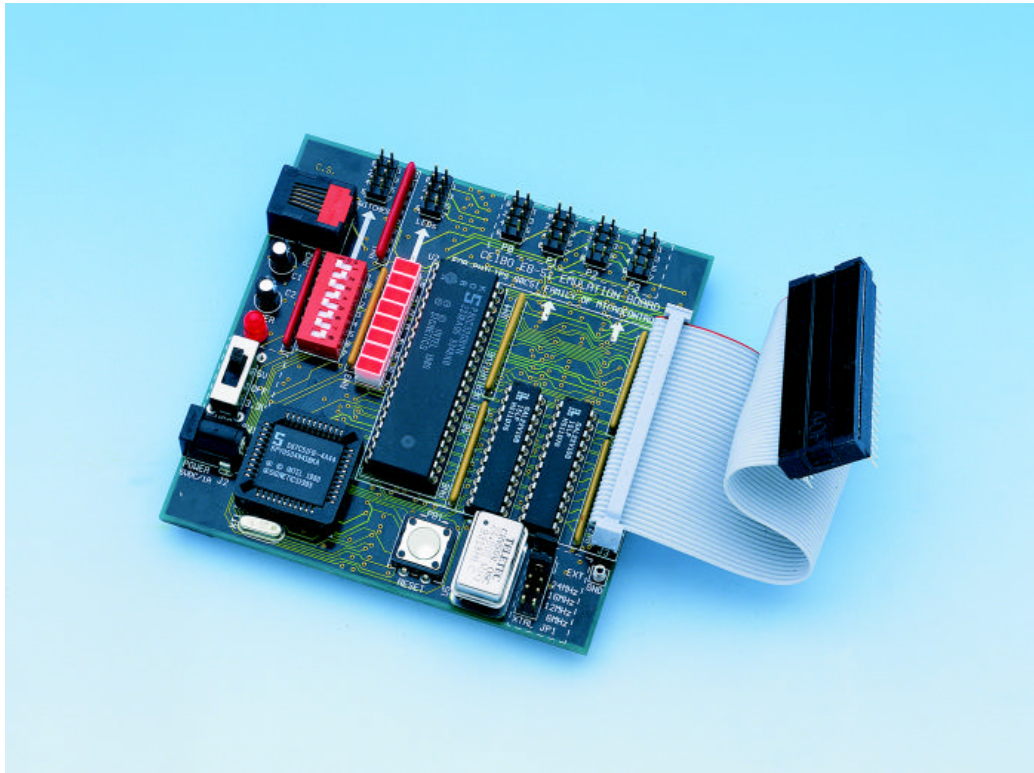


EB-51 Low-Cost Emulator



Development Tool for 80C51 Microcontrollers

FEATURES

- **Emulates 80C51 Microcontrollers and Derivatives**
- **Real-Time Operation up to 40 MHz**
- **3.3V or 5V Voltage Operation**
- **Source-Level Debugger for C, PLM and Assembler**
- **MS-Windows Software**
- **Support for ROMless and ROMed Microcontrollers**
- **64K of Code and 64K of Data Memory**
- **Data Memory with Mapping Capabilities**
- **Performance Analyzer**
- **Real-Time and Conditional Breakpoints**
- **Emulation Header and Signal Testpoints**
- **Serially Linked to PC**

DESCRIPTION

EB-51 is a Low-Cost Emulator dedicated to all Philips 80C51 microcontroller derivatives with a 40 or higher pin count. It is serially linked to PC or compatible systems and emulates the microcontroller using either the built-in Clock Oscillator or any other clock source connected to the microcontroller. The Clock Oscillator generates 24MHz, 16MHz, 12MHz and 6MHz. The system emulates the microcontroller in both ROMless and ROMed mode. A special emulation technology is used to recreate Port 0 and 2 with standard devices, releasing most of the microcontroller resources to the user. A two microcontroller architecture leaves the serial port for user applications. The software includes a Source-Level Debugger for C, PLM and Assembler, On-line Assembler and Disassembler, Software Trace, Conditional Breakpoints and many other features. The Debuggers run under DOS and MS-Windows operating systems. The Code Memory permits downloading and modifying of users programs. Mapping the 64 KByte Data Memory to a target circuit or to the system is possible. Breakpoints allow real-time execution until an opcode is executed at a specified address or line of the Source Code. All I/O lines are easily accessed and may be connected to the on-board switches and LEDs when trying out a specific idea. The system is supplied with User's Manual, Software, Emulation Cable and Power Supply.

SPECIFICATIONS

SYSTEM MEMORY

EB-51 provides 64 KBytes of User Code Memory and 64 KBytes of User Data Memory. This RAM Memory permits downloading and modifying of user's programs and variables.

