



**AVILA
NETWORK COMPUTER**

**Operating Manual
For
GW2348-4 Network Processor**

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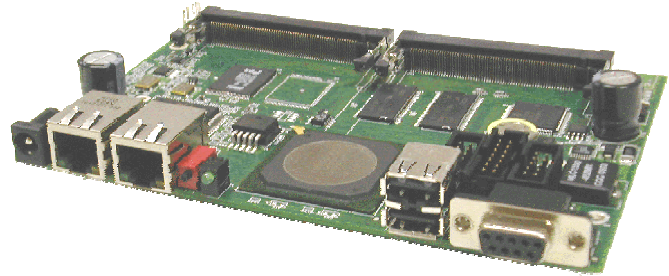
1. INTRODUCTION

1.1. Product Description

The GW2348-4 is a member of the Gateworks Avila Network Processor family. The GW2348-4 meets the requirements for enterprise and residential network applications. This single board network processor consists of an Intel® IXP425 XScale® processor operating at 533MHz, 64Mbytes of SDRAM, and 16Mbytes of Flash. Peripherals include four Type III Mini-PCI slots, two 10/100 Base-TX Ethernet channels, Compact Flash socket, and two RS232 serial ports for management and debug. Additional features include serial EEPROM, real time clock, voltage and temperature monitor, fan controller, watchdog timer, passive power over Ethernet, digital I/O, wide range DC/DC power supply, and extended temperature operation. An optional high-speed USB host controller is also available. Software support includes Linux and VxWorks® operating systems.

1.2. Standard Features

- ◆ Intel® XScale® IXP425 533MHz Processor
- ◆ 64Mbytes SDRAM
- ◆ 16Mbytes Flash
- ◆ Four Type III Mini-PCI Sockets
- ◆ Two 10/100 Base-TX Ethernet Ports
- ◆ Compact Flash Socket
- ◆ Two RS-232 Serial Ports
- ◆ General Purpose Digital I/O
- ◆ 1Kbyte Serial EEPROM
- ◆ Battery Powered Real Time Clock
- ◆ Voltage and Temperature Monitor
- ◆ Thermally Activated Fan Controller
- ◆ Watchdog Timer
- ◆ User LED and Push Button Reset
- ◆ Optional High-speed USB Host Controller
- ◆ Passive Power Over Ethernet
- ◆ Reverse Voltage and Transient Protection
- ◆ 9-48VDC Input Voltage Range
- ◆ 18W available for Mini-PCI Sockets
- ◆ 5W Typical Operating Power
- ◆ -40°C to 85°C Operating Temperature
- ◆ Software Support for Linux and VxWorks
- ◆ 1 Year Warranty



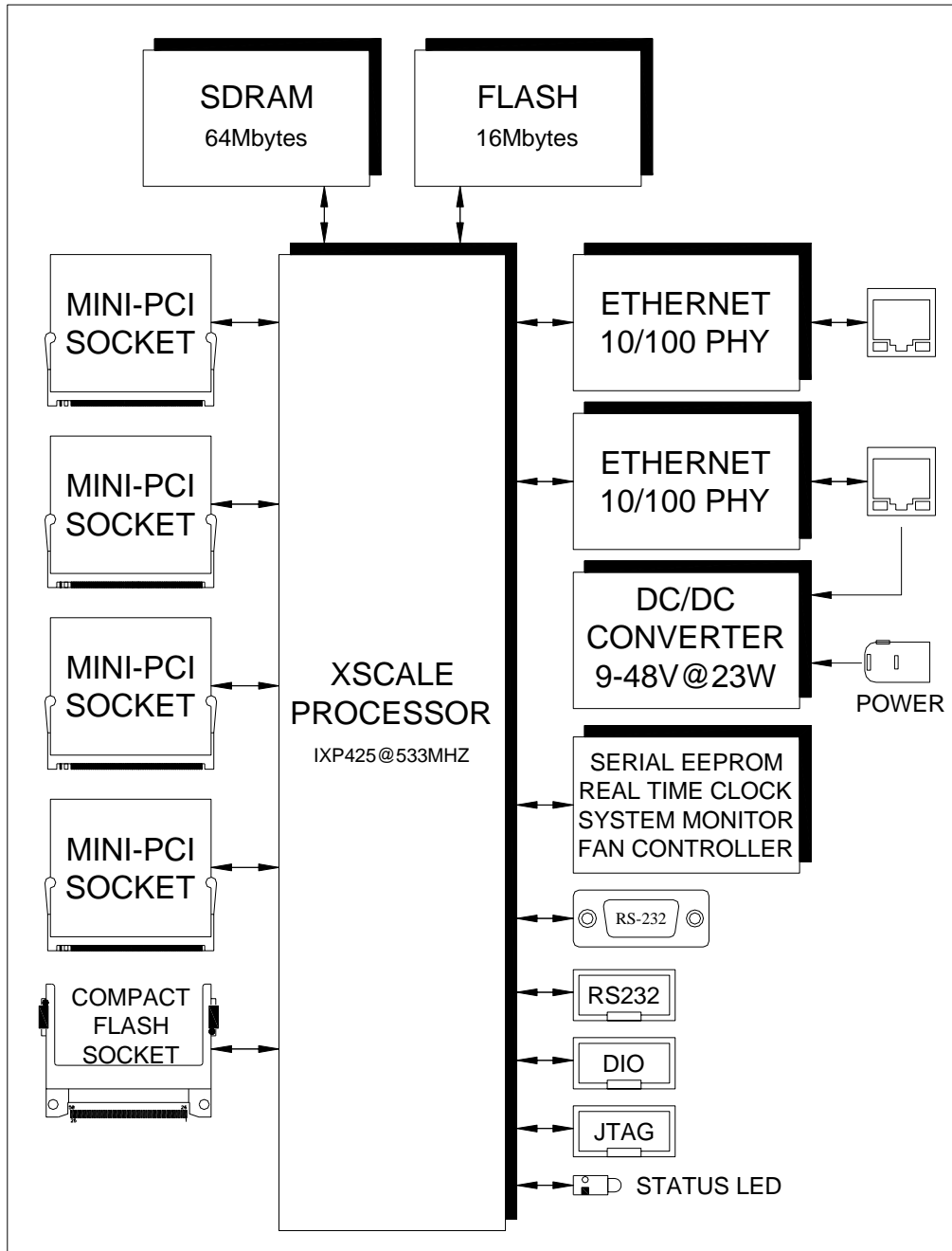
1.3. Ordering Options – Standard Configuration*

| Order Code | Processor | SDRAM | Flash | Mini-PCI | Operating Temp. |
|------------|-----------------|----------|----------|----------|-----------------|
| GW2348-4 | IXP425 @ 533MHz | 64Mbytes | 16Mbytes | 4 | -40°C to 85°C |

* Contact factory for different configurations of CPU, DRAM, Flash, and support peripherals

1.4. Functional Blocks

The functional block diagram for the GW2348-4 network processor is shown below followed by a detailed description of each major functional block.



