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Foreword

Welcome to the SCOPE. This is the beginning of your journey into the beautiful future of audio. You have surely already recognized that the SCOPE is not a conventional product designed for one specific task. It is a new technology platform for audio that is potentially suited to any audio task imaginable, going much further than any previous audio product. The potential extends far beyond the applications (devices) included in this first release of the platform – the supplied devices (like synthesizers, effects etc.) are just the beginning of a new universe of applications and possibilities in audio. But even the initial functionality is much more powerful than any product before now, and the longer you work with the system, the more possibilities you will discover. Never before has so much functionality, versatility and pontential been combined in one system. There are no limits on how to use the many items in the library – the SCOPE is a unique, powerful tool that lets you get creative again!

It's impossible to compare SCOPE with any other audio system because the nature of the SCOPE is so different from any convential approach. You cannot get an accurate overview of the full scope of the SCOPE with just a brief look at it. Maybe this sounds as if SCOPE is highly complicated and difficult to handle. The good news - it's not. In the audio universe of the SCOPE, there are just a few generic rules to follow – all the rest is pure freedom.

Once you grasp the intuitive concept behind the SCOPE, you can start to travel through a new universe of audio that has no known limits. We, the developers, have been SCOPE pilots for a while now, and it is still exciting to make new discoveries – and it's getting more exciting every day, especially now, as the development environment becomes available to the public. From now on we won't be travelling alone. It is great to welcome YOU onboard along with the many other innovative minds – we are the pioneers in a new audio world and it is up to us, the SCOPE community, to innovate and shape the future of audio engineering.

The first release of SCOPE emphasizes the development platform functionality as well as analog and FM synthesis, effects, and mixing. Again, this is just the starting point. Unlike other products, SCOPE is suited as a tool for many areas in the audio world. The pro audio recording and post production studio will find the SCOPE useful as a stong synthesis engine and for its versatile mixing and routing functionality. The unmatched flexibility makes the system a valuable tool for those involved in sound installations. SCOPE is equally well suited for many applications in the test and measurement field. Audio developers will find the SCOPE the ideal development environment, for rapid prototyping of their own algorithms or as a universal test environment for any audio development.

Foreword

As the functionality of the platform and environment grows, the SCOPE will embrace more and more applications. If you think you are missing a certain functionality, it may well be that, due to the system' flexibility, you will find another way to reach your goal. If you still find a limitation, all you need is a little patience. The more people that become involved with the platform, the faster the system will grow. Never before has a system provided such creative power to the user. The extensive development environment of the SCOPE enables audio developers to create new applications easily, and this, in turn, will expand the reach of the platform significantly. In fact, you should expect the system to grow exponentially. It is our goal to make the SCOPE the most broadly supported and most powerful audio DSP platform on the planet.

For now we hope (and expect) your work with SCOPE will be both fun and rewarding. We're proud to have you on board – have a pleasant flight.

Sincerely yours,

Frank Hund

President CreamWare GmbH

About The Manual

SCOPE wasn't built in a day. And no one will master it in a day – there's simply too much to know. However, you can and *should* expect to do interesting things with SCOPE during your first session as a SCOPE user. The SCOPE user documentation has been designed to promote this goal.

The main components of the documentation – in the manuals and in SCOPE itself – are described in overview below.

The Quick Tour For Designers

The best place for all users to begin, but especially budding designers. This chapter provides basic orientation regarding the SCOPE workspace – what the major features of the workspace are, what they're called, how to find them, and how to get around in SCOPE in general.

Using SCOPE In The Studio

SCOPE offers practically limitless design possibilities. However, it's also an outstanding platform for straight-ahead studio work, and includes a plethora of fully-developed, finished devices. For those who wish to simply "use" SCOPE, rather than jumping immediately into design, this chapter provides the information needed to get up and running (you can even skip the Quick Tour).

This chapter also provides full information regarding general configuration of the SCOPE hardware and software. Additional chapters describe the individual synthesizer, mixer and effects devices in full detail.

If you've already used Pulsar, you'll be able to pick up and go with SCOPE right away. Using SCOPE as a studio tool is almost exactly the same as using Pulsar – but SCOPE puts significantly more power into your hands.

