Bernie][The Rescue 3.0

Emulating the famous Apple][gs

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1. Installation Procedure

1.1 Downloading Bernie

Bernie is available as a CompactPro™ or StuffIt™ archive. To install Bernie, follow these steps:

download Bernie from the F.E.Systems web site at
http://www.magnet.ch/emutech/Download/ .
Decompress the software with StuffIt Expander™. If your mainstream web browser is properly installed, it should decompress the Bernie archive automatically. We are also offering Bernie as a CompactPro archive if you do not have StuffIt installed.

1.2 Obtaining a ROM Dump

Since Bernie is a software-only emulator, it **requires a copy of the Apple IIgs ROM**. We are not allowed to include this code due to the copyrights that prevent us from doing so. Consequently, you have to create an image of a Apple IIgs ROM yourself.

Bernie can handle both ROM 01 and ROM 3. You can install either of them, or both at the same time. The ROM dump(s) must be located in the **same folder as the Bernie application.** The ROM file(s) go by "*Apple IIgs ROM 01*" or "*Apple IIgs ROM 3*", respectively. Bernie will find the files no matter how they're labeled and renames them appropriately. You only need to throw them into the Bernie application directory. (Please decompress the files manually if they have been compressed before.)

Here's how you can make a ROM dump of a Apple IIgs ROM. Please be sure to follow these steps precisely, otherwise your ROM dump might end up being corrupted:

turn on your Apple IIgs and boot into ProDOS 8
If you have a **ROM 1** Apple IIgs enter the following text (do not enter the "]" and "*") `]call -151*0/800<FE/0.7FFFM`

```
*BSAVE ROM1,A$800,L$8000*0/800<FE/8000.FFFFM
*BSAVE ROM1,A$800,L$8000,B$8000*0/800<FF/0.7FFFM
*BSAVE ROM1,A$800,L$8000,B$10000*0/800<FF/8000.FFFFM
*BSAVE ROM1,A$800,L$8000,B$18000
```

If you have a **ROM 3** Apple IIgs enter the following text (do not enter the "]" and "*") `]call -151*0/800<FC/0.7FFFM`

```
*BSAVE ROM2,A$800,L$8000*0/800<FC/8000.FFFFM
*BSAVE ROM2,A$800,L$8000,B$8000*0/800<FD/0.7FFFM
*BSAVE ROM2,A$800,L$8000,B$10000*0/800<FD/8000.FFFFM
*BSAVE ROM2,A$800,L$8000,B$18000*0/800<FE/0.7FFFM
*BSAVE ROM2,A$800,L$8000,B$20000*0/800<FE/8000.FFFFM
*BSAVE ROM2,A$800,L$8000,B$28000*0/800<FF/0.7FFFM
*BSAVE ROM2,A$800,L$8000,B$30000*0/800<FF/8000.FFFFM
*BSAVE ROM2,A$800,L$8000,B$38000
```

In the Apple IIgs Finder, copy the file(s) ROM1 and/or ROM2 to a disk that has been formatted as a HFS (Macintosh) disk before. Do NOT use a ProDOS disk.
Insert this disk into your Mac's disk drive and move the ROM file(s) into the Bernie application directory.

CAUTION: Do not use a ProDOS-formatted disk for copying the ROM file(s). Always use a Macintosh (HFS) disk.

Making a ROM dump is not for the faint-hearted. If you feel you need additional help, we will gladly help you.

1.3 Packaging List

When you have downloaded everything, you should have the following files all in the same directory:

Bernie][The Rescue application
a ROM 01 dump (optional if you also have a Rom 3 dump)
a ROM 3 dump (optional if you also have a Rom 01 dump)
Documentation (User's Manual)
Register application
Release Notes
Application Notes
Please read the Release Notes carefully. They contain late-breaking news and explain with just a few words what has changed since the previous release.

The Application Notes is a document that discusses specific Apple II application and how they interact with Bernie, what settings should be used for best performance etc.

1.4 Everything In Place?

When you now start the Bernie application, you should see (in that order):

a **registration screen** - push the "Not Yet" button when it becomes available or enter your registration key
a large **blue window** with an error message saying "Check Startup Device"
The error message "Check Startup Device" is exactly what you'd see on a real Apple IIgs if you turned it on without inserting a disk. In other words, your Mac has now been taught hardware-emulating a IIgs, now it's time to shop for the software.

Congratulations, you now have a full-featured Apple IIgs® running on your Macintosh® hardware!

1.5 Where To Go From Here

We recommend you to read the rest of this **Getting Started** section and try the various options on the living object. You do not need system software for exploring most emulation-related features. Once you got familiar with the emulator, you can start using Apple IIgs software.

At this time, you might want to learn what other people are doing with Bernie. Consider subscribing to the **Bernie mailing list**, a mailing list that focuses on Apple II emulation with Bernie. Details on subscriptions are available on the web. The Bernie crew is monitoring the mailing list and providing answers in case your feeding questions into it.

Upon reading this section, you should get your hands on a few **disk images**. Most will already be eager to recycle their huge software archive. If you do not have Apple IIgs software within reach, consider downloading a few titles from the Internet (see our Download page for links).

Next, we very strongly recommend you to learn the details of Bernie's **disk handling** as described in the Storage section. It's not a particularly simple topic but crucial for having an enjoyable time with Bernie.

For the ultimate support experience, we would also be glad to welcome you in Delphi's Apple forum. We are doing online support there as our time permits and would enjoy talking to you. Look for the Apple II forum.

Finally, have a look at the **remaining chapters** (video, audio, printing).

2. Starting Bernie][The Rescue

Once you have completed the steps in chapter 1, you're ready for liftoff. The Bernie team at F.E.Systems wishes you a great time with Bernie!

2.1 Memory

Bernie has been designed to work in small memory partitions ("heaps"). The factory setting is approx. 4.5 Mb RAM. This application size is about the equivalent of a 1.5Mb Apple IIgs system. (Ca. 3 megabytes are reserved for Bernie, all remaining free RAM will be allocated for Apple IIgs memory.) If you would like to increase available Apple IIgs memory, follow these steps:

Make sure Bernie is not already running. If it is, choose Quit from Bernie's File menu.
Locate the Bernie application on your Mac and highlight its icon in the Finder window
Choose "**Get Info**" from the File Menu (in the Finder)
If you are running MacOS 8.5 or later, choose "Memory" from the popup.
Enter a new application size in the "preferred" text box. Each additional **64 kB** will translate into 64 additional kilobytes of Apple IIgs memory.
Close the window
The next time you start Bernie, the changes in memory allocation will take effect. Please keep in mind that Bernie will not allocate more than **8 megabytes** and not more than

14 megabytes with the ViagRAM™ 14Mb option enabled. A stock Apple IIgs does not support more than 8Mb of RAM.

2.2 Working with Bernie][The Rescue

2.2.1 Keyboard

Bernie translates Mac keyboards into Apple IIgs key codes. Bernie does also support **international character sets.**

There are just a few important special keys on your Mac keyboard:

The Apple IIgs Reset key is the **delete** key on the Mac keyboard. The Mac's shutdown/startup key retains its original function. The delete key allows you to reset (**control+delete**) and reboot (**control+command+delete**) the system.

The keypad may not work as expected. If you are trying to type on the keypad and nothing happens, make sure you have disabled joystick emulation via the keypad. To turn it off, choose "Joystick Support/None" from the Setup menu

To access Macintosh menu key commands, press command-shift-[key] instead of command-[key].

Tidbit: On slower Macs, consider enabling keyboard buffering in the Apple IIgs' Classic Control Panel:

push command-control-escape
enter the Control Panels section
choose the Keyboard panel
activate keyboard buffering

2.2.2 Customized Keyboard Layouts

Bernie is shipping with **customized keyboard** layouts for your Mac. The layouts tell your Mac to let through certain key combinations that are crucial for a few applications such as ProSEL and AppleWorks UltraMacros. The Bernie keyboard layouts are included with the Bernie application and must be installed first:

locate the file "Bernie Keyboard - U.S." or an international variant that matches your requirements. Layouts for French, British, German and Dvorak keyboards are included. (Users of earlier versions of Bernie can download the layouts from the web.)

grab the file with the mouse and drop it onto the system suitcase of your start disk. The system suitcase is located on your startup disk in the system folder. It's the file titled "System".

If the operation has been successful, you will notice a menu to the right on the Mac menu bar - next to the applications menu - that is now listing the keyboard layout you just copied/moved.

Bernie's keyboard layout handling is very flexible and allows for simultaneous use of a customized Bernie layout while retaining the original layout in other applications running in the background. To activate automatic layout switching, please open the Preferences menu (from the Setup menu):

Check the box **Remember Last Keyboard**. Bernie will now behave as follows:

When you switch to another application, the keyboard layout that was active before you *launched* Bernie will be made available

Upon returning to Bernie, the layout that was active before you put Bernie into background will be restored

When you quit Bernie and "Remember Last Keyboard Layout" is checked, Bernie will try to activate the layout when you launch Bernie the next time

2.2.3 Function Keys

Bernie also supports function keys. The keys are reserved as follows:

F5	toggle Joystick
F6	toggle Mouse
F7	sound on/off
F8Shift-F8	Power Mode on/offPut Bernie into background and make the Finder active
F9	Speed Nanny on (regulated emulation speed)
F10	a wee bit slower
F11	a wee bit faster
F12	Speed Nanny off: max. speed
Shift-F13	Power off-on (cold reset)
Shift-F14	Shutdown (quit Bernie)
F15	Halt

2.2.4 Mouse

For most desktop based Apple IIgs applications, the mouse switching is done automagically by Bernie. However, if the application is not using the Event Manager to poll the

mouse, you have to manually turn on mouse emulation to use it as an Apple IIgs mouse. You need to enable Mouse Support when you are running an application with mouse control and nothing happens when you're moving the mouse.

There's an easy shortcut to switch between Mac and GS mouse: **Command-Shift-M**. Alternately, you can also **click in the Video window** while holding down **Command-Shift**.

The mouse is polled 30 times a second which is sufficient in most situations. If you feel the mouse is jerky and unresponsive, you can double accuracy by:

opening the Preferences window from the Setup menu
clicking the Video panel (the second icon which shows parts of a monitor)
activate "Smooth Mouse Tracking"
Note that updating mouse position more frequently has a marginal impact on execution speed.

2.2.5 Joystick

Games are more fun when played with a joystick. Bernie offers varies "emulations" for getting the most out of your input devices.

Input Sprockets Support

Input Sprockets is a technology from Apple Computer. It's a programming interface that offers unified code for controlling joystick-like input devices from a various manufacturers.

If you have Input Sprockets installed, be sure to have the check box "Use InputSprocket" checked. This enables InputSprockets code. Joystick configuration takes place in a separate window that you can open by pushing the "Configure InputSprocket Joysticks" button.

Direct Joystick Support

Besides InputSprockets, Bernie also supports certain joysticks directly. These include the Gravis GamePad and MouseStick devices.

When you open the Setup menu, you will find a menu item "Joystick..". This menu lets you choose one of the following emulations:

None: do not emulate joysticks at all
Keypad: use the keypad to simulate joystick movement. The keys are 8 for up, 6 right, 4 left, 2 down, and 5 to center the joystick. Note that you can tell Bernie to center the joystick automatically. (See below.)
Mouse: you may also want to use the mouse.
Other: when choosing "Other", Bernie takes you to the Preferences panel and the Joystick section. Here you can select MouseStick and GamePad devices connected to your Mac. Using dedicated joysticks for emulation is always a good idea as it doesn't block other input devices such as keypad and mouse for regular activities.

The **Joystick panel** is part of the Preferences panel and lets you refine joystick emulation

Bernie emulates up to **two joysticks**. We're aware of only game supporting two joysticks (Super Star Icehockey), but since that's our all-time favorite it was worth adding support for two devices. The popup menus will also list GamePad and MouseStick devices.

If you have a GamePad or MouseStick attached to your system and the corresponding popup menu items are dimmed, please make sure their control panels (on the Mac side) are properly installed and loaded.

Autocenter is an option for joystick emulation via keypad.

When you do not steer to a particular direction, Bernie will center the joystick. You could do so by pushing 5 on the keypad, but enabling this option frees you from doing so.

Joystick emulation is a tricky thing because timing circuits are hard to emulate. Even on the real hardware calibrating a joystick has often been a daunting task. If Bernie does not work well with your software because the emulated joystick seems to be badly calibrated, you can adjust it with the **Adjust Ratio** slider.

2.3 Starting Emulation

As soon as Bernie is loaded, emulation is running. To pause emulation, choose "Pause" from the Setup menu.

2.4 SpeedNanny

SpeedNanny is a tool for controlling the speed at which Bernie is emulating. If SpeedNanny is turned off, Bernie is humming along at top speed, typically far beyond that of a stock IIgs.

To control performance of Bernie, open the Preferences window:

If Speed Control is checked, the speed slider and popup menu become active:

choose a **base speed** from the popup menu
if you would like to **fine-tune emulated speed**, use the speed slider
The **SpeedNanny** menu command from the Setup menu toggles between control speed and full speed.

You can control SpeedNanny via function keys as well. See

the previous chapter ("Function Keys") for details.

2.5 Zip Chip™ Support

A stock Apple IIgs is running at a rather 2.8Mhz. That's why accelerators such as the Zip Chip™ have been a popular add-on.

Bernie adds support for a virtual Zip Chip. This means that Zip Chip-aware software thinks there is a Zip Chip built into Bernie.

If speed control/SpeedNanny is enabled, Bernie will perform at the speed level the virtual Zip Chip is set to. For example, when your Apple IIgs software sets the Zip Chip to 9 Mhz, then Bernie will run at 9Mhz.

(If Bernie does not support a specific speed, it will tune in on the next higher speed.)

2.6 ViagRAM™ Memory Enhancer

Bernie comes with ViagRAM™, the tool for almost doubling available memory. With ViagRAM™ enabled, your Apple IIgs software can see up to 14Mb of RAM.

Please note that in order to take advantage of ViagRAM™, you need to allocate enough memory to Bernie. For the full 14Mb of RAM, you'd need to increase Bernie's application size to 17 Mb.

Please note that ViagRAM™ patches the system and a few programs make assumptions about how memory behaves and how much is available. ViagRAM might invalidate these assumptions so the software is incompatible with the patch. One software that is known to be incompatible is **AppleWorks Classic**.

3. Miscellaneous

3.1 Switching ROMs

The Setup menu has a submenu "Switch ROM" that displays the ROM currently in use. Depending on which ROM dump you have installed, one of the two choices may be disabled.

If select a ROM dump in the "Switch ROM" submenu, Bernie will load the selected ROM and cold boot Bernie. You can't switch ROMs on the fly without rebooting the virtual IIgs.

Tidbit: You can use the "Switch ROM" command to apply changes you made to the slot settings. When switching a particular slot from "Your Card" to its built-in function (Printer, Disk Port, etc.) or vice versa, **the change will not be applied immediately**. Instead, you have to completely reboot the emulated Apple IIgs in order to make the changes take effect. This is particularly important when you'd like to print with "**InkMeister**" (Bernie's proprietary printing technology) and discover that the slot setting for slot 1 is wrong. It is not sufficient to just toggle the slot setting from "Printer" to "Your Card" but you also need to reboot the emulated Apple IIgs. The "Switch ROM" command does exactly this.

