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Z86L9900100ZEM

Z86L99 ICEBOX

User Manual

UM005100-IRR0400

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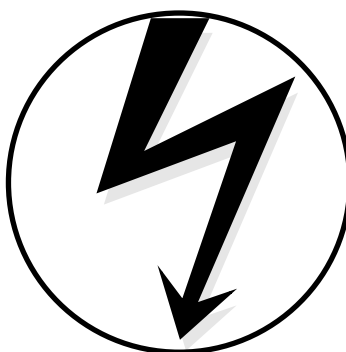
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Follow the precautions listed below to avoid permanent damage to the emulator.

- 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.



Z I L O G

ABOUT THIS MANUAL

Z86L99 ICEBOX USER'S MANUAL

PREFACE

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 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.



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Z86L99 ICEBOX USER'S MANUAL

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 the Z86L9900100ZEM ICEBOX using a DB25, RS-232 and DCE cable (Tx/D, Rx/D 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.



Z I L O G

HARDWARE INSTALLATION

Z86L99 ICEBOX USER'S MANUAL

CHAPTER 2 SET-UP AND 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.

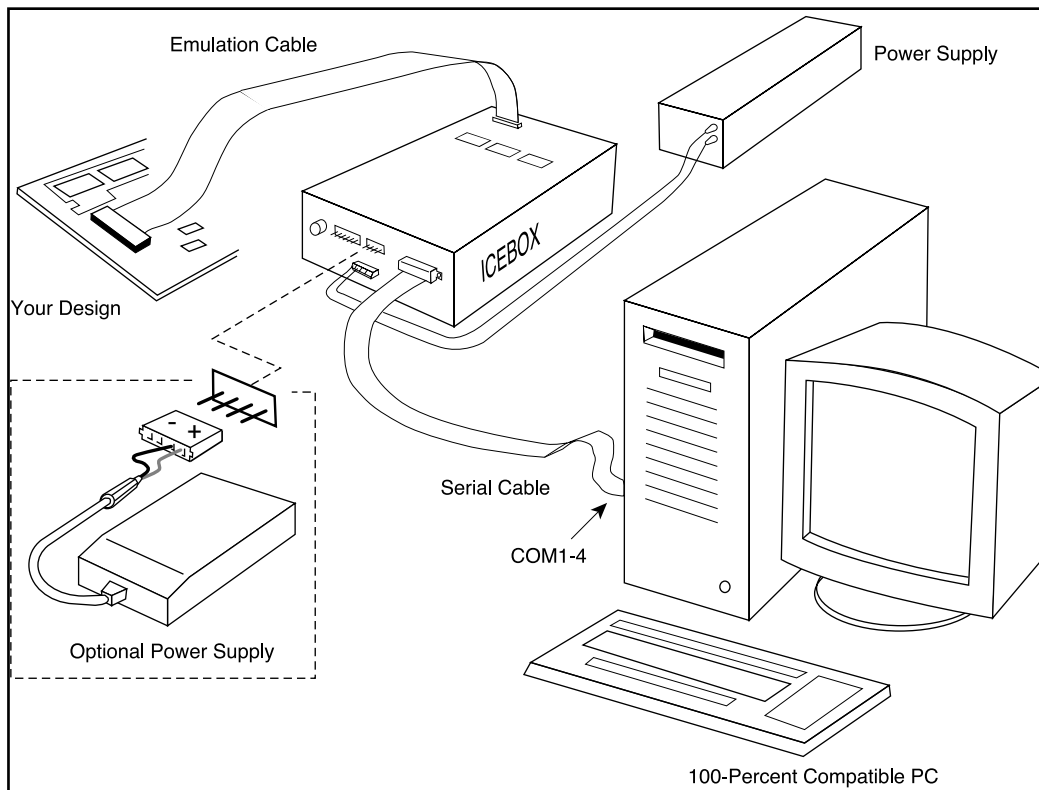


FIGURE 2-1. EMULATOR CONNECTION

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 .

