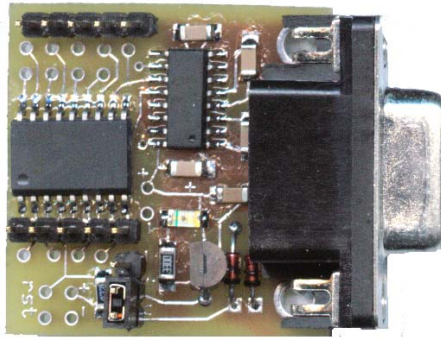# A232P88 RS232 w/PIC16F88 controller

Rev 1.0

Picture may vary from actual board due to revision changes

A compact controller board which includes an RS232 chip and standard DB9 serial connector. The board can be powered externally (3 to 6vdc) or it can be configured via a jumper to use the power available from the PC on the handshake lines. Ideal for developing small sensor projects that can be connected directly to a PC. It has an on-board voltage regulator and protection diodes for the PC handshake lines.

Parts List

5 - 0.1uf SMD capacitor
1 - 1uf SMD capacitor
1 - 330 ohm SMD resistor
1 - 4.7k SMD resistor
2 - 1N4148 (or equiv) diodes
1 - SMD LED
1 - Max3232 (or equiv) IC
1 - PIC16F88 SOIC
1 - LM3480 5v regulator
1 - DB9F connector
1 - 3 pin header w/jumper
1 - 5 pin header
1 - Printed circuit board

Assembly of this kit requires that the user has the necessary tools and skills to work with SMD (surface mount device) components. If you are not comfortable with soldering miniature parts, then please seek assistance from someone who is capable to do so. Small mistakes can cause many frustrating hours of grief in trouble shooting!

Minimum tools required:
A fine point low power (25w max) soldering iron and thin solder. Ideally, 0.022" diameter (or less) silver-bearing non-corrosive rosin core should be used. In addition. narrow needle nose pliers, diagonal cutting pliers, good quality tweezers, large magnifying glass, volt-ohm meter, and a 7 to 12 vdc power supply.
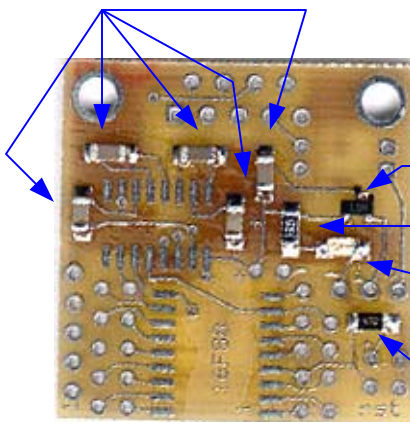
Make sure that you work in a clean well lighted area and have adequate desk area. If you have carpeting then please be aware of static discharge as well as accidentally losing tiny components in the carpets fiber. SMD capacitors and resistors are very tiny and can quickly become lost in the carpeting.

Disclaimer and Terms of Agreement

Assembly (rev D board)

Five 0.1uf capacitors

Max3232Pin 1
Banded end

Two 1N4148 diodes
Note: Banded end faces edge of the pcb

LM3480 regulator

330 ohm resistor

LED
Note: Banded end faces edge of the pcb

4.7k resistor

LED banded end

Pic16F88 Pin 1
(end with a small dot/dimple)