We are often being asked if there's a major difference between ROM 01 and ROM 3. The answer is: no, there isn't. ROM 3 is slightly faster with Bernie, but the key benefits of the ROM 3 machines were mostly in hardware design.

3.2 Miscellaneous Preferences

The Preferences window contains a "generic settings" panel. To access it, open the Preferences window and click the panel "This & That". Here's a short description of what some more obnoxious items do:

3.2.1 Special Sound Effects

Emits nostalgic sounds when ejecting disks etc.

3.2.2 Pause Emulation When In Background

Switches to pause mode when you hop to another application. This also affects emulation when you put Bernie into background with the Shift-F8 shortcut.

3.2.3 Warn On Reset and Shut Down

Displays warnings when you're about to loose data (by resetting etc.). Experienced users will find these warnings pretty annoying, but if you're new to Bernie you might want to enable them for a while.

3.2.4 Remember Last Keyboard Layout

See chapter about Keyboards for more information.

3.2.5 Support For Extended Keyboards

If this option is enabled, Bernie will not map own functions to the function keys. Instead, function keys are passed to the Apple II software.

Please note that with Support For Extended Keyboards, it is not possible to disable Mouse Support, Speed Control or Power Mode with function keys. Remember their key shortcuts!

3.2.6 Hide Mac Cursor While Typing

Well, hides the Mac cursor while typing.

3.2.7 Allow GS Clock To Overwrite Mac Clock

Bernie offers RTC (Real-Time Clock) support. When software attempts to set the clock to a new date, you have the choice to write this change through to the Mac layer.

3.3 Getting Help

You might run into situations where you would appreciate some help.

We are offering you different sources of help. Most importantly, **please read the remaining chapters**. This introduction only scratches the surface and is not supposed to reveal all the secrets.

Next, Bernie has a Help menu where you can enable **menu help**. Menu help is a variant of Apple's balloon help, but it's

not so annoying because Bernie activates it only when you have opened a menu. These messages can be actually very helpful when you are new to Bernie. We strongly recommend you to play with Bernie with menu help enabled for a while.

Join the mailing list or surf the online archive of past messages. You will find answers to many intricate questions here.

We are - as time permits - chatting in Delphi's Apple II Forum. We can work out problems there very quickly in a live conference.

Last but not least, we have the **tech support** line where a bunch of totally relaxed people will take your mail and answer whatever questions you might have, such as if I've been finally elected CEO of Apple Computer or not. Please note that we have put together some reminders that you should please read carefully before contacting us. This saves both of us time and makes correspondence much more fun. Thank you!

Audio/Video

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1. Video Support

Bernie supports the entire range of video modes the Apple IIgs offers, and that's a lot. Video modes range from low resolution graphics and text modes to Apple IIgs' super-hires mode.

Different Video Modes

Bernie is offering three video modes: **window mode, zoomed and Power Mode**. In window mode, the Apple IIgs video display is contained in a single window and you can work with other windows and applications at the same time. In zoomed mode, the video window is shrinked. Lastly, in Power Mode the Apple IIgs video will occupy the entire screen and your Mac looks like a Apple IIgs.

Different Colors

Your Mac can run at different color "depths": 256 colors, thousands of colors, millions of colors, etc. Bernie has been optimized to run in 256 colors and 16-bit color depth (thousands of colors), and you might want to take advantage of this capability. (It's even a good idea to tell Bernie to switch to 256 or thousands of colors automatically at launch time.) You can still run Bernie at any other color depth, but it will run slower.

Different Refreshes

Bernie is refreshing the video window at 15Hz, 30Hz or 60Hz. There's also an "auto" setting where Bernie will find the best refresh rate for you. An Apple IIgs has a refresh frequency of 50 or 60 Hz, but this is often too often for most work. By reducing refresh frequency, you can free a lot of resources for improved performance.

1.1 Power Mode

Bernie features a special video mode called **Power Mode**. Power Mode makes your Apple IIgs emulator look like an actual Apple IIgs. The Power Mode has the following characteristics:

if possible your monitor will be set to 640x480 or 800x600 (with extended border option)
the video window will be centered and the space around the Video will be covered by a border
Power Mode switches to 256 or thousands of colors and enables a fast video blitter for best performance
low-level mouse support is activated automatically
To activate Power Mode, push **Command-Shift-F** or the function key **F8**.

With the introduction of Bernie 3, **you may make the regular mouse and menu bar temporarily available by holding down the Shift and Command keys**.

In Power Mode, all available colors are reserved for IIgs video. Unfortunately, this prevents Bernie from displaying the border in the proper color. Bernie allows you to put aside one color for the border (see video panel in Preferences). Of course, this one color will not be available in the video window and may result (in extremely rare situations) to cosmetic quirks.

To quit Power Mode push Command-Shift-F or F8 again.

You have to remember this keystroke because the menu is not visible. Alternately, you can use the function key F8 to enter or leave Power Mode.

Displaying Aux Windows in Power Mode

Starting with version 3, it is now possible to have the Disks, Joystick and Sound windows displayed in full-screen mode. The windows will be shown at the bottom of the screen. You can swap the aux windows in and out by selecting the corresponding menu items from the Windows menu.

Tip: holding down shift and command reenables the Mac mouse. You can then click into the aux windows to configure various sound and joystick settings and eject mounted disks.

Switching to the Finder

If you just want to quickly dive into the Mac Finder and return to Power Mode later, use the shortcut **Shift-F8**. This command puts Bernie into the background and makes the Finder the active application. When you return to Bernie (for example, by choosing it in the applications menu), you'll find yourself back in Power Mode.

Important: remember that Bernie can be taught to emulate in background. If you're hiding Bernie with Shift-F8, it might still be running and other application may perform sluggish. To turn it off, check the flag "pause emulation when in background" in the Preferences.

1.2 The Preferences

Many settings can be controlled through the Preferences window. To open it, choose "Preferences" from the Setup menu:

Each option will be discussed hereafter.

1.2.1 Screen Refresh

The screen refresh rate controls how often Bernie is redrawing the video window. A Apple IIgs is updating the video sixty or fifty times a second (60Hz/50Hz), but usually it is not necessary to redraw the video window that often. By choosing a slower refresh frequency, you can free considerable resources and make Bernie run faster.

The exact overhead of screen refreshes is not fixed but depends on the software you are using. That's why Bernie is offering a "Auto" setting: it then chooses a refresh frequency that your Mac can handle without being slowed too much which is usually 30 Hz.

The recommended setting is "Auto" or "30Hz".

1.2.2 Change Screen Depth at Startup

Switches your main monitor to a color depth for which Bernie has a direct video blitter. Drivers exist for 256 colors and thousands of colors.

When launching Bernie and your video is currently set to anything below 256 colors, Bernie will switch to 256 colors. If video is set to millions of colors, Bernie will switch to thousands of colors.

Please note that the 16-bit blitter is not as fast as its 256

colors counterpart. Running Bernie in thousands of colors is very, very approximately 5 to 15% slower.

The recommended setting is to have Bernie switch to an accelerated video mode.

1.2.3 Bypassing QuickDraw

Bypassing QuickDraw means that Bernie is directly writing into the video window on screen.

The conventional approach is to write changes to a separate memory area and then copy the new content to the video window, but this is slow. That's why Bernie is offering you to directly update the video window.

Note: Bernie can only bypass QuickDraw when the video is entirely visible and not overlapped by other windows, partially off-screen or crossing two or more monitors.

The recommended setting is to bypass QuickDraw.

1.2.4 Smooth Mouse Tracking

By default, Bernie is updating internal mouse parameters 30 times per second. This is sufficient for most software and reduces mouse emulation overhead. If your software requires a finer resolution, you can tell Bernie to check the mouse position more often (60 times a second) by checking this box.

The recommended setting is to disable *smooth mouse tracking*.

1.2.5 Extended Border Area

The Apple IIgs monitor had a pretty large border surrounding the actual content. If you'd like to really feel at home, enable Extended Border to increase border size to about the size of an original Apple IIgs system.

Note: Extended Border should not be enabled on monitors with a resolution of less than 800x600 pixels because it exceeds the size of the monitor and is slowing down emulation. Power Mode will automatically disable Extended Border if your monitor does not support the minimum resolution of 800x600 pixels.

The recommended setting is to turn off extended border.

1.2.6 AppleColor™ Mode (Smoothed)

In AppleColor™ mode, Bernie smoothes 640x200 superhires video display. This eliminates stripes but some elements (notably text) might look fuzzy. Enabling AppleColor™ mode does not affect any other video mode besides 640x200 superhires.

The recommended setting is to turn off AppleColor™ mode.

1.2.7 Power Mode: Switch at Startup

Automatically switches to (full-screen) Power Mode when Bernie is launched.

1.2.8 Power Mode: Preserve Border Color Puts aside one color for the border color. This one color will not be available for superhires and theoretically can lead to cosmetic quirks. In practice, though, this should never happen.

1.2.9 Power Mode: Fade Screen at Switch

Yet another check box in the same video panel, "Fade Screen at Switch", introduces a supercool fade out/in while switching between normal (windowed) view and Power Mode.

1.2.10 Power Mode: Change Screen Resolution at Switch

When switching to Power Mode, you can tell Bernie to set your monitor to 14" resolution. If your monitor does not support 14" resolution, this option does nothing.

Bernie requires **QuickTime** to be installed, otherwise switching resolution is not supported. If QuickTime is not installed or deactivated, Power Mode will simply stay at whatever resolution it is.

Another limitations are tabbed windows in MacOS® 8. For a yet to be found reason, MacOS 8 messes up the *positions* of popup windows when switching to 14" resolution. This problem does also occur when letting Bernie do the switch. There's nothing we can do about tabbed windows - we feel that's Apple's job to fix.

1.3 Copying Content of Video Window

Bernie lets you copy the content of the Video window in two ways, either as a bitmap or as a stream of ASCII characters.

The Copy command in the Edit menu automatically chooses the proper action: if the IIgs is in graphics mode, it copies the window as a bitmap, otherwise as text. If you are not

happy with how the Copy command works, you can force Bernie to copy the text screen as a bitmap by choosing "Copy Graphics" from the Edit menu.

1.4 Video Performance Tips

With so many options it's easy to make Bernie dog-slow. Here's a short summary of what you should consider if you're looking for top performance:

switch your computer to 256 colors. This is the most important and simple tweak.
be sure the content of the Video window is entirely visible and not overlapped by other windows. (The window border may be hidden.)
turn off Smooth Mouse Tracking
go into Power Mode. Enabling Power Mode ensures all of the above performance tips are followed.

2. Ensoniq Sound Emulation

Bernie features the most advanced sound synthesizer of all Apple II emulators. It's 16-bit , 22/44kHz sound engine produces mono, stereo, stereo enhanced and Dolby Surround Pro Logic® output with a minimum of CPU resources. Internally, a non-linear, autobalancing synthesizer takes care of down-mixing up to 32 voices at highest fidelity across all Ensoniq loads. Several optimizations including SonicSense and real-time smart voice cancelation ensure available CPU time is spent where it's needed, and additional goodies such as recording to file and a high-tech sound window complete Bernie's sound support.

Getting Help

If you have questions regarding Video support, feel free to go to the Feedback page and submit us your question or comment.

2.1 Sound At A Glance

Bernie][The Rescue supports the full range of "sound reproduction". It supports so-called classic "1-bit" sound found in older Apple II programs as well as the Apple IIgs' Ensoniq® sound chip.

2.1.1 Turning Sound On/Off

Sound emulation is enabled by checking the menu item "Sound Support" from the Setup menu. When sound emulation is started, you hear a chime.

2.1.2 SonicSense: Saving CPU resources

Sound emulation requires a tremendous amount of CPU resources because the Macintosh does not have a dedicated sound chip but does all sound synthesis in software. 680x0 Macintosh systems had a sound ASIC or a DSP coprocessor, but all PowerPC-based Macs lack such a coprocessor.

Thus, Bernie gives you a helping hand. It features **SonicSense**, a technique for enabling sound automatically when software starts playing sounds and turning it off when the virtual sound chip is idle. To enable SonicSense...

open the Preferences window (see Setup menu)
click the Sound panel
check the SonicSense option
SonicSense is only active when both sound emulation is turned on and SonicSense is enabled. If you have disabled sound emulation, Bernie will not play anything.

2.1.3 The Sound Window

Just for your very own enjoyment, we have given Bernie a multifunctional **sound window** where you can watch sound emulation at work. The window includes an oscilloscope and a bar

of LEDs that represent oscillator activity, among others. It also allows for basic configuration of the sound engine.

Let's go through the window from the left to the right.

The first element is the master level meter - one for the left (L) and one for the right (R) channel.

The LED matrix in the middle of the window displays the activity of each of the 15 voices. (There are 32 voices, you may ask. That is correct, but they are almost always bundled in pairs as independent 16 voices. One voice is typically put aside for timing, hence the 15 voices display in Bernie.) Each column shows the activity of a single voice. The position of the indicator represents the volume of that particular voice.

Next to the LED matrix is a numeric indicator which is typically set to 16. The Ensoniq sound chip can be configured to serve less than its maximum of 16 voices (=32 oscillators). For example, you can choose the number of active voices in Diversi Tune.

To the right you see five loudspeakers centered around a point. Please take no offense, but the blotch is you. Depending on the currently active sound mode (mono, stereo, stereo enhanced, surround), the speaker symbols are on or off.

There are three remaining indicators at the top of the window. Their meaning is:

ON: sound emulation is enabled.
MUTE: sound emulation is disabled. No audio will be produced. Instead you will see an amazing Nite Rider™ light bouncing around.

STNDBY: SonicSense kicked in and turned off sound emulation temporarily because the sound chip was idle. Sound support will be reenabled automatically as soon as the software is playing through the Ensoniq again.

While this window is sometimes cool to look at, close it if you're done with it. The Sound window consumes an horrible amount of CPU resources. If you have a faster Mac (250Mhz or more, ballpark), this shouldn't be of much concern. On slower Macs, however, it will make a difference.

Clicking Your Way Through The Sound Window

The sound window allows you to configure essential sound settings. These include:

volume
sound mode
sound on/off
matrix display

To **set the volume**, click into the master level display. Your click must go into one of the four lower bars. (This is a feature and not a bug: the idea is to avoid accidential clicks into the higher volumes that may nuke your expensive loudspeakers.) Once you picked up the LED indicator, hold down the mouse button and set the volume to your needs. Emulation will continue in the background so you can adjust the volume with "live" feedback.

Please note that any volume level beyond the lowest possible setting may lead to distorted sound due to clipping. When you hear scratches, you should consider reducing the volume and increase your Mac's global sound volume instead.

Also note that the Sound Window volume "slider" does not offer the same resolution as its counterpart from the Preferences window. You can fine-tune the volume much better from within the Preferences window.

To **change sound mode**, click into the group of speaker icons to the right. Depending on the icon onto which you click, a different sound mode will be chosen.

Lastly, clicking either the "ON" or "MUTE" indicator toggles sound support.The LED matrix is a multi-purpose display. You can rotate through 3 different pages by clicking the two digits ("16" in the illustrations above):

The first page, recognized by a decimal number (typically a 16), shows the **oscillator activity**. Each column represents a single Ensoniq voice. The vertical range is the oscillators' output volume.

