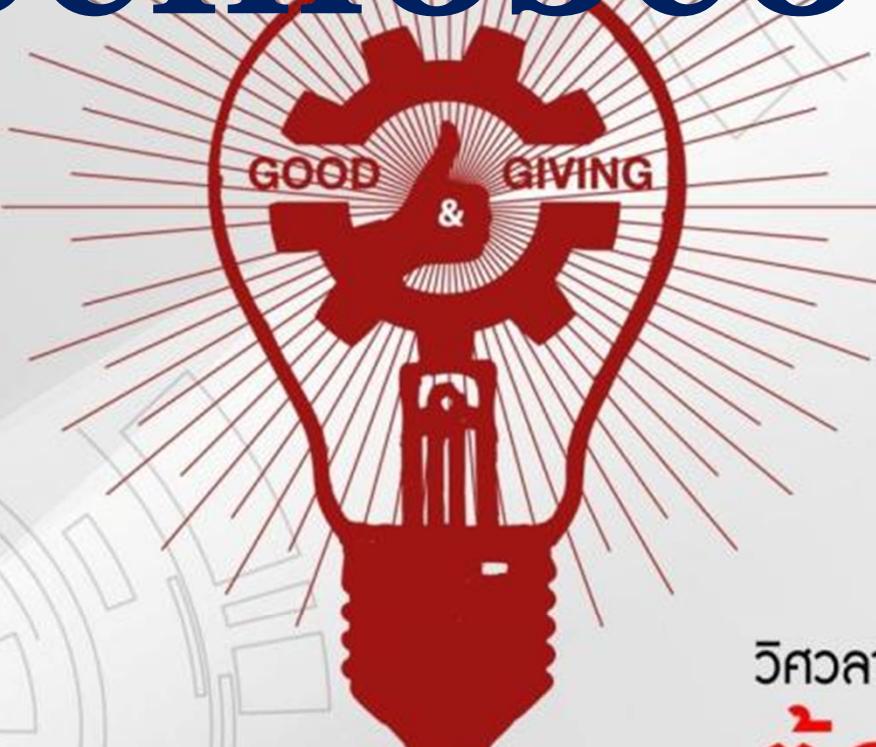


Oscilloscope



วิศวกรรมศาสตร์
ต้องเป็นหนึ่ง
และเป็นที่พึงของสังคม

Oscilloscope

- What is Oscilloscope?
- Oscilloscope Tutorial
- Oscilloscope layout
- Oscilloscope display
- Oscilloscope probe
- Vertical panel
- Horizontal panel
- Trigger panel
- Coupling
- Bandwidth limit
- Probe Calibration
- Probe Attenuation
- Vertical fine adjustment
- Invert function
- Math function
- Display reading
- Delay scan
- Auto setup
- Voltage measurement
- Time measurement
- Storage function

Oscilloscope คืออะไร

- คือเครื่องมือสำหรับวัดสัญญาณไฟฟ้าที่มีการเปลี่ยนแปลงอย่างรวดเร็วมาก โดยทำการวัดหรือลากเส้น (**plot**) กราฟของสัญญาณที่สนใจบนจอ (ซึ่งโดยปกติจะไม่สามารถมองเห็นสัญญาณไฟฟ้าเหล่านั้นได้) และรูปคลื่นหรือสัญญาณไฟฟ้าที่วัดได้จะเทียบกับเวลา โดยสัญญาณที่ต้องการจะวัดนั้นอาจเกิดขึ้นครั้งเดียว เกิดขึ้นในลักษณะช้าเดิม หรือเปลี่ยนแปลงไปอย่างไม่แน่นอน

Oscilloscope

- Oscilloscope Tutorial Part 1/3 - What is an oscilloscope?

http://www.youtube.com/watch?v=qIfo_d82Co

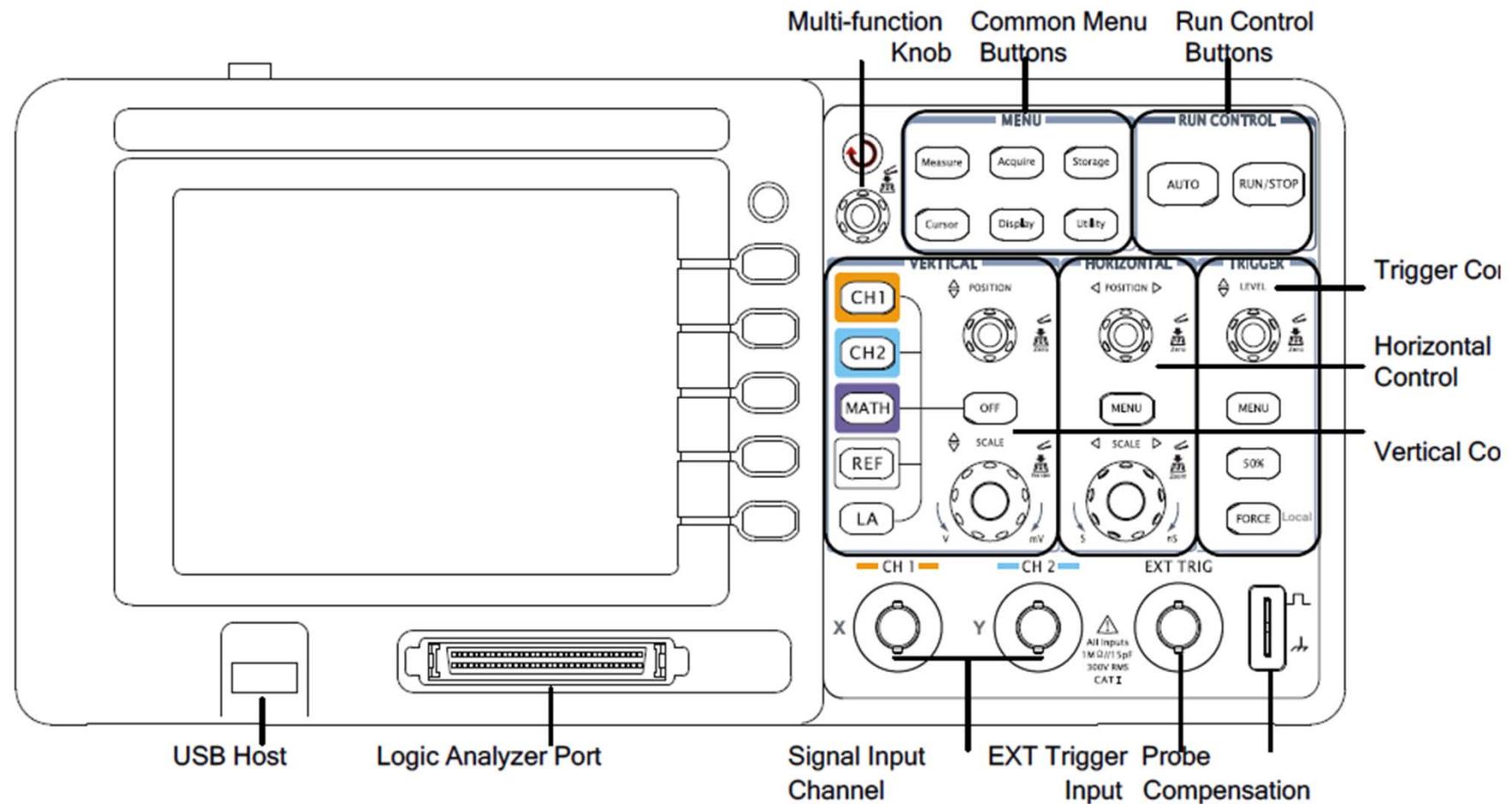
- Oscilloscope Tutorial Part 2 - Basic usage

