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Reference Manual

VL-586-1

5x86 Industrial CPU Card
for the STD 32 Bus

STD32™

VERSALOGIC CORPORATION

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VL-586-1

5x86 Industrial CPU Card
for the STD 32 Bus





M586-1

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VL-586-1

5x86 Industrial Computer
for the STD 32 Bus

REFERENCE MANUAL

Doc. Rev. 10/01/2003
(for VL-586-1 Rev. 3)

VERSALOGIC CORPORATION
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Table of Contents

Other References vi

1. Overview 1

Using This Manual 1
Introduction 1
PC/AT Compatibility 1
STD/STD32 Bus Compatibility 2
PC/104-*Plus* Compatibility 2
On-Board Memory 2
Hard Disk and Floppy Disk Interface 2
Serial Ports 2
Parallel Port 3
Counter/Timers 3
Real Time Clock with CMOS RAM 3
Interrupt Controllers 3
DMA Controllers 3
Watchdog Timer 3
Technical Specifications 4
Technical Support 5
Repair Service 5

2. DOS Based Quick Start 7

Introduction 7
Installation 8
Jumper Locations 9
Card Installation 10
Monitor Installation 11
Cable Installation 12
CMOS RAM Setup 12
CMOS Setup Options 13
Main CMOS Setup Menu 13
Basic CMOS Configuration 13
Advanced Configuration 13
Shadow Configuration 13
Reset CMOS to Last Known Values 13
Reset CMOS to Factory Defaults 14
Write to CMOS and Exit 14
Exit Without Changing CMOS 14
Clearing the CMOS RAM 15

3. Configuration 17

Hardware Jumper Summary 17
Jumper Block Locations 18

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Memory Configuration 22
ROM Configuration 22
DRAM Configuration 22
CMOS RAM Configuration 23
Battery Backed SRAM Configuration 23
Memory Map 24
I/O Configuration 25
Using 8-Bit STD Bus I/O Cards 25
Using 10-Bit STD Bus I/O Cards 25
Using 16-Bit STD Bus I/O Cards 26
Using PC/104 Modules 26
I/O Map 27
COM2 Configuration 28
RS-232 Operation 28
RS-422 Operation 28
RS-485 Operation 28
Multiprocessor Configuration 30
Multiprocessor Jumper Configuration 30
Resistor Pack Configuration 31
Multiprocessor CPU Reset 31
Interrupt Configuration 32
Interrupt Configuration Jumpers 33
STD Bus Interrupt Signals 34
CPU Interrupt Request Inputs 35
Interprocessor Communications Interrupt Configuration 37
Non-maskable Interrupt Configuration 37

4. Installation 39

Introduction 39
Card Insertion and Extraction 40
Card Installation 40
Card Placement 40
STD 80 Bus Installation Guidelines 40
STD 32 Bus Installation Guidelines 40
External Connections 41
Connector Functions 41
Connector Locations 41
High Density 100-Pin Connector 42
JA, JE – Serial Port Connectors 43
JB – LPT1 Parallel Port Connector 44
JC – Counter/Timer 45
JD – Keyboard Connector 46
JF – Hard Disk Drive Connector 47
J2 – Interrupt Connector 48
J3 – Floppy Disk Drive Connector 49
L1 – Speaker Connector 50

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5. Register Descriptions 51
Introduction 51
Register Summary 51
Direct Memory Access — Channel 1 52
Direct Memory Access — Channel 2 53
Direct Memory Access — Page Registers 53
COM1 Serial Port 54
COM2 Serial Port 54
LPT1 Parallel Port 55
Floppy Disk Drive Controller 56
IDE Hard Disk Drive Controller 56
Interrupt Controller — Master 57
Interrupt Controller — Slave 57
Counter/Timers 58
Miscellaneous 58
Special Control Register 59
Watchdog Timer Hold-Off Register 60
I/O and Memory Map Control Register 61
Map and Paging Control Register 62
Appendix A — Schematic 63
Index 72

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Other References

Acer Laboratories Inc., (408) 764-0644, http://www.ali.com.tw
M1489 / M1487 486 PCI Chipset Data Book

Chips and Technologies, Inc., (408) 434-0600, http://www.chips.com
82C735 Super I/O Chip Data Book

STD 32 Manufacturers Group, (800) 733-2111, http://www.std32.com
STD 32 Bus Specification and Designer's Guide

Advanced Micro Devices (800) 222-9323, http://www.amd.com
AM486DX5-133V17BHC *Data Book*

Additional Resources,

http://www.annatechnology.com

http://www.annatech/bookBrowseBySubjectF.asp

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Overview 1

Using This Manual

Each chapter in this manual corresponds to a step in the installation process:

Chapter 1 – Overview

Lists basic information about the CPU card, specifications, and system requirements. Use this chapter to familiarize yourself with the card and it's capabilities.

Chapter 2 – DOS Based Quick Start

Describes how to quickly get your DOS based system set up and running using a VL-586-1 CPU card.

Chapter 3 – Configuration

Describes how to jumper the CPU card.

Chapter 4 – Installation

Describes how to install the VL-586-1. It also provides details on the external connections.

Chapter 5 – Register Descriptions

Provides details about the user-programmable registers on the CPU card.

Appendix A – Schematics

Circuit diagrams.

Introduction

The VL-586-1 CPU card is fully PC hardware compatible, and features a 32-bit, 133 MHz, Am5x86 microprocessor, up to 32MB RAM, 512K or 2.5MB Flash, two COM ports, one LPT port, six counter/timers, and real time clock. The card supports all operating systems designed to execute on PC hardware (DOS, Windows 95, QNX, etc.) and can be expanded using STD/STD 32 Bus I/O cards or by plugging PC/104 or PC/104-*Plus* expansion modules directly onto the VL-586-1 circuit card.

PC/AT Compatibility

Standard I/O and peripheral interfaces, including BIOS, Embedded DOS, and a bootable Flash Disk System bring a diskless embedded PC to the STD Bus form factor.

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STD/STD32 BUS COMPATIBILITY

The VL-586-1 CPU card complies with certain subsets of the STD 32 Bus specification that allow it to communicate with STD 80 compatible 8-bit and STD 32 compatible 16-bit I/O and memory cards. In addition, the card fully complies with the STD 80 Bus specification using a bus speed of 8.33 MHz. The CPU card is compatible with all I/O and memory cards that adhere to STD 80 specifications.

PC/104-*PLUS* COMPATIBILITY

The VL-586-1's PC/104-*Plus* expansion site allows PC/104 and PC/104-*Plus* modules to be stacked directly on the board. This permits the use of high speed video modules and "local" I/O expansion in systems using multiple processor cards. Use of on-board modules requires an empty card slot space next to the VL-586-1 board. Both standard PC/104 and PC/104-*Plus* (PCI 32-bit, 33 MHz) based modules are supported.

ON-BOARD MEMORY

DRAM The on-board DRAM socket (U11) accepts one standard 72-pin SO DIMM module. A variety of sizes may be used (16M, 32M or 64M.) Fast Page Mode and EDO type modules are supported, provided they are 70ns or faster. Both 5V or 3.3V modules can be used (jumper selectable.)

BBSRAM The (-p) version of the VL-586-1 includes 512K of on-board Battery-Backed Static RAM for non-volatile storage of information. This RAM is accessible through a 64K page frame at E0000h in the main memory map.

CMOS RAM Standard setup values are stored in a small battery-backed CMOS RAM chip.

FLASH The VL-586-1 on-board ROM socket (U3) accepts 128Kx8 or 512Kx8, 32 pin plastic PLCC or 32 pin J-lead ceramic part(s). A Flash Disk System and Embedded DOS are included which allow the card to boot to the A: prompt without user configuration.

HARD DISK AND FLOPPY DISK INTERFACE

A 40-pin IDE hard disk drive interface supports modes 1 through 4 via a PCI based controller. A 34-pin floppy disk drive interface is also included on the VL-586-1 card for connection to industry standard 3½" floppy drives. Each interface supports two drives, and will work with externally mounted or in-rack devices.

SERIAL PORTS

The two on-board serial ports are hardware and software compatible with 16550 type UARTs with 16 byte FIFOs. Baud rates are programmable from 50 baud to 115K baud. COM1 is a standard RS-232 interface, COM2 can be jumpered for RS-232, RS-422, or RS-485 operation.

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PARALLEL PORT

The parallel port can be used as a standard bi-directional/ECP/EPP compatible LPT port or as 17 general purpose TTL I/O signals. When operating in standard bi-directional mode, each output line has a 24 ma current sink rating. Eight of the signals are programmable as a group for input or output, three are dedicated output, and five are dedicated inputs. A strobe signal, which produces a 50 µs pulse under program control, is also available as an output.

COUNTER/TIMERS

The VL-586-1 card includes six 8254 type 16-bit counter/timers. Three channels are used by the operating system; one channel is reserved for dynamic RAM refresh, one channel generates an 18.2 ms DOS interrupt, and another channel is used to drive the speaker. The remaining three channels are unallocated, and can be clocked with on-board crystal oscillators or from external inputs.

REAL TIME CLOCK WITH CMOS RAM

A battery-backed 146818 compatible real time clock (RTC) provides accurate date and time functions. This PC/AT compatible RTC also contains 128 bytes of battery-backed CMOS RAM with 114 bytes available as a system resource to store standard setup parameters. Normally the BIOS requires 94 bytes, leaving 20 bytes for general purpose use.

INTERRUPT CONTROLLERS

Two PC AT compatible 8259 type programmable interrupt controllers (PICs) are provided for full DOS functionality. Interrupt sources and destinations can be configured with jumper blocks. Interrupt lines connect to on-card sources, STD/STD 32, PC/104, and PCI Bus sources, and to a user connector.

DMA CONTROLLERS

The VL-586-1 has two DMA controllers which provide a total of eight DMA channels (four 8-bit channels and four 16-bit channels.) DMA control signals for seven channels are available on the PC/104 Bus. The remaining 16-bit channel is accessible only by software. DMA control signals are not available on the STD Bus, PCI Bus, or via front plane connector.

WATCHDOG TIMER

A Dallas 1232 watchdog timer circuit provides a degree of protection against hardware and software failures. When the watchdog timer is enabled, it must be periodically updated by software at least every 250 ms minimum. A system failure which prevents updating will reset the CPU. This same circuit monitors the +5V power, and handles a variety of CPU reset functions.

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Technical Specifications

Specifications are typical at 25°C with 5.0V supply unless otherwise noted.

Size:
Meets all STD 80 and STD 32 Bus mechanical specifications

Storage Temperature:
-40 °C to 85 °C

Free Air Operating Temperature:
0 °C to 65 °C

Power Requirements: *(with 8 MB DRAM, 512 K Flash, 512 K SRAM, Keyboard)*
5V ±5% @ 1570 ma
(±12V may be required by add-on PC/104 I/O modules)

System Reset:
V_{CC} sensing, resets below 4.7V
Watchdog reset (jumper option)

LPT1/Parallel Interface:
Data Lines:
Output low voltage: 0.5V @ 24 ma
Output high voltage: 2.4V @ -12 ma
Control Lines:
Output low voltage: 0.5V @ 24 ma
Output high voltage: 2.4V @ -150 µA

COM1 & COM2 Serial Interfaces:
COM2 configurable as RS-232/422/485

Floppy Disk Drive Interface:
Supports two drives.

Hard Disk Drive Interface:
Supports two EIDE drives.

Memory Sockets:
DRAM:
16, 32 or 64 MB system dynamic RAM in one 72-pin SO DIMM gold plated socket
SRAM: (battery backed on board)
128K / 512K byte battery backed static RAM in a JEDEC compatible 32-pin SOP site
Flash:
128K to 2.5 MB (64K paged)
One 32-pin PLCC socket and one 48-pin TSOP site

Memory Speed: (on-board):
RAM: 70 ns
Flash: 200 ns or faster

Bus Compatibility:
STD 80: Full compliance, 8.33 MHz bus speed
STD 32: Permanent Master, SA16, SA8 I, MB, MX
STD 32: Temporary Master, SA16, SA8 I, MB, {MX}
PC/104: Full compliance
PC/104-*Plus*: Full compliance

Specifications are subject to change without notice.

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Technical Support

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REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (800) 824-3163.

Please provide the following information:

- Your name, the name of your company, and your phone number
- The name of a technician or engineer who we can contact if we have questions
- Quantity of items being returned
- The model and serial number of each item (the serial number is a 5 digit bar code)
- A description of the problem
- Steps you have taken to resolve or repeat the problem
- The return shipping address

Warranty Repair All charges are covered, including UPS 3rd Day Select shipping charges for return back to your facility.

Non-warranty Repair All non-warranty repairs are subject to diagnosis and labor charges, parts charges, and return shipping fees. We will need to know what shipping method you prefer for return back to your facility, and we will need to secure a purchase order number for invoicing the repair.

Note! Please mark the RMA number clearly on the outside of the box before returning.

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DOS Based Quick Start 2

This chapter describes how to quickly get your DOS-based system set up and running using the VL-586-1 CPU card

Introduction

A minimum DOS based run time system requires the CPU card, a BIOS, and a boot device containing an operating system and an application program. In many cases a video card, keyboard, and monitor are added to this list, however, the VL-586-1 does not demand their presence in order to boot.

The VL-586-1 includes a Flash Disk System and an installed bootable copy of Embedded DOS. If you require a DR-DOS disk call 1-541-485-8575 and we will send one free of charge. The CMOS RAM information is shipped in its factory default condition, which allows immediate booting to the command prompt. If the CMOS Setup parameters need to be changed, the most convenient method of setting up this information is by using a keyboard and monitor. This requires the addition of a video card.

Typical components of a VL-586-1 DOS based system include:

- VL-586-1 CPU Card
- STD or STD 32 Card Cage
- Standard PC/AT keyboard
- PC/104 Video Module
- Video Monitor
- Keyboard
- Power Supply

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Installation

Caution Electrostatic discharge (ESD) can damage cards, disk drives, and other components. Do the installation procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part on the card cage.

Cards can be extremely sensitive to ESD and always require careful handling. After removing the card from its protective wrapper or from the card cage, place the card on a grounded, static-free surface, component side up. Use an anti-static foam pad if available, but not the card wrapper. Do not slide the card over any surface.

The card should also protected during shipment or storage with anti-static foam or bubble wrap. To prevent damage to the lithium battery, do not use black conductive foam or metal foil.

Warning! The lithium battery may explode if mistreated. Do not recharge, disassemble, or dispose of in fire. Dispose of used batteries promptly.

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Jumper Locations

Note Jumpers and resistor packs shown in as-shipped configuration.

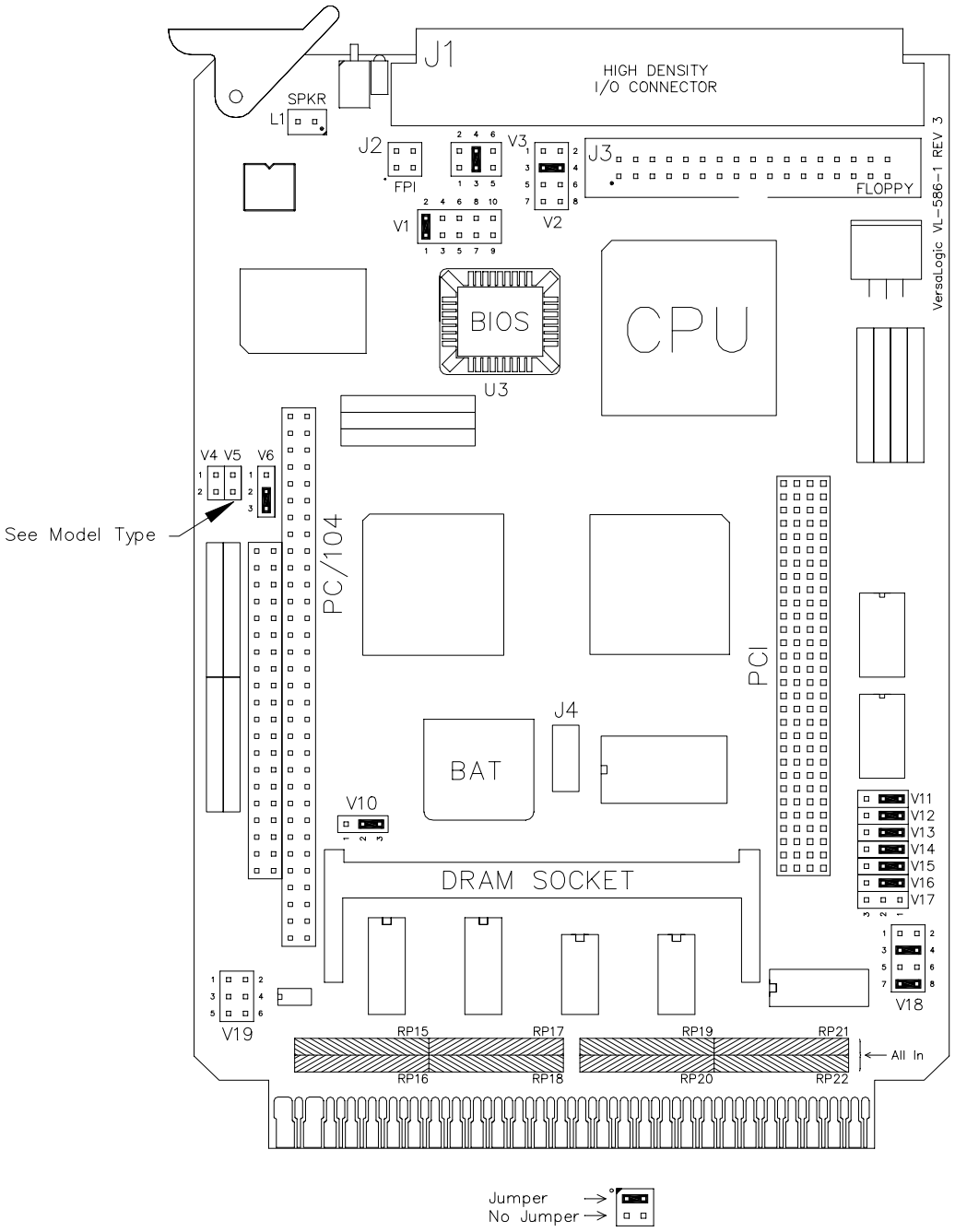


Figure 1. VL-586-1 CPU Card Layout

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Card Installation

A typical development system consists of a six-slot V32-06T Card Cage, populated with:

- VL-586-1 CPU Card (with attached EPM-SVGA PC/104-*Plus* Video Module)
- IDE Hard Disk Drive
- Floppy Disk Drive

A VGA compatible monitor and a PC/AT compatible keyboard are also required to complete the set of hardware necessary for development purposes.

