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*Econo*ROM III
User's Manual

Version 1.0

Covers Models

ER3-256, ER3-512, ER3-1M, ER3-4M and ER3-8M

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Table of Contents

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Introduction

Thank you for purchasing a TechTools product. We make every attempt to provide quality tools at reasonable prices. If you have any questions, comments or suggestions, please feel free to contact us by FAX, Voice, email or mail and express your opinions.

How To Reach TechTools

You can reach us at any of the following :

Voice:	(972) 272-9392	Monday-Friday, 9:00-5:00 Central
FAX:	(972) 494-5814	
email:	support@tech-tools.com	
web:	http://www.tech-tools.com	
Mail:	TechTools	
	PO Box 462101	
	Garland, TX 75046-2101	

Up and Running in 15 Minutes!

As engineers, we understand that you do not have time to troubleshoot your test equipment. You need to be able to trust your test equipment. With that in mind, we thoroughly test each and every *Econo*ROM III to ensure that you receive a fully functional unit. In addition, we provide a self-test function to enable you to verify proper emulator operation at any time.

The following sections are designed to get you up and running in less than 15 minutes. If your system is not running by the time you complete these instructions, please contact our technical support staff. We have many thousand emulators in use throughout the world. Many have been in service for nearly 10 years. We are confident that we can resolve the problem through email or over the telephone.

Install the Software

The *Econo*ROM III software may come on floppy, CDROM or BOTH. If a floppy was included with your emulator, it may be a complete install or a patch. Follow the instructions on the floppy.

If the floppy contains a PATCH, you will be instructed to install the software from the CDROM and THEN apply the patch.

If the floppy contains a full install, the CDROM is not needed and any ER3 software it contains is out-dated. We still include the CDROM because it contains a wealth of information.

If a floppy disk was NOT included, then the software on the CDROM was the most current at the time the product was stocked. Follow the directions on the CDROM to install the software. If your system is configured to auto-launch applications from the CDROM, our launchpad will appear after you insert the CDROM into your drive. Simply select the ER3 software option from there.

In any event, it is always advisable to check our web pages for any updates. We always post the most recent versions of our software for free download.

Disable Any In-Circuit Programming Voltages

EPROMs and some FLASH devices are usually programmed with "super voltages" (> 5V) and are designed to handle such voltages on some pins; *EconoROM III* is not! If your target is capable of in-circuit programming, disable or isolate the high voltage, not just the high voltage control signals. Even short surges during power cycling could be damaging.

> *Econo*ROM III is a 3-5volt ONLY device. Any voltage greater than 5 Volts or less than 0 Volts will damage it.

Plug the emulator into your target

Turn the target power off. Plug the supplied target interface cable into the target's EPROM socket. Be careful to align the PIN 1 end of the cable (designated with a stripe) with the PIN 1 end of the target's socket (usually designated with a notch, a dot or a '1').

*Econo*ROM IIIs ship with both 28pin and 32pin DIP cables. Use the 28pin cable if you are emulating a 28pin DIP device; the 32pin cable if emulating a 32pin DIP device. If you are emulating PLCC type devices, you will need to purchase a DIP to PLCC adapter. These are available from TechTools as well as all popular adapter manufacturers.

> ## PLUGGING THE CABLE IN BACKWARDS WILL DAMAGE *Econo*ROM III!

The number one cause of emulator failure is reverse voltage. The JEDEC standard pin-out for DIP devices places power and ground on opposite corners of the device. If one plugs an EPROM or an EPROM EMULATOR in backwards, it applies reverse voltage to the device or emulator, causing permanent damage.

If your target uses DIP sockets or a TechTools' PLCC adapter, it is fairly easy to ensure the cable is plugged in properly. Simply check (twice) that the RED stripe on the cable is aligned with the PIN 1 end of the socket.

If you are using any type of adapter between the DIP cable and your target, it can get a little more confusing. An incorrect adapter or one that is installed incorrectly could apply reverse voltages to the emulator.

If you have ANY doubts, check it out! The simplest way to check out adapters, is to insert the adapter into the target but do NOT insert the DIP cable into the adapter. The DIP socket provided by the adapter should have GROUND on one corner pin and POWER on the opposite corner. On 28 pin sockets, ground should be on pin 14 and power on pin 28. On 32 pin sockets, ground should be on pin 16 and power on pin 32.

Once you have established that the adapter is wired correctly and installed correctly, then insert the DIP cable into the adapter, aligning its RED stripe with the PIN 1 end of the DIP socket.

> ## PLUGGING THE CABLE IN BACKWARDS WILL DAMAGE *Econo*ROM III!

