# Universal Debug Engine

## Company information

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## Fields of activities

pls Programmierbare Logik & Systeme GmbH is one of the leading development tools manufacturers specialized for 16/32 Bit microcontroller by Infineon, STMicroelectronics and ARM7, ARM9, XScale derivatives.

## Short product description – Universal Debug Engine –

The **Universal Debug Engine** (UDE) for 16/32 Bit microcontroller is a new concept of our cross debugger based on a set of standard components and core specific components. UDE supports different cores and multi-core-debugging for TriCore, XC16x, ST10, C16x, ARM7, ARM9 and XScale. The new TriCore TC1766ED and TC1796ED (emulation devices) are supported via on-chip-emulation-support in detail.

UDE includes integrated functions like

- in-system programming of FLASH/OTP memories and derivatives
- target debugging and bus/message monitoring via CAN
- monitor-development-kit for the easy adaptation of custom specific monitor programs.
- and support following third-party tools
- Real-time operating systems ( CMX, Nucleus, µC/OS-II, PXROS, Keil RTX )
- C/C++ compiler support ( Tasking, Keil, Gnu)
- Test- and CASE-support ( EASYCode**,** X-TOOLS, Tessy ).

The flexible high-speed **Universal Access Device 2**[+] features the target access via JTAG-, ASC-, SSC-, CAN- and 3pin- interface. The fast adaptation to customer target systems is supported. Code trace functionality based on MCDS, OCDS L2 and ETM is available up to 180MHz target frequency.
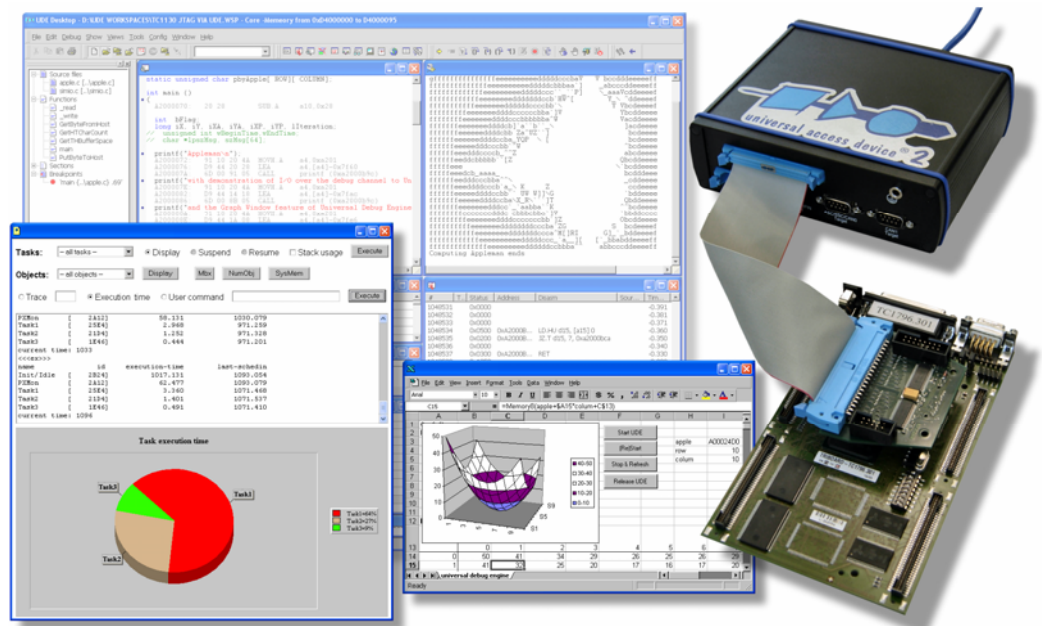
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## Universal Debug Engine - High Level Language Debugger Tool

UDE - The Flexible Debug Platform with Multi-core Debugging Universal Debug Engine (UDE) as one of the most powerful development workbenches available for Infineon's 16-bit architecture SAB C16x, C166CBC, C166S V2, XC16x, the 32-bit TriCore, TC1130, TC1796  as well the ST10F16x, ST10F26x, ST10F280, ST30, STR7 architecture from STMicroelectronics, ARM7 TDMI and ARM9 TDMI derivatives from various manufacturers lets you organize your projects, supports you while building applications and lets you run and test your software in a very convenient and cost-efficient way. UDE supports a number of different cores and Multi-core Debugging as well as standard debug features. Look to the feature overview  of Universal Debug Engine.

UDE provides full-featured JTAG OCDS Support L1 with emulator-like debug functionality - hardware breakpoints, hardware triggers, instruction trace features and more. UDE represents a completely new debugger architecture and tool concept based on a customizable set of standard components and core specific add-ons. UDE runs under Windows 98SE, Windows ME, Windows NT4.0, Windows 2000 and Windows XP.

### User Definable Enhancements
Being an integrated part of UDE, the open interface for User Definable Enhancements enables you to easily create completely new types of applications:
- HTML Scripts based on standard UDE ActiveX Control and customer-specific controls together with PERL and JAVA scripts provide fully customized hardware visualization and control.
- The Automation Interfaces of the UDE components even allow using basic UDE services for controlling the debugger and processing target communication, program flow control and symbol processing by external C/C++, VisualBasic and VBA applications.
- Substitution of the standard UDE desktop client by a customized desktop to fit the requirements of service tools, Matlab or another third-party tool integration by using the COM interface.

