DB-51 - DEVELOPMENT BOARD

HARDWARE UPDATE

Rev. 3.01 - January 2020

Description of the System

1.1. Introduction

Ceibo DB-51 Development Board has been redesigned and the new system offers more capabilities and less emulation restrictions. This document replaces the description given in the user's manual.

1.2. Specifications Update

Code Memory

The system includes 32 KBytes of RAM to be used as code memory. The user code is downloaded to this memory.

Data Memory

64K of data memory accessed by MOVX instructions is also included on the board.

Breakpoints

Breakpoints allow real-time program execution until an opcode is executed at a specified address. The system allows setting software breakpoints to any address of the user's code.

Supported Microcontrollers

The supported microcontrollers are most of the 80C51 microcontrollers and derivatives. Direct connection of 40-pin DIP, 44-PLCC, 44-QFP and 68-pin PLCC (8xC552/4 only) is possible.

Input Power

5V, 1A power supply supplied.

Mechanical Dimensions

20cm x 25cm.

Items Supplied as Standard

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

1.3. Description of the Board

Fig. 1 shows the circuit layout. This is a 4-layer board.

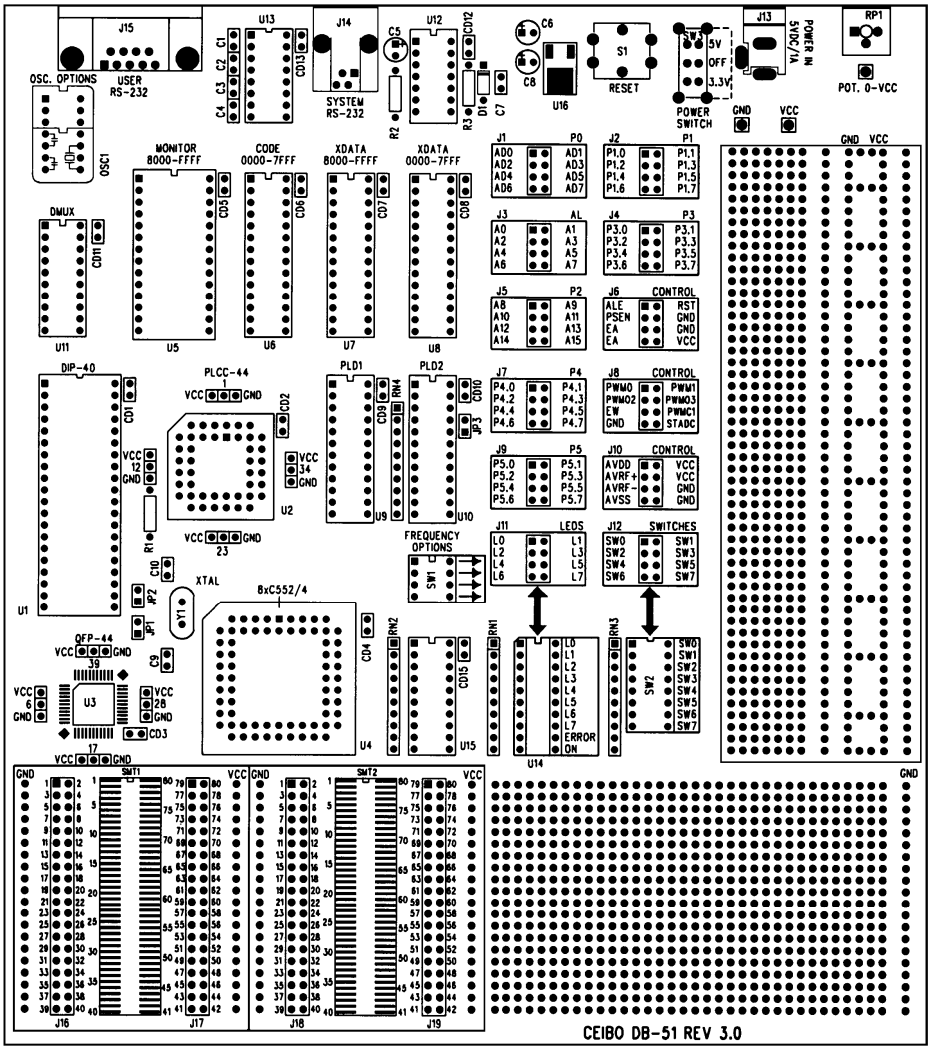

Figure 1: ***DB-51 Layout***

The first step required to work with the DB-51 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 DB-51.

On the upper side of the DB-51 you will see a phone jack and written on it, USER RS-232. It is used to serially link the DB-51 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 is supplied with the system and the connections are given separately.

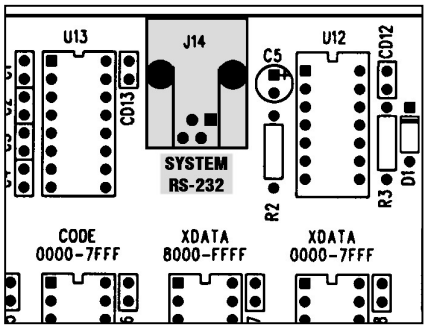

Figure 2: ***System RS-232 Connector***

