

# ERTS

## Hardware Requirements

All information in this document is collected based on our best knowledge. The information may be incomplete or out-dated. Some of the steps described may require expert computer knowledge. Any liability concerning direct or indirect damage is excluded.

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### Sound output

ERTS provides many different sound features which all require SoundBlaster® compatible soundcards:

- Internal PC Speaker (does not require soundcard)
- Sine Wave Output (uses direct programming of OPL-chip on soundcard)
- MIDI-like instrument sound (uses SBPRO FM-operators via interface from DevKit)
- VOC-file output (uses Creative Labs DOS drivers)
- WAV-file output (uses Creative Labs DOS-drivers or direct DSP programming)

Because the presentation of VOC / WAV files has been implemented based on the Creative Labs SoundBlaster Development Kit, this feature depends on the existence of Creative Labs DOS drivers. These drivers, even if not shipped with your Creative Labs soundcard, are available from [www.soundblaster.com](http://www.soundblaster.com) or [www.creaf.com](http://www.creaf.com).

Unfortunately, these drivers do not load on many compatible soundcards and cannot be used on soundcards that need an activation of SBPRO compatible mode in the AUTOEXEC.BAT because some drivers must be loaded already in CONFIG.SYS.

With the introduction of PCI soundcards, Creative Labs stopped to support SB16 mode under real-mode DOS. Only limited SBPRO mode (8-bit) is supported on PCI soundcards. If you want to use full featured sound output under ERTS we recommend to look for a used SB16 ISA card.

To enhance performance on such PCI cards and on compatible cards, newer versions of ERTS support direct output of WAV-files which does not require any installed DOS drivers.

The table below tries to summarize the resulting sound capabilities on different platforms

Feature	SBPRO ISA	SB16 ISA	SB AWE ISA	SB PCI
MIDI-instruments	✓	✓	✓	(✓)
Sine Wave	✓	✓	✓	(✓)
VOC-driver	✓	✓	✓	
WAV-driver	✓	✓	✓	
DirectWAV	✓	✓	✓	✓
Mixer	✓	✓	✓	

Please note that on all PCI cards and most SoundBlaster compatible cards only SBPRO emulation is supported, which means that WAV output is restricted to 8-bit format.

On SB AWE cards you need to run AWEUTIL.COM to use FM features.

For testing download the ERTS sound demo from [www.erts.de](http://www.erts.de).

### Sample configuration using Creative Labs DOS-drivers

Example for CONFIG.SYS entries

```
DEVICEHIGH=F:\SB16\DRV\CSP.SYS /UNIT=0 /BLASTER=A:220
DEVICEHIGH=F:\SB16\DRV\CTSB16.SYS /UNIT=0 /BLASTER=A:220 I:10 D:1 H:5
DEVICEHIGH=F:\SB16\DRV\CTMMSYS.SYS
```

Example for AUTOEXEC.BAT entries

```
SET SOUND=C:\SB16
SET BLASTER=A220 I10 D1 H5 P330 T6
```

Example for directory content C:\SB16\DRV

```
CT-VOICE.DRV
CTVDSK.DRV
```

## Video

The ERTS software package includes two different versions of ERTS:

- ERTS.EXE – The standard VGA version using standard 16-color modes
- ERTSVIPL.EXE: The VESA-VBE Super VGA version using all 256-color modes

The standard ERTS version is limited to one-color stimuli and to max three different foreground colors within the same screen image. The reason for this is that ERTS is using the VGA color planes as full screen buffers for realizing double buffer image switches even on standard VGA cards.

The VESA-VBE version of ERTS is using the VESA **VGA Bios Extension** specification to run any available resolution in 256-color modes. With this version, the performance depends on compatibility of the VESA-VBE implementation (usually built in BIOS of graphics card), and the available video RAM.

While we haven't seen any card which is not compatible to standard VGA, you cannot assume VESA-VBE compatibility of your graphics card. Read carefully the specifications and, if possible, test your model with VIPLTEST before purchasing it.

Some of the modern graphics cards are specialized on protected mode performance under MS-Windows and only offer weak VGA performance under real-mode DOS. MATROX cards usually show good performance under DOS as well.