### Unrivalled Flexible Target System Access
- JTAG OCDS L1 is fully supported by UDE offering direct high-speed access to the MCUs internal units (registers, control unit...) and features like breakpoints, stepping in ROM/FLASH as well as complex trigger conditions without any external hardware or software resources.
- OCDS L2 instruction trace capability is available for all member of the TriCore family.
- Target ROM monitor and ASC Bootstrap loader / RAM monitor solutions for a flexible access via a wide variety of debug channels (ASC, SSC, 3PIN, CAN) are available (not required to access C166CBC, XC16x, TriCore and ARM targets).
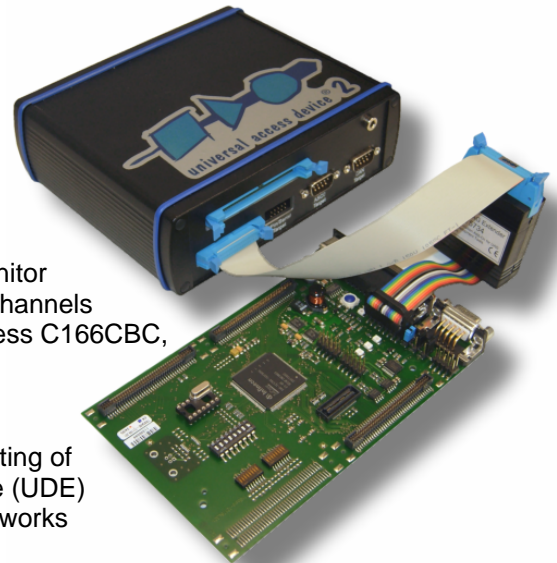
### Automated Testing with Tessy
The test system Tessy from Razorcat offers automated module testing of C code directly on the target system using Universal Debug Engine (UDE) debugging technology. It supports the whole unit testing cycle and works transparently on all target platforms currently supported by UDE.

- Systematic test case design using the classification tree method: Intuitive, easy to learn graphical representation of test specifications.
- Quick overview of test objects interface and variable usage within interface browser tools.
- Easy creation of module environment: Definition of unresolved references and all necessary stubs.
- Automatic test driver generation, test execution and evaluation of test results.
- Test driver in client/server technology allows unlimited number of test cases and minimum code/data requirements on the target system.
- Powerful support for regression testing: An interface browser tool shows both old and changed interfaces and provides comfortable interface assignment that allows automatic reusage of test data.
- For C166/ ST10 and TriCore target systems Tessy is available with Universal Debug Engine (UDE).

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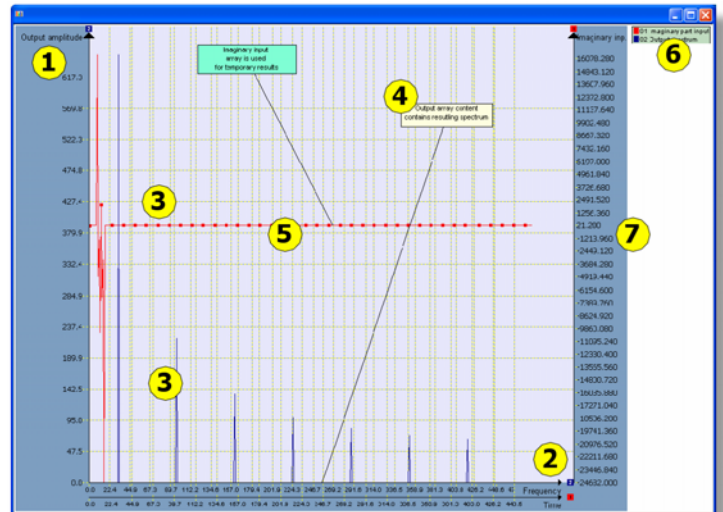
## UDE Graphical Diagram Display Window

The UDE graphical display window is a powerful visualization tool, which helps to accelerate the evaluation of complex target program data from process environment and by the verification of complex software algorithms. It can be used with all microcontroller families supported by UDE.
The UDE window displays pre-processed target system data as curves of a 2-dimensional scientific diagram. This feature makes it easier to visualize and evaluate target data to accelerate the verification of complex software algorithms and input from process environment.

Basic features of the Graphic Display Window:

- Multiple curves in one diagram window
- Separate x- and y-axis for each curve
- Flexible calculation of curve data points from target program data with UDE expressions
- Update of data after program hold or with programmable refresh rates during running and stopped target program
- Legend, Cursor, Zoom, Pan, Axis markers
- Save and restore of complex settings in UDE workspace and separate file
- Printer support.

Further helpful features to evaluate data are the zoom-, pan- and cursor functions. This functions help to view details of the current curves. The cursor function makes it easy to access to the particular data values at specific coordinates of the curve.

## CAN recorder with plug-in for CANopen visualization

The UDE CAN recorder tool provides the visualization of CAN bus communication and can be used as an add-in or as a stand-alone application. Equipped with the CANopen message formatter plug-in the CAN recorder can visualize the CANopen communication or a user-defined CAN-layer-7-protocol.

The recorder can be configured for filtering and for displaying of symbolic information and can export CAN message streams to a file. A send bar provides the sending and stimulating of the CAN bus. CAN baud rates from 50 kbit/s up to 1Mbit/s and standard / extended CAN identifier are supported.

The UDE CAN recorder supports a Common Object Model (COM). This feature allows the usage of UDE CAN recorder as plug-in of user applications as well as the script-controlled by other applications.