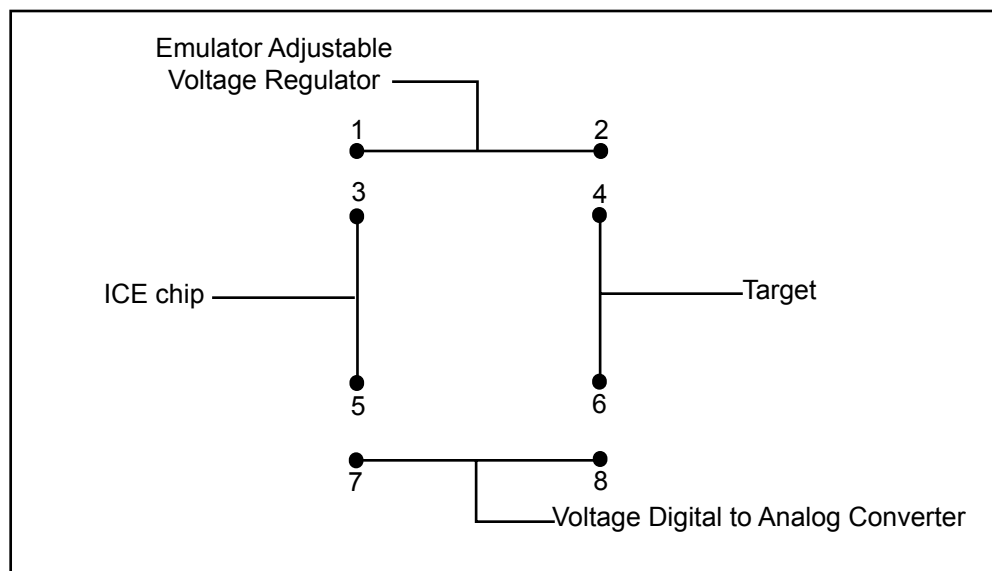


FIGURE 2-2. J6 JUMPER SCHEMATIC



**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 zillog.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	Communicating in Bisync Mode and waiting for command
	Off	Communicating in ASCII Mode or executing Bisync command
RUN	On	Running user code
	Off	Not running user code
OTP	On	The Emulator is performing OTP programing
	Off	The Emulator is not performing OTP programming
PWR	On	Emulator is powered up and Self Test is completed
	Off	Power is off
	Blink	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 <i>(The programmable regulator is currently not supported . Contact ZiLOG customer support to see if the programmable regulator has been released .)</i>
J6	4-6	In	Target is not powered by emulator <i>(See Emulator connection on page 2-2 for more information)</i>
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 (<i>see Note at the bottom of the table</i>)
JP5	2-3	In * (Default)	ICE chip uses emulator oscillator/clock (<i>see Note at the bottom of the table</i>)

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 1-1 for 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 programming 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 programming. Consult the ZDS user manual for more information on OTP programming.
6. Pull straight up on the micro controller to remove it from the OTP programming adapter.

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



Z I L O G

EMULATION

Z86L99 ICEBOX USER'S MANUAL

CHAPTER 3 OVERVIEW

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.

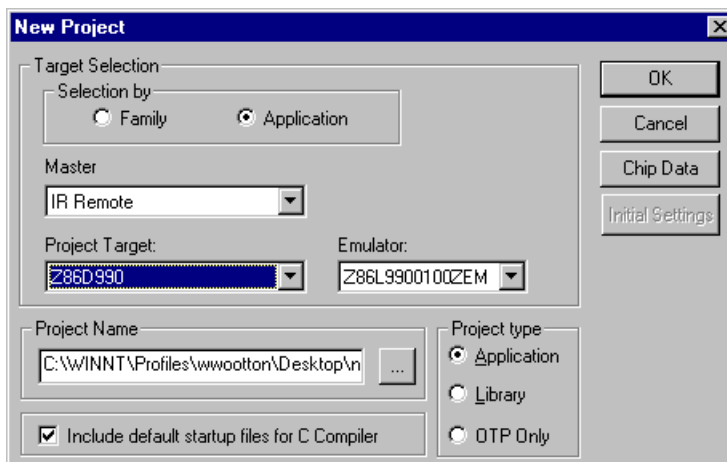


FIGURE 3-1. NEW PROJECT DIALOG BOX

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.

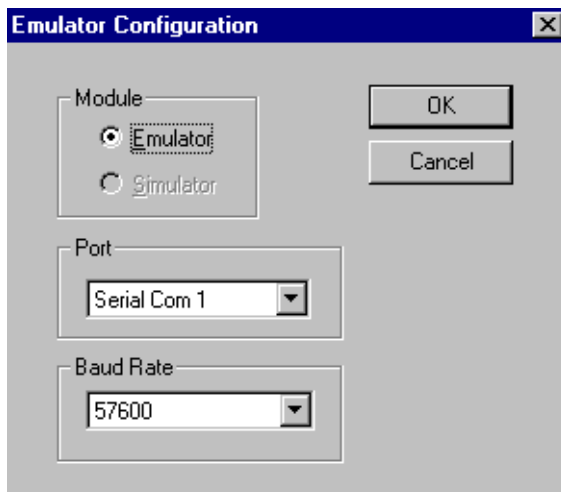


FIGURE 3-2. EMULATOR CONFIGURATION DIALOG BOX

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.

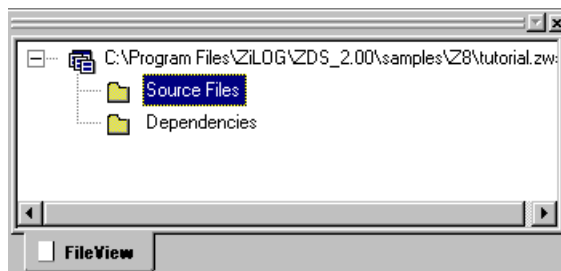
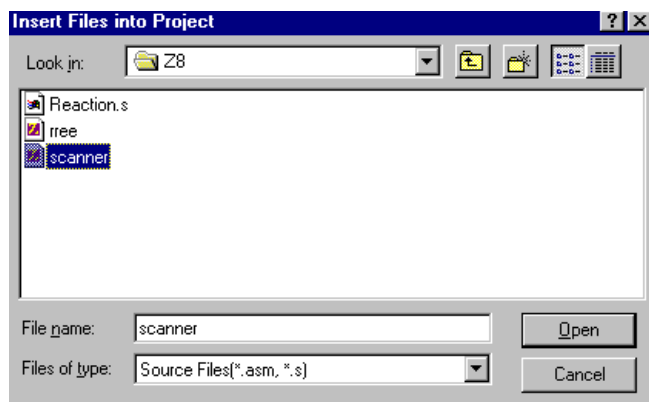


