Z86L9900100ZEM

Z86L99 ICEBOX

User Manual

UM005100-IRR0400

ZiLOG WORLDWIDE HEADQUARTERS • 910 E. HAMILTON AVENUE • CAMPBELL, CA 95008
TELEPHONE: 408.558.8500 • FAX: 408.558.8300 • www.ZiLOG.com

This publication is subject to replacement by a later edition. To determine whether a later edition exists, or to request copies of publications, contact

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

Windows is a registered trademark of Microsoft Corporation.

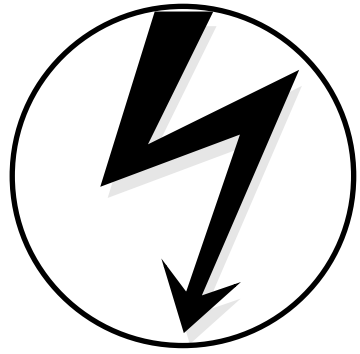
Document Disclaimer

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

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

II. Power-Up Precautions.

1. Ensure that all power to the emulator and the target application (if any) is turned OFF.
2. Connect the target pod to the target application (if any).

Electrical  Safeguards

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

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

II. Power-Up Precautions.

3. Ensure that all power to the emulator and the target application (if any) is turned OFF.
4. Connect the target pod to the target application (if any).
5. Power up the emulator, then press the RESET button.
6. Power up the target application (if any).

III Power-Down Precautions.

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

1. Power down the target application board (if any).
2. Remove the target pod.
3. Power down the emulator.

NOTES:

1. Refer to the “Precaution List” section of the Product Information sheet for additional operating precautions specific to various devices.
2. Do not leave the emulator powered up with the RS-232C 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.

PREFACE

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. Therefore, we have designed this manual to be used either as a how-to procedural manual or a reference guide to important data.

The following conventions have been adopted to provide clarity and ease of use:

- Universe Medium 10-point all-caps is used to highlight to the following items:
  - commands , displayed messages
  - menu selections, pop-up lists, button, fields, or dialog boxes
  - modes
  - pins and ports
  - program or application name
  - instructions, registers, signals and subroutines
  - an action performed by the software
  - icons
- `Courier Regular 10-point` is used to highlight the following items
  - bit
  - software code
  - file names and paths
  - hexadecimal value
- Grouping of Actions Within A Procedure Step

  Actions in a procedure step are all performed on the same window or dialog box. Actions performed on different windows or dialog boxes appear in separate steps.

TABLE OF CONTENTS

Chapter Title and Subsections **Page**

Chapter Title and Subsections **Page**

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 INTRODUCTION

OVERVIEW

Congratulations for selecting a fine development tool! The Z86L9900100ZEM ICEBOX is ZiLOG's in-circuit emulator providing emulation for the Z8 family of IR controllers. The emulator is also capable of OTP programming for the family being emulated. The emulator consists of an emulation daughter board that is plugged into a 64K motherboard via P1 and P2 headers. The Z86D99 ICE chip is used as the emulation processor on the daughter board.

The motherboard provides host communication interface, control processor, I/O space decoding and LED indicators. The emulator is designed to be used with ZiLOG Developers Studio, giving the user a total package to write, edit and debug their applications.

EMULATOR FEATURES

Key features of the Z86L9900100ZEM ICEBOX include:

- Supports up to 32K of ROM
- Vary the operating voltage from 3.0-4.0V
- Supports in-circuit emulation on target systems that operate from 3.0-4.0V
- The user can choose to power the ICE chip from either the emulator or target board
- Supports IR devices that operate up to 8MHz
- Emulates 28 and 40-pin DIP and 28-pin SOIC
- OTP programming for 28 pin DIP and 28 pin SOIC, 40 pin DIP packages
- Emulates and supports all the features and functions for a specified Z8 IR microcontroller
- Multitasking allows the user to use other Windows applications while ZiLOG Developer Studio (ZDS) is running

EMULATOR LIMITATIONS

The Z86D99 ICE chip's ROM/ROMLESS pin is used to configure the ICE CHIP for 32K of internal ROM. This configuration affects the Z86L9900100ZEM ICEBOX in the following ways:

- Will not support emulation of a ROMLESS operation mode
- If the host software specifies that a device has between 4K to 32K of ROM the emulator operates as if it is emulating a device with 32K of ROM

To emulate pull-up transistors for their target board, you must manually set the emulator's pull-up resistor dip switches. See page 2-12 for the proper settings of the emulator's dip switches.

NOTE: Mask option pull-up resistance at 3V is about 200k Ohm +/-50% at room temperature. Lower voltage may cause an increase in resistance.

SUPPORTED ZILOG DEVICES

Table 1-1 shows the products supported by the Z86L9900100ZEM ICEBOX:

TABLE 1-1. SUPPORTED PRODUCTS

Packages	Emulation	OTP	Required accessories
28 PDIP	Z86L991PZ008SC	Z86D991 PZ008SC	28 PDIP emulation pod 28 PDIP program platform (PC ASSY#99C0667-001)
28 SOIC	Z86L991SZ008SC	Z86D991 SZ008SC	28 PDIP emulation pod and a DIP to SOIC conversion adapter from Emulation Technology (AS-DIP 6-028-S003-1 or AS-DIP-6-028-S003-2) 28 SOIC program platform (PC ASSY#99C0668-001)
40 PDIP	Z86L990PZ008SC	Z86D990 PZ008SC	40 PDIP emulation pod 40 PDIP program platform (PC ASSY#990716-001) Rev. B
48 SSOP	N/A	Z86D990 HZ008SC	Accessories for the 48 pin SSOP will be available the 4th quarter of 2000

HARDWARE SPECIFICATIONS

OPERATING CONDITIONS

Operating Humidity:	10%-90% RH (Non condensing)
Operating Temperature:	20°C ±10°C
Clocks:	The control processor operates at 7.3728 Mhz, the emulation processor operates at 8Mhz
Serial Baud Rate:	57,600 bps

POWER REQUIREMENTS

This emulator requires an external 5VDC power supply.

Operating Voltage (Input):	+4.75 VDC to +5.25 VDC Max (+5.0 VDC typical)
Operating Voltage (Target):	+3.0 VDC to +4.0 VDC Max
Operating Current:	0.8A typical 1.5A MAX

SERIAL INTERFACE

ZiLOG Developer Studio communicates with theZ86L9900100ZEM ICEBOX using a DB25, RS-232 and DCE cable (TxD, RxD only).

GUI-SUPPORTED COMPILER, ASSEMBLER FORMATS

The Emulator supports object (binary or Intel hex) code files produced by ZiLOG Developer Studio (ZDS), ZiLOG Macro Cross Assembler (ZMASM).

KIT CONTENTS

The emulator kit contains one each of the following items:

- Z86L9900100ZEM ICEBOX
- Z86D991 40 PDIP program platform ZiLOG PC: 99C0716-001
- Z86D991 28 PDIP program platform ZiLOG PC: 99C0667-001
- Z86D991 28 SOIC program platform ZiLOG PC: 99C0668-001
- 40 PDIP emulation pod with cable ZiLOG PC: 99C0206-001
- 28 PDIP emulation pod with cable ZiLOG PC: 99C0217-001
- 5V Power Cable with banana plugs
- RS-232 Serial Cable, 9-pin M-F
- ZiLOG Developer Studio Installation CD
- Z86L99 ICEBOX User's Manual

ADDITIONAL ITEMS NOT SUPPLIED

The following items are required but are not currently supplied in the emulator kit:

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

OPTIONAL RECOMMENDED ITEM

The following items are recommended:

- Your target design. Typically this is a wire-wrapped or printed circuit prototype that includes a socket for the target device which the emulator cable/pod plugs into.
- Z8 C-Compiler
- Oscilloscope
- Logic Analyzer

COMPUTER REQUIREMENTS

MINIMUM REQUIREMENTS

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

75 MHz

16 MB RAM

VGA Video Adapter

Hard Disk Drive (12 MB free space)

CD-ROM Drive (a CD-ROM drive is not needed if you download ZDS from the web at www.zilog.com)

RS-232 COM Port

Mouse or Pointing Device

Microsoft Windows 95/98/NT

The following enhancements to the minimum requirements are recommended:

166MHz IBM PC

SVGA video adapter

CONTACTING ZILOG CUSTOMER SUPPORT

ZILOG has a worldwide customer support center located in Austin, Texas. The customer support center is open from 7 a.m. to 7 p.m. Central Time.

The customer support toll-free number for the United States and Canada is 1-877-ZiLOGCS (1-877-945-6427). For calls outside of the United States and Canada dial 512-306-4169. The FAX number to the customer support center is 512-306-4072. Customers can also access customer support via the website at:

- For customer service - http://register.zilog.com/login.asp?login=servicelogin
- For technical support- http://register.zilog.com/login.asp?login=supportlogin

For valuable information about hardware and software development tools go to ZiLOG home page at http://www.zilog.com. The latest released version of the ZDS can be downloaded from this site.

CHAPTER 2
SET-UP AND INSTALLATION

HARDWARE INSTALLATION

Before installing the hardware, refer to Figure 2-1 for a diagram on connecting the emulator to a PC and power supply; Figure 2-3 provides option jumper locations.

QUICK INSTALLATION INSTRUCTIONS

To install the hardware utilizing a 5VDC wall-adaptor power supply, perform the following.

1. Set the correct jumper setting for powering the ICE chip and target board. See Emulator connection on page 2-2.
2. Plug a 5.0 VDC 1.5 Amp Wall Power Adaptor to the power connector on the Z86L9900100ZEM ICEBOX.
3. Turn on the power supply and ensure that it is set to + 5.0V and current limited at 2.5A.
4. Connect the serial cable to the PC.
5. Connect the emulator to the target board (if performing in-circuit emulation).
6. Set up the oscillator and option jumpers.
7. Power up the Z86L9900100ZEM.

COMPLETE INSTALLATION INSTRUCTIONS

The following procedures illustrate a complete step-by-step guide on installing the emulator.

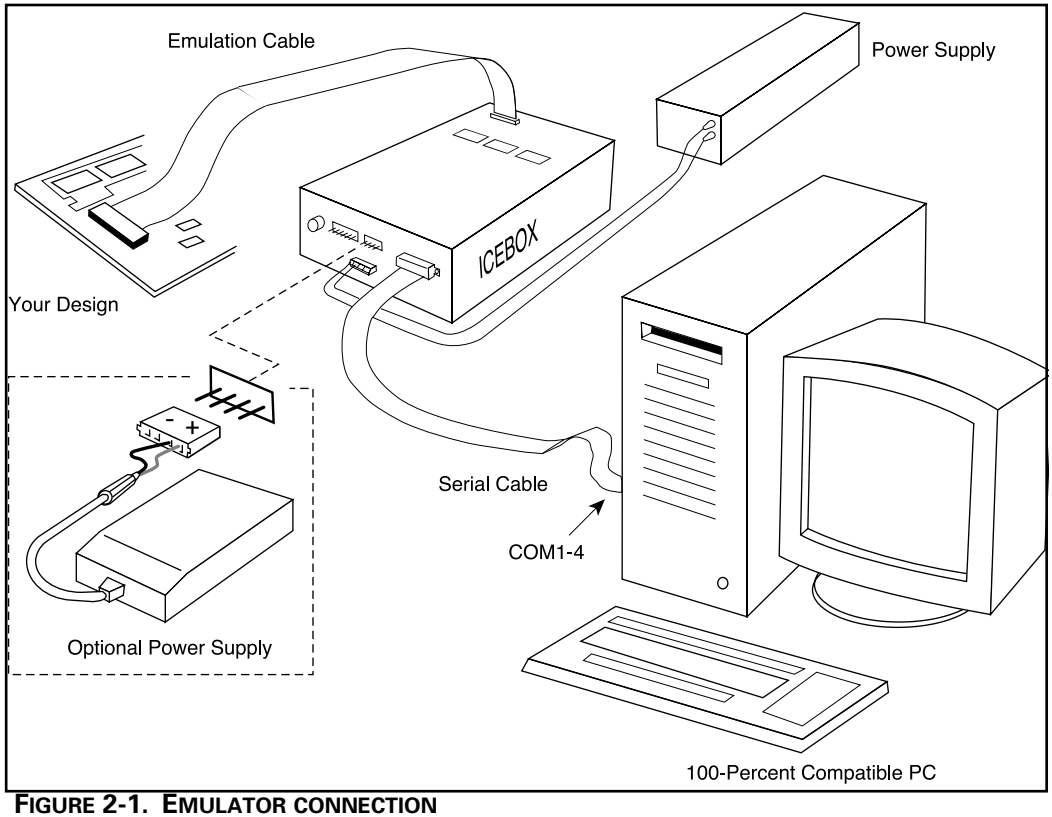


FIGURE 2-1. EMULATOR CONNECTION

Set Power Jumper

The Z86L9900100ZEM ICEBOX allows the user to power the emulator and target from a variety of different sources. Before powering the emulator the user should select their power configuration.

CAUTION!

The user must choose their power source before powering the emulator. Before selecting a power source study Figure 2-2, which shows a schematic of the J6 power jumper. Failure to properly configure the power source will result in damage to the emulator or target.

The user should choose from one of the below options when selecting their power source

- Jumper pin 1 to pin 3 and pin 2 to pin 4 to power both the ICE chip and target from the emulator's adjustable voltage regulator (*default setting*)
- Jumper pin 1 to pin 3 to power the ICE chip with the emulator's adjustable regulator
- Jumper pin 2 to pin 4 to power target with the emulator's adjustable regulator
- Jumper pin 3 to pin 4 to power the ICE chip from the target

CAUTION!

When powering the target from the emulator ensure that the target's power supply is disconnected .

