

In-Circuit Emulator for 386/486

386DX
386EX
386SX

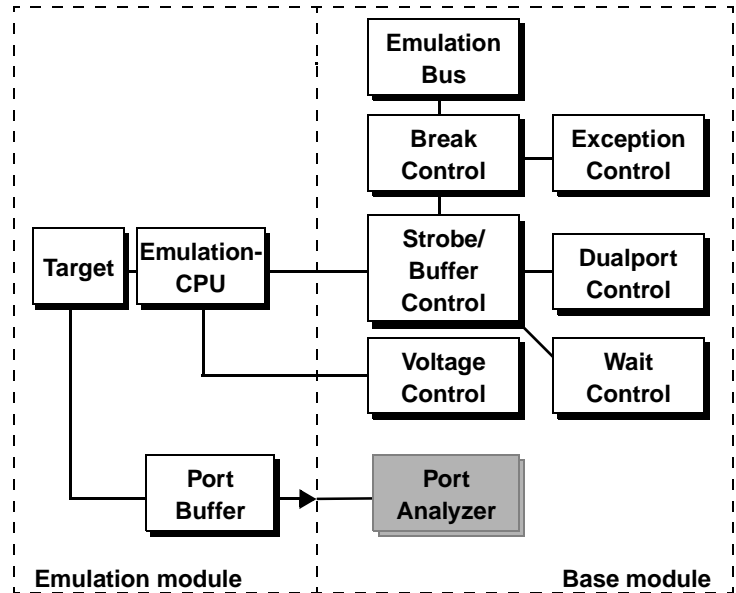
- Supports real mode and protected mode
- Support for 5V and 3.3V derivatives
- Support for all privilege levels
- Works with C, C++, PL/M, M2 and ADA compilers
- Display of hidden registers
- Debugging in boot memory
- Hidden wait system
- Dual ported memory
- Paging support
- MMU support
- FPU support
- CASE tools interface
- RTOS support
- Windows95, NT and X windows interface

The TRACE32-ICE386 supports microprocessor and controller from AMD and Intel. Its modular and open technology allows the fast integration of new chip designs.

A software compatible ROM Monitor is also available.

TRACE32 works with the highest variety of host interfaces. The communication link to the host is done by the printer port, a fibre optic interface or ethernet allowing a high-speed transfer.

Basics of Operation



The ICE-386 is a high-performance emulation system for microprocessors and controller from AMD and Intel.

On the emulation base there is an extra slot for the TRACE32 Port Analyzer. Depending on CPU type various signals can be traced. Some probes have connectors to trace external target lines.

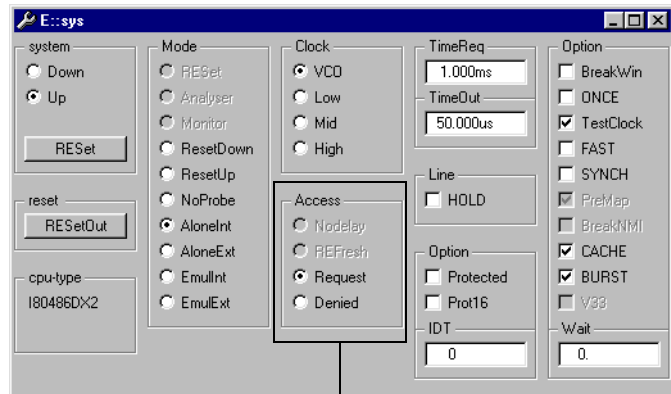
Operating Modes

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
- No Probe
- Alone Internal
- Alone External
- Emulation Internal
- Emulation External

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.

The following dual-port access mode is implemented:

- Request

Max. Operation Frequency

- 20 MHz 0 wait
- 30 MHz 1 wait
- 40 MHz 2 wait

Clock

- Operation with external or internal Clock
- 1..40 MHz internal clock

Wait System

- Additional wait cycles (1-15) may be specified
- Hidden Wait System (0-5).

TRACE32 provides a better timing on high speed target systems by generating internal (hidden) waitstates together with a 'synthetic' target interface.

Operation Modes

- Real Mode
- Protected Mode
- Virtual 8086 mode

Memory Models

ICE-386 supports the following memory models:

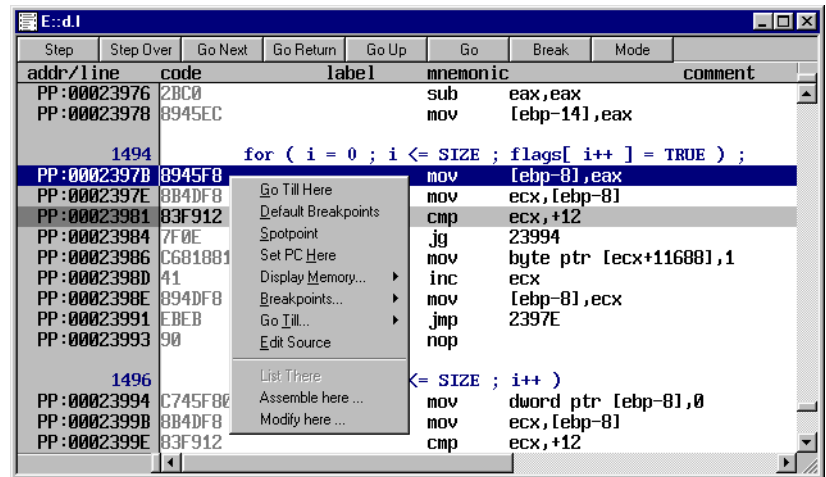
- Flat mode (uniform 4GB address space)
- Protected flat mode (separate program and data space)
- Large mode (multiple selectors used)

