

## CE-Plus I/O Expansion

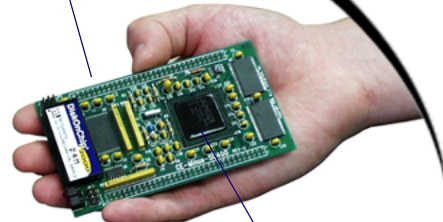
Digital Inputs (8)  
Digital Outputs (8)  
Analog Inputs (6)  
Serial Ports (3)  
Printer Port (1)



## LCD-Plus

6" 1/4 VGA RGB  
Color Graphic LCD  
With Touch Screen

## CE-Minus CPU/Engine



**Embedded Single Board Computers**

**Easy To Program**

• **Microsoft Visual C++**

• **Microsoft Visual Basic**

AMD Elan-SC400  
100 Mhz (486)

PCMCIA Card Slot  
Accepts Ethernet,  
Modem, Or ATA FLASH

On-Board Power Supply  
Accepts 8 To 18Vdc

# CE-Minus/Plus

New from R.L.C., the **CE-Minus-SC400** (486) 32-Bit Embedded Single Board CPU/Engine features on a credit card sized board, a complete **Windows CE** CPU/Engine running your applications written in Microsoft **Visual C++** or **Visual Basic**. Key hardware features include an AMD ELAN SC400 100 MHz 486 compatible CPU/Controller, RAM and FLASH Memory, Real Time Clock, Serial Port, Parallel Printer Port, LCD Graphics Controller, PCMCIA Interface, Power Management Unit, and much more. The **CE-Minus** is designed to plug directly into your custom application, or you may use our **CE-Plus** I/O expansion board and **LCD-Plus** 1/4 VGA color LCD Graphics display with built-in touch screen. Software development using Microsoft embedded visual tools includes remote debug and drag & drop features between your software development computer and the **CE-Minus**. Both Ethernet and serial port software development is supported.

## CE-Minus, CE-Plus, LCD-Plus

- \* 32-Bit ELAN SC400 (486) Embedded CPU
- \* 100 MHz Clock Speed
- \* 12 Meg-bytes On-Board FLASH Standard
- \* 16 Mega-bytes On-Board RAM Standard
- \* LCD Color Graphics Display (6", 1/4 VGA)
- \* Touch Screen Standard
- \* PCMCIA Card Interface
- \* Serial COM Ports (3)
- \* Printer Port (1)
- \* Analog Inputs (6)
- \* Digital Parallel TTL I/O (16)
- \* iSBX I/O Module Interface (2)
- \* Real Time Clock And Timers (3)
- \* User I/O Expansion Bus
- \* On-Board Power Supply



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## Software Features

- \* **Windows CE** (3.0 Standard)
- \* **Visual Basic** Supported
- \* **Visual C++** Supported
- \* **Remote Debug** Supported
- \* On-Board FLASH Programming
- \* Demo Programs Provided Free