Warning! To prevent damage, cards should be inserted in and removed from the card cage only when the system power is off.

Caution To avoid damaging cards, they must be oriented correctly (usually with the card ejector toward the top of the card cage.) Refer to the card cage documentation for the correct way to insert STD/STD 32 Bus cards.

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Monitor Installation

A VGA monitor should be connected to the EPM-SVGA module as shown .

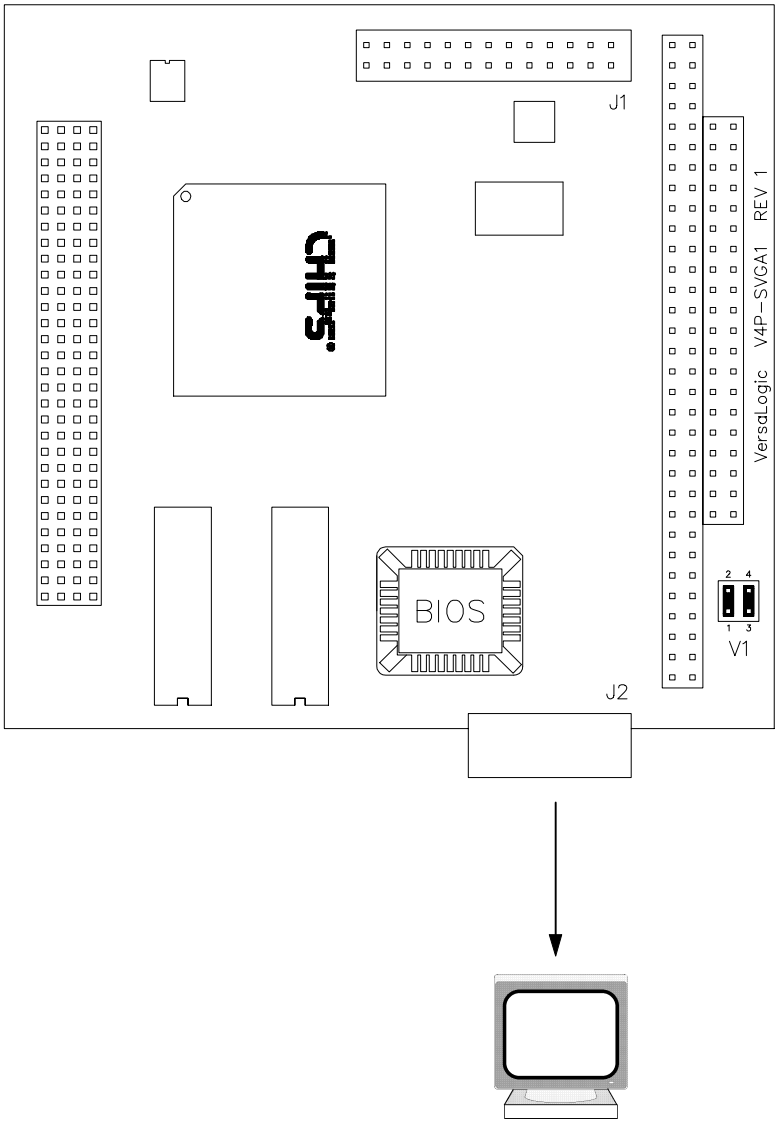


Figure 2. Jumpers/Connections for an EPM-SVGA Using a VGA Monitor

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Cable Installation

To bring the header connectors on the VL-586-1 CPU card out to industry standard PC pinouts, the VersaLogic cable VL-CBL-100A is used.

CMOS RAM Setup

The VL-586-1 CPU card uses battery-backed, non-volatile CMOS RAM provided by the real time clock chip to store system configuration settings. You can change these system settings with the Setup program (accessed manually during system boot.) The configuration information is read by the CPU upon system reset.

The Setup program is permanently stored in ROM, and can be run with or without an operating system present. To run Setup, reset the CPU card and press the DEL key when prompted.

Select "BASIC CMOS CONFIGURATION" to display a summary of the information stored in the CMOS RAM. To change the values shown, use the cursor arrows to move the highlight bar to the desired entry field and press the – or + keys to change the values.

When you are finished, exit to the main Setup menu and select "WRITE TO CMOS AND EXIT" to save the changes and exit the Setup program. The CPU will then boot from the on-board Flash Disk System (drive A:).

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CMOS Setup Options

MAIN CMOS SETUP MENU

SYSTEM BIOS SETUP - UTILITY VERSION 2.001.xxx (C) 1994-1996 VERSALOGIC, CORP. ALL RIGHTS RESERVED
Basic CMOS Configuration Advanced Configuration Shadow Configuration Format Integrated Flash Disk Reset CMOS to last known values Reset CMOS to factory defaults Write to CMOS and Exit Exit without changing CMOS
<ESC> TO CONTINUE (NO SAVE)

BASIC CMOS CONFIGURATION

This option goes to another menu which allows you to change the following:

- Date, Time
- Drive assignments and types
- Boot sequence
- Keyboard Parameters
- Memory Tests

ADVANCED CONFIGURATION

This option goes to another menu which allows you to change the following:

- Bus Timing
- Memory and I/O Mapping
- Cache Control

SHADOW CONFIGURATION

This option allows you to change ROM shadowing parameters.

RESET CMOS TO LAST KNOWN VALUES

This option acts like an undo function. It reverts all changes made in the *CMOS Setup Screens* to the values they had when Setup was first entered.

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RESET CMOS TO FACTORY DEFAULTS

This option overwrites all information contained in the CMOS RAM with predefined parameters stored in the BIOS ROM, and reboots the CPU card.

The following parameters are loaded into CMOS RAM when this option is selected:

Basic CMOS Configuration

```
+--------------------------------------+--------------------------------------+
| Base Memory       : 640              | Date (month day year) : Jan 01, 1997 |
| Extended Memory   : 15360            | Time (hours:min:sec)  : 00 : 00 : 00 |
| Drive A: type     : Flash Disk       +--------------------------------------+
| Drive B: type     : Not installed      Cyln Heads WPcom LZone Sect Size      |
| Hard disk C: type : Not installed                                           |
| Hard disk D: type : Not installed                                           |
| -------------------------------------+--------------------------------------+
| 1st Boot Device   : Mfg Mode         | Seek Floppy at Boot       : Enabled  |
| 2nd Boot Device   : Drive A:         | Seek Hard Drive At Boot   : Enabled  |
| QNX FFS Extension : Disabled         |                                      |
|                                      | Display "Hit <Del>..."    : Enabled  |
|                                      | System Configuration Box  : Enabled  |
| Typematic Keys    : Enabled          | Wait for F1 on Error      : Enabled  |
| Typematic Delay   : 250 ms           | NumLock State at Boot     : Disabled |
| Typematic Rate    : 30 cps           |                                      |
| Memory Test Tick  : Enabled          | On-board IDE controllers  : Enabled  |
| Test Above 1MB    : Enabled          | PC/104 Video Shadowing    : Enabled  |
+--------------------------------------+--------------------------------------+
```

Advanced Configuration

```
+--------------------------------------+--------------------------------------+
| AT Bus Clock                : CPUCLK/4 | Fast PC/104 Cycle          : Enabled  |
| DMA Clock                   : AT Clk/2 | Fast PCI Memory Cycle      : Enabled  |
| 16 bit PC/104 Wait States   : None     | CPU->PCI Write Buffer      : Enabled  |
| PC/104 I/O Recovery         : Enabled  | CPU->PCI Write Buff. Merge : Enabled  |
| PC/104 I/O Recovery Time    : 24*ATClk | CPU->PCI Write Buff. Burst : Enabled  |
| DRAM Read Timing            : Normal   | CPU->PCI Fast Back-to-Back : Enabled  |
| DRAM Write Timing           : Normal   | PCI->CPU Read Buffer       : Enabled  |
| 32-Bit PCI BIOS Extension   : Enabled  | PCI->CPU Write Buffer      : Enabled  |
| Reserved                    : Not Used | PCI->CPU Write Buff. Burst : Enabled  |
| Reserved                    : Not Used | Internal Cache             : Enabled  |
| Slot 1 Using INT#           : INT A    | PCI INT A -> IRQ#          : IRQ 15   |
| Slot 2 Using INT#           : INT B    | PCI INT B -> IRQ#          : IRQ 12   |
| Slot 3 Using INT#           : INT C    | PCI INT C -> IRQ#          : IRQ 11   |
| Slot 4 Using INT#           : INT D    | PCI INT D -> IRQ#          : IRQ 10   |
| Route COM3:3E8h COM4:2E8h   : PC/104   | Route I/O 0100h-027Fh      : PC/104   |
| Route Memory D0000-D7FFFh   : PC/104   | Route Memory C8000-CFFFFh  : PC/104   |
|                                      |                                      |
+--------------------------------------+--------------------------------------+
```

WRITE TO CMOS AND EXIT

This option updates the CMOS RAM with the information in the *CMOS Setup Screens*. After writing, the CMOS checksum is updated and the CPU card is rebooted.

EXIT WITHOUT CHANGING CMOS

This option acts like a cancel function. Use it to exit Setup without changing CMOS RAM.

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Clearing the CMOS RAM

Jumper V6[1-2] allows you clear the CMOS RAM contents if you remove the battery, install incorrect setup information, or otherwise corrupt CMOS RAM. To ensure integrity of the CMOS RAM, the Setup program calculates and stores an internal checksum of the setup data. Upon reset, the CPU detects if the CMOS RAM is corrupted by analyzing the checksum. If you wish to completely clear the contents of the CMOS RAM, briefly move jumper V6 to position [1-2] (top position) then back to the position [2-3] (lower position) and reboot the system. This process will load the factory default setup parameters into the CMOS RAM.

Warning! Do not apply power to the CPU card with jumper V6[1-2] installed, doing so may damage the chipset and void the warranty. Jumper V6[1-2] is only briefly used to clear the CMOS RAM.

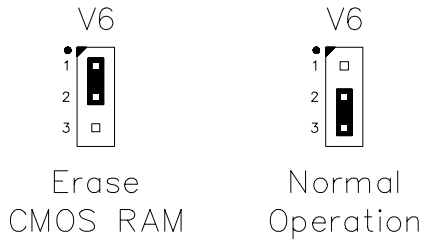


Figure 3. CMOS RAM Jumper

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Configuration 3

This chapter describes how to configure the on-board options for the VL-586-1 CPU card. Configuration involves both hardware (jumper) and software (CMOS Setup) configuration. The jumpers configure the circuitry on the card for various modes of operation. The CMOS Setup configuration completes the process by establishing default operating conditions.

Hardware Jumper Summary

Hardware option configuration is accomplished by installing or removing jumper plugs. In this chapter, the term “in” is used to indicate an installed jumper and “out” is used to indicate a removed jumper.

Use the following key to interpret the jumper diagrams used in this manual:

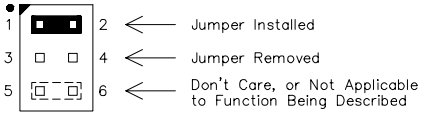


Figure 4. Jumpering Key

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JUMPER BLOCK LOCATIONS

Note Jumpers and resistor packs shown in as-shipped configuration.

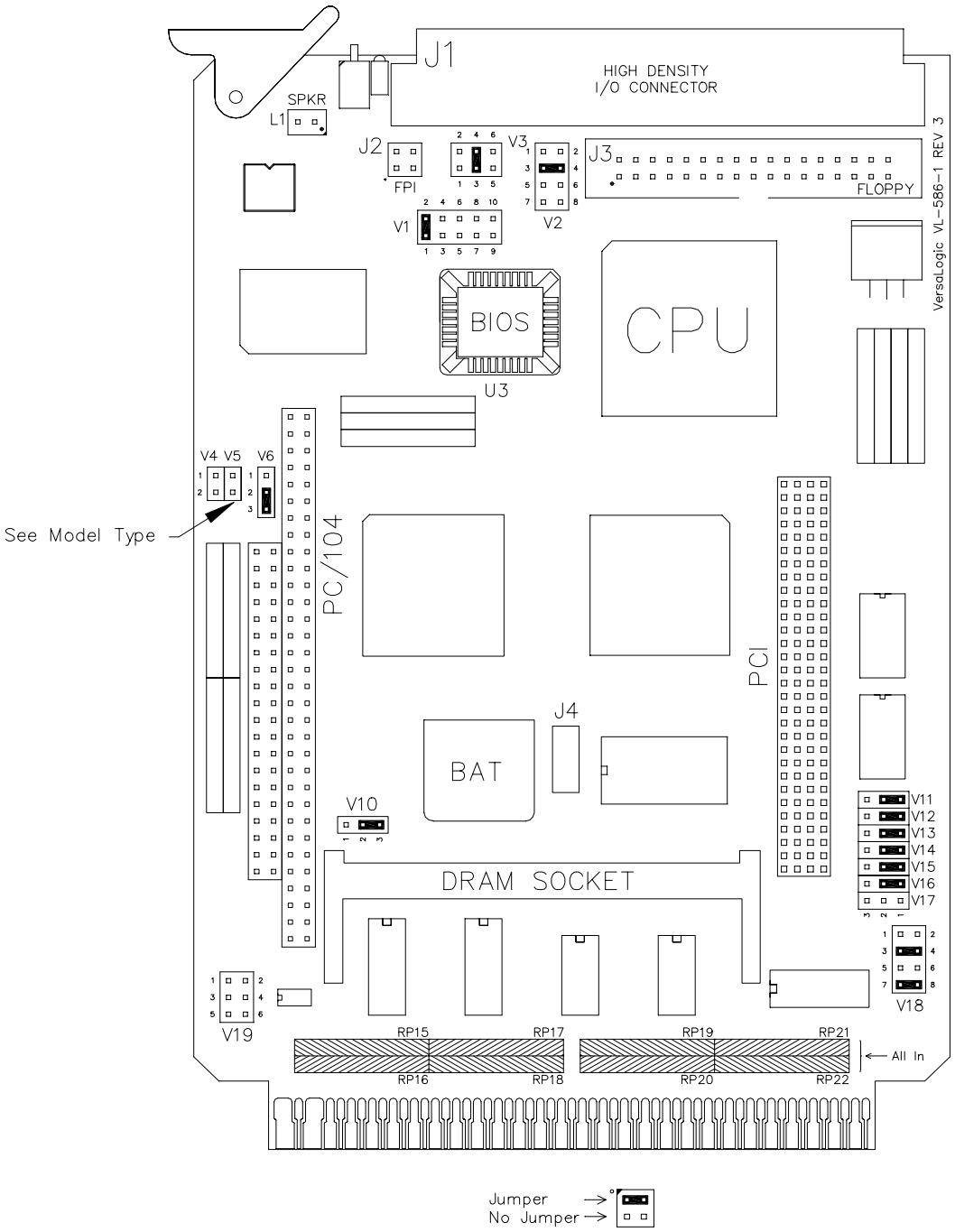
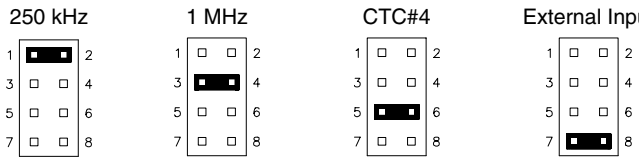
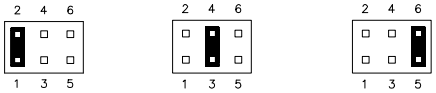


Figure 5. Jumper Block Locations

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Table 1: Jumper Summary

Jumper Block	Description	As Shipped	Page
V1[1-2]	**RS-232 Signal Enable** In — RS-232 mode. Enables the RS-232 line drivers and receivers. Out — RS-422/485 mode. Disables the RS-232 line drivers and receivers.	In	28
V1[3-4]	**RS-422/485 Ground Circuit** In — RS-422/485 mode. Connects ground to J1 pin 6A. Out — RS-232 mode. Frees J1 pin 6A for CTS2 (COM2).	Out	28
V1[5-6]	**RS-232/422/485 Mode Selector** In — RS-422/485 mode. Out — RS-232 mode.	Out	28
V1[7-8]	**RS-422/485 Differential Line Driver Control** In — RS-485 mode. Enables software control of the differential line driver. Out — RS-422 mode. Permanently enables the differential line driver.	Out	28
V1[9-10]	**RS-422/485 Transmission Line Termination** In — Terminates data circuit with 100 Ω resistor (RS-422, or RS-485 endpoint stations only) Out — Leaves data circuit unterminated (RS-485 intermediate multidrop stations only)	Out	28
V2	**Counter/Timer 5 Clock Source** 250 kHz 1 MHz CTC#4 External Input 	1 MHz	—
V3	**Counter/Timer 4 Clock Source** 250 kHz 1 MHz External Input 	1 MHz	—
V4[1-2]	**CMOS Battery Test Terminals** ***Note!*** *V4 is not a jumper. It is used as a test point to measure the current flowing in the CMOS battery circuit. Do not place a jumper on these pins.*	Out	—
V5[1-2]	**Battery Backed SRAM Power** ***Note!*** *V5 is for factory use only.* In — Power applied to Battery Backed SRAM Out — Power removed from Battery Backed SRAM	Varies	—
V6[1-2]	**CMOS RAM Erase** In — Erases CMOS RAM and Real Time Clock contents Out — Normal operation (V6[2-3] must be in)	Out	23
V6[2-3]	**CMOS RAM Power** In — Connects power to CMOS RAM and Real Time Clock circuits Out — Power disconnected	In	23
V7[1-2]	**CPU Cache Mode** ***Note!*** *V7 is for factory use only.* In — Write through mode Out — Write back mode	Out	—
V8[1-2]	**CPU External Clock and PCI Bus Speed** ***Note!*** *V8 is for factory use only.* In — 25 MHz Out — 33 MHz	Out	—
V9[1-2]	**CPU Internal Clock Speed (AMD Only)** ***Note!*** *V9 is for factory use only.* In — 133 MHz Out — 100 MHz	In	—

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Table 2: Jumper Summary (Cont.)

