(3)
Timers

(8)
Interrupts

(16)
Parallel I/O

(26)
Address Lines

(16)
Data Lines

(3)
Serial Ports
(RS-232/TTL)

386EX
Embedded CPU
(33Mhz)

512K
Flash Memory

512K
Static RAM
(Battery Backed)

(2) LED's

Real Time Clock
(Battery Backed)

PC-Minus

New from R.L.C. ,the ***PC-Minus 386EX*** Embedded Single Board Computer features on a single card a complete PC compatible CPU engine minus the expense and unwanted functions of a full PC. Key features include PC compatible CPU, Static RAM, Flash Memory, and Real Time Clock. Add additional I/O and memory using the provided ***386EX*** Data, Address, and Control bus expansion connectors. This new Embedded engine is designed to provide a cost effective, easy to program solution with ***RLC-RTOS*** Real Time Operating System support. Custom versions available upon request. The ***PC-Minus*** plugs directly into your board, or have us re-design your next board to include the ***PC-Minus.*** A proto-type development board is also available.

Hardware Features

* 32-Bit 386EX Embedded CPU (33 MHz)
* Three Serial Ports (RS-232/TTL)
* Real Time Clock (Battery Backed)
* Up To 512K On-Board FLASH EPROM
* Up To 512K On-Board Static RAM
* Program Controlled LEDs (2)
* 16 Parallel I/O Lines
* Off-Board Memory and I/O Expansion
* Address/Data/Control Buses Provided
* External Interrupts Provided (8)
* Timer/Counters & Watch Dog Timer Provided (3)
* Extended Temperature Range Standard
* Single 5Vdc Power Required

R L C

Software Features

* On-Board FLASH Programming
* C & C++ Fully Supported
* ***RLC-RTOS*** Provided Free
* I/O Driver Library Provided Free
* Demo Programs Provided Free
* Embedded Debugger Available

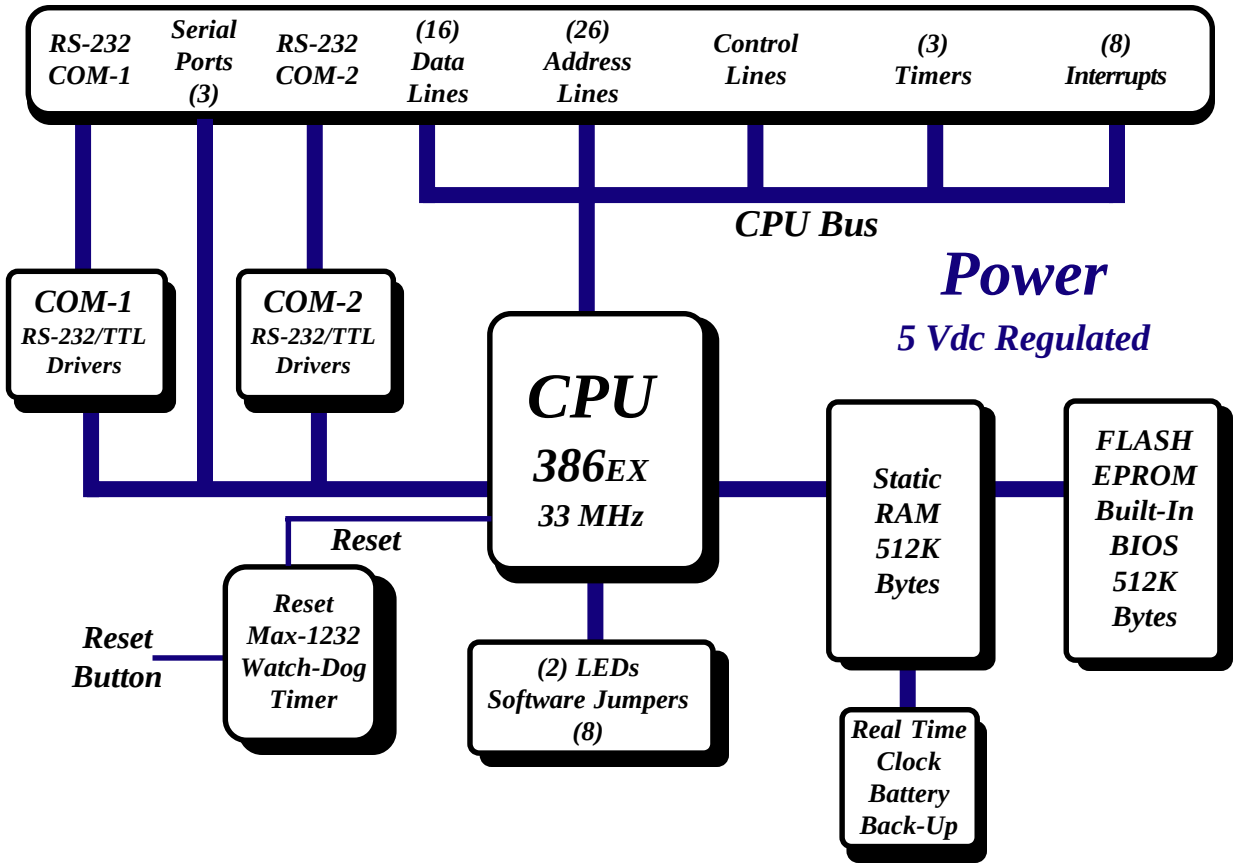
TOLL FREE
1-888-RLC-TECH
http://www.RLC.com