GW2348-4 Functional Block Diagram

Processor

The Intel® Xscale® network processor line includes the IXP420, IXP422 and IXP425 processors. The features common to these processors are listed below. The primary difference between these processors is support for encryption, operating speed, operating temperature and cost. See the following table below for the differences between the processor families. The factory default GW2348-4 includes the IXP425 processor.

- StrongARM Version 5TE Compliant
- Network processing engines to offload Ethernet filtering
- 32-bit SDRAM interface operating at 133MHz
- 32-bit PCI interface operating at 33MHz for Mini-PCI support
- 16-bit Expansion interface for Flash support
- Two 802.3 MII/RMII interfaces for Ethernet PHY support
- USB 1.1 device controller
- Two serial ports
- Four internal timers
- Internal bus performance monitoring unit
- General purpose Input/Outputs
- Watchdog Timer

| Feature | IXP420 | IXP422 | IXP425 |
|----------------------|---------------|--------|---------------|
| Speed (MHz) | 266, 400, 533 | 266 | 266, 400, 533 |
| Hardware Encryption | No | Yes | Yes |
| Extended Temperature | 266 only | No | 266, 400, 533 |
| Cost | Low | Mid | High |

IXP42x Processor Feature Comparison

SDRAM

The DRAM resides in two synchronous DRAM devices soldered directly to the board. This architecture supports SDRAM memory capacities from 32Mbytes up to 128Mbytes. The 32-bit SDRAM interface operates at 133MHz. The factory default GW2348-4 includes 64Mbytes of SDRAM.

Flash

The Flash resides in one or two J3 Intel StrataFlash® devices soldered directly to the board. This architecture supports Flash memory capacities from 4Mbytes up to 32Mbytes. The factory default GW2348-4 includes 16Mbytes of Flash in a single device.

Compact Flash

The GW2348-4 supports a single Compact Flash socket located on the rear of the board. The Compact Flash socket accepts small removable mass storage cards with storage capacities up to 4Gbytes. The Compact Flash interrupt is mapped to general purpose I/O 12 (GPIO12) of the IXP processor.

Mini-PCI Sockets

Mini-PCI is a small form factor PCI card that uses the same signal protocol, electrical specifications, and configuration definitions as conventional PCI. The GW2348-4 includes four Mini-PCI sockets. The GW2348-4 increases the Mini-PCI power specification from a maximum of 2.5W to a total of 18W for all four sockets. This permits each socket to operate 4.5W for supporting high power radios.

Ethernet

The GW2348-4 supports two Ethernet ports using an Intel LXT973 PHY Transceiver. Both channels operates in a 100BASE-TX or 10BASE-T configuration and support auto MDI/MDIX for automatically switching twisted pair inputs and outputs. Additional features include full-duplex operation for both 10Mbps and 100Mbps configurations as well as support for auto-negotiation. The Ethernet ports are available through standard RJ45 connectors. The connectors have two integrated status lights. The green status light indicates link and activity. The light is on for link and blinking for activity. The yellow status light indicates speed. The light is on for 100Mbps and off for 10Mbps.

EEPROM

The Atmel AT24C08AN is an Electrically Erasable Programmable Read Only Memory (EEPROM) with 8Kbits of storage. The 8kbits of storage is organized in a 1048 x 8-bit configuration. Additional features include 1,000,000 erase/write cycles and a 100-year minimum data retention time. Data is transmitted to and from the EEPROM over the processor I2C bus. The I2C clock frequency is 0 to 400KHz. The I2C base address is A0 hex for writes and A1 hex for reads.

Real Time Clock

The Dallas Semiconductor DS1672 is designed to count seconds and can be used to derive time-of-day, week, month, and year using software. A battery ensures uninterrupted operation when the main power supply drops below the battery voltage. The battery capacity is 35mAH. The real time clock requires 0.425 micro amps typical and 1 micro amp maximum for backup operation. This results in a battery life of 4 years minimum and more than 9 years typical. Data is transmitted to and from the Real Time Clock over the processor I2C bus. The I2C clock frequency is 0 to 400KHz. The I2C base address is D0 hex for writes and D1 hex for reads.

Temperature and Voltage Monitor

The Analog Devices AD7418 provides temperature and voltage monitoring capability. The GW2348-4 operating temperature is monitored through this device. The temperature accuracy is $\pm 1^{\circ}\text{C}$ at 25°C and $\pm 2^{\circ}\text{C}$ over the entire temperature range of -40°C to $+125^{\circ}\text{C}$. The GW2348-4 input voltage is also monitored through this device. A resistor divider is used on the A/D input to scale the input voltage down. Multiple the A/D voltage reading by 23.1 to get the actual input voltage. Data is transmitted to and from the Temperature and Voltage Monitor over the processor I2C bus. The I2C clock frequency is 0 to 400KHz. The I2C 7-bit base address is 50 hex for writes and 51 hex for reads.

Fan Speed Controller

Fan speed control increases fan service life and decreases system acoustic airflow noise. The GW2348-4 includes a Microchip TC653BE that controls the speed of a fan based on temperature. This device keeps the fan off until the GW2348-4 temperature reaches 35 degrees Celsius. The controller adjusts the fan speed from 50% to 100% between 35 and 45 degrees Celsius.

Serial I/O

The GW2348-4 includes two RS232 serial I/O ports. One serial I/O port is available through a 10-pin header and the other is available through a 9-pin female D-shell connector. The serial ports are 16550-compliant UARTs with additional depth for both the transmit and receive buffers. The interface supports transfer rates from 1200bps up to 120Kbps.

Digital I/O

The IXP processor includes a 16 bits of digital I/O. Some of these signals are used for controlling and monitoring the status of devices local to the GW2348-4 and some of them are available on a 10-pin header for application use. The function of each digital I/O signal is described in Section 2, Configuration and Installation.

USB

The GW2348-4 includes an optional high-speed USB host controller. The Philips ISP1562 integrates two Open Host Controller Interface (OHCI) cores, one Enhanced Host Controller Core (EHCI), and two transceivers. The transceivers support high-speed transfer mode at 480Mbps per second, full-speed transfer mode at 12Mbps per second, and low-speed transfer mode at 1.5Mbps per second. The GW2348-4 also includes a Micrel MIC2026 power distribution switch to enable 5V power to the USB connector under control of the ISP1562. The MIC2026 includes internal thermal and over current limiting to protect both the GW2348-4 and the USB load. The USB signals are available through a standard dual USB Type A connector. The USB Controller shares resources with the J2 mini-PCI site so that only one is functional at a time. If the USB Host Controller is loaded, the J4 mini-PCI site is not functional and should not be populated.

