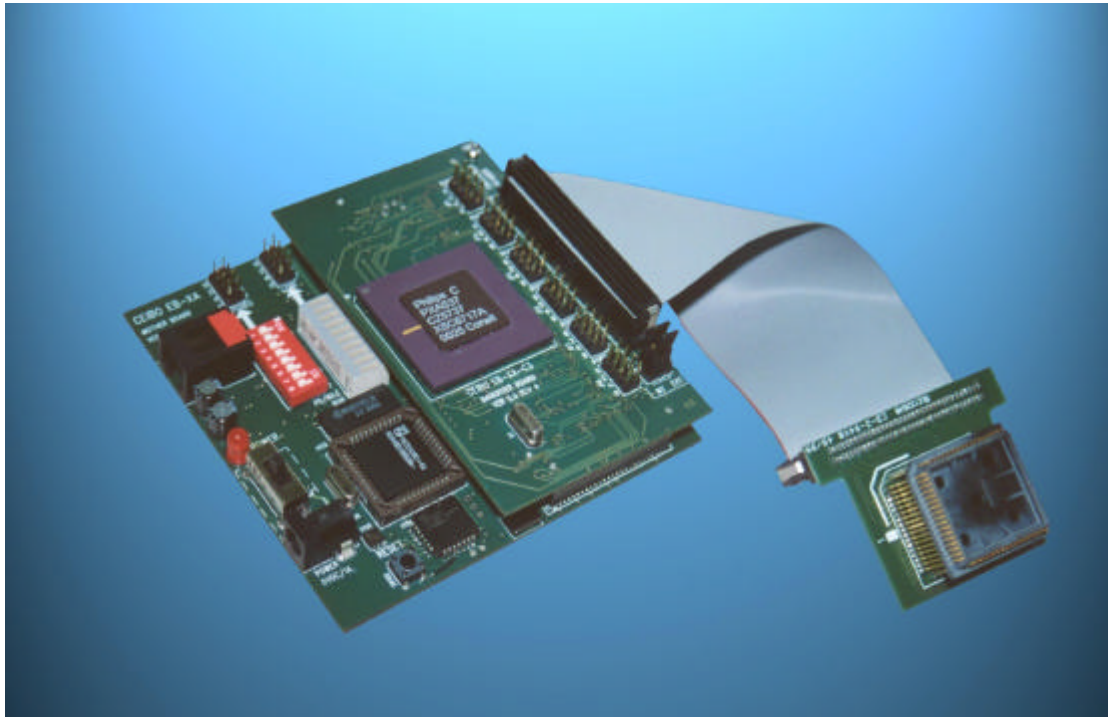# EB-XAV2 Low-Cost Emulator

FEATURES

- **Emulates XA Derivatives**

- **512K Code and Data Memory**

- **Memory With Mapping Capabilities**

- **Real-Time Trace**

- **Frequency Range up to 30MHz @ 5V**

- **Source-Level Debugger For C And Assembler**

- **MS-Windows Debugger Software for Windows NT and 95 or Later**

- **3.3V And 5V Emulation Support**

- **Support for ROMless and ROM Microcontrollers**

- **PLCC Emulation headers and Testpoints**

DESCRIPTION

Ceibo EB-XAV2 is a development tool that supports Philips XA microcontrollers 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. As the system uses Philips bond-out technology, emulation is carried out transparently and in real-time without affecting port or register states. 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 mode is used to debug the software without any hardware. Therefore, EB-XAV2 may be disconnected while using the simulation mode. The simulation mode does not implement all the chip options and it is intended only for software debugging of the basic XA functions. Use the system in emulation 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 Windows debugger software, RS-232 cable and a power supply.

SPECIFICATIONS

SYSTEM MEMORY

EB-XAV2 provides 512K of user code/data memory. This RAM memory permits downloading and modifying of user's programs and variables. Code memory is mapped as belonging to the EB-XAV2 Emulation Board or to the target system. The emulator includes 64 KBytes of RAM to be used as code memory of on-chip ROM/Flash/EPROM emulation. The system is provided with a total of 512K bytes of memory that can be mapped in 32K blocks.

BREAKPOINTS

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

WINDOWS DEBUGGER

The EB-XAV2 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.

REAL-TIME TRACE

The trace concept has changed and improved. Now the trace depth is variable to optimise it and in many cases is like endless.

