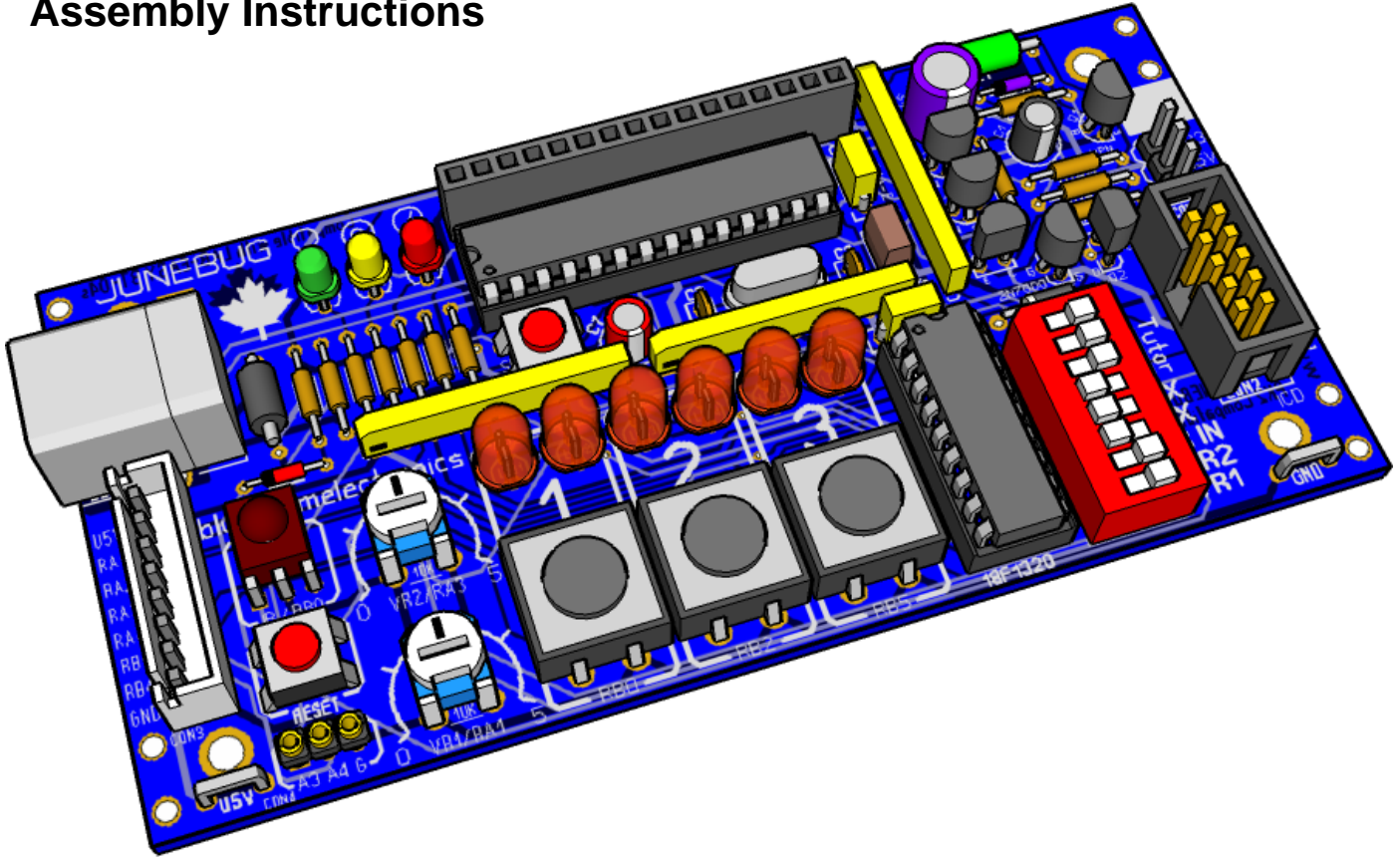


# JUNEBUG *PIC LABORATORY*

## Assembly Instructions



*The Junebug PIC Lab*

### **Introduction**

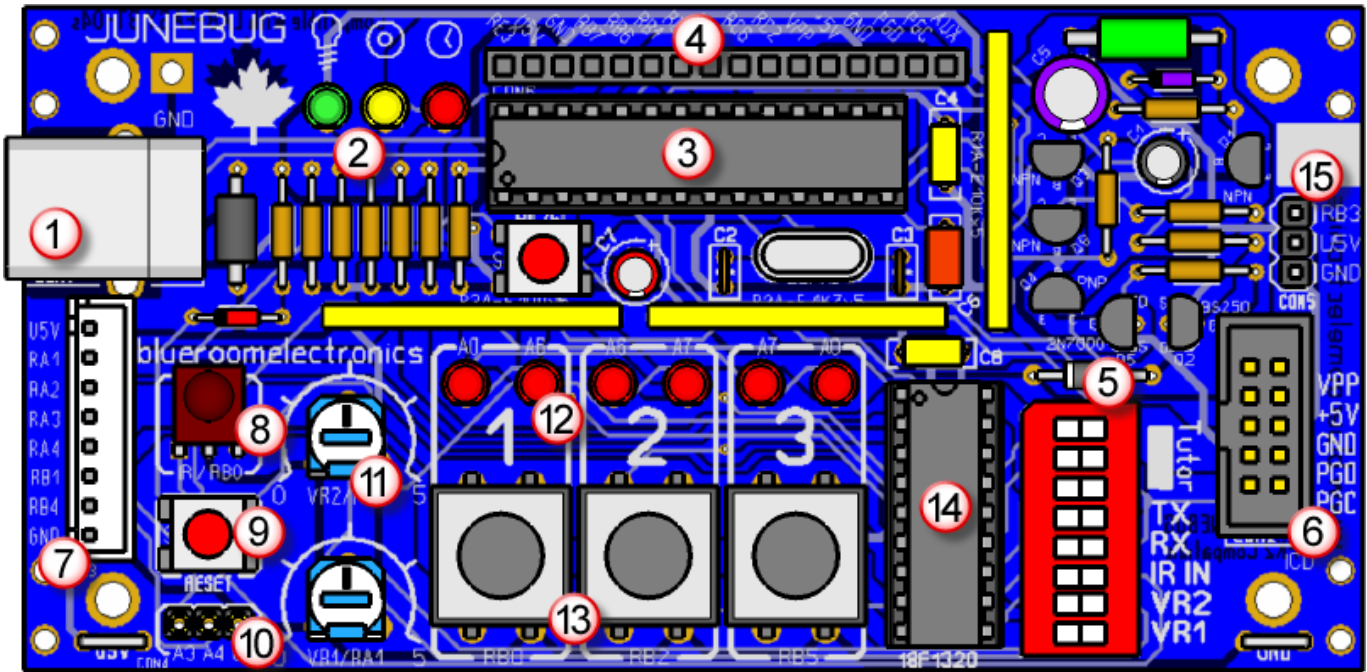
Powered from your computers USB port the Junebug is everything you'll need in a small self contained portable PIC Laboratory perfectly suited for students, educators and hobbyists. The Junebug is actually two independent kits in one.

An **MPLAB Compatible PICkit 2\* Programmer / Debugger**, works with both the Tutor and includes two external ICD connectors for your own PIC projects. The programmer also includes a very handy UART terminal.

The **advanced PIC18F1320 Experimenter / Tutor** was designed to demonstrate the 18F1320 in a hands on manner. With pushbuttons, LEDs (light emitting diodes), variable resistors, Infrared detector (38KHz TV type), UART (serial communications) there are literally thousands of program possibilities on this single board. Plenty of room for expansion too with the several built in I/O expansion connectors. No jumpers to lose as all the tutor peripherals can be controlled with a single DIP switch.

