

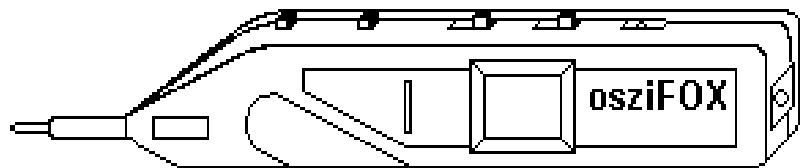
Cat. No. 22-310A

OWNER'S MANUAL

Please read before using this equipment.

WTT osziFOX V4.2

for Windows 3.1/95/98



WTT
WITTIG TEST TECHNOLOGY

FCC INFORMATION

Modifying or tampering with your Wittig osziFOX internal components can cause a malfunction and might invalidate your osziFOX's warranty and void your FCC authorization to operate it.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with the limits for a Class B digital device, as specified in Part 15 of FCC Rules. These limits provide reasonable protection against radio and TV interference in a residential area. However, your osziFOX might cause TV or radio interference even when it is operating properly. To eliminate interference, you can try one or more of the following:

- Reorient or relocate the TV or radio's antenna.
- Increase the distance between the equipment and the TV or radio.
- When using an AC adapter, use outlets on different electrical circuits for this device and the TV or radio.

Pen-type Oscilloscope osziFOX FCC ID: MSP22-310

SAFETY INSTRUCTIONS

Warning: use extreme caution in the use of this device. Improper use of this device can result in injury or death. Follow all the safeguards suggested in this owner's manual in addition to normal safety precautions in dealing with electrical circuits. Do not use this device if you are unfamiliar with electrical circuits and testing procedures.

Not for commercial or industrial use.

This oscilloscope is designed to ensure the safest operation possible. However, safe operation depends on you, the operator. Make sure you follow these simple safety rules:

- Read all of these instructions carefully, and save them for your reference.
- Follow all warnings and instructions marked on the osziFOX.
- When making voltage measurements, never touch the osziFOX's tip or a hot wire in AC wiring circuits. If you do, you could receive an electric shock.
- Never apply the osziFOX to a source of power greater than 100V DC/AC peak-to-peak. Doing so could cause electrical shock or damage to the osziFOX.

Caution: If you do not know the level of the voltage to measure in manual range control, always start at the highest range: 100V DC or AC. Never try to measure any voltage more than 30VAC on a DC source bias. Doing so might damage your osziFOX.

- Always discharge filter capacitors in the circuit under test before your attach the osziFOX. If the osziFOX touches an undischarged capacitor, it could damage it. If you touch an undischarged capacitor, you could receive an electric shock.
- Always turn off power and disconnect the osziFOX before your change power sources.
- Because many AC-DC sets have a potentially hot chassis, be sure the top of your workbench and the floor underneath it are made of nonconductive materials.
- Unplug the osziFOX near water (for example, use liquid or aerosol cleaners. Use a damp cloth for cleaning and then wipe it dry immediately.
- Do not use the osziFOX near water (for example, a bathtub, washbowl, kitchen sink, laundry tub or swimming pool).
- Do not use unapproved attachments.
- The osziFOX should be operated from a 9-13V DC power source, such as a battery or DC power supply.
- Do not allow anything to rest on the power cord. Do not locate the power supply where people might walk on the cord.
- If your osziFOX doesn't operate normally, in particular if any unusual sounds or smells come from it, immediately unplug it and contact our support center
- Do not attempt to service the osziFOX your-self; opening or removing the cover can expose you to dangerous voltage or other hazards.
- Unplug the osziFOX from the DC power source and refer servicing to qualified service personnel under the following conditions:
 - If the power cord is damaged or frayed
 - If the osziFOX has been exposed to rain or water
 - If the osziFOX does not operate normally and you are following the operating instructions
 - If the osziFOX has been dropped or damaged
 - If the osziFOX exhibits a distinct change in performance

This Wittig osziFOX is fully calibrated and tested. Under normal use, no further internal adjustment should be necessary.

Adjust only those controls covered by the operating instructions. Improper adjustment of other controls might result in damage and might require extensive work by a qualified technician to restore the osziFOX to normal operation. If the osziFOX should require repair, do not try to repair it yourself.

FEATURES

Your Wittig osziFOX V4.2 for Windows 3.X/Windows 95/DOS is a microprocessor-controlled oscilloscope and digital voltmeter housed in a small probe with a backlit mini liquid Crystal Display (LCD). All oscilloscope parameters are menu-driven and selected by pressing one of two push buttons. You can quickly and single-handedly set all parameters while looking at the point of measurement, the probe's controls, and the display. This eliminates the need for any head movement, making the osziFOX the easiest-to-use measurement tool available.

The osziFOX includes these features:

Ten Selectable Sampling Rates - lets you display signals in a wide variety of waveforms, from a small fraction of a waveform to multiple waveforms of the measured signal.

Multiple Trigger Sources - lets you select whether the oscilloscope starts a measurement using an internal or an external trigger.

Six Selectable Trigger Levels - lets you select both rising and falling signal events at different levels.

Selectable Input Voltage Ranges - lets you select the range of the measured signal for the most accurate readings.

Selectable Input Coupling - lets you select whether the signal to be measured is DC or AC coupled to the scope, and provides a zero reference for zero adjustment.

Signal Ground Line - lets you easily reference the incoming signal.

Trigger Jack - lets you connect an external trigger source.

Multiple Input Power Sources - lets you connect 9VDC-13VDC external power from a battery using the supplied power cable with alligator clips, or an optional AC adapter.

Liquid Crystal Display (LCD) - displays the recorded signal.

Software Interface - lets you use your computer to display and record measurements.

To use this osziFOX's software with Microsoft Windows, the computer must have at least:

- 80386 CPU
- 400K of available hard disk storage space
- Windows 3.1 or later

To use this osziFOX's software with MS-DOS, the computer must have at least:

- 800K of available hard disk storage space
- DOS Version 3.3 or later

Selectable Display Colors - lets you change the oscilloscope display colors for easier viewing of dual signals when using a computer monitor.

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PREPARATION

Use this manual as a guide to prepare and use the osziFOX using either the osziFOX's LCD or a computer monitor.

The computer's software offers additional help screens that can guide you through the many osziFOX functions, modes, and available options.

INSTALLING THE SOFTWARE

USING MS-WINDOWS 3.X

1. Start Microsoft Windows.
2. Insert the supplied disk into your computer's A:drive.
3. Click File in the Program Manager window.
4. Click Run... in the File Menu.
5. Type a:\setup in the Command Line box in the Run window, then click OK.
6. Click Continue in the Setup window to define the directory where you want the software installed. c:\OSZIFOX (the suggested path) appears in the Path box.
7. Click Continue to install the osziFOX software in the suggested directory, or...
Enter the desired directory name, then click Continue.
8. When the application has been successfully installed on your hard disk and Setup Complete appears in the Setup box, click OK.

