ZiLOG

C50

ICEBOX

User's Manual

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ZiLOG Worldwide Headquarters • 910 E. Hamilton Avenue • Campbell, CA 95008
Telephone: 408.558.8500 • Fax: 408.558.8300 • www.ZiLOG.com

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ZiLOG Worldwide Headquarters
910 E. Hamilton Avenue
Campbell, CA 95008
Telephone: 408.558.8500
Fax: 408.558.8300
www.ZiLOG.com

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Electrical Safeguards

WARNING:

Follow the precautions listed below to avoid permanent damage to the emulator.

If the target application board has its own power supply, follow the power-up and power-down procedures in the precise order shown below [1]:

I. Always use a grounding strap to prevent damage resulting from electrostatic discharge (ESD)

II. Power-Up Precautions

1. Remove V_{CC} jumper J1
2. Power-up the emulator [2]
3. Depress the emulator RESET button
4. Connect the target pod to the target application [3]
5. Power-up the target application (if any)

III. Power-Down Precautions

When powering down, follow this procedure in the precise order shown below:

1. Depress the RESET button on the emulator
2. Power-down the target application board (if any)
3. Remove the target pod
4. Power-down the emulator

Notes:

1. Refer to the "Precaution List" section in Chapter 5 for additional operating precautions specific to various devices.

2. Do not leave the emulator powered up with the RS-232 cable connected to a powered-down PC.

3. Before inserting target pod into target application board, refer to Chapter 2 to determine appropriate jumper selections and options.

Zilog C50 ICEBOX™ User's Manual

About This Manual

We recommend that you read and understand everything in this manual before setting up and using the product. However, we recognize that users have different styles of learning: some will want to set up and use their new emulator while they read about it; others will open these pages only as a "last resort" to check on a particular specification. Therefore, we have designed this manual to be used either as a "how to" procedural manual or a reference guide to important data.

Additional assistance is provided in the following ways:

- The emulator graphical user interface (GUI) features a complete, context-sensitive on-line help facility that provides brief messages on keyboard and ICEBOX commands and various procedures on how to use the emulator. An index and glossary are also included as part of this Help Program.
- The complete emulation board schematic diagram is included at the back of this user's manual.

Please fill out and return the enclosed Zilog Registration Cards as soon as possible so we can advise you of updates and improvements to your emulator.

C50 ICEBOX™ USER'S MANUAL

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Note: Appendix C is not available.

CHAPTER 1

INTRODUCTION

OVERVIEW

Congratulations on selecting a fine development tool! The Zilog C50 In-Circuit Emulator (ICEBOX™) is carefully engineered to provide the best balance between reasonable cost and useful features to shorten your development time for Z8® CCP™-based products (refer to "Supported Zilog Z8® Devices" section). The emulator graphical user interface (GUI) runs under MS-Windows for Zilog's Z8 family of emulators.

KEY FEATURES OF THE ZILOG EMULATOR

- Edit the contents of Program Memory or the registers, track memory locations, set break points in ROM, and single-step into codes.
- Multiple windows can be viewed and the contents of Program Memory, External Memory, and register files can be edited.
- Multiple emulators can be operated simultaneously, provided enough serial communication ports on your PC are available.
- Because of the multitasking feature of the emulator GUI, you can use other Windows applications while the emulator GUI is running.
- Learn about the emulator and start writing and debugging software using the memory available in the emulator—with or without a finished design.

SUPPORTED ZILOG Z8® DEVICES

Emulation Support	OTP Programming Support
Z86C03	Z86E03
Z86C06	Z86E04
Z86C09	Z86E06
Z86C16	Z86E07
Z86C19	Z86E08
Z86C30	Z86E30
Z86C31	Z86E31
Z86C40	Z86E40
Z86C90	

GUI-SUPPORTED COMPILER, ASSEMBLER FORMATS

The emulator GUI supports object (binary or Intel hex) produced by the Zilog Z8® and the Production Language Corporation (PLC) assembler.

HARDWARE SPECIFICATIONS

Dimensions	2.5in H x 6.25in W x 9.5in D
Target Clock or Oscillator Frequency	1 to 20 MHz (shipped with 12 MHz crystal)
Internal Clock Operating Frequency	500 kHz min for all modes of operation
Host Interface	DB-25, RS-232 DCE (TxD, RxD only)
Serial Baud Rate	19,200 bps
Power Supply Voltage	+4.75 VDC to +5.25 VDC Max (+5.0 VDC typical)
Power Supply Current	0.6 A typ
Operating Temperature	20 degrees C, ±10 degrees C
Operating Humidity	10-90% RH (non-condensing)

SUPPORT PRODUCTS PACKAGE CONTENTS

The Zilog Emulator Support Products Package contains the following items:

Hardware
C50 ICEBOX Emulator
18-pin Target Pod
28-pin Target Pod
40-pin Target Pod
25-pin RS-232 Cable
15-inch Power Cable
Z86E30 28-pin DIP OTP Device
Z86E40 40-pin DIP OTP Device

Software
Z8® GUI Diskette
ZASM-Cross Assembler Diskette
MOBJ-Object Utility Diskette

Description of Z8® GUI Diskette Files

z8cfg.o	Configuration
z8ice.exe	Executable
icehelp.hlp	Help
meter.dll	Installation library
readme	Text file
setup.inf	Installation information
setup.exe	Windows install program
z8em_c12.o	On board software for Z86C12 Emulator
z8em_c27.o	On board software for Z86C27 Emulator
z8em_c50.o	On board software for Z86C50 Emulator
z8em_c62.o	On board software for Z86C62 Emulator
z8em_c65.o	On board software for Z89C65 Emulator
z8em_c67.o	On board software for Z89C67 Emulator
z8em_c93.o	On board software for Z86C93 Emulator
z8em_l7x.o	On board software for Z86L7X Emulator
z8em_ccp.o	On board software for Z86CCP Emulator

Publications

Zilog C50 ICEBOX™ User's Manual
asm S8, Super8/Z8 Cross Assembler User's Guide
Zilog Universal Object File Utilities User's Guide
Registration Cards

REQUIREMENTS

Minimum Hardware

An IBM PC (or 100 percent compatible) 386-based machine at 20 MHz with 4 MB RAM, hard disk drive (with 1 MB available), 5.25- or 3.5-inch floppy disk drive, and VGA video adapter.

Note: A 486-based machine will provide increased overall performance.

Minimum Software Operating Systems

MS-DOS version 5.0
MS-Windows version 3.0

Additional Required Items Not Supplied with the Support Package

A source of power (+4.75 VDC to +5.25 VDC Max [+5.0 VDC typical]) for the emulator. This can be a laboratory power supply with supply current of 0.6 ampere.

Your Z8® CCP™-Based Design

Typically, this is a wire-wrapped or printed-circuit prototype that includes a socket for the Z8 CCP device, into which you can plug the emulation cable from the emulator.

RESTRICTIONS

This emulator is designed for emulation purposes only and cannot be used in standalone operation.

RC oscillator emulation is not supported.

CHAPTER 2

SETUP AND INSTALLATION

INSTALLING THE SOFTWARE

To properly install the Z8® Emulator GUI, first start the Windows application, then follow these steps:

1. Load the Z8 Emulator GUI diskette into compatible disk drive.
2. Select the Run command from the File menu, located under Windows Program Manager.
3. Type in the following at the prompt:
   "a:\setup" (or "b:\setup" if the diskette is in drive B:)

A dialog box will now prompt you for the directory into which the software will be installed (default is C:\Z8-ICE).

The setup program will copy the files into the target directory, creating a Z8-ICE icon in the Windows environment.

After the installation is finished, you can move the Z8-ICE icon into any program group of your choice.

Notes:

1. The installation procedure does not modify the "win.ini", "autoexec.bat" or "config.sys" files.
2. An alternative way to install the Z8 Emulator GUI software is to copy all the files described in the following section to your target directory and manually create a program item by using the "New" command under the File menu of the Windows Program Manager. (Consult MS-Windows documentation if you need additional information about alternate install procedures.)

INSTALLING THE HARDWARE

Before installing the hardware, refer to Figure 2-1 for a rear view of the “generic” emulator and Figure 2-2, which provides a diagram for connecting the emulator to your PC and power supply.

Note: Proper functioning of the emulator assumes that the GUI software has been properly installed and runs correctly on your PC.

Quick Installation

This section provides you with a quick overview of the steps involved in setting up the hardware. The "Complete Hardware Installation" section, which immediately follows, provides a more detailed description of the hardware setup procedure.

1. Configure the emulator for internal ROM (if running in ROM Mode).
2. Connect to a +5V power supply and adjust to 0.6A (min.).
3. Connect the serial cable to the PC.
4. Connect the emulator to your design.
5. Set up the oscillator and option jumpers. (Refer to Table 2-1 and Figures 2-3 and 2-4.)
6. Connect the emulator to a logic analyzer (if using).
7. Power up the emulator. (Refer to "Powering Up" and "Powering Down" procedures.)

