ELETTRONICA

DATASHEET

9301A MODULAR COMPUTER

GENERAL PURPOSE, PC104 FORM FACTOR COMPUTER FOR MEASUREMENT AND CONTROL APPLICATIONS

LTG ELETTRONICA
ROME - ITALY

General Purpose, Multi I/O Modular Computer

For unmanned flight applications, for ground based ones, for testing and data acquisition in a variety of environments, for command and control applications, here is a low cost, general purpose, computer system ready to be integrated in complex systems with a minimum of overhead both in hardware interfacing and, particularly, in software development

Introduction

This product is based on the PC-104 standard for very high compactness and it is built out of Commercial Off The Shelf (COTS) boards. The selection of different boards for I/O, and a high performance ELAN SC520 central processing unit from AMD offers all the typical PC interfaces, a number of analog and digital input/output (I/O channels), two serial synchronous channels for high speed communications and solid state storage. Everything is under control by one of the most reliable hard Real Time Operating Systems (RTOS) available on the market, QNX ©. Software development is made easy and comfortable by the availability of standard tools, such as the Watcom C/C++ compiler, and a POSIX compliant environment with all the familiar UNIX interfaces and libraries.

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Specifications

Central Processing Unit

Processor: ELAN SC520 (AMD) running at 100 or 133 MHz.
Throughput: 20 VAX MIPS, 11.000 KWHETS.
Memory: standard 32 or 64 Mbytes, Enhanced Data Access DRAM with error correction (ECC).
Bus: Extended Industry Standard (EISA), PC-104 form factor (IEEE996), user accessible.
Mass Memory Interfaces: standard 3,5" floppy disk drive and IDE Hard Disk. Provision for Solid State Disk-On-Chip memory modules directly on-board.

Input/Output

Standard PC/AT Interfaces: AT-101 Keyboard interface, PS/2 type mouse port.
Serial Interfaces: Four serial ports, 3 configurable as RS-232, 1 as RS-232, RS-422, RS-485, IrDa.
Synchronous Serial Interfaces: two Z85230 SCC ports, capable of up to 1 Mbps each.
Up to 57.6 Kbps in asynchronous mode, 921 Kbps in synchronous.
Supported modes: HDLC, SDLC, X.25, BISYNC, ASYNC.
Encoding: Manchester, FM1, FM0, NRZ, NRZI
Parallel Interface: bidirectional, configurable as EPP/ECP or standard Centronics.
LAN: Ethernet, 10base2 (Coax), or 10/100 BaseT (twisted pair). 10/100 Mbps, NE2000 compatible.
Analog Inputs: 32 single-ended or 16 differential analog inputs, 16-bit A/D resolution.
Input ranges: Bipolar: ±10V, ±5V, ±2.5V, ±1V, ±0.5V, Custom
Unipolar: 0-10V, 0-5V, 0-2.5V, 0-1V, Custom
Maximum input voltage: ±10V for linear operation
Overvoltage protection: ±35V on any analog input without damage
Sampling Speed: 100,000 samples/sec maximum with External trigger capability
Analog outputs: 4 single-ended, 12-bit resolution D/A.
Output ranges: Unipolar: 0-5V, adjustable, or external reference input
Output current: ±8mA max per channel (minimum output load 2K Ohms).
Digital inputs and outputs: 24 lines, user configurable
Input voltage: Logic 0: 0.0V min, 0.8V max
Logic 1: 2.0V min, 5.0V max
Input current: ±1µA max
Output voltage: Logic 0: 0.0V min, 0.33V max
Logic 1: 3.8V min, 5.0V max
Output current: ±4mA max per line

Electrical/Mechanical Characteristics

Voltage: +28 VDC with on-board DC/DC converter (also available +12 VDC or direct +5 VDC).
Power: Less than 5 Watts (CPU clock reduced, machine idling), 12.5 Watts Maximum
Cooling: Forced Air.
Packaging: Aluminium Enclosure, 75 mm (H), 125 mm (W), 155 mm (D).
Weight: Less than 0.7 Kg.

Environmental

Operating Temperature (standard): 0°C to +55 °C continuous
Operating Temperature (extreme): -20°C to +70 °C continuous
Radiation: Hardened up to 10 Krads, operating.

Hardware Description

The core of the computer system is a high integration CPU board with a full complement of standard PC interfaces including:

- 4 asynchronous serial ports
- 1 floppy disk drive port
- 1 IDE (hard disk drive) port
- 1 ECP/EPP parallel port
- 1 standard keyboard and PS/2 mouse port
- 1 Ethernet 10/100BaseT

The CPU board can support 32/64 Mbytes of ECC DRAM and includes a 512 Kbytes of Flash Memory to hold the BIOS and any eventual startup code.

A fully EISA standard expansion bus is available through the PC-104 stackable interface.

