



MPC56x NEXUS Debugger and Trace

- Support for NEXUS standard class 1 to 3
- Easy high-level and assembler debugging
- Interface to all compilers
- Program and data flow trace up to 100 MHz
- 16/32 M * 128 bit trace depth
- Trace contents readable while sampling
- Code coverage
- Performance analysis
- Trigger programming
- Interface to all hosts
- USB and ETHERNET interface included

MPC533
MPC534
MPC535
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MPC561
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MPC566

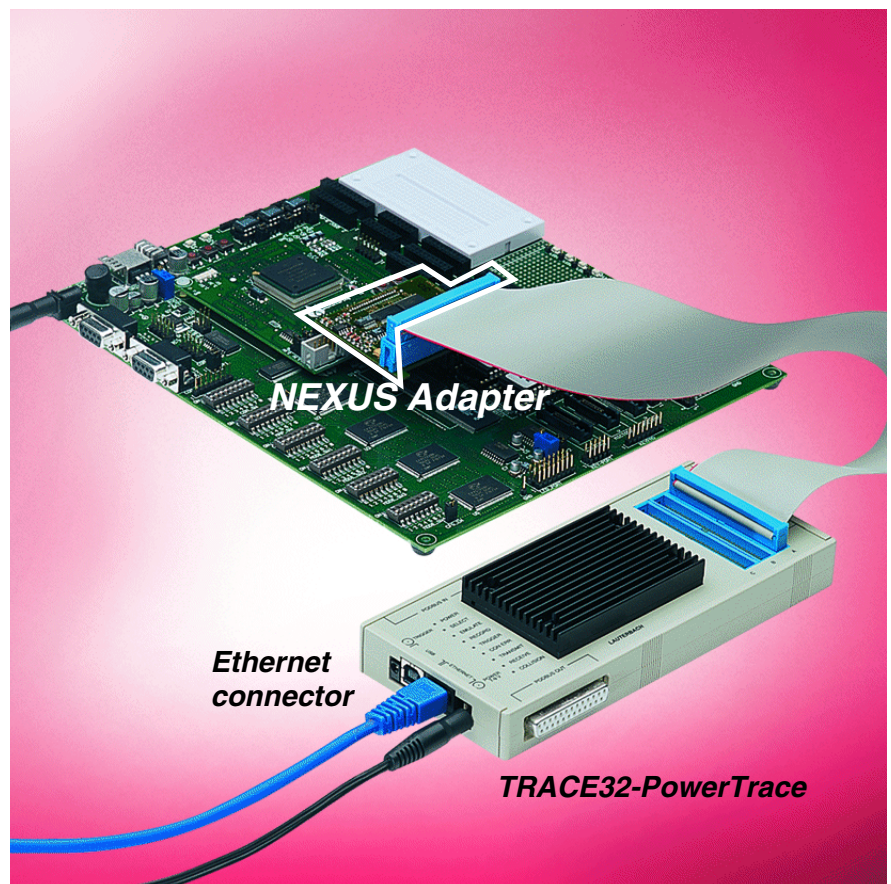
The Lauterbach product TRACE32-PowerTrace/NEXUS supports the NEXUS standard class 1 to 3. The hardware module for the NEXUS debugger is universal and allows to interface different target processors by simply changing the NEXUS adapter and starting a new software.