MMU Support

logical cal	sel	p	dpl	type
PR:000:0000000-0000007	A:03FFFC00-03FFFC07	0000:	N	dpl=0 system invalid
		0000:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0010:0000000-0000CFFF	A:000FF000-00100FFF	0010:	N	dpl=0 system invalid
PR:0020:0000000-00003FFF	A:0010C000-0010FFFF	0010:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0020:0000000-0000CFFF	A:03FFC000-03FFCFFF	0020:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0030:0000000-0000FBFF	A:03FEC000-03FFBFFF	0020:	Y	dpl=0 code nonconf readable byte noaccess avl=0 16-bit
PR:0030:0000000-0000FBFF	A:00110000-0011FBFF	0030:	Y	dpl=0 code nonconf readable byte noaccess avl=0 16-bit
PR:0040:0000000-0000FFFF	A:03F00000-03FFFFFF	0040:	Y	dpl=0 data expup writable byte noaccess avl=0 32-bit
PR:0040:0000000-0000FFFF	A:00000000-0000FFFF	0040:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0050:0000000-00004FFF	A:0001F000-000247FF	0050:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0050:0000000-00004FFF	A:00030000-00037FFF	0050:	Y	dpl=0 data expup writable byte noaccess avl=0 16-bit
PR:0060:0000000-0000FFFF	A:02000000-0200FFFF	0060:	Y	dpl=0 data expup writable byte noaccess avl=0 32-bit
PR:0060:0000000-0000FFFF	A:00100000-0013FFFF	0060:	Y	dpl=0 data expup writable byte noaccess avl=0 32-bit
		0070:	Y	dpl=0 system LDT 03FFBC00 03FF
		0070:	Y	dpl=0 system LDT 0311FC00 03FF
PR:0080:0000000-00003FFF	A:03FFBC00-03FFBFFF	0080:	Y	dpl=0 code nonconf readable byte noaccess avl=0 32-bit
PR:0080:0000000-FFFFFFF	A:FFFFFFFF-FFFFFFFE	0080:	Y	dpl=0 code conf readable page accessed avl=1 32-bit
		0080:	Y	dpl=3 code conf readable page accessed avl=1 32-bit

- Display of the descriptor table
- Target MMU scanning

HLL Debugging



The TRACE32 debugger provides a interface for C, C++, PL/M, M2 and ADA for all standard compilers. For more information on the supported compilers refer to the section "Debug Interfaces".

Full support in real-time for:

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

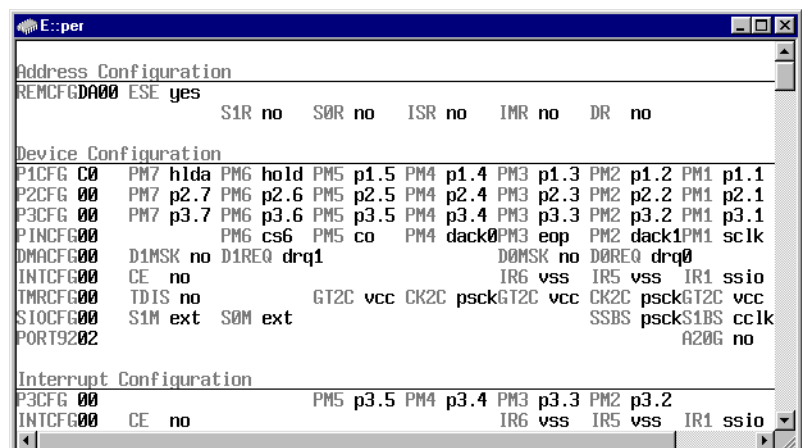
Background Task

The background task allows:

- To process interrupts

- To maintain the refresh of a target DRAM while the emulation is stopped.

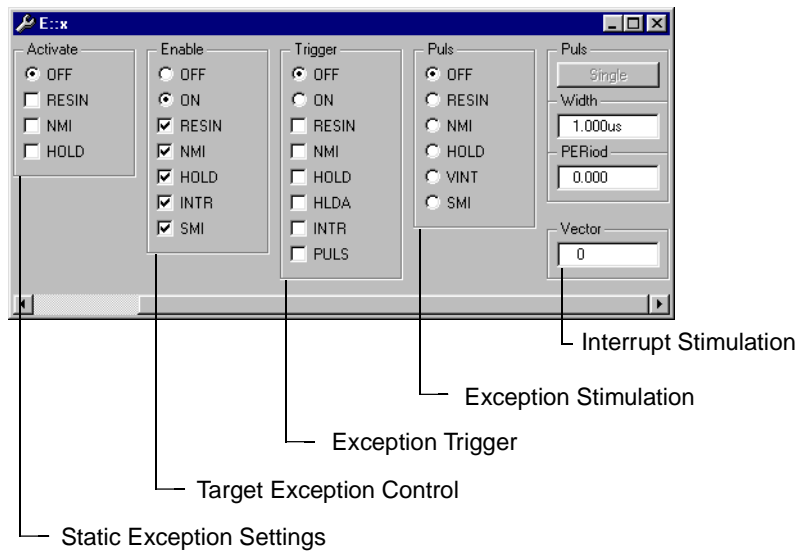
CPU Peripherals



- 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
-

Exception Control



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

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

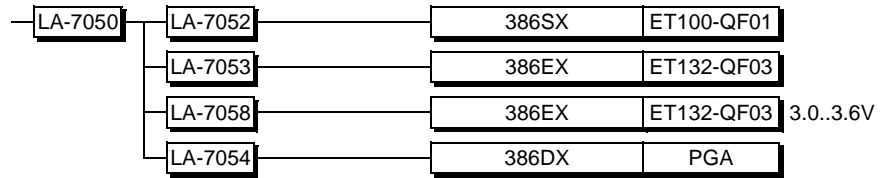
FPU Support

The display and modification of the FPU registers is supported.

