

CEIBO FE-WRD2 Development System



FEATURES

- ***Emulates Winbond W78(L)E516/E58B/L58/E858/E365/ERD2 Microcontrollers***
- ***64K Emulation Memory***
- ***Real-Time and Transparent Emulation***
- ***Frequency up to fmax 33MHz***
- ***Software Trace***
- ***Debugger For C/C++ And Assembler***
- ***44-PLCC Emulation Header***
- ***Target Board and ISP Programmer Included***
- ***RS-232 or USB Interface***
- ***64K C/ASM and 8K C++ Included***

DESCRIPTION

Ceibo FE-WRD2 is a development system that supports Winbond W78(L)E516, W78E58B, W78L58, W78E858, W78E365, W78ERD2 Microcontrollers.

It is serially linked to a PC or compatible systems and can emulate the microcontrollers using the built-in clock generator.

Emulation is carried out by loading the system with the user software into the microcontroller flash memory.

Three working modes are available: emulation, simulation and in-circuit simulation.

Emulation mode is the only **real-time mode** and 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. Real time trace is available.

The **simulation and in-circuit simulation modes do not implement all the chip options** and it is intended only for software debugging of the basic 8051 functions. **Use the system in emulation mode: simulation modes are not real-time.**

The **simulation mode** is used to debug the software without any hardware. FE-WRD2 may be disconnected 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 software includes C/C++ and Assembler Source Level Debugger, On-line Assembler and Disassembler, Trace, Conditional Breakpoints and many other features. Free limited versions of C/C++ compiler and Assembler are included in the kit.

The system is supplied with two Windows debuggers, RS-232 cable and a power supply. Two debuggers are available: Ceibo Debugger V3.xx (this is the latest debugger for all Ceibo products) and Ceibo FE-WRD2 Debugger V1.xx (a more simple but powerful debugger).

The system includes 3 main hardware boards:

1. FE-WRD2 - In-circuit Emulator
2. DB-51RD2 - Development Board
3. MP-C420 - ISP Programmer

SPECIFICATIONS

SYSTEM MEMORY

FE-WRD2 provides 64K of code memory. However, only 62K are available for user's programs while emulating because the system comes with an embedded monitor program that uses the upper 2K of the memory space. Code memory is mapped as belonging to the FE-WRD2 Emulator.

BREAKPOINTS

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

SOFTWARE TRACE

Trace can be used to display the last executed instructions in real time. Trace is variable in depth and shows backward all the sequential instructions until the last branch instruction occurs (LJMP, ACALL, DJNZ, etc.).

WINDOWS DEBUGGERS

The FE-WRD2 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.

SUPPORTED MICROCONTROLLERS

The system supports Winbond W78ERD2 microcontrollers. The standard supported package for emulation is PLCC. QFP and DIP adapters are optional.

FREQUENCY

FE-WRD2 frequency is defined by a programmable clock generator, which can be set under software control.

The minimum and maximum frequencies are determined by the emulated chip characteristics, up to $f_{max}=33\text{MHz}$ for the current silicon version.

HOST CHARACTERISTICS

PC or compatible systems with 8 MByte of RAM, one RS-232C interface card for the PC, Windows 98 or later.

INPUT POWER

5V, 1.5A power supply supplied.

MECHANICAL DIMENSIONS

Emulator: 100mm x 50 mm (approx. 4" x 2")

Development Board: 100mm x 100mm (approx. 4" x 4")

Programmer: 27mm x 44mm (approx. 1" x 1.5")

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

DIP-40 to QFP-44 adapters.

HARDWARE DESCRIPTION - FE-WRD2 EMULATOR

The first step required to work with the FE-WRD2 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 FE-WRD2 capabilities.

On the bottom side of the FE-WRD2 you will see a phone jack. It is used to serially link the FE-WRD2 to your computer by means of RS-232 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. Use the black RS-232 cable supplied with the system.