CODE MEMORY

The system includes 64 KBytes of RAM to be used as Code Memory. The upper 1 KByte of this memory is not available for programs and they are automatically loaded with a monitor program which links the microcontroller to the host computer and controls the emulation of the application software in real-time.

DATA MEMORY

The 64 KBytes Data Memory is accessed by MOVX instructions and can be mapped as belonging to the system or to the target circuitry.

BREAKPOINTS

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

SOFTWARE TRACE

Program execution can be recorded in a 64K buffer. Conditional Breakpoints may be defined to stop program execution. The user can define events and variables to be added to the Software Trace. **The Software Trace is not a real-time function and is performed by slowing down the emulation speed.**

USER SOFTWARE

EB-51 is supplied with two software packages, one running under DOS and the other under MS-Windows exclusively. The DOS software is based on pull-down menus. The Windows program carries out similar functions as the DOS program with all the features and benefits of this operating system.

SOURCE-LEVEL DEBUGGER

The EB-51 software includes a source-level debugger for assembler and high-level languages (PLM, C and others) with the capability of executing lines of the program while displaying the state of any variable.

FREQUENCY

The system includes a Crystal Oscillator able to support clock frequencies of 24MHz, 16MHz, 12MHz and 6MHz. The operating frequency range is from the microcontroller f_{min} to f_{max} in both ROMless and ROMed modes and up to 40 MHz if the microcontroller allows it.

SIMULATION DEBUG MODE

The Simulation Debug Mode allows the software to be tested without any hardware. All the emulation functions are supported by this powerful Simulation Debugger.

VOLTAGE

The system has a built-in voltage regulator that permits selection of either a 5V or a 3.3V voltage supply. Selection is done by setting the position of the power switch to the desired voltage.

PERSONALITY ADAPTERS

EB-51 uses standard microcontrollers for hardware and software emulation. The selection of a different microcontroller is made by replacing the microcontroller on the board with the appropriate microcontroller or a daughter board.

SUPPORTED MICROCONTROLLERS

The supported microcontrollers are most of the Philips 80C51 derivatives in both ROMless and ROMed versions:

80C31/2
8xC51/2/4/8
8xC51FA/B/C
8xL51FA/B/C
8xC51RA/B/C/D+
8xC504/8
8xC524/8
8xC550
8xC552/4
8xC562
8xC652/4

As the list of supported devices and available Daughter Boards is continuously evolving. Call Ceibo to receive the latest update.

EMULATION RESTRICTIONS

The following emulation restrictions are valid for EB-51:

- RD and WR lines may not be used as I/O ports. There are no restrictions while RD and WR are activated by MOVX instructions.
- The system uses some of the microcontroller resources to emulate it: one interrupt (either INT0 or INT1 according to software selection) and 3 Bytes of the internal stack.

MECHANICAL DIMENSIONS

10cm x 10cm.

ITEMS SUPPLIED AS STANDARD

Low-Cost Emulator, 40-pin Emulation Header, User Software including Source-Level Debugger, Simulator, Assembler, User's Manual, RS-232 Interface Cable and Power Supply.

WARRANTY

Two years limited warranty, parts and labor.

EMULATION MODES

Three working modes are available: Real-Time, Simulator and In-Circuit 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-51 may be disconnected from your PC while using the Simulation mode.

In the In-Circuit Simulation Mode an additional microprocessor is used to take control of the microcontroller lines and to simulate its operation but not in real-time. This operating mode allows access to all the microcontroller functions (I/O, timers, etc.) and interacts with the hardware according to the user software execution or directly by means of emulator commands sent from the host computer. The Trace, Complex Breakpoints, Performance Analyzer and many other useful functions are enabled in the In-Circuit Simulation Mode.

The combination of all the available working modes allows an easy way to debug hardware and software functions.

CIRCUIT DESCRIPTION

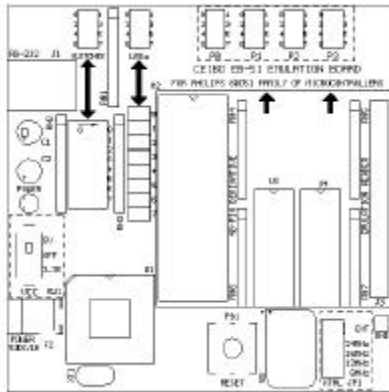


Figure 1: Circuit Layout

On top of the board you will find six 8-pin connectors. They may be used to easily interface EB-51 to an application board or to carry out test programs using the on-board resources. The switches connector provides logic states to input ports. The LEDs connector permits connecting any logic signal to observe its logic state. Port 0 to 3 are accessed through the 8-pin connectors, additionally to the Emulation Header. Port 0 and 2 are taken from the reconstructed signals. That means, these ports are being recreated and are not the direct bus signals from the microcontroller. You may also connect the supplied flat cable with the 40-pin socket attached to an Emulation Header to a target circuit. EB-51 is supplied with an 8-wire ribbon cable to connect the ports to LEDs and switches, thus allowing to easily test the program.

