OWON HDS1022M-N Dual Channel Hand-held Oscilloscope

Review by Mauro Grassi

The Owon HDS1022M-N is a portable, dual channel digital oscilloscope that can double as a digital multimeter. It comes in a rugged orange and grey multimeter style case and has two BNC sockets for the connection of oscilloscope probes. It can run from its internal batteries for about four hours or from an external plugpack supply.

This is not the only compact portable digital oscilloscope available but it is probably one of the most compact and attractive packages ever offered, considering its range of features and performance.

The DMM is a practical add-on, allowing you to carry one less instrument in the field, as the Owon HDS1022M-N is primarily an oscilloscope.

As a portable oscilloscope, it is well suited to most applications in the field, keeping in mind that its bandwidth is 20MHz when using a x10 probe (with a x1 probe, the bandwidth drops to 4MHz).

20MHz is enough bandwidth to diagnose faulty composite video signals, for example.

External Connections

On the front panel, the Owon scope has four 4mm banana sockets for connecting the multimeter leads: COM (ground), V/Ω/C (to measure voltage, resistance or capacitance) and two other sockets, one for DC and AC currents up to 400mA and the other for up to 10A.

Above the DMM sockets is an array of pushbuttons which control the oscilloscope functions. It can be toggled between scope and DMM functions by the DMM/OSC button. The display simulates that of a centre-zero analog meter but also includes digital readout. You can use the automatic scaling mode, or manually adjust the scale. You can also use a relative mode where you can set the ground reference to an arbitrary value.

The oscilloscope inputs are on the side and are standard BNC types but without probe sensing. You can select the probe type (x1, x10, x100 & x 1000) with the front panel buttons and the vertical sensitivity is adjusted accordingly. The unit is supplied with two x10 probes.

Note that the multimeter and oscilloscope inputs are isolated from each other, meaning that you can have two different GND references. This helps to avoid unintended and possibly dangerous shorts, especially when switching back and forth between DMM and oscilloscope modes.

The display

The Owon HDS1022M-N has a colour 96mm (3.8-inch) LCD with QVGA (320x200) resolution. The screen can be used with or without backlighting and can be read in direct sunlight. The display can show 4096 colours and is a good size. You can see a typical screen grab in Fig.1.

Persistence settings for the waveforms can be set from one second to five seconds and to infinite mode, a practical way to see quickly changing detail.

You can also change the display

mode to use XY where the channel 1 will correspond to the X (horizontal) coordinate while channel 2 will correspond to the Y (vertical) coordinate. The result will be a Lissajous figure.

Quick Setup

As with most oscilloscopes, this one has an "AUTOSET" feature. When you press the AUTOSET button, the oscilloscope will display the waveforms choosing the settings for the time base and vertical scale (among others) that give the optimal display. This makes it easy to get a signal on the screen. From there, you can manually adjust these settings as needed.

Incorrect settings for the trigger level and trigger offset can give a poor, unstable display. With this oscilloscope you can always zero both of these (zero corresponds to the centre of the display) by pressing the V and R keys (normally used in DMM mode to select Voltage and Resistance measurements).

Portable Use

The internal 3500mAh 7.4V Lithium Ion Battery will provide enough power for around four hours' use when fully charged. Turning off the screen backlighting will improve the battery endurance substantially.

However, you can use the plugpack to power the oscilloscope and charge the battery, when you have access to mains power. It takes about the same time again to fully charge the battery. It would also be useful to have an in-car adaptor for use with 12V systems.

Acquisition Modes

This oscilloscope supports up to three different acquisition modes. In standard mode, samples are acquired at equally spaced time intervals. This is a good general-purpose mode but you may miss fast glitches in the signal, which can be important if you are trying to diagnose faults.

Alternatively, to better capture fast glitches in the signal, you can use the peak detect mode, whereby the oscilloscope will take only the maximum and minimum points in each time interval and display those.

If the signal contains a high proportion of random noise, select the averaging mode. In this mode the oscilloscope averages out up to 128 sweeps of the waveform, effectively cancelling out the noise component.