The USB connector allows USB connection to your PC. The required drivers are included in the software. USB cable is not supplied with the system.

On the top side you will see an LED. It is software controlled and not a power indicator. ON means that the emulator is executing the user code. OFF indicates that the emulator is halted. After powering up, it blinks for a short while and then goes OFF.

The emulator must be connected to the power supply included in the system, otherwise it will not work. Use the Power Supply that comes with the system.

W78ERD2 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 W78ERD2. Use the white marking of the W78ERD2 as a reference. The cut corner of the emulator also provides a clear reference.

ISP is a jumper necessary only for firmware update, which is programmed in the Master Microcontroller. 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.

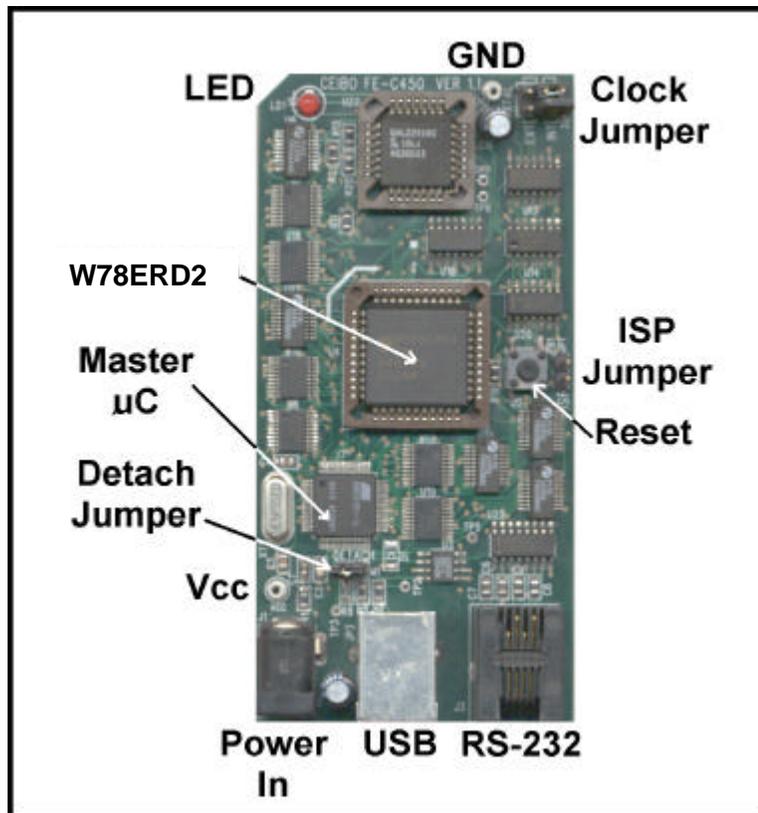


FIGURE 1.1: FE-WRD2 Emulator

The emulator two clock options. It can be used with internal clock supplied by a programmable clock generator and controlled by the Xtal setup in the Options, or clock may be taken from the target board. This is done by means of the XTAL jumper selection (or Clock jumper as in the figure).

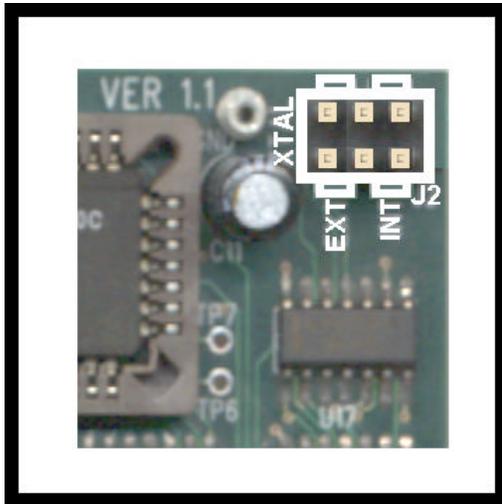


FIGURE 1.2: FE-WRD2- Xtal Jumper

The following figure shows how to set the Xtal jumpers to connect the jumpers to the internal clock source. In this case the X2 (clock out) is disconnected from the target.

