

CHAPTER TWO: *Simply Trigger*

In this chapter, see how

To control triggers

To set up an Edge trigger

To re-arm triggering

To determine level, coupling and slope

To use Window trigger

To obtain a summary of your trigger and system status

Edge Trigger on Simple Signals

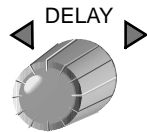
Waverunner uses many waveform capture techniques that trigger on features and conditions, which you define. These triggers fall into two major categories:

Edge — activated by basic waveform features or conditions such as a positive or negative slope, and holdoff

SMART Trigger® — sophisticated triggers that enable you to use basic and complex conditions for triggering. See Chapter 8, “Trigger Smart.”

Use the Edge trigger type for simple signals, and the SMART Trigger type for signals with rarer features such as glitches.

CONTROL TRIGGERING

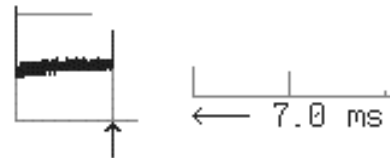


Horizontal: Turn  to adjust the trigger's horizontal position.

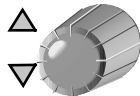
You can adjust the trigger's position from 0% to 100% pre-trigger, from left to right on the grid. DELAY can also be used for setting the post-trigger, in time units, up to 10 000 divisions, in increments of 0.1 division.

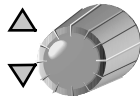
The trigger location is shown by the arrow at the grid bottom, as shown here at near right.

Post-trigger delay is labeled in the trigger delay field, where the arrow becomes horizontal, as shown here at far right.



TRIGGER LEVEL



Vertical: Turn  to adjust the trigger's vertical threshold.

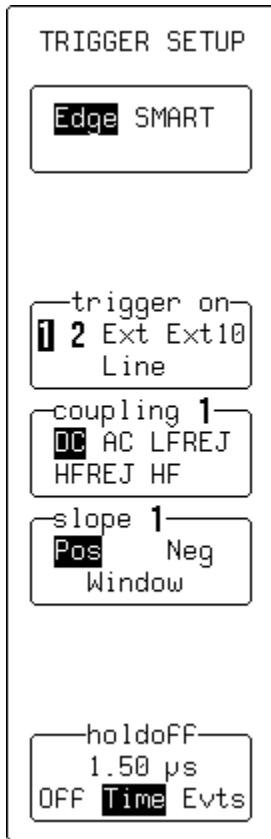
Turn this knob to adjust the level of the trigger source or the highlighted trace. Level defines the source voltage at which the trigger will generate an event — a change in the input signal that satisfies the trigger conditions.

Arrows on both sides of the grid show the threshold position. But these arrows are only visible if the trigger source is displayed and the source signal DC coupled.



SET UP AN EDGE TRIGGER


1. Press TRIGGER  to access these menus:




Use them to select the trigger source, the source's coupling, the slope — positive or negative — and the amount of trigger holdoff by time or events.



-  1. Select "Edge" or "SMART": "**Edge**" is selected by default.



TIP: Once set, trigger level and coupling pass unchanged from trigger type to trigger type for each trigger source.

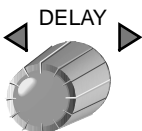
-  2. Select the trigger source. This could be a signal on a channel, the line voltage that powers the Waverunner, or the EXT BNC connector.


-  3. Select the coupling for the trigger source.

-  4. Place the trigger point on the positive or negative slope of the selected source, or choose to define a window

  When **Window** is selected from the above menu, a menu appears here that allows you to define the window's size. See page 33.

  To hold off from triggering for a defined time, or number of events, after a particular trigger event. Use this button to select **Time** or **Events**, and the knob to set the value. **Off** deactivates the holdoff. See Chapter 8, "Trigger Smart."

