

Advanced Timing Parameter Setup and Configuration

Quickly displaying timing parameters of a clock or data signal was already discussed in Chapter 1 when the operation of the JITTER VIEWS TOOLBAR was described. However, there are times when you may want to trade off the ease of use of the **MEASURE** button for more flexibility. This section is intended to provide you with the detail on how to set up timing parameters in the Custom listing in the Measure Mode menu.

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 the **MEASURE** button in the **JITTER AND TIMING ANALYZER VIEWS TOOLBAR**.
2. 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.
3. Press the menu button for **Change Parameters**. (See page 5–5.)
4. From the **Category** menu, select **JTA**. The timing parameters will then appear as a group in the Measure menu.

Note:

Each Jitter and Timing Analysis 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 Chapter 4 and 8).

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

5. 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).

Note:

If custom parameter listings are defined in **Custom** mode, they will be overwritten if you switch to **Jitter Data**, **Jitter Stat**, or **Signal Integ** modes.

Applying Timing Parameters

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 | Statistics ON or use Histogram | Period Jitter Frequency Jitter |
| Measure accuracy of half clock period compared to whole period | hperj@lv | Statistics ON or use Histogram | Half Period Jitter |
| Measure pulse width accuracy, | wid@lv | Statistics ON or use Histogram. | Width Jitter |
| Measure adjacent cycle deviation, | Delta p@lv | Statistics ON or use Histogram. | Cycle-Cycle Jitter |
| Count number of edges in a waveform, | edge@lv | — | — |
| Measure duty cycle, | duty@lv | Statistics ON or use Histogram. | Duty Cycle Jitter |
| Measure duty cycle error | Delta wid@lv | Statistics ON or use Histogram. | — |
| Measure time interval error... | tie@lv | Statistics On or use Histogram. | TIE Jitter |
| Measure n-cycle | Delta p@lv | Statistics ON or use Histogram | Cycle-Cycle Jitter |
| Measure skew | skew | Statistics ON or use Histogram | Skew |



Jitter and Timing Analyzer

| | | | |
|---|-------|--------------------------------|--------------|
| Measure absolute value of time between data edge to nearest previous clock edge | hold | Statistics ON or use Histogram | Hold Jitter |
| Measure absolute value of time between data edge to nearest next clock edge | setup | Statistics ON or use Histogram | Setup Jitter |

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 5–12).

p@lv — period at level

Calculates the period of each cycle in an acquired waveform.

CHANGE PARAM

On line
1 2 3 4 5

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

MORE p@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—

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

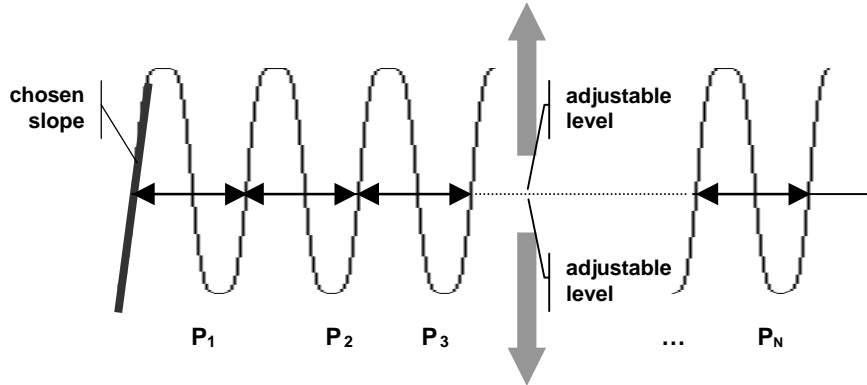
Accesses **Setup p@lv** menus (next page).

—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.



