Z86CCP01ZEM

Z8® CCP™ IN-CIRCUIT EMULATOR

FEATURES

■ Supported Devices

Packages	Emulation	OTP Programming
18-Pin PDIP	Z86C02/03/04/06/08/16 Z86E02/03/04/06/08	Z86E02/03[1]/04/06[1]/08/E18 Z8E001[2]
18-Pin SOIC	N/A	Z86E02/03/04/06/08[3]
28-Pin PDIP	Z86C30/31/32/33/233[4] Z86E30/E31/E33/733[4]	Z86E30/31[4] Z86E33/733[5]
28-Pin PLCC	Z86C30/31/32/33/233[6] Z86E30/E31/E33/733[6]	Z86E30/31[7] Z86E33/733[8]
28-Pin SOIC	N/A	Z86E30/31[7] Z86E33/733[9]
40-Pin PDIP[4]	Z86C40/C43/243[4] Z86E40/43/743[4]	Z86E40[6] Z86E43/743[10] Z86E15[11]
44-Pin PLCC	Z86C40/C43/243[12] Z86E40/43/743[12]	Z86E40[13] Z86E43/743[14]
44-Pin QFP	N/A	Z86E40[15] Z86E43/743[16]

Notes:

1. E03/06: With optional, separately purchased adapter (Z86E0601ZDP) from Zilog.
2. With optional, separately purchased adapter (Z86E00100ZAC) from Zilog.
3. With optional, separately purchased adapter (Z86E0700ZDP) from Zilog.
4. With optional, separately purchased accessory kit (Z86CCP00ZAC) from Zilog.
5. With optional, separately purchased adapter (Z86E3400ZDP) from Zilog.
6. With optional, separately purchased accessory kit (Z86C3000ZAC) from Zilog.
7. With optional, separately purchased accessory kits(Z86CCP00ZAC and Z86C3000ZAC) from Zilog.
8. With optional, separately purchased adapter (Z86E3400ZDV) from Zilog.
9. With optional, separately purchased adapter (Z86E3400ZDS) from Zilog.
10. With optional, separately purchased adapter (Z86E4400ZDP) from Zilog.
11. With optional, separately purchased adapter (Z86E1500ZDP) from Zilog.
12. With optional, separately purchased adapter (Z86C4001ZDV) from Zilog.
13. With optional, separately purchased accessory kit (Z86CCP00ZAC) and adapter (Z86E4001ZDV) from Zilog.
14. With optional, separately purchased adapter (Z86E4400ZDV) from Zilog.
15. With optional, separately purchased accessory kit (Z86CCP00ZAC) and adapter (Z86E4001ZDF) from Zilog.
16. With optional, separately purchased adapter (Z86E4400ZDF) from Zilog.

FEATURES (Continued)

- In-Circuit Program Debug Emulation

- Real-Time Emulation

- Z8 GUI Emulator Software

- Window-Based User Interface

- On-Line Help

- One-Time Programmable (OTP) Support

- Selectable Baud Rates – 9600 to 57.6 Kbps

- Bisync Error-Correcting Communications Protocol

- Source-Level Debugging

- Symbolic Disassembly in the Debug Window

- Zilog Macro Cross Assembler (ZMASM)

  - Structured Assembly and Data Code

  - Source-Level Debug Support

  - Built-In Register Equates

  - Linker

  - Integrated Editor (Windows 95)

GENERAL DESCRIPTION

Zilog's in-circuit emulators are interactive, Window-oriented development tools, providing a real-time environment for emulation and debugging. Also included is a full-featured macro cross assembler to enhance programmer productivity, when used in conjunction with the CCP Emulator.

The Z8 CCP Emulator (Z86CCP01ZEM) is a member of Zilog's ICEBOX™ product family of in-circuit emulators providing support for the Consumer Controller Processor (CCP™) microcontrollers. The emulator provides essential

timing and I/O circuitry to simplify user emulation of the prototype hardware and software product.

The Z8 CCP Emulator provides users with a hardware platform to develop and debug software in a real-time environment. In contrast, software simulators provide significantly slower operation, making them less practical for code development.

