

In-Circuit Emulator for MC6833X

MC68330
MC68331
MC68332
MC68334
MC68336
MC68338
MC68340
MC68341
MC68376
MC68F333
MC68HC16X1
MC68HC16Y1
MC68HC16Z
MC68HC916Y1

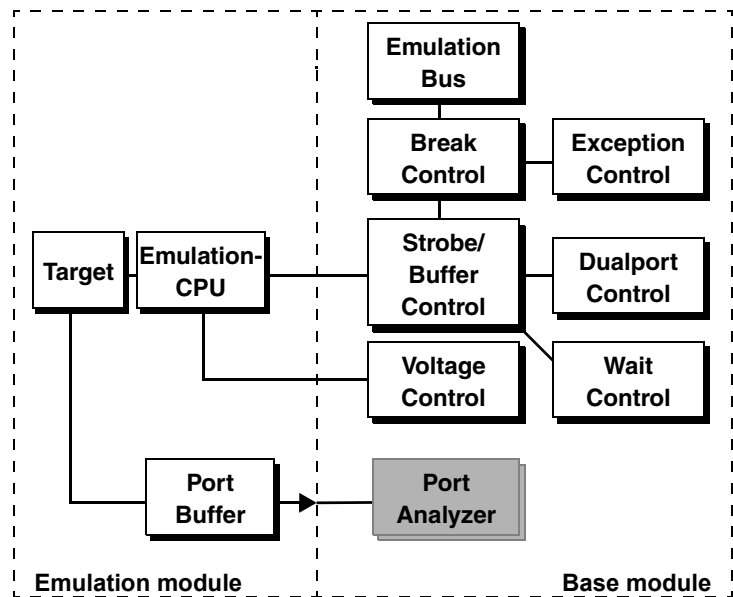
- 33 MHz zero-waitstate emulation
- 17 MHz FastTerm emulation
- 3.3V/5V support
- Trace on show-cycles
- Premapper for 32 bit emulation
- Address rebuild system
- Port E replacement
- FLASH support
- TPU debugger
- On-Circuit emulation with clip-over adapter
- Interface with all compilers
- C++ support
- CASE tools interface
- RTOS support
- Windows9x, NT and Motif interface

The TRACE32-ICE68330 supports most members of the 68330- and 68HC16-family from Freescale. The systems modular and open technology allows the fast integration of new chip designs.

A software compatible BDM debugger is also available, as well as several evaluation boards.

Features

Basics of Operation



The ICE-68330 is a high performance emulation system for most members of the 6833x-family and the 68HC16-family from Motorola.

On the base module there is an extra slot for the TRACE32 Port Analyzer. Depending on the CPU type various signals can be traced.

Operating Modes

The Emulator can work in stand-alone mode with internal clock or in active mode with internal or the target clock. On power-down of the target system the emulator tristates its output buffers and isolates its internal emulation circuits.

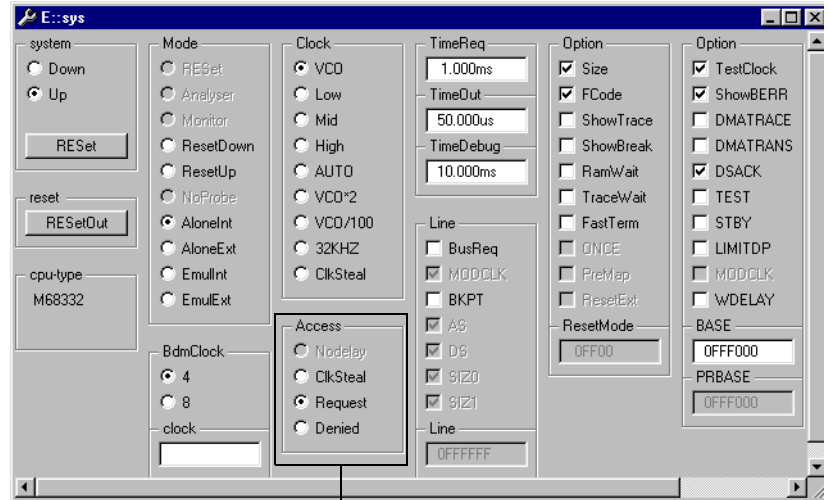
The operation modes are as follows:

- Reset Down
- Reset Up
- Alone Internal
- Alone External
- Emulation Internal
- Emulation External

Clock

- Operation with external or internal Clock
- 1..35 MHz internal clock

Dual-Port Access



Dual port access modes

All TRACE32 memories are dual-ported. The dual-port access makes it possible to display and modify the contents of the overlay memory, to set or delete breakpoints or use the flag memory while the application is running in real-time.