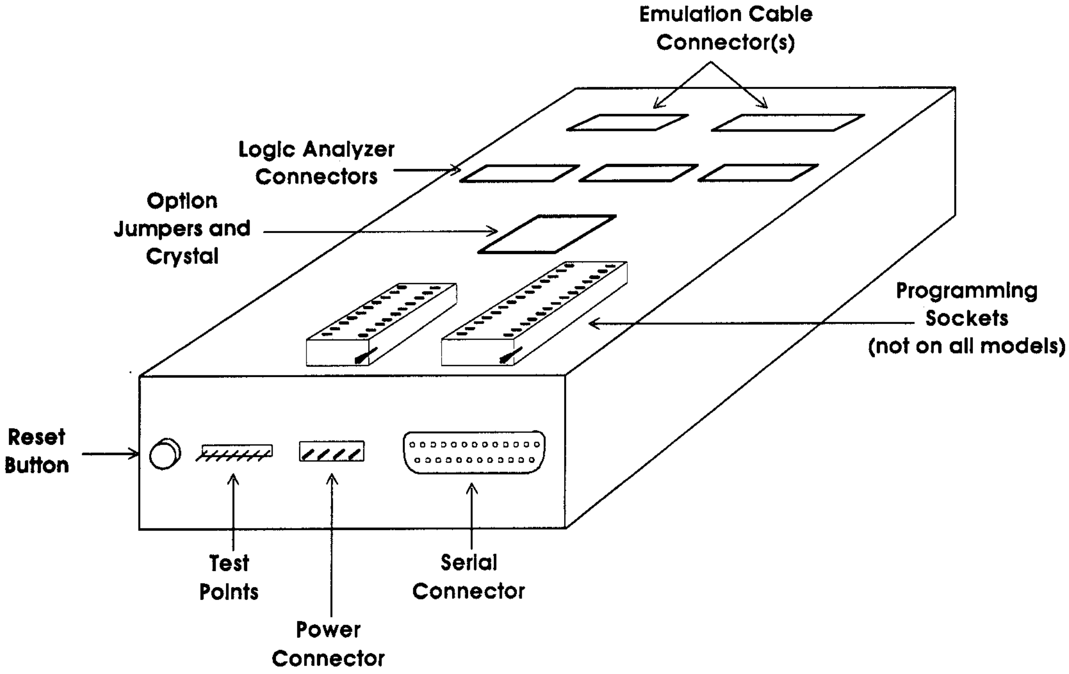

Emulation Cable Connector(s)
Logic Analyzer Connectors
Option Jumpers and Crystal
Programming Sockets (not on all models)
Reset Button
Test Points
Serial Connector
Power Connector

Figure 2-1. “Generic” Emulator (Rear View)

Complete Hardware Installation

Configuring for Internal ROM. (You may skip this paragraph if you are using external ROM.) This emulator is configured to run in "ROMless Mode," that is, it uses external ROM (Port 1 of the Z8 for multiplexed addresses and data). If, however, your application requires ROM Mode, follow these steps to reconfigure the emulator.

1. Remove the screws from bottom of the emulator and pull off the bottom of the case.
2. Straighten the handles of the programming sockets to an upright position.
   Note: We recommend that you leave the black front and back panels with the board.
3. Locate the socketed 20-pin IC labeled "U3" on the daughterboard.
   Note: For future reference, note the location of Pin 1.
4. Carefully remove the IC from the socket.
   Note: Use an IC puller or small, flat-bladed screwdriver, being careful not to bend the pins. Store in a safe place; the IC can be replaced on the daughterboard when using applications that involve ROMless Mode.
5. Locate the jumper header, which has eight jumper wires running diagonally across the top. Plug the header into the U3 socket so that Pin 1 is in the same corner formerly occupied by the IC Pin 1.
6. Carefully reassemble the emulator and replace the screws that hold the case together.

Connecting to a Power Supply. If your power supply allows voltage adjustment, do the following:

1. Turn the power supply on and adjust it to +5V.
2. Set it for at least 0.6A, if there's a current-limiting adjustment.
3. Turn the supply off or make sure a nonadjustable supply is off.
4. Locate the power cable (red wire, black wire, and banana plugs on one end). Plug in the black banana plug into the black jack on the power supply (labeled COM, GND, or with a ground symbol). Plug in the red plug into the red jack on the power supply (labeled "+" or "+V" or "+5V").
5. Plug the white connector on the other end of the cable into the matching 4-pin connector on the back of the emulator. (This connection is "keyed" to ensure against an improper connection.)

Connecting the Serial Cable to the PC. Locate the serial cable and connect the male end to the female connector on the back of the emulator, then connect the female end to either the COM1, COM2, COM3, or COM4 connector of your PC.

Note: If connector availability is limited to a 9-pin COM1 through COM4, use a different cable or a 25- to 9-pin converter. (Zilog does not provide either of these items.)

INSTALLING THE HARDWARE (Continued)

Connecting to Your Design. (If your design is ready.) Locate the emulation cable for your Z8® CCP™-based design.

Note: Wear a properly grounded wrist strap or similar ESD protection before proceeding with this step.

Plug one end of the emulator cable into your Z8 CCP socket, being **very careful** to orient the Pin 1 marking (as indicated by the red mark on the ribbon cable) to match the way your board is built. Plug the other end of the cable into the matching blue connector on top of the emulator.

Note: The inductance and capacitance of the emulation cable may affect the signals to and from the emulator and target board, especially if the target board has low-current drivers, pull-ups, and pull-downs. We recommend that you drive the XTAL pins of the Z8® with the crystal oscillator on the emulator with the J2/J3 Jumpers removed.

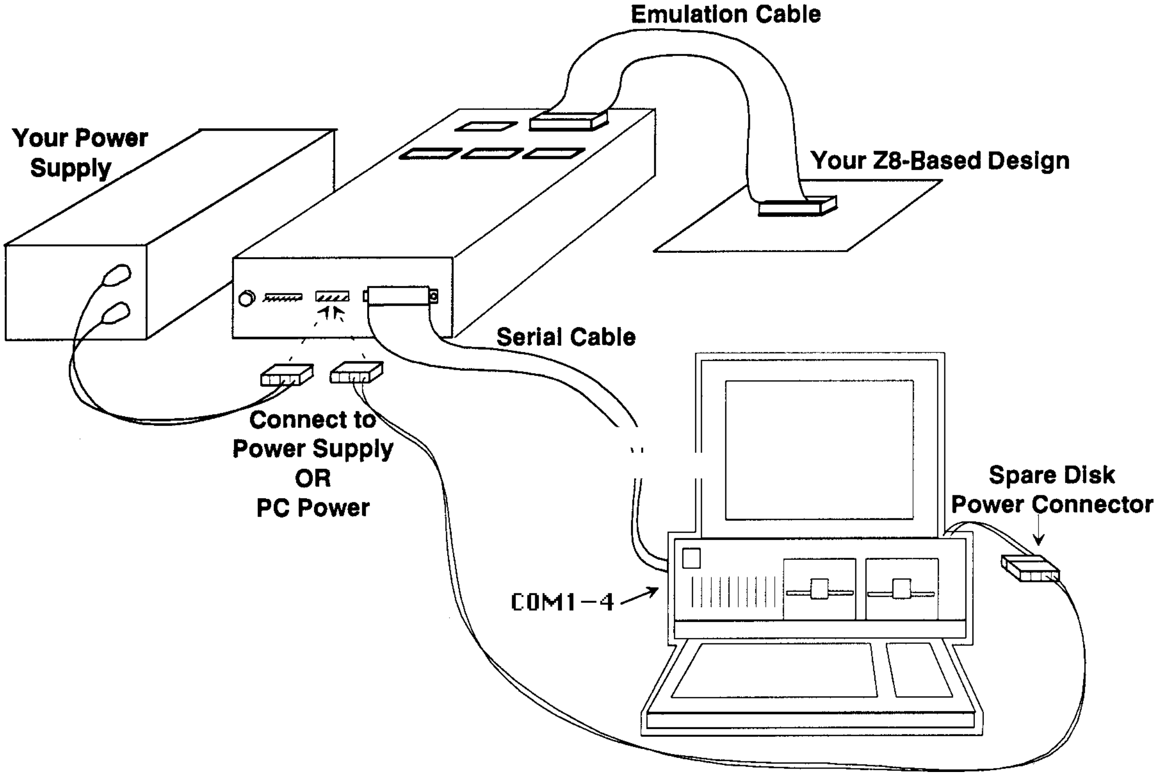


Figure 2-2. Emulator Hook-Up Diagram

Setting Up the Oscillator and Option Jumpers. The oscillator and option jumpers are accessible on top of the emulator (see Figure 2-3). The clock for the emulated Z8 CCP™ can be provided from an oscillator in the emulator or from a TTL-level clock on your design. For electrical reasons, it cannot be provided from the oscillator on your design until you're done using the emulator and have done one of three things: 1) programmed an EPROM or OTP Z8 and installed it in your design, 2) programmed an external EPROM and installed it and a ROMless Z8 in your design, or 3) installed a masked-ROM Z8 in your design.

Note: Each emulator is shipped with a standard oscillator, typically 12 MHz. If you want another rate, remove the stock oscillator and install a different one.

The option jumpers, which are located on the top cover, allow you to configure things like whether the emulator provides power to your design on the V_{cc} pin(s) of the emulated Z8 CCP, and how the clock pin of the emulated Z8 CCP is connected (refer to Table 2-1).

