9 FFT MENU

NOT available in Lite version!

9.1 INTRODUCTION

By selecting the FFT command from the main menu bar, it is possible to carry out Fourier analysis of the input signal to determine its frequency content using the Fast Fourier Transform (FFT).

The ability to process two channels simultaneously and to select the appropriate sampling frequency (from 51200 Hz to 1600 Hz), the possibility of triggering with respect to the generated signal, and the presence of a total harmonic distortion (THD) analyzer make this control panel a flexible and valuable instrument. Finally, there is also the very useful facility to quickly and easily swap back and forth between the time and frequency domains at the touch of a key.

9.2 FFT CONTROL PANEL

Fig. 9.1 shows the layout of the FFT control panel.

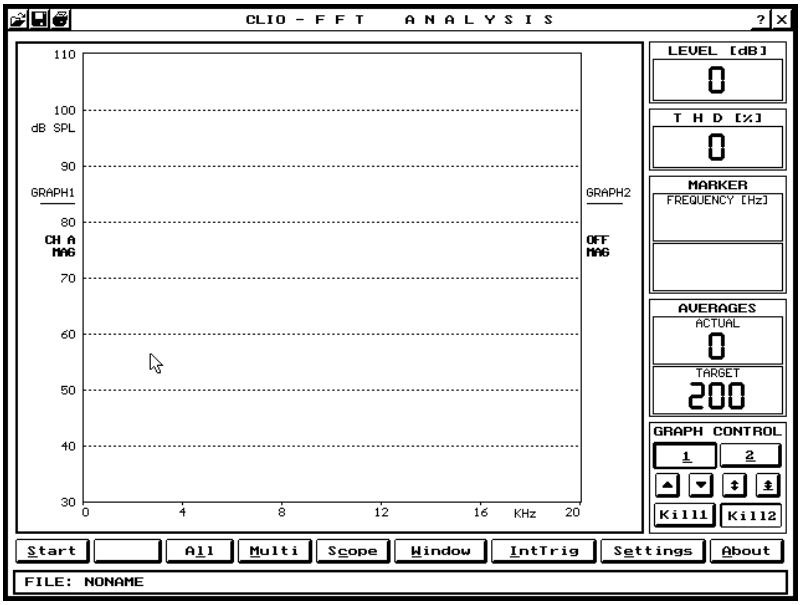


FIGURE 9.1 – The FFT Analysis control panel

Remember that, while executing an FFT measurement, it is possible to enter the Scope control panel directly, view the signal in the time domain, and come back to the frequency domain without even stopping the measurement.

NOTE: When saving or loading files from disk in this control panel, always remember that the file extension connected to this measurement is ".FFT". This extension will be used automatically when you are working from within the FFT control panel.

9.2.1 FFT MEASUREMENT SETTINGS AND LOCAL SETTINGS

The measurement settings (recallable with the Settings button), together the local settings (recallable with **SHIFT-F1**), define the conditions under which the FFT measurement is performed.

When you enter the FFT local settings dialog box, as you can see in figure 9.2, you will note that it is different from the one of the other measurement panels (described in 7.3); there isn't the possibility of choosing the input channel (see later) and there is a **wider** choice of sampling frequencies (six instead

of three): this lets the user select the more appropriate sampling and to reach the lower limit of 1600 Hz sampling with a maximum of 0.39 Hz frequency resolution.

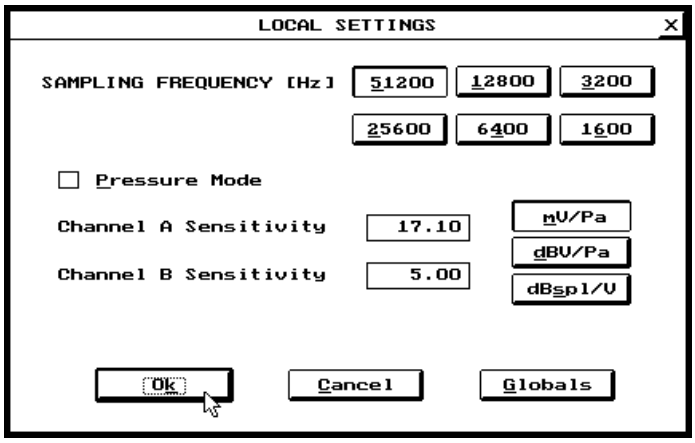


FIGURE 9.2 – The FFT Locals dialog box

Please note that, differently from all the others control panels, the choice of the input acquisition channel is not made in this dialog box but in the FFT measurement settings one. When you recall it, as seen in figure 9.3, you have the following possibilities:

FFT Size Is the number of samples processed by the FFT. The higher this quantity, the better frequency resolution is obtained; this is particularly evident when displaying the measurement with a logarithmic frequency axis. It also directly condition the execution time of the measurement and the refresh of the display.

Window Selects the type of frequency weighting window to be applied to the acquired data before transformation. See the Scope and Window function buttons later.

Averages Selects the Frequency Average mode and the number of averages to be performed.