The next part you should identify is the POWER IN jack located on the top right section of the board. This connector is used to apply a regulated +5V 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.

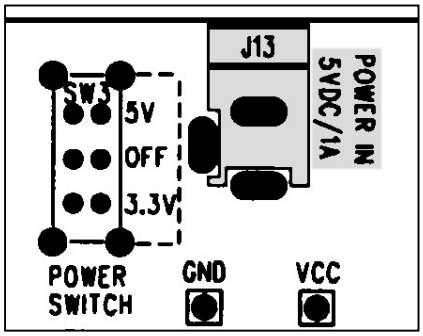

Figure 3: ***Power Connector***

The power switch is besides the Power In jack. It has three positions: OFF, 3.3V and 5V.

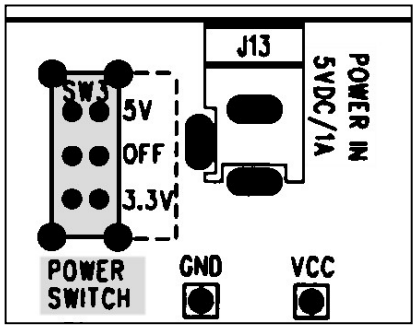

Figure 4: ***Power Switch***

Although the input voltage is always 5V, the system has a built-in voltage regulator (U16) that drops the voltage to 3.3V if the switch is set accordingly. *The system setup is for 5V, so set the switch to 5V to use the system.* The 3.3V support requires all the integrated circuits on the board working at such a voltage and this is not the case of the standard system. many microprocessors will not work at

3.3V or at the full frequency range, so for normal operation it is strongly recommended to used this switch set to 5V.

Also on the top of the board there is a Reset pushbutton. It is used to reset the microprocessor on the board, although while setting the switch from OFF to +5V, this operation is automatically carried out. pressing the pushbutton while the system is executing the user code will cause a communications error.

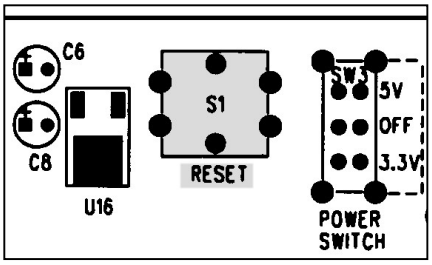

Figure 5: ***Reset Pushbutton***

A second RS-232 connector is provided (J15) and it is used to connect the microcontroller serial port to a user application. This is a 9-pin D-Type connector. The cable for this connector is not supplied. DB-51 already uses the serial port to connect the board to the PC debugger, but this port may be shared with a user application.

