

Basic Concept

- Universal Emulator and Debugger Systems
- Scalable from 8 to 64 Bit
- Transparent for all ICE Probes
- Compatible Low-Cost Debugging System
- Very fast Window System
- Integrated HLL Debugger
- Integrated RTOS Debugger
- Integrated Test Language
- State Analyzer
- Performance Analyzer
- Port Analyzer
- Timing Analyzer
- Ethernet, USB or Parallel Interface

Development systems using In-Circuit Emulators and Logic Analyzers have been successfully used for many years. Originally, they were dedicated units often attached to a dedicated computer system (the MDS). In the early

80's, universal, stand alone models began to appear which could be used with any computer via an RS232 interface.

With the increasing use of high-level languages however, programs can now easily reach several MBytes in length which may cause

problems when downloading to conventional emulators. Also, faster CPUs are being used and multitasking/multiprocessing are now common place features in high-performance systems.

Introduction

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tures in high-performance systems. This document describes the TRACE32 Logic Development System, an universal system especially designed to provide a complete integrated environment with the performance and flexibility that sets new standards for leading edge designers. It is a NO COMPROMISE SYSTEM - the result of over 500 man years of development and based on many more years of experience with microprocessor development systems. TRACE32 is designed and produced by Lauterbach Datentechnik GmbH, the leading European MDS companies.

System Concept

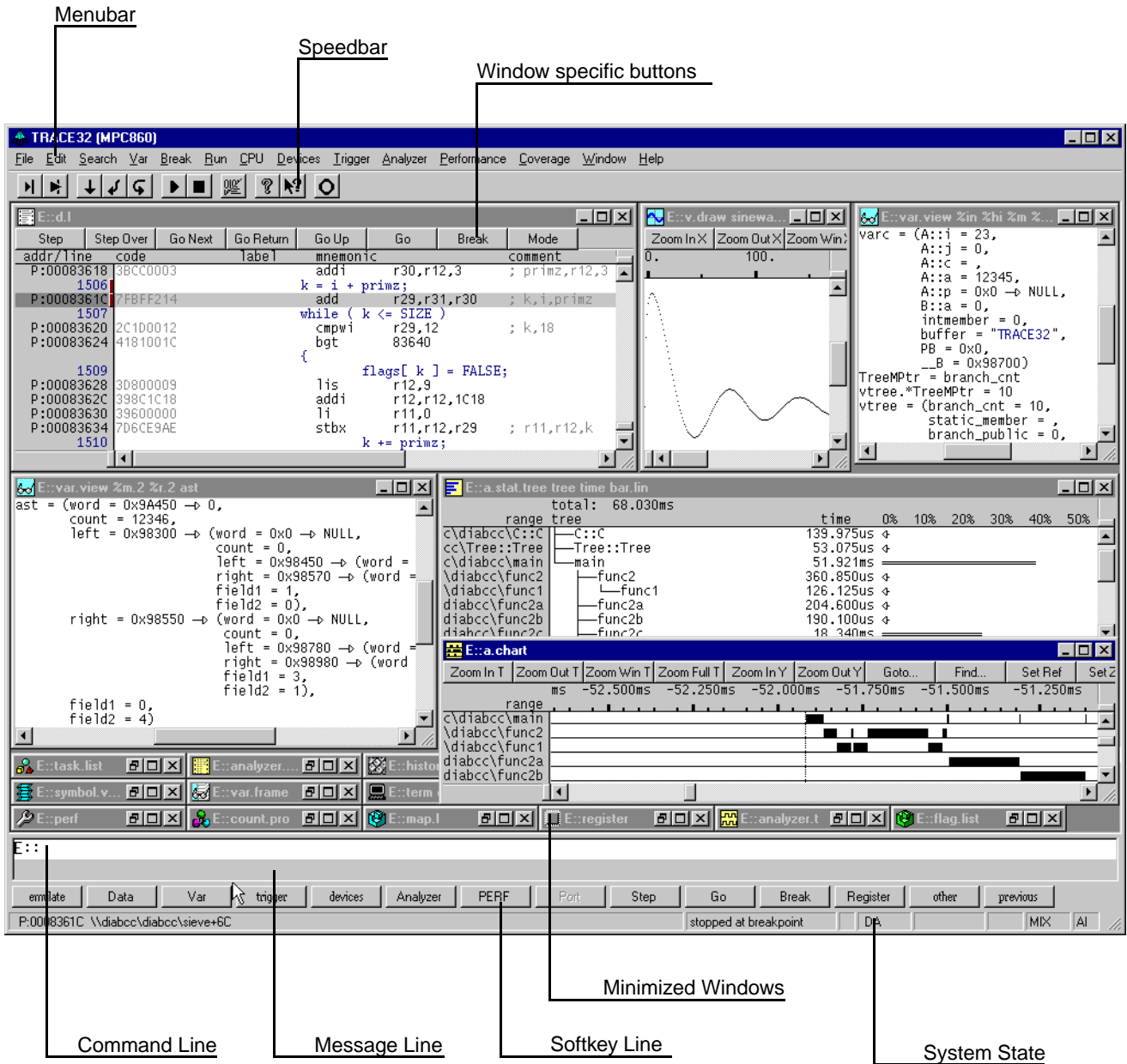
The designers of the TRACE32 system were asked to produce a truly integrated, universal development system i.e. a system which can be connected to most workstations and can contain any combination of instruments which may be required for microprocessor systems development including In-Circuit Emulator, Logic State Analyzer, Logic Timing Analyzer, Simulator, Universal Device Programmer, Pattern/Stimuli Generator, Frequency/Pulse Generator, Universal Counter/Timer, Communication Tester Analyzers etc. In order to achieve this, special emphasis was given to the modular structure of the hardware and software so that expansion is easily achieved. The system is based on an active controller (TRACE32-SCU) with a 32 bit CPU and up to 64 MBytes RAM. Most of the system software is downloaded into this ram, which makes the system virtually host independent. The host system runs some software for the GUI but the bulk of the work is done by the system controller at high-speed. For this reason and for high-speed program downloading, the speed of data transfer between the host system and the TRACE32 is very important, and to solve the problem, an optional fiber optic interface is available which allows transfers of 2 Mbit/sec (160 Kbyte/sec