<http://www.youtube.com/watch?v=hUIgAu3QQWQ>

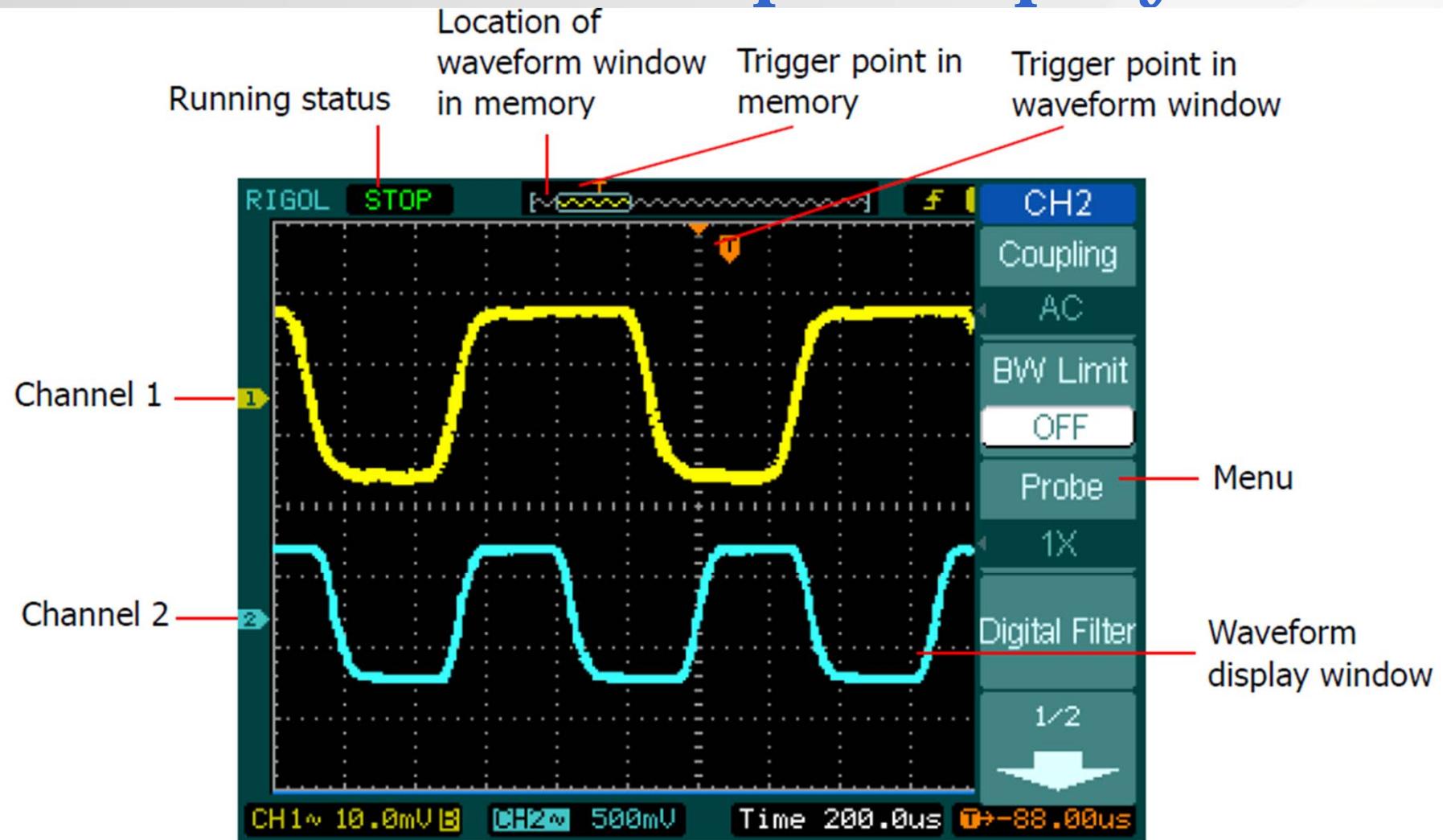
- Oscilloscope Tutorial Part 3 - Advanced functions

http://www.youtube.com/watch?v=g_KuGEh0PyA

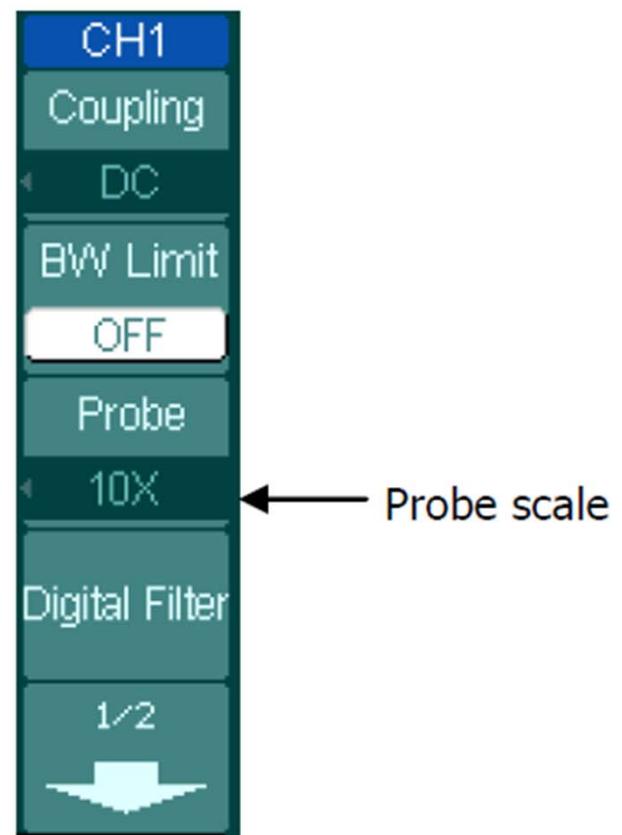
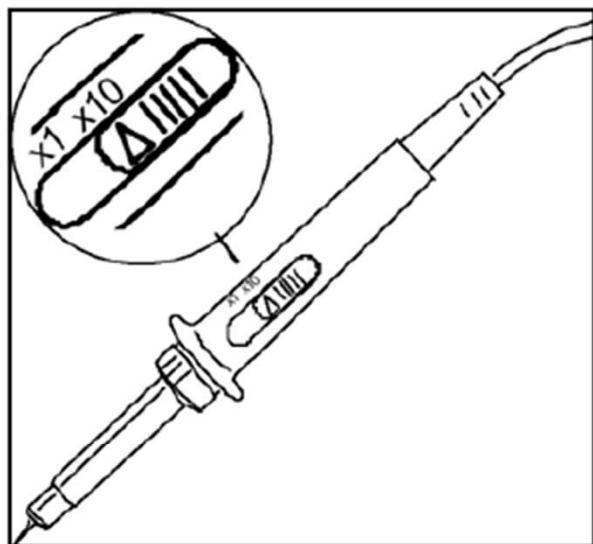
Oscilloscope Layout



