

TEK1230

070-6878-01  
PRODUCT GROUP 43

1230 Operator's

# 1230

LOGIC ANALYZER

## OPERATOR'S MANUAL

Please check for change information  
at the back of this manual


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## PREFACE

This manual describes the TEKTRONIX 1230 Logic Analyzer. The 1230 is a modular, general-purpose test and measurement tool for designing, manufacturing, and servicing digital devices. The analyzer mainframe is lightweight, rugged, portable, and quiet. Because it is a modular instrument, you can configure the analyzer to meet your specific application. The 1230 Logic Analyzer supports hardware debugging, software analysis, microprocessor disassembly, and hardware/software integration.

### About the 1230 Logic Analyzer

In its basic configuration, the 1230 Logic Analyzer can acquire data on 16 channels at 25 MHz, 8 channels at 50 MHz (asynchronous), or 4 channels at 100 MHz (asynchronous). You can also install up to three 16-channel 1230E1 Expander Cards in the analyzer, increasing the number of acquisition channels to 32, 48, or 64.

With each additional 16-channel expander card installed, the analyzer also lets you use an additional timebase. This lets you collect data simultaneously from different parts of the system under test (SUT) at different sampling rates and threshold voltages. For example, a 64-channel analyzer can disassemble an 8-bit microprocessor and acquire 16 channels of data at a sampling rate of 40 ns at the same time.

Optional RS-232C and GPIB interfaces let you use the 1230 Logic Analyzer as part of an integrated system. These interfaces let you transfer acquired data and analyzer setup information between the 1230 and a remote host system. With these interfaces, you can also control the analyzer from your host keyboard.

The 1230 is easy to use. Screen and pop-up menus let you make changes quickly and easily, while a menu bar at the bottom of each menu lists the keys to press for menu features. The analyzer also provides online help if you need more information about the screens.

## About This Manual

You don't have to read this manual from front to back. In general, the manual is organized so that user information is provided in the first sections, and reference information is listed in later sections.

The manual is divided into these sections:

- Section 1 Getting Started.** This section describes the analyzer front and back panels, tells you how to power up, and shows you how to acquire data in the default setup. This section also describes basic analyzer menus and features.
- Section 2 Procedures.** This section gives you simple procedures and examples for changing setup parameters and acquiring data using the demonstration test card supplied with your logic analyzer.
- Section 3 Setup Menus.** This section describes the setup menus and shows you how to change setup parameters for your applications.
- Section 4 Data Menus.** This section describes the analyzer's acquisition screen and data menus. This section also shows you how to manipulate acquired data in state and timing displays. For in-depth information about disassembly, refer to your microprocessor disassembly probe operator's manual.
- Section 5 Utility Menus.** This section describes the analyzer's standard and optional utilities, except for the optional GPIB interface. For in-depth information about the GPIB interface, refer to your GPIB operator's manual.

**Appendix A Logic Analyzer Concepts.** This appendix introduces you to logic analyzing and explains basic logic analyzer concepts such as clocking, triggering, and glitches.

**Appendix B Default Menus.** This appendix lists the default analyzer menus.

**Appendix C Installation and Setup.** This appendix shows you how to install and set up standard and optional analyzer accessories. This appendix also shows you how to connect acquisition and microprocessor probes, and how to power up the analyzer.

**Appendix D Accessories and Specifications.** This appendix lists all the standard accessories, optional accessories, and specifications for the analyzer.

## Glossary

You may receive change pages or notices with this manual reflecting post-publication changes. Please check at the back of this manual, behind the yellow tab, for change information.



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## OPERATOR'S SAFETY SUMMARY

The general safety information in this summary is for both operator and service personnel. Specific cautions and warnings are found throughout the manual where they apply, but may not appear in this summary.

### TERMS IN THIS MANUAL

**CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property.


**WARNING** statements identify conditions or practices that could result in personal injury or loss of life.


### TERMS AS MARKED ON EQUIPMENT


**CAUTION** indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

**WARNING** indicates only a personal injury hazard not immediately accessible as one reads the marking.

### SYMBOLS AS MARKED ON EQUIPMENT

 **WARNING** – high voltage.

 Protective ground (earth) terminal.