The second page, labeled "SP", consists of a **spectrum analyzer**. The leftmost bar displays the lowest bands (around 80 Hz) and so forth. Note that the spectrum display is backed by very, very time-intense math routines. We do not recommend running the spectrum analyzer on slower Macs.

The third page (marked with a "Fr") shows in what **frequency band** each oscillator is playing. (Note: the frequency at which an oscillator is running is independent of the actual output frequency of an audio wave. If you're interested in actual output frequency, you need to go with the spectrum analyzer.) The frequencies displayed here are internal Ensoniq parameters.

Configuring the sound engine by clicking into the sound window is also supported in full-screen mode. Holddown command-shift (to make the mouse pointer appear) and change the settings to your needs.

2.2 The Sound Preferences

2.2.1 Playback Mode

The playback mode lets you choose among various settings.

Mono outputs a mono signal and is the fastest mode requiring only a fair amount of CPU resources.

Stereo provides you with a stereo output if your Mac can reproduce two channel sound.

If you are connecting headphones, we recommend you to choose **Stereo Enhanced** - this mode reduces the stereo effect for more relaxed listening with headphones.

Dolby® Surround is Bernie's state-of-the-art surround sound engine. If you have your Mac connected to a Dolby® Pro

Logic/THX® decoder/preamplifier, this mode outputs 4 channel surround sound (left, right, center, rear). Unfortunately, in order to hear sounds on the center and rear channels, Apple IIgs software must be capable of addressing more than just the standard two stereo channels. See below for information on "Rear Channel Automapping".

VectorSound modes are high-precision stereo playback modes. They come with enhanced accuracy and real-time audio filters. The recommended setting is *mono* for best performance or *stereo* for games and music applications. Use *VectorSound* for high-fidelity music applications.

VectorSound™ Sound Modes

Besides the usual suspects mono, stereo, stereo enhancement and surround playback mode, the new VECTORSOUND engine comes in various flavours.

VS™ Direct: this mode selects the new, high-precision sound engine. This mode comes close to regular stereo mode but is even more accurate than the already improved mono or stereo modes. This is the fastest VECTORSOUND mode and the recommended choice for gaming and listening to lower-quality sounds (such as MODs) or voices. VS Direct produces really crisp audio.

VS™ Interpolated: the linear sound mode adds very limited bit enhancement that actually may lead to a noticeably dampened sound. It's almost as fast as VS Direct, though, which may be the only reason why it's there. Ahem. :-)

VS™ Harmonic: Bernie's Harmonic mode smoothes a wave very accurately. Unfortunately, there's an awful lot of math required for this, thus VS Harmonic is dog-slow. The resulting wave is supersmooth. The inherent drawback of VS Harmonic is that high-pitched sounds and noises can't be reproduced precisely. Thus, VS™ Harmonic works best with high-quality FM sounds such as those found in SynthLab. It's an experimental sound mode that may or may not cut it for you.

VS™ Harmonic Compressed: based on the Harmonic sound filter, the compressed flavour greatly reduces the effects on high-pitched sounds. It's a compromise between Direct and Harmonic modes.

2.2.2 Volume Amplifier

The Volume slider lets you amplify sound.

If you increase volume beyond the "Normal" setting, you may experience audible scratches in some situations. Amplifying the volume basically says that you are increasing volume beyond what's mathematically correct, so scratches are necessarily part of the process.

The recommended setting is to set volume to *normal*. Some software is playing at a very low level (for example SynthLab) and may need to increase volume.

2.2.3 Extra Features

The Extra Features are a collection of unique functions that improve sound quality:

Crisp 44kHz Hi-Fi sound lets you choose between 22kHz (off) and 44Khz (on). 44kHz produces crystal-clear output but also doubles the amount of audio data. If your computer is short of CPU cycles or you are recording to disk, downsizing sound to 22kHz is an option you should consider.

Rear Channel Automapping screens the sounds played through the Ensoniq and dynamically maps certain voices to the rear and center channels. This option is only active when used with Dolby Pro Logic sound mode. It allows you to listen to surround sound even if the Apple IIgs software is designed to play stereo only. This is an experimental feature and may not always produce 'good' sound. Check it out!

High-Precision Timing is a new feature for audiophiles. With this option Bernie will dedicate more resources to sound emulation which allows the emulator to make the timing more accurate. Of course there's a trade-off between accuracy and emulation speed, especially on slower Macs. We do recommend High-Precision Timing for use with music applications and games. *You should disable this feature when recording to disk.*

2.2.4 Optimizations

The Extra Features are a collection of unique functions that improve sound

Smart Voice Cancellation is a technique for cutting down the number of redundant voices. Enabling it reduces overhead without sacrificing quality.

SonicSense is a special feature that cuts down sound emulation overhead to an absolute minimum. You should always enable SonicSense. Basically, it means that sound is turned off automatically after 2 seconds of silence and restarted when sound resources are being used again. When sound is turned off by SonicSense, the red light in the "Sound" window is blinking.

2.3 Sound Capture

2.3.1 Using Sound Capture

Sound Capture is a feature that lets you save audio to a Macintosh sound file. The resulting file is a QuickTime AIFF document that you can open in QuickTime Player or virtually any sound editor for further processing.

To start sound capture, open the Edit menu and select "Capture Sound...". Bernie asks you for a file name and where to save the file.

To stop sound capture, select the same menu item again.

2.3.2 Performance Considerations

Recording sound to a file involves quite some action, and slower Macintosh systems may not keep up with the data stream. To give you better control over sound recording, here are some technical details that will allow you to better configure Bernie's sound capture feature.

Sound recording is always done in the current sound mode. The sound mode is a combination of mono/stereo and 22/44kHz HiFi sound. (Stereo includes stereo enhanced and surround sound. Bernie does never record in VectorSound mode but switches back to regular stereo for performance reasons.) Depending on the combination of the two factors, the data volume can *quadruple* in worst case. To give you a better understanding of the amount of data, here're some figures for a 1-minute recording:

22kHz, mono: 2.5 Mb (43 kB/second)

22kHz, stereo: 5 Mb (86 kB/second)

44 kHz, mono: 5 Mb (86 kB/second)

44 kHz, stereo: 10 Mb (172 kB/second)

The higher throughput is the more likely is the chance of dropped frames. A dropped frame is a chunk of audio data that was generated but couldn't be written to disk because the previous frame was still waiting in the queue. If you are experiencing a lot of dropped frames, you should consider switching from 44kHz to 22kHz or from a stereo mode to mono.

Another, very important influence on your system's ability to keep up with the data stream is the *High-Precision Timing* option. As mentioned earlier, this feature sacrifices valuable CPU resources for increased accuracy. Even on faster Macs the data flow generated by high-bandwidth sound modes (44kHz stereo) and the immense overhead of High-Precision Timing can lead to dropped frames. Therefore, **we recommend to turn off *High-Precision Timing* while a sound capture is in progress.** Your Mac is given more time to process the sound data without giving up sound quality.

2.3.3 Sound Capture Errors

Because Sound Capture really dislikes shortages in CPU cycles, you are given a detailed summary upon stopping a recording. When all went smoothly, Bernie displays the following message in the status bar:

All data has been recorded successfully.
That's the message we're all looking for. In some situations, however, dropped frames occured and Bernie posts a message to the Error window:

Some data was lost (99% written).
This message means that a very small fraction of the sound data could not be recorded to disk. Actually, you shouldn't worry about a result of 99% as a dropped frame or two can easily occur during the very beginning of the sound recording process. (The MacOS gets a hiccup when creating the file and updating the Finder window or desktop. Chances are almost 50-50 it drops a frame at that time.)

A more worrying error message would be:

Some data was lost (50% written).

This typically happens when your Mac is technically not able to record at the pace you chose. In this situation you need to...

if applicable, record to a faster storage device or RAM disk.
quit background applications and close Finder windows
disable High-Precision Timing
switch from 44 kHz to 22 kHz
switch from stereo to mono
We recommend that you proceed in this order.

Things are different when dropped frames were caused by a **disk-related error**. There are a number of potential problems that can happen when a software is writing to disk, and Sound Capture is no exception. Typical errors are disks with not enough free space or when Bernie was not given write access. If a disk error occured, Bernie will post an additional error message to the Error window indicating why the file could not be written properly

.

Due to the way how Sound Capture is wired internally, Bernie can't stop Sound Capture by itself. So when a disk error or dropped

frame occurs, Sound Capture will continue even when no sound data can be written because of a filled hard disk or the like. It's therefore a good idea to double-check storage space and make sure everything's settled for Sound Capture.

2.4 Sound Performance Tips

Sound emulation may slow down Bernie on low-end Power Macs significantly. For best performance, be sure to:

enable SonicSense and Smart Voice Cancelation
use Mono playback
disable High-Precision Timing
we have found that Macs are somewhat faster when the Mac (not Bernie!) is set to 44kHz: open the Sound control panel and set "Sound Out" to 44Khz.
the Sound window (see Window menu) displays some fancy controls. However, opening this window eats valuable CPU resources, so better close it when speed is critical.
some music applications provide options for reducing the number of active voices

Storage

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1. Introduction

Emulators have a problem - they are emulating a particular machine in software but do not have access to the peripherals the software is expecting. Thus, emulators such as Bernie][The Rescue have to find alternate ways for retrieving and storing information.

Luckily, the Apple IIgs and Macintosh share many hardware components, and Bernie does a good job of bridging technical differences. This chapter explains how Bernie can work with your software archive via the built-in disk drive (hereafter referred to as the "SuperDrive"), shared volumes and disk images.

Overview

The chapter 2 in this document describes the different types of "**disks**" (physical disks, virtual disks, shared volumes), how you can create a new virtual disk, share a volume and what disk formats are supported.

Next, we'll elaborate on the **Cleverport interface**, a custom disk controller that is fast, flexible and gets the job done. About 95% of Apple IIgs software is compatible with the Cleverport. It does not emulate the underlying hardware but rather intercepts calls to the Firmware. The advantage is that this is really fast and proven. Cleverport has been part of Bernie since its introduction and is the default "disk environment".

The fourth chapter describes the **Intricate Whirl Machine (IWM)** that substitutes Cleverport. The Intricate Whirl Machine is emulating Apple IIgs disk hardware on the lowest possible level and allows you to run those very rare titles that refuse to work with the Cleverport. The IWM requires some technical understanding (notably how drives are mapped), but it's operating transparently and hides its technical nature from the user. We recommend you to stick with Cleverport unless you want to run some software where IWM emulation is mandatory.

The fifth section discusses support for **5.25" disk images**, i.e. what images are supported and how you can manage them.

Another chapter in a separate document explains **disk preferences**, a real time-saver for advanced Bernie users. Disk preferences allow you to define certain settings for individual disk images and activate them when booting from them.

Getting Help

If you have questions regarding storage, feel free to go to the Feedback page and submit us your question or comment.

2. Real, Virtual And Shared Disks

Bernie supports a variety of disk formats, from physical 3.5" disks to volumes that appear on your Mac desktop. For each type there's a lot of information to share with you, so let's start. The following subchapters discuss each disk type.

2.1 The SuperDrive

A wonderful thing is that Macs and IIgs computers have the same 3.5" disk drive in common. This enables Bernie to read disks that were created on a IIgs.

Bernie is compatible with HFS, ProDOS (GS/OS) and MS-DOS disks. It can read from and write to physical 3.5" disks. Bernie does *not* require PC Exchange or File Exchange (MacOS 8.5) for reading ProDOS disks.

2.2 Virtual Disks

Virtual disks seem to be a confusing concept for users new to emulators. Understanding how virtual disks (or disk images) work is essential because they offer unique advantages.

A virtual disk is a **file** on one of your Mac volumes that appears as a disk in the emulated Apple II. Apple II software is seeing this disk as a disk inserted into a storage peripheral because the emulator mimics the hardware of such a drive. In reality, Bernie intercepts read/write commands to this virtual device and translates them into read/write commands to a file on a Mac volume. Thus, all accesses to this drive are affecting the Macintosh file. The files are therefore called "disk images" or "virtual disks".

As with real disks, disk images have to be inserted and ejected. Instead of "inserting" disks, making a disk image available is referred to as **mounting** a disk image.

Disk images can be of almost any size and come in different flavors, i.e. **formats**. Bernie supports different formats. Except for the Universal Disk Format (also referred to as "2IMG" format), none of them offers a particular advantage over others. They are supported because these already exist or because they can be further used with other tools such as disk copiers. Bernie supports:

"DiskCopy" : Disk Copy is a popular disk copier from Apple Computer. You can turn "real" 3.5" disks into disk images using Disk Copy and directly use the resulting disk image with Bernie. Bernie supports DiskCopy 4.2 and DiskCopy 6 images, except for DiskCopy 6 compressed images. *They will not work.*

"**Universal Disk Image**" (2IMG): There's a new disk image format that will work with most regularly updated emulators across all platforms. Bernie can create, read and write such images. These images can also contain emulator-specific enhancements and user comments, though these features are not yet supported by Bernie. For compatibility reason, we recommend you to use this type.

"**Hard Disk Image**": A less popular disk image. You will hardly use it, but it's nice to know Bernie can deal with it.

"**Raw Data Image**": A disk image format that does not have a header. It's merely a collection of disk blocks.

Bernie also supports 5.25" disk images:

ProDOS-order: disk images with a "**.po**" suffix have been formatted with ProDOS or GS/OS.

DOS-order: disk images with a "**.do**" suffix have been formatted with DOS 3.3.

Nibblized Data: disk images with a "**.nib**" suffix.

2.2.1 Creating a Virtual Disk

Creating a virtual disk is as simple as saving a file. To create a new image, follow these steps:

open the File menu and choose "Create New Disk..."
choose a disk image format, preferably "Universal Disk Image"
choose a size
give the new image a name and save it to a Macintosh volume
Done!

2.2.2 Automatic Initialization

Disk images created within Bernie using the "Create Disk.." command are initialized automatically with ProDOS®. This means you can create a disk image and it will be recognized immediately. It is not possible to initialize disk images with DOS 3.3®.

2.2.3 Mounting Disk Images

To **mount** a disk image, choose the "Mount Disk.." item from the "File" menu. This opens a standard file dialog where you can pick your disk images.

Please note that there're a number of shortcuts that simplify disk mounting significantly. These shortcuts - drag & drop mounting, recently mounted disks list, and the Disks' window button bar - are explained thoroughly in chapter 3.

2.2.4 Mounting Multiple Disk Images With MacOS 8.1 or Earlier

With Bernie, you can put disk images that somehow belong together into folders and mount them all at once. To do this, click again the Mount button in the Disks window or choose "Mount Disk.." from the File menu. A dialog box appears:

In the illustration above, a folder has been highlighted. By pushing the **Accept** button, you tell Bernie to mount **everything** in that folder.

Please note the stress on "everything". Since disk images often

have invalid file types (due to downloading etc.), Bernie really tries very hard to mount as much as possible. If you have other files in a folder, Bernie would look into each file and display an error message for each file that is not a disk image. Thus, please mount only folders that only contain those disk images you want to mount.

Besides mounting each file, Bernie will also verify if each disk image has the proper type. If not, it "auto-types" disk images so they will show up properly the next time. This is all done automagically in the background.