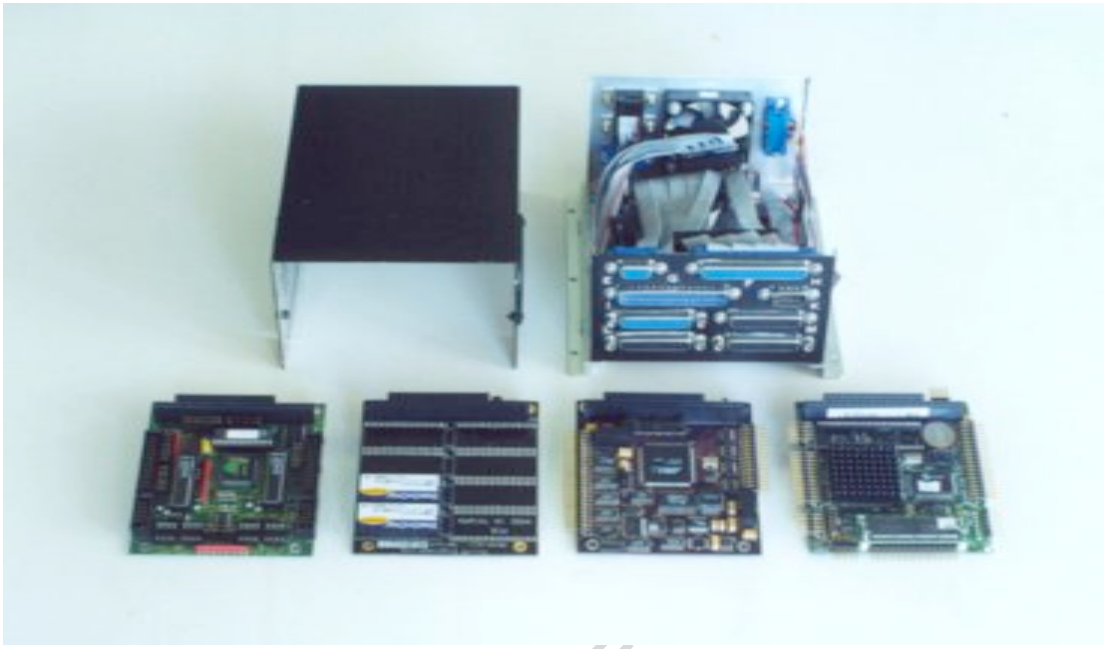
For many applications it is inconvenient to use standard hard disk drives to hold the operating system and the dedicated applications. Therefore the computer system comprises some slots in the CPU board, and a dedicated board that can be populated with Flash Memory devices which are seen like standard mass memory units by the operating system and can be formatted in any standard way.

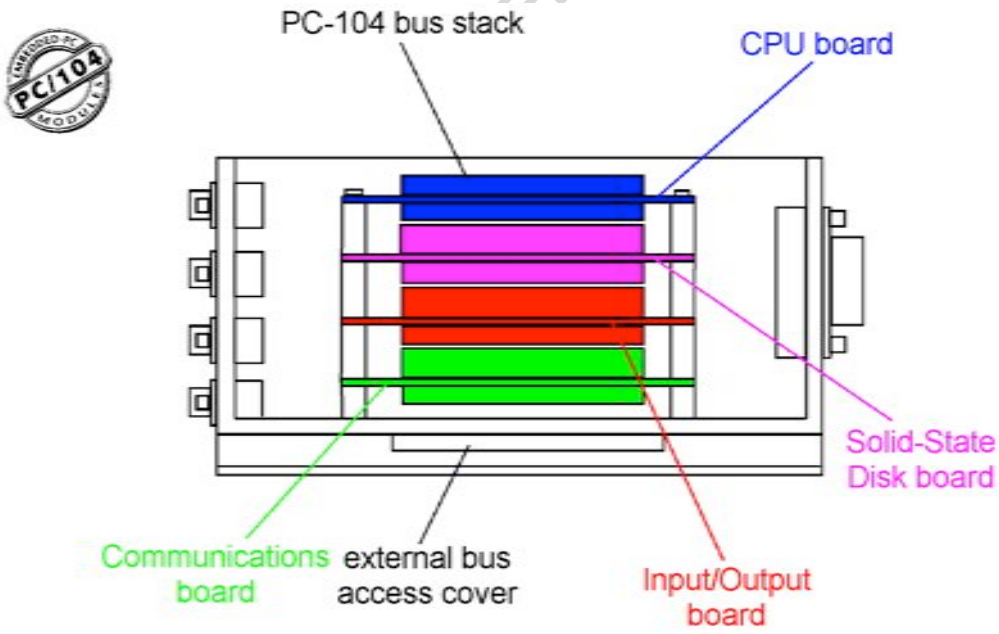
To offer a valid alternative to the basic communications capabilities of the standard PC, a third board is build into the system to provide two full-duplex high-speed independent serial channels.
The two channels can be separately programmed for asynchronous or synchronous data links. In the latter case many character or bit oriented protocols are available, including SDLC/HDLC. A comprehensive subset of X.25 will be soon made available to take advantage of this board.