The CANopen message formatter is a plug-in for the UDE CAN recorder and can visualize the CANopen communication. The plug-in scans and interprets DCF-files automatically. This makes data of CANopen networks and CAN nodes available. If no DCF-file is available the message formatter interprets all CANopen standard objects corresponding to the default specification.
In other cases the CANopen message formatter handles an interpretation file for the visualization functionality of the UDE CAN recorder. This file can be edited and manipulated by the user, for example for visualization of a user-defined CAN-layer-7-protocol.

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**MCDS Instruction Trace**

MCDS support is an Add-in available for UDE and is used to capture processor states in real-time using an USB or JTAG connection to the derivative. This can only be done with the MCDS onchip trace features of special versions of TriCore TC1796 derivatives.

**OCDS L2 Instruction Trace**

Hard real-time debugging requires close interaction with the processor. Tracing shall provide a chronological picture of a system's inner workings up to, starting from or in the vicinity an event, mainly to guide a human in understanding a faulty program. OCDS L2 was defined for this purpose and is available on the TriCore derivatives. The OCDS L2 unit of the TriCore derivatives supports the recording of a running program's trace. In combination with the JTAG OCDS L1 unit a comfortable watching of the program flow in real-time is possible. UDE, the Universal Debug Engine, supports basically the OCDS unit by the Universal Access Device add-on. OCDS L2 Instruction Trace is supported by the Universal Access Device - Trace Board option.

**ETM Instruction Trace**

The Embedded Trace Macrocell (ETM) of ARM derivatives is supported by UDE and is used to capture processor states in real-time using a dedicated connection to the derivative. The ETM v1.2 is supported via 4/8 bit port width, Halfrate Clock Mode is supported too.
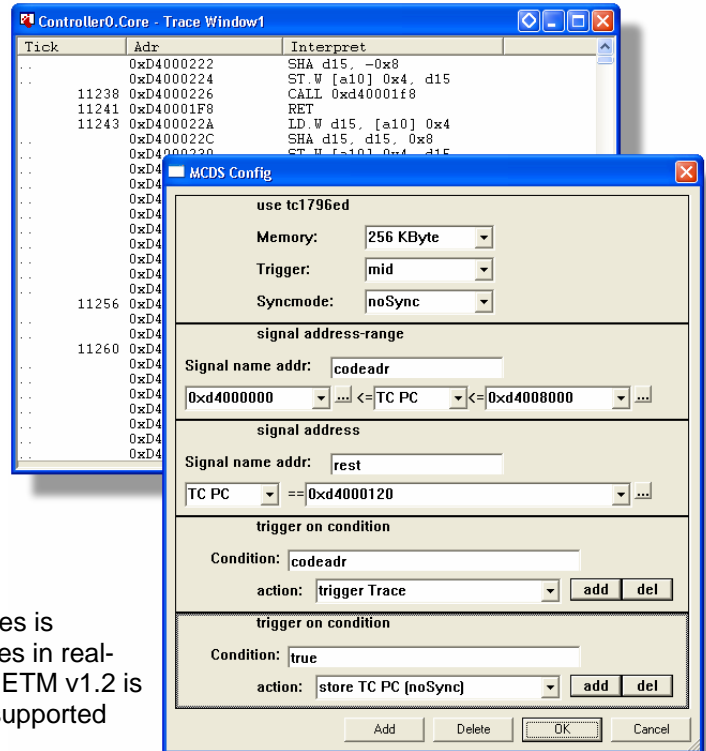
# Universal Debug Engine Version 2 – Feature List

**Enhanced ARM7 / ARM9 support with the proven characteristics of Universal Debug Engine**
- Support for new microcontrollers from Freescale (MAC71xx), Phillips (LPC3180) and ST Microelectronics (STR910)
- Programming support for on-chip and external FLASH memories.
- The list of the supported controllers constantly grows.
  Ask us for your type of ARM microcontroller!

**Support for XScale embedded processors**
- Support for PXA255 and PXA27x embedded processors
- The communication between debugger and target processor is realised via the JTAG Interface and a specific debug handler, which runs in the mini instruction cache of the XScale processors. The intelligent memory management ensures the proper function even of applications which changes dynamically exception vectors.

**Enhanced TriCore support**
- The 'Universal Emulation Configurator' unlocks the power of On-chip emulators (MCDS) from TriCore emulation devices TC1766ED and TC1796ED.
  Complete ready-to-use emulation kits simplifies significantly test and debugging.
- Trigger transfer window offers tracing of changes of a 32 bit memory location.
- A new dialog allows simple configuration of peripherals for suspend mode during hold.
- A time measurement function using the system timer of TriCore is now available.
- New TriCore family members: TC116x, TC176x, TC1766, TC1792

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**Enhanced XC16x support**
- Trigger transfer window offers tracing of changes of a 16 bit memory location.
- Attaching to a running application and breakpoint support with minimal intrusion is offered by a new connect option for using debugger in a production environment.
- New XC16x derivatives: XC164CM, XC164S, XC164D, XC164N

**Established line of smart communication devices:**

**UAD2**
- USB 2.0 with 480 MBit/s
- Target interfaces: JTAG (ARM and Infineon), CAN, serial interfaces
- Up to 2,5 MByte/s JTAG download speed
- CAN recorder functionality

**UAD2+**
- Host interfaces: USB 2.0 with 480 MBit/s, IEEE1394 (Firewire with 400 MBit/s), 100 MBit Ethernet now available
- Target interfaces: JTAG-Extender (ARM and Infineon), CAN, 3-Pin, serial interfaces
- Target and host interfaces with electrical isolation except USB 2.0
- Up to 3,5 MByte/s JTAG download speed
- CAN recorder functionality
- optional: OCDS Level II (Trace) up to 180 MHz

**New trace capabilities**
- Program trace for PCP2 (TriCore)
- Activity trace for DMA (TriCore)
- Program and data trace support based on Enhanced Trace Macrocell (ETM) in ARM derivatives

**Profiling page**
- Profiling functions based on instruction pointer trace data from OCDS level II, ETM, On-chip Emulators (MCDS), simple instruction pointer snooping or simulator output.

