

# **ATOM**

## **Half Length Multimedia PC**



## **User Manual**



# ATOM

## User Manual

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<b>COMPANY PROFILE .....</b>	<b>1</b>
<b>INTRODUCTION.....</b>	<b>1</b>
MANUAL OBJECTIVES .....	1
LIMITATIONS OF LIABILITY .....	1
PRECAUTIONS .....	1
<i>ELECTRO-STATIC DISCHARGES</i> .....	1
<i>ON-BOARD BATTERY</i> .....	1
RELATED PUBLICATIONS.....	2
TRADEMARKS .....	2
<b>USER GUIDE.....</b>	<b>3</b>
OVERVIEW .....	3
<i>BOARD LEVEL FEATURES</i> .....	3
<i>CPU</i> .....	4
<i>PROCESSOR SOCKET</i> .....	4
<i>SECOND LEVEL CACHE</i> .....	4
<i>SYSTEM MEMORY</i> .....	4
<i>BUS EXPANSION SLOTS</i> .....	5
<i>ELECTROMAGNETIC COMPATIBILITY</i> .....	5
SPECIFICATION .....	5
<b>HARDWARE DESCRIPTION.....</b>	<b>7</b>
CHIPSET .....	7
82439HX XCELERATED CONTROLLER (TXC) .....	7
PCI/ISA IDE XCELERATOR (PIIX3).....	7
UNIVERSAL SERIAL BUS (USB).....	8
I/O CONTROLLER.....	8
<i>IDE SUPPORT</i> .....	8
SMC 37C932 SUPER I/O CONTROLLER .....	9
<i>FLOPPY CONTROLLER</i> .....	9
<i>KEYBOARD/MOUSE INTERFACE</i> .....	9
<i>REAL TIME CLOCK, CMOS RAM AND BATTERY</i> .....	10
<i>ATOM IS YEAR 2000 COMPLIANT</i> .....	10
CHIPS & TECHNOLOGY GRAPHICS SUBSYSTEM .....	10
<i>DISPLAY CAPABILITIES</i> .....	10
BIOS.....	10
<i>SYSTEM SETUP UTILITY</i> .....	11
CONNECTING AN LCD TO ATOM.....	11
<i>BACK PANEL CONNECTORS</i> .....	11
<i>ON-BOARD CONNECTORS</i> .....	11
<i>UTILITY CONNECTOR</i> .....	11
<i>SPEAKER</i> .....	11
<i>RESET</i> .....	11
<i>IDE LED</i> .....	11
<i>BUS CONNECTORS</i> .....	11
JUMPERS.....	12
<i>CMOS BATTERY SOURCE (CLEAR CMOS) J1</i> .....	12
<i>SPEED SELECTION JUMPERS JP6</i> .....	12
<i>PANEL POWER SUPPLY J21</i> .....	12
USER-INSTALLABLE UPGRADES.....	12
<i>SYSTEM MEMORY</i> .....	12
<i>EDO DRAM</i> .....	13

<i>REAL TIME CLOCK BATTERY REPLACEMENT</i> .....	13
<i>GRAPHICS MEMORY UPGRADE</i> .....	13
SOLID STATE DISK SUPPORT .....	13
ADDRESS MAPS.....	13
<i>MEMORY MAP</i> .....	13
<i>I/O MAP</i> .....	14
<i>PCI CONFIGURATION SPACE MAP</i> .....	14
<i>INTERRUPTS &amp; DMA CHANNELS</i> .....	16
CONNECTORS.....	17
<i>ATOM PISA</i> .....	17
<i>SOLID STATE DISK (SSD) ORIENTATION</i> .....	17
<i>ATOM ISA</i> .....	18
<i>BACK PANEL CONNECTORS</i> .....	18
<i>VIDEO CONNECTOR P18 (15 WAY CONDENSED D-TYPE)</i> .....	18
<i>PS/2 KEYBOARD PORT P19 (6 WAY MINI-DIN)</i> .....	18
<i>RS232 SERIAL PORT 1 P20 (9 WAY D-TYPE)</i> .....	18
<i>ETHERNET UTP CONNECTOR P25 (8 WAY RJ45 )</i> .....	19
INTERNAL I/O HEADERS & CONNECTORS.....	19
<i>PRIMARY E-IDE CONNECTOR P13 (2X20 WAY HEADER)</i> .....	19
<i>ECP/EPP PARALLEL PORT JP1 (2X13 WAY HEADER)</i> .....	19
<i>PS/2 MOUSE PORT JP2 (5 WAY HEADER)</i> .....	20
<i>RS232 SERIAL PORT 2 P21 (2X5 WAY HEADER)</i> .....	20
<i>DUAL USB PORTS JP3 (2X5 WAY HEADER)</i> .....	20
<i>LCD PRIMARY CONNECTOR P11 (2X25 WAY 2MM HEADER)</i> .....	20
<i>LCD SECONDARY CONNECTOR FOR 36 BIT PANELS P24 (2X10 WAY 2MM HEADER)</i> .....	21
<i>DIGITAL VIDEO OPTION P23 (2X20 WAY 2MM HEADER)</i> .....	21
<i>CD-AUDIO INPUT P7 (4 WAY BOX SOCKET)</i> .....	21
<i>AUDIO CONNECTOR P8 (2X5 WAY 2MM BOX SOCKET)</i> .....	21
<i>FLOPPY DISK DRIVE CONNECTOR P12 (2X17 WAY HEADER)</i> .....	22
<i>RS485 SERIAL PORT 2 P14 (2X5 WAY HEADER)</i> .....	22
<i>IRDA CONNECTOR JP5 (5 WAY HEADER)</i> .....	22
<i>BATTERY CONNECTOR P1 (4 WAY HEADER)</i> .....	22
<i>FAN POWER CONNECTOR J19 (2 WAY HEADER)</i> .....	22
<i>LCD VEE INTERFACE CONNECTOR JP4 (5 WAY HEADER)</i> .....	23
<i>POWER CONNECTOR J20 (4 WAY)</i> .....	23
<i>UTILITY CONNECTOR P16 (2X10 WAY HEADER)</i> .....	23
<i>COAST CACHE CONNECTOR P3</i> .....	23
<i>SPEED SETTING JP6</i> .....	23
<i>CMOS CLEAR J1</i> .....	24
<i>PANEL SUPPLY J21</i> .....	24
<i>PINOUT OF ISA, PISA AND PCI CONNECTORS</i> .....	25
ERROR MESSAGES.....	27
<i>ERROR BEEP CODES</i> .....	27

## COMPANY PROFILE

Blue Chip Technology is a leading specialist PC product manufacturer in Europe.

Blue Chip Technology provides innovation with quality design and manufacturing from a single source.

Based in the North West of England, our purpose built complex contains both advanced research and development facilities, and manufacturing facilities.

Specialising in the provision of industrial computing and electronic solutions for a wide range of UK and European organisations, Blue Chip Technology has one of the UK's largest portfolios of industrial PCs, peripherals and data acquisition cards. This extensive range of products, coupled with our experience and expertise, enables Blue Chip Technology to offer an industrial processing solution for any application. The ATOM Single Board PC is the latest addition to our portfolio, providing a cost effective product development and volume production tool for OEMs.

