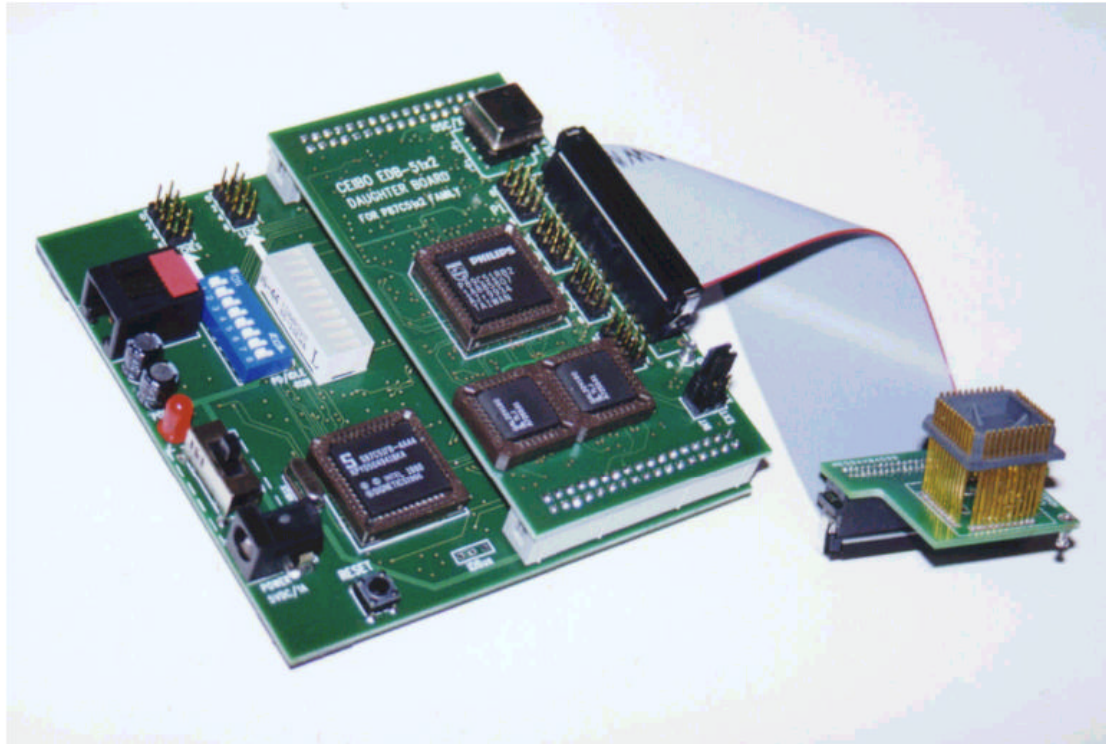


EB-51X2 Low-Cost Emulator



Low-Cost Emulator for Philips 80C51X2 Microcontrollers

FEATURES

- **Emulates 8051 Derivatives with 6/12 Clocks/Cycle**
- **64K Code And 64K Data Memory**
- **Memory With Mapping Capabilities**
- **Real-Time Trace**
- **Frequency Range up to 40MHz**
- **Source-Level Debugger For C And Assembler**
- **MS-Windows Debugger Software**
- **Performance Analyzer**
- **Emulation Header and Signal Testpoints**
- **Serially Linked to IBM PC at 115Kbaud**