R.L.C. Enterprises, Inc.

2985 Theatre Drive, Paso Robles, CA 93446 Phone (805) 239-9737 FAX (805) 239-9736

PC-Minus

Off-Board Memory & I/O Expansion Connector



POWERFUL - EXPANDABLE - INEXPENSIVE - EASY

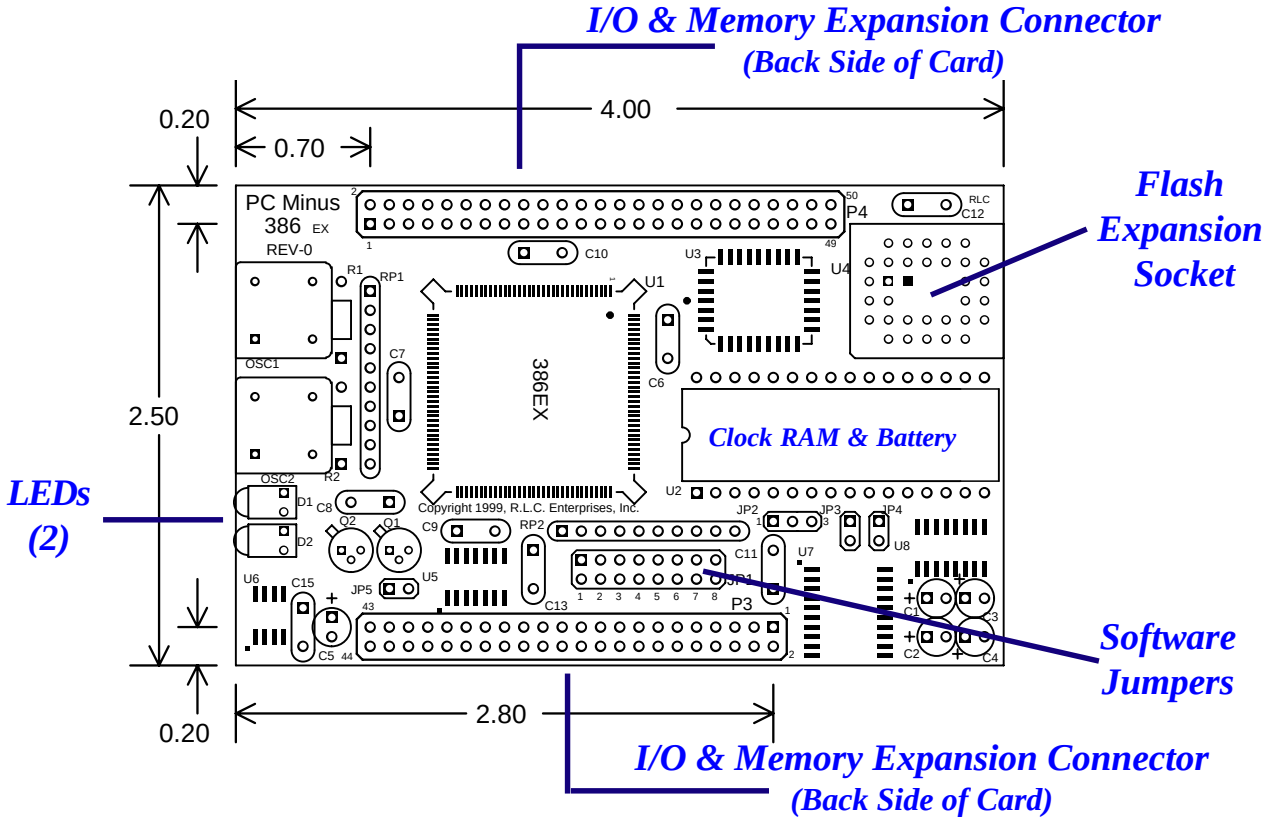
The PC-Minus Embedded Single Board Computers are Powerful because they use the new Intel 32-bit ***386EX*** embedded microprocessors at speeds up to 33 MHz and are object code compatible to the PC/XT/AT.