2.2.5 Aliases Of Disk Images

Bernie properly resolves aliases to disk images. You might want to use aliases for creating worksets - folders with disk images belonging together while keeping the original disk images in their place. For example, you could store aliases of a GS/OS system disk and your favorite GS/OS application in one directory.

2.3 Shared Volumes

Volume Sharing basically means that you can mount any volume seen in the Finder also in the Apple II environment. This applies to ProDOS volumes (mounted with PC Exchange or other third party tools), HFS volumes (MacOS), MS-DOS volumes and CD-ROMs. You can only mount the first session of a multisession CD-ROM.

Volume sharing has one pretty steep requirement - the volume you'd like to share must appear on the Mac desktop first. While this doesn't sound too difficult, it often is because ProDOS support on the Mac is a rather dark chapter. Here's a short summary which tools might help you:

PC Exchange is the best choice if you are owning an **original Apple hard disk with standard Apple partitioning**. If you are using third-party drives or have reformatted your hard disk for use with RAMFast, PC Exchange won't work.

FWB's Hard Disk Toolkit is a killer SCSI toolkit for techies. It's complicated but incredibly powerful. You can mount ProDOS volumes with great success. Unfortunately, FWB nuked

ProDOS support in version 2.x, but even recent versions reportedly still feature ProDOS support (though FWB is denying it.) There're some caveats with FWB's Hard Disk Toolkit - see next section.

SilverLining Light let's you mount certain ProDOS partitions, too. It's an utility from La Cie Inc.

Apple's **Drive Setup** utility also has a Mount option but refuses to work with non-Apple drives. Still, you can patch Drive Setup to work with other drives as well.

The SilverLining and Drive Setup options have been suggested on the Bernie mailing list - you might want to join the list for more information.

Volume sharing frees you from moving your data - for example from your former Apple II hard disk - to a virtual volume via 3.5" disks. You can access all data on a volume (some file system specific restrictions may apply) - easily and at pretty high transfer rates.

2.3.1 Sharing a Disk With MacOS 8.5

choose "Share Disk..." from the File menu
highlight a volume
push the "Choose" button

2.3.2 Sharing a Disk With MacOS 8.1 Or Earlier

choose "Mount Disk.." from the File menu
push the "Desktop" button to see a list of all available volumes
highlight a volume
set the check box "read-only" the the appropriate setting (see below)
click the button at the bottom that says "Mount <volume>" where <volume> is the name of the volume you selected.

Important: you can't share the startup volume. If you select the

startup volume, the Mount button will be dimmed.

Tidbit

If you are familiar with **ShrinkWrap**, volume sharing can be an incredibly useful tool for transferring data even if you only have a single disk attached to your Mac.

With ShrinkWrap you can create disk images that mount just like real disks on the Mac desktop. You can copy data onto it and then tell Bernie to share the disk. Works like a charm.

To do so, launch ShrinkWarp (currently at version 3). Then choose the command "New Image" from the "Image" menu and create a new disk. ShrinkWrap will mount the image automatically so you can start using it immediately.

When you're done, go to Bernie and choose "Mount Disk.." or "Share Disk..." from the "File" menu. Share the disk as outlined above.

2.3.3 Read-Only or Read/Write Access ?

Below the Mount button is a checkbox titled "read-only". It is checked by default. This checkbox allows you to mount a volume in two completely different ways - it's not just that write access is enabled or not, instead there are some major differences in how the volume is mirrored in the Apple II environment.

If read-only is checked, the volume appears in the Apple II environment as a write protected Smartport device. Simultaneously, Bernie places a lock on the volume in the MacOS layer, thus preventing any modifications. (You will see a "lock" in the Finder windows.) Consequently, you have read-only access from both MacOS and the Apple II. When you unmount the volume in Bernie, the lock will be removed and you can read and write again from

within MacOS. (Note: the Finder does not automatically update the Finder windows. Therefore, you might still see the disk lock even though it has been removed. Please close the Finder windows and reopen them to see the changes.)

If read-only is cleared, the volume will be removed from the desktop and Bernie is taking over control. Although this seems to be much cooler than read-only access, there are some important pitfalls you should be aware of:

Some FWB Hard Disk Toolkit (HDT) drivers are incompatible with volume sharing. This is a deficiency of the HDT driver. We have found that all HDT drivers do not work on removable media with the "physical eject on unmount" flag checked. (This flag is in the HDT driver configuration. Please consult the manual for more details.) There are two workarounds: either disable "physical eject on unmount" or use a different driver.

HDT versions prior to v2.0 do not implement certain driver calls properly. You will not be able to use volume sharing with HDT versions predating 2.0 (whether the media is removable or not).

This information applies to you only if you are using the "Hard Disk Toolkit" software from FWB Inc.

Be very careful with HFS volumes. Even though GS/OS can access HFS volumes, the HFS driver in GS/OS is known to be very buggy and can corrupt a volume effortlessly. There are patches that fix some of the most annoying quirks, but you still risk loss of data. We recommend you to use HFS volumes only with dependable media or in read-only mode. In read-only mode data on the shared disk can't be modified and you're on the safe side.

While the volume is controlled by Bernie in write-enabled mode, MacOS does not claim the volume is in use. Consequently, you could eject removable media easily and nobody would complain. **DO NOT EJECT THE MEDIA.** Instead, follow these steps:

shut down GS/OS or ProDOS 16 so all open buffers/caches are written to disk

unmount the volume in Bernie (push the "Eject" button)
the volume will reappear in the Finder. Drag it to the Trash.
As you can see, sharing a volume in read/write mode does not come for free. We have implemented the read-only mode for those who do not want to risk loss or corruption of data caused by components that are not necessarily under Bernie's control. After all, read-only mode is perfect for transferring huge volumes of data. Better safe than sorry!

2.3.4 Aliases Of Volumes

With Bernie, you can make aliases of volumes and mount the alias. Bernie will resolve the alias and share the volume.

Because volumes can be shared read-only or with full read/write access, the function of aliases has been extended:

if an alias is locked, the volume it is pointing at will be shared read-only
if an alias is not locked, the volume will be shared read/write
Please keep in mind that sharing HFS volumes with full read/write access is *not* recommended.

3. The CleverPort™ Interface

The CleverPort is Bernie's proprietary disk interface. It's a substitute for SmartPort, a technology built into Apple IIgs computers. The SmartPort serves as a not-so-low-level interface for exchanging data in blocks of 512 bytes per transaction. CleverPort intercepts and interprets these command sent through the Smartport interface.

CleverPort emulates an imaginary device chain of up to 8 devices. Each device can hold one disk of virtually any size. It works with "real" 3.5" disks, virtual disks and shared disks equally well.

For the sake of simplicity, please make sure the menu item "Low-Level Disk Support" in the Setup menu is **disabled** while working through this chapter. The exact function of this flag is explained in a

more technical chapter about the "Intricate Whirl Machine IWM". Basically, you have the choice between running Bernie with CleverPort or with IWM emulation - they are mutually exclusive. But the question remains:

When Should I Use CleverPort?

Always use CleverPort ***except*** with very few software titles that refuse to work with it. These include some GS/OS 4.0 disks and some self-booting demos. Almost all programs written with just the slightest intention of compatibility are compatible with CleverPort. CleverPort is faster and supports a much wider range of disk capacities than IWM emulation.

3.1 The Disks Window

The Disks window gives you control over the imaginary device chain. Upon launching Bernie, it looks more or less like the figure below:

3.1.1 The Built-In SuperDrive: Mounting a 3.5" Disk

The window contains only one device (drive) that is labeled "built-in SuperDrive" and resides at ID 2. A chain may contain devices from 1 to 8 - in this case we only have this single device.

This particular drive is actually an exception because it is always mounted and visible. Whenever you stick a disk into your Mac's 3.5" disk drive, the disk you have inserted will be mapped to this unit. Analogously, if you'd like to eject a disk in the built-in 3.5" drive, you only need to tell Bernie to eject the media in the drive titled "built-in SuperDrive".

3.1.2 Mounting A Disk Image

Usually, you won't use real 3.5" disks that often because they are

rather slow compared to disk images. Also, you can have only one single 3.5" disk online which restricts usage.

What you need is a drive that is loaded with a virtual disk. To mount a disk image, push the "Mount" button at the bottom and pick a disk image. (To learn more about how to create a new disk image, please turn to the chapter "Creating a Virtual Disk".) For the sole purpose of demoing how the window will look like, assume we have mounted a really large disk image titled "Games":

Bernie has created a device for this new image and mapped it to unit #1. Bernie will always **map a new image to the lowest-numbered free unit.** Next to the drive icon you can see the disk image's name ("Games"), it's size and what kind of disk image it is. In the example above, Games is huge disk image with 32 Mb worth of data. If we mounted more images, the window would grow in the following way:

(Please ignore the small "I" and "II" boxes. Their use will be explained in chapter 4.)

3.1.3 Mounting Disks & Volumes By Drag & Drop

Picking disk images and volumes from standard "File Open" dialog boxes can be tedious. That's why Bernie allows you to grab disk images from the Finder and drop them onto the Disks window:

locate a disk image, volume icon or alias
click it and hold down the mouse button
drag the icon to the Disks window
while the cursor is on top of the Disks window, you will notice a very faint blue border
release the mouse button
When mounting volumes that way (i.e. when sharing volumes by drag&dropping their icon), the volume will always be mounted in read/write mode.

3.1.4 Mounting a Recently Used Disk Image or

Volume

Bernie keeps track of the last few mounted disk images and shared volumes. To see a list of recently used disks...

open the File menu and select a disk from the "Mount Recent" submenu
in the Disks window, push the Mount button and hold down the mouse button until a popup menu appears

hold down the "Mount" button for apopup menu of recently used disks

3.1.5 Selecting/Deselecting a Drive

Suppose you want to do something particular with a disk image such as locking it, ejecting it, or whatever. To select a target device for these actions, click once on a device so that it becomes highlighted:

If there's a selected device, all of the buttons at the bottom are active.

To **deselect** it, click it again.

3.1.6 Ejecting a Disk

Unlike Mac 3.5" drives, 3.5" drives for the IIgs feature a "manual eject" button for ejecting disks. So does Bernie.

Before further elaborating on how to manually eject a disk, let's start with a **very important warning**. Ejecting a disk makes the volume unavailable. If, for example, you are ejecting a disk while Apple II software is still writing to a disk or has still buffers to be flushed, the

ejected disk may be severely corrupted because not all data could be written to disk. **To prevent corruption**, please keep this in your mind:

if possible, always let the system software eject a disk. For example, when you're in the Finder move the disk to the trash.
if you are not sure if all caches have been flushed, quit the current application or shut down the virtual IIgs properly
Basically, Bernie does not introduce any additional "catches". These rules are valid on any system with removable media.

Actually, there are four different ways of how to manually eject a disk. Each works equally well:

select a drive, then push the green *EJECT* button at the bottom of the Disks window
each drive has its own eject button. Push to the right of the disk slot to eject a disk.

open the Setup menu and the *Eject Disk...* submenu. You can either choose *Eject More* to select multiple disks and eject them at once choose a particular drive, identified by its unit ID

3.1.7 Locking/Write-Protecting a Disk

Bernie also allows you to "soft-lock" a disk image. The image is not physically locked, but Bernie pretends it is. Apple II software is unable to modify the content of software that operates on a disk (image) with a soft-lock.

Note: in some situations a disk is **always locked**, and you can't do anything about that. This happens when you are mounting disk images who have been locked in the MacOS Finder, or shared volumes in read-only mode.

To lock a disk, do this:

select a target drive
push the green *LOCK* button at the bottom of the Disks window

3.1.8 Rearranging the Device Chain

Up to now you have seen how to mount additional disks by using the Mount function. New disks have been added by creating a new drive at the lowest-numbered free slot. It is possible, however, that you'd like to mount a disk at another ID. For example, the unit ID is indirectly determining from which volume will be booted and at which slot/drive combination a disk resides. (More about booting under Cleverport in the next chapter.)

To move a disk to a new (free) unit, follow these steps:

select a target drive
push the up or down arrow buttons to move the drive to the next higher or lower free unit
(Note: the arrow buttons are at the bottom of the Disks window. The arrow *keys* on the keyboard do not work here.)

Note that the arrow keys move a drive only from one free unit ID to the next. Example:

In this example, drive #1 hopped to the next higher free unit which is unit 3. (If you pushed the up arrow again, it would hop on to unit 6.)

Warning: remapping a drive may severely confuse the system software. Furthermore, if there are still disk caches with data not written to disk, the disk image may become corrupted. We strongly recommend you to remap devices only during startup, after shutdown, or while working with ProDOS 8. For the system, remapping is basically the same as ejecting a disk, so the same warnings apply here.

3.2 Booting With CleverPort

When Bernie reboots with CleverPort enabled, it first determines which drive to boot from. It does this by first inspecting the unit #1, and if this drive does not contain a bootable disk or is empty, advances to unit 2 and so on. Once it finds a bootable disk, it moves it down to unit 1 because this is the drive Bernie does always boot from. In case unit 1 was already occupied by a non-

bootable disk, Bernie simply swaps unit 1 with the first bootable disk.

Consider this situation:

When you boot Bernie with CleverPort, it first checks units 1 and 2. Since both units are empty, Bernie proceeds with unit 3 where it finds a bootable disk ("Sword of Sodan" - don't ask for it, it's only the demo version :-) .) Hence, it moves "Sword of Sodan" down to unit 1 and boots from it.

(If there were another disk at unit 1, Bernie would have moved it to unit 3.)

3.2.1 Manually Adjusting Boot Order

With this knowledge you can choose any boot order you wish. Just make sure the disk you want to boot from is the first bootable disk in the device chain. It needs not be at unit 1 but may not be preceded by another bootable disk.

For example, if you'd like to boot from the volume "Games" in the right illustration above, you would have to move "Sword of Sodan" one place up (to unit 3) and move "Games" down to unit 1.

Here a brainteaser for techies: you could also move "Games" down to unit 3 first and then move "Sword of Sodan" up. "Sword of Sodan" would then be reassigned to unit 6. Bernie would still see "Games" as the first bootable device and move it to unit 1 automatically. Hooray!

3.3 Declaring Default Startup Disks

After spending some time Bernie, you will eventually find that you are mounting the same boot disk with every new Bernie session. Luckily, you can tell Bernie to automatically mount one or several disk images every time Bernie is started.

When opening the Preferences window and choosing the "Storage" panel, you'll find a box where you can define your startup disks. To pick your startup disks, push the button "Select Startup Disk or Folder".

As with mounting disk images, you may choose to either pick a single disk image or an entire folder. For more information please turn to "Mounting Multiple Images". (This also applies to MacOS 8.5 and later.)

Lastly, the checkbox "**Don't mount when starting with a disk image**" deserves an explanation. It is possible to start Bernie by dropping a disk image onto Bernie's application icon, or by double-clicking it. The latter is probably the way you're usually starting Bernie.

When starting Bernie with a disk image, you can tell Bernie whether you would like to load any startup disks plus the disk images you dropped onto the Bernie icon or just those you dropped. For example, if your startup disk is a GS/OS start disk and you're dropping your favorite, self-booting game onto the Bernie icon, you might not want to have the startup disk loaded. In other situations it might be still appropriate. This checkbox lets you configure Bernie to your requirements.

