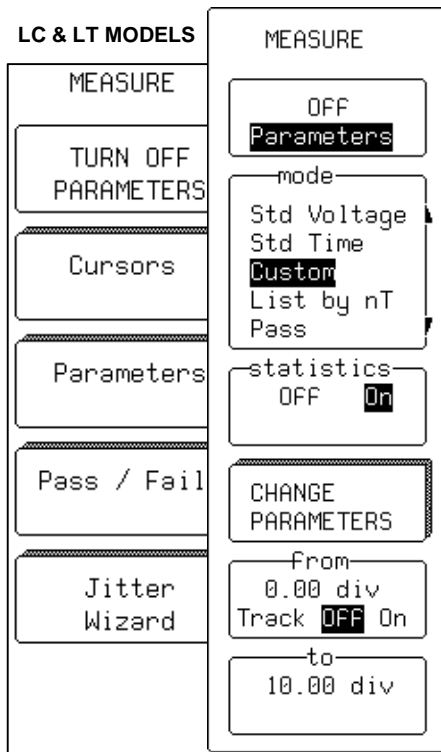


## Choosing a Timing Parameter

Like the instrument's other parameters, Jitter & Timing Parameters perform waveform measurements automatically. They are applied and adjusted using dedicated on-screen menus and accessed by the following simple steps:



1. Press **MEASURE** on the *WavePro* DSO (**CURSORS/MEASURE** or **MEASURE TOOLS** on other models).
2. On models other than *WavePro* DSO, select **Parameters**. The special parameters grid will be displayed and the "Measure menus appear.
3. Scroll through the "mode" menu and choose **Custom**. In the "Statistics" menu below this, **On** can be selected to display each parameter's **average**, **low**, **high**, and **sigma** values.
4. Press the menu button for **Change Parameters**. (See page 6-3.)
5. From the "Category" menu, select **JTA**. The timing parameters will then appear as a group in the "measure" menu.
6. Choose the desired parameter, which will be highlighted both on the "measure" menu and beneath the grid. Up to five parameters can be selected for display, each shown on its own line below the grid. Other kinds of parameters can also be selected from these menus, such as histogram parameters from the **Statistics** category (see next chapter).

Each JTA parameter operates on a level of the acquired waveform that can be selected either in volts or as a percentage of signal amplitude.

Each parameter calculation is performed over all cycles or edges present in the input signal, without limitation. The acquired set can then be analyzed using Histograms or Trends (see Chapters 7 & 8).

Advanced interpolation filtering is applied to the signal edges in the vicinity of the measurement points to optimize measurement accuracy, repeatability and speed.



### Which Parameter?

This table lists the Jitter & Timing Parameters (second column from left) and offers hints on the tasks they can perform. Additional analysis and processing of the waveform can be carried out by activating **Statistics** and using histogram parameters (as described on the previous page). Finally, one of the variants of *JitterTrack*, (see Chapter 3) might serve as an alternative for the same task.

To...	Use Timing Parameter:	For Further Processing, Use	Or <i>JitterTrack</i> ...
measure accuracy of clock, period or frequency,	p@lv freq@lv	<b>Statistics On</b> (see previous page) or use <b>Histogram</b> (see Chapter 7).	<b>Period Jitter</b> <b>Frequency Jitter</b> (see Chapter 3).
measure pulse width accuracy,	wid@lv	<b>Statistics On</b> or use <b>Histogram</b> .	<b>Width Jitter</b>
measure adjacent cycle deviation,	Dp@lv	<b>Statistics On</b> or use <b>Histogram</b> .	<b>Cycle-to-Cycle Jitter</b>
count number of edges in a waveform,	edge@lv	—	—
measure duty cycle,	duty@lv	<b>Statistics On</b> or use <b>Histogram</b> .	<b>Duty Cycle Jitter</b>
measure time interval error...	tie@lv	<b>Statistics On</b> or use <b>Histogram</b> .	<b>Interval Error Jitter</b>
measure n-cycle	n-cycle@lv		<b>N-Cycle Jitter</b>
measure skew	skew		<b>Clock Skew</b>
measure setup	setup		<b>Setup</b>
measure hold	hold		<b>Hold</b>

The menus shown on this and the following page are displayed when, for example, period-at-level on Clock is selected as the timing parameter. These menus and their descriptions are representative of all the timing parameters except tie@lv (see page 6–10).

### p@lv — period at level

Calculates the period of each cycle in an acquired waveform.

#### —On line—

Selects for modification as many as five different parameters, each placed on its own line: 1, 2, 3, 4 or 5.