INSTALLING THE SOFTWARE

USING MS-WINDOWS 95

1. Insert the supplied disk into your computer's A:drive.
2. Click the Start button.
3. Click Run...
4. Type a:\setup in the Open command line box in the Run window, then click OK.
5. Click Continue in the Setup window to define the directory where you want the software installed. C:\OSZIFOX (the suggested path) appears in the Path box.
6. Click Continue to install the osziFOX software in the suggested directory, or....
Enter the desired directory name, then click *Continue*.
7. When the application has been successfully installed on your hard disk and Setup Complete appears in the Setup box, click OK.

INSTALLING THE MS-DOS SOFTWARE

If your computer does not have MS-Windows, you can install the supplied MS-DOS software into your computer's C: drive.

1. Type md c:\proscope to create a directory on your computer's C: drive where you can install the osziFOX software.
2. Insert the supplied disk in your computer's A:drive.
3. Type copy a:*. * c:\proscope to copy all the files from your A: drive to the C:\proscope directory.

CONNECTING POWER

You can power the osziFOX from:

- A bench-top power supply (such as Cat. No. 22-120)
- A 9-volt battery (such as Cat. No. 23-553)
- An AC adapter (such as Cat. No. 273-1651)

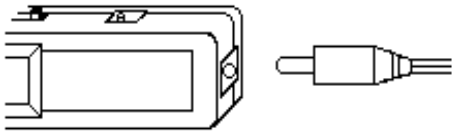
Using a Bench-Top Power Supply

If you are using a bench-top power or a 9-volt battery:

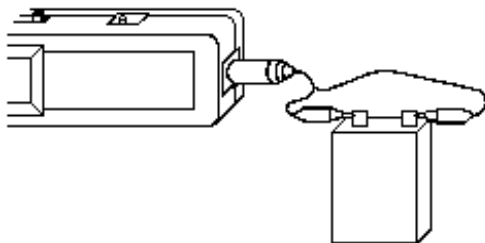
1. Set the input coupling switch to GND.

Important: You must first set the input coupling switch to GND to initialize the probe every time you turn on the osziFOX, even if you want to measure a circuit's signal using the same settings previously used.

2. Insert the supplied power cable's barrel plug into the osziFOX power jack.



3. Connect the supplied power cable's alligator clips to the DC power source.



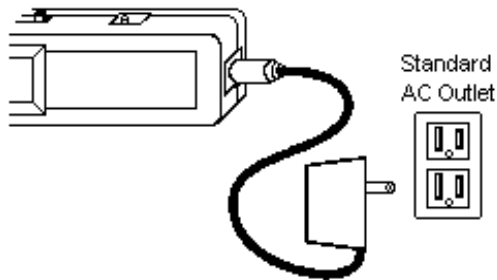
Cautions:

- Make sure the input power source is between +9V DC and +13V DC.
- Make sure to observe the proper polarity by connecting the red clip to + and the black clip to -.

CONNECTING POWER (cont.)

Using an AC Adapter

If you are using an optional AC adapter:



1. Set the input coupling switch to GND.

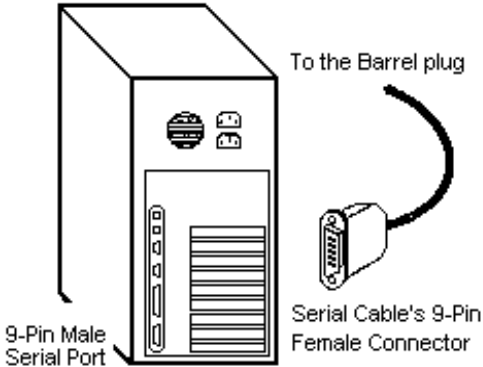
Important: You must first set the input coupling switch to GND to initialize the probe every time you turn on the osziFOX, even if you want to measure a circuit's signal using the same settings previously used.

2. Insert the proper-sized barrel plug into the adapter's wire jack so it reads TIP +.
3. Insert the barrel plug into the osziFOX's power jack.
4. Connect the AC adapter's power module to a standard AC outlet.

Caution: Use only an AC adapter that supplies 9-13 volts DC, delivers at least 100 milliamps, and has a barrel plug that correctly fits the osziFOX power jack with its center tip set to positive. The recommended AC adapter meets these specifications. Using an adapter that does not meet these specifications could damage the osziFOX or the adapter.

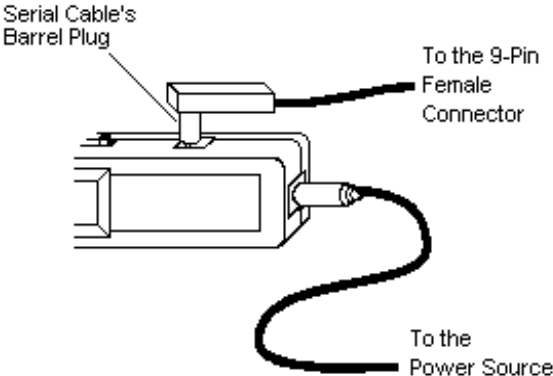
CONNECTING A COMPUTER

- 1. Plug the supplied serial cable's 9-pin female connector into your computer's 9-pin male serial port connector.



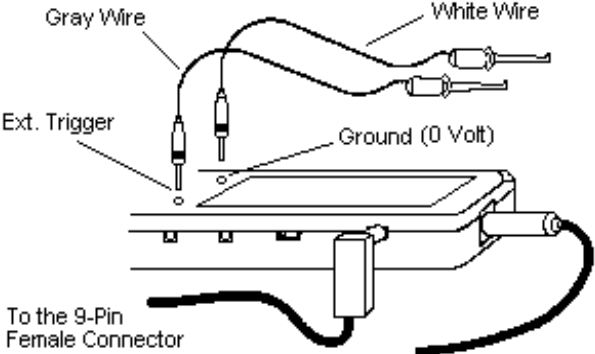
Note: If your computer has a 25-pin serial port connector, you can use a 9-pin to 25 pin adapter cable.

- 2. Insert the supplied serial cable's barrel plug into the osziFOX's serial connector.



CONNECTING THE EXTERNAL INPUTS

- 1. Connect the supplied white signal wire's plug into The GROUND (0 Volt) jack.
- 2. If you are using an external trigger source, connect the supplier gray trigger wire's plug into the EXT. TRIGGER jack.



Caution: If you are not going to use an external trigger source, do not connect the gray trigger wire to the osziFOX.

BASIC OPERATION

USING THE SOFTWARE

If all you want to do is make a quick and basic signal detection or AC/DC voltage measurement, you can simply use the osziFOX's display.