The Z8 CCP Emulator can be connected to a serial port (COM1, COM2, COM3, and COM4) of the host computer and uses Graphical User Interface (GUI) software.

SPECIFICATIONS

Operating Conditions

Operating Temperature:	20°C ±10°C
Supply Voltage:	+7.5 VDC to 10.0 VDC (+8.0 VDC typical)
Minimum Emulation Speed:	1 MHz internal SCLK
Maximum Emulation Speed:	6 MHz internal SCLK 12 MHz external Crystal (shipped with 8 MHZ crystal)
Operating Humidity:	10-90% RH (non-condensing)

Power Requirements

+8.0 VDC @ 0.5A typical, 0.8A maximum

Dimensions

Width:	7.00 in. (17.7 cm)
Length:	9.00 in. (22.9 cm)
Height:	0.9 in. (2.3 cm)

Serial Interface

RS-232C @ 9600, 19200 (default), 28800, or 57600 Baud

HOST COMPUTER

Minimum Requirements

IBM PC (or 100-percent compatible) 386-Based Machine

33 MHz

4 MB RAM

VGA Video Adapter

Hard Disk Drive (3.0 MB free space)

3.5-inch, High-Density (HD) Floppy Disk Drive

RS-232C COM Port

Mouse or Pointing Device

Microsoft Windows 3.1

The following changes to the Minimum Requirements are recommended for increased performance:

Pentium-Based Machine:

- 75 MHz (or faster)
- 16 MB of RAM (or more) SVGA Video Adapter
- Color Monitor
- Printer
- Microsoft Windows 95
- Hard Disk Drive (10.0MB free space)

ZMASM REQUIREMENTS

If using the optional Zilog Macro Cross Assembler, the following table lists the host computer requirements for it:

Table 1-1. **Minimum and Recommended System Requirements**

	Windows 3.1		Windows 95			
	ZMASM		ZMASM		ZDS	
	Minimum	Recommended	Minimum	Recommended	Minimum	Recommended
Processor	386	486	486	Pentium	486	Pentium
Speed (MHz)	33	66	66	100 (or higher)	66	150 (or higher)
RAM (MB)	4	8	8	16 (or more)	8	32 (or more)
Video Adapter	VGA	SVGA	VGA	SVGA	SVGA	SVGA
Hard Disk (MB) (Free Space)	2.0	4.0	3.0	4.0	10.0	16.0
3.5-Inch, HD Floppy Disk Drive	✓	✓	✓	✓	✓	✓
RS-232C Com Port	✓	✓	✓	✓	✓	✓
Color Monitor		✓		✓	✓	✓
Mouse/Pt. Device	✓	✓	✓	✓	✓	✓
Printer		✓		✓	✓	✓
Editor		✓		✓	Included	Included

ADDITIONAL REQUIRED ITEMS NOT SUPPLIED

- Power source
- RS232 cable
- Host computer
- 28-pin ZIF Socket[*]
- 28-pin DIP Target Cable[*]
- 40-pin ZIF Socket[*]
- 40-pin DIP Target Cable[*]
- Your target design

Typically, this is a wire-wrapped or printed-circuit proto-type that the Target Cable plugs into to emulate the target device.

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[*]depending upon target device.

KIT CONTENTS

Z8 CCP Emulator Kit

Circuit Board
  CMOS Z86C9320VSC
  20MHZ CMOS Z86C5020FSE ICE Chip
  8K x 8 Static RAM (for Code Memory)
  18-Pin DIP Zero Insertion Force (ZIF) Programming
    Socket
  Sockets Available for 28/40-Pin Target Cables
  Holes Available for 28/40-Pin ZIF Sockets
  RS-232C Interface (25-pin)

Cables
  18-Pin DIP Target Cable
  Power Cable

Host Software
  Z8 GUI S/W Diskette
  ZDS/Zilog Macro Cross Assembler Diskettes

Note: Cross-Assembler and C Compiler are sold separately from Production Languages Corp. and other third-party development tool companies:

Production Languages Corp.   (817) 599-8363

                             E-mail: info@plcorp.com

                             Internet: www.plcorp.com

Refer to the Zilog Internet site (www.zilog.com) for more information on third-party support.

