Contents

Introduction

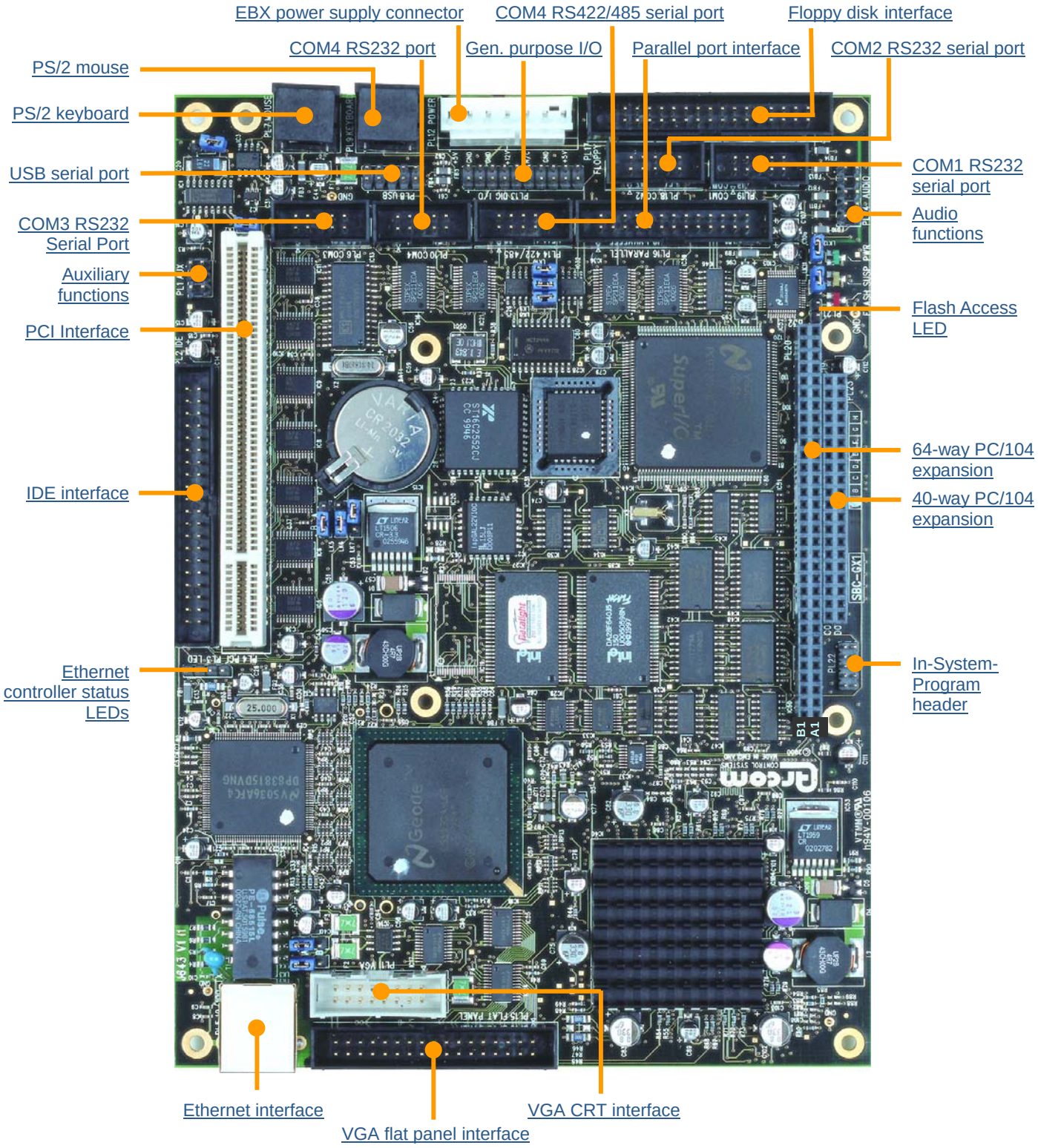
The SBC-GX1 is a high-performance, high-functionality multimedia PC/AT compatible processor board designed to be embedded into OEM equipment. It contains all the standard features found in a PC/AT system with some embedded and multimedia additions. These include silicon disk drive, 10/100 Base-T Ethernet, 16-bit SoundBlaster, PC/104 bus, PCI bus, CompactFlash socket, MMX-enhanced CPU and high performance Flat Panel VGA controller.

Once you have completed development the board can be purchased in the following standard variants:

- SBC-GX1-M0-F0 AMD Geode™ GX1 300MHz CPU, No DRAM, No Flash
- SBC-GX1-M32-F0 AMD Geode™ GX1 300MHz CPU, 32M DRAM, No Flash
- SBC-GX1-M0-F16 AMD Geode™ GX1 300MHz CPU, No DRAM, 16M Flash
- SBC-GX1-M32-F16 AMD Geode™ GX1 300MHz CPU, 32M DRAM, 16M Flash.

The SBC-GX1 can also be supplied with other DRAM options up to 256MB. Please contact Arcom for details.

SBC-GX1 'at a glance'



Features

CPU

- AMD Geode™ GX1 300MHz MMX-enhanced processor.

Chipset

- AMD CS5530A I/O Companion.

Cache

- 16K L1 write-back cache.

BIOS

- Award Software PCI Plug and Play BIOS or General Software Embedded BIOS 2000.
- On-board reprogramming.

System memory

- Up to 256MB un-buffered 3.3V SDRAM (144-pin SODIMM).

Silicon disk

- Up to 16MB Intel StrataFlash.
- Datalight FlashFX Flash filling system.

Video

- National Geode XpressGraphics™.
- 1MB – 4MB shared memory.
- XVGA for CRT and Flat Panel displays.
- 32-bit PCI local bus interface.
- VGA BIOS integrated into system ROM.
- Simultaneous CRT and Flat panel display.

Integrated I/O

- National Semiconductor NS97317 with built-in Real Time Clock and Keyboard controller.

Audio

- XpressAUDIO™ 16-bit SoundBlaster compatible.
- National Semiconductor LM4548 CODEC.
- Line IN, Line OUT and Microphone.

Enhanced IDE

- Bus Mastering mode, up to two devices.
- Supports PIO Mode 4 and Ultra DMA/33 Hard Disk and ATAPI CD-ROM Interface.
- Supports two floppy drives 360KB, 720KB, 1.2MB, 1.44MB, 2.88MB.

Parallel port

- High speed parallel port SPP/EPP/ECP mode.
- BIOS Configurable.

Serial ports

- Four 16C550 compatible high speed UARTs.
- 3 x RS232 and 1 x RS232/422/485 Interfaces.

USB interface

- Two Universal Serial Bus (USB) interfaces.
- USB 1.0 Compliant.

Network support

- National Semiconductor DP83815 10/100-BASETX Ethernet controller.
- 32-bit PCI interface.

Expansion

- PC/104 expansion bus - 8/16 bit ISA bus compatible interface.
- 33MHz +5V PCI Interface.

Software compatibility

- Datalight ROM-DOS operating system licence supplied with each board (if flash memory is fitted).
- Windows 98/NT/CE/2000/XP/Embedded NT, Linux, QNX, VxWorks.
- Other x86 compatible software applications.

Size

- EBX Compatible footprint 5.75” x 8.00” (146mm x 203mm).

Handling your board safely

Anti-static handling

This board contains CMOS devices that could be damaged in the event of static electricity discharged through them. At all times, please observe anti-static precautions when handling the board. This includes storing the board in appropriate anti-static packaging and wearing a wrist strap when handling the board.

Battery

The board contains a Lithium non-rechargeable battery. Do not short circuit the battery or place on a metal surface where the battery terminals could be shorted. During shipment the battery is isolated from the boards circuitry and should be connected before using the board, please refer to the link section of this manual for details.

When disposing of the board or battery, take appropriate care. Do not incinerate, crush or otherwise damage the battery.

Packaging

Please ensure that should a board need to be returned to Arcom, it is adequately packed, preferably in the original packing material.

Electromagnetic compatibility (EMC)

The SBC-GX1 is classified as a component with regard to the European Community EMC regulations and it is the users responsibility to ensure that systems using the board are compliant with the appropriate EMC standards.

Conventions

The following symbols are used in this guide:

Symbol	Explanation
	Note - information that requires your attention.
	Tip - a handy hint that may provide a useful alternative or save time.
	Caution – proceeding with a course of action may damage your equipment or result in loss of data.
	Jumper fitted on pin A.
	Jumper fitted on pin B.
	Jumper is fitted.
	Jumper is not fitted.

Getting started with your SBC-GX1

The Development Kit contains a ‘Quickstart’ manual. You should read this manual for information about setting up and starting to use the SBC-GX1 board. Once you have completed this task you will have a working SBC-GX1 system and can start adding other peripherals to enable you to start development.

In this section we guide you through setting up and using some of the features of the SBC-GX1. If you would like more detailed information on any aspect of the board refer to the Detailed hardware description section beginning on page 62.

The SBC-GX1 uses an Award Software PCI BIOS (Basic Input-Output System) to provide support for the board as standard. The BIOS has a built-in setup program that you use to modify the basic system configuration. The setup program can be started during the power on sequence by pressing the **DEL** key when prompted or by pressing **CTRL** – **ALT** – **ESC**. The setup parameters are stored in the CMOS RAM and are retained when the power is switched off, providing the battery backup supply is connected (see Jumpers and connectors, page 18, for details).

The BIOS defaults have been selected to enable the board to operate with a minimum of devices connected. If CMOS settings are lost the board will correctly power up and boot from the on-board flash disk (if present), without any other peripherals connected.

In order to support Windows CE. NET and Windows XP Embedded, the SBC-GX1 uses a General Software Embedded BIOS 2000. Throughout this manual there are references to the Award BIOS If your board is using the General Software BIOS, see the section General Software Embedded BIOS 2000 on page 42 for configuration information.

CPU configuration

The SBC-GX1 board has been specifically designed to support AMD’s Geode™ GX1 MMX – Enhanced processor. The appropriate voltage and speed selections are configured during the assembly process - no user configuration required. The CPU is fitted to the board during assembly and is supplied ‘ready to run’.

Installing memory

The SBC-GX1 supports a single 144-pin SODIMM (Small Outline Dual In-line Memory Module). If your board was supplied without any memory fitted (M0 variant) or you wish to upgrade your memory, then you need to source a standard un-buffered 3.3V SDRAM module that conforms to either the PC100 or PC133 specifications. The SBC-GX1 supports 16MB, 32MB, 64MB, 128MB and 256MB modules.

No link settings are required to enable the board to support different memory sizes. The BIOS automatically detects the memory and configures the board appropriately. Always ensure that the power is switched off before attempting to insert a memory module. The

module should be inserted in the DIMM1 socket (on the underside of the board) in an ESD safe area, and you should be wearing an earth strap or touching a grounded surface to protect the device. The memory module is designed to ensure that it can only be plugged in with the correct orientation. If the module does not fit, check the key locations and ensure the memory is the correct type.

The memory module should be inserted into the socket at a 45 degree angle. Once fully pushed into the socket the module can be pressed down towards the board. The tabs on the socket automatically latch over the module and secure it in place. Removal of the memory is achieved by gently pulling the two tabs sideways. The module will release and can then be removed easily.

Once power is applied to the board, the BIOS automatically configures the memory. During the memory check, a message is displayed show the amount of DRAM found.

Connecting a floppy disk drive

The SBC-GX1 supports up to two standard floppy disk drives. These can be connected to PL17 via a 34 way twisted ribbon cable. Both disk drives should be configured to use drive select 1. Drive A: should be connected via a twisted cable and drive B: via a straight cable. The BIOS default configuration assumes that a 1.44MB floppy disk is connected as drive A:. If you require a different configuration you must configure the BIOS using the setup utility – see Award BIOS setup on page 25 for details.

In order to support two floppy disk drives at the same time the 34 way cable should be fitted with three connectors. The board connector and one of the drive connectors should be fitted 1:1 and the third connector should have a twist in the cable which swaps pins 10 to 16 on this connector.

Connecting a hard disk drive

Up to two IDE hard disk drives can be supported by the SBC-GX1. Both drives should be connected to PL2 via a 40 way 1:1 ribbon cable. The primary drive should be setup as a ‘master’ and the secondary drive as a ‘slave’. The BIOS automatically detects the hard disk drive during the POST processes and configures the hardware correctly. The BIOS attempts to load an operating system from the primary disk drive which becomes drive C: once the operating system has loaded. If the board is fitted with flash memory and this has been formatted as a silicon disk drive, then it will be allocated drive D:. The secondary drive will be allocated the next available drive letter.

Connecting a CD-ROM (IDE Type)

If a CD-ROM drive is required in the system, it may be connected in place of the secondary drive detailed above. The CD-ROM should be configured as a ‘slave’ device. Drivers are required to support the drive under DOS. If a bootable CD is inserted in the drive the BIOS can be configured to automatically boot from this CD. See the BIOS features setup section beginning on page 31 for details.

Using the CompactFlash socket

The SBC-GX1 has a Type II CompactFlash socket mounted on the underside of the board. This socket is connected to the secondary IDE controller. The socket supports both Type I and Type II CompactFlash cards. If a CompactFlash card is plugged into the socket it acts as a normal hard disk drive and is detected by the BIOS during the POST process. If the card has an operating system loaded and there are no standard hard disk drives connected the board boots from the CompactFlash card and this becomes drive C:.

The CompactFlash card can only be inserted into the socket one way. The correct orientation is for the top of the card i.e. the normal printed side to be closest to the PCB.

Connecting a mouse

A PS/2 mouse can be connected to PL9. A suitable mouse is supplied as part of the development kit and a driver has been included on the support CD to enable this mouse to be used under DOS. Windows 98/2000/NT/XP provides mouse support via built-in drivers.

Using the serial interfaces (RS232)

The four serial port interfaces on the SBC-GX1 are fully PC compatible. These are decoded at standard PC address locations for COM1, COM2, COM3 and COM4. PC applications can use these ports without any special configuration. COM3 and COM4 can use non-standard IRQ lines, which enables all four ports to have an individual IRQ assigned. See the Jumpers and connectors section, page 18, for details.

Connection to the serial ports is via a 10-way boxed header. The pin assignment of these headers is arranged to enable a 9-way IDC D-Type Plug to be connected directly to pins 1-9 on the cable. The D-Type connector is compatible with the standard 9-way connector on a desktop machine. A suitable cable is provided in the development kit. See Appendix B – Connector details for pin details.

Connecting a printer

An enhanced printer port is incorporated onto the SBC-GX1. This port can be used to support a Centronics-compatible printer or ECP/EPP bi-directional device. The signals are routed to a 26-way boxed header and the pin assignment has been arranged to allow 1:1 connection with a 25-way IDC D-Type socket. This socket is compatible with a standard printer port connector on a desktop machine. See Appendix B – Connector details for pin details.

Using the audio features

There are three audio interfaces supported on the SBC-GX1: line in, line out and microphone. the line in and line out interfaces support stereo signals and the microphone provides a mono input. Connections are routed to a 10-way boxed header PL24. The relevant signals for each interface are shown in Appendix B – Connector details.

The standard connector for these signals is a 3.5mm stereo jack.

The audio device is a 16-bit SoundBlaster compatible interface. The BIOS provides the user the ability to configure the I/O address, IRQ and DMA settings for this device. This enables it to be used with existing Soundblaster-16 applications. The audio features are supported by installable device drivers under Windows 98/NT/2000/XP (see the Operating System drivers section, beginning on page 54, for details).

Settings are configured in the BIOS as default. These can be modified during POST using the setup utility. See 16-bit SoundBlaster, page 74 for details.

If you are using Windows you must install the audio drivers before these features can be used. The drivers enable the standard Windows add on to access the SBC-GX1 audio functions.

Using the flat panel interface

AMD's CS5530, used on the SBC-GX1, supports an 18-bit TFT flat panel display interface as well as a conventional CRT monitor. Flat panel support is configured using the *Integrated Peripherals* option within the Setup utility. See page 39, for details.

The default BIOS for the SBC-GX1 sets the output to simultaneous CRT and flat panel display. This ensures that you can plug in a standard PC style monitor and start using the board straight away. The default BIOS can be used to drive a color 640 x 480 6.5" NEC TFT flat panel part number NL6448BC20-08. This panel is supplied in the flat panel variant of the SBC-GX1 development kit. The development kit also contains the associated cable to enable connection of the display.

If you wish to use this display then connect it to the SBC-GX1 via the flat panel interface connector PL15.

The BIOS has built-in support for other display resolutions and these can be selected using the BIOS setup menus. If you need further information regarding other flat panels supported by the SBC-GX1 contact Technical Support. See page 82 for details.

Using the PC/104 expansion bus

PC/104 modules can be used with the SBC-GX1 to add extra functionality to the system. This interface supports 8/16 bit ISA bus style peripherals.

Arcom has a wide range of PC/104 modules which are compatible with the SBC-GX1. These include modules for digital I/O, analog I/O, motion control, video capture, CAN bus, serial interfaces etc. Please contact Arcom sales (see page) if a particular interface you require does not seem to be available as these modules are continually being developed. Other manufacturers boards can also be used with this interface if they conform to the PC/104 specification.

In order to use a PC/104 board with the SBC-GX1 it should be plugged into PL20 for 8-bit cards and PL20/PL23 for 16-bit cards. Before powering up the system ensure that

you have checked that the link settings on the card for I/O address, IRQ and DMA settings do not conflict with any devices on the SBC-GX1.

If you are using a PC/104 card that requires +5V, this is automatically supplied via the PC/104 header. If you require +12V this is only available if the +12V pin on the power connector PL12 has been connected to a supply. If you require –12V or –5V these must be supplied directly to the PC/104 board.

Using the USB ports

The Universal Serial Bus (USB) controller is disabled by default. To enable this feature you use the *Chipset features setup* option within the Setup utility - see page 34 for details. Once this device has been enabled, the PCI Plug and Play BIOS sets up the control registers and the device is available for use. The standard USB connector is a 4-way socket, which provides power and data signals to the USB peripheral. The 10-way header (PL8) has been designed to be compatible with PC expansion brackets that support two USB sockets (See the USB interface section on page 75 and Appendix B – Connector details for further details.)

The USB device should be supplied with a driver that must be installed to enable the device to be used. (Refer to the documentation supplied with the device.) Most USB peripherals are only supplied with drivers for Windows 98/2000/XP operating systems. If you are not using one of these operating systems then you will need to investigate the availability of drivers.

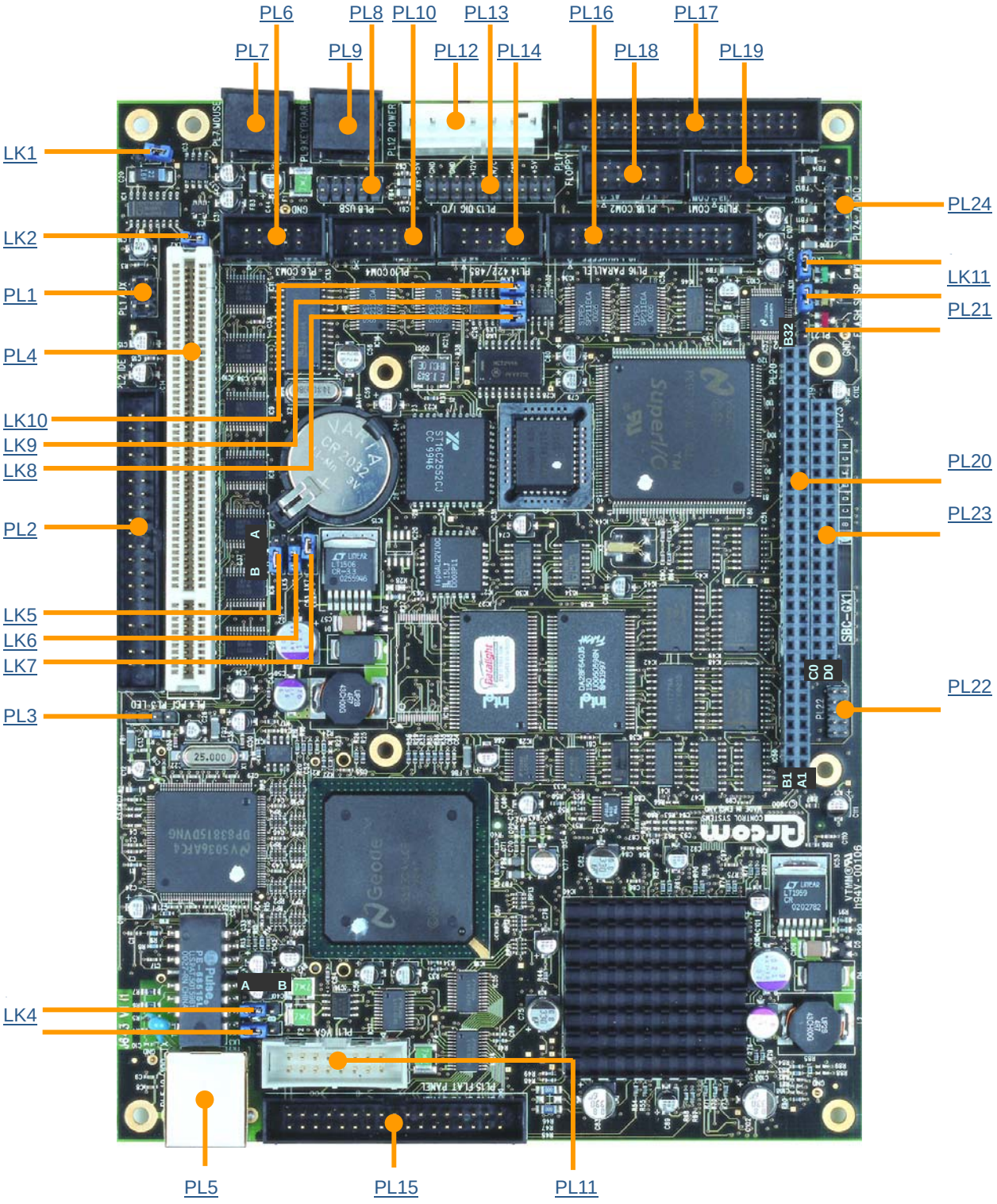
Using the Ethernet interface

National Semiconductor’s DP83815 Ethernet controller is configured by the Award Plug and Play BIOS during the POST process. Drivers for various operating systems are supplied on the support CD. The appropriate driver must be loaded before the Ethernet interface can be used.