The tutorials

Here's where to begin learning the SCOPE development environment, after you've read the *Quick Tour* chapter. The tutorials walk you step-by-step through typical SCOPE circuit construction procedures based on simple circuit and device examples. They don't explain everything there is to know about the SCOPE features they demonstrate. The emphasis is on learning by doing. This puts you on the fastest track to becoming familiar and competent with SCOPE as a development tool.

Tutorial 1: Basic Techniques guides you along a direct path toward the creation of a simple SCOPE device, using the simplest and most fundamental methods.

Tutorial 2: Further Techniques extends the knowledge you gain from *Tutorial 1* with the introduction of more advanced circuit manipulation techniques, including an in-depth tour of the Module Properties tool, and the basics of device surface construction and modification.

The Circuit Design and Device Design chapters

These sections go into depth on a wide range of topics of interest to advancing SCOPE developers, including application techniques for specific modules, device design conventions and considerations, SCOPE signal characteristics, and advanced tool functions – with special emphasis on the "left side" of the Project Explorer. Numerous examples are included to illustrate the points explained. These chapters are the place to go when you find yourself needing to understand more of what's going on "behind the screens" than is explained in the tutorials. The tutorials prepare you to be able to make use of this material.

The Graphical Design chapter

This chapter provides thorough background information regarding the advanced graphics environment which is a central component of SCOPE, along with a detailed explanation of the individual graphical design tools, including the "right side" of the Project Explorer. The theory and practical techniques which are presented here will enable you to make full use of SCOPE's graphical design capabilities, not only for custom device surface design, but also for creation of custom graphical control modules. Examples are provided to make the application of this information clear.

SCOPE online help

The Help Window is a SCOPE tool which makes SCOPE a friendlier place to work. It provides instant plain-text descriptive information for individual SCOPE circuit modules or their individual connection points, simply by positioning the mouse cursor over them. These descriptions explain the function of a module or connection and provide helpful tips regarding applicatons and usage.

Tool Tips, the smaller cousin to the Help Window, provides instant pop-up information directly next to the cursor, including full-length names for module connection pads and, in some cases, their signal units and instantaneous values.

A few general suggestions

1. Expand the Acrobat Reader window to full size for most comfortable viewing of the manual.

2. As much as possible, run SCOPE *while* reading the manual. Get hands-on with SCOPE, right from the start.

3. Have fun!

About SCOPE

Congratulations! Welcome to SCOPE. Still wondering just a little bit what exactly it is that you've bought? The next few pages offer an overview of the product and the possbilities it provides.

SCOPE combines the SCOPE board, featuring state-of-the-art digital signal processing (DSP) hardware and extensive input/output (I/O) facilities, with cutting-edge software to produce an environment in which virtually anything having to do with digital audio is not only possible, but also remarkably easy. Furthermore, it is an open and open-ended environment which permits the user to "dig in" as deep as desired. Barriers to creative use of the system have been not merely avoided, but aggressively eliminated. Our goal is to encourage serious involvement on the part of the user, as well as to promote active third-party development.

SCOPE hardware

The SCOPE board provides a *very* generous amount of general-purpose DSP power and an expandable hardware platform which is independent of the host computer into which it is installed, along with the ability to connect directly to almost any type of external sound device via MIDI, analog audio, S/P-DIF and ADAT optical digital audio interfaces.

General-purpose DSP power means: full flexibility. The functions which the DSP section performs are defined entirely by the software which is loaded into it. There are no desgined-in functional constraints, no pre-defined fixed commitment of computing resources, and no up-front compromises in audio quality.

Host independence means that the audio performance of the system is essentially the same regardless of the specifications of the host computer (CPU speed, amount of installed memory, etc). It also means that the SCOPE board is inherently capable of operating in various types of host computer. Windows PCs are only the beginning.

Expandable hardware means that the SCOPE concept encompasses systems with multiple SCOPE boards operating in tandem, to multiply available DSP power and I/O capacity. Host independence is not compromised here. Communication among multiple SCOPE boards takes place via a proprietary hardware bus which connects the boards directly to one another and is fully independent of the host system bus.

SCOPE software

The SCOPE software comprises advanced DSP software and an immensely flexible and powerful graphics-based system running on the host, which makes the power of the DSP system readily accessible to the user and provides a previously unattained degree of power, ease of use and creative potential (not to mention outstanding aesthetics!).