Jumper Block	Description	As Shipped	Page
V10[1-2]	**SO DIMM Supply Voltage (5 Volts)** In — Connects 5 Volts to SO DIMM Socket Out — Disconnects 5 Volts from SO DIMM Socket	Out	22
V10[2-3]	**SO DIMM Supply Voltage (3.3 Volts)** In — Connects 3.3 Volts to SO DIMM Socket Out — Disconnects 3.3 Volts from SO DIMM Socket	In	22
V11[1-2]	**Interrupt Configuration (IRQ3 / COM2 interconnect)** In — Connects COM2 to IRQ3 Out — Disconnects COM2 from IRQ3	In	32
V11[2-3]	**Interrupt Configuration (IRQ3 / INTRQ* interconnect)** In — Connects STD Bus INTRQ* (P44) to IRQ3 Out — Disconnects STD Bus INTRQ* from IRQ3	Out	32
V12[1-2]	**Interrupt Configuration (IRQ9 / INTRQ* interconnect)** In — Connects STD Bus INTRQ* (P44) to IRQ9 Out — Disconnects STD Bus INTRQ* from IRQ9	In	32
V12[2-3]	**Interrupt Configuration (IRQ9 / Front Plane Interrupt 0 interconnect)** In — Connects Front Plane Interrupt 0 (J2 pin 2) to IRQ9 Out — Disconnects FPI0 from IRQ9	Out	32
V13[1-2]	**Interrupt Configuration (IRQ10 / INTRQ1* Interconnect)** In — Connects STD Bus INTRQ1* (P37) to IRQ10 Out — Disconnects INTRQ1* from IRQ10	In	32
V13[2-3]	**Interrupt Configuration (IRQ10 / Counter-Timer 2 interconnect)** In — Connects Counter / Timer 2 Output to IRQ10 Out — Disconnects CTC2 from IRQ10	Out	32
V14[1-2]	**Interrupt Configuration (IRQ11 / INTRQ2* interconnect)** In — Connects STD Bus INTRQ2* (P50) to IRQ11 Out — Disconnects STD Bus INTRQ2* from IRQ11	In	32
V14[2-3]	**Interrupt Configuration (IRQ11 / Counter-Timer 3 interconnect)** In — Connects Counter / Timer 3 Output to IRQ11 Out — Disconnects CTC3 from IRQ11	Out	32
V15[1-2]	**Interrupt Configuration (IRQ12 / INTRQ3* Interconnect)** In — Connects STD Bus INTRQ3* (E67) to IRQ12 Out — Disconnects INTRQ3* from IRQ12	In	32
V15[2-3]	**Interrupt Configuration (IRQ12 / Counter-Timer 4 interconnect)** In — Connects Counter / Timer 4 to IRQ12 Out — Disconnects CTC4 from IRQ12	Out	32
V16[1-2]	**Interrupt Configuration (IRQ15 / Front Plane Interrupt 1 interconnect)** In — Connects Front Plane Interrupt 1 (J2 pin 4) to IRQ15 Out — Disconnects FPI1 from IRQ15	In	32
V16[2-3]	**Interrupt Configuration (IRQ15 / Counter-Timer 5 interconnect)** In — Connects Counter / Timer 5 to IRQ15 Out — Disconnects CTC5 from IRQ15	Out	32
V17[1-2]	**IPC Configuration (IPC / INTRQ* interconnect)** In — Connects IPC signal to STD Bus INTRQ* (P44) Out — Disconnects IPC from INTRQ*	Out	32
V17[2-3]	**IPC Configuration (IPC / INTRQ4* interconnect)** In — Connects IPC signal to STD Bus INTRQ4* (P05) Out — Disconnects IPC from INTRQ4*	Out	32

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Table 3: Jumper Summary (Cont.)

Jumper Block	Description	As Shipped	Page
V18[1-2]	**CPU response to SYSRESET*** In — CPU resets whenever STD Bus SYSRESET* (P47) goes low Out — CPU ignores activity on STD Bus SYSRESET* (P47)	Out	30
V18[3-4]	**Push-button Reset / Bus Interconnect** In — Connects STD Bus PBRESET* (P48) to CPU reset circuits Out — CPU ignores activity on, and does not drive STD Bus PBRESET* (P48)	In	30
V18[5-6]	**Non-Maskable Interrupt / BUS Interconnect** In — Connects STD Bus NMIRQ* (P46) to CPU NMI input Out — CPU ignores activity on STD Bus NMIRQ* (P46)	Out	30
V18[7-8]	**Permanent / Temporary Master Selection** In — Permanent Master Mode (V18[1-2] must be out, RP15 – RP22 must be in) Out — Temporary Master Mode (RP15 – RP22 must be out)	In	30
V19[1-2]	**General Purpose Digital Input** In — Causes bit D5 (GP0) of the SCR register to read as “1” Out — Causes bit D5 (GP0) of the SCR register to read as “0”	Out	30
V19[3-4]	**Multiprocessor Configuration** In — Dual master mode. Uses BUSAK* (P41) for bus arbitration. Out — Permanent or temporary master mode.	Out	30
V19[5-6]	**Multiprocessor Configuration** In — Dual master mode. Uses BUSRQ* (P42) for bus arbitration. Out — Permanent or temporary master mode.	Out	30

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Memory Configuration

ROM Configuration

The VL-586-1 on-board ROM socket (U3) accepts 128Kx8 or 512Kx8, 32 pin plastic PLCC or 32 pin J-lead ceramic part(s). An extractor tool (such as VersaLogic part number VL-HDW-202) is required to remove the rectangular PLCC device without damage.

The VL-586-1 is sold with two ROM options:

BIOS/Flash Option (-h) — *BIOS & 512KB Flash Disk System*. Socket U3 contains a Flash chip with BIOS, Flash Disk System, and a bootable copy of Embedded DOS.

BIOS/Flash Option (-k) — *BIOS & 2.5M Flash Disk System*. Socket U3 contains a Flash chip with BIOS, Flash Disk System, and a bootable copy of Embedded DOS. An additional 2M surface-mount Flash chip is installed on the back side of the board.

There are no configuration jumpers for the ROM sockets.

DRAM Configuration

The on-board DRAM socket (U11) accepts one standard 72-pin SO DIMM module. A variety of sizes may be used (16M, 32M or 64M.) Fast Page Mode and EDO type modules are supported, provided they are 70ns or faster, and both 5V or 3.3V modules can be used.

The amount of memory is automatically determined by the BIOS when the system is reset. The only configuration necessary is to jumper the DRAM socket for the correct operating voltage.

Caution Severe damage will result if a 3.3V memory module is jumpered for 5V. The VL-586-1 is shipped in the 3.3V position for safety.



Table 4: SO DIMM Supply Voltage Configuration Jumper

Jumper Block	Description	As Shipped
V10[1-2]	**SO DIMM Supply Voltage (5 Volts)** In — Connects 5 Volts to SO DIMM Socket Out — Disconnects 5 Volts from SO DIMM Socket	Out
V10[2-3]	**SO DIMM Supply Voltage (3.3 Volts)** In — Connects 3.3 Volts to SO DIMM Socket Out — Disconnects 3.3 Volts from SO DIMM Socket	In

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CMOS RAM CONFIGURATION

Jumper V6[1-2] (top position) can be briefly used to erase the contents of the CMOS RAM should it become necessary to do so.

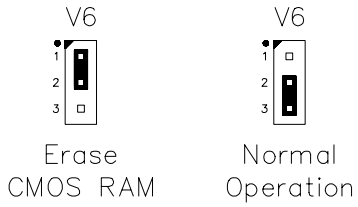


Table 5: CMOS RAM Jumpers

Jumper Block	Description	As Shipped
V6[1-2]	**CMOS RAM Erase** In — Erases CMOS RAM and Real Time Clock contents Out — Normal operation (V6[2-3] must be in)	Out
V6[2-3]	**CMOS RAM Power** In — Connects power to CMOS RAM and Real Time Clock circuits Out — Power disconnected	In

BATTERY BACKED SRAM CONFIGURATION

Jumper V5 provides a means to disconnect power to the Battery Backed SRAM chip. This jumper is for factory use only.

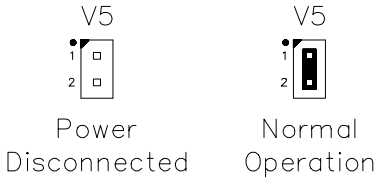


Table 6: CMOS RAM Jumpers

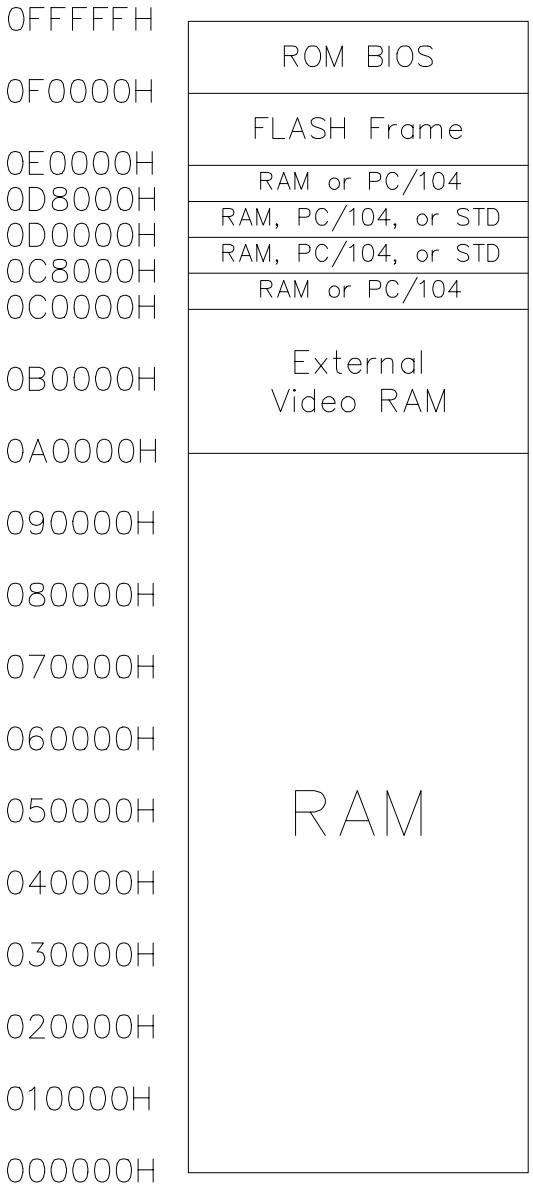
Jumper Block	Description	As Shipped
V5[1-2]	**Battery Backed SRAM Power** ***Note!*** *V5 is for factory use only.* In — Power applied to Battery Backed SRAM Out — Power removed from Battery Backed SRAM	Varies

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MEMORY MAP

The lower 1 Meg. memory map of the CPU is arranged as follows. The upper 64K of Flash is write protected, and contains the system BIOS. It always appears from 0F0000h to 0FFFFFh. Bits D4–D0 in the MPCR register select which Flash ROM page is mapped into the 64K Page Frame (0E0000h to 0EFFFFh). See IOMMAP and MPCR registers starting on page 61 for further information.

Two settings in the Advanced Configuration screen of the CMOS Setup menu control the memory region from C8000 to D7FFF and direct this area to the PC/104 or STD/STD 32 Bus.



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I/O Configuration

In addition to on-board I/O devices, the VL-586-1 also supports STD/STD 32 Bus I/O cards and PC/104 (and PC/104-*Plus*) modules.

The total I/O space of the CPU card is 64K. The actual I/O map of the system is defined by the fixed addresses of the on-board devices in conjunction with the addresses used by external STD Bus and PC/104 modules. External ports can be mapped at any address which doesn't conflict with the addresses used by on-board devices.

USING 8-BIT STD BUS I/O CARDS

STD Bus I/O cards which only decode 8 address bits (A0 - A7) will work properly with the VL-586-1 provided the STD Bus signal IOEXP is decoded low on the I/O card. IOEXP will be driven low in the I/O address range FC00h to FFFFh. The I/O card can be configured to use any 8-bit address in the range 00h to FFh.

- 00h – FFh (With IOEXP decoded low)

A card which does not support IOEXP will repeat every 256 (100h) bytes throughout the entire 64K I/O space. This will cause conflict with reserved I/O addresses used for on-board devices. Operation in this manner is not recommended.

Application software should be written to communicate with the I/O cards using the addresses listed above as X+FF00h. For example if your I/O card is addressed at 38h, the software should use FF38h as the I/O port address.

USING 10-BIT STD BUS I/O CARDS

STD Bus I/O cards which only decode 10 address bits (A0 - A9) will work properly with the VL-586-1 when addressed in the following I/O ranges:

- 2E8h – 2EFh IOMAP1 Bit must = 1. See page 27 for further information.
- 3E8h – 3EFh IOMAP1 Bit must = 1. See page 27 for further information.
- 100h – 16Fh IOMAP2 Bit must = 1. See page 27 for further information.
- 177h – 1EFh IOMAP2 Bit must = 1. See page 27 for further information.
- 200h – 27Fh IOMAP2 Bit must = 1. See page 27 for further information.

Cards will repeat every 1024 (400h) bytes throughout the entire STD Bus I/O space. This means a card jumpered as shown above will occupy I/O addresses X+0000h, X+0400h, X+0800h, X+0C00h, X+1000h, X+1400h, etc., where X represents the selected I/O address(es).

If IOEXP is decoded low, the card will only appear in the FF00h to FFFFh range (assuming the card is addressed at 300h to 3FFh). Operation in this manner is not recommended.

Application software should be written to communicate with the I/O cards using the exact addresses listed above (i.e., X+0000h). For example if your I/O card is addressed at 220h, the software should use 0220h as the I/O port address.

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USING 16-BIT STD BUS I/O CARDS

STD Bus I/O cards which decode all 16 address bits (A0 - A15) will work properly with the VL-586-1 when addressed in the following I/O ranges:

- 0100h – 16Fh IOMAP2 Bit must = 1. See page 27.
- 0177h – 1EFh IOMAP2 Bit must = 1. See page 27.
- 0200h – 027Fh IOMAP2 Bit must = 1. See page 27.
- 1000h – FFFFh Always enabled

USING PC/104 MODULES

All PC/104 modules decode 10 address bits (A0 - A9) and will work properly with the VL-586-1 when addressed in the following I/O ranges:

- 100h – 16Fh IOMAP2 Bit must = 0. See page 27.
- 177h – 1EFh IOMAP2 Bit must = 0. See page 27.
- 200h – 27Fh IOMAP2 Bit must = 0. See page 27.
- 2E8h – 2EFh COM4 Range: IOMAP1 Bit must = 0. See page 27.
- 300h – 3E7h Always enabled
- 3E8h – 3EFh COM3 Range: IOMAP1 Bit must = 0. See page 27.

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I/O MAP

Various regions of the 64K I/O space are divided up and can be routed to either the PC/104 or the STD/STD 32 bus interfaces. The IOMAP1 and IOMAP2 bits in the IOMMAP Register (see page 61) control the routing of these areas. The control bits default to values established in the CMOS Setup *Advanced Configuration* screen, however, they can also be manipulated in real time under program control.

0000h	00FFh		On Board Devices
0100h	016Fh		**IOMAP2** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
0177h	01EFh		**IOMAP2** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
01F0h	01FFh		Undefined
0200h	027Fh		**IOMAP2** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
0280h	02E7h		Undefined
02E8h	02EFh	(COM4)	**IOMAP1** 0 = PC/104 Bus 1 = STD Bus (IOEXP Signal Driven High)
02F0h	02FFh		Undefined
0300h	03E7h		PC/104 Bus
03E8h	03EFh	(COM3)	**IOMAP1** 0 = PC/104 Bus 1 = STD Bus
03F0h	03FFh		On Board Devices
0400h	0FFFh		PC/104 Bus
1000h	FBFFh		STD Bus (IOEXP Signal Driven High)
FC00h	FFFFh		STD Bus (IOEXP Signal Driven Low)

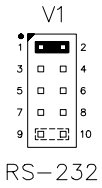
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COM2 Configuration

Serial Port COM2 can be operated in RS-232, RS-422, or RS-485 modes. Jumper V1 is used to configure the port.

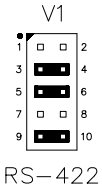
RS-232 Operation

For RS-232 operation, jumper V1 should be jumpered as shown. The state of jumper V1[9-10] doesn't matter, it can be in or out.



RS-422 Operation

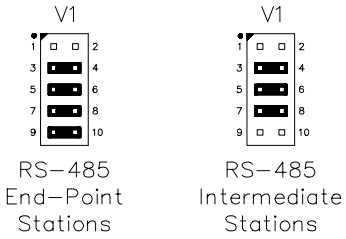
For RS-422 operation, jumper V1 should be jumpered as shown.



Note This configuration inserts a 100 Ohm line termination resistor in the circuit. An equivalent resistor must exist at the opposite end of the cable to form a 50 Ohm balanced transmission line.

RS-485 Operation

Removing V1[9-10] leaves the data circuit unterminated so that COM2 can be used as an intermediate station in an RS-485 multidrop system. When COM2 is used in multidrop operations, remove jumper V1[9-10] from all stations except both ends of the line.



