

User Guide for DSG Scope, Generator & Spectrum Analyzer
Version V2.05 Copyright CL System 2002

Introduction

DSG01 (Digital Scope & Generator V01) is a PC Digital Sampling Oscilloscope, an arbitrary (any waveform) Digital Signal Generator and a Spectrum Analyzer that plugs into a PC parallel port.

All functions apart from specifying the save-file name are activated via mouse clicks.

All scope operations are software selectable and results can be exported to Excel spreadsheet.

The Scope and Generator functions can be combined to produce a circuit or component analyzer, such as circuit bandwidth display, inductor, capacitor, transformer and transistor response curves.

The simplicity and ease of use are ideally suited to students, hobbyists and professionals.

The compactness of the unit allows field use with a portable PC and battery pack.

DSG boast features that are not common at this price levels.

***** IMPORTANT *****

Read First before using the DSG01

First, power up PC and check the LPT or Printer port mode is set to **ECP** or **ECP+EPP** in the BIOS setup. For instruction see www.clsystem.co.uk/lptport.htm

Allow the PC to boot into Windows, then attach the DSG to the printer port and apply power to the DSG.

The DSG is not electrically isolated from the chassis of the PC, therefore the chassis is the analog ground of the DSG.

WARNING: For your safety do not apply over 20V to the DSG01.

When using the software for the first time it will prompt you for the LPT port address.

By default it is set to LPT1 at port address 378H.

Please confirm or select the correct port and press EXIT.

If you need to change it again, select the PORT button on the main scope display

Click on the Scope mode indicator Window to select different SCOPE modes. Click anywhere in the signal display window to refresh the display

The vertical scroll buttons are only visible in X 2 and X 5 vertical magnification

In generator mode, the output signal is present even if the PC is powered off.

When not in use, make sure power to the DSG is switched off

USE ONLY supplied approved power adapter , using any other type will invalidate the warranty and could damage the DSG01

***** Warranty is invalidated if the DSG case is opened ****

Package contents

1. DSG01 unit itself.
2. Software on floppy disks or CD
3. Power adaptor

Optional Accessories

1. 1x / 10x oscilloscope probe (BNC)
2. Test lead (BNC to crocodile clips)
3. Parallel port extension cable

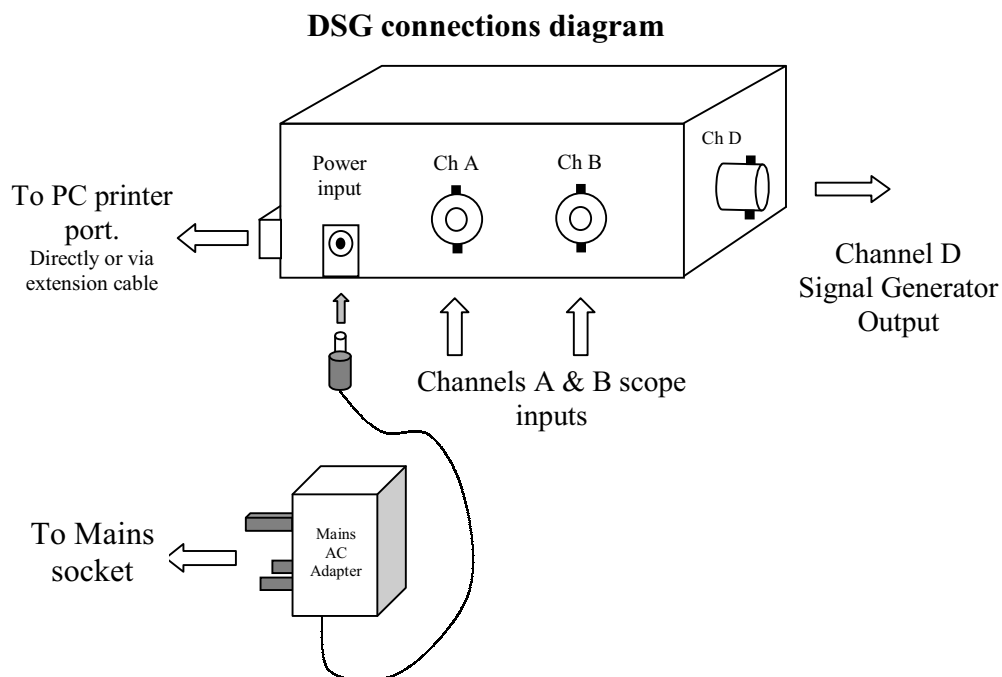
Hardware Requirement

PC running Windows 9x/Me/NT/2000/XP with **ECP** printer port.

