

## ***CEIBO FE-51RD2 Development System***



Development System for Atmel AT89C51RD2 Microcontrollers

### **FEATURES**

- **Emulates Atmel AT89C51RD2**
- **60K Code Memory**
- **Real-Time Emulation**
- **Frequency up to 40MHz / 3V, 5V**
- **ISP and X2 Mode Support**
- **MS-Windows Debugger For C And Assembler**
- **Emulation Headers and Signal Testpoints**
- **Target Board and Programmer Included**
- **Serially Linked to IBM PC at 115Kbaud**

## **DESCRIPTION**

Ceibo FE-51RD2 is a development tool that supports *ATMEL W&M 89C51RD2* microcontrollers at any frequency allowed by the devices. It is serially linked to a PC or compatible systems and can emulate the microcontrollers using any clock. Emulation is carried out by loading the system with the user software and an embedded monitor program. FE-51RD2 locates the monitor in the upper 4K of the code memory space, together with the ISP routines. The system uses standard devices for real-time and transparent emulation. 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. Three working modes are available: real-time, in-circuit simulation 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 in-circuit simulation is used to provide a trace function by slowing down the emulation speed; instructions are executed by the simulator, except the peripheral related instructions. The simulation is intended only for software debugging of the basic 8051 functions. FE-51RD2 may be disconnected while using the simulation mode. The software includes C and Assembler Source Level Debugger, On-line Assembler and Disassembler, a limited C Compiler and many other features. The system is supplied with MS-Windows debugger software, RS-232 cable power supply, mechanical adapters and other accessories.

## **SPECIFICATIONS**

### **SYSTEM MEMORY**

FE-51RD2 provides 64K of code memory. However, only 60K are available embedded monitor program that uses the upper 4K of the memory space. Code memory is mapped as belonging to the FE-51RD2 Emulator.

### **BREAKPOINTS**

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

### **WINDOWS DEBUGGER**

The FE-51RD2 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 98 or later and also under Windows NT.

## **SUPPORTED MICROCONTROLLERS**

The supported microcontrollers are Atmel W&M 89C51RD2 microcontrollers and other derivatives that will be announced in the future. The standard supported package for emulation is PLCC.

## **FREQUENCY**

FE-51RD2 runs 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 8 MByte of RAM, one RS-232C interface card for the PC, Windows 95 or later.

## **INPUT POWER**

5V, 1.5A power supply supplied.

## **ITEMS SUPPLIED AS STANDARD**

Development system including emulator, programmer and development board, PLCC emulation header, Windows software with source level debugger, on-line assembler and disassembler, user's manual, RS-232 cable and power supply.

## **OPTIONS**

QFP and DIP adapters.

## **PARTS OF THE SYSTEM**

The system includes 3 main hardware boards:

1. FE-51RD2 - In-circuit Emulator
2. DB-51RD2 - Development Board
3. MP-51RD2 Microcontroller Programmer

## **HARDWARE DESCRIPTION**

### **FE-51RD2 EMULATOR**

The first step required to work with the FE-51RD2 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 FE-51RD2.

On the bottom side of the FE-51RD2 you will see a phone jack. It is used to serially link the FE-51RD2 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.

On the right side of the RS-232 connector you will see a POWER LED indicating whether or not the power is applied to the system. The emulator must be connected to a target to be powered and to receive the clock input, otherwise it will not work.

If you do not have your target system, you can use DB-51RD2 Board that is included in the system.

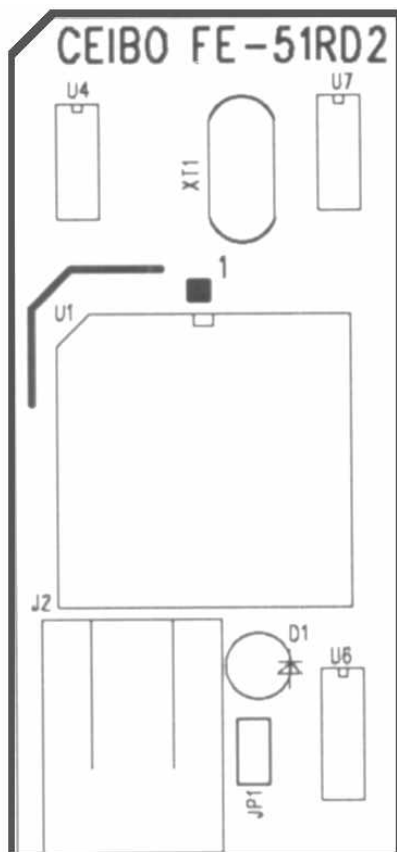


FIGURE 1: FE-51RD2 Emulator

U1 is the microcontroller used for your emulation. It is placed on a 44-PLCC socket.

On the other side of the board there is a PLCC plug that you must connect to a target board.

Make sure that pin #1 of your target is aligned to pin #1 of the emulator, which is clearly marked and has the same direction as U1.