Display 1/2 Defines the input channel and function to be displayed by Graph number 1 or 2 (see later).Three frequency functions can be selected: Magnitude, Real Part and Imaginary Part of the FFT. The FFT will be calculated either on channel **A**, **B** or **A-B**; when **A/B** is selected the result will be the complex division of channel **A** and channel **B** FFTs, thus obtaining the **transfer function** between the two channels.
NOTE: simultaneous calculation and display of **A-B** and **A/B** is not allowed.

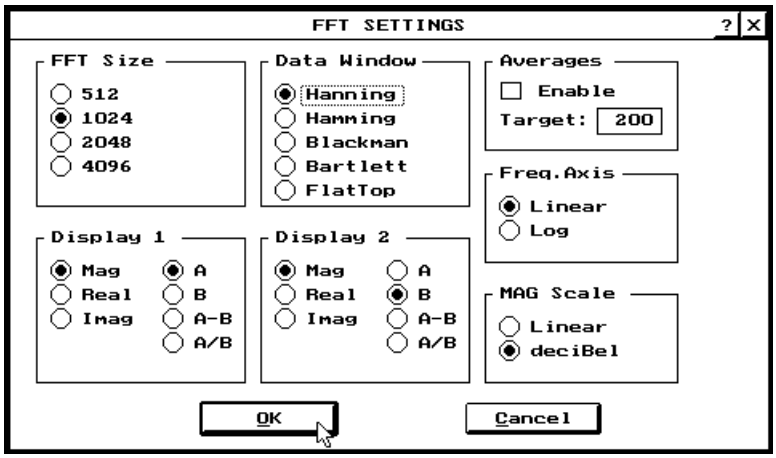


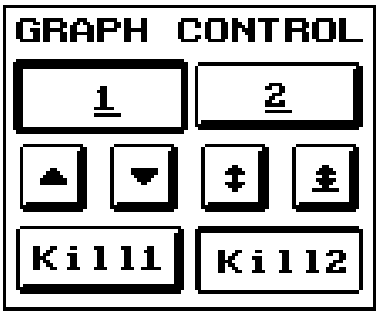
FIGURE 9.3 – The FFT Settings dialog box

Freq.Axis Selects linear or logarithmic scale for the frequency axis.

MAG Scale Selects linear or decibel scale for the Y-axis when Magnitude display is selected.

NOTE: These settings and the graph control ones (see next) are saved with the measurement data in the FFT file on disk; when you recall a previously saved file its settings will reset the FFT control panel.

9.2.2 GRAPH CONTROL



These settings define the conditions under which the FFT measurement is displayed. The FFT control panel has the possibility of simultaneously displaying two curves which relate to one of the input channels or a to a function of them. The graph with its references on the right Y-axis is named **Graph 1**, the other **Graph 2**. The user can choose which is the **active graph** drawn with the **active color**; the second one is displayed in a different second color; the references on the Y-axis and the auxiliary information (see later 9.2.4) of the active graph are also displayed with the active color; the references on the Y-axis of the second graph are of the same color of this graph.

It is possible to easily select the active graph and to change its display settings (even on-the-fly while the measurement is progressing); it is also possible to avoid the display of one graph turning it off.

It is possible to select between several different amplitude scales, depending on the function chosen; when dealing with a logarithmic scale it is possible to select a 1, 2, 5, 10, 20 or 50 dB/division scale; otherwise with a linear display it is possible to have a full scale ranging from 50 V (or Pa) to 0.1 mV (or Pa).

1	Select Graph 1 as active. Equivalent to pressing the **1** key.
2	Select Graph 2 as active. Equivalent to pressing the **2** key.
Kill1	If pressed turns Graph 1 off. Equivalent to pressing the **Alt-1** key.
Kill2	If pressed turns Graph 2 off. Equivalent to pressing the **Alt-2** key.
↕	Modifies the range of the amplitude display of the active graph decreasing its scale factor, thus obtaining the effect of magnifying the curve. The same result is obtained by pressing the **PageUp** key.
↕	Modifies the range of the amplitude display of the active graph increasing its scale factor, thus obtaining the effect of compressing the curve. The same result is obtained by pressing the **PageDown** key.
▲	Shifts the displayed curve upwards (according to the current range of the amplitude display). Equivalent to pressing the ↑ key.
▼	Shifts the displayed curve downwards (according to the current range of the amplitude display). Equivalent to pressing the ↓ key.

9.2.3 FUNCTION BUTTONS

Start — Starts a new FFT measurement. The display will continuously refresh but if you are in Average mode the measurement will end after the pre-defined number of averages has been reached, unless you manually stop the measurement process.
NOTE: The input sensitivity reflects the value set within the Generator&LevelMeter (and controllable with the **F9** and **F10** keys) control panel; if the input AutoRange (see 8.1.5) is selected also the FFT will autorange.

S**t**op — Stops the FFT measurement.

A**l**l — Starts the generation of an **All-tone** signal. The signal is chosen between the four available (ALL512.SIG, ALL1024.SIG, ALL2048.SIG, ALL4096.SIG) depending on the FFT size selected.

Multi — Starts the generation of a **Multi-tone** signal. The signal is chosen between the four available (M512.SIG, M1024.SIG, M2048.SIG, M4096.SIG) depending on the FFT size selected.