A unique customisation and specialised system integration service is also available, delivering innovative solutions to customers problems. The company's success and reputation in this area has led to a number of large design and manufacturing projects for companies such as GEC Marconi, Aston Martin, Shell and British Gas.

British Standards Institute approval (BS EN 9001) means that all of Blue Chip Technology's design and manufacturing procedures are strictly controlled, ensuring the highest levels of quality, reliability and performance.

Blue Chip Technology are also committed to the single European market and continue to invest in the latest technology and skills to provide high performance computer and electronic solutions for a world-wide customer base.



# INTRODUCTION

## MANUAL OBJECTIVES

This manual describes in detail the Blue Chip Technology ATOM Single Board processor card.

We have tried to include as much information as possible but we have not duplicated information that is provided in the standard IBM Technical References, unless it proved to be necessary to aid in the understanding of the ATOM.

The manual is sectioned and includes a User Guide which will help the non technical user to get the unit up and running. A Troubleshooting Guide is also included to help when things go wrong.

We strongly recommend that you study this manual carefully before attempting to interface with ATOM or change the standard configurations. Whilst all the necessary information is available in this manual we would recommend that unless you are confident, you contact your supplier for guidance.

Please be aware that it is possible to create configurations within the CMOS RAM that make booting impossible. If this should happen, clear the CMOS settings, (see the description of the Jumper Settings for details).

If you have any suggestions or find any errors concerning this manual and want to inform us of these, please contact our Technical Services department with the relevant details.

## LIMITATIONS OF LIABILITY

In no event shall Blue Chip Technology be held liable for any loss, expenses or damages of any kind whatsoever, whether direct, indirect, incidental or consequential, arising from the design or use of this product or the support materials supplied with this product. If this product proves to be defective, Blue Chip Technology is only obliged to replace or refund the purchase price at Blue Chip Technology's discretion according to their Terms and Conditions of Sale.

## PRECAUTIONS

It is imperative that precautions are taken to avoid electro-static discharges, or any maltreatment of the on-board battery.

### ***ELECTRO-STATIC DISCHARGES***

The devices on this card can be totally destroyed by static electricity. Ensure that you take necessary static precautions, ideally wear an approved wrist strap or touch a suitable ground to discharge any static build up. This should be repeated if the handling is for any length of time.

When carrying the board around, please place it into the anti-static bag in which it came. This will prevent any static electricity build up.

### ***ON-BOARD BATTERY***

This board is fitted with a Lithium battery. Great care should be taken with this type of battery. Under NO circumstances should :

- the outputs be shorted
- be exposed to temperatures in excess of 100°C
- be burnt
- be immersed in water

- be unsoldered
- be recharged
- be disassembled

If the battery is mistreated in any way there is a very real possibility of fire, explosion, and harm.

## **RELATED PUBLICATIONS**

The following publications will provide useful information related to the Standard Personal Computer and can be used in conjunction with this manual.

- IBM Personal Computer AT Technical Reference, 1502494, IBM, 1984.
- IBM Personal System/2 and Personal Computer BIOS Interface Technical Reference, 15F0306, IBM, 1987.
- The Programmers PC Sourcebook, Microsoft
- The Winn L. Rosch Hardware Bible, Brady

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# USER GUIDE

## OVERVIEW

The Blue Chip Technology ATOM single board PC sets new standards for integration of the latest advances in processor, memory, and I/O technologies. The ATOM PISA complies with the new PISA standard providing ISA and PCI bus interfaces on a single card. This half card multimedia PC is an ideal platform for the increasing requirements of today's and tomorrow's embedded applications. The ATOM ISA provides continued support for legacy ISA backplanes.

The flexible design will accept processors operating at 100, 133, 166, 200, 233, 266 and 300MHz, including MMX devices. The user may install 256 KB of asynchronous Cache, or 256 KB or 512 KB of Pipeline Burst Cache RAM in the form of a COAST (Cache On A STick) Module. The memory sub-system is designed to support up to 256MB of EDO DRAM (for improved performance) or standard Fast Page DRAM in standard 72-pin SIMM sockets. A screwdriver activated SPGA socket accommodates the CPU.

The ATOM single board PC utilises Intel's Triton 82430HX PCIset to provide increased integration and performance over other single board PC designs. The Triton PCIset contains an integrated PCI Bus Mastering IDE controller with a high performance IDE interface allowing up to two IDE devices (such as hard drives, CD-ROM readers, etc.). The SMC 37C932 Super I/O controller integrates the standard PC I/O functions: floppy interface, two FIFO serial ports, one EPP/ECP capable parallel port, a Real Time Clock, keyboard and mouse (PS/2) controller.

The ATOM also provides for driving up to twenty external ISA (and four PCI expansion slots - PISA version only).

In addition to superior hardware capabilities, a full set of software drivers and utilities are available to allow advanced operating systems such as Windows™ 95 to take full advantage of the hardware capabilities. Features such as bus mastering IDE, Windows™ 95/98 ready Plug and Play, Advanced Power Management (APM) are available for the ATOM.

### **BOARD LEVEL FEATURES**

- SPGA socket supporting 75 - 300 MHz operation
- On-board 3.3 V CPU voltage regulator
- Intel Triton 82430 PCIset chipset:
  - 82439HX Xcelerated Controller (TXC)
  - PIIX3 PCI ISA IDE Accelerator (PIIX3) bridge
- 256KB or 512 KB PipeLine Burst Level 2 cache or 256 KB Asynchronous Level 2 cache using plug-in COAST connector
- Two SIMM sockets providing up to 256MByte of EDO or FPM DRAM
- C&T 69000 PCI CRT/LCD graphics controller with:
  - 2 MByte video memory
- PCI and ISA expansion busses via a PISA connector or ISA only via ISA connector
- SMC 37C932 I/O controller providing:
  - Dual PCI IDE interfaces
  - Dual floppy interface
  - EPP/ECP bi-directional parallel interface
- PCI 100/10 base-T Ethernet controller
- Dual USB ports
- Stereo sound (Soundblaster™ compatible )

- Dual RS232 serial ports. RS422/485/IRDA port. option on the second serial port.
- Real-time clock with on-board battery
- PS/2 mouse and keyboard connectors
- Plug-in M-Systems Flash modules up to 72MB capacity.
- Drive for up to 20 ISA and 4 PCI cards (PISA version)

## **CPU**

The ATOM single board PC is designed to operate with Pentium-class Processors running at 2.2, 2.8, 2.9 or 3.3 Volts. An on-board voltage regulator circuit provides the required voltage for the processor from the incoming 5 volt power supply.

The Pentium processor maintains full backward compatibility with the 8086, 80286, i386™ and Intel486™ processors. It supports both read and write burst mode bus cycles, and includes separate on-chip code and data caches which employ a write-back policy. Also integrated into the Pentium processor is an advanced numeric co-processor which significantly increases the speed of floating point operations, whilst maintaining backward compatibility with Intel486™ math co-processor and complying to ANSI/IEEE standard 754-1985.

