CONTENTS

1. SAFETY PRECAUTION

CQ5010Ais a portable Oscilloscope with frequency bandwidth of 0~10 MHz and sensitivity of 5mV/DIV~5V/DIV. Equipped with 10:1 probe which makes the sensitivity up to 50V/div. Sweep at 0.1S/DIV ~ 0.1μS/DIV on horizontal system. The oscilloscope is easy to operate, and highly reliable. It is an ideal instrument for research, production, education, and development in electronic device or circuitry.

The instrument is designed and tested in accordance with EN publication 61010, CAT II, Pollution degree II and Overvoltage 600V. The instrument has been tested in accordance to the following EC Directives (EMC):

a. EN50082
b. EN55011
c. EN61000-3-2
d. EN61000-3-3

The instrument complies with the requirements of the European Council Directive 89/336/EEC (EMC Directive) and 73/23/EEC (Low Voltage Directive). To ensure that the instrument is used safely, follow all safety and operating instructions in this manual. If the instrument is not used as described in this manual, the safety features might be impaired.

WARNING

⚠

Non compliance with the warnings and/or the instructions for use may damage the instrument and/or its components or injure the operator.

Take extreme care for the following conditions when using the instrument:

- For your own safety and that of the instrument, you must follow the procedures described in this instruction manual and especially read all the notes preceded by the symbol ⚠ carefully.
- Do not use this instrument in a location where there is explosive gas in the vicinity. The use of this instrument in a location where there is explosive gas could result in explosion.
- If there is any smoke, abnormal odor, or abnormal sound coming display type this instrument, immediately switch off the power and disconnect the power cord. Continuous using of this instrument under these conditions could result in electrical shock or fire. After disconnecting the power cord, contact the service offices for repair. Repair by the user is dangerous and should be strictly avoided.

- Take care not to allow water to get into this instrument or the wetting of the instrument. The use of this instrument in a wet state could result in electrical shock or fire. If water or other foreign matter has gotten into this instrument, first switch the power off, remove the power cord and call for repair.
- Do not place this instrument on an unstable place such as on a shaky stand or on a slant. The dropping or turning over of this instrument could result in electrical shock, injury or fire. If this instrument has dropped or its cover has been damaged, switch the power off, remove the power cord and call for repair.
- Do not allow any foreign matter such as metal or inflammable substance to get in from the air hole. The entrance of any foreign matter from the ventilation port, etc., could result in fire, electrical shock, or power failure.
- Use this instrument with the rated AC power supply. Use of this instrument with a voltage other than specified could result in electrical shock, fire or power failure. The usable power voltage range is marked on the rear panel.
- Do not remove either the cover or panel.
- Take sufficient care when measuring high voltages.
- Do not modify this instrument.
- Avoid use of any damaged cable or adapter.

2. SPECIFICATIONS

2.1 VERTICAL SYSTEM

Sensitivity	5mV/DIV. ~5V/DIV ±3%
Hold Off Time	≧2.5:1
Rise Time	≦35ns
Bandwidth(-3dB)	DC:0~10MHz AC:10Hz~10MHz
Input Impedance	1MΩ ±3%,30 pF ±5pF
Max. Input Voltage	400V (DC + AC peak)

2.2 TRIGGER SYSTEM

Trigger Sensitivity	Int 1 div., Ext 0.3V
Trigger Input Impedance	1MΩ 30pF
Trigger Max. Input Voltage	400Vpk
Trigger Sources	Int, Line, Ext
Trigger Mode	Norm, AUTO, TV

2.3 HORIZONTAL SYSTEM

Sweep Time	0.1S / DIV ~0.1μs / DIV ±3%
Variable Range	≧2.5:1

2.4 X-Y MODE

Sensitivity	0.2V/DIV～0.5V/DIV
Bandwidth(-3dB)	DC: 0~1MHz AC: 10Hz~1MHz

2.5 CALIBRATION SIGNAL

Waveform	Symmetric Square Wave
Range	05.V ±2%
Frequency	1KHz ±2%

2.6 CRT

Display Area	8 × 10DIV 1DIV=6mm
Accelerating Voltage	1200V
Display Color	Green

2.7 POWER SOURCE

Voltage Range	220V-240V,110V-127V
Frequency	50Hz ±2Hz 60Hz±2Hz
Max. Watt	25W

2.8 PHYSICAL FEATURES

Weight	3kg
Dimensions (H x W x D)	85 ×215 ×278mm

2.9 WORKING ENVIRONMENT

Working temperature	0°C ~ 40°C
Storage Environment	-40°C ~60°C
Working Humidity	90%(40°C)
Storage Humidity	90%(50°C)
Working Altitude	500m
Non-Working Altitude	15000m