There are 3 modes for dual-port access

- Request
- ClockSteal
- Halt

The **REQUEST mode** is the default method accessing memory in real-time. It works only if the Busrequest/BusGrand function is enabled. If these pins are changed to alternate function, dualport access will not work

correctly. Probes with a SCIM module have an integrated port replacement and require only the BR line.

The **ClockSteal mode** enables dual-port accesses by stopping the clock for some cycles. This works only if the emulator uses the internal VCO. It is not possible to run this access mode with external clock signals or with 32 KHz clock sources (PLL system active). If dual-port access is required and the Request mode cannot be used, the software for the periodic timer and the software watchdog must be modified to use the direct clock input.

HALT mode enables dualport access by forcing the HALT-pin. This mode is required if none of the other modes will work. It has no speed or software restrictions.

In **Denied mode** the dual port access is switched off.

HLL Debugging

The screenshot shows the TRACE32 debugger interface. At the top, there is a menu bar with options: Step Over, Go Next, Go Return, Go Up, Go, Break, and Mode. Below the menu bar is a table with columns: HLRSH, addr/line, and source. The source code is as follows:

```

anzahl = 0;
for ( i = 0 ; i <= SIZE ; flags[ i++ ] = TRUE ) ;
for ( i = 0 ; i <= SIZE ; i++ )
{
  if ( flags[ i ] )
  {
    primz = i + i + 3;
    k = i + primz;
    while ( k <= SIZE )
    {
      flags[ k ] = F...
      k += primz;
    }
    anzahl++;
  }
}
return anzahl;

```

A context menu is open over line 32, listing the following options: Go Till Here, Default Breakpoints, Spotpoint, Set PC Here, Display Memory..., Breakpoints..., Go Till..., and Edit Source.

The TRACE32 debugger provides an interface to C, C++, ADA, MODULA, PASCAL and Pearl for all standard compilers. For more information on the supported compilers refer to the section "Debug Interfaces".

Full support in real-time for:

- ROM and external busses
- Break-before-line operation
- HLL single step in real-time
- Trigger and trace on local variables
- Trigger on bit variables

Address Rebuild System

If the address lines A19 ... A32 of the CPU are configured as chip selects, it is necessary to recover the addresses to provide trace and trigger capabilities. There are different ways to recreate the addresses:

- Recreate the addresses from chip selects by using the registers

- Software based address recreation
- Address recovery by PLD logic

An other solution is to program the address pins to their address function and to generate the chip selects by a GAL or PAL.