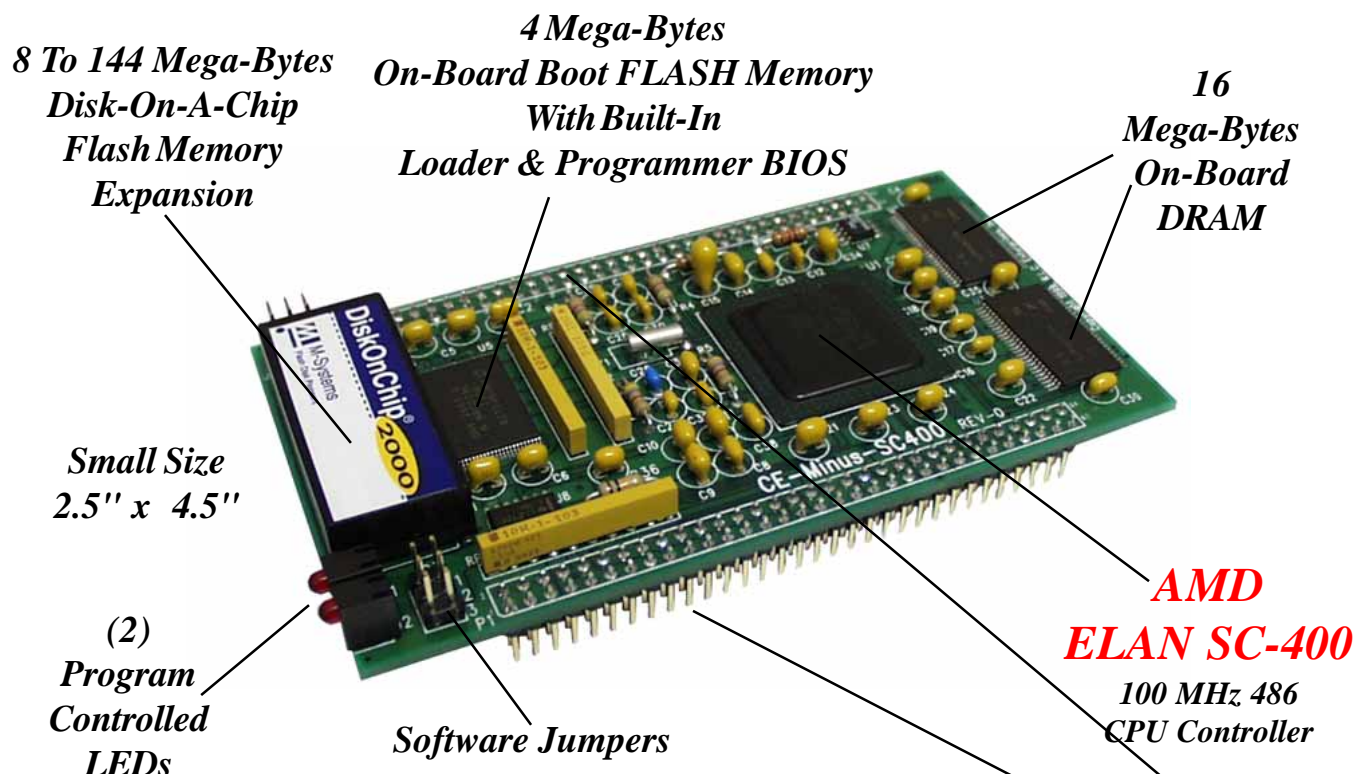
**TOLL FREE**  
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# R.L.C. Enterprises, Inc.