EB-51 emulation frequency is defined by the 24MHz crystal oscillator installed on a socket. 24MHz is the maximum frequency you can apply to the microcontroller while emulating the on-chip ROM. In ROMless mode the maximum frequency may be up to 40MHz, depending on the microcontroller installed in the board. A lower frequency is achieved by dividing the 24MHz according to a jumper selection. You can connect any frequency you desire to the microcontroller from an external clock source. Different frequency options may be achieved by replacing the 24MHz crystal oscillator with another oscillator.

EMULATION SUPPORT

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

<i>Microcontroller on EB-51</i>	<i>Supported Microcontrollers</i>
Philips 80C32 or 87C52	80C31/2, 8xC51/2/4/8
Philips 87C524 or 87C528	8xC524/8
Philips 87C51FB	8xC51FA/B/C
Philips 87C504	8xC504/8
Philips 87C550	8xC550
Philips 87C654	8xC652/4
Philips 87C51RD+	8xC51RA/B/C/D+
Dallas 80C310	80C310
Dallas 80C320	80C320
Dallas 80C323	80C323

Supported Microcontrollers

Using Philips microcontrollers activates the "ROM Emulation Mode". Using different microcontrollers not listed above may cause the system to operate only in ROMless mode.

3.3V and 5V operation may be achieved by using a microcontroller that is able to operate at both voltages.

The following table shows as an example some of the 3.3V and 5V supported devices:

<i>Microcontroller on EB-51</i>	<i>Supported Microcontrollers</i>
Philips 87C51FB	8xC51FA/FB/FC

3.3V and 5V Supported Microcontrollers

By using different Daughter Boards, you can emulate additional 80C51 derivatives. The addition of the 80C552 Daughter Board allows emulation of the microcontrollers listed in the following table:

<i>Microcontroller on EB-51</i>	<i>Supported Microcontrollers</i>
Philips 87C552	8xC552, 8xC562
Philips 87C554	8xC554

8xC552/4 Supported Microcontrollers

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

DEBUG CAPABILITIES

The Debugger is used to load a program, execute it in real-time, simulate the software environment and many other functions. Following are the capabilities of the debugger.

TRACING

A program may be executed one line at a time. Programs can be traced using high-level language lines or assembly instructions.

STEPPING

This is like tracing but program execution steps over CALL instructions without leaving the current procedure.

VIEWING

The Debugger opens special windows showing the program state from various perspectives: variables and their values, breakpoints, a source file, CPU registers, memory, peripheral registers, etc.

INSPECTING

The Debugger can delve deeper into the program to show the variable contents.

CHANGING

The current value of a variable can be replaced with a specified value.

WATCHING

Program variables can be isolated and their values kept track of while the program runs.

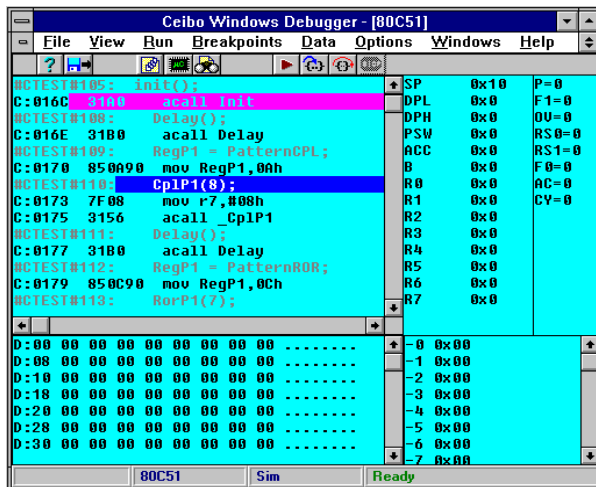


Figure 2: EB-51 Windows Debugger

EB-51 - ORDERING INFORMATION

<i>Item</i>	<i>Description</i>
EB-51	Emulator, Emulation Header, Software, Power Supply, Cables.
EB-51-320	Upgrade kit for Dallas 80C310/320/323 Support
ADP-20D	40-pin DIP to 20-pin DIP Adapter
ADP-40D	44-pin PLCC to 40-pin DIP Adapter
ADP-44P	40-pin DIP to 44-Pin PLCC Adapter
ADP-44Q	40-Pin DIP to 44-Pin QFP Adapter
ADP-44Q-P	40-Pin PLCC to 44-Pin QFP Adapter
H-552EB-68P	Emulation Header for 8xC552/4
B-552EB	Daughter board for 8xC552/4
MP-51RD2	Microcontroller Programmer
EB-USB	USB Adapter