INSTALLING THE HARDWARE (Continued)

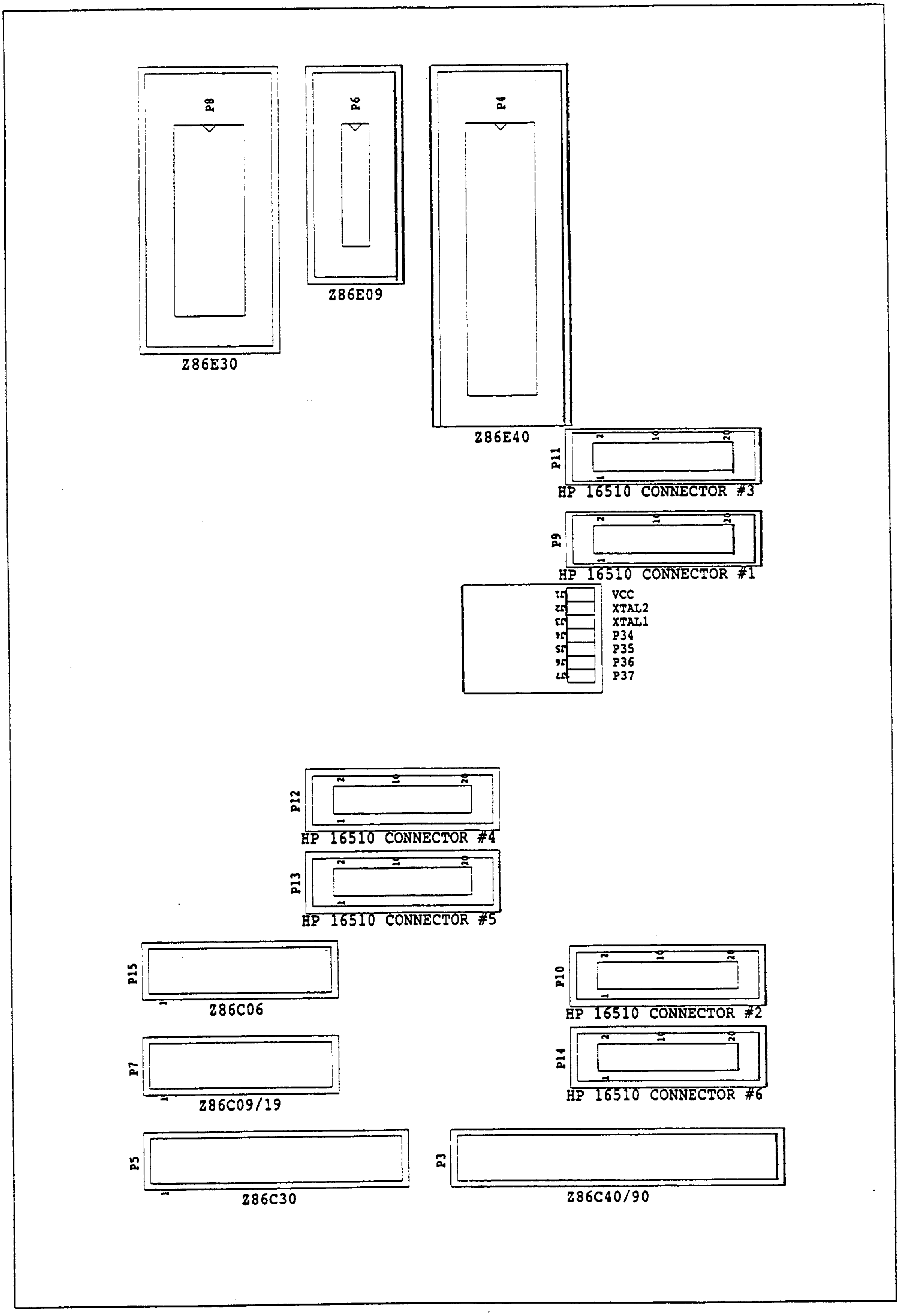


Figure 2-3. Emulator (Top View) for Jumper Locations

Table 2-1. Emulator Jumper Options

Jumper	Installed	Open
J1	Emulator supplies power to target board via V_{CC} pin(s) of Z8® CCP™.	Emulator power isolated from target board.
J2	XTAL2 pin of the emulator ICE chip is connected to XTAL2 pin of Z8 CCP Pod. (Target board can use clock from emulator — remove crystal.) Refer to Figure 2-4.	XTAL2 not interconnected.
J3	XTAL1 pin of Z8 CCP emulator connected to XTAL1 pin of Z8 CCP Pod. (Target clock runs emulator— remove crystal.)	XTAL1 not interconnected.
J4–J7	Reserved.	Reserved.

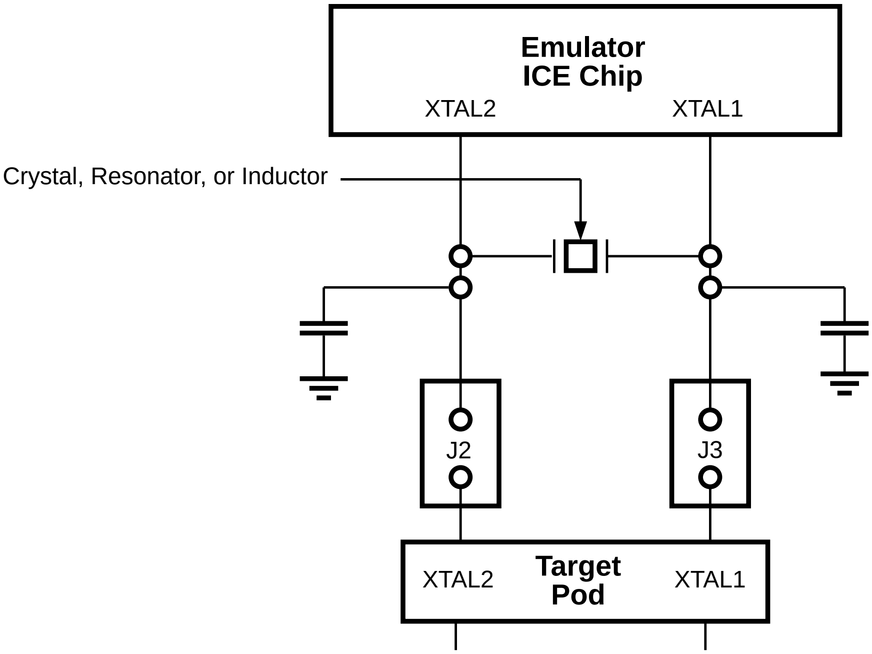


Figure 2-4. Jumper Options Diagram

INSTALLING THE HARDWARE (Continued)

Connecting to a Logic Analyzer. Connect termination adapters between each gray connector on top of the emulator and the pod connector of the logic analyzer.

Table 2-2. Emulator Logic Analyzer Connections

	HP	P9 (Con. 1)	P10 (Con. 2)	P11 (Con. 3)	P12 (Con. 4)	P13 (Con. 5)	P14 (Con. 6)
Pin	Analyzer	Sig. Name	Sig. Name	Sig. Name	Sig. Name	Sig. Name	Sig. Name
1	(NC)	(NC)	(NC)	(NC)	(NC)	(NC)	(NC)
2	(NC)	(NC)	(NC)	(NC)	(NC)	(NC)	(NC)
3	CLK	/AS	/DS	SCLK	/REGWR	/REGRD	/MAS
4	D15	A15	ICRAM	P37	/BRP_ROM	TCLK	P17
5	D14	A14	/DS	P36	P20_DI	/CE_ERF	P16
6	D13	A13	/AS	P35	CT0	/REGWR	P15
7	D12	A12	R/W	P34	P27_D0	/REGRD	P14
8	D11	A11	SCLK	P33	/STOP	RBP3	P13
9	D10	A10	/SYNC	P32	P34_SK	RBP2	P12
10	D9	A9	IACK	P31	/STOPREC	RBP1	P11
11	D8	A8	/RESET	P30	P35_SS	RBP0	P10
12	D7	A7	D7	P27	IWD7	RA7	P07
13	D6	A6	D6	P26	IWD6	RA6	P06
14	D5	A5	D5	P25	IWD5	RA5	P05
15	D4	A4	D4	P24	IWD4	RA4	P04
16	D3	A3	D3	P23	IWD3	RA3	P03
17	D2	A2	D2	P22	IWD2	RA2	P02
18	D1	A1	D1	P21	IWD1	RA1	P01
19	D0	A0	D0	P20	IWD0	RA0	P00
20	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd	Gnd

WARNING:

If your design already has a power supply, **do not** power from the emulator V_{CC} pin.

Powering Up. If anything unusual (such as unexpected sounds and smells) occurs the first time you turn on the power supply, quickly turn off the power supply and check your connections. If your power supply allows voltage adjustment, adjust it again to +5V. (The value may be somewhat lower than +5V because of the load of the emulator.) If it has a current meter, ensure that the emulator is drawing within the rated current.

After power-up, depress the RESET button to reset the Z8® ICE Chip. If the emulator is not powering your design through the V_{CC} pin, turn on the power supply of the design.

Powering Down. When powering down, follow the procedure described below:
1. Depress the RESET button on the emulator.
2. Power-down the target application board (if using its own power supply).
3. Remove the target pod.
4. Power-down the emulator.

EMULATOR OPERATION

Resetting the Emulator. Pressing the RESET button on the emulator resets the state of the target Z8 CCP and much of the status that you establish using the GUI. For example, it resets the emulated ROM size to 4 Kbytes, and clears all 32 Kbytes Breakpoint ROM. If your application board drives the /RESET pin of the Z8 CCP socket Low, the target Z8 CCP is reset. For example, it sets the Program Counter to %000C, but does not affect most of the other GUI and emulator status.

Note: After reset, you must wait a minimum of 5 seconds (for completion of self tests) before starting GUI.

WARNING:

To run the emulator, you must always press the RESET button on the emulator **before** selecting the Z8-ICE icon.

ROM Size. The emulator has the selectable ROM size of 4K, 8K, 16K, and 32K.

Breakpoint Implementation. The emulator bases its breakpoint facility completely on addresses, rather than on inserting special “Trap” instructions into the program, which means you can set breakpoints in ROM on your target board. The emulator reads a 32Kx1 static RAM for each cycle emitted by the Z8 CCP during code execution.

EPROM/OTP Programming

The emulator provides OTP programming for the following devices: Z86E40, Z86E06*, Z86E30, Z86E04, Z86E3, Z86E03*, Z86E08, and Z86E07†. (Refer to Table 2-3: Emulator Programming Operations and Functions.)

* OTP device not currently available.
† Use the E08 option to program the E07.

Emulator Programming Operations

Table 2-3. Emulator Programming Operations and Functions

Operations	Functions Performed
BLANK CHECK	Checks whether the OTP device is blank.
VERIFY	Compares the contents of the emulator code memory and the OTP device.
PROGRAM	Writes the contents of the emulator code memory to the OTP device.
EXAMINE	Reads the contents of the OTP to the emulator code memory.
CHECKSUM	Calculates the checksum of the OTP device only and displays it on the screen. (Note: Checksum differences are explained in the “OTP” section in Chapter 4: Summary of Windows, Commands, and Operations.)
ROM protect	ROM protection programming option.
RAM protect	RAM protection programming option.
Low Noise	Low-noise programming option for Z86E08 and Z86E04 only.
RC	RC programming option.