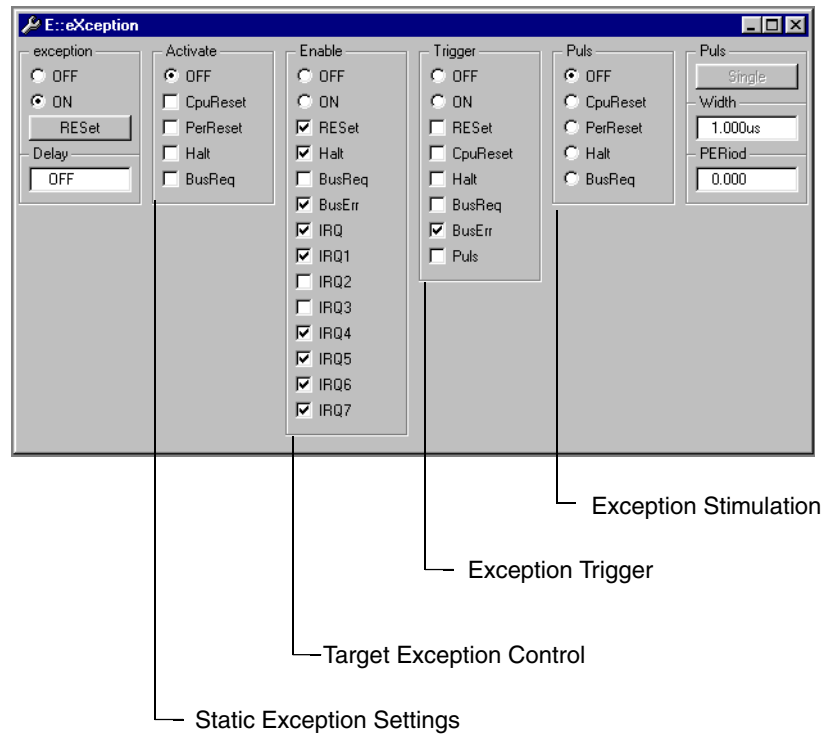
Target Clock and Voltage Monitoring

This feature prevents failures caused by missing clock or undervoltage.

Wait System

- Additional wait cycles (1-15) may be specified
- Up to 250 wait cycles (4K blocks global and bitwise)

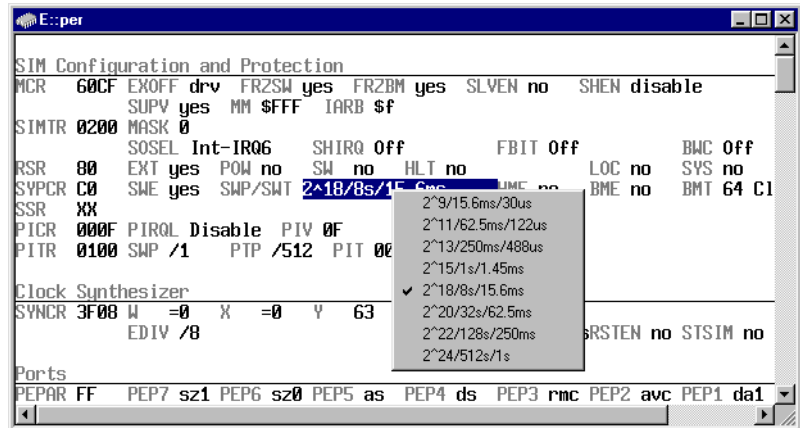
Exception Control



The TRACE32 exception controller allows you to permanently activate an exception, to enable or disable specific

exceptions, to trigger on specific exceptions or to stimulate an exception.