5. Turn  to adjust the trigger's horizontal position, and the amount of pre-trigger, as desired.

6. Turn  to adjust the trigger voltage level.

TO DETERMINE TRIGGER LEVEL, COUPLING AND SLOPE



Level defines the source voltage at which the trigger circuit will generate an event: a change in the input signal that satisfies the trigger conditions. The selected trigger level is associated with the chosen trigger source.

Trigger level is specified in volts and normally remains unchanged when you change the vertical gain or offset. The amplitude and range of the trigger level are limited as follows:

- ± 5 screen divisions with a channel as the trigger source
- ± 0.5 V with EXT as the trigger source
- ± 5 V with EXT/ 10 as the trigger source
- None with LINE as the trigger source (zero crossing is used).

Coupling refers to the type of signal coupling at the input of the trigger circuit. As with the trigger level, you can select the coupling independently for each source. Change the trigger source and you can change the coupling. You can choose from these coupling types:

DC: All the signal's frequency components are coupled to the trigger circuit for high frequency bursts or where the use of AC coupling would shift the effective trigger level.

AC: The signal is capacitively coupled, DC levels are rejected and frequencies below 50 Hz attenuated.

LF REJ: The signal is coupled through a capacitive high-pass filter network, DC is rejected and signal frequencies below 50 kHz are attenuated. For stable triggering on medium to high frequency signals.

HF REJ: Signals are DC coupled to the trigger circuit, and a low-pass filter network attenuates frequencies above 50 kHz; used for triggering on low frequencies.

HF: Use only when needed for triggering on high-frequency repetitive signals. HF is automatically overridden and set to AC when incompatible with trigger characteristics such as those of SMART Trigger.

Slope determines the direction of the trigger voltage transition used for generating a particular trigger event. You can choose a positive or negative slope. Like coupling, the selected slope is associated with the chosen trigger source.

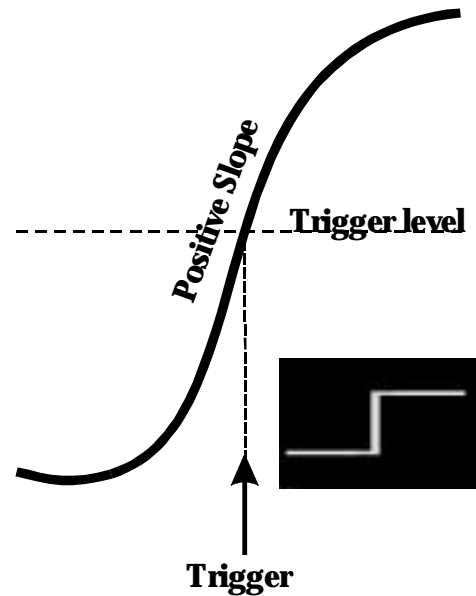


Figure 1. Edge trigger works on the selected edge at the chosen level. The slope — positive here — is highlighted on the trigger icon.


PART ONE: GETTING STARTED

TO RE-ARM A TRIGGER


Three trigger re-arming modes — *AUTO*, *NORMAL*, and *SINGLE* — are available for all types of triggers. In addition, *STOP* cancels the capture in all three modes.




AUTO

Press  to activate *AUTO* mode: the trace will automatically be displayed if no trigger occurs soon after. But if a signal does occur, Waverunner behaves as if in *NORMAL* mode.


NORMAL

Press  to enter *NORMAL* mode and continuously update the display while there is a valid trigger. If there is no valid trigger, the last signal is retained and the warning "*SLOW TRIGGER*" is displayed in the trigger status field.

SINGLE

Press  to enter *SINGLE* mode: the Waverunner will wait for a single trigger to occur, then display the signal and stop capturing. If no trigger occurs, you can press this button again to manually trigger the scope.