But, if you want to make a more detailed determination of a measured signal (such as a frequency, signal amplitude, phase shifting, DC biasing, etc.), you need to use the osziFOX's software to display the measurements on your computer's monitor.

- If you are using MS-Windows 3.X:
 - a. Double click the **WTT osziFOX** Program Group.
 - b. Then double click the **WTT osziFOX** icon.



- If you are using MS-Windows 95:
 - a. Click the **Start** button.
 - b. Place the mouse icon on **Programs** to select it.
 - c. Place the mouse icon on the **WTT osziFOX** icon to select the osziFOX folder.
 - d. Click on the **osziFOX** program.



- If you are using MS-DOS:
 - a. Type `cd c:\proscope` then press **Enter** to enter the osziFOX directory.
 - b. Type `scopedos.exe` to select the osziFOX software.
 - c. Press **Enter** to start the osziFOX software.

Note: The operating instructions in this owner's manual are specific to using MS-Windows 3.X/95.

USING THE TOOL BAR

After you start the osziFOX V4.2 using Windows 3.X or Windows 95 software, these icons appear on your monitor's display.
(You can also access these functions using the provided keyboard shortcuts.)



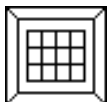
Opens an existing osziFOX document (Ctrl-O)



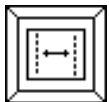
Saves the active document (Ctrl-S)



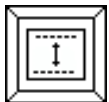
Enters comments about the current osziFOX document (Ctrl-C)



Shows and hides the oscilloscope screen's grid (Ctrl-G)



Shows and hides the vertical cursors (Ctrl-V)



Shows and hides the horizontal cursors (Ctrl-H)



Shows and hides the trigger level line (Ctrl-L)

Note: You can select this mode only when the Trigger mode is set to + **INTERN** or + **EXTERN**.



Freezes the measured signal on the oscilloscope display (Ctrl.I)

USING THE TOOL BAR (cont.)



Switches between seconds and Hertz for the measured signal (Ctrl-U)

Note: You can use this mode only when the vertical cursors appear on the oscilloscope display.



Lets you change the colors in the oscilloscope display (Ctrl-F)



Calls up the print dialog menu (Ctrl-P)



Turns on and off the Digital Voltmeter (DVM) function (Ctrl-D)



Freezes the displayed DVM measured value (Ctrl-A)

Note: You can use this mode only when the **DVM** function is selected.

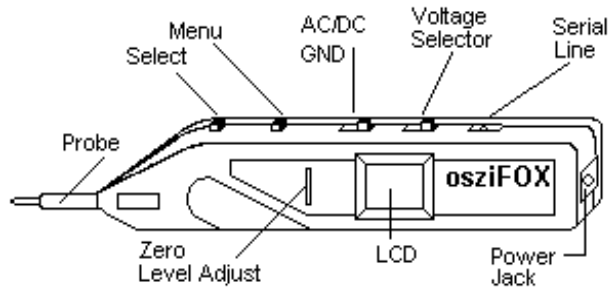


Provides information about osziFOX



Opens the help files (Shift +F1)

USING THE AVAILABLE MODES



Selecting a Mode

1. Press **Menu** to display the available modes shown below.
2. Press **Select** to set the desired option in each of the available modes.

Mode	Options			
Timebase	<u>Time</u>	<u>Grid Set</u>		<u>Grid Not set</u>
	50 ns	0.5µs/div	20 Msa/s	50ns 20MSa/s
	100 ns	1µs/div	10 Msa/s	100 ns 10Msa/s
	0.5µs	5µs/div	2 Msa/s	0.5µs 2 Msa/s
	1µs	10µs/div	1 MSA/s	1µs 1 MSA/s
	5µs	50µs/div	200kSa/s	5µs 200kSa/s
	10µs	100µs/div	100kSa/s	10µs 100kSa/s
	50µs	0.5ms/div	20kSa/s	50µs 20kSa/s
	0.1ms	1ms/div	10kSa/s	0.1ms 10kSa/s
	0.5ms	5ms/div	2kSa/s	0.5 ms 2kSa/s
1ms	10ms/div	1kSa/s	1ms 1kSa/s	
Trigger Source	Auto + INTERN - INTERN + EXTERN - EXTERN			
Backlight	ON OFF			
Trigger Level	+ INTERN		+ Extern	
	+ 0.1 V	+ 1V	+ 10V	
	+ 0.3 V	+ 3V	+ 30V	
	+ 0.5 V	+ 5V	+ 50V	
Trigger Mode	SINGLE		RUN	

Mode Definitions

Timebase - the ProeScope's timebase is its sampling rate (the rate at which measurements are taken) and is not always the same as used in typical oscilloscopes.

- The timebase on the osziFOX's LCD represents the probe's sampling rate and is shown in seconds (such as 0.1 ms, meaning that the osziFOX takes a measurement every 0.1 ms).
- The timebase on the computer's display depends on whether or not you select the grid overlay to appear on the oscilloscope's display.
 - When the grid is not displayed, the timebase on the computer's display shows the osziFOX sampling rate (matches the timebase shown on the osziFOX's LCD).
 - When the grid is shown, the timebase on the computer's display is 10 times the LCD's sampling rate and is shown in seconds per grid division (the same as in typical oscilloscopes).

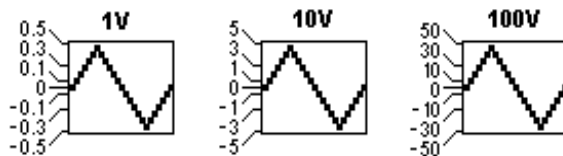
Trigger Source - A trigger source selection determines how a received pulse or signal is to be monitored or measured. The five selectable trigger sources are:

AUTO: The osziFOX continuously measures and records signals each time a trigger occurs regardless of its level (higher, lower, or equal to the incoming signal). If you set the input coupling switch to **GND**, the osziFOX automatically sets the trigger to **AUTO**.

+ INTERN: The osziFOX records signals only when the defined trigger event occurs. The signal is recorded when the trigger level is equal to the incoming signal and the signal is rising.

- INTERN: The osziFOX records signals only when the defined trigger event occurs. The signal is recorded when the trigger level is equal to the incoming signal and the signal is falling.

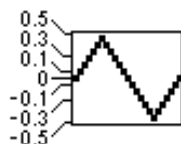
Note: The maximum and minimum voltage levels of the + or - internal trigger depends on the **1V/10V/100V** input voltage selector



+ EXTERN: The osziFOX records signals only when the defined trigger event occurs. The signal is recorded when the trigger level is equal to the signal present at the external trigger plug and the signal is rising.

- EXTERN: The osziFOX records signals only when the defined trigger event occurs. The signal is recorded when the trigger level is equal to the signal present at the external trigger plug and the signal is falling.

