



**Z86L98ZEM**  
**Z8<sup>®</sup> In-Circuit Emulator**

**Product Specification**

PS002603-0108

 **Warning:** DO NOT USE IN LIFE SUPPORT

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# Revision History

Each instance in the revision history table reflects a change to this document from its previous revision. For more details, refer to the corresponding pages and appropriate links in the table below.

<b>Date</b>	<b>Revision Level</b>	<b>Description</b>	<b>Section</b>
January 2008	03	Removed 44L QFP.	Emulator Kit Contents on page 4



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# Z86L98ZEM Z8<sup>®</sup> In-Circuit Emulator

## 1.1 Features

Package	Emulation	OTP	Required Accessories
28 PDIP	Z86L81/2/5/6/8 Z86L98	Z86D86*	28 PDIP emulation pod 28 PDIP OTP Adapter (PC ASSY#99C0667-001)
28 SOIC	Z86L81/2/5/6/8 Z86L98	Z86D86*	28 PDIP emulation pod and a DIP to SOIC conversion adapter (AS-DIP 6-028-S003-1 or AS-DIP-6-028-S003-2) from Emulation Technology (not included with kit) 28 SOIC OTP Adapter (PC ASSY#99C0668-001)
40 PDIP	Z86L87/L89/L73	Z86D73	40 PDIP emulation pod 40 PDIP OTP Adapter (PC ASSY#99C0669-001)
44 PLCC	Z86L87/L89/L73	Z86D73	44 PLCC emulation pod 44 PLC OTP adapter (PC ASSY#99C0670-001)
68 PLCC	In-Circuit Emulator	Z86D93	Z86D9300ZDV 68 PLCC OTP Adapter (PC ASSY# 99C0672-001) (not included with kit)

Note: \*Current OTP support is limited to 32 KByte

- Supports up to 64 K of ROM
- Varies the operating voltage from 3.0–4.0 V
- Supports in-circuit emulation on target systems that operate at 3.0–4.0 V
- Powers the In-Circuit Emulator (ICE) chip from either the emulator or target board
- Supports IR devices that operate at up to 8 MHz
- Emulates 28-pin DIP, 40-pin DIP, and 44 PLCC
- Provides OTP programming for 28-pin DIP and SOIC packages, 40 PDIP, 44 PLCC
- Emulates and supports all the features and functions for a specified Z8<sup>®</sup> IR micro-controller
- Multitasks to use other Windows<sup>®</sup> applications while Zilog Developer Studio (ZDS) is running

## 1.2 General Description

Zilog's in-circuit emulators are interactive, Windows-oriented development tools, providing a real-time environment for emulation and debugging.

The Z86L98 emulator (Z86L9800ZEM) is a member of Zilog's ICEBOX<sup>®</sup> product family of in-circuit emulators. The emulator provides essential timing and I/O circuitry to simplify user emulation of prototype hardware and software products.

The Z86L98 emulator provides users with a hardware platform to develop and debug software in a real-time environment. In contrast, software simulators are significantly slower making them less practical for code development.

The Z86L98 emulator can be connected to any serial port (COM1, COM2, COM3, and COM4) on the host computer. Zilog Developer Studio (ZDS) software initiates the interaction between the host computer and the emulator.

### 1.2.1 Notes/Limitations

The ROM/ROMLESS pin is used to configure the Z86D93ICE chip for either 32 K or 64 K internal ROM. This configuration affects the Z86L9800ZEM in the following ways:

- Does not support emulation of a ROMLESS operation
- If the host software specifies that a device has between 4 K to 32 K of ROM, the emulator operates as if it is emulating a device with 32 K of ROM.
- If the host software specifies that a device has more than 32 K of ROM, the emulator operates as if it is emulating a device with 64 K of ROM.

► **Note:** Mask option pull-up resistance at 3 V is approximately 200 k $\Omega$   $\pm$  50% at room temperature. Lower voltage can cause increased resistance.