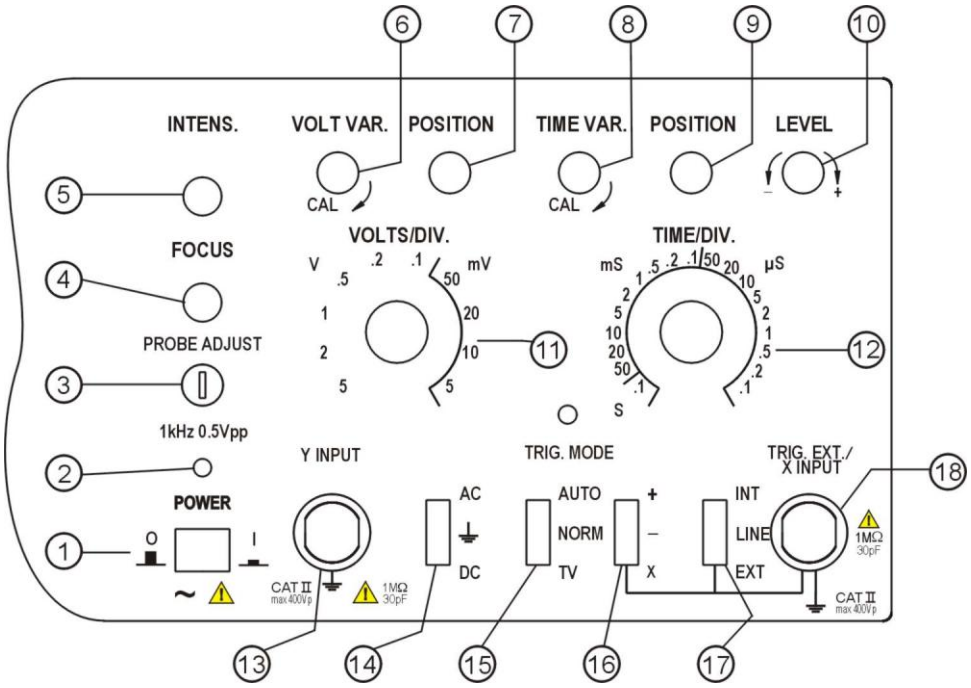
2.10 PRESSURE-PROOF TEST

Pressure-proof test	1500V 1min

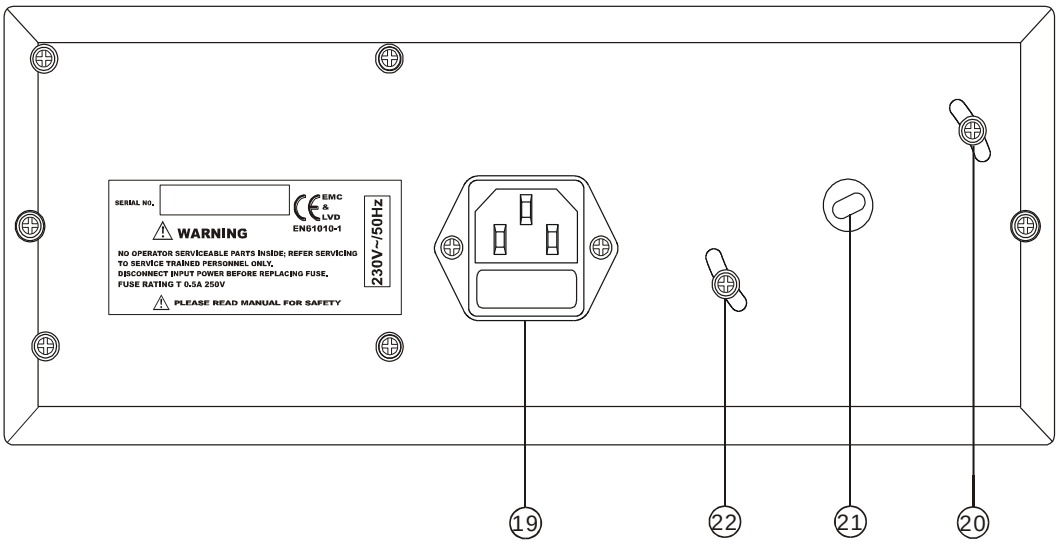
3. CONTROL AND INDICATORS

3.1 Control Panel Position

3.1.1 Front Panel Fig 3-1



3.1.2 Rear Panel Fig 3-2



3.2 FUNCTIONS OF CONTROL SWITCHES

NO.	Control Switches	FUNCTIONS
1	POWER SWITCH	Power on/off
2	POWER LIGHT	Lights when power on
3	PROBE ADJUST	Provide symmetric square wave for 0.5V range, frequency=1KHz. Used for compensate for differences in input capacitance between oscilloscopes.
4	FOCUS	After obtaining appropriate brightness with INTENSITY, adjust FOCUS for clearest line
5	INTENSITY	Controls brightness of display
6	VAR (Vertical)	Provides continuously variable sweep rate, turn clock wise till the end is the calibrating position
7	POSITION	Adjust the vertical system of the trace on the screen
8	VAR (Horizontal)	Provides continuously variable sweep rate, turn clock wise till the end is the calibrating position
9	POSITION	Horizontal positioning control of trace on the screen
10	LEVEL	Control signal trigger to sweep at certain level
11	VOLTS/DIV	Adjust sensitivity of the vertical system
12	TIME/DIV	Adjust sweep rate
13	INPUT	Y vertical input terminal
14	coupling options (AC⊥DC)	Selects input coupling options
15	Trigger mode (AUTO, NORM, TV)	AUTO : Single trace is shown even no signal existed. automatically reverts to triggered sweep operation when adequate triggered signal comes in. NORM: In normal triggering mode, sweep is only generated when adequate trigger signal is present TV: Used for TV signals
16	SLOPE (+/-; X)	+: Triggering occurs when trigger signal crosses trigger level in a positive-going direction. -: Triggering occurs when trigger signal crosses trigger level in a negative-going direction X: Selects X-Y mode