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 μ V
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 5–9). The exception is **tie@lv** (page 5–8), 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–

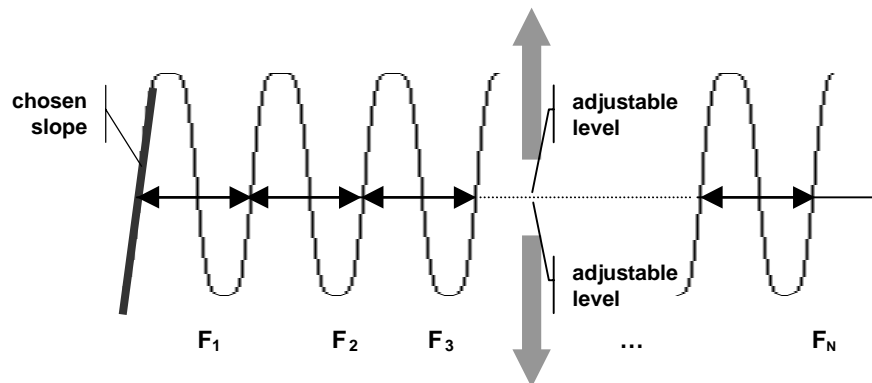
For selecting the voltage or amplitude-percentage setting of the level on the waveform at which the timing is to be measured. Also selects whether the measurement should be made on a **Pos**(itive or rising edge) or a **Neg**(ative or falling edge).

FIND LEVEL

Automatically finds and sets the threshold to the appropriate level.

Applying Timing Parameters

freq@lv (frequency at level) Returns the frequency of each pulse in acquired waveformMenus and

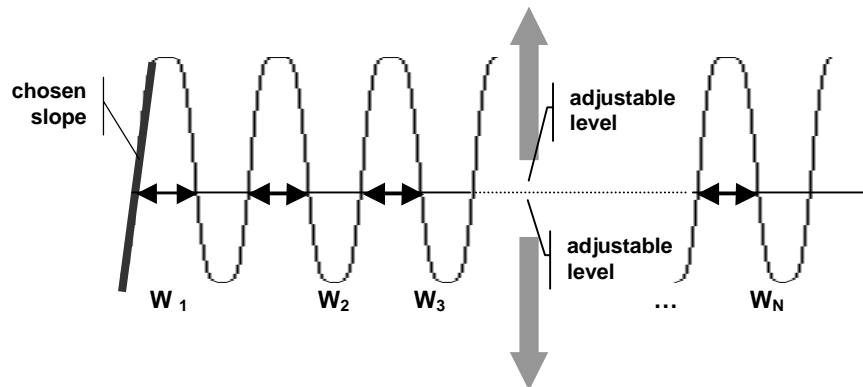


setup for **freq@lv** are the same as for **p@lv**.

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

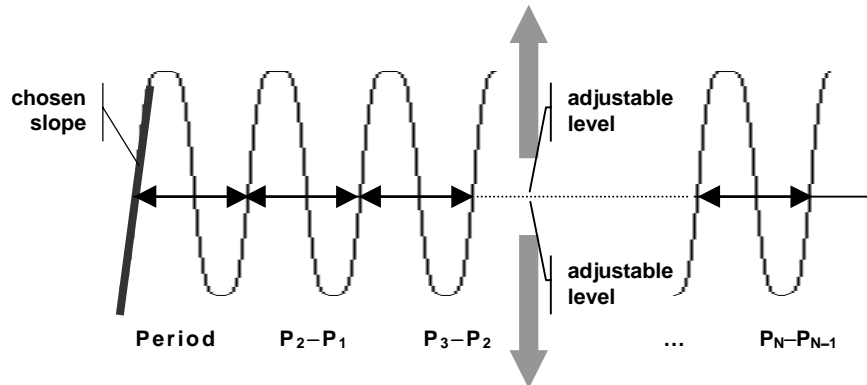
wid@lv (width at level)