 **ATTENTION** – refer to manual.

### GROUNDING THE PRODUCT

This product is intended to operate from a power source that does not apply more than 230 volts rms between the supply conductors or between either supply conductor and ground.

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

**DANGER ARISING FROM LOSS OF GROUND**

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

**USE THE PROPER POWER CORD**

Use only the power cord and connector specified for your product, and be sure it is in good condition. Refer to Section 1, *Getting Started*, or Appendix C, *Installation and Setup*, for information about power cords and connectors.

**USE THE PROPER FUSE**

To avoid fire hazard, use only a fuse of the correct type, voltage rating and current rating as specified in the parts list for this product.

**DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES**

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

**USE CARE WITH COVERS REMOVED**

To avoid personal injury from high current, remove jewelry such as rings, watches, and other metallic objects before removing cover. Do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.



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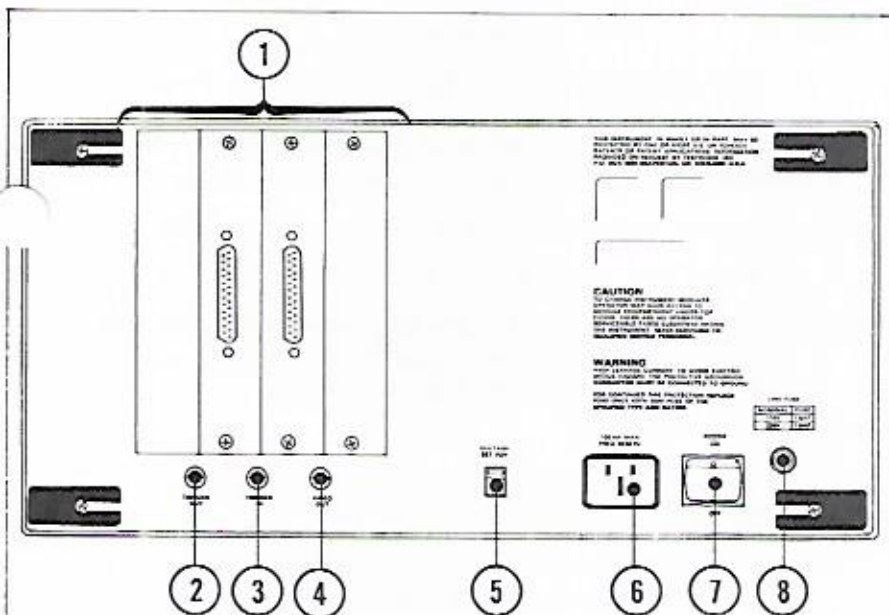
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GETTING STARTED

8. **MENU key.** Use this key to call up the Main menu or return to the immediately previous menu you displayed. You can also use this key to exit the online notes which give you information about each 1230 menu.
9. **NOTES key.** Use this key to display online help about each 1230 menu. You can also use this key along with the ENTER key to initialize the analyzer without turning the 1230 off.
10. **Power indicator.** This light is on when the analyzer is turned on.
11. **Probe slots.** To acquire data, you must always have a probe plugged into probe slot A. If you're using more than one probe, other probes can be plugged into the other slots.

6878-01

Figure 1-1. 1230 front panel.



1. **Option card connection ports.** When you install option cards, the option card cables connect to the inside of these ports.
2. **TRIGGER OUT.** Use this connection to send a signal to another device.
3. **TRIGGER IN.** Use this connection to receive a signal from another device.
4. **VIDEO OUT.** A composite of the display screen.

5. **Line voltage selector.** The selector switch lets you choose between 115 V and 230 V for the input power voltage.
6. **Power cord connector.**
7. **Power switch.**
8. **Fuse.**

6878-02

Figure 1-2. 1230 back panel.

