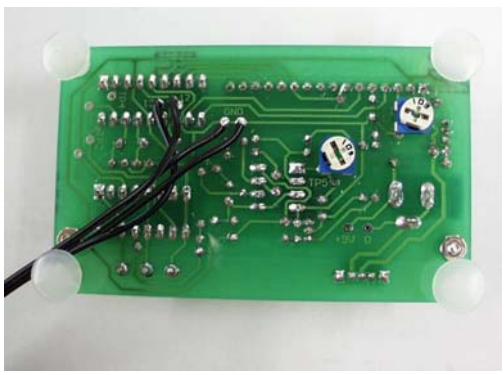
K168. EPE WIND SPEED METER

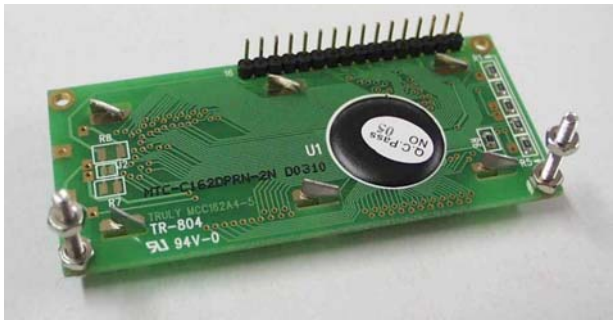
This is a Kit of the no-moving parts Wind Speed Meter published in the UK electronics magazine Everyday Practical Electronics, January, 2003, pages 44 to 51. A copy of the article is included with the kit since the Meter performed almost exactly as described in the article.

We have redrawn the PCB so that the 2x16 LCD fits on top of the main PCB. The schematics have been redrawn but we have kept the same Component Designators. An Off/on switch and input protection diode have been added. Ten mm nylon standoffs in each corner raise the PCB and allow the two switches S2 and S3 to come out. Also access to VR1 and VR2 is easy since both trimpots are mounted underneath the PCB. Access to test points with a CRO is also easy with this arrangement. We did not keep the In Circuit Programming header.

Assembly. There are two links to add to the board. Add the lowest height components first. The two trimpots are mounted under-neath the PCB. Pads labelled 12 and 13 under the PIC firm-ware are for switches S2 and S3 resp. (Remember pin 1**2** for S**2**; pin 1**3** for S**3**.) Add about 6" of wire from these pads and the two GND pads provided. S2 and S3 are needed for testing and minor calibration later. Label the two switches.



Do not attach the 9V battery snap for the moment. Do the testing with the a power supply using the power jack center-positive input. Add the 16 pin male connector and the two 18mm screws to the LCD as shown. After mounting add the third screw to each leg to secure the LCD in place.



Ultrasonics assembly. Mount the two ultrasonic transducers faces 18 cm or 6 7/8" apart. We used araldite and mounted them on a pair of unbroken wooden chopstocks. The software is written for this spacing so I suggest you do the same for your first model.

Make sure they face each other squarely. When set we joined the two earth pins with green wire. Connect the assembly to the PCB using three wires: GND, X4 and X3. You can use the pins provided or solder direct to the pads. Note each ultrasonic transducer is treated the same. No track needs to be kept of which is the Tx and which is the Rx. See the EPE article for more details on this.

Firmware. We used the code as supplied by EPE. However, there was a small bug in it. The second and third last lines of the hex file needed interchanging with changes to the line numbering and check digits. You can get the asm and correct hex file from our website at

http://www.kitsrus.com/zip/k168code.zip

Photos. You can download the color jpg's of the photos in this documentation from our website at

http://www.kitsrus.com/jpg/k168_x.jpg

where x is 1 to 6.

Testing. Now is the time to read and follow the EPE article. We will not repeat the setup and testing here but just stress some points we found.

1. Getting trimpot VR2 (P2) set was a bit tricky. However, we found that when the trimpot was in the 2pm to 2.30pm position we got the best stability. (See photo.) This meant that the pot was biased about 15K ohm to the R8 resistor and 85K ohm to pin 1 of IC4.
2. We needed a correction of -3 on the correction mode screen 3 on our prototypes in order to get 0 0 0 1 0 0 readings when S2 was pressed and the sensors were in still air..

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Note what is written on page 50: 'There will always be a bit of value changing seen, due to the simple nature of the transducers and the amplifier'.

Wind pulse and wind mask we had no reason to change.

If you have a CRO you can investigate the details of the waveforms and triggering as discussed in the article. We have made pads under the board to solder a 9V battery snap when you want to take the meter out in your car to test.