On-Circuit Emulation

- Support for Clip-Over adapters

Modules Overview



Debug Interfaces

TRACE32-PowerView supports most compilers, realtime operation systems and debuggers.

New integrations are mostly done on customers request. If your compiler or RTOS is not supported now, please ask us !

Compiler Support Real Mode

Language	Compiler	Company	Option	Comment
ASM	AXLS	HP	HP	Source level debugging
C	BORLANDC	Borland	EOMF-86	with Paradigm LOCATE
C	ORGANON	CADUL	EOMF-86	Banking support
C	IC86	Intel	OMF-86	
C	MCC86	Mentor Graphics	EOMF-86	incl. Microtec ext.
C	MSC/MSVC 16BIT	Microsoft	EOMF-86	with Paradigm LOCATE
C	MSC/MSVC	Microsoft	EXE/TD	with Paradigm LOCATE
C	ICC86	TASKING	OMF-86	
C	ICC86	TASKING	IEEE	
C++	BORLANDC	Borland	EXE/TD	
C++	MSVC 16BIT	Microsoft	EXE/CV	
MODULA	LOGITECH M2	Terra Datentechnik	MAP/REF	
PASCAL	TEK-PASCAL	Tektronix	TEK	
PLM	PL/M86	Intel	OMF-86	reads src or list file

Compiler Support Protected Mode

Language	Compiler	Company	Option	Comment
C	GNU-C	FSF	DBX	
C	GNU-C	FSF	ELF/ DWARF2	
C	GCC386	Greenhills	COFF	
C	IC386	Intel	OMF- 386	
C	IC286	Intel	OMF- 286	
C	MCC386	Mentor Graphics	EOMF- 386	
C	HIGHC	Metaware	ELF/ DWARF	
C	HC386	Metaware/ SSI	OMF386/ SPF	
C	MSVC/CSI	Microsoft/ CSi	EOMF- 386	
C	MSVC-1.5	Microsoft/ Pharlap	EOMF- 386	Pharlap ETS
C	MSVC	Microsoft/ Pharlap	EXE/CV	
C	MSVC	Microsoft/ SSI	OMF- 386/CV	SSI Link386
C	SCO-UNIX- CC	SCO	COFF	
C++	BORLAND C	Borland	EXE/ BC5	
C++	ORGANON	CADUL	OMF386 ++	
C++	GNU-C++	FSF	DBX	
C++	HIGH-C++	Metaware	ELF/ DWARF	
C++	HC386	Metaware/ SSI	OMF/ SPF	
C++	MSVC	Microsoft/ Pharlap	EXE/ CV4	

RTOS Support Real Mode

Name	Company	Comment
ChorusOS	Sun Microsystems	
Nucleus PLUS	Mentor Graphics	
pSOS+	Integrated Systems	2.1 to 2.5, 3.0
RTXC 3.2	Quadros Systems Inc.	
VxWorks	Wind River Systems	5.x and 6.x

RTOS Support Protected Mode

Name	Company	Comment
ChorusOS	Sun Microsystems	
Linux	-	Kernel Version 2.4 and 2.6
Moblin	-	Kernel Version 2.4 and 2.6
Nucleus PLUS	Mentor Graphics	protected mode
RTXC 3.2	Quadros Systems Inc.	real/protected mode
VxWorks	Wind River Systems	5.x and 6.x

Debugger Support Real Mode

CPU	Debugger	Company	Host
ALL	X-TOOLS / X32	blue river software	Windows
ALL	CODEWRIGHT	Borland	Windows
ALL	EASYCODE	EASYCODE GmbH	Windows
ALL	ECLIPSE	Eclipse.org	Windows
ALL	LDRA TOOL SUITE	LDRA Software Techn.	Windows
ALL	ATTOL TOOLS	MicroMax	Windows
ALL	VISUAL BASIC INTERFACE	Microsoft	Windows
ALL	LABVIEW	NATIONAL INSTRUMENTS	Windows

CPU	Debugger	Company	Host
ALL	CODE::BLOCKS	Open Source	-
ALL	RAPITIME	Rapita Systems Ltd.	Windows
ALL	DA-C	RistanCASE	Windows
ALL	RHAPSODY IN MICROC	Telelogic	Windows
ALL	RHAPSODY IN C++	Telelogic	Windows
ALL	WINDOWS CE PLATF. BUILDER	Windows	Windows

Debugger Support Protected Mode

CPU	Debugger	Company	Host
ALL	X-TOOLS / X32	blue river software	Windows
ALL	CODEWRIGHT	Borland	Windows
ALL	EASYCODE	EASYCODE GmbH	Windows
ALL	ECLIPSE	Eclipse.org	Windows
ALL	LDRA TOOL SUITE	LDRA Software Techn.	Windows
ALL	ATTOL TOOLS	MicroMax	Windows
ALL	VISUAL BASIC INTERFACE	Microsoft	Windows
ALL	LABVIEW	NATIONAL INSTRUMENTS	Windows
ALL	CODE::BLOCKS	Open Source	-

CPU	Debugger	Company	Host
ALL	RAPITIME	Rapita Systems Ltd.	Windows
ALL	DA-C	RistanCASE	Windows
ALL	RHAPSODY IN MICROC	Telelogic	Windows
ALL	RHAPSODY IN C++	Telelogic	Windows
ALL	WINDOWS CE PLATF. BUILDER	Windows	Windows

Operation Voltage and Frequency

The maximum operation frequency of TRACE32-ICE depends on:

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

Denied Access

Module	CPU	F-W0-15	F-W0-35	S-W0-15	S-W0-35	S-W1-15	S-W1-35	DRAM
LA-7054	386DX	21.0	16.4	14.8	12.4	24.6	20.6	
LA-7058	386EX	21.0	15.6	13.8	11.2	25.0+	20.5	
LA-7052	386SX	22.0	17.0	18.0	14.5	30.1	24.2	

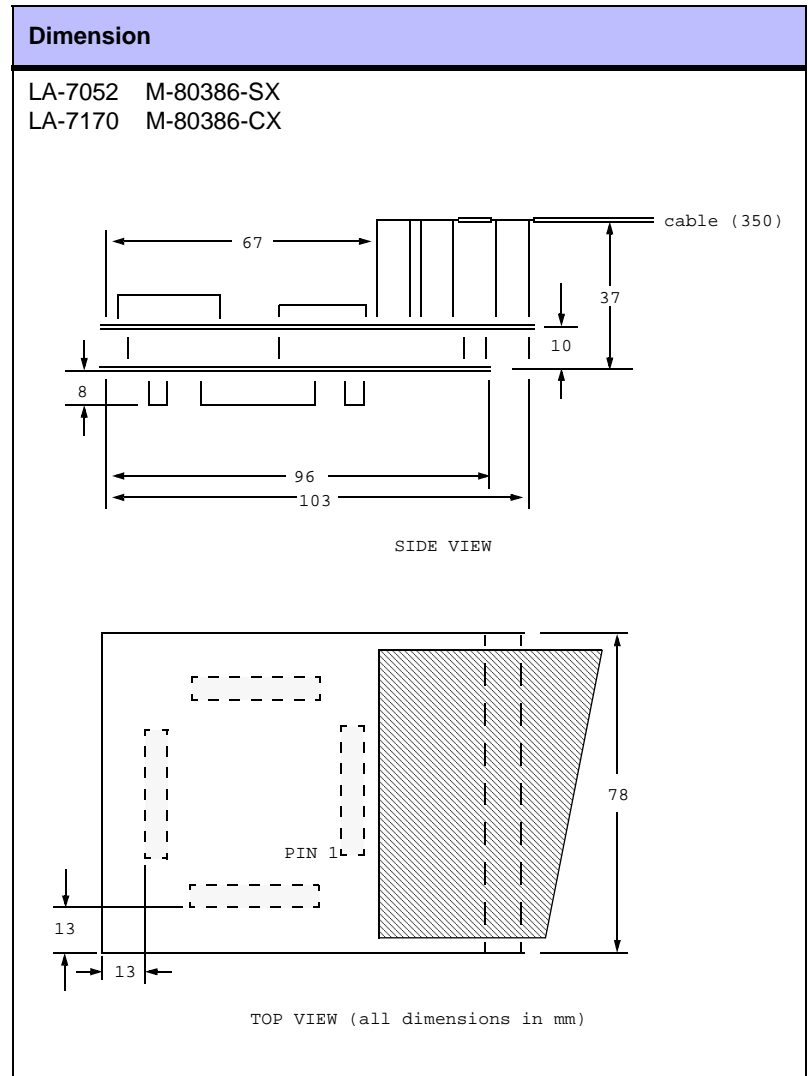
Operating Voltage

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.

CPU	Module	Adapter	Voltage Range
386EX	LA-7058	-	3.0 .. 3.6 V

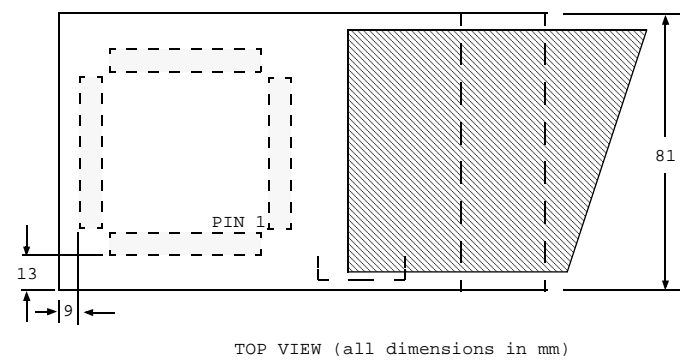
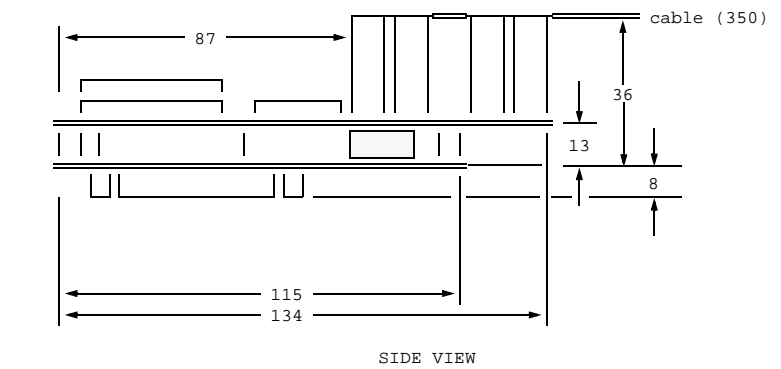
Dimensions