**RTOS support**
- RTOS support pages added for CMX from CMX systems and µC/OS-II from Micrµum. The pages offer visualization of operating system objects and states during runtime.

**Enhanced CAN support**
- CANopen support in CAN recorder for standard messages by default and for application specific messages with Device Configuration Files (DCF) as data base.
- Support for user defined proprietary CAN Layer-7 protocols.
- CAN monitor with on-chip debug support for TriCore and XC16x

**User interface improvements**
- Every window can now in MDI, floating, docked or tabbed state.
- New docking containers allow freely arrangement of tabbed windows by the user.
- Reworked HTML pages with consistent look-and-feel and better navigation.

**Latest versions of C/C++ - compilers are supported:**
- C16x/ST10/XC16x: Tasking V8.6r1, Keil V6.04
- TriCore: GNU V3.3.7.1 (HighTec), Tasking 2.4r1
- ARM: RealView MDK-ARM 3.03 (Keil/ARM), GNU 3.4.1 (HighTec)

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# *Product Information*

Q1/2007

On Top Solutions for
System Development of the

# *16 / 32 Bit Microcontroller Families*

C16x, XC16x, ST10, C166CBC, C166S V2,
TriCore, ARM7, ARM9, ARM11 and XScale

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*Release 8.1 UDE*

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# What You Can Expect:

## A Complete Development Environment for
## C16x, XC16x, ST10, TriCore, ARM7, ARM9/11 and XScale

**Inside this booklet, you will find information about:**

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## Universal Debug Engine – Workbench for fast C16x, ST10, TriCore, ARM7, ARM9, ARM11, XScale Development

The Universal Debug Engine (**UDE**) is the state-of-the-art Development Environment for application development with the Infineon C16x, XC16x, TriCore, the STMicroelectronics ST10, the ARM7, ARM9, ARM11 and XScale microcontroller families. It offers a collection of tools including source file management, project building and powerful HLL debugger with various high-speed communication paths to the customer's hardware target system with target monitor. All components work together in an optimized manner.

### The goal: Minimized turn-around time for efficient application engineering

UDE as a part of the package is a powerful HLL debugger to test microcontroller applications created in C/C++ language and/or Assembly. Together with the Universal Access Device, the communication add-on of UDE and the possible used target monitor it offers real-time execution between breakpoints on the customer's target system.

The profit is on you when using the Integrated Development Environment with integrated tools. There is just one Graphical User Interface for Development, Debugging and Emulation. Multiple high-speed interfaces allow a very flexible target system access.

### Further benefits

- **Save development time** – start with just one tool

- **Cost efficient for workgroups** – save by choosing the right mixture of UDE ROM monitor or emulator solutions
- **One-stop support** for all components of the Integrated Development Environment (debugger, editor, compiler, RTOS, …).

The Universal Debug Engine and a C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11, XScale cross compiler (Tasking, Keil, GNU and WindRiver) in minimum make a complete and powerful package for starting a professional development project.

The Universal Debug Engine is an open platform offering different interfaces to other tools. Optionally, it can be feature-enhanced by the following components that can be included into the workbench:

- Evaluation Boards from different vendors for a quick start with new C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11 and XScale derivatives.
- Portable Monitor Development Kit to use the UDE debugger on any application specific hardware.
- CASE Tool with interface to debugger Universal Debug Engine supporting Enhanced Nassi-Shneidermann-Charts - a great help for reengineering, maintenance and program documentation.
- Real-Time Operating Systems with detailed support within the debugger Universal Debug Engine to use reliable software components for standard programming tasks.
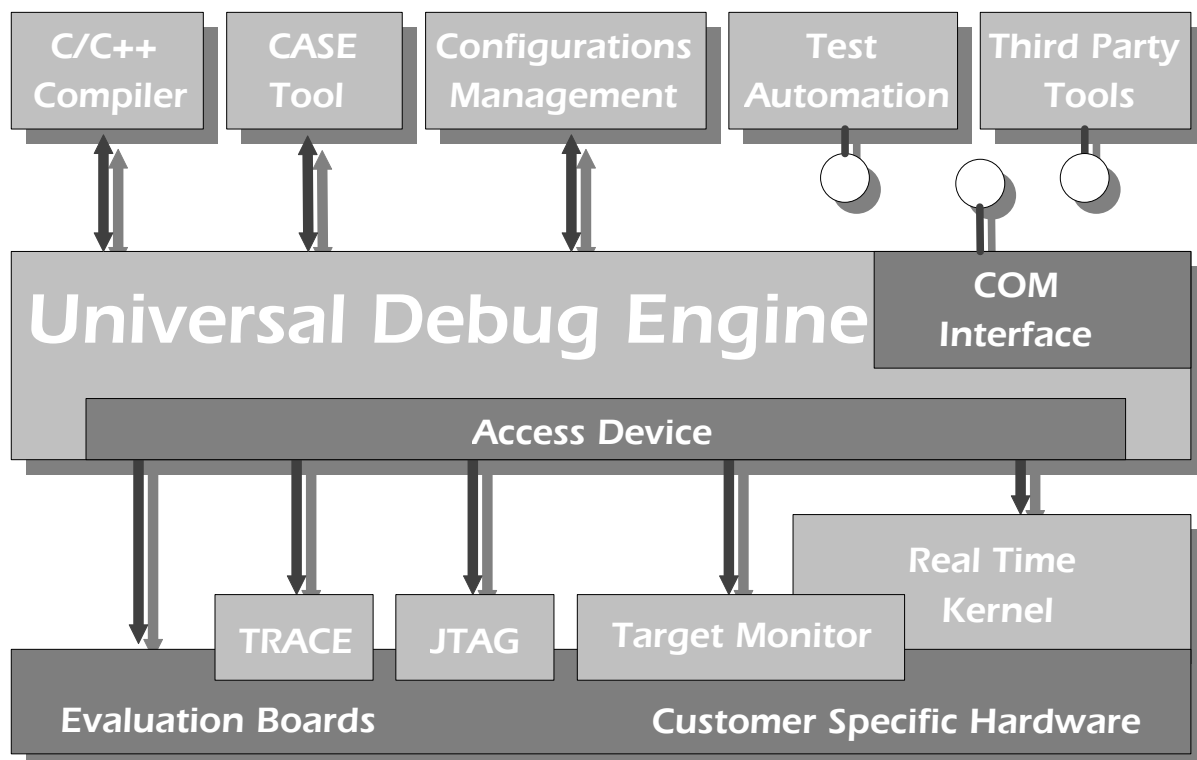
# Universal Debug Engine – High Level Language Debugger