The old carpenters' rule applies here: 'MEASURE twice – CUT once.'

Connect RESET

The RESET line must be connected to guarantee proper target operation. The reset signal is automatically asserted during each emulator access. This prevents the target from "running stupid" while we change its code space. The reset signal is released at the completion of the transfer, allowing the target to restart with the new code image. We also use the reset line to prevent the target from attempting to execute code before the emulator recognizes that the target has sufficient voltage to run.

*Econo*ROM III provides two reset outputs. RESET is an open emitter, ACTIVE HIGH output. /RESET is an open collector ACTIVE LOW output. Both signals are pulled to the in-active state via very weak resisters. Connect the appropriate output to your target's RESET circuitry.

*Econo*ROM III's reset signal should be connected to the target's reset circuitry at the most "upstream" point available. This is usually an RC combination that senses the target's power up or a manual reset switch. Sometimes this circuitry is connected directly to the CPU reset input. In other targets, it will be connected to the input to a reset chip, power management chip, a watchdog timer chip or a Schmitt trigger gate.

> ### DO NOT CONNECT *Econo*ROM III's RESET OUTPUT ACROSS A TOTEM-POLE OR BIPOLAR GATE, OR DIRECTLY TO GROUND OR 5VOLTS. THIS MAY RESULT IN DAMAGE TO *Econo*ROM III OR THE TARGET.

If your target has a reset button, determining where to connect the reset line is easy. Use a DVM, SCOPE or logic probe to measure the voltage of both sides of the switch. They should be different (one HIGH and one GROUND). Push and hold the button and take the two measurements again. Both should now be the same (HIGH or GROUND). Notice that one side of the switch remained the same, the other side changed states. Connect the reset lead to the side that CHANGED STATES. The level at this point indicates which POLARITY (RESET or /RESET) we should use. Ground indicates active LOW; use /RESET. HIGH indicates active high; use RESET.

The next easiest connection point is an RC reset network. If you find a resister and capacitor in series between power and ground with the common point connected to the CPU or a monitor chip marked something like reset or clear, you probably found it. Connect the reset line at the RC juncture. If the resister is connect to ground and the capacitor is connected to power, use the RESET signal. If the resister is connected to power and the capacitor is connected to ground, use the /RESET signal. In some targets, the resistor or the capacitor may be missing but these instructions would still apply if you imagine the missing component is internal to the processor or monitor chip. If you are not sure, ask 'sparkie' (a technical term for the hardware engineer that designed the board).

Call our technical support if you are unsure about which output to use or where to connect to your target.

Apply Power

The emulator can be powered from the target or via an optional external power supply.   If your target operates at 5Volts and can supply the extra emulator current (100ma typical/200ma max) to the memory socket, then you can use target power. If your target operates at less than 5V or is incapable of supply the extra emulator current, then you must use an external power supply.   External power supplies are available from TechTools or your local dealer. The external supply must provide a regulated 5VDC at 300ma or greater.

The emulator status LED operates differently based on whether you are using target power or external power.

Using Target Power

Turn on your target power supply. The emulator status LED should glow a STEADY GREEN. If not, refer to the troubleshooting tips below to correct the problem before continuing.

LED does not turn on:

> # Immediately turn off target power and correct the problem before reapplying power!

Your target does not have enough power to operate the emulator or power is not reaching the emulator.
- Verify all target cable connections
- Verify the target cable is plugged in correctly (pin 1 orientation)
- Verify that any adapters you might be using are the correct pin-outs.
- Once you are SURE the emulator is not being subjected to reverse voltage, verify the target provides at least 4.5V to the memory socket WHILE THE EMULATOR IS PLUGGED IN. Connect an external power supply to the emulator if necessary.

LED GLOWS RED:

Your target does not have enough power to operate the emulator or is supplying less than 4.5V.
- Verify all target cable connections
- Verify the target cable is plugged in correctly (pin 1 orientation)
- Verify that any adapters you might be using are the correct pin-outs.
- Verify the target provides at least 4.5V to the memory socket WHILE THE EMULATOR IS PLUGGED IN. Connect an external power supply to the emulator if necessary.

LED Flashes GREEN:

You have enough power, but you failed to connect the reset line properly. When the emulator is first powered up, it asserts RESET to keep the target from running until it has received a download. The flashing GREEN LED indicates target activity.
- Verify the RESET line is connected
- Verify your selection of the RESET attachment point
- Verify your selection of RESET polarity.

Using External Power

Connect the external power supply but leave the target turned off. The emulator status LED should glow a STEADY RED, indicating the presence of emulator power but not target power. If not, disconnect the emulator power and refer to the troubleshooting tips below to correct the problem before continuing.

