OS-782

DIGITAL OSCILLOSCOPE & MULTIMETER

PROMAX

SAFETY NOTES

Read the user's manual before using the equipment, mainly " SAFETY RULES " paragraph.

The symbol  ***on the equipment means "SEE USER'S MANUAL". In this manual may also appear as a Caution or Warning symbol.***

Warning and Caution statements may appear in this manual to avoid injury hazard or damage to this product or other property.

CONTENTS

English

TABLE OF CONTENTS

English

Oscilloscope & Multimeter
Digital Storage
OS-782

1 GENERAL

1.1 Description

The **OS-782** poliscope has two measurement instruments built-in: one digital oscilloscope and one multimeter. Its rugged construction, small size, lightweight and battery-powered, lead it to be a handheld instrument ideal to carry out multiple external measurements, where to work with conventional equipments it is very uncomfortable. It is very useful to measure the electrical magnitudes and to repair electronic equipments given its large diversity of functions, which causes that it become an useful tool in laboratories, as well as for R&D and training activities.

The measurement carried out by the equipment appears on a hi-resolution LCD with backlight.

Their basic characteristics in each one of their operating modes are:

- Two-channels oscilloscope with bandwidth of 20 MHz.
- Sampling rate of 100 MS/s.
- Trigger: TV and edge.
- 20 automatic measurements modes.
- Auto-scale function.
- Memory depth of 6k points by channel.
- USB port.
- Digital Multimeter of 3 ¾ for measurements of R, V, A and C.
- AC adapter and LI-ion battery.
- Display LCD colour of 3.8 " with backlight, 320x240 pixels.
- Vertical and horizontal cursors.

English

1.2 Specifications Oscilloscope ⚠

Only if another instructions are provided, are all technical specifications applicable to the probe with the 10X attenuation switch setting and the HDS series digital type oscilloscope. In order to be up to these specifications, the oscilloscope should meet the following requirement.

- The instrument should operate continuously for more than 30 minutes under the specified operating temperature.
- If the operating temperature range of variation is up to or larger than 5 Celsius degrees, the system function menu must be opened to make the system perform a "self - calibration" procedure.

Except those specifications marked with the word **"Typical"**, all specifications can be up to.

SAMPLING

Sampling modes	Normal sampling. Peak detection. Average value.
Sampling rate	100 MSa/s.

INPUT

Input coupling	DC, AC, Ground.
Input impedance	1MΩ ± 2 % connected in parallel with 20pF ± 5 pF.
Probe attenuation coefficient	1x, 10x, 100x, 1000x.
Max. Input voltage	400V (peak).
Channel delay time(typical)	150 ps.

HORIZONTAL

Sampling rate range	10S/s~100MS/s.
Waveform interpolation	(sin x)/x.
Record length	6 K points on each channel.
Scanning speed range (S/div)	5ns/div~100 s/div, stepping in the "1- 2.5 - 5".
Sampling rate and relay time accuracy	±100ppm(any time interval which is equal to or larger than 1ms).
Time interval (T) measurement Accuracy full bandwidth l	Single: ± (1 sampling interval time+100 ppm reading+0.6 ns)>average 16: ±(1 sampling interval time +100 ppm reading+0.4 ns).

VERTICAL

Analog digital converter (A/D)	With the resolution of 8 bits, make sampling on both channels synchronously.
Sensitivity range (V/div)	5mV/div~5V/div at the input BNC.
Displacement range	±50 V(500 mV~5 V), ±2 V(5 mV~200 mV).
Analog bandwidth	20 M.
Single bandwidth	Ancho de banda completo.
Low frequency response (coupling, AD, -3dB	≥5Hz (at the BNC).
Rise time (typical one at the BNC)	≤17.5ns.
DC gain accuracy	±5 %.
DC measurement accuracy (average value sampling mode)	The voltage difference (V) between any two. points on the waveform after averaging the captured waveforms more than16: ±(5% reading + 0.05 divisions).

Trigger

Trigger sensitivity (Edge triggering)	
DC coupling	CH1 and CH2: 1div(DC~ full bandwidth).
AC coupling	Same as the DC coupling when it is equal to or larger than 50Hz.
Triggering lever range	±6 divisions from the screen center.
Triggering level accuracy (typical) which is applicable to the signal with rise and fall time equal to or longer than 20ns	±0.3 divisions
Trigger displacement	655 divisions for pre-triggering and 4 divisions for post- triggering.
Trigger Holdoff range	100 ns~10 s.
Make a 50% level setting (Typical).	Operation with the input signal frequency equal to or larger than 50Hz.
Trigger sensitivity (Video Triggering and typical mode)	2 divisions of peak-to-peak value.
Signal system and line/field	Support the NTSC, PAL and SECAM frequency (Video triggering mode) broadcasting systems of any field or line frequency.

Measurement

Cursor measurement	Voltage difference (ΔV) and time difference (ΔT) between cursors (ΔV).
Auto measurement	Peak-to-peak value, average value, root mean square value, Frequency, cycle period, Vmax, Vmin,Vtop, Vbase, Vamp, Overshoot, Preshoot, RiseTime, Fall Time, +Width, -Width, +Duty, -Duty, Delay A B and Delay B A.

English

GENERAL SPECIFICATIONS

Display	
Display type	3.8'' color LCD display.
Display resolution	320 (horizontal) x 240 (vertical) pixels.
Power consumption	4096 colors.
Mechanical features	
Dimensions	180 (W) × 115 (H) × 40 (D) mm.
Weight	0.645 kg.
Power supply	
Internal	7.4 V Li-Ion Built-in Rechargeable battery.
External	Means network adapter included. For Europe and other countries.
Input	100-240 VAC 50 Hz / 6W.
Working environment	
Temperature Operation	0 to 50 °C.
Power adapter	0 to 40 °C.
Storage Temperature	-20 to +60 °C.
Humidity in operation	
0 to 10 °C	no condensation.
10 to 30 °C	95 %
30 to 40 °C	75 %
40 to 50 °C	45 %
Humidity in storage	
0 to 10 °C	no condensation

ACCESSORIES

Two 1:1 (10:1) passive oscilloscope probes of 1.2 meters long SA016 x1 x10.
A pair of test leads of multimeter PP013.
One communication cable for USB port.
A measuring extension module for small current
A measuring extension module for small capacitance.
One AC power adapter for Europe and other countries (AL782)
A User Manual.0 MI1452
An operational optical disk.
A software CD.

1.3 Specifications Multimeter

Maximum tension of the points of measure to land 400V CAT II
Voltage (VDC)
Input Impedance: 10MΩ

Range	Accuracy	Resolution
400 mV	± 1% ± 1 digit	100 μV
4.000 V		1 mV
40.00 V		10 mV
400.0 V		100 mV

Input protection 1000 VDC or peak AC

Voltage (VAC)
Input Impedance: 10M Ω.
Frequency range: from 40 Hz to 400 Hz.
Display: Virtual value of the sine wave.

Range	Accuracy	Resolution
4.000 V	± 1% ± 3 digits	1 mV
40.00 V		10 mV
400.0 V		100 mV

Input protection 750 VDC or peak AC

Direct Current (ADC)(1)

Range	Accuracy	Resolution
40.00 mA	± 1% ± 1 digit	10 uA
400.0 mA	± 1.5% ± 1 dígito	100uA
20A**(2)**	± 3% ± 3 dígitos	10 mA

Alternating Current (AAC) (1)

Range	Accuracy	Resolution
40.00 mA	± 1.5% ± 3 digits	10 uA
400.0 mA	± 2% ± 1 digit	100 uA
20A**(2)**	± 5% ± 3 digits	10 mA

(1) ATENTION: Not to overcome in any case 400mA or 20A respectively.
(2) With the extension module of measure of current.

English

Resistance

Range	Accuracy	Resolution
400.0 Ω	± 1% ± 3 digits	0.1 Ω
4.000k Ω	± 1% ± 1 digit	1 Ω
40.00k Ω		10 Ω
400.0k Ω		100 Ω
4.000M Ω		1 KΩ
40.00M Ω	± 1.5% ± 3 digits	10 KΩ

Capacitance

Range	Accuracy	Resolution
51.20 nF	± 3% ± 3 digits	10pF
512.0 nF		100pF
5.120 uF		1nF
51.20 uF		10nF
100 uF		100nF

Diode

Voltage reading: 0 V ~ 1.5 V

On-off Test

You can a beep sound when the on-resistance is less than 50 Ω.

2 SAFETY RULES

2.1 General

* Only use this equipment as **OSCILLOSCOPE** in systems with their negative of measurement connected to no-dangerous voltages with respect to the ground potential.
* Only use the equipment as **MULTIMETER** in points with a maximum potential of 400 V with respect to the ground potential and over **voltage category CAT II.**
* This equipment can be used in **Overvoltage Category II** installations and **Pollution Degree 2** environments.

  The adapter of net can be used only in interiors.
* When using some of the following accessories **use only the specified ones** to ensure safety

  Power adapter.
  Test leads (Multimeter)
  Measurement probes (Oscilloscope)

* **The negative of measurement like Osciloscope** is common to the negative potential of the conector of input / output of information.
* **El negative of measurement** of the channels of the osciloscopio is common.
* On having effected measurements to disconnect the cables that are not in use.
* Revise the condition **of test leads** before the utilization.
* Observe all **specified ratings** both of supply and measurement.
* Remember that voltages higher than **70 V DC** or **33 V AC rms** are dangerous.
* Use this instrument under the **specified environmental conditions**.
* **The user not authorized** to carry out the following maintenance operations.
  Any change on the equipment should be carrier out byqualified personnel.
* **Do not obstruct the ventilation system**.
* Follow the **cleaning instructions** described in the Maintenance paragraph.

English

* Symbols related with safety:


DIRECT CURRENT


ALTERNATING CURRENT


DIRECT AND ALTERNATING


GROUND TERMINAL


PROTECTIVE CONDUCTOR


FRAME TERMINAL


EQUIPOTENTIALITY

ON (Supply)


OFF (Supply)


DOUBLE INSULATION
(Class II Protection)


CAUTION
(Risk of electric shock)


CAUTION REFER TO MANUAL


FUSE

2.2 Descriptive Examples of Over-Voltage Categories

Cat I Low voltage installations isolated from the mains

Cat II Portable domestic installations

Cat III Fixed domestic installations

Cat IV Industrial installations

3 DESCRIPTION FOR FRONT PANEL AND KEYS

See the following Figure 1 :

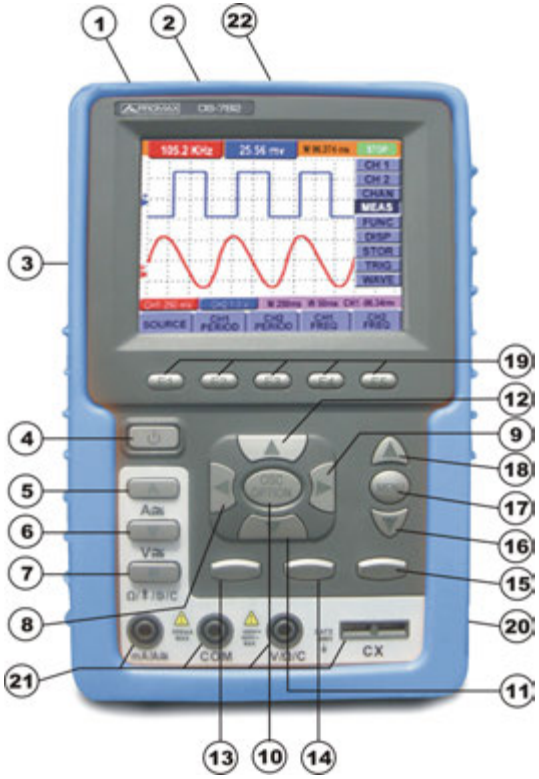


Figure 1.- Front Pannel.

