

## Introduction

This document provides a brief hardware description and operating limitations for the individual boards associated with the MakerLisp computer system.

## Board Descriptions

The MakerLisp computer system consists of four printed circuit boards:

1. The CPU Card
2. The I/O Expansion Board
3. The VGA Display Controller
4. The USB Keyboard Controller

The CPU Card provides the processor and associated memories.

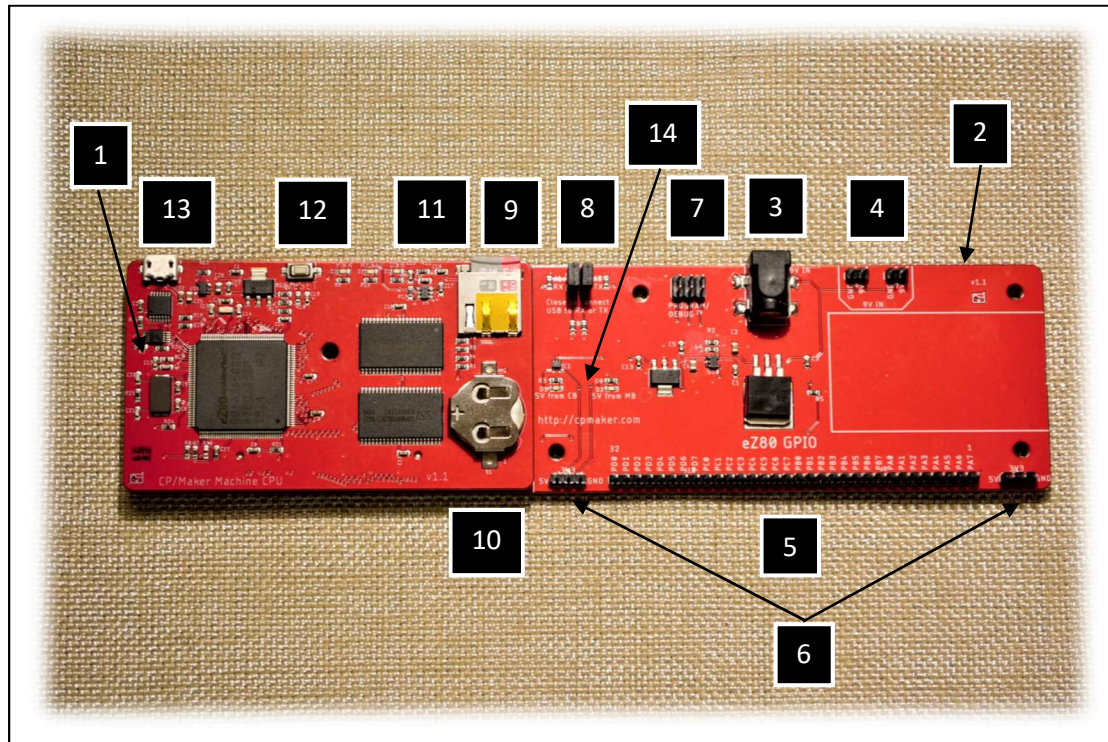
The purpose of the I/O Expansion Board is to provide breakouts for external power and signal connections. It has these features:

- High-density connector for CPU Card
- External DC power connector (2.1 mm barrel jack)
- Header pins for 9V battery or other external power
- 5V and 3.3V regulators
- Power switching circuitry
- Power status LEDs
- CPU GPI/O header pins

The VGA Display Controller provides an interface to an external VGA monitor and can display text and graphics symbols on the screen at various resolutions. Data are provided to this board from the CPU via a serial connection.

The USB Keyboard Controller acts as a USB host for an external USB keyboard. This board provides data to the CPU via a serial connection.