- Verify the external power supply is properly connected and plugged into a powered socket.
- Verify the external power supply is providing a regulated 5VDC at 300ma or more.
- Verify the external power supply is wired correctly (center is positive, ring is ground).
- Disconnect the target cable and re-apply emulator power. If the LED now GLOWS RED, the target wiring, adapters or cabling are incorrect.

Turn on target power. The emulator status LED should change from a steady RED GLOW to a steady GREEN GLOW. If not, refer to the troubleshooting tips below before continuing.

LED Turns OFF:

Something is VERY wrong with the target wiring, cables or adapters.

> ## Immediately turn off target power and then emulator power. Correct the problem before reapplying power!

LED STAYS RED:

The emulator did not sense at least 3V from the target power pins.
- Verify all target cable connections
- Verify the target cable is plugged in correctly (pin 1 orientation)
- Verify that any adapters you might be using are the correct pin-outs.

LED Flashes GREEN:

The emulator detected the target's power, but the reset line is not properly connected. When the emulator is first powered up, it asserts RESET to keep the target from running until it has received a download. The flashing GREEN LED indicates target activity.
- Verify the RESET line is connected
- Verify your selection of the RESET attachment point
- Verify your selection of RESET polarity.

Connect the Download Cable

Select an unused **PRINTER** port on your PC. Remove any "dongles", security keys, printer switch boxes or extension cables from the port. Plug the supplied download cable directly into the selected printer port. Plug the other end of the cable into *Econo*ROM III's "IN" port.

> PLUGGING *Econo*ROM III INTO A SERIAL PORT or an ETHERNET CABLE COULD DAMAGE THE EMULATOR!

Connect Daisy-chain Cables

Multiple units are daisy-chained by connecting the "OUT" connector from one unit to the "IN" connector of the next unit. Additional units are added in the same manner. Use the supplied 12" daisy-chain cable to interconnect the units.

When daisy-chained together, the emulators automatically determine their position in the chain, making it unnecessary to configure their addresses. However, it is important that you understand how their addresses are determined.

The LAST EMULATOR in the chain (the one without a cable plugged into its "OUT" connector) is always emulator #1. The next emulator in the chain is #2 and so forth. The emulator closest to the PC will always be the highest numbered emulator.

Run self-test

Running self-test immediately after installation gives you a solid baseline and helps you to find and correct any errors early on. Self-test will verify proper installation of all drivers, proper operation of the parallel port and all *Econo*ROM III functions except the target interface buffers.

You will find 16 and 32bit console mode programs in directories below your install directory. The 16bit self test is included in case you plan to use the 16bit loader on a DOS machine. The 32bit self-test should be used if you are planning to use the Windows Quickloader or the 32bit console mode loader. We recommend using the 32bit self-test if you are running under Windows 95 or above.

If you are using multiple *Econo*ROM IIIs, we recommend that you test them collectively to ensure reliable operation in the final configuration.

Type "ER3TEST32" to run a full speed test over printer port 0x378. You can change the printer port by using a /P parameter. For example, if your emulator is connected to a printer port at 0x3bc, you would enter "ER3TEST32   /P3BC".   The most common printer port addresses (in order of popularity) are 378, 278 and 3bc.

If any of these tests fail, refer to the troubleshooting section for assistance. If the troubleshooting section does not resolve the problem, contact our technical support people for help.

Load your program

Your system should be functional and ready to go to work at this point. You can use the command line loader (ER3LD32.EXE) or the Windows GUI loader (Quickloader) to load and verify files.

Start with a file that is known to work in this target. The binary image of a functioning EPROM is the best file to start with. Most EPROM programmers can read an EPROM and save its contents into a raw binary file. If binary is not an option, have the programmer store the file in Intel HEX or Motorola 'S' format.

This establishes a solid base-line. You can always come back to this file to verify everything is functioning (except perhaps your last code revision).

If you choose to use the ER3LD32 program, run it without parameters to see a simple help screen. You can also refer to the section below on ER3LD/ER3LD32.

If you choose to use the Quickloader software, the setup should be pretty self-evident. Additionally, you can refer to the on-line help under the HELP menu.

If your system is not running at this point, check the troubleshooting section for suggestions. If that does not resolve the problem, PLEASE CONTACT OUR TECHNICAL SUPPORT at

support@tech-tools.com or (972) 272-9392.

We are confident that we can solve the problem in a timely manner!

Software

*Econo*ROM III ships with several programs. The command line driven programs document their valid parameters if you invoke them with a '?' for a parameter. For example, to see the valid options for the loader program, type "ER3LD32 ?". All programs except the Quickloader are batchable command-line style programs. The following are brief descriptions of the functions of each program.