The PC-Minus Embedded Single Board Computers are Expandable because they provide for off-board I/O and Memory expansion using the provided expansion connectors with full Address, Data, and Control buses available. A proto-type board is also available.

The PC-Minus Embedded Single Board Computers are Inexpensive because they do not need a card cage or rack full of other cards. They also only provide the basic CPU engine function, not the unwanted functions many embedded PCs provide.

The PC-Minus Embedded Single Board Computers are Easy because they are based on an industry standard Intel processor family and are fully supported by Microsoft & Borland C/C++. The ***RLC-RTOS,*** Embedded Real Time Operating System demos and drivers are provided free.

Actual Size *(Inches)*



Functional Description

386EX CPU Chip

Our new ***PC-Minus*** Embedded Single Board Computers feature a high performance, low power 32-bit embedded microprocessor which is object code compatible to the PC/XT/AT family. The 386EX CPU chip also provides three independent UARTs, three counter/timers, programmable interrupt controller, programmable chip select unit, wait state generator, parallel I/O lines, and much more. These on-chip functions are made available at the off-board expansion connectors. The CPU Address, Data, and Control buses are made avalable at the expansion connectors.

On-Board Memory

The ***PC-Minus*** provides up to 512K-bytes of on-board FLASH EPROM and up to 512K-bytes of battery backed Static Ram Memory. The ***RLC*** BIOS allows new programs to be down loaded and programmed directly into the FLASH EPROMS without the use of external EPROM programmers or ultra-violet erasers. You may down load through the RS-232 port using the provided program down loader which runs on any standard PC/XT/AT. The area in the FLASH EPROM which holds the BIOS is protected against accidental programming. FLASH EPROMs are 100% dependable and are unaffected by glitches, program crashes, etc. FLASH EPROMs allow for fast program development and easy field updates. Off-board memory is expandable using the expansion connectors.

Memory & I/O Expansion

I/O and memory may be expanded using the CPU Address, Data, and Control buses which are made available at the expansion connectors. The 386EX CPU chip provides three independent UARTs, three counter/timers, programmable interrupt controller, programmable chip select unit, wait state generator, parallel I/O lines, and much more. These on-chip functions are made available at the off-board expansion connectors.