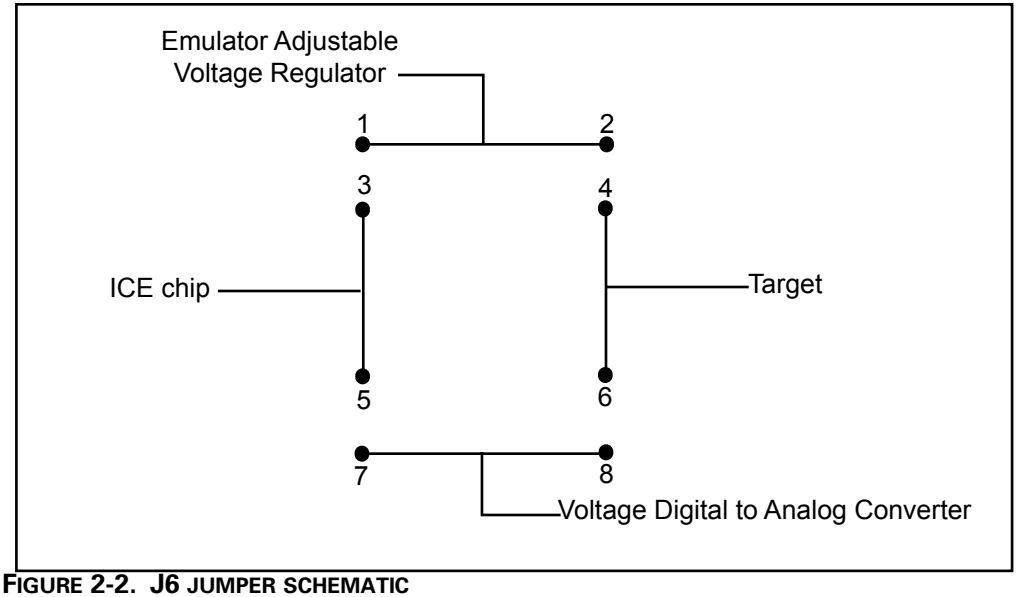


FIGURE 2-2. J6 JUMPER SCHEMATIC

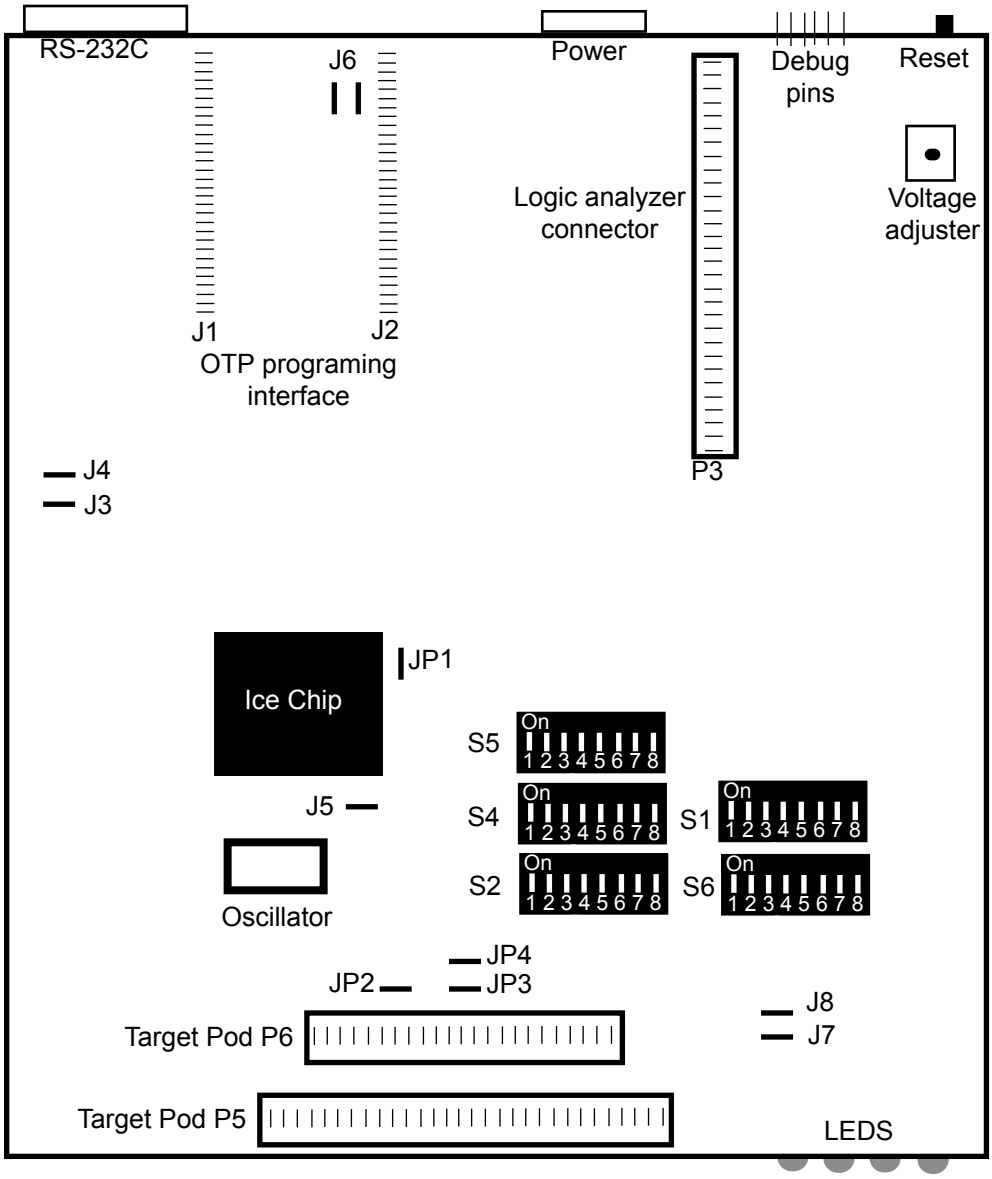


FIGURE 2-3. Z86L9900100ZEM ICEBOX EXTERNAL TOP VIEW

Connect the Power Supply

1. If the power supply provides voltage adjustment:
   - Turn the power supply on and adjust it to +5V
   - Adjust the setting adjustment for at least 2.5A, if there is a current-limiting adjustment.
2. Turn the power supply off.
3. Locate the power cable (red wire, black wire, and banana plugs on the other end). Plug in the black banana plug into the black jack on the power supply (labeled COM, GND, or with the ground symbol). Plug the red plug into the red jack on the power supply (labeled +, +V or +5V).
4. Plug the white connector on the other end of the cable into the matching 4-pin connector on the back side of the emulator. (This connection is keyed to ensure against an improper connection.)

NOTE: The ZiLOG Power Supply Accessory Kit (ZPS05V00ZAC), which is sold separately, provides a fixed-5V Universal Output Power Supply, accepts 110V to 220V AC input, and includes a power cable and an in-line jack cable.

CAUTION!

Always check the supply voltage before plugging in the power cord.

Connect the Serial Cable to the PC

Locate the serial cable. Connect the male end to the female connector on the back of the ICE-BOX, and the female end to either the COM1, COM2, COM3, or COM4 connector of the host PC.

NOTE: If connector availability is limited to a 9-pin COM1 through COM4, then use either a different cable or a 25-pin to 9-pin converter. (Available at any electronics store for a nominal fee.)

Connect to the Design

Connect to the target design by performing the following steps:

1. Locate the emulation cable for the device.

CAUTION!

Wear a properly grounded wrist strap or similar ESD protection before continuing.

2. Plug the cable into the target device. Ensure that the pin 1 marking (as indicated by the red mark on the ribbon cable) matches pin 1 on the target board.
3. Plug the other end of the cables into target pod on top of the emulator. See Figure 2-3 for the location of the target pod.
4. Select the power source for the Z86D99 ICE chip by configuring the J6 jumper. See Table 2-2 for more information on jumper settings and Figure 2-3 for the location of the J6 jumper.
5. Select either the supplied 8MHz oscillator or the target's oscillator to clock the ICE chip. See Jumper settings on page 2-10 for more information on how to configure the emulator to use the target boards oscillator.

CAUTION!

The user can not run the emulator's oscillator if the target oscillator or XTAL is connected. At this time use one of the following methods to set the ICE-chip's clock:

- To use the emulators oscillator remove the target's oscillator and connect pin 2 to pin 3 on the J5 jumper
- To Use the target's oscillator and connect pin 1 to pin 2 on the J5 jumper and remove the ICEBOX's 8 MHz oscillator located at Y1.

Adjust the voltage

If the emulator is powered by its adjustable regulator then the voltage must be manually set. Set the emulator voltage by performing the following steps:

CAUTION!

If the target and emulator are using separate power supplies then the ICE chip voltage must be adjusted to match the target's device voltage. Failure to match the target devices voltage with the ICE chip's voltage could result in damage to the emulator, target device or ICE chip.

1. Locate the voltage adjuster on top of the emulator. See Figure 2-3 for the location of the voltage adjuster.
2. Attach the voltmeter lead to either pin 1 or pin 2 on the J6 jumper and ground.
3. Apply power to the emulator with the target device disconnected.
4. Turn the voltage adjuster's screw until the voltmeter read-out matches the target device output voltage.

Connect Logic Analyzer (Optional)

The logic analyzer can either be connected as part of the initial setup, or later as the user continues working with their design.

Connect to a logic analyzer by performing the following steps:

1. Locate the cable for the logic analyzer.

NOTE: Wear a properly grounded wrist strap or similar ESD protection before continuing.

2. Plug the logic analyzer into the ZiLOG logic analyzer adapter (sold separately from the Z86L9900100ZEM ICEBOX kit).

NOTE: The logic analyzer adapter can be ordered from customer support by requesting part number 98C0289-001.

3. Plug the cable from the ZiLOG logic analyzer adapter into the emulator. Ensure that the pin 1 marking (as indicated by the red mark on the ribbon cable) matches the pin 1 on the target board. See Figure 2-3 for the location of the logic analyzer connector.

Power the Emulator

If anything unusual (such as an unexpected sound and/or smell occurs when turning on the power supply, turn off the power supply and check the setting for the J6 jumper. See Emulator connection on page 2-2. If the power supply allows voltage adjustment, adjust it again to +5V. (It may be somewhat lower than +5V because of the emulator load.

After power-up, press the RESET button to reset the ICE chip. (Pressing the RESET button avoids bus contention on the I/O lines.) If the emulator is not powering your design through the V_{CC} pin, turn on the power supply of the design.

CAUTION!

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

When powering down, follow the procedure described below:

1. Power down the target application board (if using the target power supply).
2. Power down the emulator.

NOTE: Refer to the complete Electrical Safeguards information shown on the inside cover of this manual.

SOFTWARE INSTALLATION

For more information on installing ZDS refer to the user manual PDF that is included on the installation CD-ROM or download ZDS literature from the ZiLOG web page at zilog.com.

EMULATOR OPERATION

The following topics guide the user on how to operate the emulator and configure jumper settings.

RESETTING

Press the RESET button on the emulator to reset the state of the target device and the status that was established using ZDS.

For example, the emulator sets the program counter to %000C.

After reset, wait until the Ready LED is ON and has finished blinking before starting ZDS. Refer to the LED Operation section of this chapter for more details.

NOTE: Always press the RESET button on the emulator before starting ZDS.

LED Operation

ZiLOG emulators use LEDs to communicate the different hardware states. The following table gives a description of the LEDs. The Z86L9900100ZEM LED's are located on the right front of the emulator.

Figure 2-4. Front LED Assignments

LED	Indication	Description
READY	On Off	Communicating in Bisync Mode and waiting for command Communicating in ASCII Mode or executing Bisync command
RUN	On Off	Running user code Not running user code
OTP	On Off	The Emulator is performing OTP programing The Emulator is not performing OTP programming
PWR	On Off Blink	Emulator is powered up and Self Test is completed Power is off Emulator is self-testing

JUMPER SETTINGS

The following table lists jumper setting that the are easily configured by the user. See Figure 2-3 for the jumper locations.

TABLE 2-1. JUMPER SETTINGS

Jumper	Pin	Position	Description
J1	N/A	Out (Default)	OTP programming adapter pins
J2	N/A	Out (Default)	OTP programming adapter pins
J3	1-2	Out (Default)	Reserved for data memory (do not use)
J4	1-2	Out (Default)	Reserved for external memory (do not use)
J6	1-3	In (Default)	ICE chip is powered by the emulator's adjustable regulator
J6	2-4	In (Default)	Target is powered by emulator's adjustable regulator
J6	5-7	In	ICE chip is powered by a programmable regulator *(The programmable regulator is currently not supported . Contact ZiLOG customer support to see if the programmable regulator has been released .)*
J6	4-6	In	Target is not powered by emulator *(See Emulator connection on page 2-2 for more information)*
J7	N/A	Open (Default)	Do not Jumper, jumping these pins will short port 4 pin 3 VCC! These two pins are used as a connector for the port 4 pin 3 IR LED.
J8	1-2	In (Default)	Connects Ports 4 pin 3 to target
J8	1-2	Out	Disconnects ports 4 pin 3 from target
JP1	1-2	In	Disable Vbo
JP1	1-2	Out (Default)	Enable Vbo
JP2	1-2	In (Default)	AVDD to VDD core
JP2	1-2	Out	Target board will supply power to AVDD (a 40 pin part is being emulated)
JP3	1-2	In	A 28 pin part is being emulated
JP3	1-2	Out (Default)	VCC_I isolates from AVDD (use internal filter)
JP4	1-2	In (Default)	Cap's to AVDD
JP4	1-2	Out	N/A

TABLE 2-1. JUMPER SETTINGS (CONTINUED)

Jumper	Pin	Position	Description
J1	N/A	Out (Default)	OTP programming adapter pins
JP5	1-2	In	ICE chip uses target oscillator/clock *(see Note at the bottom of the table)*
JP5	2-3	In * (Default)	ICE chip uses emulator oscillator/clock *(see Note at the bottom of the table)*

NOTE: The user can not run the emulator's oscillator if the target oscillator or XTAL is connected. At this time use one of the following methods to set the ICE-chip's clock:

- To use the emulators oscillator remove the target's oscillator and connect pin 2 to pin 3 on the J5 jumper
- To use the target's oscillator and connect pin 1 to pin 2 on the J5 jumper

Setting Jumpers for Targets

For all targets ensure that JP2 and JP4 are always connected. For 40 pin targets also connect JP3.

DIP SETTINGS

DIP switch banks S1 and S3 are used to disable digital functions for ports 1 and 3. DIP switch banks S2, S4, S5 and S6 are used to emulate port pin pull-up transistors for the Ice Chip. See Figure 2-3 for the location of the DIP switches. The following tables list DIP settings that are easily configured by the user.