Notes:
1. Do not keep the OTP device in the ZIF socket while in Emulation Mode.
2. When programming a device, ensure that other programming sockets are empty.

Emulator Test Points

There are seven numbered test points on the back of the emulator; however, not all of the test points are used. The following table lists and describes the test points.

Table 2-4. Emulator Test Points

Number	Description
1	Ground
2	Goes low during data strobe when the Z8 accesses a breakpoint location.
4	Goes high whenever the emulator is emulating due to a GO; goes low due to a STOP operation.
7	If this input is low (for example, if jumpered to Test Point 1), the emulator doesn't stop emulating when it reaches a breakpoint, but continues to produce a pulse on Test Point 2.) This feature allows you to use the Breakpoint facility of the emulator to control or trigger external equipment.

CHAPTER 3

Z8® EMULATOR SAMPLE SESSION

Z8® EMULATOR SAMPLE SESSION

This sample session is designed to introduce you to the features of the Z8® graphical user interface (GUI) software and thoroughly acquaint you with the various GUI windows you will be using in this program. For best results, follow the steps in sequential order. Topic headings (such as “Using the Debug Window”) have been added to the Sample Session Procedure so you can better pinpoint specific topical “how to” information.

The chapter concludes with some brief notes and some figures that help explain the multiple window and multitasking capabilities of the GUI software. (Refer to Chapter 4: Summary of Menus, Commands, and Operations for more information about all elements of the GUI.)

Note: In order to properly demonstrate the program features, be prepared to import sample files (at procedural step 8) in this session. You can download Zilog sample files from Zilog's Bulletin Board Service (ZBBS). (Refer to Appendix A for the procedure to obtain these files.

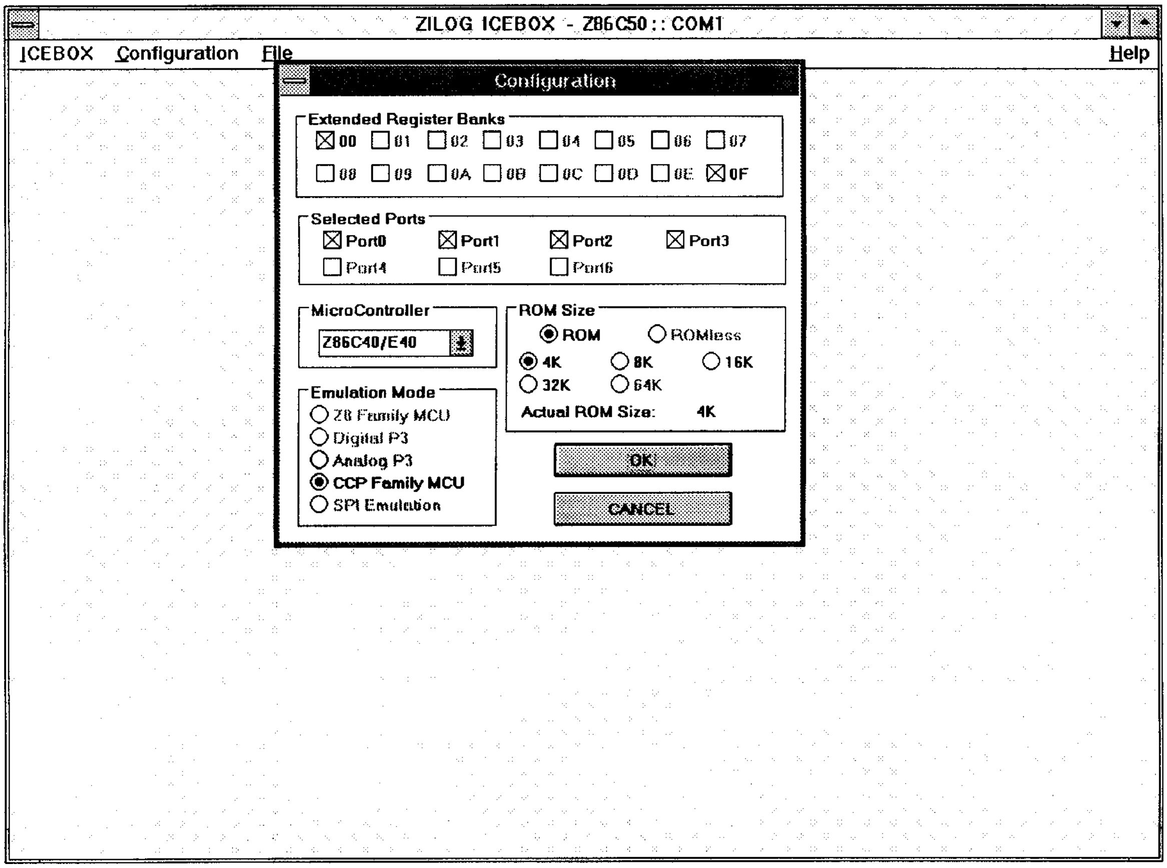
Starting the Application

1. Press the RESET button on the emulator.
2. Double click the Z8-ICE icon.
   Confirm the COM port connections; change the default if necessary. The change is saved and will become the new default the next time around. If the communication attempt between PC and the emulator fails, you may have to check the connection or reset the emulator.
3. Wait for the initialization procedure to complete.
4. Click the OK button to continue (or the CANCEL button to quit), after the self-testing results are displayed.

Z8® Microcontroller Emulation

5. Select the Z8 microcontroller currently being emulated from the microcontroller section in the Configuration Dialog Box (see Figure 3-1).

Z8 EMULATOR SAMPLE SESSION (Continued)



Extended Register Banks
☒ 00 □ 01 □ 02 □ 03 □ 04 □ 05 □ 06 □ 07
□ 08 □ 09 □ 0A □ 0B □ 0C □ 0D □ 0E ☒ 0F

Selected Ports
☒ Port0 ☒ Port1 ☒ Port2 ☒ Port3
□ Port4 □ Port5 □ Port6

MicroController
Z86C40/E40

ROM Size
● ROM ○ ROMless
● 4K ○ 8K ○ 16K
○ 32K ○ 64K
Actual ROM Size: 4K

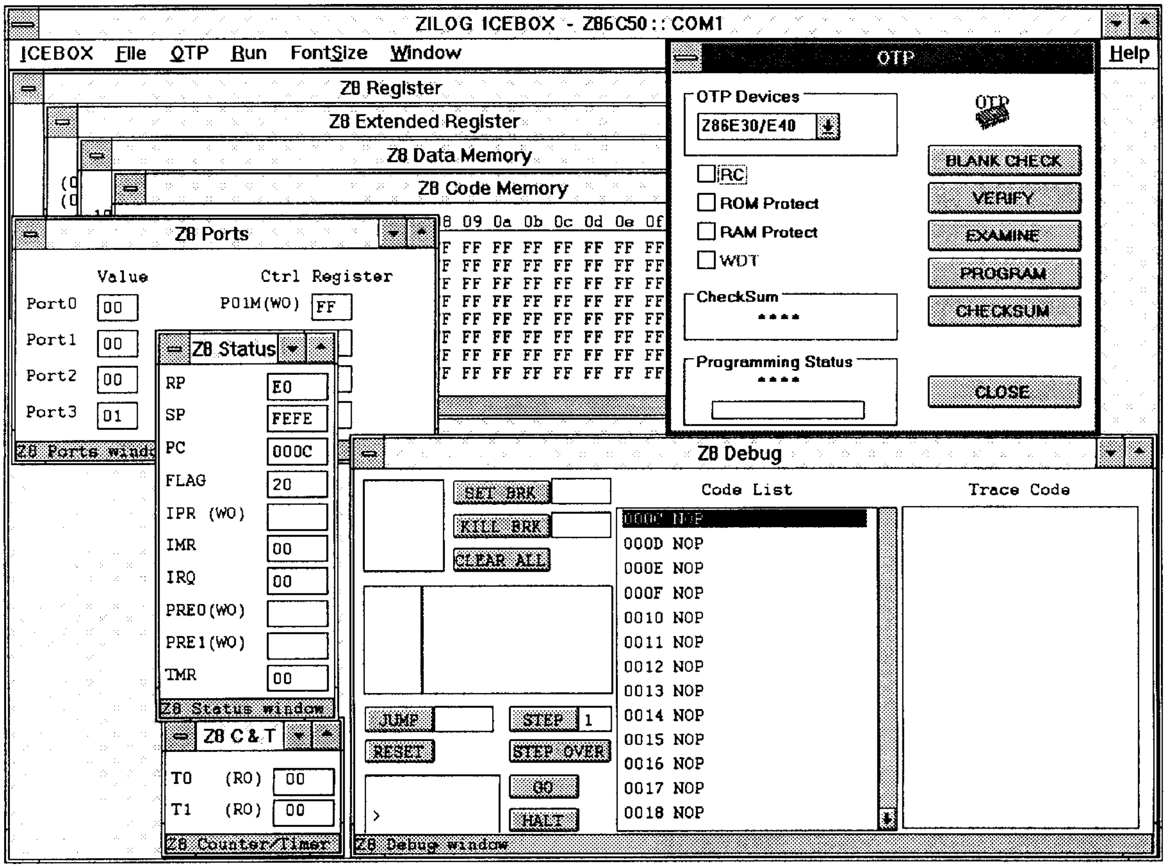
Emulation Mode
○ Z8 Family MCU
○ Digital P3
○ Analog P3
● CCP Family MCU
○ SPI Emulation

Figure 3-1. Zilog ICEBOX Configuration Dialog Box

6. Select the emulation ROM size (see Figure 3-1, which shows this value as “4K”). This affects the size of the code file you can download.

   Note: The Configuration dialog box is only accessible when no other window is open.

