

International Fifth Prize

MultiMet

a virtual DVM/scope for the PC

As indicated by its name, MultiMet is a Multi-function measurement instrument (Met for Meter). It is capable of performing an amazing number of functions. Obviously, all of this is not possible with just software: the assistance is needed of an analogue-to-digital converter interface of miniature size which is designed to plug into the PC's parallel port connector.

Software and hardware design by
F. Mocq (France)

The Jury was duly impressed by the presentation of this competition entry, which is a full-blown project really, and not just software. The program requires a small converter interface which takes the form of a small plug-in device for the Centronics port. One side of the interface has a 25-pin Sub-D plug for the connection to the PC, the other, a BNC socket. The circuit diagram and the printed circuit board artwork for the interface are shown in Figures 1 and 2 respectively. Note that the small board is double-sided, and that the artwork is printed at actual size to help you produce a perfectly working interface board.

Circuit diagram

The analogue input is protected against overvoltages by a pair of diodes. Sense wires or sockets are not required because the supply voltage is

furnished by the PC's parallel port. The A-D converter used here is a low-power, 12-bit type (4,096 values). The output data is written to the PC in serial fashion, the parallel port being programmed to act as an interface. The acquisition speed depends, to a certain extent, on the speed of the PC. Tests indicated some 9,300 samples/s using a 386DX40, and 16,500 samples/s using a Pentium-100. Apparently, the converter, limited to 12.5 kHz by the manufacturer, may be used at a higher speed without running into problems. Programs requiring a graphical display are better off if a Pentium or a 486DX100 is used. The analogue input covers 0 to 5 V in 4,095 steps. The accuracy achieved by the system is of the order of mVs. The input impedance of about 100k Ω is not likely to present problems to any sensor interface supplying an output voltage between 0 and 5 V (tem-

Technical Characteristics

Analogue voltmeter	
Digital voltmeter	
Oscilloscope	
Data recorder	
Based on LTC1286 (Linear Technology)	
Resolution	12 bits
One differential analogue input	
Power supply	4.5 to 9 V
Current consumption	250 μ A, 1nA in sleep mode
Sample-and-hold internal	
Max. clock speed	200 kHz
Max. sampling rate	12.5 kHz
Min. hardware requirements:	386 PC or better, VGA card, largest possible base memory size for fast acquisitions.

perature, pressure, humidity, speed, current, light intensity, etc.). There you are: at last, a useful application for your vintage 386 computer, barred from the world of Windows 95. Considering the number of inputs/outputs which remain available on the PC's parallel interface, it is possible to envisage more extensions: several converters, outputs for driving an antenna rotor, a battery charger, or implementing an optical isolation based on the 6N139 to protect the PC, etc.

Software

Note: it makes no sense to copy the files to the hard disk as the installation procedure must be run from diskette.

The program was written in C, to be more precise: C++ version 3.0. The source file is supplied, including the Borland extensions which are required

for compilation. The fact that the program is made up of modules has helped a great deal in the development, and will not fail to facilitate its maintenance.

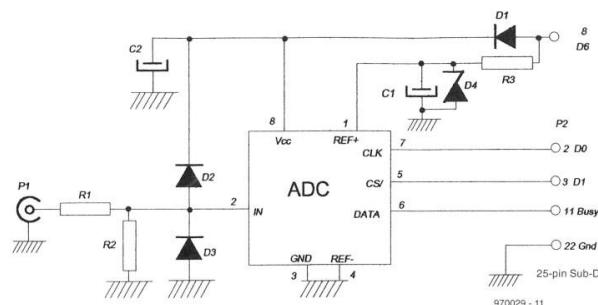
MULTI.H is the header file in which the functions used by the program are declared.

MULTI.C is the main program, written to handle the initialisations and the launching of the virtual test instruments.

MULTI.GENC contains the general usage functions, such as read_data().

VOLTMET.C is an oscilloscope aimed at signal observation, but also capable of capturing and saving screens to the hard disk (16 screens in the present versions).

FAST-OSCILLO is a variant of



the previous module, of which it forms a part, actually. Fast-Oscillo displays curves on the screen after having acquired the data, whence its higher acquisition speed.

DATA.LOG.C is a logger of data on disk, offering a sampling rate of anything between 10,000 per second and 1 per 18 hours. For fast acquisitions, the size of the data file is restricted

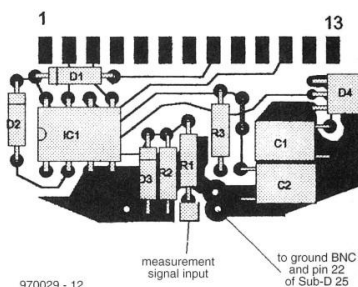
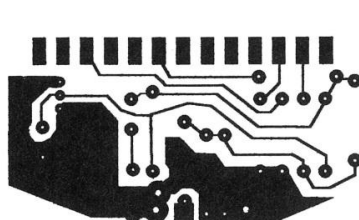
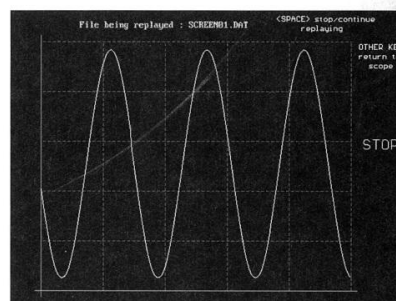
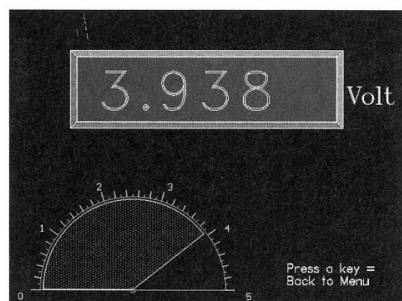
by the capacity of the conventional (base) memory (<640 kBytes); for slow acquisitions, the restricting factor is the available disk space.

MULTI.HLP supplies informa-

tion on using the program. The oscilloscope screens and the data recorded on the disk are in ASCII format, ready for importing into a spreadsheet program or table maker. The accompanying examples include classic alternating waveforms captured in oscilloscope mode, and the charging graph of a NiCd battery recorded in data recorder mode. These recordings have been processed using Excel and given a graphical treatment. Excel has no problems importing ASCII files containing delimiters.

The two screendumps shown here as illustrations give only a modest impression of the numerous possibilities offered by this combination of hardware and software.

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