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Table 7: Serial Port Jumpers

Jumper Block	Description	As Shipped
V1[1-2]	**RS-232 Signal Enable** In — RS-232 mode. Enables the RS-232 line drivers and receivers. Out — RS-422/485 mode. Disables the RS-232 line drivers and receivers.	In
V1[3-4]	**RS-422/485 Ground Circuit** In — RS-422/485 mode. Connects ground to J1 pin 6A. Out — RS-232 mode. Frees J1 pin 6A for CTS2 (COM2).	Out
V1[5-6]	**RS-232/422/485 Mode Selector** In — RS-422/485 mode. Out — RS-232 mode.	Out
V1[7-8]	**RS-422/485 Differential Line Driver Control** In — RS-485 mode. Enables software control of the differential line driver. Out — RS-422 mode. Permanently enables the differential line driver.	Out
V1[9-10]	**RS-422/485 Transmission Line Termination** In — Terminates data circuit with 100 Ω resistor (RS-422, or RS-485 endpoint stations only) Out — Leaves data circuit unterminated (RS-485 intermediate multidrop stations only)	Out

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Multiprocessor Configuration

The VL-586-1 CPU card supports multiple master operation for systems requiring additional processing capability or for "smart I/O" operations. In a multiple master system, one CPU must be configured as a permanent master and other CPUs are configured as temporary masters. In this scheme, a bus arbiter plugged into Slot X is used to arbitrate access to the bus. A special dualmaster mode is available for two CPUs to work together without a bus arbiter. In this configuration, one CPU should be jumpered as a permanent master and the other CPU should be jumpered as a dualmaster.

MULTIPROCESSOR JUMPER CONFIGURATION

Jumper blocks V19 and V18 are used to select the bus mastering mode.

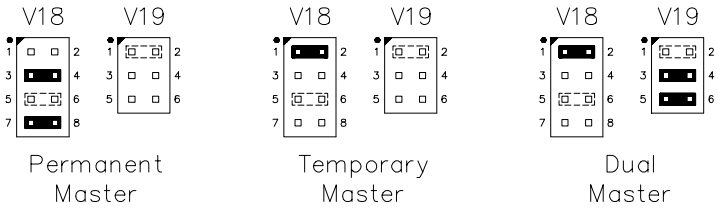


Table 8: Multiprocessor Configuration Jumpers

Jumper Block	Description	As Shipped
V18[1-2]	**CPU response to SYSRESET*** In — CPU resets whenever STD Bus SYSRESET* (P47) goes low Out — CPU ignores activity on STD Bus SYSRESET* (P47)	Out
V18[3-4]	**Push-button Reset / Bus Interconnect** In — Connects STD Bus PBRESET* (P48) to CPU reset circuits Out — CPU ignores activity on, and does not drive STD Bus PBRESET* (P48)	In
V18[7-8]	**Permanent / Temporary Master Selection** In — Permanent Master Mode (V18[1-2] must be out, RP15 – RP22 must be in) Out — Temporary Master Mode (RP15 – RP22 must be out)	In
V19[3-4]	**Multiprocessor Configuration** In — Dual master mode. Uses BUSAK* (P41) for bus arbitration. Out — Permanent or temporary master mode.	Out
V19[5-6]	**Multiprocessor Configuration** In — Dual master mode. Uses BUSRQ* (P42) for bus arbitration. Out — Permanent or temporary master mode.	Out

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RESISTOR PACK CONFIGURATION

The eight resistor packs (RP13 through RP20) near the STD Bus connector must be removed for temporary master or dualmaster operation. Only one CPU in the card cage should have the resistor packs installed; the permanent master.

Note Two resistance values are used, 1.8KΩ and 330Ω.

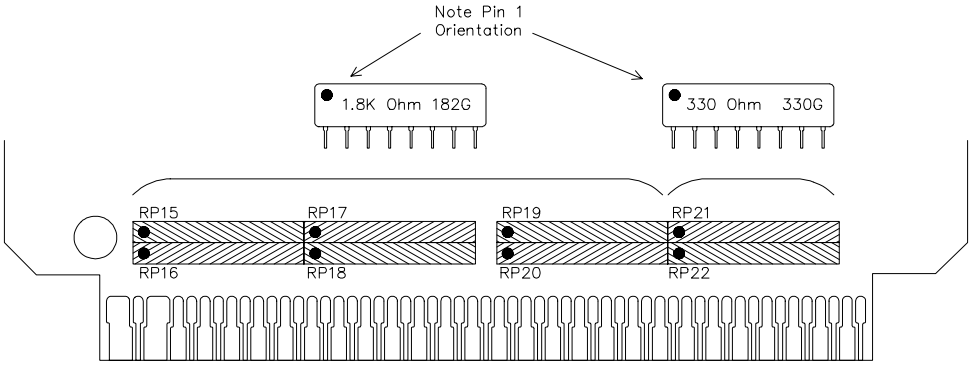


Figure 6. Multiprocessor Resistor Packs

MULTIPROCESSOR CPU RESET

The CPU reset configuration depends upon the selected STD Bus master mode. Jumpers V18[1-2] and V18[3-4] configure the CPU to drive and respond to the STD Bus signals SYSRESET* and PBRESET* in different ways depending on the bus master mode.

Permanent Master — The CPU is reset by pressing the on-board push-button, and optionally, by a low level on PBRESET* arriving on the bus. Permanent masters are responsible for driving the SYSRESET* signal to reset temporary masters in the same card cage (which are configured to react to SYSRESET*). To prevent a persistent reset state, the permanent master is configured to ignore SYSRESET*.

Temporary Master — The CPU is reset by pressing the on-board push-button, and optionally, by a low level on SYSRESET* arriving from the permanent master via the bus. A temporary master should never respond directly to PBRESET* nor drive SYSRESET*.

Dual Master — Same as temporary master mode.

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Interrupt Configuration

Seven three-position jumper blocks are used to configure the interrupt sources on the VL-586-1. Each jumper block is used to select one of two interrupt sources and route it to the interrupt controller. Wire wrap techniques can be used to route interrupt sources to the CPU's IRQ inputs if the factory provided jumpers do not provide suitable connections.

Note Jumpers shown in as-shipped configuration.

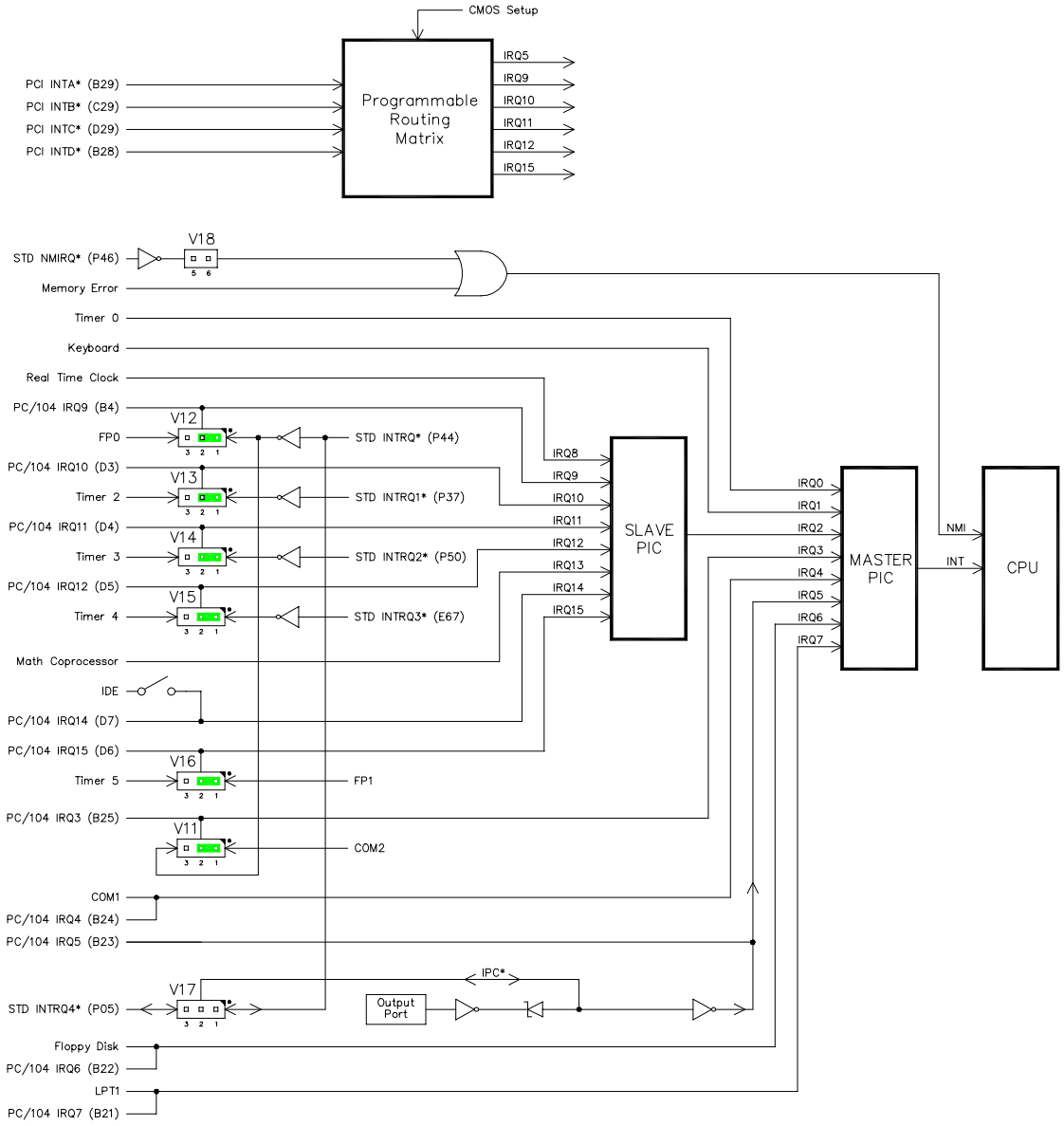


Figure 7. Interrupt Circuit Diagram

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INTERRUPT CONFIGURATION JUMPERS

Table 9: Interrupt Configuration Jumpers

Jumper Block	Description	As Shipped
V11[1-2]	**Interrupt Configuration (IRQ3 / COM2 interconnect)** In — Connects COM2 to IRQ3 Out — Disconnects COM2 from IRQ3	In
V11[2-3]	**Interrupt Configuration (IRQ3 / INTRQ* interconnect)** In — Connects STD Bus INTRQ* (P44) to IRQ3 Out — Disconnects STD Bus INTRQ* from IRQ3	Out
V12[1-2]	**Interrupt Configuration (IRQ9 / INTRQ* interconnect)** In — Connects STD Bus INTRQ* (P44) to IRQ9 Out — Disconnects STD Bus INTRQ* from IRQ9	In
V12[2-3]	**Interrupt Configuration (IRQ9 / Front Plane Interrupt 0 interconnect)** In — Connects Front Plane Interrupt 0 (J2 pin 2) to IRQ9 Out — Disconnects FPI0 from IRQ9	Out
V13[1-2]	**Interrupt Configuration (IRQ10 / INTRQ1* Interconnect)** In — Connects STD Bus INTRQ1* (P37) to IRQ10 Out — Disconnects INTRQ1* from IRQ10	In
V13[2-3]	**Interrupt Configuration (IRQ10 / Counter-Timer 2 interconnect)** In — Connects Counter / Timer 2 Output to IRQ10 Out — Disconnects CTC2 from IRQ10	Out
V14[1-2]	**Interrupt Configuration (IRQ11 / INTRQ2* interconnect)** In — Connects STD Bus INTRQ2* (P50) to IRQ11 Out — Disconnects STD Bus INTRQ2* from IRQ11	In
V14[2-3]	**Interrupt Configuration (IRQ11 / Counter-Timer 3 interconnect)** In — Connects Counter / Timer 3 Output to IRQ11 Out — Disconnects CTC3 from IRQ11	Out
V15[1-2]	**Interrupt Configuration (IRQ12 / INTRQ3* Interconnect)** In — Connects STD Bus INTRQ3* (E67) to IRQ12 Out — Disconnects INTRQ3* from IRQ12	In
V15[2-3]	**Interrupt Configuration (IRQ12 / Counter-Timer 4 interconnect)** In — Connects Counter / Timer 4 to IRQ12 Out — Disconnects CTC4 from IRQ12	Out
V16[1-2]	**Interrupt Configuration (IRQ15 / Front Plane Interrupt 1 interconnect)** In — Connects Front Plane Interrupt 1 (J2 pin 4) to IRQ15 Out — Disconnects FPI1 from IRQ15	In
V16[2-3]	**Interrupt Configuration (IRQ15 / Counter-Timer 5 interconnect)** In — Connects Counter / Timer 5 to IRQ15 Out — Disconnects CTC5 from IRQ15	Out
V17[1-2]	**IPC Configuration (IPC / INTRQ* interconnect)** In — Connects IPC signal to STD Bus INTRQ* (P44) Out — Disconnects IPC from INTRQ*	Out
V17[2-3]	**IPC Configuration (IPC / INTRQ4* interconnect)** In — Connects IPC signal to STD Bus INTRQ4* (P05) Out — Disconnects IPC from INTRQ4*	Out

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STD BUS INTERRUPT SIGNALS

The following table describes the six STD Bus interrupt signals. Some of these interrupt signals are hardwired to specific IRQ inputs, and others are connected to jumpers for custom configuration.

Table 10: STD 32 Interrupt Signals.

Function	STD-32 Signal Name	STD-32 Pin Number	Typical Use	Notes
NMI*	NMIRQ*	P46	High priority interrupts which should not be ignored. **Note:** An arbiter card can generate NMI in an error condition.	NMIRQ* can be connected to the CPU NMI interrupt input by inserting jumper V18[5-6]. If multiple CPU's are used, typically only one CPU will be jumpered to respond to NMI.
INTRQ*	INTRQ*	P44	General purpose or Interprocessor Communications Interrupt (IPC)	INTRQ* can also be jumpered to drive IRQ9 or IRQ3. INTRQ* can also be used to carry the Interprocessor Communications Interrupt (IPC) between multiple CPU's by inserting jumper V17[1-2]. Activity on INTRQ* will drive IRQ5.
INTRQ1*	INTRQ1*	P37	General purpose	INTRQ1* can be configured to drive IRQ10.
INTRQ2*	CNTRL*	P50	General purpose	INTRQ2* can be configured to drive IRQ11.
INTRQ3*	INTRQ3*	E67	General purpose	INTRQ3* can be configured to drive IRQ12.
INTRQ4*	VBAT	P05	General purpose	INTRQ4* can be jumpered to carry the Interprocessor Communications Interrupt (IPC) between multiple CPU's by inserting jumper V17[2-3]. The IPC signal is hardwired to IRQ5.

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CPU INTERRUPT REQUEST INPUTS

The seventeen standard IBM compatible interrupt inputs (IRQs) are shown below.

Table 11: Interrupt Request Inputs

Interrupt Signal Name	Interrupt Number	Typical Source of Interrupt on an IBM AT	As Shipped Configuration	Notes
NMI	—	IOCHCK from PC/104 Bus.	PC/194 IOCHK	STD Bus NMIRQ* routed to CPU NMI input, but can be disconnected by removing a jumper.
IRQ0	08h	Timer 0	Hardwired to Timer 0	Internal signal, not available to the outside world.
IRQ1	09h	Keyboard	Hardwired to on-board keyboard controller.	DOS/BIOS expects keyboard interrupts on this input.
IRQ2	0Ah	Slave Interrupt Controller	Hardwired to secondary PIC	Internal signal, not available to the outside world.
IRQ3	0Bh	COM2	COM2	DOS/BIOS usually expects COM2 interrupts on this input. Comes from the on-board COM2 circuitry or from STD INTRQ. Also connected to PC/104 bus.
IRQ4	0Ch	COM1	Hardwired to COM1 and PC/104	From COM1 circuits or PC/104 bus.
IRQ5	0Dh	LPT 2	STD Bus Disconnected	IPC Interrupts or PC/104 bus.
IRQ6	0Eh	Floppy Disk	Hardwired	From floppy disk circuit or PC/104 bus..
IRQ7	0Fh	LPT1	Hardwired	From printer port circuit or PC/104 bus.

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Table 11: Interrupt Request Inputs

Interrupt Signal Name	Interrupt Number	Typical Source of Interrupt on an IBM AT	As Shipped Configuration	Notes
IRQ8	70h	Real Time Clock	Hardwired	Internal signal, not available to the outside world. Can be used for alarms or periodic interrupts.
IRQ9	71h	Unassigned	INTRQ	From front plane interrupt connector, STD INTRQ or PC/104 bus.
IRQ10	72h	Unassigned	INTRQ1	From Timer 2, STD INTRQ1, or PC/104 bus..
IRQ11	73h	Unassigned	INTRQ2	From Timer 3, STD INTRQ2, or PC/104 bus.
IRQ12	74h	Unassigned	INTRQ3	From Timer 4, STD INTRQ3 or PC/104 bus.
IRQ13	75h	Math Coprocessor	Hardwired	Internal signal, not available to the outside world.
IRQ14	76h	Hard Disk Drive	Hardwired	From PC/104 Bus and on-board IDE controller.
IRQ15	77h	Unassigned	Front Plane	From Timer 5, Front Plane Interrupt connector, or PC/104 bus.

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INTERPROCESSOR COMMUNICATIONS INTERRUPT CONFIGURATION

Jumpers V17[1-2] and V17[2-3] are used to route the Interprocessor Communications (IPC) interrupt signal. Two choices are available: IPC can be carried on the STD Bus signal INTRQ* (P44) or INTRQ4* (P05). If IPC is not being used, both jumpers can be removed to free up INTRQ* and INTRQ4* for other purposes.

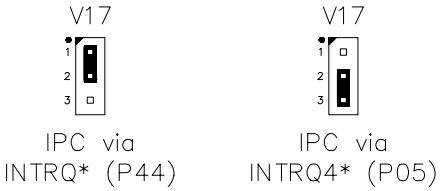


Table 12: Interprocessor Communications Interrupt Jumpers

Jumper Block	Description	As Shipped
V17[1-2]	**IPC Configuration (IPC / INTRQ* interconnect)** In — Connects IPC signal to STD Bus INTRQ* (P44) Out — Disconnects IPC from INTRQ*	Out
V17[2-3]	**IPC Configuration (IPC / INTRQ4* interconnect)** In — Connects IPC signal to STD Bus INTRQ4* (P05) Out — Disconnects IPC from INTRQ*	Out

NON-MASKABLE INTERRUPT CONFIGURATION

Jumper V18[5-6] is used to connect the STD Bus NMIRQ* (P46) signal to the CPU NMI input. When this jumper is removed, NMIRQ* can be used for other purposes.