Documentation

■ *8-Bit Embedded Microcontroller Product Guide CD ROM,* which contains Z8 device product specifications, support product user's manuals and guides, application notes, and other valuable information.

■ *Z8® CCP™ Emulator User's Manual*

■ *Z8 CCP Emulator Product Information Sheet*

■ *Zilog Macro Cross Assembler User's Manual*

Z8 CCP Emulator Accessory Kit†
(Z86CCP00ZAC)

  (Not included with Z86CCP01ZEM)
  28-Pin ZIF Socket
  28-Pin DIP Target Cable
  40-Pin ZIF Socket
  40-Pin DIP Target Cable
  DB25 RS-232C Cable
  Power Cable with Banana Plugs
  9VDC Wall Adapter Power Supply

Z86C30 Accessory Kit†
(Z86C3000ZAC)

  (Not included with Z86CCP01ZEM)
  28-Pin PLCC/SOIC-to-Dip Programming Adapter
  28-Pin PLCC Emulation Pod

Z86C40 44 PLCC Emulation Pod†
(Z86C4001ZDV)

  44-Pin PLCC Emulation Pod

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†Consult the current Customer Procurement Specification for a complete list of contents. This list is representative only.

LIMITATIONS

1. Typing into the File Name box in order to change the drive in the file download and load symbol dialog boxes is not anticipated by the GUI. Instead, use the mouse in the Directories box as the workaround.

2. Switching ICEBOX™ emulators without quitting the GUI is not supported and may cause unexpected results.

3. The maximum loadable symbols is 32,768, provided there is enough system resource (memory).

4. The keyboard and mouse will lock up if the screen saver supplied by Windows 3.1 times out while the GUI software is waiting for the user to complete entering a line of assembly code in the Debug window. To recover, the user must reset the computer. The workaround is to turn off the screen saver, set the screen saver to a much longer time out value, finish the line of code before the time-out occurs (press ENTER), or use a different screen saver such as "After Dark." This problem may also exist at other points in the GUI that request input from the user.

5. Although GUI 3.00 and later support baud rates up to 57.6K baud, the actual maximum usable rate may be less due to limitations of the user's hardware or system software setup. The maximum usable rate is determined by the user's tolerance of the frequency of communication errors.

6. The initial blue Zilog screen can be distorted by other active windows. This only affects the appearance, not the functionality, of the GUI.

7. Do not put a breakpoint at addresses after STOP instruction. This will cause the program counter to continue at that location after a Stop-Mode Recovery.

8. Single-stepping into the Halt instruction will cause an ICEBOX "Fatal Error" message to be displayed on the screen. The ICE chip must be reset, either by /Reset pin on the target board or by resetting the whole ICEBOX by pressing the emulator MASTER RESET button at the back of the emulator.

9. Clicking on the HALT button does not always halt the ICEBOX 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). You may also reset the application using the emulator MASTER RESET button; however, this will reset the whole ICEBOX.

10. RC oscillator emulation is not supported.

11. Since the emulator uses the Z86C50 ICE chip, Port 1 cannot be configured to Low EMI mode. Bit 4 in PCON registers must be set to logic "1".

    Note: This is not a problem with the actual emulated device.

12. When the software enters a STOP mode and the HALT control button in the GUI software is pressed, any SMR source on the application board is activated. The emulator will then jump back to address 000C, which is normal. But when continuing the program with a GO command from 000C, a POR reset is performed, resetting all control registers.

    A workaround is to do a JUMP 000D and execute with GO. This will not issue a POR reset.

13. Although the GUI displays two timers (T0,T1) for Z86C02/E02, only Timer1 is valid for these devices.

14. Multiple emulators instances cannot be used when the OTP Programming Window is open.

PRECAUTIONS

ALL Devices

1. GUI software versions prior to 3.00 are incompatible with hardware containing BOOTROM 3.00. The GUI software may still boot, but will fail at some later point.