The XA bondout chip has special signals to recreate the internal program counter. The new implementation of the real-time trace records up to 256 frames with the recreated program counter "changes" due to non-sequential instructions (call, jump, interrupt, etc.) Only the changes are recorded in the trace. The software completes the executed instructions between non-sequential instructions, so the trace depth is variable and according to this definition. This allows a high performance usage of the trace memory.

This dose not mean that the trace is 256 as an average of code execution it is many millions of frames.

SUPPORTED MICROCONTROLLERS

The supported microcontrollers are most of the Philips XA microcontrollers in both ROMless and ROMed versions. EB-XAV2 has daughter boards to emulate different microcontrollers. Currently the supported derivatives are G3, C3, C49 and S3.

MICROCONTROLLER SELECTION

EB-XAV2 uses bond-out Philips microcontrollers for hardware and software emulation. The selection of a different microcontroller derivative is made by replacing a by replacing the daughter board. EB-XAV2 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 30MHz.

HOST CHARACTERISTICS

PC or compatible systems with 4 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

Emulator with 512 KByte Memory, 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

Daughter boards and emulation headers for the different microcontrollers

HARDWARE DESCRIPTION - MAIN BOARD

The first step required to work with the EB-XAV2 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-XAV2. On the upper left side of the EB-XAV2 you will see a phone jack and written on it, RS-232. It is used to serially link the EB-XAV2 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 RS-232 cable connections are given separately.

The next part you should identify is 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.

J101 and J102 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-XAV2 is supplied with an 8-wire ribbon cable to connect the ports to LEDs and Switches, thus allowing to easily test your program.
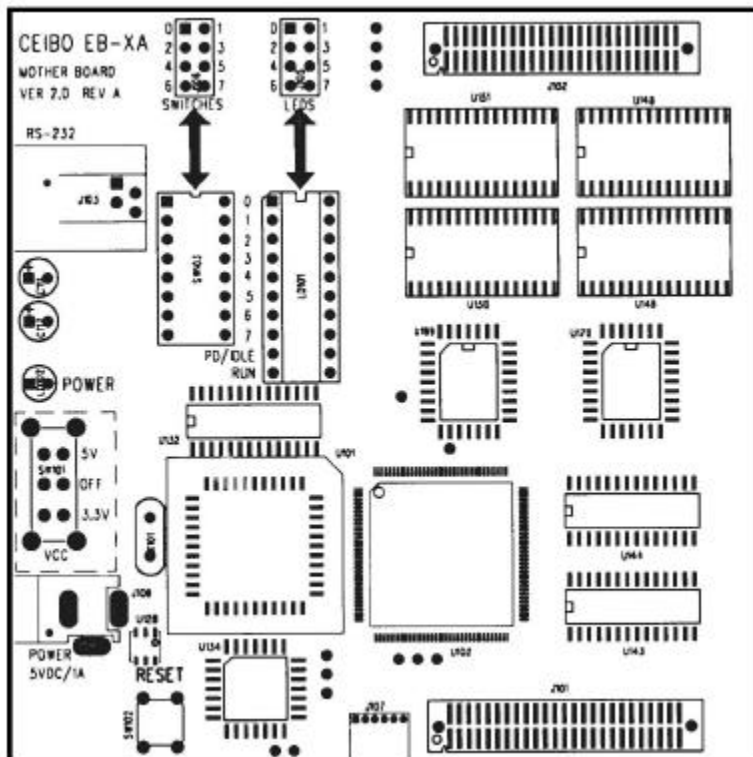

FIGURE 1: Main Board Layout

U101 is a microcontroller used by the system to communicate to the PC. **U101 is not the emulated microcontroller.** The emulated microcontroller 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. Reset operation is explained separately.

The main board accepts daughter boards to emulate microcontroller with different packages or capabilities. Currently there are four daughter boards: EB-XA-G3 (44-PLCC), EB-XA-C3 (44-PLCC), EB-XA-G49 (44-PLCC) and EB-XA-S3 (68-PLCC).