Description:

1. Power adapter jack.
2. USB port.
3. Backlight switch.
4. : Power switch.
5. A: Multimeter current measurement key.

English

6. V: Multimeter voltage measurement key.
7. R: Multimeter resistance, triode, On/Off and capacitance measurement key.
8. OSC ◄: Oscilloscope left-direction adjustment key.
9. OSC ►: Oscilloscope right-direction adjustment key.
10. OSC OPTION: Oscilloscope setting key.

    With the combination application of the four keys "OSC ◄", "OSC ►", "OSC ▲" y "OSC ▼", the users can make the following settings circularly by pressing OSC OPTION. The settings include: Voltage Unit Scale of Channel 1 (CH1 VOL); Voltage Unit Scale of Channel 2 (CH2 VOL); Primary Timebase (TIME BASE), zero point position of channel 1(CH1 ZERO), zero point position of channel 2(CH2 ZERO), trigger horizontal position (TIME) and trigger level position (TRIG).

    - When performing Waveform Calculation, the users can also adjust and calculate the Display Multiplying Factor of waveform (CHM VOL) and the vertical display position (CHM ZERO).
    - In cursor measurement mode, the users can adjust the positions of Cursor 1 (V1 or T1) and Cursor 2 (V2 or T2).

11. OSC ▼: Oscilloscope display downward adjustment key.
12. OSC ▲: Oscilloscope display upward adjustment key.
13. OSC/DMM: Operation mode switching key between oscilloscope and multimeter.
14. AUTOSET: Oscilloscope "AUTOSET" setting key.
    - Under the Multimeter Mode, when performing the current or voltage measurement, you can make a measurement switch between AC and DC with this key pressed; when performing the resistance measurement, you can select resistance, diode, On/Off or capacitance measurement circularly with this key.
    - While this key is used for auto setting under the oscilloscope operation mode.
15. RUN/STOP: key for running or stopping the operation.
16. MENU ▼: Choose the lower item on the menu list.
17. MENU: Show / Hide the menu.
18. MENU ▲: Choose the upper item on the menu list.
19. F1~F5: Switch or Adjust options for each menu.
20. BCN input connectors for oscilloscope channels: CH1 and CH2.
21. Multimeter input terminals: Three terminals banana-type; Ma/A, COM, V/Ω/C and two socket terminals for capacitance measurement.
22. Probe compensation output. Test signal of 5 Vpp and 1 kHz frequency.

4 USING THE OSCILLOSCOPE

4.1 Power-Up the oscilloscope

Connect oscilloscope to AC power via a power adapter as shown in Figure 1. (The oscilloscope may still work with built-in Li-ion battery even without AC power supply).

Turn the oscilloscope on by pressing down the power on/off key " ".

The instrument then performs Selfchecking after power on. A greeting window and a sentence "press any key to continue" will display on the screen when the system finishes selfchecking.

The users can press any key to enter the measuring function.

The oscilloscope is powered up in its last setup configuration.

4.2 Charging the oscilloscope

The lithium battery is possibly not charged when delivery. To make the battery with enough electric quantity, it must be charged for 4 hours (the test tool must be turned off during charging). The battery can supply power for 4 hours after being charged completely.

When supplying power by using the battery, a battery indicator is displayed on the top of the screen to show the consumption condition of electric quantity. The symbols that are possibly appear include , , and , where shows that the battery can only be used for about 5 minutes. To charge the battery and power the instrument, connect the oscilloscope using a power adapter according to Figure 1 to charge the battery. The charging speed can be increased by turning off the test tool.

NOTE	To avoid superheat of battery during charging, the environment temperature is not allowed to exceed the permissible value given in technical specification.

NOTE:	No hazard will occur even connecting the charger for a long time, e.g. during a whole weekend. The instrument can automatically switch to slowly charging status.

English

4.3 Oscilloscope Operation Window

See the following figure 2 :

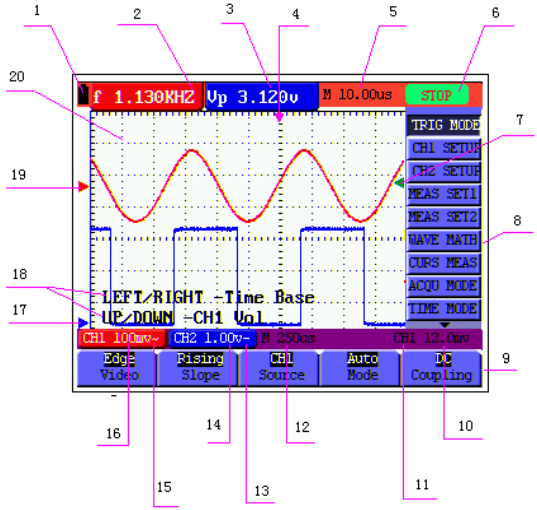


Figure 2.- Oscilloscope Operation Window.

Description

1. Battery electric quantity indicating symbols, including: , , , y .

2,3 Measurement indicators 1 and 2. Diverse parameters can be shown: Frequency "f", peak value (Up), V (average value) etc…

Two parameters from one channel or one parameter from each channel can be shown.

4. The pointer indicates the horizontal triggering position.

5. This reading gives the Time Difference between the horizontal triggering position and the screen centerline. It reads zero when the pointer is in the center of the screen.

6. The trigger state indicates the following information.

Auto: The oscilloscope is working in the automatic mode and displaying the waveform under the non-trigger state.

Trig'd: The oscilloscope has detected a trigger and collecting the information generated after the trigger.

Ready: All pre-triggered data have been captured and the oscilloscope has been ready to receive trigger signals.

Scan: The oscilloscope can gather and display the waveform data continuously in scanning mode.

Stop: The oscilloscope has stopped collecting the waveform data.

7. The green pointer shows the trigger voltage level.

8. Oscilloscope main menu. Pressing the "**MENU** button this menu will be visualised/hide.

9. Menu setting options: There are different setting options for different menus.

10. It reads the value of trigger voltage level.

11. The display shows the trigger signal source.

12. The reading gives the value of primary time base.

13. These graphics present the coupling modes of channel CH2. The graphic "~" indicates AC, the graphic "–" indicates DC.

14. It shows the vertical V/div value for channel CH2.

15. These graphics show the coupling mode of CH1, among which the graphic "~" express indicates AC, the graphic "–" indicates DC.

16. It shows the vertical V/div value for channel CH1.

17. The blue indicator shows the CH2 zero position. If channel CH2 is deactivated, this indicator disappears

English

18. **OSC OPTION** indications: Whenever you press the **OSC OPTION** they are shown parameters to be modified by means of the cursor keys: ◄, ►, ▲ and ▼.

19. The red indicator shows the **CH1** zero position. If channel **CH1** is deactivated, this indicator disappears.

20. Waveform display area. Red waveform represent **CH1**, blue waveform represent **CH2**.

4.4 Navigating a Menu

The following example shows how to use the tool's menus to select a function, as shown in the following figure.

1. Press the **MENU** key to show the Functions Menu in the right side of the display and the corresponding parameters or options in the lower part of the display. In order to hide the Functions Menu press the **MENU** key again.
2. Press the **MENU** ▲ or **MENU** ▼ key to select different function menus.
3. Press a key from **F1** to **F5** to modify the diverse parameters of each function.

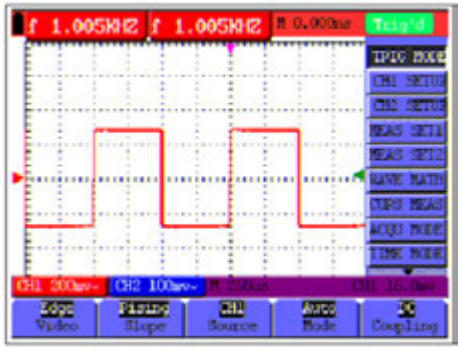


Figure 3.- The tool's menus.

4.5 Manually Setting the Vertical System, Horizontal System and Trigger Position

With the combination application of the four keys "**OSC ◄**", "**OSC ►**", "**OSC ▲**" and "**OSC ▼**", the users can make the following settings circularly by pressing **OSC OPTION.** The settings include: Voltage Unit Scale of Channel 1 (**CH1 VOL**); Voltage Unit Scale of Channel 2 (**CH2 VOL**); Primary Timebase (**TIME BASE**), zero point position of channel 1(**CH1 ZERO**), zero point position of channel 2(**CH2 ZERO**), trigger horizontal position (**TIME**) and trigger level position (**TRIG**).

The following example shows how to use "**OSC OPTION"** key to make a setting.

1. Press once the **"OSC OPTION"** key; the following is displayed at the bottom left side of the screen, as shown in the figure below.

◄/► – Time Base

▲/▼ – CH1 Vol

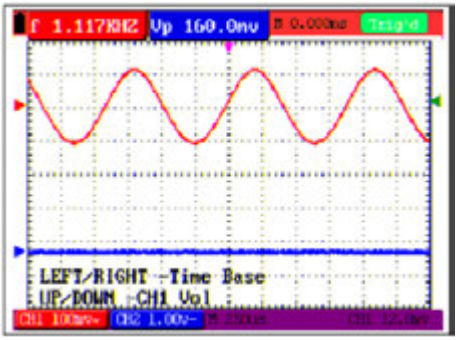


Figure 4.- Voltage Unit Scale of Channel 1.

2. Press the key "**OSC ▲**" or "**OSC ▼**" to adjust the vertical scale of Channel 1 and press , y "**OSC ◄**" "**OSC ►**" to adjust the horizontal time scale.

3. Press "**OSC OPTION"** once again, the following display is visible at bottom left side of the screen, as shown in the following figure:

◄/► – Time Base

▲/▼ – CH2 Vol

English

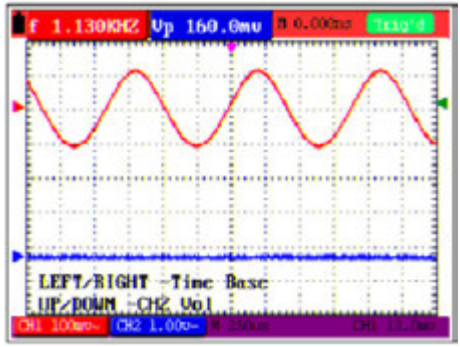


Figure 5.- Voltage Unit Scale of Channel 2.