Triggering

For triggering, the oscilloscope has AC or DC coupling and LF and HF rejection. It also has an unusual feature allowing you to change the so-called SENSITIVITY. This is a multiplicative factor between 0.2 and 1.0 applied to the trigger. It refers to the proportion of the current vertical division setting under which the trigger will be ignored and making the oscilloscope more or less sensitive to triggering. This is useful for adding another layer of filtering and reducing the effects of unwanted noise.

Edge and video triggering are available. In edge mode, triggering occurs when the signal contains a rising or falling edge passing through the trigger threshold, which is selectable. With video mode, both PAL and NTSC/SECAM are supported.

A third triggering option is ALTERNATING. In this mode, you can select edge or video triggering for each channel. Triggering will then alternate between the chosen triggering options for channels 1 and 2.

This is useful if you are viewing two substantially different signals simultaneously, such as two signals with markedly different frequencies, for example. The use of this mode is shown in Fig.2.

Menu System

The Menu System is composed of a vertical on-screen column of options (appearing and disappearing on the

Specifications at a glance:

Input channels:	2
Analog Bandwidth:	DC to 20MHz (x10 probe)
Sampling Rate:	100MS/s
Vertical Sensitivity:	5mV/div
Vertical Resolution:	8 bits
LCD panel:	94mm QVGA (320x200)
Size (including case):	185h x 122w x 43d (mm)
Net weight:	645g

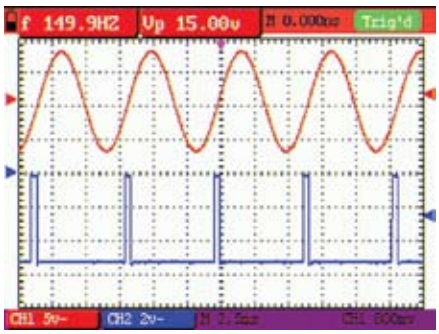


Fig.1: a sinusoidal waveform (red trace) at around 150Hz and amplitude 15V peak to peak. The second channel (blue trace) shows a pulse train at around the same frequency. The timebase is set for 2.5ms per division while the vertical scale stands at 5V/div for the red trace and 2V/div for the blue trace. The small coloured triangles to the left indicate the GND reference for each channel, while those to the right indicate the trigger level.

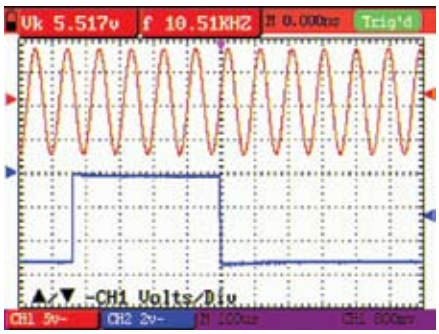


Fig.2: two signals, one a sinusoidal waveform and the other a digital signal are shown on the same display, showing the use of the ALT (alternate) triggering mode. The frequency of the sinusoidal waveform is much greater than that of the digital waveform (as much as a hundred times). With the alternating trigger mode, we are still able to capture the edge of the low frequency signal. Without the alternating trigger, it would be impossible to make sense of the blue trace.

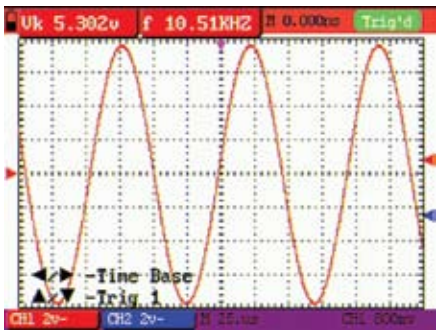


Fig.3: the measurements corresponding to the cycle RMS and frequency of the red trace can be seen in the top left corner of the screen. The measurement is applied to the sinusoidal wave shown as the red trace. Note that the background colour of the measurement window corresponds to the colour of the trace on the screen. In this case, they are both red as they correspond to the red trace. You can choose two on screen measurements from either channel (red or blue).

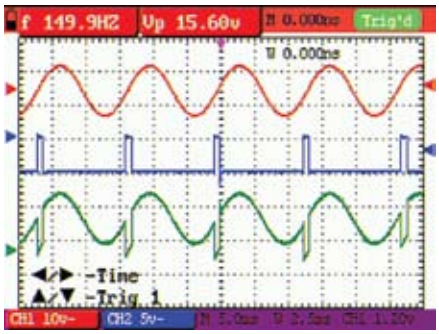


Fig.4: the red trace is a sinusoidal waveform at around 150Hz while the blue trace is a pulse train at similar frequency. The green waveform is the result of the MATHs function that subtracts the value of the blue trace from the red trace in real time. The timebase stands at 5ms/div. Note that the vertical scales for the two input channels differ and are shown in the bottom left corner of the screen to be 10V/div for the red trace and 5V/div for the blue trace.