*\* Unlike the Microchip® PICkit 2 the Junebug does not have a programmable VDD supply (5V targets only)*

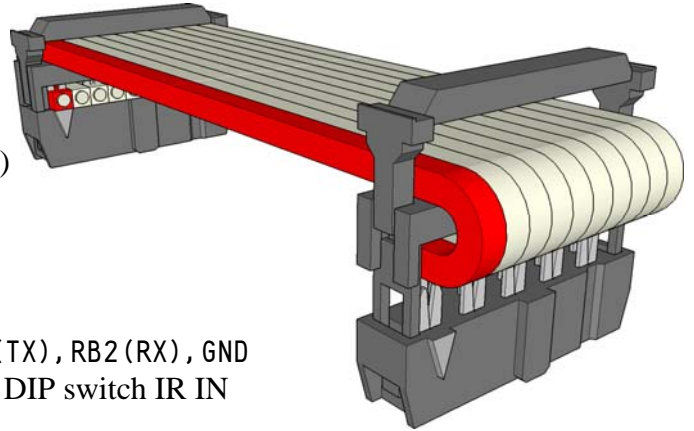
## The Junebug PIC Lab Overview



### PICKit 2 Compatible Programmer / Debugger & UART tool

1. USB-B connector, provides power and communication for the Junebug, Tutor & target projects
2. Programmer status Power, Target Power & Busy
3. PIC18F2550 preprogrammed with .hex
4. 18F2550 ICP, expansion & PK2 compatible
5. Tutor mode switch see page 6 for details
6. ICD programming / debugging connector (2x5 type)

*\*Typical ICD cable pictured right →*



### PIC18F1320 Tutor / Trainer

7. USER I/O connector U5V, RA1, RA2, RA3, RA4, RB1 (TX), RB2 (RX), GND
8. 38KHz Infrared detector / demodulator enable with DIP switch IR IN
9. Reset or RA5
10. CON4 A3, A4, GND socket designed for iButton® / 1-wire®, and various small parts
11. VR1 & VR2 variable resistors on RA1 & RA3 (DIP switch selectable)
12. Six multiplexed LEDs
13. Pushbuttons on RB0, RB2 & RB5
14. PIC18F1320 for user programs and software development
15. CON5 designed for buzzers, servo motors, PWM and general I/O

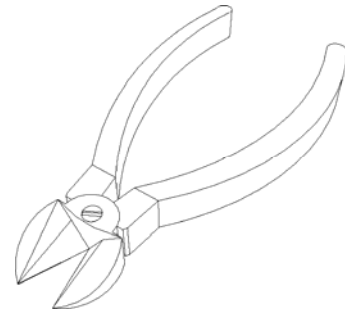
Located on the left of the Junebug; it makes some of the 18F1320 pins available for your own projects. It also gives you access to your computers USB power supply but keep in mind only 100ma is available from the USB port. If you need more, most powered USB hubs will supply 500ma to the Junebug and your target projects. Do not supply current / voltage to the U5V pin it is a 5V source.

*\*The ICD cable must be short to avoid communication errors with the target PIC, usually less than 8" (20cm)*

## Necessary Tools *(not included in kit)*

As with any electronic kit the following tools are essential:

- Low wattage fine tip soldering iron <50W
- Resin core solder
- Wire cutters or side cutters (small)
- Needle nose pliers (small)
- Slotted screwdriver (small)
- Phillips screwdriver (small)
- Multimeter (this really is a must for any electronics project)



## Assembly

Traditionally it's easiest to assemble a circuit board with the lowest profile and/or smallest parts first.

Install resistors R4 thru R16

Small signal diodes D1 & D3 (Red 1N4148)

Schottky diode D2 (1N5817)

*Note: diodes use a colored band to denote polarity*

Ferrite bead FB1 and 680uH inductor L1

SIP resistors R1 (10K), R2 (100ohm) & R3 (4.7K)

Capacitors C2, C3, C4, C6 & C8

Crystal Y1 *(a spacer is optional but recommend)*

IC socket for U1 & U2 *(notice notch orientation)*

Transistors Q1, Q3, Q6 (NPN) and Q4 (PNP)

MOSFETs Q2 (BS250) and Q5 (2N7000)

*Note: Check the datasheet for DGS orientation*

3mm LED5 (green), LED6 (amber) & LED7 (red)

5mm or 3mm LED1 thru LED6 (red)