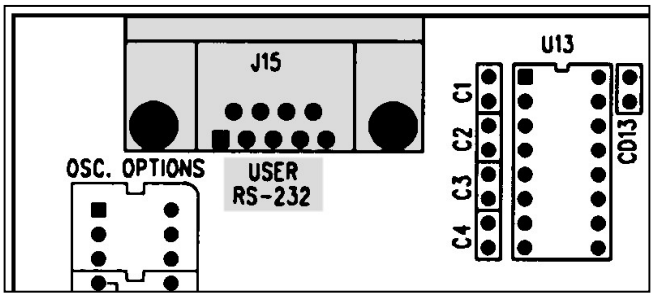

Figure 6: ***User RS-232 Connector***

U14 is a 10-LED array. While powering the system on, the ON LED will light up. The error LED will be on if the hardware of the system is not working properly; this is only a partial self-test indicator for major problems. Another 8 LEDs (L0 to L7) are used to connect I/O ports and display the line status; a logic "1" state turns the LED on. These LEDs are connected through J11.

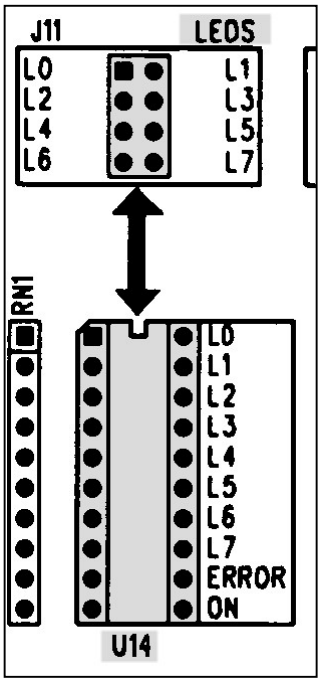

Figure 7: ***LEDs***

Besides the LEDs you will find 8 switches (SW2) that are used to apply logic states to input lines. These switches can be connected through J12.

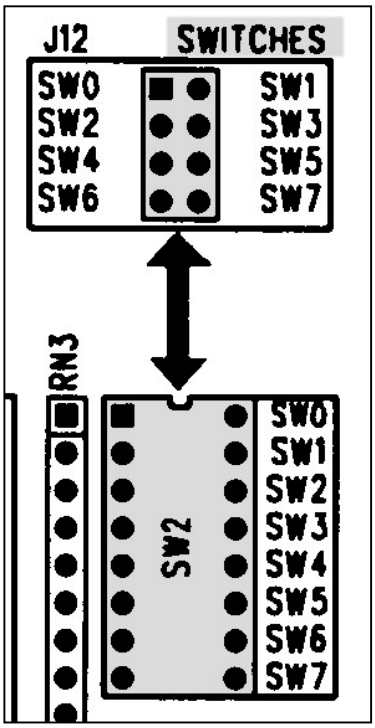

Figure 8: ***Switches***

DB-51 is supplied with an 8-wire ribbon cable to connect the ports to LEDs and Switches, thus allowing to easily test your program.

1.4. Frequency

The system uses a *11.0592MHz* crystal (Y1) to operate. This basic frequency is also used to generate the baud rate, so *it cannot be changed* without certain considerations.

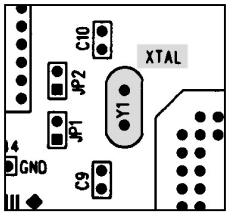

Figure 9: ***Crystal***

On the right corner of the board you will find the place to set your desired oscillator frequency (OSC1) if the default valued does not meet your requirements.

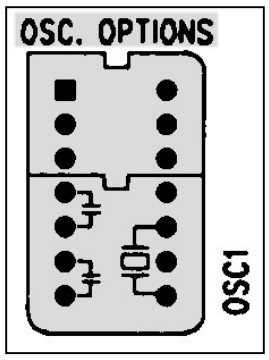

Figure 10: ***Oscillator Options***

If you want to use a full size crystal oscillator, you may connect it as shown in Figure 10. It will occupy the complete area grayed inside OSC1.