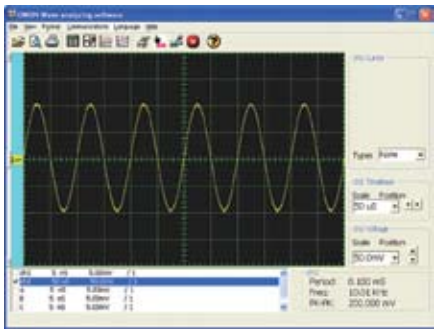


Fig.5: this is the supplied PC software running on Windows XP. A sinusoidal wave is shown as well as the various menus. The PC software allows you to capture waveforms from the oscilloscope as well as to print them. The data is transferred either through a USB port or a serial port. You can also view the data table and export it to an Excel spreadsheet. Keep in mind that the PC software does not allow you to export bitmaps. To do that you can use a USB flash disk.

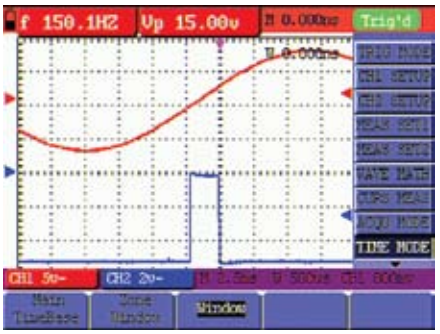
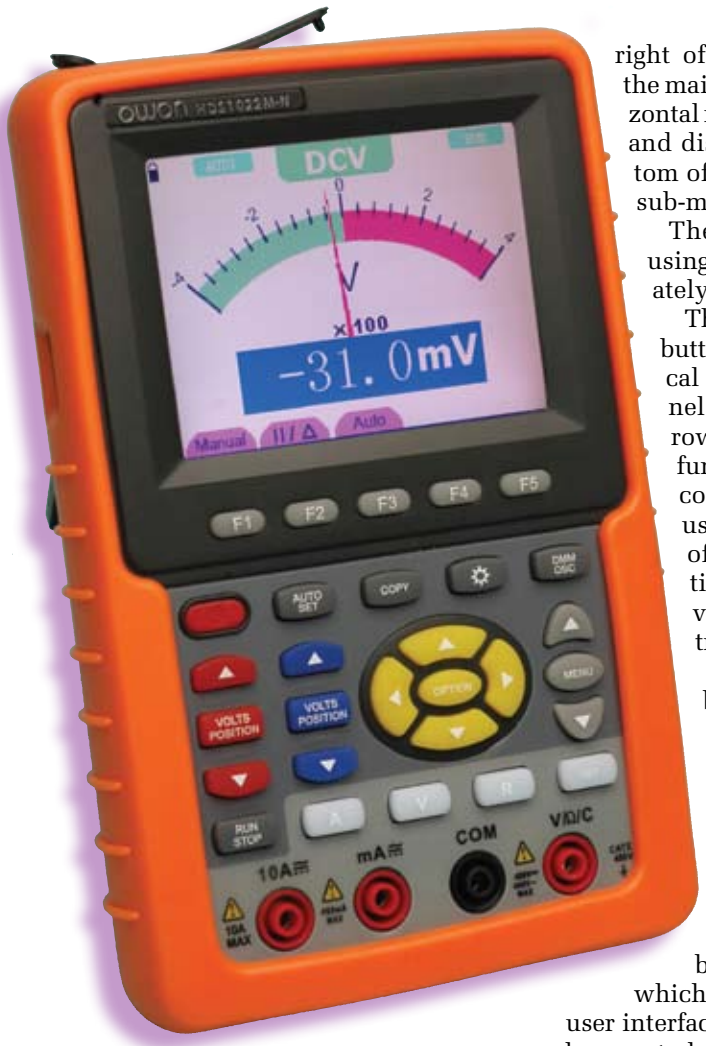


Fig.6: the result of using the windowing feature is shown in this screen grab. This feature allows you to effectively zoom in on the two signals. The two signals are the same as those shown in Fig.1. You select the desired windowing by using the horizontal cursors, shown on the screen as dashed purple lines (not shown here). Once you select the windowing option, the time scale is modified so that previously selected window now encompasses the entire display.