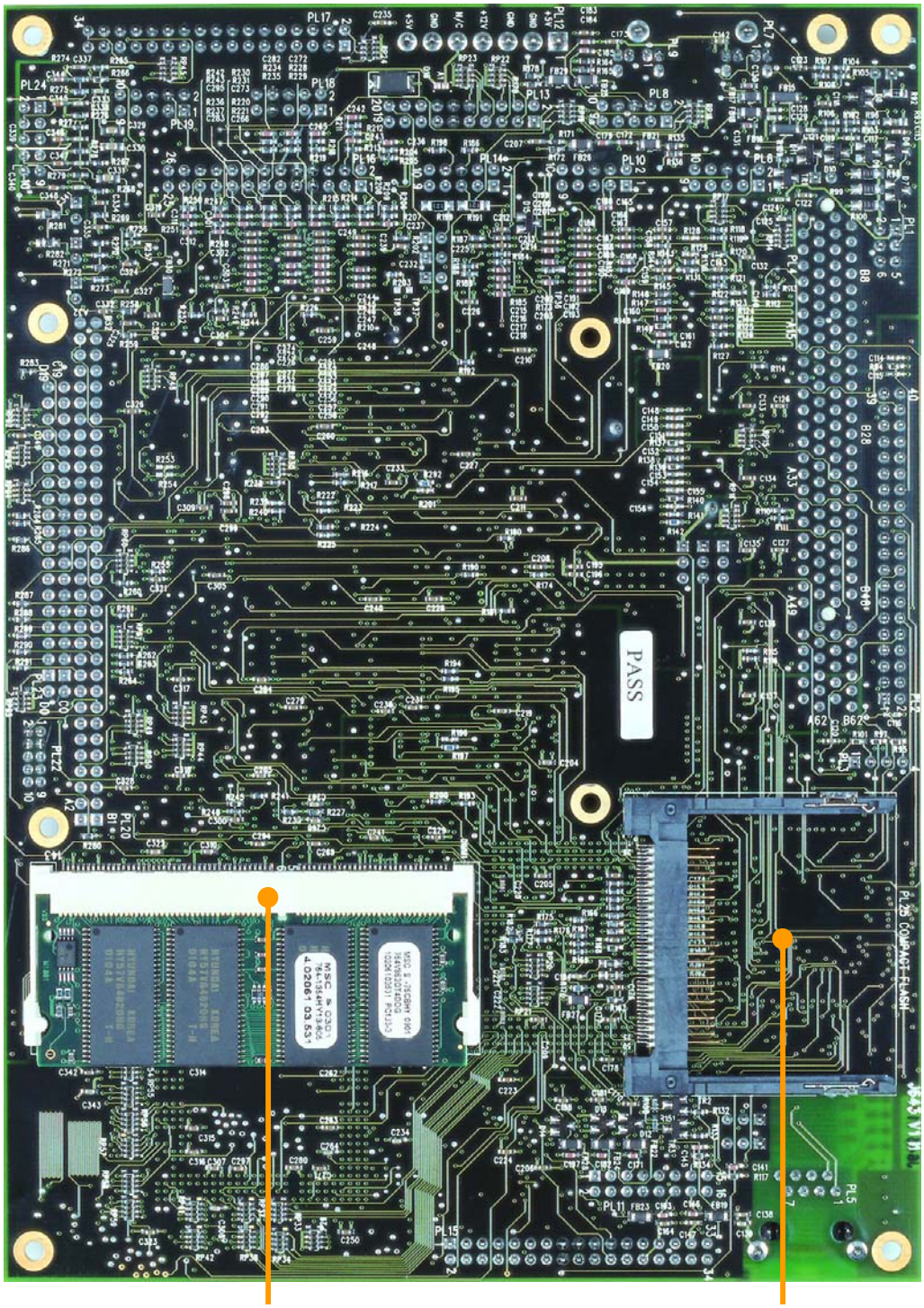
Connection is made via the 8 way RJ45 connector PL5. A second connector PL3 provides outputs that can be used to control LED's for 10M, 100M and LINK status. See Appendix B – Connector details for pin assignments for this connector.

Jumpers and connectors

The following diagram shows the jumpers and connectors on the front of the SBC-GX1. Click on any jumper or connector for information.



The following diagram shows the connectors on the back of the SBC-GX1:



Jumpers

There are twelve user-selectable jumpers on the SBC-GX1. Further details are provided about each of these below. The diagram indicates the default position for each link.

Jumper	Description
LK1	Watchdog timer timeout selection
LK2	Watchdog timer enable
LK3	LCD backlight supply voltage
LK4	LCD panel power supply voltage
LK5	COM4 IRQ routing
LK6	COM3 IRQ routing
LK7	Clear CMOS/battery disable
LK8, LK9, LK10	RS485/422 configuration
LK11, LK12	User jumpers

LK1 – Watchdog timer timeout selection

The watchdog timer has two pre-configured timeout delays: 2 or 8 seconds. This link is used to choose the timeout period you require.

LK1	Description
	2 second timeout.
	8 second timeout.

Default setting: 

LK2 – Watchdog timer enable

Used to enable/disable the watchdog function. When the link is in the enabled position, the watchdog timer can be started by writing to I/O location 93H. See the Watchdog timer section, page 74, for further details.

LK2	Description
	Enabled
	Disabled

Default setting: 

LK3 – LCD backlight supply voltage

Used to select the LCD backlight supply voltage (BLKSAFE). There are two options available: +5V or +12V.

LK3	Description
	+5V backlight
	+12V backlight

Default setting: 

If +12V is selected, this voltage must be supplied from an external source via the power connector PL12 pin 4.

LK4 – LCD panel power supply voltage

Used to select the LCD panel power supply voltage (VDDSAFE). There are two options available: +5V or +3.3V.

LK4	Description
	+5V supply
	+3.3V supply

Default setting: 

LK5 – COM4 IRQ routing

Used to select which IRQ signal is connected to the COM4 serial port.

LK5	Description
	IRQ3
	IRQ10

Default setting: 

LK6 – COM3 IRQ routing

Used to select which IRQ signal is connected to the COM3 serial port.

LK6	Description
	IRQ4
	IRQ11

Default setting: 

LK7 – Clear CMOS/battery disable

A battery link is fitted that is used to prevent drain on the battery during shipment. This link can also be used to clear the contents of the CMOS RAM.

LK7	Description
	Battery backup enabled
	Battery backup disabled. (CMOS RAM cleared.)

Default setting: 

LK8, LK9 and LK10 – RS485/422 configuration

These jumpers are used to configure the RS485/422 serial interface. They can be used to enable/disable the RS485 receive buffer and RS485/422 line termination. See the section RS422/485 interfaces, page 78, for more details.

LK8	Description
	RS485 receiver enabled.
	RS485 receiver disabled.

Default setting: 

LK9	Description
	RS485 termination resistor connected.
	RS485 termination resistor disconnected.

Default setting: 

LK10	Description
	RS422 termination resistor connected.
	RS422 termination resistor disconnected.

Default setting: 

LK11 & LK12 – User jumpers

These two jumpers are user-configurable. They have no function on the SBC-GX1, but can be used by an application program to signify a configuration setting. The position of these jumpers can be read via the special function I/O register at address 259H. See the section User Jumpers, page 75, for further details.

LK11	Description
	Bit 1 of 259H ‘Logic 1’.
	Bit 1 of 259H ‘Logic 0’.

Default setting: 

LK12	Description
	Bit 2 of 259H ‘Logic 1’.
	Bit 2 of 259H ‘Logic 0’.

Default setting: 

Connectors

There are twenty five connectors on the SBC-GX1 that let you connect external devices such as keyboards, floppy disk drives, hard disk drives, printers etc. Detailed pin assignments are shown in Appendix B – Connector details.

Connector	Description
PL1	Auxiliary Functions
PL2	IDE Interface
PL3	Ethernet Controller Status LED's
PL4	PCI Interface
PL5	Ethernet Interface
PL6	COM3 RS232 Serial Port
PL7	PS/2 Keyboard
PL8	USB Serial Port
PL9	PS/2 Mouse
PL10	COM4 RS232 Serial Port
PL11	VGA CRT Interface
PL12	EBX Power Supply Connector
PL13	General Purpose I/O
PL14	COM4 RS422/485 Serial Port
PL15	VGA Flat Panel Interface
PL16	Parallel Port Interface
PL17	Floppy Disk Interface
PL18	COM2 RS232 Serial Port
PL19	COM1 RS232 Serial Port
PL20	64-way PC/104 Expansion
PL21	Flash Access LED
PL22	In-System-Program header
PL23	40-way PC/104 Expansion
PL24	Audio Functions
PL25	CompactFlash socket (on the underside of the board)

Award BIOS setup

The SBC-GX1 is normally supplied with an Award Software BIOS. This section explains how to use the CMOS Setup Utility to modify the Award BIOS configuration.

In order to support Windows CE. NET and Windows XP Embedded, the SBC-GX1 requires a General Software Embedded BIOS 2000. If your board is using the General Software BIOS, see page 42 for setup information.

To launch the CMOS Setup Utility:

1. Turn on the computer. The Power On Self Test (POST) routine then starts. A short while into this routine the following message is displayed:

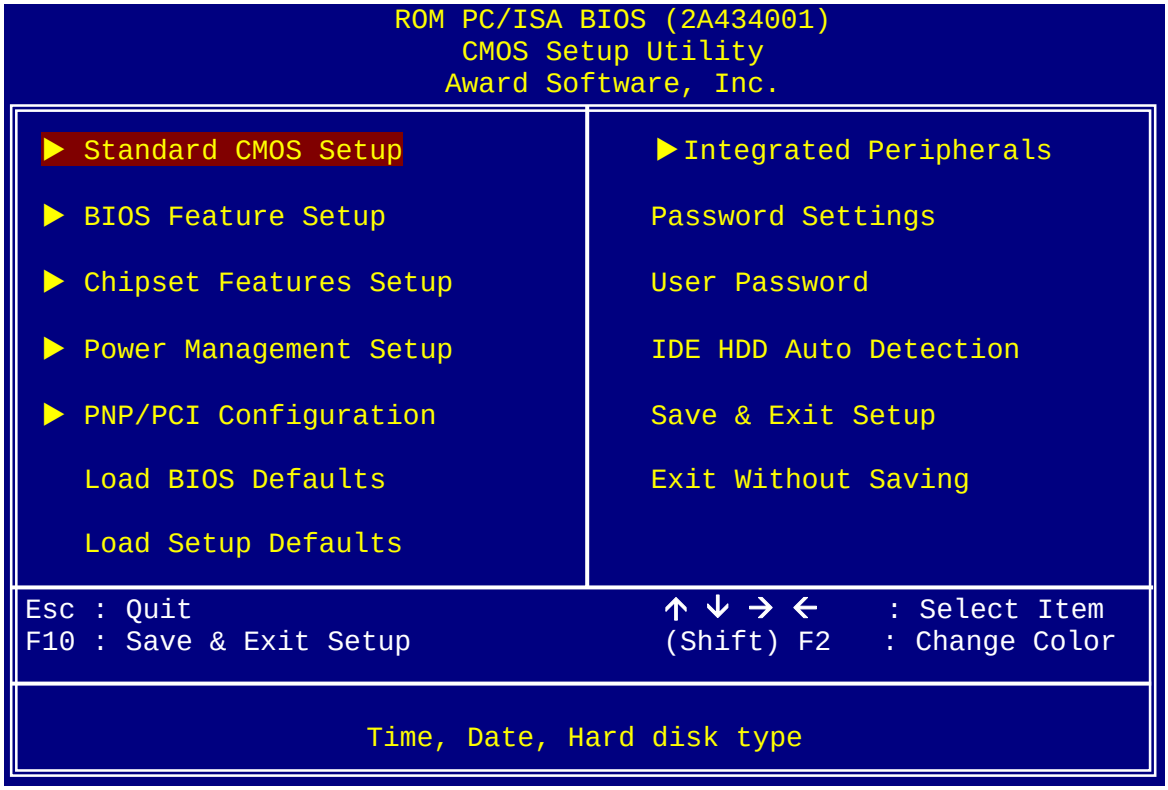
   ```
   Press DEL to enter SETUP
   ```

2. Press either the **Del** key or the **Ctrl**, **Alt**, and **Esc** keys simultaneously.

   If the message disappears before you respond and you still wish to enter setup, restart the computer to try again by pressing the ‘reset’ button, turning it off and back on, or pressing the **Ctrl**, **Alt**, and **Del** keys simultaneously.

The Main menu

When you launch the Award BIOS CMOS Setup Utility, the *Main Menu* is displayed:



Use arrow keys to highlight the item you require and press **Enter** to select it. The options available are summarized in the following table:

Option	Explanation
Standard CMOS Setup	Used to configure the items in a standard compatible BIOS. See page 30.
BIOS Features Setup	Used to configure the Award special enhanced features. See page 31.
Chipset Features Setup	Used to configure the chipset special features. See page 34.
Power Management Setup	Provides a range of 'green' functions, e.g. to set when the monitor and hard disk drive will timeout. See page 36.
PnP/PCI Configuration Setup	Used to assign DMA and IRQ signals. See page 38.

continued…

Option	Explanation
Load BIOS Defaults	Used to revert to the original factory-assigned BIOS settings. These are the most stable values for the system. Use them if the system is performing erratically due to hardware problems. When you select this option you are prompted: `Load BIOS Default (Y/N) ?N` Enter **Y** to replace you current settings with the BIOS defaults.
Load Setup Defaults	Used to revert to the setup default values. These are the 'best case' values for the system, and should provided optimum system performance. When you select this option you are prompted: `Load Setup Default (Y/N) ?N` Enter **Y** to replace you current settings with the Setup defaults.
Integrated Peripherals	Used to configure the IDE hard drive and programmed input / output features. See page 39
Password Settings	In the *BIOS Features Setup*, you can specify that a password is required every time the system is rebooted, and/or to enter the Setup utility. (You do this using the *Security Option* - see page 31 for details.) If a password is required, you can use this option to set and change the password that must be entered. You are prompted: `Enter password:` Enter the password you require using up to eight characters, and confirm it when prompted. You can cancel this process at any time by pressing **Esc**. The new password overwrites any password previously used.
IDE HDD Auto Detection	Used to automatically configure hard disk parameters. When you select this option, auto-detection starts. Details of the first hard disk drive are displayed, and you are prompted: **`Do you accept this drive C: (Y/N)?`** To save the details detected, enter **Y**. The system then searches for further hard disks. Alternatively, press **N** to continue without saving the details.
Save & Exit Setup	Saves any changes you have made to the CMOS, and exits the CMOS Setup Utility.
Exit Without Saving	Cancels any changes you have made to the CMOS, reverting to the previous settings, and exits the CMOS Setup Utility.

Please note the following:

- A description of the option currently highlighted is displayed at the bottom of the screen.
- You can press **F1** to pop up a help window listing the keys available and the selections that can be made for the highlighted item. Press **Esc** to close this window.
- The BIOS settings are stored in battery-backed RAM that retains information when the power is turned off.

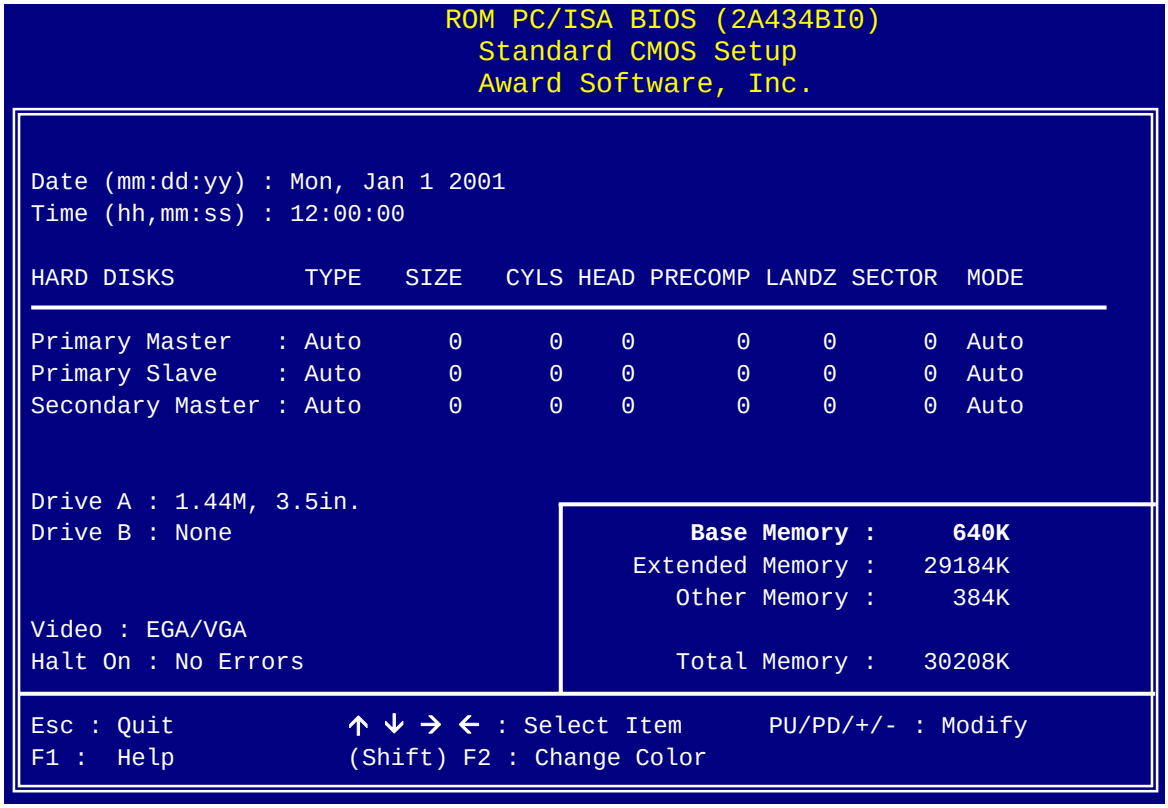
Control keys

The following keys are available while using the Award BIOS CMOS Setup utility:

Key	Explanation
↑	Moves to previous item.
↓	Moves to next item.
←	Moves to the item on the left.
→	Moves to the item on the right.
Esc	In the Main menu, quits without saving changes to CMOS. In the Standard CMOS setup menu, returns you to Main menu.
Page Up	Increases the numeric value or make changes.
Page Dn	Decreases the numeric value or make changes.
F1	Displays general help. This is only available in the Standard CMOS setup menu and the Main menu.
F2	Changes the color from total 16 colors.
F3	Displays a calendar. This is only available in the Standard CMOS setup menu.
F4	Reserved.
F5	Restores the previous CMOS value from BIOS. This is only available in the Main menu.
F6	Loads the default CMOS value from BIOS default table. This is only available in the Main menu.
F7	Loads the default.
F8	Reserved.
F9	Reserved.
F10	Saves all CMOS changes. This is only available in the Main menu.

Standard CMOS setup

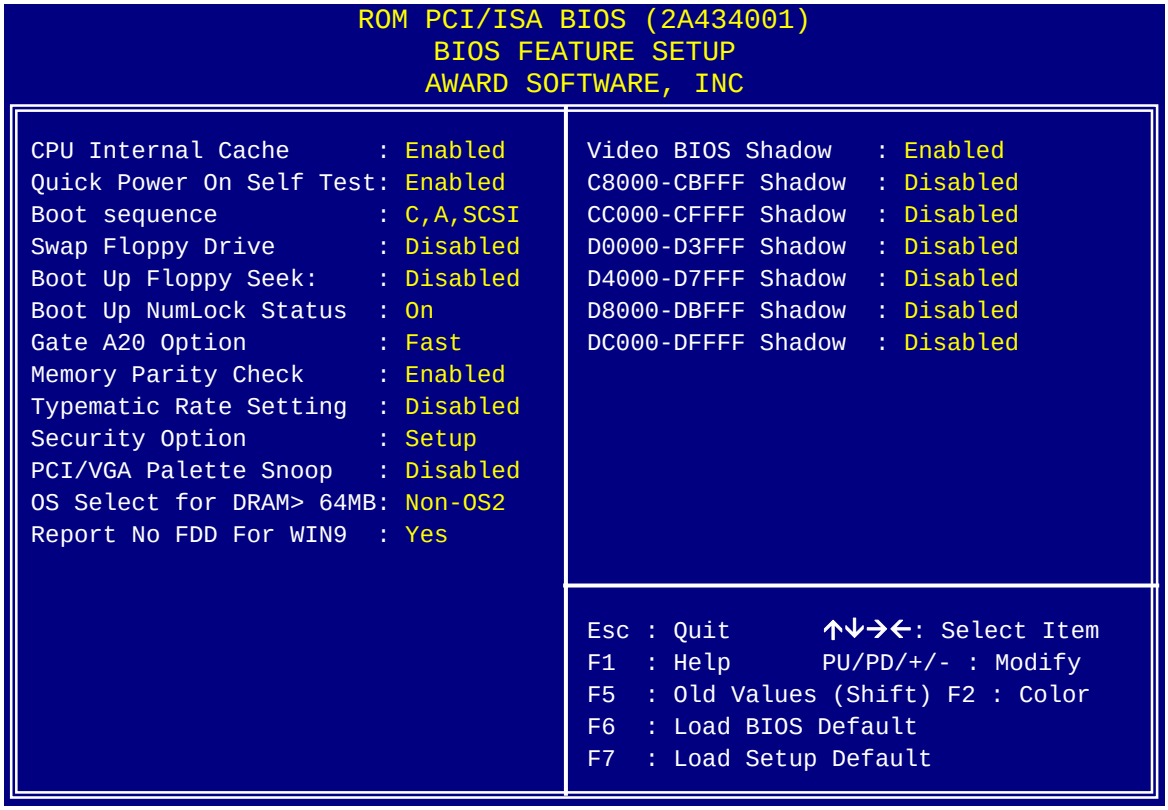
The items in the Standard CMOS Setup Menu are divided into several categories, each of which contains one or more than one setup item.