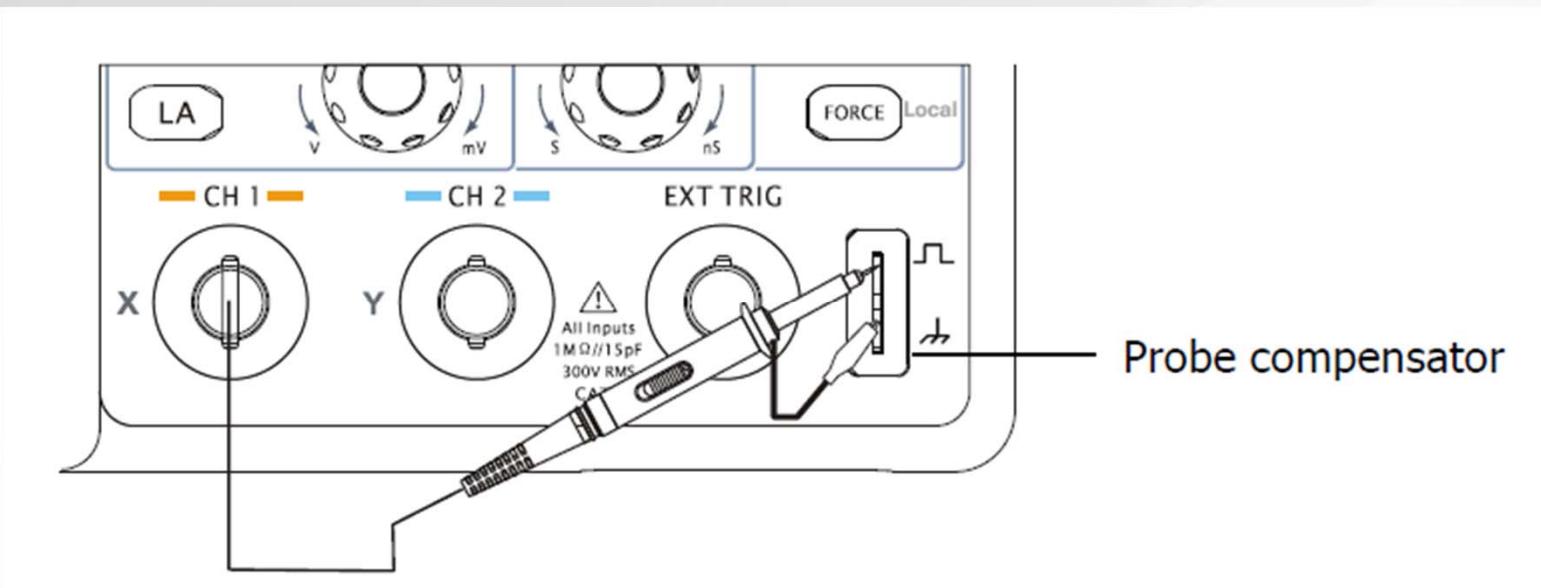
Oscilloscope Display



Probe setting



Probe Calibration



Over compensated



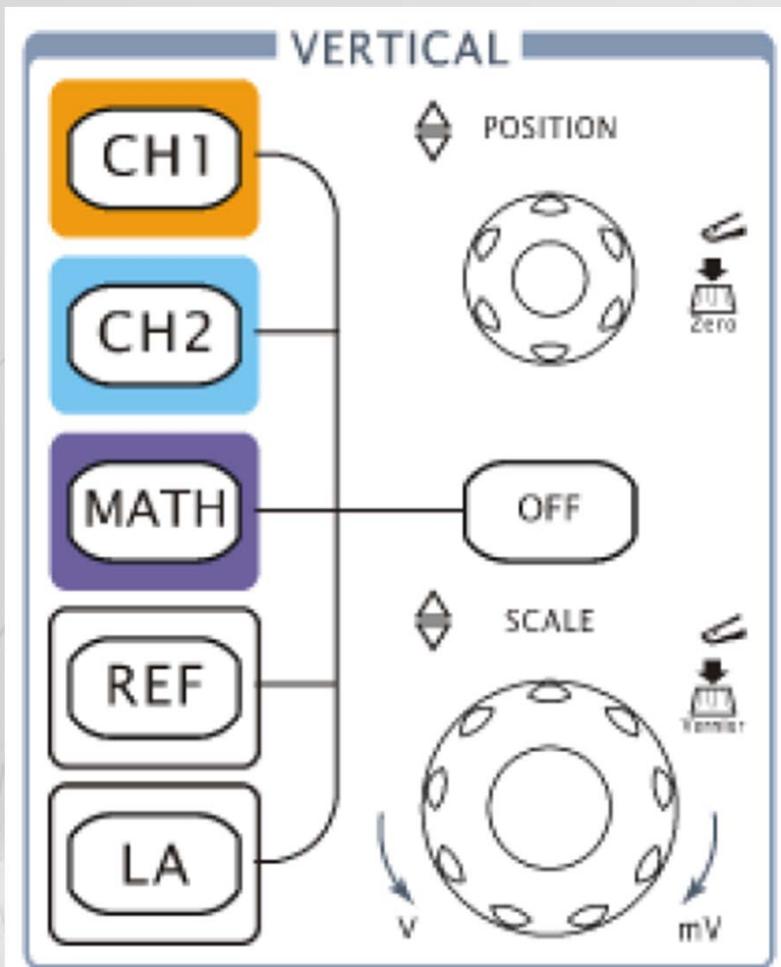
Correctly Compensated



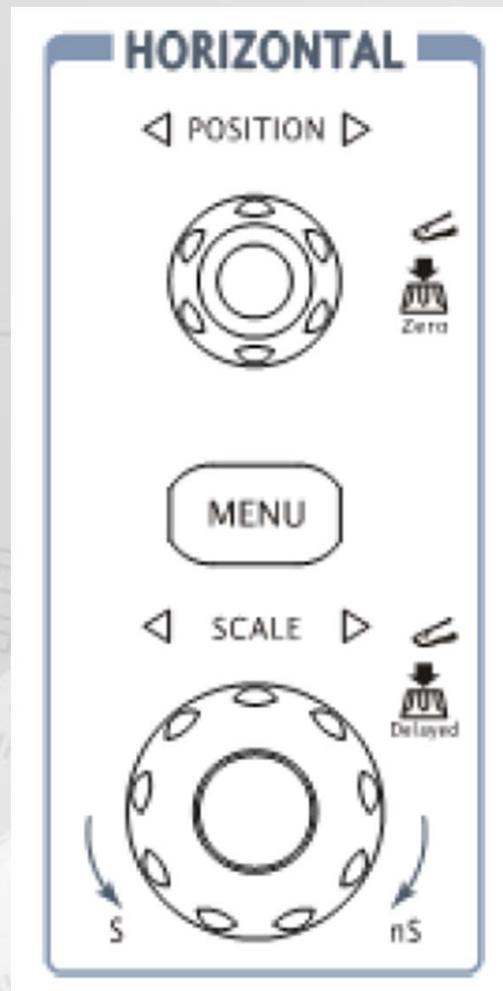
Under Compensated



Vertical Panel



Horizontal Panel



Trigger Panel



Setting up the channel



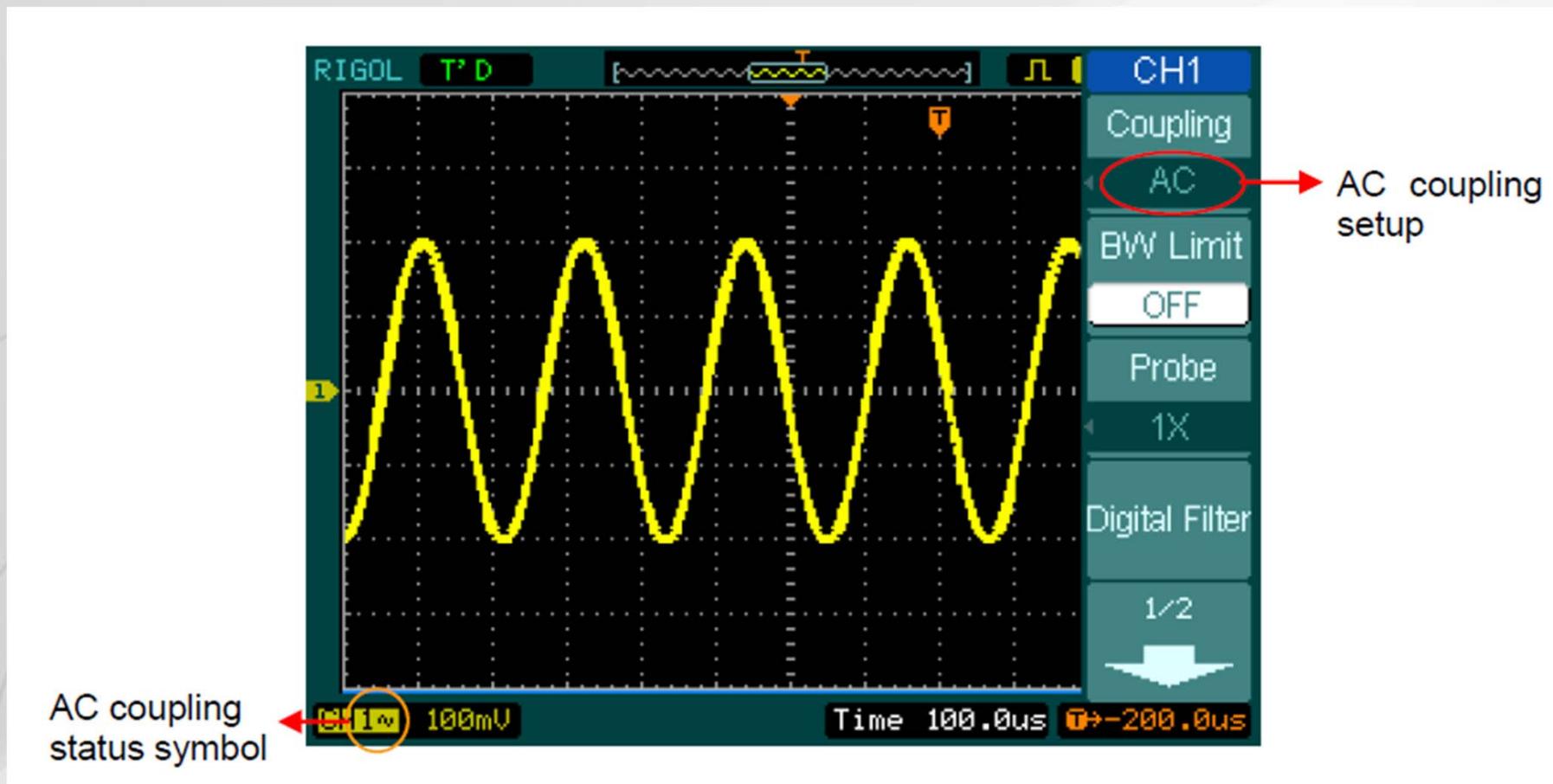
Menu	Settings	Comments
Coupling	AC	Blocks the DC component of the input Signal
	DC	Passes both AC and DC components of the input signal
	GND	Disconnects the input signal
BW Limit	ON	Limits the channel bandwidth to 20MHz to reduce display noise.
	OFF	Get full bandwidth.
Probe	1X	Set this to match your probe attenuation factor to make the vertical scale readout correct
	5X	
Probe	10X	
	50X	
Probe	100X	
	500X	
Probe	1000X	
Digital filter		Setup digital filter (See table 2-4)
1/2		Go to the next menu page (The followings are the same, no more explanation)