QuickLoader

Quickloader (qloader.exe) is a 32bit Windows application. It operates under all 32bit versions of Windows including NT and 2000. Quickloader operates in 2 modes; one-click and fully interactive. In one-click mode, Quickloader performs automatic download and verify of one or more files via a single mouse click on a sys-tray icon. In fully interactive mode, Quickloader provides a full GUI interface to allow you to view and edit the files, control individual transfers and configure the project. Additionally, you can monitor the voltages, reset status and target activity from the hardware monitor window.

Extensive on-line help is included with Quickloader. The Quickloader help file can be accessed from the HELP menu or by double-clicking on the 'QL3HELP.HLP' file.

ER3LD, ER3LD32

ER3LD and ER3LD32 load binary and HEX files into one or more emulators. They can also perform a VERIFY-ONLY if you suspect that the emulator contents have been corrupted.

ER3LD32 uses our ring-0 drivers to access the low-level printer port registers. It works under ALL 32 bit versions of Windows (including NT and 2000).

ER3LD is a 16bit, DOS mode program. It operates under DOS and all versions of Windows EXCEPT NT and 2000.

Run either program without parameters to see a help screen on the command line options. Notice that all parameters are optional and have logical defaults. You only need to specify the parameters you would like to change from their defaults.

EXAMPLE LOAD PARAMETERS:

ER3LD32 file.bin /i32	Loads FILE.BIN into emulator #1 at port 0x378. Configure emulator to emulate a 32Kx8 (256Kbit) device
ER3LD32 file.bin /p3bc /i128	Loads FILE.BIN into emulator #1 at port 0x3bc. Configure emulator to emulate a 128Kx8 (1 Mbit) device
ER3LD32 file.bin /e2 /i1024	Loads FILE.BIN into 2 emulators, starting with #1. Configure emulators to emulate 1024x8 (8Mbit) devices
ER3LD32 file.bin /e4 /f2 /i8	Loads FILE.BIN into 4 emulators, starting at #2. (2,3,4,5) Configure emulator to emulates 8Kx8 (64Kbit) devices
ER3LD32 file.hex /d0 /h /i512	Loads FILE.HEX into emulator #1. Source file is in HEX. Configure emulator to emulate a 512Kx8 (4Mbit) device.

During the load and/or verify, the STATUS LEDs of all involved emulators will flash RED as they are accessed. At the completion of the transfer, target reset will be released. At this point, the STATUS LEDs will indicate the target status (RED = no target power, GREEN = target power good, FLASHING GREEN = target accessing the emulator).

The *Econo*ROM III loader is very flexible, allowing any combination of emulators to be loaded in almost any manner desired. The loader can load to individual units or automatically perform file splitting between 2 or more units. When the loader splits a file between multiple emulators, it will always place the **FIRST BYTE** of the file into the **LOWEST NUMBERED EMULATOR** involved in the transfer. Successive bytes are loaded into successive emulators. The following examples demonstrate this:

EXAMPLE 1

If you have two emulators daisy-chained together, and wish to split a file between them, you would specify: "ER3LD filename /e2 /f1". The /f1 is optional since the default is start with emulator #1. The /e2 parameter tells the loader that two emulators are involved in this transfer.

The loader will place the EVEN bytes (0,2,4..) of the file into emulator #1 (the LAST emulator in the chain). The ODD bytes (1,3,5..) will be placed into emulator #2. Note that you control which emulator holds the ODD bytes and which one holds the EVEN bytes by the order in which you daisy-chain the emulators.

EXAMPLE 2

If you have four emulators daisy-chained together, a "/E4 " parameter would cause the loader to perform a 32 bit split between all four emulators. Bytes 0,4,8.. would be placed in the lowest numbered emulator (#1 by default). Bytes 1,5,9.. would land in the next higher numbered emulator. Bytes 2,6,10.. would be end up in the next emulator. Finally bytes 3,7,11… would be found in the highest numbered emulator involved in the transfer Again the byte ordering is determined by the emulator daisy-chain order.

ER3TEST, ER3TEST32

These programs verify the reliability of the printer port and system wide communications with the emulators. They also perform a very complete self-test of all attached emulators. These programs tests all emulator functions except the actual target interface buffers and target interface cable/connection.

ER3TEST32 uses our ring-0 drivers to access the low-level printer port registers. It works under ALL 32 bit versions of Windows (including NT and 2000).

ER3TEST is a 16bit, DOS mode program. It operates under DOS and all versions of Windows EXCEPT NT and 2000.