Note: The maximum and minimum voltage levels of the + or - external trigger is always + 0.5V



Mode Definitions (cont.)

Trigger Mode - The trigger mode determines when a new measurement is to be taken and displayed. These are the two available trigger modes:

RUN: The probe records a new signal every time the defined trigger event occurs. Use this mode to measure or monitor a continuously running signal.

SINGLE: The probe records a new signal each time you press **Select** and the defined trigger event occurs. Use this mode to measure or monitor a signal that occurs only once, such as the noise heard when you turn on an electronic device.

Backlight - Lights the LCD so you can use it in low light areas.

Function - Lets you use the osziFOX either as an oscilloscope or a digital voltmeter.

Trigger Level - Establishes the voltage level at which the measurement will begin.

USING THE OSCILLOSCOPE

The following applications describe how to make basic waveform measurements with the osziFOX. These applications are not described in detail, but are designed to familiarize you with basic oscilloscope operating techniques.

Cautions:

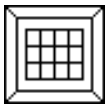
- Never try to measure an AC peak-to-peak or a DC voltage that exceeds 100 volts.
- If you are not sure of what the measured signal level is, always start with the highest range.

ESTABLISHING THE SCREEN'S VERTICAL DEFLECTION FACTOR

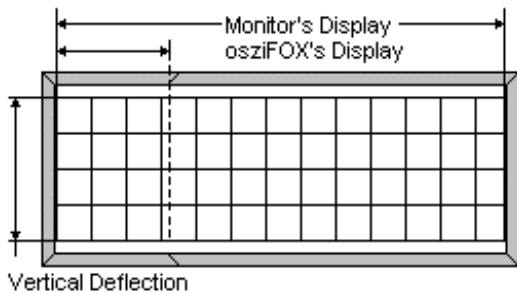
When a measured signal appears on the oscilloscope's screen, you can use the grid overlay to measure the vertical displacement, then multiply this displacement by the deflection factor of the oscilloscope's screen to estimate the measured voltage.

To do this, you must first establish the screen's vertical deflection factor.

1. Click on the grid icon so the screen's grid overlay appears.



2. Divide the input voltage selector setting (1, 10, or 100) by 4 (the number of vertical squares).



The result is the screen's vertical deflection factor. For example, if the input voltage selector is set to 10, and you divide 10 by 4, then the screen's vertical deflection factor is 2.5 volts/square

Therefore, if a measured signal is about 3 squares high, then the signal is estimated to be about 7.5 volts ($3 \times 2.5 = 7.5$).

Notes:

- The screen's deflection factor applies only to the oscilloscope screen on the computer's monitor, and does not apply to the display on the osziFOX.
- The grid overlay is not necessary if you want only to detect a signal but do not need to calculate voltage or frequency.
- The grid is necessary in order to calculate voltage, frequency, or both without using the cursors.

CHANGING THE DISPLAY COLORS

You can define the color you want for the oscilloscope and DVM displays' background, signal waveform, oscilloscope's cursors, or oscilloscope grid.

1. Click on the Define Colors icon, or from the View menu, click Define Colors.



2. When the Define Colors box appears, click on the item you want to change.

Background - lets you select the background color of the oscilloscope and DVM displays.

Waveform - lets you select the color of the measured signal waveform that appears on the oscilloscope display (and the characters in the DVM display).

Cursor - lets you select the color of the horizontal and vertical cursors on the oscilloscope display.

Grid - lets you select the color of the overlay grid on the oscilloscope display.

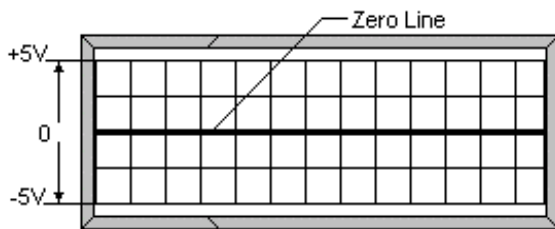
3. Click on the desired color for the selected item from 16 pre-defined basic colors, then click OK to confirm your selection. The colors selected for the four options are saved to the osziFOX backup file.

MEASURING A DC VOLTAGE

In oscilloscope measurements, the DC component of a waveform is usually measured in terms of its DC flatline or AC average displacement above or below a reference line.

The maximum DC voltage measurement you can make is determined by the positions of the input voltage selector and the zero line.

For example, if the input voltage selector is set to 10 and the zero line is set at the middle position, the maximum measurement is + 5 Volts.



Follow these steps to measure a DC voltage deflection.

1. Continuously press **Menu** until the **FUNCTION** mode appears on the display.
2. Press **Select** to set the function mode to **DVM**, then press **Menu** again.
3. Set the input coupling switch to **GND**.
Note: When you set the input coupling switch to **GND**, the osziFOX automatically resets the trigger mode to **AUTO**.
4. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
5. If not already on, click on the grid icon, so the computer screen's grid overlay appears.
6. Rotate **Zero Level** to position the zero reference line:
 - a. On the bottom of the display until the v indicator appears on the osziFOX's LCD (to get the maximum positive (+) measurement), or
On the top of the display until the indicator appears on the osziFOX's LCD (to get the maximum negative (-) measurement).
 - b. Slowly re-adjust **Zero Level** in the opposite direction just until the v or ^ indicator disappears from the osziFOX's LCD.

Notes:

- The grid must be turned on
- The reference line on the oscilloscope display should be set to just above the bottom line or just below the top line on the grid.
- The position on the grid overlay depends on the input signal's polarity and amplitude, but should be chosen so the trace lies along one of the grid overlay's major divisions. If the trace is widened by stray interference, ground the probe body near the point being measured.

The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (Do not adjust Zero Level control after the reference is established.)

MEASURING A DC VOLTAGE (cont.)

7. If it was necessary to ground the tip (see Step 6, third notes bullet), remove the tip from the ground or reference voltage. This readies the tip so you can use it to make a measurement.
8. Set the input coupling switch to DC. The selected setting appears on your computer's monitor.
Important: Do not adjust the Zero Level control after the reference is established.
9. If you know the level of the signal to be measured, set the input voltage selector as follows.

Switch Position	Measures
1 V	0.00-1.00 V
10 V	0.0-10.0 V
100 V	0-100 V

Note: If you do not know the level of the signal to be measured, always set the input voltage selector to **100 V**.

10. Click on the horizontal cursor icon to display the horizontal cursors. The Volt: box appears below the grid display.
 - a. Place the mouse cursor directly over the oscilloscope screen's lower horizontal cursor until the cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until the screen's lower horizontal cursor is superimposed directly on the reference line.

Note: See "Using the DVM" to measure a DC voltage using the DVM window on the computer display.