effective code transfer rate) or an ETHERNET connection (up to 500 Kbyte/sec). The three major instruments i.e. In-Circuit Emulator, Logic State Analyzer and Timing Analyzer can be operated either stand alone (with a system controller-SCU) or as an integrated set via one system controller. They can be further expanded using the PODBUS which is a high-speed serial bus, onto which may be connected other smaller instruments such as the Stimuli Generator, Eprom Simulator, Communication Analyzers etc. Whatever the configuration is, all instruments are controlled via the system control unit and therefore a single workstation console. The integration between instruments is total in that they can all be controlled through the same windowing software. Intertriggering lines are provided such that each instrument can directly trigger others or be triggered or used as qualifiers for other trigger events. The native GUI software provides an intuitive, consistent, high-performance user interface which may be operated by any combination of mouse, keyboard or softkeys (function keys). TRACE32 is not an expansion of an existing 8 bit development system, but a completely newly developed system for CPUs up to 32 bit wide and takes into account the special needs of

such systems including multitasking, multiprocessing and high-level language support.

Features

User Interface



User Interface

High-Performance Interactive

Basic Concept
Features



User Interface

All commands can be entered via the keyboard, the function keys, the mouse, pull-down menu or command scripts.

Universal Window System

Windows of any size can be created and positioned anywhere on the screen. In each window there is a horizontal and a vertical scroll bar. Up to 128 windows may be open simultaneously. Windows may either be static (contents fixed), dynamic (contents variable) or temporary. Dynamic windows are updated at a rate of up to 700 times per second. Workstation based software uses the same graphic elements like the host operation system.