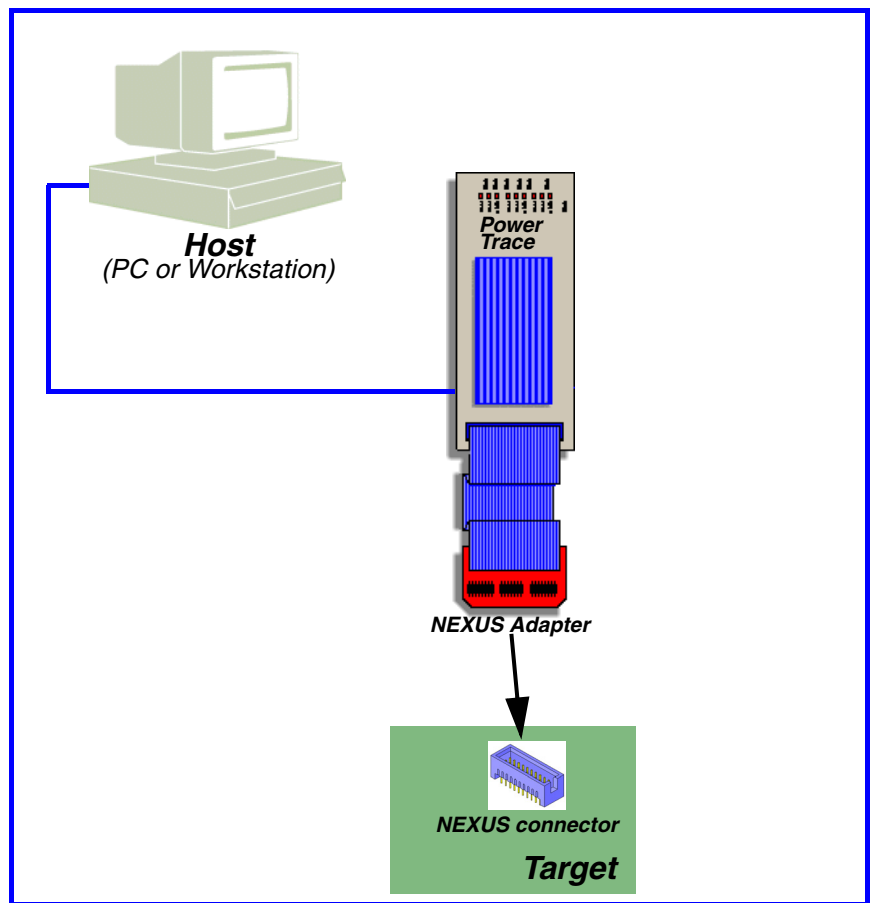
Hardware Concept

TRACE32-PowerTrace/NEXUS

The NEXUS support is based on the universal hardware module TRACE32-PowerTrace. The connection to the NEXUS interface on the target is done by a CPU specific NEXUS adapter.

TRACE32-PowerTrace includes a USB and Ethernet interface.

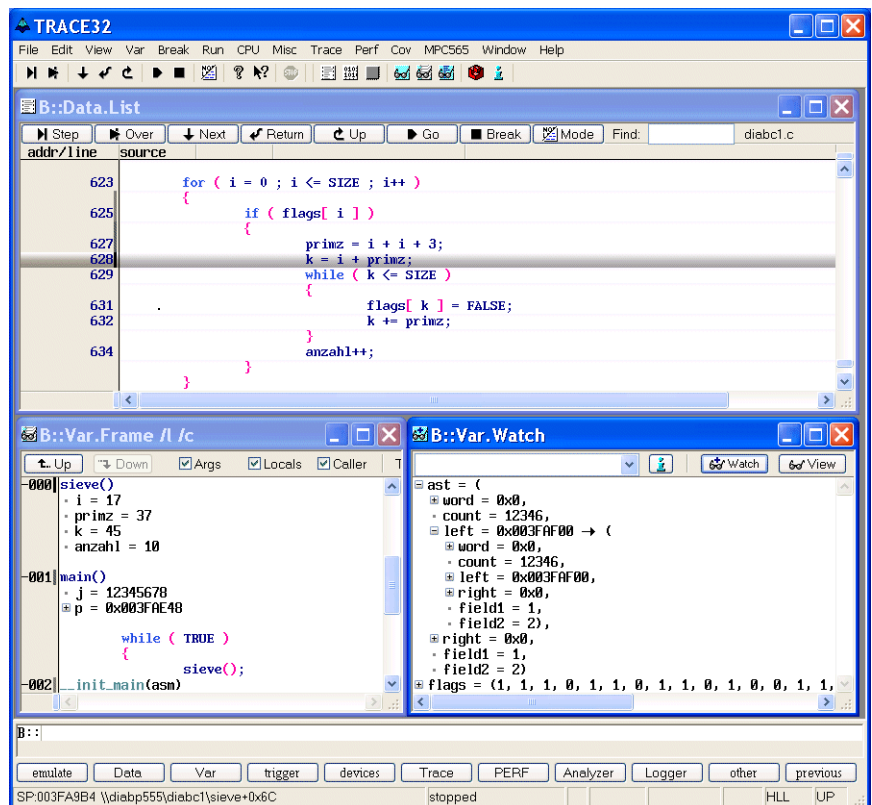


**PowerTrace**

- Universal debugger hardware for all architectures
 - Ethernet or USB interface included
 - Program and data flow trace for NEXUS up to 100 MHz
 - 16 MFrame trace memory
 - 96 channels
 - 32 bit time stamp, 20 ns resolution
- CPU specific NEXUS Adapter**