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

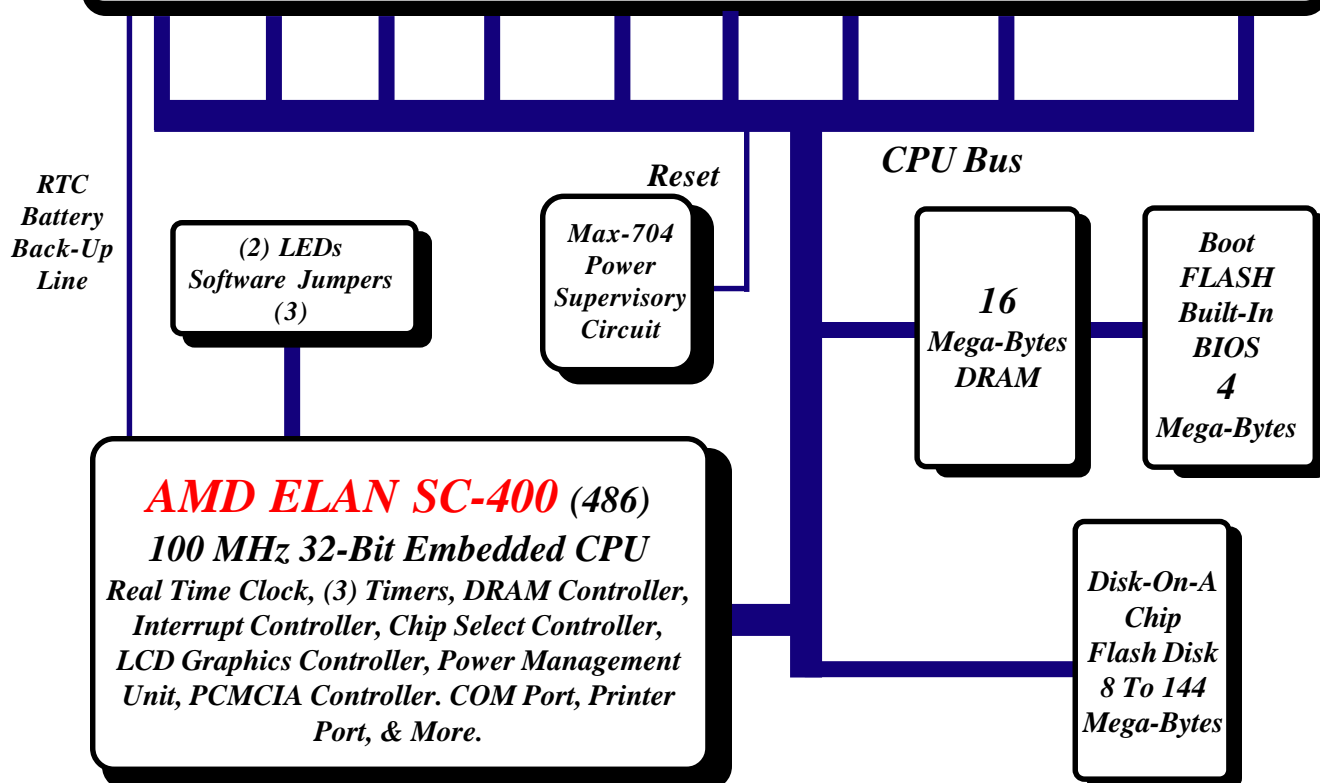
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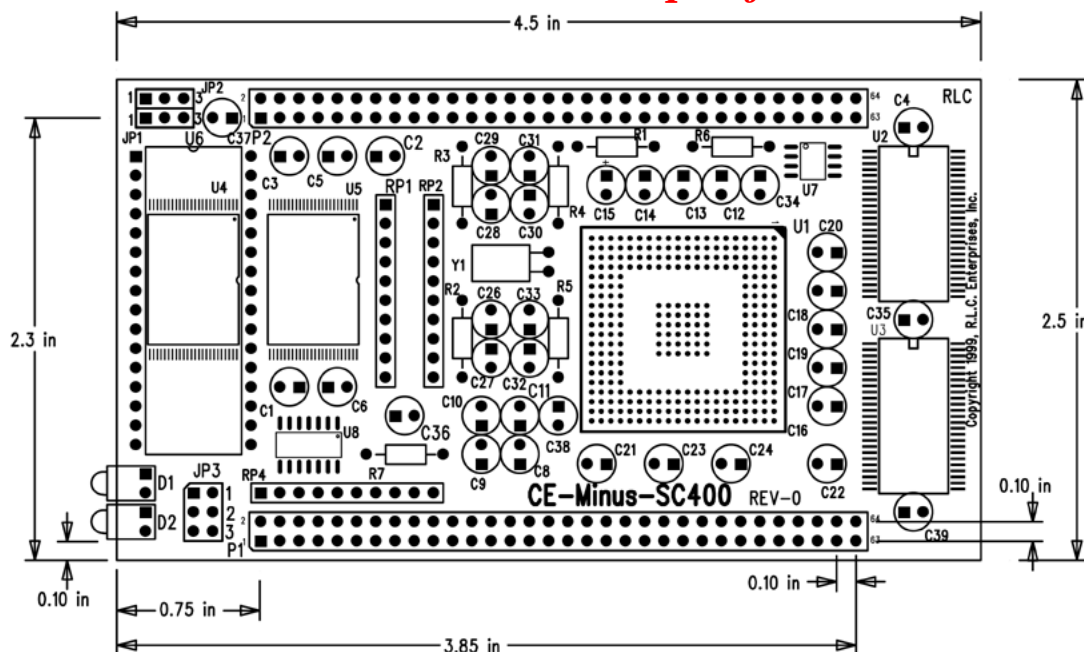
# CE-Minus