DESCRIPTION

Ceibo EB-51X2 is a development tool that supports Philips 8051 microcontrollers with 6/12 clocks/cycle at any frequency allowed by the devices. It is serially linked to a PC or compatible systems and can emulate the microcontrollers using either the built-in clock generator or any other clock source connected to the microcontroller. Emulation is carried out by loading the system with the user software and an embedded monitor program. EB-51X2 locates the monitor in the upper 1K of the code memory space. The system uses Philips standard devices for real-time and transparent emulation. The system accepts devices operating with 6 or 12 clocks per cycle without any special setup. Furthermore, the microcontrollers can be used in emulation mode where I/O ports are not affected by the emulation process, or in ROMless mode that uses Port 0 and 2 as bus lines. The emulator is not frequency or voltage restricted, so it can be used to emulate the microcontroller in the complete range of parameters defined by the device. Two working modes are available: real-time and simulator. In the real-time mode the user software is executed transparently and without interfering with the microcontroller speed. Breakpoints can be added to stop program execution at a specific address. The simulation is intended only for software debugging of the basic 8051 functions. EB-51X2 may be disconnected while using the simulation mode. The software includes C and Assembler Source Level Debugger, On-line Assembler and Disassembler, Trace, Conditional Breakpoints and many other features. The system is supplied with MS-Windows debugger software, RS-232 cable and a power supply.

SPECIFICATIONS

SYSTEM MEMORY

EB-51X2 provides 64K of user code memory and 64K of user data memory. This RAM memory permits downloading and modifying of user's programs and variables.

CODE MEMORY

Code memory is mapped as belonging to the EB-51X2 Low-Cost Emulator. The system includes 64 KBytes of RAM to be used as code memory. However, this RAM memory can be used partially and up to 63K.

DATA MEMORY

Data memory can be mapped as belonging to the emulator or to the target circuitry. The system includes 64 KBytes of RAM to be used as data memory.

BREAKPOINTS

Breakpoints allow real-time program execution until an opcode is executed at a specified address.

WINDOWS DEBUGGER

The EB-51X2 software includes a source level debugger for Assembler and high-level languages C and others) with the capability of executing lines of the program while displaying the state of any variable. The debugger uses symbols contained in the absolute file generated by the most commonly used Assemblers and High Level Language Compilers. The CEIBO Windows Debugger runs only under Windows 95 or later and also under Windows NT.