### Testing your graphics card with VIPLTEST

Included in the ERTS package and also available on [www.erts.de](http://www.erts.de) is the VIPLTEST.EXE utility that tests the basic VESA-VBE features required by ERTS. The VIPLTEST utility consists of the following sub-tests:

- *Enumerating and addressing available full screen pages:* This test tests the switching of video memory. Note that the number of available full screen images depends on resolution and available Video RAM. ERTS needs at least two images for the Intelligent PreLoad technique. If you want to use additional images to realize very fast image switches, you must make sure that Video RAM is sufficient.
- *Image to Image transfer:* This test tests if the transfer of images between two video memory areas is working properly.

- *Screen Synchronization*: This test tests the synchronization of the Vertical Retrace and also the millisecond timer. A vertical bar is displayed with different millisecond delays with respect to the running video refresh beam. If synchronization and timing works properly, the top of the bar will become more and more invisible because the refresh beam already passed this screen area.
- *Sync Behind*: This test tests whether your graphics card requires one additional refresh cycle before switching memory. After re-programming the new video memory, most cards do switch after one further refresh period. To achieve proper timing, ERTS can change into SYNCBEHIND mode. This mode causes ERTS to immediately switch memory addresses and then wait for the next retrace (instead of waiting for the retrace and then switch memory). As this behavior of your graphics card cannot be automatically recognized, be sure to run this test and to set this DOS environment entry if required.
- *8-bit DAC*: If your graphics card supports 8-bit DAC (256-color intensity levels), VIPLTEST will also run this test. This test currently results in a "coordinates out-of-range" message if you test more than one resolution within one run of VIPLTEST. To avoid this start VIPLTEST just for one resolution.

### Using third party VESA-VBE driver

If your card is not compatible to VESA-VBE try the Universal Display Driver from [www.scitech.com](http://www.scitech.com). Sometimes, only the BIOS implementation is incompatible.

### Flashing pre-images of forthcoming stimuli

If you notice that some of your pictures are very shortly visible before they are actually displayed, your graphics card needs the set SYNCBEHIND=TRUE entry (see SYNCBEHIND test of VIPLTEST).

### Monitor

ERTS can be adjusted to any monitor size by setting the physical dimensions in ERTSCFG. This way, you can be sure that a given distance of two stimuli is the same on different monitors.

Note that TFT monitors have a fixed physical pixel metric. If you work in resolutions smaller than the display, the resulting visible image might be smaller than the physical screen. For example, if you run 640x480 on a Laptop with 800x600, the image will not cover the entire screen. However, some graphics cards provide automatic stretching of the images.

## Response Devices

ERTS supports standard input devices such as PC keyboard and mouse buttons. If you look for variable key layouts and absolute accurate timing, you might want to use external keys instead. Any external response devices require the optional EXKEY-device which is a TTL-based microprocessor logic that transmits any external events via parallel port to the PC.

EXKEY is connected to the parallel port and requires standard configuration of the port (see next section).

### Passive external response pads

You can connect any type for micro-switch to EXKEY that is able to close and open a TTL-like circuit. EXKEY can handle up to 70ms debouncing of contacts. BeriSoft Cooperation ships response pads with 2x1, 1x4, 1x6 layout.

### Active external response devices

As EXKEY works on a TTL level, active TTL-signals can be connected as well (ATTENTION: This requires expert knowledge and absolute confirmation that the signal is TTL compatible). A signal will be interpreted as an key press.

Use this feature to integrate external devices such as external voicekey devices, physiological triggers, MRI-scan signals, and LPT output from other PCs.

## Parallel Port

If you want to send EEG-marker or use the EXKEY TTL-interface for connecting external response devices, you need a parallel port. The following aspects are to be considered

- Make sure that the parallel port is configured as standard in your computer's BIOS.
- At the same port, you can use EXKEY and send EEG-signals. To do this, you must split the data lines and one ground line from the remaining lines. The data lines are for sending EEG-signals, the other status lines are for receiving signals from EXKEY.
- ERTS does support multiple parallel ports if properly installed.
- EXKEY requires correct interrupt configuration of your parallel port.

## Dual Monitor

For monitoring the progress of the experimental session outside of the room, ERTS does support a dual monitor solution which is based on installing a VGA card and a monochrome Hercules Card in the same machine.

As Hercules cards are meanwhile very hard to get, we are currently implementing a MS-Windows ERTS Terminal which lets you monitor a running ERTS session via serial communication.

## CPU

Because ERTS is a 16-bit application it runs on any CPU higher or equal 386.

## Memory

ERTS mainly uses conventional memory. Only sound and graphics files are stored into extended memory. To free as much as possible conventional memory, some extended memory is recommended. For working with large sound and graphics files, sufficient extended memory must be available.