EB-XA-G3, EB-XA-C3 and EB-XA-G49 DAUGHTER BOARDS
Daughter Board EB-XA-G3 is used to emulate all the XA-G3 microcontroller derivatives with 44-PLCC package. Daughter Board EB-XA-G49 is similar to it but with a different bond-out chip installed on the board. EB-XA-C3 has a different PCB layout and bondout chip and it is used to emulate the XA-C3 derivatives. Ceibo also has emulation adapters for other packages support.
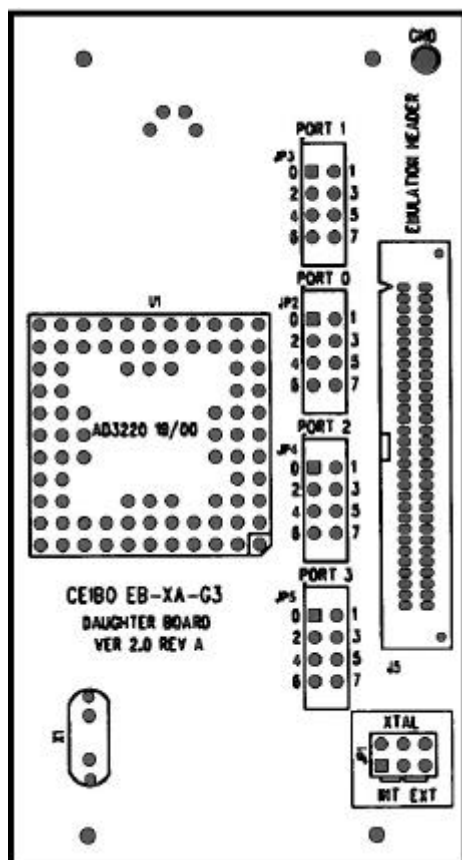

FIGURE 2: EB-XA-G3 Daughter Board Layout

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 400KHz to 40MHz in steps of 2KHz from the Options/Xtal Menu and the board uses as special clock source controlled by software for this purpose. The default value of this clock source is 14.745MHz.

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.
JP1 is the header that defines which clock source is being used.
The headers with the jumper caps set the clock to be supplied by an external source from the target board (not the emulator) or to system programmable clock (**Options/XTAL Menu**).

If the oscillator/crystal option is implemented (a crystal or an oscillator is placed on the empty socket) the jumper caps **must** be removed from the headers.
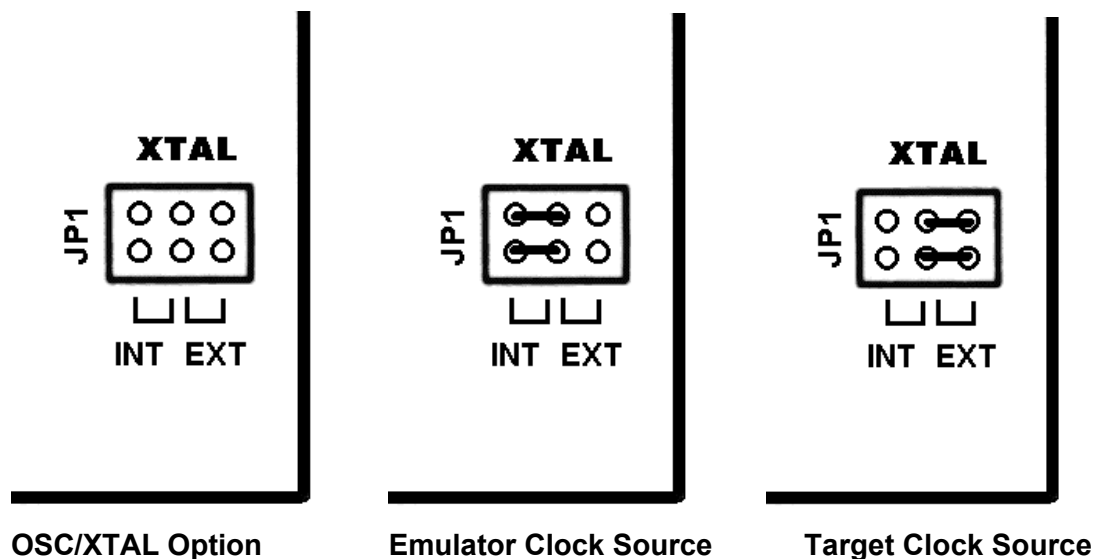

OSC/XTAL Option   Emulator Clock Source   Target Clock Source

FIGURE 3: 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.