JTAG Programming Port

A JTAG debug port is available to facilitate program download directly into Flash memory. See section 2.7 for instructions on using the Gateworks JTAG Programmer.

Status LED and Push Button Reset

The GW2348-4 includes a status LED and a push button for generating reset. The LED is connected to general purpose I/O 3 (GPIO3).

DC/DC Converter

A switching DC/DC converter supplies power to the GW2348-4. This allows support for a wide input voltage range and higher power radios with high efficiency operation. The DC/DC has a minimum input voltage of 9VDC and a maximum of 48VDC. **DO NOT EXCEED THE 48VDC INPUT MAXIMUM OR DAMAGE MAY OCCUR TO THE BOARD.** The input power is supplied through a power connector or through the RJ45 Ethernet connector in a power over Ethernet configuration. The voltage drop due to the resistance of the Ethernet cable between the GW2348-4 and the power injector must be considered when selecting the power supply operating voltage. The input is protected against reverse voltage connection and transient voltage spikes. Refer to Section 2, Input Voltage Selection, for additional information on choosing an input voltage.

2. CONFIGURATION AND INSTALLATION

The following section gives memory, interrupt, I2C and digital I/O mappings specific to the GW2348-4. See the *Intel IXP4XX Product Line and IXC1100 Control Plane Processors Developer's Manual* for more information on these interfaces.

2.1. Memory Mapping

The memory map and Expansion bus chip select mapping for the GW2348-4 is shown below.

| Memory Address | Size | Description |
|-----------------------|----------|---|
| 0000_0000 – 0FFF_FFFF | 256Mbyte | Flash Memory (32Mbyte max) |
| 0100_0000 – 2FFF_FFFF | 756Mbyte | SDRAM Memory (128 Mbyte max) |
| 3000_0000 – 3FFF_FFFF | | Reserved |
| 4000_0000 – 47FF_FFFF | | Reserved |
| 4800_0000 – 4FFF_FFFF | 128Mbyte | PCI Bus |
| 5000_0000 – 5FFF_FFFF | 256Mbyte | Expansion Bus |
| 6000_0000 – 63FF_FFFF | 64Mbyte | Queue Manager |
| 6400_0000 – BFFF_FFFF | | Reserved |
| C000_0000 – C3FF_FFFF | 64Mbyte | PCI Controller Configuration and Status |
| C400_0000 – C7FF_FFFF | 64Mbyte | Expansion Bus Configuration |
| C800_0000 – C800_0FFF | 1Kbyte | High Speed Serial |
| C800_1000 – C800_1FFF | 1Kbyte | Console Serial |
| C800_2000 – C800_2FFF | 1Kbyte | Performance Monitor |
| C800_3000 – C800_3FFF | 1Kbyte | Interrupt Controller |
| C800_4000 – C800_4FFF | 1Kbyte | GPIO Controller |
| C800_5000 – C800_5FFF | 1Kbyte | Timers |
| C800_6000 – C800_6FFF | 1Kbyte | Wan/HSS Network Processor A |
| C800_7000 – C800_7FFF | 1Kbyte | Ethernet Network Processor B |
| C800_8000 – C800_8FFF | 1Kbyte | Ethernet Network Processor C |
| C800_9000 – C800_9FFF | 1Kbyte | Ethernet MAC A |
| C800_A000 – C800_AFFF | 1Kbyte | Ethernet MAC B |
| C800_B000 – C800_BFFF | 1Kbyte | USB Device Controller – Not Used |
| C800_C000 – C800_FFFF | | Reserved |
| C801_0000 – CBFF_FFFF | | Reserved |
| CC00_C000 – CC00_00FF | 256byte | SDRAM Configuration Registers |
| CC00_0100 – FFFF_FFFF | | Reserved |

Note: The bottom 256Mbytes is configurable through bit 31 of the EXP_CONFIG0 register.

Memory Map

| Chip Select | Description |
|-------------|--------------------------------|
| CS0 | Flash Memory (U3) |
| CS1 | Compact Flash Socket #CS0 (J5) |
| CS2 | Compact Flash Socket #CS1 (J5) |
| CS3 | Flash Memory (U4) |
| CS4-CS7 | Not Used |

Expansion Bus Chip Selects

2.2. PCI Device Mapping

The GW2348-4 PCI device mapping is listed below.

| Bus Number | Device Number | Fcn Number | IRQ Number | Description |
|------------|---------------|------------|------------|------------------------------------|
| 00 | 01 | 0 | 28 | Mini-PCI Slot (J3) |
| 00 | 02 | 0 | 27 | Mini-PCI Slot (J1) |
| 00 | 03 | 0 | 26 | Mini-PCI Slot (J4) |
| 00 | 04 | 0 | 25 | Mini-PCI Slot (J2) |
| 00 | 05 | 0-2 | 28 | Optional USB Host Controller (J18) |

PCI Device Map

2.3. Interrupt Mapping

The IXP42X processor allows for 32 interrupts which originate from either internal processor blocks or from the 14 dedicated GPIO pins. The interrupt mapping is shown below.

| Interrupt | Function |
|-----------|-----------------------------|
| 0 | WAN/HSS NPE |
| 1 | Ethernet NPE A |
| 2 | Ethernet NPE B |
| 3 | Queue Manager (1-32) |
| 4 | Queue Manager (33-64) |
| 5 | General Purpose Timer 0 |
| 6 | GPIO(0) – GPIO Header (J8) |
| 7 | GPIO(1) – GPIO Header (J8) |
| 8 | PCI Interrupt |
| 9 | PCI DMA Channel 1 |
| 10 | PCI DMA Channel 2 |
| 11 | General Purpose Timer 1 |
| 12 | Device USB – Not Supported |
| 13 | Console Serial |
| 14 | Timestamp Timer |
| 15 | High-Speed Serial |
| 16 | Watchdog Timer |
| 17 | Performance Monitoring Unit |
| 18 | Performance Monitoring Unit |
| 19 | GPIO(2) – GPIO Header (J8) |

| | |
|----|--|
| 20 | GPIO(3) – GPIO Header (J8) |
| 21 | GPIO(4) – GPIO Header (J8) |
| 22 | GPIO(5) – Reserved for Serial Transceiver Control |
| 23 | GPIO(6) – Reserved for I2C Bus SCL |
| 24 | GPIO(7) – Reserved for I2C Bus SDA |
| 25 | GPIO(8) - Mini-PCI Socket J2 INTA or Mini-PCI Socket J4 INTB |
| 26 | GPIO(9) - Mini-PCI Socket J4 INTA or Mini-PCI Socket J1 INTB |
| 27 | GPIO(10) - Mini-PCI Socket J1 INTA or Mini-PCI Socket J3 INTB |
| 28 | GPIO(11) - Mini-PCI Socket J3 INTA or Mini-PCI Socket J2 INTB or USB Host Controller |
| 29 | GPIO(12) – Compact Flash Socket |
| 30 | SW Interrupt 0 |
| 31 | SW Interrupt 1 |