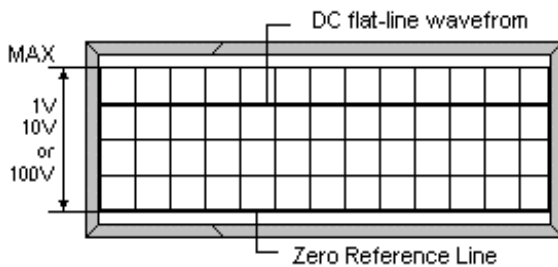
11. Apply the probe tip to the signal source. The oscilloscope grid display vertically displaces the DC signal's flat-line away from the zero reference line.

Caution: Never try to measure a DC voltage that exceeds 100 volts.

12. Click on the oscilloscope hold icon.



13. Calculate the DC signal using the oscilloscope's grid display as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's upper horizontal cursor until the cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until the screen's upper horizontal cursor is superimposed directly on the DC signal's flat-line waveform.



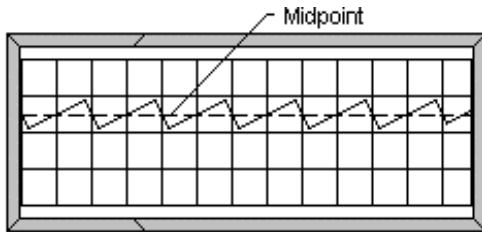
14. Read the measured value in the delta Volt: box. The delta Volt: box shows the actual DC voltage level of the signal at the measured point.

delta Volt:

MEASURING THE DC BIAS VOLTAGE OF AN AC SIGNAL

If you are measuring the DC component of an AC signal (AC on a DC bias), calculate the waveform's average vertical distance from the zero reference line as follows:

Note: The average level of a pure sinusoidal, square, or triangular waveform is the midpoint between the positive and negative signal peaks.



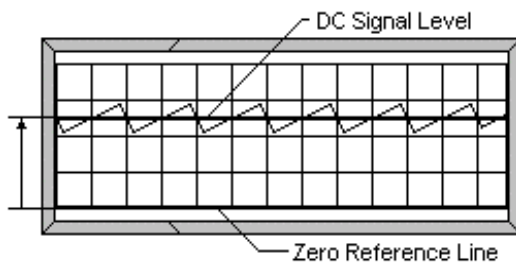
1. Repeat Steps 1-10 of "Measuring a DC Voltage" on Page 19.
2. Apply the probe tip to the signal source. The oscilloscope grid display vertically displaces the signal away from the zero reference line.

Caution: Never try to measure an AC peak-to-peak or DC voltage that exceeds 100 volts.

3. Click on the oscilloscope hold icon.



4. Calculate the DC bias using the oscilloscope's grid display as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's upper horizontal cursor until the cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until the screen's upper horizontal cursors is superimposed directly on the AC signal's midpoint between the positive and negative signal peaks.



Note: When measuring a waveform, start with the smallest selectable timbase on the osziFOX (50ns) and increase it one step at a time (100ns, 0.5 μ s, 1 μ s, 5 μ s, 10 μ s, 50 μ s, 0.1ms, 0.5ms, or 1 ms) until the displayed signal shows at least two complete cycles of a waveform.

5. Read the measured value in the delta Volt: box. The delta Volt: box shows the actual DC voltage level of the signal at the measured point.

delta Volt:

Important: The DVM display does not accurately measure AC on a DC bias. When making this type a measurement, either disregard its indication or turn off the DVM display by clicking on the voltmeter icon.



MEASURING AN AC VOLTAGE

In oscilloscope measurements, the AC component of a waveform is usually measured in terms of its peak-to-peak value. You can easily make this type of measurement by using the grid overlay on the oscilloscope screen to measure the vertical distance between peaks and multiplying this distance by the oscilloscope screen's deflection factor. The result is the actual peak-to-peak voltage.

Follow these steps to measure a waveform's peak-to-peak AC component.

Caution: To avoid an overload when measuring AC, make sure the zero line is centered vertically on the grid overlay.

1. Set the input coupling switch to **GND**.

Note: When you set the input coupling switch to **GND**, the osziFOX automatically resets the trigger mode to **AUTO**.

2. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
3. Rotate **Zero Level** until the zero reference line is centered vertically on the grid overlay.

Note: If the trace is widened by stray interference, ground the probe body near the point being measured. The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (Do not adjust the **Zero Level** control after the reference is established.)

4. If it was necessary to ground the tip (see Step 3 note), remove the tip from the ground or reference voltage. This readies the tip so you can use it to make a measurement.

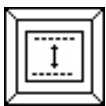
Set the input coupling switch to **AC**.

6. If you know the level of the signal to be measured, set the input voltage selector as follows.

Switch Position	Measures
1 V	0.00-1.00 V
10 V	0.0 -10.0 V
100 V	0-100 V

Note: If you do not know the level of the signal to be measured, always set the input voltage selector to **100 V**.

7. Click on the horizontal cursor icon to display the horizontal cursors. The Volt: box appears below the grid display.



8. Apply the probe tip to the signal source, then click on the oscilloscope hold icon.

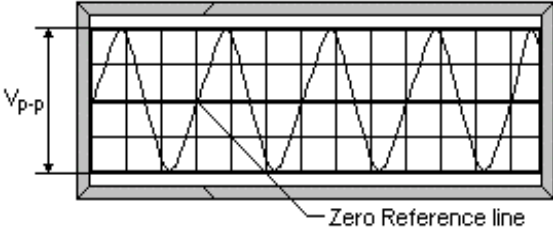


Caution: Never try to measure an AC voltage that exceeds 100 volts peak-to-peak.

9. Measure the vertical distance between the positive and negative peaks as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's upper horizontal cursor. The cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until the screen's upper horizontal cursor touches the top of the signal peaks.
 - c. Place the mouse cursor directly over the oscilloscope screen's lower horizontal cursor. The cursor's shape changes to a cross.

MEASURING AN AC VOLTAGE (cont.)

- d. While you press and hold the left mouse button, move the mouse up or down until the screen's lower horizontal cursor touches the bottom of the signal peaks.



Note: See "Using the DVM" to measure an AC RMS voltage using the DVM window on the computer display.

- 10. Read the measured value in the Volt: box. The Volt: box shows the actual AC peak-to-peak voltage level of the signal at the measured point. delta Volt:

8.9 V

Notes:

- You can also calculate the approximate voltage level by multiplying the approximate distance by the deflection factor.
- This technique can also be used to make measurements between two other points on the waveform.
- To accurately measure an AC peak-to-peak voltage, you should have at least two complete cycles of a waveform on the display.

MEASURING AN INSTANTANEOUS VOLTAGE

You can use the osziFOX to measure an AC signal's instantaneous voltage at any given point on the signal waveform.

1. Set the input coupling switch to **GND**.
2. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
3. Rotate the **Zero Level** to vertically position the trace to a convenient line on the grid overlay.