Software Concept Debugger

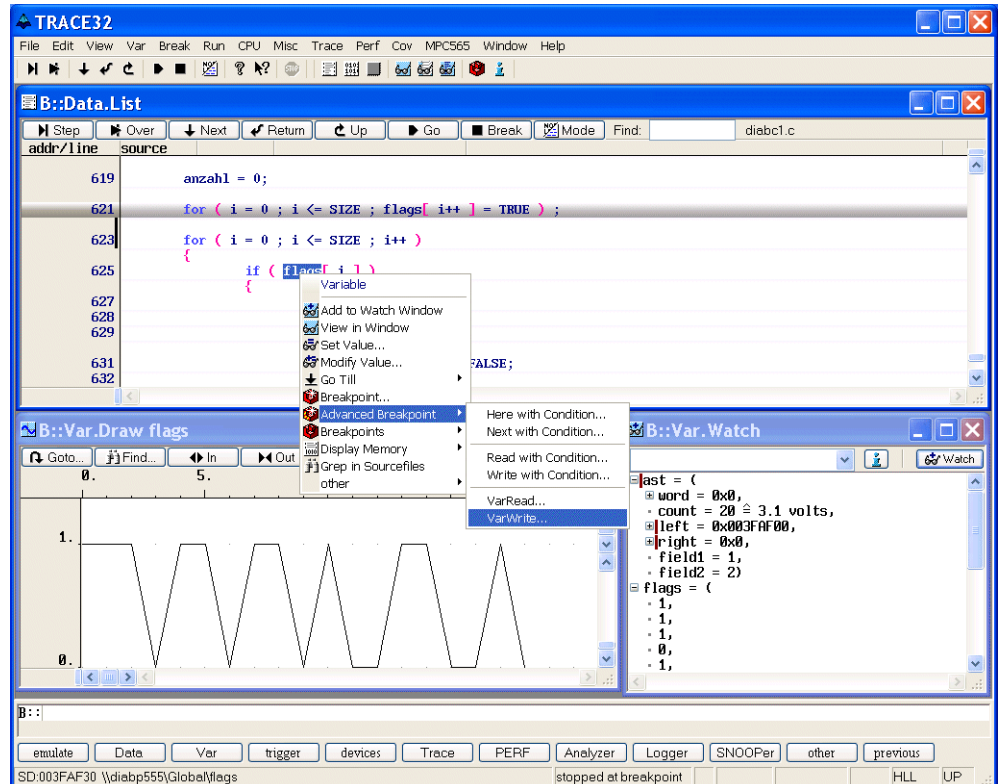
Symbolic Debugging



A hierarchical symbol database enables structured symbolic debugging. Symbol names can be used to show single program addresses, mod-

ule names and memory classes. The disassembler can use the symbols for labels and/or operands. Demangling for C++ signatures is supported.

High-Level Language Debugging



TRACE32 can directly load the output of all standard compilers for C, C++, JAVA, Pascal, Modula2, PEARL and ADA from most compiler vendors. Program display and debugging can be done in assembler, high-level or in a mixture of both. It is possible to con-

struct both assembler and high-level windows on the screen simultaneously. All variable types specific to the high-level language can be displayed and modified. Addresses can be absolute, relative or line number based.

Real-time update

Real-time update of memory and variables is possible while the CPU is running.

Debugging

The debugger uses the following breakpoint implementations to stop the program execution at a certain instruction:

- unlimited number of software breakpoints for code in RAM
- Unlimited Code Breakpoints in FLASH areas
- a limited number of onchip breakpoints for code in ROM/FLASH

The onchip breakpoints can also be used to stop the program execution after a read/write access to a specific memory address.

The number of available onchip breakpoints depends on the resources provided by the CPU used.