Hardware Installation

DSG01 plugs straight into the PC parallel port or via port extension cable. Make sure no other device is using the port and if known, record the port address. **The PC port mode must be set to ECP mode**. See instructions on page 1.

Before plugging in the DSG to the PC make sure the PC is OFF. Power up the PC. Connect the AC power adaptor to the DSG01. Lastly, plug in and switch on the DSG01 AC Adaptor at the wall socket.



Software Installation

Insert the floppy disk or CD into the PC
Start up Windows Explorer or My Computer and browse the disk.

Open or run 'Setup.exe'

This will start the installation process. Follow the prompt on the screen.

When the software is run the first time it will prompt you the confirm or change the parallel port address.

If the default address of 378h, LPT1, is valid the status 'FOUND' will be shown on the screen. In this case just press 'EXIT' to proceed to the main screen.

If the status 'NOT FOUND' is shown, then select one of the other LPT port until the status 'FOUND' is displayed. Then select 'EXIT' to proceed to the main screen.

The port address can be changed anytime by selecting the 'PORT' button in the main screen.

Using the SCOPE

The Scope mode is the default screen.
Clicking the Scope mode indicator Window will toggle to other modes.

Important note: The PC chassis earth (normally the mains earth) is the analog ground of the DSG.

Therefore, all reading will be with respect to the PC chassis earth.

Warning: For your safety, do not apply over 20V to the DSG01. Even though the DSG01 will measure up to 120V with a 10X probe, by accidentally switching to 1X mode while a high voltage is applied to the probe tip will damage both the DSG01 and/or your PC and expose yourself to electrical hazard.

Connect the probe to the DSG input A and/or B
Set the Channel Range by clicking on the 'RANGE' button.
Select AC or DC input coupling by clicking the 'AC/DC' button.
Select the probe mode either 1x or 10x by clicking the 'PROBE' button.

Use the ON/OFF button to enable or disable channel sampling and file load operations. When a channel is turned OFF, the channel window darkens and data update of the channel is inhibited. This feature can be used to freeze individual channel, allowing trace comparisons. It can also be used to selectively load saved waveforms.

Select trigger mode either instant 'INST' or trigger 'TRIG' by clicking the 'MODE' button.
For the first reading it may be advisable to select 'INST'.

If 'TRIG' mode, then select the trigger source, either channel A or B
Select the trigger slope type either + or -
Click 'SET LEVEL' button and adjust the trigger level using the < on > buttons. The trigger level line will be displayed on the scope screen.
Click 'Single' or 'Repeat' button to sample and display the signal once or repeatedly.

Select Trigger 'Normal' mode to display signal from the start of the buffer after capture. In this mode the horizontal scroll position resets to the start of the buffer after every capture.

Select Trigger 'Delay' mode to display signal from the current horizontal scroll position after capture. This function is similar to an analogue scope delayed trigger view.

Select PRE (pretrigger) OFF, 10 or 100 points

With pretrigger, 10 or 100 sample points before the trigger events are displayed.

Make sure the signal is valid prior to trigger, otherwise the pretrigger data is invalid.

Select the sampling rate using the < and > buttons in the SAMPLING RATE window. Select the sampling size using the < and > buttons in the SAMPLING SIZE window. A 4K sampling size is normally adequate to start with.

Select Channels to be display

Click on the A or B buttons to display channel trace. The button will turn bold when selected.

Both channels A or B are disabled if either 'A+B' or 'A-B' is selected.

Click the 'JOIN' button to toggle line drawing between sampled points.