FIGURE 3-3. PROJECT VIEWER WINDOW

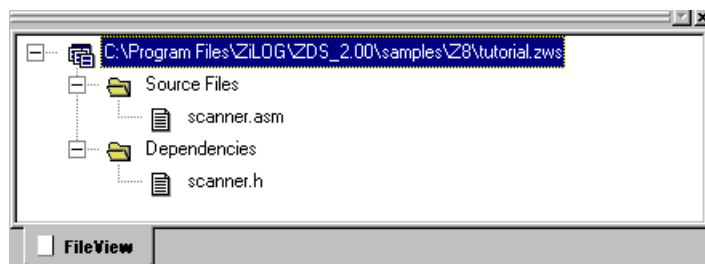
Add an existing file

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 	<ul style="list-style-type: none"> Shows the symbols and the contents of the registers (see the ZDS user manual for more information) 	
Z8 Standard Registers	<ul style="list-style-type: none"> Shows the contents of the Z8 standard registers 	
Code Memory 	<ul style="list-style-type: none"> Allows the user to monitor, edit, and download a <code>file.ld</code> or <code>file.hex</code> into the Code Memory from generated assembly source code Tracks a specific address entered in the Code Address edit box 	
Disassembly	<ul style="list-style-type: none"> Shows code memory along with the corresponding disassembled code Allows the user to edit, and download a <code>file.ld</code> or <code>file.hex</code> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none">• Modify the timer/counter registers in this window	
Ports Register	<ul style="list-style-type: none">• Monitor and edit port registers in this window	
Internal Data Memory	<ul style="list-style-type: none">• 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.
- Uninitialized 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.



Z86L99 ICEBOX USER'S MANUAL

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. #	ZiLOG, Inc.
Software Version	System Test/Customer Support
Manual Number	910 E. Hamilton Ave., Suite 110, MS 4-3
Host Computer Description/Type	Campbell, CA 95008
	Fax Number: (408) 558-8536
	Email: tools@zillog.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.



Z86L99 ICEBOX USER'S MANUAL

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.



Glossary

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.



Glossary

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.



Glossary

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.