#### —Category—

Specifies the category of parameter. When **JTA** is selected, the **measure** menu (below) will feature the jitter & timing parameters.

#### MORE p@lv SETUP

Accesses **SETUP p@lv** menus (next page).

#### —measure—

For choosing the parameter to be measured on the selected line.

#### —source—

Selects the channel or trace on which the parameter will be measured. And whether **Clock** or **Data** mode will be used. The associated menu knob highlights the channel or trace, while the corresponding button changes the **Clk / Data** selection.

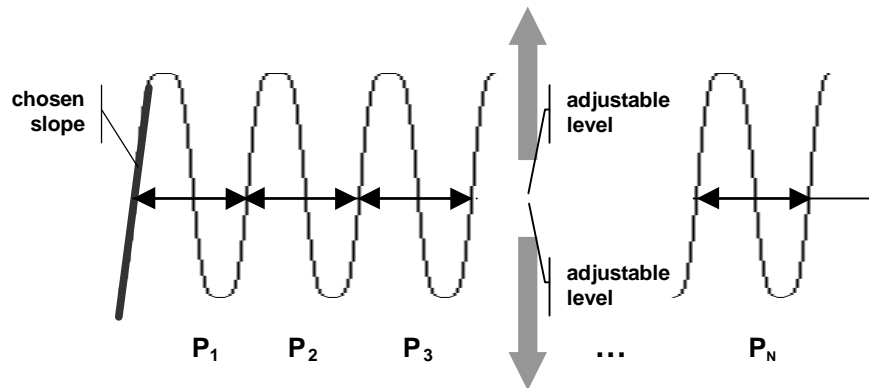


Fig. 6.1 – p@lv: measures the period of all cycles in the waveform; level and slope are specified by the user.

## SETUP p@lv (Level)

SETUP p@lv

SET INPUT TO  
MAX AMPL

level is  
absolute  
percent

level  
0 pV  
Pos Neg

FIND  
LEVEL

A menu group like the one shown here appears when Clock mode and MORE... SETUP is selected (see previous page), allowing comprehensive level configuration. But when Data mode is selected, both level and frequency are set up (see page 6–9). The exception is tie@lv (page 6–8), which offers both level and frequency in either Clock or Data mode.)

### SET INPUT TO MAX AMPL

If the source is a channel or a trace displaying a zoom of a channel, pressing this button is equivalent to selecting VAR gain and pressing FIND, for the source channel. This maximizes SNR, which can improve measured jitter.

### –level is–

Determines whether the levels should be set in absolute — in volts — or as a percentage of signal amplitude.

### –level–

For selecting the voltage or amplitude-percentage setting of the level on the waveform at which the timing is to be measured. Also selects whether the measurement should be made on a **Pos**(itive or rising edge) or a **Neg**(ative or falling edge).

### FIND LEVEL

Automatically finds and sets the threshold to the appropriate level.

**freq@lv (frequency at level)** Returns the frequency of each pulse in acquired waveform. Menus and setup for freq@lv are the same as for p@lv.

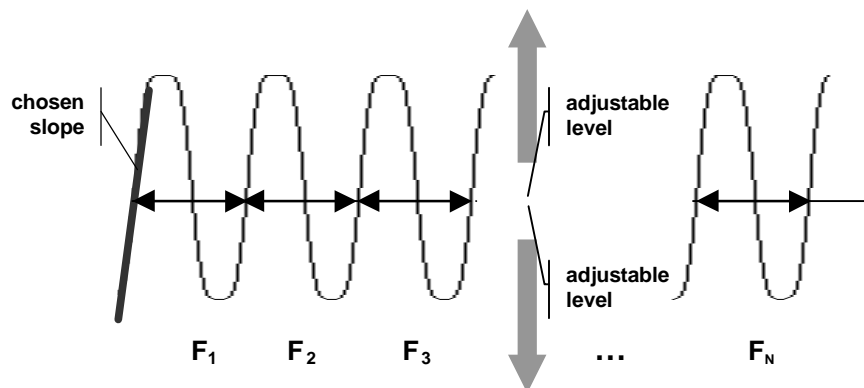


Fig. 6.2 – freq@lv: measures the frequency of pulses in the waveform; level and slope are specified by the user.

**wid@lv (width at level)** Returns width, positive or negative, of each pulse in acquired waveform. Menus and setup are same as for p@lv.