*Note: LEDs have a flat side indicating polarity*

Momentary Pushbuttons SW1 thru SW5

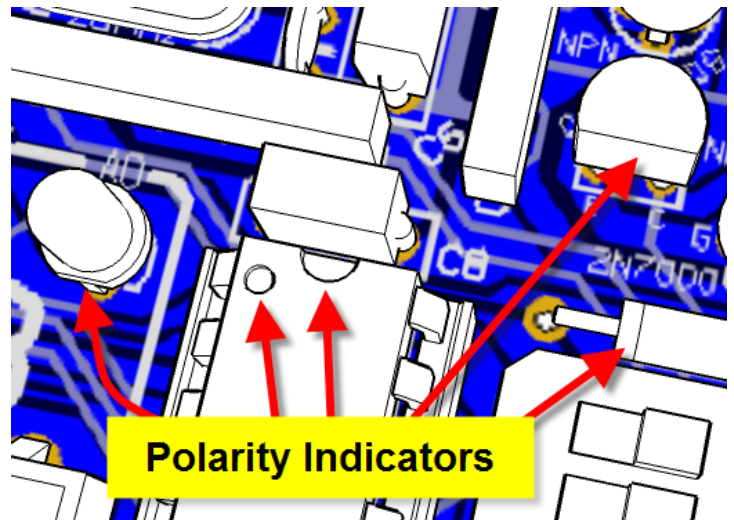
Eight position DIP Switch SW6

38KHz IR detector IR1 *(carefully bend leads before installing)*

Variable Resistors VR1 & VR2

Electrolytic Capacitors C1, C5 & C7 *(Note: polarity indicator; usually a white stripe indicating negative)*

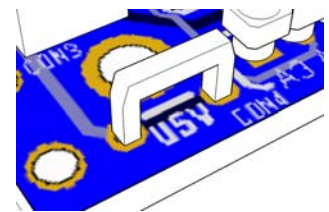
All remaining parts including connectors CON1 thru CON8 *(take your time soldering the USB GND lugs)*



## Initial Testing

Connect the Junebug to your computers USB port, the green power LED should glow.

If you have a voltmeter check for approximately 5V between U5V and GND



## Final Assembly

Make sure the board is unpowered then install U1 & U2. Note their orientation before inserting.

*Optionally you can install small wire loops for attaching alligator clips using left over resistor leads.*

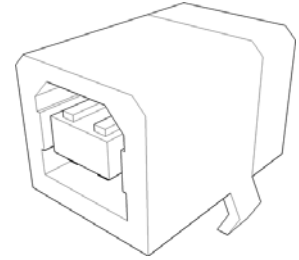
Your kit includes a pre-programmed PIC18F2525 (PK2V021000.HEX) the firmware is automatically updated by MPLAB when needed. If you have a problem with the firmware holding down SW5 (directly below the 18F2550 while you connect the USB cable should initiate the bootloader (busy LED flashing) Run either the PICKit 2 or MPLAB software to initiate a reinstall of the Junebug (PICKit 2) firmware.

There's a demo program "Junebug LED Demo" near the end of this document for testing the LEDs.

## Parts List JUNEBUG

### Capacitors

2	C2, 3	22pF ceramic
2	C4, 8	0.1uF monolithic
1	C6	0.47uF monolithic
1	C7	4.7uf 6.3V radial electrolytic
1	C1	22uF 25V radial electrolytic
1	C5	100uF thru 220uF

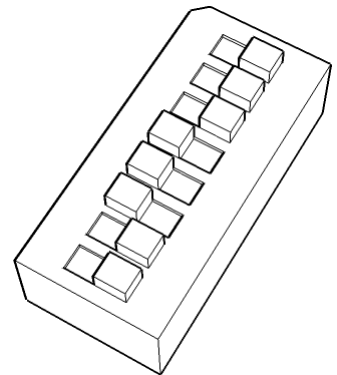


### Resistors 1/4W

1	R2	100 x 5	SIP 10pin 5 independent resistors
1	R3	4.7K x 5	SIP 10pin 5 independent resistors
1	R1	10K x 5	SIP 10pin 5 independent resistors
3	R9, 11, 12	100	Brown, Black, Brown, Gold
4	R8, 13, 14, 17	330	Orange, Orange, Brown, Gold
3	R4, 5, 10	1K	Brown, Black, Red, Gold
1	R6	2.7K	Red, Yellow, Red, Gold
2	R15, 16	22K	Red, Red, Orange, Gold
1	R7	100K	Brown, Black, Yellow, Gold
2	VR1, VR2	10K	10K Trimmer potentiometers