UDE - The Flexible Debug Platform with multi-core Debugging Universal Debug Engine (UDE) as one of the most powerful development workbenches available for STMicroelectronics 16bit ST10 architecture, Infineon's 16bit architectures C16x, XC16x, C166CBC, C166S V2, the 32bit TriCore, ARM's ARM7, ARM9, ARM11 architectures and the XScale architecture lets you organize your projects, supports you while building applications and lets you run and test your software in a very convenient and cost-efficient way. UDE supports a number of different cores and Multi-core Debugging as well as standard debug features.

UDE provides **full-featured JTAG Support** with emulator-like debug functionality - hardware breakpoints, hardware triggers, trace features and more. UDE represents a completely new debugger architecture concept based on a customizable set of standard components and core specific add-ons.

## User Definable Enhancements

Being an integrated part of UDE, the open interface for User Definable Enhancements enables you to create easily completely new types of applications:

- HTML Scripts based on standard UDE ActiveX Control and customer-specific controls together with PERL and JAVA scripts provide fully customized hardware visualization and control.
- The **Automation Interface** of the UDE components even allow using basic UDE services for controlling the debugger and processing target communication, program flow control and symbol processing by external C/C++, Visual Basic and VBA applications.
- Substitution of the standard UDE desktop client by a customized desktop to fit the requirements of service tools, Matlab™, LabVIEW™ or another

third-party tool integration by using the COM interface.

## Unrivalled Flexible Target System Access

- JTAG/OCDS L1 and EmbeddedICE are fully supported by UDE offering **direct high-speed access to the MCU**'s internal units (registers, control unit...) and features like breakpoints, stepping in ROM/FLASH as well as complex trigger conditions without any external hardware or software resources.
- **OCDS L2 trace** and **ETM trace** support allows the watching of the flow of a running program in real-time within the process environment for core, PCP, PCP2, DMA, if available. Timing measurements of critical sections are also possible.
- **ETB** trace as internal buffer of trace data is supported by UDE.
- Target **ROM monitor and bootstrap loader**/RAM monitor solutions for a flexible access via a wide variety of debug channels (ASC, SSC, 3-Pin, CAN) are available (not required to access C166CBC, XC16x, TriCore and ARM targets).

## Supported Microcontrollers

UDE offers comprehensive debug support for all of the
- C16x, XC16x, C166CBC, C166S V2 families
- ST10x16x, ST10x26x and ST10x28x families
- TriCore family derivatives like TC1130, TC1164, TC1766, TC1796, TC1796ED, TC1910, TC1920
- ARM7TDMI, ARM9TDMI, ARM11, XScale

and further MCUs. See the chapter 'Derivatives Support Summary' for a detailed overview about all supported microcontrollers.
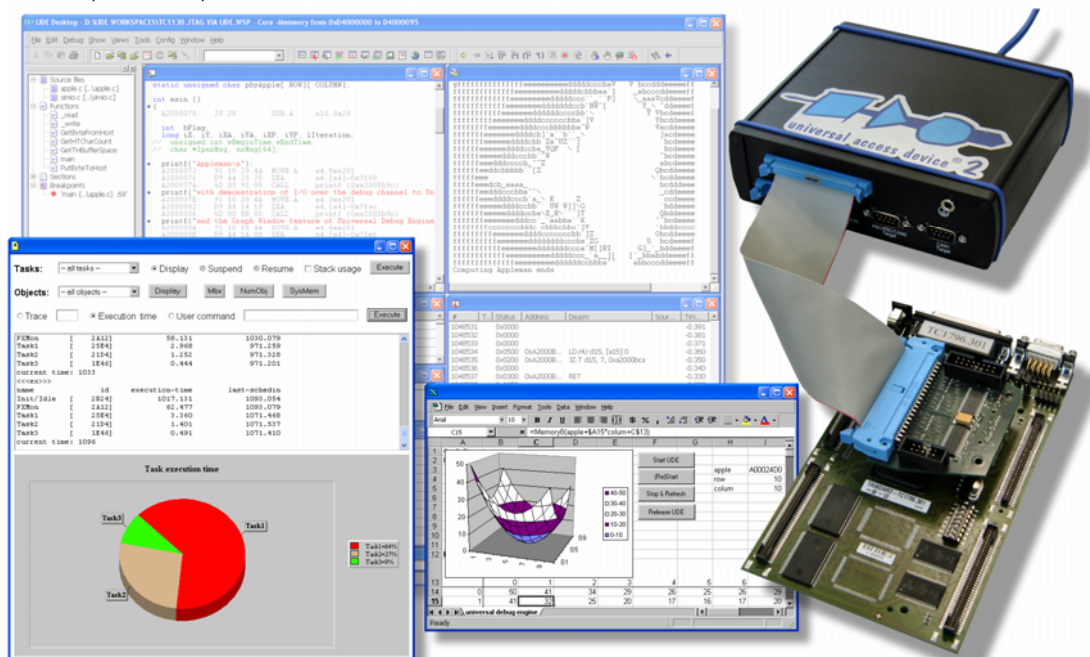
# Debug Solutions