7. Click on the OK button (or depress the RETURN key) to accept the configuration.
8. Open the Code Memory window under the menu named ICEBOX.
   If the characters are either too small or too large, use the Font Size menu to choose an appropriate font size. You can scroll up and down the memory space, “size” the window, make direct memory changes, and use the tracking facility to reach a particular memory location.



```
8  09 0a 0b 0c 0d 0e 0f
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
F  FF FF FF FF FF FF FF
```

	Value	Ctrl Register	
Port0	00	P01M(WO)	FF
Port1	00		
Port2	00		
Port3	01		

RP	E0
SP	FEFE
PC	000C
FLAG	20
IPR (WO)	
IMR	00
IRQ	00
PRE0(WO)	
PRE1(WO)	
TMR	00

T0 (RO)	00
T1 (RO)	00

OTP Devices: Z86E30/E40

□ RC
□ ROM Protect
□ RAM Protect
□ WDT

CheckSum: ****

Programming Status: ****

STEP 1

```
Code List          Trace Code
000C NOP
000D NOP
000E NOP
000F NOP
0010 NOP
0011 NOP
0012 NOP
0013 NOP
0014 NOP
0015 NOP
0016 NOP
0017 NOP
0018 NOP
```

>

Figure 3-2. Various ICEBOX Windows

Monitoring/Modifying/Downloading Files

9. Use the File menu to download your sample file to the Z8® Code Memory (refer to Appendix A: How to Receive Zilog Sample Files). The Code Memory window is updated to show the current memory content.

   Note: When downloading a hexadecimal file, the file size showing in the file downloading dialog box is the size of the memory the downloaded file will occupy, not the actual file size.

10. Open a Register window and modify the values of the registers.

    Note: Be careful in modifying ports or read-only registers, since the values represented on the screen cannot be changed for those registers. The write-only registers will display values that may not represent the real values loaded for those registers.

11. Open an Extended Register window and modify the registers.
12. Open a Status window and a Counter/Timer window to monitor the special registers.

Using the Debug Window

13. Open the Debug window.
    The content of the Program (Code) Memory is disassembled and listed here. You can do line-down or page-down to get around in the code list, but **page-up or line-up is not supported**. You can do a direct jump to any particular memory address.
14. Set a break point and start the program by clicking the GO button.

    Notes:

    1. The mouse cursor is changed to a sand glass shape. The only action allowed after a “GO” is halt. If there are no break points, click on the HALT button to halt the execution.
    2. If the application inadvertently goes into STOP 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 RESET button.

15. Click on the HALT button to halt an execution.

OTP Operations

16. Select the OTP menu item under the Code Memory menu or Debug menu of the emulator. An OTP dialog box is opened from which you can perform the operations of OTP. Close the OTP window by selecting the Quit menu item.

Window Refresh

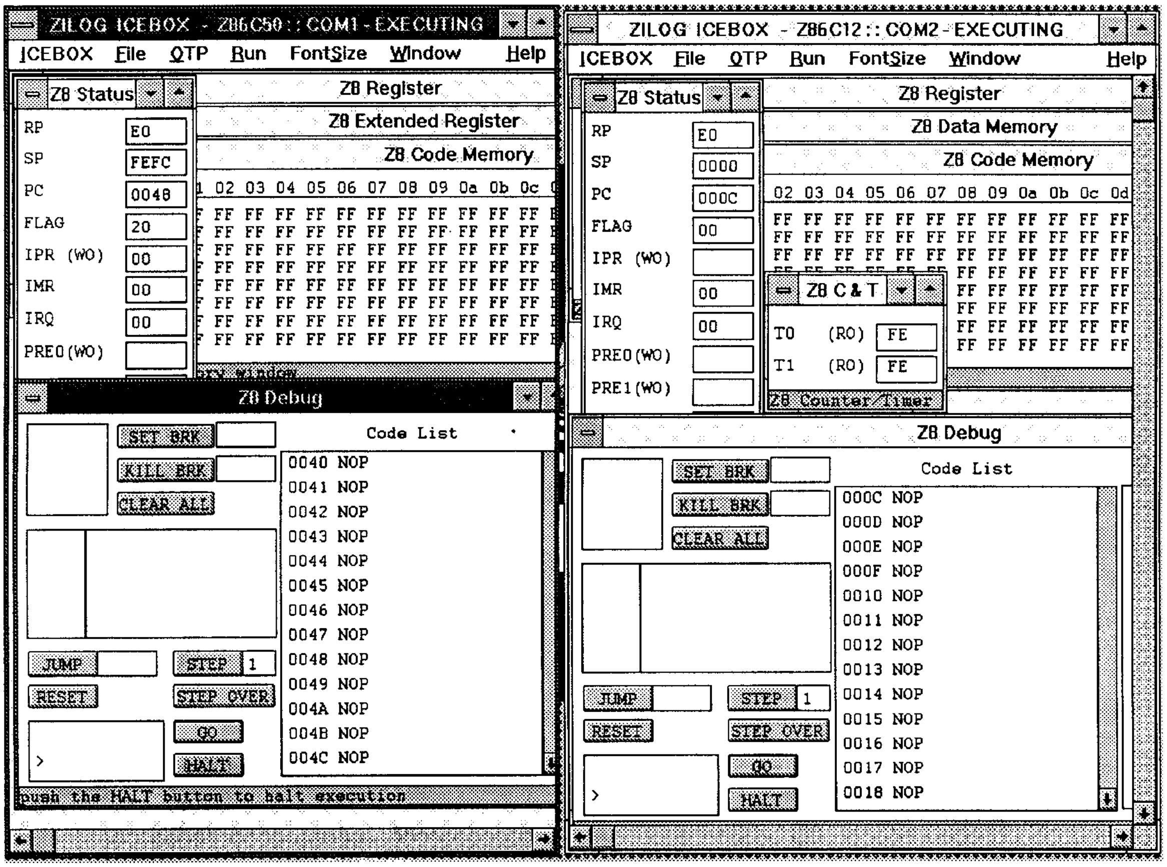
17. Double click on caption bar of the Register window to refresh it and check the value of the registers.

Saving and Quitting

18. Select “Save Session” from the File menu to save the current setting in a session file. The next time you use the interface, you can reload the last session by using the “Load Session” command in the File menu.
19. Quit the application.

RUNNING MULTIPLE INSTANCES

The Z8® emulator will allow several emulators running at the same time, if your PC has more than one communication port. Figure 3-3 shows two emulators running at the same time.



ZILOG ICEBOX - Z86C50 :: COM1 - EXECUTING

```
RP         E0
SP         FEFC
PC         0048
FLAG       20
IPR (WO)   00
IMR        00
IRQ        00
PRE0(WO)
```

```
1 02 03 04 05 06 07 08 09 0a 0b 0c
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
F FF FF FF FF FF FF FF FF FF FF FF
```

STEP 1

```
0040 NOP
0041 NOP
0042 NOP
0043 NOP
0044 NOP
0045 NOP
0046 NOP
0047 NOP
0048 NOP
0049 NOP
004A NOP
004B NOP
004C NOP
```

push the HALT button to halt execution

ZILOG ICEBOX - Z86C12 :: COM2 - EXECUTING

```
RP         E0
SP         0000
PC         000C
FLAG       00
IPR (WO)
IMR        00
IRQ        00
PRE0(WO)
PRE1(WO)
```

```
T0   (RO)   FE
T1   (RO)   FE
```

```
02 03 04 05 06 07 08 09 0a 0b 0c 0d
FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF FF FF FF FF FF FF FF FF FF
                  FF FF FF FF FF FF
                  FF FF FF FF FF FF
                  FF FF FF FF FF FF
                  FF FF FF FF FF FF
                  FF FF FF FF FF FF
```

STEP 1

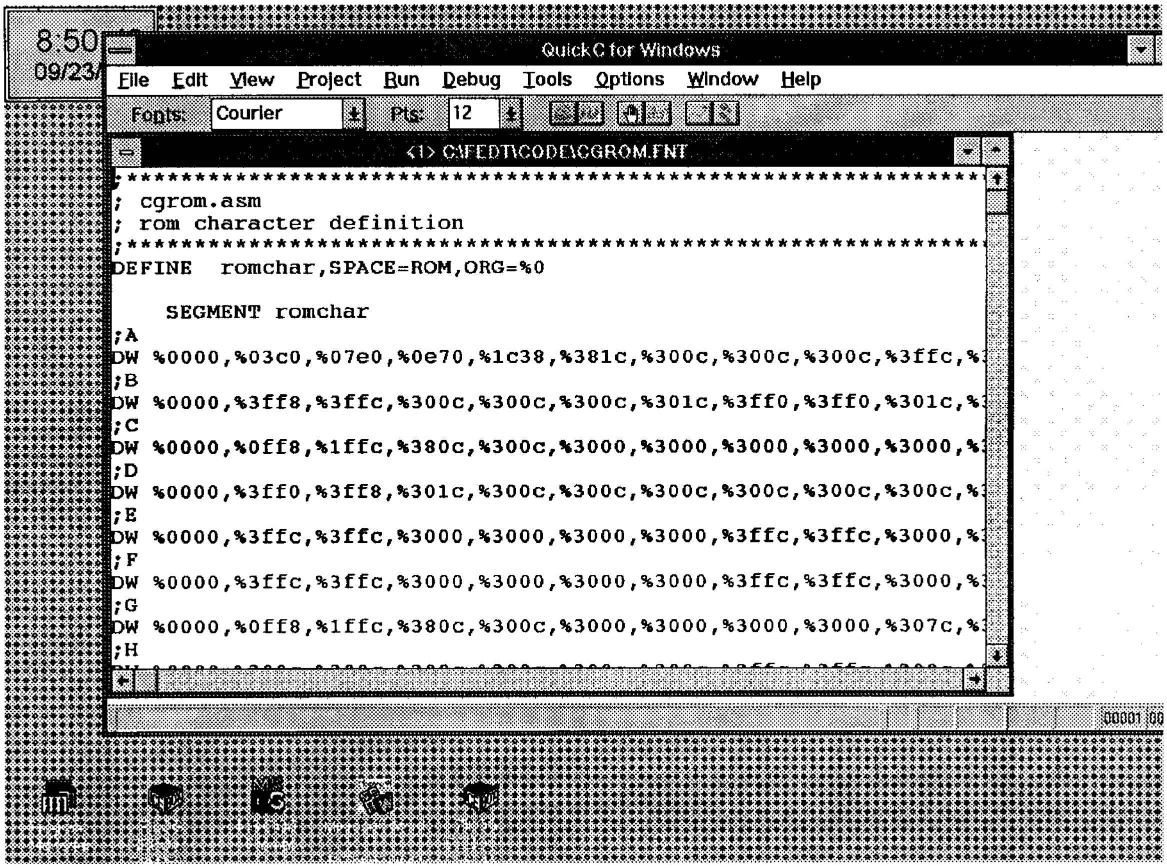
```
000C NOP
000D NOP
000E NOP
000F NOP
0010 NOP
0011 NOP
0012 NOP
0013 NOP
0014 NOP
0015 NOP
0016 NOP
0017 NOP
0018 NOP
```

Figure 3-3. Running Multiple Instances

Note: Running multiple instances of the Z8 emulator GUI (two or more emulators running simultaneously) requires more memory than single-emulation operation; therefore, we recommend using a PC with 8 Mbytes RAM. In addition, two more communication ports are needed when running multiple instances.