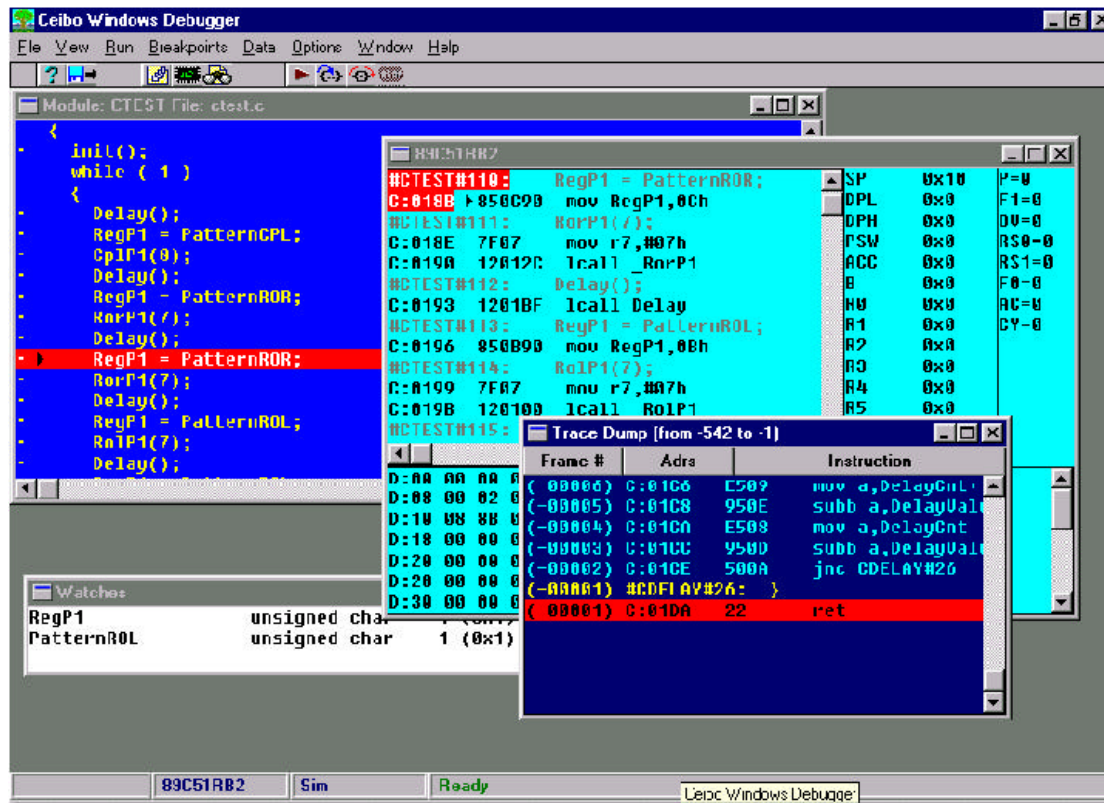


Figure 1: *Windows Debugger*

REAL-TIME TRACE

The trace is a real-time function and records up to 1K instructions. Larger trace memory is available optionally.

SUPPRTED MICROCONTROLLERS

The supported microcontrollers are most of the Philips 80C51 microcontrollers in both ROMless and ROMed versions. EB-51X2 has daughter boards to emulate different microcontrollers.

MICROCONTROLLER SELECTION

EB-51X2 uses standard Philips microcontrollers for hardware and software emulation. The selection of a different microcontroller is made by replacing the microcontroller on the daughter board or if the package is different, by replacing the daughter board. EB-51X2 runs at the frequency setup of the system or from the clock source supplied by the user hardware. The minimum and maximum frequencies are determined by the emulated chip characteristics, while the emulator maximum frequency is 40MHz.

HOST CHARACTERISTICS

PC or compatible systems with 1 MByte of RAM, one RS-232C interface card for the PC, Windows 95 or later.

INPUT POWER

5V, 1.5A power supply supplied.

MECHANICAL DIMENSIONS

10cm x 10cm.

ITEMS SUPPLIED AS STANDARD

Development tool with 128 KByte Memory, one Philips 8051 microcontroller derivative, one daughter-board and emulation header, Windows software including source level debugger, on-line assembler and disassembler, user's manual, RS-232 cable and power supply.

OPTIONS

4K trace memory (1K is the default configuration). Daughter boards and emulation headers for the different microcontrollers.

CIRCUIT DESCRIPTION

The first step required to work with the EB-51X2 board is to be able to identify its different parts and to understand how the electronics function. This will help you to take full advantage of all the available capabilities of the EB-51X2.

On the upper left side of the EB-51X2 you will see a phone jack and written on it, RS-232. It is used to serially link the EB-51X2 to your computer and to utilize the software in emulation mode instead of just the simulator. The emulation mode is used to interact with the hardware while the simulator is independent of any hardware connection.

The DC POWER jack located on the bottom left section of the board. This connector is used to apply a regulated DC voltage to the board. You should use the power supply included with the system. If you are using another power supply, the plug must be with the plus on the tip.

On the left side you will see a POWER LED indicating whether or not the power is applied to the system.

J112 and J113 connectors are used to install the daughter board with the emulated microcontroller on it. The system will not work without a daughter board properly installed on it.

On the top of the board you will find two 8-pin connectors. The SWITCHES connector provides logic states to input ports. The LEDs connector permits to connect any logic signal and to observe its logic state. EB-51X2 is supplied with an 8-wire ribbon cable to connect the ports to LEDs and Switches, thus allowing to easily test your program.