## POWER UP AND ACQUIRE DATA

This procedure shows you how easy it is to start acquiring data with the 1230 Logic Analyzer.

1. Make sure power to the 1230 and your SUT is off.

**CAUTION**

*Make sure power to the 1230 and SUT is off. If you connect the acquisition probe when the 1230 is off and the SUT is on, too much power can flow through the probe inputs and damage the probe.*

2. Plug your acquisition probe into slot A on the 1230.
3. Connect your acquisition probe to your SUT.
4. Turn on the 1230, which supplies power to the probe. The Initialization menu is now displayed on your 1230 screen. Figure 1-3 shows the Initialization menu.
5. Turn on your SUT.
6. Press MENU to initialize the 1230 and call up the Main menu. Figure 1-4 shows the Main menu.
7. Press START to acquire data with the default 1230 setup. In the default setup, the 1230 triggers on all don't cares at an asynchronous sampling rate of 1  $\mu$ S.

During the acquisition, the Acquisition Process screen is displayed, telling you the status of the acquisition; for example, that the 1230 is waiting for the trigger to occur. Figure 1-5 shows a sample Acquisition Process screen.

As soon as the acquisition is complete, the analyzer automatically displays the acquired data in the default display format, a timing diagram. Figure 1-6 shows a sample timing diagram.



WED, JUN 15, 1988

11 07 -DEFAULT

**Tektronix** 1230/64 Channel Logic Analyzer, V3.05  
 (C) Tektronix, Inc. 1987, 1988 All rights reserved.

Use the NOTES key whenever information is needed,  
 or consult the Operator's Manual.

X represents DON'T CARE condition.

Press MENU to continue

6878-03

Figure 1-3. Initialization menu. When you first turn on the analyzer, this menu is displayed. This menu won't be displayed again unless you turn on the analyzer again or reset it by firmly pressing NOTES and ENTER at the same time. The menu bar at the bottom of the screen tells you that pressing MENU calls up the Main menu.

SETUP	DATA	UTILITY
0 Timebase	6 Mem Select	B Storage
1 Channel Groups	7 State	C Sys Settings
2 Trigger Spec	8 Disassembly	
3 Conditions	9 Timing	
4 Run Control		

Select Screen: Hex Key or ▲▼ for cursor, then ENTER

6878-04

Figure 1-4. Main menu Press MENU to call up the Main menu. This menu gives you access to the analyzer's setup, data, and utility menus. The menu bar at the bottom of the screen tells you which keys to press to select other analyzer menus.

```
THU, MAY 12, 1988 Acquisition Process 17 46 -DEFAULTI
Timebase Status
```

II

Initializing

```
Stop Acquisition: STOP
```

6878-05

Figure 1-5. Acquisition Process screen. As soon as the 1230 is connected to your SUT and initialized, you can acquire data from your SUT. This screen tells you the status of the acquisition. For example, the screen can tell you which trigger statement is being executed, whether or not the trigger has been found, and whether or not memory is being filled.

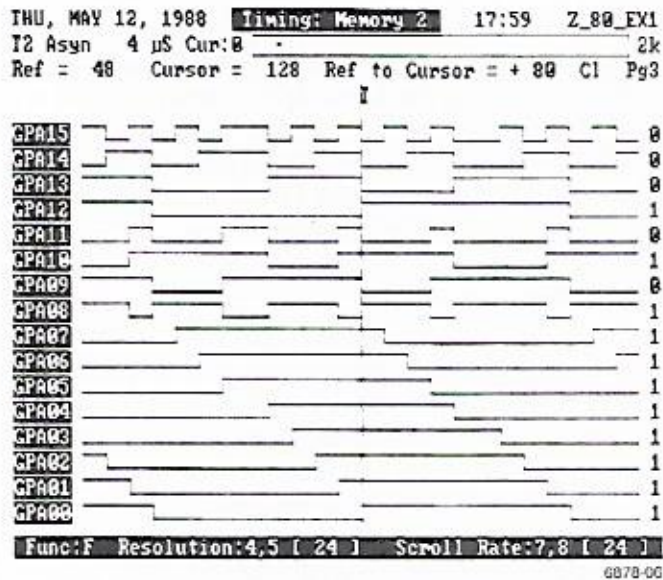


Figure 1-6. Sample timing diagram. As soon as the acquisition is complete, the 1230 automatically displays the acquired data for you. The default data display is a timing diagram. Press MENU, then 7 to call up the corresponding state table for your data acquisition.