Interrupt Map

2.4. Digital I/O Mapping

The GW2348-4 uses the IXP42x Processor digital I/O for controlling and monitoring the status of various devices. The IXP42x processor includes three 16-bit registers for configuring, initializing, and using the digital I/O. The output enable register (GPOER) configures each bit as an input or output. The data output register (GPOUTR) controls the digital I/O configured as outputs. The input register (GPINR) reads the digital I/O configured as inputs. See the *Intel IXP4XX Product Line and IXC1100 Control Plane Processors Developer's Manual – Chapter 13*. The digital I/O bit mapping is shown below.

| GPIO Bit | Direction | Description |
|----------|---------------|--|
| 0 | In or Out | Digital I/O Header J8 pin 1 |
| 1 | In or Out | Digital I/O Header J8 pin 3 |
| 2 | In or Out | Digital I/O Header J8 pin 5 |
| 3 | In or Out | Digital I/O Header J8 pin 7 or |
| | Out | Unpopulated Status LED D20 or |
| | Out | Status LED D21 |
| 4 | In or Out | Digital I/O Header J8 pin 9 |
| 5 | Out | RS232 Serial Port Driver Enable or |
| | Out | Unpopulated Status LED D19 |
| 6 | Out | I2C Bus SCL |
| 7 | Bidirectional | I2C Bus SDA |
| 8 | In | Unpopulated Mini-PCI Interrupt |
| 9 | In | Mini-PCI Interrupt – See IRQ Map Section 2.3 |
| 10 | In | Mini-PCI Interrupt – See IRQ Map Section 2.3 |
| 11 | In | Mini-PCI Interrupt – See IRQ Map Section 2.3 |
| 12 | In | Unpopulated Compact Flash Interrupt |
| 13 | Out | PCI Reset |
| 14 | Out | Unpopulated Watchdog Timer Strobe |
| 15 | Out | Expansion Bus Clock |

