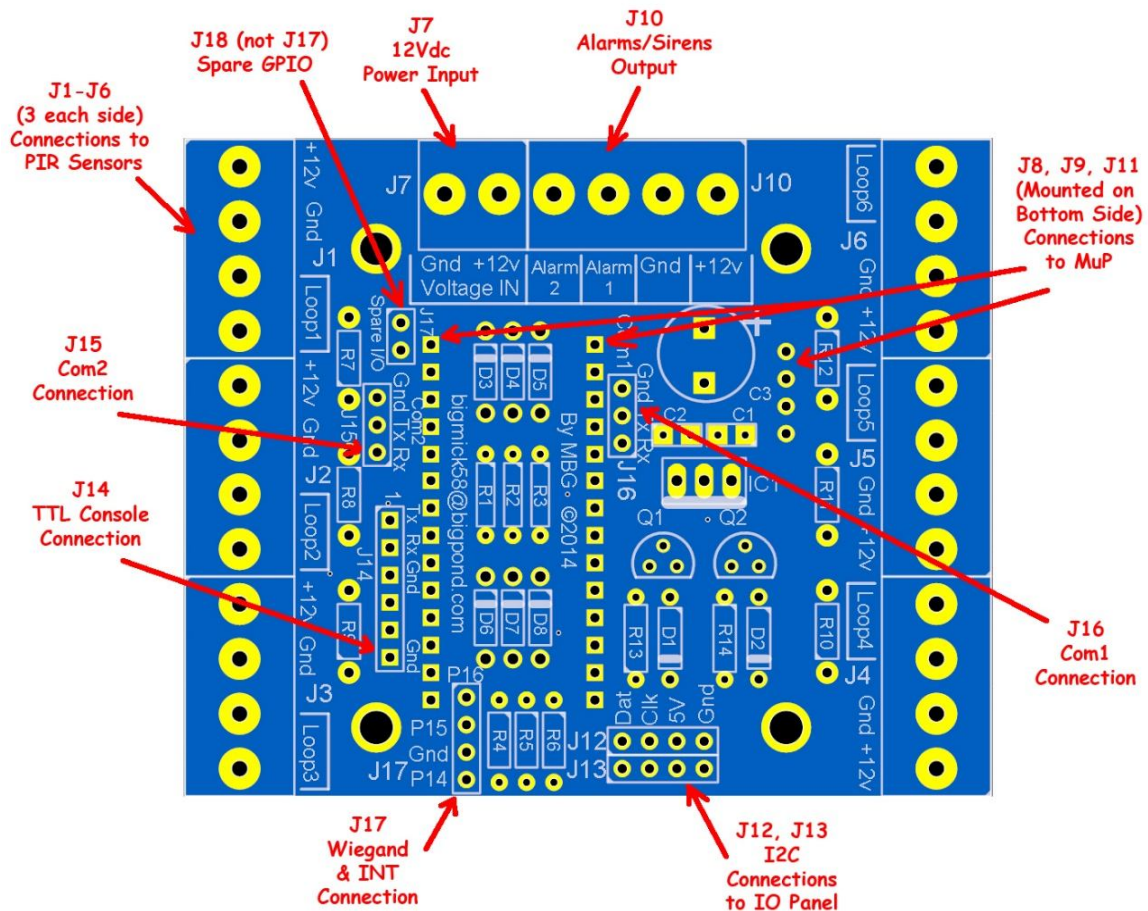
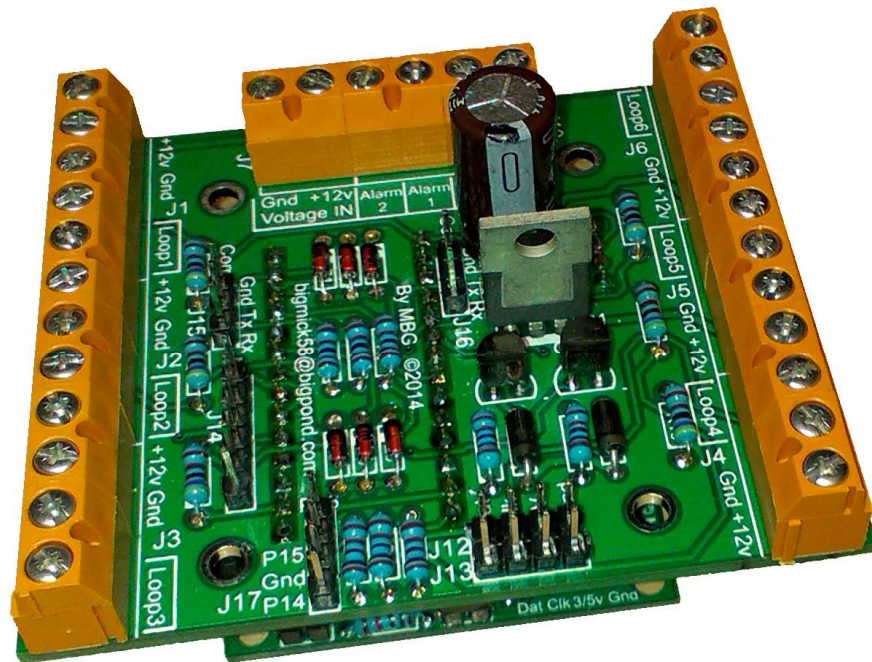