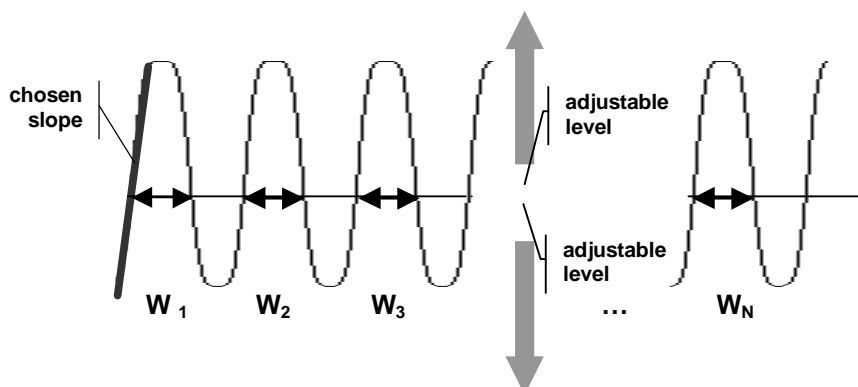


Fig. 6.3 – w@lv: measures the width of all pulses in the waveform; level and slope are specified by the user.

**Dp@lv (delta period at level)** Calculates adjacent cycle deviation (cycle-to-cycle jitter) of each cycle in acquired waveform. Menus and setup are same as for p@lv.

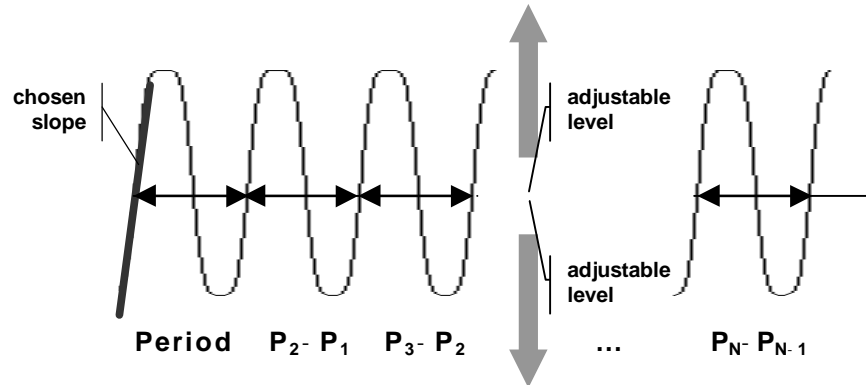


Fig. 6.4 –  $\Delta p@lv$ : measures the difference between consecutive cycles in the waveform; level and slope are specified by the user.

**edge@lv (edge at level)** Counts number of edges, positive or negative, in source trace. Menus and setup are same as for p@lv.

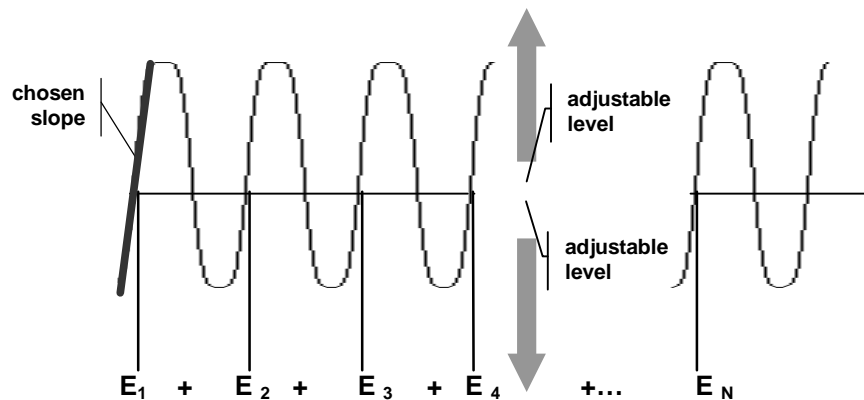


Fig. 6.5 – edge@lv: counts the number of rising, or falling, edges in the waveform; level and slope are specified by the user.

**duty@lv (duty cycle at level)** Calculates the duty cycle of each period in the source trace. The menus and setup for this parameter are the same as for those of p@lv.