Window Configuration Save and Restore Facility

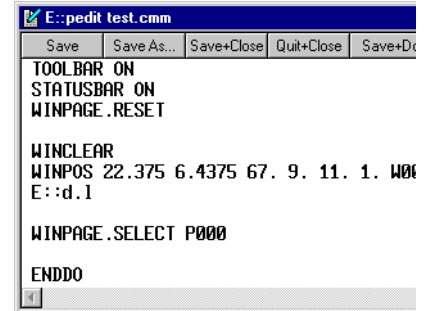
Each window configuration that the user designs can be saved for later reuse. Several user predefined configurations can easily be selected by switching the window pages.

Special Test Language for Automatic Test Applications - PRACTICE II

TRACE32 has its own special BASIC-like meta-language called PRACTICEII which is a superset of it's fundamental commands. Complete programs may be constructed using PRACTICEII for automatic testing or for the construction of command macros. All aspects of the systems may be controlled/programmed via the PRACTICE language.

- The PRACTICE Language supports the following Data Types:
 - Boolean, Binary, Hex, Integer
 - Float, Character, String, Range
 - Address, Address Range, Time
 - Binary Mask, Hex Mask
- 64 Bit Floating Point Arithmetic
- Functions

All important characteristics of the system can be accessed by the PRACTICE language functions. In particular the PRACTICE program can be used to automatically enter target data.



5 Screen Areas

For interactive operation, the screen is split into several areas:

- State Line
- Window Area
- Command Line
- Message Line
- Soft Keys (function keys)

- PRACTICE Command Words
 - (block)
 - GOTO, GOSUB, RETURN, JUMPTO
 - DO, ENDDO, END
 - STOP, CONTINUE, PBREAK
 - IF, ELSE
 - WHILE
 - WAIT, BEEP, ON
 - INKEY, PRINT, AREA, ENTER
 - ENTRY
 - READ, WRITE, OPEN, CLOSE
 - PLIST, PEDIT, PMACRO
- Structured Programs

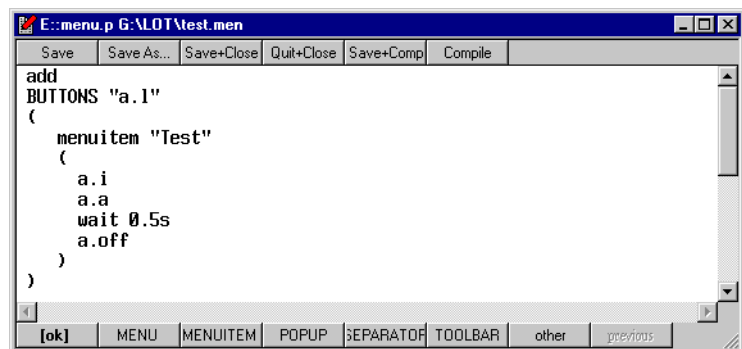
PRACTICE is a highly structured language. Local and global variables may be used. One module (file) may call another.
- Inbuilt Source Text Editor
 - Multiwindow Capability
 - Search and Replace Functions
 - Very Fast
 - Block Copy and Block Move
- Commands and Parameter History

The last commands or parameters can be recalled from the command buffer.

- LOG Capability
 - All commands, function key and mouse operations may be recorded to a file. The file can be re- executed.
- Setup Store
 - Storing the state of the system
- Documentation System
 - Save any window to a file
 - Complete listings or graphics
 - ASCII or postscript files
- Printer Interface
 - Text and graphics printing
 - Different printers and formats
 - Postscript Support
 - Native Window Printing

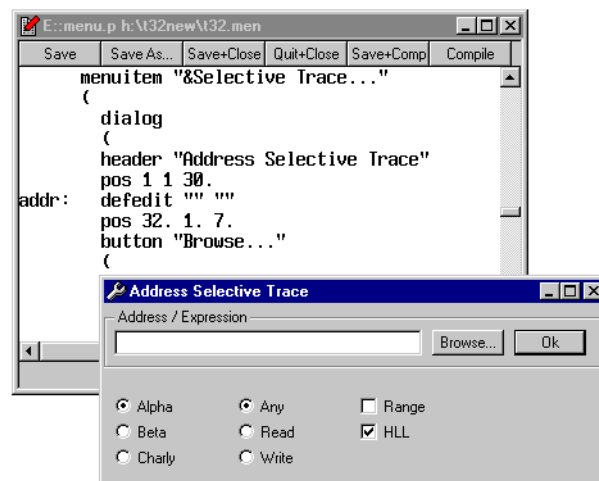
generates a PRACTICE file, which may be edited.

