight into the sound structure of your CS1x, and at the same time learned how different Voices are chosen within a Performance. Let's take another step along this route.

✗PERIMENT:

Let's start with the last settings for Performance "Bassline". Select any Program from the Voice table. Memorise the Bank and Program numbers (e.g. "ld:Mini QSA" = Pre 08 + PGM #40), then input these values by calling up BANK and PROGRAM respectively.

Now select Layer 2 (PART LAYER key / +). Selecting BANK will show "Bank off" on the display. Let's make use of the DATA knob for a change – after all, you need to step through all the XG banks before you get to Material Voice banks Pre 00-12. This shows by the way that XG banks can also be

used for Performance layers. Now try to find a voice that works with the sound just set for Layer 1. You have just found the basis for your first sound creation!

The more alert readers among you may have noticed the mention of bank **Pre 12** in the last X-PERIMENT. This little riddle is easily solved by looking at the DATA LIST on page 14. Here you will find a further 6 Material Voices as **drum kits**, which can be found in Performances 128 to 128. These drum sounds are discussed in detail in section "*Techno/ Dance Productions with the CS1x*".

All the Voices shown in the DATA LIST (pages 12 – 14) can also be used for **Multi Parts 5-16** in the Performance mode (in addition to the XG voices and drum kits). There they can be selected using Bank/Program changes. More about this in chapter "*Song Production – the Basics*", which also looks at the somewhat neglected XG Voices in greater detail.

Performance Storage and Management

You can transfer single Performances or complete Performance Banks from the CS1x to any computer, be it a PC, Atari or MAC, and vice versa with the aid of a **Bulk Dump**. This allows you to save this sound data to floppy or hard disk. The same thing can be achieved with MIDI Data Recorders (as described in the manual) like. the MDF2. If desired you can keep an archive of CS1x Performances. If you have little or no experience in this field, we recommend you read this section carefully. First we would like to take a look at **transferring all USER Performances and UTILITY settings** to the computer and then back to the CS1x.

✕PERIMENT:

Call up UTILITY – BULK DUMP and dial-up function "**Bulk Dump All**". The following sequencer settings are required: MIDI Thru off, SysEx on, a slow tempo (around 80 bpm). Now start recording, wait for the count-in to finish and then start the transmission by choosing YES at the CS1x. Stop the sequencer as soon as it finishes receiving data, and save the newly recorded track, which now contains a long list of Sys-Ex blocks, to a floppy or a hard disk.

Transmitting the data back is just as easy. Warning: don't let yourself be irritated by the note about "**Bulk Dump Receive**" in the manual (page 42). This function, or one like it, simply isn't available on your CS1x! Data transmission is instead achieved simply by playing back the recorded sequencer track. You are not even required to set anything up on the CS1x. By the way, the display should confirm the incoming data with a "Receiving" message.

If you want to continue with the X-PERIMENT, load files *TUTORIAL.MID* (from the TUTORIAL DISK), *CSUSER.MID*, and *CSEXTRA.MID* (from the "BLUE X-TRA" disk") and send the respective banks to the CS1x.

Now that you have transferred various banks to the CS1x, you may wonder how Performances based on different banks can be combined. Simple: use the UTILITY function "**Bulk Dump 1 Perf**"!

✕PERIMENT:

Let's say you want to copy Performance 001 "Pf Wurlitza" from the Extra bank to the User bank. First of all send the Extra bank as described above ("CSEXTRA.MID") complete from the sequencer to the CS1x. Select memory location USER 001. Now call up UTILITY – BULK DUMP – "1 Perf",

start recording a new sequencer track (set this up as in the previous X-PERIMENT) and press YES. Follow this by sending the complete USER bank ("CSUSER.MID") to the CS1x. Finally, play back the earlier recorded Bulk Dump for the Extra Performance "Pf. Wurlitza". The sound is now initially held in the working memory of the CS1x, and can now be saved to the USER memory of your choice using STORE.

It should now be clear how single Performances are managed. As a rule of thumb however you will want to transmit one bank's several Performances into another. For this we would recommend you first send all the required Performances separately to the sequencer (1 track per sound!). Next transfer the target bank; now you can finally transmit the required Performances back to the CS1x, one by one. Remember however to STORE each Performance as it arrives, otherwise each transmitted Performance would simply overwrite the last held in the temporary work space of the CS1x. And it goes without saying of course that when finished you should send your newly created bank completely to the sequencer using "Bulk Dump All", and there save it to floppy or hard disk.

Analogue Workshop

The CS1x's easy to understand tone generation ability is largely based on analogue synthesis. The following step-by-step guide will serve as an introduction to the analogue building blocks used in the CS1x.

Our tips and tricks can be applied not only to analogue synthesis, but all kinds of tone generation. Naturally, we can't cover every possible detail of analogue synthesis.

Before we begin, a quick note about the fundamental differences between traditional analogue parameters and those found on your CS1x. Oscillators on the CS1x, unlike analogue oscillators, consist of complete timbres with filter, envelope and LFO settings (Material Voices). Therefore, any parameters that you set are 'offsets values' to the settings used in a particular sound, in other words the parameters you set may appear to audibly contradict the displayed values or Knob positions. As always, let your ears decide.

Please note: *although the following text refers to the analogue synthesizers' classic sound components like VCO, VCA or VCF, they are of course implemented digitally in the CS1x.*

Sound Central – The Oscillator

The heart of the classic synthesizer is the oscillator, or VCO (Voltage-Controlled-Oscillator). The oscillator provides the raw waveforms, which in the CS1x consist of samples with stable tuning. Usually these samples consist of sawtooth, triangle and square waves, as well as several pulse modulated waves. The VCO also controls the pitch of its wave. Coarse tuning is performed in semi-tone steps (Note Shift), fine tuning in cent steps (Detune), LFO's or envelope generators are also frequently used to modulate the pitch of the oscillator. This also applies to the VCA, which is responsible for amplifying the oscillators' audio outputs so that you may hear them. The CS1x Volume parameter is the equivalent of the VCA.

Picture the CS1x's four Layers as four separate VCOs. Each oscillator's waveform can be selected using the Bank and Program Change commands. As the CS1x doesn't provide for Material Voices with pure synthesizer waveforms, it would be necessary for you to laboriously create unfiltered pulse and sawtooth waves… don't worry, we have taken care of this rather dry and long-winded task: you will find many variants on the classic synthesizer waveforms in the first dozen memories of the **Performance Tutorial Bank**. You may of course employ any Performances as an Init Voice, as a reference sound to browse through the Material and XG voices, or simply to practice on. By the way, if you haven't already 'injected' your CS1x with our additional sound data (TUTORPF.MID), you should do so now (see section '*Performance Bulk Dumps*'). You will not be able to successfully complete our Analogue Workshop without it.

Lets begin with a simple but immensely useful example: if you are using two or more oscillators to generate your sound you should always detune each oscillator a little using the

Detune function. This single parameter can be used to liven up your sound. To hear this effect for yourself, try altering the Detune parameters of two CS1x VCOs.

✗PERIMENT:

Select Performance TP001. Both of this sound's oscillators are set to exactly the same frequency, resulting in a somewhat 'flat' sound. Now change the first VCOs Detune setting to a negative value, and the second to a positive one, say -2,00 and +2,00. Feel free to experiment with other values. Notice how these contrasting frequencies affect your sound. Be careful however not to detune just one of the VCOs (for example 0 and +4,00), as this can ruin the overall tuning of your sound! The two Detune values should always cancel each other out when added together. By the way, some Performances (namely TP003 or 005) use this Detune effect already.

Coarse tuning is another basic tool in the construction of sounds. The most practical use of coarse detuning involves transposing a VCO by one or more octaves. When doing this however, always make sure that the Detune parameter is set to 0. If the fancy takes you, you may even transpose an oscillator or CS1x Layer by a whole 4 Octaves! With a bit of luck you can program some impressive sounds using this feature. Intervals other than octaves may also be used for some specialised sounds, mostly 4ths or 5ths (5 or 7 semi-tone intervals), major or minor 3rds (3 or 4 semi-tones) aswell as major or minor 7ths (10 or 11 semi-tones).

✗AMPLE:

Sounds with transposed oscillators can be found in the CS1x Preset bank. The Layers of Performance "Sq: RytField" (P006) for example are tuned to 3rds (Note Shift -12/+04). Please note: to use this sound in minor harmonies you will need to adjust the second Layer's Note Shift value to +3 (minor 3rd). In contrast, Performances "Sc: TheWerks" (P022), "Fx: Orient" (P044) and "Ld: E-no" (P064) are downwardly transposed by a 4th. 5th layering is just as popular. Examples here are factory-set sounds "Sq: Strobe" (P009), "Fx: Morning" (P038), "Ld: Fifths" (P065) and "Ld: Croma" (P073).

So, now you know how and when to tune the oscillators, i.e. the CS1x Layers. We all know however that 'it's the sound that makes the music', so let's look at the VCO waveforms in more detail. Just as different synthesizers' filters all sound very different, VCOs, too, all have their own distinctive sound. Some analogue synths even allow smooth step-free transitions between sawtooth and triangle waves, two waveforms per oscillator and other such fun things. The CS1x isn't the odd one out here. It is possible for instance to coax two **Sawtooth Waves** with different sound characteristics from it. The first wave corresponds to the sawtooth waves that have already proven successful with YAMAHA's SY99 and SY85 synthesizers. New here however is the second, more transparent sawtooth waveform (TP004). We don't wish to be secretive about this one: the sound is based on a multisample, transposed by an octave via the pitch envelope, which gives the sound its fresh tonal shade. There won't be many of the dinosaur analogue synths that can serve up such a brilliant waveform – this wave is particularly recommended for Dance and Techno tracks. By the way: you will probably want to use this wave as a starting point for your own analogue sounds, so we have added a second VCO for you and detuned both oscillators against each other (TP003/005).

Another of analogue synthesis' strong favourites is the **Square Wave** (TP006): this is actually a specific pulse waveform with a peak-trough relationship of 50%. To maintain some oscillation you again have to use two VCOs and slightly detune them against each other. The square wave however is more sensitive to this than the sawtooth wave. The best

results are obtained with minimal detuning. You may also need to reduce the second VCO's level a little (TP007). To be honest, though, this really is a matter of personal taste.

Pulse waveforms, unlike periodic square waves, describe the percentual relationship between the wave's peeks and troughs. As a rule of thumb: moving further away from the consistent square oscillations (50%) results in an ever more nasal sound. Pulse widths less than 10% are – musically speaking – less prolifc. At worst your waveform will approach a pin shaped pulse, i.e. the wave is barely audible. Contained within the wave reservoir are many useful pulse waves, with wave ratios varying between 25% (TP008) and 10%(TP009). The latter is often used to emulate the sound of a clavinet.

Another typical tool in analogue synthesis is the **oscillator synchronisation** (or oscillator sync), originally devised to avoid the inevitable drift between two VCOs. This method opens the doors to the delectable 'sync sounds', two examples of which exist as ROM samples in the CS1x's memory (TP010/011).
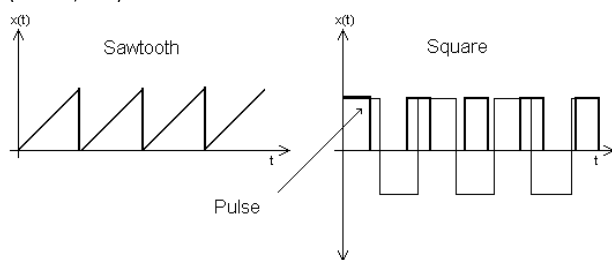
The VCO Waveforms:
Sawtooth, Square, Pulse

Particular attention should also be paid to the **Sine Wave**. This purely electronically generated wave is alone in not having any harmonics at all, and as such is practically useless for subtractive synthesis. Nevertheless, the sine wave can be found in many a synthesizer's VCO section, and is therefore also included in our Tutorial Bank (TP012). Just how this wave can be used is fully explored in section "*Pulling out all the Stops*". Much more common is the **Noise Generator**, a further source of sound apart from the VCOs. In the era of digital synthesis, the poor old noise generator has taken somewhat of a back seat. Nevertheless, noise generation still has many interesting applications.

The Filters – Tastebuds for your Ears

Let's take a look at subtractive synthesis' most important element, the Filter, or VCF (Voltage Controlled Filter). This sound component removes selected frequencies from your source material, i.e. the harmonically rich VCO waveforms. The most common used type of flter is the low-pass flter, which also helps the CS1x to its characteristic sound. Technically, the flter removes the upper frequencies selected by it's programmable **cutoff point**, whilst the lower frequencies beyond this point pass through unaffected. Specifcally, the CS1x flter implementation revolves around a version of a low-pass flter with a 12db/Oct rolloff. This means that frequencies will be attenuated by 2kHz at 12dB, 4kHz at 24dB, and so on, and as such is suitable for most applications.

The flter also has a **Resonance Parameter**, which accentuates the frequencies near the cutoff-point. Resonance has many applications beyond the typical character it lends to many synthesizer sounds. Heavy use of resonance, coupled with the above mentioned noise generator can result in many attention-grabbing sounds. On the other hand, a gentle dose of resonance can cleverly be used to 'thin out' a sound in a

way not possible by simply reducing its volume. In fact, it is generally true that increasing the resonance a fltered signal will make it sound quieter. Pay particular attention to your sound's bass region; it's here where fltering can affect the perceived 'stability' of your sound. Of course you may also use resonance with the flter wide open. The following example will illustrate how and when resonance may be used on its own like this.

✕PERIMENT:

Select the harmonically rich choir sound (TP014). In the context of a rhythm heavy dance arrangement, the choir sound would beneft from a little more 'transparency'. But how? The flter frequency is already optimal, whilst you have other plans for the effects. The solution here is a little trick: use the resonance as a kind of 'pseudo enhancer', a psychoacoustic studio tool used to add high frequencies to 'dull' audio signals. Turn up your resonance! You will fnd your sound has become 'fresher', and will now sit better in your arrangement. Of course this trick can be used in other situations, for example to add a glossy sheen to dull bass drums, tom samples and cymbals.

Exactly how Cutoff and Resonance will affect your sound is easily revealed – simply play with the CS1x's equally labelled Knobs. Both parameters are fundamental in the creation of sound, and their ability to give shape to sound are immense. The low-pass flter's abilities range from the simple 'darkening' of a sound right through to fddly tasks. One of these is the creation of Formants. This, in simple terms, is the use of resonance to accentuate a specifc frequency range, so that all partial tones in this region regardless of their fundamental root frequency are noticeably pronounced. The vowels found in human language (A-E-I-O-U) rely on characteristic formant areas. To clarify all this, take the sound (TP015). Here the two VCOs used are fltered differently, the frst without any resonance. The second however uses heavy resonance to produce typical **formants**, which can be changed using varying cutoff settings.

Dynamic Helpers – Envelopes

All the sound components we have looked at so far have been 'static' in their effect, that is to say that they haven't affected a sound differently over time. Enter the Envelope Generators of the CS1x. Envelope generators control Volume (AEG), the Filter (FEG) or the Pitch of your sound (PEG). An envelope follows the traditional **ADSR model**: Attack controls your sound's fade-in time, **D**ecay determines the time it takes to reach the Sustain level, **S**ustain controls the volume your sound will settle at whilst holding down a key, and fnally **R**elease sets how long your sound will ring out after releasing the key. Uniquely, the pitch envelope adds Intensity and Level parameters to the standard envelope model (PEG Init, Attack and Release Level) – see section "*Performance Mode*", "*Layer Edit3*" in the manual.

Lets start with the **Filter Envelope**. It is responsible for varying the flter's cutoff point over time, and, as mentioned above, crucial in determining the contour of your sound. More often than not, envelopes with slow fade-out times are used. This is achieved by dropping the flter's cutoff point to the programmed FEG Sustain Level. In our example sound (TP016) this 'dropping' happens quite quickly. This is just perfect for bass or sequencer sounds, which need to be 'tight'. As a rule you should pay a lot of attention to your envelopes – especially within song arrangements. You will fnd that the decay times used have to 'gel' with the rhythmic structure of a piece – a tricky piece of engineering, which sadly is often overlooked. For example, a bass sound that

dies away too quickly will not 'support' the rest of your arrangement properly. In extreme cases this will leave 'holes' which can effectively kill the groove of your piece. Using an overly long decay time on the other hand can also cause problems; it may smear a delicately composed rhythmic line. As always, a little delicacy is required. As you can see, acquainting yourself with the properties of envelopes early on will pay off in the long run, especially as every synthesizer, including the CS1x, reacts to parameter changes in its own unique way.

✗PERIMENT:

Vary the decay time of Performance TP017 to see how quickly filter frequency really drops. Try setting the FEG Decay Time parameter initially to +10, then -15, and finally -35. Important in this also is the envelope's FEG Sustain Level. Setting this to its minimum -63 level will result in the note completely fading out. By the way, this sound has two Layers, and so you will need to edit both oscillators' values simultaneously – this is achieved by holding down the Octave Shift key (found on the top left above the display) whilst changing any parameters.

In stark contrast, the next filter sound (TP018) typifies the classic 'sweep' characteristic, i.e. the resonation filter's frequency rises gradually (Attack Time=+55) and then drops sharply (Decay Time) to the level set by Sustain Level. Another variation on this theme is the third envelope type (TP019). Here the filter frequency drops a little during the initial stages, and then rises fairly quickly to its maximum value (FEG Sustain Level=+63). Feel free to explore the properties of this example's envelope more fully. You may also try Preset Performances 047 and 048 for further experimentation. These will let you compare different decay times for bass sounds.

Unlike the filter envelope, the **Amplitude Envelope Generator** (AEG) affects a sound's volume level, and is therefore also called referred to as the Volume Envelope. The scenario where volume levels stay the same throughout the various stages is often described as an 'organ envelope'. The Tutorial Bank has many examples of this type of sound (e.g. TP001 to TP010). Because of this property, many of the sounds show the effects of the filter envelope more clearly (e.g. TP018/019).

✗PERIMENT:

Using a highly percussive amplitude envelope will give a majestic filter sweep little time to develop. As an example, select Performance TP020. Although you can discern the filter effect with this sound, it is far too short lived. Organ envelopes are simply invaluable for this type of effect. Try setting both Layers' Amplitude Envelope Decay and Sustain Time to the maximum +63. Now sit back and listen to the filter as nature had intended!

Organ envelopes aren't always as useful as in our little example. It is usually important to be able to finely tune a sound's volume level over time; for example most sounds tend to gradually 'die away'. A held piano note would eventually completely disappear. The CS1x however is no piano; leave the Sustain Level at a high enough setting, and your note will ring on and on until you release the key (TP021). In this particular kingdom a synthesizer rules alone. Therefore feel free to sculpt your amplitude envelopes any which way you want.

Occasionally all that's required is to 'soften' a sound's initial attack, say with a brass or solo sound. Pad sounds, including choirs and strings, always use even longer fade-in and fade-out times (TP023), but wait, it isn't quite that easy. First of all it is always important to find the right envelope for the right job. A good example of the different effect created by fading

out the filter rather than the volume of your sound can be found in Preset Performances 015 and 016. Of course it is also good to realise that a sound is the sum of all of its components. You can spend hours lovingly sculpting your filter envelope, but if your low-pass filter's cutoff setting allows all of your sound's frequencies to pass through unhindered, nothing much will happen. In short, the interplay between the filter and amplitude envelopes is vital. A few examples.
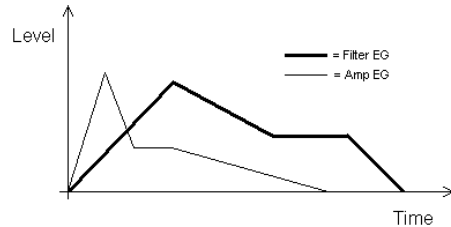
Filter and
Amplitude Envelopes

✗AMPLE:

In order for your sound to be affected by specific filter modulation after the release of a key, your amplitude envelope needs to be longer than your filter envelope. Using a short release setting for your filter envelope (Release Time=-63) will generate a 'tearing' effect, typically used for E-pianos, harpsichords or acoustic guitar sounds. A slight increase in release time can produce a simple 'echo effect' (TP024). Such tricks can also be applied to a sound's attack time. For instance, a sound's 'hard' edge caused by a fast-attacking filter envelope can successfully be softened by decreasing its amplitude attack time a little, without the 'brightness' loss you would get when applied to the filter envelope. Remember, these two envelopes work as a team.

Let's finally take a look at the **Pitch Envelope**. Unlike the FEG and AEG, this envelope is predominantly used for specialist applications, and as such is rarely found on analogue synthesizers. Despite this, the PEG has many more uses than you may at first suspect. To prove it, a number of examples… first a little practise to get you fully aquainted with this particular envelope.

✗PERIMENT:

Call up Performance TP026. We're aiming to 'drift' the first oscillator gradually away from VCO2 (whose pitch stays constant). Apply the following settings to the Pitch Envelope (Layer1): our sound is supposed to drop after a predetermined time (PEG Atk Tm=+56) by a quarter note (PEG Atk Lv=-27), and then casually restore its pitch (PEG Dcy Tm=+30). When releasing the key our sound shall then jump upwards (PEG Rel Tm=-63) by another quarter note (PEG Rel Lv=+27). If you want to hear your sound 'howl' rather than jump, try setting PEG Rel Time to +40. By the way, if everything went as planned your sound should resemble Performance TP027 – try it!

All this illustrates nicely how siren-type effects can be produced without the aid of the more obvious LFO. More often than not though the pitch envelope is used in the attack phase of the sound, particularly when imitating acoustic instruments. Pretty obvious when you think about it; the pitch of such instruments is still volatile during the plucking of a string or the initial blowing of a flute or trombone. Use of this subtle effect can also give synthesizers a more natural sound.

Obvious examples are brass sounds (TP028). Here the initial 'tearing' at the sound's pitch delivers the right feel. Ideally this change in pitch should be as inconspicuous as possible, but there is of course a time and place for drastic pitch envelope surgery to produce those classic 'pitch warp' effects, like sound TP029. Tip: when using two VCOs, try setting the first oscillator's PEG to a positive value, and the second oscillators PEG to a negative one – after all, variety is the spice of life!

Have you ever attempted to program certain drum sounds or special effects using synthesizer waveforms? Or how about using the pitch envelope to transpose a multi-sample? Let's take a look at some examples.

Take a boring sinewave and combine it with a simple PEG envelope, and hey presto – instant E-toms (TP030)! Another popular trick when using sample ROM synthesizers is the transposition of entire multi-samples – using the pitch envelope!