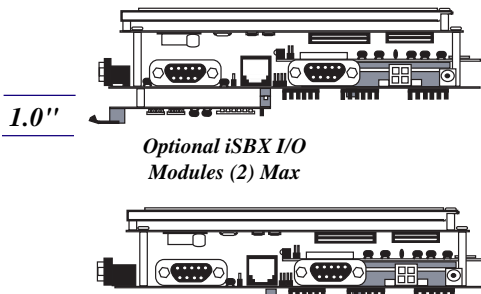
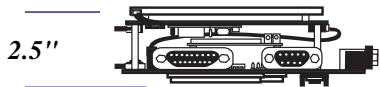
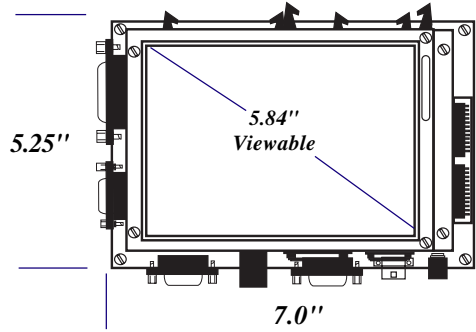
## CE-Minus Interface Expansion Connectors P1 & P2

Serial Port (COM-1)	Printer Port (LPT-1)	LCD Graphics Controller	Data Lines (16)	Address Lines (16)	Control Lines	PCMCIA Controller Interface	Chip Selects & Interrupts	Matrix /XT/AT Key Board Interface
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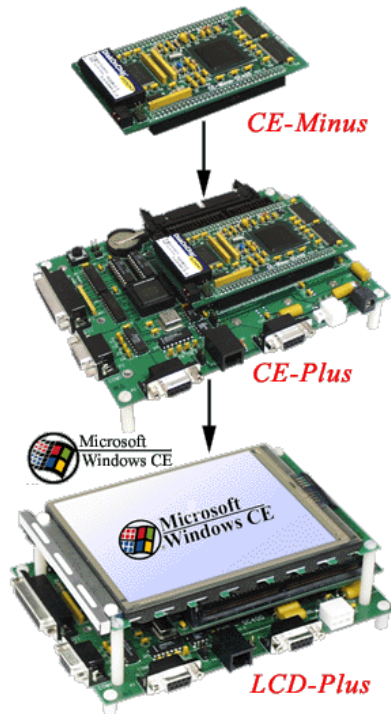