For a half size crystal oscillator, use the partial grayed area of Figure 11.

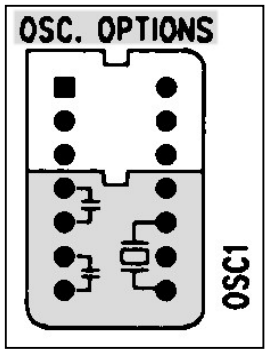

Figure 11: ***Half-Size Oscillator***

Another option is to use a 2-pin crystal connected as shown in Figure 12, with the addition of two capacitors (recommended values: 22pF to 47pF).

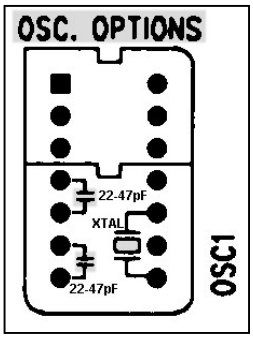

Figure 12: ***Crystal Option***

If you replace the factory setup, two other steps are required:

1. Disconnect the default crystal capacitors, C9 and C10. This is done by cutting Jumpers JP1 and JP2.

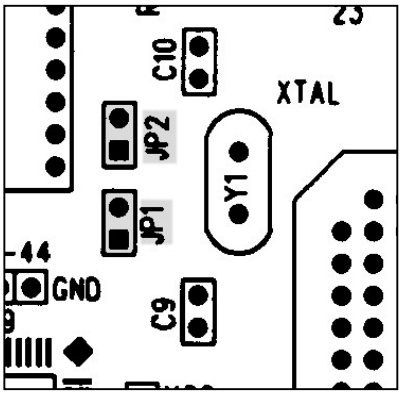

Figure 13: ***Capacitor Jumpers***

1. Tell the system which frequency you connected. This is done by setting Frequency Options Switch (SW1).

Do not move the SW1 switches if you are not changing the frequency.

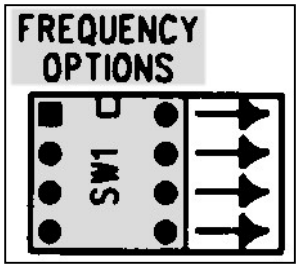

Figure 14: ***Frequency Options Switch***

1.5. Microcontrollers

The system is supplied with one of three possible options:

1. 40-pin DIP microcontroller on U1.

2. 44-pin PLCC microcontroller on U2.

3. 80C552 68-pin PLCC microcontroller on U4.

You may use any 8051 chip with the above pinout. Furthermore, a 44-pin QFP microcontroller can be soldered on U3.

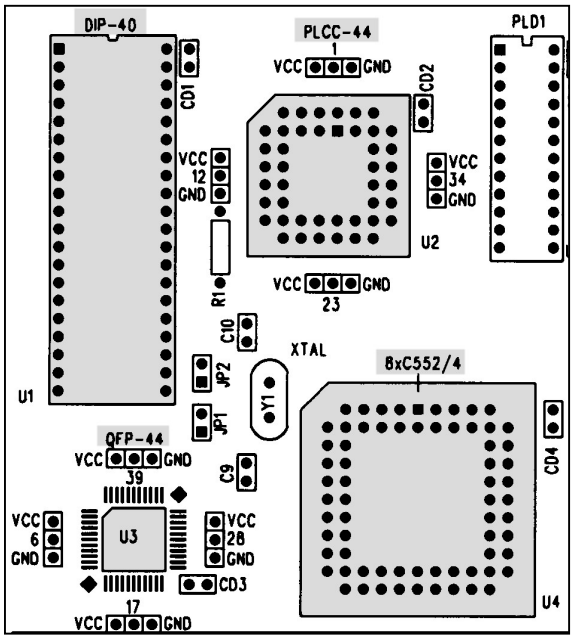

Figure 15: ***Microcontrollers***

If you are replacing the microcontroller, please *do not forget that only one microcontroller can be installed on the board*. Remove the factory supplied microcontroller before installing some other on the board, otherwise you will cause a short-circuit.