Use the arrow keys to highlight the item you want to change, and then use the **Page Up** and **Page Down** keys to select the value you want.

BIOS features setup

The options in the *BIOS Feature Setup* screen let you configure the BIOS features:



The following table explains the settings you can choose:

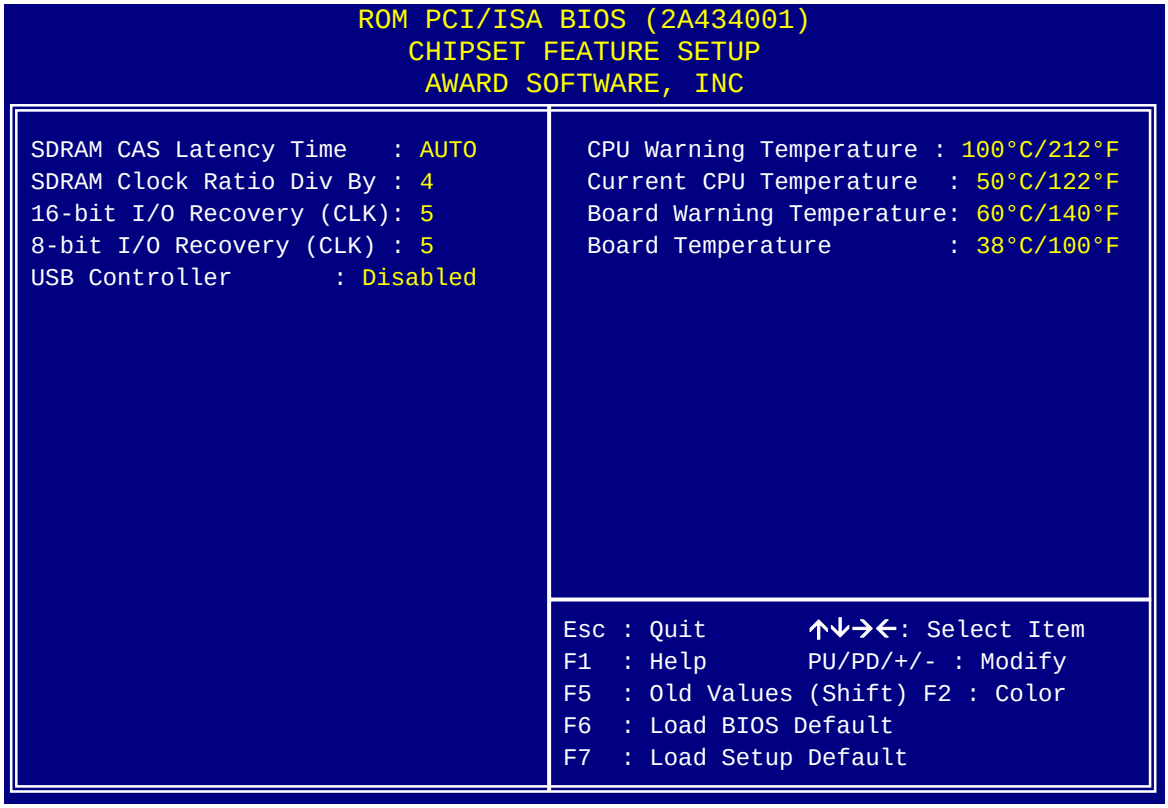
Field	Explanation
CPU Internal Cache	Depending on the CPU/chipset design, enabling this option can speed up memory access. The default value is 'enabled'.
Quick Power On Self Test	If set to 'Enable', some of the checks in the Power On Self Test (POST) are skipped, speeding up the procedure.
Boot Sequence	Determines the sequence in which the computer searches for the hard disk operation system (e.g. DOS).
Swap Floppy Drive	Users can enable this item so that BIOS will see the hardware 'Drive A:' as 'Drive B:', and 'Drive B:' as 'Drive A:.
Boot Up Floppy Seek	Choose whether a test is carried out during the Power On Self Test (POST), to determine whether the floppy disk drive installed supports 40 or 80 tracks. 360K drives support 40 tracks while 720K , 1.2M and 1.4M drives support 80 tracks.
Boot Up NumLock Status	The keypad keys on the keyboard can generate numbers or arrows, depending on whether the NumLock is turned on or off. The choice you make here determines the initial setting each time the computer is turned on. The default value is 'On', which means that the keypad keys will generate numbers.
Gate A20 Option	This option controls the way the A20 line is used on the SBC-GX1.The default setting is fast, which is the optimum setting for this board.
Memory Parity Check	Enables Parity checking on the main system memory. This option can only be enabled if the memory module fitted supports the extra parity bits.
Typematic Rate Setting, Typematic Rate (Chars/Sec), Typematic Delay (Msec)	Select 'Enable' to specify typematic rate settings. You can choose: • The Typematic Rate. This is the rate at which characters are generated, i.e. displayed on screen, when a key is pressed and held down. The options available are: 6, 8, 10, 12, 15, 20, 24 or 30 characters per second. • The Typematic Delay. This is the time, when holding a key, between the first and second character being displayed. The options available are: 250, 500, 750 and 1,000 msec.

continued…

Field	Explanation
Security Option	Lets you limit access to either the system and the Setup utility, or just the Setup utility. Choose: • *System* – you must enter a password before the system will launch, or to enter the Setup utility. • *Setup* – you must enter a password to enter the Setup utility.  To subsequently disable security select *Password Settings* at the *Main Menu*, leave the password blank, and press **Enter**.
PCI/VGA Palette Snoop	Enables access to the VGA palette via the PCI bus memory space.
OS Select for DRAM> 64MB	Enables the OS to access memory above 64MB.
Video BIOS Shadow	Determines whether video BIOS will be copied to RAM, increasing video speed.
C8000-CBFFF Shadow/DC000-DFFFF Shadow	Determines whether each 16KB block of upper memory is shadowed into main system memory. Shadowing copies to contents of ROM into Ram which provides a faster execution speed.

Chipset features setup

The *Chipset Feature Setup* menu is optimized for the SBC-GX1 board. The following options are available:



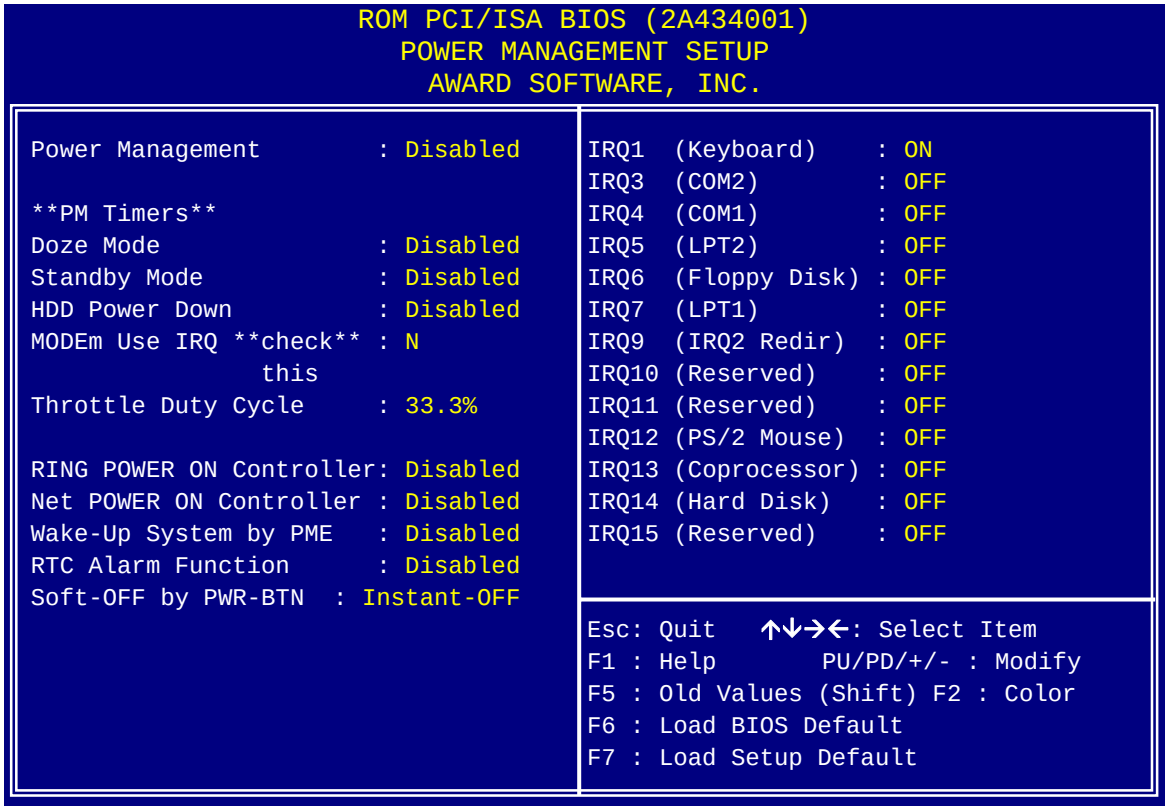
Field	Explanation
SDRAM CAS Latency Time	Used to match the timing to the memory module being used. The default setting is AUTO, which means that the CAS latency is set by the BIOS when it reads the EEPROM device located on the memory module. You can also choose a CAS latency of 2 or 3. Please check the specification for the memory module before altering this setting. A CAS latency of 2 gives best performance providing the memory module is designed to operate at this speed.

continued…

Field	Explanation
SDRAM Clock Ratio Div By	Used to set the SDRAM interface speed. The options are divide by 4 or divide by 3. The divide by 4 setting sets the SDRAM interface to 75MHz and divide by 3 sets it to 100MHz.  Due to the design of the AMD Geode GX1 processor, the memory must be rated faster than the interface speed. Therefore if you are running the memory at 75MHz you should use PC100 memory, if you are running at 100MHz you need PC133 memory. Using the wrong type of memory will cause the board to operate incorrectly.
16-bit I/O Recovery (CLK)	This is the number of clock cycles inserted between 16-bit I/O cycles.
8-bit I/O Recovery (CLK)	This is the number of clock cycles inserted between 8-bit I/O cycles.
USB Controller	Set USB Controller to ‘Enabled’ if you want to use any USB devices.
USB Legacy Support	Available when *USB Controller* support is enabled. Choose whether support for a USB keyboard and mouse is required.
CPU Warning Temperature	Used to set the trip level on the LM84 remote temperature sensor, which is used to monitor the CPU die temperature. Once the threshold is reached the LM84 output will be driven low.
Current CPU Temperature	Displays the current CPU temperature. This is updated every second (approximately).
Board Warning Temperature	Used to set the trip level on the LM84 local temperature sensor, which is used to monitor the board temperature around the LM84. Once the threshold is reached the LM84 output will be driven low.
Board Temperature	Displays the current board temperature. This is updated every second (approximately).

Power management

The settings in the *Power Management Setup* screen determine the power the system consumes.



The suspend function doesn't work if the Power Management is disabled. You must enable Power Management before you can run the suspend mode.

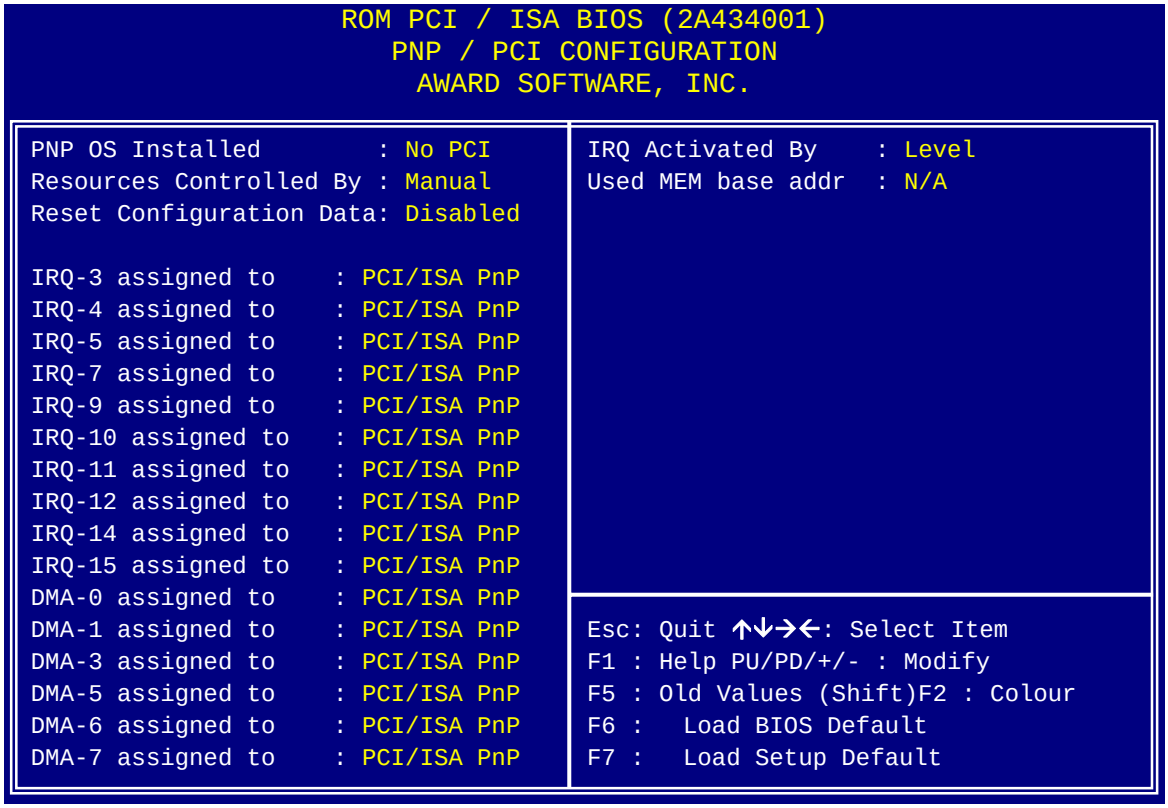
Field	Explanation
Power Management	Used to specify your power management requirements. The options available are : • *Disable* - global power management is disabled. • *User Define* - users can configure their own power management settings (see below). • Min Saving - pre-defined timer values are used such that all timers are at their maximum value. • *Max Saving* - pre-defined timer values are used such that all timers are at their minimum value.

continued…

Field	Explanation
	If you choose to configure your own power management settings, you are prompted to specify the following: *Doze Mode* – Medium power saving mode, display is blanked. *Standby Mode – Low power mode CPU is placed in suspend state and display controller is turned off. Pressing the resume button will cause the CPU to exit this condition.* *HDD Power Down* – defines the continuous hard disk drive idle time before the hard disk enters power-saving mode (motor off). The options available are 'Disabled' (the hard disk drive will not go into power-saving mode), or to enter power-saving mode after 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 20, 30, 40, or 60 minutes.
	 When the hard disk drive is in power-saving mode, any access to the hard disk wakes it up.
MODEM Use IRQ	This function allows an IRQ to be assigned to an external MODEM,
Throttle Duty Cycle	When Power Management is enabled the BIOS can be used to run the processor at a slower speed. This is achieved by using a mechanism called Throttling. When Throttling is enabled the processor will be STOPPED for the selected period of time each cycle.
RING POWER ON Controller	This function enables the RING indicator form one of the serial ports to be used as a wake up event.
Net POWER ON Controller	This function enables the Ethernet controller to generate a wake up event.
Wake-Up System by PME	Enables the PCI bus PME signal to wake the system up from sleep mode.
RTC Alarm Function	Enables the RTC Alarm to wake the system up from sleep mode.
Soft-OFF by PWR-BTN	This function is not supported on the SBC-GX1.
IRQ1, IRQ2, IRQ4 to IRQ7, IRQ9 to IRQ15	These functions allow the corresponding IRQ to be selected as a wake up event.

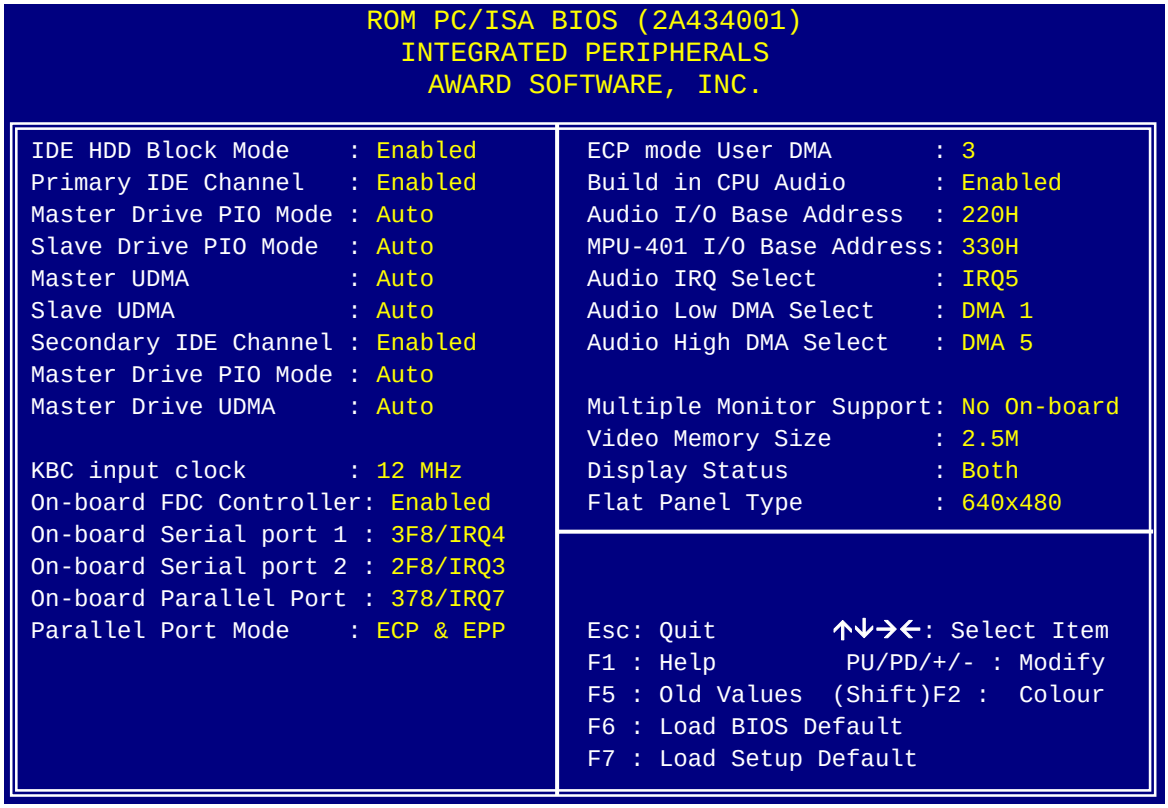
PNP / PCI configuration setup

The settings in the *PNP/PCI Configuration* screen determine the IRQ resources for the system.



Make selections according your system environment.

Integrated peripherals



Field	Description
IDE HDD Block Mode	Enables/Disables block mode IDE transfers.
Primary IDE Channel	Enables/Disables the Primary IDE controller.
Master Drive PIO Mode	Enables/Disables Programmable I/O mode for the Primary Master.
Slave Drive PIO Mode	Enables/Disables Programmable I/O mode for the Primary Slave.
Master UDMA	Enables/Disables Ultra DMA operation for the Primary Master.
Slave UDMA	Enables/Disables Ultra DMA operation for the Primary Slave.
Secondary IDE Channel	Enables/Disables the Secondary IDE controller.
Master Drive PIO Mode	Enables/Disables Programmable I/O mode for the Secondary Master.

continued…

Field	Description
Master Drive UDMA	Enables/Disables for the Ultra DMA operation Secondary Master.
KBC Input clock	Selects the input clock source for the Keyboard controller either 12MHz or 8MHz can be selected.
On-board FDC Controller	Enables/Disables on-board Floppy disk controller.
On-board Serial ports 1 and 2	Used to set the I/O and IRQ setting for the onboard serial ports.
On-board Parallel Port	Used to set the I/O and IRQ setting for the onboard Parallel port.
Parallel Port Mode	Sets Parallel port mode of operation.
ECP mode User DMA	Selects DMA channel to be used when the parallel port is in ECP mode.
Build in CPU Audio	Enables/Disables the on-board audio controller.
Audio I/O Base Address	Set's I/O base address for the Audio registers, default setting 220H.
MPU-401 I/O Base Address	Set's I/O base address for the Audio registers, default setting 330H.
Audio IRQ Select	Interrupt line used for Audio support, default is IRQ 5.
Audio Low DMA Select	Set's 8-bit DMA channel for Audio, default is 1.
Audio High DMA Select	Set's 16-bit DMA channel for Audio, default is 5.
Multiple Monitor Support	Selects the configuration for supporting more than one VGA adapter card. This feature can be used to set the default display when a secondary PCI VGA adapter is used with the SBC-GX1.
Video Memory Size	The video memory is shared with the main system memory and can be set to 1.5MB, 2.5MB or 4MB. The default setting is 2.5MB. Setting this feature to 4M allows some of the higher resolution modes to be displayed. (Please refer to the GX1 data sheet supplied on the support CD.) Whatever memory you assign to video is not available to be used as system memory.