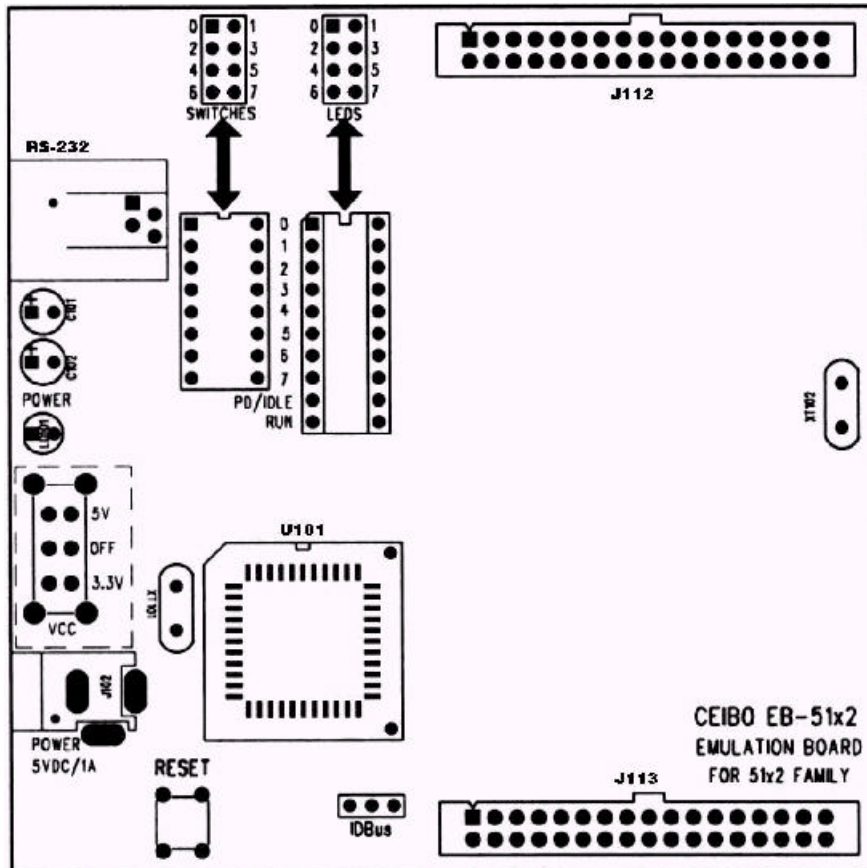


Figure 2: Emulator Layout

U101 is a microcontroller used by the system to communicate to the and it is not the emulated microcontroller which is placed on the daughter board. The power switch is on the left side of the board. It has three positions: OFF, 3.3V and 5V. Although the input voltage is always 5V, the system has a built-in voltage regulator that drops the voltage to 3.3V if the switch is set accordingly.

On the bottom of the board there is a Reset pushbutton.

The main board accepts daughter boards to emulate microcontroller with different packages or capabilities. Currently there are three daughter boards: B-RX2 (44-PLCC), B-591 (44-PLCC) and B-554 (68-PLCC).

44-PIN DAUGHTER BOARDS

Daughter Board B-RX2 or B-591 accept microcontrollers with 44-PLCC package. Ceibo also has 40-DIP to 44-PLCC socket converters in case the user wants to replace the supplied microcontroller another one with 40-DIP package.

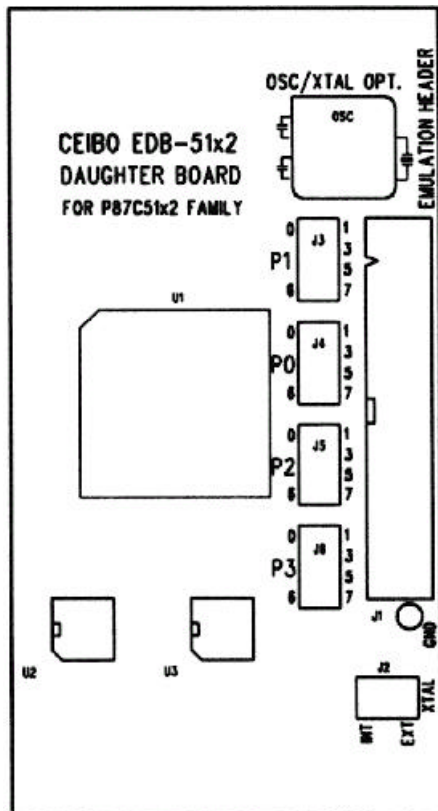


Figure 3: 44-Pin Daughter Board Layout

These daughter boards recognize the technology used: 6 or 12 clocks/cycle and no special setup is required except having the corresponding microcontroller on U1 in the daughter board.