Peripheral Window



- 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
-

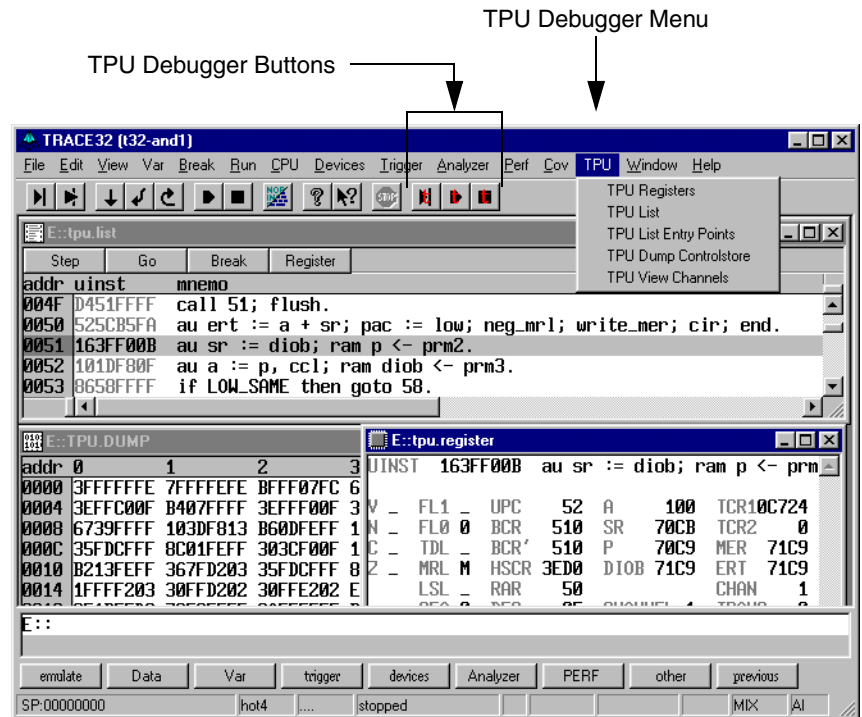
Programming of the On Chip FLASH

ICE-68330 supports the programming of the on chip flash memory. Therefore the emulator generates the flash programming voltage.

On-Circuit Emulation

- Support for clip-over adapters

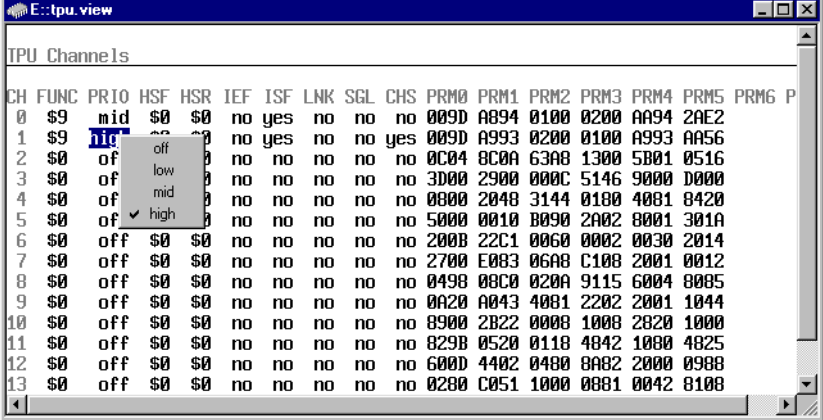
TPU Debugger



The TPU module is a complex free programmable RISC processor. The TRACE32 TPU debugger supports:

- Display and setting of the TPU registers
- Display of the TPU configuration for each channel
- Display of the TPU microcode
- Hexdump of the TPU microcode
- Display of the entry-table in a symbolic format
- Single stepping of the TPU microcode
- Setting breakpoints in the TPU microcode
 - μ PC breakpoints
 - Channel breakpoints
 - State breakpoints

TPU Configuration



The screenshot shows a window titled 'tpu.view' with a table of 'TPU Channels'. The table has columns: CH, FUNC, PRIO, HSF, HSR, IEF, ISF, LNK, SGL, CHS, PRM0, PRM1, PRM2, PRM3, PRM4, PRM5, PRM6, P. A pull-down menu is open over the PRIO column, showing options: off, low, mid, and high. The 'high' option is selected.

CH	FUNC	PRIO	HSF	HSR	IEF	ISF	LNK	SGL	CHS	PRM0	PRM1	PRM2	PRM3	PRM4	PRM5	PRM6	P
0	\$9	mid	\$0	\$0	no	yes	no	no	no	009D	A894	0100	0200	A894	2AE2		
1	\$9	high	\$0	\$0	no	yes	no	no	yes	009D	A993	0200	0100	A993	AA56		
2	\$0	off	\$0	\$0	no	no	no	no	no	0C04	8C0A	63A8	1300	5B01	0516		
3	\$0	off	\$0	\$0	no	no	no	no	no	3D00	2900	000C	5146	9000	D000		
4	\$0	off	\$0	\$0	no	no	no	no	no	0B00	2048	3144	0180	4081	8420		
5	\$0	off	\$0	\$0	no	no	no	no	no	5000	0010	B090	2A02	8001	301A		
6	\$0	off	\$0	\$0	no	no	no	no	no	200B	22C1	0060	0002	0030	2014		
7	\$0	off	\$0	\$0	no	no	no	no	no	2700	E083	06A8	C108	2001	0012		
8	\$0	off	\$0	\$0	no	no	no	no	no	0498	08C0	020A	9115	6004	8085		
9	\$0	off	\$0	\$0	no	no	no	no	no	0A20	A043	4081	2202	2001	1044		
10	\$0	off	\$0	\$0	no	no	no	no	no	8900	2B22	0008	1008	2820	1000		
11	\$0	off	\$0	\$0	no	no	no	no	no	829B	0520	0118	4042	1000	4025		
12	\$0	off	\$0	\$0	no	no	no	no	no	600D	4402	0480	8A82	2000	0988		
13	\$0	off	\$0	\$0	no	no	no	no	no	0280	C051	1000	0081	0042	8108		