Module Dimensions



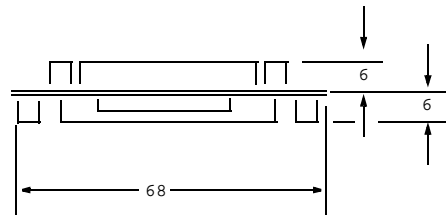
Dimension

LA-7053 M-80386-EX
LA-7058 M-80386-EX-3.3V

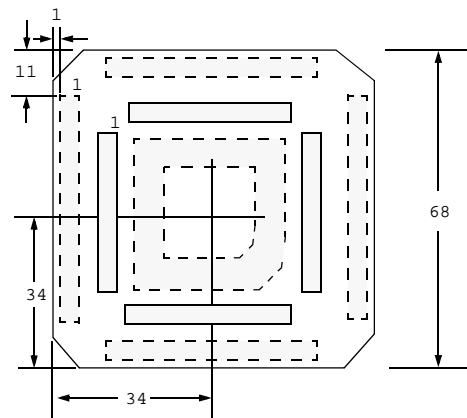


Dimension

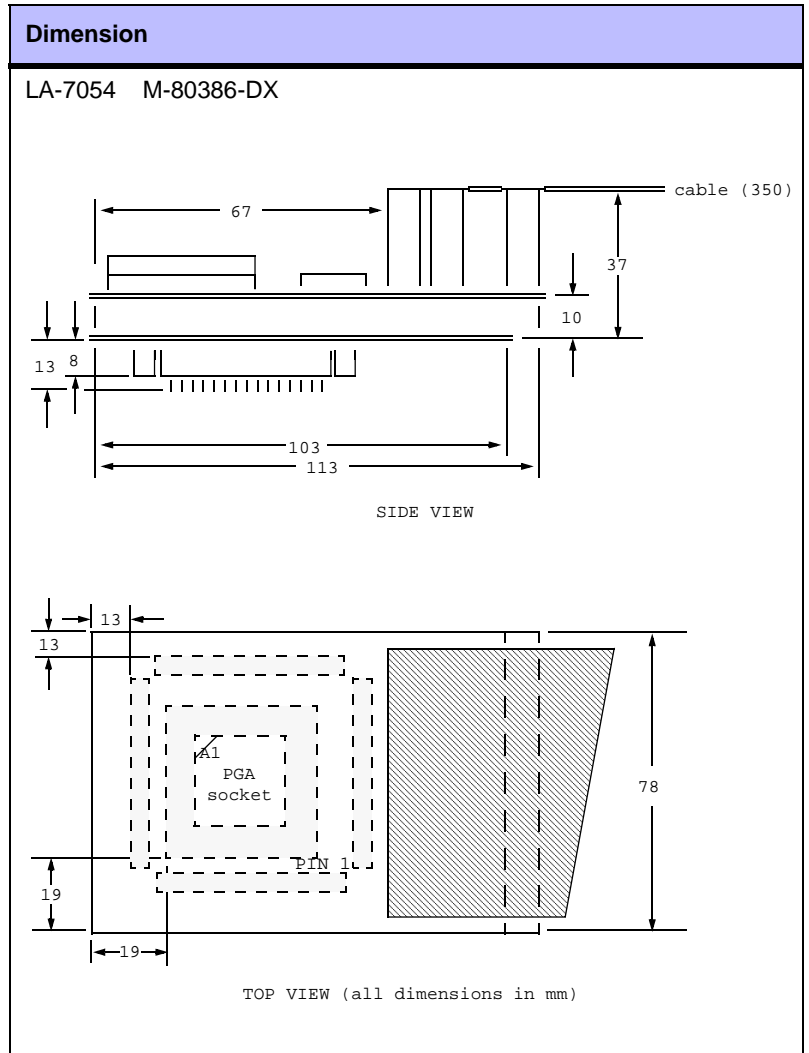
LA-7059 A-80386EX-PGA



SIDE VIEW



TOP VIEW (all dimensions in mm)



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 Technology, YAMAICHI, AMP, TOKYO ELETECH etc.

The following table lists the physical dimensions of these connectors.

CPU	Dimension
386SX	<p>ET100-QF01</p> <p>100-QF01 TOP-VIEW</p>
386EX 386EX	<p>ET132-QF03</p> <p>132-QF03 TOP-VIEW</p>

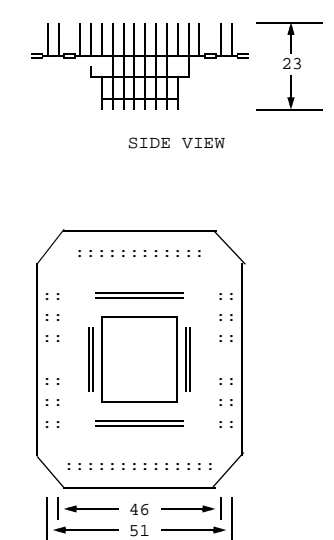
Adapter

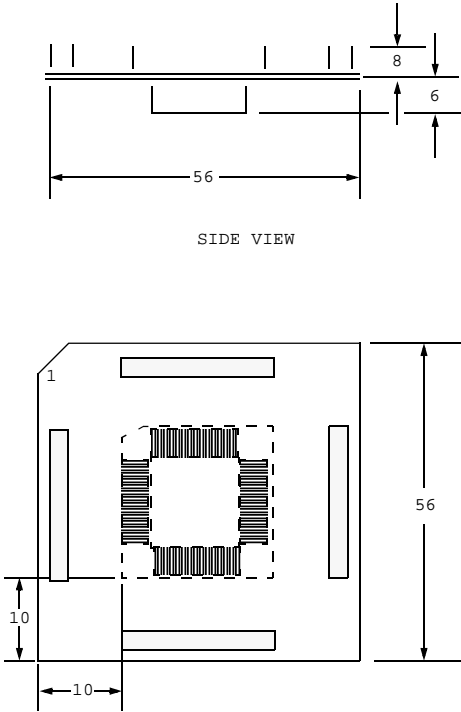
The adapters connect in different ways

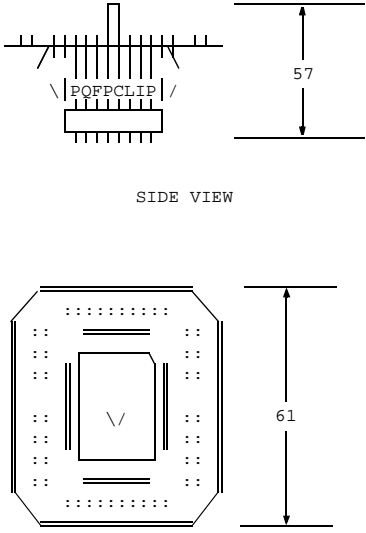
- With Clip-Over Adapters the CPU can stay on the target board.
- With Solder-ON adapters the CPU must be removed