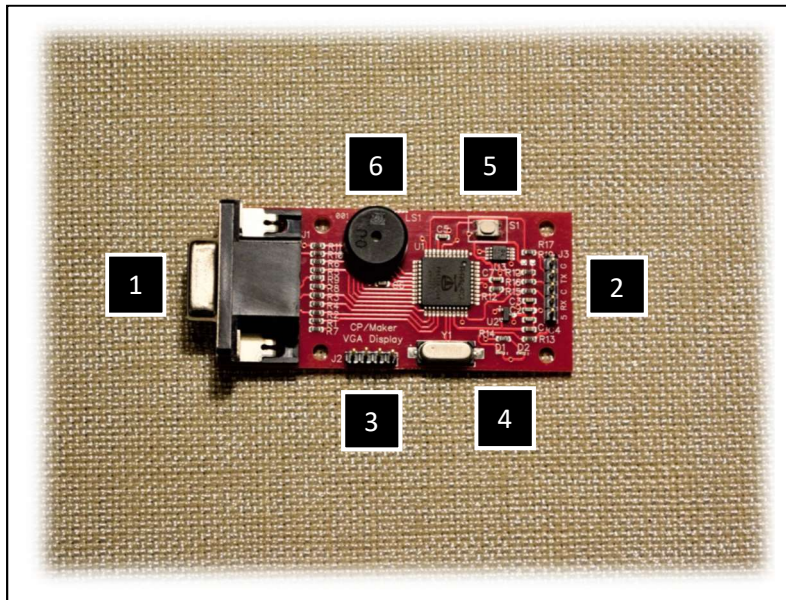
## CPU Card and I/O Expansion Board



**CPU Card and I/O Expansion Board Descriptions**

Item	Description
1	CPU Card
2	I/O Expansion Board
3	2.1mm barrel jack for external power input – 7V min to 25V max, center positive
4	Header pins for external DC power supply input or 9V battery
5	Header for CPU I/O ports
6	Header pins for 3.3V and 5V regulated power outputs
7	CPU Card debug port
8	Jumpers to connect CPU Card UART signals to USB/UART bridge RX jumper connects CPU UART0 RX input to USB/UART bridge TX jumper connects CPU UART0 TX output to USB/UART bridge
9	CPU Card SD card socket
10	CR1632 coin cell for CPU Card real-time calendar clock power
11	Status LEDs for CPU Card RED – CPU Card power GRN – driven by CPU GPI/O pin, indicates system initialization complete YEL – USB enumeration status
12	CPU Card reset button
13	CPU Card USB connector
14	I/O Expansion Board power status LEDs RED – power is sourced from CPU Card USB connector BLU – power is sourced from I/O Expansion Board

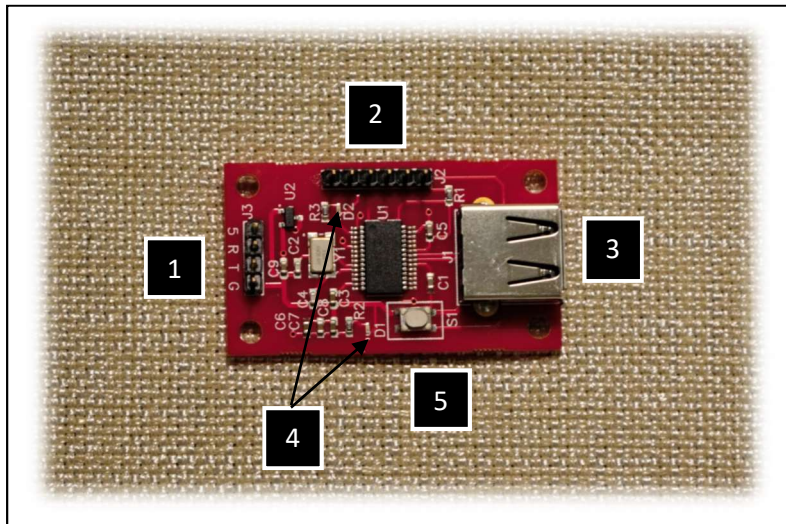
## VGA Display Controller



**VGA Display Controller Descriptions**

Item	Description
1	DB15 VGA monitor connector
2	Board interface header 5 – 5V regulated power input RX – VGA Display Controller serial input C – VGA Display Controller ready output TX – VGA Display Controller serial output G – GND
3	Programming Connector
4	Board status LEDs RED – VGA Display Controller 5V power GRN – driven by GPI/O pin, indicates VGA initialization complete
5	VGA Display Controller reset button
6	Loudspeaker

## USB Keyboard Controller Board



**USB Keyboard Controller Board Descriptions**

Item	Description
1	Board interface header 5 – 5V regulated power input R – USB Keyboard Controller serial input T – USB Keyboard Controller serial output G – GND
2	PIC32 MCU program/debug header
3	USB host connector
4	Board status LEDs RED – 5V power status LED YEL – Keyboard enumeration status
5	Board reset button

## Power Supplies

The CPU Card, VGA Display Controller, and the USB Keyboard Controller are all designed to operate from a source of regulated 5V power. When the I/O Expansion Board is utilized, it can provide regulated 5V power to all three of these boards. The I/O Expansion Board has a 2.1mm barrel jack (center pin positive) that is compatible with the plugs found on many wall power adapters. The I/O Expansion board also has header pins for DC power input. A voltage regulator on the I/O Expansion Board provides 5V power from the barrel jack or header pins.

The I/O Expansion Board can operate on any voltage between 7V and 25V. The chosen wall adapter or external DC source should supply at least 500 mA to provide sufficient current for all boards and allow extra current for I/O pins.

To minimize power dissipation, it is recommended that the I/O Expansion Board be used with a 9V power input and the 5V output current should be limited to 500mA maximum. Contact MakerLisp for more information on other operating conditions.

The VGA Display Controller and the USB Keyboard Controller have header pins that allow 5V power to be connected using jumper wires. This power should be sourced from the header pins on the I/O Expansion Board.

### Automatic Power Switching

The 5V power bus has automatic power switching between the CPU Card USB connector and the I/O Expansion Board power inputs. Power switching between the input sources is automatic so that it is not possible to damage the boards. If power is connected to the USB connector on the CPU Card only, this will provide 5V power to the entire system. If power is connected to the I/O Expansion Board, it will have priority and will supply the 5V power bus.