- Display of the configuration for each channel
- Pull down menus for settings
- Display can be reprogrammed to fit to the application's need

Modules Overview

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Debug Interfaces

Compiler 68k

CPU	Language	Compiler	Company	Option
68K	ADA	ALSYS-ADA		IEEE
68K	ADA	TELESOFT-ADA	Telesoft	IEEE
68K	ASM	RTOS	IEP GmbH	SYM/LOC
68K	ASM	ASM68K	Mentor Graphics Corporation	IEEE
68K	ASM	VERSADOS-ASM	NXP Semiconductors	VERSADOS
68K	ASM	OS-9-ASSEMBLER	Radisys Inc.	ROF
68K	ASM	AS68	TASKING	IEEE
68K	C	HP-64000-C		HP
68K	C	ORGANON	CAD-UL Electronic Services GmbH	BOUND
68K	C	C68K	Cosmic Software	COSMIC
68K	C	GNU-C	Free Software Foundation, Inc.	ELF/DWARF
68K	C	GNU-C	Free Software Foundation, Inc.	COFF
68K	C	GNU-C	Free Software Foundation, Inc.	ELF/DWARF
68K	C	GREEN-HILLS-C	Greenhills Software Inc.	COFF

CPU	Language	Compiler	Company	Option
68K	C	ICC68K	Introl Corporation	ICOFF
68K	C	MCC	Mentor Graphics Corporation	IEEE
68K	C	HT-68K	Microchip Technology Inc.	HITECH
68K	C	HICROSS-68K	NXP Semiconductors	HICROSS
68K	C	CC68K	NXP Semiconductors	COFF
68K	C	ULTRA-C	Radisys Inc.	ROF
68K	C	OS/9-C	Radisys Inc.	ROF
68K	C	CROSSCODE-C	SDSI	SDS
68K	C	SCC68K	Sierra	COFF
68K	C	SUN3-CC	Oracle Corporation	DBX
68K	C	ICC68K	TASKING	COFF
68K	C	ICC68K	TASKING	IEEE
68K	C	TT-68K	TASKING	IEEE
68K	C	TCC68K	TASKING	AOUT
68K	C	TEKTRONIX-C	Tektronix	COMFOR
68K	C	D-CC	Wind River Systems	IEEE
68K	C	D-CC	Wind River Systems	ELF/DWARF
68K	C++	ORGANON-C++	CAD-UL Electronics Service GmbH	BOUND

CPU	Language	Compiler	Company	Option
68K	C++	GNU-C++	Free Software Foundation, Inc.	DBX
68K	C++	GNU-C++	Free Software Foundation, Inc.	ELF/DWARF
68K	C++	CCC68K	Mentor Graphics Corporation	IEEE
68K	C++	HICROSS-68K	NXP Semiconductors	HICROSS
68K	C++	CODEWARRIOR	NXP Semiconductors	ELF/DWARF
68K	C++	CROSSCODE-C++	SDSI	SDS
68K	C++	D-C++	Wind River Systems	ELF/DWARF
68K	MODULA	MOD68K	Introl Corporation	ICOFF
68K	MODULA	MCS2	Multichannelsystems GmbH	COFF
68K	MODULA	MCDS	NXP Semiconductors	MCDS
68K	PASCAL	MPC	Mentor Graphics Corporation	IEEE
68K	PEARL	RTOS	IEP GmbH	SYM/LOC

Compiler 68HC16

CPU	Language	Compiler	Company	Option
68HC16	C	CX68HC16	Cosmic Software	COSMIC
68HC16	C	ICC6816	IAR Systems AB	UBROF
68HC16	C	ICC68HC16	Introl Corporation	ICOFF
68HC16	C	HICROSS-68HC16	NXP Semiconductors	HICROSS