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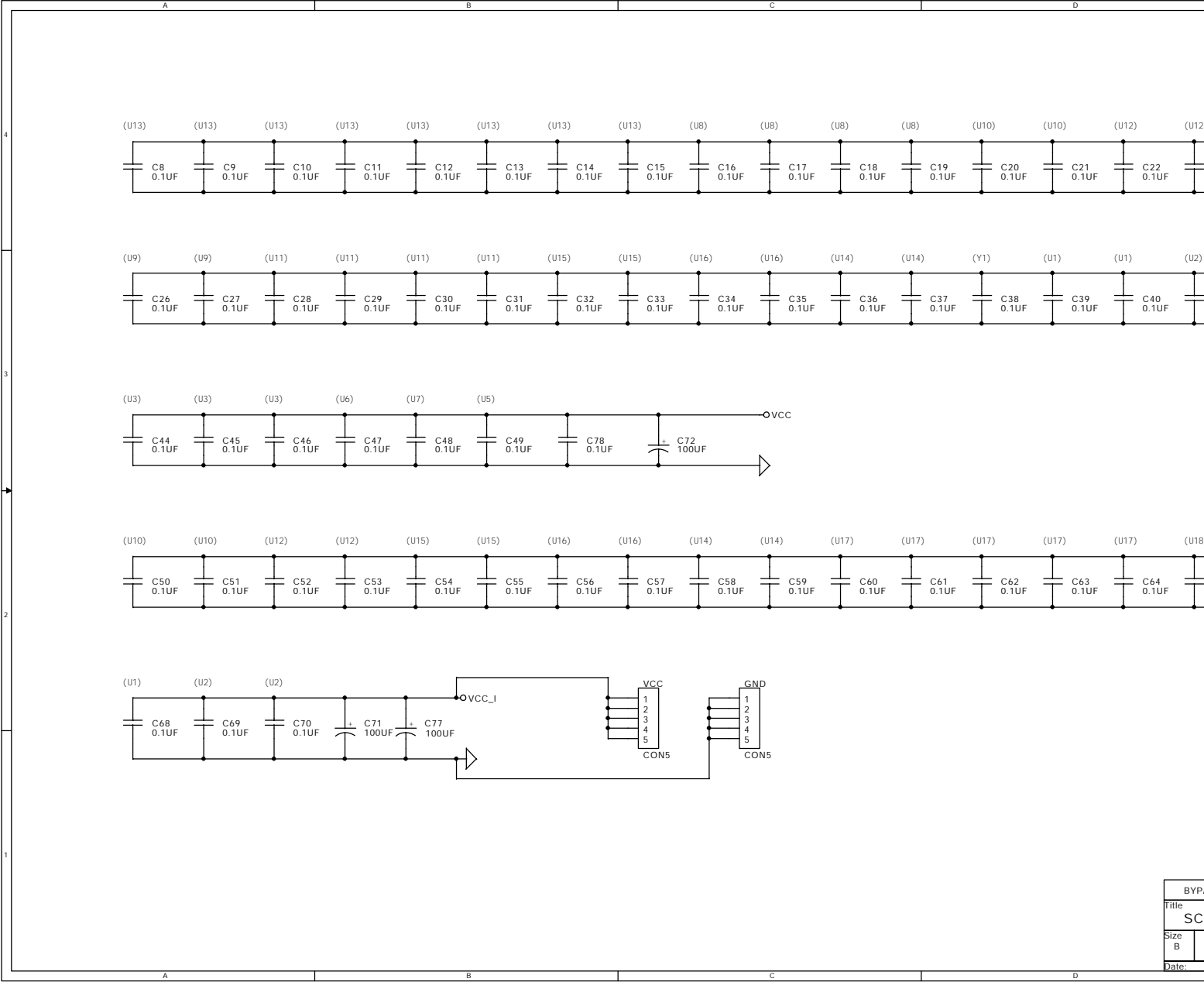
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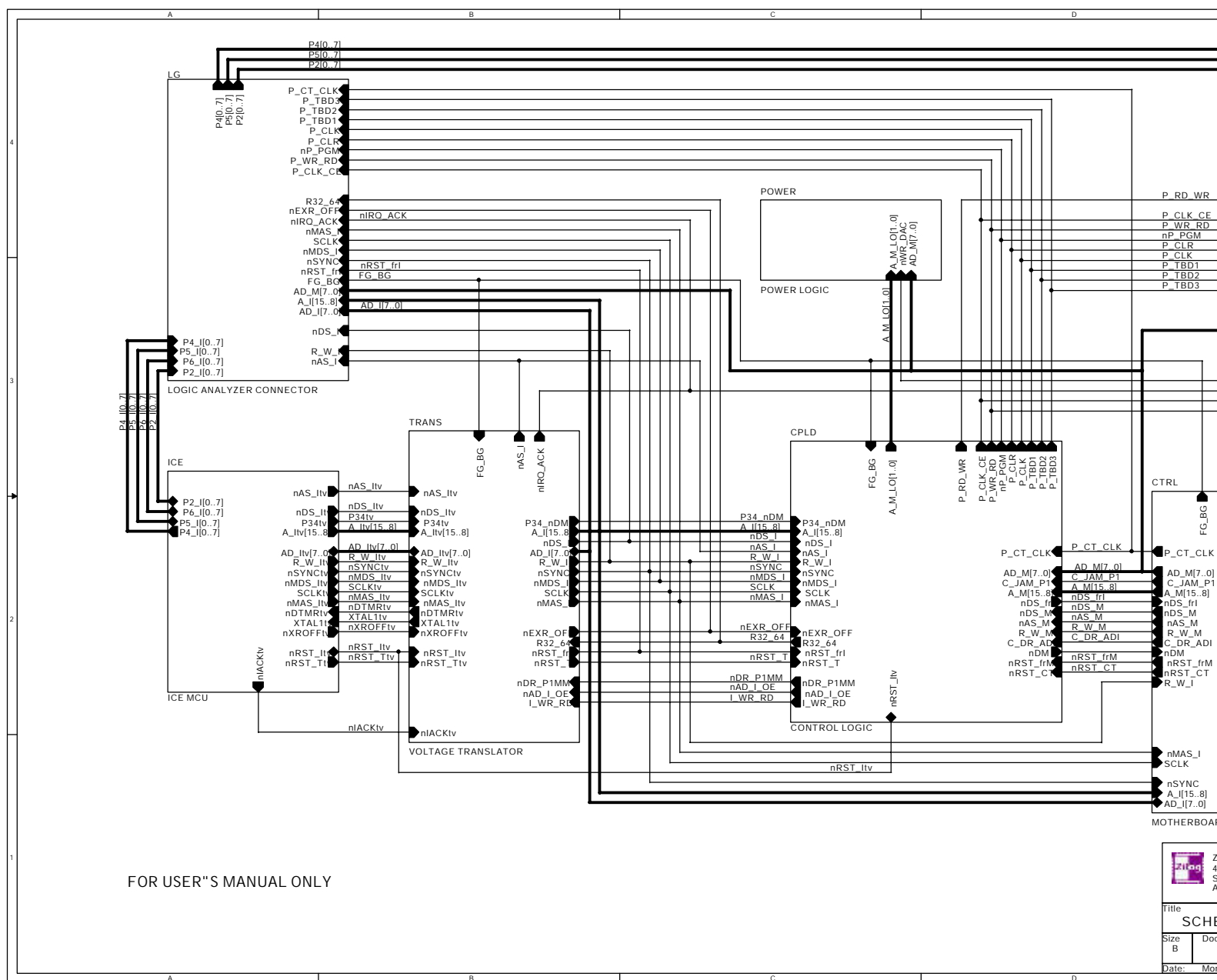
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