The DSP software

The DSP operating system provides efficient, transparent and above all *flexible and dynamic* management – loading, interconnection and removal – of DSP software modules. These modules – SCOPE is delivered with a library of well over a hundred of them – perform building-block functions ranging from extremely simple (e.g., combining two audio signals) to quite complex (such as voice management for a polyphonic MIDI synthesizer). The library of DSP modules is continually being expanded by both Creamware and third-party developers.

The DSP operating system has been designed from the ground up to permit minor or drastic changes to the complement of loaded modules, or to the connections between them, *while the system is in use*, without excessive delays or unpleasant side effects, and to efficiently facilitate the distribution of these modules among the multiple DSP chips on a SCOPE board – or on multiple boards – without any need for the user to be concerned with or even aware of the details.

The host software

The host system software coordinates the activities of the DSP operating system and presents the user with a highly-intuitive graphical representation of the loaded DSP modules and the connections between them. Manipulation of DSP modules via this interface is slightly less complicated than connecting the components of a stereo system together.

The host software provides an additional library of building-block components – the graphical elements which implement onscreen display functions and mouse-operated controls. Via the same graphical interface used to manipulate DSP modules, these elements can be connected directly to DSP modules, thus providing the basis of the user interface to the DSP system and making it fully interactive.

The graphical object library further includes surface elements upon which the display and control elements can be arranged to form complete custom control panels for devices consisting of a handful or hundreds of DSP modules. The host software tool set includes a full suite of graphics tools for altering every conceivable aspect of the appearance of these surfaces and the other onscreen elements, permitting highly stylized "front panel" design.

But surface appearances are only part of the story. Sophisticated tools and methods are also provided for dealing with the structure of a design. As just one example: groups of library modules, along with the user-created connections between them, can be combined into custom modules featuring user-designated inputs and outputs. These can be saved as new components and used just like library modules, extending the library. Complex user-defined module circuits can thus be kept ready at hand, neatly encapsulated, with no need to recreate them from scratch for each new use or to confront their internal details. Naturally, user-defined modules can likewise be incorporated into further user-defined modules. This hierarchy can be extended to any number of levels, facilitating the construction of highly complex devices while retaining a clearly organized, manageable structure. Of course, the available design tools and methods go far beyond this one example.

SCOPE applications

The circuit/graphics design process described above culminates – *if* desired – with the incorporation of interconnected module groups and associated custom control surfaces into integrated devices – full-function software equipment, actually, such as the mixers, synthesizers and effects devices included with Pulsar. It should come as no surprise to hear that SCOPE was the development system used to create these devices. Properly packaged, the devices you create with SCOPE can likewise be used in Pulsar. This is, in fact, one of the specific intended applications for SCOPE.

However, creation of finished devices is by no means the only use for SCOPE. You can also use it to create custom setups of all kinds – to suit your signal processing or routing needs of the moment, for expermentation of all kinds, or to augment existing devices with just a little added functionality. There's no requirement that you make your SCOPE setups look nice or package them for mass consumption. "Quick and dirty" is also okay – and with SCOPE, *very* quick. The graphics tools and custom control surface design capabilities are available for use, but are not mandatory – likewise for the hierarchical circuit design options. If you want, you can drop knobs and displays, raw DSP modules and complete synthesizers onscreen randomly and hook them up – this also works.

On the other hand, there's no reason why the facilities of SCOPE can not also be applied to the development of devices which are ultimately to be realized as stand-alone hardware units. SCOPE lends itself quite well to rapid prototyping of both internal functional aspects and front panel layout – potentially even for equipment which has nothing to do with synthesizers, effects or even audio.

Speaking of synthesizers – the full set of finished synthesizers provided to Pulsar users is of course also provided with SCOPE. But the SCOPE user has the advantage of the SCOPE board, with almost four times as much DSP power as the Pulsar card. So, it's also entirely possible to use SCOPE simply as a super-Pulsar. The manual chapter *Using SCOPE In The Studio*, in conjunction with the chapters describing the individual synths and other devices, give you all the information you need for this. We highly recommend it – it doesn't exclude any of the other possibilities, and it's a helluva lot of fun!

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