4. Press the "**OSC ▲**" or "**OSC ▼**" key to adjust the vertical scale of Channel 2 and press the "**OSC ◄**" or "**OSC ►**" key to adjust the horizontal time scale.

5. Press the "**OSC OPTION**" key one more time, and the following display is visible at the bottom left side of the screen, shown as the following figure.

◄/► – Time

▲/▼ – CH1 Zero

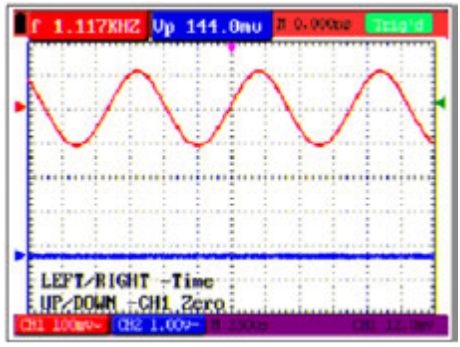


Figure 6.- Zero point position of channel 1.

6. Press "**OSC ▲**" or "**OSC ▼**" key to adjust the zero position of Channel 1 in vertical direction and press "**OSC ◄**" or "**OSC ►**" key to adjust the horizontal position.

7. Again, press "**OSC OPTION**" key and the following appears at the bottom left side of the screen, shown as the following figure 7.

◄/► – Time

▲/▼ – CH2 Zero

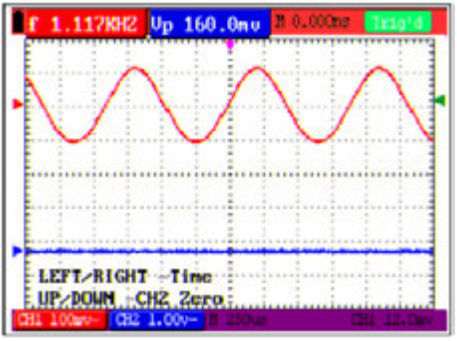


Figure 7.- Zero point position of channel 2.

8. Press the "**OSC ▲**" or "**OSC ▼**" key to adjust the zero position of Channel 2 in the vertical direction and press "**OSC ◄**" or "**OSC ►**" key to adjust the horizontal position.

9. Press "**OSC OPTION**" key once more and the following appears at the bottom left of the screen, shown as the following figure 8.

◄/► – Time

▲/▼ – Trig

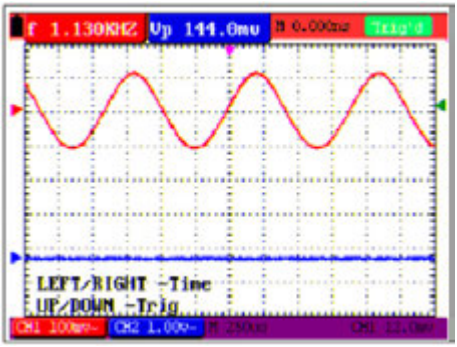


Figure 8.- Trigger level position.

English

10. Press the "**OSC ▲**" or "**OSC ▼**" key to adjust the trigger position of Channel 2 and press "**OSC ◄**" or "**OSC ►**" key to adjust the horizontal position.

11. Press the **"OSC OPTION"** key again and return back to step 1.

4.6 Resetting the Oscilloscope

If you want to reset the Oscilloscope to the factory settings, do the following:

1. Press "**MENU**" key and the function menu appears on the right side of the screen.

2. Press the "**MENU ▲**" or "**MENU ▼**" key to select function setting and three options are visible at the bottom of the screen.

3. Press "**F1**" **RESET** key to select the factory settings. The oscilloscope is set to be the factory settings.

   See the following figure 9.

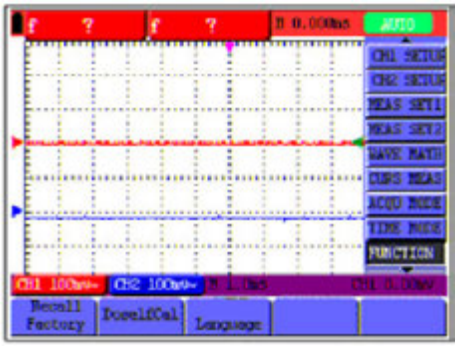


Figure 9.- Reset the Oscilloscope.

4.7 Displaying an Unknown Signal with Auto Set

The Auto-Set feature lets the Oscilloscope display and measure unknown signals automatically. This function optimizes the position, range, time base, and triggering and assures a stable display of virtually any waveform. This feature is especially useful for quickly checking several signals.

To enable the Auto-Set feature, do the following:

1. Connect the test probe to the tested signals.

2. Press the **AUTO SET** key and the Oscilloscope is under the automatic measurement condition. The tested signals appear on the screen.

4.8 Automatic zero-returning of trigger horizontal position and trigger level position

When we adjust the trigger horizontal position and trigger level position to be maximal to make it off the screen center remotely, then we perform the following steps to make trigger horizontal position and trigger level position return to zero automatically.

1. Press "**OSC ◄**" key and "**OSC ►**" key simultaneously, the trigger horizontal position automatically returns to zero.

2. Press "**OSC ▲**" and "**OSC ▼**" button simultaneously, the trigger level position automatically returns to zero.

4.9 Automatic Measurements

The Oscilloscope offers 20 ranges of automatic scope measurements. Your can display two numeric readings: **measurement 1** and **measurement 2**. These measures are shown in the left upper part of the display and can be shown two parameters of a same channel or a parameter of each channel.

To choose a frequency for CHI1, do the following:

1. Press **MENU**, key and the function menu appears on the right side of the screen.

2. Press "**MENU ▲**" or "**MENU ▼**" key to select **measurement 1**. Five items selectable are visible at the bottom of the screen.

3. Press **F1** key and select **Freq CH1** from the mean square root value item. The **measurement 1** window turns its color into red and shows the frequency for input CHI.

NOTE: When pressing the F1~F5 keys the measured channel CH1/CH2 changes alternatively.

English

To choose a Peak-Peak measurement for Input CH2, do the following:

1. Press **MENU**, key and the function menu is displayed on the right side of the screen.

2. Press "**MENU ▲**" or "**MENU ▼**" key and select **Measurement 2**, with 5 items selectable displayed at the bottom of the screen.

3. Press **F4** key to select **PK-PK CH2** from Peak-Peak item. The **measurement 2** window turns its color to be blue and shows the peak-peak value for input CH2. (See the following figure 10).

NOTE: When pressing the **F1**~**F5** keys the measured channel **CH1**/**CH2** changes alternatively.

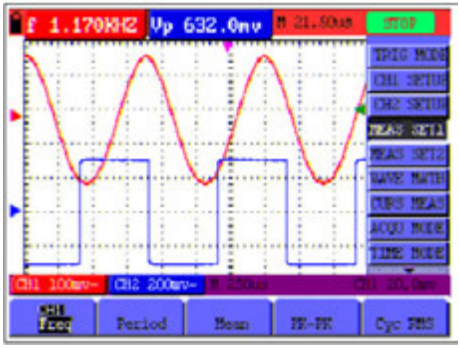


Figure 10: Automatic scope measurements.

4.10 Freezing the Screen

You can freeze the screen (all readings and waveforms):

1. Press the **RUN/STOP** key to freeze the screen and **STOP** appears at top right side of the screen.

2. Press the **RUN/STOP** key once more to resume your measurement. (See the following figure 11).

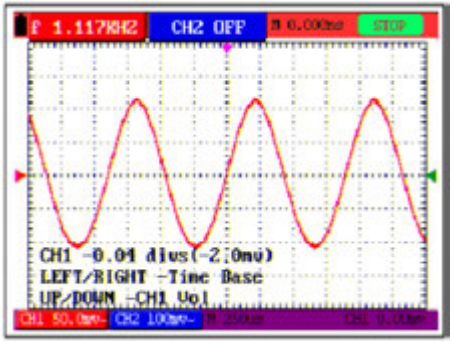


Figure 11.- Freezing the screen.

4.11 Setting the Vertical CH1 and CH2

Each channel has its own independent vertical menu and each item can be set respectively based on the specific channel.

Open the vertical menu of functions and select to **CHANNEL 1** or **CHANNEL 2** functions. The parameters to be modified with **F1~F5** keys appear in the lower part of the display.

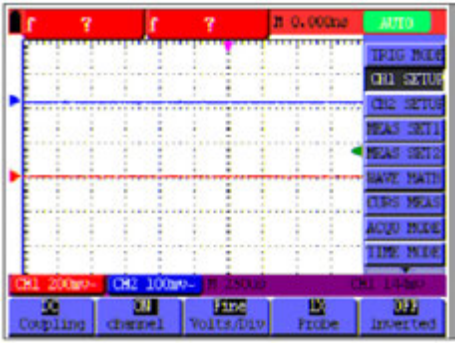


Figure 12.- Setting the Vertical CH1 and CH2.

English

The following Table describes the **Vertical Channel** menu:

Function menu	Setting	Description
Coupling	**AC** **DC** **Ground**	The **DC** component in the input signal is blocked. The **AC** and dc components of the input signal are allowed.
Channel	**Close** **Open**	Close the channel. Open a channel.
Probe	**1x** **10x** **100x** **1000x**	Select one according the probe attenuation factor to ensure a correct vertical scale reading.
Invert	**Close** **Open**	Waveform is displayed normally. Open the **Invert** function of the waveform setting.

4.11.1 Setting the Channel Coupling

With **CH1** taken for example, the measured signal is a sine wave signal containing a dc offset. Press **F1 Coupling** first and then **AC** to make an ac coupling setting. The dc component contained in the tested signal is blocked.

Press **F1 Coupling** first and then **DC** to make a dc coupling setting. Both dc and ac components contained in the tested signal are permitted. The waveform is displayed as the following figure 13, figure 14.

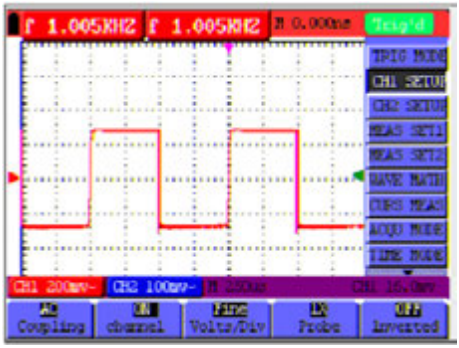


Figure 13.- AC coupling.