1. **Mount and solder the 0.1uf capacitors,resistor and LED on the top side**
   The dark green band (cathode) of the LED faces the pcb's edge
2. *Carefully orient* **and solder the Max3232 and PIC16F88 in place**
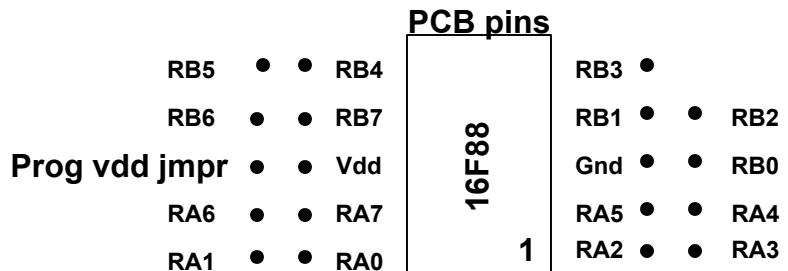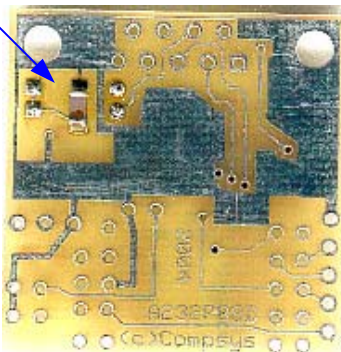   Note where the PIN 1 positions are of the PIC and Max3232
3. **Mount the LM3480 regulator (number faces up) and the 2 1N4148 diodes**
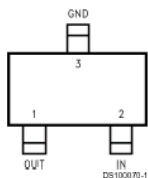   The dark band (cathode) of the diodes face the pcb's edge
4. **Solder the 1uf capacitor on the** *back side* **of the pcb as shown below.**
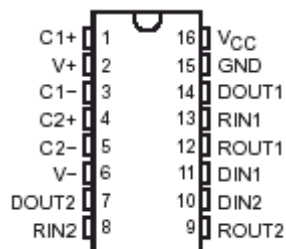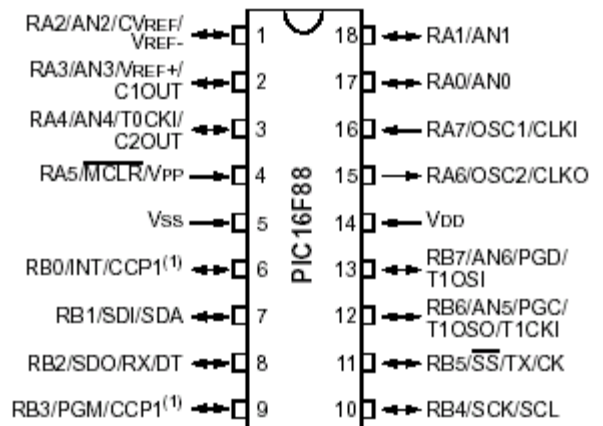5. **Solder the RS232 DB9F connector and any pin headers (see next page)**

1uf capacitor

PCB pins

RB5	• •	RB4		RB3 •	
RB6	• •	RB7		RB1 • •	RB2
Prog vdd jmpr	• •	Vdd	16F88	Gnd • •	RB0
RA6	• •	RA7		RA5 • •	RA4
RA1	• •	RA0	1	RA2 • •	RA3

LM3480 (5v or 3.3v reg)

GND
3
1   2
OUT   IN
DS100070-1

Max3232 (or equiv)

C1+	1	16	V_{CC}
V+	2	15	GND
C1−	3	14	DOUT1
C2+	4	13	RIN1
C2−	5	12	ROUT1
V−	6	11	DIN1
DOUT2	7	10	DIN2
RIN2	8	9	ROUT2

PIC16F88

|			
RA2/AN2/$\overline{C}V_{REF}$/VREF-	1	18	RA1/AN1
RA3/AN3/VREF+/C1OUT	2	17	RA0/AN0
RA4/AN4/T0CKI/C2OUT	3	16	RA7/OSC1/CLKI
RA5/$\overline{MCLR}$/VPP	4	15	RA6/OSC2/CLKO
Vss	5	14	VDD
RB0/INT/CCP1[1]	6	13	RB7/AN6/PGD/T1OSI
RB1/SDI/SDA	7	12	RB6/AN5/PGC/T1OSO/T1CKI
RB2/SDO/RX/DT	8	11	RB5/$\overline{SS}$/TX/CK
RB3/PGM/CCP1[1]	9	10	RB4/SCK/SCL

Power supply options

PIC 5 pin programming header

*Normally the PIC will need to be powered by its own power source. If the programmer is to be used to supply power, then a link or jumper needs to be placed on the two points next to Pin 4 (shown in red box)