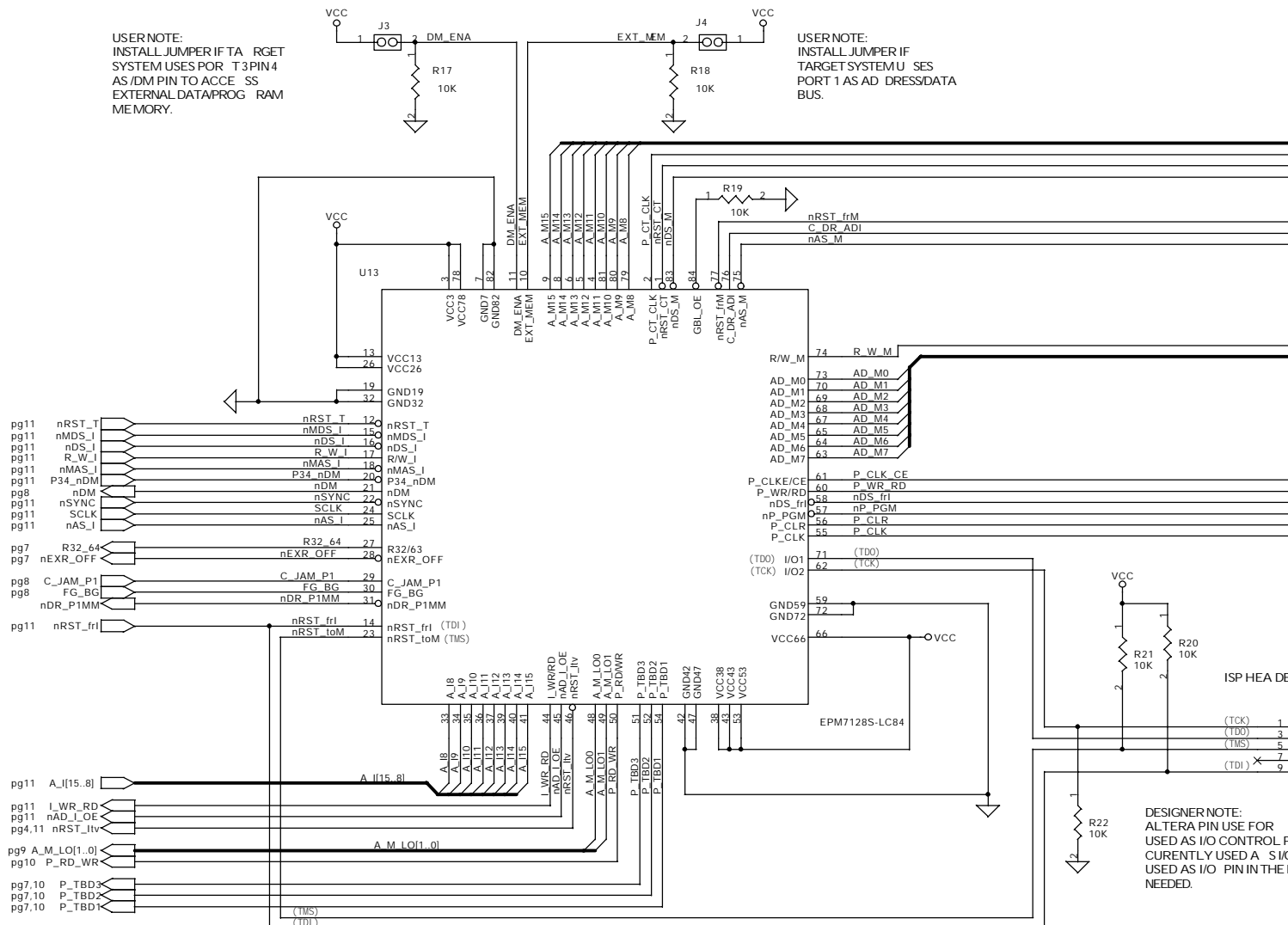
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USER NOTE:
INSTALL JUMPER IF TARGET
SYSTEM USES PORT 3 PIN 4
AS DM PIN TO ACCESS
EXTERNAL DATA/PROGRAM
MEMORY.