Field	Description
Display Status	Used to select the default display type. The options available are CRT, LCD or Both. The default setting is Both.
Flat Panel Type	Used to configure the LCD interface output for the desired display resolution. The default setting is 640 x 480 18-bit TFT.

General Software Embedded BIOS 2000

If you require support for Windows CE.NET or Windows XP Embedded, the SBC-GX1 can be supplied with a General Software Embedded BIOS 2000.

This section explains how to use the CMOS Setup Utility to modify the General Software Embedded BIOS 2000 configuration.

To launch the CMOS Setup Utility:

1. Turn on the computer. The Power On Self Test (POST) routine then starts. A short while into this routine the following message is displayed:

   ```
   Press DEL to enter SETUP
   ```

2. Press either the **Del** key or the **Ctrl**, **Alt**, and **Esc** keys simultaneously.

   If the message disappears before you respond and you still wish to enter setup, restart the computer to try again by pressing the ‘reset’ button, turning it off and back on, or pressing the **Ctrl**, **Alt**, and **Del** keys simultaneously.

Option	Explanation
Reset CMOS to factory defaults	Restores the CMOS values to the hard-coded factory settings. This is the same as removing the battery link.
Write to CMOS and Exit	Saves any changes made to the CMOS, and exits the CMOS Setup utility.
Exit without changing CMOS	Cancels any changes you have made to the CMOS, reverting to the previous settings, and exits the CMOS Setup utility.

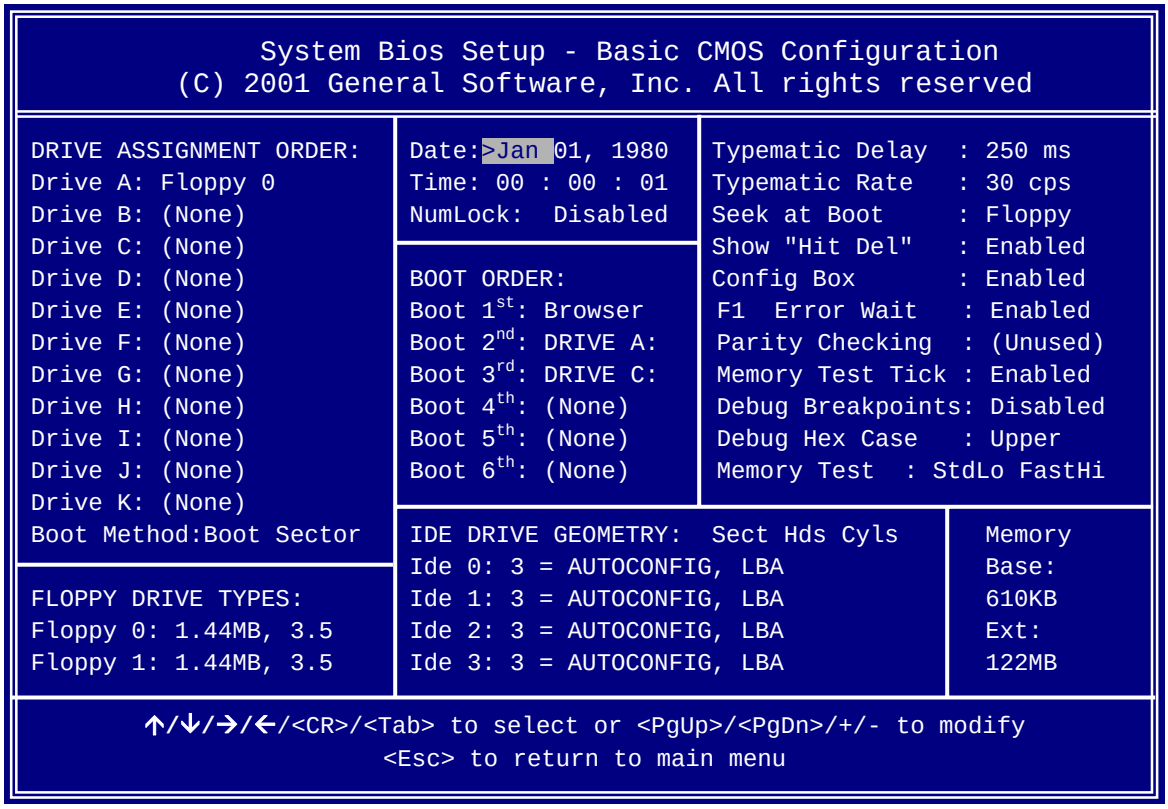
Control keys

The following keys are available while using the General Software Embedded BIOS 2000 Setup utility:

Key	Effect
↑	Moves to previous item.
↓	Moves to next item.
←	Moves to the item on the left.
→	Moves to the item on the right.
Tab	Moves to the next cell
+, -	Changes the selection
Esc	Returns to the previous menu (or exits with out saving).

Basic CMOS configuration screen

The *Basic CMOS Configuration* screen looks like this:



Field	Explanation
Drive assignment order	Used to associate a drive with the physical interface. Each drive must be assigned a drive letter in order for it to be used. There is an extra field at the bottom of the column: *Boot Method*. For normal use of booting an OS from the boot sector of the selected drive, select ‘Boot Sector’ If ‘Windows CE’ is selected the BIOS will attempt to load and execute a Windows CE Kernel file (NK.BIN), from the root directory of a selected drive.
Boot order	Determines the order that the SBC-GX1 will attempt to boot from a drive. Set this to your required boot order. If a valid boot record is not found on the first drive, the BIOS will attempt to boot from the next drive in the list.

continued…

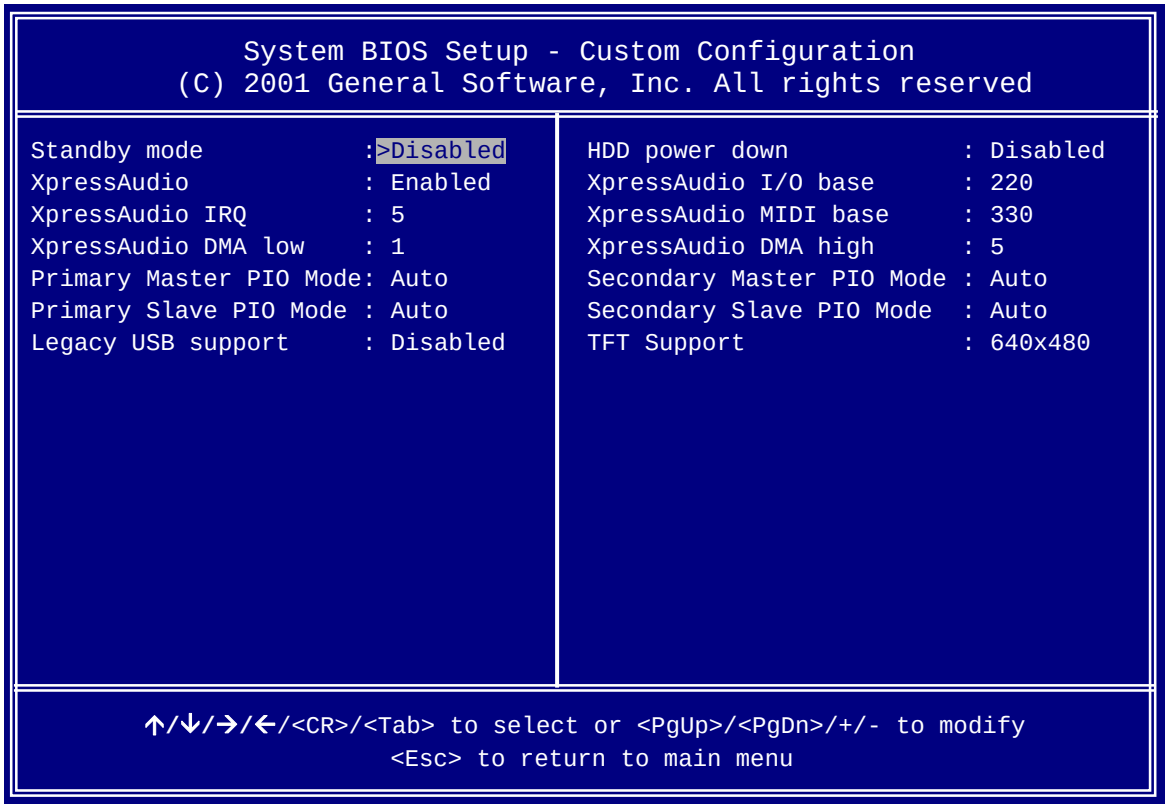
Field	Explanation
IDE drive geometry	If an IDE device is assigned a drive letter in the 'Drive Assignment Order' column, then the IDE drives must be configured in the 'ATA DRV Assignment' column. • IDE 0 - IDE Primary Master Device (on-board IDE). • IDE 1 - IDE Primary Slave Device (on-board IDE). • IDE 2 - IDE Secondary Master Device (CompactFlash). • IDE 3 - IDE Secondary Slave Device (not used). To use the primary IDE drive on the SBC-GX1, configure IDE 0 in the ATA DRV Assignment section, map IDE 0 to drive C: in the *Drive assignment order* section, and set the required Boot order. The IDE devices can be configured to be in five different modes: • 'USER' lets you manually select the number of cylinders, heads and sectors associated with the IDE device. • 'AUTOCONFIG PHYSICAL' auto-detects the drive geometry at POST. No translation is performed, so the size of the drive is limited to a maximum of 512MB. • 'AUTOCONFIG LBA' also auto-detects the drive geometry at POST. The geometry is translated using the standard LBA convention. This supports drive sizes up to 16GB. • 'AUTOCONFIG PHOENIX' setting is the same as the 'AUTOCONFIG LBA', except that the translation is done using the Phoenix Software CHS convention. • 'IDE CD-ROM' provides support for ATA IDE CD-ROM drives.
Typematic Delay	Specify the time, when holding a key, between the first and second character being displayed. The options available are: 250, 500, 750 and 1,000 msec.
Typematic Rate	Select the rate at which characters are generated, i.e. displayed on screen, when a key is pressed and held down. The options available are: 6, 8, 10, 12, 15, 20, 24 or 30 characters per second.
Seek at Boot	During POST the BIOS can be configured to cause a seek of the physical drives. This can be used to force a floppy disk, hard drive or CD-ROM to 'spin up'. There are four settings available: • None: No seek operation is performed. • Both: Seeks both Floppy and IDE drives. • IDE: Seeks any devices connected to the IDE interface. • Floppy: Seeks floppy disk drive only. This is the default selection.

continued…

Field	Explanation
Show "Hit Del"	Determines whether the prompt to 'Hit Del for setup' is displayed during the POST.
Config Box	Determines whether the configuration screen is displayed at the end of the POST.
F1 Error Wait	If enabled, the BIOS pauses during the POST process if it encounters an error. A message is displayed indicating what the error is. The user must press **F1** to proceed.
Parity Checking	Not currently used.
Memory Test Tick	Speaker produces a ticking noise during memory test routine, when enabled.
Debug Breakpoints	If enabled, the Embedded BIOS responds to breakpoints.
Debug HEX Case	Used to set the default text in the Embedded BIOS debugger to upper case or lower case characters.
Memory Test	Used to select the type of memory test run during the POST process. You may want to choose different options to test style for the lower and upper memory regions. The options available are: StdLo FastHi (the default setting), StdLo StdHi, StdLo FullHi, FullLo FastHi, FullLo StdHi, FullLo FullHi, FastLo FastHi, FastLo StdHi, and FastLo FullHi.

Custom configuration screen

The *Custom Configuration* screen looks like this:



Field	Explanation
Standby mode	Used to specify whether the BIOS should put the SBC-GX1 board into a low power Standby mode if there is no activity. If you enable this feature, you can choose to put the board into power down after 1, 2, 5, 10, 15, or 30 seconds, or 1, 2, 5, 10, 15 mins, or 30 mins, or 1, 2 or 5 hours. The default setting is for board power down to be disabled.
HDD power down	Used to specify whether the BIOS should put the hard disk drive into its power down mode if the drive is not accessed within the specified period. If you enable this feature, you can choose to put the hard disk into power down after 1, 2, 5, 10, 15, or 30 seconds, or 1, 2, 5, 10, 15 mins, or 30 mins, or 1, 2 or 5 hours. The default setting is for HDD power down to be disabled.

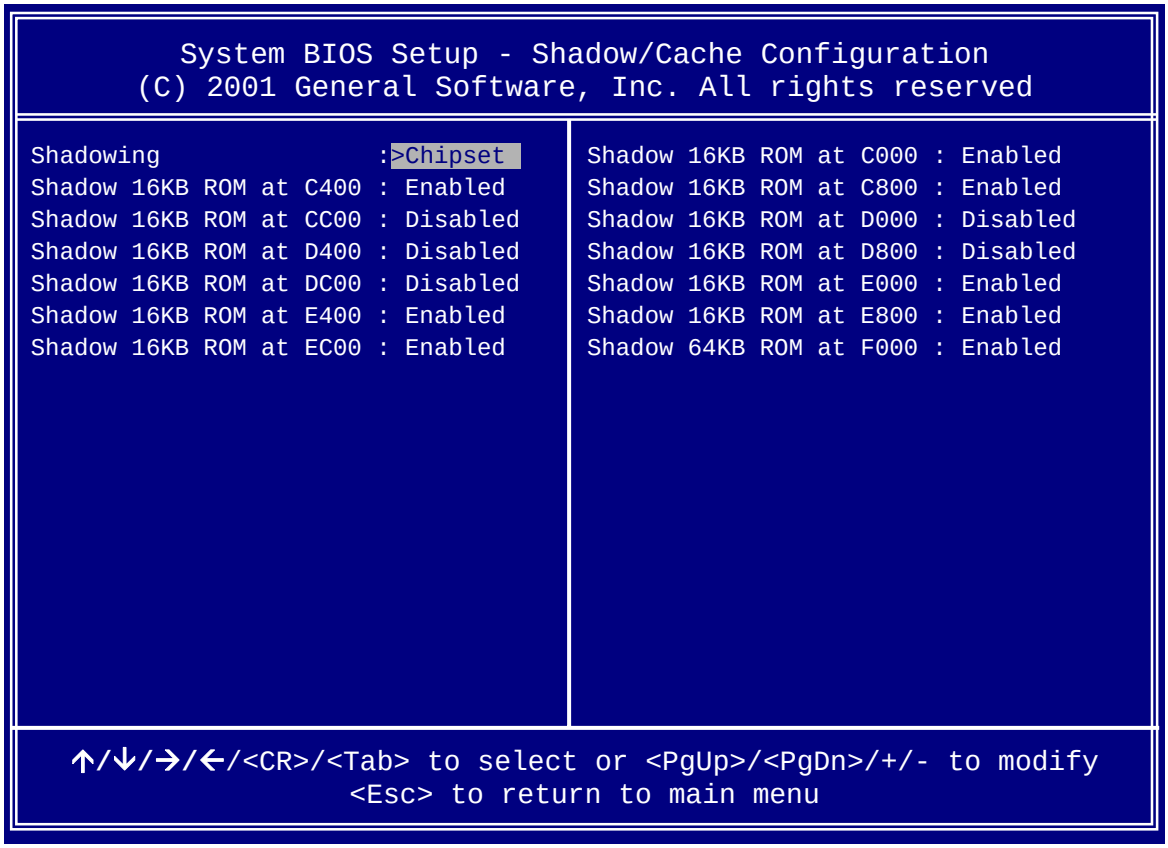
continued…

Field	Explanation
XpressAudio	The AMD Geode™ GX1 can be used to emulate a Soundblaster-16 by enabling this feature. If the XpressAudio feature is enabled, the I/O base, IRQ and DMA settings need to be configured. The options available are: • I/O Base - 220H*, 240H, 260H, 280H, Disabled. • IRQ - 2, 5*, 7, 10. • MIDI Base - 300, 330*, Disabled • DMA Lo - 0, 1*, 3, 5, 6, 7 • DMA Hi - 0, 1, 3, 5*, 6, 7 The asterisk, *, indicates the default settings. These are the settings required to provide Soundblaster-16 compatibility.
Primary Master PIO Mode	Determines whether the programmable I/O mode for the Primary Master IDE interface is auto-detected during the POST process.
Secondary Master PIO Mode	Determines whether the programmable I/O mode for the Secondary Master IDE interface is auto-detected during the POST process.
Primary Slave PIO Mode	Determines whether the programmable I/O mode for the Primary Master IDE interface is auto-detected during the POST process.
Secondary Slave PIO Mode	Determines whether the programmable I/O mode for the Secondary Master IDE interface is auto-detected during the POST process.
Legacy USB support	Determines whether support for Legacy USB is enabled. This is required if a USB keyboard or mouse is going to be used with the board.
TFT Support	Determines whether the TFT output is switched on or off. If it is switched off, only the CRT output is active. If it is switched on, both the CRT and flat panel outputs are enabled. You can choose from the following resolutions: 640 x 480 (the default resolution), 800 x 600, 1024 x 768.

Shadow configuration setup screen

This screen lets you enable and disable the shadowing of areas of ISA ROM regions. Normally shadowing should be enabled at E000-F000 to maximize system ROM BIOS performance, and any other region that a ROM BIOS extension may be executed from.

These settings are entered into the following screen:



Software support

The development kit contains a support CD that incorporates reference material and software utilities that can be used to support the SBC-GX1. The following sections describe the software support and provide guidelines for using the drivers supplied on the CD.

Datalight ROM-DOS 6.22

If your SBC-GX1 board is fitted with flash memory it will be supplied with a license for Datalight's ROM-DOS 6.22 operating system. This operating system will be pre-installed on the flash drive.

ROM-DOS is a Microsoft MS-DOS compatible operating system that has been specifically designed for embedded systems. The system and command files are physically much smaller, but still provide full compatibility to allow standard DOS applications to run without modification. ROM-DOS supports all the standard utility files like SYS, PRINT, MODE, FDISK, FORMAT etc. These files are supplied on the support CD and can be used as required.

A full user manual for ROM-DOS is also supplied on the CD that provides detailed information on the operating system and supported interrupts and features.

Datalight FlashFX flash filing system

The flash memory incorporated onto the SBC-GX1 is configured as a silicon read/write disk drive. This disk is supported using Datalight's FlashFX software. This software is designed to enable the disk to be accessed using standard DOS routines. The FlashFX software is installed during the POST process as a BIOS extension. This enables the flash disk to be used as a boot disk and this will be the default boot device if a hard disk drive is not present in the system. When shipped the flash memory is formatted and configured as a ROM-DOS system disk.

The FlashFX software has been designed to incorporate wear levelling algorithms. The wear levelling ensures that the flash memory is used evenly and that no one sector is continually being written to. This maximizes the write performance of the flash device.

The support CD contains utilities that can be used to ensure that the flash disk is configured correctly (see the README file in the FLASHFX directory on the support CD). If the flash disk gets corrupted for any reason, these utilities can be used to reformat the flash. The boot disk provides an automatic mechanism for reformatting the flash memory and copying the ROM-DOS operating system.

FLASHROM Utility

The FLASHROM utility lets you update the BIOS used on the board. This may be required if you experience incompatibilities with the BIOS and a later version is available. This utility may also be used to provide more support for flat panel displays. The default BIOS on the SBC-GX1 supports some built-in display configurations and these may not be suitable for your application. Please contact Arcom if you need support that is not in the standard BIOS.

The FLASHROM utility can be invoked from the DOS command line and should be supplied with the BIOS image file name required, i.e. FLASHROM BIOS.BIN. The program will automatically load the file and reprogram the BIOS ROM. Once the device has been reprogrammed you must reboot the system.

During this process it is important that you do not switch off the board as this may cause the BIOS ROM to be corrupted which will render the board inoperable.

Boot disk

The CD contains a ROM-DOS boot disk image. The image is stored in the BOOTDISK directory. It can be loaded onto a blank floppy disk using the FLWRITE utility stored in this directory. (See the README file for the latest information.) The floppy disk image is compatible with a 1.44MB floppy disk.

The boot disk can be used to load the ROM-DOS operating system from a floppy disk drive. A menu is provided once the board has started to boot providing options to perform some pre-defined operations. These include:

- Booting ROM-DOS.
- Reprogramming the BIOS using FLASHROM.
- Reformatting the flash disk.
- Copying the system files to the flash disk.

Once the appropriate selection has been made, the software performs the operation automatically.

Operating System drivers

The support CD contains drivers for XpressGraphics™, XpressAudio™, PCI Bridge, UDMA Bus mastering IDE controller and DP83815 Ethernet controller. The following sections provide details for installing these drivers for Windows 98 and NT4. The CD also contains drivers for some other operating systems - See the documentation on the CD for more details.

Windows 98 driver support

Before installing Windows 98 power up the board and enter the Setup utility by pressing the **Del** key during the POST. In the *BIOS features* screen set the boot sequence to ,CD-ROM, C, A', and in the *Chipset features setup* screen (see page 34) enable USB support if required. Close the Setup utility, saving the changes.

Insert the Windows 98 CD into the drive and reboot the system. Install Windows 98, following the instructions provided in the Windows 98 user manual.

When Windows 98 has been installed, insert the support CD and follow the steps detailed below to install each driver.

XpressGraphics™ video driver

1. In the Control Panel, select *System* → *Device Manager* and choose *Display Adapters*.
2. Select *Standard PCI VGA adapter* and click on **Properties**.
3. Select the *Driver* tab and click on *Update driver*.
4. Select *Search for a better driver*.
5. Select *Other location*.
6. Select the path *D:\Win98\Video* and click on **OK**.
7. Wait while the driver installs. When this process is complete, click on **Finish**.
8. When prompted, click on **Yes** to restart your computer.
9. Check that the driver is present. In the Device Manager, look under *Display Adapter* for 'XpressGraphics'. If it's not present repeat the procedure.