4. Intricate Whirl Machine IWM

Recent releases of Bernie feature IWM emulation for compatibility with very hardware-dependent software. These software titles "talk" directly to the hardware and require highly accurate emulation. IWM emulation replaces CleverPort, Bernie's proprietary disk controller that has been discussed in chapter 3.

When Should I Use IWM emulation?

IWM emulation has been streamlined to work with very hardware-specific software. It does not offer the flexibility and speed of CleverPort. However, it enables you to run software from the FTA and improves compatibility with copy-

protected software (see below for more information).

Bernie's IWM emulation mimics the availability of the original disk controller in every Apple IIgs. Currently, IWM emulation is limited to up to two 3.5" drives that each can hold one disk of 800kB capacity.

Note: IWM emulation outlaws disks with capacities other than 800kB. This means that you can only use software that comes on 800kB disks or disk images. Although you can still mount disks of any size, Bernie will ignore anything but 800kB disks while being in IWM emulation.

4.1 Enabling IWM Emulation

To enable IWM emulation, you have two possibilities

choose Low-Level Emulation from the Setup menu
in the Apple IIgs control panel, set Slot 5 to "Smart Port"
While choosing a simple menu command is rather straightforward, the latter point needs to be elaborated. The Apple IIgs offers a group of control panels that are either accessed by pushing Command-Control-Escape or by selecting "Control Panels" from the Apple menu. In either case, there's a "Slots" panel for configuring the slots in a Apple IIgs. Each slot can either take over a built-in function or activate the (external) card it is holding. In Bernie, this concept is used to switch between Cleverport (our proprietary disk controller) and IWM emulation, the built-in disk controller. Assuming that you have opened the Classic Control panels (push Command-Control-Escape) and opened the Slots panel, you will see a screen like the one below:

If slot 5 is set to "**Smart Port**", **IWM emulation** is active.	If slot 5 is set to "**Your Card**", Bernie's proprietary

CleverPort interface is active.

Note: switching from IWM emulation to CleverPort or vice versa involves rebooting your virtual Apple II. You can change the settings any time but they won't take effect until you reboot

If you are unsure whether IWM emulation or Cleverport is active, just have a look at the Disks window. The title bar indicates which component is currently running:

IWM emulation is **active** IWM emulation is **inactive**

In order to facilitate switching from IWM to CleverPort, Bernie now automatically enables CleverPort when there's no bootable 3.5" disk mounted.

4.2 Drive Mapping

As you have eventually noticed in the chapter about CleverPort, the device chain displayed in the Disks window sometimes contains small tags that look like this:

As noted earlier, IWM emulation is restricted to 2 3.5" drives. The Disks window, however, allows you to mount up to 8 disks of any size. Bernie thus has to find two disks in the device chain that are compatible with IWM emulation. The two drives that meet this criteria are marked with a "I" and "II" respectively.

4.2.1 How And When Drives Are Mapped

Bernie reassigns drive for IWM use on two occasions:

when you **reboot** Bernie, it scans the device chain and maps the first two drives with 800kB media to IWM unit I and unit II

when you **mount** a new disk image and IWM unit I or unit II are not mapped (for example because you previously ejected the disk in IWM unit I), the drive with the new disk image will become one of the undefined IWM units.

Note that Bernie tries hard to stay in synch with software that may be still accessing an IWM-mapped drive. For example, when you are using the arrow buttons to move a drive to a new position in the device chain, Bernie will also move the IWM mapping. An IWM mapping is only invalidated when you actually eject the media or reboot Bernie.

4.3 Technical Differences IWM / CleverPort

Software using IWM emulation transmits and receives data byte-by-byte. (The CleverPort, on the other hand, communicates on block level which equals 512 bytes per transaction.) Consequently, IWM emulation is much slower than CleverPort. Luckily, we have highly optimized IWM emulation in Bernie so you won't notice a tremendous performance hit. Nevertheless, CleverPort is still faster and more flexible.

4.4 Copy Protection

Copy protection often manipulates disk bytes in a nonstandard way. This can go as far as formatting a disk as a spiral. It's therefore up to the software to read a protected disk and reconstruct the original data.

Although Bernie does feature low-level disk emulation, there's a big catch which basically neutralizes the inherent advantages of low-level emulation. Think about how disks are read into memory: First, you insert a protected 3.5" disk into the built-in disk drive. Bernie then attempts to read from this disk. This read operation tells your Mac to transfer a few disk blocks from the media into memory and translating the encoded disk bytes (disk bytes are encoded in a rather complicated way) into regular blocks of 512 bytes each. If all goes well, Bernie translates the 512 byte blocks back into encoded

disk bytes and feeds them into the Apple II software, byte-by-byte. The point is that although the Apple II software will only see the encoded disk bytes, all data on a disk will first have to go through a decoding and encoding stage because the Mac can't be told to just retrieve the raw data as it comes in. *The Mac* always attempts to decode whatever it finds, and the Mac does not know about Apple II copy protection.

Put briefly, the fact that the Mac has the first shot on the protected disk prevents Bernie from running some copy-protected software because the Mac wants to decode disk bytes and expects to find data that is encoded in a standard way. If there's a copy protection that, the Mac will be unable to figure out what's on the disk and reports an error.

4.5 Zero Memory Footprint Caching

Zero Memory Footprint Caching is a dynamic caching algorithm that speeds up disk access with IWM emulation, especially when used in conjunction with slow peripherals. For instance, Bernie's caching tremendously speeds up transfer rates with physical 3.5" disks.

Zero Memory Footprint means that you need not allocate a disk cache or increase Bernie's application size in order to accommodate space for disk caches. Instead, Bernie configures and sizes its cache automatically and transparently without decreasing memory available for IIgs memory or other functions. Bernie maintains two separate write-through caches (one for each IWM drive) with average cache hits of between 20 and 30% (ballpark).

5. 5.25" Floppy Disks

Before 3.5" disks appeared in the mid 80ies, 5.25" floppy disks were the de facto standard in "mass media". Today, floppy disks are no longer used, but if you'd like to enjoy the hundreds of classic games and other, early milestones in Apple II computing, then they will

most likely come on 5.25" disks.

5.25" support in Bernie is somewhat limited. It has been designed to enable you to run all those classic games like Choplifter, Hard Hat Mack, etc. Bernie's 5.25" implementation is not currently compatible with GS/OS. We are working on that.

Important: **you can't format 5.25" disk images due to technical limitations.**

5.1 5.25" Basics

Although hardware is radically different, Bernie][The Rescue integrates 5.25", 3.5" and SmartPort devices seamlessly in one device chain. You have become familiar with the "Disks" window in chapter 3, and 5.25" floppy disks are also displayed in the same window:

device chain with one 5.25" disk image

device chain with two 5.25" disk images

(for more information on the "P" icon, please turn to chapter "Disk Preferences".)

5.25" units do always appear at the top of the device chain

Bernie reserves two logical units right above the regular CleverPort units 1 through 8 for floppy disks. The two drives represents drive 1 and drive 2 of an imaginary 5.25" disk controller in slot 6.

you can't move a CleverPort unit into the 5.25" area and vice versa

A CleverPort device can only be used with the CleverPort or, in case of 800kB disks, IWM emulation. Similarly, 5.25" floppy disks require a different "kind" of hardware emulation and thus can't be used with CleverPort or IWM emulation. The arrow buttons only work within the CleverPort/IWM area and within the 5.25" area.

you can move 5.25" disks from drive 1 to drive 2 and vice versa

However, you can still use the arrow buttons in the "Disks" window to move a floppy disk in drive 1 to drive 2 on condition that drive 2 is empty. Analogously, a disk in drive 2 can be moved to drive 1 if the latter is empty.

ejecting a 5.25" disk

Analogously to CleverPort devices, you can eject a 5.25" disk by clicking on its drive door.

5.2 ProDOS or DOS 3.3 Formatted?

Bernie's two most widely used disk formats are **DOS-order** and **ProDOS-order** 5.25" disk images. This naming convention is highly confusing because it does not refer to the system software on a disk image but which formatting scheme has been applied for that disk. In order to understand the difference, here're a few comments on **'sector interleaving'**.

> A 5.25" disk consists of 16 sectors per track. DOS and ProDOS do not, however, write these sectors sequentially to disk but order them so that the read/write routines of the OS kernel achieve best possible throughput. In other words, each OS assumes an "interleaf factor" - a physical displacement of two logically adjacent sectors - so that the OS has some time for de- or encoding between two sectors.
>
> For example, assume the head just flew over sector 1 and the OS read that sector into memory. Next, the OS needs to decode what it just read, and that process takes some time. When the decoding stage is completed, the OS continues reading the disk. Until that happens, about 5 sectors have gone by in the meantime. Hence the OS resumes reading 7 sectors later, and the OS defines interleaving so that the next sector read is actually logical sector 2. If the sectors were ordered strictly logically, there would be quite some overhead

- almost one full rotation per sector. With the introduction of interleaving, sectors can be read much more efficiently.

Now there're two bad things about this: first, the sectors are numbered only in the order as they appear physically on the disk (i.e. strictly from 0 through 15). Secondly, DOS and ProDOS have different interleaf factors which means that Bernie is unable to locate a sector without knowing which OS did format that disk.

The consequences of the differences in sector interleaving are that you have to decide which formatting scheme has been applied. The emulation world distinguishes between DOS-order images (for disks with DOS 3.3 interleaving) and ProDOS-order images (same for ProDOS). Disk images usually have a file name with a ".DO" or ".PO" suffix.

When opening a 5.25" disk image, Bernie first tries to determine whether it's a ProDOS or a DOS-order image. It then asks you for the formatting scheme and makes its best guess the default choice:

Upon choosing a formatting scheme, Bernie sets the **file type** of the disk image so it can be recognized the next time automatically. DOS-order images will be given the file type **DOS3** while ProDOS-order disk images are of type **PDOS**.

Tip: if you are unsure about a disk's formatting scheme, choose DOS 3.3. DOS-order disks are much more common than their ProDOS counterparts.

Bernie also supports a third disk image: so-called "nibble" images. Images of that type usually have a ".nib" in their filenames. Images containing nibblized disk data do not require you to know which formatting scheme has been applied because they are a (more or less) 1:1 dump of the original disk. Bernie directly feeds "nibble" images into the emulated hardware, and it's up to the OS to make any sense of it.

5.3 Disk Images Recognized by Bernie

Bernie assumes that every file with a generic file type and a file size of exactly 140kB (143,360 bytes) or 227.5kB (232,960 bytes) is a 5.25" disk image. More precisely, the following file types may be used:

TEXT, ????, BINA, DSK5: files whose formatting scheme has to be determined manually
DOS3: disk images that have been formatted with DOS 3.3
PDOS: disk images that have been formatted with ProDOS
NIBL: 1:1 disk copy containing disk data in its nibblized form
The **DSK5** files originate from "Stop The Madness", an Apple II+ emulator for Macintosh computers. You can use these images directly.

Most disk images ship in either DOS-order or ProDOS-order format. This format is the preferred choice for **unprotected** software. However, protected software will possibly not work with these formats because they do assume a standardized disk layout.

For **protected** software, your only choice are **nibblized disk images** that directly dump the data as it appears "under the drive head" to the disk image file. These images are a bit larger in size because they also record all the bytes needed for synchronizing and positioning the drive head. Nibble images are not a creation of Bernie but are used by other emulators and support has been added for compatibility with existing images. Although the name suggests otherwise, the nibble format does *not* perfectly mimic a 5.25" floppy disk. (Techies: there is no halftracks support and tracks have fixed length.) Consequently, a disk image format that does not capture 100% of a disk may fail in some situations. If you are only downloading disk images, this is a non-issue because people who have uploaded nibble images have done so because it works for that particular software. You should keep this in your mind only when you're going to make your own copies.

5.4 Additional Technical Information

Bernie's current 5.25" hardware emulation features two tweaks, an auto-alining mechanism and a 'turbo' mode for improved throughput. Both features are disabled for nibble disk images.

The *auto-aligning* mechanism improves head positioning accuracy during write operations. It can't be turned off.

The *'turbo'* mode is currently always enabled (except for "nibble" images) and can't be disabled. It improves overall throughput during read operations by as much as 30% average (ballpark) but also introduces odd disk behavior from the viewpoint of the emulated software. We have tested the corresponding code intensively and couldn't find any incompatibilities caused by this tweak. An upcoming release will allow you to turn it off.

5.25" emulation does not use caching.

6. CataDog™ File Browsing

CataDog™ is a stand-alone file cataloging utility integrated into Bernie. It allows you to:

view the complete catalog of a disk, disk image or shared volume
view file types and file sizes
filter catalogs by file type
CataDog is compatible with any ProDOS-formatted disk. It also supports extended GS/OS files. CataDog does *not* support HFS, DOS 3.3 or MFS formats.

6.1 Cataloging a Disk

CataDog works closely with Bernie's "Disks" window. You select the disk you wish to catalog in the "Disks" window. (To open the "Disks" window, push command-shift-D or open the Window menu and choose "Disks".)

Next, select a single disk by clicking on its drive icon once:

select a disk (image) by clicking it once

Afterwards, open the Window menu and choose "Catalog". This brings up a new window that may look similar to the one below:

The CataDog window displays the following information:

file name or folder name
file type as a hexadecimal code or three-letter abbreviation if available
file size
total number of files and folders displayed
The window works very much like Mac Finder windows. Directories have a small arrow to the left. Clicking this arrow expands and collapses a directory.

Tip: If you wish to expand an entire file tree (that is, see all files and directories inside a folder), *option-click* a folder.

Tip: If you wish to resize the window horizontically so you can just see all information, click the window's zoom box.

6.2 Browsing By File Type

CataDog also includes a filter so you only see files of a particular file type. Bernie understands all official three-letter abbreviations (such as AWP, TXT, BIN) and hexadecimal codes.

To activate the type filter, click the "ALL" button in the CataDog status bar. The button is highlighted and shows an ellipsis.

You have now the possibility to:

enter a three-character abbreviation or
a hex code.
Let's filter all binary files of type BIN:

Type B, then I, and finally N:

When you enter the last character, Bernie will check the completed code. If it can't find it in its internal database, it will bark and go back to the ellipsis.

If the code could be recognized successfully, the catalog will immediately reflect the new filter setting.

Analogously, if you'd like to specify a file type by its hexadecimal code, you enter a **dollar sign** plus two hexadecimal digits such as:

To disable the type filter and view all files and folders, click the file type field again.

Communications

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7. Performance Tips

1. Introduction

Communications support is one of the most challenging tasks for emulation software. With Bernie, communications support has been implemented using a very hardware-oriented approach offering compatibility with virtually all software accessing the Apple IIgs' serial port architecture. *Please note that Bernie does not support **AppleTalk** at this time.*

Bernie's serial communications support is referred to as CerealPuffs™ (aka serial ports), and the port administration code - that also manages Mac serial ports for InkDirect™ - is called MuesliPump™. This section describes Bernie's CerealPuffs technology, how to configure the ports, emulation limitations, and performance tips.