As 44-pin PLCC and QFP derivatives are not 100% pin-compatible, the board provides jumpers on the pins that may change to be wired accordingly. These jumpers are on the following pins:

QFP (U3) - 6, 17, 28, 39.

PLCC (U2) - 1, 12, 23, 34.

1.6. Wire-wrap Area

DB-51 can be used to build up a prototype of your design. You may add to the board your circuitry. There are three main expansion areas on the board.

The first area is for SMT with two blocks can be used to place different SMT, SOJ and SO packages. You can solder the integrated circuits and access the different pins through the 0.1" holes that are beside the chip footprint, so standard wires can be easily added to the board. Furthermore, you will find close to the chips two rows of holes for GND and Vcc Connections.

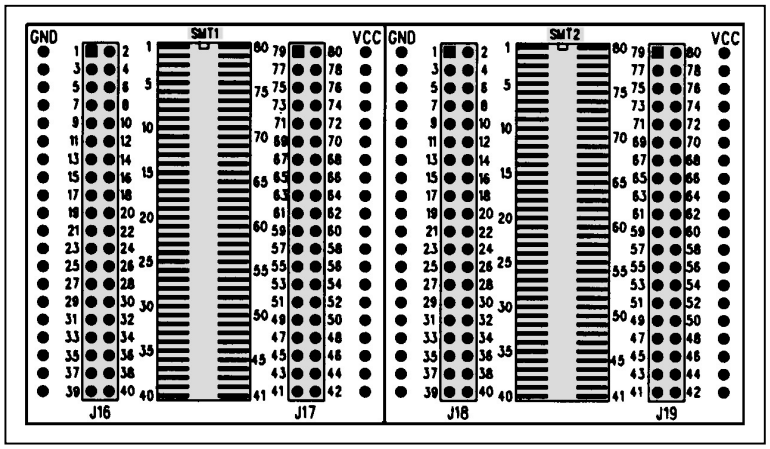

Figure 16: ***SMT Area***

The second area is very general and can be used for PLCC, PGA and DIP packages. It is a 0.1" matrix with GND on the right side and Vcc on the left side (same as for SMT2).

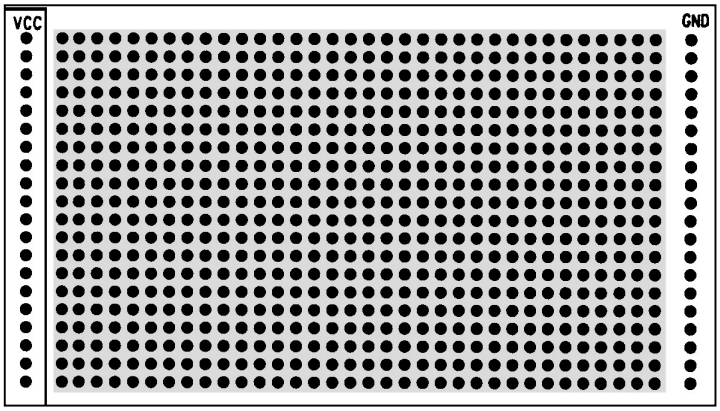

Figure 16: ***PGA Area***

The last area is for DIP packages and discrete components such as capacitors, resistors, etc.