MuP - Security



Preamble:

The MuP-Security project came about due to a request from David Hall, a member of 'The Back Shed Forum', for a board that could plug into MuP to provide the basis of a home and/or shop security system. He had a specific need for a cheap, well featured alarm controller and graciously sponsored the design and prototyping of what is now known as MuP-Security. MuP-Security is 76mm x 61mm (3" x 2.4") and will bolt directly on top of a MuP CPU Board. Information on MuP can be found on 'The Back Shed Forum' using the following URL:

http://www.thebackshed.com/forum/forum_posts.asp?TID=6573&KW=MUP+Ver.+2

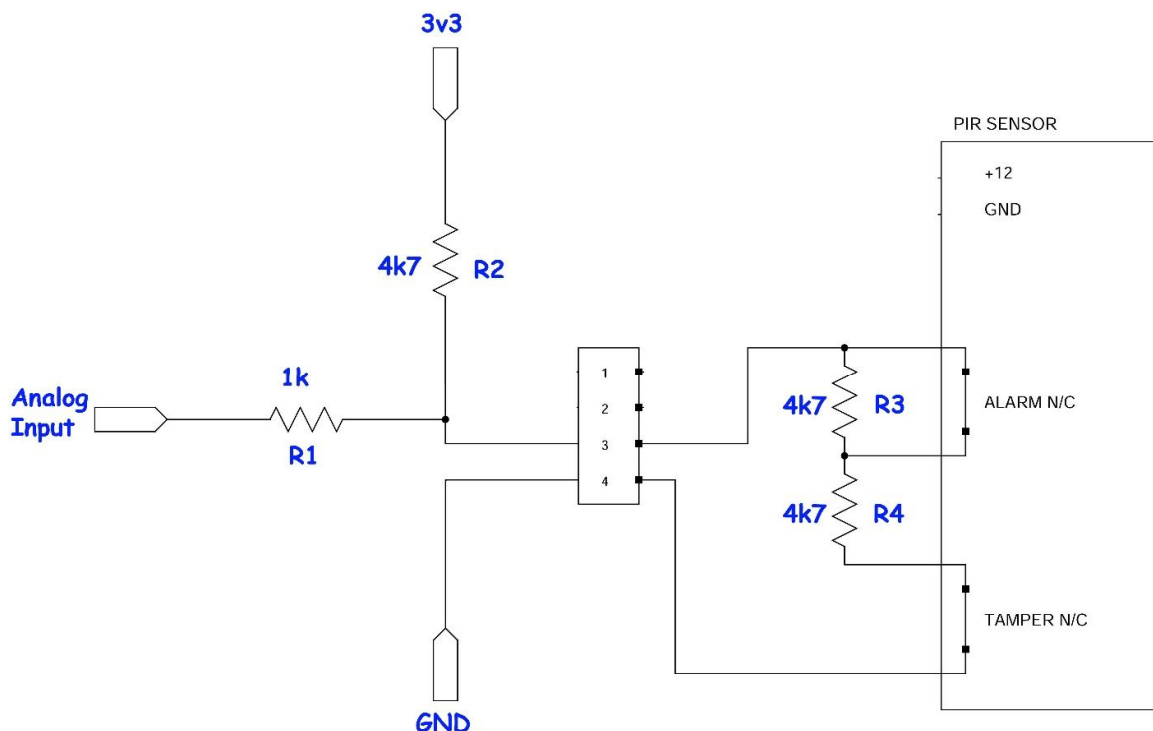
As at the time of writing (Aug-2014) there is no available 'ready-to-run' software to run this board but it is in the process of being written. Any software releases will be published on 'The BackShed Forum' (microcontroller and PC Projects section) linked here:

http://www.thebackshed.com/forum/forum_topics.asp?FID=16&PN=1

MuP-Security will **NOT** function by itself and requires MuP for the 'smarts' of the project.

Board Concept:

The general theory behind using MuP as the basis for a security system is, by using ANALOG inputs, it is possible to measure voltages across a voltage divider made up of several resistors. Take a typical alarm sensor circuit, as shown below:



It can be seen that in a normal, non-triggered sensor, situation that we would have the following situation, (Ignore R1 as the Analog input has a relatively high input impedance).

3v3 through R2 then through a closed sector relay (R3 shorted out) then through R4 to GND. This effectively gives us a simple 2 series resistor voltage divider and should give us a reading of $(3.3/2)$ 1.65v.

If the sector is triggered then this would add R3 into the series of resistors and the reading at the Analog input should be $(3.3 \times 2/3)$ 2.2v.

If however someone cuts the wires to the sensor or tampers with its casing the tamper switch would open and break the connection to GND meaning that the full 3v3 should be read at the Analog input.

Using that theory it is possible to monitor the above scenarios very easily using just the one Analog input. We have used 6 Analog inputs which will allow 6 `standard wired' sensors or 12 `zone doubled' sensors. Zone doubling basically means that another PIR sensor is paralleled across the first but by using different resistor values for R3 and R4 we can determine which of the 2 sensors has been triggered. Note, zone doubling alters the voltage readings seen at the Analog input and these will be different to those of single zone reading.

Input Protection:

We have provided over voltage input protection to each of the 6 Analog inputs by means of fast switching Shotky diodes just in case of a wiring error when installing the sensors.

Switched Outputs:

Two transistor driven switched outputs (12v output level) are provided to drive sirens, alarms, strobes etc. either directly, if under 500mA each, or via external relay circuitry.

I²C User interface Panel: (J12 & J13)

Due to the lack of IO lines for the features that we wanted, we have opted to use an I²C controlled user interface Panel. See details about the IO Panel at the following URL:

[Http://blabla](http://blabla)

The IO Panel allows the MuP to use only 2 IO pins to drive a 20x4 LCD module, 8 indication LEDs and a 4x4 matrix keypad.

TTL Serial Interfaces: (J15 & J16)

We have brought out MuP TTL serial ports (Com1 and Com2) to 3 pin headers for connection to external devices such as a GPS module and 3G Dialer.

Com1: (J16) **Dave Please advise what we will connect here**

Com2: (J15) **And Here**

Weigand Interface: (J17)

We have brought out 2 IO pins (Pin15 & 16) to J17 along with GND in the hope that we can support what is generally a high-end user input console. As this protocol is not supported by the MicroMite's MMBasic directly, we hope to be able to 'bit-bang' the Wiegand protocol, if this is not possible then we have two extra IO pins available there for general use.

Interrupt from IO Panel: (J17)

The IO Panel has the facility to set an interrupt pin LOW if a key has been pressed, this can be useful in letting MuP know that a key has been pressed and that it needs to service the keypad routine.