Speed is everything with telecommunications. It means bandwidth and getting things done sooner. For emulation software, communication speed also stands for added **overhead** because the same signals, flags, and maintenance tasks have to be processed at extremely high frequencies. As an example, a connection at 28,800 baud not only implies a throughput of (max.) 3.5kB per second but also an insane emulation-specific overhead of 28800 interrupts per second, or just a mere *34 microseconds* for completely dealing with an emulated interrupt cycle (plus doing regular stuff). This example shows why choosing a high connection speed does not always lead to the expected outcome. In fact, it can place such a burden on the system that your there's no time left for doing anything reasonable!

Getting Help

If you have questions regarding communications, feel free to go to contact the communications guy.

2. Credits

It is very unusual to put the credits at such a prominent place, but F.E.Systems owes a few people that kind of appreciation.

We would like to thank **Richard Bennett** for helping during the entire development cycle at a level that goes far beyond the usual Q & A support. Richard has written Marinetti, the popular TCP/IP software for Apple IIgs computers, and implemented the serial drivers for Seven Hills Software's commercial Spectrum communications software. Put briefly, he's the guy who knows answers to serial questions. And, honestly, without Richard offering his help, we're not sure if we had tackled serial communications at all.

We would like to thank **Ewen Wannop** - another Spectrum programmer - who is getting increasingly involved with Bernie's serial communications, and are looking forward to improving Bernie to meet Spectrum's needs.

Writing software with that kind of support is just more fun.

3. Configuration

Configuring serial ports is a snap:

Bernie is emulating both the Apple IIgs printer and modem ports. Each of the two ports can be connected with any serial port or device on your Mac (serial ports, most internal modems, some PC cards, third-party serial cards, etc.). Bernie is offering three different ports:

Apple IIgs printer port
Apple IIgs modem port
InkDirect™
(InkDirect™ is a low-level printing technology and discussed in a separate chapter.) Each of these emulated Apple IIgs ports can be associated with a Mac serial port.

3.1 Choosing a Port: Port Menu Items

A port can be either off or linked to a Mac port. There's a 1:1 relationship between Apple IIgs ports and Mac ports, that is, a Mac port can only be linked to a single Apple IIgs port and vice versa.

When you have chosen a Mac port for, say, the Apple IIgs printer port, that Mac port is dimmed in all other port selection menus. You can't select that Mac port for any other emulated port. If you would like to reassign the Mac port to another port, you need to reset the original connection first (by setting the port to *off*) and then make your new choice.

Redirecting output to a File - as the port selection menus suggest - is not yet implemented and always dimmed. Let's have a more detailed look at each of the settings:

3.1.1. Port Setting "Off"

When a port is set to "Off", Bernie will only service the port so the software sees a fully functional serial controller that is not connected with the outer world. This setting is, for

example, sufficient for running Diversi-Tune that is using the serial controller for timing purposes but does not actually transmit or fetch any data (as long as MIDI is disabled.)

3.1.2. Port Setting "File"

This feature is not yet implemented and always dimmed.

3.1.3. Port Settings "Printer Port" and "Modem Port"

These two are most commonly seen port types and correspond to the two serial ports that are ingredients of most if not all desktop Macs.

3.1.4. Port Setting "Internal Printer/Modem Port"

This port is usually what you get with a PowerBook or a Duo without docking station/minidock.

3.1.5. Port Settings Only Show "Off" and "File"!

Communication support is only available in registered versions of Bernie. If your copy is not registered, then the port menus will only show the "Off" setting and the dimmed "File" option. You can get the rest of the menu at a very fair price.

3.2 Port Speed

With Bernie, you can tell Bernie to choose a port speed for you automatically or select a specific baud rate. The baud rates for each port are independent of each other.

3.2.1 Automatic Baud Rate

Since Bernie is emulating the Zilog communications controller, it knows very well what port speed your Apple IIgs is requesting. Thus you can tell Bernie with the Auto setting to set the Macintosh port to whatever baud rate the Apple II software is asking for. For example, if your telecom software configures your Apple IIgs modem port to run at 9,600 baud, Bernie would tell your Mac to establish a 9'600 connection on the Mac side.

Unfortunately, there are some rather unusual port speeds not support by the Macintosh. In that case Bernie is picking the next higher port speed.

3.2.2. Setting a Port Speed Manually

If you have a fast Macintosh and you want to take advantage of your systems performance, the port speed menu lets you select a specific port speed. The speed you select will be the rate at which Bernie will actually communicate with the outer world. The advantage of overriding port speed is that you can feed your Apple II software much faster than it was originally designed for. And because Bernie is typically running much faster than a stock Apple IIgs, it is very likely your software can deal with it.

Please note that you often can't increase port speed to an arbitrary value. For instance, if you have a serial device that can't go faster than 9600 baud, you won't be able to communicate at higher baud rates than this.

4. Baud Rate And Protocol Options

Except for the linking of Apple IIgs Ports to Mac ports, the whole configuration of the serial ports is done through your Apple II communications software. Please refer to the documentation of your telecomm software of how to adjust the baud rate and protocol options (parity, data and stop bits).

Bernie supports:

any port speed up to 57,600 baud
5, 6, 7 and 8 data bits
odd, even parity, or none
Bernie does not support AppleTalk at this time.

For example, the configuration screen in ProTerm looks like this:

(Missing Picture)

These settings will configure the ports for 4800 baud, 8 data bits, no parity, 1 stop bit.

5. Handshaking

Understanding handshaking requires a thorough understanding of how communication devices interact. Feel free to skip this discussion if you're new to Bernie or just don't want to bother with technical details. Please come back when you'd like to use a modem or network.

Whenever two persons or machines are communicating, people and machines must agree upon certain gestures or signals to indicate that communication can start.

Handshaking controls the flow of data between two devices. When one device is tinkering with the handshaking signal, the other knows that there is some problem on the other end and communication should be suspended until further notice. This may happen because the device must pay attention to something else, it encountered an error or the unexpected happened.

In the communications world, there are two commonly used methods of implementing handshaking: software handshaking and hardware handshaking.

5.1. Software Handshaking

Software handshaking is based on a convention between the sender and receiver. They agree on special characters that signal "I'm ready" or "stop sending me data". This method is simple and works pretty well, but it has the big disadvantage that there are special characters that may not be used within regular data packets because they would be interpreted as handshaking signals. Therefore, **software handshaking may not be used for transmitting binary data** (8 bits) but with ASCII text only. Text messages have the property of making use of only a very limited range of characters so that certain symbols are used for controlling data flow.

Software handshaking is also called "XON/XOFF handshaking".

5.2. Hardware Handshaking

If you need to transmit data with full 8 bits, there's a special line commonly referred to as "Data Terminal Ready", or **DTR**. DTR indicates whether a device is ready for communication or not. It basically does the same thing as software handshaking but is making use of a hardware signal.

The problem with DTR is that it is not really popular on the Mac to use DTR for handshaking. Modems for example are using the DTR line for something else: to hangup. (You really wouldn't want to hangup and redial every time your Apple II software is requesting a short time-out!) Therefore, Bernie features a number of methods for emulating DTR - this enables your Apple IIgs software to rely on DTR while offering compatibility with Macintosh serial devices.

The *Communications* panel in the *Preferences* window includes a popup menu for choosing a **DTR emulation**. This menu is valid for both Apple IIgs ports. Each option will be discussed in detail hereafter.

5.2.1. Ignoring DTR

The "Ignore" setting is a brute force approach - handshaking will simply be ignored. This means that your Apple IIgs has no means to indicate to the sender that it should stop sending data.

5.2.2. Hardware

The preferred option is full hardware emulation of the DTR signal. This means that a device will see a change in DTR when your Apple II software is accessing DTR.

While this option could be described as the only faithful DTR emulation, it assumes that the serial device knows what a change in DTR means. Unfortunately, most of today's modems are using DTR for a different purpose, namely for holding a connection alive. Asserting the DTR line does not affect handshaking but disconnects your connection completely which is not exactly what you wanted. Please consult your modem's manual to see if it supports DTR for handshaking.

Hardware emulation is the preferred choice if your serial device supports DTR handshaking.

5.2.3. Software

If you are only transmitting/receiving text data, Bernie allows you to map hardware handshaking to software handshaking. Changes in the DTR signal will be mapped to their software handshaking equivalent, that is Bernie is sending XON/XOFF characters depending on the state of the DTR signal.

Software emulation is the preferred choice when sending ASCII text.

5.2.4. Emulated

The last choice is "emulated DTR", a pretty sophisticated Bernie special. Instead of actually routing DTR information to the serial device, the DTR signal is processed entirely within Bernie.

A request to stop sending data is typically caused because the software needs some time to recover from a task or save the previous data to disk. Bernie starts buffering the incoming data until your Apple II software is back and ready to fetch more data.

The drawback of this method is that Bernie's buffer is rather small and tends to overflow itself soon. So this implementation does not work when your software needs a long time to recover. Bernie does use software handshaking when it can't buffer data any longer, but then the same limitations as described in "Software" above apply.

Emulated DTR is the preferred choice when your Apple II software can keep up with data flow and only rarely needs time to recover.

5.3. Compatibility Mode

Serial communication is truly a bottleneck, that's why Bernie is optimizing a few steps to make it go real fast. Unfortunately, one or two applications make very strong assumption on how much data comes in and when there's time left to process it. Too many assumptions for our taste.

Bernie's compatibility mode is slowing down bandwidth but addresses these problems. Applications affected are ProTerm and ReadyLink.

If you are looking for a solid telecommunications software that has been fully tested with Bernie][The Rescue, we recommend you to check out Spectrum (commercial) and Marinetti (currently freeware). These two products are mature products and still being worked on.

6. The Communications Window

The communications window gives you an overview of your serial connections. The window consist of two panels, one for each emulated port:

(Missing Picture)

Rx = "Receiver" (incoming characters), Tx = "Transmitter (outgoing characters)

6.1. Port Active

Next to the Port A/B is a LED that goes on when the port is "connected", that is, when you have linked it to a Mac port. You can activated a port in the Communications panel of the Preferences window.

6.2. Rx In Progress

The "RD" light turns green whenever a read operation is in progress. Bernie is then fetching characters from the Mac's serial port and passes them to the Apple II software.

6.3. Tx In Progress

The "TR" light turns green whenever a send operation is in progress. Bernie is then transmitting characters the Apple II software feeded into the serial controller and passes it onto the serial port.

6.4. Communication Error

With every connection, communication errors may appear and have to be dealt with. The communication error happens between the serial device and Bernie (and not between the Apple II software and Bernie). Bernie is detecting errors and passes this information on to the Apple II software. When an error occurred, the "ERR" light goes on and an error message appears in the LCD display below.

6.5. DTR Handshake, Tx Handshake

These two indicators show whether data is "flowing" or transmission has been suspended. If the DTR Handshake is on, incoming characters will be buffered but not delivered to the Apple II software. Plus, the sender will be notified of the change in DTR. (Note that the exact behavior of DTR depends on how you have configured DTR emulation.)

Analogously, Tx Handshake reflects the state of outgoing characters. If the Tx Handshake LED is on, no characters will be transmitted.

6.6. Rx/Tx Buffer Fill Grade

The LEDs show how many bytes are waiting to be delivered to the Apple II software (Rx) or the serial device (Tx).

6.7. LCD Multipurpose Display

Lastly, each port is featuring a small display. This display keeps you informed on:

the current port speed
flow control (DTR, CTS, XON, XOFF signal changes)
error conditions (framing errors, parity, overflow, break conditions)
"OFF" if the port is inactive

7. Performance Tips

As you remember from the introduction, speed is very critical and communications support requires a lot attention from the CPU. We have stated that the faster a port is running, the more overhead is produced which in turn may degrade performance and reliability (since there's no hardware handshaking yet.)

Several real-world experiments and feedback from users showed that a good communication speed is around 9600 baud. On first-generation Macs (60-80 Mhz), real-world throughput is around 6000 or 7000 baud, so it is pointless to choose higher connection speeds. Instead, talking at 7200 or 9600 baud is a real gain because emulation overhead will give your Mac more room to breathe and actually allows for a steady communication at Bernie's maximum bandwidth.

If you own faster Macs, you can extrapolate reasonable settings for your machine. For 150 Mhz Macintosh computers, you might well experience best performance at 32,800 baud - it is left as an exercise to the user to find the best setting. There are simply too many external factors (overall system speed, background tasks, third-party tools slowing down) that we can give you an ultimate recommendation.

Printing

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5.9. Printing without Preview

1. Introduction

Since the first incarnation of InkMeister™, other possibilities to print your documents have been continually added. So there are now four technologies:

InkMeister Light™ translates single characters passed through the GS slot 1 by 8-bit Apple II- and text based GS/OS software into QuickDraw, the Mac's native imaging system. This enables you to see this sort of output in a preview window (the so-called "InkMeister™ Control Center"), and to print it on any MacOS compatible printer.

InkDirect™, introduced with Bernie v1.3 allows you to send the characters passing through the GS slot 1 directly to a Mac serial port of your choice. This way the 8-bit Apple II- or text based GS/OS software is able to control a printer attached to that Mac serial port.

InkMeister Pro™, which is not yet finished, allows you to print graphics and text from GS/OS desktop applications. To use this option you install the GS/OS printer driver called "InkMeister" supplied with Bernie in your GS/OS system. This driver passes GS QuickDraw II commands to Bernie, where they are translated into Mac QuickDraw commands for previewing and printing. As of now some features are not yet implemented, among them bitmaps and direct printing (i.e. preview mode is required).

Cereal Puffs™, introduced with Bernie v1.3, support the GS Serial Ports by connecting them to the Mac serial port(s) of your choice. With this configuration you can print like on a real GS, using the usual printer drivers and cables. Since this solution emulates the chip used for serial communication in a real GS, it uses a bit more CPU power from your PowerMac than the other three technologies. This technology is described in detail in the Communications chapter of this documentation.

Getting Help

If you have questions regarding InkMeister™ Light, Pro or InkDirect™, feel free to contact Urs Hochstrasser of F.E.Systems.

2. InkMeister Light™

InkMeister Light™ is the integrated text printing solution for Bernie][the Rescue. For once we departed from the principle of emulating 'metal'. The reasons for this are simple: MacOS compatible printers are page printers (QuickDraw or PostScript devices) rather than text printers. However, most 8-bit Apple // titles, among them the very popular AppleWorks Classic, expect just such a text printer.

That is where InkMeister Light™ comes in. It allows 8-bit or text based GS/OS software (such as the ORCA shell) to print to a virtual text printer. The output is then converted to a format your MacOS compatible printer can understand and print accordingly.

InkMeister Light™ emulates a text printer attached to slot 1, but it doesn't support all the details you can set for the actual Printer Port.

InkMeister Light™ requires Slot 1 to be set to "Your Card" in the Apple IIgs Control Panel. If slot 1 is set to "Printer", do this:

enter the Control Panel
open the "Slots" sub-panel
change slot 1 to "Your Card"
close the "Slots" screen by hitting the RETURN key, and leave the Control Panel
reboot the emulated Apple IIgs (changes will not take effect until you reboot)
You can reboot the emulated Apple IIgs by choosing "Reset" from the "Setup" menu.

When you print the first time the 'Preview' option will be enabled (you can check this in the 'InkMeister' submenu in the 'File' menu). Therefore the 'InkMeister Control Center' (a preview window) will appear when the first page is finished. You can invoke this window with the 'Printer' command in the 'Window' menu as well. More on the preview window later.