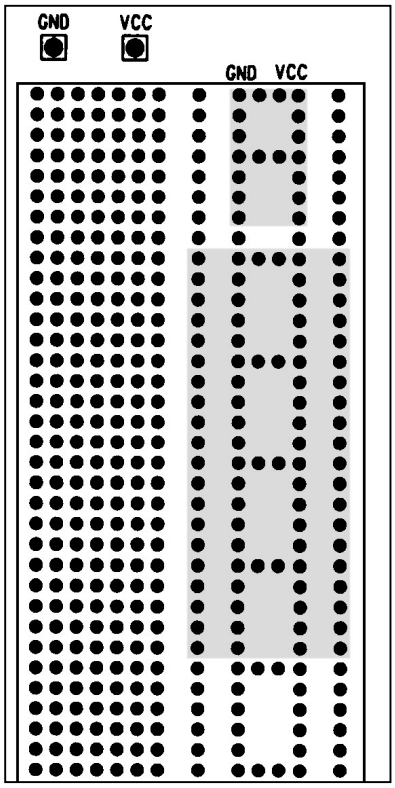

Figure 17: ***DIP Area***

Figure 17 shows how to connect 14-pin DIP (0.3") and 40-DIP (0.6") chips. The unused holes in the grayed area are short-circuited with the used holes, so they can be used to connect the wires. Vcc an GND traces are clearly visible on the board and the holes inside the grayed areas belong to those connections. The two testpoints are also provided to check voltages.

1.7. Signal Testpoints

All the microcontroller signals can be accessed on the board and connected to LEDs, switches or wired to any expansion circuitry.

J1 to J6 are common to all the derivatives and are connected directly to the mircontroller. J3 connects the demultiplexed address lines.

J7 to J10 belong to the 8xC552/4 signals only.

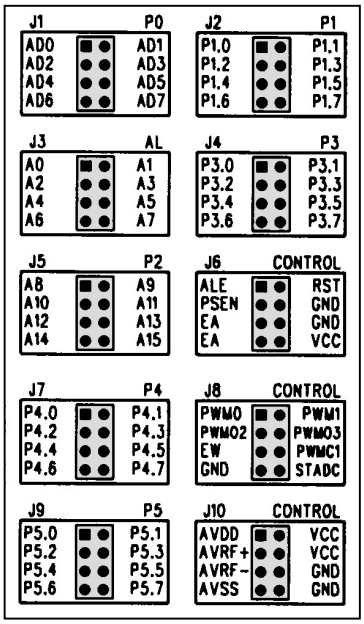

Figure 18: ***Microcontroller Signals***

1.8. Circuit Diagrams

Following are the schematics of DB-51.