## **PROCESSOR SOCKET**

The ATOM single board PC has a 321-pin SPGA socket. Processor replacement requires the careful use of a flat blade screwdriver. A heatsink and fan will be required for many of the processors. These will make CPU fitting difficult because of their placement, especially if they reduce the mechanical advantage of the screwdriver. The screwdriver can be cranked to overcome this by putting a bend in it at the point it contacts the edge of the CPU. 3.5mm screwdrivers have been found to be ideal.

Insert the CPU carefully observing the missing pin of the polarisation corner (inspect the pins for alignment first). Place the screwdriver all the way into the special aperture in the socket between CPU and large capacitors. Using only the flat of the blade against the CPU, lever the CPU away from the capacitors until a sharp click indicates proper location. Check that the CPU now sits as far towards the memory end of the socket as possible. The edge should rest against the plastic by the extraction screwdriver aperture.

Removal is an identical operation using the aperture on the memory side and levering towards the capacitors, followed by easy lifting out of the socket.

## **SECOND LEVEL CACHE**

A second level cache using the COAST connector can complement the Pentium processor's internal cache. Pipeline Burst SRAM provides performance similar to expensive Synchronous Burst SRAMs for only a slight cost premium over the slower performing Asynchronous SRAMs. With the Triton chipset, the performance level of Pipeline Burst and Synchronous SRAMs is identical.

## **SYSTEM MEMORY**

The ATOM single board PC provides two 72-pin SIMM sites for memory expansion. The sockets support 1M x 32 (4 MB), 2M x 32 (8 MB), 4M x 32 (16 MB), 8M x 32 (32 MB), 16M x 32 (64 MB) and 32MB x 32 (128 MB) single-sided or double-sided SIMM modules. Minimum memory size is 8 MB and maximum memory size, using two 32MB x 32 SIMM modules, is 256 MB. Memory timing requires 70 ns fast page devices or, for optimum performance, 60ns EDO DRAM. If the memory bus speed is 60 MHz or slower (75MHz, 90MHz, 120MHz, 150MHz or 180MHz Pentium Processor speed), 70ns EDO DRAM may be used. If the memory bus speed is 66 MHz, 60 ns DRAM should be used. Additionally, 36-bit SIMM modules may be used to provide either standard parity operation or the parity circuitry can be used by the HX chipset to provide ECC correction. EDO DRAM is designed to improve DRAM read performance. Both sockets must be occupied with identical SIMM types as the two sockets are arranged in a bank which provides a 64-bit wide data path. There are no jumper settings required for the memory size or type, this is automatically detected by the system BIOS.

## **BUS EXPANSION SLOTS**

The ATOM is designed for use in an embedded application and provides expansion via PISA or ISA edge connectors. The PISA version can plug into a suitable backplane to drive up to 20 ISA bus expansion cards and 4 PCI expansion cards. The ISA version can drive up to 20 ISA bus expansion cards.

## **ELECTROMAGNETIC COMPATIBILITY**

This product meets the requirements of the European EMC Directive (89/336/EEC) and is eligible to bear the CE mark.

ATOM has been assessed operating in a Blue Chip Technology PC. However, because the board can be installed in a variety of computers, certain conditions have to be applied to ensure that the compatibility is maintained. Subject to those conditions, it meets the requirements for an industrial environment (Class A product).

- The board must be installed in a computer system chassis which provides screening suitable for an industrial environment.
- Any recommendations made by the computer system manufacturer/supplier must be complied with regarding earthing and the installation of boards.
- The board must be installed with the optional back plate securely screwed to the chassis of the computer to ensure good metal-to-metal (i.e. earth) contact.
- Most EMC problems are caused by the external cabling to boards. It is imperative that any external cabling to the board is totally screened, and that the screen of the cable connects to the metal end bracket of the board and hence to earth. It is recommended that round screened cables with a braided wire screen are used in preference to those with a foil screen and drain wire. Use metal connector shells which connect around the full circumference of the screen: they are far superior to those which earth the screen by a simple "pig-tail".
- The keyboard and mouse will play an important part in the compatibility of the processor card since they are ports into the board. Similarly, they will affect the compatibility of the complete system. Fully compatible peripherals must be used otherwise the complete system could be degraded. They may radiate or behave as if keys/buttons are pressed when subject to interference. Under these circumstances it may be beneficial to add a ferrite clamp on the leads as close as possible to the connector. A suitable type is the Chomerics type H8FE-1004-AS.
- Ensure that the screens of any external cables are bonded to a good RF earth at the remote end of the cable.

Failure to observe these recommendations may invalidate the EMC compliance.

### **Warning**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## **SPECIFICATION**

ATOM Power Requirement	+5 V $\pm$ 5%	Required for processor operation.
	+12 V $\pm$ 5%	Required for Network /Audio.
	+3.3 V $\pm$ 5%	} Not required for board operation.
	-5 V $\pm$ 5%	
	-12 V $\pm$ 5%	} The ISA, & PCI voltage rails are linked on board.

Typical System Consumption	3.5A 5V	K6-2/300, 16 MB RAM, 256 KB cache
	0.15A 12V	
Temperature	2.0A 5V	C6 200, 32MB RAM, 256KB cache IDT C6MP200 3.3V 66MHz bus.
	0.15A 12V	
Shock	Non-Operating	-40°C to +70°C +0°C to +55°C (min. airflow of 200 lpm)
	Operating	
Vibration	Non-Operating	Half sine, 2ms, 1 m drop
	Operating	
EMC	Non-Operating	5 Hz - 500 Hz, 3.1 g RMS random 10 Hz - 500 Hz, 1.0 g RMS random
	Operating	
MTBF	Emissions	EN55022 (A) EN50082-2 in a Blue Chip ICON Industrial PC Chassis
	Immunity	
Dimensions	Calculated	>100,000 Hrs
	Board only	338 x 122 mm

Power Consumption figures given are for typical configurations.

This information is preliminary and is provided only as a guide to calculating approximate total system power usage when additional resources are added.

## CHIPSET

The Intel 82430HX PCIset consists of the 82439HX Xcelerated Controller (TXC) and one 82371SB PCI/ISA IDE Xcelerator (PIIX3) bridge chip.

### 82439HX XCELERATED CONTROLLER (TXC)

The 82439HX provides all control signals necessary to drive a second level cache and the DRAM array, including multiplexed address signals. The TXC also controls access to memory and generates snoop controls to maintain cache coherency. The TXC comes in a 324-pin BGA package and includes the following features:

- Microprocessor interface control
- Integrated L2 write-back cache controller
  - Pipeline burst SRAM
  - 256 KB direct-mapped
- Integrated DRAM controller
  - 64 bit path to memory
  - Support for EDO and fast page DRAM
  - Parity and non-parity support
- Fully synchronous PCI bus interface
  - 25/30/33 MHz bus speed
  - PCI to DRAM > 100 MB/sec
  - Up to four PCI masters in addition to the PIIX3

### PCI/ISA IDE XCELERATOR (PIIX3)

The PIIX3 provides the interface between the on-board PCI and ISA buses and integrates a dual channel fast IDE interface capable of supporting two devices. The PIIX3 integrates seven DMA channels, one 16-bit timer/counter, two eight-channel interrupt controllers, PCI-to-AT interrupt mapping circuitry, NMI logic, ISA refresh address generation, and PCI/ISA bus arbitration circuitry together onto the same device. The PIIX3 comes in a 208-pin QFP package and includes the following features.