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



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

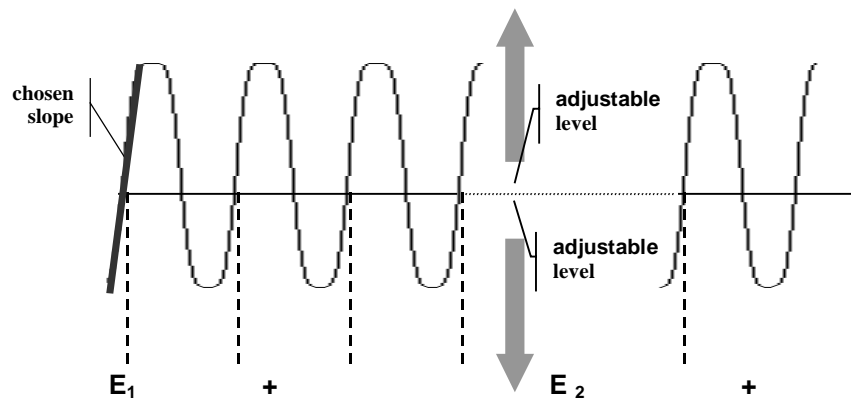
Delta p@lv (delta period at level) Calculates adjacent cycle deviation (cycle-cycle jitter) of each cycle in acquired waveform. Menus and setup are same as for p@lv.



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.



hperj@lv
(Half Period@Level)

SETUP OF B

use Math?

No Yes

Math Type

FFTAVG
 Functions
Jitter
 Histogram
 Per.Hist

MORE
JITTER SETUP

FIND JITTER
TRACE

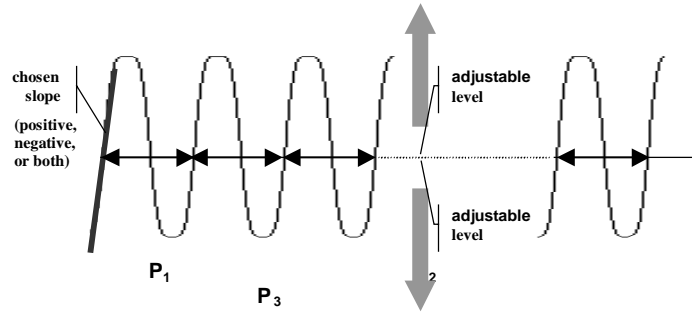
type

Intvl.Error Clk Data

of

1 2 3 4 A C D
 M1 M2 M3 M4

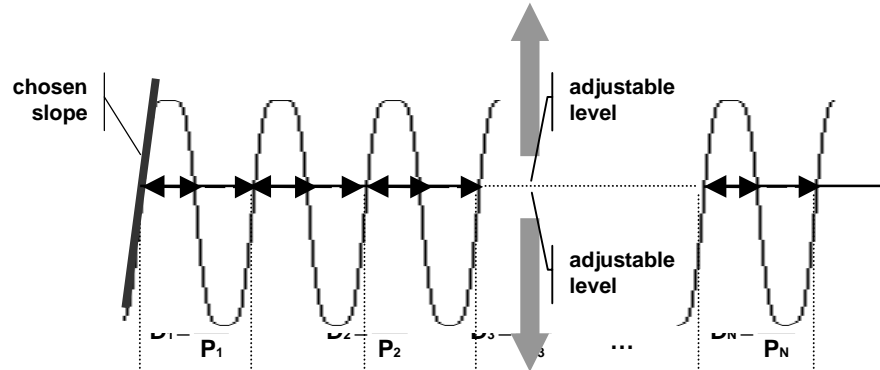
Calculates the relation of a half period to the full period. That it is a part of, always measuring the half period value of the left most half period in the full period. If **level** is set to Pos, it measures every other half period beginning with the positive slope of the beginning with the negative slope of the period. If **level** is set to Both, it measures every half period.





Jitter and Timing Analyzer

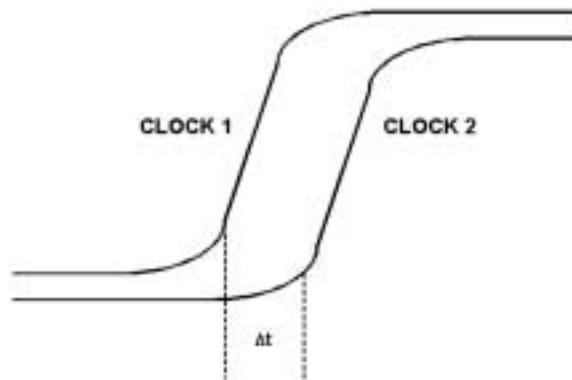
duty@lv (duty cycle at level) Calculates the duty cycle of each period in the source trace. The menus and setup for this parameter are the same as for those of **p@lv**.