Spare IO Lines: (J18):

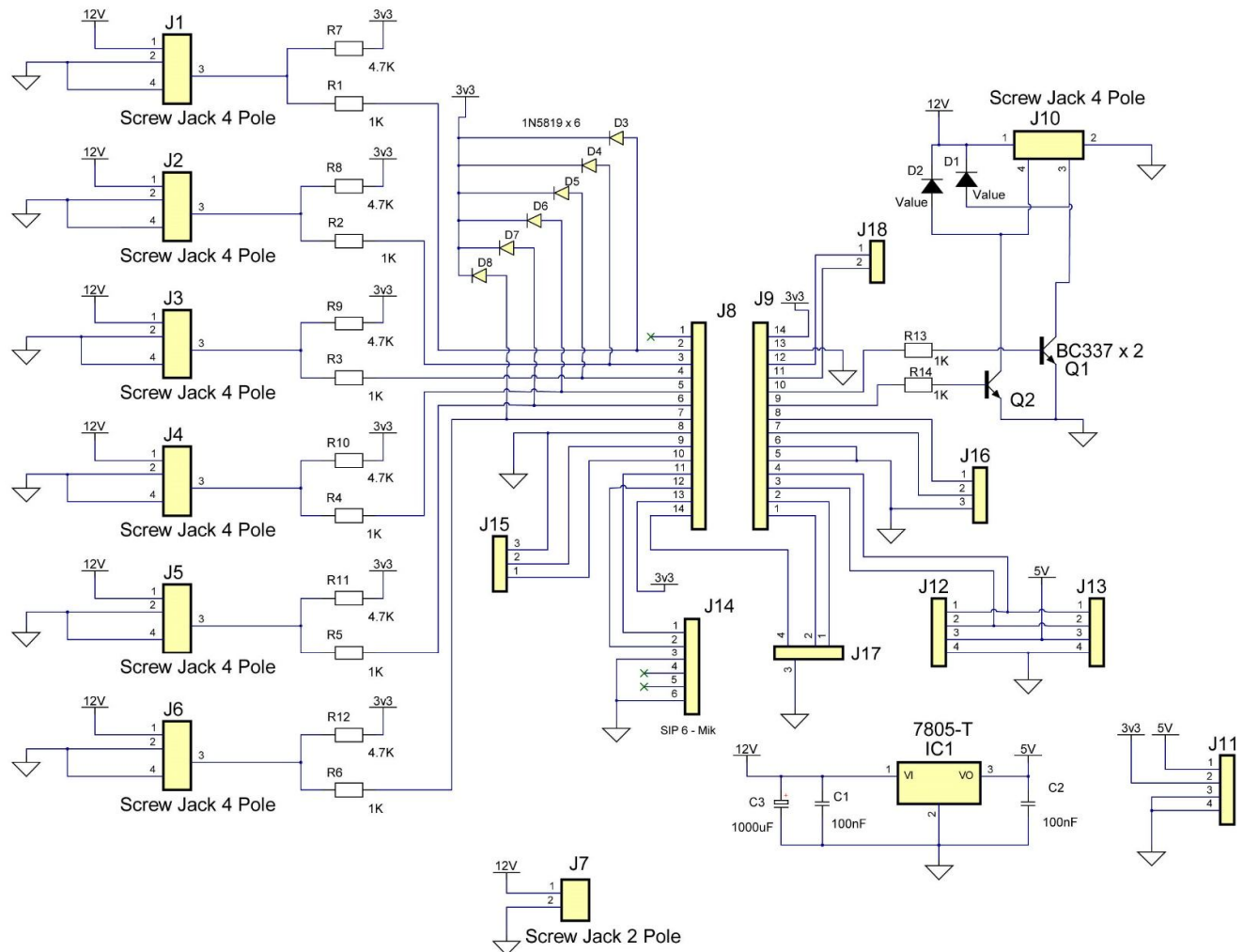
Note J18 is labelled incorrectly as J17 (on the PCB) and is located near R7 in the upper left region of the PCB. As we found that we still had 2 IO lines left after we had laid out the PCB we decided it was better to give these a home so we ran Pin(24) and Pin(25) to this header for General IO.