- Interface between the PCI and ISA buses
- Universal Serial Bus controller
  - Host/hub controller

— Integrated 8 x 32-bit buffer for bus master PCI IDE burst transfers

— Bus master mode

- PCI 2.1 compliant
- Enhanced fast DMA controller
- Interrupt controller and steering
- Counters/timers
- SMI interrupt logic and timer with fast on/off mode

## UNIVERSAL SERIAL BUS (USB)

The ATOM single board PC features two USB ports available via cable set. The ports permit the direct connection of two USB peripherals without an external hub. If more devices are required, an external hub can be connected to either of the built-in ports. ATOM fully supports the standard universal host controller interface (UHCI) and uses standard software drivers that are UHCI-compatible. Features of the USB include:

- Self-identifying “hot pluggable” peripherals
- Automatic mapping of function to driver and configuration
- Support for isochronous and asynchronous transfer types over the same set of wires
- Support for up to 127 physical devices
- Guaranteed bandwidth and low latencies appropriate for telephony, audio, and other applications
- Error handling and fault recovery mechanisms built into protocol

### NOTE

Computer systems that have an unshielded cable attached to the USB port might not meet FCC Class B requirements, even if no device or a low speed (sub-channel) USB device is attached to the cable. Use shielded cable that meets the requirements for high speed (fully rated) devices.

## I/O CONTROLLER

### *IDE SUPPORT*

The ATOM single board PC provides one high performance bus-mastering PCI IDE interface capable of supporting PIO Mode 3 and Mode 4 devices. The system BIOS supports Logical Block Addressing (LBA) and Extended Cylinder Head Sector (ECHS) translation modes as well as AT API (e.g. CD-ROM) devices on the IDE interface. Detection of IDE device transfer rate and translation mode capability is automatically determined by the system BIOS.

Microsoft will provide this driver for Windows™ 95/98, other software vendors may make drivers available for other operating systems.

Detailed information on the PCIset is available in the Intel 82430 PCIset data sheet.

## **SMC 37C932 SUPER I/O CONTROLLER**

Control for the integrated serial ports, parallel port, floppy drive, RTC and keyboard controller is incorporated into a single component, the SMC 37C932. This component provides:

- Two powered NS16C550-compatible UARTs with send/receive 16 byte FIFO
- Multi-mode bi-directional parallel port
  - Standard mode; IBM and Centronics compatible
  - Enhanced Parallel Port (EPP) with BIOS/Driver support
  - High Speed mode; Extended Capabilities Port (ECP) compatible
- Industry standard floppy controller with 16 byte data FIFO (2.88 MB floppy support)
- Integrated Real Time Clock
- Integrated 8042 compatible keyboard/mouse controller

The 37C932 is normally configured by the BIOS automatically, however configuration of these interfaces is possible via the CMOS set-up program that can be invoked during boot-up. The serial ports can be enabled as various standard COM ports, or disabled. The parallel port can be configured as normal, bi-directional, EPP/ECP, or disabled. The floppy interface is also configurable.

Header connectors located near the top of the board allow cabling to use these interfaces. Take care to observe the polarity of the headers. Pin 1 is placed at the metal bracket end of the board on all the open headers.

### ***FLOPPY CONTROLLER***

The 37C932 is software compatible with the DP8473 and 82077 floppy disk controllers.

The floppy interface can be configured for 360 KB or 1.2 MB 5¼" media or for 720 KB, 1.44 MB, or 2.88 MB 3½" media in the BIOS set-up. By default, the Floppy A interface is configured for 1.44 MB and Floppy B is disabled.

### ***KEYBOARD/MOUSE INTERFACE***

A PS/2 keyboard/mouse connector is located on the back panel side of the single board PC. A splitter cable allows mouse and keyboard connection, else only the keyboard occupies this connector. The mouse interface is also available through a polarised header. A Polyswitch resettable fuse protects the 5V lines to these connectors. Care must be taken to turn off the system power before installing or removing a keyboard or mouse, otherwise the fuse may trip. The Polyswitch will reset itself once the fault condition is cleared and the power to the circuit is removed, allowing it to cool.

The integrated 8042 microcontroller contains the AMI Megakey keyboard/mouse controller code which, besides providing traditional keyboard and mouse control functions, supports Power-On/Reset (POR) password protection. The POR password can be defined by the user in the Setup program. The keyboard controller also provides the facility for a <CTRL> <ALT> <DEL> "hot key" sequence to perform a system

The CMOS RAM can be set to specific values or cleared to the system default values using the BIOS SET-UP program. Also, the CMOS RAM values can be cleared to the system defaults by using a configuration jumper on the single board PC. The appendix lists the jumper configurations.

An on-board Lithium battery provides power to the RTC and CMOS memory. The battery has an estimated lifetime of three years if the board remains unpowered. When the system is powered up, power is drawn from the power supply to extend the life of the battery.

## ***ATOM IS YEAR 2000 COMPLIANT***

## **CHIPS & TECHNOLOGY GRAPHICS SUBSYSTEM**

The ATOM single board PC is provided with the very latest C&T 69000 graphics controller with 2 MB of graphics memory. Both CRT and LCD interfaces are provided. ATOM supports a wide variety of monochrome and colour Single-Panel, Single-Drive (SS) and Dual-Panel, Dual Drive (DD) passive STN and active matrix TFT/MIM LCD, EL and plasma panels. ATOM supports a wide range of panel resolutions.

The 69000 has a 32-bit graphics engine that provides acceleration for scaling the video display without compromising picture quality or frame rate. Hardware acceleration for graphics functions such as line draws, System-to-screen and screen-to-screen BitBLTs, ROPs, which optimise performance operation under Windows™ and other GUI environments.

Note that Chips and Technology are now a part of Intel Corporation.

### ***DISPLAY CAPABILITIES***

The 2MB of video memory can support a variety of resolutions.

The representation of each picture element (pixel) is key to working out capability.

256 colours requires 8 bits (1byte), 64K colours 16 bits (2bytes), 16M colours 24 bits (3bytes).

So 640x480x16M colours requires 640x480x3 bytes = 921600; easily fits into our 2,097,152 bytes of memory.

The drivers supplied from C&T also need to support the desired resolution. These generally support 640x480x16M, 800x600x16M, 1024x768x64K, 1280x1024x256 and 1600x1200x256. However, 16:9 format plasma panel and portrait mode have been provided previously.

Be aware that driving older or cheaper monitors beyond their capabilities can destroy them.

## **Bios**

The ATOM single board PC uses a Phoenix BIOS and a C&T Video BIOS both of which are stored in EPROM/Flash. In addition to the System and Video BIOSes, the EPROM also contains the Setup utility.

informs users to press the <F2> key to access Setup. Deep power-down displays may not light up in time to display this message.