Setting up the channel

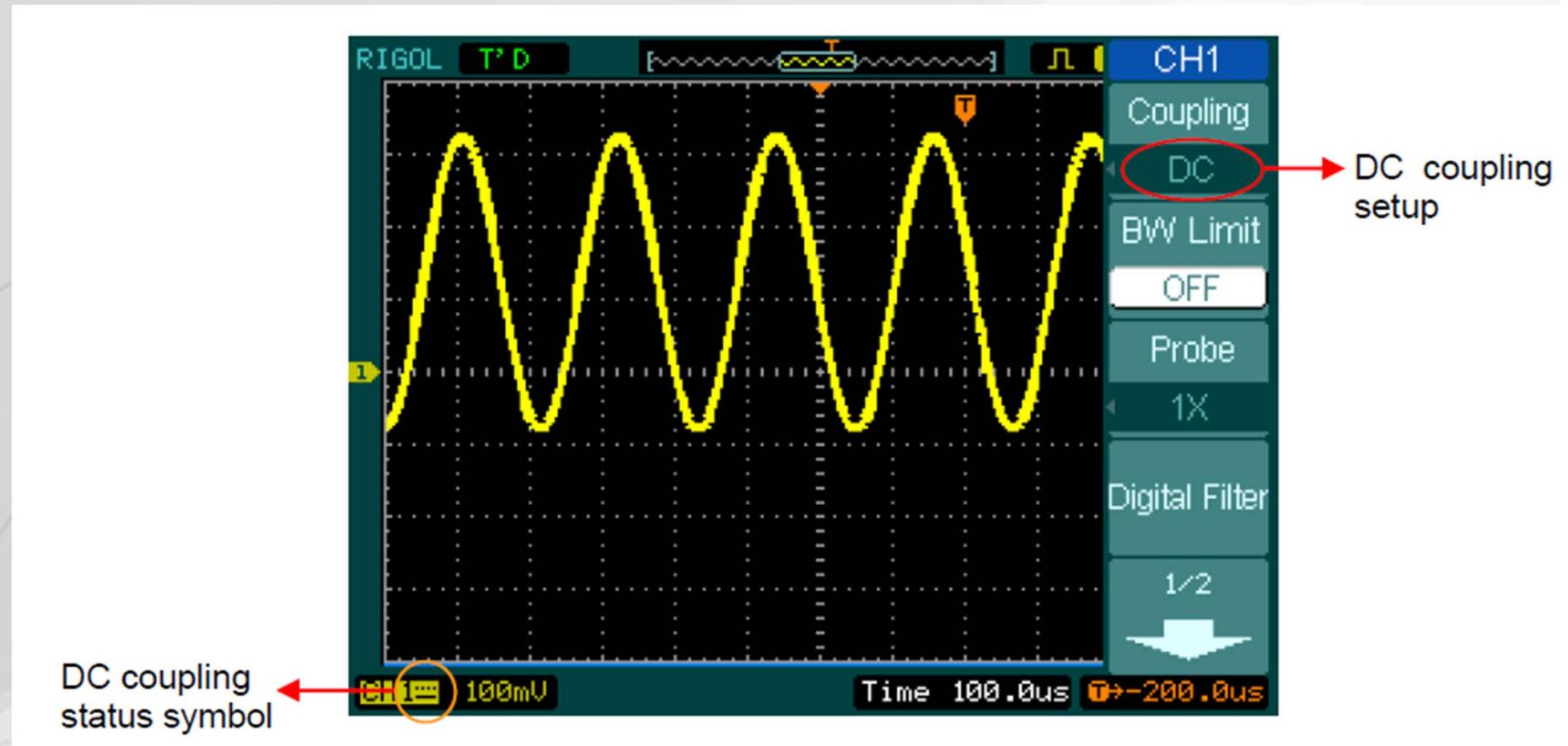


Menu	Settings	Comments
Up arrow icon	2/2	Back to the previous menu page (The followings are the same, no more explanation)
Volts/Div	Coarse Fine	Selects the resolution of the <u>SCALE</u> knob Defines a 1-2-5 sequence. To change the resolution to small steps between the coarse settings.
Invert	ON OFF	Turn on the invert function. Restore original display of the waveform.