User Configurable Menu System



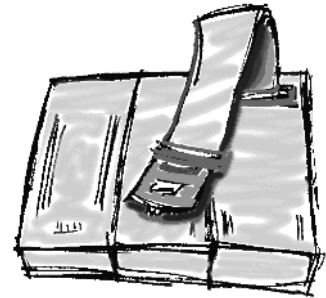
- Main Menu
- Local Pulldowns
- Shortcuts

User Configurable Dialog Boxes



PODBUS

Through the use of high integration techniques (e. g. surface mount, multi-layer pcbs etc.) it is now possible to manufacture small pod sized test instruments. The controls for these instruments are provided via the workstation windows environment. POD-BUS is a specially developed serial bus which operated at 10MBit/s transfer rate. The instruments (up to 8) are powered via the POBBUS and intertriggering and synchronisation signals are available in a similar fashion to the TRACEBUS.



Automatic Software Configuration on Bootstrap

- Automatic hardware recognition
- Driver selection by setup file

Computer and Operating System Independency

The TRACE32 development system has a high-performance 32 bit CPU with large directly addressable memory, the largest part of which is used to run the control software. The connection to the host system is made using a

fiber optic, Ethernet or LPT: interface. The only host specific parts of the systems are the driver software which runs on the host (i.e. a relatively small part of the total software) and the interface card.

Support for High-Performance Workstations and Networks

Because of the high transfer rate of the optical interface it becomes possible to fully utilise high-performance host computers. Loading times of 50 - 500 Kbytes per second are typical and screen updates are instantaneous.

Colour graphic screens are supported with up to 256 x 256 characters and use on large screens is highly recommended.

Host	OS	Company	Comment
AXP-STATION			
AXP-STATION	DIGITAL UNIX	DEC	Motif
AXP-STATION	VMS/AXP 1.5	DEC	Motif
DEC-STATION			
DEC-STATION	ULTRIX 4.3	DEC	Motif
HP-9000/300			
HP-9000/300	HP-UX 8.0	HP	Motif
HP-9000/700			
HP-9000/700	HP-UX 8.0	HP	Motif
HP-9000/700	HP-UX 9.0	HP	CDE
HP-9000/700	HP-UX 10.X	HP	CDE
IBM-RS6000			

Host	OS	Company	Comment
IBM-RS6000	AIX 4	IBM	CDE
MACINTOSH			
MACINTOSH	LINUX/PPC	LINUX	Motif/Lesstif
MACINTOSH	MAC OS-X/X86	APPLE	Motif
PC			
PC	MS-DOS 3.2	MICROSOFT	
PC	SCO-ODT 2.0	SCO	Motif
PC	WINDOWS 3.1	MICROSOFT	
PC	WINDOWS-NT	MICROSOFT	
PC	XENIX-286 2.3	SCO	only with terminal
PC	XENIX-386	SCO	only with terminal
PC	NOVELL-UNIXWARE	NOVELL	
PC	WINDOWS 95/98	MICROSOFT	
PC	SCO-OPENSERVR	SCO	CDE
PC	WINDOWS 2000	MICROSOFT	
PC	WINDOWS ME	MICROSOFT	
PC	WINDOWS XP	MICROSOFT	
PC	WINDOWS VISTA	MICROSOFT	32/64 bit
PC	WINDOWS 7	MICROSOFT	32/64 bit
PC	LINUX	LINUX	32/64 bit, Motif/Lesstif
PS/2			
PS/2	WINDOWS 3.1	MICROSOFT	
SPARC			
SPARC	SUNOS 4.1.1	SUN	Sunview, Motif or Open Windows
SPARC	SOLARIS 2.3	SUNSOFT	Open Windows or Motif
SPARC	SOLARIS 2.X	SUNSOFT	CDE
SUN3			
SUN3	SUNOS 4.0.3	SUN	Sunview, Motif or Open Windows
VAX-STATION			
VAX-STATION	VMS/VAX 5.5	DEC	Motif

Complete Development System

TRACE32 supports several development and test instruments. Apart from the In-Circuit Emulator there is a Timing Analyzer (TA32), Stimulus Genera-

tor (STG) or EPROM simulator. All instruments are controlled through a consistent command set via the window interface.