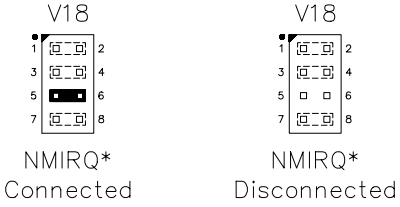


Table 13: Non-Maskable Interrupt Jumper

Jumper Block	Description	As Shipped
V18[5-6]	**Non-Maskable Interrupt / BUS Interconnect** In — Connects STD Bus NMIRQ (P46*) to CPU NMI input Out — CPU ignores activity on STD Bus NMIRQ (P46*)	Out

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Installation 4

Introduction

Before installing the CPU card in a card cage, you must confirm that the on-board battery is activated.

Caution Electrostatic discharge (ESD) can damage cards, disk drives, and other components. Do the installation procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part on the card cage.

Caution Cards can be extremely sensitive to ESD and always require careful handling. After removing the card from its protective wrapper or from the card cage, place the card on a grounded, static-free surface, component side up. Use an anti-static foam pad if available, but not the card wrapper. Do not slide the card over any surface.

The card should also be protected during shipment or storage with anti-static foam or bubble wrap. To prevent damage to the lithium battery, do not use black conductive foam or metal foil.

Warning! The lithium battery may explode if mistreated. Do not recharge, disassemble, or dispose of in fire. Dispose of used batteries promptly.

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Card Insertion and Extraction

Cards should be inserted or removed from the STD Bus card cage only when the system power is off. If you meet resistance when extracting a card, make sure the retainer bar on the card cage is out of the way.

CARD INSTALLATION

The VL-586-1 card can be used alone, as a single board computer; as the only computer in a card cage with other I/O cards; or in conjunction with several other CPUs in a multiprocessing arrangement.

Cards must be oriented correctly in the card cage (usually with the card ejector toward the top of the card cage). Refer to the card cage documentation for the correct way to insert STD/STD 32 Bus cards.

Caution Cards inserted upside down can cause severe damage to the circuit card, the motherboard, and possibly the power supply.

CARD PLACEMENT

The CPU can be inserted into any available slot in an STD/STD 32 Bus card cage. When using an STD 32 card cage, the left most slot position is designated as Slot X and is not bussed in parallel with the other slots. Do not insert the CPU or any I/O card into this slot; it is reserved for a bus arbiter or a power supply card.

STD 80 BUS INSTALLATION GUIDELINES

An 8-bit STD 80 card cage (like VersaLogic's VX-Series) can be used if cost savings are a prime consideration over performance, however, the use of 8-bit cages greater than six slots is not recommended due to the high performance bus drivers used on the VL-586-1. An 8-bit STD Bus card cage may be a good choice in small embedded control systems, especially if all I/O cards are 8-bit STD 80 Bus cards, or if the system is a single-board (CPU only) design. Multiprocessing is not supported in 8-bit cages. Dynamic bus sizing signals on the CPU card automatically determine the restricted data bus width, and will divide 16-bit memory and I/O transactions into two separate 8-bit cycles. No jumper configuration is needed on the CPU card, however, some 16-bit I/O cards might need to be specially jumpered to operate with an 8-bit data bus.

STD 32 BUS INSTALLATION GUIDELINES

The VL-586-1 card complies with all STD 32 specifications. If the CPU is used with other STD 32 compatible I/O cards, the highest performance will be realized by plugging all the cards into an STD 32 card cage.

A variety of STD 80 (8-bit) and STD 32 (8 or 16-bit) cards can be mixed in an STD 32 card cage. Dynamic bus sizing signals automatically determine the data bus width.

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External Connections

This chapter describes the external interfaces available on the VL-586-1 CPU card.

CONNECTOR FUNCTIONS

Table 14: Connector Functions

Connector	Function
J1	High Density I/O Connector
J2	Front Plane Interrupt Connector
J3	Floppy Drive Connector
L1	Speaker Connector

CONNECTOR LOCATIONS

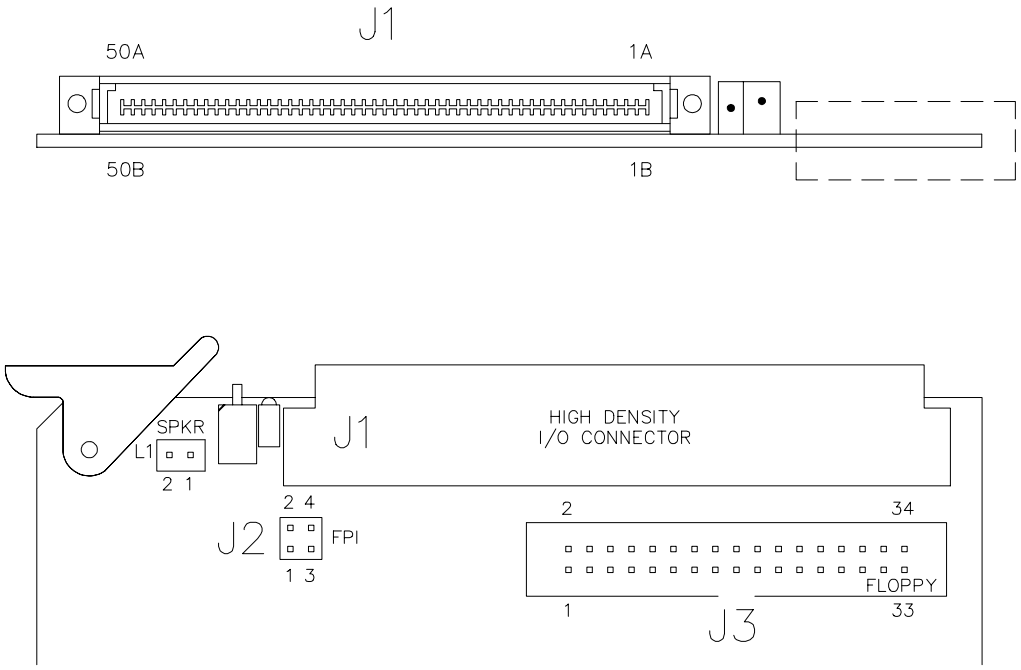


Figure 8. Connector Locations

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HIGH DENSITY 100-PIN CONNECTOR

The high density 100-pin connector is brought out to standard PC connectors by cable assembly VL-CBL-100A. This chart shows the pinout for the cable assembly.

Table 15: J1 High Density 100-Pin Connector Pinout

J1 Pin	External Connector	Pin	Signal
1A	**COM2**	1	Data Carrier Detect
2A	JA	6	Data Set Ready
3A		2	Receive Data
4A		7	Request to Send
5A		3	Transmit Data
6A		8	Clear to Send
7A		4	Data Terminal Ready
8A		9	Ring Indicator
9A		5	Ground
10A		—	No Connect
11A	**LPT1**	1	Strobe
12A	JB	14	Auto feed
13A		2	Data bit 1
14A		15	Printer error
15A		3	Data bit 2
16A		16	Reset
17A		4	Data bit 3
18A		17	Select input
19A		5	Data bit 4
20A		18	Ground
21A		6	Data bit 5
22A		19	Ground
23A		7	Data bit 6
24A		20	Ground
25A		8	Data bit 7
26A		21	Ground
27A		9	Data bit 8
28A		22	Ground
29A		10	Acknowledge
30A		23	Ground
31A		11	Port Busy
32A		24	Ground
33A		12	Paper End
34A		25	Ground
35A		13	Select
36A	**TIMERS**	1	Counter / Timer 3 Out
37A	JC	2	Ground
38A		3	Counter / Timer 4 In
39A		4	Ground
40A		5	Counter / Timer 4 Out
41A		6	Ground
42A		7	Counter / Timer 5 In
43A		8	Ground
44A		9	Counter / Timer 5 Out
45A		10	Ground
46A		11	Non-Maskable Interrupt
47A	**KBD**	4	+5V
48A	JD	1	Keyboard Data
49A		3	Ground
50A		5	Keyboard Clock

J1 Pin	External Connector	Pin	Signal
1B	**COM1**	1	Data Carrier Detect
2B	JE	6	Data Set Ready
3B		2	Receive Data
4B		7	Request to Send
5B		3	Transmit Data
6B		8	Clear to Send
7B		4	Data Terminal Ready
8B		9	Ring Indicator
9B		5	Ground
10B		—	No Connect
11B	**IDE**	1	Reset signal from CPU
12B	JF/JG	2	Ground
13B		3	Data bit 7
14B		4	Data bit 8
15B		5	Data bit 6
16B		6	Data bit 9
17B		7	Data bit 5
18B		8	Data bit 10
19B		9	Data bit 4
20B		10	Data bit 11
21B		11	Data bit 3
22B		12	Data bit 12
23B		13	Data bit 2
24B		14	Data bit 13
25B		15	Data bit 1
26B		16	Data bit 14
27B		17	Data bit 0
28B		18	Data bit 15
29B		19	Ground
30B		20	No connection
31B		21	No connection
32B		22	Ground
33B		23	I/O write
34B		24	Ground
35B		25	I/O read
36B		26	Ground
37B		27	I/O Channel Ready
38B		28	No connection
39B		29	No connection
40B		30	Ground
41B		31	IRQ14
42B		32	Drive 16-bit I/O
43B		33	Address bit 1
44B		34	No connection
45B		35	Address bit 0
46B		36	Address bit 2
47B		37	Reg. access chip select 0
48B		38	Reg. access chip select 1
49B		39	No connection
50B		40	Ground

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JA, JE – Serial Port Connectors

Connectors JA (COM2) and JE (COM1) provide signals for two serial I/O ports. COM1 supports RS-232 operation only, and COM2 operates in RS-232, RS-422, or RS-485 mode.

Table 16: JA, JE RS-232 Serial Port Connector Pinout
DB 9-Pin Male

JA, JE Pin	Signal Name	RS-232 Signal Description	Signal Direction
1	DCD	Data Carrier Detect	In
2	RXD*	Receive Data	In
3	TXD*	Transmit Data	Out
4	DTR	Data Terminal Ready	Out
5	Ground	Ground	—
6	DSR	Data Set Ready	In
7	RTS	Request To Send	Out
8	CTS	Clear To Send	In
9	RI	Ring Indicator	In

Table 17: JA RS-422/485 Serial Port Connector Pinout
DB 9-Pin Male

JA Pin	RS-422			RS-485		
	Signal Name	Description	Direction	Signal Name	Description	Direction
1	N/C	—	—	N/C	—	—
2	TD2+	Transmit Data Positive	Out	TD2+	Transmit Data Positive	Out
3	N/C	—	—	N/C	—	—
4	RD2–	Receive Data Negative	In	TD2/RD2–	Transmit/Receive Data Negative	Out/In
5	N/C	—	—	N/C	—	—
6	N/C	—	—	N/C	—	—
7	TD2–	Transmit Data Negative	Out	TD2–	Transmit Data Negative	Out
8	Ground	Ground		Ground	Ground	—
9	RD2+	Receive Data Positive	In	TD2/RD2+	Transmit/Receive Data Positive	Out/In

Note: In RS-485 mode, do not make connection to pin 2 [TD2+] or pin 7 [TD2–].

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JB – LPT1 Parallel Port Connector

The bi-directional parallel port at JB can be used as a standard PC compatible LPT1 port or as 17 general purpose TTL I/O signals.

Table 18: LPT1 Parallel Port Pinout
DB 25-Pin Female

JB Pin	Signal Name	Centronics Signal	Signal Direction
1	STB*	Strobe	Out
2	PD0	Data bit 1	In/Out
3	PD1	Data bit 2	In/Out
4	PD2	Data bit 3	In/Out
5	PD3	Data bit 4	In/Out
6	PD4	Data bit 5	In/Out
7	PD5	Data bit 6	In/Out
8	PD6	Data bit 7	In/Out
9	PD7	Data bit 8	In/Out
10	ACK*	Acknowledge	In
11	PBSY	Port busy	In
12	PE	Paper End	In
13	SLCT	Select	In
14	AFX*	Auto feed	Out
15	PERR*	Printer error	In
16	INIT*	Reset	Out
17	SLIN*	Select input	Out
18	Ground	Ground	—
19	Ground	Ground	—
20	Ground	Ground	—
21	Ground	Ground	—
22	Ground	Ground	—
23	Ground	Ground	—
24	Ground	Ground	—
25	Ground	Ground	—

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JC – COUNTER/TIMER

External access to a variety of Counter/Timer signals is available through connector JC.

Table 19: Counter/Timer Connector Pinout
14-Pin Female IDC

JC Pin	Signal Name	Function
1	OCTC3	Counter / Timer 3 Out
2	Ground	Ground
3	ICTC4	Counter / Timer 4 In
4	Ground	Ground
5	OCTC4	Counter / Timer 4 Out
6	Ground	Ground
7	ICTC5	Counter / Timer 5 In
8	Ground	Ground
9	OCTC5	Counter / Timer 5 Out
10	Ground	Ground
11	NMI*	STD Bus Non-Maskable Interrupt
12	N/C	
13	N/C	

Note: The Non-Maskable Interrupt is not available on revision 1 or revision 2 of the VL-586-1 circuit board.

OCTC3 — Counter / Timer 3 Output. This TTL output signal is the primary output signal for counter / timer 3.

ICTC4 — Counter / Timer 4 Input. This TTL input signal is used as the primary input control signal for counter / timer 4.

OCTC4 — Counter / Timer 4 Output. This TTL output signal is the primary output control signal for counter / timer 4.

ICTC5 — Counter / Timer 5 Input. This TTL input signal is used as the primary input control signal for counter / timer 5.

OCTC5 — Counter / Timer 5 Output. This TTL output signal is the primary output control signal for counter / timer 5.

NMI* — STD Bus Non-Maskable Interrupt. This TTL input signal is used to signal the CPU of an extremely high priority event, such as imminent loss of power, memory error, or bus parity error. Interrupts requested through this input cannot be disabled. They are latched by the CPU, and have the highest priority of all the interrupts. An NMI will abort a DMA transfer if one is in progress. A low level applied to the NMI* pin cause an INT 02h resulting in a dispatch through the interrupt vector at 0000:0008h.

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JD – KEYBOARD CONNECTOR

A standard IBM PC keyboard can be attached to connector JD.

Table 20: Keyboard Connector Pinout
6-Pin Mini DIN PS/2 Style

JD Pin	Signal Name	Function
1	KBDATA	Keyboard Data
2	N/C	No Connection
3	GND	Ground
4	5VCC	+5V
5	KBCLK	Keyboard Clock
6	N/C	No Connection

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JF – HARD DISK DRIVE CONNECTOR

Two standard IDE drives can be connected to the VL-586-1 through this connector.

Caution Cable length must be 18" or less to maintain proper signal integrity. The grounds in this connector should not be used to carry motor current.

Table 21: IDE Hard Drive Connector Pinout
40-Pin Female IDC

JF Pin	Signal Name	Function
1	SYSRST*	Reset signal from CPU
2	GND	Ground
3	HDD7	Data bit 7
4	HDD8	Data bit 8
5	HDD6	Data bit 6
6	HDD9	Data bit 9
7	HDD5	Data bit 5
8	HDD10	Data bit a
9	HDD4	Data bit 4
10	HDD11	Data bit 11
11	HDD3	Data bit 3
12	HDD12	Data bit 12
13	HDD2	Data bit 2
14	HDD13	Data bit 13
15	HDD1	Data bit 1
16	HDD14	Data bit 14
17	HDD0	Data bit 0
18	HDD15	Data bit 15
19	GND	Ground
20	N/C	No connection
21	N/C	No connection
22	GND	Ground
23	HDIOW*	I/O write
24	GND	Ground
25	HDIOR*	I/O read
26	GND	Ground
27	HDIORDY	I/O Channel Ready
28	N/C	No connection
29	N/C	No connection
30	GND	Ground
31	IRQ14	IRQ14
32	HDIO16*	Drive 16-bit I/O
33	HDA1	Address bit 1
34	N/C	No connection
35	HDA0	Address bit 0
36	HDA2	Address bit 2
37	HDCS0*	Reg. access chip select 0
38	HDCS1*	Reg. access chip select 1
39	N/C	No connection
40	GND	Ground

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J2 – INTERRUPT CONNECTOR

A 4-pin header connector, J2, provides external access to two interrupt lines.

Table 22: Front Plane Interrupt Connector Pinout.

J2 Pin	Signal Name	Function
1	Ground	Ground
2	FP0*	Front Plane 0 Interrupt
3	Ground	Ground
4	FP1*	Front Plane 1 Interrupt

FP0* — Front Plane 4 Interrupt. This TTL input signal is used as a general purpose interrupt request input. If jumper V12[2-3] is inserted, a low level (or high-to-low transition) applied to the FP0* pin will request an interrupt via IRQ9. In DOS configuration, this will cause an INT 71h resulting in a dispatch through the interrupt vector at 000:01C4h.

FP1* — Front Plane 6 Interrupt. This TTL input signal is used as a general purpose interrupt request input. If jumper V16[1-2] is inserted, a low level (or high-to-low transition) applied to the FP1* pin will request an interrupt via IRQ15. In DOS configuration, this will cause an INT 77h resulting in a dispatch through the interrupt vector at 000:01DCh.

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J3 – Floppy Disk Drive Connector

The VL-586-1 CPU card supports a standard 34-pin PC/AT style floppy disk interface at connector J3.

Note Note that Drive A and Drive B are reversed compared to a typical PC system. This was done to accommodate a single Drive A using a straight ribbon cable without a twist. Cable length must be 18" or less to maintain proper signal integrity. The grounds in this connector should not be used to carry motor current.

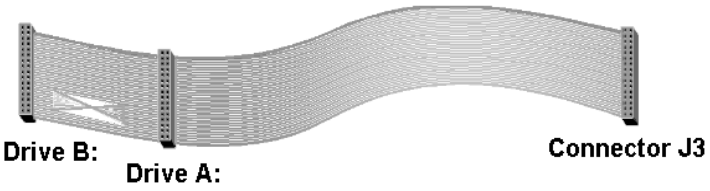


Table 23: Floppy Disk Interface Connector Pinout.