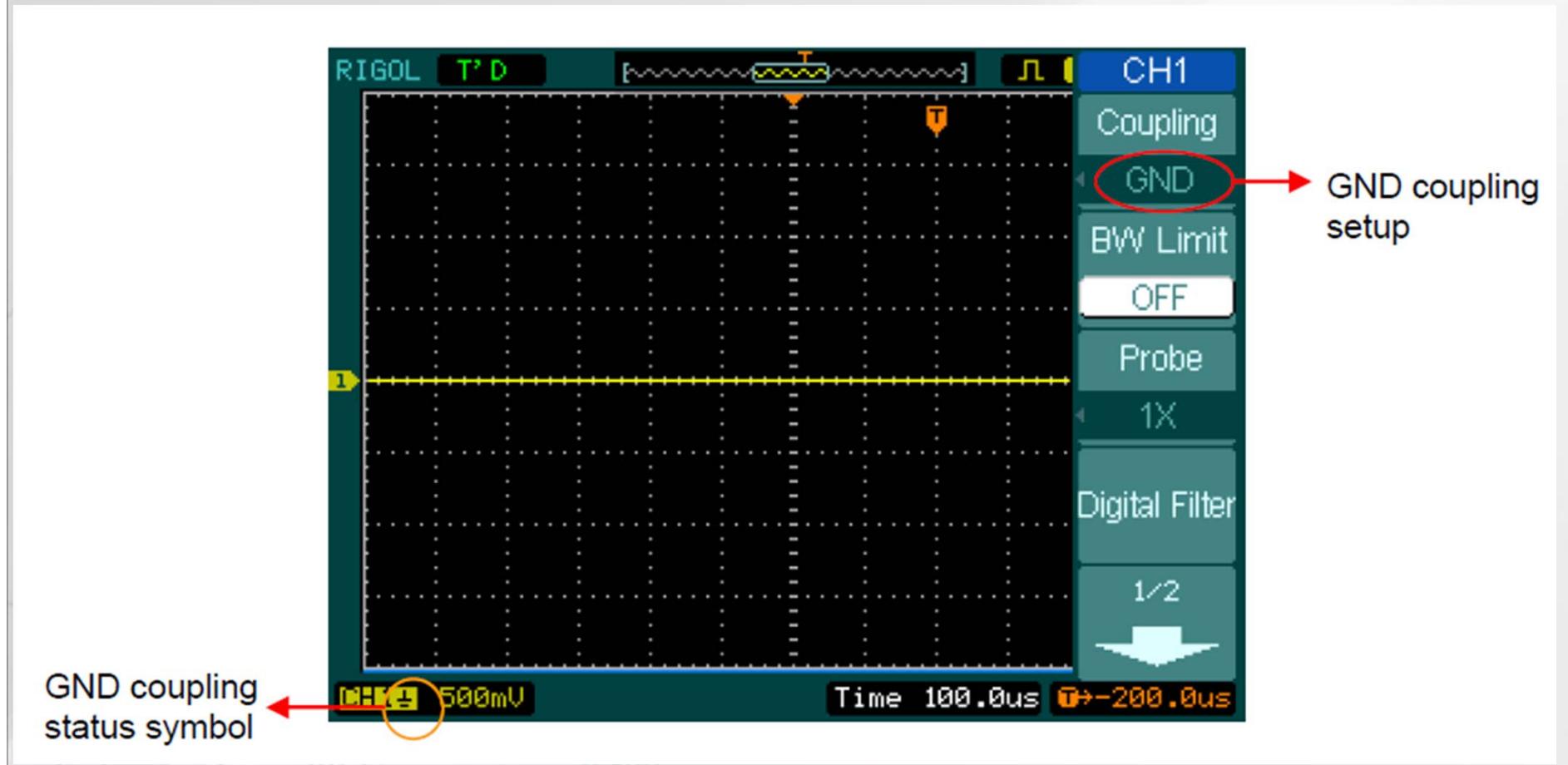
AC Coupling



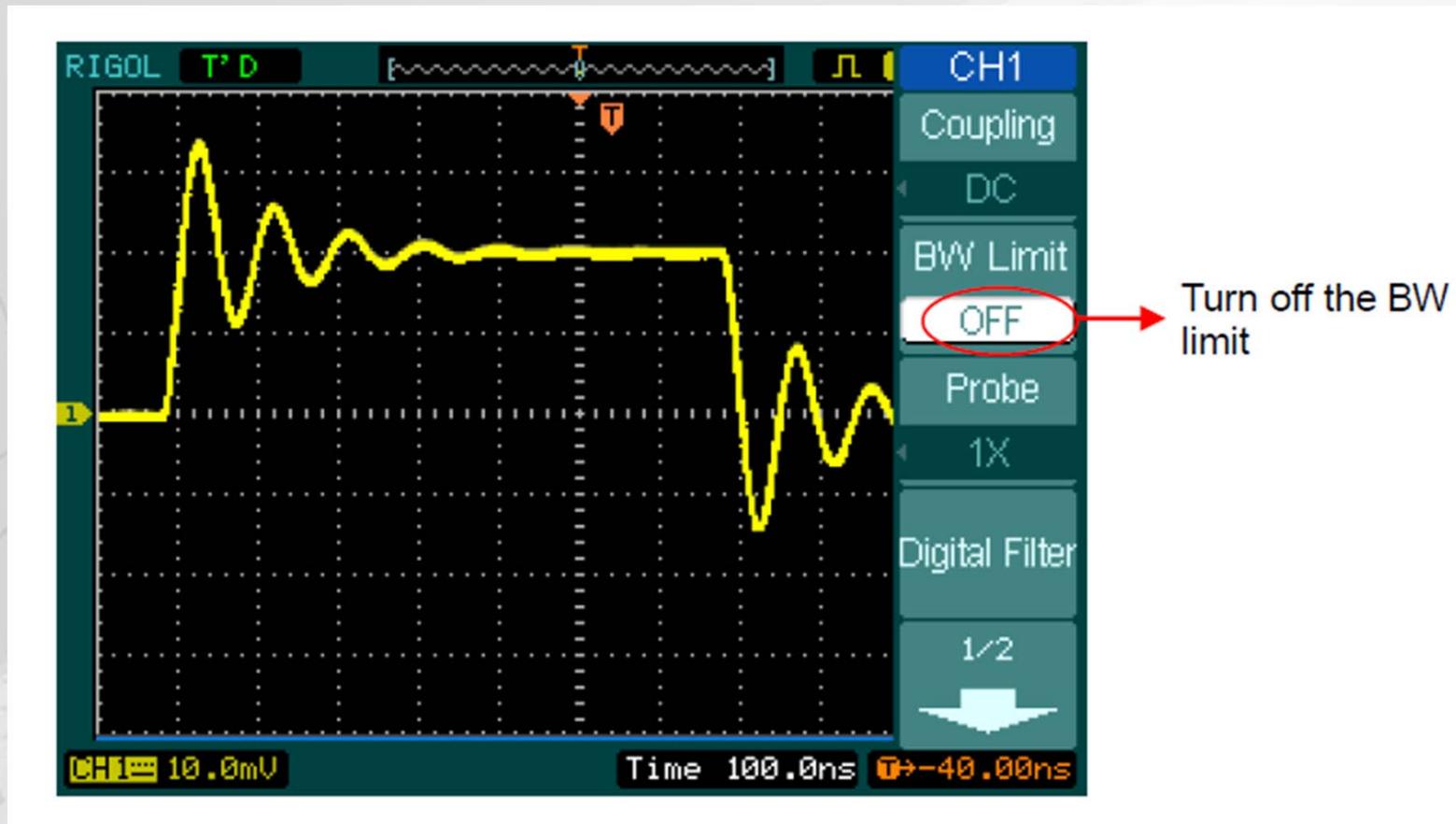
DC Coupling



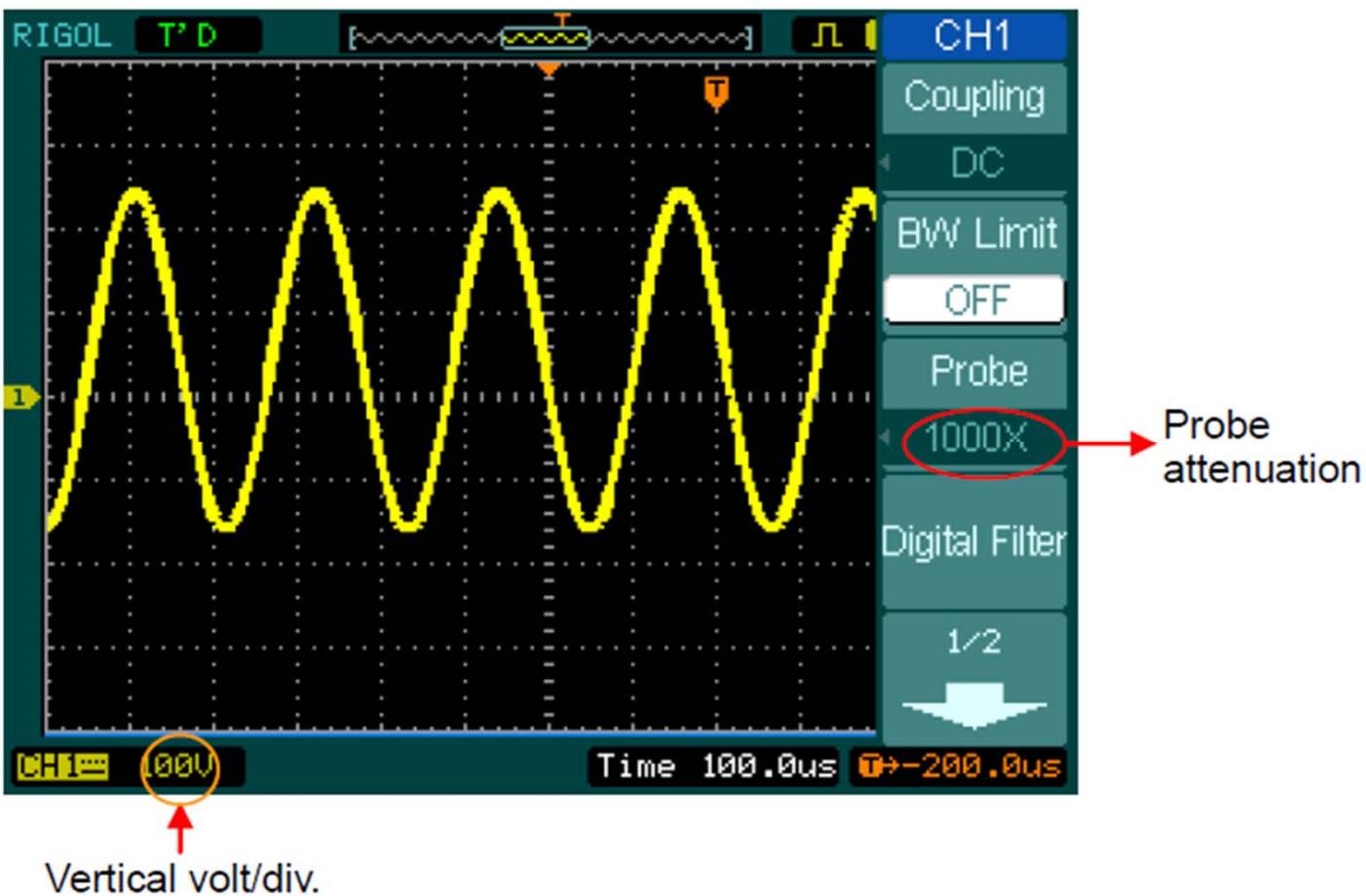
Ground Coupling



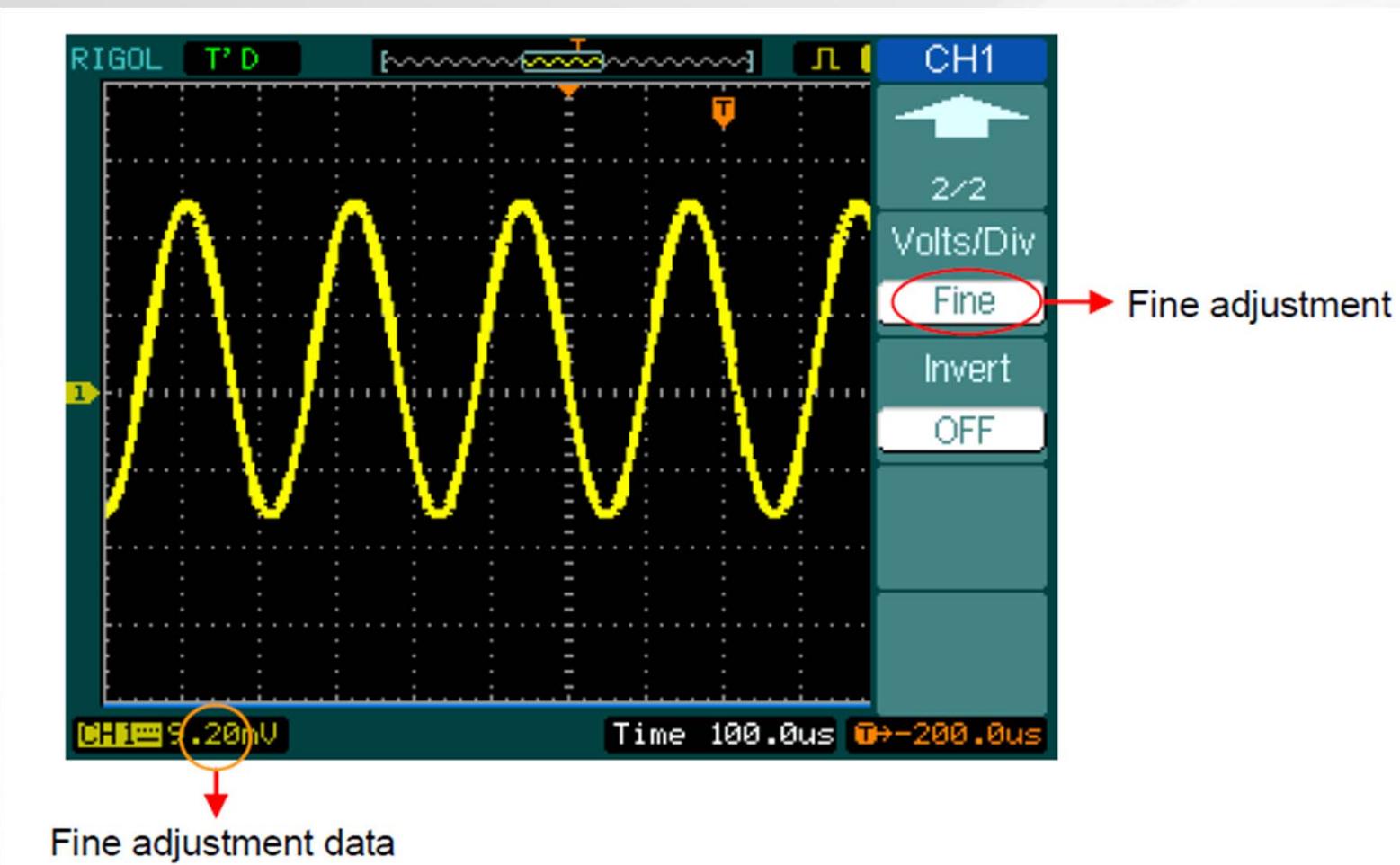
Bandwidth Limit



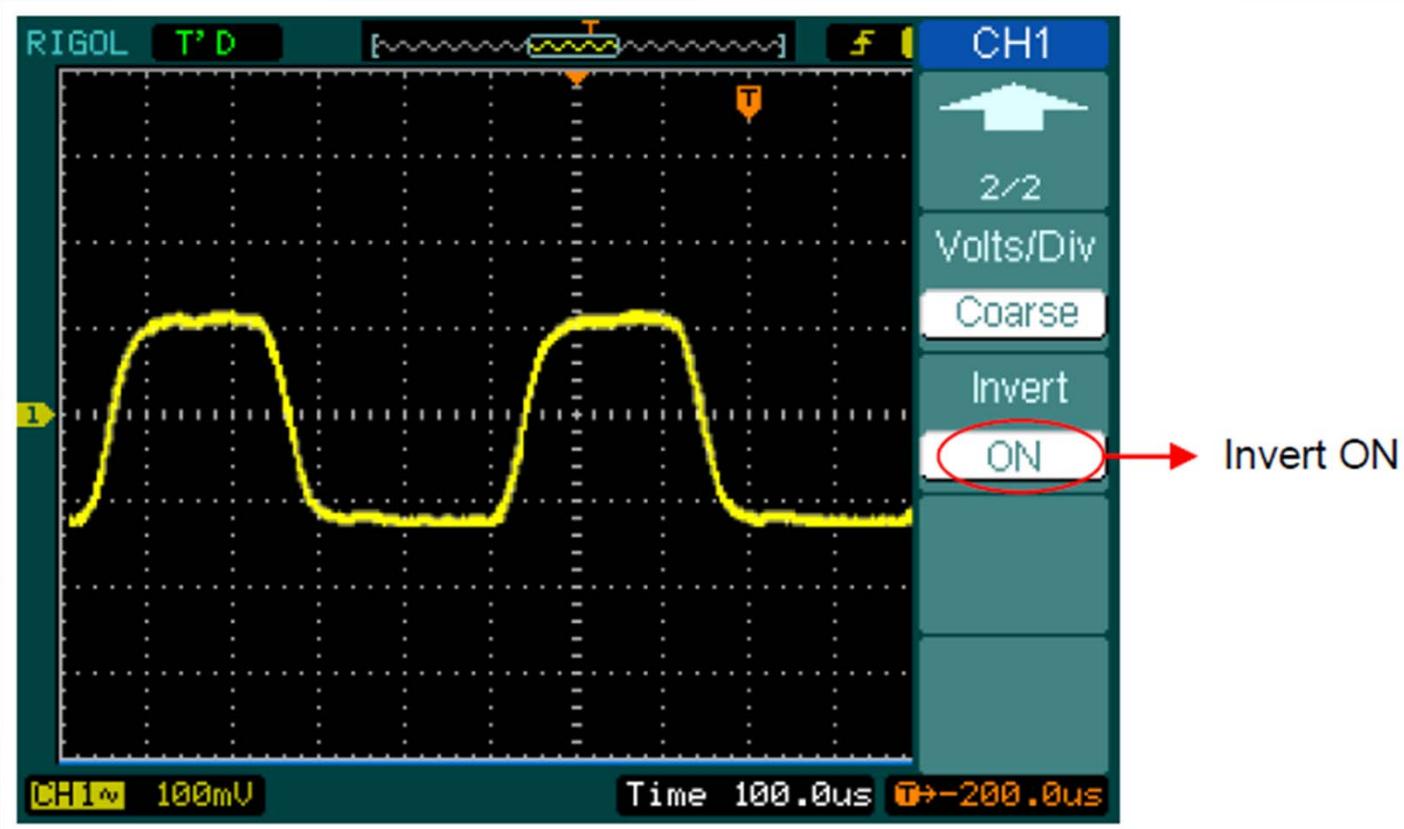
Probe Attenuation



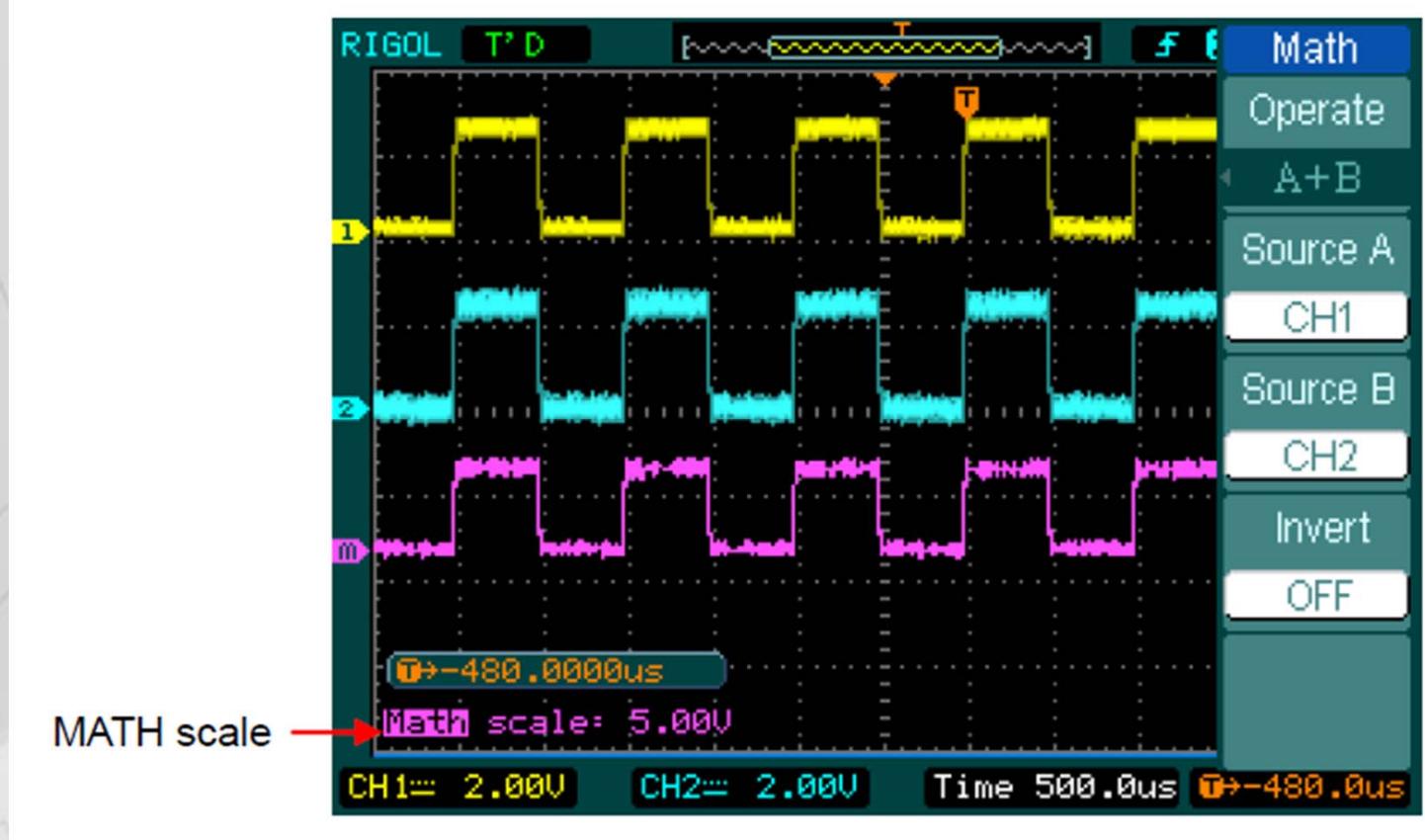
Vertical fine adjustment



Invert function



Math function

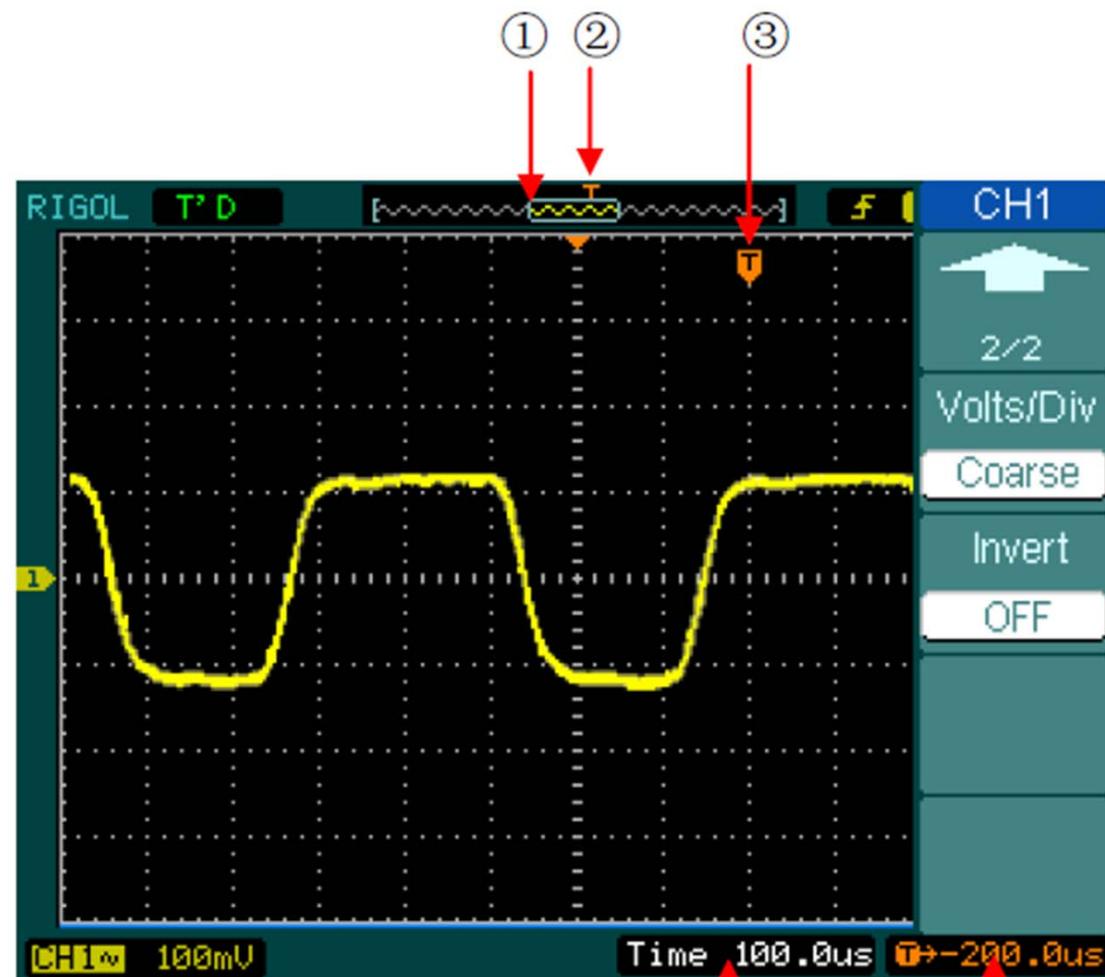


Math function

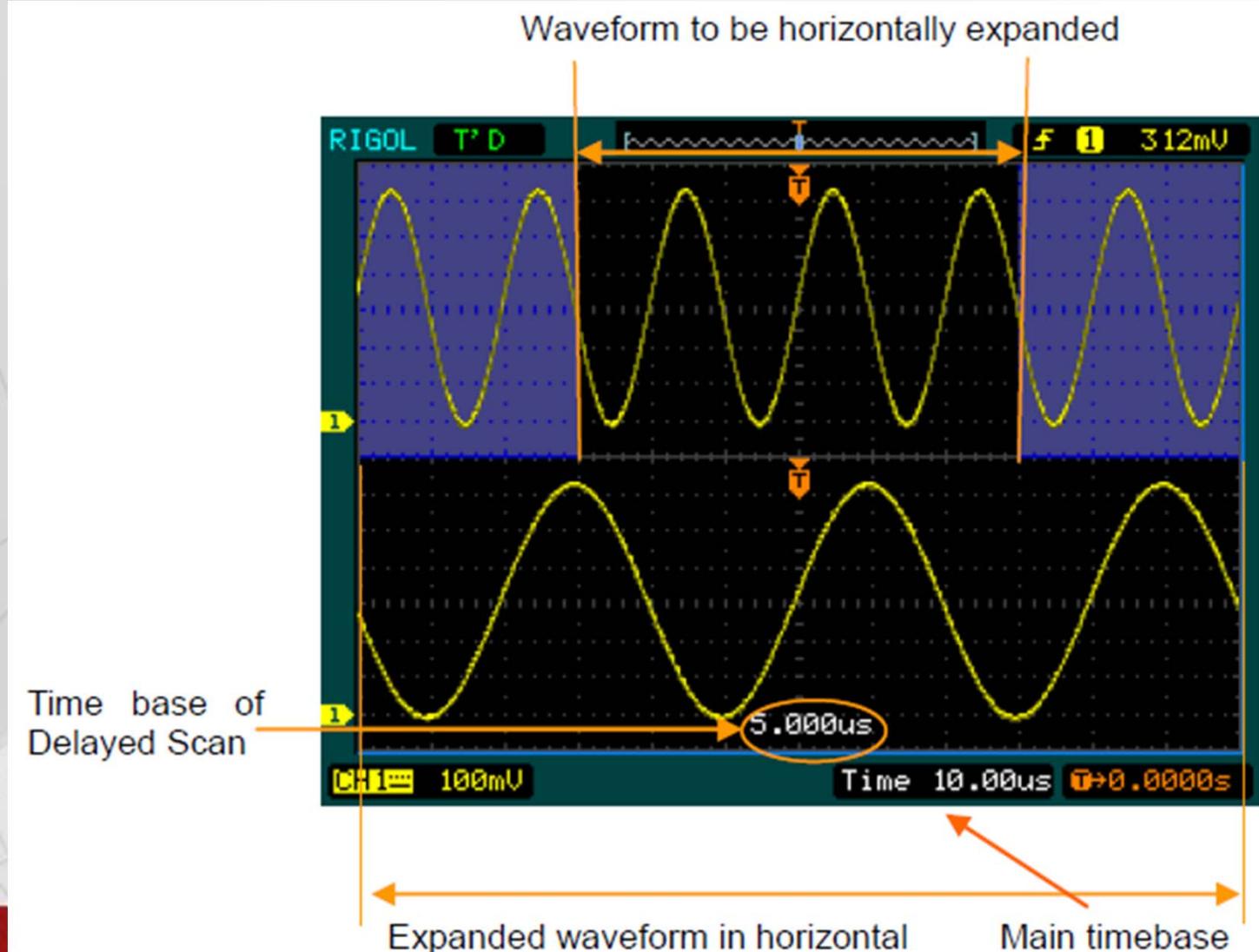


Menu	Settings	Comments
Operation	A+B A-B AxB FFT	Add source A and source B Subtract source B from source A Multiply source B by source A Fast Fourier Transform
Source A	CH1 CH2	Define CH1 or CH2 as source A
Source B	CH1 CH2	Define CH1 or CH2 as source B