Transposing a Layer up or down this way by 12 semitones can completely change the basic character of a sound. Transposing down can lure Mellotron-like sounds from your CS1x – for an example try the string sound TP031, which can be enhanced still further by the use of filters or the effects. Shifting this sound's pitch upward however will produce a harmonically richer tone (TP004/005).

It's just as easy and simple to conjure up impressive slide effects (TP032), a useful addition to any synth bass sound.

Helper Motors – the LFOs

The Low Frequency Oscillator or LFO is a special kind of oscillator. Unlike VCOs, the LFOs frequency range is roughly between 0,1 and 100Hz. Of course the frequencies aren't used for audio signals, but rather as controlling signals to modulate the VCO, VCF or VCA sound components. The CS1x calls these LFO modulation types PMOD, FMOD and AMOD.

A synthesizer, just like the human voice, violin, trumpet and many other acoustic instruments, seems 'cold' without the use of some vibrato. To illustrate, select the aforementioned pad sound (TP023): although enriched by the detuning of its two VCOs it still doesn't appear as 'alive' as would be desirable for a successful pad sound.

Pitch LFO to the rescue. This little devil can be used to subtly modulate the pitch of a sound, thereby making it seem more 'alive' – much like the natural vibration of the human voice.

To achieve this effect, use a consistent waveform like the triangle wave. Differing speeds and intensities are also useful; both VCO's LFO values should never be identical. It generally pays to offset parameters a little against each other, not just where LFOs are concerned – this gives synthetic sounds life. Our string pad (TP033) also gains 'depth' from this treatment. In some cases you may even avoid the need for post-chorusing altogether. Any sounds used for solo work should use a slightly delayed Pitch LFO, i.e. Vibrato. This can best be demonstrated with a simple synthesizer sound (TP034). Here the Material voice used is already programmed to delay the LFO so that the Vibrato is less abrupt.

Just as much fun can be had with the random **Sample&Hold** waveform (TP036). The short melodic phrases that this waveform can produce have many uses beyond the obvious lead sounds or imaginative sound collages. An LFO with a square waveform can also be used to generate little sequencer-like phrases, such as fifth or whole octave pitch jumps. Dig deeper in the CS1x's bag of tricks though and you will find the ingenious arpeggiator, which will produce stylish rhythmic musical phrases for you. After all, the overworked LFO needs a rest now and then!

You may have stumbled across some sounds in the User bank that at first sound like a simple arpeggiator pattern. A quick glance to the display however reveals that the Arpeggiator is inactive. Here are the sounds in question "Sq:Cyborg" and "Fx:SinCrony" We have modified both these performances a little – you can find them in the Tutorial Bank (TP036/037). Your task is to re-activate the LFOs (AMOD and FMOD). You will find that the LFO modulation used in this sound plays an very important role.

Completely different sound impressions can be derived from use of the **Filter LFO**. Well-known wah-wah effects can be achieved when using this component to affect a resonating filter's Cutoff Frequency. The triangle wave is the obvious waveform to use here. Start out by using a slow LFO speed (TP038) – you can always tweak it later. An 'impulsive' modulation is desirable when quick chord changes are in order, but lingering pad sounds prefer a more gentle LFO movement. The fun really starts though with the sawtooth waveform, which will generate rhythmic filter movement just perfect for a sequenced arrangement. The Filter LFO with the sawtooth wave can also be used to 'chop up' filter sweeps (a la TP039). Great fun, and not just for our young techno generation.

Let's press on: the CS1x LFO can also manipulate amplitude (i.e. volume) as well as filter and pitch. This LFO, known as **Amplitude LFO** or "LFO Amod", is primarily used for Tremolo effects. Just so you don't get lost in the drudgery of grey theory, here's another little exercise:

Dial-up Performance TP040; a guitar sound which can be made more interesting by applying tremolo effects. To do this, call the Amplitude LFO for both Layers into action (simultaneous edit). The modulation value shouldn't exceed +05. You may want to control when the tremolo effect is applied, rather than have it on all the time. In this case reset the modulation value back to 0. Now set (say) Assign2 to control LFO-Amplitude-Modulation. Oh, by the way, we've already done this for you, try playing with Knob6. Now you can freely add tremolo effects to your guitar sound whenever you want.

Are you getting familiar with the amplitude LFO? A little further experimentation should give you an even better idea how and when it can be used. First in line for treatment are strings and other pad sounds (TP041). Here too natural sounding and consistent volume changes are achieved with the triangle waveform. The sawtooth in contrast produces more distinctive rhythmic patterns (TP042) which tend to be more ornate, however, than the comparative LFO Filter modulation.

Question: what's even better than a LFO? Answer: two LFOs! The CS1x though has only a single LFO. How can we solve this?

Simply combine two Layers when you want to play with two LFOs. Offsetting the speeds of the two LFOs can yield surprising results. Try doubling/halving the speed of the first LFO, or vice versa. Panning each VCO hard left and right

helps to accentuate the interplay between the two LFOs (TP043). Even 'analogue echo effects' can be achieved with the LFO. For this, the sawtooth wave is most appropriate. You will need to play 'staccato' (release the keys quickly) in order to get these echo effects (TP044).

Everything sounds reasonable so far. But what does **Init Phase** do? Don't panic, all shall be revealed: as the name suggests, this function is used to determine the LFO's general phase setting. All of the CS1x Low Frequency Oscillators can be synchronised to each key press using the "Retrigger" option. When this is set, a sound's modulation begins exactly when a key is pressed (TP045), something which is usually desirable. Now all LFOs are running in phase, there is no variation between each separate voice. Should you wish to involve a little randomness in this process however take a look at "Freerun" (TP046). Both examples demonstrate nicely how the different phase settings affect a sound.

About the Little Things

Now that we're approaching the end of our little workshop we should take a look at what effect the monophonic mode has on the Portamento function and other sound parameters, features which are so often neglected. This is a shame because as in life, it's the little things that count.

The **Mono/Poly** setting determines whether a sound can play many notes at once or just one at a time. To save on voices? No, this time it's not a case of economics, it simply wouldn't make sense. Instead, the Mono function is a tool to replicate specific playing techniques used with analogue synthesizers.

All monophonic synths respond in a certain way when a second note is pressed whilst the first is still being held. Incidentally, a polyphonic synthesizer's Unison Mode does exactly the same thing, i.e. all voices are assigned to a single note – every new voice cuts off the previous, which resurfaces however when the new note is released. This effect is used to produce fast trills in synth solos. To demonstrate, here's a sound which you can play polyphonically first (TP047), and then monophonically (TP046). Comparing the two modes should give you a good insight into the practical uses of the Mono function.

The difference between the Mono and Poly mode is even more pronounced when used in conjunction with the **Portamento** feature (Porta Switch or via Controller #65). This parameter is also part and parcel of synthesizer playing techniques. The Portamento function principally enables step-free gliding from one tone to the next, one of electronic music's most fundamental stylistic tools. The Portamento speed has to be selected according to the sound and interpretation used. With the sequencer this can be achieved with Controller #5 (Portamento Time).

It is often required to be able to vary the glissando effect on impulse during a live performance. This can be particularly useful with different solo phrases. Setting Assign1 to the PortaTime function will allow you to control the Portamento speed with Knob3. The Performances TP049/050 will demonstrate this nicely. Pay particular attention to the Portamento differences in the Poly and Mono modes. Try varying the Portamento speed and observe how the CS1x reacts. A little time and effort is all it takes to deliver impressive synth solos to an appreciative audience – practise makes perfect!

The Mono mode in conjunction with the Portamento Function can approximate the **Single Trigger Mode**, made popular by many Minimoog bass lines: when two keys are held down at the same time during legato style playing, the second note's attack phase (usually a typical filter sweep) is inaudible – the first note's envelope stays uninterrupted. Only when the current key is released will the second note's envelope come into effect.

To make all this a little clearer, call up Performance TP051. Playing this bass sound staccato style will produce a percussive filter attack for each note. During legato playing however only the first note's attack is heard. Why? Simple: the Portamento function is in effect, although the characteristic pitch glide is missing. This is achieved by setting the Portamento speed to 0 – a little trick, used here to great effect. If you want Portamento however, simply adjust the speed for the required effect. Now disable the Single Trigger Mode (TP052O). Trill a few notes, and you will find that many playing techniques and much phrasing is now impossible.
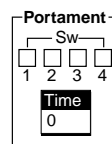
*The Portamento Function
can be activated for each Layer*

Lastly, the somewhat tricky subject of **Touch Sensitivity**. The CS1x offers no fewer than four related functions (see section "*Performance*", "*Velocity*" in the manual). More often than not you will want to finely tune a Performance's touch dynamic individually. How is this achieved?

The Performance's touch sensitivity can be set using the Velocity Offset function. In order to fully exploit the whole dynamic range, Velocity Depth should be set to maximum 127. Select Performance TP053. Now gradually increase the Offset value. See what happens? The touch sensitivity is beginning to stabilise. This sounds great. Unfortunately the tone is getting brighter. That's not quite right! Why is this happening? The culprit here is the Material Voice. It is programmed to increase the filter frequency with increasing key velocity. Therefore, increasing the offset value also increases the sound's harmonic overtones. Beware – many other sounds exhibit this behaviour too when their touch sensitivity values are changed.

Many sound creators take particular pride in their famous Velocity Switch sounds. To prove the point we have created four sounds, which will demonstrate the practical uses of velocity switching.

The Performance's touch sensitivity can be set using the Velocity Offset function. In order to fully exploit the whole dynamic range, Velocity Depth should be set to maximum 127. Select Performance TP053. Now gradually increase the Offset value. See what happens? The touch sensitivity is beginning to stabilise. This sounds great. Unfortunately the tone is getting brighter. That's not quite right! Why is this happening? The culprit here is the Material Voice. It is programmed to increase the filter frequency with increasing key

velocity. Therefore, increasing the offset value also increases the sound's harmonic overtones. Beware – many other sounds exhibit this behaviour too when their touch sensitivity values are changed.

Many sound creators take particular pride in their famous Velocity Switch sounds. To prove the point we have created four sounds, which will demonstrate the practical uses of velocity switching.

Résumé

We've made it – that was a lot to take in! Now spoil yourself, relax to a little demo sequence we prepared earlier (DEMO1.MID), and listen out for special guest appearances by the Analogue Workshop All-stars!

(A)   The song begins with a Performance with two oscillators that are detuned against each other in real-time using Assign2 (Knob 6). We'd like to point out once again that **fine tuning the VCOs** can sound interesting in itself and provides for many yet unexplored possibilities. In general, today's approach to VCOs is quite different from what is was in the '70s and '80s. Most TB-303 type bass sounds were programmed with just a single VCO, something that has become fashionable once again. Back then, mighty Minimoog basses using three oscillators (!) were very popular. Today, two VCOs are commonly detuned against each other, particularly with lead or sequencer sounds.

(B)   You will hear a little sequencer theme starting at bar 9, which we will use to demonstrate a little trick: the sound is initially programmed without **Filter Resonance**, but this becomes active in the second half (bar 13-17). Note how the sound is changed. It suddenly sounds fresher and as a result is more discernible in the arrangement. If you wish to apply this little artistry to other sounds, you need to ensure that the cutoff frequency used is set to the maximum value, otherwise you will hear the typical synth bass or sweep sound resonance filter effect.

(C)   Now we move onto a good example of the interaction between the **Filter and Amplitude Envelopes**: at first you can hardly hear this sound's filter sweep as the amplitude isn't set correctly for it. At bar 21, however, the sound's fade-out time is increased (Assign1: AEGDcyTime) and now the filter sweep's development has become audible. To summarise: the filter envelope is only fully effective when the amplitude envelope is stable enough.

(D)   Bar 33 introduces a pad sound. The sound does seem a little bland, despite the lively beating produced by its two detuned VCOs. This becomes even more obvious in bar 39, where the same chords are played by a synth pad for comparison. The sound's richness here is due to intensive **LFO Pitch Modulation**. In the most extreme cases you can even forgo the Chorus effect altogether, which can be a great help, especially with the Multi mode's tricky effect assignment.

(E)   The next example will show just how and when the **Amplitude LFO** can be applied: it doesn't always have to involve synth sounds. An acoustic guitar sound can be invigorated with Tremolo effects, too, especially when blended in authentically with Knob6. Pay particular attention to when the Tremolo is applied. With a little practice you'll be able to play many sounds authentically using real-time control.

(F)   Bar 54 introduces an extra classy analogue sound: no, you're not listening to the CS1x effects here, these echo effects are part of the sound! This is done with the aid of the Amplitude LFO, here using the **sawtooth LFO waveform** to imitate this effect. The effect is emphasised six bars later with determined filter modulation. This trick can be especially useful in the Multi mode (as in example D), where the Variation effect may already be assigned to other tasks and no "Delay" is available.

(G)   We're now playing a simple chord sequence with two different **LFO Phase** settings: you won't notice anything special in the first instance, as all voices start with their respective triggering as expected (Phase Init: Retrigger). If you set the LFO to "Free Run" however, the notes are triggered irregularly. This is demonstrated by the repeated chord sequence, which is now played by Performance TP064. We have reinforced these irregularities with random Pan movements ("Random").
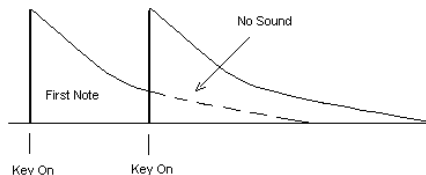
*Illustration: The CS1x Mono Function –
ideal for Solo or Bass Sounds.*

(H)   The focus shifts to the **Portamento and Poly/Mono functions** at bar 80: here we are switching between the two modes whilst playing a lead sound, to make studying these functions easier. Compare the differences between the two modes; the Portamento function is very revealing here. It would be better still to try out the behaviour of Mono and Poly sounds for yourself, so stop the sequencer and select Performances TP049/050. If you prefer to stay inactive for a while, then at least listen to the modulations of the following solo part's fade-out, Portamento speed, as well as Filter frequency and Resonance.

(I)   Whilst the finale may not be grandiose, it is certainly informative: note the **Single Trigger** mode's specialities, here shown with a typical synth bass sound. Hand on heart, have you ever investigated this subject? If you haven't, you really should spend some time on it. Until you have, you will not be able to arrange your bass lines for this style. especially if you want to produce the unmistakable bass slide effects. So, acquaint yourself with the Single Trigger mode (also known as Legato mode) and its properties. Bar 118 sees a slide effect without the use of the Single Trigger mode, which kicks in however at the next bar. Take note of the two different sounds produced. The previous sequences also will clarify this interesting phenomenon.

Arpeggiator – A Box full of Tricks for all Occasions

The CS1x Arpeggiator is very clearly laid out. It consists of only three parts: Type, Tempo and Subdivide. In addition the CS1x outshines itself with 2 further settings which you should get aquainted with early on.

One of these is the **Hold function**, which can be activated by pressing both buttons on the left hand side above the LC-Display. This function greatly aids relaxation during live performances, as it has since its earliest incarnation: you need to play a chord only once; the Arpeggiator play will repeat it tirelessly for you. This frees both hands for other tasks and can, amongst other things, be very 'handy' for trying out different arpeggios or sequencer sounds!

With the aid of the **Arpeggiator Split** function you can limit the Arpeggio key range to notes below the C3 key (see section "*Performance Mode*"; "*Arpeggiator Split*" in the manual). Notes above this point can then be used for accompanying flls, perhaps using a different sound altogether.
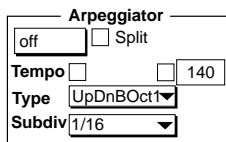
Arpeggiator Uses at a Glance

✗AMPLE:

We have prepared two sounds for this which can be found in the Tutorial Bank. To start with, call up Performance TP058. Now trigger the Arpeggiator using a single key below C3. The sequence will keep on running, even after you have let go of the key thanks to the activated Hold function. You can still use both hands to play chords or flls on any of the keys above the Split point – go on, try it!

You need to be careful however when using Split Performances, as the Arpeggiator will distribute any chord notes over the entire note range, regardless of which sounds will be played. In other words, if you are using two different sounds split across they keyboard, it's quite possible that the Arpeggiator mix up both sounds! Performance TP059 is a good example of this. Here a Rhodes sound used above the split point has suffered in the process. Tip: If you want to ensure that the Arpeggiator only triggers the sound below the split point, use the following Arpeggio types: UpOct1, DwnOct1/2/4, UpDwA/BOct1 as well as Random Oct.

Now let's look at the three main functions. To begin with, you can select any of the **30 available Arpeggio Patterns**. These can broadly be divided into seperated chords and special patterns that vary in sound colour, dynamics or rhythm. The second function is all about tempo. If you want to use the Arpeggiator with a drum machine or sequencer and wish to be able to react to any tempo changes or drifting, set this to MIDI. This instructs the CS1x to wait for an external 'director' via the so-called MIDI Clock Pulses.

There are three things you should bear in mind: First check that your sequencer can actually send **MIDI Clock** commands. If you can't hear an Arpeggio Part, the most likely explanation is that MIDI Clock is disabled in your sequencer program, so always check to make sure it's enabled. Secondly it is advisable to time-shift the track containing any Arpeggiator chords by a few milliseconds. This ensures more precise Arpeggio starts. Thirdly, experience has shown the value of re-triggering any Arpeggios that step through the same notes repeatedly as often as possible. The same method has also benefted the sampled drum loops by ensuring clean timing.

To begin with though you have to establish the actual length of your Arpeggio loop. To work this out we have to deal with the Arpeggiator's third major function, the **Rhythmic Resolver** (Subdivide). Some of the available divisions are self explanatory: 1/32, 1/16, 1/8 and 1/4 divide a chord into 32nds, 16ths, 8ths and quarter notes. 16th, 8th or 4th triplets are however resolved and played by 1/24, 1/12 or 1/6. But wait, there's more, the CS1x also offers 3 further divisions (3/23, 3/16, 3/8). Later we'll deal with their applications with a little exercise.

✗PERIMENT:

Without knowing much about it we wish to determine an Arpeggio's length. Just how the Arpeggio proceeds is dependent on several factors – the Arpeggio type, the rhythmic resolution but also the total voice number used in an arpeggiated chord. Select Performance TP060.

Now start playing using a four note chord, for example a C major triad with an octave root note. The Arpeggiator begins by breaking down the chord into 8ths (Subdivide: 1/8) and then arpeggiates it over two octaves (type: UpOct2). You will hear that the Arpeggio repeats itself after exactly one bar (s. Note Example A). This means the loop is 4 beats long, i.e. you can re-trigger the Arpeggio after 4 beats. Now experiment with different Arpeggio types and rhythmic resolutions. For instance, select Arpeggio type "DwOct1" and a 1/16 resolution. If you now play the same chord you will notice that the Arpeggio now loops after only one quarter (s. Note Example B). Feel free to try a few other combinations. You will soon get a feel for how the different Arpeggios sound.

Note Example A

Note Example B

First Steps

Let's deal with the simple Arpeggio patterns "Up/Down" and "Random" first. These are by no means unique to the CS1x, but can be found on many a synthesizer and therefore serve well as an introduction as to the how Areggiators automatically break up chords. What this actually sounds like isn't important right now. We want to concentrate exclusively on the sequence of notes produced. We recommend Performance TP060 or a similar percussive sound for reference.

✗PERIMENT:

Select a 1/16 resolution and a tempo between 100 and 120bpm. You can of course also set the tempo via MIDI Clock synchronisation – actually that's a good idea, as you can then use the sequencer as a reference to help you understand the Arpeggio beats and rhythms better. Use the four note C major chord for all Arpeggios (triad + octave root note). Now listen how the Arpeggiator translates this chord:

"UpOct1-4" – here each chord note is playing from the bottom note to the top note over 1, 2 or even 4 octaves if desired. The opposite sequence results from type "DownOct1-4", i.e. the notes are played starting with the highest down to the lowest. "Random Oct1/2/4" however selects the chord notes randomly from a 1 to 4 octave range.

Whilst the above Arpeggio types hardly require further explanation, there is one noteworthy difference in the case of the combined Up/Down Arpeggio type. As you might expect, in both cases the Arpeggiator begins with the lowest note, ascends to the top, and then descends back down again, regardless whether 1, 2 or 4 octaves are selected. Still, the note sequence produced is slightly different:

✗PERIMENT:

Play the C major chord using Performances TP061 and TP062. If you now follow each sound i.e. the sequences generated by "UpDwAOct2" and "UpDwBOct2", you will notice a small irregularity with type B: the root note is not played again after the highest note has been reached – all the other Arpeggio types in the last X-PERIMENT did! This results in an unwanted 'shifting', i.e. the Arpeggio's root note doesn't always fall exactly on the correct beat. The following Note Examples should make this a little clearer.

Note Example: UpDwAOct2

Note Example: UpDwBOct2

Sound Rhythm Tricks

Looking at these UpDown Arpeggios may lead you to the conclusion that the chord notes 'are somehow drifting across the beats'. Perhaps you have already come across this phenomenon when working with other Arpeggiators or testing some of the CS1x factory sounds. It's true: you can never separate rhythms and chords when working with the Arpeggiator! Here's a little example.

✗PERIMENT:

Leave the resolution of Performance TP063 set to 1/16 and type "UpOct2". Now play a C major triad in the basic configuration and examine which betas the arpeggiated sounds fall on. After the first cycle the root note lies somewhere between the second and third beat, after the second cycle it falls on the fourth and after the third it's now between the first and second beats, and so on. If you set the resolution to 1/24 triplet however, the C note will always fall exactly on each beat. Let's look at this from another angle: Trigger the Arpeggiator with a four note chord (use the C major chord with root note octaves) and you will find that the C note doesn't fall on the beat anymore. To correct this, choose an even-numbered resolution (e.g. 1/16 or 1/8). Now everything is back to normal – i.e. the arpeggiated root note fall once again exactly on the expected beats.

Note Example: 1/16

Note Example: 1/24

Are you with us this far? We have a little X-PERIMENT that will demonstrate the direct relationship between the number of chord notes and the chord's rhythmic resolutio.n The rule of thumb here is that you should always choose even numbered chords for even rhythmic resolutions (1/4, 1/8, 1/16 and 1/32) and (say) three note or five note chords with odd-numbered resolutions (1/6, 1/12, 1/24). That's the only way to avoid generating unwanted syncopations with the Arpeggiator.