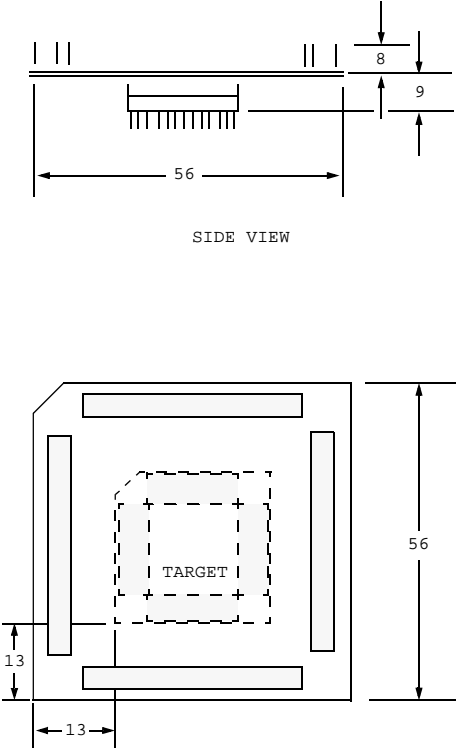
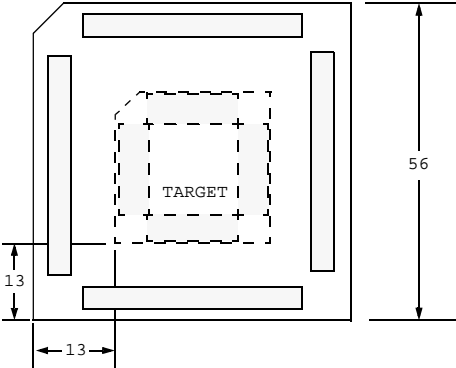
- YAMAICHI and AMP adapters fit to the CPU socket

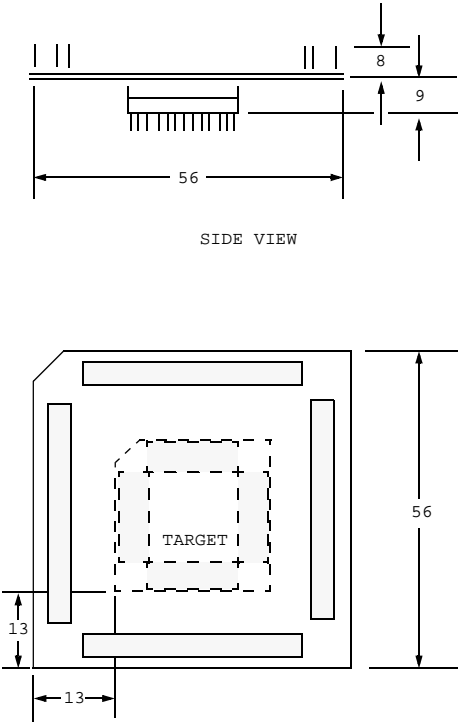
The following table lists the physical dimensions of these adapters.

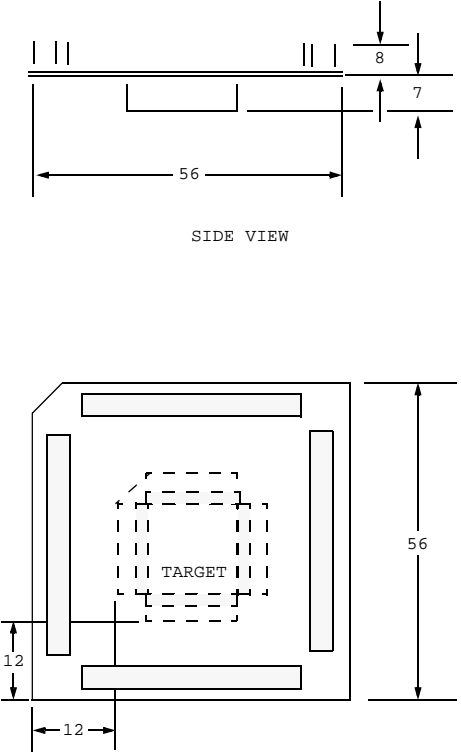
Socket CPU	Adapter
ET100-QF01 386SX	ET-1050 ET100-SET-QF01 Surface Mountable Adapter for ET100 to QF01  <p style="text-align: center;">SIDE VIEW</p> <p style="text-align: center;">TOP VIEW (all dimensions in mm)</p>