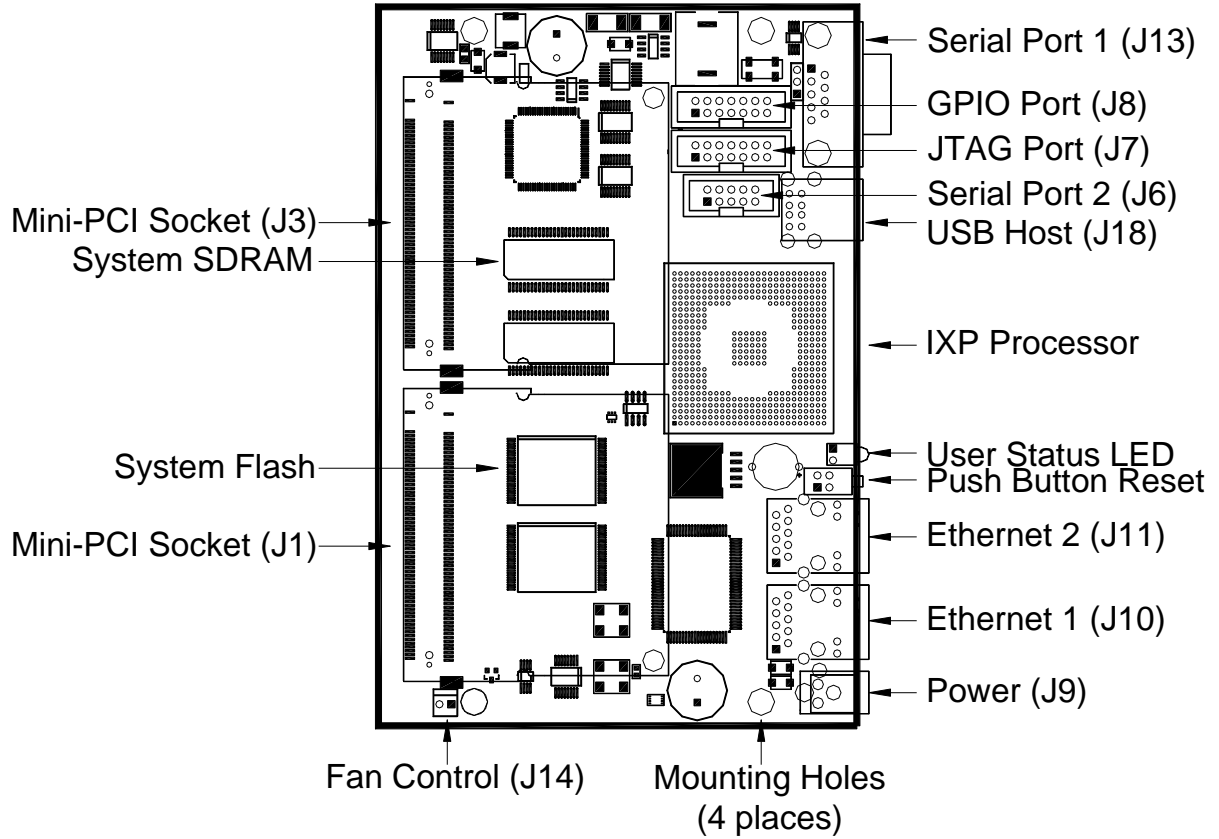
Digital I/O Map

2.5. Interface Connectors

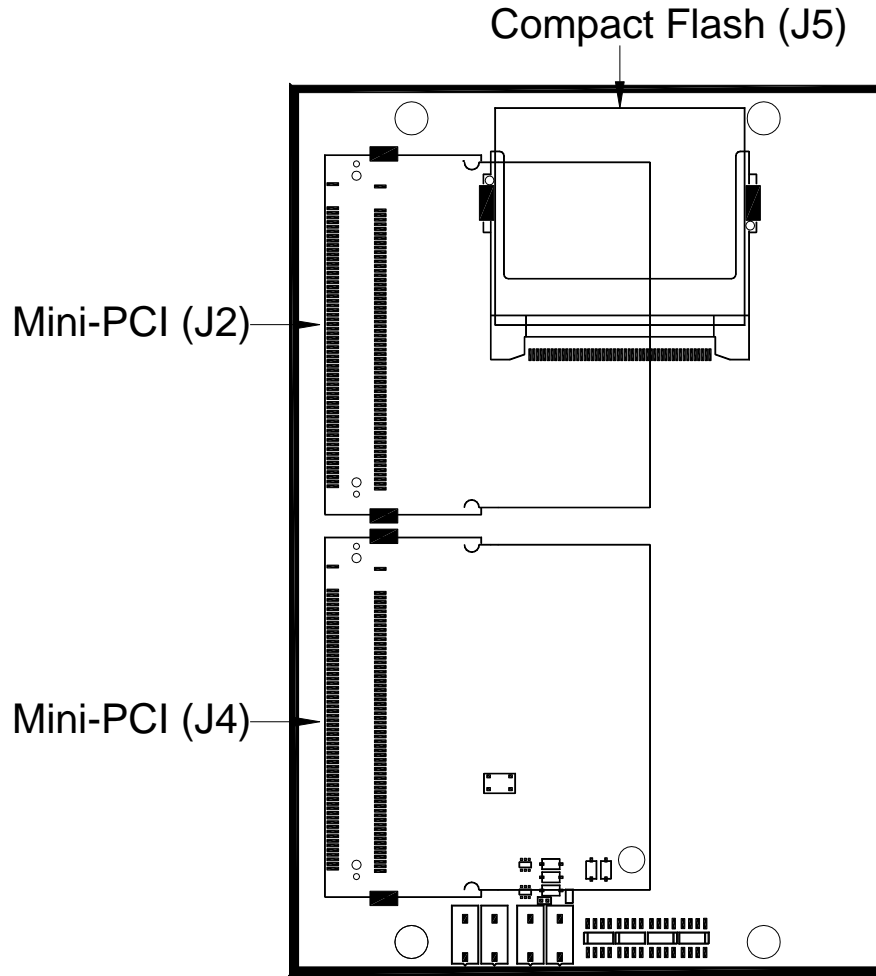
The GW2348-4 interface connector pin assignments and signal descriptions are included in the following sections. The connectors are listed in the table below and the connector locations are shown in the following diagrams.

| Connector | Populated | Function |
|-----------|-----------|----------------------------------|
| J1 | Yes | Mini-PCI Socket Top Side |
| J2 | Yes | Mini-PCI Socket Bottom Side |
| J3 | Yes | Mini-PCI Socket Top Side |
| J4 | Yes | Mini-PCI Socket Bottom Side |
| J5 | Yes | Compact Flash Socket Bottom Side |
| J6 | Yes | COM2 Serial Port |
| J7 | Yes | JTAG Port |
| J8 | Yes | Digital I/O |
| J9 | Yes | 2.5mm Barrel Jack Power |
| J10 | Yes | Ethernet1 |
| J11 | Yes | Ethernet2 |
| J12 | – | Not Used |
| J13 | Yes | COM1 Serial Port |
| J14 | Yes | Fan Controller |
| J15 | – | Not Used |
| J16 | No | Auxiliary Power |
| J17 | No | Auxiliary Power |
| J18 | No | Optional Dual USB Host Connector |
| J19 | No | High Speed Serial Mezzanine |

Connectors



Top Side Component Locations



Bottom Side Component Locations

Mini-PCI Sockets (J1, J2, J3, J4)

There are four Mini-PCI sockets for expanding the peripheral support with high-speed PCI devices. The GW2348-4 supports standard 3.3V Mini-PCI cards. Support is not provided for audio, modem, and networking sideband signaling as defined in the Mini-PCI specification. The GW2348-4 Mini-PCI connector signaling is illustrated in the following table. The power supply provides a total of 18W of 3.3V power to the Mini-PCI sockets for supporting high power radios.

| Pin | Signal | Connect | Pin | Signal | Connect | Pin | Signal | Connect |
|-----|----------|----------|-----|---------|-----------|-----|----------|----------|
| 1 | TIP | NC | 44 | AD26 | AD26 | 87 | AD7 | AD7 |
| 2 | RING | NC | 45 | CBE3# | CBE3# | 88 | VCC3 | VCC3 |
| 3 | LANRXP | NC | 46 | AD24 | AD24 | 89 | VCC3 | VCC3 |
| 4 | LANTXP | NC | 47 | AD23 | AD23 | 90 | AD6 | AD6 |
| 5 | LANRXN | NC | 48 | IDSEL | IDSEL | 91 | AD5 | AD5 |
| 6 | LANTXN | NC | 49 | Ground | Ground | 92 | AD4 | AD4 |
| 7 | LANRSV | NC | 50 | Ground | Ground | 93 | Reserved | Reserved |
| 8 | LANRSV | NC | 51 | AD21 | AD21 | 94 | AD2 | AD2 |
| 9 | LANRSV | NC | 52 | AD22 | AD22 | 95 | AD3 | AD3 |
| 10 | LANRSV | NC | 53 | AD19 | AD19 | 96 | AD0 | AD0 |
| 11 | LANGNP | NC | 54 | AD20 | AD20 | 97 | VCC5 | NC |
| 12 | LANRNN | NC | 55 | Ground | Ground | 98 | Reserved | Reserved |
| 13 | LANYEP | NC | 56 | PAR | PAR | 99 | AD1 | AD1 |
| 14 | LANYEN | NC | 57 | AD17 | AD17 | 100 | Reserved | Reserved |
| 15 | CHSGND | CHSGND | 58 | AD18 | AD18 | 101 | Ground | Ground |
| 16 | Reserved | Reserved | 59 | CBE2# | CBE2# | 102 | Ground | Ground |
| 17 | INTB# | INTB# | 60 | AD16 | AD16 | 103 | ACSYNC | NC |
| 18 | VCC5 | NC | 61 | IRDY# | IRDY# | 104 | M66EN | NC |
| 19 | VCC3 | VCC3 | 62 | Ground | Ground | 105 | ACDIN | NC |
| 20 | INTA# | INT# | 63 | VCC3 | VCC3 | 106 | ACDOUT | NC |
| 21 | Reserved | Reserved | 64 | FRAME# | FRAME# | 107 | ACCLK | NC |
| 22 | Reserved | Reserved | 65 | CLKRUN# | Pull Down | 108 | ACID0 | NC |
| 23 | Ground | Ground | 66 | TRDY# | TRDY# | 109 | ACID1 | NC |
| 24 | VCC3AX | VCC3 | 67 | SERR# | SERR# | 110 | ACRST | NC |
| 25 | CLK | CLK | 68 | STOP# | STOP# | 111 | AMON | NC |
| 26 | RST# | RST# | 69 | Ground | Ground | 112 | Reserved | Reserved |
| 27 | Ground | Ground | 70 | VCC3 | VCC3 | 113 | AGND | NC |
| 28 | VCC3 | VCC3 | 71 | PERR# | PERR# | 114 | Ground | Ground |
| 29 | REQ# | REQ# | 72 | DEVSEL# | DEVSEL# | 115 | AOUT | NC |
| 30 | GNT# | GNT# | 73 | CBE1# | CBE1# | 116 | AIN | NC |
| 31 | VCC3 | VCC3 | 74 | Ground | Ground | 117 | AGND | NC |
| 32 | Ground | Ground | 75 | AD14 | AD14 | 118 | AINGND | NC |
| 33 | AD31 | AD31 | 76 | AD15 | AD15 | 119 | AGND | NC |
| 34 | PME# | NC | 77 | Ground | Ground | 120 | AGND | NC |
| 35 | AD29 | AD29 | 78 | AD13 | AD13 | 121 | Reserved | Reserved |
| 36 | RSVD | RSVD | 79 | AD12 | AD12 | 122 | MPCIACT | NC |
| 37 | Ground | Ground | 80 | AD11 | AD11 | 123 | VCC5AX | NC |
| 38 | AD30 | AD30 | 81 | AD10 | AD10 | 124 | VCC3AX | VCC3 |
| 39 | AD27 | AD27 | 82 | Ground | Ground | 125 | CHSGND | CHSGND |
| 40 | VCC3 | VCC3 | 83 | Ground | Ground | 126 | CHSGND | CHSGND |
| 41 | AD25 | AD25 | 84 | AD9 | AD9 | 127 | NC | NC |
| 42 | AD28 | AD28 | 85 | AD8 | AD8 | 128 | NC | NC |
| 43 | Reserved | Reserved | 86 | CBE0# | CBE0# | | | |