International Characters

InkMeister Light™ supports all foreign character sets you can select in the GS' Control Panel ('Display language'). InkMeister Light™ reads this setting and translates its output accordingly. Due to this mechanism you can't mix foreign characters from different sets on the same printout.

Line Length

Some software doesn't limit the length of printed text lines (e.g. Applesoft BASIC). Therefore you can set the line length in the Preferences.

2.1 AppleSoft BASIC

In BASIC you can use

```
PR#1
```
to redirect output to InkMeister Light™. Accordingly, in the monitor you would use `1`<*CTRL-P*>. Of course the same rules apply as if you were using a real printer, so when using DOS 3.3 or ProDOS BASIC.SYSTEM you should use

```
PRINT CHR$4;"PR#1"
```
in BASIC programs instead. To print listings or other output with lengthy lines you can limit the line length in the Preferences

2.2 ORCA Shell (GS)

You need to install the `.PRINTER` driver which came with your ORCA package prior to using InkMeister Light™. After installing you can redirect output to the printer as usual:

```
catalog > .printer
```
It might be necessary to disable the 'add LF after CR' feature in the ORCA text printer control panel to avoid double spaced text.

2.3 AppleWorks Classic

In order to print from AppleWorks you need to create a **Custom Printer Driver**. Here's how to do it in AppleWorks Classic 3.0:

To do this you select 'Other Activities' from the main menu in AppleWorks. There you select 'Select standard settings for AppleWorks', and then 'Specify information about your printer(s)'.

Select 'Add a printer' (remove another if necessary), select 'Custom printer' and call it 'InkMeister'.
Give 'Slot 1' as access.
Set the following options:
'Needs line feed after each return': NO
'Accepts top of page commands': YES
'Stop at end of each page': as you like (recommended NO)
'Platen Width': 8.0 inches (unless you print in landscape orientation)
'Printer codes': see step 5
'Interface cards': select and set 'Current control chars' to 'None' (normally there is 'Control-I 80 N'. Remove it).
Set Printer Codes You can set codes for 'Boldface, Subscript and Superscript' and for 'Underlining'. The codes are given in the Printer Codes section below. For underlining use 'Printer has start/stop underline commands'. There are more options (Italics, Outline and Shadow) which you can set with 'Special Codes'.
Return to the main menu by pressing the 'Escape' key several times. You are now set to use InkMeister Light™ with AppleWorks Classic.

HINT: AppleWorks asks you 'How many copies?' before printing. Leave this at '1' since you can set the number of copies in your MacOS Print Dialog. This will be much faster!

2.4 Form Feed on a Partially Printed Page

A page is only printed (or appears in the preview window) when it is finished, i.e. when the page is full or InkMeister Light™ received a form feed character (Control-L) from the software. If you want to get your page immediately you can invoke the 'Form Feed' command from the 'InkMeister' submenu ('File' menu) or by clicking on the Form Feed Button in the preview window. If Form Feed Timeout is enabled, a form feed is forced after 30 seconds of printing inactivity. This won't be necessary in AppleWorks Classic since it sends a Form Feed automatically.

2.5 Preferences

You invoke the InkMeister™ specific preferences panel by selecting 'Preferences...' from the 'Setup' menu (and clicking on the printer icon) or by clicking on the 'Preferences' Button in the preview window.

2.5.1 Force Monospaced

Although the recommended default font for InkMeister Light™, Courier, is a monospaced font, this is not the whole story. When printed in boldface or another more space consuming typeface even a character from the Courier font takes up more space. This is a general problem on the Mac if you want to align monospaced characters.

Therefore InkMeister Light™ offers a solution with this 'Monospaced' mode. If it is enabled, every single character is placed individually and exactly. This yields proper alignment in text screen based word processors like AppleWorks Classic. On the other side this method is very time consuming and printing is slowed down considerably.

HINT: If available, you can also choose the font

Courier New instead of enabling "Force Monospaced". CourierNew is monospaced across all font variations, and it allows you to perfectly align text without having to enable InkMeister™ Light's time & memory-consuming "Force Monospace" option.

2.5.2 Font and Size

Here you can choose any font installed in your system and a fair amount of different point sizes. There are some important issues about the selection of these parameters.

If you want your text to align properly stick to Courier or another monospaced font

Don't use 'Force Monospaced' on a proportional font (such as Helvetica or Times); it just looks awful!

In the present version of InkMeister Light™ line height is fixed to 12 points. Use bigger font sizes at your own risk.

2.5.3 Margins

You can set InkMeister™ Light's margins manually (in 1/4 inch increments) or automatically to the printable area of the page. If you need exact alignment in relation to the paper, specify zero margins ('None').

2.5.4 Line Length

Some software doesn't limit the length of printed text lines (e.g. Applesoft BASIC). Therefore you can set the line length (Unlimited, 30, 72, 80 or 132 characters). When printing from AppleWorks Classic, set this option to 'Unlimited'.

2.5.5 Printer Command Style

As explained in 'Printer Codes' below you can specify printer commands with Esc or additionally with **<...>** brackets. Since the latter method prevents you to print a '<', it is an option.

2.5.6 Form Feed Timeout

This feature frees you from the burden of giving manual form feeds. After 30 seconds of printing inactivity it forces a form feed.

2.6. Printer Codes

Printer codes can be given in two different styles. The first method uses the 'Escape' Character (ASCII 27) to tell InkMeister Light™: here's a command! This method is useful in most cases, especially in word processors like AppleWorks Classic, where you can define 'Escape' codes in a printer driver.

However, if you want to format your text just using a text editor (as the ORCA editor for example) you can't put 'Escape' into the text. Therefore there is a second method using '< >' brackets to tag a command. This mode is normally disabled since it prevents you from printing these brackets altogether! You can set the option in the Preferences panel (invoked with 'Preferences' from the 'Setup' menu and clicking on the printer icon, or directly in the preview window button bar).

Examples for both command styles: Esc BB equals <BB> (Boldface Begin).

	Begin	End
Boldface	BB	BE
Underline	UB	UE
Subscript	-B	-E
Superscript	+B	+E
Italics	IB	IE
Outline	OB	OE
Shadow	SB	SE

3. InkDirect™

Introduced with Bernie v1.3, this technology allows you to send the characters passing through the GS slot 1 directly to a Mac serial port of your choice. This way the 8-bit Apple II- or text based GS/OS software is able to control a printer attached to that Mac serial port directly.

Since InkDirect™ gets its data by the same mechanism as InkMeister Light™, it **requires Slot 1 to be set to "Your Card" in the Apple IIgs Control Panel.** If slot 1 is set to "Printer", do this:

enter the Control Panel
open the "Slots" sub-panel
change slot 1 to "Your Card"
close the "Slots" screen by hitting the RETURN key, and
leave the Control Panel
reboot the emulated Apple IIgs (changes will not take

effect until you reboot)

You can reboot the emulated Apple IIgs by choosing "Reset" from the "Setup" menu.

To enable InkDirect™, you open the 'Preferences' dialog from the 'Setup' menu. Then you select the 'Serial' preference panel:

In the 'InkDirect' part of this panel you can enable InkDirect by selecting a Mac serial port in the 'Port' popup menu.

A port can be dimmed when

The port was in use by some other program or the system software when Bernie was launched. In this case it will stay dimmed until you quit Bernie. If the port had been left open by some haywire program you need to reboot your Mac to get the port back.

The port is in use by one of the GS ports (by the CerealPuffs™). When you disable that port, the corresponding Mac port will be available again.

If no ports are displayed in the popup menu, there might be something wrong with your registration...

The 'File' menu item is dimmed on purpose: this feature is not yet implemented.

The remaining popup menus are used to configure the selected serial port. They are modeled after the 'Apple Serial Tool' from the 'Communications Toolbox' and implement the typical Macintosh serial architecture. This seems to be a bit different from the GS. If you need an exact copy of the GS serial ports, use CerealPuffs™ instead.

The check boxes have the following meaning:

Add LF after CR — Some printers require a LF (line feed character) after a CR (carriage return). If the software you are using doesn't support this, you can enable it here.

Strip MSB — Some Apple II text based software sets the MSB (most significant bit) of each character to 1 for normal text, even when printing (e.g. Applesoft BASIC). Most printers don't like this, because the standard ASCII code doesn't use the MSB at all. By enabling this option you can reset that bit to zero to make your printer happy.

The instructions in the InkMeister Light™ chapter concerning Applesoft BASIC, ORCA Shell (GS) and AppleWorks Classic apply with the following exceptions:

The 'Line length' popup in the 'InkMeister' preferences panel doesn't apply to InkDirect™.

In AppleWorks Classic you must select the appropriate printer driver for your printer. Interface init strings must be disabled (the infamous Control-I 80 N).

If your printer needs an LF after CR, enable it only once (either in the printer driver or in the InkDirect™ preferences).

The rest of the InkMeister Light™ chapter doesn't apply to InkDirect™, neither does the 'InkMeister' preferences panel.

NOTE: As soon as InkDirect™ is enabled, InkMeister Light™ won't be able to print, until you disable InkDirect™ again. InkMeister Pro™ is not affected.

4. InkMeister Pro™

InkMeister Pro™ allows you to print graphics and text from GS/OS desktop applications. To use this option you install the GS/OS printer driver called **InkMeister**, supplied with Bernie in your GS/OS system. This driver passes GS QuickDraw II commands to Bernie, where they are translated into Mac QuickDraw commands for previewing and printing. Some features are not yet implemented. This release handles: basic graphic objects (circles, rectangles, lines, points), fill and frame patterns and colors for these objects in 640 mode, blend dithered colors or print pure colors, text.

It does not support yet: long text, pixmaps, regionsdirect printing (i.e. preview mode is required).

InkMeister Pro™ is software shipping in two parts. One part is integrated into Bernie, the other half is a custom printer driver that comes on a tiny disk image (**InkMeister Pro Driver**). To install InkMeister Pro™, follow these steps:

Launch Bernie
mount the "InkMeister Pro Driver" image

copy the InkMeister Pro driver to the folder
*:System:Drivers: on your GS/OS startup disk
now open the control panels from the Apple menu (in the emulated IIgs, not on your Mac)
open the "DC Printer" panel
select "InkMeister" in the "Printer Type" list. (You can ignore the upper list.)
Congratulations, now you can print from within GS/OS desktop applications!!

Please keep in mind:

always enter a valid page range when printing. Most applications do deal properly with partially specified printer records, but for example AppleWorks GS makes quite a mess if you leave these fields blank.
almost all controls in the InkMeister Pro 'Page Setup' and 'Print' dialogs are not wired yet. They simply do nothing. Exceptions: the Color Blend check box and the Page Range do work.
In this version you can only print to the preview window (and from this onto paper), thus direct printing without preview is not yet implemented.

5. The InkMeister™ Control Center

This window is also called the preview window. Any time something is printed to InkMeister Light™ or InkMeister Pro™, and preview mode is enabled (in the 'InkMeister' submenu in the 'File' menu), this window pops up and displays the output. You can also invoke this window by selecting 'Printer' in the 'Windows' menu.

In this window you always see a gray outline, even if there is

nothing printed yet. The gray area indicates the non-printable area of your printer to help you adjust the margins if necessary (see section Preferences for details).

NOTE: If you don't see a gray outline, please check whether you have selected a printer in the Chooser or as desktop printer. If you select a printer, you need to do a Page Setup prior to printing.

There are several controls at the bottom of the window which are described here in more detail:

5.1. Scale Popup

You can look at your output in several magnifications, from 400% to 25%. Moreover there are two special display modes: 'Fit' fits the whole page, whatever the size and shape of the window. 'Shady' fits the page to the width of the window. Users with large screens might like that feature...

5.2. Double/Halve Scale

These buttons double or halve the view scale of your output. Disabled when in 'Fit' or 'Shady' mode.

5.3. Preferences Button

Go directly to the InkMeister™-related panel of the 'Preferences' dialog. This might take a while if you invoke it for the first time and have a lot of fonts installed on your Mac.

5.4. Page Setup Button

Invokes the Mac's Page Setup dialog. Same as selecting 'Page Setup...' from the 'File' menu.

5.5. Print Button

Invokes the Mac's 'Print...' dialog and prints the contents of the print queue (the pages in the preview window). It clears the queue afterwards.

5.6. Page Flip Buttons

If there are more than one page in the preview buffer you can flip pages (browse the queue) with these buttons. The current page number is displayed between the two buttons.

5.7. Form Feed Button

Forces a form feed on an unfinished page. Same as 'Form Feed' from the 'InkMeister' submenu in the 'File' menu.

5.8. Clear Queue Button (Trash Can)

Clear the print queue and get rid of the preview window's content. Same as 'Clear Queue' from the 'InkMeister' submenu in the 'File' menu.

5.9. Printing without Preview

If preview mode is disabled, InkMeister™ prints directly, without putting up a 'Print' dialog. Instead it takes the settings from the last print job or creates a new one with default values.

NOTE: Printing without preview is not yet implemented for InkMeister Pro™.

Preferences

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2.2.1 Creating a Preset File
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3. Disk Preferences

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1. Introduction

Bernie features a wide range of customizations. A few selected options that you might need to change often are available directly from the Setup menu. These include:

turning sound on and off
turning low-level mouse emulation on and off
turning low-level disk support on and off
turning speed control (SpeedNanny) on and off
The vast majority of customizations, though, is available through Bernie's Preferences window. This chapter explains the various preferences panels, how you can create presets, and attach preferences to disk images.

1.1 Window Behavior

To **open** the Preferences window, choose "Preferences..." from the Setup menu. If you open the window for the first time in a session, this operation may take a few seconds as a lot of initialization has to take place.

To **close** the Preferences window, click the window's close box. Closing the window does not affect the preferences - all options retain their setting.

The Preferences window is rather large if you have a small monitor. Therefore, Bernie lets you shrink the window by clicking the **zoom** box of the Preferences window:

2. Presets

Bernie is offering a wide range of customizations. This allows you to get the most out of available resources.

Unfortunately, this also means that different applications require different setups. For example, you might want to configure Bernie to work as fast as possible with productivity software while entertainment software should also deliver rich sound. To free you from going through all the preferences, Bernie lets you create presets.

2.1 What's a Preset?

A preset is a group of preferences of your choice. A preset may contain options from one panel, selected options from multiple panels, or even a complete dump of all available customizations.

2.2 Creating a Preset

2.2.1 Creating a Preset File

The last panel - *Presets* - in Bernie's Preferences window lets you create, edit and delete presets. To create a new preset, open the *Presets* panel and bush the button "New Preset...":

A dialog appears asking you for a name for the new preset. The name you enter here must be a valid MacOS file name.

2.2.2 How Presets Are Stored

Presets are stored as files in a special folder. This folder is created automatically when you start Bernie for the first time. This folder is called "Preferences Sets" and is located in Bernie's application folder:

You do not need to bother about how Bernie stores presets since both creating and deleting preset files is done via buttons in the Preferences window. However, you might want to look at the preset files if you'd like to exchange presets with other users.