2. For some 386 PCs, a baud rate of 19.2K or less is necessary because the Windows' communication driver does not guarantee "reliable" operation above 9600 baud. On some slower 386 machines, selecting a high baud rate might crash the Windows' environment or result in excessive communication errors.

3. When simultaneously running two different GUI versions on two different Communication Ports, the former executed version is used for both emulators. This is a Windows Operating System bug.

4. The emulator cannot be operated while performing ESD/EMI testing on the target board.

5. Executing GUI. The GUI will occasionally continue to indicate "Executing" after a Halt instruction. Pushing the GO button will then result in Executing. (Executing showing at the top of the screen.)

PRECAUTIONS (Continued)

6. Ensure that the target cable is correctly aligned (pin-1 to pin-1) before inserting into the target system. Incorrect alignment may damage the emulator and/or the target system.

7. All Z8 control registers are Write-Only unless stated otherwise.

8. The general-purpose registers after Power-On Reset or at initial emulator use will be different than the actual device. The emulator self-test will always leave the same values in the general-purpose registers, while the real device will have a random or undefined value.

9. Power Supply ramp-up/rise time must be such that when the minimum power-on reset time (Tpor) expires, the V_{CC} must be in the supported specified operating range of the device.

10. If Program Counter jumps to an unknown address:

    a. Stack is not set to internal. Register %F8 (P01M Register) bit D2 not set to state "1".

    b. Stack Pointer Register %FE(SPH) and Register %FF(SPL) are not initialized. For internal Stack, SPH does not have to be initialized since it is not used. The SPH and SPL are reset to 00H after any reset or Stop-Mode Recovery.

    c. Any instruction other than "DI" was used to disable interrupts.

    d. The Stack overflowed into the general-purpose register locations.

    e. Extra "POP", "PUSH". "IRET", or "RET" was encountered.

    f. When making changes to the IMR register, the GLOBAL interrupts must be disabled first using DI instruction.

11. If the Program keeps resetting:

    a. Program Counter rolled over from value "FFFF" to "0000" and proceeded back to beginning of program.

    b. Watch-Dog Timer (WDT) was not refreshed from devices with WDT feature.

12. Check the T_{POR} and T_{WDT} specifications of the device that you wish to emulate. The actual specification may differ from the ICE chip specifications. The Z86C50 ICE chip typical WDT time period is configured using bits 0 and 1 of the WDTMR register located in Bank F of the Expanded Register Group at address 0FH.

Typical Z86C50 ICE Chip WDT Time-Out Period		
Internal RC (ms) Time-Out		
Bit 1	Bit 0	Z86C50
0	0	4
0	1	9
1	0	18
1	1	75

Note: Typical Z86C50 T_{POR} = 6.0 ms.

13. Do not start the emulator with OTP device in the programming socket, as the emulator may not start up correctly.

14. A shorted PLCC or DIP OTP can crash the emulator when inserted into the OTP programming socket. If a PLCC part is inserted in such a way as to cause a temporary short, then functionality is lost. An attempt to perform BLANK CHECK on such a part will cause the "hourglass" to appear continuously. The Windows application must be reset and restarted.

15. The status color bar in OTP dialog box will be cleared in the area where a new window opens on top of it.

16. Do not press the emulator MASTER RESET when the ICEBOX is in the OTP dialog for programming. If MASTER RESET is pressed while the GUI is doing OTP programming, close the OTP dialog box and reopen it to reload the information back to the hardware.

    Note: The ICEBOX is really sitting idle, although the Command Status shows "Processing" after the GUI re-establishes the communication link when "Retry" was selected in the "Out of Synchronization with the emulator" dialog box.

17. When device serialization is enabled in the OTP dialog, the GUI copies the current serial number to code memory immediately before performing a VERIFY operation. If this behavior is undesirable, then device serialization should be disabled prior to invoking the VERIFY operation.

18. The bits of non-implemented features (of devices having a PCON register) must be set to state "1" on the emulator.

19. When interrupts are enabled, breakpointing after a Halt instruction, the emulator will break at the first instruction in the interrupt service routine that is serviced when an interrupt occurs.