A special case are the dotted note rhythms (3/8, 3/16 and 3/32). The above rules don't apply here. These resolutions are particularly interesting for odd-numbered beats (e.g. æ, 3/8 or 6/8). You will need to play chords with an even note number to play back these three-part rhythms correctly.

✗PERIMENT:

Select Performance TP064 with Arpeggio type „UpOct2" and a 3/8 resolution. Now playing a triad will find the root note on the first beat in the 4th bar, in other words irregular cycles are generated. A 4 note chord however generates symmetrical 4 bar cycles, i.e. the root note is repeated after the first cycle on bar 3, after the second cycle on bar 5 and after the third cycle on bar 7 etc - always on the first beat.

Note Example: 3 notes

Note Example: 4 notes

Between you and me: you don't always have to be so strictly analytical. The occasional breaking of the rules and other such mischief often produces the most interesting music! Anyway, these rules only really apply to the consistent Arpeggio types like the CS1x's Up/Down patterns. If you are planning to use more noise orientated sounds or special effects, feel free to experiment as much as you want. After all, if it sounds right, use it.

Fun to the power of 15!

If all this leaves you cold, you clearly haven't heard the CS1x's 15 special Arpeggio types! First a quick note: all special types don't lend themselves well to triplet rhythms. The best results are achieved with a 4/4 beat and a resolution of 1/16, 1/8 or 1/32.

No doubt, a lot can be achieved with these ready made sequences, especially when you have just run out of good ideas. But what exactly is happening here? In order utilise these 15 Arpeggio types more effectively you will need to aquaint yourself with each of their properties.

Put simply, the special Arpeggios add filter and pan position modulation as well as more complex stepping of rhythm and dynamics to the more straight forward Up/Down Arpeggios. Chord notes, their number and octave position however are resolved differently from what you might expect. For example, playing a four note chord with some Arpeggio types will result in only two notes being played in different octaves. We will demonstrate the properties of the special Arpeggio types with a few exercises. Let's use a systematic approach and start with the filter.

✗PERIMENT:

Select Performance TP065 and play any single note. Can you hear the filter modulation already? Well no, of course not. Don't worry, we are not trying to catch you out; we simply wish to show you that the filter frequency has to be set correctly in order for the filter modulation to have any effect. All you need to do is turn the Cutoff knob anti-clock-wise. Now you should hear the filter change across two bars: the cutoff frequency rises during the first four beats, then drops during the second half at the same rate. This is due to the Arpeggio Type "Techno-A"!

The CS1x however boasts a second type – "SweepLine": here, too, the Arpeggio automatically modulates the filter frequency, raising it after the third quarter, and then dropping again after the third quarter of the second bar. Intrigued? Go ahead, select Performance TP066 and see for yourself.

Of course you can always change the filter yourself in real-time with the CS1x knobs. Dynamic Pan Positions are more tricky. Never fear, the Arpeggiator will once again make your life that little bit easier by providing types that take care of distributing your notes in the stereo image. Here, too, you will need to pay particular attention to the corresponding sound parameters, as the modulation can be affected by the unsuitable effect settings (e.g. an excessive "Chorus Send" value) as well as the Pan Position function.

✗PERIMENT:

Using Performance TP067, hold the keys down for at least two bars. As well as rhythmically distributing the held notes the Arpeggio pattern "Techno-D" also loosens the rhythm with pulsating left-right movements. This will breathe plenty of life into your sequencer arrangement. Arpeggio type "Echo&Pan" is also a good alternative. Here, too, the Arpeggio sequence influences the sound's Pan Position. To demonstrate, try Performance TP068.

Things don't always run as smoothly as in these examples. Sometimes you need to tinker a little to actually hear the Pan modulations. For example, try getting these stereo movements to work with Performance TP069! Have you discovered how to do it yet? The key to success here lies with the Variation effect: set "Var Send" to "On" for the first Layer and bathe in the full Arpeggio effect inclusive of Pan modulation.

There is much you can do with these filter and Pan modulations. Nevertheless, the most noticeable property of the special Arpeggios is doubtless their 'musicality',') supported by individual rhythms, small dynamic shifts as well as the chord note variations. Let's spend a little time on these 'dynamic' changes.

✗PERIMENT:

Let's examine Arpeggio "Echo&Pan" a little more closely. As the name suggests, this type automagically produces echo effects – mostly with the help of different key velocity values. Play Performance TP070 with any sound you wish: its volume audibly fluctuates within a single bar. This process is repeated every four beats. The same thing happens with Arpeggio type "TekkEcho" (TP071). Although the Arpeggio figure here is 8 beats long the dynamic pattern is the same. You can observe this, for example, with the "BaseLineB" type. Tip: if you like the Arpeggio's rhythmic and pan movements, but aren't so keen on the dynamic variations, simply set the Velocity Offset value to the maximum +63.

Let's go one step further and finally examine the musical aspect. Let's look at how many chord notes the Arpeggiator actually utilises. Particularly with respect to song production,

the CS1x offers a choice of very special Arpeggio types. Their names will already give you clues as to how these may be put into action.

✕PERIMENT:

Begin by selecting Performance TP072. Playing (for example) a C major triad in it's basic configuration will give you a typical bass figure. Hardly surprising when you take a look at the Arpeggio type in the display: "BaseLineC"! Now take a closer listen. The Arpeggiator plays only root notes and 3rds ! Not all your held notes are being played. The Arpeggiator 'filters' the notes depending on the context and what its sequence is supposed to do – just as well! This type, like the other "BaseLine" types for example simply ignores your chord's 5th.

There are some other types that also don't translate your chords in the way that you might expect. Arpeggio types "SweepLine" and "PulseLine" as well as "SyncopaA" or "Techno-C" for example accept only chords with up to three notes, in other words a 7th or even a 9th is simply ignored. Alternatively you can reduce a 7th chord to three notes by leaving out the chord's 5th. Use Performances TP073 and TP075 as a starting point to explore the polyphony and overall structure of each Arpeggio type.

Effects – used in a different way

Enough of these lengthy experiments. With the help of a few practical examples we now would like to show you the Arpeggiator's many musical day-to-day applications .

The interplay between sounds and Arpeggio sequence is an important area that we haven't even touched on so far, but therein lies the art of Arpeggio playing! An Arpeggio that triggers hundreds of different sounds will produce just as many different results, and when used with especially flexible instruments like the CS1x they open up a whole world of possibilities.

This is particularly emphasised when you consider the musicians used to be stuck with analogue synthesizer sounds. Many interesting tonal shades could of course be got from their fast envelopes, heavy ring modulators or powerful noise generators, but it was sheer Utopia to envisage being able to control all imaginable samples with an Arpeggiator. Simply put, the CS1X blows the tonal 'corset' to smithereens, and with it all convention and ability to imagine the things that can be realised with an Arpeggiator.

Therefore let's start with sounds that you might never even have dreamed of using. Several years ago, when sampling technology finally become affordable, it's performance wasn't restricted to your everyday 'natural' instruments like piano and strings, but extended to very specialised effects generated by a Sampler, which was particularly popular in the studio scene and could thus be heard in numerous productions.

One of the most well-known of these was the 'Mickey Mouse' effect. So why not use the Arpeggiator to create an unusual effect?

✕AMPLE:

The following five Performances really should convince you that this subject is seriously worth looking into. So, dial up the first sound example TP076 and play it with just one note. If this doesn't even vaguely make you smile, select the next Performance. This too is a special kind of effect, which really

doesn't require further commentary. Seriously though, don't you think it would be very 'original' to use these little sequences with, or as the basis of one of your songs?

The next three Arpeggiator sounds are much easier to integrate into a sequencer arrangement. For example you could use them to program unusual rhythm tracks. As mentioned before, the Arpeggio as well as its tonal aspect play an important role in this.

✕AMPLE:

Let's deal with Performance TP078. It is based on the SFX voice "Burst" and has deliberately been transposed another two octaves (Note Shift=+24) – this is where the 'Aliasing Effects' come to the fore. If you have never come across this term before, here is a quick explanation: Aliasing errors occur when a sound's frequency is greater than half that of the sampling frequency used to digitise it. The result is a frequency differential that corresponds exactly to the difference between the original frequency and the sampling frequency. Tonally speaking, Aliasing results in drastic distortion, which can however be used very effectively in sound development with ROM-Sample-Synthesizers, especially with the aid of the Arpeggiator.

Perhaps you have by now thought about using the CS1x Arpeggiator to imitate wave sequencing – well, you can.

✕AMPLE:

The Arpeggio found in TP076 is straight from the Wavestation. The basic sound, as in our last example, was shaped primarily with the aid of the pitch envelope. Equally important are the effects, especially the Delay (VARY TYPE). The delay times take their cue from the Arpeggiator tempo. A little tip for fiddlers: try to work with keyboard splits if you want to create even more interesting wave sequences. Assign Material voices that complement each other well for each of the four Layers.

The last SFX Arpeggio is a percussive sequence which can be applied universally. Particularly nice here is Pan Position modulation.

✕AMPLE:

Select Performance TP080 and, as in the previous examples, play only a single note. The sound's main character is provided by the Flanger effect. This effect is responsible for the regular up and down movements that you will have noticed immediately. The Flanger by the way is also sometimes referred to as the 'Jet Effect'. Pay particular attention to the relationship between the Flanger's LFO speed and the Arpeggio tempo. With this, too, many variation possibilities can be achieved.

Feel free to experiment with the Arpeggio types and tempi of all these SFX examples. Utilising the Hold function will save you having to constantly re-trigger your Arpeggios.

Hard Chord Work

Furthermore you can use the integrated Arpeggiator for various chord break-up duties. Particularly musical sequences can be arranged intuitively with the special Arpeggio types, and here the same applies again: a more unusual sound results in a more original Arpeggio.

Let's however deal first and foremost with the traditional synthesizer sounds. In this area alone there are thousands of possibilities to explore, all of which can be used effectively for your arrangements. To demonstrate we have prepared two Performances.

✗AMPLE:

Performance TP081 consists of only one Layer, that is to say you could always use two detuned oscillators to give the sound volume. If this sound however is only to be used as an arpeggiated accompaniment, then one Layer should suffice. Doing so also helps keep the voice count low, which will benefit any multi-timbral duties. Again, pay attention to the effects. Here, as with TP079, the delay is used rhythmically.

If you hold your chord down a little longer you will find that the Arpeggio generated sequence repeats after exactly two bars. Here is a simple but efficient trick: vary the length of the sequence, i.e. trigger the Arpeggio already after a quarter, a half or a whole bar. This will shape your Arpeggio in ever more interesting ways and allow it to be used more distinctly.

Select the next Performance (TP082) to hear a classic Arpeggio sequence. A simple analogue sound is steadily arpeggiated up and down over four octaves. Altogether this sound is fairly delicate and can thus be utilised for graceful as well as frantic accompanying parts (ARP Subdiv 1/32). Intriguing effects can be achieved by varying the tempo during the Arpeggio process – simply use Knob 3 (Assign1). This really is a special means of expression. You can now shape the Arpeggio to any musical context (for instance to heighten chord sequences by stepping them chromatically upwards and downwards) or to your own personal interpretation.

Sounds interesting – but can the Arpeggiator only be used for Synthesizer sounds? Well, actually no, even traditional musicians get a great deal out of it. He/she may for example use it to create Tremolo effects for acoustic instruments, like the mandolin or steel drums. "UpOct1" or "DwOct1" are the most appropriate Arpeggiator types for this. Here's a little exercise.

✗PERIMENT:

Consider Performance TP012 as a "Sound Init". Now instead of the sine wave select Steel Drums (e.g. XG001/#15) and activate the Arpeggiator (the Arpeggiator type is already set correctly). All that's needed now is a tempo between 200 and 240bpm; all entries have been made. Now play your Steel Drums, in thirds just like the original. If you are pleased with the result, save your Performance. To add even more authenticity to the sound, try setting Assign1 to control the Arpeggio tempo as in our last example and gently vary the speed of the Tremolo with Knob 3.

Naturally this isn't all there is to it. Following are another four sequences that are particularly useful for modern styles like House or Trance – you should like those.

✗AMPLE:

The Performances TP083/084 are really quite traditional. With the first you will hear a two bar Clavinet sequence. You should keep your triggering chords held down for at least four beats on account of the daring downward octave jump and special rhythm.

The next Performance is enriched with Pan and Echo effects, and would work nicely as a House piano. Here a single key triggers an entire 7th chord (minor 7). Interesting also is the real-time control via Assign1/2. Knob 6 will let you vary the chord note's volume, whilst Knob 3 is used to vary the rhythmic resolution (Subdivide). Moving this knob fully clockwise decreases the note values from 1/16 down to 1/32, which effectively doubles the speed of the sequence – one to use quickly and impulsively!

To prove once and for all that the sound used is the most important element that gives the Arpeggio sequence its character, we have assigned Arpeggio type "Echo&Pan" to a phased choir sound. The resulting sound can be found in TP085. Hard to believe that this fourth and final example is based on the same Arpeggio type, isn't it? Particularly ingenious is the use of the differing dynamic values that are generated by the Arpeggio sequence. If the values exceed 92, an 'analogue' filter sound is heard (Layer2), if they are less you hear a 'digital' sound instead (Layer1).

Keeping in Line

It doesn't always make sense to trigger arpeggios with triads or other chords. Often it is better to play a single note, or the Arpeggiator may reduce polyphonic playing to a single note anyway. Naturally we have some examples for this, and will comment on them below.

✗AMPLE:

The first Performance (TP087) is a good example of arpeggio filter modulation. Combined with the distortion effect the filter movements are nicely pronounced and should set well even with Hardcore Freaks. As mentioned before, play this Performance with a single note only. Triads wouldn't really be useful here because of the fuzz effect. A second voice however may be added if you insist. A listen to the third Arpeggio Demo will reveal all.

The second Performance (TP088) is living proof that a bass line Arpeggiator type isn't restricted to bass sounds. Here we are using a particularly flavoursome sequence, seasoned to taste with a hefty dose of flanging. The Arpeggiator insists on playing only the root and 3rd notes, even if you play a triad; this is a good thing.

Perhaps you prefer to work with monophonic sequences, but the Arpeggiator occasionally produces two or more notes at once. No problem, with the aid of a small trick: simply use the Poly/Mono function to reduce your Arpeggio to one note, just like that. This opens up a whole new bag of variation possibilities, which in turn affect the Arpeggio pattern. A little example should make this clearer.

✗AMPLE:

Change Performance TP089 to POLY (Layer1). Now if you trigger the Arpeggiator, you can if so desired play polyphonic chords. This would however be a little impractical with bass sequences, especially if you use the Portamento function. As you will have already seen in the *Analogue Workshop*, sounds are supposed to be played monophonically with this function. We have already set up the Performance this way and thereby enabled the "Techno-B" Arpeggio type for bass lines. While you're at it, try out Performances TP090 and 091. X-

periment a little with the Portamento and Poly/Mono functions to give you an idea of how Arpeggio sequences can be significantly altered with them.

Let's Groove!

Anyone who has worked with Samplers will be familiar with their quirks: you have to constantly process drum loops with the time-stretch function so that they follow your song tempo correctly – this can take some time. On top of this you can barely influence any of the loop's instrumentation, never mind edit the grooves themselves.

How about triggering a drum kit with the Arpeggiator – is this possible? Yes, of course it is. The rhythms that can be created this way at the touch of a key would be very difficult to create using the Drum Editor of your sequencer package. And there are of course other advantages – you can use the CS1x's effects and other parameters on each sound individually, you can create new grooves with the Arpeggio styles, and these can always be synched to your sequencer's MIDI clock so they always run perfectly in time with your song!

So, call-up a drum kit set and turn on the Arpeggiator: sequences will spit out drums sounds like there is no tomorrow! Quite incredible really what uses the drum sounds can be put to. A few tips:

✕AMPLE:

All our recommendations are based on Performance TP092. To begin with, leave the Arpeggiator set to "Techno-C" as this is perhaps the most suited to the spontaneous arranging of rhythm patterns, particularly when improvising with drum sounds. Start out by triggering only single notes. You will hear special single bar patterns. A few examples follow:

F#1: Fill / Snare drum und Hihat
F2: Basic Groove / Bass and Snare drum, Toms
H2: Add Drum Sequence / Analogue Toms and Snare
D#3: Basic Groove / Bass drums and HandClap
F#3: Fill / typical for Hihats

So, how about using chords? Let's try the following combinations: F2 – Ab2 – Bb2 – Eb3. Press each chord note one-after-the-other and listen to the gradual build-up of a complete drum kit groove. We actually use this rhythm for the first Arpeggiator Demo.

Trying out several variations should pay off, too – different Arpeggio types, effects or other sound modules can all give interesting results.

✕AMPLE:

Select the next drum kit (TP092) with an Arpeggio type of "DAHouse". The first thing you will notice here is the rhythmic use of the Delay effect. The sound is further processed by the pitch envelope. Using some subtle changes makes for a more lively drum sequence. You could use these grooves for effective rhythm tracks. Now add a bass drum to the grovve (Four on the Floor) and bingo – you have an instant original Dance sequence! An alternative to this can be found in the next memory. Here the Arpeggio type "PulseLine" is put to work with a clichéd Flanger effect.

❯ DEMO

📁 **To finish this tutorial please load the following Demo Sequences from the Tutorial Disk:**

📄 ARPDEMO1.MID

📄 ARPDEMO2.MID

📄 ARPDEMO3.MID

Please note: *when playing these files, sound data for the Performances used is transmitted to the CS1x. This means that unlike the sound examples you don't have to transmit the Tutorial bank or any other bank manually.*

We hope the first demo will inspire you to use the Arpeggiator for original drum patterns or other types of rhythm parts. Thanks to the MIDI clock synchronisation the tempo varies between around 40 and 250bpm. Pay attention also to the use of knobs and Scenes.

Just how you can utilise the CS1x Arpeggiator for typical Synthesiser phrases is demonstrated in our next example: interesting here is the support given by the Delay effect, the filter modulation and especially the varying of the Arpeggio length. Chords are triggered here every one or two beats, i.e. every half or quarter note – in important tool in building tension in the sequence. The third and final example is a brute Techno sequence. Please note the large gaps between the various triggered chord notes in your sequencer. As you can see, choosing the right chords is very important!

Performance Mode – Practical Knowledge

Now that we have looked in detail at the CS1x sound components and its Arpeggiator, let's devote some time to its Performance Mode.

The following three subjects should generate particular interest: use of the knobs and Scenes, Effect applications and, finally, tips and tricks for live applications. If you haven't already transferred the relevant sound bank ("TUTOR-PFM.MID") to your CS1x, you should do so now.

Scenes – what are they?

Let's begin with Scenes. You may not be familiar with this term. The principle that it is based on, however, is easily explained: each of the two Scene switches can be used to store all six knob positions in a Performance, which can later be recalled by simply pressing the right switch. In the simplest case scenario, each switch is used to select a tonal variation of the sound used. You could for instance use the knobs to speed-up a pad sound's fade-in and out times, thereby making it more suitable for rhythmic or solo playing, and then save these settings to one of the Scene switches. Now you can effortlessly change between the two sound types without having to switch Performances.

✗AMPLE:

Let's assume you often play pad sounds, but want to use them also in other ways. The Preset sound P101 allows you to switch at lightning speed from a slow fade synth pad (Scene 1) to another variant (Scene 2) that can be used for melodic phrases or certain themes. Often it is helpful enough to be able to call-up different filter settings with the Scenes (P093), but as you can already alter the Filter's frequency with knob 5, using Scenes may seem a little awkward. However, ask yourself how often you have been able to spontaneously find exactly the right frequency with the knob.

Synth brass sounds also benefit greatly from having two variants ready to call-up. The Preset sound P110 reveals itself to be particularly flexible. Whilst the Scene 2 setting is suited to pad parts, Scene 1 lends itself to much more up-front keyboard riffs. The golden middle ground, a nicely balanced brass sound, is occupied by the Performance itself, i.e. when none of the Scene keys are depressed.

The tonal possibilities offered by Scenes increase dramatically, however, when both Scenes are activated simultaneously. You can now 'fade' between the two stored knob positions, from Scene 1 to Scene 2 and back again. The CS1x's Utility mode factory settings assign this task to the Mod wheel as standard. Just as effective however is the use of a connected rocker pedal. Doing so will leave the Mod wheel free for other tasks like Filter or Vibrato effect. Of course you will need to assign these playing aids afresh in the **Utility mode**. Select the ASSIGN CTRL NO and press one of the Scene switches. Now use the Up/Down knob to find the "Foot Ctrl" setting – and you're done.

So, what can be done with this? Well, let's say you have programmed a high Resonance value for Scene 1, and a low value for Scene 2. Increasing the Controller value (MW/FC) will now continuously decrease the sound's Resonance. Of course if you only want to vary a sound's Resonance you can achieve this just as easily with the respective knob – the use of Scenes would be illogical here. The point is that you can control many modulations simultaneously with Scenes – a single movement can affect the central Envelope parameters (knobs 1+2), Filter (knob 4+5) and a further two freely definable Control knobs (3+6) all at once – to great effect!

The best results can be achieved with clever programming of Assign1/2. You can for instance achieve morph-like effects if you are working with volume level modulation. Put simply: a piano changes into a string sound. Or you can use **Scene morphing** to shape a moderate pad sound into a cutting sequencer sound – the possibilities are endless. Let's explore such sounds using the 'learning by doing' principle! Don't worry, we aren't going to leave you out in the cold. We have five examples that show what can be fabricated with the Scenes.

Day to Day things

Before we begin you should know how to **store a Scene**. This is basically very easy: first arrange the knobs as desired. Once you have hit on an interesting sound you can save this variant by holding down the Store key and then pressing the first Scene switch. Now create another variant and save this one to Scene 2. It is important that the two variants complement in each other tonally. Always bear in mind that any morphing occurs first from Scene 1 to Scene 2!

Scene1			Scene1		
Atack	Relese	Asgn1	Atack	Relese	Asgn1
-64	0	33	0	10	0
C.Off	Rez	Asgn2	C.Off	Rez	Asgn2
8	13	-64	8	-12	63

Knob positions for Scene Morphing

If you wish to fade in a sound you should take care that the first Scene doesn't result in a relatively loud or harmonically rich sound. Initially, both Scene settings are stored in the working memory of the CS1x. You will need to save your Scene settings together with the compete Performance or they will be lost every time you change to another Performance or into the Multi mode. Be careful, it's easy to make a little mistake here: you should reset all the knobs to their middle position before you actually store your Performance, otherwise you will have inadvertently changed your entire Performance!