17	INT/EXT/LINE	Switch to select the Trigger Source INT/EXT/LINE
18	Ext. Trig Input Terminal	When switching [16] to EXT/X, it's X-Y input terminal; When switching [17] to EXT, it's Ext. Trig. Input terminal.
19	POWER INPUT CONNECTOR AND FUSE	Power Input connector (refer to the rear panel for voltage) 220V –240V,110V-127V

3.3 OPERATING INSTRUCTION

3.3.1 VOLTAGE CHECKING

CQ5010A oscilloscope used 220V-240V,110V-127V voltage. Before using, make sure that the correct voltage is being used. Otherwise, it would cause accident and damage to the instrument.

3.3.2 BASIC OPERATION

(1) POSITION FOR COMPONENTS

COMPONENTS	POSITION
INTENSITY [5]	Center
FOCUS [4]	Center
POSITION [7] [9]	Center
VOLTS/DIV [11]	0.1V
VAR [6] [8]	Calibration position
AUTO/NORM [15]	Auto
TIME/DIV [12]	0.5mS
SLOPE +/- [16]	+
INT/EXT/LINE [17]	INT
AC⊥DC [14]	DC

(2) OPERATION

a. Power on [1],

b. Power lights at [2],

c. Allow for warm-up of about 5 minutes, then adjust the intensity[5],

d. Adjust focus [4] for clearest line. If unstable, adjust level [10] .

(3) Horizontal Level Adjustment :

a. Slightly turn [20]、[22] counter clockwise, but not to unscrew;

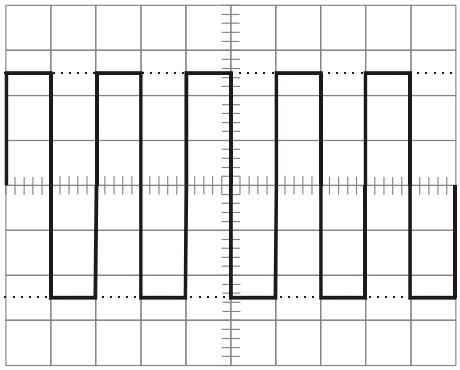
b. Insert a straight end screw driver to [21], and observe the wave, move screw driver in order to let the wave parallel with the horizontal line ;

c. Screw the [20] 、[22].

(4) Connects the calibration signal [3] to Y input terminal[13] with 1:1 probe

(5) Adjust positions [7] 、[9] to obtain waveform like Fig 3-3.

Fig 3-3



3.3.3 VERTICAL SYSTEM OPERATION

(1) VOLTS/DIV switch should turn to the correct position following the input signal range. Adjust position [7] to show the whole waveform within available area. Adjust with VAR [6] if necessarily, Variable ratio is ≧2.5:1.

