

Technical documentation of the voting system v1

General information on the models

The models are produced on one side.

0 ohm resistors allow the welding of components on one side of the model.

These are intended only to prevent the crossing of different lines.

Surface-mounted technology has been used for welding of various components.

Mounting screws as well as most of the surface of the model are connected to ground.

Pines for measure voltage and to supply the models have been added but we will return in more detail in the description of the receiver and transmitter.

100nF capacitors were added to each entry of the main components.

Resistance values were chosen through principal component documentation or current.

The capacitor values were chosen through principal component documentation.

The receiver (RX v1A)

The receiver is the centerpiece of the system. It was through it that the information flows, remote controls to the computer.

The ZigBee module makes the link with the remote. It was it who receives the responses received from the remote ZigBee modules.

The receiver must be connected to a computer to send the statistics received. We add a microcontroller to do all the operations necessary for the operation of the receiver. Namely, the calculation of percentages questions, the ZigBee module programming and management of transfers. The module will be connected to the computer via USB. This will also link its power. We will add a converter USB/RS-232 to make the connection between computer and microcontroller.

We could have removed the converter but the USB management is complex, this alternative simplify the future programming.

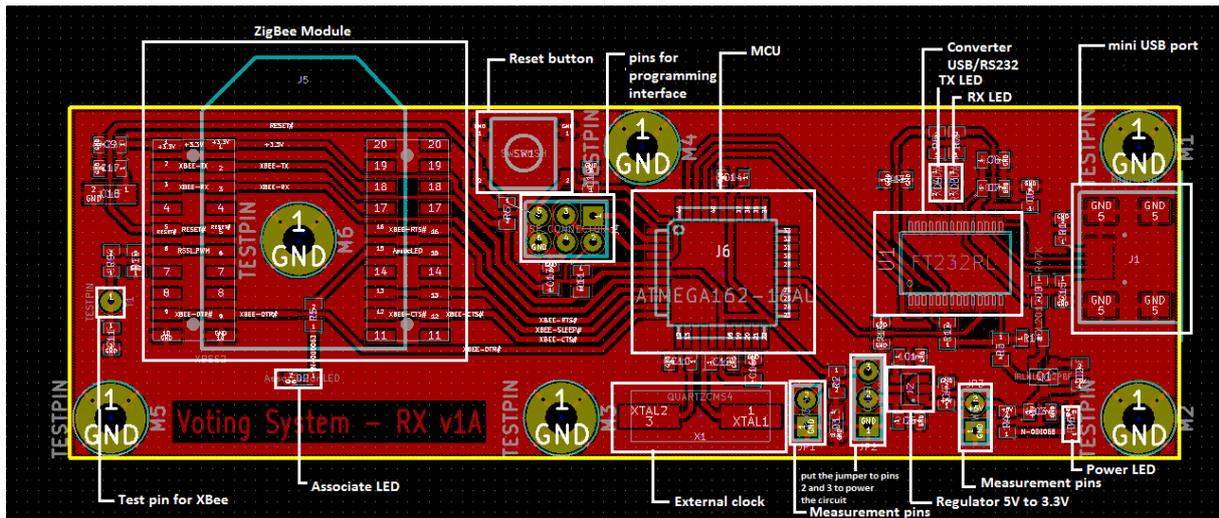
Led:

There are four LEDs on the model.

The first is that the PW LED is lit when the power is available.

The second is the Associate LED. Its operation is described in detail in the XBee part.

Finally the last two are the RX and TX LEDs. There are lit when there is a data transfer on serial lines from the USB port to the converter.



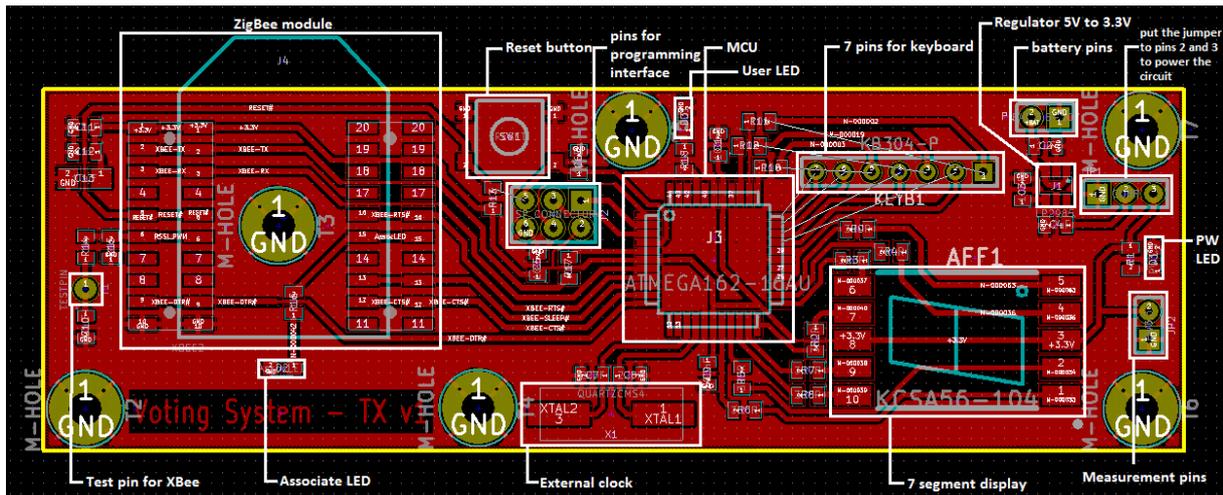
Annotated diagram of the receiver

The transmitter or remote control(TX v1)