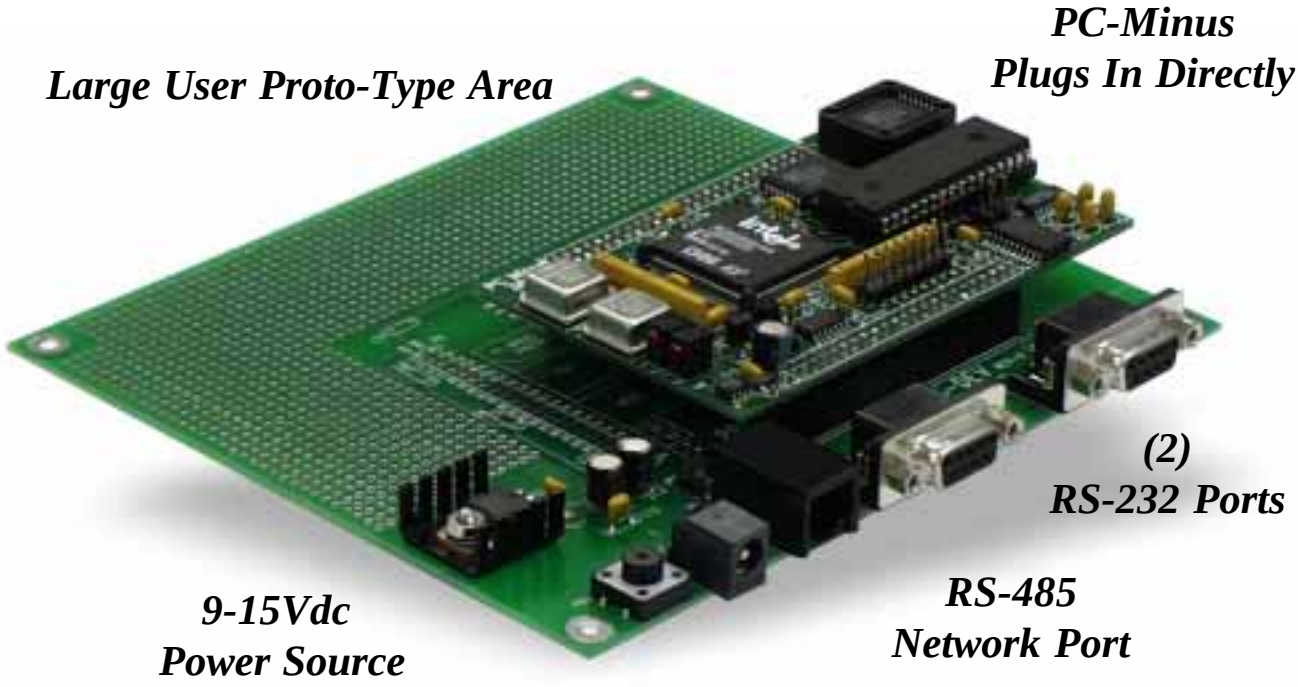
Real Time Clock

A Real Time Clock provides standard time and date functions independent of the CPU. Software is provided. The Real Time Clock is battery backed by the on-board lithium battery. The Real Time Clock and battery back-up feature is optional and must be specified at the time of order.

Miscellaneous Functions

The on-board MAX-1232 circuit provides a watch-dog timer used to monitor proper operation of the CPU. If the watch-dog is not periodically updated the system will be reset. The reset circuit is flawless and ensures that the CPU is held in reset until the power is adequate and stable. A reset button input is also provided. An eight position jumper block is provided that may be read by the user application program. Two LEDs are provided which can be turned on/off under program control at any time.

Proto-type & Development



Platform Development Board

General Description

The Proto-Type Development board provides all of the support interfaces needed to develop a new application with the ***PC-Minus***. The ***PC-Minus*** plugs directly into the platform development board. All of the 386EX signals needed are brought out to headers ready to connect to the engineer's custom circuits. The platform board also provides two RS-232 ports and one RS-485 network port ready for use. The CPU Address, Data, and Control buses are made available at the expansion connectors on the platform development board. An on-board power supply allows simple non regulated wall transformers to power the ***PC-Minus*** and the platform development board.