(2) Input coupling options: "DC" is used for observing object with direct current signal such as logical and static signals, "DC" must be used with low frequency. "AC" is used for observing the AC component of signals. "⊥" is used to establish a trace at the zero volt reference.

(3) X-Y OPERATION: When [16] at EXT/X, CS10H Oscilloscope should be used for X-Y operation, at the moment Input [13] is Y-axis with the same sensitivity as Y, Input [18] as X-axis.

3.3.4 TRIGGER SOURCE

In Fig 3-1, [17] provides 3 sources for selection, INT trigger、EXT trigger input from [13], LINE input from power source.

3.3.5 HORIZONTAL SYSTEM OPERATION

(1) Sweep set up : turn the sweep switch to correct position according to signal frequency, adjust POSITION [9] to obtain the whole waveform within available area. Adjust with VAR [8] if necessarily, Variable ratio ≧2.5:1.

(2) There are 3 kinds of Trigger sources: [15] "AUTO" auto sweep, when triggering signal is applied, Level [10] will adjust to proper position. The screen showing steady free run wave required frequency higher than 20Hz; [15] "NORM" while waiting for sweep, no trace; when receiving input signal, the circuits was triggered to sweep and show waveform . [15] "TV" used to determine TV signal. The signal is negative.

(3) SLOPE selection: Used to select whether the trigger signal crosses trigger level in a positive-going or a negative-going direction.

(4) Level set up : Use to adjust signal sweep on a level as starting reference.

3.3.6 SIGNAL CONNECT

(1) Probe operating : Use 10:1 or 1:1 alternating probes. When using 10:1 probe, input impedance is 10MΩ 16 pF. While if 1:1 is used for observing lower signal, input impedance is 1MΩ 30 pF with input capacitance at 70pF. At this stage, please consider of the affection of the probe upon the detected circuits.

(2) Probe Adjustment

Before using , 10:1 probe must be adjusted correctly, see Point 4.1.2

4 Measurement

4.1 EXAMINATION AND ADJUSTMENT BEFORE MEASUREMENT

In order to be more accurate and prevent errors, the following observations should be done before taking measurement.

4.1.1 TRACE ROTATION

Generally, horizontal trace on the screen should parallel with the horizontal line. Due to the earth's magnetic field and other factors which causes horizontal trace leaning and making errors, you must examine the followings before taking measurement:

(1) Adjust components on the front panel to obtain a horizontal trace on the screen .

(2) Adjust vertical position and make sweep baseline lied in horizontal line of vertical center

(3) Examine whether sweep baseline is parallel with horizontal line, if not , please following point 3.3.2(3) to correct it .

4.1.2 PROBE COMPENSATION

Adjustment of probe is useful to compensate mistakes cause by difference of oscilloscope input characteristic:

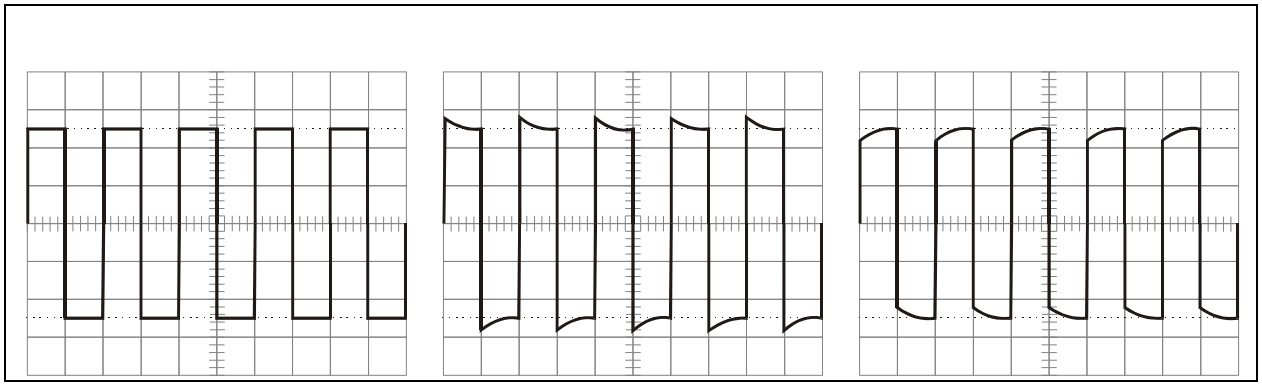
(1) Follow step 3.3.2, setup front panel components, and obtain a sweep baseline.