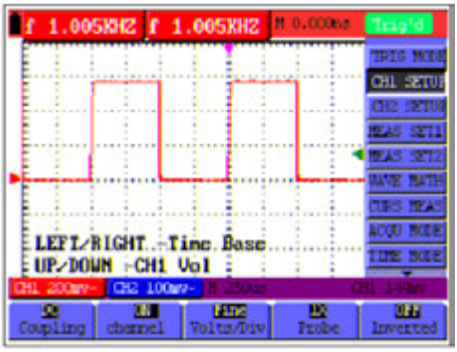


Figure 14.- DC coupling.

4.11.2 Make Open and Close Settings on Channel

With CH1 taken for example:

Press **F2 Channel** first**,** then **Close** to make a Close setting on CH1.

Press **F2 Channel** key first**,** then **Open** to make an Open setting on CH1.

4.11.3 Adjusting the Probe Scale

It is necessary to adjust the probe attenuation scale factor correspondingly in the channel operation menu in order to comply with the probe attenuation scale. If it is a 10:1 probe, the scale of the input channel of the oscilloscope should be selected as **10X** to avoid any error occurring in the displayed scale factor information and tested data.

Press **F3 Probe** to jump to the relative probe:

Probe attenuation factor	Corresponding Menu Setting
1:1	1x
10:1	10x
100:1	100x
1000:1	1000x

Table.- Probe attenuation factor and the corresponding menu setting

English

4.11.4 Setting of Inverted Waveform

Inverted waveform: The displayed signal reverses 180 degrees relatively to the ground potential.

Press **F4 Invert** to start Invert; again press **F4 Invert** to close Invert.

4.12 MATH function "MATH"

The **MATH** functions in showing the result of adding, subtracting, multiplying or dividing calculation on CH1 and CH2 channel waveforms. Also, the result of arithmetic operation can be measured with grid or cursor. The amplitude of the calculated waveform can be adjusted with CHM VOL, which is displayed in the scale factor form. The amplitude ranges from 0.001 through 10 and steps in the 1-2-5 form, that is, it can be expressed as 0.001X, 0.002X, 0.005X, 10X. The position of the calculated waveform can be adjusted up and down with the **CHM ZORE** key used.

The corresponding operation function table.

Setting	Description
CH1-CH2	CH1 waveform minus CH2 waveform.
CH2-CH1	CH1 waveform minus CH2 waveform.
CH1+CH2	Add CH1 waveform into CH2 waveform.
CH1*CH2	Multiply CH1 waveform and CH2 waveform.
CH1/CH2	Divide CH1 waveform by CH2 waveform.

To perform the **CH1+CH2** waveform calculation, do the following:

1. Press the **MENU** key and the function menu appears at the right of the screen.

2. Press the "**MENU ▲**" or "**MENU ▼**" key to select **MATH** and 5 options are displayed at the bottom of the screen.

3. Press the **F3 CH1 + CH2** key and the obtained waveform **M** appears on the screen. Again, press the F3 key and Close the waveform **M**.

4. Press the **OSD OPTION** key and the following is displayed on the screen:

   ◄/► - Time Base
   ▲/▼ - CH1 Vol

5. Press the "**OSC ▲**" or "**OSC ▼**" key to adjust the amplitude of the waveform **M**.

6. Again, press the **OSD OPTION** key twice and the screen shows the following:

◄/► Time
▲/▼ - CHM Zero

7. Press the "**OSC ▲**" or "**OSC ▼**" key to adjust the position of the waveform Math. Now, look at the display and you will find a screen that looks like the following Figure 15.

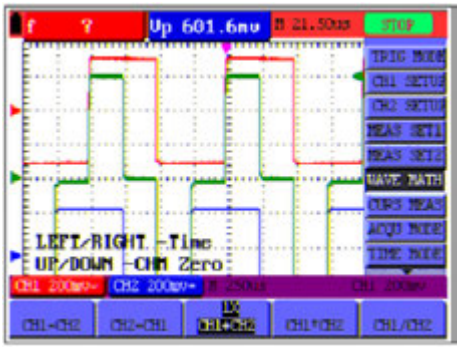


Figure 15.- Waveform mathematics.

4.13 Setting the Trigger System. TRIGGER Function.

The **Trigger** defines the time when the acquisition of data and display of waveform start. If it is set correctly, the trigger can turn an unstable display into a significant waveform.

When starting the acquisition of data, the oscilloscope collects sufficient data to draw the waveform at the left side of the triggering point. With waiting for the triggering condition, the oscilloscope is gathering data continuously. After a trigger is detected, the oscilloscope gathers enough data continuously to draw the waveform at the right side of the triggering point.

To make a trigger mode setting, do the following:

1. Press the **MENU** key and the function menu appears at the right of the screen.

2. Press the "**MENU ▲**" or "**MENU ▼**" key to select **TRIG MODE** and five items selectable are displayed at the bottom of the screen.

English

3. Select and press one from **F1 through F5** key to make a different setting.

4. Press the **OSD OPTION** key and the following is shown on the screen:

◄/► – Time
▲/▼ – Trig

5. Press the "OSC ▲" or "OSC ▼" key to adjust the trigger level position. Now, look at the display: you can see a screen in the following figure 16.

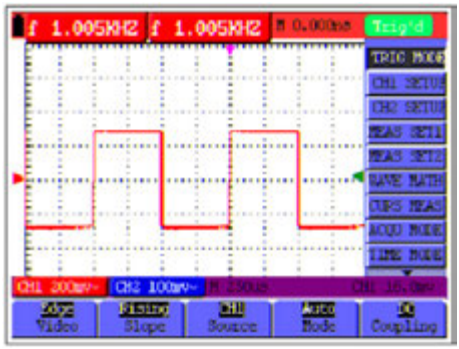


Figure 16.- Edge triggering.

4.14 Triggering Control

There are two triggering modes including Edge triggering and Video triggering. Each trigger mode is set by different function menu.

Edge triggering: It occurs when the trigger input passes through a given level along the specified direction.

Video triggering: Perform video field trigger or line trigger on the standard video signals.

4.14.1 Edge triggering

The **Edge triggering** menu is described in the following table.

Function menu	Settings	Description
Slope	**Rise**	Triggering on the rise edge of the signal.
	Fall	Triggering on the fall edge of the signal.
Signal source	**CH1**	CH1 is used as the trigger source.
	CH2	CH2 is used as the trigger source.
1/2 →		To next menu.
2/2 →		Back to previous menu.
Bloqueo		To holdoff menu.
Trigger mode	**Auto**	Acquisition of waveforms is possible even if there is no triggering condition detected.
	Normal	Acquisition of waveforms can only be done when the triggering condition is satisfied.
	Single shot	The sampling is performed on a waveform when one trigger is detected, then stop sampling.
Coupling	**AC**	With this mode selected, the DC component is prevented from passing-though.
	DC	All dc components are allowed.
	HF Suppression	The HF part of the signal is prohibited and only the HF component is allowed.
	LF Suppression	The LF part of the signal is prohibited and only the LF component is allowed.

Term interpretation

Trigger modes: There are three kinds of trigger modes available for this oscilloscope, that is, auto, normal and single shot.

English

1. Automatic trigger mode: The oscilloscope can acquire the waveform without any triggering condition detected in this mode, in which it will be triggered compulsively when waiting for a specified period of time without any triggering condition ignited When an invalid trigger is enforced the oscilloscope can not keep the waveform in phase.

2. Normal trigger mode: In this mode, the oscilloscope cannot acquire the waveform till it is triggered. When there is not any trigger, the oscilloscope will display the origin waveform without new waveforms captured.

3. Single shot mode: In this mode, the oscilloscope will detect a trigger and capture a waveform at each time when the customer presses the **RUN/STOP** key.

4.14.2 Video triggering

With **Video triggering** selected, the oscilloscope performs the **NTSC, PAL** or **SECAM** standard video signals field, line trigger, odd field, even field or line num trigger. Now, you can see a screen that looks like the following figure 17, figure 18.

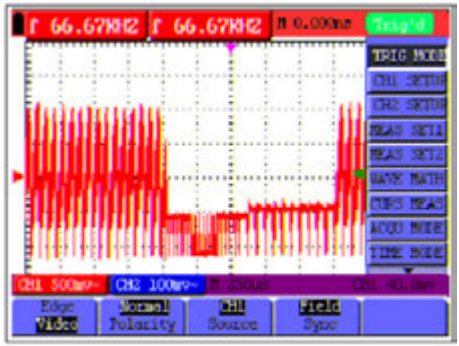


Figure 17: Video field trigger.

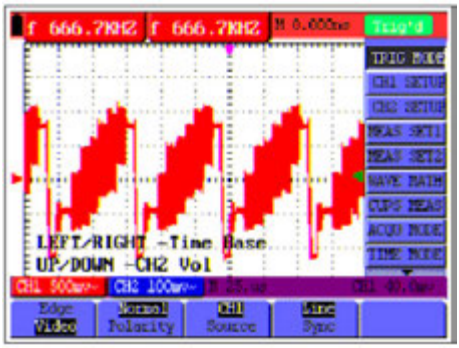


Figure 18.- Video line trigger.

The Video triggering menu is described in the following table:

Function menu	Settings	Description
Polarity	**Normal**	Applicable to the video signal in which the black level is of low level.
	Invert	Applicable to the video signal of which the black level is of high level.
Signal source	**CH1**	Select CH1 as the trigger source.
	CH2	Select CH2 as the trigger source.
Sync	**Line**	Make a video line trigger synchronization setting.
	Field	Make a video field trigger synchronization setting.
	Odd Field	Make a video odd field trigger synchronization setting.
	Even field	Make a video even field trigger synchronization setting.
	Line NO	Make a video designed line.
1/2 →		To next menu.

The Video triggering menu (Second page):

1. When the sync is Line, Field, Odd Field, Even Field, the second page menu is shown as below.

Format	NTSC PAL/SECAM	Video format setting
Holdoff		To go to holdoff menu
2/2 →		Back to previous menu.

English

2. When the sync is Designed Line,the second page menu is shown as below.

Format	NTSC PAL/SECAM	Video format setting
Line	Increase Decrease	Set the line value to increase Set the line value to decrease
Line No.		Set and Show the line valve
Holdoff		To go to holdoff menu
2/2 →		Back to previous menu.

When you go to the holdoff menu,you can see a screen in the following figure 19.

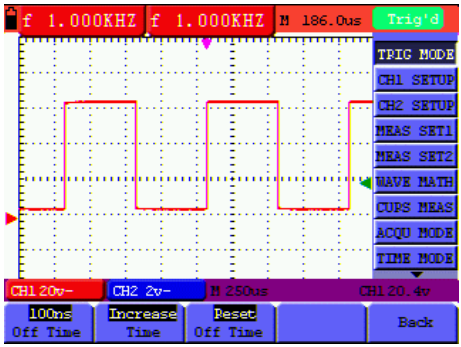


Figure19.-Trigger Holdoff.

The Holdoff menu is described in the following table:

Function menu	Settings	Description
Off Time		Set time slot before another trigger event.
Time	Increase Decrease	Set the off time to increase Set the off time to decrease.
Reset **Off Time**		Reset Holdoff time to 100ns.
Back		Back to previous menu.