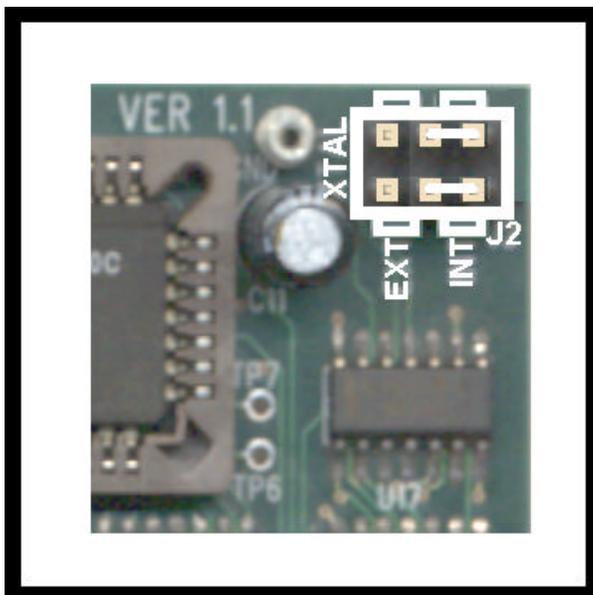


FIGURE 1.4: FE-WRD2 Xtal Jumper - Internal (X2 connected to target)

An external clock source may be used to drive the W78ERD2. In this case, there are two setups:

- a. Set the jumpers as shown in the following figure.
- b. Make sure that your target provides clock by means of a crystal oscillator and not just a 2-pin crystal.

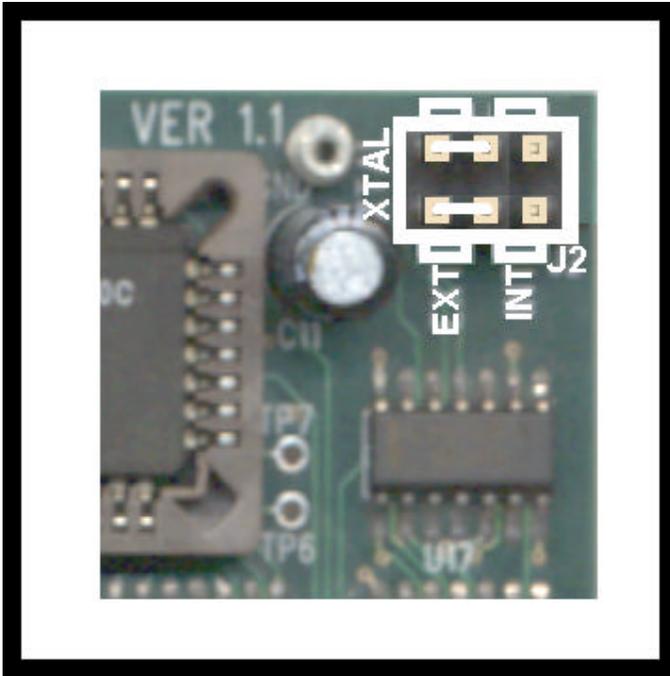


FIGURE 1.5: FE-WRD2- Xtal Jumper - External

Vcc and GND testpoints are on the emulator.

GND testpoint can be used to connect an oscilloscope. It is not necessary to make any connection between GND of the emulator and GND of a target board as the GND line is connected through the PLCC block.