(2) Set VOLTS/DIV to 10mV/DIV.

(3) Connect CH1 10:1 probe to input terminal, and connect with "CAL".

(4) Follow Chapter 3 to operate relative components, get waveform on the screen as figure 4.1

(5) Observe whether the waveform compensation is good, if not , you can adjust the LF compensation components as shown in figure 4-2



Good Compensate Over Compensate Under Compensate

Fig 4-1

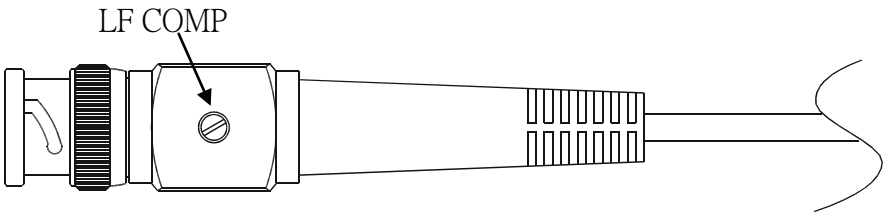


Fig 4-2

4.2 MEASUREMENT

4.2.1P-P Voltage Measurements

Step :

(1) Input signal to INPUT [13] terminal.

(2) Setup VOLTS/DIV and observe waveform, let waveform display on the screen within 5 divisions, and turn VAR clockwise to the calibration position.

(3) Adjust level to make waveform steady.

(4) Adjust sweep controls to show at least one cycle waveform on the screen.

(5) Adjust vertical position to make the bottom of waveform lies on a horizontal axis on the screen. Fig 4-3A.

(6) Adjust horizontal position to make the top of waveform lies center of vertical axis. Fig 4-3B.

(7) Read the divisions between A-B on vertical direction.

(8) Calculate the signal Vp-p using the formula below :

Vp-p= DIV of vertical direction× Sensitivity

For example, In Fig 4-3, vertical divisions of A-B is 4.1 DIV, sensitivity of the 10:1 probe is 2V/DIV, then Vp-p=2×4.1=8.2(V)

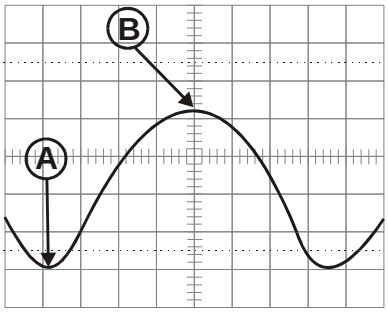


Fig 4-3

4.2.2 DC VOLTAGE MEASUREMENT

STEP:

(1) Setup front panel connector to obtain a sweep baseline on the screen.

(2) Setup input coupling options as "⊥".

(3) Setup POSITION, let sweep baseline coincide with horizontal center, define it as zero reference level.

(4) Input signal into terminal.

(5) Set input coupling to "DC", adjust VOLTS/DIV, let waveform show in the proper position on the screen, turn VAR to the calibration position.

(6) Read the divisions between the zero reference level to the wave form by the tested object.

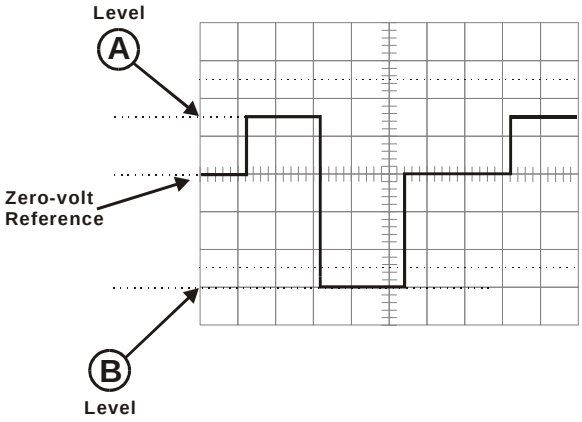
(7) Calculate the DC voltage:

V= divisions on vertical axis × sensitivity × direction(+/-)

Shown in Figure 4-4, zero reference level at the center, use 10:1probe, sensitivity is 2V/Div, 2 points as A & B, A is 1.5 Div. over the zero reference level, B is 3Div. below the zero reference level. DC voltage level of the 2 points are :

VA = 1.5 x 2 x (+) = 3 V VB = 3 x 2 x (-) = -6 V

Fig 4-4



4.3 TIME MEASUREMENTS

4.3.1 TIME SPACE MEASUREMENTS

This is a procedure for making time (period) measurements between two points on a waveform:

(1) Connect the signal to be measured to the input terminal [19].