The rest of this section describes basic features of the 1230. Section 2 shows you some simple examples of setting up the 1230, acquiring data, triggering on a word condition, and capturing glitches. Sections 3 through 5 explain setup, data and utility menus in detail.

## BASIC FEATURES

The 1230 has many features that make it easy to use. Among them are the 1230's modular configuration, single-keystroke functions, pop-up menus, and online note screens. This discussion explains the menus and online note screens.

## Initialization Menu

When you first turn on the 1230, an Initialization menu is displayed. This tells you the name and firmware version number of the 1230 Logic Analyzer. The menu also gives the time and date, tells you how to get online notes, and tells you that in the displays, an X represents a don't care. Figure 1-3, earlier in this section, shows the Initialization menu.

## Main Menu

Press MENU to call up the Main menu. This menu lets you choose setup, data, and utility menus for using and configuring the 1230. Figure 1-4, earlier in this section, shows the Main Menu. When you first call up the Main menu, the cursor highlights the upper left field, Timebase. When you return to the menu, the cursor highlights the last selection you made.

To choose a menu from the Main Menu, press the hexadecimal key associated with the menu. For example, press 0 for the Timebase menu, 7 for a State Table, or 8 for the Storage menu. You can also use the cursor keys to scroll to the menu selection and then press ENTER. The selected menu is then shown on the screen.

There are three spaces (fields) reserved for menus associated with options. The analyzer displays a menu only if the option is installed. If you don't have any options, these fields are blank. If you press those keys or try to select those fields, the analyzer ignores your request. You can install up to three of these options in the 1230:

- Parallel printer
- RS-232C
- GPIB
- International notes

## Other Menus

The 1230 has three types of menus: setup, data, and utility menus. These menus are shown as screen or pop-up menus.



### **Screen and Pop-up Menus**

Some 1230 menus are screen menus, and some are pop-up menus. Screen menus, such as the Channel Grouping menu, take up the entire display screen. Pop-up menus, such as the Conditions menu, take up less than a whole screen. Pop-up menus are displayed on top of screen menus. This is especially handy for the Conditions menu, because you can look at your defined conditions and the information on a screen menu at the same time.

### **Setup, Data, and Utility Menus**

Setup menus let you set up the 1230 for different kinds of acquisitions. For example, set-up menus let you link probes for parallel data acquisition, specify channel groups, and set trigger events. Data menus display acquired data in different formats, such as timing diagrams and state tables. Data menus also let you manipulate data; for example, compare two different acquisitions. Utility menus control support features or menus you add by installing options, such as the Parallel Printer or RS-232C menu.

The next three tables briefly describe the standard and optional menu selections.

**Table 1-1  
Setup Menus**

Setup Menu	Description
Timebase	Sets the sampling rate and clocking format (asynchronous or synchronous), glitch detection, and probe threshold voltage. This menu also lets you link probes in the same timebase or in separate timebases.
Channel Grouping	Assigns probe channels to groups so that you can acquire and display data in groups meaningful to your application.
Trigger Spec	Defines the trigger statements that control data acquisition and storage. Trigger statements include fields that control trigger conditions, number of occurrences of the conditions, trigger actions, and destinations.
Conditions	Defines the word values for word recognizers used in the Trigger Spec menu. Conditions may also be used as comparison masks.
Run Control	Specifies which memory data is stored in, at what memory location the trigger is stored, and when the 1230 begins looking for the trigger condition. This menu also controls memory comparisons.