J3 Pin	Signal Name	Function	J3 Pin	Signal Name	Function
1	Ground	Ground	18	DIR	Direction Select
2	R/LC	Load Head	19	Ground	Ground
3	Ground	Ground	20	STEP*	Motor Step
4	NC	No Connection	21	Ground	Ground
5	Ground	Ground	22	WDAT*	Write Data Strobe
6	NC	No Connection	23	Ground	Ground
7	Ground	Ground	24	WGAT*	Write Enable
8	INDX*	Beginning Of Track	25	Ground	Ground
9	Ground	Ground	26	TRK0*	Track 0 Indicator
10	MTR1*	Motor Enable 1	27	Ground	Ground
11	Ground	Ground	28	WPRT*	Write Protect
12	DRV0*	Drive Select 0	29	Ground	Ground
13	Ground	Ground	30	RDAT*	Read Data
14	DRE1*	Drive Select 1	31	Ground	Ground
15	Ground	Ground	32	HDSL	Head Select
16	MTR0*	Motor Enable 0	33	Ground	Ground
17	Ground	Ground	34	DCHG	Drive Door Open

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L1 – SPEAKER CONNECTOR

Connector L1 is provided for connecting an 8Ω speaker to the card.

Table 24: Speaker Connector Pinout.

L1 Pin	Signal Name	Function
1	Timer 2 Out	Speaker drive
2	Ground	Ground

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5 Register Descriptions

Introduction

This chapter lists all the user-programmable registers on the VL-586-1 CPU card. Programming details are included for non PC/AT registers only, information on the standard PC/AT registers can be found in *The Programmer's PC Sourcebook* or *The Undocumented PC* listed in "Other References" on page vi.

Register Summary

The tables in this section list all programmable registers on the VL-586-1 CPU card. They are organized in the following groups:

Table 25: Programmable Registers

Registers	Page
DMA 1 Controller	52
DMA 2 Controller	53
DMA Page	53
COM1 Serial Port	54
COM2 Serial Port	54
LPT1 Parallel Port	55
82C735 Configuration	
Interrupt Controller (Master)	57
Interrupt Controller (Slave)	57
Counter/Timer (Channels 0 - 2)	58
Counter/Timer (Channels 3 - 5)	58
VersaLogic Registers	58

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DIRECT MEMORY ACCESS — CHANNEL 1

Table 26: DMA 1 Controller Registers

Mnemonic	R/W	Address	Name
DMA0ADRA	R/W	0000h	DMA Channel 0 Current Address
DMA0CNTA	R/W	0001h	DMA Channel 0 Current Word Count
DMA1ADRA	R/W	0002h	DMA Channel 1 Current Address
DMA1CNTA	R/W	0003h	DMA Channel 1 Current Word Count
DMA2ADRA	R/W	0004h	DMA Channel 2 Current Address
DMA2CNTA	R/W	0005h	DMA Channel 2 Current Word Count
DMA3ADRA	R/W	0006h	DMA Channel 3 Current Address
DMA3CNTA	R/W	0007h	DMA Channel 3 Current Word Count
DMACSA	R/W	0008h	DMA Command/Status Register
DMARQA	R/W	0009h	DMA Request Register
DMAMASKA	R/W	000Ah	DMA Single Bit Mask Register
DMAMODEA	R/W	000Bh	DMA Mode Register
DMACBPA	R/W	000Ch	DMA Clear Byte Pointer
DMAMCA	R/W	000Dh	DMA Master Clear
DMACMA	R/W	000Eh	DMA Clear Mask Register
DMAWAMA	R/W	000Fh	DMA Write All Mask Register Bits

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DIRECT MEMORY ACCESS — CHANNEL 2

Table 27: DMA 2 Controller Registers

Mnemonic	R/W	Address	Name
DMA0ADRB	R/W	00C0h	DMA Channel 0 Current Address
DMA0CNTB	R/W	00C2h	DMA Channel 0 Current Word Count
DMA1ADRB	R/W	00C4h	DMA Channel 1 Current Address
DMA1CNTB	R/W	00C6h	DMA Channel 1 Current Word Count
DMA2ADRB	R/W	00C8h	DMA Channel 2 Current Address
DMA2CNTB	R/W	00CAh	DMA Channel 2 Current Word Count
DMA3ADRB	R/W	00CCh	DMA Channel 3 Current Address
DMA3CNTB	R/W	00CEh	DMA Channel 3 Current Word Count
DMACSB	R/W	00D0h	DMA Command/Status Register
DMARQB	R/W	00D2h	DMA Request Register
DMAMASKB	R/W	00D4h	DMA Single Bit Mask Register
DMAMODEB	R/W	00D6h	DMA Mode Register
DMACBPB	R/W	00D8h	DMA Clear Byte Pointer
DMAMCB	R/W	00DAh	DMA Master Clear
DMACMB	R/W	00DCh	DMA Clear Mask Register
DMAWAMB	R/W	00DEh	DMA Write All Mask Register Bits
DMAWAXB	R/W	00DFh	DMA Write All Mask Register Bits X

DIRECT MEMORY ACCESS — PAGE REGISTERS

Table 28: DMA Page Registers

Mnemonic	R/W	Address	Name
DMA2PG	W	0081h	DMA Channel 2 Page Register
DMA3PG	W	0082h	DMA Channel 3 Page Register
DMA1PG	W	0083h	DMA Channel 1 Page Register
DMA0PG	W	0087h	DMA Channel 0 Page Register
DMA6PG	W	0089h	DMA Channel 6 Page Register
DMA7PG	W	008Ah	DMA Channel 7 Page Register
DMA5PG	W	008Bh	DMA Channel 5 Page Register
RAPREG	W	008Fh	Refresh Address Page Register

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COM1 Serial Port

Table 29: COM1 Serial Port Registers

Mnemonic	R/W	Address	Name
RBRA	R	03F8h	Receiver Buffer Register A
THRA	W	03F8h	Transmit Holding Register A
DLLA	R/W	03F8h	Divisor Latch (LSB) A
IERA	R/W	03F9h	Interrupt Enable Register A
DLMA	R/W	03F9h	Divisor Latch (MSB) A
IIRA	R	03FAh	Interrupt Identification Register A
LCRA	R/W	03FBh	Line Control Register A
MCRA	R/W	03FCh	Modem Control Register A
LSRA	R	03FDh	Line Status Register A
MSRA	R	03FEh	Modem Status Register A
SCRA	R/W	03FFh	Scratchpad Register A

COM2 Serial Port

Table 30: COM2 Serial Port Registers

Mnemonic	R/W	Address	Name
RBRB	R	02F8h	Receiver Buffer Register B
THRB	W	02F8h	Transmit Holding Register B
DLLB	R/W	02F8h	Divisor Latch (LSB) B
IERB	R/W	02F9h	Interrupt Enable Register B
DLMB	R/W	02F9h	Divisor Latch (MSB) B
IIRB	R	02FAh	Interrupt Identification Register B
LCRB	R/W	02FBh	Line Control Register B
MCRB	R/W	02FCh	Modem Control Register B
LSRB	R	02FDh	Line Status Register B
MSRB	R	02FEh	Modem Status Register B
SCRB	R/W	02FFh	Scratchpad Register B

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LPT1 PARALLEL PORT

Table 31: LPT1 Parallel Port Registers

Mnemonic	R/W	Address	Name
LPRD	R	0278h	Line Printer Read Data Register
LPWD	W	0278h	Line Printer Write Data Register
LPS	R	0279h	Line Printer Status Register
LPRC	R	027Ah	Line Printer Read Control Register
LPWC	W	027Ah	Line Printer Write Control Register

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FLOPPY DISK DRIVE CONTROLLER

Table 32: Floppy Disk Drive Controller Registers

Mnemonic	R/W	Address	Name
FDCMSR	R	03F4h	Main Status Register
FDCDR	R/W	03F5h	Data Register
FDCST0	R	03F5h	Status Register 0
FDCST1	R	03F5h	Status Register 1
FDCST2	R	03F5h	Status Register 2
FDCST3	R	03F5h	Status Register 3
FDCDCR	W	03F2h	Drive Control Register
FDCDRR	W	03F7h	Data Rate Register
FDCFDR	R	03F7h	Fixed Disk Register

IDE HARD DISK DRIVE CONTROLLER

Table 33: IDE Hard Disk Drive Controller Registers

Mnemonic	R/W	Address	Name
IDEDR	R/W	01F0h	Data Register
IDEER	R	01F1h	Error Register
IDEWP	W	01F1h	Write Precompensation Register
IDESC	R/W	01F2h	Sector Count Register
IDESN	R/W	01F3h	Sector Number Register
IDECNL	R/W	01F4h	Cylinder Number Register Low
IDECNH	R/W	01F5h	Cylinder Number Register High
IDEDH	R/W	01F6h	Drive/Head Register
IDEST	R	01F7h	Status Register
IDECMD	W	01F7h	Command Register
IDEDIR	R	03F7h	Digital Input Register
IDEFDR	W	03F6h	Fixed Disk Register

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INTERRUPT CONTROLLER — MASTER

Table 34: Master Interrupt Controller Registers

Mnemonic	R/W	Address	Name
ICW1A	W	0020h	Initialization Command Word 1
ICW2A	W	0021h	Initialization Command Word 2
ICW3A	W	0021h	Initialization Command Word 3
ICW4A	W	0021h	Initialization Command Word 4
OCW1A	W	0021h	Operation Command Word 1 (Interrupt Mask)
OCW2A	W	0020h	Operation Command Word 2 (Priority & Finish Control)
OCW3A	W	0020h	Operation Command Word 3 (Mode Control)
ISRA	R	0020h	In-Service Register
IRRA	R	0020h	Interrupt Request Register
IPWA	R	0020h	Interrupt Poll Word
IMRA	R	0021h	Interrupt Mask Register

INTERRUPT CONTROLLER — SLAVE

Table 35: Slave Interrupt Controller Registers

Mnemonic	R/W	Address	Name
ICW1B	W	00A0h	Initialization Command Word 1
ICW2B	W	00A1h	Initialization Command Word 2
ICW3B	W	00A1h	Initialization Command Word 3
ICW4B	W	00A1h	Initialization Command Word 4
OCW1B	W	00A1h	Operation Command Word 1 (Interrupt Mask)
OCW2B	W	00A0h	Operation Command Word 2 (Priority & Finish Control)
OCW3B	W	00A0h	Operation Command Word 3 (Mode Control)
ISRB	R	00A0h	In-Service Register
IRRB	R	00A0h	Interrupt Request Register
IPWB	R	00A0h	Interrupt Poll Word
IMRB	R	00A1h	Interrupt Mask Register

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COUNTER/TIMERS

Table 36: Channels 0 to 2

Mnemonic	R/W	Address	Name
T0CNT	R/W	0040h	Timer 0 Count Load/Read
T1CNT	R/W	0041h	Timer 1 Count Load/Read
T2CNT	R/W	0042h	Timer 2 Count Load/Read
TCW0	W	0043h	Timer Control Word

Table 37: Channels 3 to 5

Mnemonic	R/W	Address	Name
T3CNT	R/W	0044h	Timer 3 Count Load/Read
T4CNT	R/W	0045h	Timer 4 Count Load/Read
T5CNT	R/W	0046h	Timer 5 Count Load/Read
TCW3	W	0047h	Timer Control Word

MISCELLANEOUS

Table 38: Miscellaneous PC/AT-Style Registers

Mnemonic	R/W	Address	Name
CSP	R/W	0061h	Control/Status Port
RTCIDX	W	0070h	Real Time Clock Index and NMI Mask
RTCDP	R/W	0071h	Real Time Clock Data Port

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SPECIAL CONTROL REGISTER

SCR (READ/WRITE) 00E0H

D7	D6	D5	D4	D3	D2	D1	D0
LED	Reserved	GP0	IPC	Reserved	Reserved	PM	WDOGEN

Table 39: Special Control Register Bit Assignments

Bit	Mnemonic	Description
D7	LED	**Light Emitting Diode** — Controls the on-board LED. LED = 0 Turns LED off. LED = 1 Turns LED on.
D6	—	**Reserved** — This bit has no function. Always reads as 0.
D5	GP0	**General Purpose Jumper Input** — This bit reflects the state of jumper V19[1-2]. GP0 = 0 Jumper out. GP0 = 1 Jumper in.
D4	IPC	**Interprocessor Communication** — Used to signal the attention of other CPU cards in a multiprocessor environment. IPC controls an open collector signal, TIPC*. Jumper block V17 configures the TIPC* signal to be carried on the STD Bus signal INTRQ* (P44). As an alternative, TIPC* can be carried on the STD Bus signal INTRQ4 (P05). An active low signal on this circuit (generated locally by writing a 0 to this bit, or received from the STD Bus) requests an interrupt on IRQ5. In DOS configuration, this causes an INT 0Dh resulting in a dispatch through the interrupt vector at 0000:0034h. IPC = 0 TIPC* released for other cards to drive. IPC = 1 TIPC* signal is driven active low.
D3	—	**Reserved** — This bit has no function. Always reads as 0.
D2	—	**Reserved** — This bit has no function. Always reads as 0.
D1	PM	**Permanent Master** — This status bit reflects the state of jumper V18[7-8]. Writing to this bit has no effect. PM* = 0 Jumper out. PM* = 1 Jumper in.
D0	WDOGEN	**Watchdog Enable** — Enables and disables the watchdog timer reset circuit. WDOGEN = 0 Disables the watchdog timer. WDOGEN = 1 Enables the watchdog timer.

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WATCHDOG TIMER HOLD-OFF REGISTER

WDHOLD (WRITE ONLY) 00E1H

D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	0	1	0

A watchdog timer circuit is included on the CPU card to reset the CPU if proper software execution fails or a hardware malfunction occurs. The watchdog timer is enabled/disabled by writing to bit D0 of SCR

If the watchdog timer is enabled, software must periodically refresh the watchdog timer at a rate faster than the timer is set to expire (250 ms). Writing a 5Ah to WDHOLD resets the watchdog time-out period, preventing the CPU from being reset for the next 250 ms.

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I/O AND MEMORY MAP CONTROL REGISTER

IOMMAP (WRITE ONLY) 00E2H

D7	D6	D5	D4	D3	D2	D1	D0
Reserved	Reserved	Reserved	Reserved	MMAP2	MMAP1	IOMAP2	IOMAP1

Table 40: I/O and Memory Map Register Bit Assignments

Bit	Mnemonic	Description
D7-D4	—	**Reserved** — These bits have no function. Always read as 0.
D3	MMAP2	**Memory Map Select 2** — Selects PC/104 or STD Bus memory access. MMAP2 = 0 C8000h to CFFFFh = PC/104 Bus MMAP2 = 1 C8000h to CFFFFh = STD Bus
D2	MMAP1	**Memory Map Select 1** — Selects PC/104 or STD Bus memory access. MMAP1 = 0 D0000h to D7FFFh = PC/104 Bus MMAP1 = 1 D0000h to D7FFFh = STD Bus
D1	IOMAP2	**I/O Map Select 2** — Selects PC/104 or STD Bus I/O access. IOMAP2 = 0 0100h to 01EFh, 0200h to 027Fh } = PC/104 Bus IOMAP2 = 1 0100h to 01EFh, 0200h to 027Fh } = STD Bus ***Note!*** *See I/O map on page 27 for further information.*
D0	IOMAP1	**I/O Map Select 1** — Selects PC/104 or STD Bus I/O access. IOMAP1 = 0 02E8h to 02EFh (COM4), 03E8h to 03EFh (COM3) } = PC/104 Bus IOMAP1 = 1 02E8h to 02EFh (COM4), 03E8h to 03EFh (COM3) } = STD Bus ***Note!*** *See I/O map on page 27 for further information.*

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MAP AND PAGING CONTROL REGISTER

MPCR (READ/WRITE) 00E3H

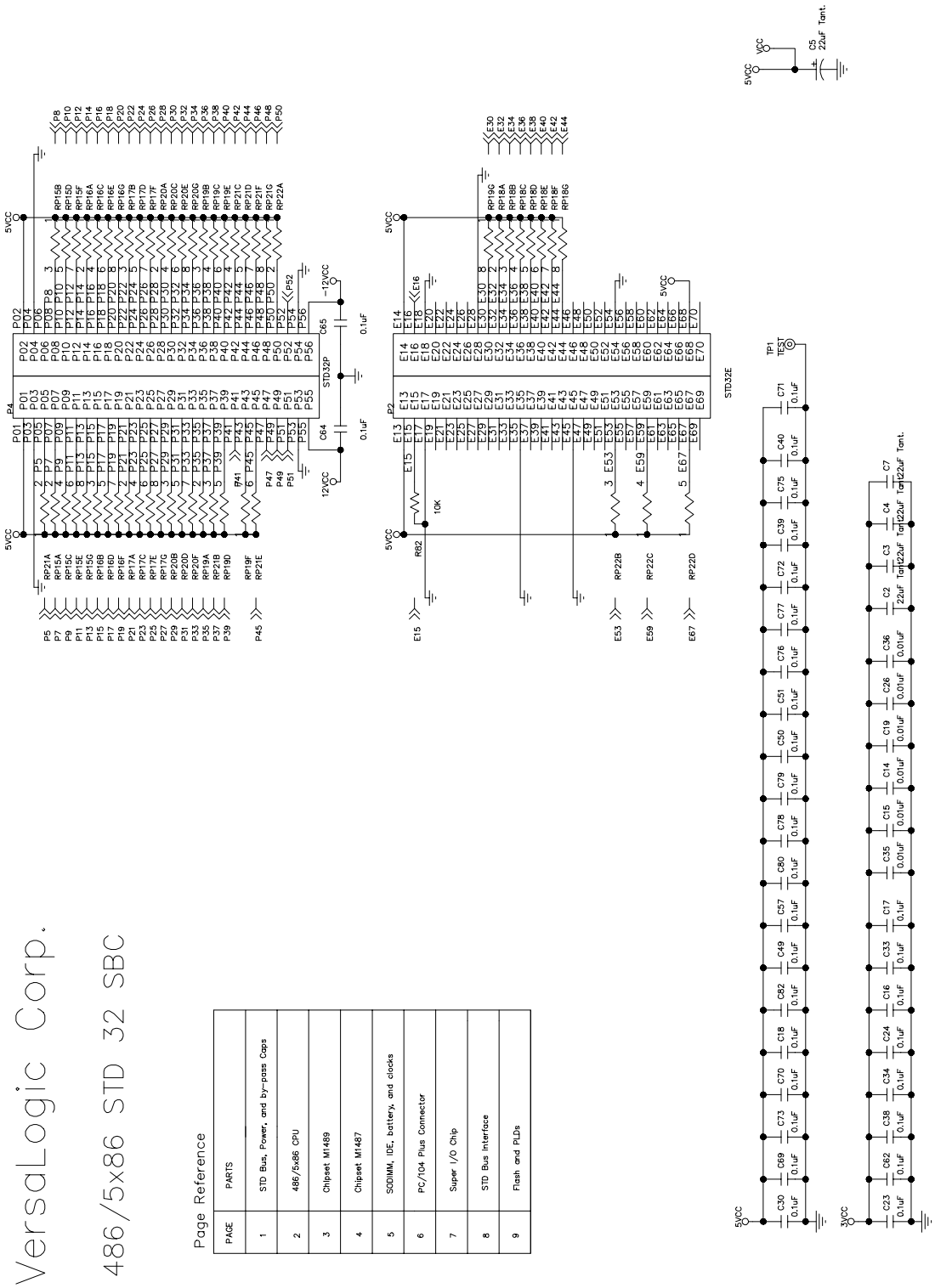
D7	D6	D5	D4	D3	D2	D1	D0
FPAGE	Reserved	RPG5	RPG4	RPG3	RPG2	RPG1	RPG0