Mini-PCI Connector

Compact Flash Socket (J5)

The pin assignment for the industry standard Compact Flash socket is shown below. The Compact Flash is connected to the expansion bus on the IXP processor. The GW2348-4 Compact Flash connector signaling is illustrated in the following table. The Compact Flash interrupt is connected to general purpose I/O 12 (GPIO12) of the IXP processor.

| Pin | Signal | Connect | Pin | Signal | Connect |
|------------|---------------|----------------|------------|---------------|----------------|
| 1 | Ground | Ground | 26 | CD1# | No Connect |
| 2 | D3 | EXP D3 | 27 | D11 | EXP D11 |
| 3 | D4 | EXP D4 | 28 | D12 | EXP D12 |
| 4 | D5 | EXP D5 | 29 | D13 | EXP D13 |
| 5 | D6 | EXP D6 | 30 | D14 | EXP D14 |
| 6 | D7 | EXP D7 | 31 | D15 | EXP D15 |
| 7 | CS0# | EXP CS1# | 32 | CS1# | EXP CS2# |
| 8 | A10 | EXP A10 | 33 | VS1# | No Connect |
| 9 | ATASEL# | Ground | 34 | IORD# | EXP RD# |
| 10 | A09 | Ground | 35 | IOWR# | EXP WR# |
| 11 | A08 | Ground | 36 | WE# | Pull Up |
| 12 | A07 | Ground | 37 | INTRQ | No Connect |
| 13 | VCC | VCC | 38 | VCC | VCC |
| 14 | A06 | Ground | 39 | CSEL# | Ground |
| 15 | A05 | Ground | 40 | VS2# | No Connect |
| 16 | A04 | Ground | 41 | RESET# | RESET# |
| 17 | A03 | Ground | 42 | IORDY# | No Connect |
| 18 | A02 | EXP A2 | 43 | INPACK# | No Connect |
| 19 | A01 | EXP A1 | 44 | REG# | Pull Up |
| 20 | A00 | EXP A0 | 45 | DASP# | No Connect |
| 21 | D00 | EXP D0 | 46 | PDIAG# | No Connect |
| 22 | D01 | EXP D1 | 47 | D08 | EXP D8 |
| 23 | D02 | EXP D2 | 48 | D09 | EXP D9 |
| 24 | IOCS16# | No Connect | 49 | D10 | EXP D10 |
| 25 | CD2# | No Connect | 50 | GND | GND |

Compact Flash Connector

COM2 Serial Port Header (J6)

The COM2 serial port is available through a 10-pin header in a 2x5 configuration with 0.1-inch pin spacing. The mating connector is an AMP/Tyco 746288-1, available from Digi-Key as part number AKN10A-ND. The pin assignment supports a ribbon cable connection to a standard 9-pin D-shell connector.

| Pin | Signal | Pin | Signal |
|-----|---------------|-----|-----------------|
| 1 | No Connect | 2 | No Connect |
| 3 | Transmit Data | 4 | Clear To Send |
| 5 | Receive Data | 6 | Request To Send |
| 7 | No Connect | 8 | No Connect |
| 9 | Ground | 10 | No Connect |

COM2 Serial Port Header

JTAG Port Header (J7)

The JTAG programming port is available through a 14-pin header in a 2x7 configuration with 0.1-inch pin spacing. The mating connector is an AMP/Tyco 746288-2, available from Digi-Key as part number AKN14A-ND. The primary purpose for the JTAG Port is to facilitate program download into Flash memory. This feature requires the GW16012 JTAG Programmer. The JTAG programming port also includes a three-wire configuration of Serial Port 1. This feature requires the GW16027 JTAG Serial Adapter to convert the 3.3V serial port signals to standard RS232 levels.

| Pin | Signal | Pin | Signal |
|-----|-----------------|-----|-----------------|
| 1 | 3.3V | 2 | COM1 RXD (3.3V) |
| 3 | JTAG RST | 4 | Ground |
| 5 | JTAG TDI | 6 | Ground |
| 7 | JTAG TMS | 8 | Ground |
| 9 | JTAG TCK | 10 | Ground |
| 11 | JTAG TDO | 12 | Board Reset |
| 13 | COM1 TXD (3.3V) | 14 | Ground |

JTAG Port Header

Digital I/O Header (J8)

The digital I/O is available through a 10-pin header in a 2x5 configuration with 0.1-inch pin spacing. The mating connector is an AMP/Tyco 746288-1, available from Digi-Key as part number AKN10A-ND. Note that GPIO3 is shared with the status LED as described in Section 2, Digital I/O Mapping.

| Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|
| 1 | GPIO0 | 2 | Ground |
| 3 | GPIO1 | 4 | Ground |
| 5 | GPIO2 | 6 | Ground |
| 7 | GPIO3 | 8 | Ground |
| 9 | GPIO4 | 10 | Ground |

Digital I/O Header

Power Connector (J9)

Power is applied to the GW2348-4 through a standard 2.5mm x 5.5mm barrel jack or through either Ethernet Connector. The input voltage range is 9VDC minimum and 48VDC maximum. The power jack should have the positive input voltage on the inner sleeve and ground on the outer sleeve. The mating connector is a G/S SR2048A, available from Jameco as part number 190537CJ. The schematic symbol representing this configuration is shown below.