To perform many command and control task a high precision I/O board has been added to the stack to provide:

- 16 differential or 32 single-ended analog input channels (16 bits of resolution) with programmable ranges and gains (typical –10 to +10 Vdc). DMA capability.
- 4 single-ended analog outputs channels (12 bit of resolution) with programmable ranges.
- A high precision voltage reference, temperature compensated.
- 24 independently programmable digital input/output channels. Also configurable as input and/or output ports with full handshake control lines.
- 2 timer/counters for synchronization purposes or frequency measurements. Also used to sync DMA acquisition.

Other standard PC104 boards can be installed in the system, for example to interface exotic sensors like synchro or resolvers.





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Software Description

From the programmers viewpoint this computer system can be used with any standard PC/AT compatible operating system. In particular it can be provided with a licensed ROMDOS to enable the user to develop applications within a standard DOS compatible environment.

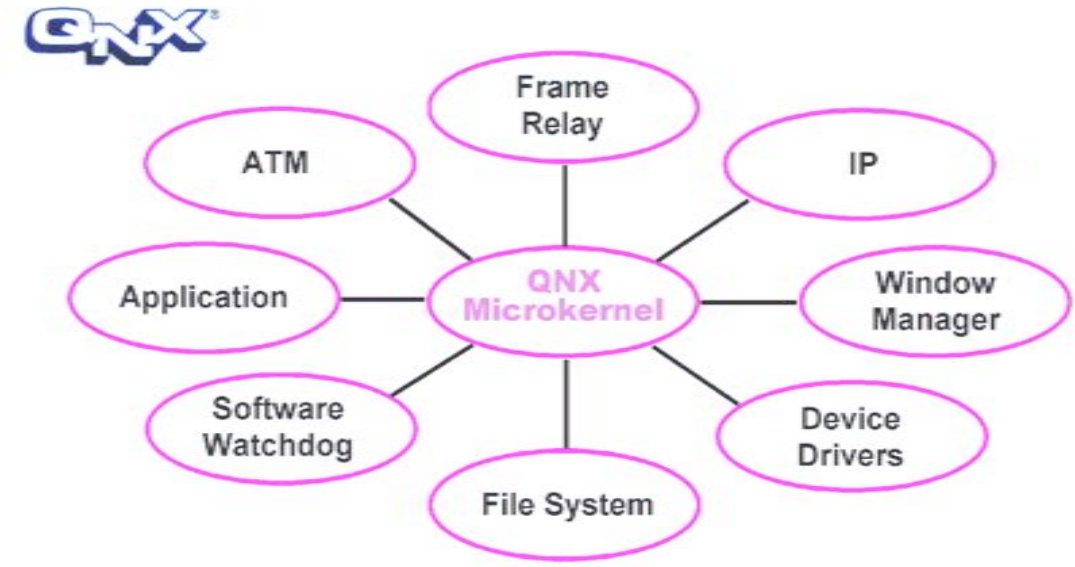
However to fully take advantage of the architecture and to improve the reliability of the application we provide the system with a dedicated configuration of QNX version 4. QNX is the leading hard real time, micro-kernel based, multi-tasking operating system chosen for many mission critical applications throughout the world.

The strength of QNX grows from its message-passing architecture which streamlines the interfaces between every single module which composes the operating system itself. Being the architecture full scalable it is possible to run the operating system and many concurrent applications even in only 4 Mbytes of main memory and with a minimal access to mass memories. And for the same reason only the modules which are of interest to the application are installed, with a consequent reduction in costs and in complexity.

Hardware access from the very controlled environment of QNX is possible thanks to specialized functions which enable the programming of user interrupt service routines without any performance penalty. Latency time is guaranteed to be below a certain threshold depending from the CPU clock operating speed. Hard real time applications can be programmed easily following some standard guidelines and without any overhead in terms of previous experience from the programmer.

From the developer viewpoint QNX offer the typical context of a UNIX machine with POSIX compliant library and a few dedicated functions (namely process control routines and message passing primitives). Any application can be designed by developing single tasks which interacts each other via message passing in cooperative architectures following, for example, the client-server model, the server-subserver model, or any other model preferred. Many UNIX and DOS applications can be ported to QNX with a minimum set of modifications.

Software development is available as a full QNX installation with the Photon graphical user interface (GUI) and the Watcom C/C++ compiler (plus all the standard UNIX tools like grep, lex, yacc, vi, make and so on). Developed software can be easily transferred to the target system with many methods depending the level of accessibility of the hardware. During the operative life of the system, software can be downloaded also via the communications link. Operating system updates can be performed at any time and can be limited to only affected modules.



Conclusions

The PC/AT architecture is today a recognized standard even for mission critical and performance critical applications. The availability of high grade, industrial strength, COTS product has been carefully evaluated and enable us to offer a reliable, robust and easy to use computer system for both command and control applications (like as an on-board computer for unmanned vehicles) and for data gathering and processing applications (like in scientific instrumentation control). The availability of a safe real time operating system to complement the hardware is the key to offer a comprehensive product easily interfaceable and programmable for any application.

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