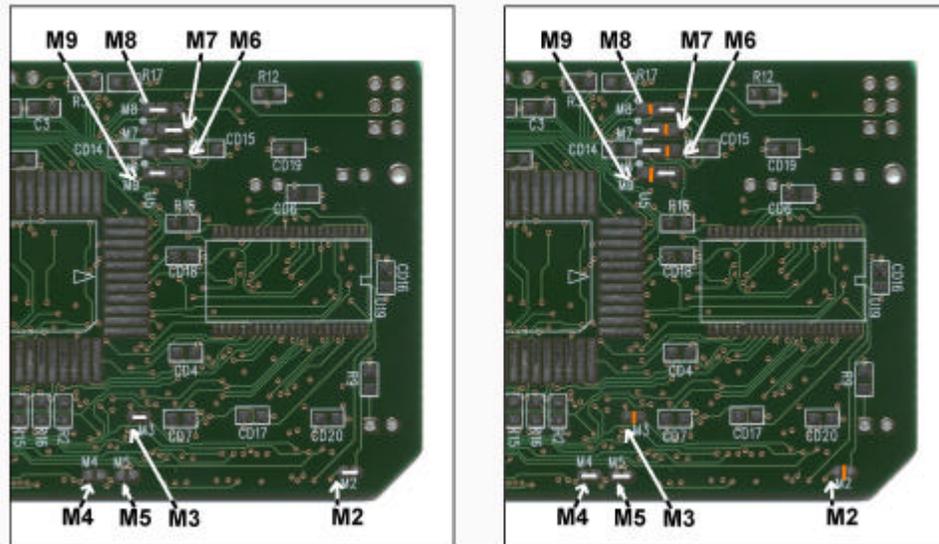
Vcc signal is disconnected in the emulator PLCC block. Therefore, the target board must have its own power supply. If you want to use the emulator together with DB-51RD2 board, then connect them as follows:

- a. Plug the emulator into DB-51RD2 PLCC socket.
- b. Connect a wire between Vcc testpoint on FE-WRD2 emulator and Vcc testpoint on DB-51RD2 board.
- c. Set the power switch on DB-51RD2 to OFF.
- d. Connect the power supply to the FE-WRD2 emulator.

The system may be connected to your PC by means of USB.

Another hardware setup on the emulator is related to the **shared UART**. The factory setup is **UART0** shared; that means the emulator takes control of

RxD0 and TxD0 lines while stopping the emulation. This factory setup may be changed to **UART1** shared; in this case the emulator takes control of **RxD1 and TxD1 lines** while stopping the emulation. The following figure shows both setups.



UART 0 - FACTORY SETUP

UART 1 - CHANGES

FIGURE 1.6: Emulator FE-WRD2 UART Setup

| Jumper | UART0 | UART1 |
|--------|---------------|---------------|
| M2 | CONNECTED | OPEN |
| M3 | CONNECTED | OPEN |
| M4 | OPEN | CONNECTED |
| M5 | OPEN | CONNECTED |
| M6 | 2-3 CONNECTED | 1-2 CONNECTED |
| M7 | 2-3 CONNECTED | 1-2 CONNECTED |
| M8 | 1-2 CONNECTED | 2-3 CONNECTED |
| M9 | 1-2 CONNECTED | 2-3 CONNECTED |

Table 1.1: Emulator FE-WRD2 UART Setup

The white lines on M2 to M9 means that the jumpers are connected. The dark lines on the jumpers mean that they are disconnected. M6, M7, M8 and M9 have three contacts and they are numbered 1-2-3 from left to right and they are connected or disconnected as shown in the Table 1.1.

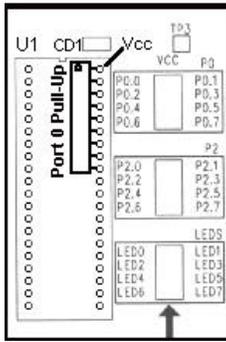


FIGURE 1.8: Adding Pull-Ups to Port 0 on DB-51RD2

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-WRD2 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/C420 programmer to program the microcontroller installed on the 40-DIP or 44-PLCC socket. A 10-pin ribbon cable is supplied for this purpose.