20. Port 0, Port 1, and Port 2 have auto latches permanently enabled.

21. SCLK/16 Mode of SMR register is not supported.

Z86C03/C06/C16

1. Devices with the comparator output feature have the P32 comparator output coming out of P35.

2. The register %F8(P01M register) bits D4 and D3 must be set to state "0" and bit D2 must be set to state "1".

3. WDT Register (F) %0F can only be written in the first 60 internal system clocks from the start of program execution.

4. The PCON register on Z86C16 is not reset after Stop-Mode Recovery.

5. The SPI functions are not supported.

6. When using the emulator to emulate the C06, the comparator outputs are at P34 and P37, which is different than the C06, which is at P34 and P35.

Z86C02/C04/C08/E02/E04/E08

1. The register %F8(P01M register) bits D4 and D3 must be set to state "0" and bit D2 must be set to state "1".

2. The Emulation Rising Edge of P32 in Digital Mode. For Z86C02/04/08 emulation, the IRQ3 rising edge interrupt on P32 is not supported. To implement the rising edge of P32, a jumper from P32 must be connected to Pin 1 of U27 74HCT04. Another jumper must connect the output of the 74HCT04 Pin 2 to P30 on emulation socket P3, Pin 25 or emulation socket P2, Pin 18.

   The Emulation Rising Edge of P32 in Analog Mode. For Z86C02/04/08 emulation, the IRQ3 rising edge interrupt on P32 is not supported. To implement the rising edge of P32, a jumper from P37 must be connected to Pin 1 of U27 74HCT04. Another jumper must connect the output of the 74HCT04 Pin 2 to P30 on emulation socket P3, Pin 25 or emulation socket P2, Pin 18. The PCON bit D0 must be set to state "1".

3. Stop Mode. P27 is used to release Stop Mode. However, since the CCP emulator (C50 ICE Chip) is used, you must write to SMR(F)0B 101 in D2, D3, and D4. Use the following code:

```
LD RP, #%0F            ;select Bank F
LD %0B, #00110100B     ;selects P27 as the Stop-
                       ;Mode Recovery pin.
```

   This code must be removed before final ROM code submission or OTP programming. Note that P27 must

be in Input Mode, which is accomplished with the following code:

```
LD P2M, #1xxxxxxxB
NOP                    ;clears pipeline
Stop                   ;halts processor
```

4. Watch-Dog Timer (WDT) running in Stop Mode is not supported.

5. Z86C02/04/08 do not support WDT register. Use the command "4F" to run WDT in Halt Mode.

6. The register %FA (IRQ register) bits D7 and D6 must be set to state "0".

Z86C30/C31/C32/C33/233/E30/E31/E33/733

1. Devices with the comparator output feature have the P32 comparator output coming out of P37.

2. The register %F8(P01M register) bits D4 and D3 must be set to state "0" and bit D2 must be set to state "1".

3. WDT Register (F) %0F can only be written in the first 60 internal system clocks from the start of program execution.

4. Reg(F)%00 PCON has D2 controlling the open-drain for Port 0 and D1 controlling the open-drain for Port 1.

5. The "No Auto Latch" feature is not implemented.

6. Does not emulate clock-free WDT reset for Z86C33/233.

Z86C40/C43/C50/C89/C90/243/E40/E43/743

1. Devices with the comparator output feature have the P32 comparator output coming out of P37.

2. WDT Register (F) %0F can only be written in the first 60 internal system clocks from the start of program execution.

3. Reg(F)%00 PCON has D2 controlling the open-drain for Port 0 and D1 controlling the open-drain for Port 1.

4. The "No Auto Latch" feature is not implemented.

5. To emulate the Z86C89/90, select the 'Z86C40/E40' option from the "Microcontroller" pull-down window of the Configuration dialog box, which appears when the Z8 CCP GUI starts up and when the Configuration Menu item is selected from the ICEBOX Menu.

6. Does not emulate clock-free WDT reset for Z86C43.

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