TABLE 2-2. DIP SETTINGS TO DISABLE DIGITAL FUNCTIONS

DIP bank	Switch	Description
S1	1	Turn off to disable digital functions for Port 5 Pin 0
S1	2	Turn off to disable digital functions for Port 5 Pin 1
S1	3	Turn off to disable digital functions for Port 5 Pin 2
S1	4	Turn off to disable digital functions for Port 5 Pin 3
S1	5	Turn off to disable digital functions for Port 4 Pin 4
S1	6	Turn off to disable digital functions for Port 4 Pin 5
S1	7	Turn off to disable digital functions for Port 4 Pin 6
S1	8	Turn off to disable digital functions for Port 4 Pin 7

TABLE 2-3. DIP SETTINGS TO SET PULL-UP RESISTORS

DIP bank	Switch	Description
S2	1	Turn on to set a pull-up resistor for Port 2 Pin 0
S2	2	Turn on to set a pull-up resistor for Port 2 Pin 1
S2	3	Turn on to set a pull-up resistor for Port 2 Pin 2
S2	4	Turn on to set a pull-up resistor for Port 2 Pin 3
S2	5	Turn on to set a pull-up resistor for Port 2 Pin 4
S2	6	Turn on to set a pull-up resistor for Port 2 Pin 5
S2	7	Turn on to set a pull-up resistor for Port 2 Pin 6
S2	8	Turn on to set a pull-up resistor for Port 2 Pin 7
S4	1	Turn on to set a pull-up resistor for Port 5 Pin 0
S4	2	Turn on to set a pull-up resistor for Port 5 Pin 1
S4	3	Turn on to set a pull-up resistor for Port 5 Pin 2
S4	4	Turn on to set a pull-up resistor for Port 5 Pin 3
S4	5	Turn on to set a pull-up resistor for Port 5 Pin 4

TABLE 2-3. DIP SETTINGS TO SET PULL-UP RESISTORS (CONTINUED)

DIP bank	Switch	Description
S4	6	Turn on to set a pull-up resistor for Port 5 Pin 5
S4	7	Turn on to set a pull-up resistor for Port 5 Pin 6
S4	8	Turn on to set a pull-up resistor for Port 5 Pin 7
S5	1	Turn on to set a pull-up resistor for Port 6 Pin 0
S5	2	Turn on to set a pull-up resistor for Port 6 Pin 1
S5	3	Turn on to set a pull-up resistor for Port 6 Pin 2
S5	4	Turn on to set a pull-up resistor for Port 6 Pin 3
S5	5	Turn on to set a pull-up resistor for Port 6 Pin 4
S5	6	Turn on to set a pull-up resistor for Port 6 Pin 5
S5	7	Turn on to set a pull-up resistor for Port 6 Pin 6
S5	8	Turn on to set a pull-up resistor for Port 6 Pin 7
S6	1	Turn on to set a pull-up resistor for Port 4 Pin 0
S6	2	Turn on to set a pull-up resistor for Port 4 Pin 1
S6	3	Turn on to set a pull-up resistor for Port 4 Pin 2
S6	4	Turn on to set a pull-up resistor for Port 4 Pin 3
S6	5	Turn on to set a pull-up resistor for Port 4 Pin 4
S6	6	Turn on to set a pull-up resistor for Port 4 Pin 5
S6	7	Turn on to set a pull-up resistor for Port 4 Pin 6
S6	8	Turn on to set a pull-up resistor for Port 4 Pin 7

NOTE: Mask option pull-up resistance at 3V is about 200k Ohm +/-50% at room temperature. Lower voltage may cause an increase in resistance.

PERFORMING OTP PROGRAMMING

The Z86L9900100ZEM ICEBOX is designed for OTP programming. To perform OTP programming perform the following steps:

1. Locate the supplied OTP adapter for the micro controller you wish to program. Consult Table 1-1for the proper OTP adapter.
2. Insert the OTP adapter into the emulator's OTP Programming socket (J1 and J2), see Figure 2-3.
3. Place the micro controller into the OTP programing adapter.
4. If the adapter is equipped with a ziff socket, ensure that the ZIF socket locking lever is in the down (closed) position.
5. Perform OTP programing. Consult the ZDS user manual for more information on OTP programing.
6. Pull straight up on the micro controller to remove it from the OTP programing adapter.

NOTE: Be careful not to bend the micro controller's pins when removing it from the OTP adapter.

CHAPTER 3
OVERVIEW

EMULATION

The Z86L9900100ZEM ICEBOX uses the Z86D99 ICE chip to provide emulation for the Z8 family of IR controllers. The emulator is capable of OTP programming for the family being emulated. The user can manually set pull-up resistors and adjust the voltage of the ICE chip to match the target's voltage.

USING ZDS

This emulator is fully compatible with ZiLOG Developer Studio (ZDS) software. The following steps briefly describe the procedures necessary to setup and create projects with the Z86L9900100ZEM emulator. A summary of the emulator's available debug windows is also included at the end of this chapter.

For more detailed information on using ZDS, refer to the ZDS User Manual (in PDF format) located on the installation CD-ROM, or download the latest information from our web site at www.zilog.com.

SELECT THE EMULATOR

To select the emulator and create a new project, perform the following steps:

1. Open ZDS by selecting Start>Programs>Zilog Developer Studio> ZDS.
2. Choose New Project from the File menu. The New Project dialog box appears.

NOTE: If the project has already been created, select Target from the Project menu and perform the following steps for the ZiLOG MCU Database dialog box. See Figure 3-1.

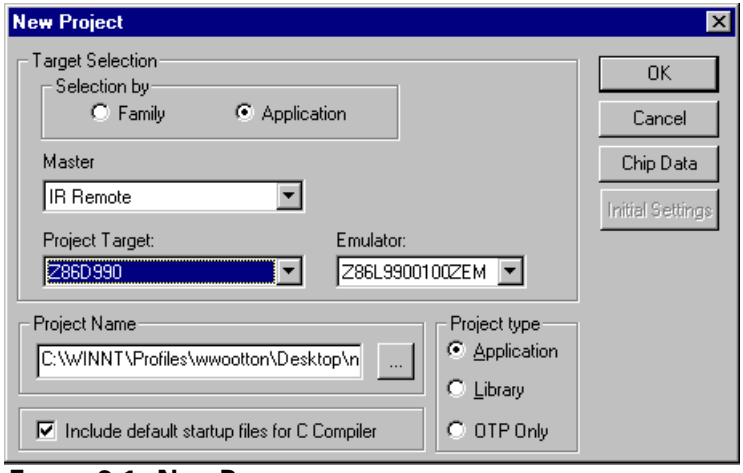


FIGURE 3-1. NEW PROJECT DIALOG BOX

3. Select Application in the Selection by field.
4. Select IR Remote from the Master pop-up list.
5. Select a microcontroller from the IR Remote family in the Project Target pop-up list.
6. Select Z86L9900100ZEM in the Emulator pop-up list.

7. Click on the browse button (...) in the Project Name field. The New Project Browse dialog box appears.
8. Enter the project file name and select a path in the New Project Browse dialog box.

NOTE: All build output files, such as linker and assembly files are saved in the same directory as the project.

9. Click Save. The project name appears in the Project Name field in the New Project dialog box.
10. Click on Chip Data to view the micro controller specifications.

NOTE: Fields in the Chip Data page are read-only and can't be modified.

11. Click OK. The new project is saved as the name specified in the New Project Browse dialog box.
12. Select Emulator Configuration from the Project menu. The Emulator Configuration dialog box appears. See Figure 3-2.

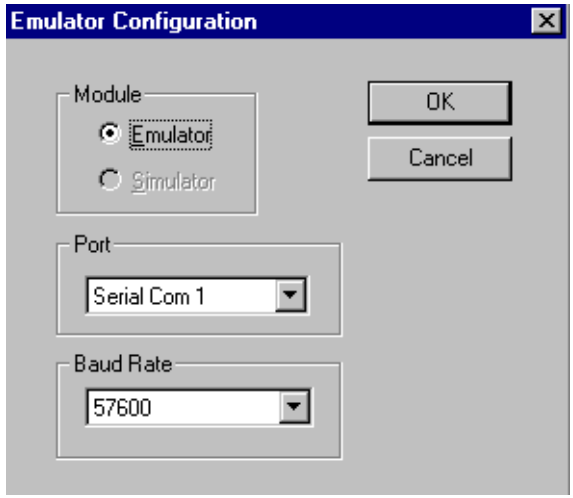


FIGURE 3-2. EMULATOR CONFIGURATION DIALOG BOX

13. Ensure that Emulator is selected in the Module field.
14. Select the port the emulator is connected to from the Port pop-up list.
15. Select 57600 from the Baud Rate pop-up list.
16. Click OK to close and apply the Emulator Configuration options.
17. Select Save Project from the File menu to save the emulator configuration setting.

OPEN A PROJECT AND ADD FILES

A previously created project has the following attributes saved with it:

- Target settings
- Assembler and Linker settings for the specified target
- Source files (including header files)

NOTE: Use the Project Viewer window to view and access the various files in any given project.

Perform the following steps to open a previously created project:

1. Select Open Project from the File menu. The Open Project dialog box appears.
2. In the Open Project dialog box, select the previously created project. The project appears in the Project Viewer window. See Figure 3-3.

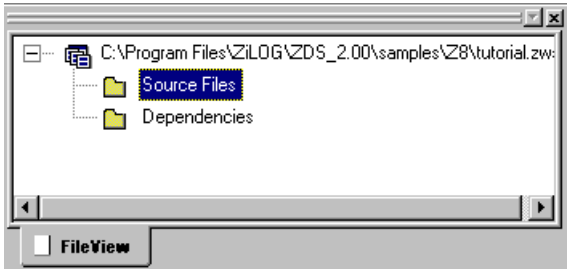


FIGURE 3-3. PROJECT VIEWER WINDOW

Add an existing file

Perform the following steps to add an existing file to a project:

1. Select Add to Project>Files from the Project menu. The Insert Files into Project dialog box appears. See Figure 3-4.

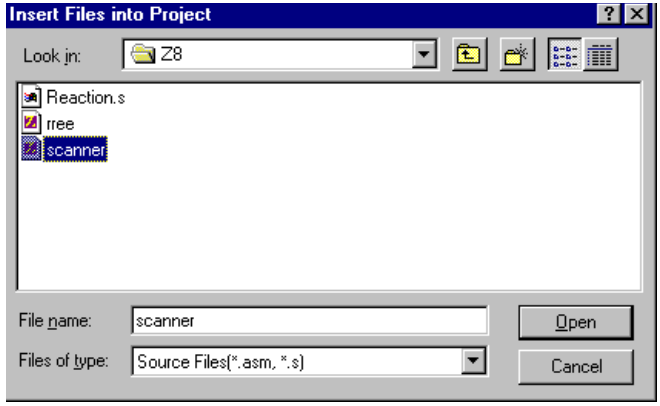


FIGURE 3-4. INSERT FILES INTO PROJECT DIALOG BOX

2. Select the file to add to the project.
3. Click Open. The file appears in the Project Viewer window. See Figure 3-5.

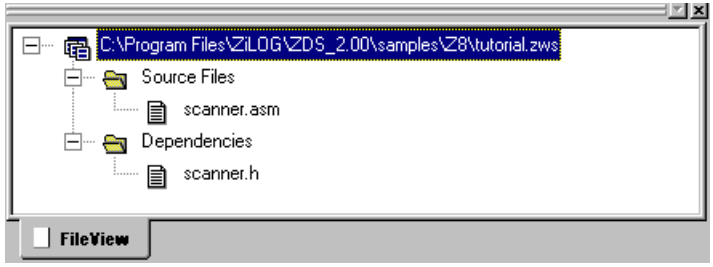


FIGURE 3-5. PROJECT VIEWER WINDOW WITH FILE

4. Double-click on the file in the Project Viewer window. The file appears in the ZDS main Edit window.

   NOTE: In some cases, non-editable files, such as `.obj` files need to be included in a project. These files will be displayed in the source file list, but cannot be opened. When the project is built, these files are automatically linked.

5. Select Update All Dependencies from the Build menu. The Dependencies folder list in the Project Viewer window is updated.

Add a new file

1. Select Add to Project>New from the Project menu. The Insert New Files Into Project dialog box appears.
2. Type a file name in the File Name field.
3. Click Open. The new file name appears in the Project Viewer window with a `.asm` suffix, and a blank Edit window also appears.

NOTE: Header and Included files do not have to be added. The program detects those called by the source code.

AVAILABLE DEBUG WINDOWS

The following table lists the debug windows that are available using ZDS.

TABLE 3-1. DEBUG WINDOWS

Window	Function (Updated values will display in red)
Watch 	• Shows the symbols and the contents of the registers (see the ZDS user manual for more information)
Z8 Standard Registers	• Shows the contents of the Z8 standard registers
Code Memory 	• Allows the user to monitor, edit, and download a `file.ld` or `file.hex` into the Code Memory from generated assembly source code • Tracks a specific address entered in the Code Address edit box
Disassembly	• Shows code memory along with the corresponding disassembled code • Allows the user to edit, and download a file.ld or file.hex into the Code memory • Follows the program counter • Provides a complete scroll down with this window, however the scroll up is limited • Accesses the disassembly of code at the address specified in the Code Address field • The Disassembly window is automatically displayed when debugging hex code or whenever there is no corresponding source file available at the address specified by the program counter
Z8 Register File	• Shows all Z8 internal and external registers, all RAM pointer and data registers, status registers and status flags, and stacks • Monitor and edit write-able registers in this window
Z8 Expanded Register	• Displays the Z8 Expanded Register banks that are specified in the configuration • Monitor and edit write-able registers directly in this window by selecting a specific bank tab
Working Registers	• Modify and view working registers in this window

TABLE 3-1. DEBUG WINDOWS (CONTINUED)

Window	Function (Updated values will display in red)
Timer Counter Registers	• Modify the timer/counter registers in this window
Ports Register	• Monitor and edit port registers in this window
Internal Data Memory	• Display address from FF00 to FFFF

APPENDIX A
TROUBLESHOOTING GUIDE

INTRODUCTION

Before contacting a ZiLOG representative or submitting a Problem Report, please follow these simple steps. Also, check the Precautions and Limitations sections in the Product Information document included with the emulator to eliminate other possible known problems. If a hardware failure is suspected, contact a local ZiLOG representative for assistance.