## 1.3 Specifications

<b>Operating Conditions</b>	
Operating Temperature	20 °C ±10 °C
Supply Voltage	+5.0 VDC
Minimum Emulation Speed	1 MHz internal SCLK
Maximum Emulation Speed	1 MHz internal SCLK 8 MHz external clock (shipped with 8-MHz clock oscillator)
Maximum Emulation Memory	64 K
Maximum Hardware Breakpoints	256
Emulation Processor	Z86D9308VSC
Operating Humidity	10%–90% RH (noncondensing)
<b>Power Requirements</b>	+5.0 VDC @ 1 A Minimum (typical 800 mA)
<b>Dimensions</b>	
Width:	6.25 in. (15.8 cm)
Length:	9.50 in. (24.1 cm)
Height:	2.50 in. (6.35 cm)
<b>Serial Interface</b>	RS-232C@9600, 19200 (default), 28800, or 57600 Baud

## 1.4 Emulator Kit Contents

The emulator kit contains one of each of the following items:

- Z86L98 Emulator board
- Z86D86 28 PDIP program platform Zilog PC: 99C0667-001
- Z86D86 28 SOIC program platform Zilog PC: 99C0668-001
- Z86D73 40 PDIP program platform Zilog PC: 99C0669-001
- Z86D73 44 PLCC program platform Zilog PC: 99C0670-001
- 40 PDIP emulation pod with cable Zilog PC: 93C0024-001
- 28 PDIP emulation pod Zilog PC: 99C0473-001
- 44 PLCC emulation pod Zilog PC: 99C0273-001
- Power Cable with Banana Plugs
- RS-232 Serial Cable, 9-pin male and 25-pin female
- Zilog Developer Studio Installation CD
- Z86L98 Emulator User's Manual
- *Zilog Developer Studio Manual* contained on the ZDS installation CD-ROM.

► **Note:** If the ZDS CD-ROM does not contain the manual, it can be downloaded from the Zilog web site at [www.zilog.com](http://www.zilog.com).

### 1.4.1 Additional Items Required

The following item is required but is not currently supplied in the emulator kit:

- Power source (+5 VDC typical) for the emulator. This can be a laboratory power supply with a current rating of at least 1.5 ampere.

### 1.4.2 Optional Recommended Items

The following items are recommended:

- Target design, this is usually a wire-wrapped or printed circuit prototype that includes a socket for the target device which the emulator cable/pod plugs into.
- C-Compiler
- Until ZDS's C-Compiler is completed, use Production Languages Corp. (PLC) 3xx IDE tool to compile programs in C. Contact Zilog customer support for more information on the ZDS C-Compiler.
- Oscilloscope



- Logic Analyzer

### 1.4.3 Minimum Requirements of Host Computer

- IBM PC (or 100 percent compatible) Pentium-based machine
- 75-MHz CPU
- 16-MB RAM
- VGA Video Adapter
- Hard Disk Drive (12 MB free space)
- CD-ROM Drive
- RS-232C COM port
- Mouse or pointing device
- Microsoft Windows® 95/98/NT

The following changes to the minimum requirements are recommended for increased performance:

- 166-MHz or faster processor
- SVGA Video Adapter

## 1.5 Precautions

### 1.5.1 ZDS IDE Limitations

1. Does not support downloading of PLC's .1od file
2. Overlapping contents of code/register/output windows when they dock closely and horizontally.
3. Work around: Use View/Refresh command
4. Resizing windows sometimes changes the starting address back to zero and the Data Memory window to its starting external address memory.
5. A new Debugger window sometimes hides behind open windows. Move or reduce the number of open windows to view the new window.
6. There is no flag if the debugger .1d file is older than the Assembly files when connecting or downloading codes to the emulator.
7. External DATA memory fill takes at least 50 seconds per 1 K of data memory. This slow-down avoids time-out errors and loss of communication. Note that using the External Data memory window is valid only when it exists on the target application board.

8. Does not support saving debugger set-up/windows.
9. Does not support short cut or hot keys for the Debugger.
10. Does not support stepping into an include file.
11. The Disassembly window-up arrow scroll does not work yet.