Power Connector

Ethernet Connectors (J10, J11)

The GW2348-4 contains two 10/100 Base-TX Ethernet channels. Both Ethernet channels are available through standard 8-pin RJ45 connectors. The ENET1 Ethernet connector supports passive power over Ethernet. This enables the GW2348-4 operating voltage to be provided through the Ethernet connector rather than the input power connector. The input voltage requirements are given in Section 3, Specifications.

| Pin | Signal | Standard Wire Color |
|-----|---------|---------------------|
| 1 | TX+ | WHITE/ORANGE |
| 2 | TX- | ORANGE |
| 3 | RX+ | WHITE/GREEN |
| 4 | PoE + V | BLUE |
| 5 | PoE +V | WHITE/BLUE |
| 6 | RX- | GREEN |
| 7 | GND | WHITE/BROWN |
| 8 | GND | BROWN |

Ethernet Connector J10

| Pin | Signal | Standard Wire Color |
|-----|------------|---------------------|
| 1 | TX+ | WHITE/ORANGE |
| 2 | TX- | ORANGE |
| 3 | RX+ | WHITE/GREEN |
| 4 | No Connect | |
| 5 | No Connect | |
| 6 | RX- | GREEN |
| 7 | No Connect | |
| 8 | No Connect | |

Ethernet Connector J11

COM1 Serial Port Connector (J13)

The COM1 serial port connector is an industry standard female 9-pin D-shell connector with the pin assignment given in the table below. The DCE pin assignments permit a direct connection to a standard PC DTE port running terminal emulation software. The mating connector for insulation displacement ribbon cable is CW Industries CWR-280-09-000, available from Digi-Key as part number CMM09G-ND.

| Pin Number | Signal |
|------------|-----------------|
| 1 | No Connect |
| 2 | Transmit Data |
| 3 | Receive Data |
| 4 | No Connect |
| 5 | Ground |
| 6 | No Connect |
| 7 | Clear To Send |
| 8 | Request To Send |
| 9 | No Connect |

COM1 Serial Port Connector

Fan Controller (J14)

The fan is connected to a 2-pin MTA connector. The mating connector is an AMP/Tyco 770602-02, available from Digi-Key as part number A19490-ND. This connector requires separate contacts AMP/Tyco 770666-2, available from Digi-Key as part number A23962-ND. Only 5V fans are supported. Suggested fans are Orion's OD4010-05x series available from Mouser Electronics (www.mouser.com).

| Pin Number | Signal |
|------------|------------------------|
| 1 | Fan Power (5V @ .1A) |
| 2 | Ground - Speed Control |

Fan Speed Control Connector

Optional Dual USB Host Connector (J18)

The GW2348-4 includes an optional dual Type A connector to support the USB host configuration.

| Pin | Signal |
|-----|------------------|
| 1 | USB1 Switched 5V |
| 2 | USB1 Data- |
| 3 | USB1 Data+ |
| 4 | Ground |
| 5 | USB2 Switched 5V |
| 6 | USB2 Data- |
| 7 | USB2 Data+ |
| 8 | Ground |

USB Host Connector

2.6. Input Voltage Selection

The GW2348-4 is capable of operating over a wide input voltage range of 9VDC to 48VDC. The amount of power available for the mini-PCI sockets is limited at lower input voltages as shown in the table below. For example, operating at an input voltage of 12V limits the total power available to the Mini-PCI sockets to 9.4W or 2.35W per socket in a four-socket system. Full Mini-PCI socket power of 18W is available at input voltages above 20V.

| Input Voltage (V) | Mini-PCI Power (W) |
|-------------------|--------------------|
| 9 | 5.8 |
| 10 | 7.0 |
| 11 | 8.2 |
| 12 | 9.4 |
| 13 | 10.6 |
| 14 | 11.8 |
| 15 | 13.0 |
| 16 | 14.2 |
| 17 | 15.4 |
| 18 | 16.6 |
| 19 | 17.8 |
| 20-48 | 18.0 |

Input Voltage versus Mini-PCI Power

2.7. JTAG Programming

The GW2348-4 Flash memory is programmed through the JTAG port. Gateworks offers a low cost GW16012 JTAG programmer that enables the developer to program or recover the Flash image through a standard PC parallel port. Gateworks also offers a GW16013 JTAG gang programmer for simultaneously programming up to 16 GW2348-4 processors in a production environment.

The following are the steps required to use the GW16012 JTAG programmer.

1. Connect the GW16012 JTAG programmer to a PC parallel port using the standard DB25 cable included with programmer.
2. Connect the 10-pin IDC female from the GW16012 dongle to the GW2348-4 JTAG connector.
3. Create a bootable DOS floppy with the FLASH.EXE program and the binary image. The FLASH.EXE program is a DOS program, which must be run from a DOS prompt, it cannot be run from a Windows DOS box. The development kit CDROM contains both the FLASH.EXE program and the default factory programmed image.
4. Insert the DOS bootable floppy, with the FLASH.EXE program and binary image into the PC's floppy drive and boot to DOS.
5. Run the FLASH.EXE program with the following syntax
CC:> flash *image.bin* {p} {v} where p=program, v=verify and *image.bin* is the binary image.

Examples:

```
C:> flash GW2348-4.bin p
```

Program the Flash with the GW2348-4.bin image

```
C:> flash GW2348-4.bin v
```

Verify that the Flash matches the GW2348-4.bin image

```
C:> flash GW2348-4.bin pv
```

Program and verify the Flash with the GW2348-4.bin image

2.8. Getting Started

The GW2348-4 is factory configured with Redboot v2.01 and a uCLinux port programmed into Flash memory. The software is configured to use either serial port for a serial console. To get started, connect a serial cable from to another computer running a terminal software application such as Windows HyperTerminal. Configure the terminal program for 115,200 baud, 8 data bits, 1 stop bit, no parity and no flow control. Apply power and watch for Redboot and Linux output on the serial console.

It is also possible to communicate to the GW2348-4 using a telnet session over Ethernet. First, connect the J10 Ethernet port on the GW2348-4 to the Ethernet port on a Host Computer using either a standard or a crossover cable. The default telnet address for the GW2348-4 is 192.168.3.2. Second, configure the Host Computer IP address to be on the same subnet (i.e. 192.168.3.99). Third, switch to Host Computer to a command prompt and type C:>telnet 192.168.3.2. The GW2348-4 console information will now be routed to the Host Computer display.

2.9. Manufactures Website Links / Support Mailing List

The section provides links to hardware and software related web sites. An email mailing list is also available for Avila board support issues. To subscribe send an empty email to: ***avila-subscribe@lists.unixstudios.net*** then confirm with a reply email. You can then post and view messages on the mailing list.