If the initial ZiLOG screen is not appearing after selecting the COM port and the screen message displays Time-out while reading:

1. Check the RS-232C cable connection and communication port selection in ZDS. See Select the Emulator on page 3-2 for more information on how to configure the host PC's port.
2. Reset the emulator and ZDS.
3. If you are using the emulator's oscillator, ensure that you removed the target's oscillator and connected pin 2 to pin 3 on the J5 jumper.
4. If ICEBOX stops working after connecting to the target, check whether the target crystal is removed while using the ICEBOX's oscillator.
5. Try connecting another cable.
6. 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.

7. Ensure that the power supply is connected, is turned on, and power is available.
8. Ensure that the power supply is set at +4.75 VDC to +5.25 VDC Max (+5.0 VDC typical).
9. Ensure that the J6 power jumper has been properly configured. See Emulator connection on page 2-2 for more information on setting the J6 jumper.
10. Check if power supply is supplying the required current (0.8A typical) to the emulator.

11. Check P42 pin. If P42 stays low check the target pod and ensure that it is not shorting to ground. If it is shorted, ensure that you are using the proper emulation pod, see Table 1-1.
12. After resetting the emulator, wait a minimum of 5 seconds before running ZDS.
13. If P42 always shows low, check the 40-pin target pod's pin 31.

NOTE: The previous Z86L71 and Z86L98 ICEBOX 40 pin target pod have pin 31 connecting to ground for emulating the L73/87/89. That target pod can not be used for Z86L990 emulation. Only use the target cable which is shipped with the Z86L99 ICEBOX.

COUNTER JUMPS TO UNEXPECTED ADDRESS

Any instruction other than a `DI` instruction is used to disable interrupts. Possible causes include:

- The stack overflows into the general register locations.
- Extra `POP`, `PUSH`, `IRET`, or `RET` is encountered (stack unbalanced).
- Program resets repeatedly.
  - Program counter rolls over from value FFFF to 0000 and proceeds back to the beginning of program.
  - Watch-Dog Timer (WDT) is not initialized or refreshed.
- Unintialized interrupt vector is activated. The interrupt vector is not set to the interrupt handler.

ZDS ERROR MESSAGES

CAN NOT OPEN WINDOWS

If this message appears while attempting to open a window in ZDS, there may be too many applications running. Try closing the other active applications or exit and restart your PC.

OUT OF SYNCHRONIZATION WITH THE EMULATOR

This message appears whenever communication between the emulator and the PC is interrupted.

1. Ensure that the power cable is connected.
2. Ensure that the RS-232C cable is connected.
3. Change the baud rate setting (default is `19200`). A lower setting usually improves communications reliability.
4. Reestablish communication between ZDS and the emulator. See the ZDS user manual for more information establishing communication with an emulator.

APPENDIX B
PROBLEM/SUGGESTION REPORT FORM

If you experience any problems while operating this product, or if you note any inaccuracies while reading the User's Manual, please copy this form, fill it out, then mail or fax it to ZiLOG. We also welcome your suggestions!

Customer Information

Name		Country	
Company		Telephone	
Address		Fax Number	
City/State/ZIP		E-Mail Address	

Product Information and Return Information

Serial # or Board Fab #/Rev. #

Software Version

Manual Number

Host Computer Description/Type

ZiLOG, Inc.
System Test/Customer Support
910 E. Hamilton Ave., Suite 110, MS 4-3
Campbell, CA 95008
Fax Number: (408) 558-8536
Email: tools@zilog.com

Problem Description or Suggestion

Provide a complete description of the problem or your suggestion. If you are reporting a specific problem, include all steps leading up to the occurrence of the problem. Attach additional pages as necessary.

GLOSSARY

Address Space	Physical or logical area of the target system's Memory Map. The memory map could be physically partitioned into ROM to store code, and RAM for data. The memory can also be divided logically to form separate areas for code and data storage.
ANSI	American National Standards Institute.
ASCII	American Standard Code of Information Interchange.
ASM	Assembler File.
ASYNC	Asynchronous Communication Protocol.
ATM	Asynchronous Transfer Mode.
B	Binary.
Baud	Unit of measure of transmission capacity.
Binary	Number system based on 2. A binary digit is a bit.
BISYNC	Bidirectional Synchronous Communication Protocol.
Bisynchronous Communications	A protocol for communications data transfer used extensive in mainframe computer networks. The

	sending and receiving computers synchronize their clocks before data transfer may begin.
Bit	A digit of a binary system. It has only two possible values: 0 or 1.
BPS	Bits Per Second. Number of binary digits transmitted every second during a data-transfer procedure.
Buffer	Storage Area in Memory.
Bug	A defect or unexpected characteristic or event.
Bus	In Electronics, a parallel interconnection of the internal units of a system that enables data transfer and control Information.
Byte	A collection of four sequential bits of memory. Two sequential bytes (8 bits) comprise one word.
CALL	This command invokes a subroutine
Checksum	A field of one or more bytes appended to a block of n words which contains a truncated binary sum formed from the contents of that block. The sum is used to verify the integrity of data in a ROM or on a tape.
COM	Device name used to designate a communication port.

Control Section	A continuous logical area containing code or user data. Each control section has a name. The linker puts all those control sections with the same name in one entity. The linker provides address spaces to the control sections. There are either absolute control sections or relocatable ones.
CPU	Central Processing Unit.
Cross-Linkage Editor	A linkage editor that executes on a processor that is not the same as the target processor.
DSP	Digital Signal Processing. A specialized microprocessor that is tailored to perform high repetition math processing and improve signal quality.
Emulator	An emulation device. For example, an In-Circuit Emulator (ICE) module duplicates the behavior of the chip it emulates in the circuit being tested.
External Symbol	A symbol that is referenced in the current program file but is defined in another program file.
GUI	Graphical User Interface. The windows and text that a user sees on their computer screen when they are using a program.
H	Hexadecimal, Half-Carry Flag.
Hex	Hexadecimal.
Hexadecimal	A Base-16 Number System. Hex values are often substituted for harder to read binary numbers.
ICE	In-Circuit Emulator. A ZiLOG product which supports the application design process.
IE	Interrupt Enable.

IM	Immediate Data Addressing Mode.
IMASK	Interrupt Mask Register.
IMR	Interrupt Mask Register.
INC	Increment.
INCW	Increment Word.
Initialize	To establish start-up parameters, typically involving clearing all of some part of the device's memory space.
Instruction	Command.
INT	Interrupt.
Internal Symbol	A symbol that is defined in a program file. This symbol could be visible to multiple functions within the same program file.
I/O	Input/Output. In computers, the part of the system that deals with interfacing to external devices for input or output, such as keyboards or printers.
IPR	Interrupt Priority Register.
Ir	Indirect Working-Register Pair Only.
IR	Infrared. A light frequency range just below that of visible light.
IRQ	Interrupt Request.
ISDN	Integrated Services Digital Network.
ISO	International Standards Organization.

JP	Jump.
JR	Jump Relative.
Library	A File Created by a Librarian. This file contains a collection of object modules that were created by an assembler or directly by a C compiler.
Local Symbol	Symbol visible only to a particular function within a program file.
LSB	Least Significant Bit.
MCU	Microcontroller or Microcomputer Unit.
MI	Minus.
MLD	Multiply and Load.
MPYA	Multiply and ADD.
MPYS	Multiply and Subtract.
MSB	Most Significant Bit.
Nibble	A Group of 4 Bits.
NMI	Non-Maskable Interrupt.
NOP	No Operation.
Object Module	Programming code created by assembling a file with an assembler or compiling a file with a compiler. These are relocatable object modules and are input to the linker in order to produce an executable file.
OMF	Object Module Format.

OPC	Operation Code.
Op Code	Operation Code.
OTP	One-Time Programmable.
PCON	Port configuration register.
PER	Peripheral. A device which supports the import or output of information.
POP	Retrieve a Value from the Stack.
POR	Power-On Reset.
Port	The point at which a communications circuit terminates at a Network, Serial, or Parallel Interface card.
PRE	Prescaler.
PROM	Programmable Read-Only Memory.
Protocol	Formal set of communications procedures governing the format and control between two communications devices. A protocol determines the type of error checking to be used, the data compression method, if any, how the sending device will indicate that it has finished sending a message, and how the receiving device will indicate that it has received a message.
PRT	Programmable Reload Timer or Print.
PTR	Pointer.
PTT	Post, Telephone, and Telegraph. Agency in many countries that is responsible for providing telecommunication approvals.

Public/Global Symbol	A programming variable that is available to more than one program file.
PUSH	Store a Value In the Stack.
r	Working Register Address.
R	Register or Working-Register Address, Rising Edge.
RA	Relative Address.
RAM	Random-Access Memory. A memory that can be written to or read at random. The device is usually volatile, which means the data is lost without power.
RC	Resistance/Capacitance.
RD	Read.
RES	Reset.
Resolution	In a digital image, the total number of pixels in the horizontal and vertical directions.
RFSH	Refresh.
ROM	Read-Only Memory. Nonvolatile memory that stores permanent programs. ROM usually consists of solid-state chips.
ROMCS	ROM Chip Select.
RP	Register Pointer.
RR	Read Register or Rotate Right.
SCF	Set C Flag.

SIO	Serial Input/Output.
SL	Shift Left or Special Lot.
SLL	Shift Left Logical.
SMR	Stop Mode Recovery.
SN	Serial Number.
SOIC	Small Outline IC.
SP	Stack Pointer.
SPH	Stack Pointer High.
SPI	Serial Peripheral Interface.
SPL	Stack Pointer Low.
SRAM	Static Random Access Memory.
SR	Shift Right.
SRA	Shift Right Arithmetic.
SRC	Source.
SSI	Small Scale Integration. Chip that contains 5 to 50 gates or transistors.
Static	Characteristic of Random Access Memory that enables It to operate without clocking signals.
ST	Status.
STKPTR	Stack Pointer.

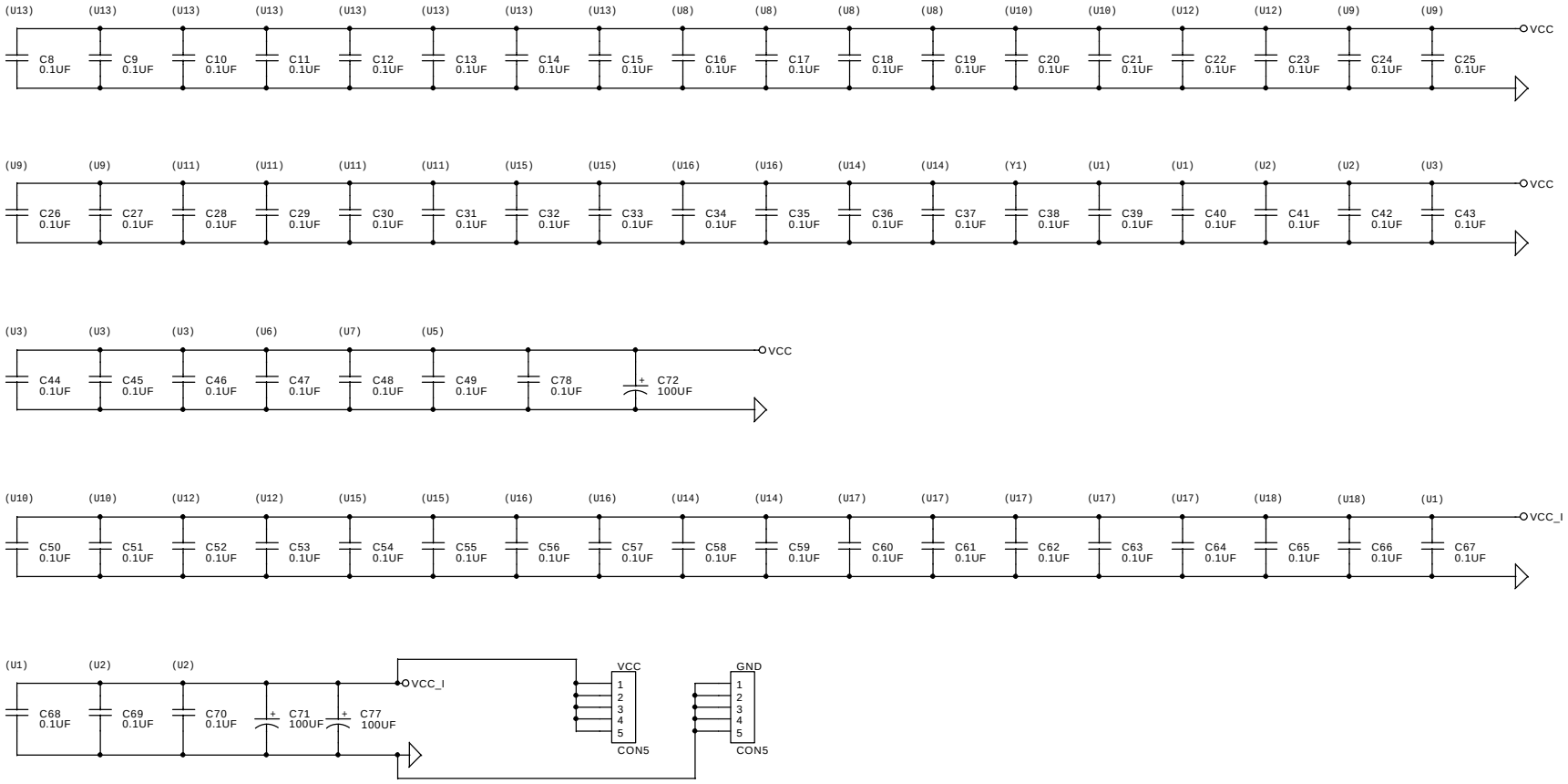
SUB	Subtract.
SVGA	Super Video Graphics Adapter.
S/W	Software.
SWI	Software Interrupt.
Symbol Definition	Symbol defined when the symbol name is associated with a certain amount of memory space, depending on the type of the symbol and the size of Its dimension.
Symbol Reference	Symbol referenced within a program flow, whenever It is accessed for a read, write, or execute operation.
SYNC	Synchronous Communication Protocol. An event or device is synchronized with the CPU or other process timing.
TC	Time Constant.
TCM	Trellis Coded Modulation.
TCR	Timer Control Register.
TMR	Timer Mode Register.
UART	Universal Asynchronous Receiver Transmitter. Component or functional block that handles asynchronous communications. Converts the data from the parallel format in which it is stored, to the serial format for transmission.
UGE	Unsigned Greater Than or Equal.
UGT	Unsigned Greater Than.