Utilities

The CDROM contains several command line utilities. The loaders provide all HEX conversions and file manipulations needed so separate utilities are not really needed. They are provided to assist in manually manipulating data files if desired. The utilities operate under DOS and ALL versions of Windows.

Enhancements

Faster Downloads - Turn Off Verify

After you have used the emulator for a while and gained confidence that it is loading reliably, you can add a /V0 parameter to tell the loader to skip the verify operation. This will reduce your load times by over 75%! *Econo*ROM III is optimized for the fastest possible downloads. Therefore, the data stream FROM the HOST TO *Econo*ROM III is much faster than the reverse direction.

If you ever wish to verify the CURRENT contents of *Econo*ROM III's memory against a file, simple do a load with a "/V2" option (verify ONLY).

Memory Retention

*Econo*ROM III uses SRAMs to store the code image. If you wish to cycle the target power to see the target execute from power up, you will need to connect an external power supply to the emulator to maintain the SRAM contents during the power outage. The emulator will retain its contents as long as EITHER target power is applied OR external power is supplied to its power-in connector. The external power must be a regulated 5VDC at 300ma or more.

Increase 16bit Transfer Speed

The 16bit loader (ER3LD.EXE) is capable of over-running some printer ports. To allow proper operation with ALL printer ports, the 16bit loader includes a SPEED parameter. Once basic functionality is established, you may choose to speed-up your 16bit downloads. The download speed defaults to its slowest setting to insure compatibility with all printer ports. The self-test program does a reliability test at a specified speed setting. Re-run the ER3TEST program with a faster speed setting (lower /Dx number). If the reliability test shows that the system is reliable at this speed, you will be able to use this same parameter on the program.

Troubleshooting

The distribution software contains a test program called ER3TEST32.EXE. ER3TEST32 verifies the port address, its reliable at the selected transfer speed and the emulator's functionality as well as proper installation of the ring-0 drivers. The first step in troubleshooting is to run this program and make special note of any problems it reports.

Regardless of the symptom, verify the following:
1. There are no "dongles", security keys, switch boxes or other devices between the *Econo*ROM III download cable and the printer port.
2. Try each available printer port configuration. Some ports work best in STANDARD, AT, NIBBLE or COMPATIBLE mode. Others may provide more reliable high-speed operation when set to ECP, EPP, PS2, Bi-directional or HIGH-SPEED mode.
3. The target is powered up or an external power supply is connected to the emulators
4. All download, daisy-chain and target interface cables are tight and fully inserted.
5. The selected printer port is not being serviced by a print spooler or some type of TSR.
6. If the PC is a laptop or a "GREEN" PC, verify that the printer port is not disabled, powered down or configured for any type of power savings mode.

In all cases, try "booting" clean from a DOS diskette to see if the symptoms disappear. If the 16bit loader and self-test programs work under this condition, chances are good that some other program is interfering with our access to the printer port.

DLL not found or DRIVER not found

Drivers not properly installed

The 32bit software versions require our ring-0 drivers. These are automatically installed into the correct directories and added to the windows registry when you use our SETUP.EXE program. You must run SETUP.EXE install the files onto a computer. Just COPYING the files will not properly register them with Windows.

Under NT and 2000, you must have ADMINISTRATIVE/Supervisor PRIVILEGES to properly install the drivers and update the registry.

Failed to re-boot after installation

The drivers will not become active until after you re-boot. Sorry, as much as we hate the 'reboot windows for this to take affect' syndrome, its just the way it works.

Printer Port Not Found Message

Specified the wrong port address

The software could not find a printer port at the specified address. Try another address. The command line programs use a /Pxxx parameter to select the port address. The Quickload uses pull-down selections. The most common addresses are 378, 278 and 3BC. Also verify that the attached emulators are powered up. Un-powered emulators could prevent the software from seeing the port itself.

Using the wrong software

Under NT and Windows 2000 Professional, you MUST use the 32bit software. These include ER3LD32.EXE, ER3TEST32.EXE and Quickloader. These programs all use our ring-0 drivers to access the printer port hardware. Win95, Win98 and ME users may user either the 16bit or 32bit versions of these programs. Win3.1 and DOS users must use the 16bit versions (ER3LD.EXE and ER3TEST.EXE). We do not provide a 16bit GUI application for DOS or Win3.1.

No Emulator(s) Found

Specified an existing but incorrect printer port.

This error message indicates that the specified port was found, but no emulators were found at that port. The emulators might be plugged into a different port. Change the port selection to specify the correct port or move the download cable to the specified port. The most common printer port addresses are 378, 278 and 3BC. If you are using the command-line loaders, use the /Pxxx parameter to specify the port.