EB-XA-S3 DAUGHTER BOARD
Daughter Board EB-XA-S3 emulates the XA-S3 deirvatives with 68-PLCC package.
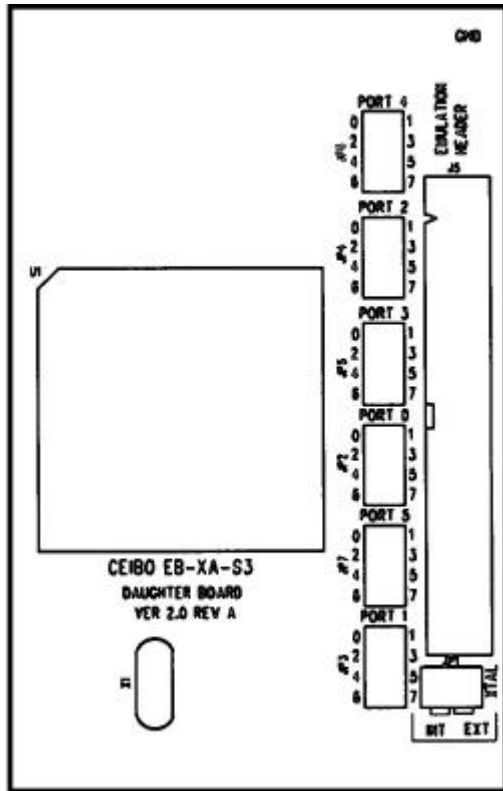
FIGURE 4: 68-Pin Daughter Board Layout

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 400KHz to 40MHz in steps of 2KHz from the Options/Xtal Menu and the board uses as special clock source controlled by software for this purpose. The default value of this clock source is 14.745MHz. JP1 is the header that defines which clock source is being used.

The headers with the jumper caps set the clock to be supplied by an external source from the target board (not the emulator) or to system programmable clock (**Options/XTAL Menu**).

If the oscillator/crystal option is implemented (a crystal or an oscillator is placed on the empty socket) the jumper caps **must** be removed from the headers.

Frequency Setup is similar to that shown in Figure 1.4.

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 HEADER

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-XA 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-XAV2 systems is as follows:

Microcontroller	Daughter Board	Header	Special Adapter	fmax	Voltage
XA-G3x	EB-XA-G3	44-PLCC	40-DIP, 44-QFP	20/30 MHz	3.3/5V
XA-C3x	EB-XA-C3	44-PLCC	40-DIP, 44-QFP	20/30 MHz	3.3/5V
XA-G49	EB-XA-G49	44-PLCC	40-DIP, 44-QFP	20/30 MHz	3.3/5V
XA-S3x	EB-XA-S3	68-PLCC	80-QFP	20/30 MHz	3.3/5V

Supported Microcontrollers

As the list of supported devices and available daughter boards is continuously evolving, call Ceibo to receive the latest update.

POWER SUPPLY

EB-XAV2 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-XAV2 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.

RESET OPERATION and LEDs

The POWER LED is on when the power supply is ON.

Two LEDs of the LED-bar are used to indicate software events: PD/IDLE and RUN.

PD/IDLE lights up when the emulated microcontroller is in **power down or idle mode**. Nevertheless, the support for these modes depends on the emulated microcontroller and the availability of these indications in emulation mode. Most of the current microcontrollers do not have this capability.

RUN blinks on error, is on while running a program and goes off while halting the emulation.

The RESET pushbutton operates as follows:

1. When the program is running, restarts it.

2. Pressing it once while the program is halted, resets the emulator but

preserves the setup, memory contents, etc. Pressing it twice is like the power off/on sequence.

EMULATION RESTRICTIONS

The following restrictions are valid for EB-XAV2:

1. Code/data memory is overlapped while mapping it as belonging to the emulator.

2. EB-XAV2 Monitor Program shares 32 bytes of the memory. The options menu allow to define this reserved memory at any address of the 64K available for the code memory. For example, if the 32K boundary is selected, addresses 7FE0h to 7FFFh may be reserved by the system.

3. The program also uses 6 Bytes of the system stack memory.

4. The Simulator does not support any peripheral and interrupt simulation.

5. WAIT input must not stuck to an active level if enabled by software. Otherwise the emulator will generate an error message.

6. Breakpoint Vector - EB-XAV2 monitor uses this vector to set software breakpoints. The corresponding addresses are filtered and protected while loading a program, although the user can overwrite it during program execution. A solution is using a software interrupt if needed in the application. The breakpoint addresses are reserved by EB-XAV2. Furthermore, it is recommended to locate NOPs in these addresses absolutely, so the compiler will not try to write any other code on them.

The Watch Dog feed sequence must not be single stepped. These two instructions must only be executed in real-time. Note that Watch Dog setup is normally defined in the startup sequence, so do not single-step or animate it unnecessarily

EB-XAV2 - ORDERING INFORMATION

Item	Description
EB-XAV2	Emulator, Software, Power Supply, Cables.
EB-XA-G3	Daughter Board
EB-XA-G49	Daughter Board
EB-XA-S3	Daughter Board
EB-XA-C3	Daughter Board