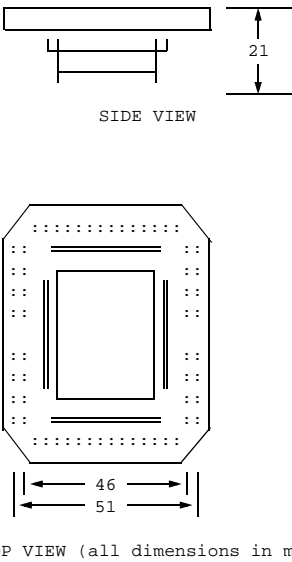
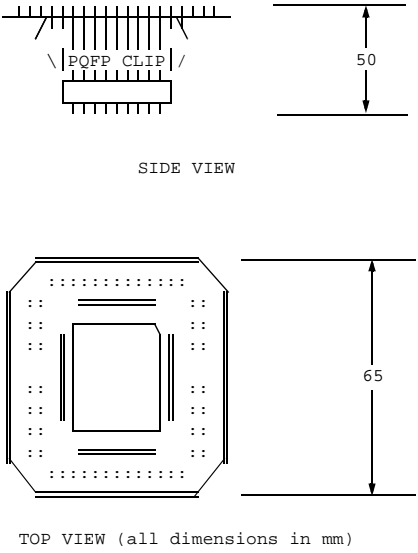
Socket CPU	Adapter
ET100-QF01 386SX	<p data-bbox="927 371 1422 456">YA-1051 ET100-EYA-QF01 Emul. Adapter for YAMAICHI socket ET100-QF01</p>  <p data-bbox="1139 734 1238 757">SIDE VIEW</p> <p data-bbox="1023 1234 1362 1256">TOP VIEW (all dimensions in mm)</p> <p>The side view shows a profile of the adapter with a total length of 56 mm. The top edge has a height of 8 mm, and the bottom edge has a height of 6 mm. The top view shows a square footprint with a side length of 56 mm. The central area contains a square array of pins. The distance from the left edge to the center of the pin array is 10 mm, and the distance from the bottom edge to the center is also 10 mm. A small dimension '1' is indicated at the top-left corner of the main body.</p>

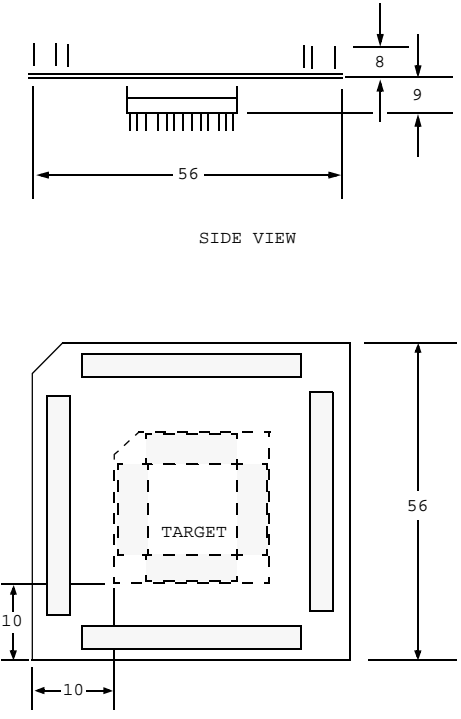
Socket CPU	Adapter
<p>ET100-QF01</p> <p>386SX</p>	<p>ET-1052 ET100-CFET-QF01 Clip-Over Adapter for ET100 to QF01</p>  <p>The drawing shows two views of the adapter. The side view shows a component with a central notch and a height dimension of 57 mm. The top view shows an octagonal footprint with a central square notch and a width dimension of 61 mm. The text 'POFPCLIP' is visible in the side view, and 'TOP VIEW (all dimensions in mm)' is written below the top view.</p> <p>SIDE VIEW</p> <p>TOP VIEW (all dimensions in mm)</p>

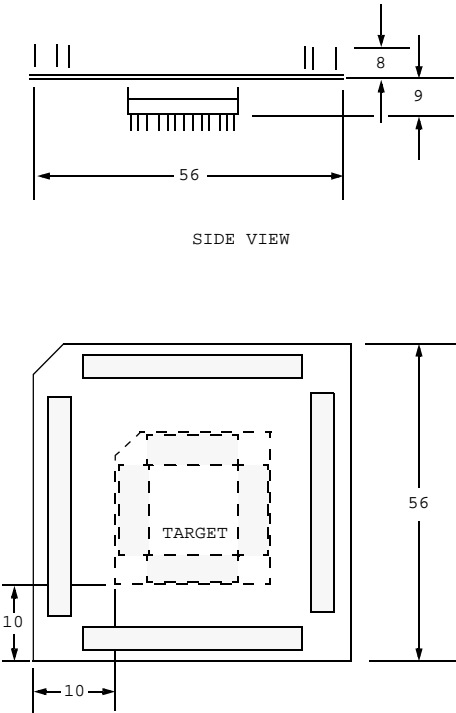
Socket CPU	Adapter
ET100-QF01 386SX	<p data-bbox="927 371 1378 456">LA-1053 ET100-FP100-R Adapter for ET100 to Footprint AMP/3M Sockets</p>  <p data-bbox="1139 759 1238 777">SIDE VIEW</p>  <p data-bbox="1024 1301 1362 1319">TOP VIEW (all dimensions in mm)</p> <p>The technical drawing consists of two views: a side view and a top view. The side view shows a rectangular component with a total length of 56 mm. It features a central section with a width of 8 mm and a height of 9 mm. The top view shows a square footprint with a side length of 56 mm. A central square area is marked with a dashed line and labeled 'TARGET'. The distance from the center of the target to the left and bottom edges of the footprint is 13 mm.</p>

Socket CPU	Adapter
ET100-QF01 386SX	<p data-bbox="927 371 1378 456">LA-1054 ET100-FP100-L Adapter for ET100 to Footprint AMP/3M Sockets</p>  <p data-bbox="1145 734 1246 757">SIDE VIEW</p> <p data-bbox="1023 1240 1362 1263">TOP VIEW (all dimensions in mm)</p> <p>The side view shows a rectangular component with a total length of 56 mm. It has a height of 8 mm on the top edge and 9 mm on the bottom edge. The top view shows a square footprint with a side length of 56 mm. A central square area is labeled 'TARGET' and is surrounded by a dashed line. The distance from the center of the target to the inner edge of the footprint is 13 mm on both the horizontal and vertical axes.</p>