2.2.3 Choosing a Preset

Upon creating a preset file, you can start editing it. However, you first need to tell Bernie which preset you'd like to edit:

The *Edit Preset* popup menu lists all currently available presets. (The "Harddisk" item is a disk image - please turn to chapter "Disk Preferences" to learn more about an interesting variant of the presets concept.)

2.2.4 Adding Preferences to a Preset

Now that you've chosen a target preset, we're ready to add preferences.

Adding preferences to a preset basically means copying global preferences to the preset. There's a special shortcut for adding an option: clicking a control while holding down the command key.

When you command-click a control, the control retains its setting and becomes movable. It follows the movement of the cursor until you release the mouse button. At the same time, the white area at the bottom of the Preferences window pops up. This is a drop box where you can drop the control. The control will then be added to the currently selected preset. Such an action might look like this:

(Missing Picture)

The option "Speed Control" has been clicked while holding down the command key,
and then moved to the presets drop box.

Keep these things in mind:

When adding a control to a preset, it will be added with its current setting. Thus you might need to change the setting before adding it to the preset.

To add a slider to a preset, be sure to command-click the slider. Command-clicking its labels will not work.

You can only add controls, not group boxes or panel icons. (You can, however, add all preferences in the *Presets* panel.)

If you have command-clicked a control by mistake and would like to *not* add it to a preset, just drop it anywhere but in the presets drop box. A control will only added when it has been moved into the presets drop box.

2.2.5 Dropping a Control Gives You an Error Message

Remember that we first had to choose a preset in the *Presets* panel. In some situations Bernie deselects the current preset and reverts to the "none" item. This happens when:

deleting the current preset
mounting, unmounting (ejecting) or remapping a disk or disk image

In such cases, just open the *Presets* panel again and pick the preset you'd like to edit.

2.2.6 Adding All Preferences (*Copy Globals*)

If you'd like to add many preferences or all to a preset, it is very tiresome to add all controls one-by-one. That's why Bernie features a button in the *Presets* panel that lets you copy all preferences in one batch. Please note that this operation will overwrite any previously added preferences.

To add all preferences to a preset, push the ***Copy Globals*** button in the Presets panel.

Even if you don't need a complete set of preferences, adding all options first may be faster than adding individual settings. You can later remove specific items easily.

2.2.7 Adding Special Features

As mentioned in the introduction, some of Bernie's preferences are not accessible from within the Preferences window and thus can't be added to presets as outlined above. These features include mouse, sound, disk, and video emulation modes and are listed in the *Setup* menu.

For this reason, the *Presets* panel has a popup menu with which you can add those preferences to the currently chosen preset:

Upon choosing one of the items from the Special Features menu, it appears in the list.

2.2.8 Replacing Items

If you need to change the setting of a preset's item, you basically need to overwrite it with the same preference and the changed setting:

make the desired preset the current setting
activate the panel containing the desired feature
command-click the control and drag it into the preset drop box

2.2.9 Deleting Items

It is likely that you might want to remove one or several settings from a preset at one point. Imagine you have a preset that looks like this:

(Missing Picture)

The illustration above shows a preset where multiple items have been selected. You have the following possibilities:

click an item
use the Shift key for making a contiguous selection
use Command for making disjunct selections
Upon making a selection, push the key Delete Items to remove the selected options from the preset.

2.3 Applying Presets

The reason you created presets is that you can easily set a number of preferences items to a predetermined value.

To apply a preset, you have to choices:

Make the desired preset the current preset (by selecting it in the *Edit Preset* popup menu) and push the *Apply* button below

Open the Setup menu and the Presets... submenu. This submenu lists all available presets. Selecting a preset from this menu applies the preset.

When Bernie is running, the settings it is using are those of the Preferences window. The settings are the global settings and the only ones Bernie is considering. When applying a preset, Bernie copies the preset's settings to the global settings. It is not possible to revert to the original global settings with an undo operation or a similar function.

2.4 Deleting Presets

To delete a preset and all settings contained within, make the preset the current preset and push the *Delete Preset* button.

Theoretically, a deleted preset and an empty preset both do nothing. Technically, however, an empty preset is still occupying (very little) disk space while a deleted preset is removed entirely from disk.

3. Disk Preferences

A preset has to be applied manually by choosing the corresponding menu items. Bernie also supports a concept referred to as "Disk Preferences". Disk preferences are presets that are associated with disk images. They are not stand-alone preferences files but rather attached to disk image files.

3.1 Attaching Preferences to Disk Images

Creating disk preferences works almost identically to creating presets. Instead of creating a new preset, however, you only need to mount the disk image you'd like to attach preferences to. Bernie automatically makes available all mounted disk images in the *Presets* panel. In the example below there are three disk images mounted:

(Missing Picture)

In the this particular case, there are three mounted disk images. They are listed in the Presets panel. To attach preferences to a disk image, just make it the current preset and start adding preferences.

In other words, the *Edit Preset* menu in the *Presets* panel is a dynamic list that always includes all mounted disk images plus presets you may have created on your own.

Please note that ejecting a disk image makes the disk unavailable and thus any preferences attached to it can no longer be edited, deleted or applied.

3.2 Applying Disk Preferences Automatically

So, what's the benefit of disk preferences over regular presets? Since disk preferences are associated with a particular software, you can tell Bernie to apply attached preferences whenever you are booting from such a disk image. In other words, whenever Bernie is booting from a disk image that is including preferences, Bernie is applying the settings.

You can **enable and disable** this functionality in the *Presets* panel. The check box *Apply Disk Prefs When Booting From Image* controls whether Bernie is allowed to apply disk preferences or not. If you disallow Bernie to apply disk preferences, they behave exactly as presets and you need to apply them manually.

Typical use of this feature is to configure games for sound support and joystick emulation. (You might even want to tell Bernie to switch to Power Mode each time you boot your favorite demo software.) You might want to configure your productivity software for maximum performance

Limitations

Please note that Bernie does only apply preferences during the **boot process**. For example, if you boot from a GS/OS boot disk and then launch a software that resides on a different disk image, there's no way to tell Bernie to apply settings for that particular application. You would only be able to specify settings for the GS/OS boot disk.

3.3 Deleting Disk Preferences

As with presets, you can delete disk preferences by pushing the *Delete Preset* button. In the case of disk preferences, Bernie does of course not delete the disk image. (Remember that disk preferences become a part of the disk image file.) The preferences are removed but the disk image stays intact.

3.4 Shared Volumes and 3.5" Floppies

Disk preferences can only be attached to disk image files. It is not possible to create disk preferences for (physical) 3.5" floppies and shared volumes.

Total Integration

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1. Introduction

Bernie][The Rescue is a full-featured emulator offering the most complete set of features found on an original Apple IIgs. In your everyday work with Bernie, however, you are typically not just limiting yourself to the Apple II environment but do a reasonable sharing of tasks between your virtual Apple II and your Mac. You might be using your Mac for surfing the web and checking your e-mail while composing documents in AppleWorks Classic. Emulators are no longer just measured up by how they emulate a platform but also how well they integrate into your existing system.
Bernie Total Integration is the first serious attempt to offer true Apple IIgs/Mac integration and data mobility. It is a work in progress and will gradually evolve into - total integration. So, what can it do for you?

Bernie Total Integration allows you to exchange

clipboards
files
Please keep in mind that the functionality discussed herein is only available from within GS/OS applications*, and only if they make use of the toolbox.* (There is no way for Bernie to support

applications that come with a proprietary clipboard implementation.)

To exchange **clipboards**, Bernie adds a hotkey that enhances Copy and Paste commands from the Edit menu. Choosing Copy in a Apple IIgs application places a copy of the selected text into the Macintosh clipboard. Choosing Paste in a Apple IIgs application pastes the Macintosh clipboard.

Copying **files** is a snap. You can...

drag & drop files into the Apple IIgs Finder
copy files from the Apple IIgs Finder to a download folder on the Mac
Bernie can copy entire file trees, preserves file types and automatically adapts file names to the requirements of the target OS.

1.1 Installation

Bernie Total Integration (**BTI**) comes in two parts. One part is already built into the Bernie application while another comes as a GS/OS system extension: the *Bernie Enabler*. Hence it is not possible to just add the *Bernie Enabler* to an older copy of Bernie.

BTI requires system 6.0 or 6.0.1. Since it is a GS/OS-specific system file, it is not functional under any other operating system such as ProDOS 8 or DOS 3.3.

To install BTI follow these steps:

start Bernie with a GS/OS system disk version 6.0 or 6.0.1
mount the disk image "Bernie Total Integration" that came with the Bernie distribution. It is located in the folder "Total Integration".
the Apple IIgs Finder will show the disk. There is a single file on it, the "Bernie.Enabler".
copy this file into your GS/OS startup disk's **System.Setup** folder. (The folder is located inside the "System" folder on your GS/OS startup disk.)
restart GS/OS to activate the new features
A successful installation looks like this:

(MissingPicture)

The Bernie.Enabler has been copied into the System.Setup folder inside the System folder

Congratulations, Bernie Total Integration is now installed. If you have multiple GS/OS startup disks you would most likely want to copy the *Bernie.Enabler* file onto them as well.

2. Copying Files To The Apple IIgs

This chapter explains how you can copy files between MacOS and GS/OS.

2.1 Copying Files To The Apple IIgs Finder

The most straightforward approach is to copy files with the IIgs Finder being the active application. Follow these steps:

open a directory window in Bernie.

select the Mac files and drag them into an open Apple IIgs Finder window:

When you release the mouse button, the files will be copied to the directory window onto which the files were dropped. If you dropped the file(s) into the desktop area or some other place other than a directory window, the file(s) will be copied to a special folder. (See section 2.2.)

We recommend you that you keep the *status bar visible*: Bernie will display the current file and tell you when the copy session is done with.

During a copy session Bernie does not respond to any other events.

File Types and Names

File types are preserved. Types encoded to PC/File Exchange standards will be applied. Although files may have a generic ("dog-eared") icon on the Mac, their original file type will restored when they are copied back.

Unfortunately, the ProDOS file system has very restrictive naming conventions. Therefore, Bernie converts file names by providing a close match.

Size Limitations

There is no limit on how many files or folders can be copied except that you might run out of available memory. The file expansion algorithm goes a number of extra miles for saving memory, so this is rather unlikely.

Duplicate Files

Bernie does not replace duplicate files by default. If you rather prefer the opposite, that is, want to give Bernie permission to delete a duplicate file in the destination directory, there's a check box for enabling this option. Please see chapter 3.2 for details.

2.2 Copying Files To A GS/OS Application

The previous section explained how to copy files with the IIgs Finder running. It is, however, also possible to copy files in any other GS/OS desktop application.

When you drop files into the Apple IIgs Finder and there's no Finder directory window open or no Finder around, Bernie puts the files into the folder

`<`*`startup disk`*`>:`**`Bernie.Transfer`**`:`
Bernie will create the transfer folder automatically if it doesn't already exist.

3. Copying Files To The Macintosh

3.1 The Bernie.Transfer Folders

Copying files from the Apple IIgs to the Mac works slightly differently than the other way around. Since it's not possible to drag&drop files outside the video window, Bernie Total Integration introduces "transfer folders". Whenever you drop files or folders into a transfer folder, you indicate Bernie that you'd like to copy the data to a Mac disk.

To prepare for future IIgs->Mac copy sessions, create a folder titled ***Bernie.Transfer*** on *any* disk you like and in *whatever* directory. You can even have *multiple* transfer directories around, such as one on the desktop and another one in your working directory. As long as you call them *Bernie.Transfer*, Bernie will figure it out. These directories will stay empty anyway (exception: see chapter 2.2, "Copying Files To A GS/OS Application").

3.2 Preparing For File Transfers

Before you can copy files, you need to tell Bernie where to put the files on your Macintosh hard disk. The preferences window has a dedicated "Total Integration" section where you can pick a download folder:

Pick a download location by pushing "Select Download Folder"

You need to choose a download location only once. All subsequent copy operations will use that folder.

There's also a check box "**Overwrite duplicates**". By default, Bernie refuses to replace files in the target directory and will generate an error in the error log. By checking "Overwrite duplicates", you give Bernie permission to *permanently delete* files at the target destination so the copy operation can be completed. Please use this option wisely as it may result in loss of data!

3.3 How To Copy Files

Now that you created a transfer directory or chose a download folder, let's push some bytes around. Grab a folder and drag&drop it onto the transfer directory:

Here we're dragging the System folder into the transfer directory

Bernie will start copying the files. This process may take some time. Again we recommend that you keep the **status bar** visible so you know what's going on. The status bar will display the currently being copied. The message "Done" appears when all files have been processed.

4. Error Reporting

Bernie Total Integration comes with very explicit error reporting when things go wrong during a copy session.
When an error occurs, Bernie opens a dedicated window where it keeps track of the ten most recent errors. It lists each incident with the file's pathname, a human-readable description of the problem plus during what kind of copy session the problem occurred:

The window has a capacity of 10 items. The oldest item will be deleted when a new error occurs.

Please remember that Bernie does not really like replacing files - for your data's security. If you want to explicitely overwrite duplicates:

when copying files from the **Mac to the GS**, hold down the option key when dropping the files into Bernie
when copying files from the **GS to the Mac**, check the box "replace duplicates" when Bernie is asking for the download location
The error messages will be preserved when closing and reopening the window. To open it, choose "Copy Errors" from the Window menu.

5. Shared Clipboards

Bernie Total Integration enhances the standard Copy and Paste commands so that you can directly access the Macintosh clipboard:
you can paste the Mac clipboard into a IIgs desktop application
you can copy text from a IIgs desktop application to the Mac clipboard
To activate the enhanced Copy&Paste functions, **hold down the option key** while choosing the Copy or Paste menu items.

Bernie supports plain ASCII text only. You can't copy&paste styled text or pictures.

Example: Pasting the Mac clipboard into a GS/OS application

Assume the Mac clipboard contains the following:

(Missing Picture)

Now hold down the option key and choose the Paste command from the File menu:

*Choose Paste **while holding down the option key***

...which yields the following result:

Example: Copying the IIgs clipboard to the Mac clipboard

Analogously to the previous example, highlight some text and copy it to the clipboard. Remember to hold down the option key:

Choose Copy ***while holding down the option key***

...yields:

(MissingPicture)

6. Cross-Platform Aliases

Bernie Total Integration 1.2 introduces cross-platform aliases. A cross-platform alias is a link to a GS/OS application or document. The link is stored on your Macintosh hard disk. Upon double-clicking an alias file, the following happens:

if not already running, Bernie will be launched
when Bernie has finished booting into GS/OS, the application will be started
if you clicked a *document* link, the document will be opened

Cross-platform aliases only work within GS/OS. It is assumed that you have configured Bernie so that it automatically mounts a GS/OS startup disk with Bernie Total Integration installed. If Bernie does not mount GS/OS disks automatically, lacks the Total Integration extension or the Finder will not become the active application for whatever reason, *the alias will be queued* until all of the former conditions are met.

To create an alias, start the Apple IIgs Finder and select a single document or application:

Make an alias by selecting an application or document and choosing "Create Alias..."

Then open the "Extras" menu and choose "Create Alias...". Bernie will open a Save As dialog for saving the alias to a Mac disk.

Note: if the Extras menu does not appear on your system, the GS/OS system disk you're using has not been enhanced with Bernie Total Integration. Please see chapter 1.1 for installation.

-End-