COMPONENTS

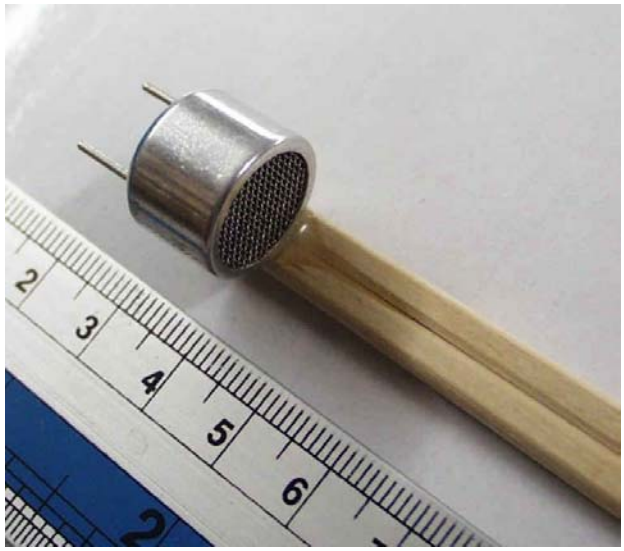
Resistors 5%,		
1K brown black red	R1 R11	2
4K7 yellow violet red	R8	1
10K brown black orange	R3 R7 R9 R10	4
47K yellow violet orange	R2	1
100K brown black yellow	R4 R5	2
1M brown black green	R6	1
10K Koa trimpot 103	P1 (VR1)	1
100K Koa trimpot 104	P2 (VR2)	1
pins		3
1nF ceramic	C7	1
10p ceramic	C3 C4 C9	3
100p ceramic	C5	1
1N4004	D1	1
1N4148	D2	1
BC548	TR1	1
20.000MHz crystal 49S	X2	1
100n 104 mono .1"	C1 C2	2
100n 104 ceramic	C6 C8	2
2.6mm x 18mm screw		2
2.6mm nuts		6
9V battery snap		1
Push-on switch	S2 S3	2
SPDT switch	S1	1
Nylon standoffs		4
Power Jack	X1	1
40kHz ultrasonic transducers	X3 X4	1 set
4052 IC	IC3	1
16F628-20/P	IC1	1
LM358	IC4	1
8 pin IC socket		1
16 pin IC socket		1
18 pin IC socket		1
16 pin male connector		1
16 pin female connector		1
16x2 LCD no back light		1
K168 PCB		1

Like John Decker we tried ultrasonic transducers with solid metal fronts (400ER180 and 400 ET180) but in initial trials they did not seem to work. However, this needs more experimenting.

Spurious Readings. If you find that you are getting a stream of about 6 correct readings followed by one very wrong reading (like 3mph, 3.4 3.6 3.1 3.2 19.5 3.4 3.5…) then try recalibrating P2 just a little. Press S2 and make a slight change or maybe a big change in the P2 position to get a 1 2 1 1 2 on the right hand side. I have found there are several positions (at around the 2.30pm position) where there are minimim readings. Some of them seem to give more spurious readings than other positions. I have usually found that I can get one position which does not give spurious readings.

Alternatively you can press S3 and go to averaging mode as described in the EPE article. That evens out the spurious readings.

Permission. This kit has been used with permission from Everyday Practical Electronics. The PCB has been completely redesigned. The software is used as supplied by EPE with one bug correction.