Open Structure of the Hardware and Software

All data formats are open so that the adaptation of existing software is easily accomplished. Via the modular cassette design of the hardware, expan-

sion of the basic instrument can be done at any time and with the minimum of disruption.

Independence from Special Bus-Based Computer Systems

The only computer specific part of the hardware is the interface card. Therefore, the transfer of the instrument to a

different host system does not require significant investment as regards the TRACE32 system.

Support for Multiprocessor Development

All emulator modules are fitted with special start/stop synchronisation logic so that several emulators can be syn-

chronised with less than 1ms timing skew, for the effective debugging of multiprocessor targets.

Intertriggering Facility over the System Bus

In the instrument bus there are four intertrigger lines to allow instruments to trigger each other. These trigger channels can be used to trigger external

instruments or to take in external triggers from other instruments to be used as triggers or qualifiers.

Expansion Capabilities

Up to 16 major instruments (e.g. emulators, logic analyzers or device programmers or any combination) can be connected to the system bus.

Easy Software Updates

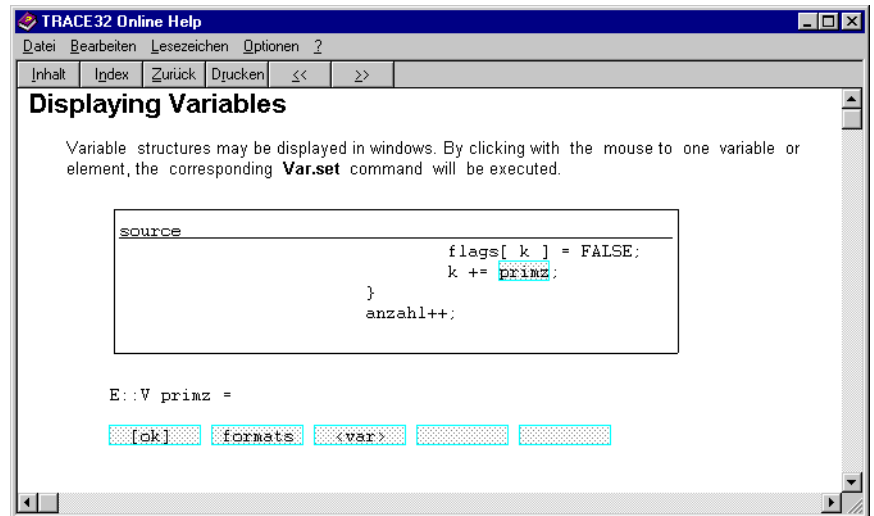
Apart from the boot loader, there are no parts of the TRACE32 software in EPROMs, the software is simply loaded from the host development system into the system controllers ram.

The software updates are distributed on CD-ROM, PC formatted disks, QIC150 or DAT tapes. The firmware is, wherever possible, loaded from disk.

Comprehensive Documentation

The TRACE32 contains a 6000 page operating manual built into the software. It is fully indexed and cross referenced by keywords shown in bold text. The manual is accessed by opening a window to it or to a specific command.

From there it is possible to browse through a section or move to a related section by using the mouse to point to an index keyword or by typing a new command or function name. Context sensitive help is provided for all elements of the GUI.



Waarranty

- 1 Year Software Warranty
Software updates for the first year is included in the price.
- 3 Years Hardware Warranty
The warranty period for the TRACE32 system is 3 years.

Not included are all probe pins, plugs etc. or damage through mistreatment.

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