XpressAUDIO™ audio driver

1. In the Control Panel, select *System* → *Device Manager* and choose *Other Devices*.
2. Select *PCI Multimedia Audio Device* and click on **Properties**.
3. Select the *Driver* tab and click on **Update driver**.
4. Select *Search for a better driver*.
5. Select *Other location*.
6. Select the path *D:\Win98\Video* and click on **OK**.
7. Wait while the driver installs. When this process is complete, click on **Finish** then **Close**.
8. Check that the driver has installed correctly. To do this make sure that 'XpressAudio PCI Bridge' is present in the *Sound*, *Video*, and *Other Game Controller* categories in the Device Manager.
9. Still in the Device Manager, choose *Other Devices*.
10. Select *Unknown Device* and click on **Properties**.
11. Select the *Driver* tab and click on **Update driver**.
12. Select *Search for a better driver*.
13. Select *Other location*.
14. Select the path *D:\Win98\Audio* and click on **OK**.
15. Wait while the driver installs. When this process is complete, click on **Finish** then **Close**. Insert the Windows 98 CD-ROM if prompted.
16. When prompted, click on **Yes** to restart your computer.
17. Check that the driver has installed correctly. To do this make sure that 'XpressAudio 16-bit Sound' is present in the *Sound*, *Video*, and *Other Game Controller* categories in the Device Manager.

National Semiconductor DP83815 Ethernet driver

1. In the Control Panel, select *System* → *Device Manager* and choose *Other Devices*.
2. Select *Ethernet Device* and click on **Properties**.
3. Select the *Driver* tab and click on **Update driver**.
4. Select *Search for a better driver*.

5 Select *Other location*.

6 Select the path *D:\Win98\Ethernet* and click on **OK**.

The file 'NET83815.INF' will be found. Wait while the driver installs.

7 Insert the Windows 98 CD-ROM if prompted. If Windows complains it can't find a file on the CD-ROM, click on **Skip File**.

8 When the process is complete, click on **Finish**.

9 When prompted, click on **Yes** to restart your computer.

10 Check that the driver is present. In the Device Manager, look under *Network Adapters* for 'Corp DP83815 10/100 MacPhyter3V PCI Adapter'. If it's not present repeat the procedure.

UDMA driver

1 In the Control Panel, select *System* → *Add New Hardware*.

2 Click on **No**, then **Next**, then select **Hard Disk Controller**.

3 Select **Have disk**.

4 Select *D:\Win98\UDMA\CX5530.INF*.

5 In the *Install from disk* window, click on **OK**.

If the file cx5530.sys is not found, search on the root D:\ of the support CD.

6 Select *Cyrix 5530 Master PCI to Dual IDE Controller* and click on **Next** twice.

7 Wait while the driver installs. When this is complete, click on **Finish**.

8 In the Control Panel, select *System* → *Device Manager* and choose *Hard Disk Controller*.

9 Select *Standard Dual IDE Controller* and click on **Remove**.

10 When prompted, click on **Yes** to restart your computer.

Windows displays a message indicating that it is locating new Hardware.

11 Click on **Yes** to restart your computer each time when prompted.

12 Check that the driver is present. In the Device Manager, look under *Hard Disk Controllers* for 'Cyrix 5560 Master PCI to dual IDE Controller', 'Primary Cx5530 Bus Master IDE Controller' and 'Secondary Cx5530 Bus master IDE Controller'. If they're not present, repeat the procedure.

ACPI bridge

1. In the Control Panel, select *System* → *Add New Hardware*.
2. Select **PCI Bridge**.
3. Select *Reinstall Driver* and click on **Next**.
4. Select *Display a list of all drivers* and click on **Next**.
5. Click on **Have Disk**.
6. Select *D:\Win95\PCI Bridge* and select the file *Cx55x0mp.inf*.
7. Click on **OK**, **OK**, then **Next**.
8. Click on **Finish** and **Close**.

Windows NT4.0 Driver Support

Before installing Windows NT 4.0, power up the board and enter the Setup utility by pressing the **Del** key during the POST. In the *BIOS features* screen set the boot sequence to CD-ROM, C, A. Close the Setup utility, saving the changes.

Insert the Windows NT 4.0 CD into the drive and reboot the system. The CD-ROM will be detected as 'IDE CD-ROM (ATAPI 1.2)/PCI IDE Controller'.

You do not need to select any additional SCSI adapters, CD-ROM drives or special disk controllers.

Install NT 4.0 on an NTFS partition. When prompted, select *Do not connect this computer to a network at this time* and leave the video controller configured as standard VGA. If you would like to install Windows NT 4.0 Service pack 6a, select the file 'D:\NT4SP6A\I386\UPDATE\UPDATE.EXE' from the support CD once NT 4.0 has completed installation.

Before installing Windows NT 4.0 remove link LK5. If this link is not removed NT will not install correctly.

XpressGraphics™ video driver

1. Insert the support CD.
2. In the Control Panel, select *Display*, go to the *Settings* tab, and select *Display Adapters*.
3. Select **Change** on *Adapter type*.
4. Click on *Have disk*.
5. Enter D:\WinNT\Video and select **OK**.
6. Select *National Semiconductor Corporation GX* and select **OK**.
7. Select *Third party Driver?* Then click on **Yes**, **OK**, then finally and **Close**.
8. When prompted, click on **Yes** to restart your computer.

XpressAudio™ audio driver

1. In the Control Panel, select *Multimedia* and go to the *Devices* tab.
2. Click on **Add** and select *Unlisted or updated driver*.
3. Enter the path D:/WinNT/AUDIO and click on **OK**.
4. Select *NationalXpressAudio(TM) Driver*.

5 Specify the I/O, IRQ and DMA settings (the driver does not auto-detect them. These must be identical to the settings specified in the *BIOS features setup* screen in the Setup utility (see page 31). The default settings are:

Audio I/O Base Address	220H
MPU-401 I/O Base Address	330H
Audio IRQ Select	IRQ5
Audio Low DMA Select	DMA 1
Audio High DMA Select	DMA 5

National Semiconductor DP83815 Ethernet driver

1 In the Control Panel, select *Network* and go to the *Adapters* tab.

2 Click on **Add** and then **Have Disk**.

3 Enter the path D:\WinNT\Ethernet and click on **OK**.

4 Select *National Semiconductor Corp DP8315 10/100 Macphyter3v PCI* and click on **OK** followed by **Close**.

5 Select the protocols you require. When prompted, insert the Windows NT installation CD-ROM into the drive. Complete installation as described in the Windows NT documentation.

UDMA installation

1 In the Control Panel, select *SCSI Adapters* and go to the *Driver* tab.

2 Remove the existing driver (ATAPI).

3 Click on **Add driver**.

4 Enter the path D:\WinNT\UDMA.

5 Enter the location D:\ when prompted and click on **OK**.

6 When prompted, click on **Yes** to restart your computer.

Other software support

The support CD also contains the following material:

- Microsoft Internet Explorer 5.0
- Mitsumi mouse driver (For DOS)
- Adobe Acrobat Reader 4.05
- Example source code for:
  - General purpose I/O.
  - LM84 Temperature monitor.
  - RS485/422 Serial Communications.

Please refer to the documentation on the CD for the latest information.

Hardware support

As the SBC-GX1 is a fully compatible PC/AT processor board. Any standard PC reference guide will provide information on hardware aspects of the board. The following material has been included on the support CD as it relates to specific features of the board which may not be available from other sources. This information is stored in the Reference directory:

- AMD Geode™ GX1 data sheet.
- AMD CS5530A data sheet.
- National Semiconductor NS97317 Super I/O controller data sheet.
- National Semiconductor LM4548 AC97 Audio CODEC data sheet.
- National Semiconductor LM84 data sheet.
- I^2C specification.
- National Semiconductor DP83815 Ethernet controller data sheet.
- Intel StrataFlash data sheet.
- PC/104 specification.
- EBX specification.

If you are trying to locate information on a specific function that is not included above, Appendix F – Reference information provides references to some relevant Internet sites.

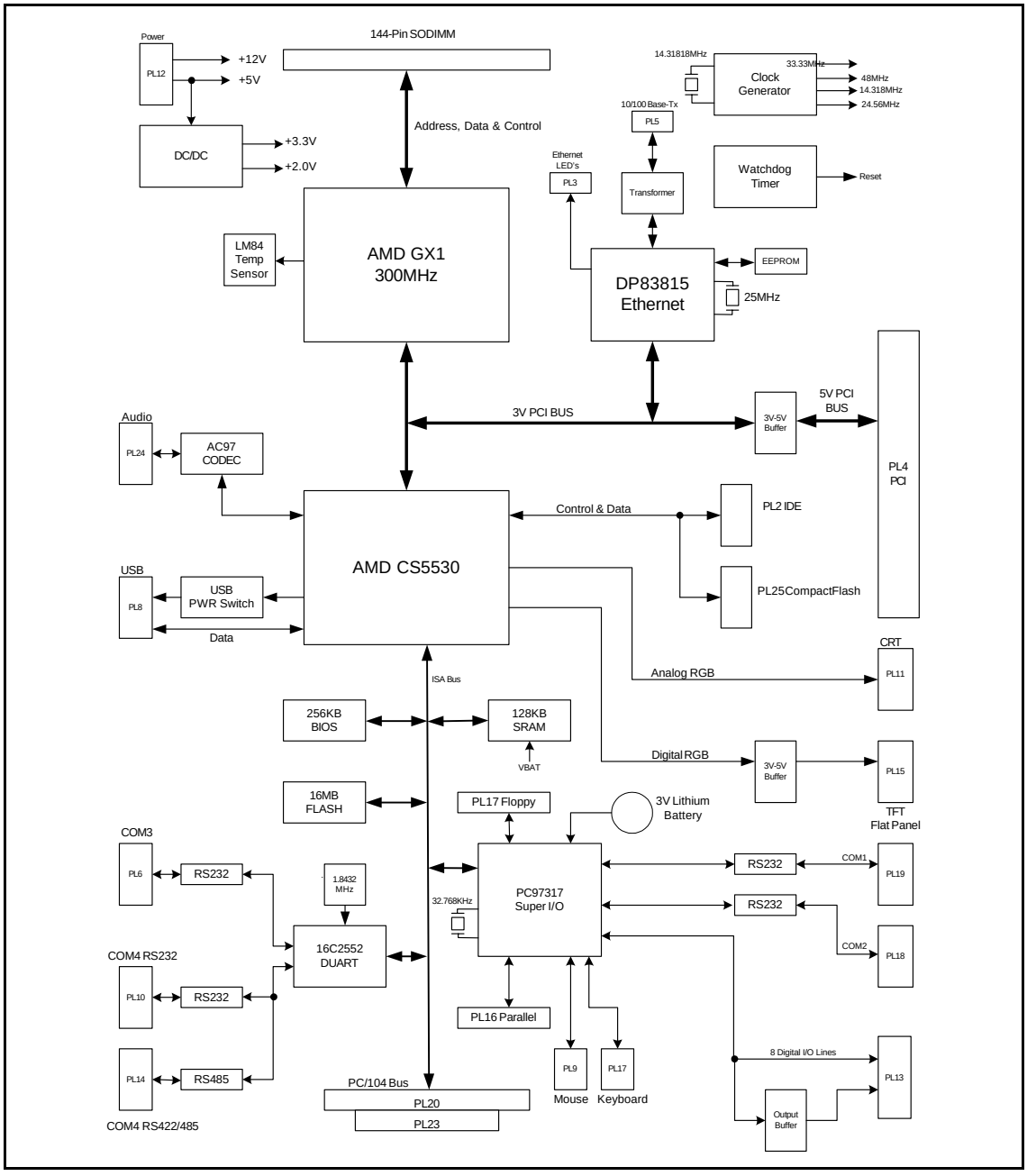
Please refer to the documentation on the CD for the latest information.

Detailed hardware description

The following section provides a detailed description of the functions provided by the SBC-GX1. This information may be required during development once you have started adding extra peripherals or are starting to use some of the embedded features.

SBC-GX1 block diagram

The diagram below illustrates the functional organization of the SBC-GX1:



Processor

The AMD Geode™ GX1 processor is an MMX-Enhanced Pentium class processor. It has been designed to provide a low power, low cost fully integrated PC/AT compatible system. The GX1 is a 64-bit x86 compatible device and has 16K L1 write-back cache integrated into the processor. The device also contains an integrated floating point unit. A 300MHz part is used on the SBC-GX1, this part is supplied with a 33MHz clock signal and multiplied within the device.

The processor has two supply rails the core is powered from a +2.0V source and the I/O is powered from +3.3V. These voltages are generated on the SBC-GX1 from the main +5V supply input.

Along with the CS5530 I/O companion chip the GX1 provides a Synchronous DRAM controller, VGA Video Controller, PCI 2.1 compatible bus controller, 32-bit IDE controller, SoundBlaster compatible Audio device, PCI-ISA bus bridge, standard ISA bus motherboard peripherals and a dual USB controller.

The GX1 processor is packaged in 352 pin ball-grid-array (BGA), and therefore is attached to the board during the assembly process. The board will be configured with the correct voltage setting and clock selection for the processor.

The GX1 processor is a low power device and a passive heatsink has been used to support this device on the SBC-GX1. This heatsink provides the correct heat dissipation to enable the processor to operate at ambient temperatures up to 60^{o}C (140^{o}F).

Memory

The SBC-GX1 supports three types of memory device - the system memory that is provided by a Synchronous DRAM module, the BIOS EPROM, and the Flash memory. Further details about each are provided below.

Synchronous DRAM Interface

A single 144-pin Small Outline Dual Inline Memory Module (SODIMM) socket, DIMM1, provides support for up to 256M bytes of synchronous DRAM. This interface is designed to support 16MB, 32MB, 64MB, 128MB and 256MB modules which are 3.3V compatible and meet the PC100 or PC133 timing specification. The SODIMM socket is designed to ensure that only the correct type of memory is installed.

The BIOS automatically detects the amount of memory inserted into this socket during the power up process, and sets up the appropriate registers correctly with the Geode™ GX1 processor. The BIOS can also be configured to perform an exhaustive test on this memory during the POST process to ensure it is functioning correctly. This does, however, increase the boot time.

The performance of the SBC-GX1 can be improved by selecting the correct type of memory. The board supports two memory speeds 75MHz (divide by 4) or 100MHz (divide by 3). Due to the design of the AMD Geode GX1 processor, the memory used must be rated above the nominal operating frequency. Therefore if the memory bus

runs at 75MHz PC100 memory should be used. If the bus runs at 100MHz then PC133 memory should be used.

The CAS latency can also have a large effect on performance of the board. The board can support modules with a latency of 2 or 3 clocks. The clock divider and CAS latency settings are altered in the *Chipset features setup* screen within the Setup utility (see page 34). The default values select a bus speed of 75MHz and CAS latency is automatically detected by the BIOS.

The memory timings cannot be changed if the board is using the General Software BIOS. The timings are fixed and the board is configured for operation at 75MHZ with a CAS latency of 3.

BIOS EPROM

A 256K byte Flash EPROM device is used to store the BIOS code. This device can be reprogrammed in situ. using the FLASHROM utility supplied on the support CD (See the software support section for details). The BIOS stored in this device is compressed to save space and is uncompressed during the power up process. The system BIOS is copied into shadow RAM between 0E0000H and 0FFFFFH and the VGA BIOS is copied to 0C0000H.

The flash device is a +5V only device and there are no link settings required to enable programming.

Flash memory

The SBC-GX1 board supports up to 16MB flash memory. This memory is configured to be a read/write silicon disk drive. The Datalight FlashFX flash filling system is automatically loaded during the POST routine to enable the flash drive to be accessed. The flash drive uses a 16K memory window at 000DC000-000DFFFFH to access the devices and two I/O address locations are used to select the appropriate flash area. Under normal circumstances the Flash FX driver should be used to access this memory. The FLASH status LED illuminates whenever the Flash drive is accessed.

The I/O registers are shown on the next page for information.

258H I/O Write

Bit No.	Paged address register 0
0	Address bit A14
1	Address bit A15
2	Address bit A16
3	Address bit A17
4	Address bit A18
5	Address bit A19
6	Address bit A20
7	Address bit A21

259H I/O Write

Bit No.	Paged address register 1
0	Address bit A22
1	Address bit A23
2	No function
3	Software flag 1
4	Software flag 2
5	No function
6	FLASH/SRAM selection 0 = Flash pages enabled, 1 = SRAM pages enabled
7	Flash Reset/Power down 0 = device is reset/powered down, 1 = device is enabled

259H I/O Read

Bit No.	Paged address register 1
0	Flash busy signal (0 = BUSY)
1	User link 1 LK11 (0 = CLOSED, 1 = OPEN)
2	User link 2 LK12 (0 = CLOSED, 1 = OPEN)
3	Software flag 1
4	Software flag 2
5	No function
6	FLASH/SRAM selection
7	No function

These two I/O registers (258H-259H) are reset to 00h (write) on power up/reset. This ensures that the Register 1 Bit 7 is 0, i.e. Flash is disabled and write protected.

Static RAM

The SBC-GX1 is designed to support a 128K byte static RAM device. This device is decoded using the same memory window as the Flash disk. Selection between Flash and SRAM is achieved by setting bit 6 in I/O register 259H. If this bit is set to ‘logic 0’ (default) the flash devices are accessed. If this bit is set to ‘logic 1’ the SRAM is accessed.

The static RAM device is powered from the on-board battery when the main supply is removed to ensure that data is non-volatile.

Static RAM is not fitted as standard. If you require static RAM, please contact Arcom for further information regarding build variants which support this part.

Memory map

The following table shows the memory map for the SBC-GX1:

Address	Block size	Description
0FFFC0000H	256K	System BIOS ROM
08FFFFFFH	-	Extended memory limit (Depending on SDRAM fitted)
00100000H	255M	Extended memory
000E0000H	128K	System BIOS ROM and embedded SETUP
000DC000H	16K	FlashFX BIOS extension and Flash/SRAM Disk Window
000C8000H	64K	Directed to PC/104 bus
000C0000H	32K	VGA BIOS extension
000A0000H	128K	Video RAM
00000000H	640K	System RAM

I/O map

The PC/AT I/O address map is limited to 1K addresses. This is because only the lower ten address lines were originally used to decode I/O devices. The remaining lines were treated as undefined. Therefore the usable address range is from 0-3FFH. Above this range, devices are imaged and accessed throughout the entire 64K I/O address range of the processor.

The following table shows the I/O address mapping for the SBC-GX1. If expansion boards are added via the PC/104 interface you should ensure that they are configured to be at a free address location. Failure to do so will result in them not functioning correctly, and may even cause the SBC-GX1 board to stop operating.

Device	I/O location (hex)
DMA Controller 1	000-00F
Interrupt Controller 1	020-021
Timer/Counter	040-043
Keyboard/Mouse	060-064
Real Time Clock	070-071
DMA Page Registers	080-08F
Watchdog Timer	093
Interrupt Controller 2	0A0-0A1
DMA Controller 2	0C0-0DF
Audio	220-22F
Flash Paging Registers	258-259
RS232 Power-down Latch	260
COM4	2E8-2EF
COM2	2F8-2FF
MPU-401	330-33F
Parallel Port	378-37F (278-27F[1])
Video Controller	3B0-3BB, 3C0-3CF, 3D0-3DF
COM3	3E8-3EF
Floppy Disk	3F0-3F7
COM1	3F8-3FF

The Parallel printer port is decoded at 378-37FH when using the Award BIOS, and at 278-27FH when using the General Software BIOS.

Graphics controller

The AMD Geode GX1 processor contains a high performance graphics controller. With the support of the CS5530, this can be used to drive TFT LCD flat panel and CRT displays simultaneously. The graphics controller is supported by a fully PC compatible video BIOS which enables it to support all standard VGA and XGA graphics modes.

The video memory is shared with the main system memory and can be configured in the BIOS to allocate either 1.5MB, 2.5MB or 4MB of memory to the video controller. Once this memory is allocated it is no longer available for application use. The BIOS displays a message during the boot process to show how much memory is allocated to the graphics.

A full explanation of the graphics controller operation can be found in the GX1 and CS5530 data sheets which are included on the support CD.

The following table shows the video resolutions supported by the GX1 with the corresponding number of bits per pixel.

Resolution	Bits per pixel
640 x 480	8/16
800 x 600	8/16
1024 x 768	8/16
1280 x 1024	8

When configured for TFT flat panel support the following table shows the correspondence between the panel data bus signals FPD0-FPD17 and the display colour bits:

Panel data bus bit	18-bit TFT	12-bit TFT	9-bit TFT		
			640x480	1024x768	
FPD 17	R5	R5	R5	R5	Even
FPD 16	R4	R4	R4	R4	
FPD 15	R3	R3	R3	R3	
FPD 14	R2	R2		R2	Odd
FPD 13	R1			R1	
FPD 12	R0			R0	
FPD 11	G5	G5	G5	G5	Even
FPD 10	G4	G4	G4	G4	
FPD 9	G3	G3	G3	G3	
FPD 8	G2	G2		G2	Odd
FPD 7	G1			G1	
FPD 6	G0			G0	

continued…

Panel data bus bit	18-bit TFT	12-bit TFT	9-bit TFT		
			640x480	1024x768	
FPD 5	B5	B5	B5	B5	Even
FPD 4	B4	B4	B4	B4	
FPD 3	B3	B3	B3	B3	
FPD 2	B2	B2		B2	Odd
FPD 1	B1			B1	
FPD0	B0			B0	

The flat panel and CRT interface signals are routed to two separate connectors, both displays can be driven simultaneously. The ability to drive both displays is dependant on the particular timing parameters of the flat panel display. It is not always possible to select appropriate clock rates to achieve an output on the CRT and flat panel displays.