Using wrong download cable or backshell

The EconoROM III download cable is compatible with the older FLexROM II product but is NOT compatible with EconoROM II or earlier FlexROMs. Use the cable provided with EconoROM III.

Transfer speed set too high for this port (16bit loaders only).

The 16bit software is capable of over-running some printer ports. You may need to reduce the speed to achieve reliable operation in these situations. The ER3TEST program verifies transfer reliability. Test the desired transfer speed reliability with "ER3TEST /dx" (where x is 0,1,2,3 or 4). /d0 is the fastest setting.

If you are daisy-chaining several emulators, their combined load can slow down the printer port rise times, resulting in a need to slow down the transfer speed to avoid over-running the port signals. Run the ER3TEST program with the emulators daisy-chained together to properly reproduce the eventual working environment.

One or more Emulators not powered up.

*Econo*ROM III draws its operating power from the target's EPROM socket or an optional external power supply. The target must be powered up or the external power supply connected during all load or verify operations. If multiple emulators are daisy-chained, they must ALL be powered up to talk to ANY of them.

Target power is noisy or Voltage too low.

*Econo*ROM III draws more current than the EPROM it is replacing. If the target is a very low power system, or is already pushing its power supply limits, it may not have enough extra current to power the emulator, causing power fluctuations or noise. This is a rare condition, but worth mentioning.

If the target voltage (at the memory socket) is less than 4.5V, then an external power supply MUST be connected to the emulator.

If the emulator is being powered from the target, ensure that the memory socket the emulator is plugged into has sufficient by-pass capacitance (a good idea for EPROMs as well!).

Fails Verify

File too large

The file may be too large for the emulator, causing the data to wrap-around or to be truncated. For example, an ER3-1M can hold up to 1Mbit of data (128Kbytes). Any file larger than 131,072 bytes would overflow an ER3-1M (as well as a 1Mbit EPROM/FLASH). Look at the BINARY file size and verify that it is less than or equal to the emulator's maximum size.

If you are working with HEX files, note that the size of the HEX file is irrelevant. Look for 'out-of-range' messages during the HEX conversion.

Target Power noisy or Voltage too low.

Noise problems are very dynamic. It is possible that we could identify the emulators but be unable load and verify properly. *Econo*ROM III draws more current than the EPROM it is replacing. If the target is a very low power system, or is already pushing its power supply limits, it may not have enough current to spare to power the emulator, causing power fluctuations or noise. An external power supply would solve this.

Transfer speed set too high for this port (16bit loaders only).

The 16bit software is capable of over-running some printer ports. You may need to reduce the speed to achieve reliable operation in these situations. The ER3TEST program verifies transfer reliability. Test the desired transfer speed reliability with "ER3TEST /dx" (where x is 0,1,2,3 or 4). /d0 is the fastest setting.

If you are daisy-chaining several emulators, their combined load can slow down the printer port rise times, resulting in a need to slow down the transfer speed to avoid over-running the port signals. Run the ER3TEST program with the emulators daisy-chained together to properly reproduce the eventual working environment.

A print spooler or TSR is interfering with our port accesses

Try "booting" clean from a DOS diskette to see if things stabilize. If this corrects the problem, suspect that some other program (like a print spooler) is interfering with our access to the port.

Printer port set to an incompatible mode

If your printer port is configurable through BIOS settings, try each configuration. Some ports will perform better in STANDARD, AT, NIBBLE or COMPATIBLE mode. Others will allow higher transfer speeds when configured for ECP, EPP, PS2, HIGH-SPEED or similar settings. This is rarely a problem.

Verifies, but target does not run

Target not being reset or not being released from reset

If the wrong reset output is being used or it is connected to the wrong spot on the target, it may not be resetting the target during the download. We would get a good download, but the target was fetching garbage during the transfer. Some processors will HALT, others will simply execute the random garbage they received. In either event, the processor will not "know" to start over and execute the new code.

Try pushing your target's reset button if it has one. If it starts to run, the reset line is connected to the wrong place on the target.

Try removing the reset line. If the target starts running, you probably selected the wrong reset polarity.

If the emulator is running from an external power supply, try removing the reset line and cycling TARGET power. If the target now comes up and runs, the reset signal connection was wrong. While you could do this after each load, we highly recommend correcting the reset problem to make resets automatic and to prevent the target from running garbage during the download. The reset line also ensures proper power-up sequencing by preventing the target from fetching code before the emulator has had a chance to enable its target-side buffers.

Emulator device size set wrong.