BOM:

Reference	Type	Description
C1	100nF	0.1" footprint
C2	100nF	0.1" footprint
C3	1000uF -16v/25v	Electrolytic 0.2" spacing
D1	1N4001	50V 1A Rectifier
D2	1N4001	50V 1A Rectifier
IC1	LM7805	5V Reg TO-220
J1	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J2	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J3	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J4	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J5	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J6	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J7	Screw Jack 2 Pole	0.2" (5.08mm) Pitch
J8	14 Pin SIP (Female)	Mounted on Rear
J9	14 Pin SIP (Female)	Mounted on Rear
J10	Screw Jack 4 Pole	0.2" (5.08mm) Pitch
J11	4 Pin SIP (Female)	Mounted on Rear
J12	4 Pin SIP (Male)	I ² C Header
J13	4 Pin SIP (Male)	I ² C Header
J14	6 Pin SIP (Male)	TTL Serial I ² face
J15	3 Pin SIP (Male)	Com2 Interface
J16	3 Pin SIP (Male)	Com1 Interface
J17	4 Pin SIP (Male)	Weigard/GPIO I ² face
J18	2 Pin SIP (Male)	General IO (Spare)

Reference	Type	Description
Q1	BC337	NPN TRANSISTOR
Q2	BC337	NPN TRANSISTOR
R1	1K	1/4 Watt
R2	1K	1/4 Watt
R3	1K	1/4 Watt
R4	1K	1/4 Watt
R5	1K	1/4 Watt
R6	1K	1/4 Watt
R7	4.7K	1/4 Watt
R8	4.7K	1/4 Watt
R9	4.7K	1/4 Watt
R10	4.7K	1/4 Watt
R11	4.7K	1/4 Watt
R12	4.7K	1/4 Watt
R13	1K	1/4 Watt
R14	1K	1/4 Watt
D1	1N5819	LDO Schotky 40V 1A
D2	1N5819	LDO Schotky 40V 1A
D3	1N5819	LDO Schotky 40V 1A
D4	1N5819	LDO Schotky 40V 1A
D5	1N5819	LDO Schotky 40V 1A
D6	1N5819	LDO Schotky 40V 1A

Schematic:



TTL Serial Console (J14):

We have provided a header, J14, to provide easy access to the MMBasic on MuP so that the controlling program can be updated. This header conforms to the standard header J2 on MuP itself except that none of the voltages (5v or 3v3) are connected due to the relatively heavy loads that can be connected to MuP-Security, as such to communicate with MuP it will be necessary to also have MuP-Security powered via the 12Vdc power source.

Construction:

Building MuP Security is very straight forward, the only consideration to be careful of is that headers J8, J9 and J11 are mounted on the bottom layer of the IO Panel, these are to mate with MuP and transfers all of the required signals between the two boards. We recommend mounting these headers last so that they don't get damaged in the soldering process.

A standard TO-220 heat sink needs to be fitted to the LM7805 regulator but we recommend fitting it facing backwards, towards the bottom of the PCB (towards Q1 and Q2), so that Com1 is easily accessible. A small blob of 'hot melt' glue or silicone between the heat sink and C1 will stop the heat sink from being bent down and shorting against anything.

Power Source:

MuP-Security expects that the input power source (which will get transferred to the remote sensors as well) to be 12Vdc and of sufficient current to drive the entire circuit including MuP, MuP-Security, IO-Panel, any sirens/alarms/strobes etc and all of the remote sensors. We can't comment on current draw for the sensors and sirens but you should allocate at least 1A for all of the control circuitry. Our suggestion would be to use a 12Vdc (3A or 5A) power supply.

MuP-Security regulates the 12Vdc down to 5Vdc and in turns transmits this to MuP via header J11, MuP regulates this to 3v3 to power not only MuP but MuP-Security as well.