(2) Adjust level to obtain steady waveform.

(3) Turn VAR clockwise to the calibration position, and set sweep controls to obtain a normal display of 1-2 signal cycles.

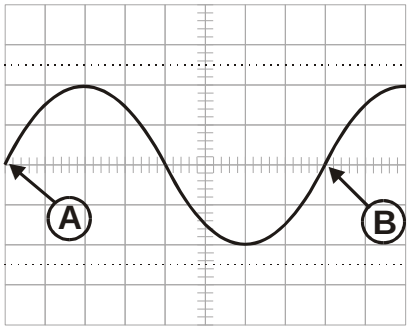
(4) Using the vertical and horizontal positions, set two points to be measured in the waveform on the same horizontal level.

(5) Measure the distance between the two points , the measurement is calculated by the following equation:

$$\text{TIME (S)} = \frac{\text{Distance between 2 points (DIV)} \times \text{rate of sweep (t/Div)}}{\text{Horizontal factor}}$$

Shown in figure 4-6, distance between A & B is 8 Div. sensitivity is 2 μS/Div, Horizontal factor x 1, then Time measurement is 16μS

Fig 4-6



4.3.2 CYCLE & FREQUENCY MEASUREMENTS

Shown in Fig 4-6, frequency measurements are made by measuring the time period of one cycle of waveform (T), and calculating the frequency that equals the reciprocal of the time period. For example, T=16μS, then frequency is:

$$F = 1/T = \frac{1}{16 \times 10^{-6}} = 62.5 \text{ KHz}$$

4.3.3 PULSE RISE TIME AND FALL TIME MEASUREMENTS

For rise time and fall time measurements, the 10% and 90% amplitude points are used as starting and ending reference points.

(1) Apply a signal to the input jack [13].

(2) Use the VOLTS/DIV and VAR controls to adjust the waveform peak to peak height to five divisions.

(3) Adjust vertical position so that the tops of the waveform coincide with 100% point, while the bottoms of the waveform coincide with 0% point.

(4) Adjust Sweep switch to obtain the positive-going direction or negative-going direction of the waveform on the screen.

(5) Use the horizontal POSITION control to adjust the 10% points to coincide with a vertical reference line.

(6) Measure the horizontal distance in divisions between the 10% and 90% points on the waveform (divisions).

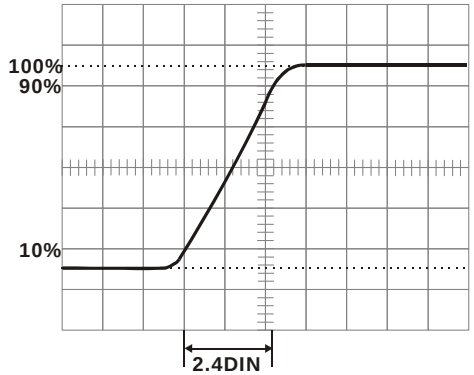
(7) Pulse rise time and fall time measurement is calculated by the following equation:

$$\text{Rise Time} = \frac{\text{Horizontal distance (div)} \times \text{sensitivity (Time/div)}}{\text{Horizontal factor}}$$

For the example shown in Fig.4-7, the horizontal distance from 10% to 90% is 2.4 divisions, the sweep TIME/DIV setting is 1μS/DIV, factor x 1. The rise time is calculated as follows:

$$\text{Rise Time} = \frac{1\mu\text{S/DIV} \times 2.4\text{DIV}}{1} = 2.4\mu\text{S}$$

Fig. 4-7



4.4 TV Signals measurement

Steps :

(1) Connect TV signals to INPUT jack [13]

(2) Set Trigger method to "TV" [10], Sweep switch turn to 2mS/Div.

(3) Observe the screen, it should be negative synchronize pulse wave.

(4) Adjust VOLTS/DIV and VAR to obtain proper range.

4.5 X– Y mode applications

There are some cases which X axis requires control from external signals, e.g. external connection of sweep signals, signals of Lissajous pattern or other equipment's display setup. X-Y mode operation is turn [16] to EXT/X, input signals through [18], then input Y signal through [13].

5 . ACCESSORIES

1 Probe 1 pc.

2 Cord 1 pc.

3 User's manual

⚠ WARNING

DO NOT OPEN THE CASE, HIGH VOLTAGE EXISTED.