You should also be aware of the following: you may occasionally have played with the knobs and wondered why no changes could be heard. Strange, how can this be explained? It's quite simple: if you have activated one or both of the Scenes, any knob movements are simply ignored. The knob settings you have made will have no effect even when the Scenes are deactivated.

Why Scenes?

Most startling first and foremost is the blending of two different sounds, which as we have already pointed out is commonly known as **morphing**. Most sound programmers using sample-synthesizers work with contrasting level modulations for two or more partial tones. With the CS1x this, the simplest and easiest method, is achieved with the aid of Assign2, i.e. Knob 6. By the way: if you haven't fully aquainted yourself with the Assign1/2 parameters and functions, we would recommend you read though the relevant pages in your manual. Never fear, morphing is much more easily achieved than you may think. The next example should help you understand the rules involved.

✗ AMPLE:

Select Performance TP095. Naturally you need to activate both Scene switches (the LEDs will light up). So much for the preparation, now let's have some fun: hold any note and 'morph' between Scene 1 and 2 using the Mod wheel. You are now actually blending between a square wave (Scene1) and a sawtooth wave (Scene2). A glance behind the scenes reveals the programming involved. Find the Assign2 page. The Performance is made up of two partial tones. Both components are assigned Volume modulation, however using different modulation intensities. The first Layer is set to a negative value (-32), the second with a matching positive one (+32) – this is the real trick. Result: turn Knob 6 fully clockwise to hear the Layer1 sound (Ld: Volfet A) and fully counter-clockwise to hear the Layer2 sound (Ld: Volfet B).

The same process can be used to create other morphing sounds. If this type of Performance appeals to you, use TP095 as a starting point. Make sure you use plenty of contrasting sound combinations. As always, X-PERIMENTing is everything!

A Performance doesn't always need to change so significantly as with the previously described level modulation. Impressive sound developments can also be achieved without the help of Assign1/2. Modulating only Filter and Envelopes can be interesting enough, especially where analogue synthesizer sounds are concerned!

✗ AMPLE:

Select Performance TP096. Here a heavily filtered and resonanced sawtooth with minimal fade-in and out times is transformed into a harmonically rich pad sound with the usual envelope curves. Other parameters apart from the filter sweep (achieved with only the Filter's cutoff point) are affected as well. This gives the sound more universal applications. Let's stay with this Performance a little while, but this time deactivate the two scenes. Particularly noteworthy are the two assignable knobs: play a little with Knob6. If you listen carefully you will notice that turning the knob anti-clockwise causes LFO Amplitude modulation, whilst a clockwise turn results instead in LFO Filter frequency modulation. Let's now concentrate on the Assign1 knob. This is set to enable you to transpose the entire Performance's pitch by +/- 2 octaves. In contrast to the Pitch modulation with Assign2, the pitch can be changed continuously, without the usual semi-tone steps. Consider Knob 3 as an additional Pitch wheel.

Let's leave this aside for a moment: Why not assign Knob3 or Knob6 with Filter modulation? But which should you choose? The central parameters Cutoff frequency and Resonance already have their own dedicated knobs, so they are out of the equation. The following example might give a possible answer to this question.

✗ AMPLE:

You have selected Performance TP097. This is a classic lead sound, which thanks to Scene morphing can be played very expressively. Aside from the Filter frequency, the Filter Envelope's fade-in and out times are also modulated; this time Assign1 is responsible for the fade-out phase. All three Layers of the Performance have to use the same fade-in value if the fade-in times are to be modulated consistently (FEGAtkTime=+32). Scene1's settings result in intense filtering and a very drawn-out fade-in time. Holding down any key for more than 10 seconds will show how slow the fade-in phase really is. Not so with the second Scene. Here the Filters' fade-in time is minimal and is markedly 'opened' – so, can you guess what happens during Scene morphing…?

Let's look at Pan position modulation. Marked left-right movements within the stereo image don't really cause a sensation these days. Great fun can be had however if other parameters are modulated in harmony. This really is the secret of every effective Pan modulation! Let your imagination roam free. For example, choosing the oft recited Filter modulation can never be wrong.

✗ AMPLE:

For this, too, we have prepared a little sound example (TP098). There is no need to work with opposite modulation intensities here as the Performance contains only the one Layer – the Assign2 setting "Pan+32" will suffice. Now to the Scenes: here the Performance is filtered quite differently and two completely different Pan positions are used. Morphing from Scene1 to Scene2 will result in a filter sweep with the added tension of the left-right movements.

In contrast to all our previous Scene examples which focused exclusively on analogue synth sounds, we would like to finish with an example to show that conventional sounds too can be played more dynamically with Scene morphing. We have just touched on one of the classic weaknesses of ROM-Sample-Synthesizers. A waveform is simply reproduced and can often seem very static. Scene morphing is a new form of modulation that, whilst not solving the problem completely, may contribute some new and interesting ideas.

✗ AMPLE:

String sounds in particular are used in many different forms with sequencer arrangements. Often you will have utilised a variety of sounds to better imitate playing techniques such as Marcato or Pizzicate. You can't honestly say though that you were completely happy with this approach. The crux of the matter are the envelopes; they should react to your playing technique but instead you have to adapt your playing to them. Here the Scenes can provide a lot more flexibility. Why not try this out for yourself with Performance TP089. After a short while you will find that Scene morphing allows the string sound to be phrased much more distinctively.

The Effects

The Yamaha synthesizer offers a choice of three independent effects – Reverb, Chorus as well as a special Variation effect. Although you cannot program the first two effects at the machine itself, the Variation effect offers a plethora of parameters for you to play with. You can read up on this subject in the Appendix of the manual as well as the chapter about song production. We would like to concentrate however on a few effect types and their parameters.

In Performance mode the Variation effect can only be used with the **Insertsetting**. In contrast to the Multi mode you can however switch the effect on and off for each Layer. There is

one thing that needs to be considered though: If you activate the Variation effect for all Layers (VARI SEND=On) you can't set the Chorus and Reverb intensities separately. In the real world this is a small price to pay, but you should be aware of this phenomenon nonetheless. With the aid of a little exercise this will soon click into place.

✗PERIMENT:

Change the amount of Reverb (Rev Send) on Performance TP100. Setting Layer1 to (say) 040 will automatically set this value of Layer2 also. This doesn't happen if you disable the **Variation effect** for either Layer1 or 2 (Off). Now Chorus and Reverb levels can be set for each Layer individually. This ability to use different effect levels for different Layers helps to develop impressive, multi-dimensional sounds.

Only Send Levels can be programmed at the machine itself for the first two effects, Reverb and Chorus. Things get more complex with the Variation effect, which also offers Chorus and Reverb types. Here each type's parameters can be extensively programmed, and single parameters can even be controlled in **real-time**. If, for example you wish to control the Chorus or Reverb's "Dry/Wet" parameter, take the diversion via the Variation effect.

It isn't clear which effect parameters are available for real-time control without further documentation. We'd like to point you at this point to the "*Effect Parameter List*" in the manual's Appendix (page 49). On the CS1x the **target parameters** are tightly coupled to the Effect programmes and can't be manually defined. This list will show which parameters can be real-time controlled (right hand column – marked with a dot).

Next you will want to know which **playing aid** can be used to control a Variation effect parameter. You have two options: you will work with **Knob3** first and foremost by setting "ASIGN=VariContrl". Please remember that using Knob6 you can't limit the modulation intensity here. This may call for a little delicacy. You can also use the **foot rocker pedal** (FC Vari EF) for real-time control.

So much for our little introduction. We will now bit by bit sketch the most often used Variation effect types. More extensive details can always be found in the manual.

❯(A) Delay

Next to Reverb and Chorus, **Delay** is one of the most important effect types. The CS1x offers a choice of several types. Each program delays the output signal in its own particular way.

✗PERIMENT:

You have called up Performance TP101. Just play a few notes or chords ("staccato" would be best) and listen out for the effect of the Delay. Now repeat this for the other Delay types – you will soon see how each effect reacts.

Although Delay effects are most commonly used for solo sounds, studio professionals also have another application for them: you use the Delay to support the rhythm track. To do this you have to carefully choose delay times that match the song tempo. In practice you will end up having to re-evaluate the Delay times constantly. This little formula makes the process a lot easier:

$$(DelayTime) = \frac{60}{(Tempo)} \times 1000$$

This result will work with quarter notes. To calculate for 8 beats per bar, simply divide by two, for half note beats multiply by 2 or divide by 4 for 16 beats per bar, etc.

By the by: Several of the BlueBook Demo Sequences also use this trick. Take particular note of the effect programming used in the second Arpeggio demo, or the sound example "SweepRun". Both sequences use Delay rhythmically. You should practice this a little so that you can use it, too.

✗PERIMENT:

Your mission, should you choose to accept it, is to re-establish the correct Delay effect settings for TP012, so that the signal is delayed in time with the Arpeggio tempo (=120bpm). This is how we do it. You can work out the correct delay times with the above formula; it's best to choose 250ms (1/8) and 125 (1/16). Remember to consider the other parameters, too. To begin with vary the Dry/Wet relationship, which determines the intensity of the Delay effect. The Feedback Level (FB Lvl) also plays an important role. This parameter controls the number of repeats produced. Last but not least you should experiment with the unique "Input Set" function.

❯(B) Phaser

As the name suggests, the Phaser effect is created by periodic phase shifting of the effected signal from the original signal. This effect was especially popular in the 70s and was used for many a Rhodes, string ensemble or electric guitar. Today the Phaser is often applied to atmospheric pad sounds and other types of synth sound.

✗AMPLE:

You can find typical examples of this in the Tutorial Bank, a string pad (TP103) as well as a digital synth sound (TP104). The first thing you will notice about both Performances is a slow LFO movement; this can be accelerated by choosing a higher frequency value (LFO Fq – Hz). The intensity of the Phaser effect can be determined with three parameters – LFO Depth, FB Level and of course Dry/Wet. Playing with these values should give you a good handle on what each does.

❯(C) Flanger

The Flanger effect too is based on periodic Phase modulation. In principle the Flanger works more like a Chorus which sends a programmable part of its effected signal back into itself (Feedback Level). This results in the Flanger's characteristic comb filter effect. Listen closely to the subtle differences between the Phaser and the Flanger, as they may at first sound very similar.

✗AMPLE:

Tutorial Performance TP105 demonstrates the use of the Flanger with analogue synthesizer sounds. Devote some time to all of its parameters. Carefully increase the LFO intensity and vary the LFO speed (LFO Fq). Using the Feedback Level to accentuate the comb filter effect is also very revealing. Setting a value of +83 or higher for the FB Lvl throws the Flanger into feedback. The Feedback Level is also often referred to as Resonance.

➤ (D) Auto Wah

The wah-wah effect is commonly used with various guitars. As a rule, it is controlled dynamically with a foot rocker pedal. It actually consists of a particular low-pass filter whose cutoff frequency is periodically, i.e. "automatically" varied. The Auto Wah can be put to many uses with the CS1x.

✗AMPLE:

As a keyboard player you may wish to use this effect for Clavinet sound for example. To hear this for yourself, try out Performance TP106. In this case the sound is shaped further still with the dynamic use of the CS1x's Filter, which explains its lively play response. Of course you can apply the Wah effect similarly to guitar sounds. Alternatively it can be used to create X-PERIMENTal sound collages. Consider the Wah as a second filter that is even capable of resonance. A good example of this is Performance TP107.

➤ (E) Amp Simulation

This effect too is a typical guitar effect. It essentially imitates the sound of an amplifier combo. The CS1x even allows you to choose between different amp characteristics (Transistor/Valve). On top of this there's a low-pass filter and the parameter "Drive" which controls how the input stage is overdriven. The entire setup requires a little practice which will pay off in the end however.

✗AMPLE:

A common use of this effect is found in Performance TP108. You may not even perceive the effect on the first listen. This will quickly change when you disable the Variation effect (VARI SEND=On). The basic sound now sounds much more synthetic and carries and entirely different frequency signature.

Naturally you aren't limited to string instruments. Other sounds too can use this type 'effectively'. Organ sounds for instance can use a little dirt. A good example for this is Performance TP109, which without the amp simulation would sound rather too 'digital'.

➤ (F) Auto Pan and Tremolo

Both these effect programs are very similar. The Pan effect is really nothing more than two combined Tremolo effects that work against each other. The Auto Pan is primarily set with the "Direction" and "LFO Freq" parameters. The Tremolo effect even offers Pitch Modulation (compare this with Pitch LFO – Analogue Workshop). First and foremost you will use the "AM Depth" function which is responsible for Volume modulation, i.e. Tremolo.

✗AMPLE:

You will find two different E-Piano sounds in the Tutorial Performance bank. Using the first example (TP110), experiment with various "Direction" settings. Here the developers demonstrated their meticulous attention to detail. This can only be good for you. The Tremolo effect is very pronounced in the second E-Piano (TP111). For a change of scenery take a good look at the Pitch Modulation as well. Of course you can also use this effect simply as an additional LFO.

➤ (G) Rotary Speaker

The Rotary Speaker (Leslie effect) is based on the Doppler effect. It is primarily used to liven up organ sounds through the periodic varying of pitch as well as volume and tonal colour that arise when a loudspeaker is rotated. Common are two rotation speeds: the slow setting (Slow Leslie) gives a kind of cathedral effect, similar to a floating Chorus effect. In contrast, a vibrating, spinning soundscape is produced by fast rotation (Fast Leslie). The increase/decrease between these two speeds are a great tool for creating musical tension.

✗AMPLE:

A slow Leslie organ can be found in Tutorial Bank memory location 112. As this example demonstrates, a medium value for both the "LFO Depth" and "Dry/Wet" parameters fares well. You determine the rotary speed with the "LFO Fq" function, which initially is set to 0,63Hz. Knob3 (Assign1=Vari-Contrl) can be used to control the speed in real-time and helps to play your organ authentically. With this in mind, take a look at section "*Controlling Correctly*". It goes without saying that the Leslie effect can be used for sounds other than organs. To prove the point, listen to a synth bass sound (TP113).

➤ (H) Equaliser

The CS1x finally offers a choice of two different equalisers, a three band mono EQ (Bass, Mid, Treble) as well as a 2 band EQ. Their uses can be very varied. The first variant lends itself to drastic sound reshaping, whilst the latter is well suited to the accentuation of various levels (drum kit, bass etc.).

✗AMPLE:

Let's spend a little time with the equaliser using Performance TP114. Try to eliminate the sound's bass content (L.Gain) and work especially with parameters "M.Width" and "M.Gain". Be careful however: the 3 band EQ is a mono effect, and as such it finally disables any of your Layers' Pan settings.

Live Application

The CS1x is downright destined to be used as a Performance Synthesizer, not least because of it's eye-catching looks and very portable design. As a live musician you will be confronted with a unique set of problems, so we'd like to show you a few tricks to help you achieve those tasks and keep you in control of your CS1x when on stage.

A keyboard sound's moment of truth comes especially when playing live. Fundamentally, your Performances should meet two main criteria here. For one the sound has to be endowed with **plenty of harmonics**. If necessary, you can boost certain frequency regions. Secondly you should mostly use fast attacks for sounds. A harmonically rich E-piano sound with a gentle **attack phase** would not really be suited for live performance. Here are a few tricks to help you set up your Performances for live applications:

✗PERIMENT:

The attack phase of sound TP115, as you can hear, is hardly optimal. This E-piano sound is missing the characteristic bell-like attack component. We have prepared this hammer

noise for you. All you need to do to make it audible is set the Volume for Layer1 to the maximum 127. Now the Rhodes sound will assert itself in your arrangement thanks to this little insider's trick, which can of course be used for other tonal shades. The presence of a sound is especially governed by its attack phase.

Organ sounds too run the risk of sounding too dull and can often be lost in the battle for prominence in the live instrument war. This can be avoided. The solution here is to use add a harmonically rich component to your basic sound.

✗PERIMENT:

We will explain how this is done with the aid of Performance TP116. Try gradually increasing the second Layer's volume. With this you are blending in a digital sound, whose sole purpose in life is to add a little transparency to your organ sound. How much of this sound you add to the organ is really a matter of personal taste. It is worth listening to this partial tone in isolation to better understand what's going on.

A word about **touch sensitivity**: keep your sound's touch sensitivity as low as possible. This way many sounds cut through the mix better. A pad sound that you probably often play with your left hand shouldn't really respond to touch at all. Experience has shown that it is far more practical to control a pad sound's volume with a volume pedal or fader. That way you have far better control of your sound's level. Also don't forget to 'compress' your touch sensitivity values when preparing Performances.

Another important step is to ensure that you sounds' levels **relative to each other** are OK, otherwise you will have to constantly correct them during the performance. When setting the levels, however, you should not simply rely on the "Perf Level" value as a guide. Filter and effect settings will also indirectly affect the overall volume of a Performance. Therefore, keep listening to each sound against the other – let your ears decide.

Split Performances

Musicians that don't work with "Keyboard Splits" are an endangered species. The advantages are clear: you can play several sounds spread across 61 keys without having to switch Performances. This is how it's done: -

The programming effort required here is minimal and can be mastered effortlessly, even by beginners. Simply call-up the "**Note Limit**" function and determine the lower (LIMIT LOW) and upper (LIMIT HIGH) end points for the relevant Layer. As a rule of thumb you will usually only split two sounds across the keyboard, a pad for your left and another sound for your right hand. A little tip: always stick to the same split point, e.g. middle C (C3). If you do need to use different keyboard splits once in a while, you should make a note of it in the display (e.g. "Pad/Pno-F3").

Set out bellow are four Performances that we have put together to demonstrate the most important aspects of sound shaping for live performance.

✗AMPLE:

Performances TP117-120 contain typical live performance split sounds. The split point is always at C3. The sound assigned to the upper part of the keyboard can be played from this point onwards. We have programmed a combination of pad and E-piano sounds for our frst example (Split-1), the second consists of a CP70 piano as well as an organ sound (Split-2). You can change the sounds used quickly if you wish using Bank/Program changes. Pay attention also to the effect settings. Now let's look at the purpose of controller "Assign2". As we already know, it is often necessary to change the volume levels of your sound during live performance, either manually or with a foot pedal. Let's say you decide that your pad sound is way too loud. This is the trap spilt sounds fall into: if you change your volume with the Master Volume control, all your split sounds will be quieter and not just the pad sound. This can be a real nuisance, but never fear, there is a solution:

✗AMPLE:

A particularly elegant solution can be found in the use of Knob6. In Performances TP117/119 it is programmed to control the volume of your left hand sound only, independently of the right hand sound, i.e. only Layer1's level is affected. To be exact, you can only use the knob to decrease the level; turning it clockwise has no effect. If however you want to be able to increase the level as well you need to ensure that the Layer's volume is not set to the maximum 127. As you can see, when using modulation you need to take all the corresponding parameters into account.

Another dicey subject is the transposition of sounds during a live performance. A piano sound especially benefts from this ability as even 61 keys aren't always enough to fully exploit a piano's tonal possibilities. To begin with you can work with the CS1x's Shift and PART/LAYER keys to transpose an entire octave by up to +/-3 octaves. Once again, this is more tricky with split sounds, where you would usually only want to transpose a single sound and not the entire Performance.

✗AMPLE:

Here too you can make good use of the "Assign2" controller. Turning Knob6 clockwise in Performances 118/120 transposes the left hand sound up by an octave, whilst the right hand sound remains unaffected.

The Assign2 value of course doesn't correspond to the Note Shift parameter. As we have already pointed out earlier, you should always consider to the relationship between the modulation intensity and its starting value. Always orient yourself first by the Note Shift value. If for example it's set to +00 you should use a modulation value of +17 to enable a shift of exactly two octaves. If the Note shift value however is set to +12 you should use a modulation value of +25. You can try this out with Performance TP118.

Pulling out all the Stops

To round up this chapter we would like to look at sounds that you will want to use again and again, not just for live performance.

We are talking about the **Hammond sounds**. These sounds are a good basis on which to explore further aspects of sound programming.

First a look at the concepts involved. The organ's registers comply with the laws of **Additive Synthesis**. In contrast to Subtractive Synthesis, where certain frequency regions are selectively eliminated, here sine based tone frequencies corresponding to the position of a pipe organ or the partial-tone components of the treble range are mixed together, or 'added'. Individual drawbars or stops, also known as "choirs", are used to regulate the sine oscillations levels per position (pitch).

The classic Hammond organ has a total of **nine drawbars** (see table). The first two bars (Sub) lie an octave below the fundamental tone (16') and a 5th (5 1/3') above respectively. Die positions 8' to 2' make up the second section. The last drawbar cluster includes the upper three positions which correspond to the fifth, sixth and eighth harmonic sequence of partial tones.

Drawbar	Position	Note Shift	Note Sft – CS1x
1	16'	-12	-24
2	5 1/3'	+7	-5
3	8'	0	-12
4	4'	+12	0
5	2 2/3'	+19	+7
6	2'	+24	+12
7	1 3/5'	+28	+16
8	1 1/3'	+31	+19
9	1'	+36	+24

We want to emulate exactly this drawbar principle with the CS1x. To this end we are also adding single sine oscillations and tuning them for the relevant frequency behaviour. We need to improvise a little however as the CS1x is limited to four Layers. Don't panic, they are sufficient if you cleverly adopt only a part of the drawbar method. Each Layer can only be transformed however by +/-24 semi tones. In order to keep the total position's range intact you can for instance subtract -12 from all Note shift values (see the table's right column).

About the **sound programming**: we have designed two detailed sound examples for you to make this as easy to follow as possible, broken up the entire programming session into four steps and finally additionally documented them. The only real difference between these two examples can be found in the different sine waves and positions used.

Step 1 = Layering sinewaves and determining Positions

To begin with we have settled on four positions and chosen an appropriate Material voice. The first organ (TP121) consists of positions 16' – 2 2/3' – 2' – 4' and a simple sine wave (PRE1#48). Not so with the foundation of the second organ sound (TP125): here you will a hear a sine-like waveform along with a characteristic click sound during the attack phase (PRE7#074). With the classic Hammond sounds this 'organ percussion' occurs at 4' and 2 2/3'. We have however set the positions a little differently: 8' – 5 1/3' – 2' – 16'.

Step 2 = Setting Drawbar Positions

To get this right you have to regulate the volume relationships between all four Layers. Be careful, though; the biggest mistakes happen here. If the drawbar relationships, i.e. the level relationships between the different sine waves don't harmonise properly, your sound will seem completely unbalanced. The first example emphasises the popular 2 2/3' register (Layer2 – Volume 123). This is essential for authentic jazz registration. The remaining examples however reside in the middle position (Layer1/3/4 – Volume 63). The second drawbar setting (TP126) is considerably more 'neutral' and can as such be applied more universally. This is achieved by accentuating, i.e. stabilising the fundamental tone (Layer1) a little.