### Semiconductors

2	D1, 3	1N4148 Small Signal Diode
1	D2	1N5817 Schottky Diode
1	IR1	TSOP34838 38KHz IR detector Vishay
6	LED1, 2, 3, 4, 5, 6	3mm or 5mm RED LED
1	LED7	3mm GREEN LED
1	LED8	3mm YELLOW LED
1	LED9	3mm RED LED
1	Q1, 3, 6	2N3904 NPN (EBC)
1	Q4	2N3906 PNP (EBC)
1	Q5	2N7000 N-Channel 200ma MOSFET
1	Q2	BS250P P-Channel 230ma MOSFET
1	U1	PIC18F2550 (programmed with PK2V021000.HEX firmware)
1	U2	PIC18F1320 (Tutor)

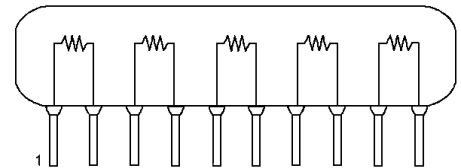


### Switches

3	SW1, 2, 3	Pushbutton (Small or Large 450-1131-ND see text)
2	SW4, 5	Small pushbutton (450-1173-ND)
1	SW6	DIP Switch 8 position

### Connectors

1	CON1	RA USB B connector
1	CON2	ICD 2x5 PCB Male Shrouded
1	CON4	3pin machine socket RA3, RA4, GND
1	CON7	3pin header RB3, +5V, GND
1	CON8	8pin Molex connector +5V, RA1, RA2, RA3, RA4, RB1/TX, RB4/RX, GND
1	CON6	16pin header for 18F2550 (pins 11 thru 16 are PICKit2 compatible) RE5, U5V, GND, RB7, RB6, RB1, RB0, RC7, RC6, RC2, VPP, +5V, GND, PGD, PGC, AUX