ULE	Unsigned Less Than or Equal.
ULT	Unsigned Less Than.
UM	User's Manual.
USART	Universal Synchronous/Asynchronous Receiver/Transmitter. Can handle synchronous as well as asynchronous transmissions.
USB	Universal Serial Bus.
USC	Universal Serial Controller.
UTB	Use Test Box. A board or system to test a particular chip in an end-use application.
V	Volt, Overflow Flag.
V_{CC}	Supply Voltage.
V_{DD}	Voltage from the Digital Power Supply.
V_{PP}	Programmed Voltage.
VRAM	Video Random-Access Memory. A special form of RAM chip that has a separate serial-output port for display refresh operations. This architecture speeds up video adaptor performance.
V_{REF}	Analog Reference Voltage.
WDT	Watch-Dog Timer. A timer that, when enabled under normal operating conditions, must be reset within the time period set within the application (WDTMR (1,0)). If the timer is not reset, a Power-on Reset occurs. Some earlier manuals refer to this timer as the WDTMR.

WDTOUT	Watch-Dog Timer Output.
Word	Amount of data a processor can hold in its registers and process at one time. A DSP word is often 16 bits. Given the same clock rate, a 16-bit controller processes four bytes in the same time it takes an 8-bit controller to process two.
WR	Write.
WS	Wafer Sort.
X	Indexed Address, Undefined.
XOR	Bitwise Exclusive OR.
XTAL	Crystal.
Z	Zero, Zero Flag.
ZASM	ZiLOG Assembler. ZiLOG's program development environment for DOS.
ZDS	ZiLOG Developer Studio. ZiLOG's program development environment for Windows 95/98/NT.
ZEM	ZiLOG Emulator.
ZiLOG Symbol Format	Three fields per symbol including a string containing the Symbol Name, a Symbol Attribute, and an Absolute Value in Hexadecimal.
ZLD	ZiLOG Linkage Editor. Cross linkage editor for ZiLOG's microcontrollers.
ZLIB	ZiLOG Librarian. Librarian for creating library files from locatable object modules for the ZiLOG family of microcontrollers.

ZMASM	ZiLOG Macro Cross Assembler.
ZDS	ZiLOG's program development environment for Windows 3.1 and up.
ZOMF	ZiLOG's Object Module Format. The object module format used by the linkage editor.

INDEX

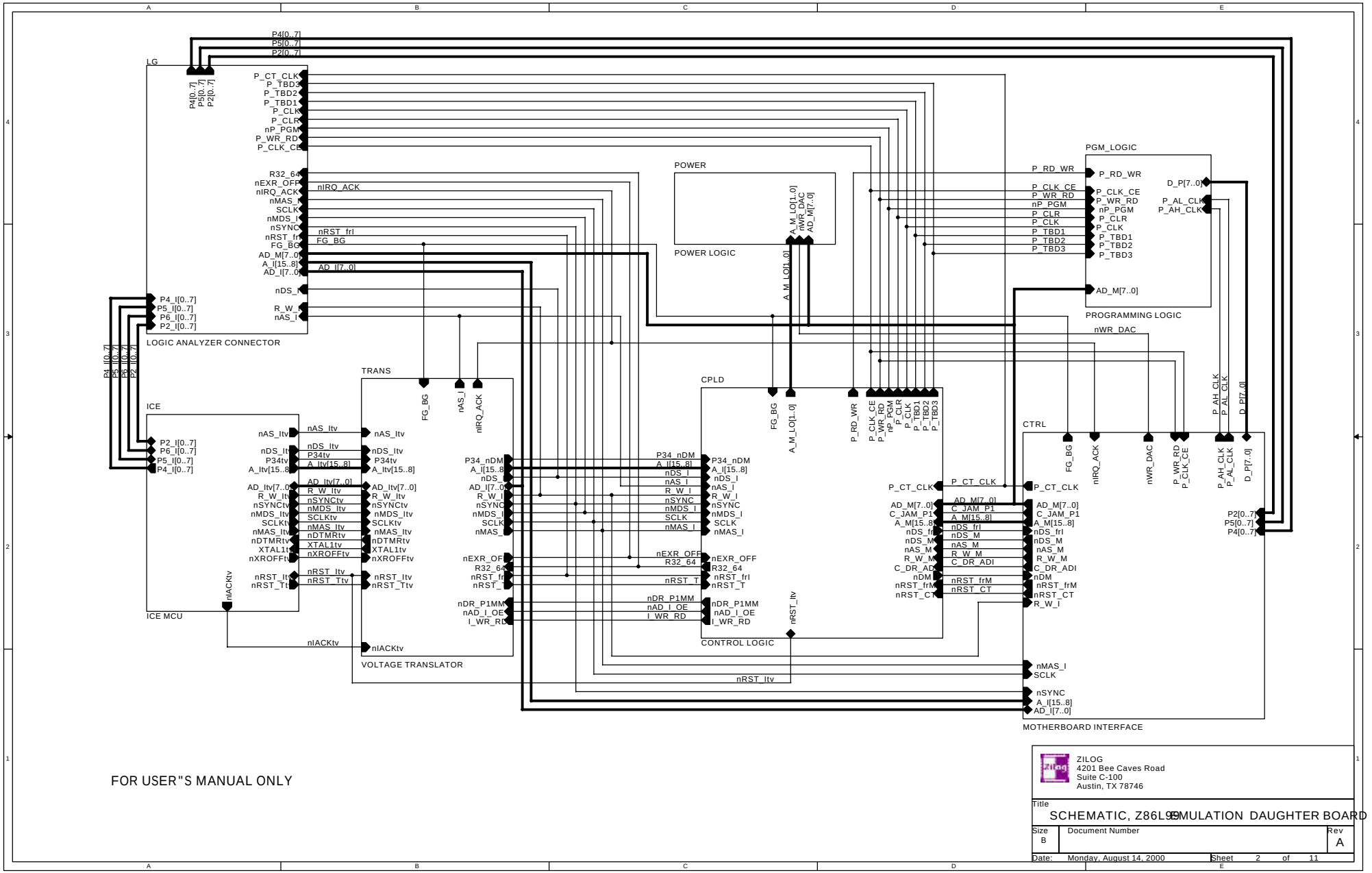


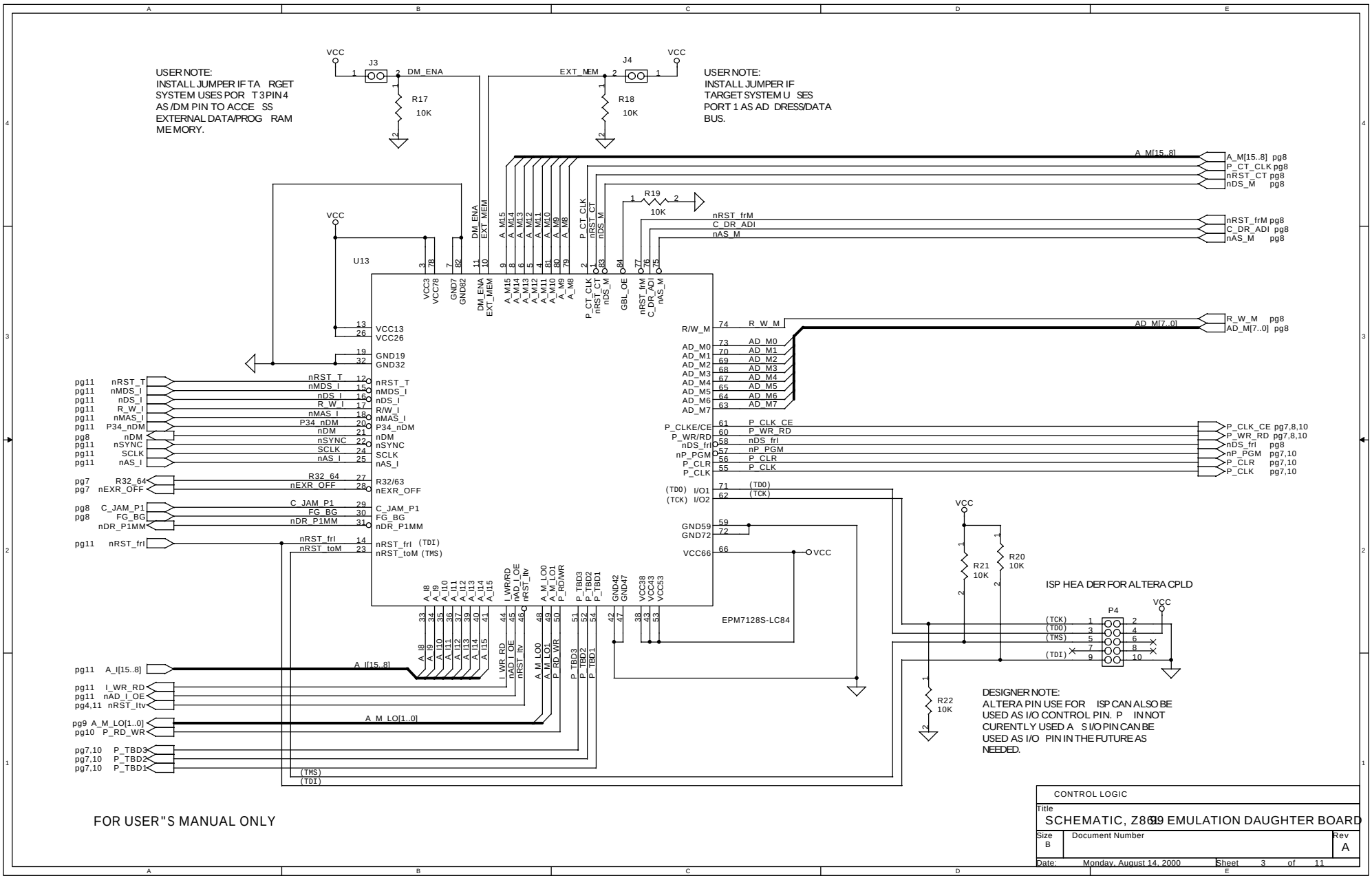
BYPASS/DECOUPLING CAPACITORS

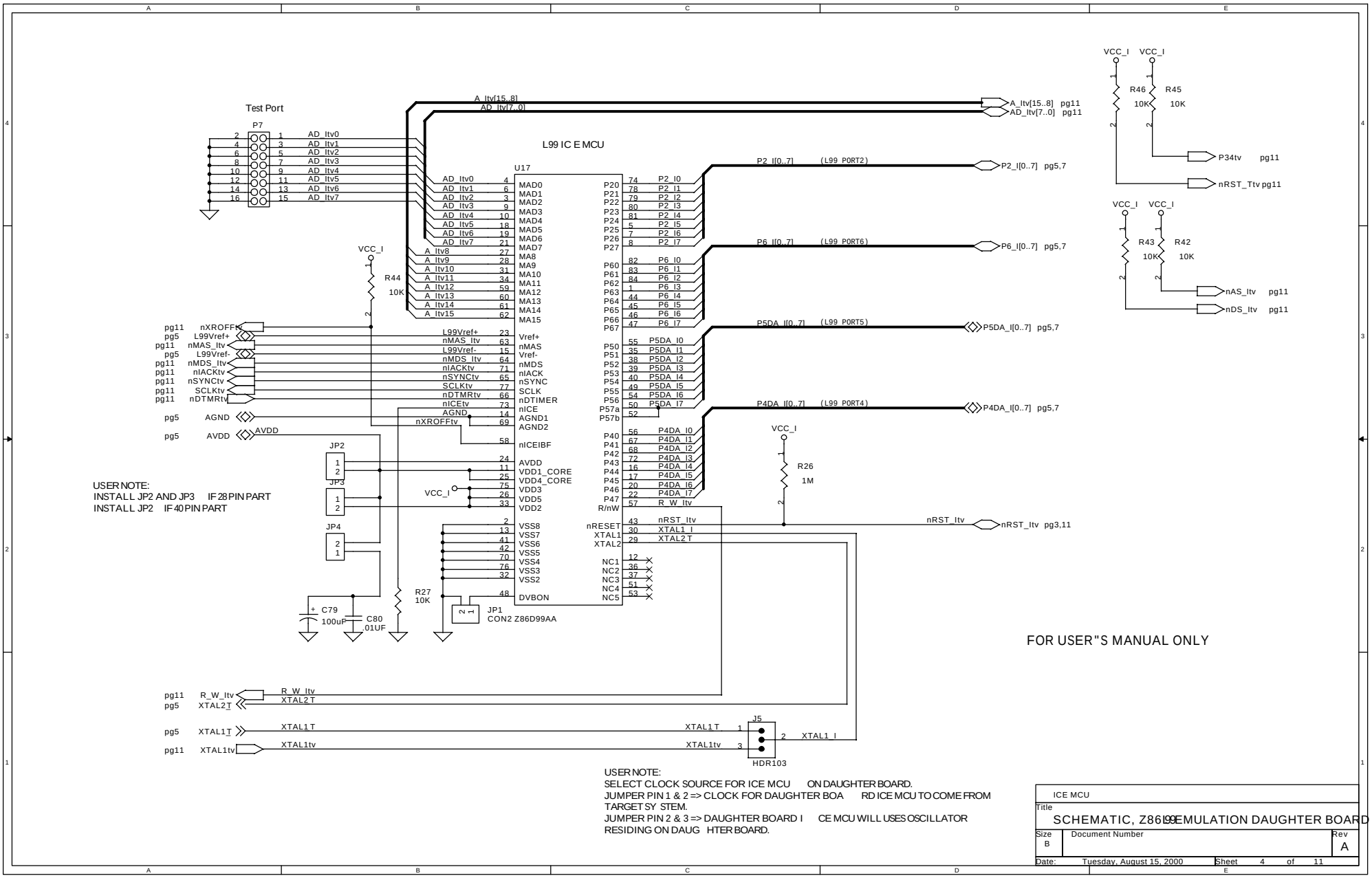
Title: SCHEMATIC, Z8L99 EMULATION DAUGHTER BOARD