The CRT output signals are routed to a 16-way 0.1” boxed header PL11. These signals will normally be connected directly to a VGA compatible CRT monitor. A suitable cable is provided as part of the SBC-GX1 development kit. The following table shows the connection details for this cable. The CRT signals may be affected by noise and therefore this cable should be kept as short as possible and should be routed away from other signals to stop any crosstalk.

PL21 Pin	Signal Name	15 way D-Type High Density
1	RED	1
2	Ground	6
3	GREEN	2
4	No Connection	4
5	BLUE	3
6	Ground	7
7	No Connection	9
8	No Connection	11
9	Ground	8
10	Ground	5
11	Ground	10
12	HSYNC	13
13	No Connection	12
14	VSYNC	14
15	No Connection	15
16	No Connection	-

The flat panel signals are configured by the VGA BIOS during the power up process. The default BIOS is designed to drive the 6.5” NEC TFT panel (NL6448BC20-08) as part of the flat panel development kit. This is a 640 x 480 color 18 bit TFT display (Connection details are provided in Appendix E – TFT display interface cable.) The default BIOS is configured to drive both the CRT and flat panel interfaces simultaneously. This can be modified using the Integrated peripherals option in the Setup utility (see page 39). This option can also be used to alter the flat panel support for different resolution displays.

If the display you have is not supported by the default BIOS, please contact Technical Support who will be able to advise whether an updated version of the BIOS is available for your display. See page 82 for details. There is a utility on the support CD AWDFLASH which can be used to update the BIOS device automatically.

The support CD contains drivers for Windows 98 and NT 4.0.

Interrupt assignments

The SBC-GX1 contains two 8259 interrupt controllers, which are cascaded in the standard PC/AT compatible format. The table below shows the IRQ routing of the on-board devices.

IRQ	Usage
0	8254 Timer
1	Keyboard
2	Cascade used for IRQ8-15
3	COM2/COM4
4	COM1/COM3
5	Audio Controller
6	Floppy Disk
7	Printer
8	Real Time Clock
9	Unused
10	COM4
11	Ethernet/COM3
12	Mouse
13	Coprocessor
14	Primary IDE
15	Secondary IDE

These IRQ signals are routed to the PC/104 interface as well as the on-board devices. PC/104 boards can only use these signals if they are unassigned or the on-board device is disabled. Some of the interrupt lines are connected to PCI devices on-board these are the Ethernet controller, VGA controller and USB device. During the Plug and Play BIOS configuration these devices are configured to use an available IRQ line. The table shows the default IRQ routing for these devices. If the devices are disabled or an adapter card is plugged into the PCI connector which requires an interrupt this routing may change.

Before using these interrupts check that the appropriate line is not already configured for another device. If you need to free up a particular interrupt it may be possible using the *PNP / PCI configuration setup* screen in the Setup utility – see page 38 for details. If an interrupt line is selected to support *Legacy ISA mode*, it is not used by the Plug and Play BIOS and remains free for ISA bus use. This normally applies only to IRQ lines that are greater than IRQ9, as the lower order interrupts are already assigned to ISA bus devices.

Care should be taken when configuring these interrupts as you may find that particular combinations do not provide a working solution. This may be due to two or more PCI devices being routed to the same IRQ line. Although this is allowable in the PCI specification, not all device drivers provide the ability to share the interrupts.

DMA controller

There are two 8237 DMA controllers on the SBC-GX1. These are cascaded in a standard PC/AT style. DMA channels 0-3 are used to support 8-bit devices and DMA channels 4-7 support 16-bit devices. DMA channel 4 is used to provide cascading between the two controllers and therefore is unavailable for use. The table below shows the default assignment for the DMA channels on the SBC-GX1.

DMA	Usage
0	Unassigned
1	Audio Controller
2	Floppy Disk Interface
3	Parallel Port (ECP Mode)
4	Cascade
5	Audio Controller
6	Unassigned
7	Unassigned

The DMA signals are routed to the PC/104 interface as well as the on-board devices. They may only be used if they are unassigned or the on-board peripheral is disabled.

IDE interface

The SBC-GX1 has a two Integrated Drive Electronics (IDE) controller interfaces. These IDE controllers are 32-bit PCI device and support Ultra DMA/33 modes of operation. The IDE controllers also support Bus mastering mode and a suitable driver is supplied on the support CD. The 32-bit interface provides a much faster access speed than the original ISA style interface.

Primary interface

This interface supports up to two hard disk drives. The disk drives are connected via a 1:1 40-way ribbon cable using PL2. One drive must be configured as a ‘master’ and the other drive as a ‘slave’. An IDE compatible CD-ROM drive can also be used and should be configured as the ‘slave’ device.

The BIOS automatically detects which devices are connected via this interface and configures the controller accordingly. The BIOS can be configured to make either the hard disk drive or CD-ROM the default boot device.

If a hard disk drive is attached to this interface, with the default configuration the drive is used as the standard boot device and the flash disk, if present, becomes the next available drive.

Secondary interface (CompactFlash)

The secondary controller is used to support a compact flash card interface. The CompactFlash socket PL25 is mounted on the underside of the SBC-GX1. This socket can be used to support both Type I and Type II CompactFlash cards. The CompactFlash card can be used to replace a mechanical drive in the system. If a formatted bootable card is placed in this socket, and there is no boot device connected to the primary controller, the BIOS boots from CompactFlash.

Floppy disk controller

The floppy disk interface is designed to support up to two standard floppy disk drives. Connections are made via a 34 way 0.1” boxed header PL17. (See Appendix B – Connector details for pin assignment details.) All standard capacities including 360KB, 720KB, 1.2MB,1.44MB and 2.88MB are supported. The BIOS must be configured appropriately for the desired format using the Setup utility. The default BIOS configuration supports a single 1.44MB floppy disk drive configured as drive A: and if this drive contains a bootable floppy when the board is powered up it is used as the default boot device. If no drive is present the BIOS continues to operate correctly.

The floppy disk drive cable should have three connectors, two of which are connected directly 1:1 and one of which has pins 10-16 twisted. If only one drive is required it should be connected via the twisted cable and the drive should be setup to use drive select 1. If two drives are required the second drive should also be configured for drive 1, but should be connected via the straight connector. This connection does not provide power and therefore a separate cable from the main supply should be used.

The floppy disk interface is decoded in I/O address space at 3F0-3F7H and uses IRQ6 and DMA channel 2.

Real time clock

The Real time clock is fully compatible with the PC/AT standard clock device. The date and time functions are stored in the real time clock when the main power is removed as long as the battery backup supply is enabled (see LK3 description). As well as providing time and date information, the real time clock stores the BIOS settings. The real time clock is decoded in I/O address space at 70-71H and is connected to IRQ8. The real time clock registers are accessed via an indexed addressing mechanism. I/O location 70H is used to select the appropriate register and 71H is used to access the data.

The maximum rated current for the real time clock is 2uA and the battery backup supply is provided by a Lithium coin cell with a capacity of 180mA. This battery provides sufficient support for at least 10 years. The battery is disabled during shipment to prolong the useful life. If the board is going to be placed out of service for long periods of time then the battery should also be disabled. If the main supply is present on the board the battery automatically gets disconnected from the real time clock circuitry.

The accuracy of the real time clock is based on the operation of the 32.768KHz watch crystal. This provides an accuracy of +/-1 minute per month if the board is in an ambient environment of +25^{o}C (77^{o}F). When the board operates beyond this temperature, then the accuracy may be degraded.

Keyboard/mouse controller

An 8042 compatible keyboard controller provides support for a standard PC/AT keyboard and mouse. Both interfaces use a 6-pin mini-Din style connector. The keyboard is connected via PL7 and mouse via PL9. The keyboard controller is decoded at I/O address location 60-64H and uses IRQ1 for keyboard and IRQ12 for mouse support. Power for the keyboard and mouse is sourced from the +5V supply and a resettable fuse protects the board if either interface is short circuited.

The development kit is supplied with a PS/2 to AT adapter cable that can be used to convert between the mini-DIN connector and the standard AT style connector. The development kit also contains a PS/2 mouse that plugs directly into PL9.

The Award BIOS automatically detects the presence of the keyboard and mouse, and provides support for these. If these devices are not plugged in, the BIOS continues to operate correctly.

Ethernet controller

A National Semiconductor DP83815 Ethernet controller provides a 10/100-BaseTX interface. This is a 32-bit PCI device that is configured by the Plug and Play BIOS during power ON. The device provides compliance with IEEE802.3u 100BASE-T specification and IEEE 802.3x Full Duplex Flow Control. A 93C46 EEPROM is used to store configuration data and ID information.

An 8-way RJ45 connector is used to provide signals. (See Appendix B – Connector details for pin assignment details.)

A second connector PL3 also provides users with status signals that are designed to drive LED's. The status lines provide 10M, 100M and LINK status. The output lines sink

current when switched on therefore the anode of each device should be connected to PL3 pin 1 and the cathode to the appropriate status line.

The support CD contains drivers for most operating systems and network software. These are stored in the Ethernet directory.

16-bit SoundBlaster

The audio support provided by the SBC-GX1 is fully compatible with the 16-bit SoundBlaster interface. This device provides support for stereo line in and line out and mono Microphone input. The SoundBlaster is supported via the XpressAudio software which is built into the BIOS code.

A National Semiconductor LM4548 AC97 Audio codec provides the output and mix signals from the input sources. The codec can be used to set the output level of each source and provide a composite signal. There is no amplifier on-board, so either active speakers or an amplifier module must be connected to the output.

Connection is made via a 10-way 0.1” header PL24. (See Appendix B – Connector details for pin assignment details.)

The audio device is connected to the PCI bus. To ensure backward compatibility it must be setup to respond to standard Audio I/O address mapping, IRQ and DMA signals. The BIOS can be configured to set the appropriate locations. The default settings are as follows:

Audio I/O Base Address	220H
MPU-401 I/O Base Address	330H
Audio IRQ Select	IRQ5
Audio Low DMA Select	DMA 1
Audio High DMA Select	DMA 5

These can be modified in the *Integrated Peripherals* screen within the Setup utility – see page 39 for details.

Drivers are supplied on the support CD for Windows 98 and NT 4.0.

Watchdog timer

The SBC-GX1 contains a watchdog timer, which can be used to protect against erroneous software. There are two timeout periods available - either 2 or 8 seconds depending on the position of LK2. The watchdog timer is disabled by a reset, and can be started by performing an I/O write to location 93H (any value causes the timer to start). If another I/O write to this location is not performed within the timeout period the board will be RESET. Writes must be continually performed to enable the board to function correctly - there is no software disable mechanism once the timer is started.

The watchdog timer can be disabled permanently by removing user link LK1. This feature may be useful during debug/development.

User jumpers

There are two user jumpers on the SBC-GX1 - LK11 and LK12. The status of these user jumpers can be read via I/O address 259H bits 1 and 2 respectively. If the link is made then the corresponding bit is read as a logic '0'. (See the Jumpers and connectors section, page 18, for further details.) These jumpers do not have any defined function on the board, and so can be used to select options in your application program.

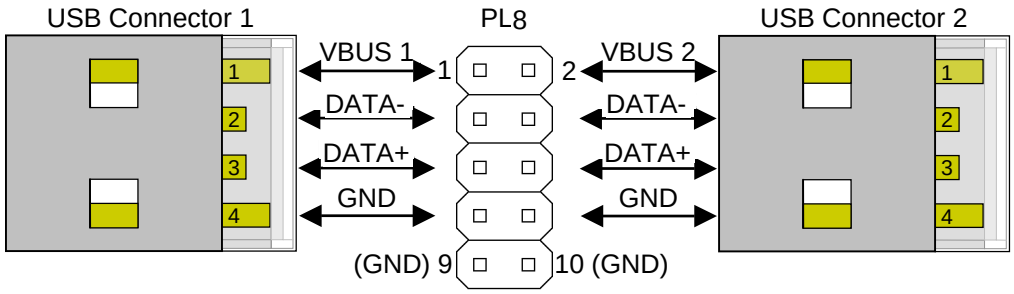
USB interface

There are two Universal Serial Bus (USB) interfaces on the SBC-GX1. These interfaces have been designed to support the Open Host Controller Interface (OpenHCI).

There are four signal lines associated with each USB channel:

- VBUS
- DATA-
- DATA+
- GND

Their arrangement is summarized in the following illustration:



A USB power control switch is used to control the power and protect against short circuit conditions. This can be enabled/disabled by the processor and the USB function needs to be enabled in the BIOS to ensure that power is supplied to each device. The USB feature is controlled using the *Chipset features setup* screen within the Setup utility - see page 34 for details.

If the USB voltage is short circuited or more than 500mA is drawn from either supply the switch turn offs the power supply and automatically protects the device and board. The VBUS signal is derived from the +5V supply via the SBC-GX1.

If you are looking for details about the USB bus, or would like to determine whether particular peripherals are available, please go to www.usb.org.

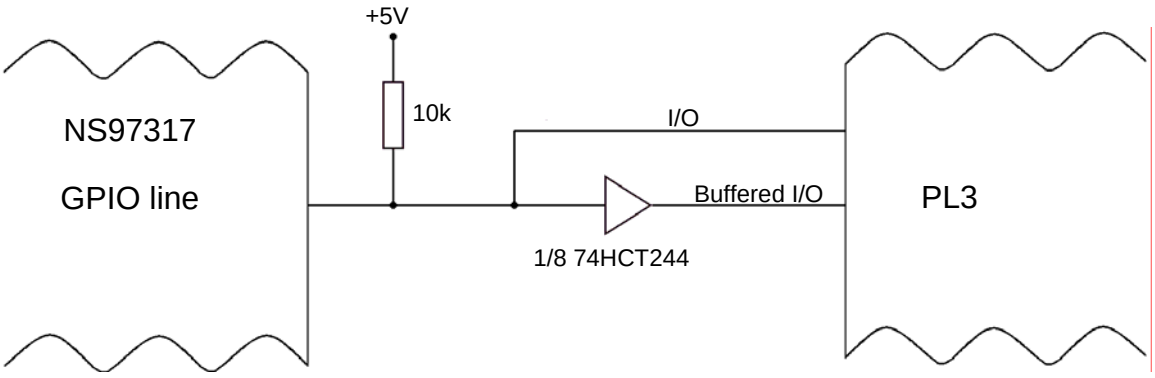
General purpose I/O

Eight general purpose I/O lines are provided on the SBC-GX1. These lines are routed to a 20-way 0.1” header PL13. The header provides un-buffered and buffered versions of the lines. The buffered version can be used to drive higher output current (up to 24mA per output) than the un-buffered version.

The I/O lines are connected to GPIO line from the National Semiconductor NS97317 Super I/O controller. The table below shows the relationship between the GPIO lines on the super I/O device and the I/O lines on PL13

NS97317 GPIO Line	PL13 GPIO Line
GPIO20	I/O0
GPIO21	I/O1
GPIO23	I/O2
GPIO24	I/O3
GPIO16	I/O4
GPIO37	I/O5
GPIO12	I/O6
GPIO17	I/O7

The following diagram shows the configuration of each I/O line:



The NS97317 GPIO lines must be configured using the registers built into the device to ensure they function correctly. Various features can be programmed for each pin, including direction control and pull up/down resistors. As the GPIO lines also share pins with dedicated functions these must be disabled if the line is to be used.

The support CD contains some example ‘C’ source code that can be used to configure the signals. This can be found in the ARCOM Examples directory.

CPU temperature sensor

An National Semiconductor LM84 temperature monitor IC is fitted to the board. This device can be used to monitor the CPU die temperature and the board temperature. It provides feedback if the temperature rises above a predefined level. The LM84 has an I^2C bus interface and is connected to three I/O lines. Two of these lines are from the CS5530 and one is from the Super I/O controller. The following table shows the connection details:

Pin Name	Device	LM84 Signal Name
GPIO3	CS5530	DATA
GPIO2	CS5530	CLOCK
GPIO10	PC97317	ALERT*

Data sheets for the LM84, CS5530, I^2C specification and NS97317 are supplied on the support CD. There is also an example program that shows how to configure the device and check the output level. The output from the LM84 is normally high, but will go to logic ‘0’ when the threshold level is reached. The output stays at logic ‘0’ until the temperature has fallen below the hysterises level. This output can be used to slow down the CPU and provide user warning if the ambient temperature becomes excessive.

The BIOS can be used to set the trip level for both the local and remote temperature sensors. The current temperature can also be read while the BIOS is in the setup screen.

PC/104 interface

The PC/104 interface supports 8/16 bit ISA style signals. Add-on boards can be used to enhance the functionality of the main board. The PC/104 standard has been adopted by a wide range of companies and boards are available which support various types of interface. This bus can be used to add digital I/O, analog I/O, serial ports, video capture devices, PC CARD interfaces etc.

Any board plugged into this interface will be accessed as if it were part of the main board, therefore it may conflict with I/O and memory devices on-board if it has not been correctly configured. Before using an expansion board you should check that it can be configured to work along side the peripherals already incorporated on-board.

The PC/104 bus signals are fully compatible with the ISA bus electrical timing definitions. Some IRQ and DMA signal lines may be associated with on-board devices and therefore are not free to be used by add-on boards.

PCI bus interface

The PCI bus signals are PCI 2.1 compliant and can be used to interface to 32-bit 33MHz compatible cards. The PCI interface only supports +5V and Universal PCI cards. When inserting a PCI card the correct orientation should be observed, otherwise damage may occur. The PCI card bracket should be in line with the keyboard and mouse connectors, and should overhang the PCB. If the bracket is not fitted please verify that the card is orientated correctly.

Serial ports

There are four high speed 16550 serial UART's on the SBC-GX1. All four channels are fully software compatible with the 16550 and can be used as standard RS232 serial interfaces. The table below shows the configuration for each channel:

			Connector	
Port	I/O Address	IRQ	RS232	RS422/485
COM1	3F8-3FFH	IRQ4	PL19	N/A
COM2	2F8-2FFH	IRQ3	PL18	N/A
COM3	3E8-3EFH	IRQ4 (or IRQ11)	PL6	N/A
COM4	2E8-2EFH	IRQ3 (or IRQ10)	PL10	PL14

The RS232 signals are routed to 10-way 0.1" boxed headers, which are designed to provide direct connection to 9-way D-type plugs. The serial ports provide support for various baud rates up to a maximum of 115Kbaud. The Award BIOS detects the serial ports during the POST process and configures the baud rate, data, stop bits, etc.

The table above provides details of the IRQ signal associated with each channel. If the standard IRQ3 and IRQ4 assignments are used then only one of the channels can be configured to use each interrupt. If your system requires more than two interrupts then the other ports can be configured to use IRQ10 and IRQ11. These interrupts may be assigned to PCI devices during the Plug and Play BIOS initialization. Therefore you should select *Legacy ISA* for these interrupts in the PNP / PCI configuration setup screen – see page 38 for details.

RS422/485 interfaces

The COM4 serial interface can be used to support RS232/RS422 and RS485 interfaces. The default configuration has been selected to enable RS232 operation.

RS422

The RS422 interface provides full duplex communication. The signals available are TXA, TXB, RXA, RXB and Ground. The maximum cable length for an RS422 system is 4000ft and it supports 1 transmitter and up to 10 receivers. To enable RS422 operation LK8 should be removed and the RTS line from COM4 should be at logic ‘0’. LK9 and LK10 should be made if the board is at the end of the network.

RS485

This is a half-duplex interface that provides combined TX and RX signals. PL14 pin 5 provides TXB/RXB and pin 6 provides TXA/RXA. A ground connection is also required for this interface. The maximum cable length for this interface is the same as RS422(4000ft), but RS485 supports up to 32 transmitters and receivers on a single network. Only one transmitter should be switched on at a time. The SBC-GX1 uses the RTS signal to control transmission, when this signal is at logic ‘1’ the driver is switched off and data can be received from other devices. When the RTS line is at logic ‘0’ the driver is on. Any data that is transmitted from the SBC-GX1 will automatically be echoed back to the receiver. This enables the serial communications software to detect that all data has been sent and disable the transmitter when required. LK8 should be made to enable the RS485 interface. LK9 and LK10 should be made if the SBC-GX1 is at the end of the network.

Parallel port

The parallel port is fully IEEE1284 compatible and provides Standard Parallel Port (SPP), Enhanced Parallel Port (EPP) and Extended Capabilities (ECP) support. The parallel port is decoded at I/O address location 378-37FH (LTP1) and uses IRQ7. In ECP mode the BIOS can be used to select an appropriate DMA channel; the default channel is DMA 3.

The parallel port has built-in protection circuitry to protect against powered devices being connected when the main supply is removed and damaging the device. Each data and control signal is designed to source/sink 14mA maximum.

The parallel port connector PL16 is a 26-way 0.1” boxed header. The pin assignment of this connector has been designed to provide 1:1 connection to an IDC 25-way D-Type socket. (See Appendix B – Connector details for pin assignment details.) The socket is compatible with a standard PC parallel port connector.

The parallel port can be used to connect an external printer, tape drive, disk drive, scanner etc., or can be used to provide additional digital I/O capability.

Power supply

The SBC-GX1 is designed to operate from a single +5V ± 5% (4.75V to +5.25V) supply. The power connector PL12 has two +5V connection and three ground connections. These connections are connected on board. PL12 also has a +12V connection defined. This supply is not required for the SBC-GX1 under normal operation, but may be used to supply +12V to the PC/104 stack if required.

Two other supply voltages are present on the board: +2.0V and +3.3V. These supplies are required for the CPU core and on-board devices. The +3.3V supply is routed to the PCI header to enable it to be used by additional cards, and can be used to power +3.3V flat panels via PL15.