Click the 'GRID' button to toggle the display grid ON or OFF.

Click the 'UNITS' button to toggle the units display ON or OFF.

When all the above are setup click the 'GO' button to initiate sampling.

Click 'STOP' to abort sampling and readjust Scope settings as necessary.

Once the signal is sampled, it is displayed in the scope display area.

Click anywhere in the signal display window to refresh the display.

Use the X- magnification scroll bars to zoom in and out of the captured data buffer.

Use the horizontal scroll bars to slide to and fro along the captured signal

The yellow highlighted bar indicates the position of displayed data within the buffer.

Use the vertical scroll and magnification buttons that are located within each channel setup window to adjust for optimum display of captured signal.

However, in A+B and A-B display modes, use the 'Y Mag' button located in the display setup window and the scroll buttons in the scope display area to adjust view.

For cursor measurement, click on the CURSOR button and move it using the < & > buttons

Clicking the CURSOR button toggles the cursor readouts of the displayed channels A, B or D.

The cursor changes color accordingly, Blue-Ch A, Green-Ch B and Red-Ch D.

The cursor window displays voltage and time (relative to the left edge of the window).

To measure frequency, use the horizontal scroll to move the start of the signal cycle to the far-left edge of the window. Then move the cursor to the end of the signal cycle.

Click on the cursor readout window and the frequency will be displayed for a few seconds

For grid and units, use the GRID and UNITS buttons to toggle them ON or OFF.

Using the FFT Spectrum Analyzer

First capture a valid signal in SCOPE mode. Adjust Range, Trigger mode...etc to obtain a good captured signal.

Press the FFT button or 'F' next to the Scope Mode Window. The display will change to display the spectral frequencies of the captured signal.

Use the horizontal scroll bars, 'UNITS' and cursor functions to obtain more precise information about the signal.

The Trigger 'Delay' mode now functions as a horizontal shift FFT spectral display after capture. Use this mode to view expanded higher spectral frequencies during repeated live capture.

The FFT values are normalized to give a reading of 100 for the maximum value.

Notes for FFT usage:

Calculated number of FFT spectral points is half the sample size.

Maximum FFT spectral frequency is half the maximum sampling frequency. Therefore, a 20Msps DSG provide a maximum of 10MHz FFT frequency.

FFT functions require sample size of 2K,4K,8K,16K and 32K. These are the sizes that are available in 'SCOPE' mode.

Therefore, if sampling is carried out in Scope & Generator mode then make sure the SCOPE mode buffer size is smaller than the generator buffer size or erratic spectral values will exist. To recalculate and display an FFT plot with a smaller buffer size, switch to SCOPE mode, adjust size then switch back to FFT mode.

The larger the sample size the higher the spectral definition but requires more computational time. If you have a fast PC, e.g. a 1GHz PC, then there should be no noticeable delays.

To display a continuously updated FFT plot, first, set the scope in 'SCOPE' mode to give a continuous sample display.

Then click 'STOP' to stop SCOPE mode and go into FFT mode. Then click 'GO'.

If you are comparing spectral frequencies of two signals, you can freeze the spectral display of one channel by just turning it OFF via the ON/OFF button in the Channel window. However, during compare, **DO NOT change the sample size or rate**, as the UNITS display for the frozen channel will be invalidated.

The FFT data can be saved and exported just like the sampled data from channels A & B.

Using the Signal Generator

Click the Scope mode indicator Window to select Generator or Scope & Generator modes.

All generator functions are available in either of these modes.

All GENERATOR controls are situated in the GENERATOR window.

In Generator mode the output is a continuous signal. The accuracy of the frequency is dependent on the selected frequency and step rate and normally better than 2%.

In Scope & Generator mode the output is swept once and Channels A & B sampled at the same time, the generator then stops to display the sampled results.

Using DSG generated signals will give either 20 or 40 cycles of the standard waveforms.

The step rates of both functions are defined by the generator step rate. E.g. if

the generator step rate is 20KHz then the sampled rate will also be at 20KHz. The displayed units will be automatically adjusted accordingly.