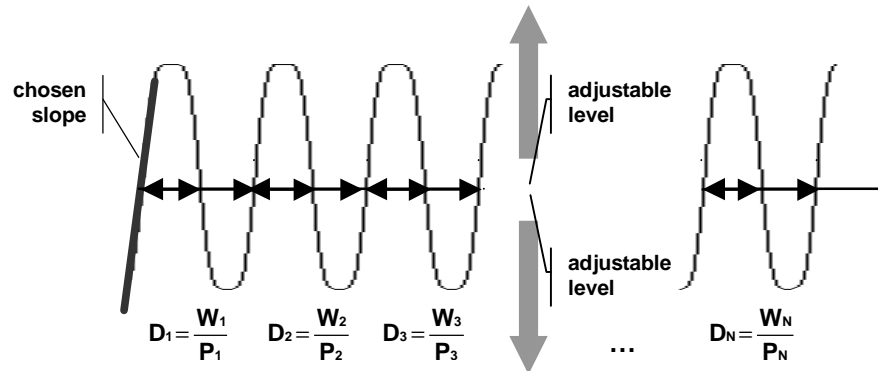


Fig. 6.6 – duty@lv: measures the duty cycle of each period in the waveform (pulse width over period); level and slope are specified by the user.

**skew@lv (skew at level)** Calculates the skew time between Clock 1 and Clock 2. You specify the level and slope for each clock edge.

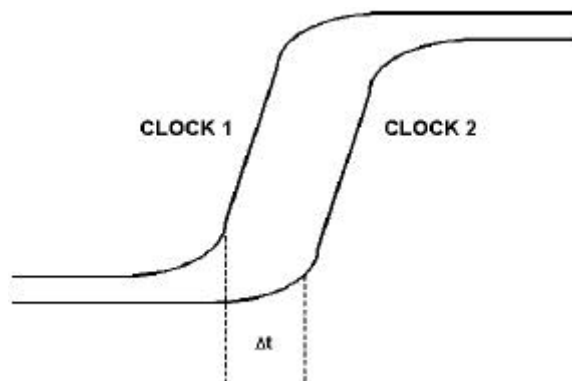


Fig. 6.7 – skew@lv: measures the skew in the waveform; level and slope are specified by the user.

### setup

Calculates the setup time from the delay edge to the clock edge. You specify the level and slope for each edge.

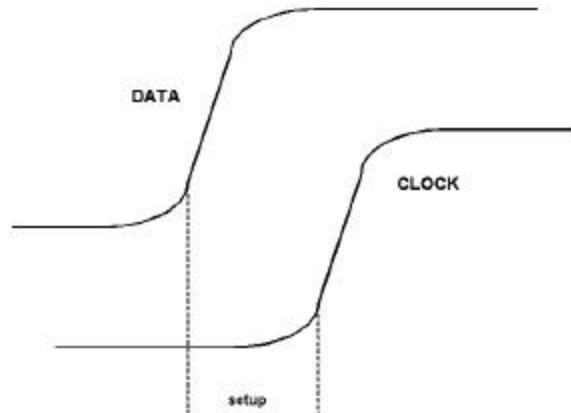


Fig. 6.8 – setup@lv: measures setup in the waveform; level and slope are specified by the user.

### hold

Calculates the hold time from the clock edge to the data edge. You specify the level and slope for each edge.

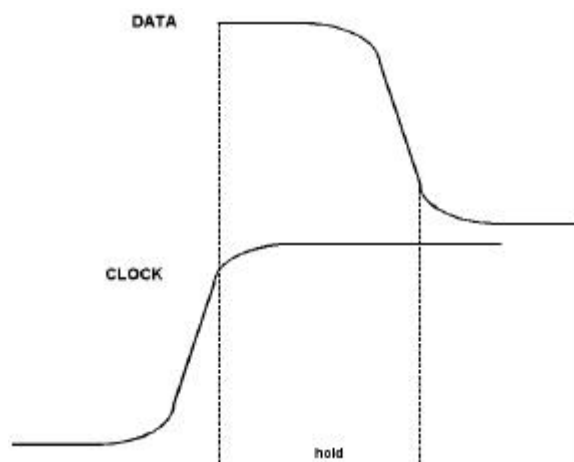


Fig. 6.9 – hold@lv: measures hold in the waveform; level and slope are specified by the user.



**dce@lv (duty cycle error)** Calculates the percent of the period for which the data is above or below a level. You specify the level and polarity.  
—CCTM only—



**tie@lv (time interval error at level)**

Calculates the time interval error in the signal, compared with an “ideal” reference position defined by the user.

CHANGE PARAM

On line  
1 2 3 4 5

Category  
DISK-Local  
DISK-PRML  
JTA  
OPTICAL-Data  
Cyclic

MORE tie@lv  
SETUP

measure  
edge@lv  
Freq@lv  
p@lv  
tie@lv  
wid@lv

source  
1 2 3 4 A B C  
Clk Data

### -On line-

To select, for modification, as many as five different parameters, each placed on a line: 1, 2, 3, 4 or 5.