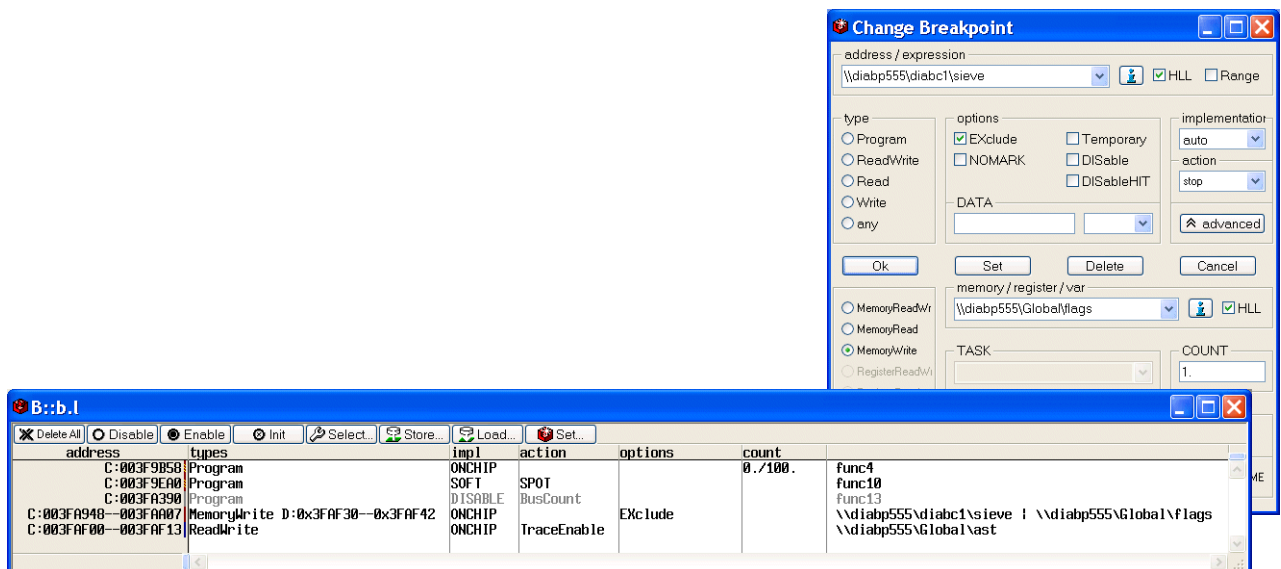
Advanced breakpoints

The NEXUS provides also a simple way to set complex break conditions:

- Setting of breakpoints to the reading and writing of specific data values
- Linking the breakpoint with a condition

- Linking the breakpoint with commands that are executed whenever the breakpoint is reached
- Spot breakpoints on data accesses

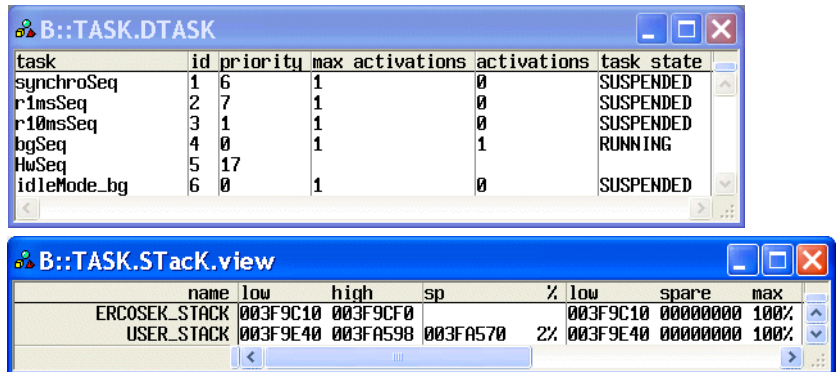
A combination of all 4 new features is also possible.



RTOS Awareness

The NEXUS Debuggers provide display functions, closely mirroring the command set of the integral debugger of the RTOS. The system resources e.g. tasks, objects, partitions, queues,

regions and semaphores can be displayed. These functions are also available if the integral debugger is not linked to the software.

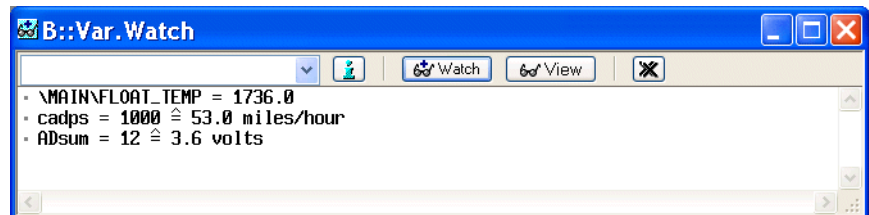


The image shows two screenshots from a debugger interface. The top screenshot is titled 'B::TASK.DTASK' and displays a table of tasks. The bottom screenshot is titled 'B::TASK.STack.view' and displays a table of stack frames.