See the BIOS user manual for further details.

## CONNECTING AN LCD TO ATOM

Unfortunately, connecting an LCD panel to a PC is not as simple as it is for a CRT. At the time of writing this manual there is still no universally accepted standard interface for LCDs. We strongly recommend that if you are in any doubt about connecting a LCD panel to ATOM you contact our Technical Services team with full details of the target display. ALWAYS check your wiring *before* you switch on.

## CONNECTORS

A selection of connectors are available on the ATOM PC board. These provide connectivity to standard external peripherals (monitor, keyboard, etc.), in-chassis peripherals (disk drives, etc.), and bus devices.

### **BACK PANEL CONNECTORS**

The back panel provides external access to the CRT, keyboard/mouse, a Serial port, and Ethernet port. All the connectors follow the industry standard (mouse access as on notebooks with Y cable).

### **ON-BOARD CONNECTORS**

There are connectors on-board for Floppy Disk Drive, IDE, LCD 1 & 2, Digital Video, RS422/485, IrDa, PISA or ISA, USB, Sound, CD Audio, PS/2 mouse and utilities connector. There are also sockets for SIMMs, COAST (cache), Flash Solid State Disks, external battery and power.

### **UTILITY CONNECTOR**

The ATOM PC board provides connectors to support functions which would normally be located within the enclosure, and also duplicate connections for some of the external interfaces (System Speaker, System Reset Switch, Keyboard, Power LED Hard Drive Activity LED, and an External Battery).

### **SPEAKER**

An on-board Piezo speaker is provided. An off-board speaker may be connected to the header (P16 pins 1 & 2). The speaker provides error beep code information during the Power-On Self Test if the system cannot recognise critical interfaces.

### **RESET**

Two pins of header P16 (pins 3 & 4) may be connected to a momentary normally open SPST switch. When the switch is closed, the system will perform a hard reset and run the POST.

### **IDE LED**

Two pins of header P16 (pins 13 & 14) may be connected to an LED to provide a light when an IDE hard drive connected to the on-board IDE controller is active.

### **BUS CONNECTORS**

must not be disturbed, or damage to the board may ensue.

### **CMOS BATTERY SOURCE (CLEAR CMOS) J1**

This jumper is used to clear the CMOS RAM in the event that the contents become corrupt. It selects the source of backup power to the CMOS RAM, and also allows the CMOS to be cleared down to the default settings.

Fitting the link to the “CLR” position with the power off, allows on-board capacitors to discharge and will reset the CMOS memory. The jumper should then be returned to the “NORM” position to restore normal operation.

### **SPEED SELECTION JUMPERS JP6**

This set of jumpers is provided to set the CPU internal speed and the CPU external bus speed.

The external bus speed is always as shown in the tables in this document.

The internal CPU speed is expressed as a multiplication of this frequency.

Unfortunately the CPU manufacturers do not have any consistency of settings for particular multiplication settings - each CPU type requires information from the data sheet! Many common, current values have been listed in this document but other requirements can be determined by understanding the BF[2-0] operation: inserting a jumper sets the signal to logical low (0V).

### **PANEL POWER SUPPLY J21**

This sets the power supplied to the panel interface to 5V or 3.3V.

Table of Jumpers

JUMPER	AREA OF INFLUENCE	LINK	ACTION
J1	CMOS Battery Support	None CLR NORM	Not Allowed Clear CMOS RAM Use on-board battery
JP6	CPU and PCI bus speed plus CPU internal speed		See “ Speed Setting <b>JP6</b> ” on page 23
J21	Panel voltage supply	3V/5V	3.3V supply 5V supply

## **USER-INSTALLABLE UPGRADES**

### **SYSTEM MEMORY**

The table shows the possible memory combinations. ATOM will support both Fast Page DRAM or EDO DRAM SIMMs, but they cannot be mixed. Parity/Error Correction is supported when using parity SIMMs (x36).

SIMM requirements are 70ns Fast Page Mode or 60ns EDO DRAM (70 ns EDO may be used with a 60

8M X 32 (32 MB)	64 MB
16M X 32 (64 MB)	128 MB
32M X 32 (128 MB)	256 MB

Note: SIMMs may be parity (x 36) or non-parity (x 32)

### *EDO DRAM*

Extended Data Out (or Hyper Page) DRAM is designed to improve the DRAM read performance. EDO DRAM holds the memory data valid until the next CAS# falling edge, unlike standard fast page mode DRAM which tri-states the memory data when CAS# negates to precharge for the next cycle. With EDO, the CAS# precharge overlaps the data valid time, allowing CAS# to negate earlier while still satisfying the memory data valid window time.

### **REAL TIME CLOCK BATTERY REPLACEMENT**

The on-board battery may be replaced using a Duracell DL2032 3 volt button cell, or equivalent.

### **GRAPHICS MEMORY UPGRADE**

The C&T B69000 has 2 MB of DRAM installed for graphics. When the 69030 becomes available this will allow 4MB of graphics to be offered.

## **SOLID STATE DISK SUPPORT**

ATOM supports the use of Solid State Disks (SSD) using M-Systems Flash devices fitted to the board using the DIL socket.

Please contact Blue Chip Technology's Technical Services for details.

## **ADDRESS MAPS**

### **MEMORY MAP**

ADDRESS RANGE (DECIMAL)	ADDRESS RANGE (HEX)	SIZE	DESCRIPTION
1024K - 131072K	100000 - 8000000	127M	Extended Memory
896K - 1023K	E0000 - FFFFF	128K	Phoenix System BIOS (not available for UMB)
K - K	CE000 - CFFFF	8K	Solid State Disk Pages
848K - 879K	D4000 - DBFFF	32K	BIOS Extensions
800K - K	C8000 - CDFFF	K	Available HI DOS memory (open to ISA and PCI bus)
640K - 799K	A0000 - C7FFF	160K	On-board video memory and BIOS
639K	9FC00 - 9FFFF	1K	Extended BIOS Data (moveable by QEMM, 386MAX)
512K - 638K	80000 - 9F5FF	127K	Extended conventional