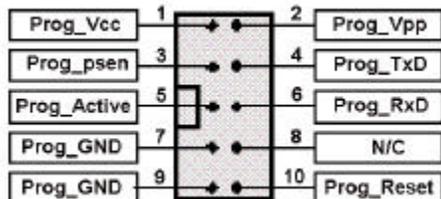


FIGURE 1.9: ISP Connector

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 W78ERD2 and as shown on J9 connector. Additional frequency options for new derivatives are prepared with C1, C2 and Y1 crystal placements.

HARDWARE DESCRIPTION - MP-C420 PROGRAMMER

This small board contain the RS-232 interface to ISP signals. Use it together with the supplied 10-pin ribbon cable and the software driver available from CEIBO.

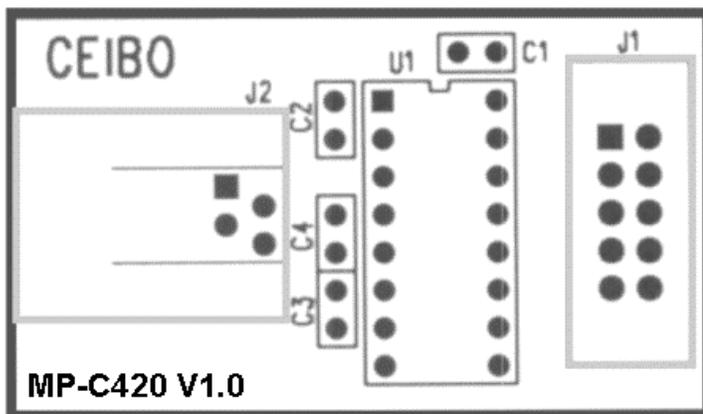


FIGURE 1.10: MP-C420 Programmer

How to Use the MP-C420 Programmer:

1. Connect it to your COM port using the RS-232 cable supplied with the system (same as for the FE-C420 emulator).
2. Connect the ISP cable supplied with the system to the programmer and also to the DB-51RD2 target board.
3. Place a microcontroller in one of the DB-51RD2 sockets (DIP or PLCC).
4. Make sure that the crystal on the DB-51RD2 is installed.

5. Power up the DB-51RD2 board.

6. Invoke the CEIBO ISP software. This is not Ceibo's debugger, but the CEIBO ISP PROGRAM

EMULATION RESTRICTIONS

The following restrictions are valid for FE-WRD2:

1. FE-WRD2 Monitor Program shares 2 KByte of the 64K memory code space. Therefore, user programs can be up to 62 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. One W78ERD2 UART of the two available in these microcontrollers is shared with the system and interrupts should not be disabled. Also the related timer to the serial port must not be stopped. The Halt Mechanism in the Options Menu offers other solutions in case you need these resources in your application. **Factory setup is UART0 shared**; that means P3.0 and P3.1 are RxD0 and TxD0 and not standard I/O lines. It is possible to free completely P3.0 and P3.1 and use UART1 instead of UART0. This is a jumper setup (see para. 1.5) and in this case P1.2 and P1.3 are RxD1 and TxD1 and not standard I/O lines. **Enable** always in the user code the **frame error bit** to make the system work better. UART shared does not affect the user code or real time execution; that means, only when the user or a breakpoint stops the emulation, then the emulator takes control of the two UART lines.

7. Breakpoints cannot be set to the Reset Vector (address 0000h-0002h), Serial Interrupt (address 0023h-0025h) or to the 2K of the reserved memory space (address F800h-FFFFh). Any other location is allowed, included inside interrupt service routines.

FE-WRD2 ORDERING INFORMATION

| <u>Item</u> | <u>Description</u> |
|--------------------|-----------------------------------|
| FE-WRD2 | In-circuit Emulator |
| DB-51RD2 | Development Board |
| MP-C420 | ISP Programmer |
| ADP-40D | 44-pin PLCC to 40-pin DIP Adapter |
| ADP-44-Q-P | 44-pin PLCC to 44-pin QFP Adapter |