Socket CPU	Adapter
ET100-QF01 386SX	<p data-bbox="927 369 1302 427">AM-1055 ET100-AMP100 Adapter for AMP QFP100 Socket</p>  <p data-bbox="1141 728 1236 750">SIDE VIEW</p> <p data-bbox="1029 1265 1364 1288">TOP VIEW (all dimensions in mm)</p>

Socket CPU	Adapter
<p>ET132-QF03 386EX</p>	<p>ET-1000 ET132-ETS-QF03 Surface Mountable Adapter for ET132-QF03</p>  <p>The side view shows a rectangular component with a height of 21 mm. The top view shows an octagonal footprint with a central square area. The width of the octagon is 51 mm, and the width of the central square is 46 mm. All dimensions are in mm.</p>
<p>ET132-QF03 386EX</p>	<p>ET-1002 ET132-CFET-QF03 Clip-Over Ad. for ET132-QF03 with Flex Cable</p>  <p>The side view shows a component with a height of 50 mm and a 'POPP CLIP' label. The top view shows an octagonal footprint with a central square area. The height of the octagon is 65 mm. All dimensions are in mm.</p>

Socket CPU	Adapter
<p>ET132-QF03 386EX</p>	<p>LA-1003 ET132-FP132-R Adapter ET132 to Footprint AMP/3M socket</p>  <p>SIDE VIEW</p> <p>TOP VIEW (all dimensions in mm)</p>

Socket CPU	Adapter
ET132-QF03 386EX	<p data-bbox="927 371 1437 427">LA-1004 ET132-FP132-L Adapter ET132 to Footprint AMP/3M sockets</p>  <p data-bbox="1139 696 1241 712">SIDE VIEW</p> <p data-bbox="1023 1193 1362 1209">TOP VIEW (all dimensions in mm)</p> <p>The side view shows a rectangular component with a total length of 56 mm. On the right side, there are two vertical dimensions: 8 mm for the top section and 9 mm for the bottom section. The top view shows a square footprint with a side length of 56 mm. A central square area is labeled 'TARGET' and is surrounded by a dashed line. The distance from the left and bottom edges of the footprint to the 'TARGET' area is 10 mm.</p>

Available Tool Chain

TRACE32 provides a complete set of development tools for this 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
- The ICD Trace, a trace extension to the BDM/JTAG debuggers or ROM monitors
- Evaluation boards, which can be used until the target hardware is available.
- The Instruction Set Simulator (SIM), a software tool for code test without any hardware

The following list give an overview which development tools are available for the specific derivatives of this family.

CPU	ICE	FIRE	ICD DEBUG	ICD MONITOR	ICD TRACE	POWER INTEGRATOR	INSTRUCTION SIMULATOR
386DX	YES			YES			
386EX	YES			YES			
386SX	YES			YES			

Order Information

Module Description

OrderNo Code	Text
LA-7050 ICE-386	ICE-386 Base Module Base Module for 80386-SX, -CX, -DX, -EX, requires LA-6410 as Analyzer
LA-7052 M-80386-SX	Module 80386-SX supports 80386-SX 33/40 MHz supports also 80386-CX by changing the CPU adaption ET100-QF01
LA-7170 M-80386-CX	Module 80386-CX supports 80386-CX 33/40 MHz supports also 80386-SX by changing the CPU adaption ET100-QF01
LA-7053 M-80386-EX	Module 80386-EX supports 80386-EX 25/33 MHz adaption ET132-QF03
LA-7059 A-80386EX- PGA	80386EX Adapter ET132 to ET144 to PGA168 Adapter for 80386EX ET132 to ET144 to PGA168
LA-7058 M-80386-EX- 3.3V	Module 80386-EX 3.3V supports 80386-EX 3.3V 25/33 MHz adaption ET132-QF03
LA-7054 M-80386-DX	Module 80386-DX supports 80386-DX 33/40 MHz adaption PGA132 and ET132

Detailed Order Information

Order No.	Code	Text
LA-7050	ICE-386	ICE-386 Base Module
LA-7052	M-80386-SX	Module 80386-SX
LA-7170	M-80386-CX	Module 80386-CX
LA-7053	M-80386-EX	Module 80386-EX
LA-7059	A-80386EX-PGA	80386EX Adapter ET132 to ET144 to PGA168
LA-7058	M-80386-EX-3.3V	Module 80386-EX 3.3V
LA-7054	M-80386-DX	Module 80386-DX
Additional Options		
AM-1055	ET100-AMP100	Adapter for AMP QFP100 Socket
YA-1051	ET100-EYA-QF01	Emul. Adapter for YAMAICHI socket ET100-QF01

Order No.	Code	Text
LA-1054	ET100-FP100-L	Adapter for ET100 to Footprint AMP/3M Sockets
LA-1053	ET100-FP100-R	Adapter for ET100 to Footprint AMP/3M Sockets
ET-1050	ET100-SET-QF01	Surface Mountable Adapter for ET100 to QF01
ET-1002	ET132-CFET-QF03	Clip-Over Ad. for ET132-QF03 with Flex Cable
ET-1000	ET132-ETS-QF03	Surface Mountable Adapter for ET132-QF03
LA-1004	ET132-FP132-L	Adapter ET132 to Footprint AMP/3M sockets
LA-1003	ET132-FP132-R	Adapter ET132 to Footprint AMP/3M socket
LA-7530	MON-386	ROM Monitor for 386/486 family on ESI
LA-6450	PA64	Port Analyzer

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