The MODE button toggles between Normal, Sweep and Custom modes.

Custom waves can either be raw, 8-bit binary or Excel decimal CSV files with data values between 0 and 255 representing 0 to 2V with between 10 to 32767 data points.

A text file with a single number on each line can be used e.g.

```
0
0
250
250
0
0
250
250
0
0
250
250
```

Select custom mode and click the 'UPDATE' button.

Select the text file in the load screen and click 'Load CSV Excel Wave'.

This will load your custom signal file into the generator (signal D).

Click 'GO' and the custom wave will be generated.

For example, with a step rate of 20 MHz the above text file will generate a 5MHz square wave (continuously if in GENERATOR mode or once in SCOPE & GENERATOR mode).

NB: The minimum number of points in a custom wave is ten. Therefore, custom file with less than 10 points will be padded with zeros.

In Scope and Generator mode the signal is generated and channels A & B sampled at the same time.

NB: In order to allow the initial analog signal to settle, the first point of the waveform is output for 400ms before the rest of the signal is generated.

This will allow any AC coupling filter to settle down. Therefore, the 1st point to your custom wave must be the value of the default state of your signal.

All built-in waveforms can be used in Normal or Sweep Mode

Normal mode square wave generator has duty cycle adjustment, in 2 percent steps, via the < & > keys below the duty cycle percentage value.

Whenever the Generator settings are changed the 'UPDATE' buttons will be highlighted to indicate the displayed generator waveform (Ch D) is invalid and requires to be updated.
Click on the 'UPDATE' button.

Custom mode has the options to copy captured signal, Ch A or B, into D
Note: This process also translates the sampled signal range of +- 1.2 or 12v to 0-2 V of the generator.

In custom mode, use the crop left, CropL, and crop right, CropR, buttons in the generator window to select the portion of the custom data to generate. ****Note**** this process is irreversible, any deleted custom data is unrecoverable.

In custom mode, the Ratio button allows magnifications of x1, x2 x5 and MAX of the custom data. MAX magnification will fill the vertical range (0 to 2V) with the custom data. For example, a signal with a peak to peak amplitude of 0.3 volts is captured in scope mode and copied to the generator. This signal can be magnified to 2V peak to peak by using the MAX function.

Printing Scope Display

The print function uses windows default printer.

Ensure the printer you are using is the default printer in Windows.
The default printer can be changed in Printer Settings within the Control Panel in Windows. Highlight the required printer, right click the mouse and select 'Set as default' property.

Click the 'PRINT' button in the DSG window

Two print options are provided:

To print the whole Scope Screen i.e. Signal windows and the controls setup select the "Print All details" button

To print just the Signal display Window select the "Print Signal Display only" button

Click "EXIT" button to return to the main screen

Using File Load function

All file load operations are carried out the same way.
In the File Load window, select the Drive, Directory and File, then click the appropriate button to load.

Different load buttons are available depending on the Scope mode you are in. For example in Generator mode only Load Custom Wave and Load Profile are available.

Load Profile requires valid Profile files of .DPF extensions.

Load Channel A & B requires valid Signal file of .DSG extensions.

By using the channel ON/OFF buttons in the channel RANGE windows, individual channel data can be selectively loaded. Turning OFF a channel prevents the file load operation from overwriting existing sampled data.

Load RAW Custom will load any files but will be truncated to a maximum length of 32768 bytes and padded to a minimum of 10 data points, giving a maximum possible continuous custom wave signal of 2 MHz.

Load CSV Excel will load Excel CSV files with data values between 0 and 255 representing 0 to 2V with between 10 to 32767 data points

A text file can also be used to load the generator.
See 'Using the Signal Generator' section.

To load FFT plots you must be in FFT mode and the file must be a valid FFT file with a .fft extension.

Using the File Save function

All files save operations are carried out the same way.
In the File Load window, select the Drive, Directory, then enter the name of the file, then click the appropriate button to save.

Different save buttons are available depending on the Scope mode you are in. For example in Generator mode only Save Custom Wave and Save Profile are available.