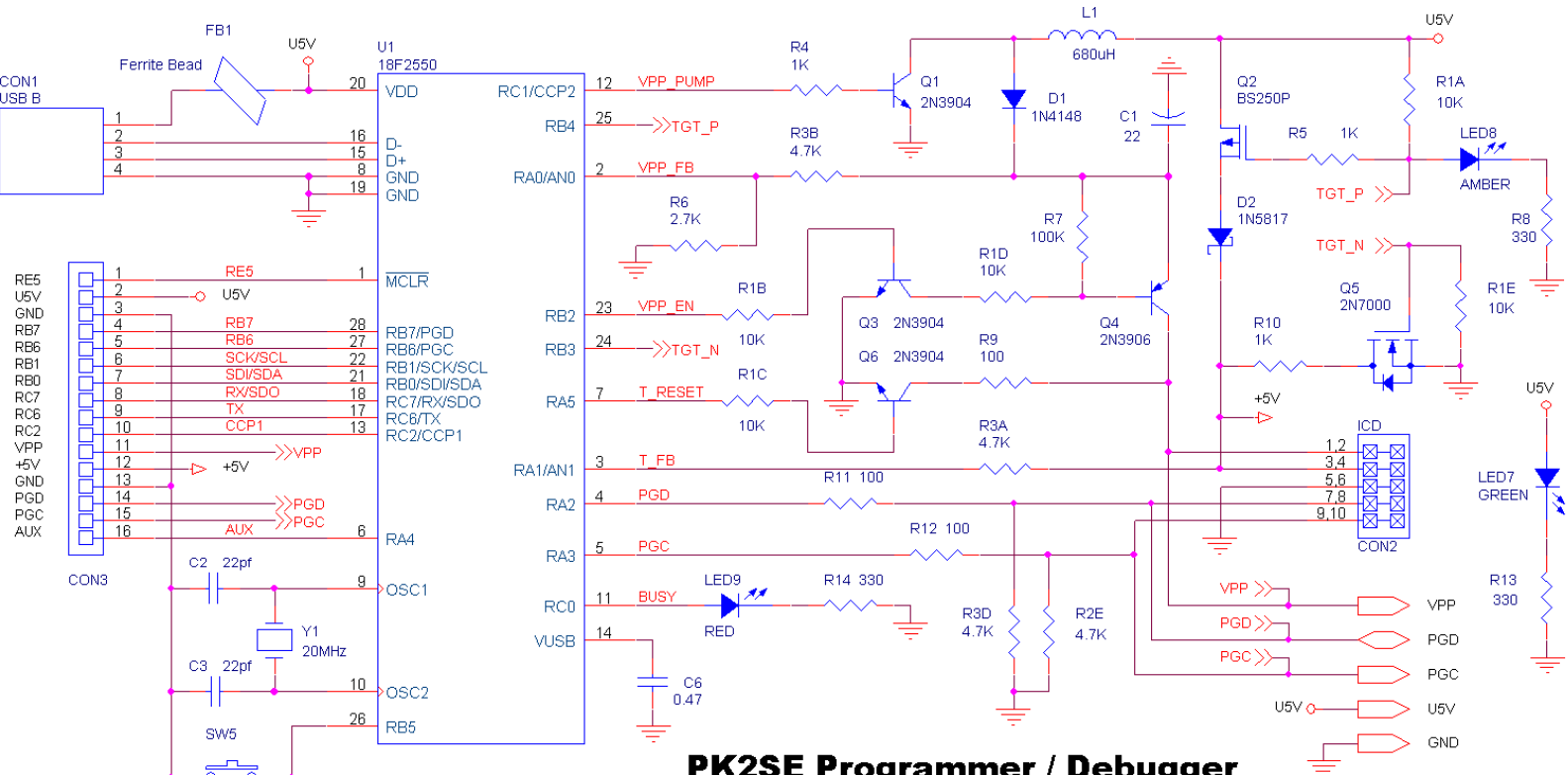


### Miscellaneous

1	FB1	Ferrite Bead
1	L1	680uH inductor
1	Y1	20MHz Crystal Low profile,

### Optional Accessories

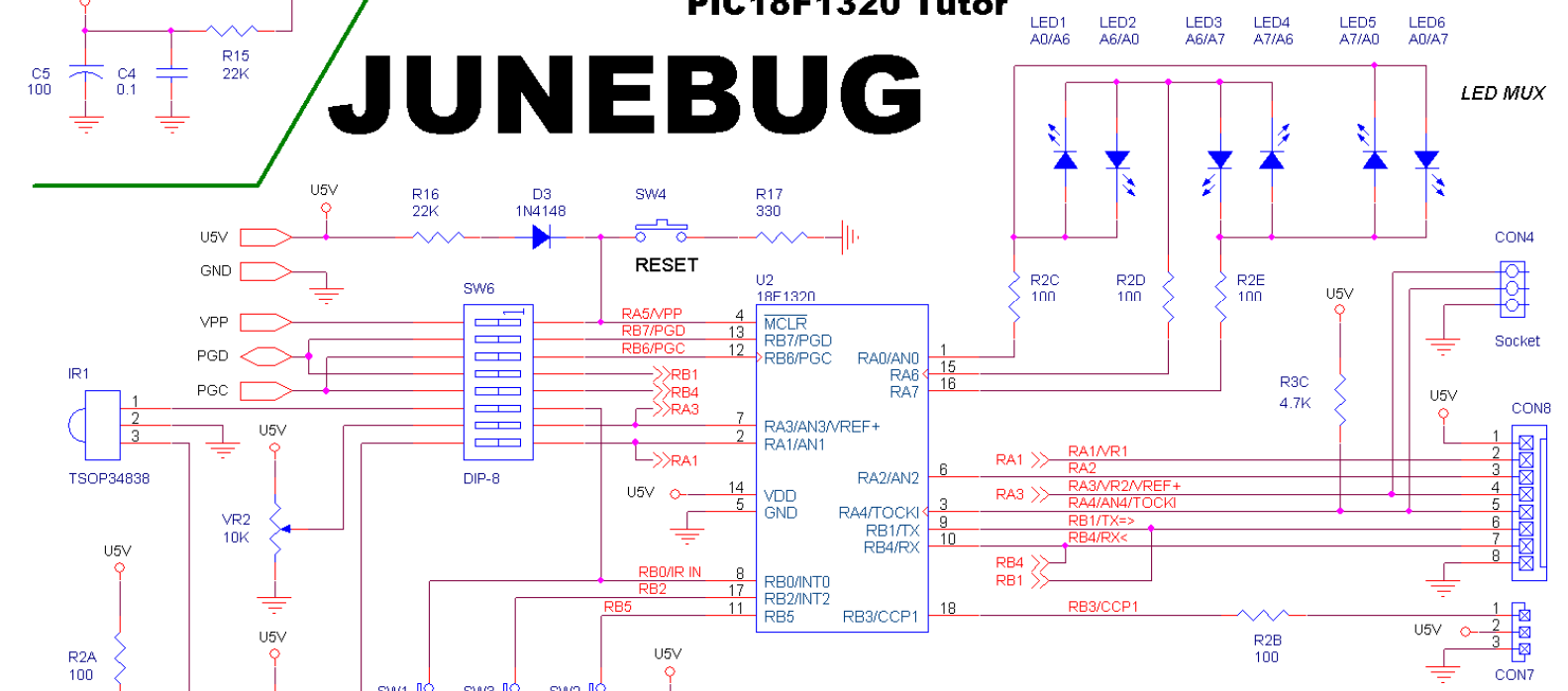
1	Enclosure	Polyview LAB-EASY BT-04 or four rubber feet
1	Insulator	crystal insulator for Y1