A centre-zero multimeter in both analog and digital format? That's just one of the modes/displays possible with the Owon!

right of the screen) comprising the main menu, as well as a horizontal row of options (appearing and disappearing from the bottom of the screen) showing the sub-menu options.

The settings are changed using the five buttons immediately below the screen.

There are two sets of three buttons for changing the vertical sensitivity of each channel, as well as a set of four arrow buttons having different functions depending on the context. The most common use for the horizontal pair of these is to change the timebase setting, while the vertical pair change the trigger level.

The menu defaults and button functions are well chosen. As with any menu-defined keyboard it can be easy to lose your way when the definitions change.

This oscilloscope shows the current definitions for the multiplexed buttons on the screen, which is helpful. Overall, the user interface is intuitive and should be easy to learn.

Quick measurements

This oscilloscope allows you to show up to two measurements, superimposed on the display in the top left corner, as shown in Fig.3.

You can choose the channel for each of the two measurements, as well as choosing what you want to measure. The choice of measurements is limited, though, to just the following five: cycle RMS, mean, peak-peak, frequency and period.

Because you can choose the channel for each measurement, you can have two of these measurements applied to the same channel.

Keep in mind that two of the five measurements are really essentially the same; frequency is the reciprocal of period. You can, however, use the two cursors to measure other vital statistics of the signal. For example, you could use the cursors on a rising level of a waveform to measure its rise time (say between the 10% and 90% points).

The supported MATHs functions include the four arithmetic operations. You can see the effect of adding, subtracting, multiplying and dividing the two signals as a third trace on the screen, in real time.

Fig.4 shows the MATHs function in action.

Saving and transferring waveforms

The oscilloscope allows you to save up to four waveforms to its internal non-volatile memory. You can also

use the small USB cable adaptor to connect a USB flash disk and save to that. This is an essential feature for any portable oscilloscope since you will be taking it in the field and will likely find it convenient to save some of your work.

Using the supplied PC software, you can then view the images on your PC. It lets you connect to the oscilloscope in real time, as well as viewing previously stored waveforms.

As far as we can see, however, it does not let you export bitmap or GIF files (the version we tested was 6.8.01), although you can get around that by printing to files.

The PC software does allow you to export the waveform data to a spreadsheet such as Excel. A screen grab from Windows XP is shown in Fig.5.

Zooming functions

The Owon HDS1022M-N oscilloscope has zooming functions. You set the width of the desired window by moving the cursors outwards from the centre of the screen. Then pressing the "Windowing" button adjusts the display to fit the selected area onto the entire display, as shown in Fig.6. We must stress though that these functions don't enable you to see very fine detail, mainly because the resolution of the display as well as the memory depth (6Kpts) are somewhat limited.

The two scope inputs are on the lower right side of the meter, adjacent to the multimeter inputs.

The remaining connectors lie along the top edge, above the screen. On the left is the DC power/charger input, with the COM, USB and HOST sockets alongside (left to right).

Conclusion

The Owon HDS1022M-N is an affordable portable oscilloscope that is best suited for diagnosing video problems in the field, as well as for debugging most lower frequency circuits (up to 20MHz). It should be suitable for most audio work as well.

The user interface is easy to learn and logical, with on-screen cues helping you at key moments. It is also nice that the cues disappear after a few seconds of inactivity, making the display less cluttered. The display is big but of relatively low resolution, it is easy to read, even without backlighting.

The fact that it incorporates a DMM is a welcome addition. Both the scope and DMM inputs are rated at CAT II 400V maximum.

The unit is supplied with two x10 oscilloscope probes and two DMM leads, as well as an aluminium carry case. The charger and PC software as well as a small cable to connect a USB device are also included in the price.

The Owon HDS1022M-N retails for $????.00 (inc. GST). For more details contact Owon Australia, Phone: 1300 792 976. Website: www.owon.com.au. SC