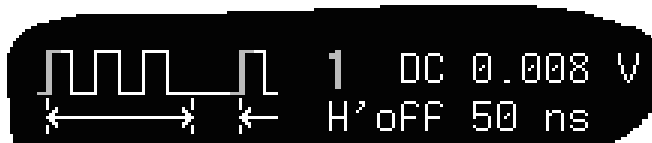
STOP

Press  to halt the capture made in *AUTO*, *NORMAL* or *SINGLE* re-arming modes. Press *STOP* to prevent capture of a new signal, or while a single-shot capture is under way to keep the last captured signal.

TO RECOGNIZE TRIGGER ICONS

Trigger icons allow immediate on-screen recognition of the current trigger conditions. There is an icon for each trigger. The more heavily marked transitions on the icon indicate the slope on which the trigger will be generated. The icons are annotated with information on the trigger settings.

This icon, for example, represents an *Edge* trigger set up to trigger on the positive slope, at a level of 0.008 V, with a holdoff time of 50 ns.



USE WINDOW TRIGGER

Define a region whose boundaries extend above and below the selected trigger level. A trigger event will occur when the signal leaves this window region in either direction and passes into the upper or lower region (Fig. 2). The next trigger will occur when the signal again passes into the window region.

1. Select

slope 1
Pos Neg
Window

.

2. Then use

window size
+ - 67.0mV
around level

 to define the size of the window region.

A bar at the left-hand side of the grid will visually indicate the window's height.

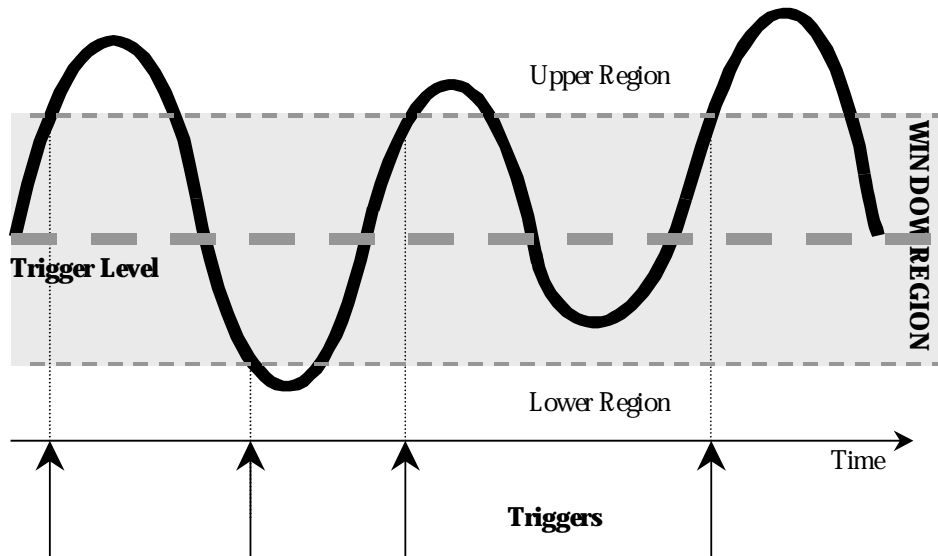


Figure 2. Window Trigger: triggers when the signal leaves the window region. The arrows indicate where triggers occur when the signal leaves the window region.

TRIGGER SOURCE

The trigger source may be one of the following:

The acquisition channel signal (CH 1, CH 2, CH 3 or CH 4) conditioned for the overall voltage gain, coupling, and bandwidth.

The line voltage that powers the oscilloscope (LINE). This can be used to provide a stable display of signals synchronous with the power line. Coupling and level are not relevant for this selection.

The signal applied to the EXT BNC connector (EXT). This can be used to trigger the oscilloscope within a range of ± 0.5 V on EXT and ± 5 V with EXT/10 as the trigger source.

Level

Level defines the source voltage at which the trigger circuit will generate an event (a change in the input signal that satisfies the trigger conditions). The selected trigger level is associated with the chosen trigger source. Note that the trigger level is specified in volts and normally remains unchanged when the vertical gain or offset is modified.