task	id	priority	max activations	activations	task state
synchroSeq	1	6	1	0	SUSPENDED
r1msSeq	2	7	1	0	SUSPENDED
r10msSeq	3	1	1	0	SUSPENDED
bgSeq	4	0	1	1	RUNNING
HwSeq	5	17	1	0	SUSPENDED
idleMode_bg	6	0	1	0	SUSPENDED

name	low	high	sp	%	low	spare	max
ERCOSEK_STACK	003F9C10	003F9CF0			003F9C10	00000000	100%
USER_STACK	003F9E40	003FA598	003FA570	2%	003F9E40	00000000	100%

OSEK awareness with ORTI support



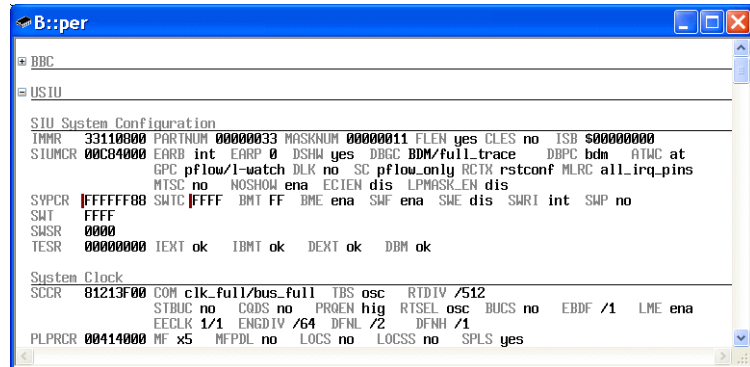
The image shows a screenshot of the 'B::Var. Watch' window. It displays a list of variables and their values, including a scaled variable display for 'cadps'.

· MAIN\FLOAT_TEMP	= 1736.0
· cadps	= 1000 $\hat{=}$ 53.0 miles/hour
· ADsum	= 12 $\hat{=}$ 3.6 volts

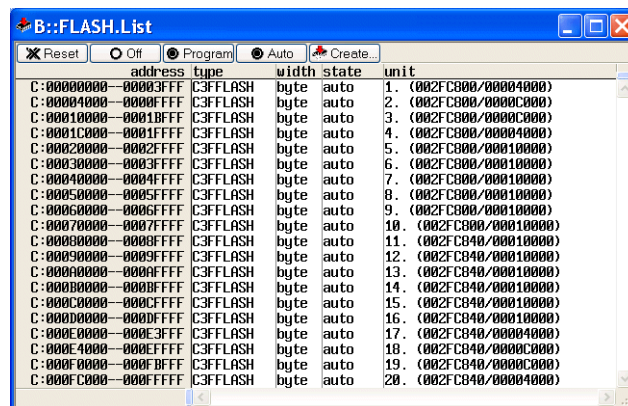
ASAP2 based scaled variable display

Peripherals

- Display of onchip peripherals
- User definable display of the onchip peripherals
- Definition is done interactive supported by softkeys
- Pull down menus for settings
- Additional description for each field



Flash Programming



The NEXUS debugger support the programming of external flash memory as well as the programming of internal flash memory of microcontrollers. The

programming can be controlled by the debugger or by a routine in the target system.

Software Concept Trace

Program/Data Flow Trace

TRACE32-PowerTrace for NEXUS samples all trace messages output via the NEXUS Auxiliary Output Port e.g. branch trace messages, data trace messages....

record	run	address	cycle	d.l	symbol	ti.back
		bgt	0x3FA9E4		; 0x3FA9E4 (-)	
625		{			if (flags[i])	
		lis	r12,0x40		; r12,64	
		subi	r12,r12,0x50D0		; r12,r12,20688	
		lbzx	r12,r12,r31		; r12,r12,i	
-000000209		D:003FAF39 rd-byte			00 \diabp555\Global\flags+0x9	0.940us
		cmpwi	r12,0x0		; r12,0	
-000000208		beq	0x3FA9DC		; 0x3FA9DC (-)	
		P:003FA9DC execute			\diabp555\diabc1\sieve+0x94	0.200us
		addi	r31,r31,0x1		; i,i,1	
-000000207		b	0x3FA990			
		P:003FA990 execute			\diabp555\diabc1\sieve+0x48	0.360us
		cmpwi	r31,0x12		; i,i,18	
		bgt	0x3FA9E4		; 0x3FA9E4 (-)	
625		{			if (flags[i])	
		lis	r12,0x40		; r12,64	
		subi	r12,r12,0x50D0		; r12,r12,20688	
		lbzx	r12,r12,r31		; r12,r12,i	
-000000206		D:003FAF3A rd-byte			01 \diabp555\Global\flags+0x0A	0.940us
		cmpwi	r12,0x0		; r12,0	