JP1 is a connector necessary only for firmware updates. Make sure that the cap is not placed on it to work properly.

If any firmware update will be necessary, follow the instructions that will come with it in [www.ceibo.com](http://www.ceibo.com).

## DB-51RD2 DEVELOPMENT BOARD

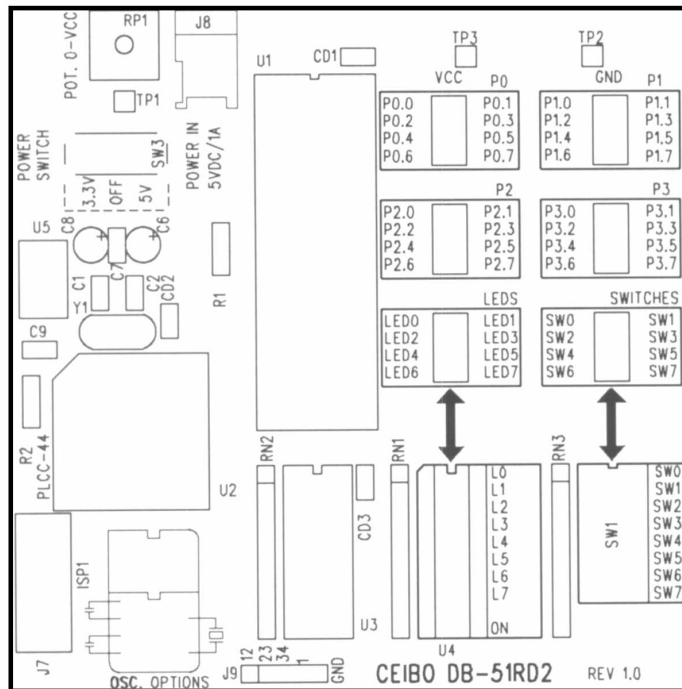


FIGURE 2: DB-51RD2 Development Board

This board is supplied to be used as a possible target and to test your software. It provides the following functionality:

- 1. Testpoints for Port lines.** Please note that Port 0 is open-drain and if you want to see a high level on these lines you must add pull-up resistors.
- 2. LEDs.** One LED is the ON/Off indicator while L0 to L7 can be used to display high-levels while connecting them to the Ports or other signals. An 8-pin jumper is supplied for that connection.
- 3. Switches.** The SWITCHES connector provides logic states to input ports. The same supplied 8-wire ribbon cable can be used to connect the ports to the Switches, thus allowing to easily test your program.
- 4. Sockets.** DIP and PLCC for microprocessors can be connected to this board. You may connect FE-51RD2 emulator to PLCC-44 socket. In such a case, make sure that U1 socket does not have a microprocessor on it.

**5. Power Switch.** 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 (U5) that drops the voltage to 3.3V if the switch is set accordingly. Use the power supply included in the system and connect it to the Power In jack (J8).

**6. Potentiometer.** This 50KOhm potentiometer is used to get on TP1 analog input from 0 to Vcc (which is 3.3V or 5V according to the power switch position).

**7. ISP Connector.** J7 is an ISP connector that can be used directly with MP-51RD2 programmer to program the microcontroller installed on the 40-DIP or 44-PLCC socket. A 10-pin ribbon cable is supplied for this purpose.

**8. Oscillator Options.** This board can be used to connect a full size crystal oscillator (16-DIP), half size (8-DIP) or a 2-pin crystal with capacitors as shown on the board.

**9. Future Options.** The board is prepared to be used with future derivatives, which have pin signals not supported by the 89C51RD2 and as shown on J9 connector. Additional frequency options for new derivatives are prepared with C1, C2 and Y1 crystal placements.

### MP-51RD2 PROGRAMMER

This small board contains the RS-232 interface to ISP signals. Use it together with the supplied 10-pin ribbon cable and the software driver available from Atmel W&M website.

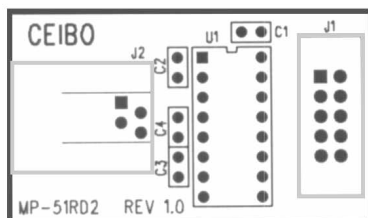


FIGURE 3: MP-51RD2 Programmer

## EMULATION RESTRICTIONS

The following restrictions are valid for FE-51RD2:

1. FE-51RD2 Monitor Program shares 4 KByte of the 64K memory code space. Therefore, user programs can be up to 60 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.
6. The UART is shared with the system and interrupts should not be disabled.
7. Real-time trace is not available in the current silicon version of the emulated microcontroller. Future silicon derivatives may include this feature.

## FE-51RD2 - ORDERING INFORMATION

<i>Item</i>	<i>Description</i>
FE-51RD2	Emulator for 89C51RD2
DB-51RD2	Development Board
MP-51RD2	Microcontroller Programmer