1 - Gnd
2 - PGC (RB6)
3 - PGD (RB7)
4 - n/c*
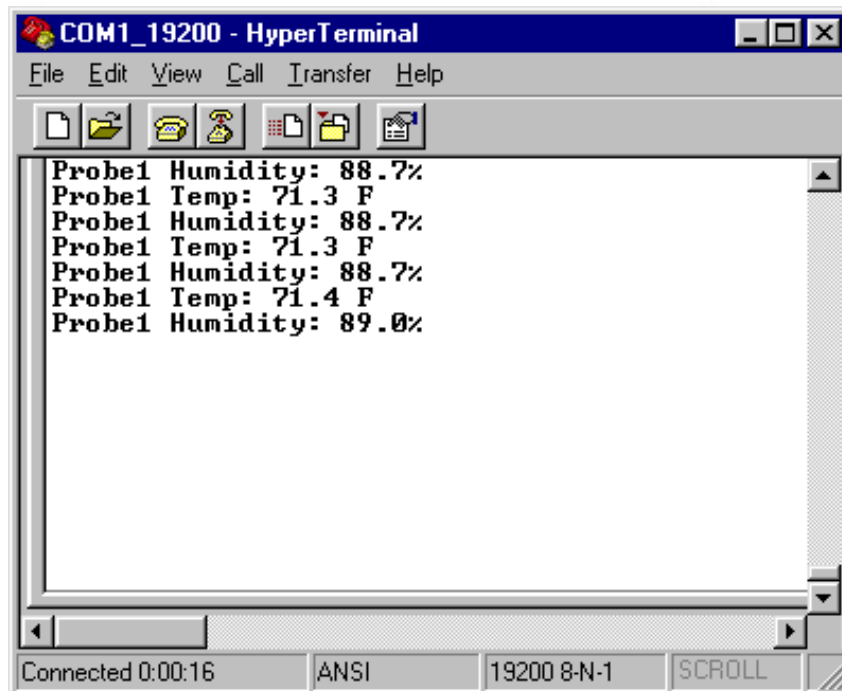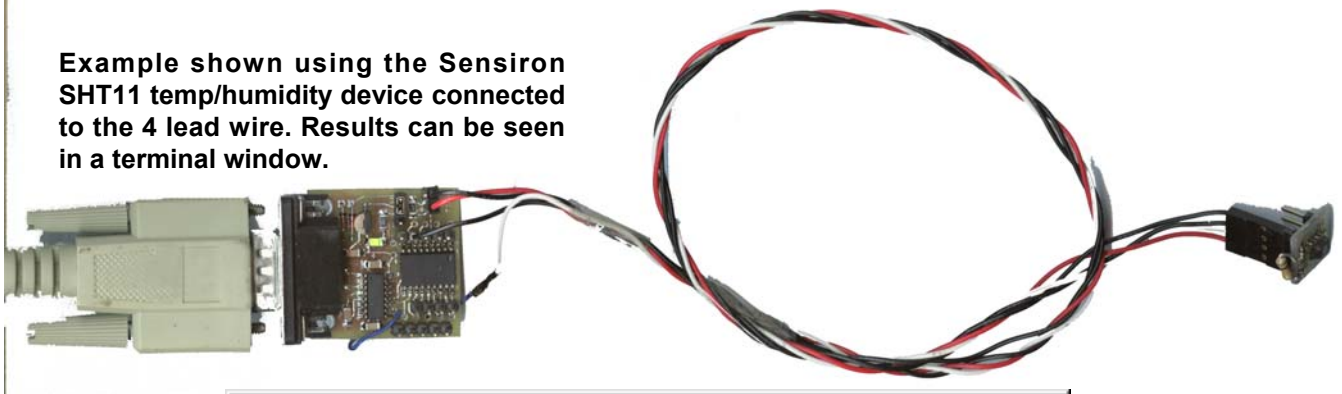5 - Vpp (RA5)
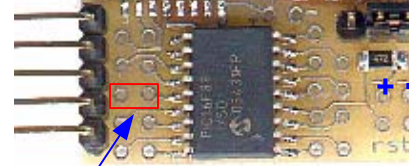
Power supply selector jumper

1   2   3
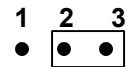
1   Gnd
2   V+ in to regulator
3   Power from RS232

To apply external power, remove the jumper cap from pins 2 and 3. Then apply external Vdc (6-9vdc) to pin 2