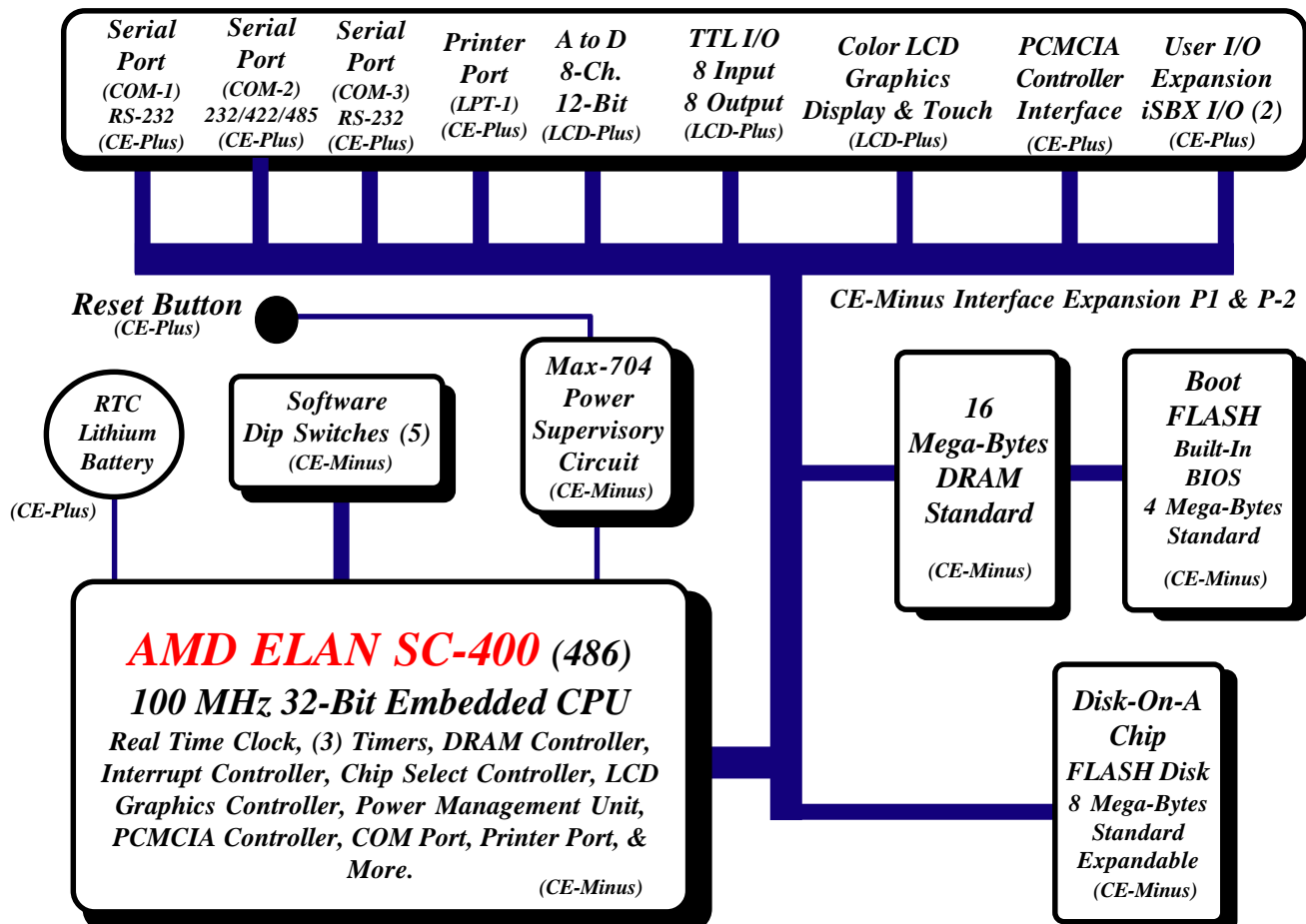
# CE-Minus, CE-Plus & LCD-Plus



**Development  
System  
CE-DEV-CT-1**



## CE-Minus, CE-Plus, & LCD-Plus System Diagram





# ***CE-Minus, CE-Plus & LCD-Plus***

## ***Functional Description***

### ***CE-Minus, CE-Plus & LCD-Plus***

#### ***General Description***

The CE-Plus I/O expansion board interfaces directly to the CE-Minus CPU/Engine and LCD-Plus display, expanding the on-board I/O of the CE-Minus single board CPU/Engine. The CE-Plus provides the user with access to all of the features of the CE-Minus plus an on-board regulated power supply, data bus buffers, I/O drivers, two additional serial ports, and user interface connectors. The CE-Plus also provides a buffered interface to the LCD-Plus 1/4 VGA display with touch screen. The CE-Plus also provides for additional I/O expansion via the two on-board iSBX direct plug-in I/O connectors and the RS-485 Network port. You may add any combination of R.L.C. iSBX I/O Modules and Network I/O Modules to your system using these standard interfaces. The CE-Plus also provides a reset button and a lithium battery for the CE-Minus Real Time Clock..

#### ***CE-Plus Serial Ports (3)***

The **CE-Plus** provides three (3) standard serial ports (COM-1, COM-2, COM-3). COM-1 is via the CE-Minus while the other two are provided by a dual 16C552 UART on the CE-Plus. Each of the three serial ports provide RS-232 receivers and drivers for Tx, Rx, signals. Standard DB-9 connectors are provided. The COM-2 port also provides RS-422/485 drivers for interfacing to Network I/O modules and other similar devices that use this type interface. This RS-422/485 network interface is provided on an RJ-11 connector.