NOTE: Trigger Holdoff can stabilize complex waveform, such as the pulse range. Holdoff time is the oscilloscope's waiting period before starting a new trigger. During Holdoff, oscilloscope will not trigger until Holdoff ends.

4.15 Acquiring Mode Setting

Open the vertical menu of functions and select the **ACQUIRE** function. The parameters to be modified with **F1**~**F5** keys will appear in the lower part of the display.

The **Acquiring Mode** menu is described in the list shown as below:

Function menu	Settings	Description
Sampling		Normal sampling mode.
Peak detection		Used to detect the jamming glitch and reduce the possible blurring.
Average value		Used to reduce the random and unrelated noises. Several average factors are available for being selected.
Average factor	4, 16, 64 o 128	Select the average factor.

4.16 Display Setting

Open the vertical menu of functions and select the **DISPLAY** function. The parameters to be modified with **F1**~**F5** keys will appear in the lower part of the display.

The **Display Setting** menu is described in the following table:

Function menu	Settings	Description
Type	**Vector** **Dot**	The vector is filled up spaces between neighboring sampling points in the display. Only sampling points are displayed.
Persistence	**Close** **1s** **2s** **5s** **Infinite**	Setting persistence time for each sampling point.
Display format	**YT** **XY**	Display the relative relationship between vertical voltage and horizontal time. Display CH1 on the horizontal axis and CH2 on the vertical axis.
Communication	**Bitmap** **Vector**	The data transmitted in communication are bitmaps. The data transmitted in communication are vectors.

English

4.16.1 Display Style

The display style includes **Vector** and **Dot** displays, shown as the following figure 20, figure 21:

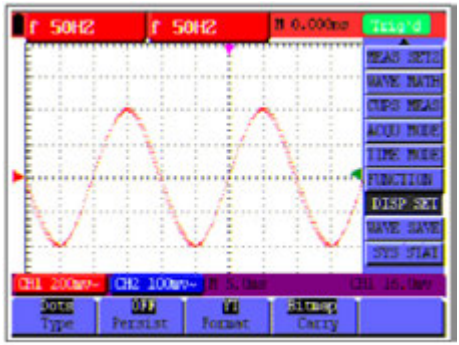


Figure 20.- Dot style.

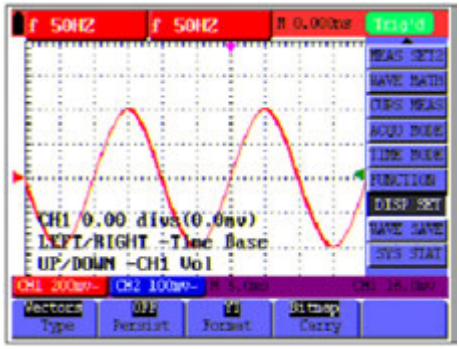


Figure 21.- Vector style.

4.16.2 Persistence

With **Persistence** function selected, the displayed saved original data gradually decay in color and the new data are bright in color; with infinite persistence mode selected, the recorded points will be kept on the screen till the controlled value is changed.

4.16.3 XY mode

This mode is only applicable to **CH1** and **CH2**. With the **XY** mode selected, **CH1** is displayed on the horizontal axis and **CH2** is on the vertical axis; when the oscilloscope is under the sampling mode in which no trigger is found, the data appear in light spots.

Operations for various control keys are shown as below:

- The **CH1 VOL** and **CH1 ZORE** for CH1 are used to set the horizontal scale and position.
- The **CH2 VOL** and **CH2 ZORE** for CH2 are used to set the vertical scale and position continuously.

The following functions do not work in the XY display mode:

- Reference or digital value waveform.
- Cursor.
- Auto Setting.
- Time base control.
- Trigger control.

4.17 Waveform Saving Setups

The oscilloscope can save 4 waveforms, which can be displayed on the screen with the present waveform. The recalled waveform saved in the memory cannot be adjusted.

The **waveform saving /recalling menu** is described in the following list:

Function menu	Setups	Description
Signal source	CH1 CH2 MATH	Select the displayed waveform which you want to save.
Wave	A, B, C, D	Select the address for saving or recalling a waveform.
Saving		Store the waveform of a selected signal source into the selected address.
Addresses A, B, C, D	Close Start	Close or start displaying the waveforms stored in address A, B, C or D.

To save a waveform on **CH1** in address A, do the following:

1. Press the **MENU** key and the function menu appears at the right of the screen.

2. Press the "**MENU ▲**" or "**MENU ▼**" key to select the Waveform Saving. Four items selectable are displayed at the bottom of the screen.

3. Press the **F1** key to select the signal source **CH1**.

4. Press the **F2** key to select the address A.

5. Press the **F3** key to save the waveform on **CH1** in address A.

To display the saved waveform on the screen, do the following:

6. Press the **F4** key to select Start for the address A. The waveform saved in address A will be displayed on the screen in green color.

The display color is green, and the zero point of waveform k, voltage and time is purple.

Now, you can see a screen that looks like the following figure 22.

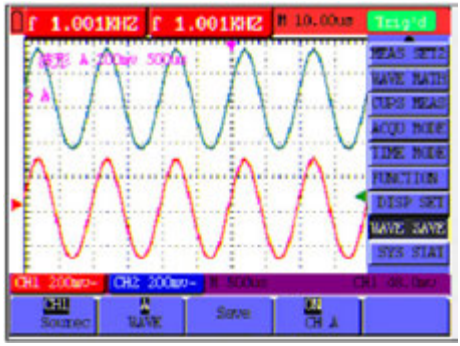


Figure 22.- Waveform Saving.

4.18 Function Setting Menu

Open the vertical menu of functions and select the **SYSTEM** function. The parameters to be modified with **F1~F5** keys will appear in the lower part of the display.

The function setting menu is described in the following list:

Function menu	Setting	Description
Recall Factory		Resume the instrument to its factory settings.
Auto Calibration		Perform the self-correcting procedure.
Language	SPANISH ENGLISH	Select the display language of the system.

Self-correcting

The self-correcting program can improve the accuracy of the oscilloscope under the ambient temperature to the maximum. If the ambient temperature variation is equal to or larger than 5 Celsius degrees, the self-correcting program should be performed to gain the maximum accuracy.

Before the self-correcting program is performed, the probe or lead should be disconnected with the input connector, then, select the **F2** key "**Self-correcting**" item. After confirming that everything is ready, press the **F2** key "**Self-correcting**" key and enter into the self-correcting program.

4.19 Making Automatic Measurements

The oscilloscope can perform 20 types automatic measurements such as frequency, cycle, average value, peak-to-peak value , root mean square value, Vmax, Vmin, Vtop, Vbase, Vamp, Overshoot, Preshoot, RiseTime, Fall Time, +Width, -Width, +Duty, -Duty, Delay A -> B and Delay A -> B. And gives two kinds of measurement results simultaneously on the screen.

The function menu for automatic measurements is described in the following list.

Function menu	Settings	Description
Freq	CH1 CH2	Measure the frequency of CH1 Measure the frequency of CH2
Period	CH1 CH2	Measure the Period of CH1. Measure the Period of CH2
Mean	CH1 CH2	Measure the average value of CHI. Measure the average value of CH2.
Peak-Peak	CH1 CH2	Measure the peak-to-peak value of CH1. Measure the peak-to-peak value of CH2.
Cyc RMS	CH1 CH2	Measure root mean square (RMS) value of CH1. Measure root mean square (RMS) value of CH2.
Vmax	CH1 CH2	Measure the Vmax of CH1 Measure the Vmax of CH2
Vmin	CH1 CH2	Measure the Vmin of CH1 Measure the Vmin of CH2

English

Function menu	Settings	Description
Vtop	CH1 CH2	Measure the Vtop of CH1 Measure the Vtop of CH2
Vbase	CH1 CH2	Measure the Vbase of CH1 Measure the Vbase of CH2
Vamp	CH1 CH2	Measure the Vamp of CH1 Measure the Vamp of CH2
Overshoot	CH1 CH2	Measure the Overshoot of CH1 Measure the Overshoot of CH2
Preshoot	CH1 CH2	Measure the Preshoot of CH1 Measure the Preshoot of CH2
Rise Time	CH1 CH2	Measure the RiseTime of CH1 Measure the RiseTime of CH2
Fall Time	CH1 CH2	Measure the Fall Time of CH1 Measure the Fall Time of CH2
+Width	CH1 CH2	Measure the +Width of CH1 Measure the +Width of CH2
-Width	CH1 CH2	Measure the -Width of CH1 Measure the -Width of CH2
+Duty	CH1 CH2	Measure the +Duty of CH1 Measure the +Duty of CH2
-Duty	CH1 CH2	Measure the -Duty of CH1 Measure the -Duty of CH2
DelayA->B	CH1 CH2	Measure the DelayA->B of CH1 Measure the DelayA->B of CH2
DelayA->B	CH1 CH2	Measure the DelayA->B of CH1 Measure the DelayA->B of CH2

To measure the frequency of CH1 with **Measurement 1** and the peak-to-peak of CH2 with **Measurement 2**, do the following:

1. Press the **MENU** key and the function menu is shown at the right of the screen.
2. Press the **MENU** ▲ or **MENU** ▼ key to select **Measurement 1**. Five options appear at the bottom of the screen.
3. Press the **F1** key to select the frequency measurement as **CH1.** The measurement window 1 on the screen turns into one red in color and shows the frequency of CH1.
4. Press the **MENU** ▲ or **MENU** ▼ key to select **Measurement 2**. Five options appear at the bottom of the screen.
5. Press the **F4** key to jump to the peak-to-peak measurement as **CH2**. The measurement window on the screen turns into one blue in color and shows the peak-to-peak value of CH2.

Now, you can see a screen that looks like the following figure.

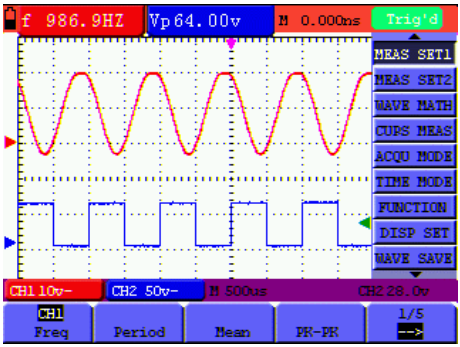


Figure 23.- Automatic Measurements.

Term interpretation

Vpp: Peak-to-Peak Voltage.

Vmax: The maximum amplitude. The most positive peak voltage measured over the entire waveform.

Vmin: The minimum amplitude. The most negative peak voltage measured over the entire waveform.

Vamp: Voltage between Vtop and Vbase of a waveform.

Vtop: Voltage of the waveform's flat top, useful for square/pulse waveforms.

Vbase: Voltage of the waveform's flat base, useful for square/pulse waveforms.