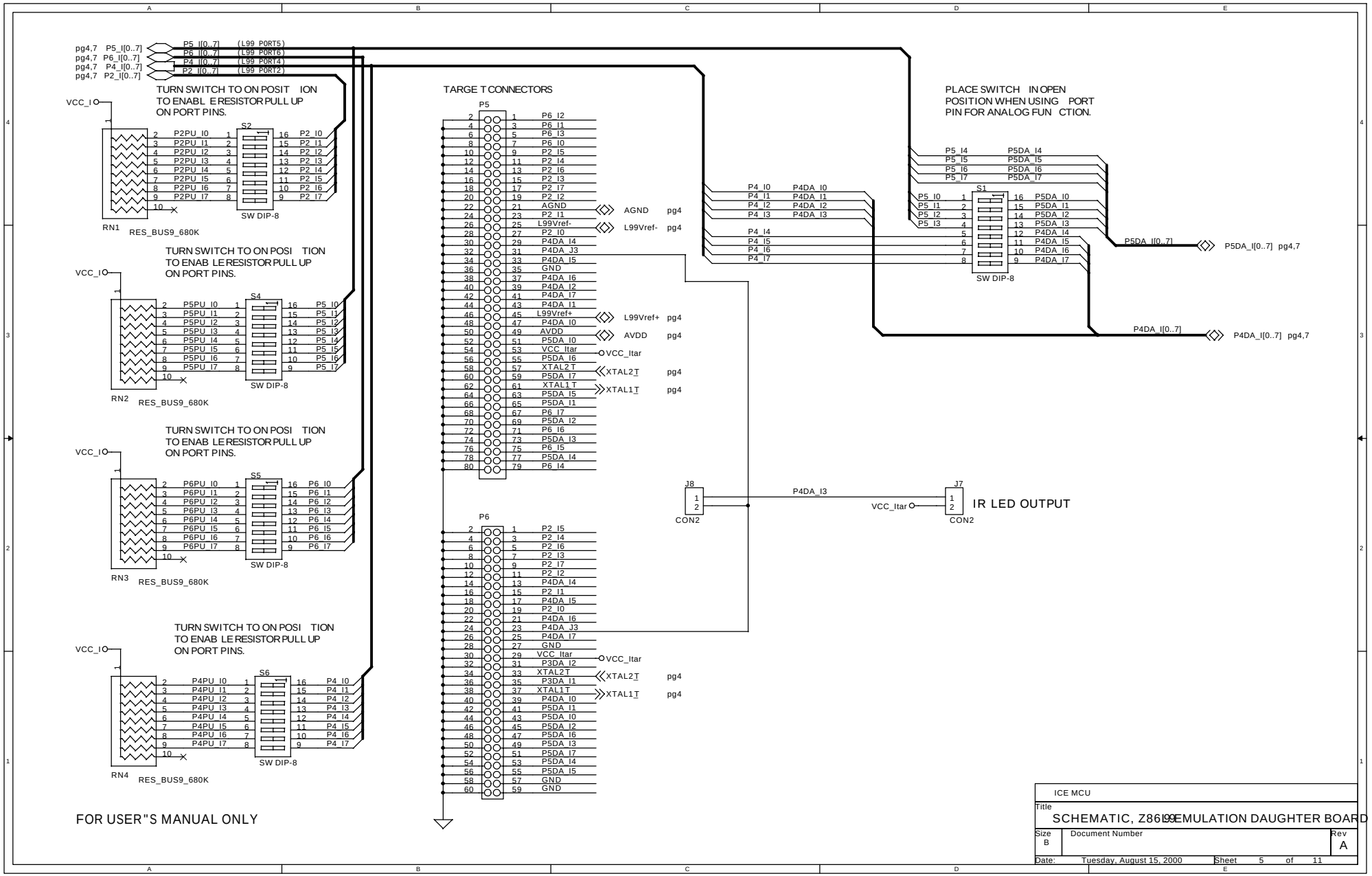
Size	Document Number	Rev
B		A

Date: Monday, August 14, 2000 Sheet 1 of 11


LG
P4[0..7]
P5[0..7]
P2[0..7]
P_CT_CLK
P_TBD3
P_TBD2
P_TBD1
P_CLK
P_CLR
nP_PGM
P_WR_RD
P_CLK_CE
R32_64
nEXR_OFF
nIRQ_ACK
nMAS_I
SCLK
nMDS_I
nSYNC
nRST_frI
FG_BG
AD_M[7..0]
A_I[15..8]
AD_I[7..0]
nDS_I
R_W_I
nAS_I
P4_I[0..7]
P5_I[0..7]
P6_I[0..7]
P2_I[0..7]
LOGIC ANALYZER CONNECTOR
POWER
POWER LOGIC
A_M_LO[1..0]
nWR_DAC
AD_M[7..0]
PGM_LOGIC
P_RD_WR
P_CLK_CE
P_WR_RD
nP_PGM
P_CLR
P_CLK
P_TBD1
P_TBD2
P_TBD3
D_P[7..0]
P_AL_CLK
P_AH_CLK
PROGRAMMING LOGIC
TRANS
ICE
nAS_Itv
nDS_Itv
P34tv
A_Itv[15..8]
AD_Itv[7..0]
R_W_Itv
nSYNCtv
nMDS_Itv
SCLKtv
nMAS_Itv
nDTMRtv
XTAL1tv
nXROFFtv
nRST_Itv
nRST_Ttv
nIACKtv
ICE MCU
VOLTAGE TRANSLATOR
FG_BG
nAS_I
nIRQ_ACK
P34_nDM
A_I[15..8]
nDS_I
AD_I[7..0]
R_W_I
nSYNC
nMDS_I
SCLK
nMAS_I
nEXR_OFF
R32_64
nRST_frI
nRST_T
nDR_P1MM
nAD_I_OE
I_WR_RD
CPLD
A_M_LO[1..0]
P_RD_WR
P_CLK_CE
P_WR_RD
nP_PGM
P_CLR
P_CLK
P_TBD1
P_TBD2
P_TBD3
CONTROL LOGIC
nRST_Itv
CTRL
P_CT_CLK
AD_M[7..0]
C_JAM_P1
A_M[15..8]
nDS_frI
nDS_M
nAS_M
R_W_M
C_DR_ADI
nDM
nRST_frM
nRST_CT
R_W_I
nWR_DAC
P_AH_CLK
P_AL_CLK
D_P[7..0]
P2[0..7]
P5[0..7]
P4[0..7]
nMAS_I
SCLK
nSYNC
A_I[15..8]
AD_I[7..0]
MOTHERBOARD INTERFACE
FOR USER"S MANUAL ONLY
ZILOG
4201 Bee Caves Road
Suite C-100
Austin, TX 78746
Title
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Size
B
Document Number
Rev
A
Date: Monday, August 14, 2000
Sheet 2 of 11


USER NOTE:
INSTALL JUMPER IF TARGET SYSTEM USES PORT 3 PIN 4 AS /DM PIN TO ACCESS EXTERNAL DATA/PROGRAM MEMORY.
USER NOTE:
INSTALL JUMPER IF TARGET SYSTEM USES PORT 1 AS ADDRESS/DATA BUS.
J3
J4
DM_ENA
EXT_MEM
R17 10K
R18 10K
R19 10K
U13
EPM7128S-LC84
R20 10K
R21 10K
R22 10K
ISP HEADER FOR ALTERA CPLD
P4
DESIGNER NOTE:
ALTERA PIN USE FOR ISP CAN ALSO BE USED AS I/O CONTROL PIN. PIN NOT CURENTLY USED AS I/O PIN CAN BE USED AS I/O PIN IN THE FUTURE AS NEEDED.
FOR USER"S MANUAL ONLY
CONTROL LOGIC
Title
SCHEMATIC, Z8S19 EMULATION DAUGHTER BOARD
Size B
Document Number
Rev A
Date: Monday, August 14, 2000
Sheet 3 of 11

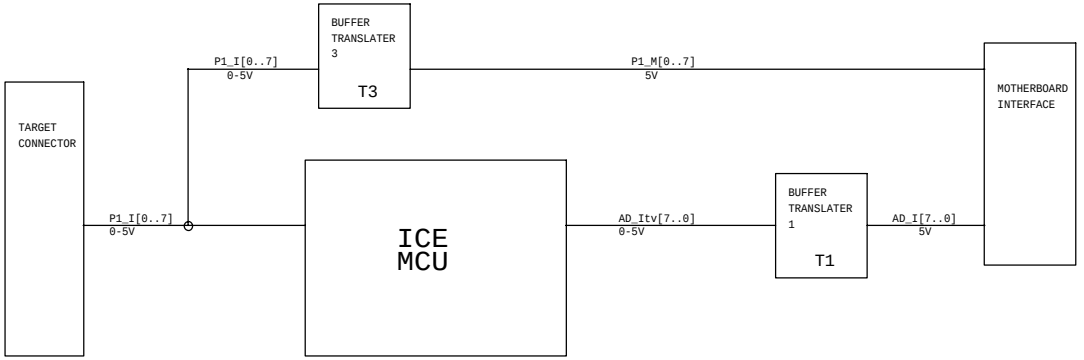

Test Port
P7
L99 IC E MCU
U17
A_Itv[15..8]
AD_Itv[7..0]
A_Itv[15..8] pg11
AD_Itv[7..0] pg11
P2_I[0..7] (L99 PORT2)
P2_I[0..7] pg5,7
P6_I[0..7] (L99 PORT6)
P6_I[0..7] pg5,7
P5DA_I[0..7] (L99 PORT5)
P5DA_I[0..7] pg5,7
P4DA_I[0..7] (L99 PORT4)
P4DA_I[0..7] pg5,7
P34tv pg11
nRST_Ttv pg11
nAS_Itv pg11
nDS_Itv pg11
nRST_Itv
nRST_Itv pg3,11
VCC_I
R44 10K
R46 10K
R45 10K
R43 10K
R42 10K
R26 1M
R27 10K
C79 100uF
C80 01UF
JP1 CON2 Z86D99AA
JP2
JP3
JP4
J5 HDR103
USER NOTE:
INSTALL JP2 AND JP3 IF 28 PIN PART
INSTALL JP2 IF 40 PIN PART
FOR USER"S MANUAL ONLY
USER NOTE:
SELECT CLOCK SOURCE FOR ICE MCU ON DAUGHTER BOARD.
JUMPER PIN 1 & 2 => CLOCK FOR DAUGHTER BOA RD ICE MCU TO COME FROM TARGET SY STEM.
JUMPER PIN 2 & 3 => DAUGHTER BOARD I CE MCU WILL USES OSCILLATOR RESIDING ON DAUG HTER BOARD.
ICE MCU
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Size B
Document Number
Rev A
Date: Tuesday, August 15, 2000
Sheet 4 of 11


P5_I[0..7] (L99 PORT5)
P6_I[0..7] (L99 PORT6)
P4_I[0..7] (L99 PORT4)
P2_I[0..7] (L99 PORT2)
pg4,7 P5_I[0..7]
pg4,7 P6_I[0..7]
pg4,7 P4_I[0..7]
pg4,7 P2_I[0..7]
TURN SWITCH TO ON POSIT ION TO ENABL E RESISTOR PULL UP ON PORT PINS.
VCC_I
S2
P2PU_I0
P2PU_I1
P2PU_I2
P2PU_I3
P2PU_I4
P2PU_I5
P2PU_I6
P2PU_I7
P2_I0
P2_I1
P2_I2
P2_I3
P2_I4
P2_I5
P2_I6
P2_I7
SW DIP-8
RN1
RES_BUS9_680K
TURN SWITCH TO ON POSI TION TO ENAB LE RESISTOR PULL UP ON PORT PINS.
S4
P5PU_I0
P5PU_I1
P5PU_I2
P5PU_I3
P5PU_I4
P5PU_I5
P5PU_I6
P5PU_I7
P5_I0
P5_I1
P5_I2
P5_I3
P5_I4
P5_I5
P5_I6
P5_I7
RN2
RES_BUS9_680K
TURN SWITCH TO ON POSI TION TO ENAB LE RESISTOR PULL UP ON PORT PINS.
S5
P6PU_I0
P6PU_I1
P6PU_I2
P6PU_I3
P6PU_I4
P6PU_I5
P6PU_I6
P6PU_I7
P6_I0
P6_I1
P6_I2
P6_I3
P6_I4
P6_I5
P6_I6
P6_I7
RN3
RES_BUS9_680K
TURN SWITCH TO ON POSI TION TO ENAB LE RESISTOR PULL UP ON PORT PINS.
S6
P4PU_I0
P4PU_I1
P4PU_I2
P4PU_I3
P4PU_I4
P4PU_I5
P4PU_I6
P4PU_I7
P4_I0
P4_I1
P4_I2
P4_I3
P4_I4
P4_I5
P4_I6
P4_I7
RN4
RES_BUS9_680K
FOR USER"S MANUAL ONLY
TARGE T CONNECTORS
P5
AGND pg4
L99Vref- pg4
L99Vref+ pg4
AVDD pg4
VCC_Itar
XTAL2T pg4
XTAL1T pg4
P6
VCC_Itar
XTAL2T pg4
XTAL1T pg4
PLACE SWITCH IN OPEN POSITION WHEN USING PORT PIN FOR ANALOG FUN CTION.
P5DA_I0
P5DA_I1
P5DA_I2
P5DA_I3
P5DA_I4
P5DA_I5
P5DA_I6
P5DA_I7
P4DA_I0
P4DA_I1
P4DA_I2
P4DA_I3
P4DA_I4
P4DA_I5
P4DA_I6
P4DA_I7
P5DA_I[0..7]
P5DA_I[0..7] pg4,7
P4DA_I[0..7]
P4DA_I[0..7] pg4,7
J8
J7
CON2
P4DA_I3
VCC_Itar
IR LED OUTPUT
ICE MCU
Title
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Size B
Document Number
Rev A
Date: Tuesday, August 15, 2000
Sheet 5 of 11