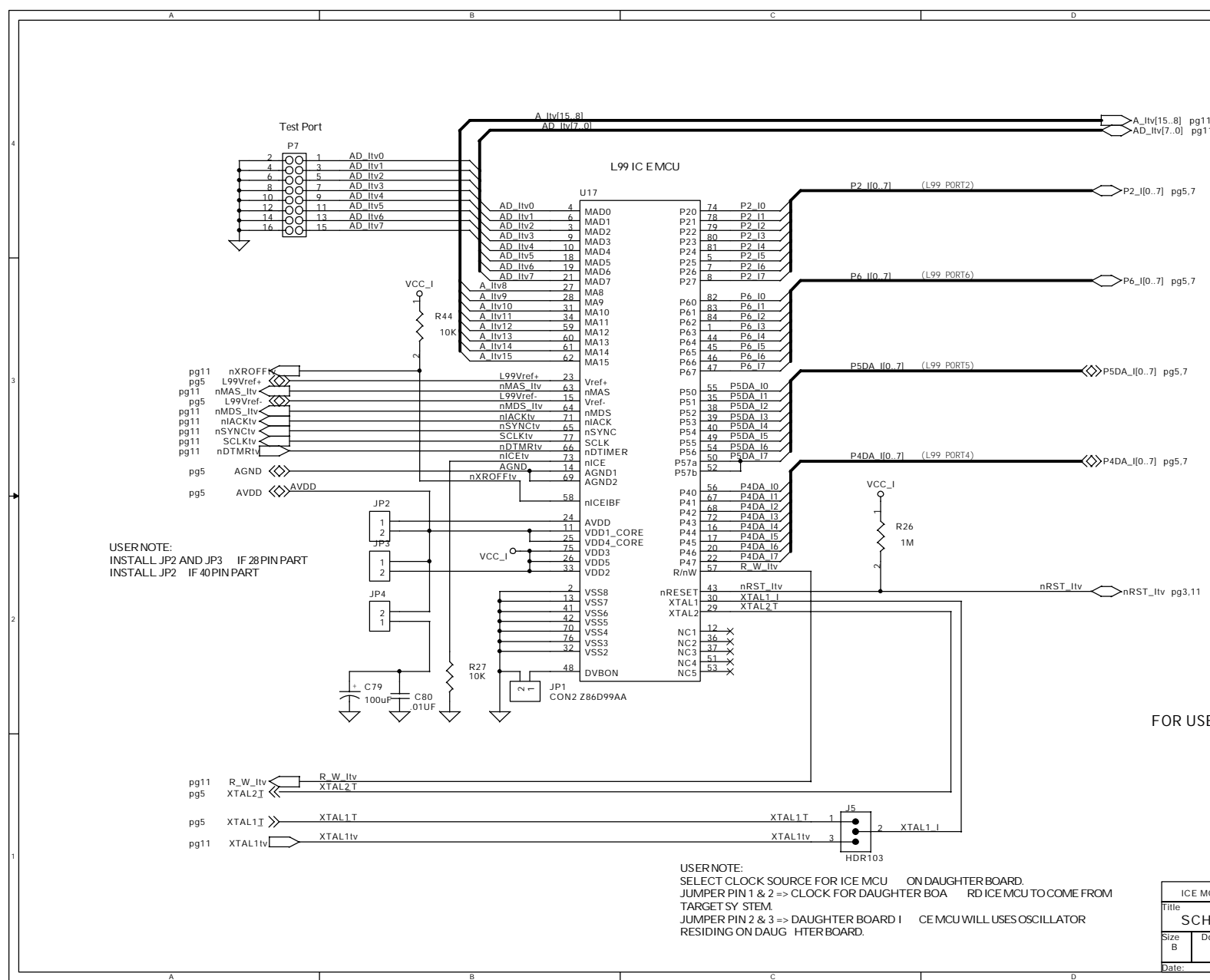
USER NOTE:
INSTALL JUMPER IF
TARGET SYSTEM USES
PORT 1 AS ADDRESS/DATA
BUS.