Invert	ON OFF	Invert the MATH waveform. Restore to original waveform display.

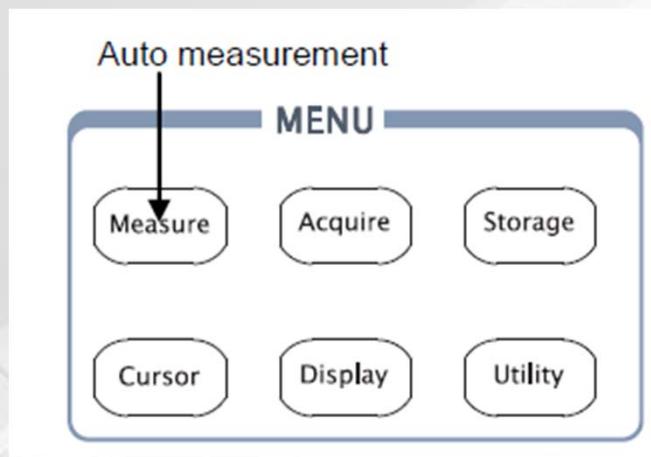
Horizontal



Delay scan



Automatic measurement



Voltage measurement

Figure 2- 111



Table 2- 73 The Voltage Measurements menu (Page 1/3)

Menu	Settings	Comments
Vmax		Measure maximum voltage of a waveform
Vmin		Measure minimum voltage of a waveform
Vpp		Measure Peak-to-Peak Voltage
Vtop		Measure a flat top voltage of a square waveform

Voltage measurement

Figure 2- 112

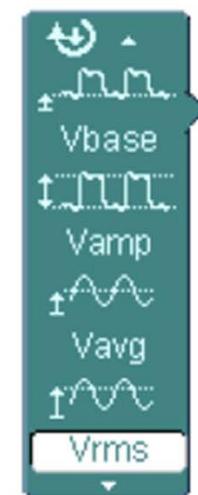


Table 2- 74 The Voltage Measurements menu (Page 2/3)

Menu	Settings	Comments
Vbase		Measure a flat base voltage of a square waveform
Vamp		Measure voltage between Vtop and Vbase
Vavg		Measure average voltage of a waveform
Vrms		Measure Root Mean Square Voltage of a waveform

Voltage measurement

Figure 2- 113



Table 2- 75 The Voltage Measurements menu (Page 3/3)

Menu	Settings	Comments
Overshoot		Measure overshoot in percentage of an edge
Preshoot		Measure preshoot in percentage of an edge

Time measurement

Figure 2- 114



Table 2- 76 The Time Measurements menu (Page 1/3)

Menu	Settings	Comments
Period		Measure Period of a waveform
Freq		Measure Frequency of a waveform
Rise time		Measure Rise Time of a rising edge
Fall time		Measure Fall Time of a falling edge

Time measurement

Figure 2- 115

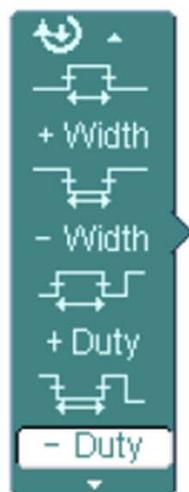


Table 2- 77 The Time Measurements menu (Page 2/3)