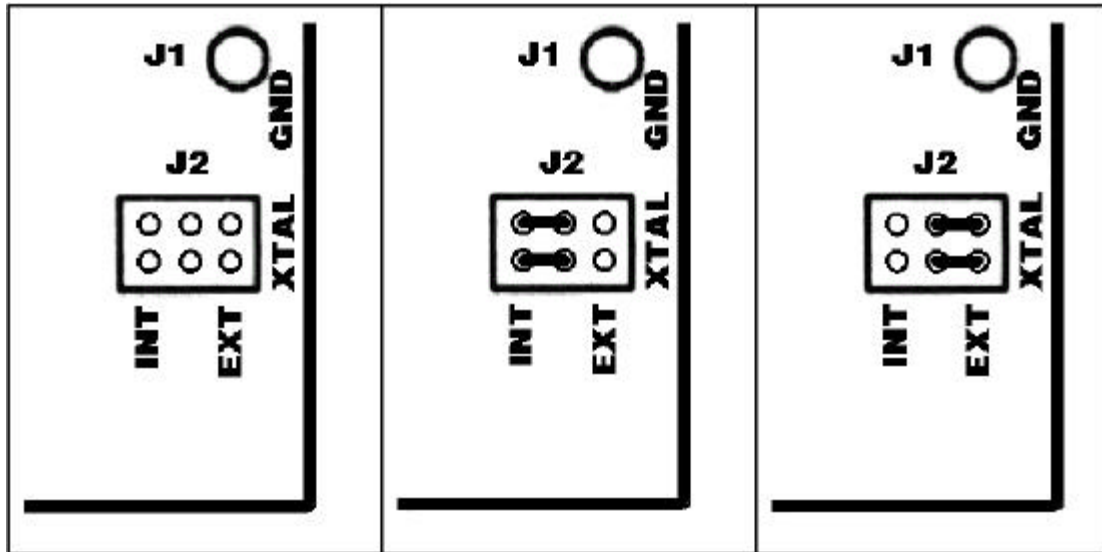
Four 8-pin connectors provide easy access to Port 0, 1, 2 and 3, which can be used to connect them to LEDs and Switches on the main board, or just as testpoints.

Frequency is programmable from 25KHz to 40MHz in steps of 2KHz and the board uses as special clock source controlled by software for this purpose. The default value of this clock source is 11.059MHz.

As an addition to this feature, a oscillator or crystal can be used. The connections are as per the drawing on the board: use an 8-pin oscillator or a crystal with two capacitors to generate the clock.

J2 is the jumper that defines which clock source is being used.

The jumpers with the caps set the clock to be supplied by an external source from the target board (not the emulator) or to system programmable clock. If the oscillator/crystal option is implemented (a crystal or an oscillator is placed on the empty socket) the caps *must* be removed from the jumpers.



OSC/XTAL Option Emulator Clock Source Target Clock Source

Figure 4: Frequency Setup

A ribbon cable must be connected to J1 to attach the emulation header if the system is connected to a target board. As Vcc is not passed through this cable, the target board must have its own power supply. GND and all other signals are connected to J1.

An additional GND testpoint is located on the right side of the board.

68-PIN DAUGHTER BOARD

Daughter Board B-554 accepts microcontrollers with 68-PLCC package and with the 8xC552/4 pinout.

This daughter board recognizes the technology used: 6 or 12 clocks/cycle and no special setup is required except having the corresponding microcontroller on U1 in the daughter board.

Six 8-pin connectors provide easy access to Port 0 to 5 which can be used to connect them to LEDs and Switches on the main board, or just as testpoints. Frequency is programmable from 25KHz to 40MHz in steps of 2KHz and the board uses as special clock source controlled by software for this purpose. J2 is the jumper that defines which clock source is being used.

The jumpers with the caps set the clock to be supplied by an external source from the target board (not the emulator) or to system programmable clock. The default value of this clock source is 11.059MHz.