Step 3 = Programming the Leslie Effect

Even the most perfect Hammond sound isn't convincing until a Leslie effect is applied! Both Performances (TP123/127) utilise a slow rotary speed as a starting point, which can however be increased in real-time with Knob3. The constant changing of rotary speed via the a controller is an important part of authentic organ playing, and should always be taken into account when programming such sounds. We leave the choice of "Slow Leslie" or "Fast Leslie" entirely up to you. To break up the monotony we have increased the rotary speed (LFO Freq) in our last step (TP124/128).

Step 4 = Preparing the Drawbar modifications

Just as enticing as changing the speed of the Leslie effect is the spontaneous control of the drawbar positions, an effect which thanks to the wide control possibilities of the CS1x can also be recreated here. This is achieved simply by volume modulation. As you will know by now, this is the job of Knob6/Assign2. You simply need to program different modulation values for each Layer. You can emphasise the characteristic register (2 2/3') with the first organ sound (TP124) by turning Knob6 clockwise (Layer2 – Volume = +32). In the second example (TP128) a different octave position is accentuated instead (2'). Please take an extra hard look at Knob6 and its effects. You can of course always work with Scene morphing, allowing drawbar changes to be made with the Mod wheel instead. Performance TP128 is a good example of this.

⏃ Song Production:
An Easy Start

Songs in Performance Mode: Six steps to success

This paragraph summarises the steps required for song productions in the CS1x Performance Mode.

You may choose a Performance (MIDI Ch. 1) and 12 Multi Parts (MIDI Ch. 5-16) for your song productions. You can tailor your Performance to your song's requirements with the keyboard's Knobs and EDIT functions, all of which can then be stored. Multi Parts however are controlled by your sequencer program using MIDI Events.

❯ Step 1 = Setting up the Performance

Search out an inspiring Preset or User-Performance to play a leading role in your song creation. Customise the sound to your requirements. If you are planning to use the Arpeggiator, set its tempo to MIDI to allow its speed to synchronise to the sequencer. If possible, save your Performance in location USER 001 (STORE, 001, ENTER, YES).

❯ Step 2 = Loading the Setup File

Load file "SETUPPF.MID" from the Tutorial disk into your sequencer. This file contains all the important initial settings used for songs in the Performance Mode. This "Setup File" begins with a System Exclusive message (Bar 1) that resets the Multi Part settings (MIDI Ch. 5-16). Following is a Bank/Program Change message that calls up USER Performance 001. If you saved your Performance to this location there is no need to alter this setting. You will not need to use the following controllers for MIDI Channel 1 very often, as any parameters they control can also be set in your Performance.

Furthermore, the Setup Data contains events and initial settings for every Multi-Part (see the table below), each separated by 1/16 gaps.

Table: Setup File Part Settings (Performance Mode, MIDI Channel 5)

Event	Parameter	Initial Setting
Control #00	Bank Select (MSB)	63
Control #32	Bank Number (LSB)	0
Program	Program Change	1
Control# 7	Volume	100
Control# 10	Pan	64
Control# 71	Resonance	64
Control# 72	AEG Release Time	64
Control# 73	AEG Attack Time	64
Control# 74	Cutoff Frequency	64
Control# 91	Reverb Send	0
Control# 93	Chorus Send	0

As you can see, these settings are the same ones you can usually find in other synthesizer's "Multi Setup" or "Song Multi". The setup bar precedes the actual song information. You can of course alter all these settings in your sequencer's edit mode to create your own initial song settings.

❯ Step 3 = Testing the sound's settings

Before you begin recording your first few tracks you should familiarise yourself with the process of programming the Setup Data. Try for yourself just how different settings affect your sound aurally. To this end you should enable your sequencer's **MIDI Thru function** ("MIDI THRU = on") and set your CS1x to **Local Off** in Utility mode. You can now choose which CS1x Part is to be used by selecting your sequencer track's MIDI Channel. You can play the Performance by choosing MIDI Ch. 1. MIDI channels 2 to 4 don't do anything as they are reserved for the Performance's 4 Layers. MIDI channels 5 – 16 control Parts 5 – 16 respectively.

Select MIDI Ch. 5, then edit the Setup Data for Part 5. Start by editing the Bank/Program Change messages to call up different sounds. The following Banks are particularly interesting:

Preset 0 = MSB 063 / LSB 000
Preset 4 = MSB 063 / LSB 004

These Banks contain the first Layer of the Performance and often provide useful sounds for song arrangement, the so-called "Material Voices".

Furthermore there are 480 XG-Voices to choose from (see the table in section "*Decisions, decisions…*"). Once you have sampled a few of these sounds you can modify them to your hearts content with the Controllers.

You should by now have a pretty good idea how song settings are achieved.

❯ Step 4 = Recording Tracks

By now all technical pre-conditions for the recording of sequencer tracks are fully met. If you want to use the Arpeggiator you must activate the sequencer's MIDI clock (Sync = intern, MIDI Clock i.e. MIDI Control = ON).

You can fully utilise all Knobs during recording (or later on a separate track) to control your sound in real-time. The sequencer records Knob movements as Control messages.

❯ Step 5 = Effect Settings

Setting up your effects is easy. All Layers and Parts are affected by the Performance Effect types settings, Chorus and Reverb. Each Performance Layer and Multi Part has its own freely programmable Send Level. The Layers' settings are programmed at the machine, whilst the Multi Parts' are set using Controllers #81 and #93 (see table "*Setup Data*"). The Variation effect is only available to Layers 1 to 4, but here it can be programmed extensively and enabled/disabled for each Layer.

❯ Step 6 = Saving Data

All song settings, with the exception of the keyboard stored Performance, are part and parcel of the songs and are automatically saved along with all other song data. Your Performances can be transferred to your sequencer as a complete personalised set using **Bulk Dump All**, or individually using **Bulk Dump 1 Perf**. From there they can then be archived to disk. Of course you can also integrate a single Performance dump into the Setup File.

The traditional approach: Multi settings at the machine

This paragraph will demonstrate a completely different method of CS1x song production.

No doubt you will already have read section "*Multi Play Mode – Multi Part Editing*" of your manual and found that the keyboard's Multi settings are volatile and can't be saved. So what is the point of working with these parameters at all? Luckily there is a way to use the sequencer song settings effectively by utilising a "Dump Request"! This involves the sequencer program 'asking' for the keyboard's Multi settings and receiving them using System Exclusive messages. This method can always be used when the device in question hasn't got a Bulk Dump facility available for specific data sets.

So, If you prefer to use your keyboard to determine the Multi setup rather than use sequencer track events, read on.

You may not know how to program a Dump Request, don't worry, we have taken care of it. On your tutorial disk you will find several files in the "REQUESTS" directory, all of which are listed in the "Overview: Tutorial Disk Files" Appendix.

Let's begin with the file "REQXGALL.MID". This can be used to initialise the Multi settings for all XG Parts (1 to 16) with a single Request. Specifically, here are the parameters as listed in the last line of the parameter matrix: Bank, Program, Volume, Pan, Reverb Send, Chorus Send, Variation Send, Cutoff, Resonance & Poly/Mono. You will find a detailed explanation of these parameters in the "*Multi Play Mode*" section of your manual.

One more tip for MIDI buffs: This request asks not only for the above mentioned parameters but all Part parameters which can be set using System Exclusive messages or the Controllers (see the following section and "*DATA LIST*", page 23).

The following example will show how you can transfer the Multi settings to the sequencer with the help of Requests.

✗PERIMENT

Call up MULTI Mode, record a few sequencer tracks and set up the respective Parts at your keyboard. If necessary, consult your manual (pages 36 to 39). Careful: don't at any time switch into Performance mode – all your settings will otherwise be lost!

Load the file "REQXGALL.MID" from the Tutorial disk ("REQUESTS" directory) into the sequencer. Now prepare another track to record the Dump information. Ensure that the sequencer doesn't filter out System Exclusive messages. Temporarily disable the sequencer's MIDI Thru function. Important: use a slow tempo, around 40 to 60bpm. Start recording. If everything works as planned, the CS1x will now receive a Request command for each Part, and in turn will send all Part settings using a System Exclusive data block.

You now have recorded all your keyboard's Multi settings into a sequencer track. Should you loose your keyboard's settings by switching it off, a power cut, by changing into the Performance mode or some other disaster, simply play back this sequencer track and all settings will be restored. Should you wish to make further changes to your settings however you will need to save these again using the Request process.

Finally you should make absolutely sure that the data transfer was successful. You will need to look at the freshly recorded track's event list. You should find 16 Sys-Ex blocks. If this is not the case, repeat the recording process using a slower tempo.

Now disable the Request data ("Mute") and quickly change into Performance mode, then back into Multi mode. This will reset all Multi settings. Now play the track containing your Sys-Ex data. If all your settings are restored, the X-PERIMENT has been a success. Please take the time to practise the transfer process a few times, this will help to avoid nasty surprises later on.

The above mentioned process is only possible if you are working in Multi mode (XG). Does this mean that in Performance mode all Multi part parameters have to be set in the sequencer? Not necessarily, here too we can offer an elegant solution: the Performance mode doesn't allow the discussed Multi settings using the parameter matrix. But that's what the Knobs are for! We need to define the Knobs temporarily as Multi part controllers, using the following scheme:

Knob 1	Volume	Controller #7
Knob 2	Pan	Controller#10
Knob 3	Reverb Send	Controller#91
Knob 4	Cutoff	Controller#74
Knob 5	Resonance	Controller#71
Knob 6	Chorus Send	Controller#93

The only things you need sort out at the sequencer end are Bank and Program Changes. You can assign the Knobs in UTILITY – ASSIGN CTRL NO. You will find it easier though to load and play the specifically prepared file "KNOB-MUL.MID" (in directory "MULTIREQ") from the Tutorial Disk. This file contains the necessary pre-programmed utility settings as Sys-Ex messages. This file is particularly useful if you don't wish to keep these assignments permanently;

doing so would disable any ASSIGN settings in your Performance. The "KNOBPFM.MID" file can be used to return all Knob assignments to their factory presets.

Another small tip for tinkerers: If you decide to use the above alternative Controller assignments as standard for your song productions, it may be wise to label each Knob with little stickers for reference, e.g. "Volume" below the "Attack" label.

So, what's it like to work with these newly defined Multi controllers? Quite comfortable actually, as it is now possible to vary the sequencer's currently active MIDI channel with them. You can use the sequencer to record each change you make, particularly useful if you want to make real-time sound changes during the song. However, we are currently only concerned with the initial values at the beginning of the song, so feel free to tinker with the controls – don't worry yet about 'writing' those values. Any changes you make are automatically stored in your keyboard as Part settings anyway, but remember to use a Request to transfer the settings to the sequencer and store them there, at least before you turn off your keyboard. The procedure for this is exactly as described above, but with one exception: use the file "REQP-FALL.MID" this time, as its Request is limited to the Parts available in the Performance mode, i.e. 5 – 16.

By the way, you can use the Knobs as described in Multi mode too. This allows you to visually track any changes you make on the display by selecting the relevant parameter – handy.

If you are using only a few sequencer tracks for your composition, you can use single Part Requests to get the Part data (REQPART 1 – 16). This method has two advantages: For one the data bulk is significantly smaller as only necessary settings are transferred. Secondly, a change to a single Part doesn't require a repeat Request for all MIDI channels every time.

Devotees of the 'building block' principle may spot yet another advantage to this approach: each Part's settings can be archived separately and can then be reused for other songs. How about a Part library, sorted into categories such as Drums, Bass, Sequencer and Hooklines, Chords, Pads, etc.?

Saving settings per single Request will also be invaluable if you are planning to set the Multi Parts using the faders or mixer pages from within the sequencer.

By the way, there is no need to laboriously enter the mixer page settings into a sequencer track as MIDI events. All fader generated settings can be requested complete from the sequencer using the Request command.

Despite our enthusiasm for Dump Requests, we should also point out some of the disadvantages of this method:

- *Additional changes are somewhat laborious as they always require a new Request. However, it is possible to add Controller events after the Sys-Ex blocks to correct single settings without the need of a new Dump.*

- *Sys-Ex data blocks do not necessarily follow the professional standard set by XG productions. None of the settings are easily visible to third parties.*

- *Using the Knobs to visually control parameters is impossible in Performance mode, unless you record these with the sequencer as Controller messages.*

Song Production: The Basics

This paragraph deals extensively with all aspects of CS1x song production and makes no attempt to fIter out any 'specialist knowledge'.

This doesn't mean though that it is necessary to fully explore each aspect in order to create songs with the CS1x.

Our earlier chapter "*Song Production – An Easy Start*" made that obvious. Everything you need to know for a quick start into multi-timbral applications with the CS1x can be found there in compressed form.

However, should you wish to take a more informative but less comfortable route through the following, often complex material, we recommend plenty of patience. Please take the time to work through each of the successive subjects and try out as many of the accompanying examples as possible. After all, your song productions are bound to beneft from it.

What is "XG"?

If you are planning to use the CS1x to play back or record sequencer songs, you should already have heard something about "XG" and be familiar with its most important properties.

The **XG Standard** is a format developed by YAMAHA and is used to control tone generators. Although XG is based on General MIDI (GM), it represents many **qualitative and quantitative improvements** over this standard. XG supports greater musical expression: the total number of sounds available in GM is drastically increased in XG. Furthermore individual sound settings and real-time control of a multitude of parameters are now possible. Finally, **compatibility between different XG models** is guaranteed despite differences in tone processing.

The XG voices are organised into banks which, with the exception of the GM compatible Bank 0, are not fully allocated. This may at frst seem confusing. A quick look at the supplied XG-Voice List however clears things up: Bank 1 and all following Banks (with the exception of the SFX-Bank) are variations of the foundation sound. The different sound characteristics can be found from each bank's column label (e.g. Stereo, Single, Slow, Fast Decay etc.). This should greatly simplify a search for a particular sound. Please take a look also at table "XG Voices" in section "*Decisions, decisions* …".

Another property of XG is that the Parts' (i.e. the MIDI channels') sound and effect settings are integrated as Controller and System Exclusive data in each sequencer track, rather than stored in the keyboard itself. This has both advantages and disadvantages.

One advantage is that songs recorded in the XG standard are always played back correctly, regardless of which XG model the song is being played back on. Total compatibility between a whole product range is guaranteed by the standardisation of all sound settings down to the smallest detail. Time consuming sound bank transferrals and the accompanying risk of data loss are thereby avoided.

XAMPLE:

You have recorded the foundations of a song on your CS1x and now wish to pass on this embryonic composition to another musician, so that he can develop your ideas or add further tracks. Without a common standard your partner would have to spend a lot of time in preparation – he would have to assign MIDI channels, fnd correct sounds and transpose octaves correctly, or even modify the drum map. Not so with XG: your partner can use your fles with a MU-50 sound module, the QS-300 synthesizer, the DB50XG sound card or any other XG model without modifcation. He will hear the song exactly as you recorded it. This greatly aids and encourages co-operation between musicians.

One disadvantage of the standardisation of XG voices is perhaps that it allows too little 'elbow room' for the creation of specialised sounds. The CS1x however offers a user-friendly solution to this problem:

The CS1x can be used multi-timbrally in not just its Multi mode, but in its Performance mode also. Both modes lend themselves well to song recording or smaller arrangements. The Multi mode follows the XG model completely, however in Performance mode you can combine the usual Layers (1 to 4) with up to 12 Multi Parts. The Multi Parts are XG compatible, but they can also make us of **Material Voices**. These are the Performances' Layers, which can be selected with specifc Bank and Program Change commands.

Is doesn't really matter whether you choose the Multi or Performance mode for song production – the actual recording procedure with external sequencers is fundamentally the same and follows the XG standard. This is particularly true for sound changes using controllers or System Exclusive messages. We will therefore cover this subject for both modes simultaneously.

Before we begin though we should take a quick look at the principal differences between the two modes. This will help you to get a better grip on which mode to choose.

Performance Mode or Multi Mode?

The Performance mode is selected with the PERFORMANCE key, and the Multi mode likewise with the MULTI key. This is of course self-explanatory. The consequences of this simple key press however aren't quite so obvious to the user – something you should know about right away. Every mode change re-initialises all of that mode's parameters, in other words they are 'reset' to their standard values. In Performance mode this applies only to the Multi Parts (5 – 16) and doesn't affect the actual Performance (Layer 1 – 4). XG experts will be familiar with this initialisation, termed "XG On".

Which mode is preferable depends on how you plan to use it. The rule-over-thumb is: if you wish to incorporate the above mentioned CS1x facilities into song production (real-time control using Knobs, Scenes, Arpeggio…) you should work in Performance mode. If however you need to be able to record or play back XG songs you should choose the Multi mode.

The following overview will clarify the main properties of each playing mode, and the differences between them.

Table: The Playing Modes of the CS1x

Performance Mode		Multi Mode (XG)	
Layers 1 to 4 (Midi Ch. 1)	128 Preset Performances 128 User Performances Variation Effect (Insert) Arpeggiator Scenes Knobs Sound editing at the keyboard	XG Parts 1 to 16 (Midi Ch. 1–16)	480 XG Voices SFX Voices Drumsets Variation Effect (Insert or System)
Parts 5–16 (Midi Ch. 5–16)	930 Material Voices 480 XG Voices SFX Voices Drumsets		
Parts 5–16 = XG compatible		All Parts fully XG compatible.	

As you can see, the CS1x can be used multi-timbrally in Performance mode too. The Performance itself consists of sound 'layers' which are mapped to MIDI channels 1 to 4. The Performance is controlled however from just one MIDI channel, usually MIDI channel 1. The Performance mode increases this choice by Parts 5 -16. This means that up to 13 Parts can be utilised in Performance mode (1 Performance + 12 Multi Parts).

Using Performance mode for song production has several distinct advantages:

- *You can use any Performance as the basis of your song and if so desired utilise Scenes, Arpeggio and the Knobs. An arrangement can then be created by adding to this Performance with Parts 5 – 16. The Performance however remains unchanged, unlike with other synthesizers where it has to be integrated into a Multi program, resulting in the loss of all effect settings.*

- *Parts 5–16 offer a particularly diverse sound potential. Aside from the 480 XG voices and various drum sets you can also use any of the 930 Material voices. The latter score highly with many sounds for up-to-date music styles like Dance & Techno. In contrast, the XG voices offer a wide spectrum of logically categorised conventional sounds. By the way, we take a closer look at choosing sounds in section "*Bank and Program changes*".*

Still, there are many good reasons to work in Multi mode: it follows the XG mode which is already implemented in other YAMAHA models (e.g. MU-50, MU-80, QS-300, CBXK1-XG). Songs recorded in XG mode can be exchanged between different XG models without any problems, although the choice of sounds is limited to 480 XG voices and 11 drum sets. In addition to Reverb and Chorus, you can also employ any single VARIATION EFFECT and freely program a Send Level for each Part (the Performance mode limits the use of the VARIATION EFFECT to Layers 1 – 4).

Never fear, you don't have to decide right from the start on which mode to use for your song productions. Performance Parts 5 – 16 are fully XG compatible. You can change modes as often as you like as long as you restrict yourself to these Parts and choose only XG voices for each of them!

Where is the Multi Setup?

Anyone familiar with other synthesizers will have come to expect that a Multi program's song settings are developed at the keyboard itself. You will need to rethink this approach with the CS1x.

You can of course program the most important settings at they keyboard in Multi mode, and then use the sequencer Request command to transfer them (see section "*The traditional approach: Multi settings at the keyboard*"). It is much more professional however to make Multi settings an integral part of your song. This is done by preceding the song information with one or two bars of **Setup Data**.

To some users this may seem a little unusual, but once put into practice has proved to be advantageous.

The Setup Data contains all the Multi mode settings you would normally program at the keyboard, in the form of MIDI events: Bank and Program changes, Pan settings, Volume settings, Effect Send Level and the most important sound parameters like Cutoff, Resonance, Attack and Release.

What MIDI events are there? How are they entered into the sequencer program? How do I create my own Setup Data? No doubt you are ready to ask many of these questions. Don't worry, we shall look at them in detail during the next few sections.

What is a "MIDI Event"?

In the next few pages we will explore the various **MIDI messages** ("events"). First a quick overview of the data types you will encounter during sequencer production.

The most important event type has to be the Note event. This is divided into "**Note on**" and "**Note off**" events, which are used to determine a note's length. Part and parcel of these events is the **key velocity**.

The second group of MIDI messages are "**continuous messages**", in other words continuously sent data. These include:

- *Aftertouch: tonal changes produced by increased key pressure.*

- *Pitch Bend: pitch changes using the Pitch Bend Wheel.*

- *MIDI Controller: "remote control" of standard parameters via MIDI.*

Program Change commands are yet another type of event used to select sound programs via MIDI.

The most specialised type of MIDI event are undoubtedly the **System Exclusive messages**, which are used to transfer machine specific parameter settings.

All these event types can be recorded and processed with virtually any hard- or software sequencer. Exactly how this occurs is dependent on the sequencer. Manual input in the EDIT mode is often preferable, if not necessary.

The most important event used in the Setup Data is the MIDI Controller. Here the CS1x is ahead of the crowd, as all Controller messages can be generated with the Knobs and sent via MIDI to the sequencer to be recorded. Program Change commands and System Exclusive messages are also utilised by the Setup Data. All other events however only come into play during the recording of a musical process, although Pitch Bend or Aftertouch settings may also occasionally be used to pre-initialise a sound.

Decisions, decisions: Banks and Programs

Sounds are selected for each Part with Bank and Program Change commands. These are inserted into the first bar of each sequencer track using the following three events:

Bank Change (MSB)	**Control 0**	**Bank Select**
Bank Change (LSB)	**Control 32**	**Bank Number**
Program Change		**Program**

As you can see, a combination of two event types is employed: two MIDI controllers and a Program Change command. It is required that these three events are recorded in this order. If further Program Changes are to occur after these initial Bank and Program Changes, all that is required is a PROGRAM CHANGE command.