The Amplitude and Range of the trigger level are limited as follows:

± 5 screen divisions with a channel as the trigger source


± 5 V with EXT/10

none with LINE as the trigger source (zero crossing is used)


Note: Once specified, Trigger Level and Coupling are the only parameters that pass unchanged from trigger mode to trigger mode for each trigger source.

OBTAIN A TRIGGER STATUS SUMMARY


Display a summary of the status of your trigger, as well as timebase, vertical sensitivity, probe attenuation, and offset and coupling for each channel.

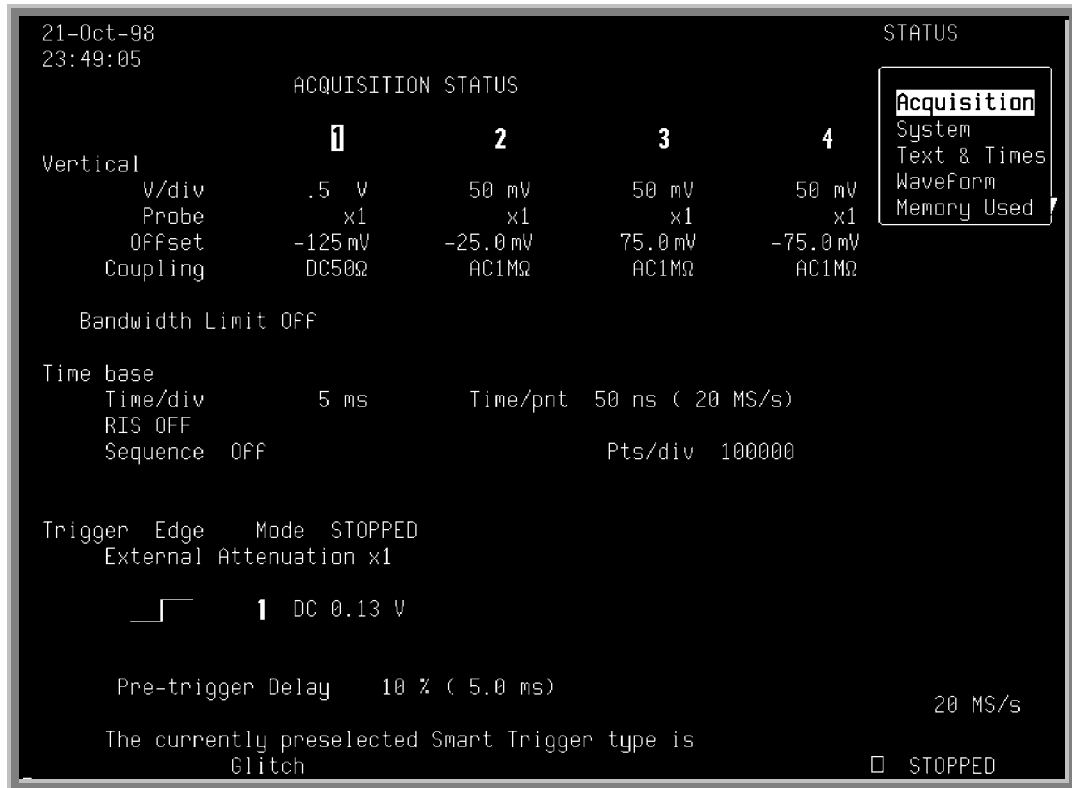
1. Press  to show the STATUS menus.
2. Press the button to select **Acquisition**.

PRINT
SCREEN

TIP: Press  to document your status summary and make a hard copy.

PANELS

Press  when you have a setting you want to reuse (see the next chapter for more on this).



Press the *SCOPE STATUS* button for access to full-screen summaries of your Waverunner's system status and other functional status.

See Chapter 8, "Trigger Smart," for more about Edge trigger and all about the SMART Trigger types.