Selective Tracing

record	run	address	cycle	d.l	symbol	ti.back
-000000028		D:003FAE64 wr-long	0000159A		\diabp555\diabc1\mstatic1	0.700us
-000000027		D:003FAE64 rd-long	0000159A		\diabp555\diabc1\mstatic1	0.840us
-000000026		D:003FAE64 wr-long	00002D30		\diabp555\diabc1\mstatic1	0.700us
-000000025		D:003FAE64 rd-long	00002D30		\diabp555\diabc1\mstatic1	0.860us
-000000024		D:003FAE64 wr-long	00005C5C		\diabp555\diabc1\mstatic1	0.700us
-000000023		D:003FAE64 rd-long	00005C5C		\diabp555\diabc1\mstatic1	0.840us
-000000022		D:003FAE64 wr-long	0000A31E		\diabp555\diabc1\mstatic1	0.700us
-000000021		D:003FAE64 rd-long	0000A31E		\diabp555\diabc1\mstatic1	0.860us
-000000020		D:003FAE64 wr-long	00010176		\diabp555\diabc1\mstatic1	0.700us
-000000019		D:003FAE3C rd-long	00001795		\diabp555\diabc1\func2\static	0.900us
-000000018		D:003FAE64 rd-long	00010176		\diabp555\diabc1\mstatic1	0.340us

TRACE32-PowerTrace/NEXUS supports selective tracing on 2 data address ranges. Selective tracing is supported on:

- Specified data accesses only

- Specified data accesses plus the complete program flow information

CTS Context Tracking System and SmartTrace

```

B::Analyzer.CTS.List
-----
record
550      func2d();
-0000000749
-0000000748      func2d                                diabc1.c\203      0.160us
205      void func2d()
-0000000748      {
autovar = 13
regvar = 7
mstatic1 = 785400
    auto short autovar; /* short stack variable */
    register short regvar; /* short register variable */

    autovar = regvar = mstatic1;
autovar = -1032
regvar = -1032
    autovar = -1032
    autovar++;
autovar = -1031
    regvar = -1032
    for ( regvar = 0; regvar < 51 ; regvar++ )
    regvar = 0
    vlong = 8636710

```

- Reconstructs registers and memory from trace
- SmartTrace fills trace gaps caused by buffer overflow

Statistic functions

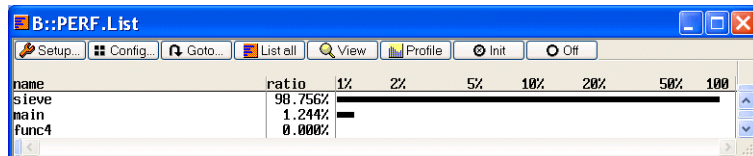
The very large trace buffer allows function runtime analysis over a long period.

tree	time	min	max	avr	count	ratio	1%	2%
(root)	317.900us	0.000	317.900us	317.900us	1. (-2)	0.000%		
└─ main	317.900us	0.000	317.900us	317.900us	1. (-1)	6.739%		
└─┬─ func2	20.760us	20.760us	20.760us	20.760us	1.	4.138%		
└─┬─┬─ func1	7.600us	2.440us	2.600us	2.530us	3.	2.398%		
└─┬─┬─┬─ func2a	9.960us	9.960us	9.960us	9.960us	1.	3.132%		
└─┬─┬─┬─┬─ func2b	9.600us	9.600us	9.600us	9.600us	1.	3.019%		
└─┬─┬─┬─┬─┬─ func2d	12.000us	12.000us	12.000us	12.000us	1.	3.773%		
└─┬─┬─┬─┬─┬─┬─ func4	7.700us	7.700us	7.700us	7.700us	1.	2.421%		
└─┬─┬─┬─┬─┬─┬─┬─ func3	1.100us	1.100us	1.100us	1.100us	1.	0.345%		
└─┬─┬─┬─┬─┬─┬─┬─┬─ func5	3.140us	3.140us	3.140us	3.140us	1.	0.987%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func8	18.860us	18.860us	18.860us	18.860us	1.	5.931%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func9	17.800us	17.800us	17.800us	17.800us	1.	2.408%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func1	10.140us	2.460us	2.640us	2.535us	4.	3.188%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func10	144.960us	144.960us	144.960us	144.960us	1.	45.587%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func11	0.000	0.000	0.000	0.000	1.	0.000%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func13	21.240us	21.240us	21.240us	21.240us	1.	1.333%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func13	17.000us	17.000us	17.000us	17.000us	1.	1.824%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func13	11.200us	11.200us	11.200us	11.200us	1.	1.805%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func13	5.460us	5.460us	5.460us	5.460us	1.	1.717%		
└─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─ func14	1.760us	1.760us	1.760us	1.760us	1.	0.553%		