Overshoot: Defined as (Vmax-Vtop)/Vamp, useful for square and pulse waveforms.

Preshoot: Defined as (Vmin-Vbase)/Vamp, useful for square and pulse waveforms.

Average: The arithmetic mean over the entire waveform.

Vrms: The true Root Mean Square voltage over the entire waveform.

Rise Time: Time that the leading edge of the first pulse in the waveform takes to rise from 10% to 90% of its amplitude.

Fall Time: Time that the falling edge of the first pulse in the waveform takes to fall from 90% to 10% of its amplitude.

+Width: The width of the first positive pulse in 50% amplitude points.

-Width: The width of the first negative pulse in the 50% amplitude points.

Delay 1→2 : The delay between the two channels at the rising edge.

Delay 1→2 : The delay between the two channels at the falling edge.

+Duty: +Duty Cycle, defined as +Width/Period.

-Duty: -Duty Cycle, defined as -Width/Period.

4.20 Setting the Cursor Measurements

This oscilloscope allows you to make manual cursor measurements on time and voltage. The signal sources include Channel 1(CH1) and Channel 2 (CH2).

The cursor measurement menus are listed and described in the following table:

Function menus	Settings	Description
Type	**Close** **Voltage** **Time**	Close the cursor measurement. Display the voltage measurement cursor and menu. Display the time measurement cursor and menu.
Signal sources	**CH1, CH2**	Select the waveform channel on which the cursor measurement will be performed.

To make a voltage measurement on **CH1**, doing the following:

1. Press the **MENU** key and the function menus are displayed at the right of the screen.
2. Press the "**MENU ▲**" or "**MENU ▼**" key to select **Cursor Measurement**. Two options are shown at the bottom of the screen.
3. Press **F1** key to select the measurement type Voltage. Two purple crossing dashed lines **V1** and **V2** are shown on the screen.
4. Press the **F2** key to select the measured channel **CH1**.
5. Press and hold the **OSC OPTION** key till the **▲/▼ CURSOR V1** is visible on the screen. At this time, adjust **OSC ▲** or **OSC ▼** and you can see that the dashed line **V1** is moving up and down while the measured voltage value of **V1** relative to the zero position of CH1 appears on the screen.

6. Press and hold the **OSC OPTION** key till **▲/▼ CURSOR V2** appears on the screen. Now, adjust the **OSC ▲** or **OSC ▼** and you can observe the dashed line **V2** moving up and down while the measured voltage value of **V2** relative to the zero position of CH1 is displayed on the screen. Also, the absolute values of **V1** and **V2** can be shown on the screen.

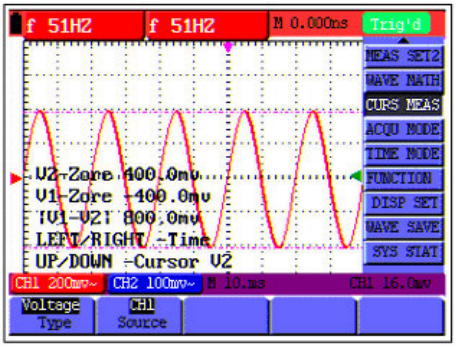


Figure 24: Use the cursor for a voltage measurement.

To use the cursor for a time measurement on **CH1**, do the following:

1. Press the **MENU** key and the function menus are displayed at the right of the screen.
2. Press the "**MENU ▲**" or "**MENU ▼**" key to select **Cursor measurement** key. Two key labels selectable are shown at the bottom of the screen.
3. Press the **F1** key to the measurement type **Time.** Two vertical dashed lines T1 and T2 appear on the screen.
4. Press the **F2** key and jump to the measured channel **CH1**.
5. Press and hold the **OSC OPTION** key till the **▲/▼ CURSOR T1** appears on the screen. Then, adjust the **OSC ▲** or **OSC ▼** and you can observe the dashed line moving left and right. At the same time, the time value of **T1** relative to the **screen middle point position** will be displayed on the screen.
6. Keep pressing on the **OSC OPTION** key till the **▲/▼ CURSOR T2** is displayed on the screen. Then, adjust the **OSC ▲** or **OSC ▼** and you can find that the dashed line **T2** is moving right and left while the time value of **T1** relative to the **screen middle point position** appears on the screen. You can also observe the absolute time values and frequencies of **T1** and **T2.** Now, you can see a screen that looks like the following figure 25.

English

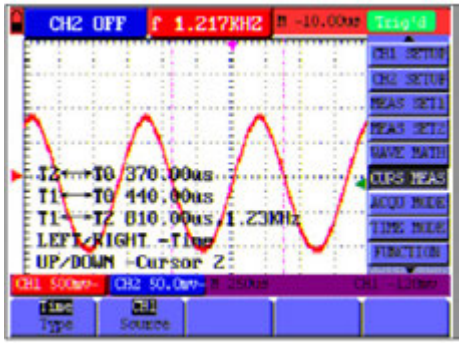
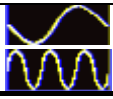


Figure 25: Use the cursor for a time measurement.

4.21 Autoscale

The function is applied to follow-up signals automatically even if the signals change at any time. Autoscale enables the instrument to set up trigger mode, voltage division and time scale automatically according to the type, amplitude and frequency of the signals.

The menu is as follows:

Function menus	Settings	Description
Autoscale	**OFF** **ON**	Turn off Autoscale. Turn on Autoscale.
Mode	**Vertical** **Horizontal** **HORI-VERT**	Follow-up and adjust vertical scale without changing horizontal setting. Follow-up and adjust horizontal scale without changing vertical setting. Follow-up and adjust the vertical and horizontal settings.
		Only show one or two periods. Show Multi-period waveforms.

If you want to measure voltage of Channel 1, you can do as the follows:

1. Press **MENU**, the function menu will appear on the right of the screen.
2. Press **MENU ▲** or **MENU ▼** and choose Autoscale, three options will show at the bottom of the screen.
3. Press **F1** and choose **ON**.
4. Press **F2** and choose **Hori- Vert**.
5. Press **F3** and  displays on the screen as figure 52:

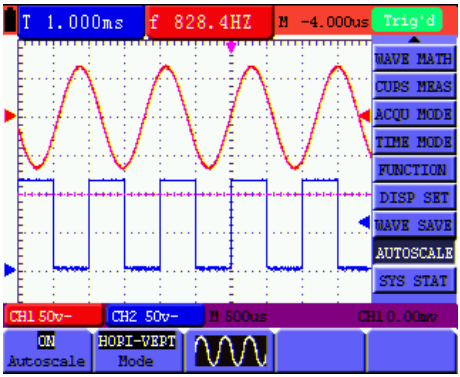


Figure 26.-: Autoscale Horizontal- Vertical multi-period waveforms.

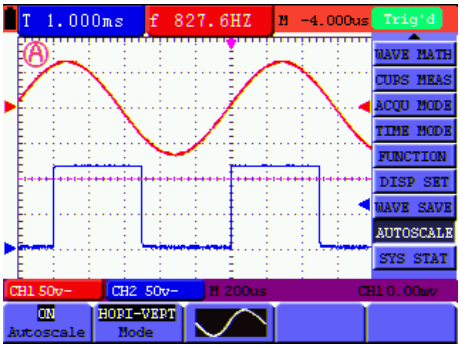


Figure 27.- Autoscale Horizontal- Vertical mono-period waveform.

English

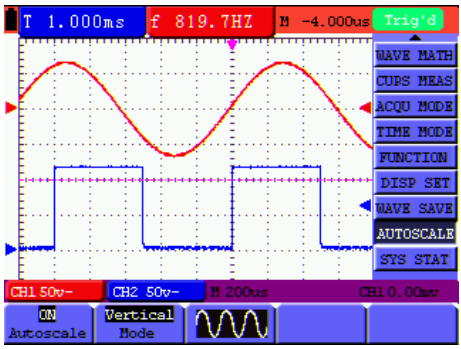


Figure 28.- Only under vertical mode multi-period waveform.

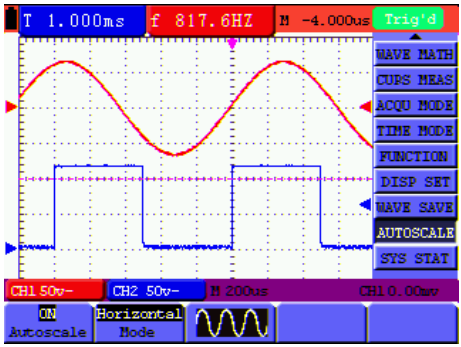


Figure 29.- Only under horizontal mode multi-period waveform.

NOTE:

1. Entering into Autoscale function and Ⓐ flicker will be on the top left corner. (flicker every 0.5 second).

2. At the mode of Autoscale, the oscilloscope can self-estimate "Trigger mode" (Edge, Video, and Alternate) and "Type" (Edge, Video). If now, you press "Trigger mode" or "Type", the forbidden information will display on the screen.

3. At the mode of XY and STOP status, pressing AUTO SET to enter into Autoscale, DSO switches to YT mode and AUTO status.

4. At the mode of Autoscale, **DSO** is always in the state of **DC** coupling and **AUTO** triggering. In this case, the forbidden information will be showing when making Triggering or Coupling settings.

5. At the mode of Autoscale, if adjust the vertical position, voltage division, trigger level or time scale of **CH1** or **CH2**, the oscilloscope will turn off Autoscale function and if press **AUTOSET** again, the oscilloscope will enter into Autoscale.

6. Turn off the submenu at the Autoscale menu, the Autoscale is off and turn on the submenu still enters into the function.

7. When video triggering, the horizontal time scale is 50us. If one channel is showing edge signal, the other channel is showing video one, the time scale refers to 50us as video one as standard.

4.22 System State Menu.

The system state menu is used to display information about the present horizontal system, vertical system, trigger system and others. The operation steps are shown as below.

1. Press the **MENU** key and the function menu is displayed at the right of the screen.

2. Press the "**MENU ▲**" or "**MENU ▼**" key to select the **System State.** Four options appear at the bottom of the screen.

3. Sequentially press key **F1** through **F4** key and the corresponding state information will be shown on the screen. The screen that looks like the following figure 30 will be displayed.

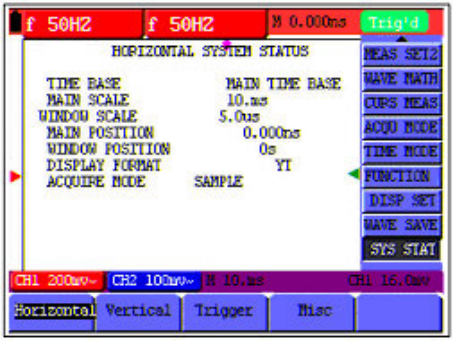


Figure 30.- System State.

4.23 Horizontal axis setting. HORIZONTAL function

Open the vertical menu of functions and select the **HORIZONTAL** function. The parameters to be modified with **F1~F5** keys will appear in the lower part of the display.