Table 41: Map and Paging Control Register Bit Assignments

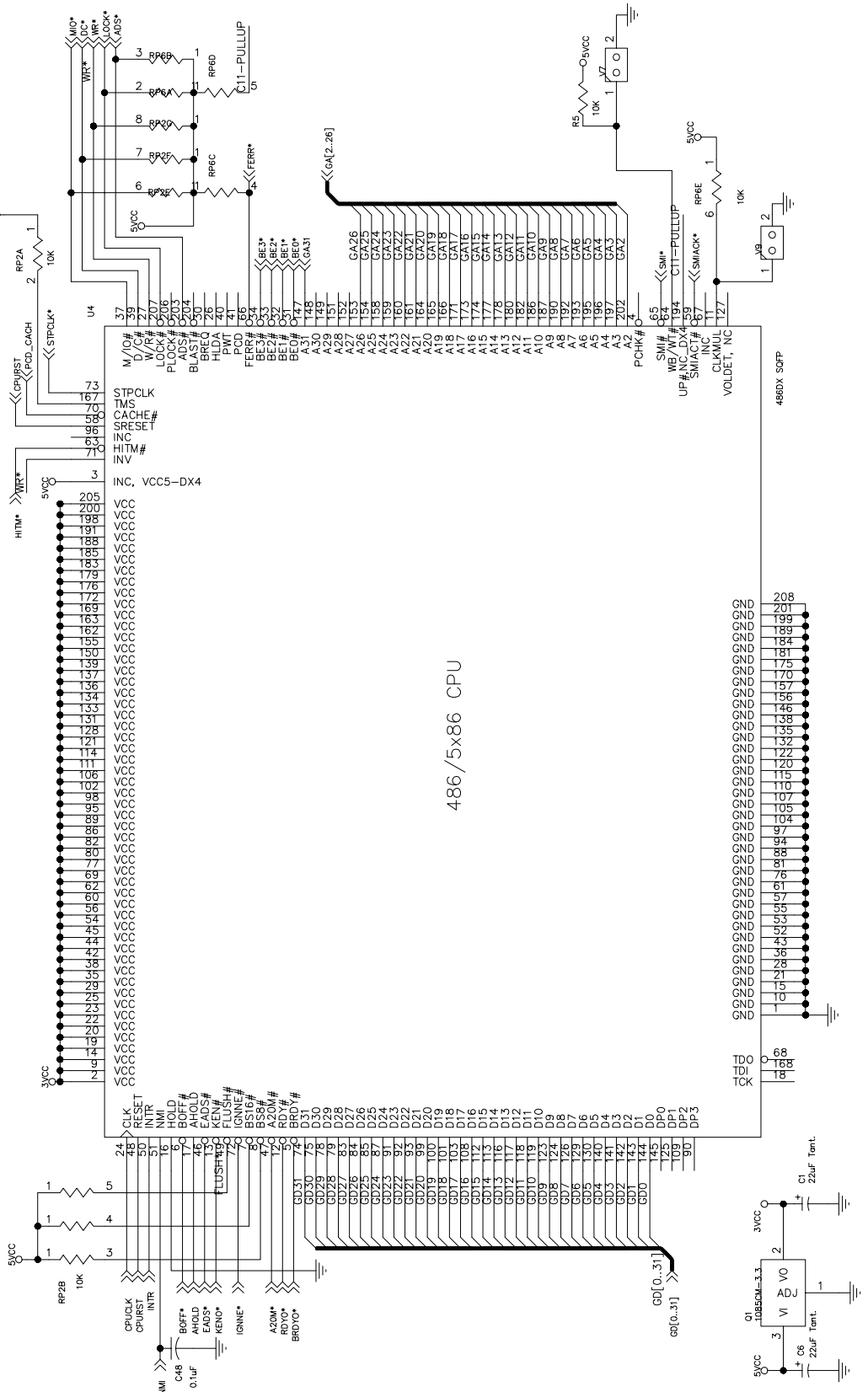
Bit	Mnemonic	Description
D7	FPAGE	**Flash Paging Enable** — Enables a 64K page frame from E0000h to EFFFFh. Used to gain access to the on-board FLASH or BBSRAM. FPAGE = 0 Page Frame Disabled. FPAGE = 1 Page Frame Enabled.
D6	—	**Reserved** — This bit has no function. Always reads as 0.
D5-D0	RPG5-RPG0	**Page Select** — Selects which 64K block is mapped into the page frame.

RPG5	RPG4	RPG3	RPG2	RPG1	RPG0	Memory Range
0	0	0	X	X	X	8 Pages BBSRAM
0	1	1	X	X	X	8 Pages FLASH 0
1	X	X	X	X	X	32 Pages FLASH 1