## Accessing the Target System the Way You Like ?
### Universal Debug Engine escorts you either way.

Our debugging software escorts you either way. Please find the following overview about the different debug solutions and their support. Typical variants for remote debug connection using the debugger Universal Debug Engine regarding the available communication interfaces on the C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11 and XScale MCU hardware:

| Controller Peripheral | Interface | Baud Rate[1] | Supported Derivative | Monitor |
|---|---|---|---|---|
| ASC0 / ASC1 asynchronous | RS232 | up to 115 kbps | C16x, XC16x, ST10, C166CBC, C166S V2, TriCore | required |
| ASC0 / ASC1 asynchronous | RS485 | up to 115 kbps | C16x, XC16x, ST10, C166CBC, C166S V2, TriCore | required |
| ASC0 / ASC1 synchronous | TTL | up to 115 kbps | C16x, XC16x, ST10, C166CBC, C166S V2, TriCore | required |
| ASC0 / ASC1 asynchronous Starterkit | RS232 | up to 9.6 kbps | C16x, XC16x, ST10, C166CBC, C166S V2 | required |
| SSC synchronous | TTL | up to 2.5 Mbps | C16x, XC16x, ST10, C166CBC, C166S V2 | required |
| SSC synchronous | RS485 | up to 2.5 Mbps | C16x, XC16x, ST10, C166CBC, C166S V2 | required |
| 3-Pin-Hardware Interface | TTL | up to 1 Mbps | C16x, XC16x, ST10, C166CBC, C166S V2 | required |
| CAN (On-Chip CAN) | CAN | up to 1 Mbps | C16x, XC16x, ST10, C166CBC, C166S V2, TriCore | required |
| JTAG (OCDS L1) | LVTTL | up to 50 MHz | XC16x, C166CBC, C166S V2, TriCore | no (partly req.) |
| JTAG (EmbeddedICE) | LVTTL | up to 30 MHz | ARM7, ARM9, ARM11, XScale | no |
| JTAG (Starterkit) | TTL | up to 80 kHz | XC16x, C166CBC, C166S V2, TriCore, ARM7, ARM9 | no |
| OCDS L2 / ETM Trace | LVTTL | up to 180 MHz | TriCore, ARM7, ARM9, ARM11 | no |
| Emulation Device | Master Interface | - | TriCore ED | no |

[1] The Baud Rate is defined by the physical transfer frequency of the transmission medium.

## Debugging via Monitor

- available for **C16x, XC16x and ST10** derivatives, for **TriCore** in preparation
- guarantees access to even the latest derivatives when emulators are not yet available
- supports communication to the host PC via different high-speed serial interfaces
- even if the application uses all of the serial ports, debugging is possible via generic port pins
- **CAN bus is available for application** even when debug communication channel is CAN
- Portable Monitor Development Toolkit for accessing proprietary target system hardware
- Monitor Configuration Tool for fast startup when using Bootstrap-loader/ASCx communication
- Service Monitors for above mentioned communication path available - the ideal solution for on-site application parameter setup.

## Debugging via JTAG - Support of OCDS L1, L2, EmbeddedICE, ETM, ETB

JTAG offers direct access to microcontrollers with an On-Chip Debug Support module (e.g. **C166CBC, C166S V2, TriCore, ARM7, ARM9, ARM11** and **XScale**). It provides a direct serial interface to the controller-internal functional units (registers, busses, control unit etc.). This way, debugging is performed without monitor software or emulators.
The EmbeddedICE is the JTAG-based debugging environment for ARM MCUs. The OCDS L1 and EmbeddedICE are the base of the latest generation of development environments with new features:
- Event Triggering by the on-chip trigger unit, by software breakpoints or by the Break Input pin
- additional execution of data transfers
- complex trigger conditions

- symbolic conditions for enhanced definitions
- task-specific breakpoints automatic selection and optimized usage of the on-chip resources
- access to the entire address space of the controller without any external hard- or software resources
- **hardware breakpoints for debugging in ROM** or on-chip FLASH
- optimized support for single-chip applications.

**OCDS L2** and **ETM** support the recording of the running program's trace of the core, PCP, PCP2 and DMA activity, if available. This allows the watching of the flow of the running program in real-time within the process environment. Timing measurements of critical sections are also possible. **ETB** is supported.