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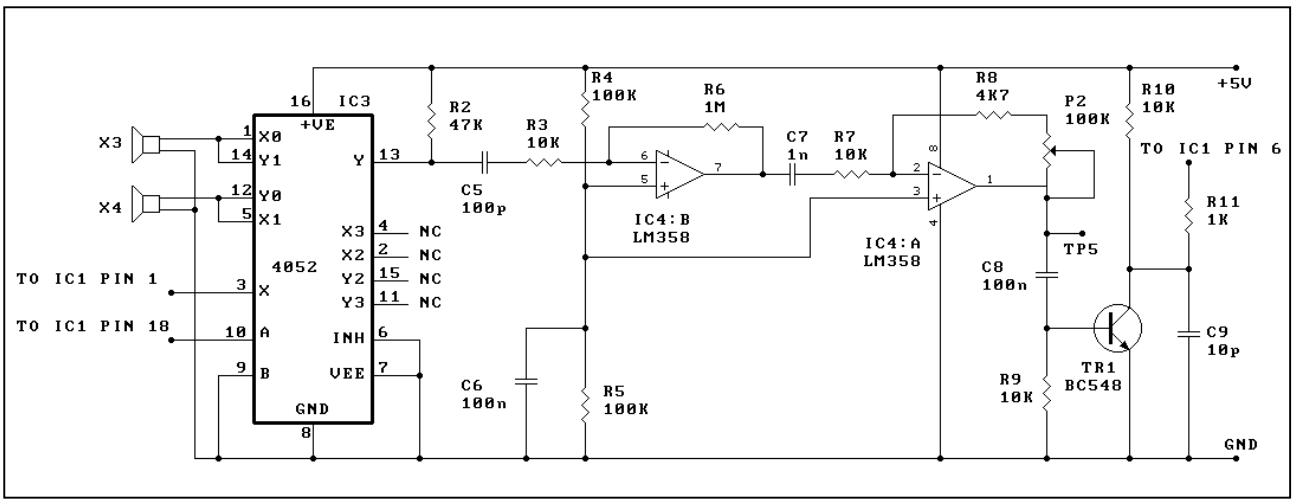

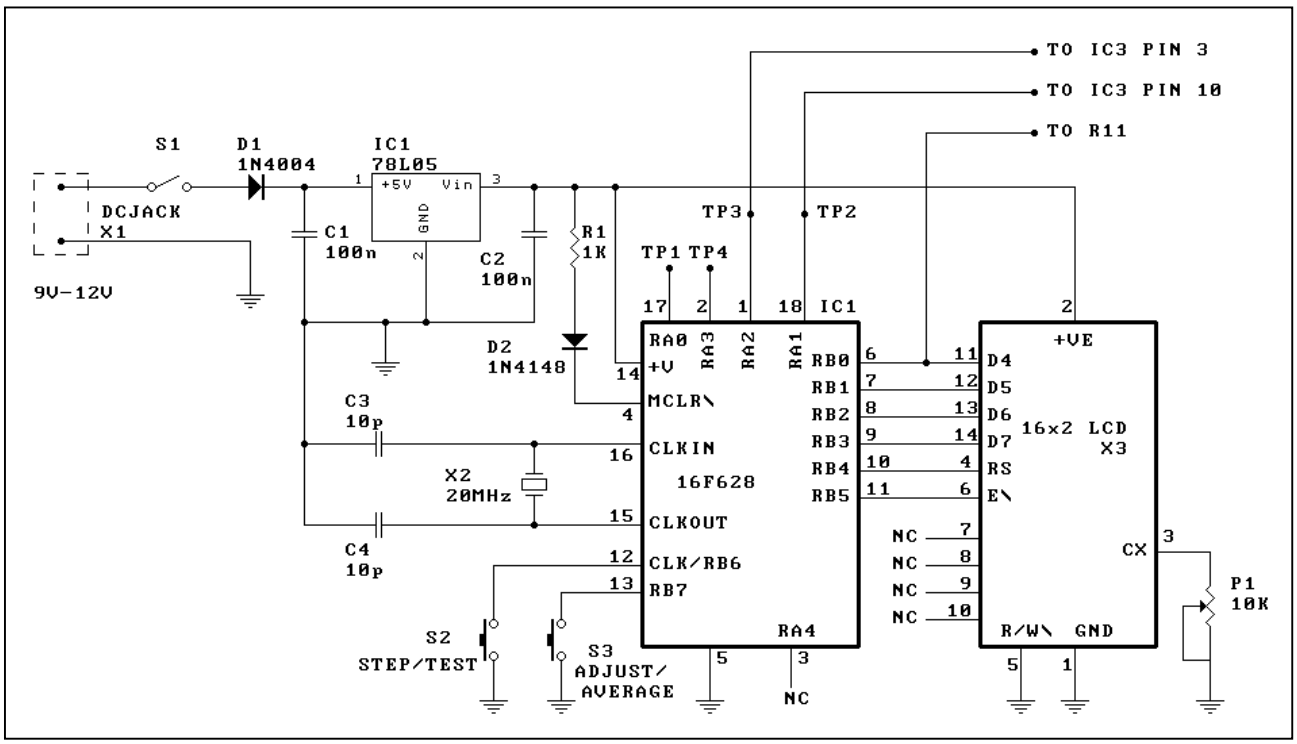

These schematic files may be downloaded from

http://www.kitsrus.com/jpg/k168_1.pcx

http://www.kitsrus.com/jpg/k168_2.pcx