The device SIZE configuration affects how many target address lines are enabled. The file will download and verify correctly as long as the file is less than or equal the SIZE setting and the maximum emulator size. If the size is set larger than the device you are emulating, some extra address lines will be enabled. The target may be driving these lines high or NOT AT ALL. This will either warp the addressing or cause random address changes. Ensure you are configuring the SIZE to match the device you are emulating.

File too large

If the file size exceeds the configured device size, the target will not be able to access the entire file. If the emulator is configured correctly and the file is larger than the device setting, your code has just outgrown its space. If you are emulating the maximum size device the target is wired to accept, you will have to reduce the code size. If the target has some unused space contiguous to the current EPROM space, you may be able to modify the target board to accept a larger EPROM. This would typically involve adding another address line to the socket and possibly modifying the EPROM chip select decodes. Of course you would need to re-configure the emulator for the larger device as well (if it has room to spare).

Wrong PLCC or other adapters used.

Any adapter used between the target cable and the target socket itself has the potential of introducing errors. In particular, PLCC footprints vary by EPROM size, model and manufacturer. In general, small EPROMs (<1Mbit) generally have one pin out and larger EPROMs have a different pin out. Most FLASH chips are pinned out like large EPROMs. However, SOME small FLASH are wired like SMALL EPROMs. In general, large devices (>=1Mbit) use a 32 pin DIP to 32 pin PLCC adapter. Smaller devices usually need a 28 pin DIP to 32 pin PLCC adapter but MIGHT need the 32 pin version. Give us a call if you are not sure.

Wrong file format specified

The files you wish to download might be in a HEX format or they might be a raw, binary image. The loaders need to be 'told' whether they are in HEX or BINARY format. If you are not sure about the file's format, "TYPE" it to the screen. If you see random printable, non-printable and graphics characters, it is BINARY. If you see well formatted HEX characters, it is a HEX file. Intel HEX files start each line with a ":". Motorola 'S' files start each line with an "S". Tektronix HEX files start with a "%" or a "/". All of our loaders automatically recognizes and converts 8 variations of these HEX formats. However, even HEX files are a FORM of binary so you must tell the loaders whether to blindly load them as binary or assume they are in HEX format.

Remember, your Resume' will load and verify, but most likely will not execute properly!

Incorrect HEX conversion

If your source file is in HEX, you may need to specify an offset to get a proper conversion. If an offset is required, it is usually the starting address of the EPROM. You can use the Quickloader editor to see where the conversion placed the binary data within the device space.

Failed to split the file between emulators

If you want the command line loader to spilt the file between multiple emulators, you need to specify a /Ex parameter to tell the loader how many emulators to split the file between. In Quickloader, you must specify the 'number of emulators'.

File loaded into the wrong emulator(s)

If you have 2 or more emulators daisy-chained, you may have loaded the file into the wrong unit(s). Watch the STATUS LEDs to see which units where actually selected for the transfer. The loaders default to emulator #1. To select a different emulator, specify a /Fx parameter. This tells the load the FIRST emulator involved in the transfer.

Incorrect Byte Order

If you are loading into multiple emulators with automatic splitting, remember that the loader will load the **FIRST byte in the file into the lowest numbered emulator** involved in the transfer. If the emulators are plugged into the wrong target sockets, you can move them to the correct sockets or you can change the order in which the emulators are daisy-chained.

Target Power noisy or Voltage too low.

Noise problems are very dynamic. It is possible that we could load and verify OK, but as soon as we release reset and let the target start running, system noise increases and trashes the system. Low system voltage could behave in a similar manner. It is possible that we could load and verify with a target voltage that is well under spec, but the target will not execute properly. *Econo*ROM III draws more current than the EPROM it is replacing. The target may be able to supply enough current during downloads, but may not be able to hold the voltage up when it starts running, causing power fluctuations or noise.

Emulator too slow

*Econo*ROM IIIs are rated at 45ns. The emulator must be at least as fast as the access times required by the target (smaller numbers are faster). If the target's access requirements are not documented, you can get a general idea of its requirements by looking at the EPROM's rating. The EPROM's speed is not an absolute indicator because many EPROMs run faster than they are marked; particularly at full voltage and room temperature. We have seen many systems that appear to run fine, even though their access times routinely violate the EPROM's rating. Fortunately, *Econo*ROM III's speed rating (45ns) is faster than most ERPOMs used in embedded systems.

Bad Code

Remember, the one variable that is always changing in this set up is the code itself! If you keep a baseline code image on hand that is known to work, you could always load that image into the emulator as a sort of sanity check.