S**c**ope — Invokes the oscilloscope control panel.
When entering Scope from the FFT control panel additional information are displayed; in fig. 9.3 we can see the case of a Hanning window selected; the oscilloscope screen will give temporal information about the shape of this window and the data to be transformed (those under the window); if no window is selected a rectangular function will be displayed.

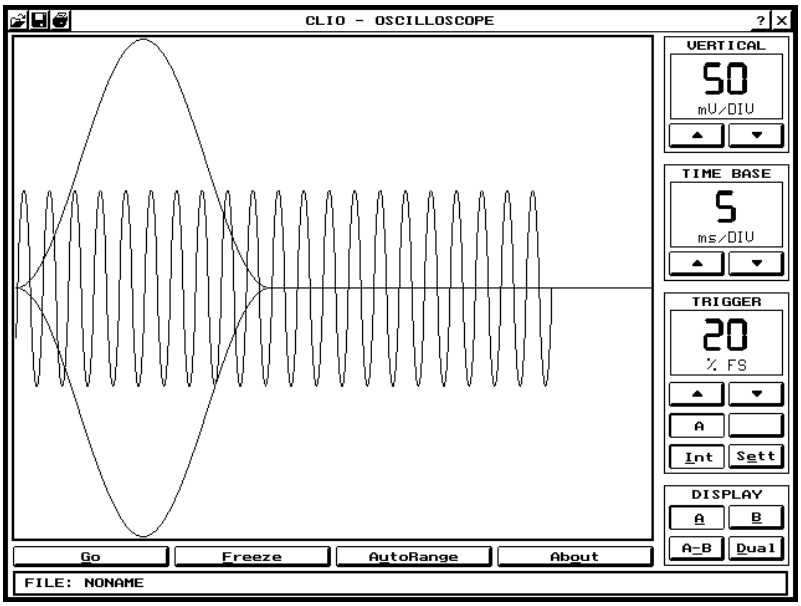


FIGURE 9.4 – The Scope control panel invoked from FFT

NOTE: The Internal Trigger mode and its associated delay time are shared between the FFT and Oscilloscope control panels (see 8.3.2).
NOTE: Since within the FFT control panel it is possible to select six sampling frequencies (instead of three) the Oscilloscope time base will behave consequently: there will be six different time bases compared to the three that you usually get when you invoke the Oscillospcope from outside FFT (Tools Menu).

Window Activates the application of a time weighting window on the input signal. The window type can be selected from the FFT Settings dialog box.

IntTrig Causes CLIO to enter the Internal Trigger mode. The acquisition is then triggered by the internally generated signal and starts after a delay time that can be input in the Scope Trigger Settings dialog box (see 8.3.2). It is particularly important to evaluate the temporal delay of the acquired signal with respect to the generated one (caused, for example, by the flight time from a loudspeaker to a microphone or by the physical distance between the two heads of a tape recorder) and to null it in order to get the correct result.

S**e**ttings Enters the FFT Settings dialog box (see 9.2.1).

About Used to input, modify or display text comments describing the present measurement.

9.2.4 AUXILIARY INFORMATION

On the right hand side of the FFT control panel is displayed some auxiliary information, as shown in Fig. 9.4. These data refer to the **active graph**.

LEVEL
Displays the total level (in dB) of the acquired signal.

THD
Shows the value of the total harmonic distortion. It is possible to read THD values as low as 0.05%.
When undertaking distortion measurements, you must always take great care when setting the input level.
NOTE: The THD calculation feature is intended only for a sinusoidal input signal.

MARKER
Displays the level of the chosen function of the selected input in each frequency bin as analyzed by the FFT. The desired frequency bin is selected by using the cursor on the screen, which can be moved using the arrow keys or by simply dragging it using the mouse while holding down the left mouse button.

AVERAGES
This display shows the target number of averages after which the measurement stops, and while in Average mode it also shows the actual number of averages that have been processed for this measurement.

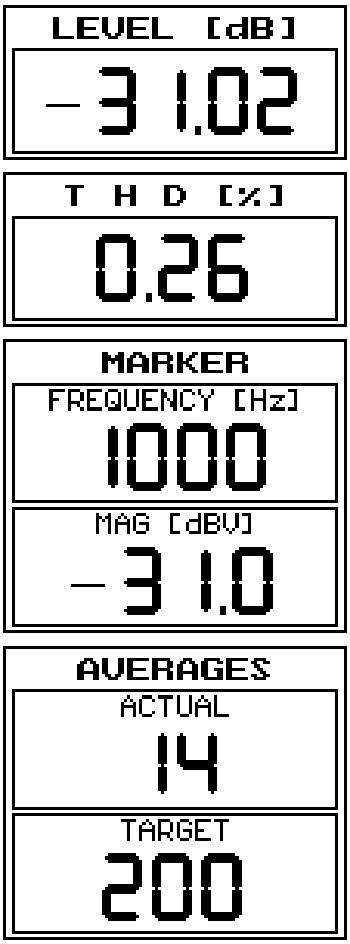


FIGURE 9.5