Save Profile will save the Profile file with the .DPF extensions.
This enables most current DSG settings to be saved and recalled later.
Use this to speed up common measurement setup by loading back the saved profile.

Save Channel A & B will save the Channel A & B Signal file with the .DSG extensions with a length defined by Buffer Size in the Scope controls.
The save file can be later recalled and displayed.

Save Custom will save the Custom wave file with the .DCG extensions

Export Signals A & B will save the data in Excel CSV format with .CSV extensions.
The number of sample points is defined by the Buffer Size in the Scope Controls.
The data is formatted as two columns (A&B) with the two-header row of information.

To save FFT plots you must be in FFT mode. Plots can be saved as a DSG FFT file with a .fft extension or exported to a .csv spreadsheet file.

DSG01 Technical Specifications (20MHz)

SCOPE

Maximum Sampling Rate : 20 Millions Samples per second
Minimum Sampling Rate: 2000 Samples per second
Maximum sample lengths of 13 secs with 32K buffer
Buffer size : Selectable 2K, 4K, 8K, 16K and 32K
Input Ranges : +-1.2V and +-12V (+-20V with X10 probes)
Input Modes: Software selectable AC or DC
Input bandwidth: 10MHz
Trigger mode : Instant or Digitally Triggered with +/- slopes
Pretrigger OFF, 10 or 100 sample points
Stability : (@ 20 C) Zero reading: +- 2 bits, Noise: +- 1 bit

SPECTRUM ANALYSER

Type : FFT (Fast Fourier Transform)
Range: 0 to 10 MHz

SIGNAL GENERATOR

Frequency Range : 5Hz to 500KHz settable to 1 percent. Accuracy to within 3%.
Signal types: Sine, Triangular, Sweep, Square and any Custom waves
Sweep Ratios of X2, X5 X10 and X20
Sweep start freq: 5,10,50,100,500,1000,5000,10000,50000,100000 Hz
Custom waves at selectable 2K, 20K, 200K, 2M & 20M Hz rates
Signal Amplitude : Built-in waveforms 0-1V and 0-2V pp
Custom value of 255 = 2V & 0 = 0V (8bits resolution)
Output Impedance : 300 Ohms

Scope Modes : SCOPE only, GENERATOR only or SCOPE and GENERATOR combined

Note: Specifications are subject to change without notice

* Requires PC running Windows 9x/Me/NT/2000/XP with ECP printer port

DSG01 Technical Specifications (30MHz)

SCOPE

Maximum Sampling Rate : 30 Millions Samples per second
Minimum Sampling Rate: 3000 Samples per second
Maximum sample lengths of 9 secs with 32K buffer
Buffer size : Selectable 2K, 4K, 8K, 16K and 32K
Input Ranges : +-1.2V and +-12V (+-20V with X10 probes)
Input Modes: Software selectable AC or DC
Input bandwidth: 15MHz
Trigger mode : Instant or Digitally Triggered with +/- slopes
Pretrigger OFF, 10 or 100 sample points
Stability : (@ 20 C) Zero reading: +- 2 bits, Noise: +- 1 bit

SPECTRUM ANALYSER

Type : FFT (Fast Fourier Transform)
Range: 0 to 15 MHz

SIGNAL GENERATOR

Frequency Range : 5Hz to 500KHz settable to 1 percent. Accuracy to within 3%.
Signal types: Sine, Triangular, Sweep, Square and any Custom waves
Sweep Ratios of X2, X5 X10 and X20
Sweep start freq: 7.5,15,75,150,750,1500,7500,15000,75000,150000 Hz
Custom waves at selectable 3K, 30K, 300K, 3M & 30M Hz rates
Signal Amplitude : Built-in waveforms 0-1V and 0-2V pp
Custom value of 255 = 2V & 0 = 0V (8bits resolution)
Output Impedance : 300 Ohms

Scope Modes : SCOPE only, GENERATOR only or SCOPE and GENERATOR combined

Note: Specifications are subject to change without notice

* Requires PC running Windows 9x/Me/NT/2000/XP with ECP printer port

Contact Information

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