**PK2SE Programmer / Debugger**

**PIC18F1320 Tutor**

# JUNEBUG



<a href="http://www.blueromelectronics.com">http://www.blueromelectronics.com</a>		
Title <i>Junebug PK2SE &amp; 18F1320 Tutor</i>		
Size	Document Number	Rev
	<b>William Richardson</b>	A
Date:	Wednesday, December 26, 2007	Sheet 1 of 1



Complete schematic for Junebug showing both Programmer (top) & 18F1320 Tutor (bottom)

**Notes:**

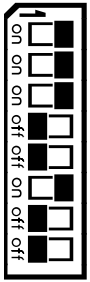
**U5V** indicates the power is continuously supplied by your computers USB port, this is normally limited to approximately 100ma. Using a powered USB hub can increase the available current 500ma.  
**+5V** indicates a switched power supply controlled by the Junebug.

## DIP Switch functions (SW6)

Junebugs Tutor has an eight position DIP switch (shown in Tutor default mode)

Switch functions from 1-8 (top to bottom)

*enable = on / right, disable = off / left*



SW6-1	Tutor	(PK2 controls 18F1320 MCLR), free running mode & SW5 RESET
SW6-2	Tutor	(PK2 controls 18F1320 PGD)
SW6-3	Tutor	(PK2 controls 18F1320 PGC)
SW6-4	TX	Uses PGD for PICKit 2 UART test mode (PICKit 2 software)
SW6-5	RX	Uses PGC for PICKit 2 UART test mode (PICKit 2 software)
SW6-6	IR IN	(38KHz IR) receiver on, <i>Pushbutton 1 is always enabled</i>
SW6-7	VR2	(0-5V pot) or USER port RA3 I/O
SW6-8	VR1	(0-5V pot) or USER port RA1 I/O

Reset switch SW4 will function when SW6-1 is off. Remember you can control reset via MPLAB.

## Required Software (free download from <http://www.microchip.com>)

**MPLAB IDE 8.00**

File Edit View Project Debugger Programmer Tools Configure Window Help

Select Programmer

- None
- 1 PICSTART Plus
- 2 MPLAB ICD 2
- 3 AN851 Quick Programmer Beta
- 4 PICKit 2**
- 5 MPLAB PM 3
- 6 REAL ICE
- 7 PRO MATE II
- 8 PICKit 1

Program  
Read  
Verify  
Erase  
Blank Check  
Read EEDATA  
Connect  
Download OS  
Abort Operation  
Release from Reset  
Hold in Reset  
Settings

**PICKit 2 Programmer - My Junebug**

File Device Family Programmer Tools Help

PIC18F Configuration

Device: PIC18F1320 Configuration: CF00 1F0F 8000 0085  
User IDs: FF FF FF FF FF FF FF FF C003 E003 4003  
Checksum: E3EB OSCCAL: BandGap:

PICKit 2 connected. ID = My Junebug  
PIC Device Found.