Note: The position on the grid overlay depends on the polarity and amplitude of the input signal, but should be chosen so the trace lies along one of the major divisions on the grid overlay. If the trace is widened by stray interference, ground the probe body near the point being measured. The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (Do not adjust the **Zero Level** control after the reference is established.)

4. If it was necessary to ground the tip (see Step 3 note), remove the tip from the ground or reference voltage. This readies the tip so you can use it to make a measurement.
5. Set the input coupling switch to **DC**.

Click on the horizontal cursor icon to display the horizontal cursors. the Volt: box appears below the grid display.



- a. Place the mouse cursor directly over the oscilloscope screen's lower horizontal cursor. The cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until the screen's lower horizontal cursor is superimposed directly on the reference line.
6. Apply the probe tip to the signal source, then click on the oscilloscope hold icon.



Caution: Never try to measure an AC voltage that exceeds 100 volts peak-to-peak.

7. Measure the vertical distance between a desired point on the waveform and the reference line as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's upper horizontal cursor. The cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse up or down until you place the screen's upper horizontal cursor on the desired point on the waveform.

Note: If you place the screen's upper horizontal cursor anywhere along the waveform, the measurement equals the instantaneous voltage. The delta Volt: box shows the instantaneous voltage level of the signal at the measured point.

delta Volt:

8.7 V

Note: You can also calculate the approximate voltage levels by multiplying the approximate distance by the deflection factor.

FREQUENCY MEASUREMENTS

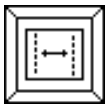
Since frequency and time are reciprocals of each other, when you know one (frequency or time), you can easily solve for the other ($f=1/t$, then $t=1/f$). Therefore, if you measure the time period of a recurrent waveform as $0.2\mu\text{s}$, the frequency is 5 Mhz (or $1/0.2\mu\text{s}$).

Note: Since a DC voltage does not have a frequency you cannot make frequency measurements on a DC voltage.

1. Set the input coupling switch to **GND**.
2. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
3. Rotate the **Zero Level** to vertically center the trace on the grid overlay.

Note: If the trace is widened by stray interference, ground the probe body near the point being measured. The trace position is the voltage reference line and all voltage measurement are read in respect to this line.
(Do not adjust the **Zero Level** control after the reference is established.)

4. If it was necessary to ground the tip (see Step 3 note), remove the tip from the ground or reference voltage. this readies the tip so you can use it to make a measurement.
5. Set the input coupling switch to **AC**.
6. Click on the vertical cursor icon to display the vertical cursors. The Time: box appears below the grid display.



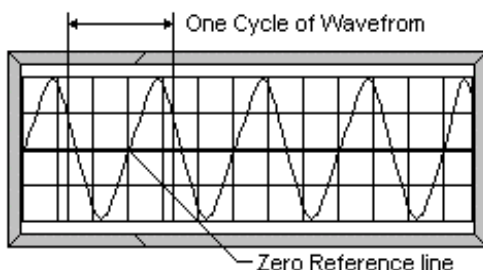
8. Apply the probe tip to the signal source, then click on the oscilloscope hold icon.



Caution: Never try to measure an AC signal that exceeds 100 volts peak-to-peak.

8. Measure the horizontal distance between rising or falling points on the displayed waveform as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's left vertical cursor. The cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse left or right until the screen's left vertical cursor touches a point where the rising or falling edge of the waveform intersects with the zero reference line.
 - c. Place the mouse cursor directly over the oscilloscope screen's right vertical cursor. The cursor's shape changes to a cross.
 - d. While you press and hold the left mouse button, move the mouse left or right until the screen's right vertical cursor touches the next point where the waveform's rising or falling edge intersects with the zero reference line.

Note: To avoid inaccurate frequency measurements, make sure you set the cursors in Steps 8b and 8d to two consecutive rising or two consecutive falling points of a displayed waveform. The frequency measurement will be inaccurate if you set one vertical cursor to a rising edge and the other to a falling edge.



FREQUENCY MEASUREMENTS (cont.)

e. When you select HERTZ, the delta Time value represents the signal's frequency. When you select Seconds, the delta Time value represents the time between the cursors.

delta Time	delta Time
0.10000 KHz	10.0 ms
Hertz	Seconds

Notes:

- You can click the tool bar button to toggle between Hertz or Seconds.
- The timebase on the computer's Timebase display changes with the grid overlay settings.



For example:

- If the grid is not shown, then the timebase displayed on the monitor is the same as the osziFOX's set sampling rate.

1ms	1kSa/s
Sampling Rate	Sampling Frequency

Since $f=1/t$, if the time period of a recurrent waveform is measured as 1ms, the sampling frequency is 1000 samples per second (or **1/1ms**).

- If the grid is shown, then the displayed timebase is the timebase of the grid. This timebase is 10 times the normal sampling rate (because there are 10 samples within each division of the grid).

10ms/div	1kSa/s
Timebase	Sampling Frequency

- You can change the timebase by pressing **Select**, without first pressing **Menu**.

- When measuring a waveform:
 - a. If either the time or frequency is known, simply calculate the reciprocal of the known value to figure the unknown value.
 - b. Start with the smallest selectable timebase on the osziFOX (50 ns) and increase it one step at a time (100 ns, 0.5 ms, or 1 ms) until the displayed signal shows one or two complete cycles of a waveform.

Frequency Measuring Limits

- You must have a minimum of one complete cycle of a waveform on the display.
- You cannot have more than one cycle per division.

PHASE MEASUREMENTS

You can compare two signal waveforms of the same frequency either from two separate points on the same electronic device, or from similar points on two separate electronic devices. The phase difference between the two signal waveforms is measured in degrees.

Note: You must calculate the number of degrees per division for this measurement to work with your osziFOX.

Grid Overlay Degree Calculation

Since a complete cycle of a sine wave is 360 degrees, it is easy to calibrate the grid overlay in degrees. For example, if the osziFOX's controls are adjusted so one cycle of the input waveform spans 9 squares on the grid, then each square represents 40 degrees of the complete cycle ($360/9=4$). The grid display is then considered to be calibrated to 40 degrees per square.

Measuring Phase

Follow these steps to measure the phase difference between two signals.

1. Set the input coupling switch to **GND**.
2. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
3. Click on the grid icon so the screen's grid overlay appears.
4. Rotate **Zero Level** to vertically center the trace on the grid overlay.

Note: If the trace is widened by stray interference, ground the probe body near the point being measured.

The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (Do not adjust the **Zero Level** control after the reference is established.)

5. If it was necessary to ground the tip (see Step 4 note), remove the tip from the ground or reference voltage. This readies the tip so you can use it to make a measurement.
6. Set the input coupling switch to **AC**.
7. Click on the vertical cursor icon to display the vertical cursors. The delta Time: box appears below the grid display.
8. Apply the osziFOX' tip to the first signal source, then click on the oscilloscope hold icon.