ADDRESS (HEX)	SIZE Bytes	FIXED RESOURCES	VARIABLE RESOURCES
0000 - 000F	16	PIIX - DMA 1	
0020 - 0021	2	PIIX - Interrupt Controller 1	
002E - 002F	2	Ultra I/O configuration registers	
0040 - 0043	4	PIIX - Timer 1	
0060	1	Keyboard Controller Data Byte	
0061	1	PIIX - NMI, speaker control	
0064	1	Kbd Controller, CMD/STAT Byte	
0070, bit 7	1 bit	PIIX - Enable NMI	
0070, bits 6:0	7 bits	RTC, Address	
0071	1	RTC, Data	
0080 - 008F	16	PIIX - DMA Page Register	
00A0 - 00A1	2	PIIX - Interrupt Controller 2	
00B2 - 00B3	2	PIIX - APM Control / Status Interrupt Controller 2	
00C0 - 00DE	31	PIIX - DMA 2	
00F0	1	Reset Numeric Error	
0100 - 0107	8	Reserved for Board Confign.	
0170 - 0177	8		
01F0 - 01F7	8		Primary IDE Channel
0200 - 0207	8		Gameport Joystick
0220			Audio
0278 - 027B	4		
02E8 - 02EF	8		
02F8 - 02FF	8		Serial Port 2
0376-377	2		
0378 - 037F	8		Parallel Port 1
0388			Audio
03B0 - 03BB	4		C&T69000
03BC - 03BF	4		
03C0 - 03DF	16		C&T69000
03E8 - 03EF	8		
03F0 - 03F5	6		Floppy Channel 1
03F6	1		Pri IDE Chan Cmnd Port
03F7 (Write)	1		Floppy Chan 1 Cmd
03F7, bit 7	1 bit		Floppy Disk Chg Chan 1
03F7, bits 6:0	7 bits		Pri IDE Chan Status Port
03F8 - 03FF	8		Serial Port 1
LPT + 400h	3		ECP regs, LPT base + 400h
04D0 - 04D1	2	Edge/Level INTR Control Reg.	
0CF8 - 0CFC*	4	PCI Config Address Reg.	
0CF9	1	Turbo & Reset control Reg.	
0CFC - 0CFF	4	PCI Config Data Reg	
FFA0 - FFA7	8		1ary Bus MasterIDE regs
FFA8 - FFAF	8		2ary Bus Master IDE regs
FF00-FF07	8		IDE Bus Master Reg.

\*only accessible by DWORD accesses.

### PCI CONFIGURATION SPACE MAP

The Triton chipset uses Configuration Mechanism 1 to access the PCI configuration space. The PCI Configuration Address register is a 32-bit I/O register located at 0CF8h, the PCI Configuration Data

1. Using a DWORD read or write command, read or write data from the I/O port CF8H

NOTE: Any address output to CF8H is always on a 4 byte (DWORD) boundary. You can read or write any BYTE, WORD or DWORD in the four byte range by using the correct offset as follows:

DWORD @ CFCh

WORD @ CFCh or CFEh

BYTE @ CFCh, CFDh, CFEh or CFFh

#### CONFIGURATION ADDRESS REGISTER BIT DEFINITION

BIT	FUNCTION / SETTING
31	1
30 - 24	RESERVED
23 -16	BUS NUMBER
15 - 11	DEVICE NUMBER
10 - 8	FUNCTION NUMBER
7 - 2	REGISTER NUMBER
1	0
0	0

CONFIG SPACE ENABLE FLAG (Bit 31): Always 1 to indicate I/O access is to configuration space.

RESERVED (Bits 30-24): Always 00h

BUS NUMBER (Bits 23-16): Always 00h unless a bridge card is installed in a PCI slot

DEVICE NUMBER (Bits 15-11): Used to indicate a specific PCI device. The Triton TSC has a predefined device number of 00000h. The PIIIX and four PCI slots also have specific device numbers, that device number is determined by which PCI Address/Data line is connected to the device's ID SEL pin. Specific mapping information is detailed in the table below.

FUNCTION NUMBER (Bits 10-8): Used to indicate a specific function in multifunction PCI devices. The PIIIX is the only multi-function device on ATOM located on the single board PC. Use 00h for the basic PIIIX device and 01h for the PCI IDE BUS MASTER FUNCTION. For a multi-function PCI add-in card, refer to the card's documentation to determine the allowable function numbers.

REGISTER NUMBER (Bits 7-2): Defines one of 64 DWORD locations for a specific PCI device.

Note that Bits 1 and 0 must always be 0h for DWORD access.

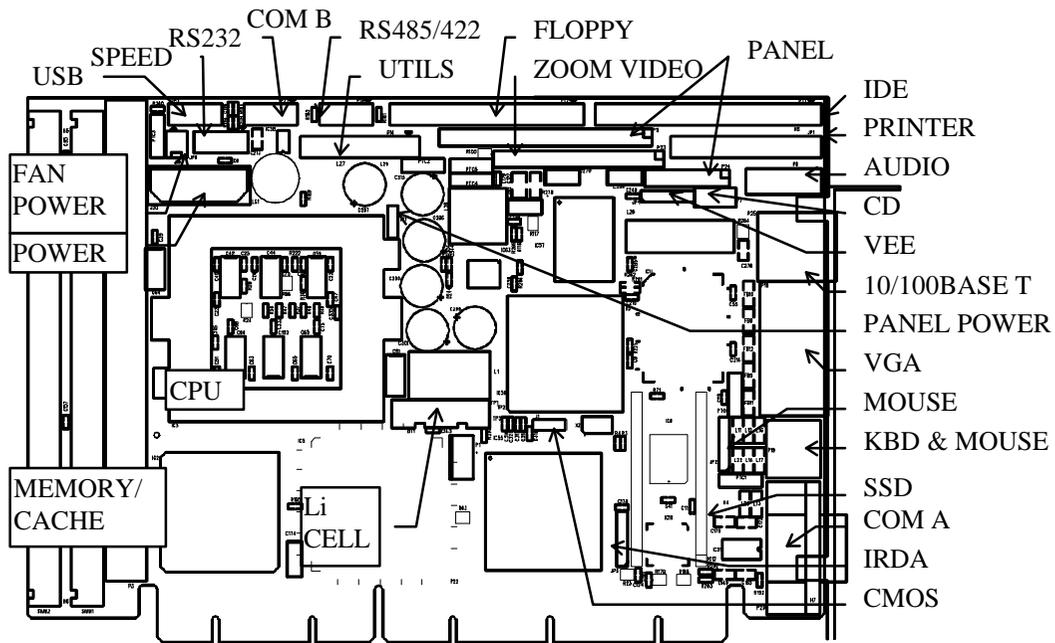
	FUNCTION		REGISTER
TSC	00 / 00 / 0	N/A	8000 0000 - 8000 00FC
PIIX	00 / 07 / 0	AD18	8000 3800 - 8000 38FC
PIIX-IDE BUS MASTER	00 / 07 / 1	AD18	8000 3900 - 8000 39FC
PIIX-Serial Bus Controller (USB)	00 / 07 / 2	AD18	8000 3A00 - 8000 3AFC
C&T69000	00 / 08 / 0	AD13	8000 4000 - 8000 40FC
RTL8139A (Ethernet)	00 / 09 / 0	AD14	8000 4100 - 8000 41FC
Slot 1		AD19	
Slot 2		AD20	
Slot 3		AD21	
Slot 4		AD22	

### **INTERRUPTS & DMA CHANNELS**

The following tables list the Interrupt and DMA Channel configuration options for on-board devices. The serial ports, parallel ports, and IDE controller can be configured using SETUP, or any other Plug and Play resource manager (such as the Windows™ 95/98 Device Manager). The Graphics interrupt is assigned by the auto-configure utility during boot up.