Trace-based Performance Analysis

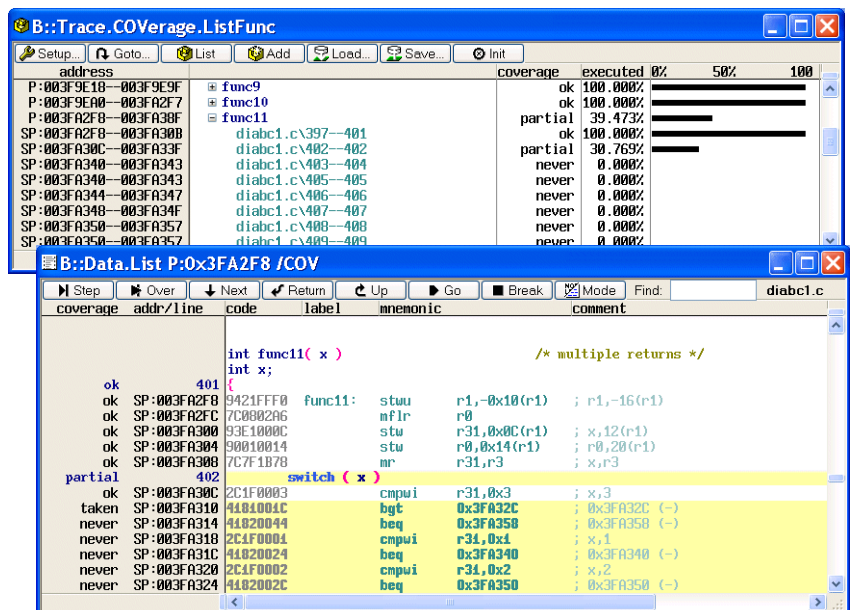
The performance measurement used by TRACE32-PowerTrace/NEXUS is a statistical process. To determine for example which function or which module uses the greatest proportion of the total runtime the recording into the

trace memory is stopped briefly to determine the current program counter contents. This measurement has absolutely no influence on the real-time behaviour.



Code Coverage

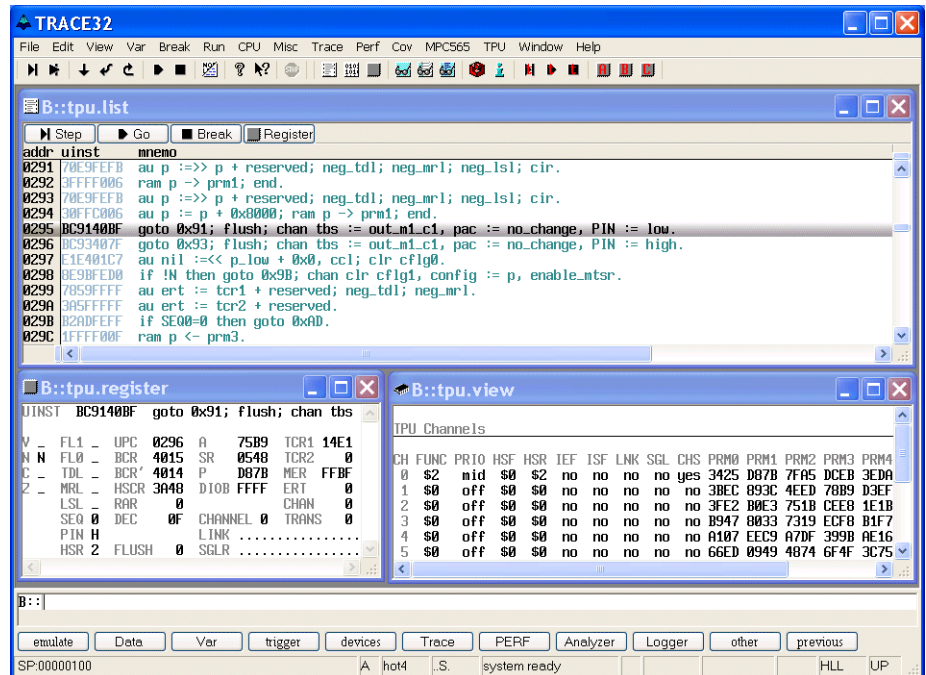
It is also possible to perform a code coverage analysis based on the comprehensive information from the trace memory.