MULTITASKING WITH OTHER WINDOWS APPLICATIONS

You can simultaneously run your emulator and other windows applications. Figure 3-4 shows an emulator working under the MS-Windows multitasking environment.


8:50
09/23/
QuickC for Windows
File Edit View Project Run Debug Tools Options Window Help
Fonts: Courier
Pts: 12
<1> C:\FEDT\CODE\CGROM.FNT
00001 00

```
;*****************************************************************
; cgrom.asm
; rom character definition
;*****************************************************************
DEFINE   romchar,SPACE=ROM,ORG=%0

    SEGMENT romchar
;A
DW %0000,%03c0,%07e0,%0e70,%1c38,%381c,%300c,%300c,%300c,%3ffc,%
;B
DW %0000,%3ff8,%3ffc,%300c,%300c,%300c,%301c,%3ff0,%3ff0,%301c,%
;C
DW %0000,%0ff8,%1ffc,%380c,%300c,%3000,%3000,%3000,%3000,%3000,%
;D
DW %0000,%3ff0,%3ff8,%301c,%300c,%300c,%300c,%300c,%300c,%300c,%
;E
DW %0000,%3ffc,%3ffc,%3000,%3000,%3000,%3000,%3ffc,%3ffc,%3000,%
;F
DW %0000,%3ffc,%3ffc,%3000,%3000,%3000,%3000,%3ffc,%3ffc,%3000,%
;G
DW %0000,%0ff8,%1ffc,%380c,%300c,%3000,%3000,%3000,%3000,%307c,%
;H
```

Figure 3-4. Multitasking with Other Windows Applications

CHAPTER 4

SUMMARY OF MENUS, COMMANDS, AND OPERATIONS

MAIN MENU

ICEBOX Configuration File Help

The Main Menu window of the emulator graphical user interface (GUI) is displayed after the GUI program is started. The following menu items can be accessed from this Main Menu:

- ICEBOX Menu
- Configuration Dialog Box
- File Menu
- Help

Each of these Main Menu items, along with all windows, subset menus, menu items, commands, and operations, are summarized in the following sections of this chapter.

CONFIGURATION DIALOG BOX

At start-up, the emulator GUI automatically detects which emulator is in use. (The user, however, can overwrite this by using a command-line option.) When a configuration dialog box is shown on the screen, you can choose the microcontroller and the ROM size you want to emulate. The code file you download to Code Memory is limited to the ROM size selected. Selected ports automatically reference port availability in the selected microcontroller. Other information about the microcontroller, such as the number of ports and extended register banks, can be observed but cannot be altered. Click the OK or CANCEL button to confirm or cancel the configuration.

Note: To modify the configuration, you must first close all open windows; the configuration command then reappears in the Main Menu.

FILE MENU

File-related commands are grouped under this menu. These commands are briefly described below.

Download To Z8 Code Memory: download a piece of Intel hexadecimal (hex) or binary format code to Code Memory (Note that when downloading a hex file, the file size showing in the file downloading dialog box is the size of the memory the downloaded file will occupy, not the actual file size.)

FILE MENU (Continued)

Upload Code Memory: Save Z8® Code Memory (part or whole) to a file in binary or Intel hex format.

Upload Data Memory Save Z8 Data Memory (part or whole) to a file in binary or Intel hex format.

Open Session: Load a previously saved session.

Save Session: Save the information of the current session: window positions, code file name, debug flags, font size, and so on, into a file that has a default extension ".prj."

ICEBOX MENU

ICEBOX Configuration File Help

From this menu you can open a number of windows and exit the application. Some windows can be opened multiple times, such as Registers, Ext. Registers, Code Memory, Data Memory, Status, Ports, and Counter/Timers. The Debug window can only be opened once. (A grayed menu item means that the corresponding window cannot be opened from the selected menu.)

Registers

The following menu bar is displayed when the Registers menu item is selected:

ICEBOX File Tracking Font Size Window Help

Register Window

This window displaying the Z8 register file can be edited directly at the location of the cursor. The ASCII representation of the contents is on the right. The current “working register bank” is highlighted. The cursor can be moved around the window by using the mouse or the arrow keys or by setting tracking options in the “Tracking” menu.

ICEBOX File Tracking Font Size Window Help

Selecting the "Tracking" menu produces the following menu items: Absolute Address Dialog Box, the Indirect (@Rg) Dialog Box, and the Register Pointer Message Box, which displays the register pointer value in hex format.

Absolute Address

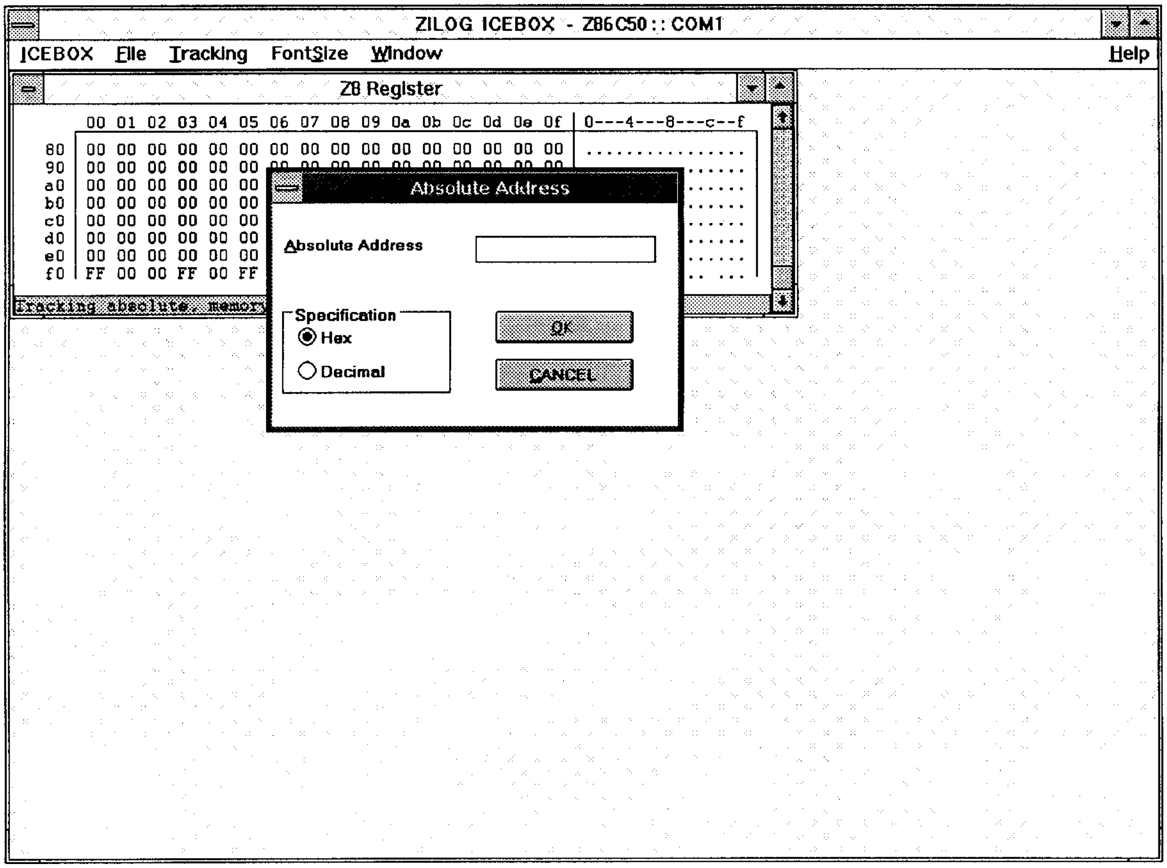
You can track to a register by its absolute address by entering the absolute address value in the dialog box that appears when Absolute Address is selected from the ICEBOX Tracking menu. The Absolute Address Dialog Box is shown in Figure 4-1

Indirect (@Rg)

You can indirectly track to a register (contents of which are the address of another register) by entering the value in the Indirect (@Rg) Dialog Box, which appears when the Indirect (@Rg) menu item is selected from the ICEBOX Tracking menu.

Register Pointer

The Register Pointer Message Box displays the address of the content of the Register Pointer register. After clicking the OK button, the address value will be highlighted in the Z8 Register window.



```
     00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f | 0---4---8---c--f
 80 |00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 | ................
 90 |00 00 00 00 00 00                               |           ......
 a0 |00 00 00 00 00 00                               |           ......
 b0 |00 00 00 00 00 00                               |           ......
 c0 |00 00 00 00 00 00                               |           ......
 d0 |00 00 00 00 00 00                               |           ......
 e0 |00 00 00 00 00 00                               |           ......
 f0 |FF 00 00 FF 00 FF                               |           .. ...
Tracking absolute, memory
```

Absolute Address:

Specification
● Hex
○ Decimal

Figure 4-1. ICEBOX Absolute Address Tracking Window.