IRQ	RESERVED INTERRUPTS
NMI	I/O Channel Check
0	Interval Timer
1	Keyboard buffer full
2	Cascade interrupt from slave PIC
3	Serial 2 (COM2)
4	Serial 1 (COM1)
5	Audio
6	Floppy Controller
7	Parallel (LPT1)
8	Real time clock
9	VGA if used, USB
10	
11	Ethernet
12	PS/2 Mouse (if present)
13	Math co-processor
14	Primary E-IDE
15	

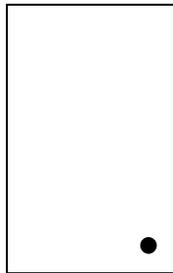
DMA	RESERVED
0	Audio*
1	Audio*
2	Floppy
3	
4	Cascade channel
5	
6	
7	

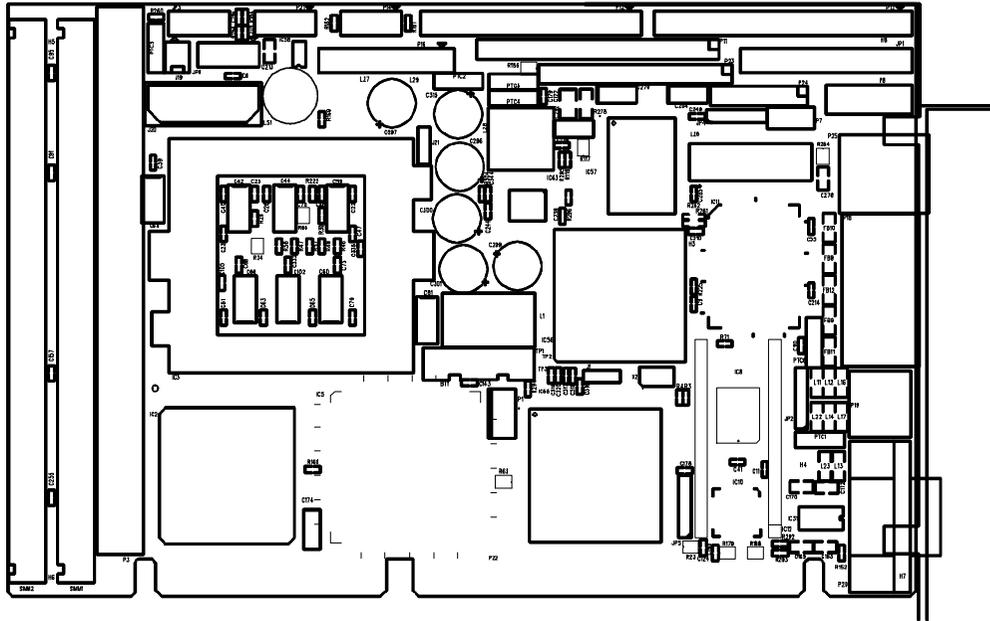


All open header pin 1 towards metal bracket =>. Square pad identifies pin 1.  
 PISA and ISA board versions identical except for edge fingers.

**SOLID STATE DISK (SSD) ORIENTATION**

Locate device as shown into above diagram.





**BACK PANEL CONNECTORS**

The back panel houses the following connectors:

**VIDEO CONNECTOR P18 (15 WAY CONDENSED D-TYPE)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	Analogue RED	2	Analogue GREEN
3	Analogue BLUE	4	Not Used
5	0 Volts (Ground)	6	0 Volts (Ground)
7	0 Volts (Ground)	8	0 Volts (Ground)
9	5V limited current	10	0 Volts (Ground)
11	Not Used	12	DCD
13	Horizontal Sync	14	Vertical Sync
15	DCC		

**PS/2 KEYBOARD PORT P19 (6 WAY MINI-DIN)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	Keyboard Data	2	Mouse Data
3	Ground	4	+5 Volts (fused)
5	Keyboard Clock	6	Mouse Clock

**RS232 SERIAL PORT 1 P20 (9 WAY D-TYPE)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	Data Carrier Detect	2	-Receive Data
3	Transmit Data	4	Data Terminal Ready

3	+VE RECEIVE
4	NC
5	NC
6	-VE RECEIVE
7	NC
8	NC

### INTERNAL I/O HEADERS & CONNECTORS

The board has a number of internal peripheral connections:

#### PRIMARY E-IDE CONNECTOR **P13** (2X20 WAY HEADER)

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	-Reset	2	Ground
3	Data bit 7 (HD)	4	Data bit 8 (HD)
5	Data bit 6 (HD)	6	Data bit 9 (HD)
7	Data bit 5 (HD)	8	Data bit 10 (HD)
9	Data bit 4 (HD)	10	Data bit 11 (HD)
11	Data bit 3 (HD)	12	Data bit 12 (HD)
13	Data bit 2 (HD)	14	Data bit 13 (HD)
15	Data bit 1 (HD)	16	Data bit 14 (HD)
17	Data bit 0 (HD)	18	Data bit 15 (HD)
19	Ground	20	Polarisation
21	Drive Request	22	Ground
23	-IO Write (HD)	24	Ground
25	-IO Read (HD)	26	Ground
27	Drive Ready	28	Cable select 330ohm to 0V
29	Drive Acknowledge	30	Ground
31	IRQ14	32	Not Used
33	Address 1 (HD)	34	1 Kohm to 0V
35	Address 0 (HD)	36	Address 2 (HD)
37	-Chip Select 0 (HD)	38	-Chip Select 1 (HD)
39	IDE LED Drive	40	Ground

#### ECP/EPP PARALLEL PORT **JP1** (2X13 WAY HEADER)

PIN N°	SIGNAL	PIN N°	SIGNAL
1	-Strobe	2	-Auto Feed XT
3	Data bit 0	4	-Error
5	Data bit 1	6	-Initialise
7	Data bit 2	8	-Select (input)
9	Data bit 3	10	Ground
11	Data bit 4	12	Ground
13	Data bit 5	14	Ground
15	Data bit 6	16	Ground
17	Data bit 7	18	Ground
19	-Acknowledge	20	Ground
21	Busy	22	Ground
23	Paper Empty	24	Ground
25	Select (Output)	26	Polarisation

3	Ground	4	+5 Volts (fused)
5	Mouse Clock		

**RS232 SERIAL PORT 2 P21 (2X5 WAY HEADER)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	-Data Carrier Detect	2	-Receive Data
3	-Transmit Data	4	-Data Terminal Ready
5	Ground	6	-Data Set Ready
7	-Ready To Send	8	-Clear To Send
9	-RI	10	Polarisation

**DUAL USB PORTS JP3 (2X5 WAY HEADER)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	USB VCC0	2	Ground
3	USB DATA0-	4	USB Ground1
5	USB DATA0+	6	DATA1+
7	USB Ground0	8	DATA1-
9	Ground	10	USB VCC1