The time base mode menu is explained as the following table:

Function menu	Setting	Explanation
Main time base		Horizontal main time base is used to wave display
Zone Window		Use two cursors to define a window area
Window extensión		Expand the defined window to full-screen display

For the operation of window extension, please execute the following steps:

1. Press **MENU** key, display the function menu on the right side of the screen.
2. Press "**MENU ▲**" or "**MENU ▼**" key to select time base mode, display three options at the bottom.
3. Press **F2** key to select window setting.
4. Press **OSC OPTION** key, pop up **TIME BASE**, at this time, then press **OSC ◄/OSC ►** key to adjust the time base window area defined by two cursors, the window size will vary.
5. Press **OSC OPTION**, key and call **OSC ◄ / OSC ►** to adjust the window position defined by two cursors, the window position is the time difference of the window center to main time base's horizontal pointer.
6. Press **F3** key, select window extension, the defined window extends into the full-screen display.

The screen that looks like the following figure 27, 28 will be displayed.

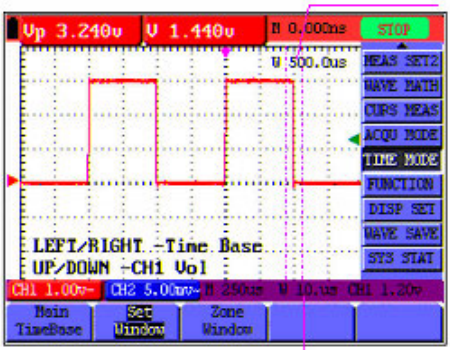


Figure 31.- Window setting.

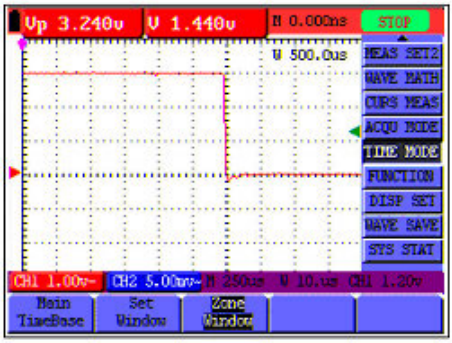


Figure 32.- Window extensión.

4.24 Data transmission to the PC

The oscilloscope **OS-782** has an **USB** port that allows to transmit the data shown and/or memorized from the instrument to the computer.

With the equipment a **CD** with the communication program is enclosed. In order to install it you must follow these instructions.

1. Insert the **CD** in the disc drive.

English

2. Open the explorer and run the **Setup.exe** file and follow the installer instructions. By default the program is installed in folder: c \ Program files \ PROMAX\OS-wave.

3. Once installed, connect the **USB** cable between the equipment and the PC. Power on the instrument, the PC will automatically detect a new equipment and request about installing the suitable driver.

4. Select the advanced method of installation and in the following screen select the folder: **USBDRIVE** which there is within the directory where the program has been installed. Press "Next" to install the driver.

5. Now you can open the **HDSO** Wave program to capture data using the PC.

5 USING THE MULTIMETER

5.1 About this chapter

This chapter provides a step-by-step introduction to the multi-meter functions of the test tool(hereafter. The introduction gives basic examples to show how to use the menus and perform basic operations.

5.2 Making Meter Connections

Use the three 4-mm safety banana jack inputs for the Meter functions: COM, V/Ω mA. Two quadratic capacitance jacks: CX. See figure 1 for the connections.

5.3 Multimeter Operation Window

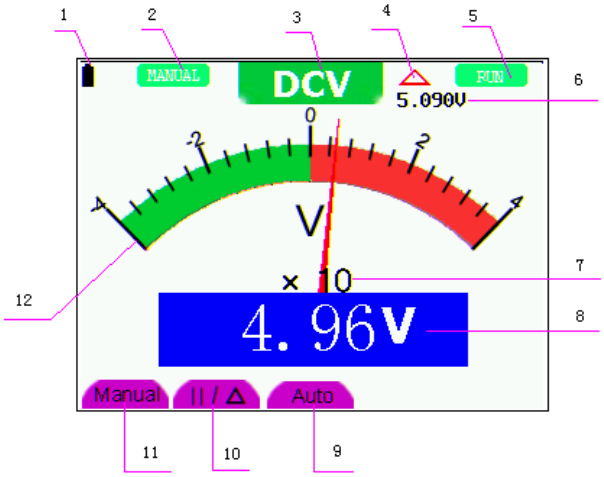


Figure 33.-

English

Description

1.- Battery electric quantity indictor.

2.- **MANUAL/AUTO RANGE** indictors, among which the **MANUAL** means measuring range in manual operation mode and Auto refers to the measuring range in automatic operation mode.

3.- Measurement mode indicators:

DCV: Direct voltage measurement CC.

ACV: Alternating voltage measurement CA.

DCA: Direct current measurement CC.

ACA: Alternating current measurement CA.

R: Resistance measurement.

: Diode measurement.


: On/Off measurement.

C: Capacitance measurement.

4.- The relative magnitude measurement indicator.

5.- Running state indicators, among which **RUN** expresses continuous update and **STOP** represents the screen locking.

6.- The reference value of the relative magnitude measurement.

7.- The multiplying power of the dial indication. To multiply the reading of dial pointer by multiplying power will get the measurement result.

8.- The mail reading of measurement.

9.- Automatic control measuring range.

10.- Absolute/ relative magnitude measuring control: The sign "II" expresses the absolute magnitude measuring control and "Δ" represents the relative magnitude measuring control.

11.- Manual control of the measurement range.

12.- Measurement analogue range. Test lead indicates the scale of test reading, different test modes display different colors.

5.4 Making Multimeter Measurements

Press **DMM/OSC key,** the oscilloscope will switch to the multimeter measure, the screen will display the multimeter windows, at the same time, prompt to correctly insert testing pen of the multimeter, at this time, then press any key to enter into multimeter measure.

5.4.1 Measuring Resistance Values

To measure a resistance, do the following:

1. Press the **R** key and **R** appears at the top of the screen.
2. Insert the black lead into the **COM** banana jack input and the red lead into the **V/Ω** banana jack input.
3. Connect the red and black test leads to the resistor. The resistor value readings are shown on the screen in Ohm. Now, you can see a screen that looks like the following figure 34.

Figure 34.- Measure resístance.

5.4.2 Making a Diode Measurement.

To make a measurement on the diode, do the following:

1. Press the **R** key and **R** appears at the top of the screen.
2. Press **AUTO SET** key once and the following is displayed on the screen

English

3. Insert the black lead into the **COM** banana jack input and the red lead into the V/Ω banana jack input.

4. Connect the red and black leads to the resistor and the diode resistor readings are displayed on the screen in **V**. Now, you can see a screen that looks like the following Figure 35.

Figure 35: Diode Measurement

5.4.3 On-off test

To perform an **On-off test,** do the following:

1. Press the **R** key and **R** appears on the top of the screen.

2. Press the **AUTO SET** key three times and the following is shown on the screen .

3. Insert the black lead into the **COM** banana jack input and the red lead into the **V/Ω** banana jack input.

4. Connect the red and black leads to the test point. If the resistance value of the tested point is less than 50 Ω, you will hear beep sound from the test tool. Now, you can see a screen that looks like the following Figure 36.

Figure 36.- On-off test.

5.4.4 Making a Capacitance Measurement

To measure a capacitance, do the following:

1. Press the **R** key and **R** appears on the top of the screen
2. Press the **AUTO SET** key four times and **C** appears at the top of the screen.
3. Insert the measured capacitance into the quadratic jack and the screen shows the capacitance reading.

NOTE: When measured value is less than 5 nF capacitance, please use small capacitance measurer of this multimeter and use relative value measuring mode to improve measuring precision. It will take about 30seconds if capacitance measurement is large than 40uF. Now, you can see a screen that looks like the following figure 36.

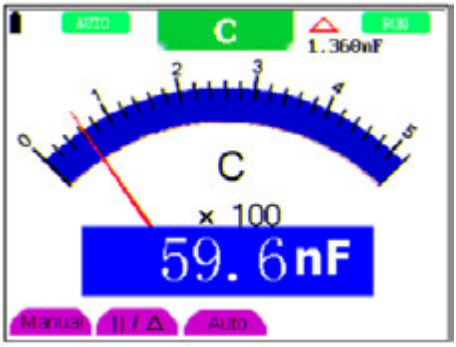


Figure 37.- Capacitance measurement.

English

5.4.5 Making a DC voltage Measurement (VDC)

To measure a **DC** voltage, do the following:

1. Press the **V** key and **DCV** appears at the top of the screen.
2. Insert the black lead into the **COM** banana jack input and the red lead into the **V/Ω** banana jack input.
3. Connect the red and black leads to the measured point and the measured point voltage value is displayed on the screen. Now, you can see a screen that looks like the following Figure 38.

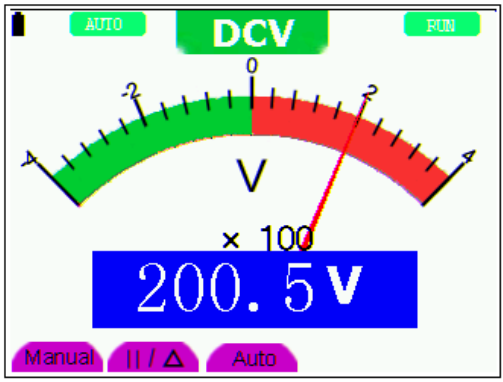


Figure 38.- DC voltage Measurement

5.4.6 Making a AC voltage Measurement (VAC)

To measure the AC voltage, do the following:

1. Press the **V** key and **DCV** appears at the top of the screen.
2. Press the **AUTO SET** key and **ACV** appears at the top of the screen.
3. Insert the black lead into the **COM** banana jack input and the red lead into the **V/** / **Ω** banana jack input.
4. Connect the red and black leads to the measured points and the AC voltage values of measured points will be displayed on the screen.

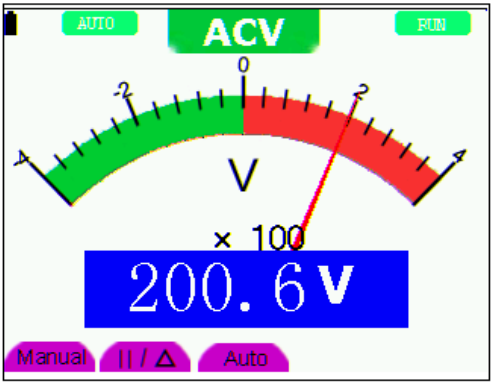


Figure 39.- AC voltage Measurement.

5.4.7 Making a DC current Measurement (AAC)

In order to carry out the measurement of current it is necessary to connect in series the meter and the circuit under test. Make sure that the circuit is disconnected before doing this connection.