The +5V supply is monitored automatically on-board. If this supply falls below 4.63V, the board is placed in 'reset'. When the power supply rises above this threshold voltage the board starts to operate again. This power supply monitor ensures that the board does not hang if the supply voltage fails at any point.

The BIOS has built-in power management, which can be enabled using the Power management screen within the Setup utility – see page 36. Various aspects of the board can be controlled by the power management software. The board can be placed in a power-down state, and normal operation can be resumed using an external input from the mouse, keyboard, serial ports, real time clock, etc. The power management software is designed to monitor activity and starts to slow down the CPU and switch off functions if long periods of inactivity are detected.

The SBC-GX1 has a dedicated I/O register that can be used to power down the RS232 serial buffers if they are not required. Each buffer has an individual control line, so they can be switched on and off in any combination. The default configuration for these buffers at power on is to be enabled. This ensures that the board operates correctly when first powered. Once running the buffers can be disabled during periods of inactivity.

The register is located at I/O address 260H and the bit definitions are shown in the following table:

Bit	Description	Operation
0	Shutdown COM1	0 = Enabled (Default)
1	Shutdown COM2	1 = Disabled
2	Shutdown COM3	
3	Shutdown COM4	
4	No Function	
5	No Function	
6	No Function	
7	No Function	

Status LED's

There are three status LED's on-board:

LED	Colour	Name	Illuminates...
1	Red	Flash Access	Each time the flash array is accessed this LED illuminate.
2	Green	Power	On during normal operation.
3	Yellow	Suspend	On during Suspend Mode. (The Power LED is also extinguished.)

PC speaker

An 8 ohm speaker may be connected to PL1 between pins 1 and 2. The speaker can be used to notify the user of an error condition during POST or normal operation. The speaker is controlled by the 8254 counter/timer (refer to PC software programming guides for more information).

The speaker output is also fed to the Audio CODEC and is mixed with the standard audio output.

Suspend/resume switch

If the power management features are enabled the processor switches into a suspend state after a defined period of inactivity. A momentary switch connected between pins 5 and 6 of PL1 causes the board to return from this suspend state when pressed. Pressing this switch during normal operation causes the system to enter suspend state immediately.

During suspend, all CPU operations are halted and the board is placed in a low power state. Once the board comes out of this state, execution continues from the point where it entered the suspend state.

RESET switch

A momentary switch may be connected between pins 3 and 4 of PL1. If the switch is pressed it causes the board to be reset. All on-board devices are reinitialized and the BIOS starts executing from the top of memory. This may be useful during development, to restart the board after a software crash.

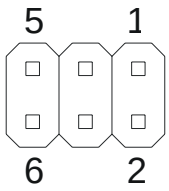
Appendix B – Connector details

PL1 - Auxiliary header

Connector: 6-way, 2.54mm (0.1”) x 2.54mm (0.1”) dual row header.

Mating Connector: Framatome 65043-034

Pin	Signal Name	Pin	Signal Name
1	Speaker Negative	2	Speaker Positive
3	Reset Input	4	Ground
5	Suspend/Resume	6	Ground

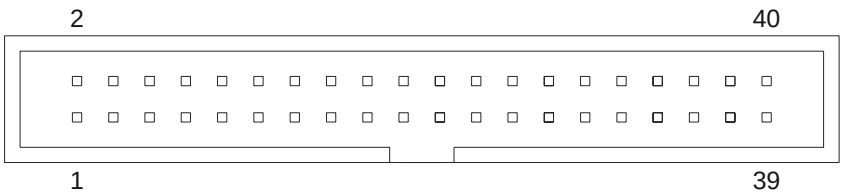


PL2 - IDE disk interface

Connector: 40-way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header.

Mating Connector: Framatome 71600-040

Pin	Signal Name	Pin	Signal Name
1	/RESET	2	Ground
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	Ground	20	+5V
21	DREQ	22	Ground
23	/IOW	24	Ground
25	/IOR	26	Ground
27	/IOCHRDY	28	Ground
29	DACK	30	Ground
31	INTR	32	/IOCS16
33	SA1	34	No Connect
35	SA0	36	SA2
37	/CS0	38	/CS1
39	LED	40	Ground



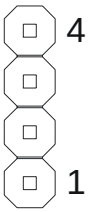
As viewed from the connector pins

PL3 – Ethernet Status LEDs

Connector: 4-way, 2.54mm (0.1”) single row header.

Mating Connector: Framatome 65240-004

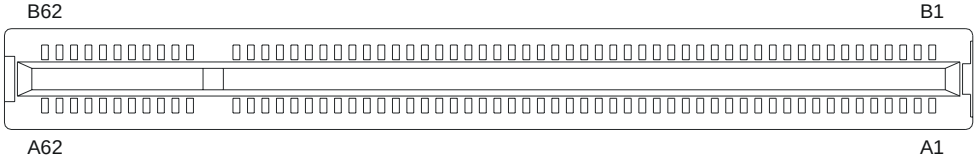
Pin	Signal Name
1	+5V
2	100Mbps
3	10Mbps
4	LINK



PL4 - PCI connector

Connector: 120-way PCI Card edge connector (5V 32-bit 33MHz PCI socket)

Pin	Side B	Side A	Pin	Side B	Side A
1	-12V	/TRST	32	AD17	AD16
2	TCK	+12V	33	/CBE2	+3.3V
3	GND	TMS	34	GND	/FRAME
4	TDO	TDI	35	/IRDY	GND
5	+5V	+5V	36	+3.3V	/TRDY
6	+5V	/INTC	37	/DEVSEL	GND
7	/INTD	/INTA	38	GND	/STOP
8	/INTB	+5V	39	/LOCK	+3.3V
9	/PRSNT1	RSVD	40	/PERR	SDONE
10	RSVD	+5V(I/O)	41	+3.3V	/SBO
11	/PRSNT2	RSVD	42	/SERR	GND
12	KEY	KEY	43	+3.3V	PAR
13	KEY	KEY	44	/CBE1	AD15
14	RSVD	RSVD	45	AD14	+3.3V
15	GND	/RST	46	GND	AD13
16	CLK	+5V(I/O)	47	AD12	AD11
17	GND	/GNT	48	AD10	GND
18	/REG	GND	49	M66EN	AD09
19	+5V(I/O)	RSVD	50	GND	GND
20	AD31	AD30	51	GND	GND
21	AD29	+3.3V	52	AD08	/CBE0
22	GND	AD28	53	AD07	+3.3V
23	AD27	AD26	54	+3.3V	AD06
24	AD25	GND	55	AD05	AD04
25	+3.3V	AD24	56	AD03	GND
26	/CBE3	IDSEL	57	GND	AD02
27	AD23	+3.3V	58	AD01	AD00
28	GND	AD22	59	+5V(I/O)	+5V(I/O)
29	AD21	AD20	60	/ACK64	/REQ64
30	AD19	GND	61	+5V	+5V
31	+3.3V	AD18	62	+5V	+5V

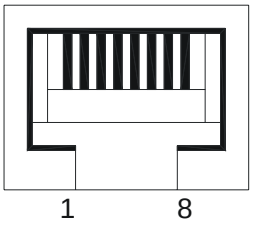


PL5 - Ethernet RJ45

Connector: Molex 9540-2881

Mating Connector: Molex 87522

Pin	Signal Name
1	TX+
2	TX-
3	RX+
4	No Connect
5	No Connect
6	RX-
7	No Connect
8	No Connect

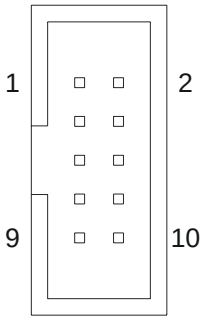


PL6 – COM3 RS232 serial port

Connector: 10 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-010

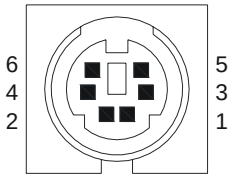
Pin (10-way header)	Signal Name	Pin (9-way D-type plug)
1	Data Carrier Detect (DCD)	1
2	Data Set ready (DSR)	6
3	Receive Data (RX)	2
4	Request To Send (RTS)	7
5	Transmit Data (TX)	3
6	Clear To Send (CTS)	8
7	Data Terminal Ready (DTR)	4
8	Ring Indicator (RI)	9
9	Ground	5
10	No Connect	-



PL7 - PS/2 keyboard

Connector: 6-pin Mini-DIN.

Pin	Signal Name
1	KB DATA
2	No Connect
3	Ground
4	+5V
5	KB CLOCK
6	No Connect

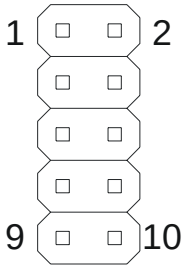


PL8 - USB ports

Connector: 10 way, 2.54mm (0.1”) x 2.54mm (0.1”) dual row pin header

Mating Connector: Framatome 65043-032

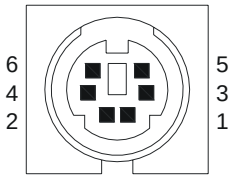
Pin	Signal Name	Pin	Signal Name
1	VBUS-1	2	VBUS-2
3	DNEG-1	4	DNEG-2
5	DPOS-1	6	DPOS-2
7	Ground	8	Ground
9	Ground	10	Ground



PL9 - PS/2 mouse

Connector: 6-pin Mini-DIN.

Pin	Signal Name
1	MS DATA
2	No Connect
3	Ground
4	+5V
5	MS CLOCK
6	No Connect

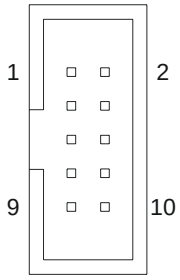


PL10 – COM4 RS232 serial port

Connector: 10 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-010

Pin (10-way header)	Signal Name	Pin (9-way D-type plug)
1	Data Carrier Detect (DCD)	1
2	Data Set ready (DSR)	6
3	Receive Data (RX)	2
4	Request To Send (RTS)	7
5	Transmit Data (TX)	3
6	Clear To Send (CTS)	8
7	Data Terminal Ready (DTR)	4
8	Ring Indicator (RI)	9
9	Ground	5
10	No Connect	-

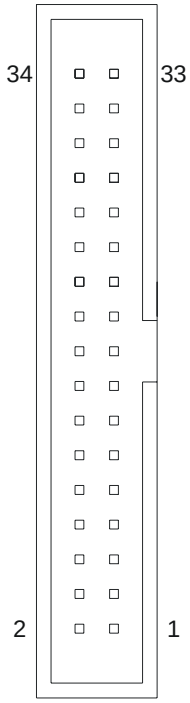


PL11 - Flat panel interface connector

Connector: 34 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-034

Pin	Signal Name	Pin	Signal Name
1	FPD0	2	FPD1
3	FPD2	4	FPD3
5	Ground	6	FPD4
7	FPD5	8	FPD6
9	FPD7	10	Ground
11	FPD8	12	FPD9
13	FPD10	14	FPD11
15	Ground	16	FPD12
17	FPD13	18	FPD14
19	FPD15	20	Ground
21	FPD16	22	FPD17
23	Ground	24	CLKFP
25	Ground	26	FPVDD
27	FPVDD	28	HSYNC
29	VSYNC	30	Ground
31	BKLSAFE	32	DISPEN
33	VDDEN	34	BKLEN

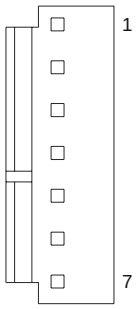


PL12 - Power connector

Connector: 7-pin locking power connector, Molex part number 26-60-4070.

Mating Connector: Molex 09-91-0700

Pin	Signal Name
1	+5V
2	Ground
3	Ground
4	+12V
5	+3.3V (Not Used)
6	Ground
7	+5V

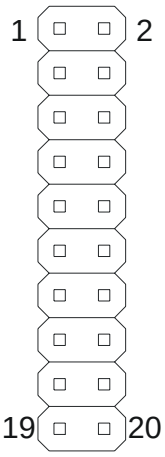


PL13 - General purpose I/O lines

Connector: 20 way, 2.54mm (0.1”) x 2.54mm (0.1”) dual row pin header

Mating Connector: Framatome 71600-020

Pin	Signal Name	Pin	Signal Name
1	+5V	2	+5V
3	GPIO0	4	GPIO1
5	GPIO2	6	GPIO3
7	GPIO4	8	GPIO5
9	GPIO6	10	GPIO7
11	Ground	12	Ground
13	Buffered GPIO0	14	Buffered GPIO1
15	Buffered GPIO2	16	Buffered GPIO3
17	Buffered GPIO4	18	Buffered GPIO5
19	Buffered GPIO6	20	Buffered GPIO7

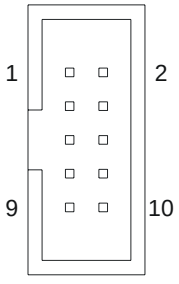


PL14 – COM4 RS485/422 serial port

Connector: 10 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-010

Pin	Signal Name	Pin	Signal Name
1	No Connect	2	No Connect
3	Ground	4	Ground
5	TXB/(RXB 485)	6	TXA/(RXA 485)
7	RXB	8	RXA
9	Ground	10	No Connect

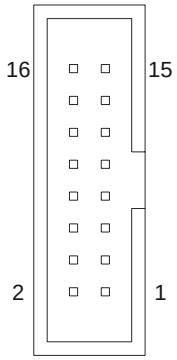


PL15 -VGA CRT connector

Connector: 16 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-016

Pin	Signal Name	Pin	Signal Name
1	RED	2	Ground
3	GREEN	4	No Connect
5	BLUE	6	Ground
7	+5V (Fused)	8	No Connect
9	Ground	10	Ground
11	Ground	12	HSYNC
13	DDCSDA	14	VSYNC
15	DDCSCL	16	No Connect

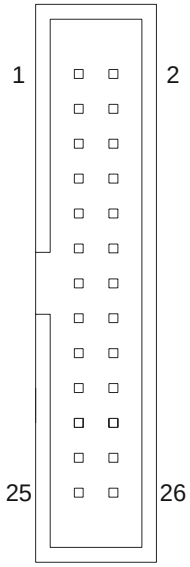


PL16 - Printer port (LTP1)

Connector: 26 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-026

26-way boxed header	Signal name	25-way D-type socket
1	STROBE	1
2	AUTOFEED	14
3	D0	2
4	ERROR	15
5	D1	3
6	INIT	16
7	D2	4
8	SELECT IN	17
9	D3	5
10	Ground	18
11	D4	6
12	Ground	19
13	D5	7
14	Ground	20
15	D6	8
16	Ground	21
17	D7	9
18	Ground	22
19	ACKNOWLEDGE	10
20	Ground	23
21	BUSY	11
22	Ground	24
23	PAPER EMPTY	12
24	Ground	25
25	SELECT	13
26	No Connect	-

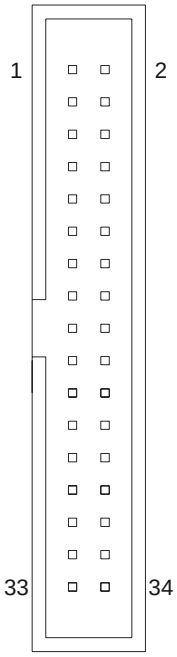


PL17 - Floppy disk interface

Connector: 34 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-034

Pin	Signal Name	Pin	Signal Name
1	Ground	2	DENSEL
3	Ground	4	-
5	-	6	DRATE
7	Ground	8	/INDEX
9	Ground	10	/MTR0
11	Ground	12	/DRV1
13	Ground	14	/DRV0
15	Ground	16	/MTR1
17	Ground	18	DIR
19	Ground	20	/STEP
21	Ground	22	/WDATA
23	Ground	24	/WGATE
25	Ground	26	/TRK0
27	Ground	28	/WP
29	Ground	30	/RDATA
31	Ground	32	HDSEL
33	Ground	34	DSKCHG

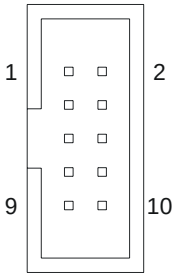


PL18 – COM2 RS232 serial port

Connector: 10 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-010

Pin (10-way header)	Signal Name	Pin (9-way D-type plug)
1	Data Carrier Detect (DCD)	1
2	Data Set ready (DSR)	6
3	Receive Data (RX)	2
4	Request To Send (RTS)	7
5	Transmit Data (TX)	3
6	Clear To Send (CTS)	8
7	Data Terminal Ready (DTR)	4
8	Ring Indicator (RI)	9
9	Ground	5
10	No Connect	-

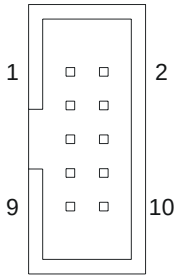


PL19 – COM1 RS232 serial port

Connector: 10-way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-010

Pin (10-way header)	Signal Name	Pin (9-way D-type plug)
1	Data Carrier Detect (DCD)	1
2	Data Set ready (DSR)	6
3	Receive Data (RX)	2
4	Request To Send (RTS)	7
5	Transmit Data (TX)	3
6	Clear To Send (CTS)	8
7	Data Terminal Ready (DTR)	4
8	Ring Indicator (RI)	9
9	Ground	5
10	No Connect	-



PL20 & PL23 - PC/104 connector

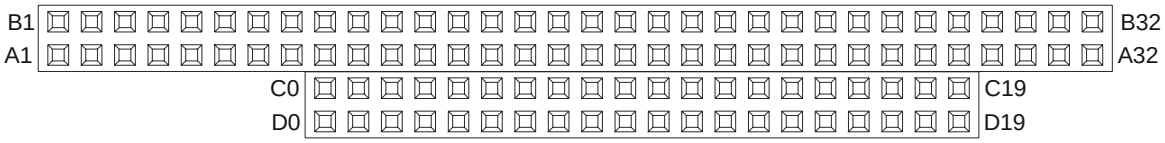
PL20 connector: 64-way, 2.54mm (0.1”) x 2.54mm (0.1”) Non-Stackthrough PC/104 compatible connector (row A & B).

PL23 connector: 40-way, 2.54mm (0.1”) x 2.54mm (0.1”) Non-Stackthrough PC/104 compatible connector (row C & D).

Pin	Row A	Row B	Row C	Row D
0	-	-	Ground	Ground
1	/IOCHCK	Ground	/SBHE	/MEMCS16
2	D7	RSTDRV	LA23	/IOCS16
3	D6	+5V	LA22	IRQ10
4	D5	IRQ9	LA21	IRQ11
5	D4	-5V	LA20	IRQ12
6	D3	DRQ2	LA19	IRQ15
7	D2	-12V	LA18	IRQ14
8	D1	/ENDXFR	LA17	/DACK0
9	D0	+12V	/MEMR	DRQ0
10	IOCHRDY	KEY	/MEMW	/DACK5
11	AEN	/SMEMW	D8	DRQ5
12	A19	/SMEMR	D9	/DACK6
13	A18	/IOW	D10	DRQ6

continued…

Pin	Row A	Row B	Row C	Row D
14	A17	/IOR	D11	/DACK7
15	A16	/DACK3	D12	DRQ7
16	A15	DRQ3	D13	+5V
17	A14	DACK1	D14	MASTER
18	A13	DRQ1	D15	Ground
19	A12	/REFRESH	KEY	Ground
20	A11	SYSCLK	-	-
21	A10	IRQ7	-	-
22	A9	IRQ6	-	-
23	A8	IRQ5	-	-
24	A7	IRQ4	-	-
25	A6	IRQ3	-	-
26	A5	/DACK2	-	-
27	A4	TC	-	-
28	A3	BALE	-	-
29	A2	+5V	-	-
30	A1	OSC	-	-
31	A0	Ground	-	-
32	Ground	Ground	-	-



PL21 – Flash access LED

Connector: 2-way, 2.54mm (0.1”) single row header

Mating Connector: Framatome 65240-002

Pin	Signal Name
1	Anode
2	Cathode

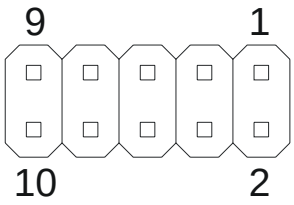
PL22 – In-system-programming header

This connector is used at assembly time only

PL24 - 16-bit SoundBlaster

Connector: 10-way, 2.54mm (0.1”) x 2.54mm (0.1”) dual row pin header

Mating Connector: Framatome 71600-010



Pin	Signal Name
1	Audio ground reference
2	Microphone IN
3	Audio ground reference
4	Line input LEFT
5	Audio ground reference
6	Line input RIGHT
7	Audio ground reference
8	Line output LEFT
9	Audio ground reference
10	Line output RIGHT

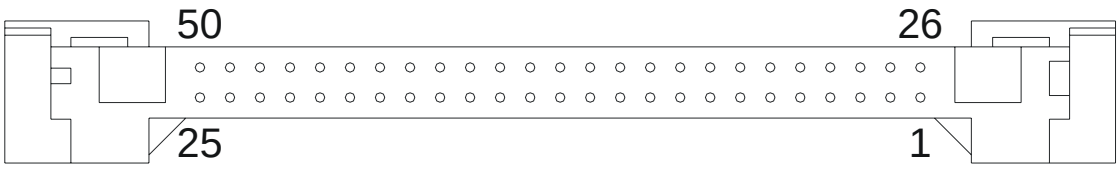
PL25 - CompactFlash connector

Connector: 50 pin CompactFlash right angle with latches.