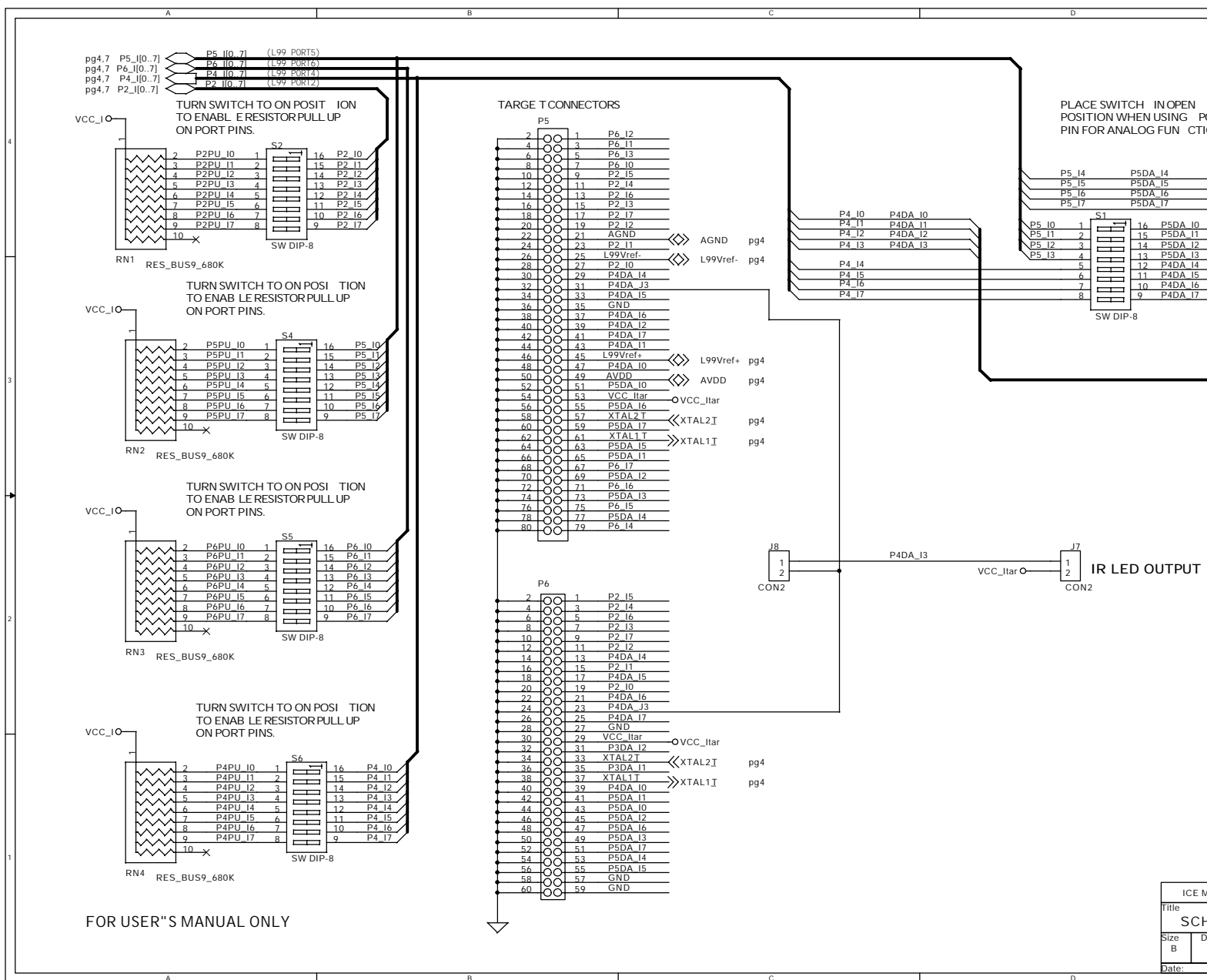


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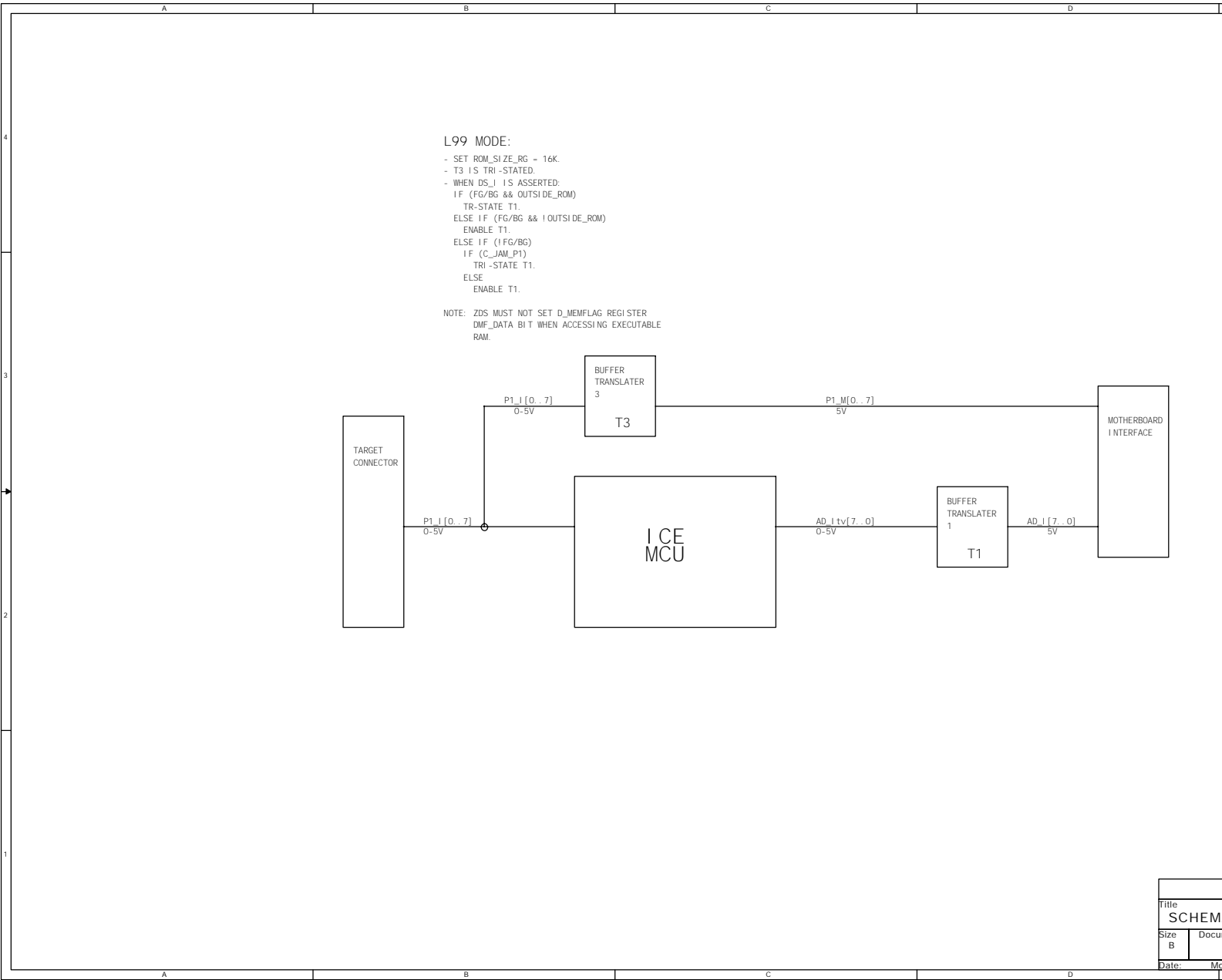
DESIGNER NOTE:
ALTERA PIN USE FOR
USED AS I/O CONTROL P
CURRENTLY USED AS A
USED AS I/O PIN IN THE
NEEDED.