If you are unsure as to how Bank and Program Changes occur within your sequencer program, this might help:

Set your sequencer to Record/Start. Call up the CS1x Preset Performance 001 at the keyboard. Now press the PRESET key. Stop the sequencer, and call up the Edit mode. Your event list should like something look this:

Startposition	Länge	Wert 1	Wert2	Wert3	Status	Kan
0001.01.000	=====	0	63	===	BankSelMSB	1
0001.01.008	=====	32	64	===	BankSelLSB	1
0001.01.016	=====	1	===	===	ProgChange	1

Event List / Bank and Program Changes

How should you interpret this diagram? Quite simple really: you have recorded Bank and Program Changes for Preset Performance 001. The first line calls up an MSB Value of 63 with Controller 0, the second sets a LSB Value of 64 using Controller 32. The third line calls up Program 1 using a "Program Change event". Be careful however: the Program Change value has to be converted if the sequencer program uses the MIDI norm for displaying them (= 0 – 127). This means that choosing Program 63 at the keyboard would be resolved as Program 62 in the sequencer's memory. The following examples and tables list the Program value per MIDI norm in brackets.

The tables below give an overview of your YAMAHA synthesizer's Bank sorted sound material.

Table: Performances and Material Voices (Performance Mode only)

	Performance MSB / LSB	Layer 1 MSB / LSB	Layer 2 MSB / LSB	Layer 3 MSB / LSB	Layer 4 MSB / LSB
Preset	063/064	Pre00 = 063/000	Pre01 = 063/001	Pre02 = 063/002	Pre03 = 063/003
User	063 / 065	Pre04 = 063/004	Pre05 = 063/005	Pre06 = 063/006	Pre07 = 063/007
Additions		Pre08 = 063/008	Pre09 = 063/009	Pre10 = 063/010	Pre11 = 063/011

The first row of the table lists the CS1x Bank Changes. The remaining rows contain Bank Changes for Material Voice Banks 00 – 12. All Material voices can be used as independent sounds for Performance Parts 5 – 16, and then called up using the above Bank Changes. Section *"About the CS1x Sound Structure"* will give you a better insight into the system used here.

✗ AMPLE:

You are creating a song in Performance mode and wish to assign PRESET 001 (= Material voice "Pre01-PGM1") to Part 5 Layer 2. You will need to input the following Bank/Program Changes:

Control 0	**063 (MSB)**
Control 32	**001 (LSB)**
Program	**001 (000)**

Table: Drumkits (Performance Mode only)

Drumkit	MSB	LSB	Prg
Tekkit	063	012	001 (000)
ElektroKit	063	012	002 (001)
JungleKit	063	012	003 (002)
HipHopKit	063	012	004 (003)
808 Kit	063	012	005 (004)
909 Kit	063	012	006 (005)

Table: XG Voices (Performance mode and XG Mode)

Bank	Category	MSB	LSB	Prg
XG Voice bank 000	GM	000	000	1–128 (0 –127)
XG Voice bank 001	KSP	000	001	
XG Voice bank 003	Stereo	000	003	
XG Voice bank 006	Single	000	006	
XG Voice bank 008	Slow	000	008	
XG Voice bank 012	Fast Decay	000	012	
XG Voice bank 014	Double Attack	000	014	
XG Voice banks 016/17	Bright	000	016–017	
XG Voice banks 018/19	Dark	000	018–019	
XG Voice bank 020	Rsonant	000	020	
XG Voice bank 024	Attack	000	024	
XG Voice bank 025	Release	000	025	
XG Voice bank 027	Rezo Sweep	000	027	
XG Voice bank 028	Muted	000	028	
XG Voice bank 032	Detune1	000	032	see XG Voice List
XG Voice bank 033	Detune2	000	033	
XG Voice bank 034	Detune3	000	034	
XG Voice bank 035	Octave1	000	035	
XG Voice bank 036	Octave2	000	036	
XG Voice bank 037	5th1	000	037	
XG Voice bank 038	5th2	000	038	
XG Voice bank 039	Bend	000	039	
XG Voice banks 040/41/42	Tutti	000	040–042	
XG Voice bank 043	Velo-Switch	000	043	
XG Voice bank 045	Velo-Xfade	000	045	
XG Voice banks 064 – 072 096 – 101	other wave	000	064–072 096–101	
XG SFX bank		064	000	

With the exception of GM Bank 000, the XG Banks are only partially allocated. To find out which voices are stored in the above Banks check out the XG Voice list. Altogether there are 480 voices contained within the XG Banks. When choosing sounds it is advisable to start with the basic sound (Bank 000) and then try out each Variation with the LSB value.

✕AMPLE:

Let's assume you are looking for a synth brass sound. As a starting point select voice "Synthbras1". The following Bank/Program Changes are required:

Control   0   000 (MSB)
Control   32   000 (LSB)
Program   063   (= i. e. 062)

A quick glance at the XG Voice List reveals all of this sound's Variations:

Bank 012 (Fast Decay)   = "Quack Brass"
Bank 020 (Rsonant)   = "RezSynBr"
Bank 024 (Attack)   = "PolyBrss"
Bank 027 (Rezo Sweep)   = "SynBras3"
Bank 032 (Detune 1)   = "JumpBrss"
Bank 045 (Velo-Xfade)   = "AnaVelBr"
Bank 064 (Other Wave)   = "AnaBrss1"

To select the Variation you want, simply change the respective Bank number, for example increasing the LSB value to 012 would give you "Quack Brass".

**Table: XG Drum kits
            (Performance mode and XG Mode)**

Drumkit	MSB	LSB	Prg
Standard Kit	127	000	001 (000)
Standard2 Kit	127	000	002 (001)
Room Kit	127	000	009 (008)
Rock Kit	127	000	017 (016)
Electro Kit	127	000	025 (024)
Analog Kit	127	000	026 (025)
Jazz Kit	127	000	033 (032)
Brush Kit	127	000	041 (040)
Classic Kit	127	000	049 (048)
SFX1	126	000	001 (000)
SFX2	126	000	002 (001)

Who is controlling whom?

Now that you are familiar with sound selection using Bank and Program Changes, let's investigate how those sounds can be changed from within a song using Controllers.

Simply, Controller messages allow real-time control of specific parameters over MIDI. The Controller messages are either stored along with Bank and Program change commands in the Setup Data preceding the song itself, or are sent along with the note information in real-time.

We will introduce the CS1x's most relevant Controllers to song production with this next table. Listed also are the Controller values that the CS1x defaults to.

Table: The most important CS1x Controllers

Controller No.	Parameter	CS1x Default Setting
7	Volume	100
10	Pan	64
17	Knob 3 Parameter (nur Performance-Modus)	64
18	Knob 6 Parameter (nur Performance-Modus)	64
71	Filterresonanz (Knob 5)	64
72	AEG Release Time Knob 2)	64
73	AEG Attack Time (Knob 1)	64
74	Filterfrequenz (Knob 4)	64
91	Reverb Send	40 (Perf. Mode = 0)
93	Chorus Send	0
94	Variation Effect Send (XG Mode only)	0

Sound parameters like Resonance, Release, Attack, Cutoff or Pan Position are edited relatively; they can be decreased as well as increased, depending on the sound's factory settings. It is important therefore to set every Controller initially to the middle value 64 to ensure that the Knob settings actually correspond to the programmed Controller values. Not so for Volume and Effect Send parameters. These work with absolute values, i.e. the keyboard's parameters are consistent with the respective Controller values.

Tip: To make life a little easier you can use a particular Controller data block as Setup Data for each track in each song. There are two files on the Tutorial disk to demonstrate how:

- *"SETUPPF" = Performance mode Setup Data (Ch. 1 + 5-16)*

- *"SETUPXG"= Multi mode Setup Data (Ch. 1-16)*

The System Exclusive Init data found at the beginning of both files is used to initialise each mode's parameters. This avoids older Multi settings from a previous song being used by mistake. We now have to follow this data with any parameter settings that deviate from their initial defaults.

File "SETUPXG" contains additional Sys-Ex messages that set up the Variation Effect ("2-Band EQ").

A closer look at UTILITY function "Assign Ctrl No" reveals where the CS1x gets its "Control Synthesizer" name. Here you can use any Knob (1 – 6) and the Mod wheel to modify default settings by assigning them to any of the above Controllers. Simply move the desired Knob or the Mod wheel and enter a new Controller number – it's that easy.

In order to keep a better perspective on the proceedings it may be advisable in most cases to leave the factory default settings alone. There are occasions however when changing these settings can be very useful.

✕AMPLE:

Let's say you want to record real-time Pan Position changes. Knobs 3 (Assign1/Data) and 6 (Assign2) that can have any parameter assigned to them are however otherwise engaged. All you need to do is to assign Knob 3 temporarily to Controller 10 (Pan Position). Now you can record and freely modulate the Pan Position with Knob 3. When you are done, reassign Knob 3 to Controller #17 again (the default setting), so that the Knob fulfils its intended function in the Performance.

The use of Knobs in this way isn't limited to the Performance. The Controller data generated by Knob movements is always sent to the MIDI channel set as TRANS CH. in

UTILTIY. In other words, you can generate Controller data with the Knobs or Mod wheel for any MIDI channel, and record this data with your sequencer. This even works in Multi mode!

✕AMPLE:

You are creating a song and wish to generate simultaneous flter and resonance modulation on MIDI channel 12 (set MIDI Ch. 12 in the sequencer's recording parameters).

Now start recording (Record) and play with Knobs CUTOFF and RESONANCE. All movements will be recorded as Controller messages 74 and 71.

It gets better still: you can also use this method to send Controller messages to other Synthesizers or tone modules.

✕AMPLE:

Let's say you want to control another YAMAHA synthesizer's VARITAION Effect Send Level on MIDI channel 16. These CS1x UTILITY settings are required:

TRANS CH = 16, ASSIGN CTRL NO = MW (move the Mod wheel), 94: Vari.

Now start to record, and use the Mod wheel to set the Variation Effect Send Level. Any wheel movements will be recorded as Controller 94 messages.

Everything under control: NPRN and RPN

The NRPN ("Non-registered Parameter Number") and RPN ("Registered Parameter Number") are special kinds of Controller message.

A single event here isn't enough. Parameter selection follows a similar path to that of Bank Change messages, i.e. Controller messages are sent for both the MSB and LSB values. This is then followed by a third Controller message which represents the parameter value ("Data Entry"). The RPN concludes its data transmission with a further two Controller events ("Reset to 0").

This multitude of events can make a sequencer track a little diffcult to follow. It is possible to use a single Sys-Ex message to control any of the parameters NRPN and RPN can control, hence you should look at each case individually to decide whether NRPN/RPN or Sys-Ex messages are appropriate. For example, NRPN/RPN messages may be preferable in these two cases:

- *You decide you only occasionally need to control parameters in addition to the ones listed above via MIDI (e.g. Decay Time, Fine Tune…) and don't wish to get involved with Sys Ex data.*

- *One of your parameters isn't just initialised at the beginning of the song but continuously varied within the song. Once the parameter is called up these changes only require a single Controller event, i.e. the data stream will be signifcantly smaller than with Sys-Ex messages!*

You will fnd a complete list of NRPN and RPN in the Appendix of your manual. You may notice that some of the parameters with their own Controller number (see previous section) crop up in this list also (e.g. Cutoff Freq, Attack Time). We can forget about these however; it would be silly to input them via NRPN, where they would require several Controller events, when a single Controller can be used instead.

Below is a list of parameters which can only be controlled via NRPN. Each value is also listed using decimal notation as most sequencer programs don't allow hexadecimal values for input:

Table: NRPN Parameters

Parameter	Cntr 99 (MSB) hexa-deci-mal	Cntr 98 (LSB) hexade-cimal	Cntr 99 (MSB) decimal	Cntr 98 (LSB) decimal
Vibrato Rate	01H	08H	1	8
Vibrato Depth	01H	09H	1	9
Vibrato Delay	01H	0AH	1	10
EG Decay Time	01H	64H	1	100
Drum Cutoff Freq.	14H	note number	20	note number
Drum Resonance	15H	note number	21	note number
Drum Attack Rate	16H	note number	22	note number
Drum Decay Rate	17H	note number	23	note number
Drum Pitch Coarse	18H	note number	24	note number
Drum Pitch Fine	19H	note number	25	note number
Drum Level	1AH	note number	26	note number
Drum Pan	1CH	note number	28	note number
Drum Reverb Send	1DH	note number	29	note number
Drum Chorus Send	1EH	note number	30	note number
Drum Variation Send	1FH	note number	31	note number

All drum parameters in this list can be programmed separately for each instrument (i.e. each key). It is therefore required to specify the relevant note number which can be found in the frst row of the XG Drum Map. You will not need to convert these numbers as the XG Drum Map values are given in decimal.

Any changes you make to the drum parameters affect the drum set used in the respective PART MODE track. For more detail consult section "*Part Mode and Drum Setups*".

In addition to the above Controller messages #99 and #98, a NRPN transmission requires a further message, Control #6 (DATA ENTRY) to enter the parameter value. To make this a little clearer here are three short examples to demonstrate how parameter changes are achieved via NRPN.

✕AMPLE:

AEG Decay Time

Control 099 001
Control 098 100
Control 006 64

The frst two Controls call up the Decay Time parameter, Control 006 then sets the required parameter value. We have chosen value 64 for this example – this is equivalent to initial value +00 in the CS1x.

✕AMPLE:

Drum Pitch Coarse

Key E1 (Analog Snare H):

Control 099 024
Control 098 040
Control 006 066

Control 099 calls up drum parameter PITCH COARSE, Control 098 sets the NOTE NUMBER (40 = E1) and Control 006 increases the sound's initial pitch by two semi-tones, resulting in the snare's higher tuning.

Let's stick with this example for a moment. Imagine you are working on a snare fll and decide that the snare should increase by a semi-tone with each beat during the fll. All you need to do is insert Controller 006 with the required value.

Don't forget to reset the snare's pitch after the fnal beat to its initial value (e.g. 66), as the rest of the song will otherwise sound a little strange.

Should the fancy take you to experiment some more with the snare, try controlling the DRUM DECAY RATE with NRPN. A value of between 80 and 100 will lend a punchy percussive edge to your snare! By the way, both Decay 1 and Decay 2 are controlled simultaneously this way.

✕AMPLE:

Drum Decay Rate

Key E1 (Analog Snare H):

Control 099 023
Control 098 040
Control 006 096

As you can see from these examples, NRPN can be used effectively and is often well worth the effort. At the same time the XG concept's ability to perform as far as real-time sound parameter control is concerned is hereby proven beyond a doubt.

We should also take a quick look at RPN messages and their applications. These messages can control three parameters (see below):

Table: RPN Parameter

Parameter	Cntr 101 (MSB) hexadecimal	Cntr 100 (LSB) hexadecimal	Cntr101 (MSB) decimal	Cntr 100 (LSB) decimal
Pitch Bend Sensitivity	00H	00H	0	0
Fine Tune	00H	01H	0	1
Coarse Tune	00H	02H	0	2

A peculiarity of RPN messages is that they require Controllers 100 and 101 to be set to 0. Strangely, this is actually done with 127.

✕ AMPLE:

Fine Tune

Control 101   000
Control 100   001
Control 006   068
Control 101   127
Control 100   127

Fine tuning is increased by 4 cents: middle value 64 + 04 steps = 68 (Control 006). In order to change a single parameter, the poor sequencer track is flooded with 5 events. In comparison, the equivalent Sys-Ex message would only require a single event: F0H.43.10.4C.08.00.09.07.44.F7. This gives us a good excuse to deal with this subject in greater detail.

Exclusive: Sys-Ex messages

You may have felt that the previously described methods of song production sound control are a little tedious. If so, feel free to skip this section. If you still want more however, it's time to get aquainted with System Exclusive messages. The following step by step guide will show just how these are put into practice.

System Exclusive data consist of a tone generator's parameter settings and can only be understood by that specific machine. Until recently, Sys-Ex messages where the domain of software programmers, who utilised them for synth editors and other software tools. The average user would only have come into contact with these messages when a BULK DUMP was sent from his or her tone generator. It wasn't necessary however to deal with the actual messages themselves.

XG elevates System Exclusive messages to a whole new plateau. There is a whole range of XG compatible machines, all of which speak exactly the same language. To clarify: an XG song will playback virtually identically on any XG machine thanks to the Controllers and single Sys-Ex messages (not blocks) used to control each sound. Therefore any songs created using a cheaper entry-level XG model will survive the upgrade to a more expensive model later on fully intact, provided they were programmed correctly. Better still: the higher quality XG machine will noticeably improve your sounds.

An important advantage of using System Exclusive messages is that they can control any CS1x parameter in real-time. It is important however to check whether these parameter values can be set using the more user-friendly Controllers. This applies particularly to Filter Frequency, Resonance, Pan Position and Effect Sends.

With this combination of different Controllers and Sys-Ex data the XG system opens the door to unimagined sound shaping possibilities, particularly in a musical context. For example, you could play a looped bass sequence and try out different sounds and different sound parameters, all from within the sequencer. Once you have settled on the right values, these values are already incorporated into the sequencer track – it can be this easy!

The first thing you need to know when getting involved in Sys-Ex data is that all values are given in hexadecimal. Some sequencers insist on using decimal notation for Sys-Ex input, so some kind of conversion is necessary. To this end you can utilise the table "DATA LIST" (page 18) or use the values (Hexa/Decimal) given in the following examples and tables.

By the way: hexadecimal values are often indicated with an H after the actual value. Sometimes a preceding $ sign is used as well.

As a handle into the Sys-EX subject we will try to explain the basic structure of a "**XG Native Parameter Change**". This is System Exclusive message which is used to change a single parameter on any XG model.

Table: Creation of a Sys-Ex message to change a parameter value (XG)

Value No.	Description	Hexadecimal	Decimal
1	Exclusive Status	F0	240
2	YAMAHA ID	43	67
3	Device Number	10	16
4	XG Model ID	4C	76
5	Adress High		
6	Adress Mid		
7	Adress Low		
8	Data		
9	End of Exclusive	F7	247

As you can see from the table, bytes 5 to 8 are given no value. This might lead you to think that bytes 1 to 4 and 9 are the same for each System Exclusive message – this is true, but with one limitation: you will see that **DEVICE NUMBER** lists a value of 16. This value 16 (10H) actually represents Device Number 1, 17 represents Device Number 2, 18 represents Device Number 3, and so on. It is usually sufficient to use any value between 16 to 31 (10H to 1F), but for this to work your XG model has to be set to Device Number ALL (ALL PART). If you are using several XG devices you can address each device separately using different Device Numbers. This requires however that you correct the Sys-Ex messages to take this into account.

We are going to use value 16 from now on, as your machine is usually either set to DEVICE NUMBER **ALL** or **1**. If your model doesn't respond to the Sys-Ex data, check that the correct Device Number is being used.

Back to the table: bytes 1 and 9 always begin and end the message. Most sequencers don't require the entry of those two bytes as a result, and usually enter them for you when inputting a message. This sometimes happens 'behind the scenes'. If in doubt, consult the relevant section in your sequencer manual. Nevertheless, these two bytes are included in all our examples – in brackets however to remind you that you might not need to enter them.

All you need now to program your first Sys-Ex message are the Address Bytes (High, Mid, Low) and the required parameter's control range. Both can be found in the "MIDI DATA FORMAT" documentation.

You may at this point find yourself getting lost in grey theory, so let's put some of this theory into practice with some Sys-Ex parameter changes. With the aid of some really useful parameter values we will show you that Sys-Ex can be fun! You will need to use the CS1x XG mode for the following examples, so press the MULTI key. The ADDRESS and DATA bytes are shown in bold type to set them apart from the ever repeating basic settings.

✗AMPLE:

Reverb Return

Let's assume you wish to control the amount of reverb via the effect signal return. The correct XG address would be "02H 01H 0CH" (hexadecimal) i.e. "2 1 12" (decimal). This communicates directly with the REVERB RETURN parameter. The control range is between 00H – 7FH (0 – 127), the default value is 40H (64). To increase the REVERB RETURN level to 4EH (78) you need to enter the following Sys-Ex message:

(F0) 43 10 4C 02 01 0C 4E (F7) = hexadecimal
(240) 67 16 76 2 1 12 78 (247) = decimal

✗AMPLE:

Chorus Type

The Sys-Ex message required to select the Chorus Type is one byte longer, as DATA is divided into MSB and LSB values. This is also true for other effect types (Reverb + Variation) and some parameters. The CHORUS TYPE Address is 02H 01H 20H (2 1 32). The values for DATA (MSB + LSB) can be found in the EFFECT TYPE LIST (S.1 MIDI DATA). Let's take the DATA values for CHORUS 4, 41H (MSB) and 08H (LSB), i.e. 65 and 8.

OK, now the complete Sys-Ex message for this example looks like this:

(F0) 43 10 4C 02 01 20 41 08 (F7) = hexadecimal
(240) 67 16 76 2 1 32 65 8 (247) = decimal

✗AMPLE:

Decay Time

Here we have a parameter that can't have a Controller assigned to it, the AEG DECAY TIME. You will be familiar with this parameter from the "Analogue Workshop". The Address for this message depends first of all on which MULTI PART is to be set. For Part 1 the message Address would be 08H 00H 1BH (8 0 27). The middle byte (00) is used to select the Part (Part 2 = 01, Part 3 = 02 etc.).

The Sys-Ex message to set the Decay value to 40H (64) looks like this:

(F0) 43 10 4C 08 00 1B 40 (F7) = hexadecimal
(240) 67 16 76 8 0 27 64 (247) = decimal

By the way, this Sys-Ex message would have exactly the same effect on MIDI channels 5–16 in Performance mode.

The following examples will show how even parameters usually set at the machine are sometimes better controlled via Sys-Ex.

✗AMPLE:

Scene Mode

You cannot save the on/off state of the Scene switch in a Performance. It would be awkward however to have to switch this manually during song playback. Let's say you wish to cross-fade between Scene1 and Scene2 using the Mod wheel ("Scene Control"). Instead of having to press both Scene keys at the beginning or somewhere in the middle of the song, enter the following Sys-Ex message:

(F0) 43 10 4B 50 00 17 03 (F7) = hexadecimal
(240) 67 16 75 80 0 23 03 (247) = decimal

The byte 8 value indicates that both Scenes are to be switched on. A value of 00 would switch both scenes off, 01 switches on Scene 1 and 02 Scene 2.

✗AMPLE:

Switching Arpeggio Type

and selecting MIDI Sync

Do you find it stimulating to change Arpeggio Type during a song? This can be achieved by programming the Performance to use Knob 3, but it is difficult to be precise in your selection with the Knob.