DO NOT REVERSE POLARITY

Place jumper cap on pins 2 and 3 to derive power from the PC's serial line. NOTE: Power is only supplied when a terminal application has "opened" the com port.
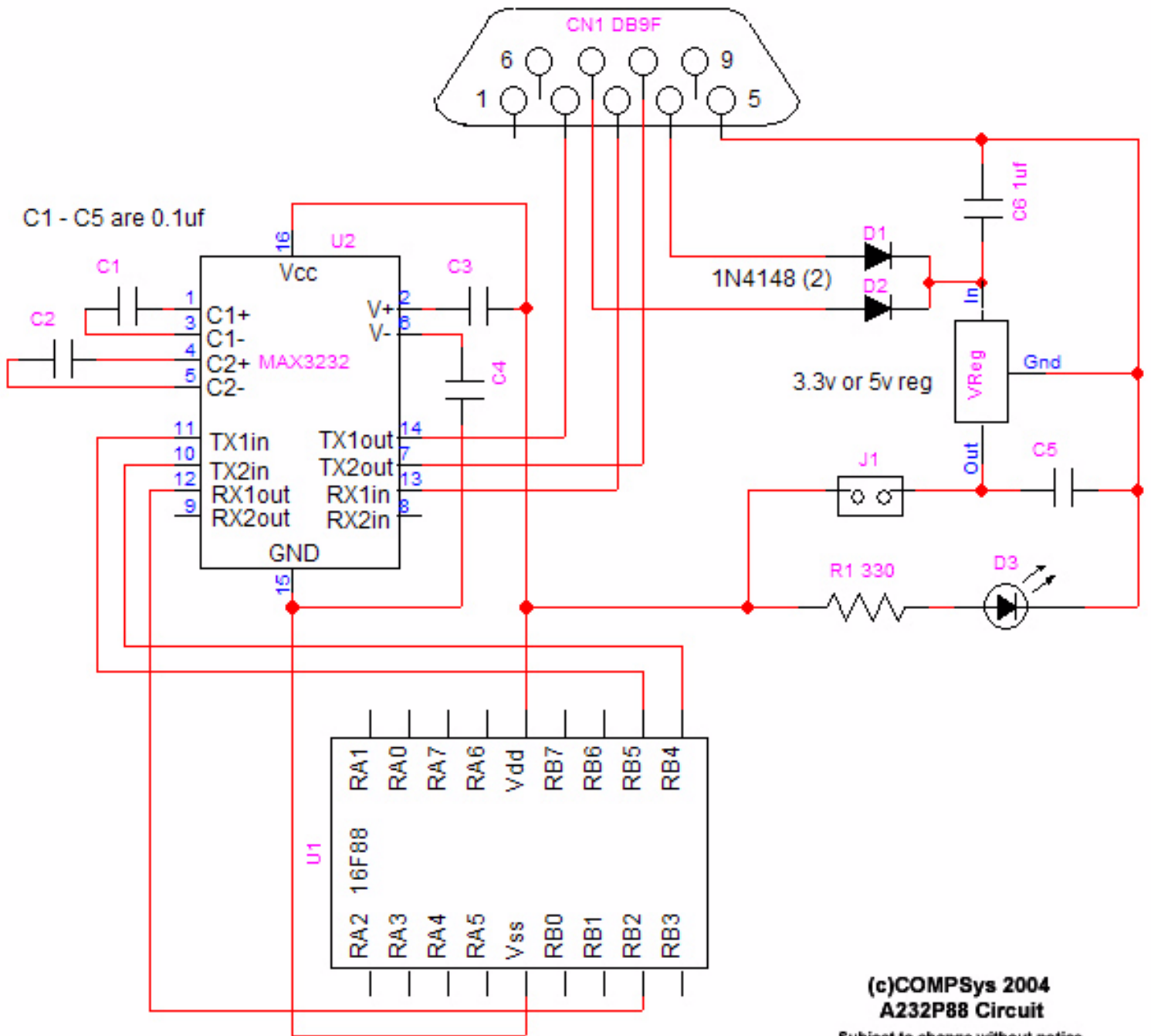
Example shown using the Sensiron SHT11 temp/humidity device connected to the 4 lead wire. Results can be seen in a terminal window.

COM1_19200 - HyperTerminal
File Edit View Call Transfer Help

```
Probe1 Humidity: 88.7%
Probe1 Temp: 71.3 F
Probe1 Humidity: 88.7%
Probe1 Temp: 71.3 F
Probe1 Humidity: 88.7%
Probe1 Temp: 71.4 F
Probe1 Humidity: 89.0%
```

| Connected 0:00:16 | ANSI | 19200 8-N-1 | SCROLL |

A232P88 Schematic

A232P88 Schematic

CN1 DB9F

C1 - C5 are 0.1uf

U2

Vcc

MAX3232

C1+
C1-
C2+
C2-

V+
V-

TX1in
TX2in
RX1out
RX2out

TX1out
TX2out
RX1in
RX2in

GND

1N4148 (2)

D1
D2

C6 1uf

VReg

In
Gnd
Out

3.3v or 5v reg

J1

R1 330

D3

C5

U1

16F88

RA2 RA3 RA4 RA5 Vss RB0 RB1 RB2 RB3

RA1 RA0 RA7 RA6 Vdd RB7 RB6 RB5 RB4