To measure a **DC** current which is less than 400 mA , do the following:

1. Press the **A** key and **DCA** appears at the top of the screen. The unit on the main reading screen is **mA. mA** and **20A** will display on the right bottom of screen, press F4 or F5 to switch the measurement between **Ma** and **20A**. 400mA is acquiescently.
2. Insert the black lead into the **COM** banana jack input and the red lead into the **mA** banana jack input.
3. Connect the red and black leads to the measured points and the **DC** current values of measured points will be displayed on the screen. Look at the display; you can see a screen that looks like the following figure 40.

English

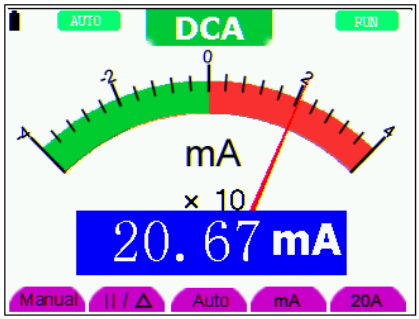


Figure 40.- DC current Measurement for 400 mA.

To measure a **DC** current which is larger than 400 mA, do the following:

1. Press the **A** key and **DCA** appears at the top of the screen. The unit on the main reading screen is **mA.**
2. Press **F5** key change to **20 A** measurement**,** he unit on the main reading screen is **A.**
3. Plug current extended module in current measure jack, then plug the probe in the module.
4. Connect the red and black leads to the measured point and the **DC** current value of the measured point will be displayed on the screen.
5. Press **F4** return to 400 mA measure.

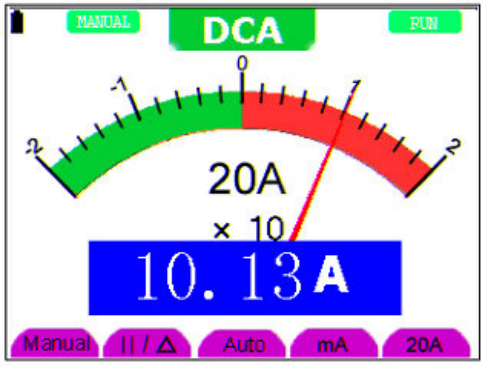


Figure 41: DC current Measurement for 20A.

5.4.8 Making an AC Current Measurement

In order to carry out the measurement of current it is necessary to connect in series the meter and the circuit under test. Make sure that the circuit is disconnected before doing this connection.

To measure an AC current which is less than 400 mA, do the following:

1. Press the **A** key and **DCA** appears at the top of the screen. The unit on the main reading screen is **mA. mA** and **20A** will display on the right bottom of screen, press F4 or F5 to switch the measurement between **Ma** and **20A**. 400 mA is acquiescently.
2. Press the **AUTO SET** key once and **ACA** is visible at the top of the screen.
3. Insert the black lead into the **COM** banana jack input and the red lead into the **mA** banana jack input.
4. Connect the red and black leads to the measured point and the **AC** current value of the measured point will be displayed on the screen. Look at the display; you can see a screen that looks like the following figure 38.

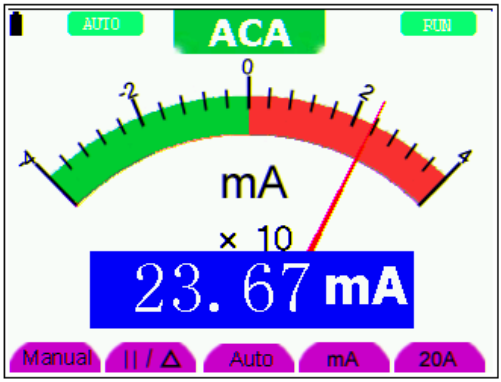


Figure 42.- AC current Measurement for 400 mA.

To measure an AC current which is larger than 400 mA, do the following:

1. Press the **AUTO SET** key once and **ACA** is visible at the top of the screen.
2. Press **F5** to select **20A** measure, the unit of main reading window is **A**.
3. Press the **AUTO SET** key once and **ACA** is visible at the top of the screen.

English

4. Plug current extended module in current measure jack, then plug the probe in the module.
5. Connect the red and black leads to the measured point and the **AC** current value of the measured point will be displayed on the screen.
6. Press **F4** return to 400mA measure.

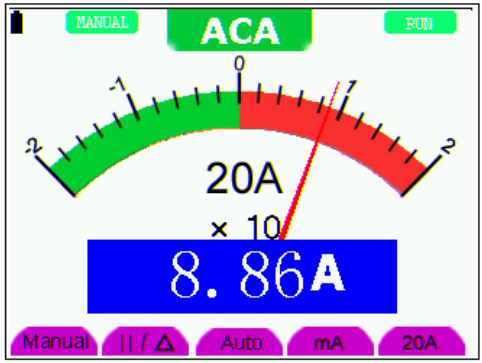


Figure 43.- AC current Measurement for 20A.

5.5 Freezing the Readings.

You can freeze the displayed readings at any time.

1. Press the **RUN /STOP** key to freeze the screen and **STOP** will be displayed at the top right of the screen.
2. Again, press the **RUN /STOP** key, you can resume your measurement.

Look at the display; you can see a screen that looks like the following figure 40.

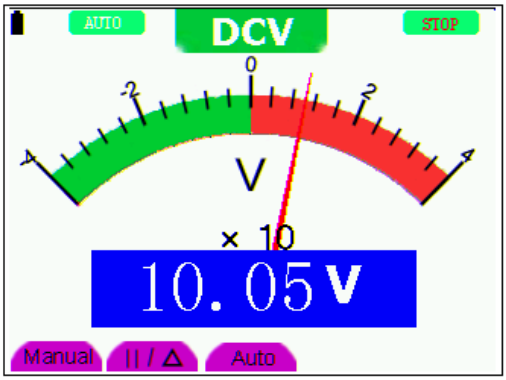


Figure 44: Freezing the Readings.

5.6 Taking a relative measurement

A currently measured result relative to the defined reference value is displayed in a relative measurement.

The following example shows how to take a relative measurement. At first, it is required to acquire a reference value.

1. Press **R** key and **R** is displayed on the top side of the screen.
2. Press the **AUTO SET** key till **C** appears at the top of the screen.
3. Plug capacitance extended module in capacitance measure jack.
4. When the reading leveling off, press **F2** key and  is displayed on the top side of the screen. The saved reference value is displayed below  .
5. Plug capacitance, the displayed major reading on the screen is actual the capacitance value.

   Look at the display, you can see a screen that looks like the following figure 32.

English

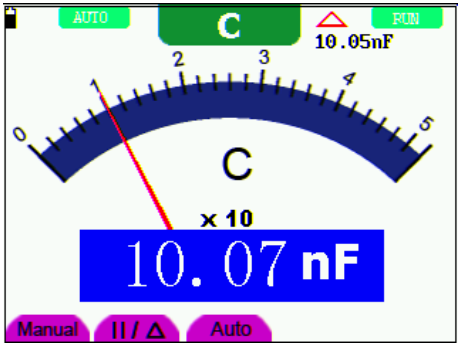


Figure 45.- Relative Measurement.

5.7 Selecting automatic/manual range adjustment

The defaulted range mode of the instrument is automatic range. To switch to the manual range, perform the following steps:

1. Press **F1** key and **MANUAL** is displayed on the top left side of the screen to enter the manual range mode.
2. Under the manual range mode, the measuring range is increased by a stage when pressing **F1** key each time, and when reaching the highest stage, it jumps to the lowest stage by pressing F1 key once again. To multiply the reading of dial pointer by multiplying power and the unit of main reading on the screen will get the measurement result.
3. Press **F3** key and **AUTO** is displayed on the top left side of the screen to switch back to the automatic range mode. Look at the display; you can see a screen that looks like the following figure 46.

Figure 46: Automatic/manual range adjustment.

ATTENTION: Capacitance measurement without manual range mode.

6 TROUBLE SHOOTING

1. **The oscilloscope does not power up.**

   It may be caused by the dead battery. At this time, the oscilloscope will not start even if it is powered by the battery charger. Firstly, charge the battery and supply the oscilloscope with power through the battery charger. However, don't switch on the oscilloscope till waiting for 15 minutes. If the oscilloscope still cannot start, please contact PROMAX for service.

2. **The oscilloscope stops work only after operating for several seconds.**

   Probably the battery is dead, Check the battery symbol at the upper right of the screen. The  symbol indicates that the battery has been run out of power and must be charged.

3. **The measurement type displays ERR when you switch to the multimeter mode.**

   Probably you do not select the measuring mode. In this case, push down any key of the three keys V, A and R. Thus, the relative measuring mode will be shown on the screen. If the ERR is still displayed, restart the oscilloscope.

4. **The measured voltage amplitude value is 10 times larger or smaller than the actual one under the oscilloscope mode.**

   Check whether the channel attenuation factor matches the actual probe error ratio.

5. **The waveform is displayed on the screen but is not stable under the oscilloscope mode.**

   - Check whether the signal item in the trigger mode menu matches the actually used signal channel.
   - Check on the trigger mode: The edge trigger mode is applicable to the universal single and the video trigger mode applicable to the video signal. Only when the proper trigger mode is applied, can the waveform be in stable.
   - Try to change the trigger coupling into the **HF repression** and **LF repression** to filter the HF or LF noise trigger by the interference.

English

6. **There is no display on the screen when you push down RUN/STOP key under the oscilloscope mode.**

   Check whether the trigger mode in the trigger mode menu is in normal or single shot and whether the trigger level is out of the waveform range.

   In such condition, adjust and make the trigger level in the middle or select the non-auto trigger mode. Additionally, press the **AUTO SET** key and complete the above setting

7. **When select the average sampling in the sampling mode or select a longer display time in the display mode under the oscilloscope, the display speed is slow.**

   It is normal in the above case.

7 MAINTENANCE AND CLEANING

7.1 Basic maintenance

Do not store or place the instrument in locations where the liquid crystal display is exposed directly to the light of the sun during long time.

Warning: Do not sprinkle the equipment or the probes with liquid or dissolvent agents, to avoid their damage.

7.2 Cleaning

Usually inspect the equipment and the probes, according to the conditions of use. In order to clean the external surface of the instrument, you must follow these instructions:

1. Clean the dust of the external parts of the instrument and the probes with a smooth cloth. When cleaning the liquid crystal display, avoid to damage the protective transparent layer.
2. Only clean the equipment when it is power off, with a previously dampened but not soaked smooth cloth. A light detergent or water can be used. Do not use any abrasive chemical detergent, to avoid damages in the equipment or the probes.

 **Warning**	Before back to power on and to use the instrument, please make sure that it has been completely dried, to avoid short-circuits and personal hazards due to the humidity.

7.3 Storage of oscilloscope

If the equipment is stored during long time, the lithium battery must be recharged before the storage.

7.4 Substitution of the battery of lithium.

Normally it is not necessary to change the battery of lithium. If it was necessary to replace her, only qualified personnel can realize this operation. For more information, put in touch with the **PROMAX** most nearby office or with his distributor.

English