Each person participating in the survey has a remote control. This will expose everyone's views. The transmitter is the simplest device. It only needs to communicate. It is composed of a ZigBee module to send its information to the receiver. A microcontroller (the same as the receiver) that connects between the keyboard and the screen and send to the ZigBee module to send information. The user types his response on the keyboard, the microcontroller sends a signal to the display shows the input number. The user then presses the validation, the microcontroller sends the information to ZigBee module which transmits to the receiver.

Led:

There are three LEDs on the model. The first is that the PW LED is lit when the power is available. The second is the Associate LED. Its operation is described in detail in the XBee. Finally the third is an LED for the user.



Annotated diagram of the transmitter

MCU

The microcontroller is an ATMEGA162-16U it has two serial ports and many programmable and fixed pins.

On each of the models, six pins are added to connect the programming interface.

Our interface is AVRISPMkII.

The pin 1 is connected to pin MISO (2) of the MCU.

Pin 2 to 3.3V input.

The pin 3 is connected to pin SCK (3) (clock) of the MCU.

The pin 4 is connected to pin MOSI (1) the MCU.

Pin 5 is connected to the RESET pin (4) of the MCU.

The pin 6 is connected to ground.

The RESET pin of the MCU and the RESET pin of the Xbee module are connected to the reset button.

This button makes it possible to reset the MCU and the Xbee module at a time.

A 4MHz quartz was added to get a more accurate clock than the one in the MCU. This Quartz is connected to pins XTAL1 (15) and XTAL2 (14).

XBee module

Serial Flow Control :

The RTS and CTS module pins can be used to provide RTS and/or CTS flow control. CTS flow control provides an indication to the host to stop sending serial data to the module. RTS flow control allows the host to signal the module to not send data in the serial transmit buffer out the uart. RTS and CTS flow control are enabled using the D6 and D7 commands.

RSSI Indicators :

It is possible to measure the received signal strength on a device using the DB command. DB returns the RSSI value (measured in -dBm) of the last received packet. However, this number can be misleading. The DB value only indicates the received signal strength of the last hop. If a transmission spans multiple hops, the DB value provides no indication of the overall transmission path, or the quality of the worst link – it only indicates the quality of the last link and should be used sparingly. The DB value can be determined in hardware using the RSSI/PWM module pin (pin 6). If the RSSI PWM functionality is enabled (P0 command), when the module receives data, the RSSI PWM is set to a value based on the RSSI of the received packet. (Again, this value only indicates the quality of the last hop.) This pin could potentially be connected to an LED to indicate if the link is stable or not.

Associate LED

The Associate pin (pin 15) can provide indication of the device's network status and diagnostics information.

The Associate pin indicates the network status of a device. If the module is not joined to a network, the Associate pin is set high. Once the module successfully joins a network, the Associate pin blinks at a regular time interval.

The Associate LED functionality is enabled by setting the D5 command to 1 (enabled by default).

The RESET pin of the MCU and the RESET pin of the XBee module are connected to the reset button. This button makes it possible to reset the MCU and the XBee module at a time.

The module programming is performed with X-CTU software from Digi.

To do that, you need to write some simple program into MCU to connect serial line from PC to XBee.

Changes for the next prototype

Swap ground, out voltage, in voltage. By this order, you cannot connect in-voltage with the ground. Add a protective film on the ZigBee module connectors to prevent the pins of the module is in contact with the surface under the connectors.

Add two holes to attach the USB port on the receiver optimally.

On the transmitter add diod to not let the current in reverse polarity.

Add on the two models a "polyswitch", it is some sort of resettable fuse (to protect the circuit against overcurrent). Add polyswitchs to USB and Battery supplying path.

MCU	Xbee	FTDI	Quartz
5	2/TX		
7	3/RX		
4	5/RESET		
11	9/DTR		
10	12/CTS		
9	13/SLEEP		
8	16/RTS		
42		1/TX	
43		5/RX	
41		3/RTS	
27		11/CTS	
15			1/XTAL1
14			2/XTAL2

Pins configuration for the MCU of the receiver

MCU	7segment	Keyboard	Xbee	User Led	Quartz
18	1/e				
19	2/d				
24	4/c				
25	5/DP				
23	6/b				
22	7/a				
21	9/f				
20	10/g				
35		1/C2			
30		2/R1			
36		3/C1			
31		4/R4			
34		5/C3			
32		6/R3			
33		7/R2			
5			2/TX		
7			3/RX		
4			5/RESET		
11			9/DTR		
10			12/CTS		
9			13/SLEEP		
8			16/RTS		
41				1	
15					1/XTAL1
14					2/XTAL2

Pins configuration for the MCU of the transmitter