Works but VERY slowly under NT/2000

Using the wrong software

The 16bit software will sometimes work on these systems, but through a virtualization mechanism that is VERY slow. Our 32bit software uses ring-0 drivers to access the hardware at about 2.5Mbit/sec. Use Quickloader or ER3LD32.EXE.

> If these tips did not solve the problem you are experiencing, please contact our technical support people at
>
> support@tech-tools.com
> http://www.tech-tools.com
> Voice: (972) 272-9392
> FAX: (972) 494-5815

FAQs

Can I use EconoROM III on a 3V target?

YES, but you will need an external power supply. Connect 5VDC at 300ma or greater to the emulator's external power connector. External power supplies are available form TechTools.

What is the lowest target voltage supported?

*Econo*ROM III was designed to support 3.0V to 5.0V targets. However, it CAN support lower voltage targets within limits. Three things set the lower limit; Logic INPUT thresholds, Vout HIGH from the emulator, and the target isolation threshold.

- Logic INPUT Thresholds. *Econo*ROM III will accept a Vin HIGH minimum of 1.5Volts. Your target MUST produce at least 1.5V for logic HIGHs. Most logic down to about 2V can meet this requirement.
- Vout HIGH levels: Your target must tolerate logic HIGHs from the emulator data lines of 3.2Volts. This depends entirely on your target design.
- Target Isolation Threshold: To allow safe target power cycling,, *Econo*ROM III constantly monitors the target's voltage. When it detects that the target voltage has dropped below a fixed threshold, it assumes the target is powering down so it turns off its output buffers to avoid leaking current into the target. It also asserts reset and turns the STATUS LED RED. If the emulator did NOT provide this safety feature, it could start reverse biasing devices on the target, potentially causing damage. Even if the target were not damaged, the current leakage could prevent the target from properly powering down. This could prevent the reset circuitry from operating. This cut-off threshold is approximate 2.7 to 2.8V.

Bottom line: You CAN emulate lower voltage targets as long as you can tolerate 3.2V on your data bus, your target provides logic highs of at least 1.5V and our low voltage cut-off circuit does not kick-in.

How accurate are EconoROM III's voltage readings?

The readings are typically accurate to +- 150mv.

Can EconoROM III emulate FLASH devices?

YES and NO. The emulator does NOT support target writes. However, if your target doesn't need to WRITE to the emulator, then emulation is possible as long as the pin-outs match or are adapted. EPROM and FLASH devices have very similar pin-outs but vary slightly to allow for the extra write/program line required by the FLASH device. *Econo*ROM III is compatible with the timing requirements of both EPROM and FLASH devices.

Do I _REALLY_ need to connect the reset line?

This seems to be the biggest hurdle for first-time users. While the reset line may not be essential in some specific cases, it is ALWAYS a good idea and OFTEN a requirement for consistent, reliable operation. There is a lot to be said for consistency during debug! It is well worth the minimal time necessary to figure out how to connect the reset line. It serves several functions:

- It keeps the target from running garbage immediately after the emulator is powered-up. The reset will be automatically released after the first code download.
- It keeps the target from running garbage DURING a download or verify.
- It ensures the target gets a clean reset and starts running the new code after a download.
- It ensures proper power-up synchronization when the emulator is being powered from external power and the target power is cycled.
- It makes the entire download/verify/run operation fully automatic and consistent.
-

Can EconoROM III emulate DIP/PLCC/TSOP… packages?

Yes. TechTools stocks low cost PLCC adapters and all emulators ship with DIP cables. We find that DIP and PLCC packages cover about 95% of our customers' needs. For other packages, we refer you to the standard adapter companies. They can provide adapters for all common EPROM, SRAM and FLASH devices.

Can I use a longer target cable?

Maybe. We use 'soft" drivers and 6" cables to minimize our impact on your target. This combination has worked very successfully for us for nearly 10 years. Lengthening the cable increases the probability of both cross-talk and line reflections.(depending on your target drivers' rise-times). Longer cables also add capacitance to the bus. If your target access times are considerably longer than ours (45ns), and/or your drivers are fairly soft, you may be able to tolerate a considerable cable length increase. On the other hand, if you need every last nanosecond of our access time and your bus has very fast rise-time drivers, you should probably stick with our proven solution.

Can I use a longer Download cable?

Yes. You can use up to 25' of download cable between the PC and the first emulator. However, we recommend that you use the 12" daisy-chain cable provide to link multiple emulators together. This provides a more 'lumped load' at the end of the line.

 If you replace the flat cable, make sure the cable is wired 1-to-1. Most data cable is wired 1-to-1. Most voice cable is wired reversed (1-to-8). If you extend the download cable by inserting a DB25M-DB25F cable, make sure all 25 pins are connected.

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