**Table 1-2**  
**Data Menus**

Data Menu	Description
Memory Select	Shows the main setup parameters for each of the four memories. This menu also lets you choose the memory you want to display.
State	Displays acquired data in state table format. This screen also shows the differences from memory comparisons.
Disassembly	If you're using one of the optional micro-processor disassembly probes, this screen displays disassembly information in hardware or software format.
Timing	Displays data using timing traces. This screen also lets you reorder, duplicate, and delete traces from the display to show only the information you want.

**Table 1-3  
Utility Menus**

Utility Menu	Description
Storage	Stores user-specified menu settings (setups). This menu lets you load stored setups so you can display data acquired using previous setups.
System Settings	Sets the date, time, screen intensity, and screen saver features.
RS-232C	Sets the baud rate, word length, parity, and stop bits for the optional RS-232C communication protocol (optional).
GPIB	Sets up the optional General Purpose Interface Bus interface. Refer to the <i>1230 GPIB Operator's Manual</i> for GPIB information.
Printer Port	Specifies how to use the optional printer port, including the range of memory to print, the print density, and other details.
International Notes	Selects the language of the notes information (optional)

### Using the Cursor

You can use the 1230 cursor keys to move around in menus and screen displays. In most cases, when you reach the end of a line or screen, the cursor wraps to the other end of the line or screen.

The first time you call up a menu, the cursor appears in the upper-left field for that menu. In general, if you move the cursor, leave the menu and then return to it before making changes in another menu, the cursor appears in the same field it last occupied.



For some menus, the cursor tracks data between the displays. For example, in data menus, the cursor tracks the same memory location (such as 0815) in each display so that you see the same information in different display formats (state, disassembly, and timing).

## Changing Menu Fields

Each menu has fields that you can change to define the way the analyzer triggers, displays, and stores data. For example, in the Timebase menu, you can change fields that describe probe links, data sampling formats and rates, glitch capture, and probe threshold voltage.

Some fields have a list of parameters you can choose from. For example, in the Timebase menu, you can choose two sampling formats: Sync (for synchronous sampling) or Async (for asynchronous sampling). Other menu fields are fields you can edit by entering values from the keypad. For example, you can edit a channel-group name to be any 3-character string you choose, such as DAT or INT.

There are different ways to change menu fields. For example, if there's a list of parameters to choose from, you can usually press 0 or 2 to cycle through the list of selections. The menu bar at the bottom of each screen lists the keys to press to do each menu function. For example, in the Trigger Spec menu, the trigger timebase field is listed in the menu bar as TrigTB:D[T1]. This tells you to press D to change the trigger timebase from T1 to another timebase. The value in brackets tells you what the current selection is for that field.

Sometimes, just putting the cursor on the field lets you change the field. For example, you can change a condition word definition, such as XXFF, as soon as you move the cursor to the definition field. Other times you may have to press ENTER to tell the 1230 that you want to change a field. For example, to change a channel group name, move the cursor to the name field and press ENTER, then enter the group name you want by using the keypad and cursor keys to enter characters.

## Scrolling Through Data

Some menus have more information than fits on the screen at one time. For example, the state table contains information for the entire 2K memory, but only 20 lines fit on the screen at a time. For these menus, use the cursor keys to scroll more data onto the screen.

When you reach the end of memory or the display, the data wraps around to the beginning again so you can display the beginning and end of memory at the same time. A blank line separates the beginning and end of memory.

## Using Menu Bars

At the bottom of each screen, a one-line help message (a menu bar) tells you which keys to press for each menu function. Figures 1-3, 1-4, and 1-6 show menu bars at the bottom of the menus.

Some data and utility menus have more than one menu bar. In these cases, press F to cycle through available menu bars. If there's more than one menu bar for the menu, you don't have to display a specific bar to use the functions listed on it. Menu bars just remind you about menu functions.

For example, one of the State Menu bars tells you to press C to compare the display and reference memories. You don't have to cycle through the menu bars until you display the bar that lists the compare instruction. As long as you're not in an editor, you can press C at any time in the state table to compare memories and display differences.