Pin	Signal Name	Pin	Signal Name
1	Ground	2	D03
3	D04	4	D05
5	D06	6	D07
7	/CS0	8	A10
9	/ATA SEL	10	A09
11	A08	12	A07
13	+5V	14	A06
15	A05	16	A04
17	A03	18	A02

continued…

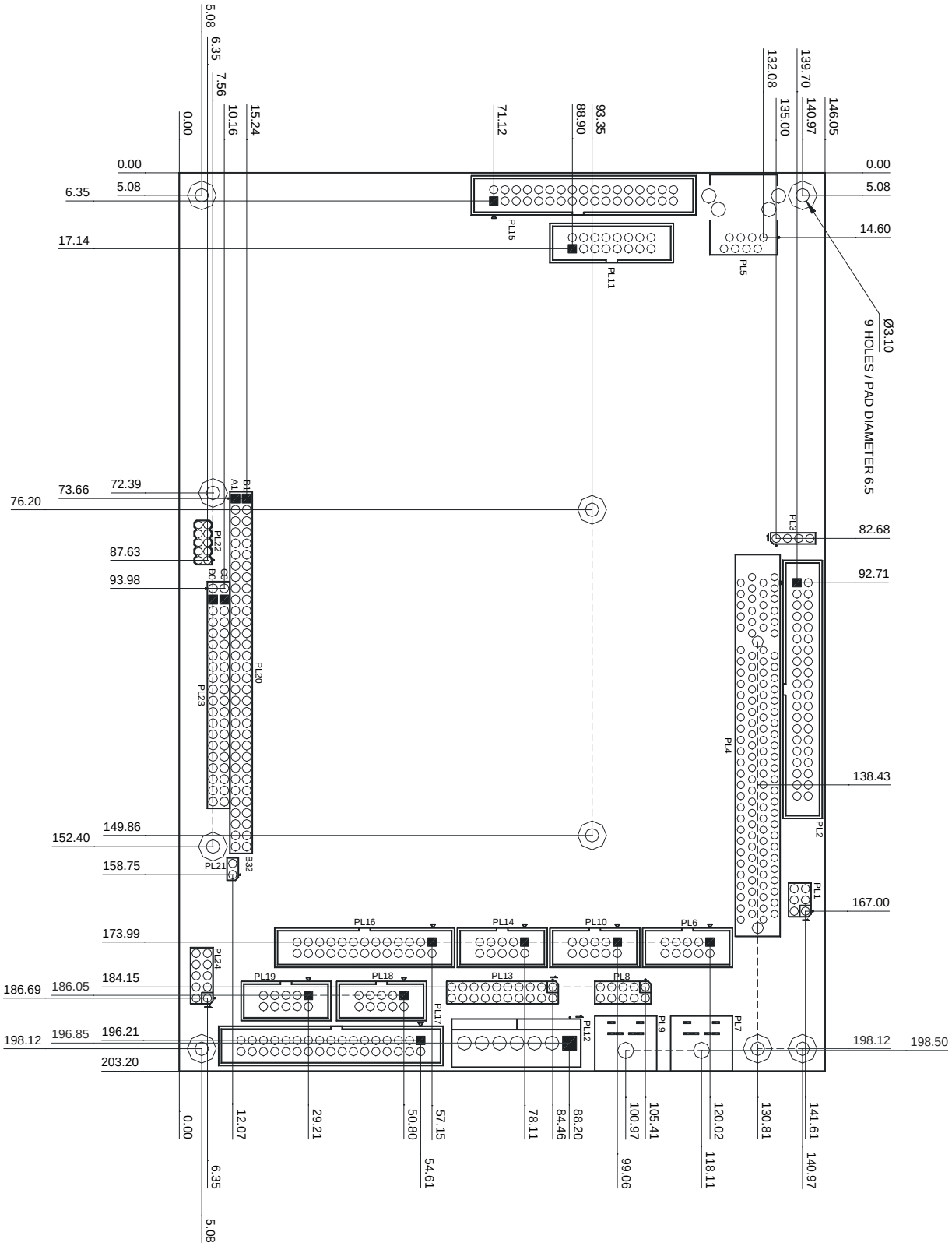
Pin	Signal Name	Pin	Signal Name
19	A01	20	A00
21	D00	22	D01
23	D02	24	/IOCS16
25	/CD2	26	/CD1
27	D11	28	D12
29	D13	30	D14
31	D15	32	/CS1
33	/VS1	34	/IORD
35	/IOWR	36	/WE
37	INTRQ	38	+5V
39	/CSEL	40	/VS2
41	/RESET	42	IORDY
43	/INPACK	44	/REG
45	/DASP	46	/PDIAG
47	D08	48	D09
49	D10	50	Ground



Appendix C – Specification

CPU	AMD Geode™ GX1 MMX-enhanced processor.		
Memory	16MB, 32MB, 64MB, 128MB, 256MB 3.3V un-buffered SDRAM. 144-pin SODIMM Module. 4MB, 8MB, 16MB Intel StrataFlash 256KB Flash BIOS EPROM, 128KB SRAM – factory fit option		
VGA Video	XpressGraphics VGA controller 1MB - 4MB shared SDRAM Video Memory CRT and TFT flat panel, Optional DSTN support via DC1 board		
Resolution	640 x 480	8/16/24	bpp
	800 x 600	8/16/24	bpp
	1024 x 768	8/16	bpp
	1280 x 1024	8	bpp
Peripherals	Serial:	COM1, COM2, COM3, RS232, COM4, RS232/422/485	
	Parallel :	SPP/EPP/ECP	
	Keyboard:	PS/2 style	
	Mouse:	PS/2 style	
	Floppy:	2 drives supported	
	IDE:	2 drives supported	
	CompactFlash:	1 x 50 pin Type I and II CompactFlash socket.	
	Audio:	16-bit SoundBlaster compatible	
	USB:	Dual channel support	
Temperature	Operating: -20°C (-4°F) to +60°C (140°F) Storage: -20°C (-4°F) to +85°C (185°F)		
Humidity	10% to 90% RH (non-condensing)		
Real-time clock	Accuracy +/- 1min/month at 25°C (77°F)		
Software	Datalight ROM-DOS operating system. Datalight FlashFX flash media management software. (Flash variants only)		
Power requirements	+5V +/- 5% 1.5A (typical), 3A (max)		
Battery	3.0V Lithium 180mAH (CR2032 Coin Cell) Maximum discharge current 2uA 10 year shelf life.		
Dimensions	EBX-compatible format 5.75” x 8.00”, 146mm x 203mm		
Weight	270 grams		
MTBF	90,000 hours based on MIL-HDBK-217F using generic failure rates.		

Appendix D – SBC-GX1 mechanical diagram



Appendix E – TFT display interface cable

The following table shows the connection details for the NEC 6.5” LCD flat panel display NL6448BC20-08E used in the development kits:

SBC-GX1 PL15	DF9M-31 D-Type	Panel Signal Name
26	28	+5V Power
27	29	+5V Power
32	27	DE
29	4	VSYNC
28	3	HSYNC
24	2	SHCLK
2	21	P3
1	20	P2
4	23	P5
3	22	P4
7	25	P7
6	24	P6
8	13	P10
9	14	P11
12	16	P13
11	15	P12
14	18	P15
13	17	P14
17	7	P19
16	6	P18
19	9	P21
18	8	P20
22	11	P23
21	10	P22
5,10,15,20,23,25	1,5,12,19,26	GND

The following table shows the connection details for the backlight inverter cable:

SBC-GX1 PL15	DF13-6S Housing
30	1,2
31	3,4

Pins 5 and 6 of the 6 way housing are not used and should be removed.

Appendix G – Display Converter 1 (DC1)

The Display Converter 1 (DC1) can be used with the SBC-GX1 to support Dual Scan STN (DSTN) and Single Scan STN (SSTN) displays.

The DC1 has been designed to support two specific displays:

- Sharp LM8V302 16-bit color DSTN display.
- Nan Ya LTBLDT168G16C 8-bit monochrome DSTN display.

Other displays may be used with the correct adjustments to the connections and configuration.

There are two variants of the DC1 available:

Variant	Description
DC1-Color	DC1 configured for Sharpo LM8V302 DSTN display.
DC1-Mono	DC1 configured for Nan Ya DSTN display.

The connector pinouts have been designed to provide simple connection to these displays.

Hardware Details

CS9211

The DC1 uses a National Semiconductor CS9211. This device interfaces with the CS5530 TFT display interface on GX1 based processor boards, converting the display signals so they are compatible with STN and DSTN LCD displays.

The pass through mode for TFT displays is not supported on the DC1, and the number of display bits is limited to 16. (The CS9211 can support up to 24-bits.)

The CS9211 incorporates frame rate modulation, dithering and control of input and output sync pulse widths, delays and polarities that allow interfaces to many different panel types. The frame rate modulation cannot be turned off; it can be modified, however, through programming registers. For programming details refer to the sample application supplied with the board and the CS9211 data sheet.

The CS9211 is configured via a four wire serial link. The DC1 uses the SBC-GX1 GPIO lines to provide this serial connection. The following table shows details of the GPIO usage on the DC1:

GPIO	Configuration	Connection	Function
GPIO0	OUTPUT	CS9211 SCK	CS9211 programming interface clock input
GPIO1	OUTPUT	CS9211 SDIN	CS9211 programming interface data input
GPIO2	OUTPUT	CS9211 SCS	CS9211 programming interface chip select
GPIO3	INPUT	CS9211 SDO	CS9211 programming interface data output
GPIO4	OUTPUT	Manual Reset	MAX811SEUS reset control (Optional)
GPIO5	OUTPUT	Contrast UP	Optional MAX686 contrast up control

SDRAM

A 16M x 16 bits SDRAM is used as a frame buffer during the DSTN mode of operation. The display data is placed into this memory and buffered before being output to the STN display.

Using the DC1

In order to use the DC1 with the SBC-GX1 you must make sure that:

- The TFT display is enabled on the GX1 board.
- The jumper that controls the TFT interface signal levels (LK4) is in position 2-3 (3.3V).

Setting this jumper in the 5V position will cause damage to the DC1 board and must be avoided.

- The backlight voltage jumper (LK3) is in the appropriate position.

There are two cables required for connection to the SBC-GX1:

- A 34-way 1:1 ribbon cable should be connected between PL11 on the SBC-GX1 and J2 on the DC1.
- A 20-way 1:1 ribbon cable should be connected between PL13 on the SBC-GX1 and J5 on the DC1.

Once these connections are made the rest of the configuration is display-specific.

The requirements for the Sharp LM8V302 and Nan Ya displays are as follows:

- **Sharp LM8V302 – DC1-Color**
  Connection to this display is made via two separate connectors J3 and J4. The pin out of these connectors is designed to provide a 1:1 connection.

  This display requires an extra contrast voltage which is not generated by the DC1 board. This voltage must be provided by an external source and connected to J6 pin 2. J7 provides support for a TDK CXA-L0612A-VJL inverter that can be used with this display.

  Once the connections are made, refer to the section Configuring the CS9211 on page 103.

- **Nan Ya LTBLDT168G16C –DC1-Mono**
  Connection to the display is made via J1, the pin out of this connector is designed to provide a simple cable between the DC1 and the display. J7 is used to connect to the backlight inverter and provides connections that enable the backlight brightness to be controlled. The Nan Ya display requires an LCD BIAS voltage VEE which is generated on the DC1.

  The VEE generation circuit uses a MAXIM MAX686 which is configured by default to provide a contrast voltage range of 20 to 24V. The output can be controlled via GPIO5 and 6 from the SBC-GX1. The MAX686 provides 64 steps between the minimum and maximum voltage. The example code provided can be used to show how the GPIO lines are used to set the output level. The voltage range can be modified to operate across the 12V to 27.5V range. This may be required if the DC1 is used to support an alternative display.

Setting the Voltage Range

The minimum voltage is controlled by the value of resistor R23.

V_{FB} = 1.25V

$V_{OUT(MIN)}$ = required minimum voltage (minimum possible is 12V)

$$R23 = \frac{120 \times 10^3 \left(V_{OUT(MIN)} - V_{FB}\right)}{V_{FB}}$$

The maximum voltage is controlled by the value of the resistor R18.

V_{FB} = 1.25V

$V_{OUT(MAX)}$ = required maximum voltage (maximum possible is 27.5V)$V_{OUT(MIN)}$ = Voltage used to determine the value of R23.

$$R18 = \frac{R23 \times V_{FB}}{V_{OUT(MAX)} - V_{OUT(MIN)}}$$

On power up the MAX686 resets to the mid-scale output voltage. This value can be calculated as follows:

$$V_{OUT(MID)} = V_{OUT(MIN)} + \left(V_{FB} - 0.635\right) \times \frac{R23}{R18}$$

Configuring the CS9211

Once the connections are made and the SBC-GX1 is powered up the CS9211 must be configured to drive the display. This can either be achieved by running a separate application program or can be included in the operating system drivers. The DC1 has been used with DOS, Windows CE and VxWorks, and an example ‘C’ application is provided showing the settings required.

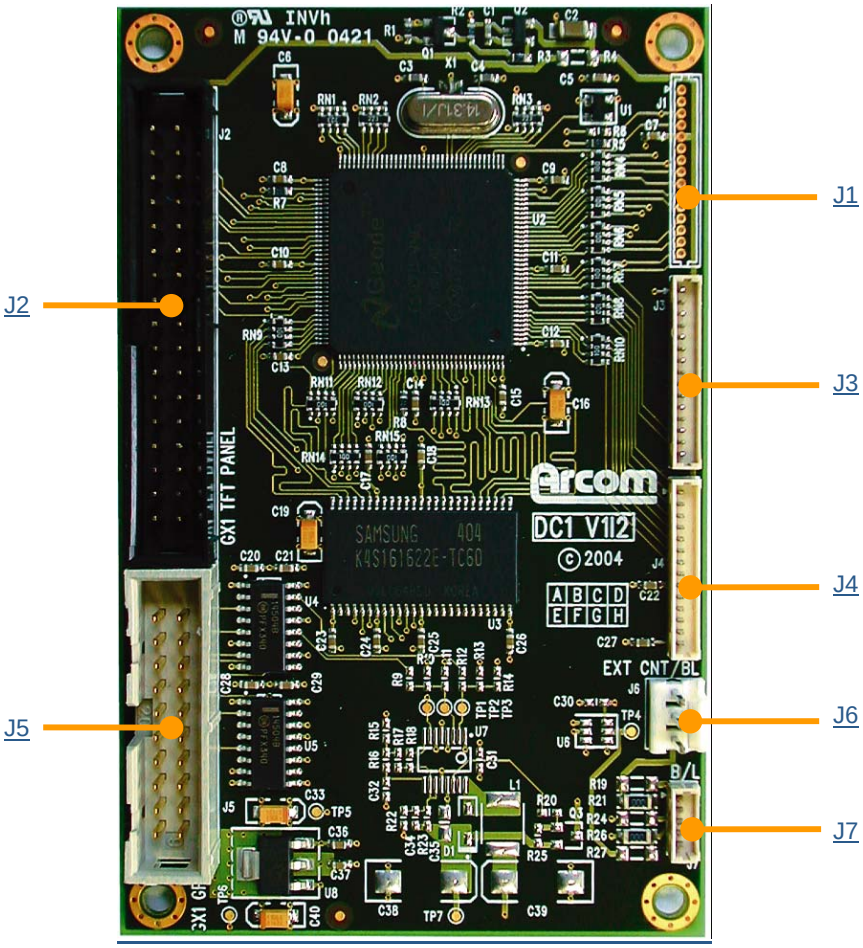
In order to achieve the optimum display for your application it may be necessary to adjust some of the CS9211 parameters. The differing and frame rate settings should be set at appropriate values for the image that is going to be displayed. Details on these settings can be found in the National Semiconductors CS9211 data sheet.

As the display is configured after the board has loaded an operating system, there will be no output on the display until this time. Therefore a CRT display may be used to ensure that the board is configured correctly.

If any of the BIOS setup parameters need to be adjusted then the CRT will be required as entering the BIOS is achieved in the initial POST process.

Connectors

The following photo shows the location of the connectors on the DC1:



These connectors are summarized in the following table:

Connector	Function	See section...
J1	Nan Ya LTBLDT168G16C 8-bit Monochrome DSTN	J1 Nan Ya LTBLDT168G16C 8-bit Monochrome DSTN, page 105.
J2	Interface connector	J2 - Flat panel interface connector, page 106.
J3	CN1 connector	J3 Sharp LM8V302 CN1 connector, page 107.
J4	CN2 connector	J4 Sharp LM8V302 CN2 connector, page 108.
J5	General purpose I/0 lines	J5 SBC-GX1 General purpose I/0 lines, page 109.
J6	Contrast Control/Backlight Power Connector	J6 - Contrast Control/Backlight Power Connector, page 109.
J7	Backlight Connector	J7- Backlight Connector, page 110.

J1 Nan Ya LTBLDT168G16C 8-bit Monochrome DSTN

Connector Type: Molex 53047-1510 15-way 1.25mm pitch wire to board connector

Mating Connector: Molex 51021

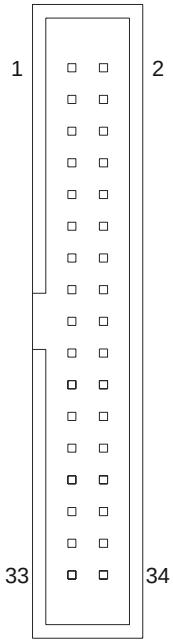
Pin	DC1 Signal	LCD Signal
1	FLM/VSYNC	YD
2	LP/HSYNC	LP
3	SHFCLK	XCK
4	DSIPEN	
5	+3.3V	VSS
6	Ground	
7	VEE	VEE
8	LD4	DU0
9	LD5	DU1
10	LD6	DU2
11	LD7	DU3
12	LD10	DU4
13	LD11	DU5
14	UD0	DU6
15	UD1	DU7

J2 - Flat panel interface connector

Connector: 34 way, 2.54mm (0.1”) x 2.54mm (0.1”) boxed header

Mating Connector: Framatome 71600-034

Pin	Signal Name	Pin	Signal Name
1	FPD0	2	FPD1
3	FPD2	4	FPD3
5	Ground	6	FPD4
7	FPD5	8	FPD6
9	FPD7	10	Ground
11	FPD8	12	FPD9
13	FPD10	14	FPD11
15	Ground	16	FPD12
17	FPD13	18	FPD14
19	FPD15	20	Ground
21	FPD16	22	FPD17
23	Ground	24	CLKFP
25	Ground	26	FPVDD
27	FPVDD	28	HSYNC
29	VSYNC	30	Ground
31	BKLSAFE	32	DISPEN
33	VDDEN	34	BKLEN

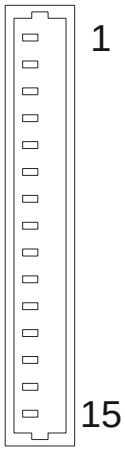


J3 Sharp LM8V302 CN1 connector

Connector Type: Molex 53047-1410 14-way 1.25mm pitch wire to board connector

Mating Connector: Molex 51021

Pin	DC1 Signal	LCD Signal
1	FLM/VSYNC	YD
2	Ground	VSS
3	DISPOFF#	DISP
4	LP/HSYNC	LP
5	+3.3V	VSS
6	SHFCLK	XCK
7	Ground	VSS
8	LD4	DU0
9	LD5	DU1
10	LD6	DU2
11	LD7	DU3
12	LD10	DU4
13	LD11	DU5
14	UD0	DU6
15	UD1	DU7

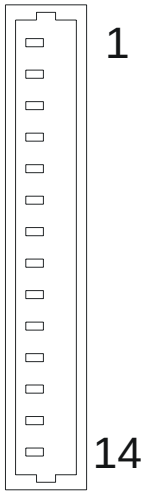


J4 Sharp LM8V302 CN2 connector

Connector Type: Molex 53047-1410 14-way 1.25mm pitch wire to board connector

Mating Connector: Molex 51021

Pin	DC1 Signal	LCD Signal
1	UD2	DL0
2	UD3	DL1
3	UD6	DL2
4	UD7	DL3
5	UD8	DL4
6	UD9	DL5
7	UD10	DL6
8	UD11	DL7
9	+3.3V	VDD
10	Ground	VSS
11	Ground	VSS
12	NC	NC
13	NC	NC
14	Vcon	Vcon

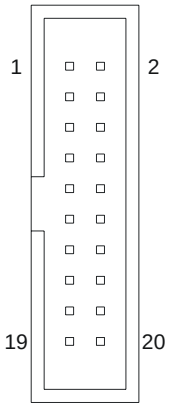


J5 SBC-GX1 General purpose I/0 lines

Connector: 20 way, 2.54mm (0.1”) x 2.54mm (0.1”) dual row boxed header

Mating Connector: Framatome 71600-020

Pin	Signal Name	Pin	Signal Name
1	+5V	2	+5V
3	GPIO0	4	GPIO1
5	GPIO2	6	GPIO3
7	GPIO4	8	GPIO5
9	GPIO6	10	Not Used
11	Ground	12	Ground
13	Not Used	14	Not Used
15	Not Used	16	Not Used
17	Not Used	18	Not Used
19	Not Used	20	Not Used

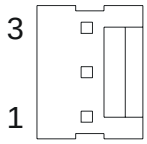


J6 - Contrast Control/Backlight Power Connector

Connector Type: 3-pin Molex 22-27-2031 0.1” pitch straight friction lock header

Mating Connector: Molex 2695

Pin	Signal Name
1	+12V
2	Vcon
3	Ground



J7- Backlight Connector

J7direct connection to TDK CXA-L0612A-VJL backlight inverter CN1 connector

Connector Type: Molex 53047-0510 5-way 1.25mm pitch wire to board connector

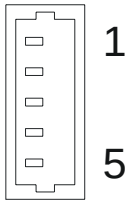
Mating Connector: Molex 51021

Pinout for DC1- Color

Pin	Signal Name
1	+12V
2	Ground
3	+12V
4	Ground
5	NC

Pinout for DC1-Mono

Pin	Signal Name
1	+12V
2	Ground
3	BKLEN
4	VCTRL
5	NC



Index

E

F

G

H

I

J

K

L

M