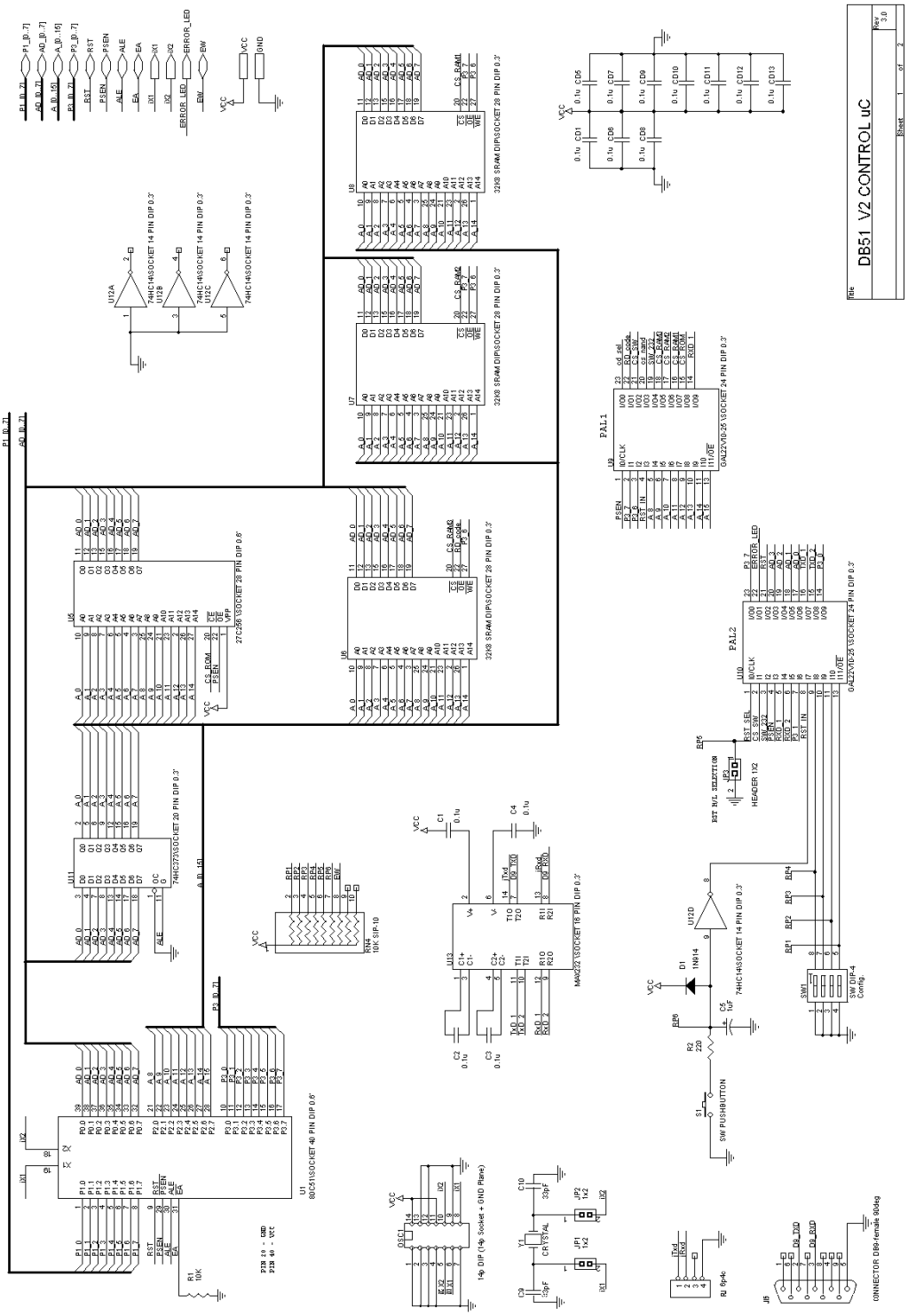

Figure 19: ***Schematics - First Part***

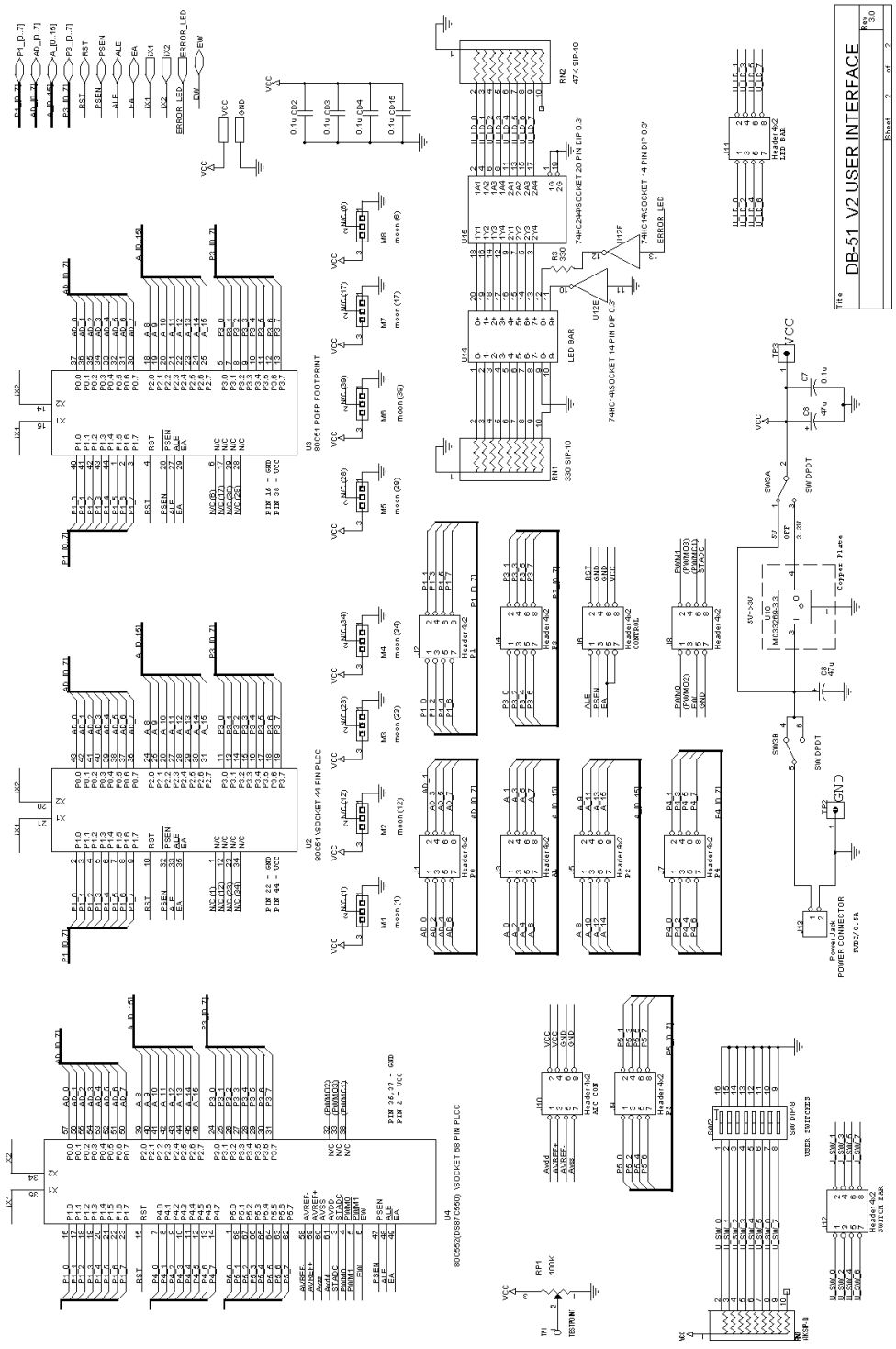

Figure 20: ***Schematics - Second Part***

1.9. Circuit Description

The different components on the board have the following functions:

Main microprocessor: U1, U2, U3 or U4. *Have only one on the board*.

RS-232 Interface: U13; it can be MAX232 or MAX202 or equivalent. Converts logic levels to RS-232 levels.

Voltage Regulator: U16; converts 5V to 3.3V for low voltage operation.

DMUX: U13; samples address which comes multiplexed with data from the microprocessor.

Monitor: U5; this 32Kx8 EPROM contains the firmware of the system. It uses the upper 32K of the 64K available for code memory.

Code RAM: U6; this 32Kx8 RAM is used to load the code that you want to debug. The upper 2K is reserved by the system, so actually *the largest program you can load is 30K*. User code is loaded starting from address 0000H, and that is one of the main differences with the old version of DB-51 which loaded user's code starting from 8000H as stated in the User's Manual.

XData RAM: U7 and U8; these 64Kx8 memory is accessed by using *MOVX instructions*. If your application is not with a RAM in this memory space, you just can remove these two devices from the board that are installed as other circuits on sockets. An example where you may have another need of the XData memory space is when you want to connect an LCD to the board, which actually the sequence of instructions is completely different than just writing to or reading from a RAM device.

PLDs: U9 and U10; these devices have the glue logic of the board.

LED Driver: U15; this is the interface between logical inputs and LED current requirements.