**LCD PRIMARY CONNECTOR P11 (2X25 WAY 2MM HEADER)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	3.3v or 5v as selected	2	Vertical Sync
3	Switched +12 volts	4	Ground
5	Switched VEE	6	Horizontal Sync
7	Switched +5 volts	8	Ground
9	Switched +5 volts	10	General Purpose 1
11	Shift Clock	12	Ground
13	Line Clock	14	General Purpose 0
15	MOD	16	Ground
17	FLM (LCD equivalent of VSYNC)	18	Ground
19	Panel Data 0	20	Ground
21	Panel Data 1	22	Panel Data 23
23	Panel Data 2	24	Ground
25	Panel Data 3	26	Panel Data 22
27	Panel Data 4	28	Ground
29	Panel Data 5	30	Panel Data 21
31	Panel Data 6	32	Ground
33	Panel Data 7	34	Panel Data 20
35	Panel Data 8	36	Ground
37	Panel Data 9	38	Panel Data 19
39	Panel Data 10	40	Ground
41	Panel Data 11	42	Panel Data 18
43	Panel Data 12	44	Ground
45	Panel Data 13	46	Panel Data 17
47	Panel Data 14	48	Ground
49	Panel Data 15	50	Panel Data 16

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	Ground	2	Panel Data 35
3	Panel Data 24	4	Ground
5	Panel Data 25	6	Panel Data 34
7	Ground	8	Panel Data 33
9	Panel Data 26	10	Ground
11	Panel Data 27	12	Panel Data 32
13	Ground	14	Panel Data 31
15	Panel Data 28	16	Ground
17	Panel Data 29	18	Panel Data 30
19	Ground	20	Ground

*DIGITAL VIDEO OPTION **P23** (2X20 WAY 2MM HEADER)*

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	Ground	2	VP0
3	Ground	4	VP1
5	Ground	6	VP2
7	Ground	8	VP3
9	Ground	10	VP4
11	Ground	12	VP5
13	Ground	14	VP6
15	Ground	16	VP7
17	Ground	18	VP8
19	Ground	20	VP9
21	Ground	22	VP10
23	Ground	24	VP11
25	Ground	26	VP12
27	Ground	28	VP13
29	Ground	30	VP14
31	Ground	32	VP15
33	Ground	34	HREF
35	Ground	36	VREF
37	Ground	38	VRDY
39	Ground	40	Ground

*CD-AUDIO INPUT **P7** (4 WAY BOX SOCKET)*

Pin N°	Signal	Pin N°	Signal
1	CD Audio In Left	2	Audio Ground
3	CD Audio In Right	4	Audio Ground

*AUDIO CONNECTOR **P8** (2X5 WAY 2MM BOX SOCKET)*

Pin N°	Signal	Pin N°	Signal
1	Line In Left	2	Line In Right
3	Audio Ground	4	Audio Ground
5	Microphone In	6	Not Used
7	Audio Ground	8	Audio Ground
9	Line Out Left	10	Line Out Right

3	Ground	4	Polarisation
5	Ground	6	Rate
7	Ground	8	-Index
9	Ground	10	-Motor 0
11	Ground	12	-Drive select 1
13	Ground	14	-Drive select 0
15	Ground	16	-Motor 1
17	Ground	18	+Direction
19	Ground	20	-Step
21	Ground	22	-Write Data
23	Ground	24	-Write Gate
25	Ground	26	-Track 0
27	Ground	28	-Write Protect
29	Ground	30	-Read Data
31	Ground	32	+Head Select
33	Ground	34	+Disk Change

**RS485 SERIAL PORT 2 P14 (2X5 WAY HEADER)**

PIN NO.	SIGNAL	PIN NO.	SIGNAL
1	+Rx FDX	2	+Term. 10 K to +5V
3	-Rx FDX	4	No Connect
5	+Tx FDX, +Rx/+Tx HDX	6	No Connect
7	-Tx FDX, -RX/-Tx HDX	8	Polarisation
9	-Term. 10 K to Gnd	10	No Connect

**IRDA CONNECTOR JP5 (5 WAY HEADER)**

Pin N°	Signal
1	VCC
2	Polarisation
3	RRX
4	Ground
5	RTX

**BATTERY CONNECTOR P1 (4 WAY HEADER)**

Pin N°	Signal
1	+3.6 Volts DC
2	Polarisation
3	Ground
4	Ground

**FAN POWER CONNECTOR J19 (2 WAY HEADER)**

2	Polarisation
3	Enable VEE
4	Switched VEE (to LCD connector)
5	Ground

**POWER CONNECTOR J20 (4 WAY)**

Pin N°	Signal
Standard 5.25" Disk Drive Connector	+5 Volts DC
	0 Volts
	0 Volts
	+12 Volts DC (Only required for Ethernet and audio).

**UTILITY CONNECTOR P16 (2X10 WAY HEADER)**

PIN N°	SIGNAL	PIN N°	SIGNAL
1	Speaker +ve	2	Speaker -ve
3	Reset +ve	4	Reset -ve (Ground)
5	NU	6	NU
7	Keylock +ve	8	Keylock -ve (Ground)
9	Power LED +ve	10	Power LED -ve (Ground)
11	External SMI +ve	12	External SMI -ve (Ground)
13	IDE LED +ve	14	IDE LED -ve
15	+5V limited current	16	0 Volts (Ground)
17	External Battery	18	0 Volts Battery (Ground)
19	Keyboard Data	20	Keyboard Clock

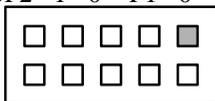
**COAST CACHE CONNECTOR P3**

This is an industry-standard connector for **Cache On A Stick**. The COAST connector is a 160-pin socket which is designed to prevent reversed fitting of the cache module.

Please note that each cache module is designed specifically for each chipset i.e. there are cache modules specific to the 430HX Triton chipset. The available options for ATOM cache are 256kbyte asynchronous, 256 or 512KByte of synchronous Pipeline burst, or none.

**SPEED SETTING JP6**

BF2 1 0 F1 0



Pin 1

0 = Jumper present

1 = Jumper absent

0	1	66MHz	33MHz
1	1	Not allowed	-

Common Processor multiplier jumper settings

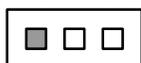
BF2	BF1	BF0	P	MMX	C6	K6(-2)[0:7]	K6(-2)[F:8]
0	0	0			-	4.5	4.5
0	0	1			5	5	5
0	1	0			4	4	4
0	1	1			-	5.5	5.5
1	0	0	2.5	2.5	-	2.5	2.5
1	0	1	3	3	3	3	3
1	1	0	2	2	2	2	6
1	1	1	1.5	3.5	4	3.5	3.5

Internal CPU speed from Host Bus Speed

Multiplier	50MHz	60MHz	66MHz
1.5	75	90	100
2	100	120	133
2.5	125	150	166
3	150	180	200
3.5	175	210	233
4	200	240	266
4.5	225	270	300
5	250	300	333
5.5	275	330	366
6	300	360	400

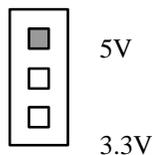
**CMOS CLEAR J1**

Normal    Clear



■ = Pin 1

**PANEL SUPPLY J21**



J1/J21: Link two pins as appropriate **without** power applied. Orientations as in diagrams of board outline p17.  
BUS Connectors





## **ERROR MESSAGES**

### ***ERROR BEEP CODES***

The BIOS performs a **Power On Self Test (POST)** after a reset or reboot. If errors occur during the POST, the microprocessor indicates the status of the test by writing codes to the I/O port at address 80 Hex.

Some of the fatal errors produce audible codes which indicate the source of the problem. For a list of these refer to the BIOS user manual.