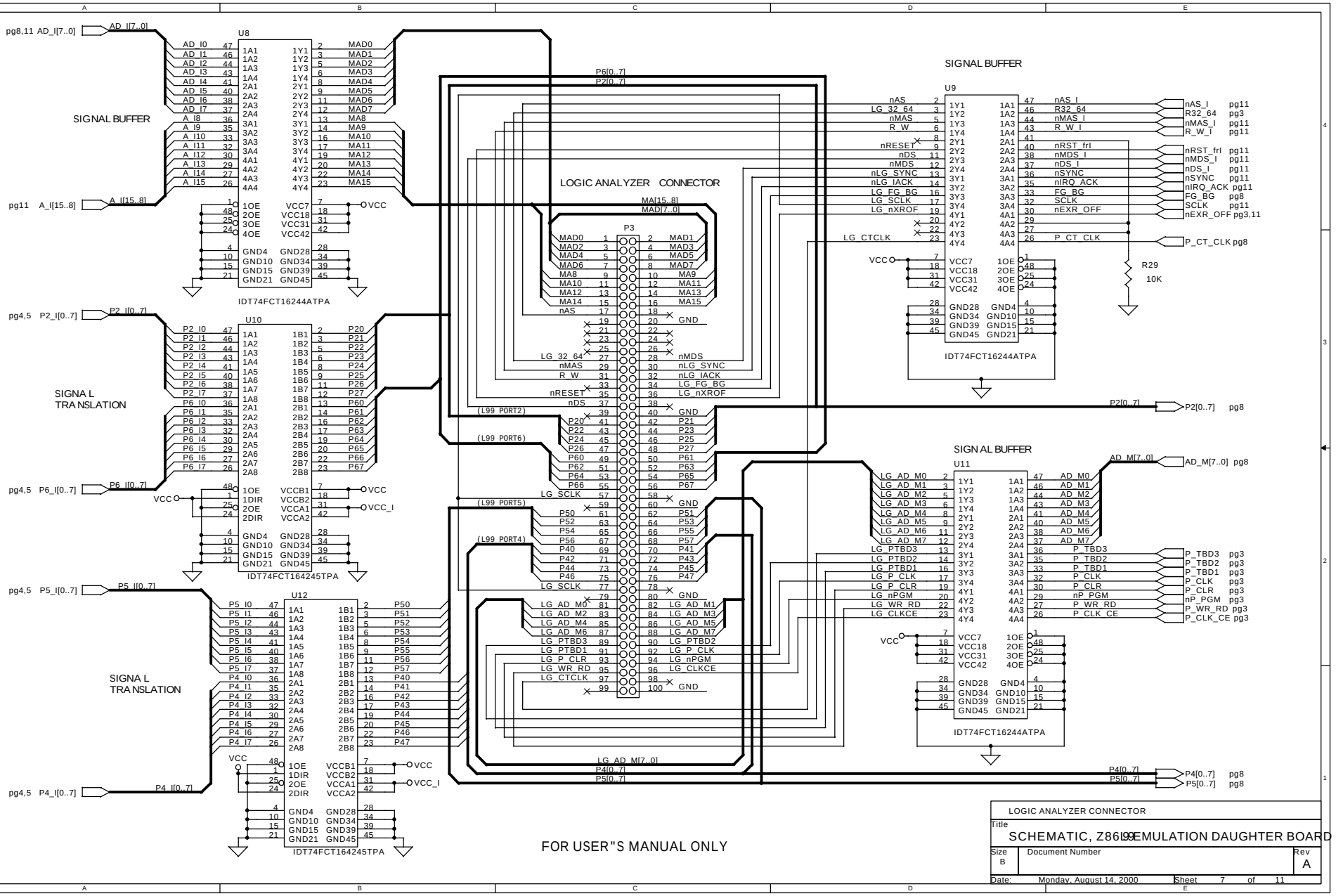
L99 MODE:

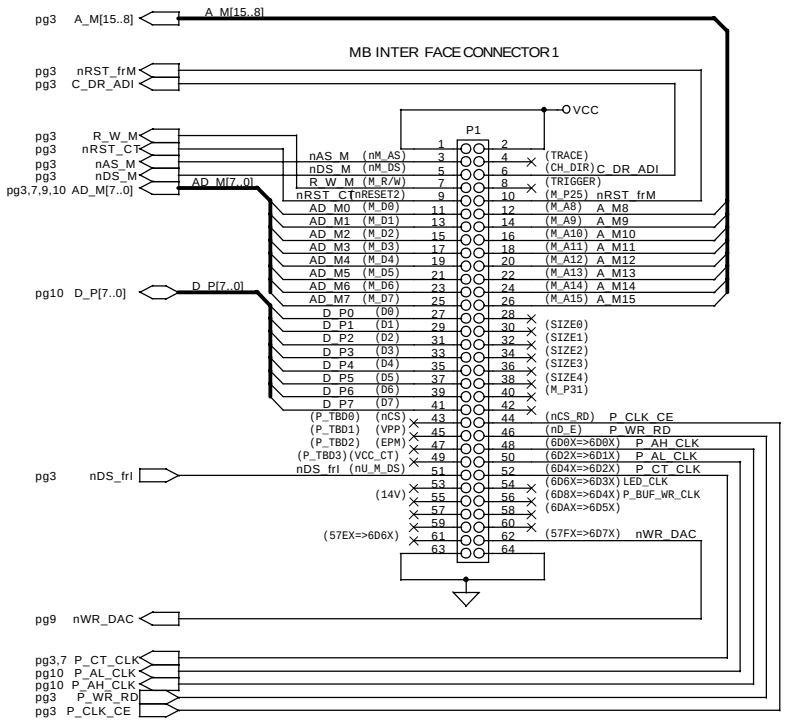
- SET ROM_SIZE_RG = 16K.
- T3 IS TRI-STATED.
- WHEN DS_I IS ASSERTED:
  IF (FG/BG && OUTSIDE_ROM)
    TR-STATE T1.
  ELSE IF (FG/BG && !OUTSIDE_ROM)
    ENABLE T1.
  ELSE IF (!FG/BG)
    IF (C_JAM_P1)
      TRI-STATE T1.
    ELSE
      ENABLE T1.

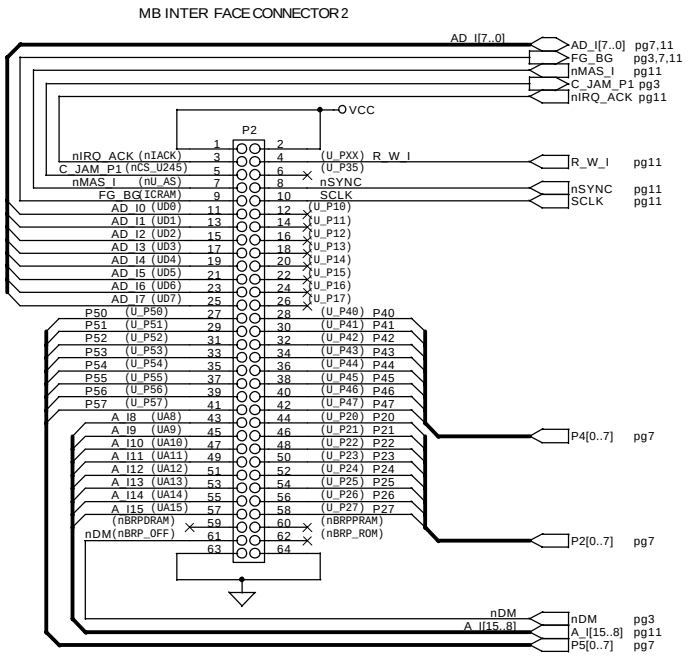
NOTE: ZDS MUST NOT SET D_MEMFLAG REGISTER
      DMF_DATA BIT WHEN ACCESSING EXECUTABLE
      RAM.



Title	SCHEMATIC, Z8619 EMULATION DAUGHTER BOARD	
Size B	Document Number	Rev A
Date: Monday, August 14, 2000	Sheet 6 of 11	

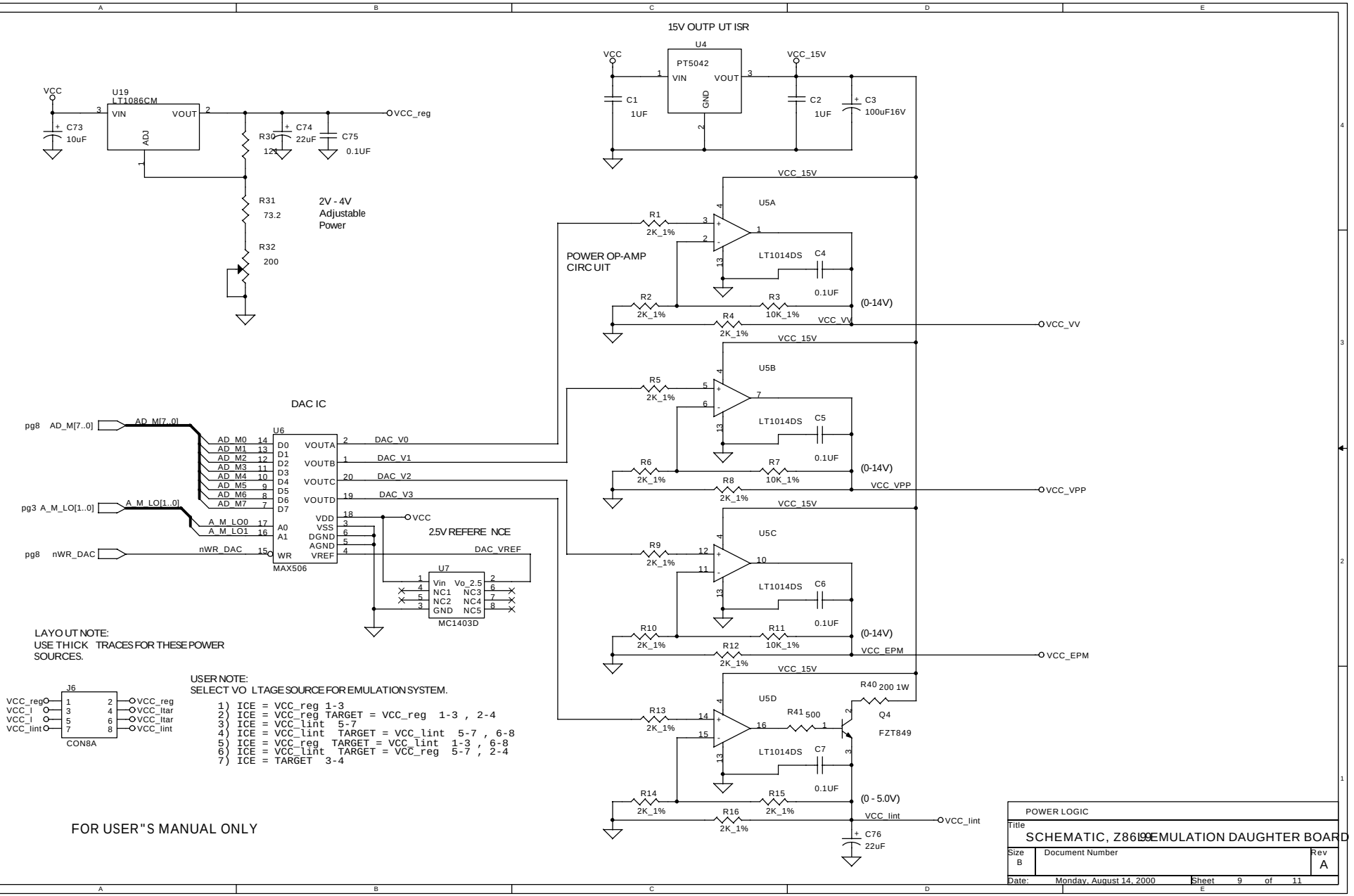

SIGNAL BUFFER
U8
IDT74FCT16244ATPA
SIGNA L TRANSLATION
U10
IDT74FCT164245TPA
SIGNA L TRANSLATION
U12
IDT74FCT164245TPA
LOGIC ANALYZER CONNECTOR
P3
(L99 PORT2)
(L99 PORT6)
(L99 PORT5)
(L99 PORT4)
SIGNAL BUFFER
U9
IDT74FCT16244ATPA
R29
10K
SIGNAL BUFFER
U11
IDT74FCT16244ATPA
FOR USER"S MANUAL ONLY
LOGIC ANALYZER CONNECTOR
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Monday, August 14, 2000
Sheet 7 of 11