UDE supports JTAG by the Universal Access Device (UAD2) hardware add-on. OCDS L2 and ETM trace are supported by the Universal Access Device - Trace Board option.

## Debugging via Emulator *

- hardware startup when severe hardware problems are expected
- additionally to the monitor solution, a trace functionality is available **debugging single-chip applications** without external RAM
- complex breakpoints / triggering on events possible
- simulation memory available, real-time execution for extremely time-critical applications

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## The Universal Debug Engine gives you the following advantages

### General Technical Information

- UDE supports all derivatives of C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11 and XScale derivatives in detail
- Enhanced state-of-the-art debugging solution for debugging of complex high-level language based C- and C++ -applications
- Code syntax highlighting
- HTML based help for all windows and dialog boxes including usage summaries and fundamentals
- **Multi-Core Debug Support.**
- FLASH programming tool for programming internal (on-chip) or external FLASH memories
- Service Monitors available for each of the communication interfaces - the ideal solution for on-site application parameter setup

### Breakpoints

- Simple, Complex and Data breakpoints

### Host/Target System Communication

**High-speed** downloading is achieved by the communication devices UAD2 and UAD2$^+$.

- JTAG up to 3,5 MByte/s @ 50 MHz.
- CAN up to 1 Mbps
- ASCx RS232/RS485/TTL up to 1 Mbps
- SSC RS485/TTL up to 2,5 Mbps
- 3Pin-Software-SSC Interface RS485/TTL up to 115 kbps
- 3Pin-Hardware Interface TTL up to 1 Mbps

- Application may use any of the serial ports, debugging possible even via simple port pins
- CAN bus available for application even when debug communication channel is CAN
- **CAN bus monitoring** (even in parallel to debugging via CAN bus) with decoding of standard and user-defined CANopen messages
- Portable Monitor Development Toolkit for accessing proprietary target system hardware

Supports communication to the host PC via a number of standard interfaces, USB, IEEE1394 and **Ethernet**.

### Graphical Display

- Flexible calculation of curve data points from target program data with UDE expressions
- Update of data after program hold or with programmable refresh rates during running and stopped target program.

### Watch and Locals Display

- **C/C++ and Assembly expressions supported**
- **Watch expressions:** C variables and constants linked in C syntax to a self-calculating expression

### Automation Support

- Batch and Script control for the debugger
- UDE object model for internal and external automation, Extendable macro library
- Automation support in HTML view or by standard script languages (e.g. VBA, HTML, JavaScript).

### Compilers

Optimized high efficient support of GNU, Tasking, Keil, HighTec and ARM Compilers and the **ELF** / **DWARF2.0** / **DWARF3.0** format.

- C166/ST10, TriCore and ARM C/C++ (Tasking)
- C166/ST10 and MDK-ARM C (Keil)
- GNU C166/ST10 and TriCore C/C++ (HighTec)
- GNU ARM7/9TDMI C/C++ (HighTec)
- ADS ARM7/9TDMI C/C++ (ARM)
- ImageCraft ARM7/9TDMI C/C++
- TriCore C/C++ Compiler (WindRiver).

### CASE Tool Support

- EasyCODE / EasyCASE (BKR Software)
- X32 (Blue River Software).

### RTOS Support

- CMX-RTX (CMX Company)
- µC/OS-II (Micriµm)
- OSEK - ORTI
- OSE-Illuminator (Enea)
- Nucleus (Accelerated Technology/Mentor)
- PXROS (HighTec).
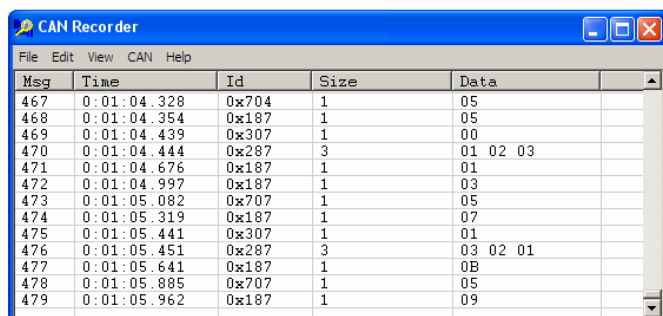
### System Requirements

- Standard PC Pentium™III ( or higher) processor running on 700 MHz with 256 MByte RAM
- Operating System Microsoft Windows™NT4.0 ( SP6 or higher), Windows™2000 ( SP2 or higher) and Windows™XP
- Windows™ Scripting Host V5.6
- Microsoft™ Internet Explorer 6.0 or higher
- 200 MByte space on local hard-disk
- CD-ROM drive for installation
- IEEE1394 or USB(2.0) port or PCI slot or
- TCP/IP network access.

**The complete tool chain is supported by pls directly - One-Stop Support !**

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## UDE CAN Message Recording with CANopen Visualization

The UDE CAN recorder tool provides the visualization of CAN bus communication and can be used as an add-in or as a stand-alone application.



Equipped with the CANopen message formatter plug-in the CAN recorder can visualize the CANopen communication or a user-defined CAN-Layer-7-protocol.

The recorder can be configured for filtering and for displaying of symbolic information and can export CAN message streams to a file. A send bar provides the sending and stimulating of the CAN bus. CAN baud rates from 50 kbit/s up to 1 Mbit/s and standard / extended CAN identifier are supported.

The UDE CAN recorder supports a Common Object Model (COM). This

feature allows the usage of UDE CAN recorder as plug-in of user applications as well as the script-controlled by other applications.