Caution: Never try to measure an AC signal that exceeds 100 volts peak-to-peak.

9. Measure the slope of the first circuit as follows:
 - a. Place the mouse cursor directly over the oscilloscope screen's left vertical cursor. The cursor's shape changes to a cross.
 - b. While you press and hold the left mouse button, move the mouse left or right until the screen's left vertical cursor touches a point where the rising or falling edge of the first waveform intersects with the zero reference line.
10. If the second signal source to be measured is a separate circuit on the same electronic device, simply remove the osziFOX's tip from the first circuit's signal source and apply it to the next circuit's signal source.

If the second signal source to be measured is a separate electronic device:

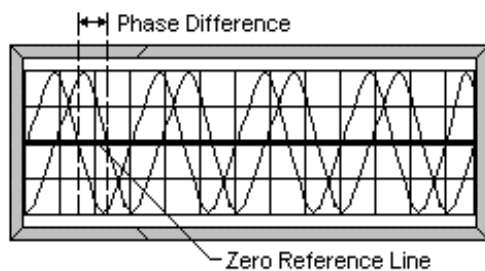
- a. Remove the clip on the ground wire and the probe's tip from the first signal source's ground and signal references.
- b. Connect the clip on the ground wire to the second signal source's ground reference.
- c. Apply the osziFOX' tip to the second signal source' circuit to be measured.

PHASE MEASUREMENTS (cont.)

11. Measure the slope of the second circuit as follows:

- Place the mouse cursor directly over the oscilloscope screen's right vertical cursor. The cursor's shape changes to a cross.
- While you press and hold the left mouse button, move the mouse left or right until the screen's right vertical cursor touches a point where the rising or falling edge of the second waveform intersects with the zero reference line.

Note: To avoid inaccurate phase measurements, make sure you set the cursors in Steps 9b and 11b to two corresponding rising or two corresponding falling points on the displayed waveforms. The phase measurement will be inaccurate if you set one vertical cursor to a rising edge and the other to a falling edge.



- When you select Seconds, the Time value represents the time between the cursors.
delta Time

10.0 ms
Time in milliseconds

Notes:

- You can click the tool bar button to toggle between Hertz or Seconds.
- The timebase on the computer's Timebase display changes with the grid overlay settings.

12. Calculate the number of degrees per division (see "Grid Overlay Degree Calculation" on Page 27).

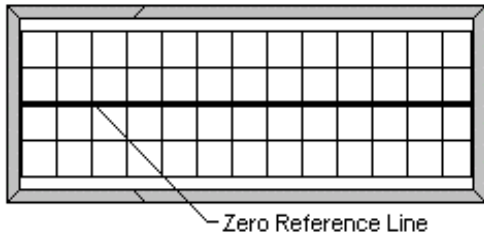
13. Divide the displacement between the vertical cursors (the value shown in the Time box) by the value in the timebase (Time-per-division), then multiply the result by the number of degrees per division calculated in Step 12.

Note: The relative amplitude of the measured signals does not affect the phase measurement if the signals are centered around the grid's center horizontal line.

Single Sweep Waveform Measurements

You can measure a waveform that occurs only once without repeating, such as a noise spike that occurs when you turn on an electronic device.

Follow these steps to measure a single sweep waveform.



1. Set the input coupling switch to **GND**.
2. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
3. Connect the **EXT.TRIGGER** wire to the trigger signal source.
4. Rotate **Zero Level** to vertically position the trace to a convenient line on the grid overlay.

Note: If the trace is widened by stray interference, ground the probe body near the point being measured. The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (So not adjust the **Zero Level** control after the reference is established.)

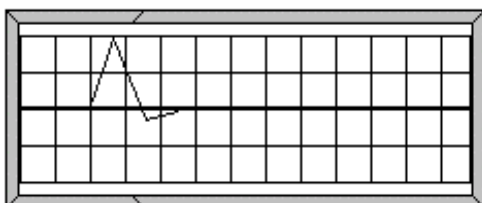
5. If it was necessary to ground the tip (see Step 4 note), remove the tip from the ground or reference voltage. This readies the tip so you can use it to make a measurement.
6. Set the input coupling switch to **AC**.
7. Continuously press **Menu** until the trigger mode appears on the display.
8. Press **Select** to set the trigger mode to:
 - **+ EXTERN** (if you want to trigger on the incoming signal's rising edge), or
 - **- EXTERN** (if you want to trigger on the incoming signal's falling edge).
9. Press **Menu** so TRIGGER LEVEL appears on the osziFOX's display.
10. Continuously press Select until you set the trigger level as desired.

Note: The trigger level you select sets the level of the incoming waveform that causes the osziFOX to begin reading the signal. The osziFOX shows the trigger level on the left side of the LCD.

11. Press **Menu** until the MODE screen appears on the osziFOX's display.
12. Press **Select** so SINGLE appears on the osziFOX display.
13. Press **Menu** so WAITING! appears on the osziFOX's display.
14. Apply the probe tip to the signal source to be measured.

Caution: Never try to measure an AC signal that exceeds 100 volts peak-to-peak.

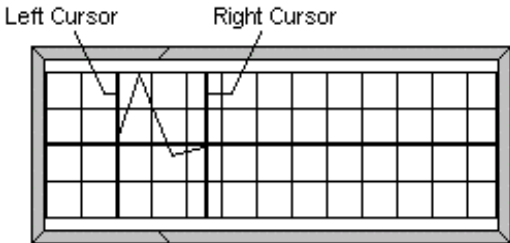
15. Turn on the device to be measured. A single waveform appears on the oscilloscope screen.



Single Sweep Waveform Measurements (cont.)

16. Measure the single sweep frequency as follows:

- a. Place the mouse cursor directly over the oscilloscope screen's left vertical cursor. The cursor's shape changes to a cross.



- b. While you press and hold the left mouse button, move the mouse left or right until the screen's left vertical cursor touches the point where the rising edge of the waveform intersects the zero reference line.
- c. Place the computer's mouse cursor directly over the oscilloscope screen's right vertical cursor. The cursor's shape changes to a cross.
- d. While you press and hold the left mouse button, move the mouse left or right until the screen' right vertical cursor touches the point where the next rising edge of the waveform intersects the zero reference line.
- e. When you select HERTZ, the Time value represents the signal's frequency. When you select Seconds, the Time value represents the time between the cursors.

delta Time	delta Time
0.10000 KHZ	10.0 ms
Hertz	Seconds

Notes:

- You can click the tool bar button to toggle between Hertz or Seconds.



- The timebase on the computer's Timebase display changes with the grid overlay settings.

USING THE DVM

The following applications describe how to make basic voltage measurements using the osziFOX's digital voltmeter (DVM) mode. These applications are not described in detail, but are designed to familiarize you with basic DVM operating techniques.