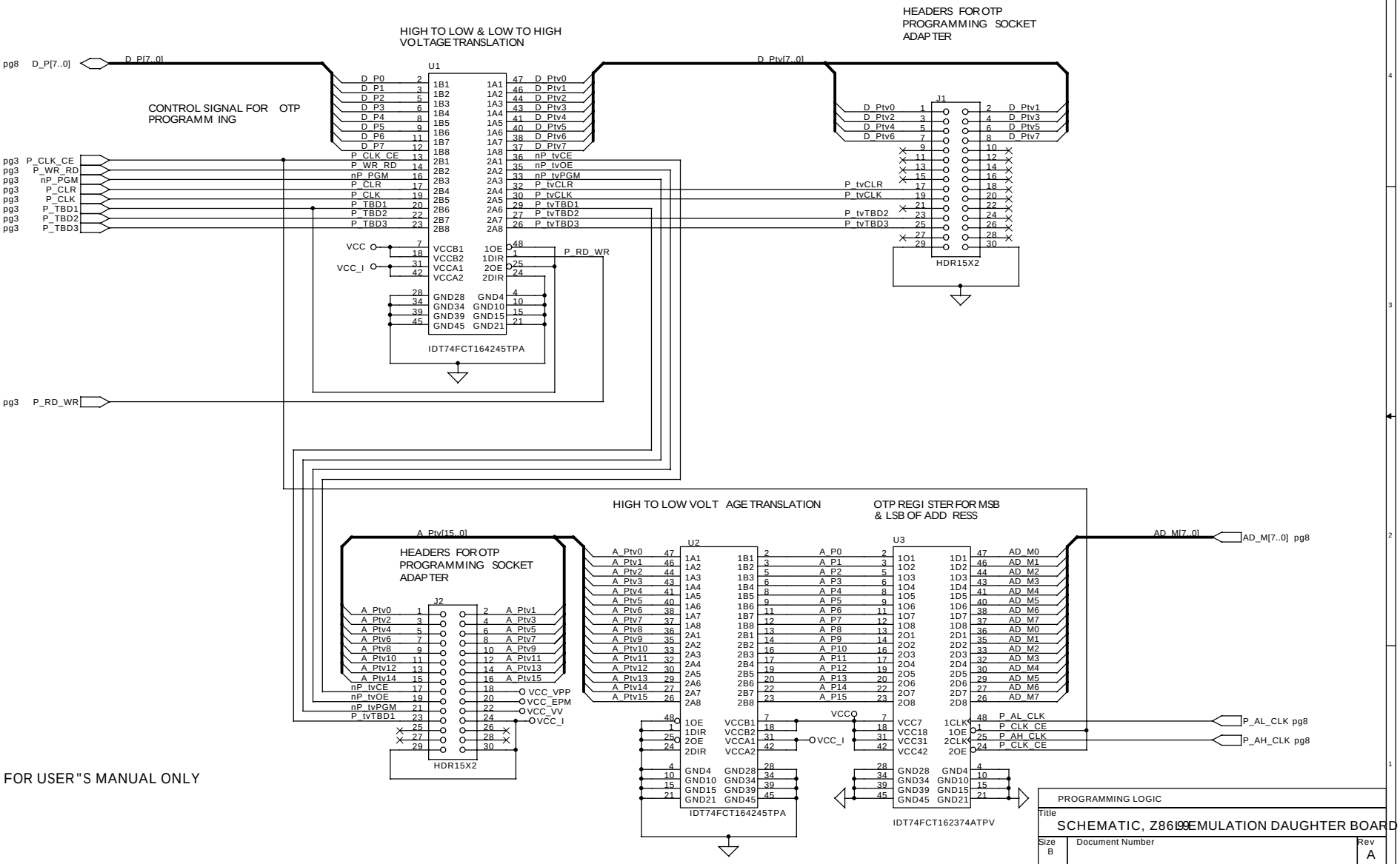


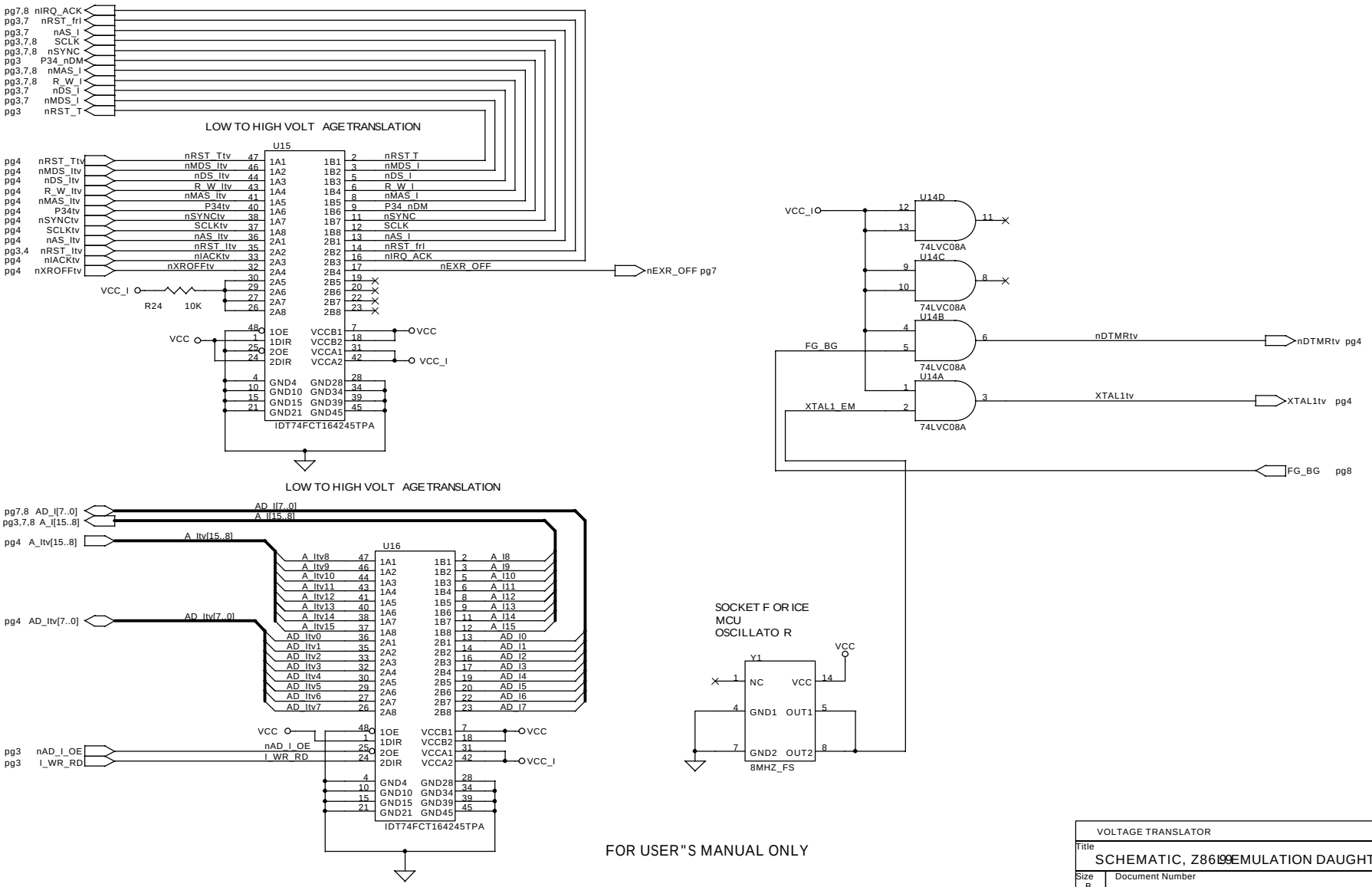


FOR USER"S MANUAL ONLY

MOTHERBOARD INTERFACE		
Title: SCHEMATIC, Z8L99 EMULATION DAUGHTER BOARD		
Size: B	Document Number	Rev: A
Date: Monday, August 14, 2000	Sheet 8 of 11	


15V OUTP UT ISR
U4
PT5042
VIN
VOUT
GND
VCC
VCC_15V
C1
1UF
C2
1UF
C3
100uF16V
U19
LT1086CM
VIN
VOUT
ADJ
C73
10uF
C74
22uF
C75
0.1UF
VCC_reg
R30
121
R31
73.2
R32
200
2V - 4V
Adjustable
Power
POWER OP-AMP
CIRC UIT
U5A
U5B
U5C
U5D
LT1014DS
R1
2K_1%
R2
2K_1%
R3
10K_1%
R4
2K_1%
C4
0.1UF
(0-14V)
VCC_VV
VCC_VV
R5
2K_1%
R6
2K_1%
R7
10K_1%
R8
2K_1%
C5
0.1UF
(0-14V)
VCC_VPP
VCC_VPP
R9
2K_1%
R10
2K_1%
R11
10K_1%
R12
2K_1%
C6
0.1UF
(0-14V)
VCC_EPM
VCC_EPM
R40
200 1W
R41
500
Q4
FZT849
R13
2K_1%
R14
2K_1%
R15
2K_1%
R16
2K_1%
C7
0.1UF
(0 - 5.0V)
VCC_lint
VCC_lint
C76
22uF
DAC IC
U6
MAX506
AD_M[7..0]
A_M_LO[1..0]
nWR_DAC
D0
D1
D2
D3
D4
D5
D6
D7
A0
A1
WR
VOUTA
VOUTB
VOUTC
VOUTD
VDD
VSS
DGND
AGND
VREF
DAC_V0
DAC_V1
DAC_V2
DAC_V3
DAC_VREF
2.5V REFERE NCE
U7
MC1403D
Vin
Vo_2.5
NC1
NC2
NC3
NC4
NC5
GND
LAYO UT NOTE:
USE THICK TRACES FOR THESE POWER
SOURCES.
J6
CON8A
VCC_reg
VCC_I
VCC_I
VCC_lint
VCC_Itar
VCC_Itar
USER NOTE:
SELECT VO LTAGE SOURCE FOR EMULATION SYSTEM.
1) ICE = VCC_reg 1-3
2) ICE = VCC_reg TARGET = VCC_reg 1-3 , 2-4
3) ICE = VCC_lint 5-7
4) ICE = VCC_lint TARGET = VCC_lint 5-7 , 6-8
5) ICE = VCC_reg TARGET = VCC_lint 1-3 , 6-8
6) ICE = VCC_lint TARGET = VCC_reg 5-7 , 2-4
7) ICE = TARGET 3-4
FOR USER"S MANUAL ONLY
POWER LOGIC
Title
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Size
B
Document Number
Rev
A
Date:
Monday, August 14, 2000
Sheet
9
of
11


HIGH TO LOW & LOW TO HIGH VOLTAGE TRANSLATION
HEADERS FOR OTP PROGRAMMING SOCKET ADAPTER
CONTROL SIGNAL FOR OTP PROGRAMM ING
pg8 D_P[7..0]
D_Ptv[7..0]
U1
J1
pg3 P_CLK_CE
pg3 P_WR_RD
pg3 nP_PGM
pg3 P_CLR
pg3 P_CLK
pg3 P_TBD1
pg3 P_TBD2
pg3 P_TBD3
P_tvCLR
P_tvCLK
P_tvTBD2
P_tvTBD3
VCC
VCC_I
P_RD_WR
HDR15X2
IDT74FCT164245TPA
pg3 P_RD_WR
HIGH TO LOW VOLT AGE TRANSLATION
OTP REGI STER FOR MSB & LSB OF ADD RESS
A_Ptv[15..0]
HEADERS FOR OTP PROGRAMMING SOCKET ADAPTER
J2
U2
U3
AD_M[7..0]
AD_M[7..0] pg8
nP_tvCE
nP_tvOE
nP_tvPGM
P_tvTBD1
VCC_VPP
VCC_EPM
VCC_VV
VCCO
P_AL_CLK pg8
P_AH_CLK pg8
P_CLK_CE
HDR15X2
IDT74FCT164245TPA
IDT74FCT162374ATPV
FOR USER"S MANUAL ONLY
PROGRAMMING LOGIC
Title
SCHEMATIC, Z86L99 EMULATION DAUGHTER BOARD
Size B
Document Number
Rev A
Date: Monday, August 14, 2000
Sheet 10 of 11


pg7,8 nIRQ_ACK
pg3,7 nRST_frI
pg3,7 nAS_I
pg3,7,8 SCLK
pg3,7,8 nSYNC
pg3 P34_nDM
pg3,7,8 nMAS_I
pg3,7,8 R_W_I
pg3,7 nDS_I
pg3,7 nMDS_I
pg3 nRST_T
LOW TO HIGH VOLT AGE TRANSLATION
U15
pg4 nRST_Ttv
pg4 nMDS_Itv
pg4 nDS_Itv
pg4 R_W_Itv
pg4 nMAS_Itv
pg4 P34tv
pg4 nSYNCtv
pg4 SCLKtv
pg4 nAS_Itv
pg3,4 nRST_Itv
pg4 nIACKtv
pg4 nXROFFtv
nRST_Ttv
nMDS_Itv
nDS_Itv
R_W_Itv
nMAS_Itv
P34tv
nSYNCtv
SCLKtv
nAS_Itv
nRST_Itv
nIACKtv
nXROFFtv
1A1 1A2 1A3 1A4 1A5 1A6 1A7 1A8 2A1 2A2 2A3 2A4 2A5 2A6 2A7 2A8
1B1 1B2 1B3 1B4 1B5 1B6 1B7 1B8 2B1 2B2 2B3 2B4 2B5 2B6 2B7 2B8
nRST_T
nMDS_I
nDS_I
R_W_I
nMAS_I
P34_nDM
nSYNC
SCLK
nAS_I
nRST_frI
nIRQ_ACK
nEXR_OFF
nEXR_OFF pg7
VCC_I
R24 10K
1OE 1DIR 2OE 2DIR
VCCB1 VCCB2 VCCA1 VCCA2
VCC
VCC_I
GND4 GND10 GND15 GND21
GND28 GND34 GND39 GND45
IDT74FCT164245TPA
U14D
U14C
U14B
U14A
74LVC08A
FG_BG
XTAL1_EM
nDTMRtv
nDTMRtv pg4
XTAL1tv
XTAL1tv pg4
FG_BG pg8
LOW TO HIGH VOLT AGE TRANSLATION
pg7,8 AD_I[7..0]
pg3,7,8 A_I[15..8]
pg4 A_Itv[15..8]
pg4 AD_Itv[7..0]
AD_I[7..0]
A_I[15..8]
A_Itv[15..8]
AD_Itv[7..0]
U16
A_Itv8 A_Itv9 A_Itv10 A_Itv11 A_Itv12 A_Itv13 A_Itv14 A_Itv15
AD_Itv0 AD_Itv1 AD_Itv2 AD_Itv3 AD_Itv4 AD_Itv5 AD_Itv6 AD_Itv7
A_I8 A_I9 A_I10 A_I11 A_I12 A_I13 A_I14 A_I15
AD_I0 AD_I1 AD_I2 AD_I3 AD_I4 AD_I5 AD_I6 AD_I7
pg3 nAD_I_OE
pg3 I_WR_RD
nAD_I_OE
I_WR_RD
IDT74FCT164245TPA
SOCKET F OR ICE
MCU
OSCILLATO R
Y1
NC VCC GND1 OUT1 GND2 OUT2
8MHZ_FS
FOR USER"S MANUAL ONLY
VOLTAGE TRANSLATOR
Title
SCHEMATIC, Z86199 EMULATION DAUGHTER BOARD
Size B
Document Number
Rev A
Date: Monday, August 14, 2000
Sheet 11 of 11