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)

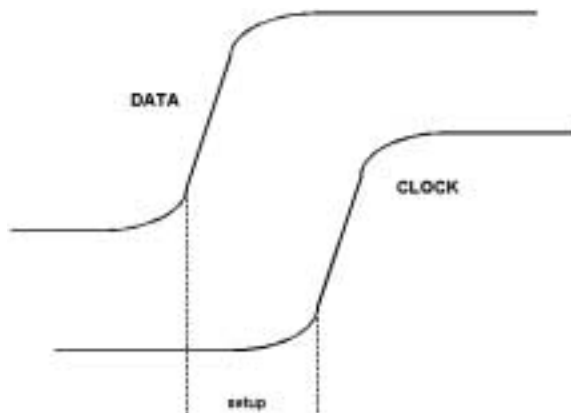
Calculates the skew time between **Clock 1** and *Clock 2*. You specify the level and slope for each clock edge.



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

setup

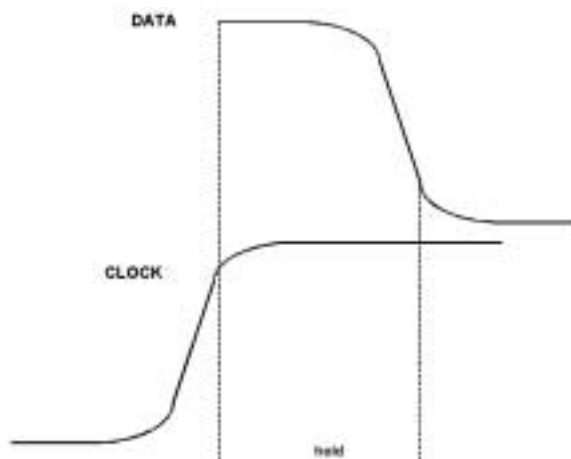
Calculates the setup time from the delay edge to the clock edge. You specify the level and slope for each edge.



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.



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



Delta wid@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.

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 5-4.

SETUP tie@lv

scale in
UI time

SET INPUT TO
MAX AMPL

set
level
Frequency

level is
absolute
percent

level
0 μ 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—

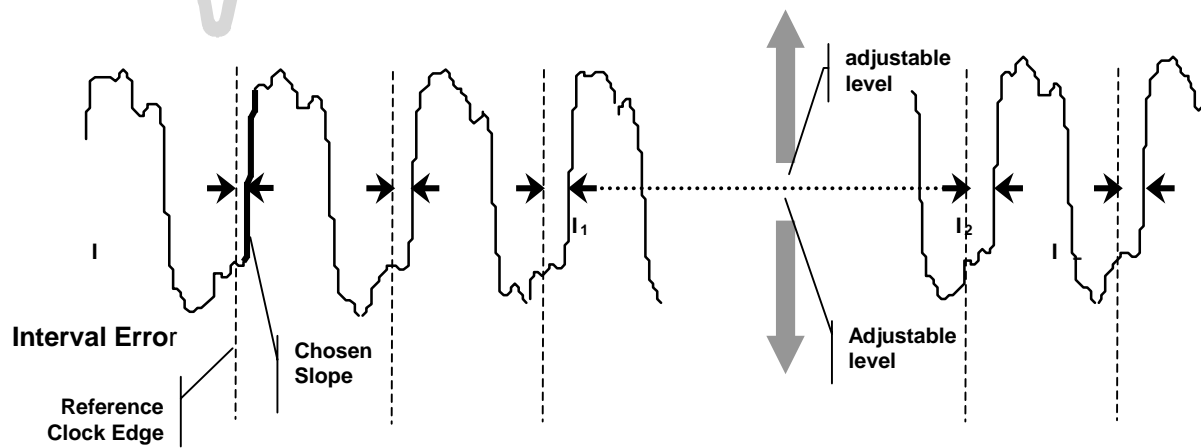
Enables the choice for the reference clock of either a **custom**, user-defined, frequency, or selection from a list of standard, pre-defined, frequencies. The frequency is adjusted using the menu immediately below.

—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.



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.

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