Rtos

Company	Product	Comment
Atego Ltd.	AdaWorld ARTK	
KadakProducts Ltd.	AMX	
Oracle Corporation	ChorusOS	
CMX Systems Inc.	CMX-RTX	
Synopsys, Inc	MQX	2.40 and 2.50, 3.6
	MTOS-UX	
Mentor Graphics Corporation	Nucleus PLUS	
Radisys Inc.	OS-9	
Enea OSE Systems	OSE Classic	(OS68)
Enea OSE Systems	OSE Delta	4.x and 5.x
	RealTime Craft	(XEC68k)
Quadros Systems Inc.	RTXC 3.2	
IBM Corp.	SDT-Cmicro	
-	uCLinux	Kernel Version 2.4 and 2.6, 3.x
Mentor Graphics Corporation	VRTX32	
Mentor Graphics Corporation	VRTXmc	
Mentor Graphics Corporation	VRTXsa	
Wind River Systems	VxWorks	5.x and 6.x

Debugger Support

CPU	Debugger	Company
	WINDOWS CE PLATF. BUILDER	-
	CODE::BLOC KS	-
	C++TEST	-
	ADENEO	-
	X-TOOLS / X32	blue river software GmbH
	CODEWRIGH T	Borland Software Corporation
	CODE CONFIDENC E TOOLS	Code Confidence Ltd
	CODE CONFIDENC E TOOLS	Code Confidence Ltd
	EASYCODE	EASYCODE GmbH
	ECLIPSE	Eclipse Foundation, Inc
	CHRONVIEW	Inchron GmbH
	LDRA TOOL SUITE	LDRA Technology, Inc.
	UML DEBUGGER	LieberLieber Software GmbH
	SIMULINK	The MathWorks Inc.
	ATTOL TOOLS	MicroMax Inc.
	VISUAL BASIC INTERFACE	Microsoft Corporation
	LABVIEW	NATIONAL INSTRUMENT S Corporation
	RAPITIME	Rapita Systems Ltd.
	RHAPSODY IN MICROC	IBM Corp.

CPU	Debugger	Company
	RHAPSODY IN C++	IBM Corp.
	DA-C	RistanCASE
	TRACEANALY ZER	Symtavisio n GmbH
	TA INSPECTOR	Timing Architects GmbH
	UNDODB	Undo Software
	VECTORCAS T UNIT TESTING	Vector Software
	VECTORCAS T CODE COVERAGE	Vector Software
68K	OS68 DEBUGGER	Enea OSE Systems
68K	SDT CMICRO	IBM Corp.
68K	DIAB RTA SUITE	Wind River Systems

Operation Frequency

The maximum operation frequency of TRACE32-ICE68330 depends on:

- The max. frequency of the CPU
- The access time of the overlay memory (15ns or 35ns)
- The mapper mode (**S**low or **F**ast)
- The number of waitstates (W0 = 0 waitstates
W1 = 1 waitstate)
- The dual-port access mode

Denied/Request Access

Operating Voltage

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Dimensions

Module Dimensions

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Connectors

On each emulation module there are half-size connectors to:

- ❑ Connect the emulation module directly to the target by providing the corresponding connectors also on the target hardware

- ❑ Connect a standard adapter from Emulation Technologie, YAMAICHI, AMP etc.

The following table lists the physical dimensions of these half size connectors.
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Adapter

Not necessary.

Available Tool Chain

TRACE32 provides a complete set of development tools for the 16x family. This includes:

- The In-Circuit Emulator TRACE32-ICE
- The high speed RISC Emulator TRACE32-FIRE
- The BDM/JTAG/ONCE etc. based In-Circuit Debugger TRACE32-ICD

- The ROM Monitor based In-Circuit Debugger TRACE32-ICD
- Evaluation boards, which can be used until the target hardware is available.

The following list give an overview which development tools are available for the specific derivatives of the 16x-family.
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Order Information

Module Description

Detailed Order Information

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