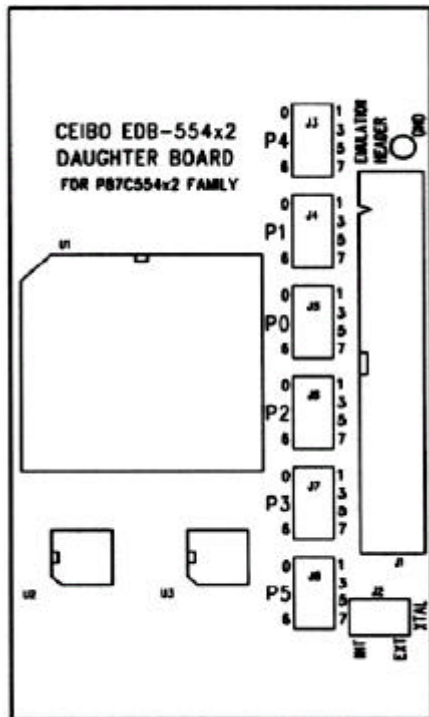
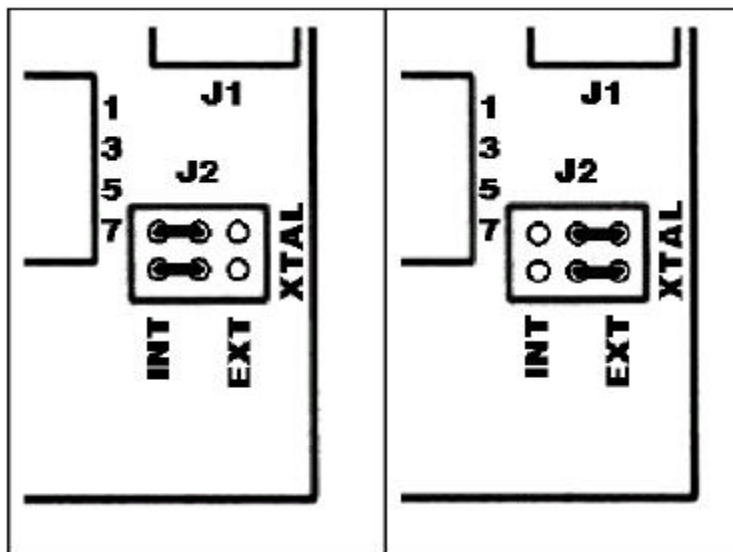


Figure 5: 68-Pin Daughter Board Layout



Emulator Clock Source Target Clock Source

Figure 6: Frequency Setup

A ribbon cable must be connected to J1 to attach the emulation header if the system is connected to a target board. As Vcc is not passed through this cable, the target board must have its own power supply. GND and all other signals are connected to J1.

An additional GND testpoint is located on the right side of the board.

EMULATION HEADERS

Different emulation headers are available to support microcontrollers in the following packages: 40-DIP, 44-PLCC, 44-QFP, 68-PLCC, 80-QFP and others. Consult www.ceibo.com for the latest list of supported packages and devices.

TRACE SUPPORT

The real-time trace function does not need additional components as it is included in the emulator circuitry.

ROM/ROMless SUPPORT

ROMless operation means the microcontroller uses external address and data buses to fetch instructions. You may use any device with EB-51X2 working in ROMless mode.

ROM mode means that Port 0 and 2 are not used to fetch instructions and they are I/O lines. You may use this mode with the supplied Philips device.

However, if you replace the supplied device on the daughter board, the system may not work in ROM mode because the microcontroller does not have the special setup required for emulation or it is not a Philips device. The following paragraph provides more details about this setup.