Font Size

You can choose from a number of font sizes: Point 6 to Point 12. However, since each system and video type may have its own font set, some font sizes may not be suitable, especially on a VGA display.

Window

The currently opened windows are listed under this menu. You can rearrange the positions of the windows on the screen in different ways by using the commands from this menu.

ICEBOX MENU (Continued)

Ext. Registers

The following menu bar is displayed when the Registers menu item is selected:

ICEBOX File Define Font Size Window Help

Ext. Registers Window

This window displays the available extended register banks of the emulated microcontroller. You can display more banks by selecting the Define menu item. The bank selected by the register pointer is highlighted. Editing can be done directly on all banks without changing the register pointer.

Data Memory

The following menu bar is displayed when the Data Memory menu item is selected:

ICEBOX File Tracking Edit OTP Font Size Window Help

Data Memory Window

This window displays the Z8 Data Memory (sometimes called External Memory). Notice that Data Memory has to be present, otherwise nothing meaningful is displayed. Editing and tracking can be performed.

Tracking

Selecting the Tracking menu produces windows similar to those from the Registers menu (see preceding Registers section); however, the Data Memory Tracking menu includes an Index Address Dialog Box, where you can enter Bank Address, Index Register, and you can select hex or decimal specifications (refer to Figure 4-2).

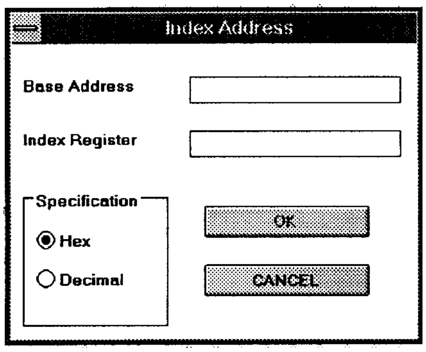


Figure 4-2. ICEBOX Data Memory Tracking Index Register

Stack Pointer

Selecting the Stack Pointer menu item from the Tracking menu produces a message box that displays the Stack Pointer value in hex format. After clicking the OK button, the address value will be highlighted in the Z8 Register window, if the value is in the range of Data Memory.

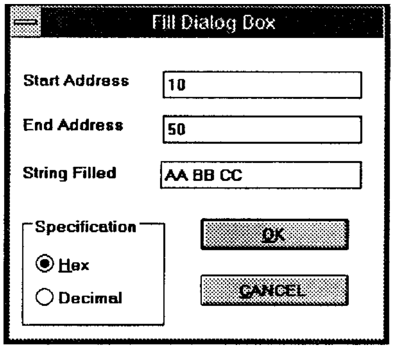
Note: The Program Counter menu item is not active from this part of the program.

ICEBOX File Tracking Edit OTP Font Size Window Help

Edit

Selecting the Edit menu from Data Memory produces two menu items: Fill and Clear All. The Fill Dialog Box has entry fields for Start Address, End Address, and String Filled (refer to Figure 4-3). The Clear All menu item provides the option of filling Z8 Data Memory with the FF (hex) value.

Note: The OTP menu and the Program Counter menu item are highlighted in gray; therefore, they are not active from this part of the program.



Start Address 10

End Address 50

String Filled AA BB CC

Specification
● Hex
○ Decimal

Figure 4-3. ICEBOX Data Memory Edit Menu Showing Fill Dialog Box.

Code Memory

Selecting the Code Memory menu item from the ICEBOX menu displays the following menu bar across the window.

ICEBOX File Tracking Edit OTP Font Size Window Help

The Code Memory window displays the Z8 Code Memory, where editing and tracking can be performed. (Refer to the preceding Data Memory section for a summary of the menu bar items and windows.)

Note: The Stack Pointer menu item under the Tracking menu is not active from this part of the program.

ICEBOX MENU (Continued)

OTP

The OTP menu is accessed from both the Code Memory menu and the Debug menu. (Refer to the proceeding Debug menu section for a complete description of OTP functions and commands.)

Status

The Status window displays some of the more important registers. The contents can be displayed in hexadecimal or binary format.

Counter/Timers

The Counter/Timer window displays the counters and timers of the current emulator. The contents can be displayed in hexadecimal or binary format.

Ports

The Ports window displays all ports and corresponding registers of current emulator. Some of the control registers are Write Only; therefore, the value will always be displayed as FF (hex) or 11111111 (binary).

Debug

Selecting Debug from the ICEBOX menu displays the following menu bar:

ICEBOX   File   OTP   Run   Font Size   Window   Help

The Debug window allows you to view the assembly code, set break points, trace through the code, and perform other debug operations. The Run menu and associated menu items are summarized, followed by brief descriptions of the Debug window elements:

File Menu

The File Menu under Debug provides the same menu items as the File menu accessed from the Main Menu, with the exception of the Load Symbol menu item.

Load Symbol — Load the symbol file to the Debug window.
To generate a symbol file, select the Zilog, Wolfgang, or 2500AD formats.

Refer to Appendix B for more information on symbol file formats and how to generate symbol files.

OTP

The CCP™ emulator provides OTP programming capabilities. Several operations can be performed:

Table 4-1. OTP Programming Operations and Functions

Operations	Functions Performed
BLANK CHECK	checks whether the OTP device is blank.
VERIFY	compares the contents of the Z8® Code Memory and the OTP device.
EXAMINE	copies the contents of the OTP device to the Z8 Code Memory.
PROGRAM	writes the contents of the Z8 Code Memory to the OTP device.
CHECKSUM	calculates the Checksum of the OTP device only and displays it on the screen.

Notes:

1. To obtain a Data I/O (such as UniSite, 3900, or 2900) calculated Checksum, the user should first download the file with 00 padding option, then perform the OTP programming. This is because Data I/O fills its memory with 00 after power up.
2. Checksum differences may occur. During user-program download, the memory is padded with code outside the user program memory if the user program is less than the emulation memory. The memory is padded with either 00, FF, or nothing according to user selection. This will not effect the user program; however, it will effect the calculation of the Checksum during the OTP programming because the Checksum is calculated through out the whole memory size of the OTP.

ICEBOX MENU (Continued)

ICEBOX File OTP Run Font Size Window Help

Run

Selecting the Run menu displays four menu items (Trace Code, Trace Call, Animate, and Clear Trace), each of which, when selected, provides further program options. Each of the Run menu items are briefly explained below. (Refer to "Debug Window Elements" for further information about specific program commands and operations that appear as part of the Debug window.)

Trace Code

Selecting the Trace Code item provides a line-by-line trace capability while running the Debug program.

Trace Call

Selecting the Trace Call item provides a trace capability of the functions calls while running the Debug program.

Animate

The Animate item allows you to single-step through the various stages of execution. Note that the information is not displayed in real time.

Clear Trace

Selecting the Clear Trace menu item clears the content of the Trace field.

Debug Window Elements

Code List

The content of the Z8 Code Memory is disassembled and displayed and any changes made to the memory are immediately reflected here. (Only line-down and page-down scrolling are allowed.) Use the JUMP button to go to an address outside the visible range. Clicking on a code line causes the address of that line to be inserted into the SET BRK, KILL BRK, and JUMP edit boxes.

Break Points

When you click on the SET BRK button, a break point is set at the address shown in the edit box. When you click on the KILL BRK button, the break point at the address shown in the edit box is deleted. The break point list box at the upper left corner of the window shows all the break points set. A click on the CLEAR ALL button deletes all the break points.

Jump/Reset

Click on the JUMP button to set the program counter to the address shown in the edit box. This is also a way to navigate the code listing.

Click on the RESET button to set the program counter to address 000c hex. A subsequent click of the GO button will cause the emulator to perform a RESET and then execute the Z8 code.

If you click the STEP button (instead of the GO button) the emulator will execute code, but **will not** cause a device reset on the Z8 ICE chip.

Trace Code/Animate

Animation is a mode where the code is continuously "single-stepped" through. A "GO" command will start the single steps and the current location of the PC will be displayed at each step. The trace option only works with Animation. You have the choice of tracing all instructions or tracing only the calls. The traced code is displayed in the Trace Buffer on the right of the window, which shows the last 100 traced entries.

Notes:

1. To execute code in real time, the Animation feature must be disabled. Trace or Animation options can be set from the "Run" menu.
2. Animation is not in real time.

Step/Step Over

Click on the STEP button to do single steps. The number of steps is determined by the number shown in the edit box (maximum of 99 steps). Never process the STEP command through the HALT or STOP instruction in your code, because the communication will be closed after processing the HALT or STOP command. "STEP OVER" only does one step at a time. It is the same as the STEP command except when the current instruction is a "CALL subroutine." In that case, the subsequent code is executed in real time until the program returns from the subroutine. STEP OVER has the same effect as setting a break point at the instruction immediately following the current one, and executing the GO command.

Go/Halt

You can click on the GO button to start the execution of the Z8 program. If the Animation flag is off at this point, the execution is real time. Otherwise, it is simulated by single steps. After a "go," the program stops when it hits a break point, a STOP or HALT instruction, or when you click on the HALT button. After a "go," the user should not attempt any other operation except clicking on the HALT button to halt the execution.

Note:

If the application inadvertently goes into Stop 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 TARGET RESET button.

Line Assembler

From the Code List field in the Debug window, you can change the Code Memory by entering the assembly code directly into the window line by line. After you input a line of assembly code, you can depress the Return key. The assembled code is then written to Code Memory.

Symbol Table

The window for the Symbol Table is located above the JUMP button. The Symbol Table can be loaded only under the following conditions:

1. A file has been downloaded into Code Memory.
2. The Debug window is selected; otherwise, the command is not accessible.

Once these requirements are satisfied, the Symbol Table command can be executed from the File menu.

For more information on symbol formats, refer to "Load Symbol", which is previously discussed in the "File" menu section of this chapter.