### -Category-

To specify the category of parameter. When **JTA** is selected, the **measure** menu (below) will feature the jitter & timing parameters.

### MORE tie@lv SETUP

Primary menu that calls up the secondary “Setup tie@lv” menus (next page).

### -measure-

To choose the new parameter to be measured on the selected line.

### -source-

Selects the channel or trace on which the parameter will be measured. And whether **Clock** or **Data** mode will be used. The associated menu knob highlights the channel or trace, while the corresponding button changes the **Clk / Data** selection.

**SETUP tie@lv (frequency)** These menus appear when “frequency” is chosen from “set” below. For an example of those menus displayed when level is chosen, see page 6–4.

SETUP tie@lv

scale in  
**UI** time

SET INPUT TO  
MAX AMPL

set  
**level**  
Frequency

level is  
**absolute**  
percent

level  
0  $\mu$ V  
**Pos** Neg

FIND  
LEVEL

### **–scale in–**

Expresses the attribute in either unit intervals (**UI**) or **time** (in seconds).

### **–set–**

Enables the choice of either **level** or **frequency** (see next page) setup. When **frequency** is chosen, the menus below reflect this.

### **–For all JTA–**

Global effect: when **Yes**, the frequency will apply to all jitter & timing parameters for which data is available.

### **–reference–**

Enables the choice for the reference clock of either a **custom**, user-defined, frequency, or selection from a list of standard, pre-defined, frequencies. The frequency is adjusted using the menu immediately below.

### **–frequency–**

When custom has been chosen from the reference menu, a particular user-defined frequency can be selected. The corresponding button for this menu highlights either the mantissa, or the frequency decade or number of digits, while the associated knob changes the highlighted value. When standard has been chosen, selection from a number of pre-defined frequencies can be made for the reference clock, using the menu button.

### **FIND FREQUENCY**

Appears when **frequency** is selected from the **set** menu (above). Automatically detects frequency and sets the bit rate.

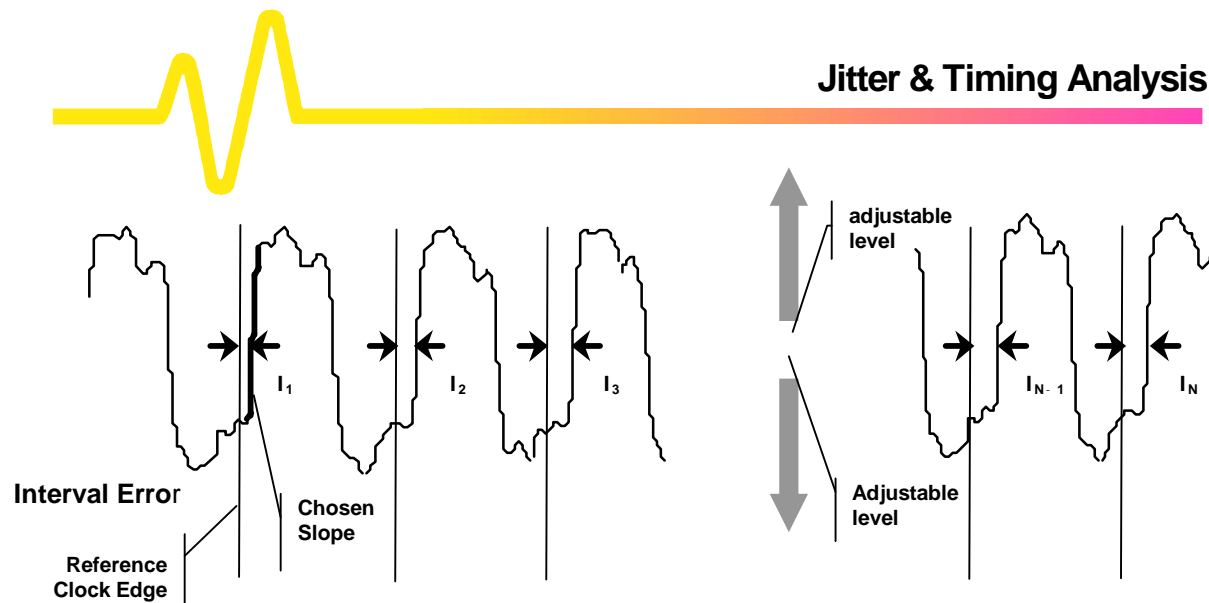


Fig. 6.10 – tie@lv: measures the time-interval error in each waveform pulse against a specified reference clock; level and slope are also specified by the user.

§ § §