EMULATION SUPPORT

The list of emulation support for standard EB-51X2 systems is as follows:

Microcontroller	Daughter Board	Header	Special Adapter	fmax	Voltage	Special Features
89C51RB2	B-Rx2	44-PLCC	40-DIP, 44QFP	20/33 MHz	3.3/5V	6/12 clocks
89C51RC2	B-Rx2	44-PLCC	40-DIP, 44QFP	20/33 MHz	3.3/5V	6/12 clocks
89C51RD2	B-Rx2	44-PLCC	40-DIP, 44QFP	20/33 MHz	3.3/5V	6/12 clocks
80C32	B-Rx2	44-PLCC	40-DIP, 44QFP	33 MHz	3.3/5V	
8xC5x	B-Rx2	44-PLCC	40-DIP, 44QFP	33 MHz	3.3/5V	
8xC51Fx	B-Rx2	44-PLCC	40-DIP, 44QFP	33 MHz	3.3/5V	
8xC51Rx+	B-Rx2	44-PLCC	40-DIP, 44QFP	33 MHz	3.3/5V	
80C554	B-554	68-PLCC	80QFP	20/33 MHz	3.3/5V	6/12 clocks
83C554	B-554	68-PLCC	80QFP	20/33 MHz	3.3/5V	6/12 clocks
87C554	B-554	68-PLCC	80QFP	20/33 MHz	3.3/5V	6/12 clocks
80C591	B-591	44-PLCC	44-QFP	16 MHz	3.3/5V	6 clocks
83C591	B-591	44-PLCC	44-QFP	16 MHz	3.3/5V	6 clocks
87C591	B-591	44-PLCC	44-QFP	16 MHz	3.3/5V	6 clocks
89C660	B-Rx2	44-PLCC	44-QFP	20/33 MHz	3.3/5V	6/12 clocks
89C662	B-Rx2	44-PLCC	44-QFP	20/33 MHz	3.3/5V	6/12 clocks
89C664	B-Rx2	44-PLCC	44-QFP	20/33 MHz	3.3/5V	6/12 clocks
89C668	B-Rx2	44-PLCC	40-DIP, 44QFP	20/33 MHz	3.3/5V	6/12 clocks

Supported Microcontrollers

If some other old derivatives are used or they are not Philips microcontrollers, they may not work properly. For *old Philips devices* causing system errors while being plugged into the daughter board, Lock bits 1 and 2 must be programmed (even if it is 80C32). Programming these security bits is the required operation needed by the Philips microcontrollers to activate the "ROM emulation mode". Using different microcontrollers not listed above or not programming the security bits may cause the system to operate only in ROMless mode. 3.3V operation may be achieved by using a microcontroller able to operate at such a voltage. As the list of supported devices and available daughter boards is continuously evolving, call Ceibo to receive the latest update.

POWER SUPPLY

EB-51X2 includes a switching power supply suitable for any country. The input voltage is 200-250VAC/0.3A, 47-63Hz and supplies 5VDC/1.5A. Power cord is not included. You may use the 5V source from EB-51X2 to feed your circuit if it does not require more than 150 mA. Vcc is disconnected in the emulation header. The Power switch may be used to drop the voltage to 3.3V.

EMULATION RESTRICTIONS

The following restrictions are valid for EB-51X2:

1. EB-51X2 Monitor Program shares 1 KByte of the 64K memory code space. Therefore, user programs can be up to 63 KBytes.
2. Code memory cannot be mapped external and always belongs to the emulator system.
3. The program also uses 4 Bytes of the internal stack memory.
4. The stack pointer may not be defined below address 7.
5. The first instruction (address 0000h) must be 3-bytes long. For example: use LJMP and not SJMP or AJMP as the first instruction. One interrupt may be shared or reserved by the system and interrupts should not be disabled.

EB-51X2 - ORDERING INFORMATION

<i>Item</i>	<i>Description</i>
EB-51X2	Low-Cost Emulator, Software, Power Supply, RS-232 Cable
B-Rx2	Daughter Board for 89CRB2/C2/D2, 89C660/2/4/8
B-554	Daughter Board for 80C554, 83C554, 87C554
B-591	Daughter Board for 80C591, 83C591, 87C591
H-40D	Header 40-Pin DIP
H-44P	Header 44-Pin PLCC
H-68P	Header 68-Pin PLCC
FC-60P	Flat Cable for 40-Pin DIP and 44-Pin PLCC
FC-80P	Flat Cable for 80-Pin PLCC
ADP-44Q	44-Pin QFP Adapter