Menu	Settings	Comments
+Width		Measure +Pulse Width of a pulse wave
-Width		Measure -Pulse Width of a pulse wave
+Duty		Measure +Duty Cycle of a pulse wave
-Duty		Measure -Duty Cycle of a pulse wave

Time measurement

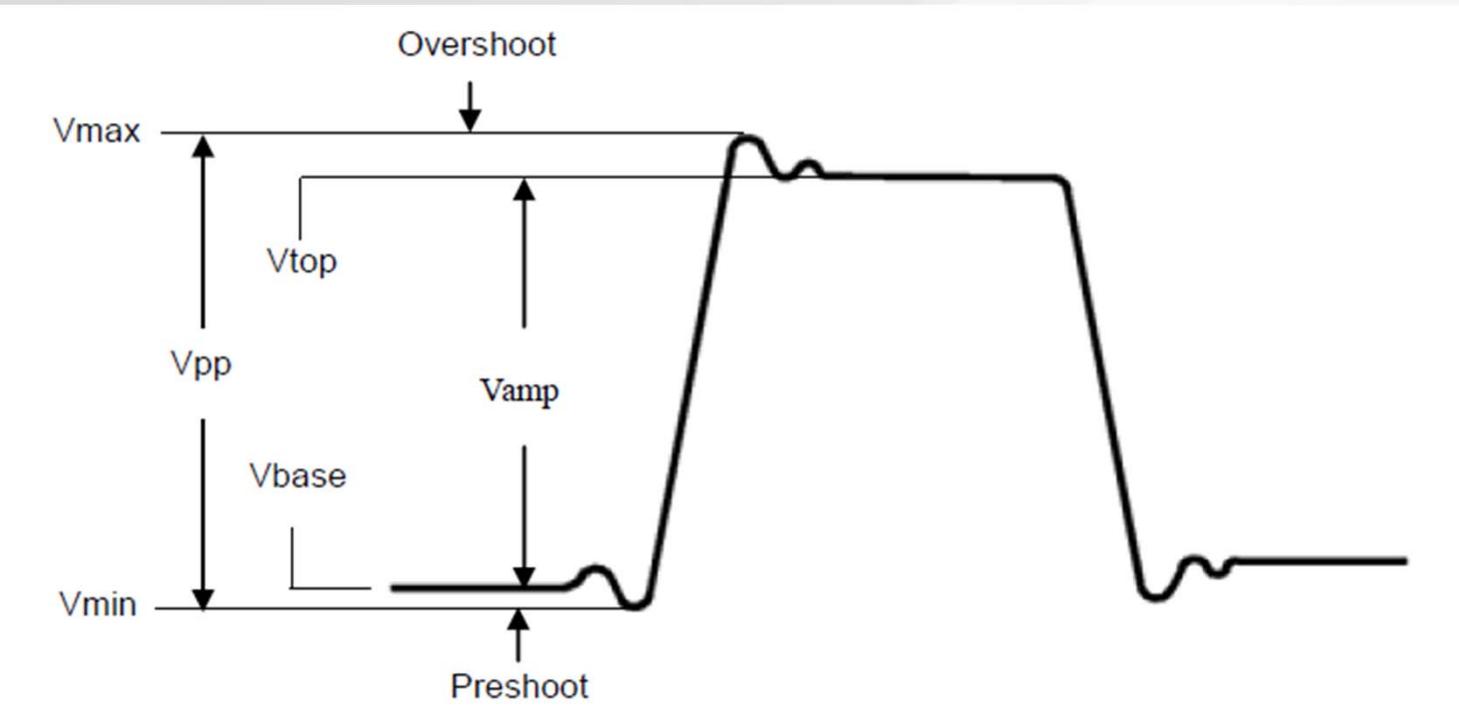
Figure 2- 116



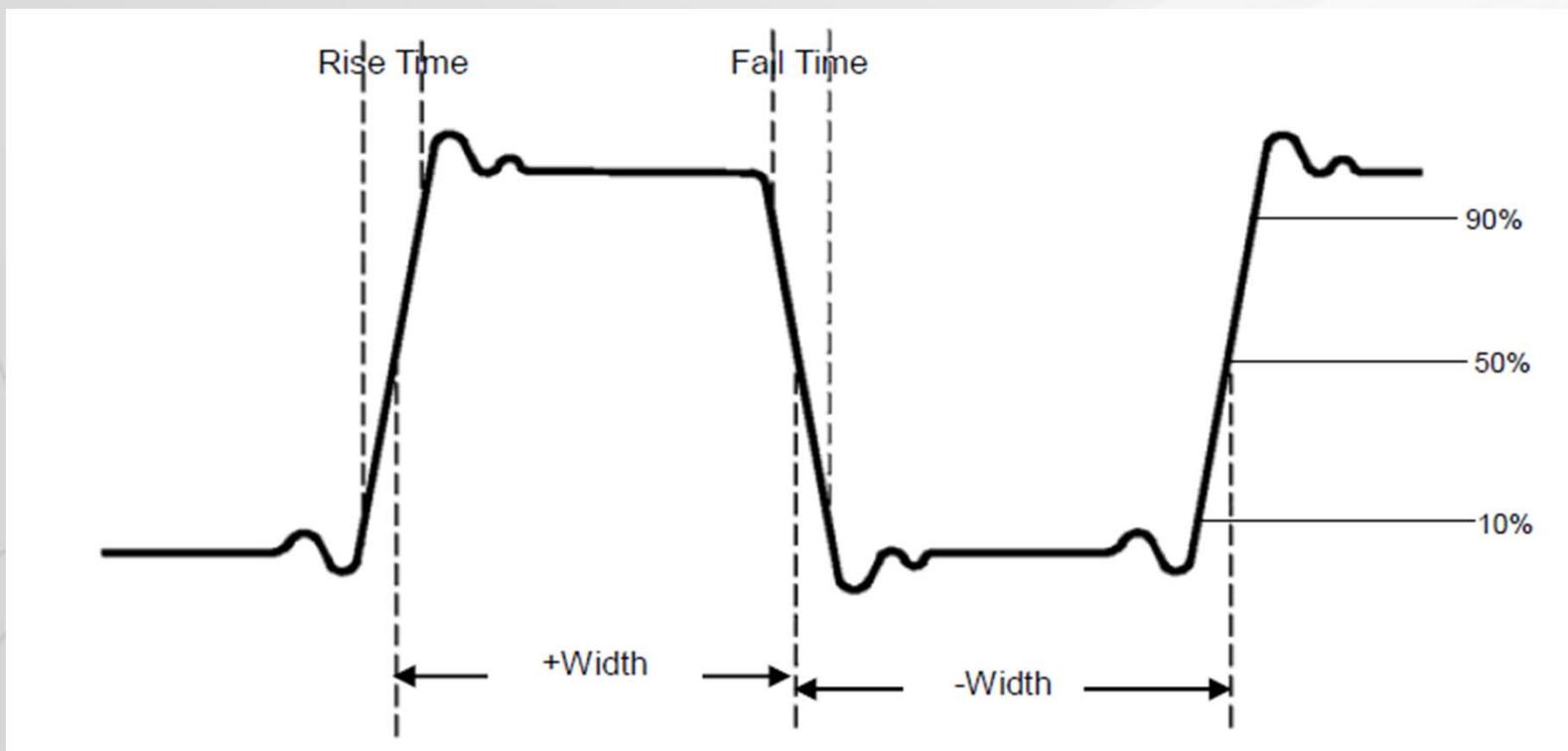
Table 2- 78 The Time Measurements menu (Page 3/3)

Menu	Settings	Comments
Delay1→2↑		Measure the signals delay between two channels at the rising edge
Delay1→2↓		Measure the signals delay between two channels at the falling edge

Voltage parameters



Time parameters



Storage function

นอกจากออสซิลสโคปจะสามารถวัดสัญญาณที่เกิดขึ้นช้า ๆ กันได้ในบางกรณีเราอาจต้องการจับสัญญาณที่เกิดขึ้นชั่วครั้งชั่วคราว ในกรณีนี้เราจะจำเป็นต้องมีคุณลักษณะที่เรียกว่า Storage function ตัวอย่างเช่นวัดระดับความต่างศักดิ์ขณะที่ปิดหรือเปิดสวิทช์ การชาร์จประจุของคาปาซิเตอร์ สัญญาณเหล่านี้เป็นสัญญาณที่เกิดขึ้นเพียงครั้งเดียว

Storage function

The following steps show how to use the oscilloscope to capture a single event.

1. Set the probe and the channel attenuations to 10X.
2. Set up the trigger.
 - (1) Press the **MENU** button in the Trigger control area to display the menu.
 - (2) Press **Edge** to select the trigger mode
 - (3) Press **Slope** to select **f**
 - (4) Press **Source** to select **CH1**
 - (5) Press **Sweep** to select **Single**
 - (6) Press **Set Up→Coupling** to select **DC**
3. Turn the vertical and horizontal **SCALE** knobs to adjust the Volts/Div and the Time base in a proper range for the signal
4. Turn the **LEVEL** knob to adjust trigger level
5. Press **RUN/STOP** button to start capturing. When the trigger conditions are met, data appears on the display representing the data points that the oscilloscope obtained with one acquisition.