RS-232/485 Serial Ports

The ***PC-Minus*** serial ports are brought out to standard PC-compatible DB-9 serial connectors. RS-232 drivers are provided for both ***PC-Minus*** serial ports. The platform board also provides RS-485 drivers for one of the serial ports. Network drivers included can be used to control any of the Network I/O modules from ***RLC***. You may use either of the RS-232 ports to connect to a PC and down load programs to the ***PC-Minus*** using the provided program down loader which runs on any standard PC/XT/AT.

Proto-type Expansion

The ***PC-Minus*** platform development board provides a large area for user expansion and interfacing to the ***PC-Minus***. Memory, I/O and Control signals are brought out to headers for easy interface to user circuits. I/O and Memory may be user expanded using the CPU Address, Data, and Control buses available at the expansion connectors.

Power Supply

A power supply on the board supplies 5Vdc at 1.5 Amp. The 5Vdc is used to power the ***PC-Minus*** as well as any user circuits on the platform development board. A standard wall transformer is provided.

Miscellaneous

The platform development board is supplied assembled and tested. It comes with an RS-232 cable and a wall transformer. The ***PC-Minus*** and a platform proto-type development board provides everything needed to start your application.

Custom Designs

Start with the platform development board and develop your application for the ***PC-Minus-386EX*** . ***RLC*** will, upon request, redesign the ***PC-Minus*** to include your custom interfaces all on one card. This will save you money and time.

Software Development

(Please see software data sheets for details)

Software development using C/C++ and/or assembly is fully supported. Using our Real Time Operating System ***(RLC-RTOS)*** you can develop your application program on any standard PC/XT/AT, and down load it into the ***SBC*** (Single Board Computer) RAM where it is debugged using our full featured remote debugger. The RS-232 link between your PC/XT/AT and the SBC operates at speeds up to 115K baud for an almost instant response. After the application program is debugged, it may be down loaded and programmed into the ***SBC*** on-board FLASH EPROMs ready for execution. ***RLC-RTOS*** Real Time Operating System, device drivers, start-up code, network drivers, and demo programs for all on-board functions are provided free of charge. The FLASH EPROM down loader utility is also provided free. The FLASH down loader utility fully supports Windows operation.

Specifications

Serial Ports:

Two ports have both RS-232 and TTL signal levels available. The third has TTL levels available.

Dimensions:

4.0 in. x 2.5 in.

Minimum Power:

Regulated 5Vdc power @ 85 ma.

Environmental:

-40 to +85C with unrestricted air flow and no condensation.

Memory:

The ***PC-Minus-386EX*** will hold a maximum of 512K-bytes of Static RAM and 512K-bytes of FLASH EPROM.

CPU Chip:

Intel 386EX operating up to 33MHz.

User Interface/Connectors:

Two headers are provided for interfacing to the 386EX Address, Data, Control, Timers, Interrupts, Parallel I/O and other functions provided by the CPU chip. A 50-pin and 44-pin header is provided on the bottom side of the ***PC-Minus.*** They are designed to plug directly into the user application board.

Off-Board Expansion Signals:

(2) RS-232/TTL Serial Ports (Com-1, Com-2)
(1) TTL Serial Port (Com-3)
(16) Bits of Parallel I/O, Provided By CPU
(3) Timer Counters
(8) Interrupt Lines
(16) Data Lines
(26) Address Lines
Control Lines For Interfacing To I/O and Memory

Standard Boards:

Off the shelf boards are fully assembled and tested. The ***PC-Minus*** is shipped with 256K or 512K bytes of FLASH memory, 128K or 512K bytes of SRAM. Manuals, Software Drivers, and Software Examples supplied free on first order. Options include Real Time Clock and Lithium battery, and extended memory.

Proto-Type Platform Board:

A proto-type board is available from ***R.L.C.*** which allows the ***PC-Minus*** to be plugged directly into a development environment. This proto-type board gives the user a wire-wrap/proto-type area and cable connections for power/ground and RS-232/485 network ports.

Special Order :

R.L.C. will, on special request, re-design the ***PC-Minus*** to include the I/O functions and interfaces required by your application. Size and shape may also be changed to your specifications. Special orders may require minimum quantity purchases and NRE charges.