In digital voltmeter measurements, the measured AC or DC voltage is converted to digital values using an analog-to-digital (A/D) converter.

In the AC mode, the osziFOX rectifies the AC signal to convert it to DC. The DC is then converted to a digital value by a 6-bit resolution S/D converter, then multiplied by 0.707 to display the RMS value. You must have at least two cycles of a waveform for the osziFOX to accurately measure AC DVM values.

Note: The voltmeter function is to be used only for pure AC and DC measurements. Only sine waves are allowed for AC measurements since the osziFOX does not support true RMS functions. For measuring an AC signal on a DC bias, use the oscilloscope (see "Using the Oscilloscope" on Page 17).

In the DC mode, the DC is directly converted to a digital value by the 6-bit resolution A/D converter. An average of up to 128 recorded values appears on the screen. A negative value is displayed when the average is below the reference line.

ZEROING THE OSZIFOX

1. Continuously press **Menu** until the **FUNCTION** mode appears on the display
2. Press **Select** to set the function mode to **DVM**, then press **Menu** again.
3. Set the input coupling switch to **GND**.

Note: When you set the input coupling switch to **GND**, the osziFOX automatically resets the trigger mode to **AUTO**.

4. Connect the **GROUND** (0 volt) wire to the signal source's ground or reference level.
5. Click on the grid icon so the computer screen's grid overlay appears.
6. If measuring a DC voltage, to avoid an overload, rotate **Zero Level** to position the zero reference line:
 - a. On the bottom of the display until the v indicator appears on the osziFOX's LCD (to get the maximum positive (+) measurement), or
On the top of the display until the \bar{v} indicator appears on the osziFOX's LCD (to get the maximum negative (-) measurement).
 - b. Slowly re-adjust **Zero Level** in the opposite direction just until the v or \bar{v} indicator disappears from the osziFOX's LCD.

If measuring an AC voltage, to avoid an overload, make sure the zero line is centered vertically on the grid overlay.

Notes:

- The grid must be turned on.
- The reference line on the oscilloscope display should be set to just above the bottom line or just below the top line on the grid.
- The position on the grid overlay depends on the input signal's polarity and amplitude, but should be chosen so the trace lies along one of the grid overlay's major divisions.
- If the trace is widened by stray interference, ground the probe body near the point being measured. The trace position is the voltage reference line and all voltage measurements are read in respect to this line. (Do not adjust Zero Level control after the reference is established.)

MEASURING AC OR DC

1. If it was necessary to ground the tip (see Step 6, 4th note bullet in "Zeroing the osziFOX"), remove the tip from the ground or reference voltage point. This readies the tip so you can use it to make a measurement.
2. Set the input coupling switch to **AC** or **DC**. The selected setting appears on your computer's monitor.
3. Set the input voltage range to the appropriate **1V**, **10V**, or **100V** range scale.

Cautions:

- Always set the selector to the highest range when you are not sure of the voltage to be measured.
 - Never try to measure a DC voltage or a peak-to-peak AC signal that exceeds 100 Volts between the measured test point and ground.
 - The maximum AC RMS measurement is (Voltage Range Selection /2) x 0.707.
4. Click on the DVM icon on the tool bar to display the DVM window.

DVM:



5. Apply the probe tip to the circuit to be tested. The actual voltage appears on the osziFOX's display and on the monitor's DVM box.



Caution: Never try to measure a DC voltage or a peak-to-peak AC signal that exceeds 100 Volts between the measured test point and ground. If you want to freeze the current voltage reading so you can take another measurement reading for comparison, click on the tool bar.



CARE AND MAINTENANCE

Your WTT osziFOX V4.2 for Windows 95/98 is an example of superior design and craftsmanship. The following suggestions will help you care for the osziFOX so you can enjoy it for years.



Keep the osziFOX dry. If it gets wet, wipe it dry immediately. Liquids might contain minerals that can corrode the electronic circuits.



Handle the osziFOX gently and carefully. Dropping it can damage circuit boards and cases and can cause the osziFOX to work improperly.



Use and store the osziFOX only in normal temperature environments. Temperature extremes can shorten the life of electronic devices and distort or melt plastic parts.



Keep the osziFOX away from dust and dirt, which can cause premature wear of parts.



Wipe the osziFOX with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the osziFOX.

Modifying or tampering with the osziFOX's internal components can cause a malfunction and might invalidate your osziFOX's warranty and void your FCC authorization to use it. If your OsziFOX is not performing as it should, take it to WTT Services for assistance.

SPECIFICATIONS 22-310A

Sampling Rates _____ 50, 100 ns, .5, 1, 5, 10, 50 μ s, .1, .5, 1 ms

max. Sampling Rate _____ 20MSa/s

DC Band Width _____ DC - 5 Mhz

AC Band Width _____ 100 Hz - 5 Mhz

A/D Converter _____ 6-Bit resolution

RAM _____ 128 Bytes

Input Coupling _____ AC, DC, or GND (Ground)

Input Voltage Ranges _____ 1V, 10V, 100V

Note: All voltages measurements are referenced to 0V ground. The effective ranges for AC volt measurements in DVM mode are 0.33V, 3.3V and 33V since the peak-to-peak voltage must be digitized and converted to the RMS value.

Trigger Definitions _____ Auto, Internal, External

Trigger Levels _____ Six selectable levels

Note: Level tolerances are dependent on the selected input voltage range: 1V +/-0.1V, 10V +/-3V, 100V +/-10V

Trigger Modes _____ Continuous RUN/SINGLE Cycle

Display _____ 16x32 dots resolution, LED backlighted

Serial Line _____ 19.200 kBaud 7 Data Bits, 1 Stop Bit, No Parity

DVM Accuracy _____ +/-2 to +/-5% (depending on the parameter settings)

Power Supply _____ 9 - 13 V DC red (+) and black (-) alligator clips

Current Required _____ Backlight Off = 12 mA Typical, Backlight On = 85 mA Typical

Dimensions (HWD) _____ (165 x 33x19mm)

Weight _____ About 86 g

Specifications are typical; individual units might vary. Specifications are subject to change and improvement without notice.

WTT Warranty Note

This product is warranted against defects for 3 years from date of purchase from WTT Direkt and authorized WTT distributors and dealers. Within this period, we will repair it without charge for parts and labor. Simply bring your WTT sales slip as proof of purchase date to WTT. Warranty does not cover transportation costs. Nor does cover a product subjected to misuse or accidental damage.

EXCEPT AS PROVIDED HEREIN, WTT MAKES NO EXPRESS WARRANTIES AND ANY IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE DURATION OF THE WRITTEN LIMITED WARRANTIES CONTAINED HEREIN. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

We Service What We Sell 1/00

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