Hardware

Processor - Intel IXP420 and IXP425

<http://developer.intel.com/design/network/products/npfamily/ixp425.htm>

Flash - Intel TE28F320J3, TE28F640J3, TE28F640J3

<http://developer.intel.com/design/flcomp/prodbref/298044.htm>

Ethernet PHY - Intel LXT973

<http://developer.intel.com/design/network/products/lan/PHYs/lxt973.htm>

Serial EEPROM - Philips Semiconductor PCF8594

<http://www.semiconductors.philips.com/>

Real Time Clock - Dallas Semiconductor DS1672

<http://www.maxim-ic.com/>

Temperature and Voltage Monitor - Analog Devices AD7418

<http://www.analog.com/>

Fan Controller – Microchip TC653BEVUA

<http://www.microchip.com/>

Software

Linux

<http://www.linux.org/>

RedBoot

<http://sources.redhat.com/redboot/>

RedHat - Linux

<http://www.redhat.com/>

uCLinux

<http://www.uclinux.org/>

MontaVista - Linux

<http://www.mvista.com/pro/downloads/ixp425.html>

VxWorks - Windriver

<http://www.windriver.com/partnerships/eval-cd/details.html?pgmid=IntelIXDP425t22>

Intel IXP4xx Software - VxWorks, Windows CE.NET, Linux

<http://developer.intel.com/design/network/products/npfamily/ixp425swr1.htm>

3. SPECIFICATIONS

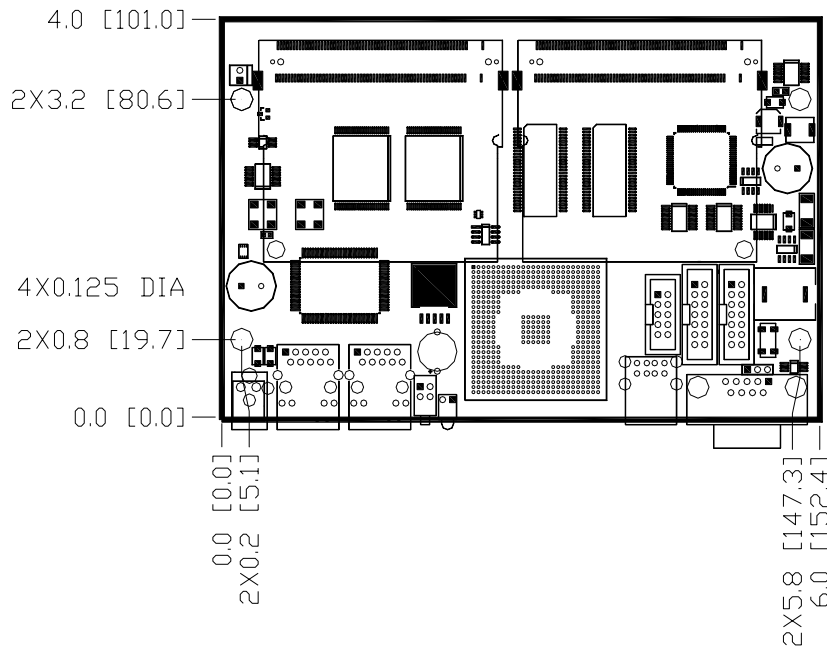
3.1. Electrical

| Parameter | Specification | |
|-------------------|---------------|-------|
| | Min | Max |
| Operating Voltage | | |
| Input Voltage | 9VDC | 48VDC |

| Parameter | Specification | |
|-----------------------------------|---------------|--|
| | Typ | |
| Operating Current | | |
| Input Current (no Mini-PCI cards) | 0.2A @ 24VDC | |

3.2. Mechanical

| Parameter | Specification |
|----------------------------|--------------------------------|
| Dimensions, Length x Width | 4.0 x 6.0 in (101.6 x 152.4mm) |
| Dimensions, Height | 0.9 in (22.9mm) |
| Weight | 5 ounces (142g) |



Mechanical Dimensions

3.3. Environmental

| Parameter | Specification |
|----------------------------------|------------------------|
| Operating Temperature | -40 to +85 °C |
| Storage Temperature | -40 to +85 °C |
| Non-condensing Relative Humidity | Less than 95% at 40 °C |

4. CUSTOMER SUPPORT

4.1. Product Revision History

Revision A – Prototype Release (ECO 1000529 dated 12/05)

The GW2348-4 is initially released at revision A and the printed circuit board at revision 01210048-01.

4.2. Technical Assistance

Gateworks technical support staff is available to assist you with questions that you may have. Please contact Gateworks using one of the methods shown below.

Phone: (805) 781-2000

Fax: (805) 781-2001

Email: support@gateworks.com

Website: <http://www.gateworks.com>

4.3. Warranty

Standard hardware warranty period is ONE year from date of purchase.

Gateworks will, solely at its option, repair or replace products, which prove to be defective in materials or workmanship, provided they are returned to a Gateworks authorized repair center. Shipment to Gateworks is at the customer's expense. Gateworks pays return shipment by ground.

Products, which in Gateworks opinion, have been subject to misuse, abuse, neglect or unauthorized alteration or repair are excluded from this warranty.

Products not manufactured by Gateworks are limited to the warranty provided by the original manufacturer and should be returned to the manufacturer in case of defect. Software is licensed AS IS. If for any reason, you are dissatisfied with the software return to Gateworks within 90 days for a full refund.

The liability of Gateworks under this agreement is limited to a refund of the purchase price of the product. In no event shall Gateworks be liable for loss of profits or other damage.

4.4. Return for Repair

You must obtain a Returned Material Authorization (RMA) number before sending any product to Gateworks. Please contact Gateworks using one of the methods shown below to obtain an RMA number. Please be ready with your name, telephone number, company name, company address, shipping address, invoicing address, product number, and a technical description of the problem. A service charge will be applied to units that are out of warranty. Please pack the unit being returned in anti-static material and ship in a sturdy cardboard box with

adequate packing material. Mark the RMA number clearly on the outside of the box before returning.

Phone: (805) 781-4000

Fax: (805) 781-4001

Email: support@gateworks.com

Website: <http://www.gateworks.com>

Address: 3026 South Higuera, San Luis Obispo, CA 93401

4.5. Life Support Policy

Gateworks products are not authorized for use as critical components in life support devices or systems without the express written approval of the president of Gateworks Corporation. Refer to the following for definitions of critical components and life support devices.

1. A critical component is any component of a life support device or system whose failure to perform can be expected to cause the failure of the life support device or system, affect its safety, or limit its effectiveness.
2. Life support devices or systems are devices or systems which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

4.6. Trademarks

All brand names or product names mentioned are trademarks or registered trademarks of their respective owners.

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