Better to use the following Sys-Ex message:

(F0) 43 10 4B 60 00 2B 00 (F7) = hexadecimal
(240) 67 16 75 96 0 43 0 (247) = decimal

The message selects Arpeggio Type 1 (UpOct1). Responsible is byte 8 again with the value 00. A value of 02 would select Arpeggio Type (UpOct2), etc.

While we're at it, we should also set the Arpeggio Tempo to MIDI via Sys-Ex, so that the Arpeggiator can be synchronised to MIDI Clock pulses:

(F0) 43 10 4B 60 00 29 00 00 (F7) = hexadecimal
(240) 67 16 75 96 0 41 0 0 (247) = decimal

Song Production: More Tips and Tricks

Part Mode and Drum Setups

There are two Drum Setups available for each of the 11 XG drum kits. These setups allow you to program each key individually. The most important parameters that can be used have already been listed in the "NRPN Parameter" table.

The XG drum kits are available to all Parts. The default settings however initialise all Parts, except drum Part 10, to **Part Mode "normal"**.

Part 10 is automatically set to **Part Mode Drum Setup 1**.

Choosing a drum kit for an additional Part will set its Part Mode to **Drum Setup 2**.

You can use the above NRPN messages or System Exclusive messages to set each drum sound.

Should you decide on the latter, you can find the necessary data in the following table. The values used communicate with Drum Setup 1, i.e. MIDI channel 10:

Table: Drum Sound Editing using Sys-Ex

Parameter	System -Exklusive message (hexadecimal)
Pitch Coarse	(F0) 43 10 4C 30 rr 00 VAL (F7)
Pitch Fine	(F0) 43 10 4C 30 rr 01 VAL (F7)
Level	(F0) 43 10 4C 30 rr 02 VAL (F7)
Panorama	(F0) 43 10 4C 30 rr 04 VAL (F7)
Reverb Send	(F0) 43 10 4C 30 rr 05 VAL (F7)
Chorus Send	(F0) 43 10 4C 30 rr 06 VAL (F7)
Variation Send	(F0) 43 10 4C 30 rr 07 VAL (F7)
Cutoff Frequency	(F0) 43 10 4C 30 rr 0B VAL (F7)
Resonance	(F0) 43 10 4C 30 rr 0C VAL (F7)
EG Attack	(F0) 43 10 4C 30 rr 0D VAL (F7)
EG Decay1	(F0) 43 10 4C 30 rr 0E VAL (F7)
EG Decay2	(F0) 43 10 4C 30 rr 0F VAL (F7)

Byte no. 6 (rr) represents the **note number** that is to be used, i.e. which drum sound is to be affected. The XG Drum Map lists the note number for each instrument. Finally you will need to convert into hexadecimal. For example: Snare H = Note # 40 = 28 (hexadecimal).

If you want to work with Drum Setup 2 using another Part, simply change byte 5 from 30 to 31.

These Sys-Ex messages should only be sent after any Bank/Program Change message, as these completely initialise every aspect of a drum kit.

By the way: the Drum Setup settings described here can be used with the XG drum kits, even in Performance mode, but not with the additional CS1x kits (Banks MSB 063 / LSB 12, Prg 001 to 006).

Things worth knowing about the Variation Effect

The CS1x effects have already been covered in detail. Still, we would like to take another look, specifically at the use of effects in song production.

The effect possibilities are essentially the same for both Performance and Multi mode. There are however two important differences:

- *You can program all settings for Parts 5-16 (with the exception of Send Level) at the machine. Multi mode however requires that you use Sys-Ex messages and Controllers.*

- *You can only use the Variation Effect for Layers 1-4 in Performance mode; Multi Parts 5-16 cannot be used. Each Layer can only switch the effects ON or OFF. The Multi (XG) mode allows you to use the Variation Effect for any single Part using the Insert switch, or for all Parts, complete with individual Send Level using the System switch.*

This has the following consequences: if it is important for you to be able to tie in 3 effects for all Parts, you may be better off recording in Multi mode. The trade-off here is that you can't use Performance mode's special features (Arpeggio, Scenes, Material Voices …). The Multi mode however can offer a vast array of effect types, all of which can be controlled with Sys-Ex. More often than not however one of the preset effect types may be sufficient.

The following table will help you to set effect types for Chorus, Reverb and Variation effects. All you need to add are the respective MSB and LSB values; these can be found in your manual's *Effect Type List*.

Table: Selecting the Effect Type via Sys-Ex

Effect	Sys-Ex message (hexadecimal)
Variation Effect Type	(F0) 43 10 4C 02 01 40 msb lsb (F7)
Reverb Effect Type	(F0) 43 10 4C 02 01 00 msb lsb (F7)
Chor.Effect Type	(F0) 43 10 4C 02 01 20 msb lsb (F7)

The actual setting of effect parameters is perhaps best left to the hardiest of MIDI enthusiasts. You would need to look up the Sys-Ex addresses for each parameter in the Data List Book. To find out which parameters are available for each effect, take a look at the *Effect Parameter List*.

The Variation Effect settings should be of particular interest. To make things a little easier we have compiled a table with the Sys-Ex messages required for Variation Effect parameters 1 – 10. Each parameter's control range (VAL) depends on the Effect Type selected. We have included a list of parameters for our favourite effects:

Table: Variation Effect Settings via Sys-Ex

Parameter No.	Sys-Ex Message	Phaser	Distortion	2-Band EQ	Delay L, C, R
Var.Eff.Para.1	(F0)43 10 4C 02 01 42 00 VAL(F7)	LFO Freq.	Drive	EQ Low Frq	Lch Delay
Var.Eff.Para 2	(F0)43 10 4C 02 01 44 00 VAL(F7)	LFO Depth	EQLowFrq	EQ Low Gain	Rch Delay
Var.Eff.Para 3	(F0)43 10 4C 02 01 46 00 VAL (F7)	Shift Offset	EQLowGain	EQHigh-Frq	Cch Delay
Var.Eff.Para 4	(F0)43 10 4C 02 01 48 00 VAL(F7)	Feedback	LPFCutoff	EQHigh-Gain	Feedb. Delay
Var.Eff.Para 5	(F0)43 10 4C 02 01 4A 00 VAL(F7)		Output Lev		Feedb. Level
Var.Eff.Para 6	(F0)43 10 4C 02 01 4C 00 VAL(F7)	EQ Low Frq			Cch Level
Var.Eff.Para 7	(F0)43 10 4C 02 01 4E 00 VAL (F7)	EQ Low Gain	EQMidFrq		High Damp
Var.Eff.Para 8	(F0)43 10 4C 02 01 50 00 VAL(F7)	EQHighFrq	EQMidGain		
Var.Eff.Para 9	(F0)43 10 4C 02 01 52 00 VAL(F7)	EQHighGain	EQMidWidh		
Var.Eff.Par10	(F0)43 10 4C 02 01 54 00 VAL(F7)	Dry / Wet	Dry / Wet		Dry Wet
Var.Eff. Conn.	(F0)43 10 4C 02 01 5A 00 VAL(F7)	0 = Insert, 1 = System			

As you can see, only some effects utilise all 10 parameters.

Some parameters (such as Delay times & EQ frequencies) will require the aid of the Effect Data Assign Tables found in the manual's Appendix. Here you will find (for example) that a value of 34 represents an EQ frequency value of 1.0kHz.

Still more Performances!

Usually you only have one Performance available per song. Wouldn't it sometimes be nice to have several? Well, with this trick you can.

You will have learned from section *"About the CS1x Sound Structure"* that a Performance's Layers can be called up individually as **Material Voices** in Multi Parts 5 – 16. Therefore, splitting a Performance's Layers across several Multi parts and then playing the same sequence on each Part effectively gives you the sound of the Performance (without the Variation Effect).

Let's assume you want to utilise four Performances in a song simultaneously. The following table shows how this is done:

Table: A Song with 4 Performances

Part	Performance	Layer	Layer 1 = MSB / LSB	Layer 2 = MSB / LSB
Performance	U005 = Sc:Superarp	4		
5 + 6	P048 = Ba:Basslin2	2	063 / 000	063 / 001
7 + 8	U002 = Sq:PanSeq	2	063 / 004	063 / 005
9	P015 = Sc:Thick	1	063 / 000	

We use the sound with the most Layers as the actual Performance, sound "Superarp" in our example. The other three Performances contain 5 Layers in total. These are distributed as Material Voices between Parts 5 – 9 (see table – column 1).

You may find it clumsy to have to use a separate sequencer track for each Material Voice. If so, simply set several Parts to the same MIDI channel (UTILITY – Rcv Ch.) Taking the above example, Parts 5 & 6 would now be controlled from MIDI channel 5, whilst Parts 7 & 8 would reside on MIDI channel 7. All you need to do is set Part 6 to Receive Ch. 5 and Part 8 to Receive Ch. 7.

You will still need to check whether each Performance's Layer parameters differ from the default 00 values. As a rule this usually only applies to **Note Shift**, **Detune**, and **Pan Position**. Any offsets here need to be transferred to the respective Multi Parts with Controller or Sys-Ex messages.

✗AMPLE:

The "Pan Seq" parameter in the Performance used in Parts 7 + 8 contains these fine tune offset values (Detune): Layer 1 = -00.3, Layer 2 = +00.3

You will need the following Sys-Ex messages to transfer these settings to Parts 7 & 8:

Part 7, Detune -00.3 = (F0) 43 10 4C 08 06 09 07 13 (F7)

Part 8, Detune +00.3 = (F0) 43 10 4C 08 07 09 08 03 (F7)

Bytes 6 (06/07) select Parts 7 and 8 respectively, bytes 7 and 8 select positive and negative Detune, whilst byte 8 contains the actual Detune value. The latter are a little difficult to grasp, so here is a table to clarify the situation:

Table: Sys-Ex data bytes for Detune

Part 7 = negative fine tuning		Part 8 = positive fine tuning	
Detune value	Data byte	Detune value	Data byte
- 00.1	0F	+ 00.1	1
- 00.2	0E	+ 00.2	2
-00.3	0D	+00.3	3
- 00.4	0C	+ 00.4	4
- 00.5	0B	+ 00.5	5
-00.6	0A	+00.6	6
- 00.7	9	+ 00.7	7
- 00.8	8	+ 00.8	8
-00.9	7	+00.9	9
-01.0	6	+01.0	0A
-01.1	5	+01.1	0B
-01.2	4	+01.2	0C
-01.3	3	+01.3	0D
-01.4	2	+01.4	0E
- 01.5	1	+ 01.5	0F

With the help of this table you can look up the most frequently used Detune values and insert them into the above Sys-Ex message (byte 9).

Luckily, the Note Shift (or sequencer Track Transpose, if applicable) and Pan Position (Controller 10) parameters a far less complicated.

Split Performances – used to great effect

Split sounds are normally programmed for live performance – a sound each for your left and right hands.

Certain types of Split Performances can however also be most effective – literally – when used for song production. There is a simple reason for this: Apart from the obligatory Reverb and Chorus effects, the CS1x also offers many fabulous Variation Effects, but these may only be used for Layers 1 – 4 whilst Parts 5 – 16 have to go without. It would be a shame If only one sound could benefit from these effects. There is a way around this limitation:

All sounds that are to be treated with the Variation Effect will need to be incorporated into the Performance if at all possible. This is made possible by using key splits for up to 4 Layers. When controlled externally, a sound can be played on a 10Ω octave range, so each sound can occupy around 2-3 octaves.

Exactly which sounds you may use for such a Split Performance depends very much on the type of effect used. EQ effects for instance are particularly good for sounds that feature prominently in your mix, such as bass drums or bass lines. Delay effects are important to arpeggios, sequences and hook lines. A Phaser can liven up any pad sound immensely. More about this can be found in the "*Effects*" section.

One thing to remember when programming is that setting "Var Send = on" equalises Chorus and Reverb Send Levels for all the Layers. Therefore it is important to try to incorporate only sounds into a split Performance that fare well with a single effect level for all Layers.

Utility mode preparations

When working with external sequencers it is important to hear any recorded Parts with the correct sound settings during the recording process, so to set your sequencer to "**MIDI Thru**". In order to avoid note 'doubling', set the CS1x to **Local off**. This effectively disconnects the CS1x keyboard from its tone generators, i.e. the keyboard now only sends MIDI information to the sequencer (via MIDI out). In turn the sequencer sends this information back to the CS1x (MIDI in) to generate the sound, but any of the sequencer's playback parameters (e.g. Transpose, Velocity) are now taken into account.

It is not necessary to select the correct MIDI channel on the CS1x, as the sequencer re-directs all information to the desired MIDI channels anyway.

Attention should however be paid to the Parts' Receive channels, which usually correspond to the Part number. It may occasionally be useful to deviate from this when a single sequencer track is to control several Parts. This function can be useful especially when the CS1x is only a part of a MIDI equipment setup. In this scenario the CS1x should usually only receive information on a few specific MIDI channels. This is achieved by disabling all other unused Parts (RcV Ch. = off).

❯ Performance drum kits

On top of the already well-known XG Drum Kits the CS1x adds a further half megabyte's worth of up-to-date drum sounds for Techno, Dance, House etc. To sample these sounds give **Performances 123 to 128** a try. These contain all of the new drum sounds in 6 kits.

However, as we have already mentioned these sounds aren't "Drum voices" as found in the XG drum kits that can be programmed individually for each key, but "Normal voices" that can be assigned to any Layer or Multi Part (5 – 16) like Material Voices. This means of course that they can't be used in XG mode. The necessary Bank/Program change messages can be found in section "*Decisions, decisions …*".

❯ Demo Bank "Dancemachine"

The CS1x Performances contain many of the sounds found in the YAMAHA QS-300 software pack "Dancemachine". A selection of the "Dancemachine" sounds is available, but somewhat hidden in an undocumented "Demo Bank" which was used for the factory demo productions. Luckily these sounds can be accessed as Material Voices with the following Bank/Program changes: MSB 063, LSB 123, Prg 074 to 128. No question about it, these sounds add significantly to any Techno/Dance armoury.

❯ Dance bass drums

The correct bass drum is essential for every Techno/Dance production. You can find many typical bass drums in XG Drum Kit "Analog" and the above mentioned CS1x Performance drum kits.

Furthermore, Performances U127 (Dist Kick) and U128 (Euro Kit) contain specialist bass drums that have already enjoyed much popularity with QS-300 users. These bass drums are derivatives of instrument "HiQ!" found in the Analog drum kit.

Even more bass drums of this type can be found in the above mentioned Demo Bank, in locations 121 – 128. Important: the root key for these bass drums is D#1. It is therefore necessary to transpose a normal bass drum track by -21.

❯ Instrument<->Part assignment

Other Yamaha synthesizers have used fixed Instrument – Part assignments for Techno kits in the past. This finally made productions based on the building block principle possible, i.e. you could now work with pre-recorded sequences, grooves, bass and chord lines etc. We recommend you use the following system in order to guarantee compatibility:

Part 9	= Bass drum
Part 10	**= HiHat**
Part 11	**= Other drums**
Part 12	**= Bass**
Part 13	**= Sequence 1**
Part 14	**= Sequence 2**
Part 15	**= Chord 1 (rhythm)**
Part 16	**= Chord 2 (Pad)**

❯Random Pan

Lively Pan modulation can loosen up any sequencer arrangement. This is as simple to realise as it is effective with the CS1X "**Random Pan**" function. This function is available in all of the CS1x's modes: with Performance Layers set the **Pan** parameter to **Rndm** (one step below -63), with the Multi Parts use the following Sys-Ex message: (F0) 43 10 4C 08 nn 0E 00 (F7). Substitute "nn" with the relevant MIDI channel (0 – 15). You need to ensure that no Controller 010 messages are sent after the Sys-Ex message, as this would disable the Random Pan setting.

Song Practice: A View behind the Scenes

Example 1: Sweep Run

This example will demonstrate:

- **Programming of Setup Data**
- **Arpeggiator use in song production**
- **Real-time Arpeggio types changes**
- **knob real-time control**
- **Fading out with Master Volume**

> **Please load the Tutorial Disk song "SWEEP-RUN.MID"**

This is a Performance mode dance sequence with a minimalistic arrangement and is very suited to exploring vital song production techniques.

First the most important preparations. We will base our example on User Performance 021 ("Fx: Sweep Run"), which has been modifed for this purpose by choosing a sawtooth wave for LFO modulation ("Saw"). This lends a more percussive edge to the Performance's typical LFO modulation. The sound's touch sensitivity has been weakened with the Velo Offset parameter (+14). To finish, the Arpeggiator was set to "MIDI" for song tempo synchronisation. To make sure that you have the correct modifcations on your machine also, we have saved the modifed Performance using a BULK DUMP to the sequencer ("1 Perf").

❭ Setup Data (Bar 1)

As you will know by now, each sequencer song is preceded by an initial Setup Data. This is used to program all the song settings you would normally refer to as 'Multi' with other synthesizers.

To make them easier to follow we have chosen the same pattern for each example:

the Setup Bar's 1/16 notes correspond the maximum 16 Parts (Multi mode), i.e. the (usually) respective MIDI channels. This way the settings of any particular part can quickly be isolated – that's very important, as the Setup Data Even List can run into some length.

The Performance mode allows a maximum of 13 Parts. The actual Performance occupies an entire quarter – the frst four 1/16. Parts 2 – 4 are not applicable. This section of the bar often has to cater for data intensive Sys-Ex messages anyway, so that's just as well.

Analysing one of our song example's Setup fle should enable you to program your own Setups. To this end load the song "Sweeprun" into your sequencer and take a look at the Event List there. You will fnd the data in the Setup Bar's frst quarter.

Startposition	Länge	Wert 1	Wert2	Wert3	Status	Kan	Kommentar
0001.01.000	=====	0	===	===	SysExYamah	1	43,10,4B,50,00,06,0
0001.01.016	=====	0	===	===	SysExYamah	1	43,10,4C,00,00,04,7
0001.01.032	=====	0	===	===	SysExYamah	1	43,00,4B,00,2E,60,0
0001.01.048	=====	0	===	===	SysExYamah	1	43,00,4B,00,17,60,0
0001.01.064	=====	0	===	===	SysExYamah	1	43,00,4B,00,09,60,0
0001.01.080	=====	0	===	===	SysExYamah	1	43,00,4B,00,29,60,0
0001.01.096	=====	0	===	===	SysExYamah	1	43,00,4B,00,29,60,0
0001.01.112	=====	0	===	===	SysExYamah	1	43,00,4B,00,29,60,0
0001.01.128	=====	0	===	===	SysExYamah	1	43,00,4B,00,29,60,0
0001.01.288	=====	7	113	===	MainVolume	1	
0001.01.296	=====	72	52	===	ReleaseTim	1	
0001.01.304	=====	71	72	===	HarmonicCo	1	
0001.01.312	=====	74	64	===	Brightness	1	

Event List "Sweeprun" / Performance Setup Data

It is quite possible – as in the above illustration – that your sequencer doesn't show the Sys-Ex messages in their entirety. In this case you will need to (right) click the data block.

The 1.01.000 position contains a Sys-Ex message that switches the CS1x into Performance mode and resets all the available parameters there for Multi channels 5-16 to their factory settings ("Performance Reset"). This reset is important and should occur at the beginning of each song so that any leftover settings from a previous song are reversed.

The next position (1.01.016) contains a Sys-Ex message used to control the Master Volume, which is set here to maximum 127.

Another 7 Sys-Ex blocks follow (positions 1.01.032 to 1.01.128); this is the previously described Bulk Dump. Thankfully you needn't concern yourself with these sounds; they are sent by the CS1x and you don't have to program them manually. The Bank/Program changes that are necessary for the other parts are not required for MIDI channel 1. Following are the Performance's Volume settings using Controller 7.

The next events are already responsible for real-time knob changes during the course of the sequence. This is always necessary if modulations aren't meant to begin with their usual middle setting, like in this case Release (Controller #72), Cutoff (Controller #74) and Resonance (Controller #71).

Pay attention now, you can easily work out the Event List's values with this little trick. You are welcome to look over our collective shoulder for this: we have X-PERIMENTed with the different knobs whilst the sequence was running (Record), until we got the desired settings for the beginning of our song. Then the last Controller value for each Controller was read and transferred to the Setup File – bingo!

You may have noticed that the Events in the Setup File are evenly spaced. This is not required, but makes everything a lot easier to follow. More importantly however, the generous gaps between the Events guarantee data security. Speaking of which, the XG standard dictates that Sys-Ex messages should be separated by gaps of at least 1/96. As a rule, Controller messages only require a 1/192 gap.

The sequence's remaining Multi parts are structured in the same way. Part 16 is a good example here (see the illustration). Here you will fnd all important Controller data.

llustration Event List "Sweeprun" / Setup Data Part 16

Startposition	Länge	Wert 1	Wert2	Wert3	Status	Kan
0001.04.288	=====	0	63	===	BankSelMSB	16
0001.04.296	=====	32	1	===	BankSelLSB	16
0001.04.304	=====	38	===	===	ProgChange	16
0001.04.312	=====	7	36	===	MainVolume	16
0001.04.320	=====	10	0	===	Pan	16
0001.04.328	=====	71	119	===	HarmonicCo	16
0001.04.336	=====	72	66	===	ReleaseTim	16
0001.04.344	=====	74	58	===	Brightness	16
0001.04.352	=====	91	91	===	ExtEff Dep	16
0001.04.360	=====	93	118	===	Chorus Dep	16

The first three Events are used to call-up the required sound program:

Controller 0 and 32, Program Change. Once more: the order of these events is crucial!

Following are the volume settings (Controller #7), Pan Position (Controller #10), Resonance (Controller #71), fade-out time (Controller #72) and Filter Cutoff (Controller #74). Finally we add Send Levels for a subtle dose of Reverb (Controller #91) and Chorus (Controller #93).

The only Controller that appears to be missing from Part 16 is the Attack time, but this is because the initial value was used and so didn't need updating.

Two drums add to this some further Sys-Ex messages, which will now be explained:

❯ Drum kit Processing

>Bassdrum (Part09)
Position 1.03.056 = Shift (-21)

The part was used to record a typical Dance bass drum, derived from the SEXAMPLE "HiQ". This wave is assigned to key D#-1. Bass drum parts are usually recorded with key C1. The following Sys-Ex message was used to correct this:

>Complete Drum Kit (Part 10)
Position 1.03.152 = Part Mode (DrumS1)

MIDI channel 10, the channel usually assigned to drum parts is switched to Part Mode "DrumS1". This allows individual setting of each drum instrument via Sys-Ex, just like a "User Drum Set". The next events communicate with and set up the snare drum (key E1). To begin with, the Decay times are shortened to make the sound more percussive. That last Part 10 Event (position 1.03.176) tunes the snare a little higher (+4).