TPU Support

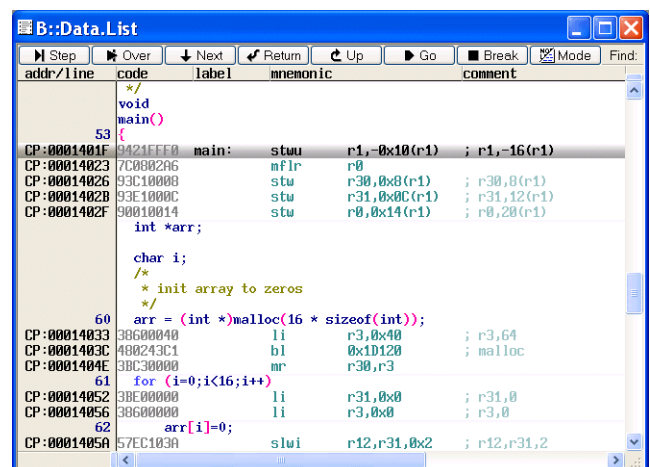
The TPU Debugger allows debugging the TPU (Timing Processor Unit) found on many Motorola Devices. It allows setting break conditions on different

events and single stepping the TPU microcode while watching the internal registers of the TPU.



Code Compression

- Full support of Phase B code compression

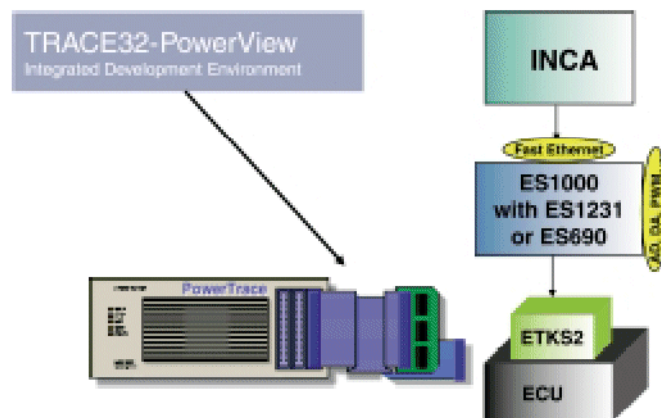


Standby Mode

Standby mode and debugging thru power-down cycle is supported.

ETK Support

The NEXUS for PowerPC can work with ETAS ETK



Supported Processors

tbd

Operation Voltage and Frequency

Operation Voltage

This list contains information on probes available for other voltage ranges.

Probes not noted here supply an operation voltage range from 4.5V to 5.5V. tbd

Frequency Trace

The maximum operation frequency of TRACE32-RISC Trace or PowerTrace depends on:

- The max. frequency of the CPU
- The number of waitstates (bus trace)

- The divide factor between trace clock and core clock
- The speed of the trace adapter

Dimensions and Adapters

Modules

tbd

Connectors (MICTOR)

Signal	Pin	Pin	Signal
HRESET-	1	2	VREF
EVTI-	3	4	RSTI-
MSEI-	5	6	MDI0
GND	7	8	GND
MCKI	9	10	MDO0
GND	11	12	GND
MCKO	13	14	EVTO-
GND	15	16	GND
MSEO0-	17	18	ARBREQ
GND	19	20	GND
MDO1	21	22	MDO2
GND	23	24	GND
MDO3	25	26	MDI1
N/C	27	28	N/C
MSEO1-	29	30	MDO4
GND	31	32	VENDEF1
MDO5	33	34	MDO6
VENDEF0	35	36	NRES0
MDO7	37	38	ARBGRANT

Order Information

Module Description

Detailed Order Information

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