#### ***CE-Plus Parallel Printer Port***

The standard parallel printer port (LPT-1) is provided by the CE-Minus and is buffered and made available at a standard interface connector on the CE-Plus.

### ***CE-Plus PCMCIA Socket Adapter***

The **CE-Plus** PCMCIA card host adapter interface conforms to PCMCIA Standard Release 2.1. The interface provides support for one external PCMCIA card socket. The PCMCIA socket adapter connects directly to the CE-Plus using a ribbon cable. Standard size or compact PCMCIA cards are accepted.

### ***CE-Plus I/O Expansion Bus***

The **CE-Plus** provides an interface connector to provide the engineer with access to the CPU address lines, data lines, chip selects, interrupts, and control signals. You can use this interface to add your own custom I/O designs to the CE-Plus.

### ***LCD-Plus Display & Touch Screen***

The **LCD-Plus** features a built-in color LCD graphics display with fully integrated resistive touch screen. The display features a 1/4 VGA resolution, 320 x 240 RGB color 4 bits per pixel. Display and touch screen drivers have been custom integrated into the Windows CE operating system. The display features a wide viewing angle with CCFL back light. Power for the LCD display is generated on-board. Software controls allow for contrast adjustment and applications to turn off the CCFL back light to conserve power. The LCD-Plus mounts directly to the CE-Plus or can alternately be mounted up to two (2') feet away.

### ***LCD-Plus Additional I/O***

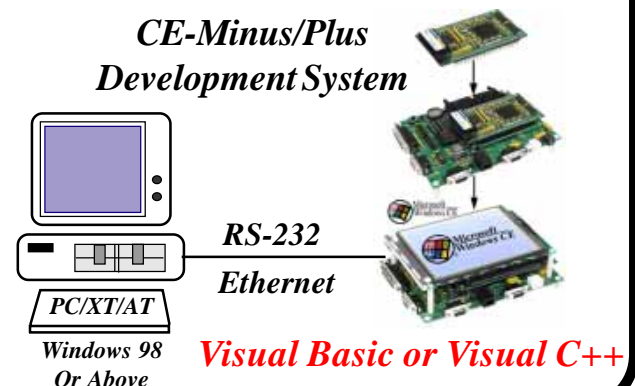
The **LCD-Plus** also provides (8) Digital TTL outputs, (8) Digital TTL inputs, and (6) channels of 12-Bit A to D conversion. These standard I/O features are made available on standard connectors. Software drivers and demonstration programs are provided for each of these I/O functions.

## ***Software Development***

**Windows CE** is a low-cost, compact real time embedded operating system from Microsoft designed for sophisticated 32-bit embedded computer solutions. Windows CE features a compact operating system which has been custom tailored and ported to the CE-Minus/Plus Embedded Single Board Computer. Many of the interfaces provided by the CE-Minus/Plus have been integrated into the operating system. You can write your application programs using Microsoft embedded Visual Basic or Visual C++ and debug your application using the full featured remote debugger. You can add custom drivers and DLLs as required for your specific hardware application.

Microsoft embedded Visual Basic or Visual C++ is used for software application development. R.L.C. will provide the Windows CE operating system custom tailored and pre-installed in the CE-Minus along with everything needed to start developing your custom software applications. Remote application development and debug is supported using the serial COM-1 port or a PCMCIA

card Ethernet connection. Full remote debug, and program transfers into FLASH DISK memory using standard drag & drop and your Windows Explorer are supported.



## ***Development System ( CE-DEV-CT-1 )***

**R.L.C.** offers a development system ( CE-DEV-CT-1 ) which provides the necessary hardware and software needed to develop software applications using Microsoft Visual Embedded Tools. The development system is shipped pre-assembled and complete with Windows CE version 3.0 pre-install and ready to run. Demonstration programs are also pre-installed ready to run and are also provided on a separate CD with source/project files included for your own use. The development system provides all hardware required to set up an environment for software development using Microsoft Embedded Visual C++ or Visual Basic. The development system comes with serial port cables, power supply, PCMCIA adapter socket, and the RLC-CD with recovery files, documentation, and demo programs with source code. You must provide your own development computer and the Microsoft Embedded Visual Tools 3.0. These tools include Visual Basic and Visual C++ compilers and debuggers and are available from Microsoft for FREE. Follow the links at our web site ( [www.rlc.com](http://www.rlc.com) ) to get your tools.