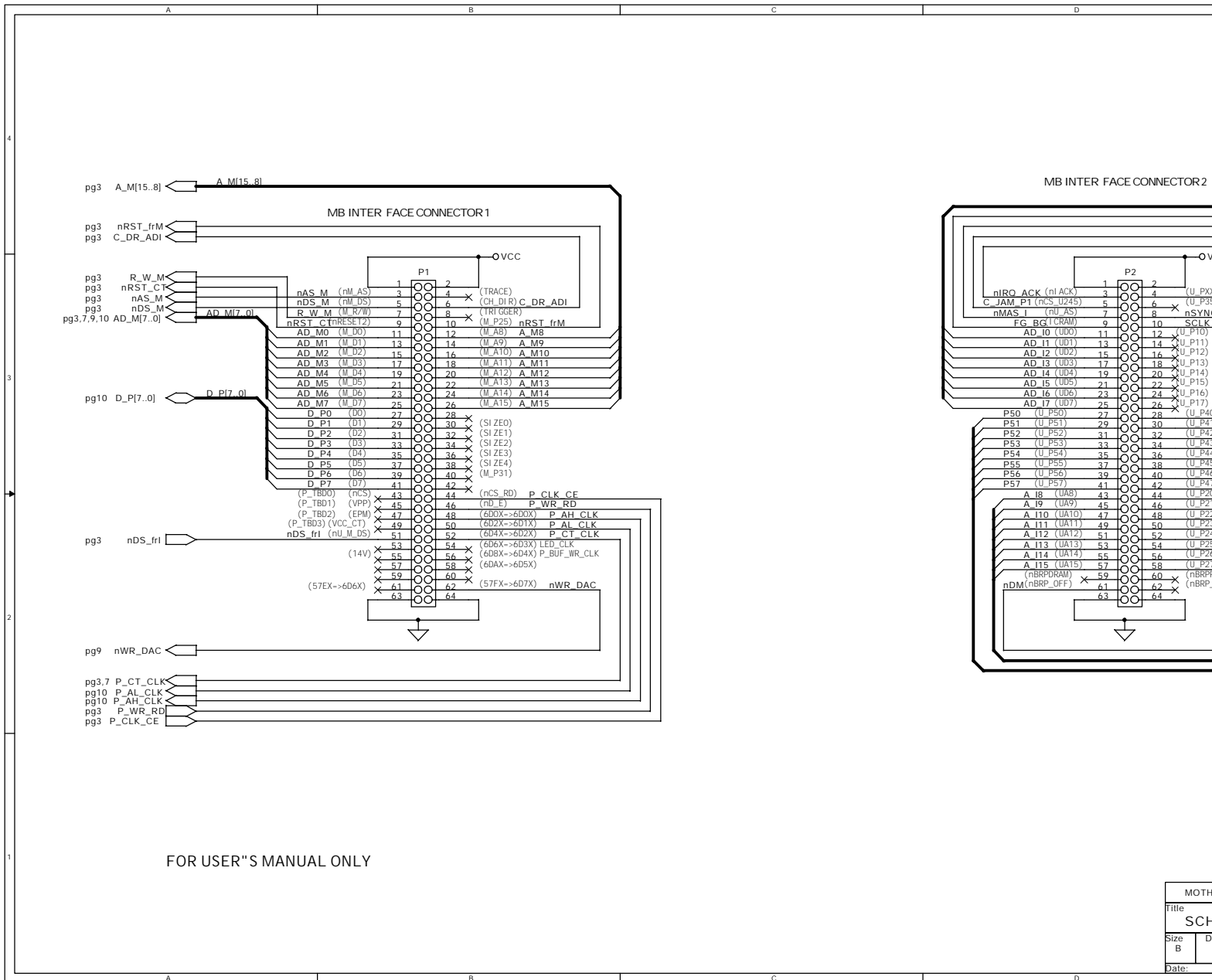
CONTROL	
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