VDD PICKit 2  
 On  
 /MCLR  
5.0

Read Write Verify Erase Blank Check

Program Memory

Enabled Hex Only Source: None (Empty/Erased)

0000	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0010	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0020	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0030	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0040	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0050	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0060	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0070	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0080	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
0090	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
00A0	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
00B0	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF

EEPROM Data

Enabled Hex Only

00	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
10	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
20	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
30	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

Auto Import Hex + Write Device  
Read Device + Export Hex File  
**PICKit 2**

### MPLAB IDE 8.0

A professional all in one PIC firmware development environment, excellent for...

- Editing
- Assembling (MPASM), Compiling (C, BASIC)
- Programming
- Simulation
- Debugging

### PICKit 2 v2.40

Provides a simple interface which is handy for...

- One button Read / Write .hex files
- TTL Software Terminal UART Tool
- Junebug Diagnostics
- Personalization (you can name your Junebug)
- EEPROM programming support (I2C, SPI & Microwire)

## Troubleshooting the Junebugs USB connection

If you get this error when running the PICkit 2 standalone software, here are a couple of quick tests.

**"PICkit 2 not found. Check USB connections and use Tools->Check Communication to retry."**

1. Check for 5V across the test points U5V and GND
  - Check your solder connections, USB (CON1) & Ferrite Bead (FB1)
2. Hold SW5 down when plugging in the Junebug to the USB port
  - If the BUSY LED does not flash then check the crystal (Y1)
3. Check for 3.3V across the 0.47uf capacitor (C6)
  - The preprogrammed 18F2525 may be blank or defective, contact your supplier for replacement

## Junebug LED Demo

```
; *** Junebug 18F1320 LED sequencer demo ***
; Flashes LEDs1 thru 6 from left to right forever
; DIP Switch (SW6) must have TUTOR on (SW6-1,2,3) all other switches off
list      p=18F1320
include <p18F1320.inc>
CONFIG   OSC = INTIO2, WDT = OFF, LVP = OFF
LED      macro    x,y                ; MACRO LED <PORTA>, <TRISA>
movlw    x
movwf    LATA                        ; LATA = x
movlw    y
movwf    TRISA                       ; TRISA = y
call     Delay                       ; call the Delay subroutine
endm     ; end macro
Count    equ 0                       ; delay loop counter
org      0                            ; reset vector
bsf      ADCON1, 0                   ; make RA0 digital
LED1     LED b'00000001', b'10111110' ; LED <PORTA>, <TRISA>
LED2     LED b'01000000', b'10111110' ; LED <PORTA>, <TRISA>
LED3     LED b'01000000', b'00111111' ; LED <PORTA>, <TRISA>
LED4     LED b'10000000', b'00111111' ; LED <PORTA>, <TRISA>
LED5     LED b'10000000', b'01111110' ; LED <PORTA>, <TRISA>
LED6     LED b'00000001', b'01111110' ; LED <PORTA>, <TRISA>
goto     LED1                       ; loop forever
Delay    decfsz  Count, f            ; decrement Count and skip when zero
goto     $-2                         ; not zero? repeat
return   ; return
END
```

# Junebug and other blueromelectronics kits are available at

## Retail Sales

 **CREATRON INC.**

255 College St. Toronto  
Ontario, Canada

Tel (416) 977-9258

Fax (416) 977-4700

[creatronpart@hotmail.com](mailto:creatronpart@hotmail.com)

<http://www.creatroninc.com>

## Online Sales



<http://www.robotshop.ca/>

## RobotShop Inc.

86 Boul. des Entreprises # 108  
Boisbriand, Québec, Canada J7G 2T3

Tel (450) 420-1446

Fax (450) 420-1447

Toll-free (within North America): 1-866-627-3178

## eBay Sales

All kits available including bare PCBs

# Creatron Electronics



Shipping worldwide

<http://stores.ebay.ca/Creatron-Electronics>

## Dealer Sales & Technical Inquiries

 **blueromelectronics** 

4544 Dufferin St. Toronto

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Tel (416) 897-1962

[sales@blueromelectronics.com](mailto:sales@blueromelectronics.com)

<http://www.blueromelectronics.com>

Info and all other inquiries [info@blueromelectronics.com](mailto:info@blueromelectronics.com)