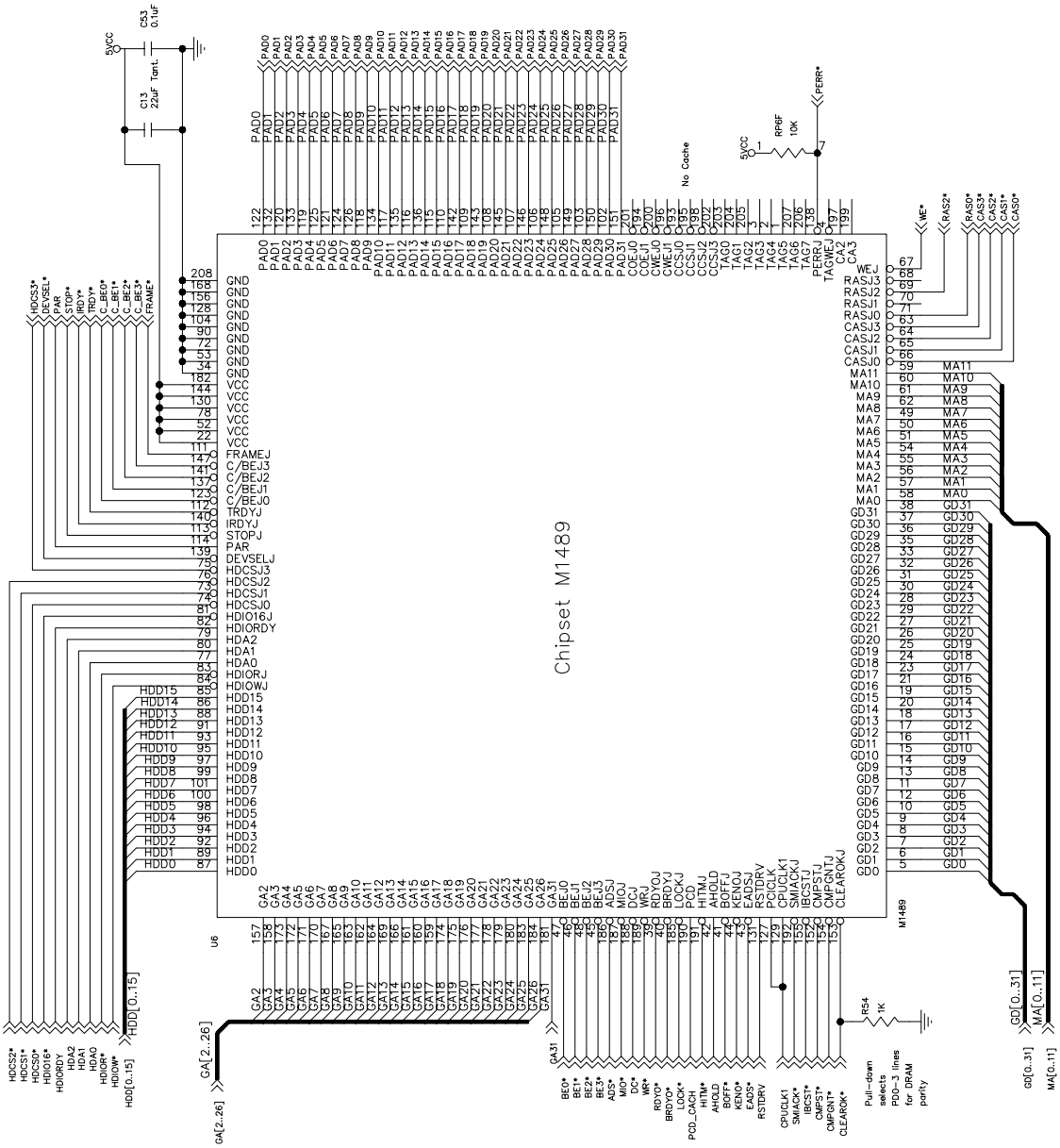
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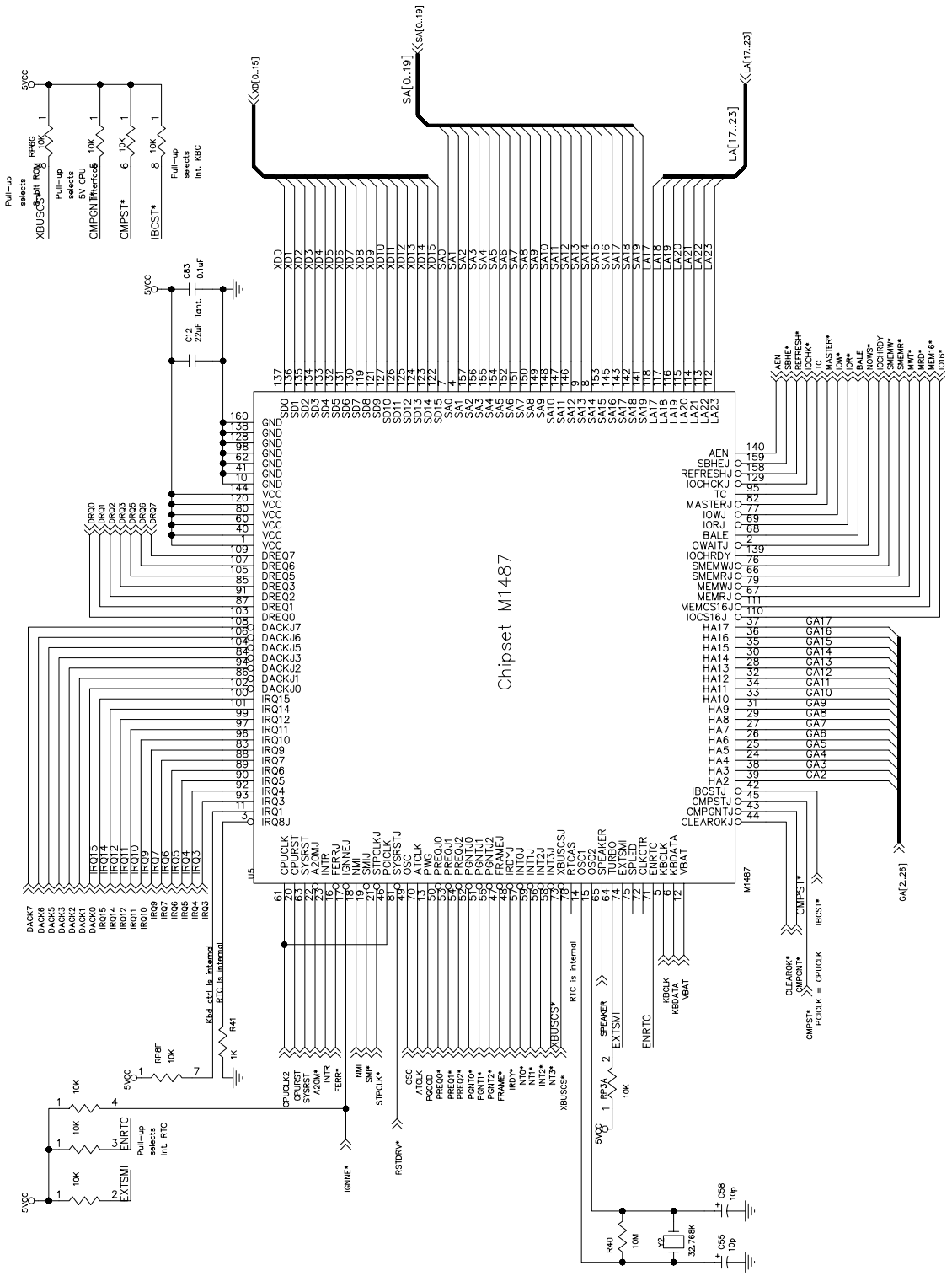
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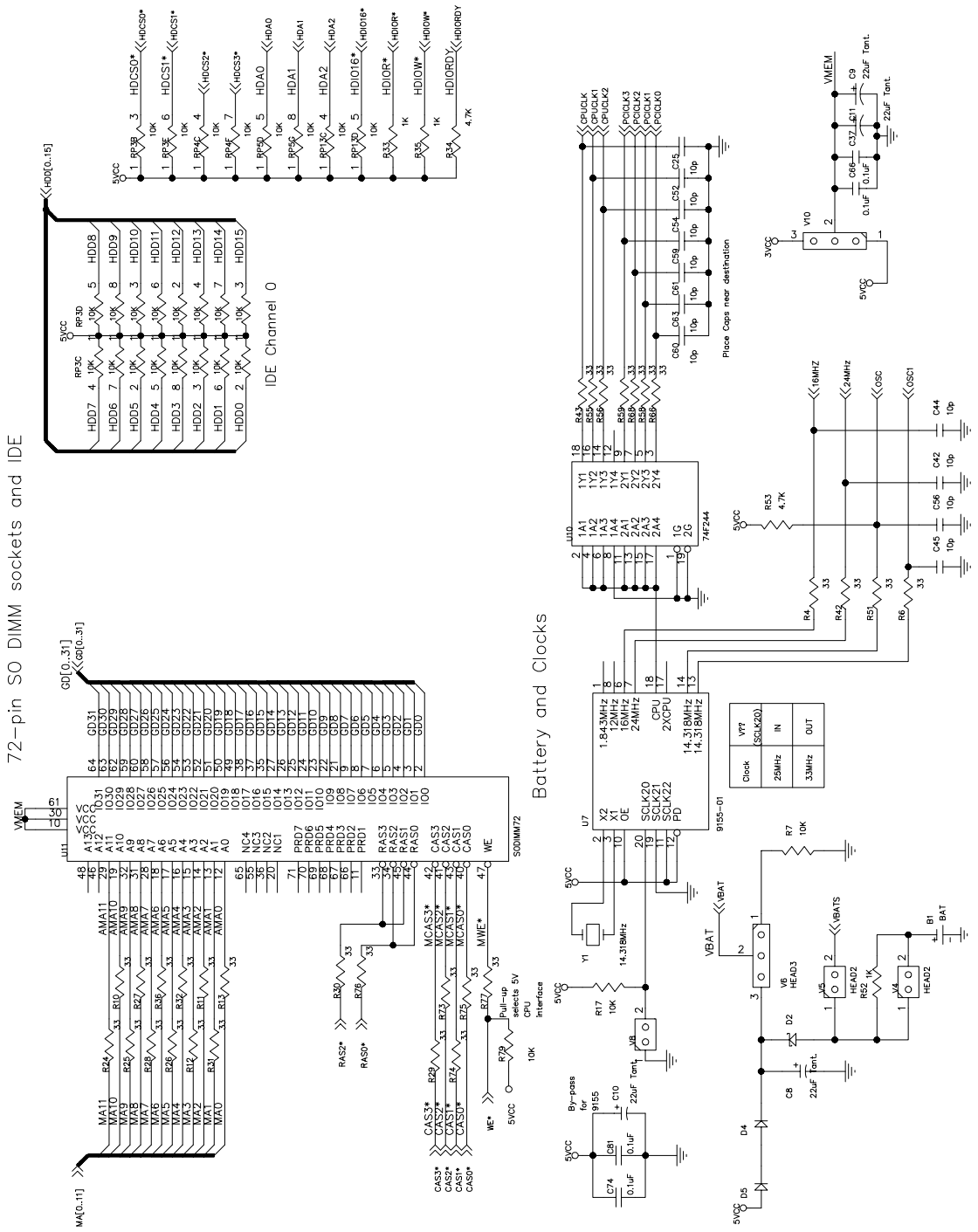
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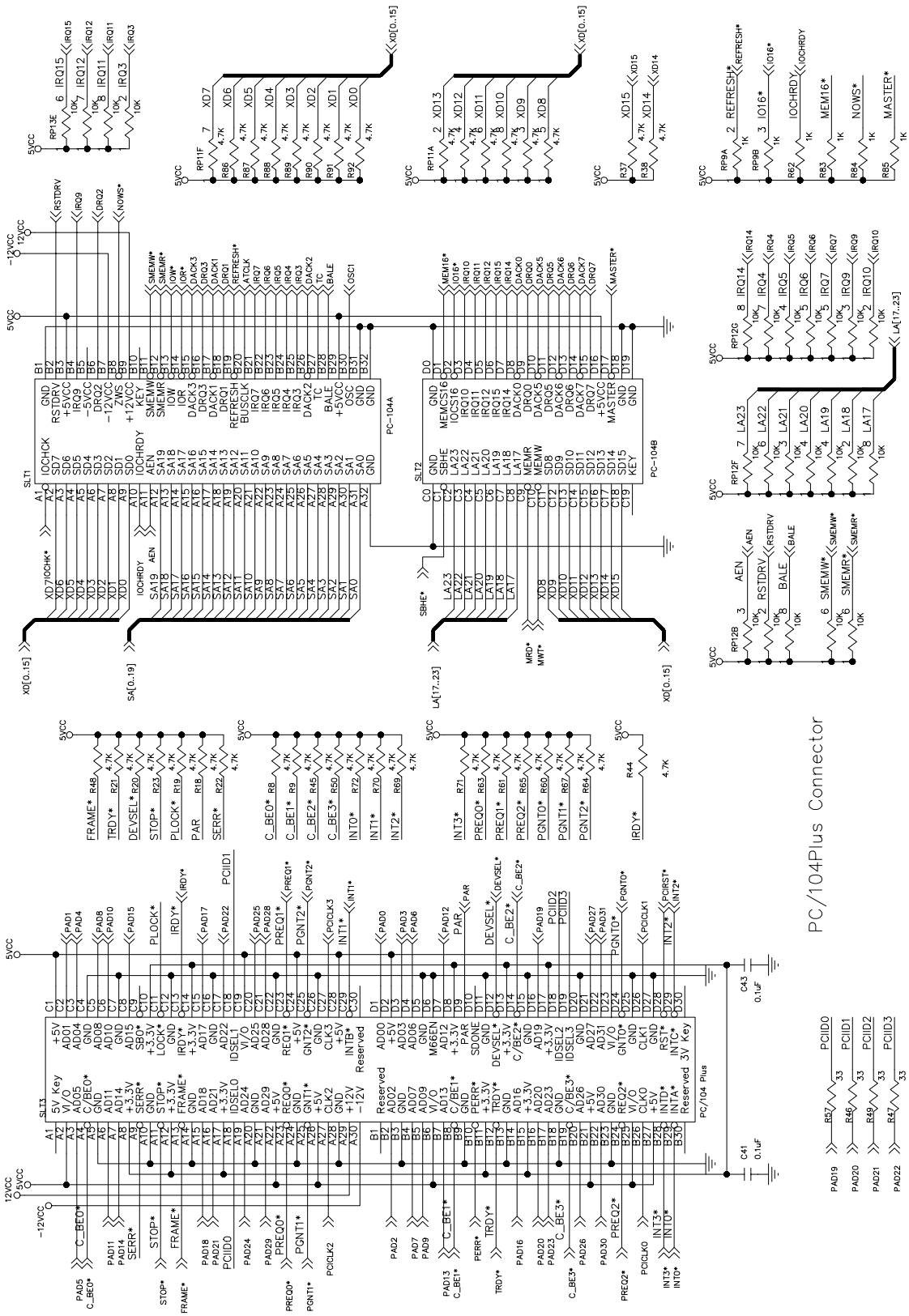
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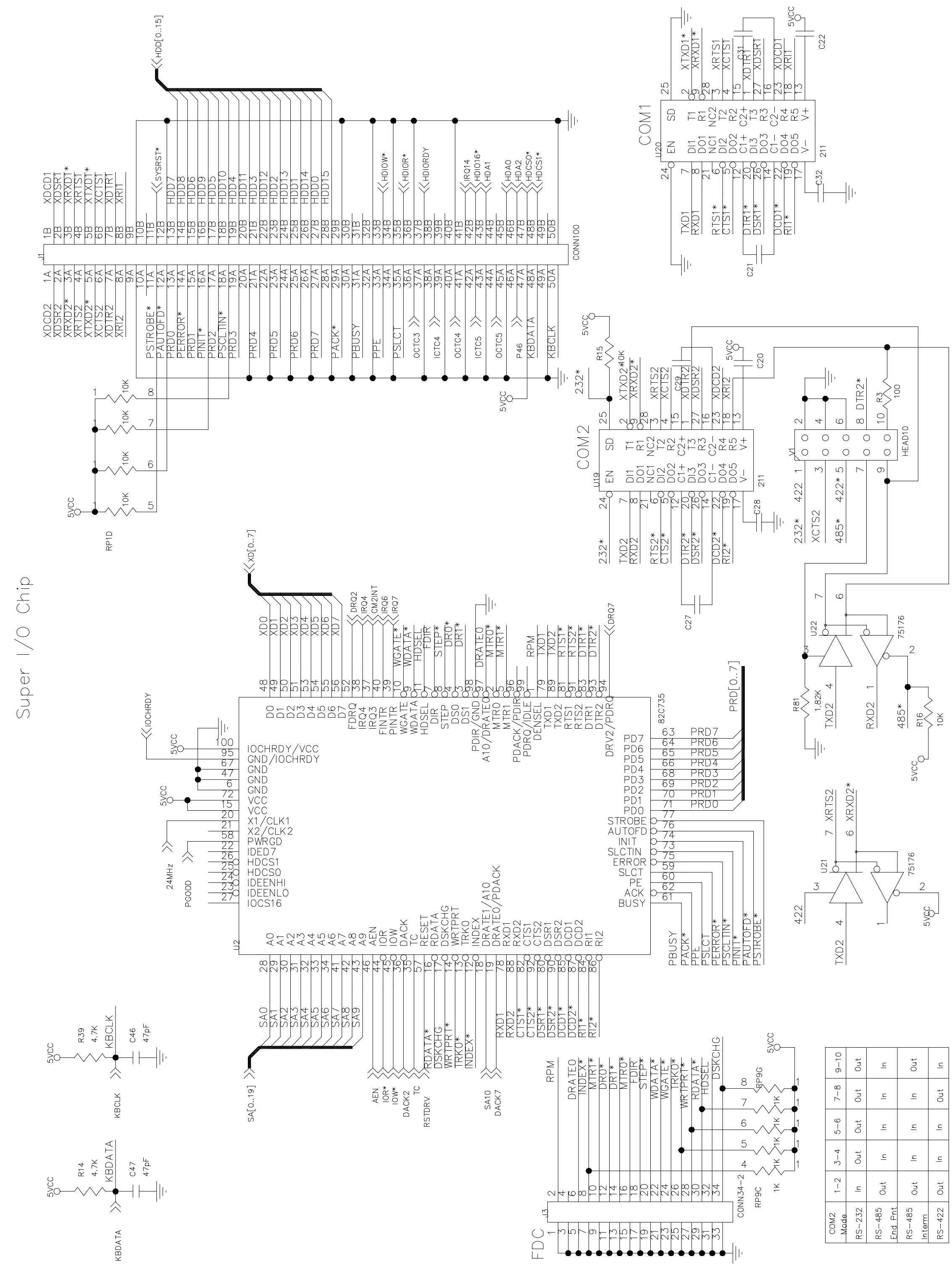
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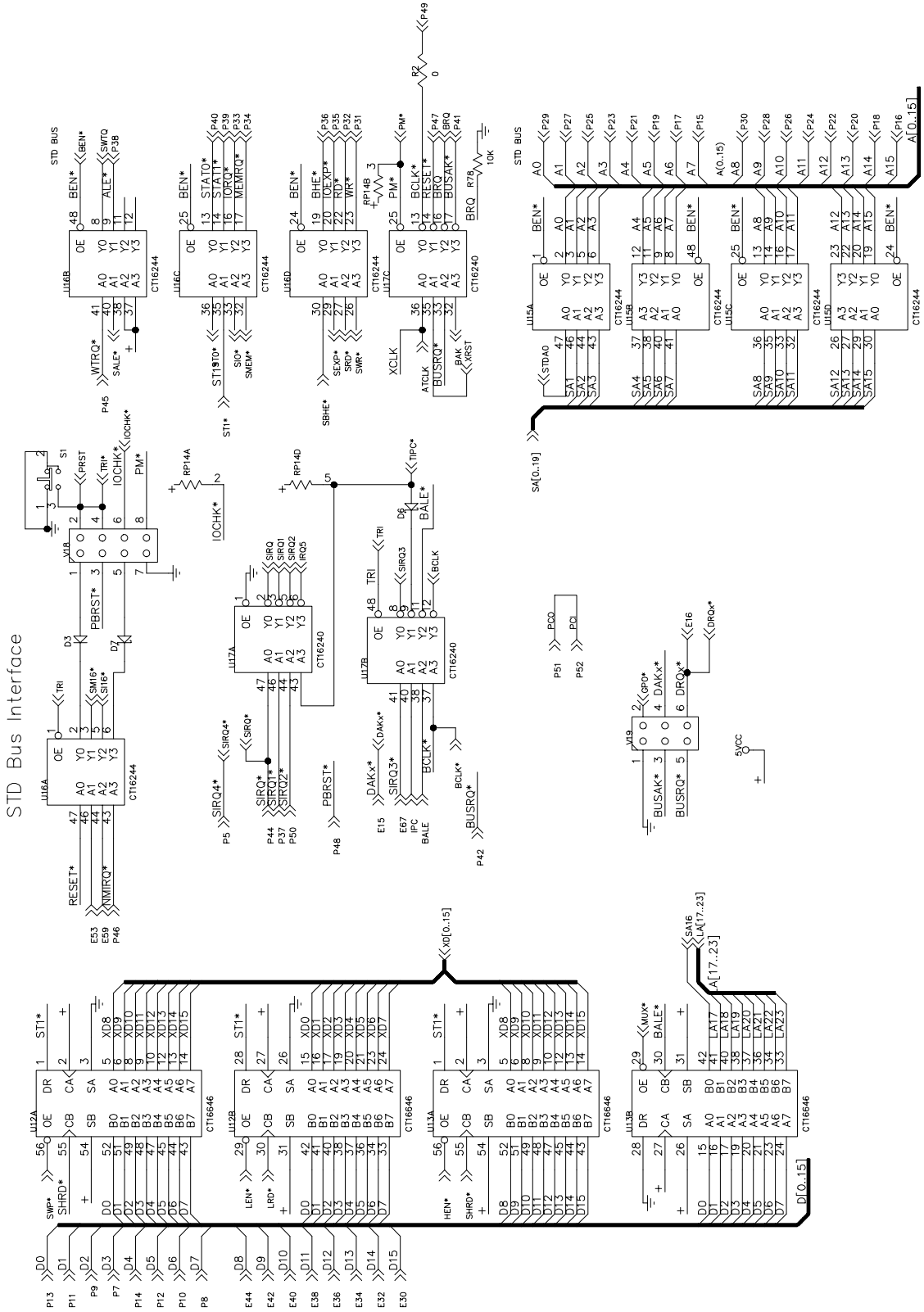
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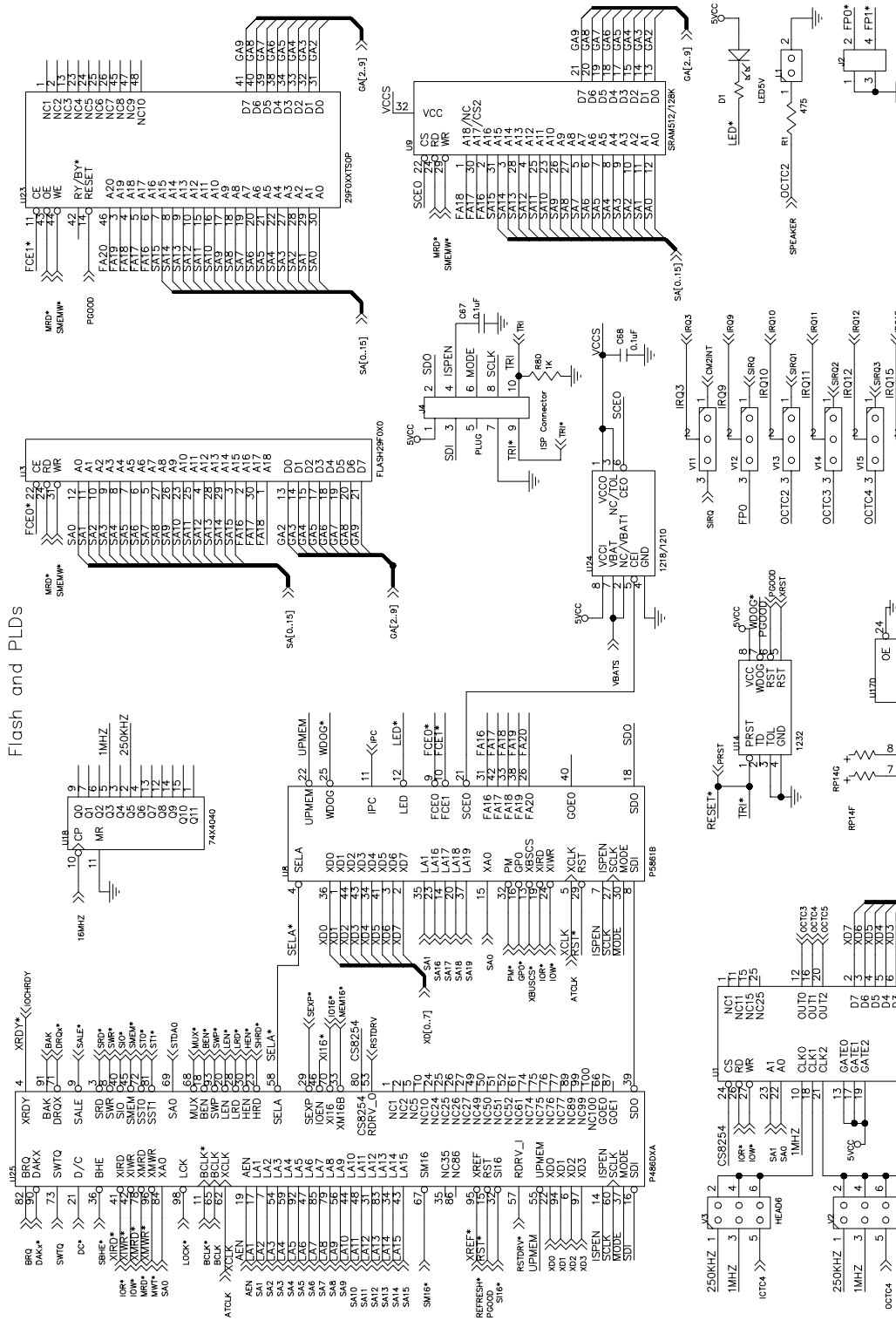
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Index

Battery
  Erasing CMOS RAM, 15
  Preventing Damage, 8
Battery Backed Static RAM. See Memory
CMOS RAM. See Memory
Connectors. See External Connectors
Counter/Timers, 3
  Control Registers, 58
  External Connector (JC), 45
  Interrupts, 35
Direct Memory Access
  Control Registers, 52
  Overview, 3
  Page Registers, 53
Dynamic Bus Sizing, 40
Electrostatic Discharge, 8, 39
External Connectors
  Cable Assemblies, 12
  J1 (High Density), 41, 42
  J2 (Front Plane Interrupts), 41, 48
  J3 (Floppy Drive Interface), 41, 49
  JA (COM2), 42, 43
  JB (LPT1), 42, 44
  JC (Counter/Timers), 42, 45
  JD (Keyboard), 42, 46
  JE (COM1), 42, 43
  JF (Hard Disk Drive), 42, 47
  L1 (Speaker), 41, 50
FLASH. See Memory
Floppy Disk Drive
  Control Registers, 56
  External Connector (J3), 49
  Interface, 2
  Interrupts, 35
General Purpose Input, 59
Hard Disk Drive
  Control Registers, 56
  External Connector (JF), 42, 47
  Interface, 2
I/O
  Control Registers
    I/O and Memory Map (IOMMAP), 61
  I/O Map, 25, 27
  IOEXP, 25
  Register Summary, 51
Installation
  Card Insertion and Extraction, 40
  Card Orientation, 40
  Overview, 39
Interrupts
  Block Diagram, 32
  Configuration, 32
  Controllers, 3, 57
  Destinations, 32
  External Connector (J2), 48
  General Purpose, 34
  Interprocessor Communications, 34, 37, 59
  Keyboard, 34
  Non-Maskable Interrupt, 34, 35, 37
  Request Inputs, 35
  Sources, 32
  STD Bus, 34
IPC. See Interrupts, Interprocessor Communications
Jumper Summary, 17
Keyboard
  External Connector (JD), 42, 46
  Installation, 11
  Interrupts, 34, 35
Light Emitting Diode, 59
Memory
  BBSRAM, 2
    Page Frame, 24, 62
  CMOS RAM
    Battery Power, 15, 23
    Erasing, 15
    Factory Defaults, 14, 15
    Overview, 2
    Setup, 12
    Spare Bytes, 3
  Control Registers
    I/O and Memory Map (IOMMAP), 61
    Map and Paging Control (MPCR), 62
  DRAM
    Overview, 2
    Refresh, 3
    SO DIMM Socket, 22
    Voltage Configuration, 22
  FLASH
    Extractor Tool, 22
    Overview, 2
    Page Frame, 24, 62
    PLCC Socket, 22

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Memory Map, 24
Multiprocessing, 30, 34
Bus Arbitration, 30
Determining which type, 59
Dual Master, 30
Permanent Master, 30
Reset Signals, 31
Resistor Packs, 31
Slot X, 30, 40
Temporary Master, 30
Video, 2
Operating Systems, 1
Parallel Port, 3
Control Registers, 55
External Connector (JB), 42, 44
Interrupts, 35
PC/104 Bus
Description, 2
Interrupts, 35
Push-button Reset, 31
Real Time Clock
Description, 3
Interrupts, 35
Reset, 31
RS-232/422/485. See Serial Ports
Serial Ports, 2
Control Registers, 54
External Connectors (JA/JE), 42, 43
Interrupts, 35
RS-232/422/485, 28, 43
Setup. See Memory
Speaker
External Connector (L1), 50
Special Control Register, 59
Specifications, 4
Static RAM. See Memory
STD/STD32 Bus
Description, 2
Technical Support, 5
Timers. See Counter/Timers
Video Adapter
Installation, 10, 11
Watchdog Timer
Enable/Disable, 59
Hold Off, 60
Overview, 3

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