WINDOW REFRESHING

When you make a change in the Z8 Code Memory window, the code view in the Z8 Debug window will be updated automatically. When you run a program from the Z8 Debug window, the Z8 Status window will be updated automatically at each step, halt, or breakpoint. All the other windows (Z8 Register, Z8 Extended Register, Z8 Code Memory, Z8 Data Memory, DSP Memory) will not be updated automatically when the program runs. To refresh the window display to reflect the current hardware values, double click the caption bar of each window.

SAVING SESSIONS/RELOADING "SAVED" SESSIONS

You can save a session and reload a “saved” session. Selecting “Save session” saves the information about the position of the opened windows, downloaded Z8 code file, font size used, and debug flags such as “Trace” and “Animation”. Not all windows reappear upon reloading of a "Saved" session.

HARDWARE RESET

When you press the emulator RESET button (or power-down, then immediately power-up), the GUI will pick up the signal from the emulator after about 5 seconds. The initial blue screen and the ZILOG logo will be shown while the emulator goes through the initialization sequence.

Note: You may have to move the mouse slightly or press a key in order for the GUI to "pick up" the reset signal.

HELP

The on-line Help program is available to provide brief help messages on various topics. The Help program features an index that easily references the ICEBOX commands and procedures. Topics covered under Help include:

- Index of the Help Program
- Keyboard Commands
- ICEBOX Commands
- Glossary of ICEBOX Program Terms
- Procedure for Using the Emulator
- How to Use Help
- ICEBOX Release Information

CHAPTER 5

TROUBLESHOOTING GUIDE AND PRECAUTION LIST

TROUBLESHOOTING GUIDE

1. Blue Zilog screen not appearing after selecting COM port and screen message displays "Time-out while reading ..."

a. check RS-232 cable connection.
b. check 19200 baud on selected COM port.
c. check if transmit/receive signals need to be swapped.

Note: On some DB9 connectors for the COM ports, the transmit/receive signal may be swapped and a "Null Modem" adapter may be required.

d. check if power supply can supply required current to the emulator.
e. check if power supply is set at correct voltage.
f. check if power supply is connected and turned on.
g. after resetting emulator, you must wait 5 seconds (minimum) before running the GUI software.

2. SELF TEST Failure

a. if "Register test fail" then check if target crystal labeled X1 and crystal load capacitors labeled "C1" and "C2" are in their socket.
b. if "Monitor RAM fail" then check U4 for damage or broken/bent leads/cold solder joints.
c. if "Break point RAM fail" or "User RAM fail" then check U13, U9, and U10 for damage or broken/bent leads/cold solder joints.
d. if depressing the emulator RESET button does not correct "SELF TEST Failure", then power-down the emulator, power-up again, then depress the emulator RESET button again.

3. OTP Program Failure

a. reset OTP device in socket and make sure there is good contact between socket and device leads. Reprogram OTP device.
b. check for worn socket. Replace socket if necessary.

4. V_{CC} Contention. To avoid V_{CC} contention when a separate V_{CC} is supplied to target, ensure that jumper J1 is not connected.

5. XTAL Contention. If XTAL is used on target and J2 and J3 are installed, ensure that XTAL is removed from emulator.

TROUBLESHOOTING (Continued)

6. Clicking on the HALT button does not halt the emulator execution. If the application inadvertently goes into STOP 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 RESET button. (This will reset the emulator.)

7. CHECKSUM differences may occur because during download of the user program the memory is padded with code outside the user program memory if the user program is less than the emulation memory. The memory is padded with either 00, FF, or nothing according to the selection by the user. This will not effect the user program. However, it will effect the calculation of the CHECKSUM during the OTP programming, because the CHECKSUM is calculated through out the whole memory size of the OTP.

8. Single-stepping into the Stop instruction will cause the ICE Chip to lock up, resulting in register failure during the Self Test. The emulator must be powered down and powered back up again.

9. Halting the program execution or breakpointing when interrupts are enabled will globally disable interrupts. The program must be reset and started from address 0000c hex.

10. Breakpointing in interrupt service routine and single-stepping pass the IRET statement will cause global interrupts to be disabled.

11. Do not put breakpoint at address after Stop instruction. This will cause program counter to continue at that location after a Stop-Mode Recovery.

12. Low-current pull-ups/pull-downs/drivers may see slower rise and fall times when the emulation cable is used due to additional inductance and capacitance of the cable.

PRECAUTION LIST

All Devices

1. Program Counter jumps to strange address.
a. stack not set to internal. Register %F8 (P01M Register) bit D2 not set to 1 state.
b. Stack Pointer Register %FB (SPH) and Register %FF (SPL) are not initialized. For internal stack, SPH does not have to be initialized since it is not used.
c. any instruction other than a “DI” instruction was used to disable interrupts.
d. the stack over flowed into the general register locations.
e. extra “POP”, “PUSH”, “IRET”, or “RET” was encountered.

2. 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.
c. single-steps more than 256 times.
d. refer to item "Precaution List—All Devices" No. 1.

3. All Z8® control registers are write only unless stated otherwise.

4. Programming the ROM protect bit on all Z8s and Z8 OTPs will disable all use of the LDC, LDCI, LDE, and LDEI instructions. Thus ROM protect does not support the use of a ROM look-up table. The value must be loaded as “immediate values.”

5. The special OTP programming options such as ROM protect, RAM protect, Low Noise, and RC will be programmed if the option has been selected and the VERIFY command was then executed.

6. Power Supply ramp-up/rise time must be such that when minimum power on reset time (T_{POR}) expires then the V_{cc} must be in the supported specified operating range of the device.

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

8. 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.

9. 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/ undefined value in the general-purpose registers.

Z86C03/06/09/16

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

2. For Z86C03/06/09/16/19/30/31 and Z86E03/30/31, 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 64 internal system clocks from the start of program execution.

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

Z86E04/E08/E07

1. Z86E04 and Z86E08 have special features such that programming the ROM protect mode will also put the device in Low EMI mode, where XTAL frequency = internal SCLK and all output drive capabilities are reduced by 75%.

PRECAUTION LIST (Continued)

Z86C30/31 and Z86E30/31

1. The Z86C30/31/40/50/89/90 and Z86E30/31/40 have the P32 comparator output coming out of P37.

2. Reg (F) %00 PCON has D2 controlling the open-drain for Port 0 and D1 controlling the open-drain for Port 1. This is for the following:
   Z86C30/31/40/50/89/90
   Z86E30/31/40

3. For Z86C03/04/06/07/08/09/16/19/30/31 and Z86E03/04/07/08/30/31, the register %F8 (P01M register) bits D4 and D3 must be set to state 0 and bit D2 must be set to state 1.

4. WDT Register (F) %0F can only be written in the first 64 internal system clocks from the start of program execution.

5. For Z86C30/31, the "No Auto Latch" feature is not implemented.

Z86C40/50/89/90 and Z86E40

1. WDT Register (F) %0F can only be written in the first 64 internal system clocks from the start of program execution.

2. The Z86C30/31/40/50/89/90 and Z86E30/31/40 have the P32 comparator output coming out of P37.

3. Reg (F) %00 PCON has D2 controlling the open-drain for Port 0 and D1 controlling the open-drain for Port 1. This is for the following:
   Z86C30/31/40/50/89/90
   Z86E30/31/40

4. For Z86C40, the "No Auto Latch" feature is not implemented.

APPENDIX A

HOW TO RECEIVE ZILOG SAMPLE FILES

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You may obtain a sample file named "Sample.Hex" which contains a sample Z8® source code file, and a Zip file named "Sample1.Zip" which contains a sample assembly batch file. These files are used in the "Sample Session" section of this manual by accessing the Zilog Bulletin Board Service (ZBBS) and downloading the named files.

The ZBBS can be reached by calling 408-370-8024. (You must use 2400 Baud Locked.) After entering the ZBBS, perform the following steps to download the Zilog files. (The ZBBS is menu-driven and user-friendly.)

Procedure to Receive Zilog Sample File

1. Type "F" at the MainMenu prompt to go to the "File System" section. (New Users must first answer a brief "New Users Questionnaire".)
2. Type "A" at the FileMenu prompt, which will result in a listing of available directories.
3. Type "8" to go to the Z8 ICEBOX software and press RETURN.
4. Type "L" (for a list of available files); press RETURN.
5. Type "D" (to download files).
6. Type the name of the files at the "Enter FileName" prompt; press RETURN.
7. Enter your Modem Protocol at the prompt (enter "?" for a listing, if necessary).
8. Once the desired file is received, type "G" for Good-bye or download another file by repeating steps 5 through 8.

APPENDIX B

SYMBOL FILE FORMATS

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Zilog Symbol File

Format

```
<symbol1> <type1> <value1>
<symbol2> <type2> <value2>
. . .
```

1. Symbol type is expressed as one letter: X= External, I = Internal, N = Local.
2. Values are given as an eight-digit hexadecimal number, such as 0000020f.
   Note: Symbols, symbol type, and values are separated by one space.

How To Generate Zilog Format Symbol Files

Use the "mnm" MUFOM utility with the following command line. (<*filename*>.lnk is the output file of the linker after relocation, as with an absolute address file.)

```
mnm  -l  -s  -o  <filename>.sym  <filename>.lnk
```

Wolfgang Symbol File

Format

```
<symbol1>:<value1>
<symbol1>:<value1>
. . .
```

1. Values are given as a four-digit hexadecimal number, such as F02B.
2. Some values are given as "taXY" with XY being a two-digit hexadecimal number.
   Note: Values are not separated by spaces.

How To Convert Zilog Linker Output File

To convert the Zilog linker output file to obtain the Wolfgang format, use the "cnvzisym.exe" utility with the following command line:

```
cnvzisym  <filename>.lnk
```

2500AD Symbol File

Generate a symbol file using the linker option -s.

(Refer to the *asm S8, Super8/Z8 Cross Assembler User's Guide* and the *Zilog Universal Object File Utilities User's Guide* for more information on object files and file utilities.)