Some more useful tips: if you want to copy the discussed Sys-Ex messages into your own songs, you can change the relevant parameter value with the penultimate Byte (before F7H). Let's say you wanted to tune the snare drum higher still. You could use a value of 46H (+6) instead of 44H(+4).

Before we deal with the next lot of bars, i.e. the musical content, two more pointers about the playing back of sequencer songs:

Your sequencer has to be set up to send MIDI clock signals, otherwise the all important Performance part will remain silent, as the Arpeggiator uselessly waits for external timing signals.

You also should always take care that the CS1x is set to Performance mode and not Edit mode, at least during play-back of the Setup bar, otherwise the Controller and Sys-Ex messages for Multi Parts 5 – 16 never reach their destination. Are you confused yet? If so, here is an overview of the complete song arrangement:

Illustration: Arrangement "Sweeprun"

❯ Arpeggiator – variously used (Bars 2-21)

The intro consists largely of the Performance Part's Arpeggio (type "Sweep Line", MIDI channel 1), which here in contrast to the later bars doesn't run all the way through, but stops after 5 8ths or so. At bar 4 a real-time knob control of Cutoff and Resonance kicks in (see track "PerfContr".

Bars 6 to 13: the Arpeggio is running throughout and is modulated by the flter. Bass drum, HiHat and Bass join in with a typical Dance groove (bass and bass drum take turns). A super-long snare fll is added during bars 10 to 13. A change is signalled towards the end of bar 13; take a look at this selection of track 2:

Startposition	Länge	Wert 1	Wert2	Wert3	Status	Kan	Kommentar
0013.03.288	=====	18	24	===	Gen.Purp.3	1	
0013.03.296	=====	18	7	===	Gen.Purp.3	1	
0013.04.258	=====	0	===	===	SysExYamah	1	43,10,4B,60,00,28,0
0013.04.267	=====	7	108	===	MainVolume	1	

Event List "Sweeprun" / Bar13

The first two Events (Controller 18) were generated by turning Knob6 (Assign2) counter-clockwise. This assigns LFO to Amplitude modulation rather then the current Filter modulation. The Arpeggio sound becomes more percussive.

The following Sys-Ex messages now select a different Arpeggio type; now "UpDwBOct4" is in effect. The Arpeggiator volume is also reduced a little.

Bars 14 – 21: the changes to the Arpeggio that were programmed at the end of Bar 13 now come into effect. The Arpeggio isn't triggered by constantly changing notes any longer, instead G2 and C2 are used consistently. A periodic flter modulation now occurs every four bars (see Parts "Filter" in track "PerfContr").

So, the Arpeggio has fulflled its task, no other Parts get to have a go.

The bass sequence is now subject to flter modulation for variety, spread over several bars. On top of that, Parts 15 and 16 now play a stereo pad.

Fade Out – The Classic Way to Finish (Bars 14-21)

The arrangement is now gradually faded out over 8 bars. Sys-Ex messages are used here to control the "Master Volume". This way the song can be faded out much more consistently, rather than using separate Controller Events for each track! There is a danger to this method however: let's assume you stop the song just before the end of the fade-out is reached. The Master Volume is now set to a very low level. You decide to end the session to work on it later. Suddenly you won't believe your ears; the CS1x has become extremely quiet, and you suspect a malfunction of some kind. Don't panic: the last Sys-Ex message used to control the Master Volume is simply still in effect. Turning the volume control won't have any effect; only a Sys-Ex message can restore the volume level. If only you had played the song to the end, the Master Volume level would have been reset to 127!

If you can't resist the temptation of working with Sys-Ex messages to control Master Volume, you should take note of the following points:

- *always enter a Sys-Ex message with the desired Master Volume at the beginning of the song.*

- *try not to stop the song during the fade-out.*

- *set the Master Volume level back to 127 at the end of your fade.*

So much for our tips on the "Master Volume" subject. We would now like to give you a quick overview of another two Demo songs.

Example 2: "Blue Fuzz"

This example will demonstrate:

- **Use of the Distortion Effect**
- **Real-Time knob Control**
- **Fade-Out using Master Volume**

Please load the Tutorial Disk song: BLUE FUZZ.MID

Arrangement "Blue Fuzz"

Chord Sequence (MIDI Ch.1)

This sound example's 'trademark' 'is the chord sequence. This special sequence controls the modifed "Disk Kick" Performance U127. The Variation effect "Distortion" in conjunction with the flter modulation and real-time Chorus Send control is very effective here.

The Setup Data is organised as in the first example. Following the Sys-Ex data for PERFORMANCE RESET, MASTER VOLUME and PERFORMANCE BULK are Controller settings that set the starting points for further real-time knob control later on.

Controller #17 = 70 (Knob 3) Distortion Drive
Controller #74 = 44 (knob 4) Cutoff
Controller #71 = 127(knob 5) RESONANCE
Controller #18 = 00 (Knob 6) Chorus Send

These values should be considered as settings for the knobs after the selection of the Performance, but before the sequence itself. Failure to set these initial values would result in values jumping during real-time control.

During the first few bars, the chord sequence can be heard initially without any flter modulation – this only begins at bar 6. Just as noteworthy: During bars 10 to 11 the Chorus Level is changed in real-time from 0 to 100 with Knob6.

The chord sequence is relegated to the background during the middle section (bars 18-25) : there's no flter modulation, Distortion Drive value is reduced to 44.

Distortion (Drive 79) comes into effect In the fnal section (bars 26-41) and the flter is modulated once again, in contrast to the bass sequence's flter movements.

❯ Drums (Ch. 8-11)

The Part mode Sys-Ex settings are particularly important for MIDI channels 8 and 10. This allows the usage of different drum sets. Part 8 requires the "Standard Kit" HiHat. Part Mode 01 ("Drum") is set for this. Part 10 (Snare + Tambourine) is assigned to "DrumS1", which also allows working with individual drum sounds, as for example the snare which is given a higher tuning.

The typical Dance bass drum (MIDI Ch. 9) was has already been discussed in the frst example. In addition to Part 8's intricate HiHats, a typical Dance offbeat HiHat from the 909 Set is used (MIDI Ch. 11)

❯ Bass (Ch. 12)

The flter modulated bass only becomes active during the middle section. The bass sound is drastically changed during bars 22 to 24. Here the Chorus level is increased sharply and the Filter is fully opened (Cutoff 127). The Volume is reduced a little to compensate for the arising increase in level. The sound then stays unchanged right through to bar 29, where the flter modulation is brought back again.

❯ Pads (Ch. 15/Ch. 15)

This stereo pad, which is divided into two channels, only comes into effect in the fnal section of the song (starting at bar 28) and markedly contributes to a change in the overall sound image.

❯ Fade-Out

As in the frst example, the fade-out is achieved with Sys-Ex Master Volume messages. The following applies here to: play the sequence right through the end so that Master Volume is reset to 127.
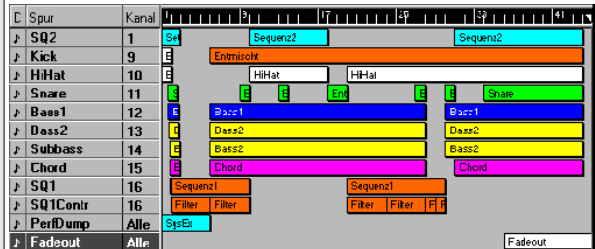
Example 3: "Tekk it"

This example will demonstrate:

- **Use of the Phasing Effect Filter Modulation in Real-Time**

🖹 **Please load the Tutorial Disk song: TEK-KIT.MID**

Arrangement "Tekk it"

❯ Sequences

This song constantly switches between Sequences 1 and 2. The frst sequence (MIDI Ch. 16) consists of periodic flter control, whilst Sequence 2 (MIDI Ch. 1 = Performance) gives rise to other sounds with an intensive Stereo Phase effect (see also under "*Effects*" in the Performance section). In addition, all Parts are heavily animated by Pan position modulations. (Pan = "Rndm").

❯ Drums

Nothing much has changed here – the bass drum (Ch. 9) is set up as in the earlier examples, the same applies to the "Standard" and "Analog" drum sets (Ch. 10/11).

❯ Bass Sequences (Ch. 12-14)

The bass sound is made up of three independent sounds that are spread among MIDI channels 12 to 14, in other words we are dealing with a multi-layered Performance. Listen to each track in isolation. Interesting here is an analysis of the sub bass which can't really be heard as such, but which nevertheless gives the bass sound its stability. If you are in any doubt about the effect the sub bass has, try switching this track on and off during playback.

Appendix

Summary of "Tutorial Disk" Files

ARPDEMO1.MID   (Sound example for Arpeggiator practice, Tempo: 143 bpm)
➥   *Activate your sequencer's MIDI Clock before playback!*

ARPDEMO2MID   (Sound example for Arpeggiator practice, Tempo: 125 bpm)
➥   *Activate your sequencer's MIDI Clock before playback!*

ARPDEMO3MID   (Sound example for Arpeggiator practice, Tempo: 165 bpm)
➥   *Activate your sequencer's MIDI Clock before playback!*

SWEEPRUN.MID   (Sound example for Song practice, Tempo: 148 bpm)
➥   *Activate your sequencer's MIDI Clock before playback!*

BLUEFUZZ.MID   (Sound example for Song practice, Tempo: 169 bpm)

TEKKIT.MID   (Sound example for Song practice, Tempo: 164 bpm)

TUTORPFM.MID   ("Bulk Dump ALL" for 128 Tutorial-Performances)

TUTRDEMO.MID   (Analogue Workshop Demo sequence))
➥   *Load fle "TUTORPFM.MID" before playback!*

SETUPPF.MID   (Performance Mode Setup File)

SETUPXG.MID   (XG Mode Setup File)

SYSEX   (System-Exclusive Files for Song Production)

KNOBMUL.MID   (Bulk Dump for Assign CTRL / Multi Mode)

KNOBPFM.MID   (Bulk Dump for Assign CTRL / Factory Settings)

REQALLPF.MID   (Dump Request for all Multi Part 5–16 Parameters)

REQALLXG.MID   (Dump Request for all Multi Part 1–16 Parameters)

REQPART1.MID   (Dump Request for all Multi Part 1 Parameters)
………………

REQPRT16.MID   (Dump Request für alle Parameter des Multi-Part 16)

Overview: "BLUE X-TRA" Disk Files

CSEXTRA.MID   ("Bulk Dump ALL" for 128 EXTRA Performances)

CSUSER.MID   ("Bulk Dump ALL" for 128 USER Performances)

Demosong 1   (Recreation Works…)

Demosong 2   (see above)

Performance List CS1x: TUTORIAL Bank (BlueBook)

No.	Cat.	Perf.- Name	Ele.	No.	Cat.	Perf. Name	Ele.
1	--	XPER-Det	2	65	--	XPR-VCF1	2
2	--	1VCOsaw1	1	66	--	XPR-VCF2	2
3	--	2VCOsaw1	2	67	--	XPR-Pan1	1
4	--	1VCOsaw2	1	68	--	XPR-Pan2	1
5	--	2VCOsaw2	2	69	--	XPR-Pan3	1
6	--	1VCOsqr	1	70	--	XPR-Vel1	1
7	--	2VCOsqr	2	71	--	XPR-Vel2	1
8	--	1VCOpl25	1	72	--	XPR-Bass	2
9	--	1VCOpl10	1	73	--	XPR-Puls	2
10	--	OscSync1	1	74	--	XPR-Sync	2
11	--	OscSync2	1	75	--	XPR-Hous	1
12	--	1VCOsine	1	76	--	Ap-SFX1	1
13	--	Noise	1	77	--	Ap-SFX2	1
14	--	XPER-Res	2	78	--	Ap-SFX3	1
15	--	2VCF	2	79	--	Ap-SFX4	1
16	--	VCF-EG1	2	80	--	Ap-SFX5	1
17	--	XPER-FEG	2	81	--	Ap-Syn1	1
18	--	VCF-EG2	2	82	--	Ap-Syn2	1
19	--	VCF-EG3	2	83	--	Ap-Clavy	2
20	--	XPER-Swp	2	84	--	Ap-Piano	4
21	--	VCA-EG1	2	85	--	Ap-Tranc	3
22	--	VCA-EG2	2	86	--	Ap-VelWv	2
23	--	VCA-EG3	2	87	--	Ap-Line1	1
24	--	VCFA-EG1	2	88	--	Ap-Line2	2
25	--	VCFA-EG2	2	89	--	Ap-Line3	1
26	--	XPER-PEGG	2	90	--	Ap-Line4	2
27	--	Checkit	2	91	--	Ap-Line5	2
28	--	PEG-Bras	2	92	--	Ap-Drum1	3
29	--	PEG-Warp	2	93	--	Ap-Drum2	1
30	--	PEG-Drum	1	94	--	Ap-Drum3	1
31	--	PEG-Melo	1	95	--	Sc-Sq/Sw	2
32	--	PEG-Slid	1	96	--	Sc-Synth	1
33	--	LFO-ModX	2	97	--	Sc-Filtr	3
34	--	LFO-Dly	1	98	--	Sc-Pan	1
35	--	LFO-S/H	1	99	--	Sc-Strgs	2
36	--	XPR-LFO1	2	100	--	XPER-Fx	2
37	--	XPR-LFO2	2	101	--	Fx-Delay	1
38	--	LFO-VCF1	2	102	--	XPER-Dly	1
39	--	LFO-VCF2	2	103	--	Fx-Phaz1	3
40	--	XPR-ALFO	2	104	--	Fx-Phaz2	2
41	--	LFO-VCA1	2	105	--	Fx-Flang	1
42	--	LFO-VCA2	2	106	--	Fx-AWah1	1
43	--	2LFO-VCF	2	107	--	Fx-AWah2	1
44	--	2LFO-VCA	2	108	--	Fx-AmpS1	2
45	--	LFO-Trig	1	109	--	Fx-AmpS2	2
46	--	LFO-Free	1	110	--	Fx-AtPan	3
47	--	Poly	2	111	--	Fx-Tremo	1
48	--	Mono	2	112	--	Fx-Lezl1	2
49	--	Poly&Prt	2	113	--	Fx-Lezl2	3
50	--	Mono&Prt	2	114	--	Fx-3BnEQ	1
51	--	SinglTrg	1	115	--	XPR-Liv1	3
52	--	SinglOff	1	116	--	XPR-Liv2	2
53	--	XPER-Vel	1	117	--	Split-1A	2
54	--	VeloStrg	2	118	--	Split-1B	2
55	--	VeloEPno	3	119	--	Split-2A	2
56	--	VelChord	3	120	--	Split-2B	2
57	--	VeloDrum	2	121	--	ORaStep1	4
58	--	ArpSplt1	2	122	--	ORaStep2	4
59	--	ArpSplt2	3	123	--	ORaStep3	4
60	--	XPER-Arp	1	124	--	ORaStep4	4
61	--	XPR-UDwA	1	125	--	ORbStep1	4
62	--	XPR-UDwB	1	126	--	ORbStep2	4
63	--	XPER-RhP	1	127	--	ORbStep3	4
64	--	XPER-3/x	1	128	--	ORbStep4	4

Performance List CS1x: EXTRA Bank ("Additions")

No.	Cat.	Perf. Name	Ele.	No.	Cat.	Perf. Name	Ele.
1	Pf	Wurlitza	2	65	Fx	Goldlox	3
2	Pf	Radio	1	66	Fx	Washout	4
3	Pf	Dance Pn	1	67	Fx	Chillin	2
4	Cp	Air Hitz	2	68	Fx	Scavenge	1
5	Cp	The Bigg	2	69	Fx	Dr Hoo	1
6	Cp	Vibes	2	70	Fx	D-Laid	2
7	Or	Drawbrs2	4	71	Fx	Wispapop	3
8	Or	Pee Ess	4	72	Fx	Comedown	3
9	Or	PhaseOrg	2	73	Fx	SpceDust	4
10	Or	DistHamm	2	74	Fx	Wowling	2
11	Or	JacjJz	2	75	Fx	Chilled	3
12	Or	Hammond	3	76	Fx	Touch	4
13	Gt	Jazz Amp	1	77	Fx	Dyna Hit	3
14	Gt	Chorus	4	78	Fx	NoseCut	1
15	Ba	Dubstar	1	79	Fx	Electro	4
16	Ba	Joda-C	2	80	Fx	Winter	4
17	Ba	s Punch	3	81	Fx	Magical	4
18	Ba	Marianas	2	82	Fx	JaWoble	2
19	Ba	Trad	1	83	Fx	CSubSub	2
20	Ba	Yeah	3	84	Et	Shaku	3
21	Ba	Boing	2	85	Et	Koto	2
22	Ba	303 Velo	2	86	Et	Bali	2
23	Ba	Outland	1	87	Et	Ravi	1
24	Ba	belishus	3	88	Se	Yavin	3
25	St	ObieStrg	1	89	Se	SweptWay	2
26	St	Phaser	2	90	Se	Fitzcarr	2
27	St	Dark	3	91	Se	HarpGlis	4
28	St	UFourier	3	92	Se	Innosans	2
29	St	Cars	3	93	Se	Monaco	3
30	St	Arco	4	94	Se	Isolator	2
31	Br	Behind	2	95	Se	E-Dropz	1
32	Br	OldTenor	3	96	Se	DeadBell	2
33	Br	GoaBrass	2	97	Se	DblWater	2
34	Br	Punchy	2	98	Se	Shinning	2
35	Br	Trumpets	3	99	Se	Jungle	4
36	Br	Section	4	100	Se	DevilCat	3
37	Br	Soft	4	101	Se	Whispers	4
38	Ld	TooClose	3	102	Se	ColorMe	2
39	Ld	Entranse	2	103	Sc	Loaded	2
40	Ld	Mini QS	2	104	Sc	ATeenth	2
41	Ld	Babylon	3	105	Sc	Ugly	2
42	Ld	Thermin	1	106	Sc	FM Inate	2
43	Ld	DistShak	4	107	Sc	Big Digi	3
44	Ld	AcidLead	2	108	Sc	Monkeee	2
45	Ld	BabyLead	3	109	Sc	Arpistic	4
46	Ld	MoogLead	2	110	Sc	Feelme	4
47	Ld	Rapland	2	111	Sc	C-Quor	1
48	Ld	Cry Baby	2	112	Sc	Strinx	1
49	Ld	SineMung	2	113	Sc	Busy	1
50	Ld	The Log	2	114	Vo	You	2
51	Ld	InYFce	3	115	Co	Split	4
52	Pd	ChoSweep	2	116	Co	Str & Pn	3
53	Pd	Synagy	2	117	Co	Fairy	2
54	Pd	Vangelis	2	118	Co	EP&Strin	2
55	Pd	Club UK	4	119	Co	Loop	4
56	Pd	Dolfins	2	120	Co	Children	3
57	Pd	Expander	3	121	Co	Syn E.P	2
58	Pd	May Trik	2	122	Co	New808	4
59	Pd	MoonPad	4	123	Sq	uirt	2
60	Pd	Nebula	3	124	Sq	Einstein	4
61	Pd	RealAnal	3	125	Sq	Estuary	2
62	Pd	Dawn	2	126	Sq	Pulshion	2
63	Pd	Satrun 5	2	127	Dr	HipSet	4
64	Fx	KeselRun	4	128	Dr	Lofi Ana	2

The little Trouble Shooter

In addition to the "Troubleshooting Guide" given in the manual we will describe some of the typical problems that are likely to crop up during use. It goes without saying that we will show you a way out this misery. So before you spend a lot of money on HOTLINE telephone calls or on the next SERVICE, you should read this section.

> The CS1x resolutely silent

Did you play a sequencer song with a fade-out? If this fade-out was generated with Sys-Ex events you will need to reset the Master Volume to a value of 127. With the sound examples this happens automatically at the beginning and end of the song. Therefore simply play the song for a second or so. If that doesn't work use a RESET (see manual, page 46). But be careful: this calls up the factory settings, which means that all USER Performances will be lost!

Another common mistake: is the CS1x still set to "LOCAL OFF" (UTILITY)? If so, the keyboard is disconnected from the sound source, and you will hear the CS1x only when working with the sequencer. Simply activate LOCAL ON.

>S ingle Performances can't be heard during playback

The culprit here may be the Arpeggiator's Tempo setting. If the Arpeggio is active and it's tempo set to MIDI, the sound cannot be played from the keyboard. Equally, the Arpeggio cannot be triggered from the keyboard because the Arpeggiator is waiting for MIDI Clock signals. You can switch off the Arpeggiator, change the Tempo setting or activate the relevant sequencer function so that it sends MIDI Clock signals to the CS1x.

> The knobs aren't working correctly

Ensure that the UTILTIY – ASSIGN CTRL assignments correspond with the default settings. You may have changed them during a song production. By the way, there are different ways of restoring the default settings: you can set them manually, transmit them via the KNOBPERR.MID fle (Tutorial Disk), RESET or load a Performance bank that contains these settings (e.g. "CSUSER.MID"). Or perhaps you have activated the Scene switches? All knob changes are ignored if you have.

> A sequencer song sounds incomplete or odd

Is the song's Performance's Arpeggiator active and its tempo set to MIDI? If so, you must activate your sequencer's clock to enable synchronisation between the Arpeggiator and the sequencer.

Are the Performance mode Multi Part MIDI channels set correctly? Please check in UTILITY – RCV CH.

Is the CS1x currently in EDIT mode? If so, the correct settings for Multi Parts cannot be received. Use the Performance key to switch into PLAY mode.

> An Arpeggio won't trigger over the whole keyboard

In this case you have to deactivate the Arpeggio Split function. Concentrate initially on the frst Layer with Arpeggiator functions using the Panel switch. Now press and hold the frst two keys to the left and above the LC-Display and press the Down key for Arpeggio type underneath the parameter matrix. This will make the "S" disappear from the display. Now you can use the whole keyboard for your arpeggios.

> The Arpeggio Split function doesn't work as desired

The Split point is set to C3. If you select an Arpeggio type whose playing range extends into the lower key half, any notes in this half will play the sound assigned to it. Simply adjust the Arpeggio type so that no notes beyond the C3 are played (e.g. UpOct1 or DwOct1).

> A sound is transposed by one ore more octaves

You may have transposed a Performance with the respective keys and then forgotten about it. To correct this, simply hold down the SHIFT key (to the left, above the LC-Display) and shift all sounds with the PART/LAYER key by +/- 3 octaves into the original octave (+0) – simply watch the display.

Index