## ***I/O And User Interfaces***

### ***Serial Ports (3):***

All three serial ports COM-1, COM-2, and COM-3 provide PC compatible signals. DB-9F locking connectors are provided on the CE-Plus. Standard PC serial cables may be used for direct connection to the serial ports. A nul-modem is not required.

### ***RS-422/485 Network Port:***

The COM-2 serial port may be used for either RS-232/422 or 485 serial communication. Connection to the RS-422/485 feature is provided by an RJ-11 connector on the CE-Plus. Standard phone style network cables may be used to connect to this feature. This feature may be used to control Network I/O modules from R.L.C. or for other custom applications.

### ***PCMCIA Interface:***

Signals are provided to implement one PCMCIA interface to support Ethernet, Modem or ATA FLASH memory cards. Software drivers are included in the Windows CE operating system. The PCMCIA socket connects directly to the CE-Plus using a ribbon cable.

### ***Parallel Printer Port:***

A locking DB-25F connector is provided on the CE-Plus for connection to the enhanced parallel printer port. A standard printer cable may be used for connection.

### ***iSBX I/O Module Interface:***

(2) iSBX I/O ports are provided on the back side of the CE-Plus. These interfaces can be used to add R.L.C. off-the-shelf iSBX I/O Modules.

### ***Parallel TTL I/O:***

Eight (8) digital TTL input pins  
Eight (8) Digital TTL output pins  
Signals available on LCD-Plus (ribbon connector)

### ***Analog Inputs:***

Six channels of A to D conversion, 12-Bit resolution  
Signals available on LCD-Plus (ribbon connector)

### ***User I/O BUS Interface:***

(8) Data Lines, (3) Address Lines, (2) Interrupt Lines,  
(1) Chip Select, I/O Read, I/O Write  
RESET, \*RESET, 5Vdc, Gnd.  
Signals available on CE-Plus (ribbon connector)

## ***LCD-Plus Display And Touch Screen***

### ***Graphics RGB Color LCD Display:***

1/4 VGA resolution, 320 x 240 RGB STN color  
Brightness = (180 cd/sq-m)  
Viewing angle = approx. +50/-50 Degrees  
CCFL back light with off/on control to conserve power  
Software controlled contrast adjustment  
LCD power provided by CE-Plus

### ***Touch Screen:***

Extremely durable glass-like resistive touch screen.  
12-Bit A to D converter used to provide high resolution and accuracy. Can be easily calibrated for use with finger, glove, or stylus. Calibration routines are built into the operating system and can be easily integrated into your application.

## ***General Specifications***

### ***Power CE-Minus, CE-Plus & LCD-Plus:***

Unregulated 8 to 18Vdc  
330 ma @ 33Mhz, Idol with CCFL back light off  
750 ma @ 33Mhz, Idol with CCFL back light on  
1200 ma @ 100Mhz, back light on

### ***Power CE-Minus Only:***

Regulated 3Vdc with maximum memory.  
90 ma. @ 33Mhz./Idol, 520 ma maximum @ 100 Mhz.  
Regulated 5Vdc power with maximum memory.  
2 ma @ 33 Mhz./Idol, 19 ma. maximum @ 100 Mhz.

### ***Environmental:***

-0 to +50C with air flow and no condensation.

### ***CPU Clock Speed:***

AMD ELAN SC400 running at 33/66/100 Mhz software selectable, and automatic power management.

### ***Special Or Custom Orders :***

**R.L.C.** will, on special request, re-design the **CE-SBC-SC400** to include the I/O functions and interfaces required by your specific application. Size and shape may also be changed to your specifications. Special orders will require minimum quantity purchases and/or NRE charges.

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