Work around: Drag the vertical scroll bar.

► **Note:** Please refer to specific Customer Procurement Specifications (CPS) or Product Information (PI) documents for specific Limitations and Precautions for each ICEBOX<sup>®</sup>/Emulator.

### 1.5.2 All Z8 Emulators

1. Do not put a breakpoint at addresses after a STOP instruction. This causes the program counter to continue at that location after Stop-Mode Recovery.
2. Single-stepping into a Halt instruction causes an ICEBOX<sup>®</sup> “Fatal Error” message appear on the screen. The ICE chip must be reset, either by the /Reset pin on the target board or by resetting the whole ICEBOX<sup>®</sup> by pressing the emulator MASTER RESET button at the back of the emulator.
3. Clicking on the STOP button does not always halt the ICEBOX<sup>®</sup> execution. If the application goes into Stop Mode or Halt Mode, the only way to halt the emulator execution is by doing a Stop- Mode Recovery (as defined by the user program). The application can also be reset by using the emulator MASTER RESET button; however, this reset the whole ICEBOX<sup>®</sup>.
4. RC oscillator emulation is not supported.
5. When the software enters STOP mode and the STOP debugging button control button is pressed, any SMR source on the application board is activated, and the emulator jumps back to address 000C hex, which is normal. But when continuing the program with a GO command from 000C hex, a POR reset is performed, resetting all control registers.
6. The emulator cannot be operated while performing ESD/EMI testing on the target board.
7. Ensure that the target cable is correctly aligned (pin1 to pin1) before inserting it into the target system. Incorrect alignment can damage the emulator/or the target system.
8. All Z8 control registers are Write-Only unless stated otherwise.
9. The general-purpose registers values after Power-On Reset or at the initial emulator use are different than the actual device. The emulator self-test always leaves the

same values in the general-purpose registers, while the real device has random or undefined values.

10. Power supply ramp-up/rise time must be set so that when the minimum power-on reset time ( $T_{oper}$ ) expires, the  $V_{CC}$  is in the specified operating range of the device.
11. If the Program Counter jumps to an unknown address:
  - (a) Stack is not set to internal. Register %F8(P01M Reg) bit D2 are not set to `State1`.
  - (b) The Stack Pointer Register %FE(SPH) and Register %FF(SPL) are not initialized. For the internal Stack, SPH does not have to be initialized because it is not used. The SPH and SPL are reset to 00H after any reset or Stop-Mode Recovery.
  - (c) An instruction other than **DI** was used to disable interrupts.
  - (d) The Stack overflowed into the general-purpose register locations.
  - (e) When making changes to the IMR register, GLOBAL interrupts must be disabled before using a DI instruction.
12. If the Program keeps resetting:
  - (a) Program Counter rolled over from value FFFF to 0000 and proceeded back to the beginning of program.
  - (b) Watch-Dog Timer (WDT) was not refreshed from devices with the WDT feature.

► **Note:** The emulator must not be started with an OTP device or Adapter in the programming socket, because the emulator might not start-up correctly.



**Caution:** A shorted PLCC or DIP OTP can crash the emulator when inserted into the OTP programming socket. If a PLCC part is inserted and causes a temporary short, then the part loses its functions. An attempt to perform BLANK CHECK on such a part causes the hour-glass to appear continuously. The Windows application must be reset and restarted.

13. The bits of non-implemented features for devices having PC ON register must be set to `State1` on the emulator.
14. When interrupts are enabled, setting a breakpoint after a Halt instruction, breaks the emulator at the first instruction in the interrupt service routine that is serviced when an IRQ occurs.
15. SCLK/16 Mode of SMR register is not supported.
16. The OTP activity bar is not proportionate to the address being processed.

# Customer Support

For answers to technical questions about the product, documentation, or any other issues with Zilog's offerings, please visit Zilog's Knowledge Base at <http://www.zilog.com/kb>.

For any comments, detail technical questions, or reporting problems, please visit Zilog's Technical Support at <http://support.zilog.com>.