### CANopen Message Formatter

The CANopen message formatter is a plug-in for the UDE CAN recorder and can visualize the CANopen communication. The plug-in scans and interprets DCF-files automatically. This makes data of CANopen networks and CAN nodes available. If no DCF-file is available the message formatter interprets all CANopen standard objects corresponding to the default specification.

In other cases the CANopen message formatter handles an interpretation file for the visualization functionality of the UDE CAN recorder. This file can be edit and manipulated by the user, for example for visualization of a user-defined CAN-Layer-7-protocol.



## UDE CAN Monitoring with On-chip Debug Support and CAN Bootstrap Loader

### OCDS Support of XC16x and TriCore
Direct debugging via CAN-Bus is provided by means of the On-Chip Debug System (OCDS) with standardized close connection to the JTAG interface due to support by the latest software package UDE-mon/LII.

The using of OCDS enables hardware breakpoints for debugging within the FLASH memory and data breakpoints, which allow for dedicated hold with read or write access to program variables. With the UDE-mon/LII target monitor the described functions are now available for all members of the XC16 and TriCore families also via CAN-Bus without limitations. Besides the extended application capabilities the user also benefits from substantially reduced system costs, since there is no more specific adaptation necessary for the user hardware.

The target monitor requires approximately 16 kByte FLASH memory and 1 kByte RAM for the TriCore

derivatives and approximately 4 kByte FLASH memory and 100 Byte RAM for members of the XC16x family. Also a message object and a CAN identifier need to be provided.

A shared utilization of one CAN module by the application and the target monitor is as easily implemented as the access to a separate CAN module of TwinCAN or MultiCAN units of the respective microcontroller. The monitor software includes the C and assembler text for the various common compiler packages and can be integrated into existing applications in a simple way.

### CAN Bootstrap Loading for XC16x and TriCore
The usage of the CAN bootstrap loading mechanism is supported by UDE and UDE MemTool.

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## UDE Graphical Diagram Display Window (scientific 2-dimensional) for verification of complex data processing algorithms

The UDE graphical display window helps to accelerate the evaluation of complex target program data from process environment and by the verification of complex software algorithms. It can be used with all microcontroller families supported by UDE.
The UDE window displays pre-processed target system data as curves of a 2-dimensional scientific diagram.

Further helpful features to evaluate data are the zoom-, pan- and cursor functions. This functions help to view details of the current curves. The cursor function makes it easy to access to the particular data values at specific coordinates of the curve.

### Basic features of the Graphic Display Window

- Multiple curves in one diagram window
- Separate x- and y-axis for each curve
- Flexible calculation of curve data points from target program data with UDE expressions
- Data acquisition on the fly of data after program hold or with programmable refresh rates during running and stopped target program
- Legend, Cursor, Zoom, Pan, Axis markers
- Save and restore of complex settings in UDE workspace and separate file
- Printer support.
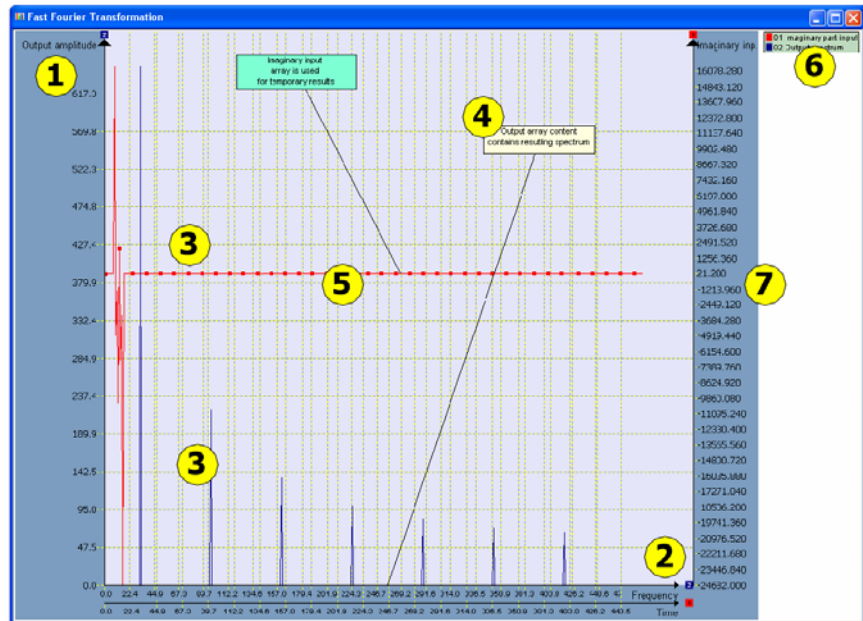


## UDE Triggered Transfer

The UDE TTF Recorder uses the **Triggered Transfer** feature of new Infineon microcontrollers. Triggered Transfer is part of the on-chip debug support implemented on these controllers. It allows transferring the value of a single memory location via the JTAG debug interface.

The transfer is triggered by a debug event of the on-chip debug support (OCDS) unit. There are several types of debug events that can trigger the transfer depending on the actual type of controller. A typical use case provided by all supported controller types is to trigger on write accesses on a single variable and to transfer the new value of the variable.

The recording is done while the target system is in running state.

# Debugger

## UDE Realtime Data Monitoring and Collection

With UDE it is possible simple program variables, contents of complex terms and physical terms from multiples of these system variables to record in real-time and evaluate within the UDE. It is, therefore, possible to analyze the real-time behaviour of the developed software and to recognize and repair problems with the distribution of the processor performance as well as synchronization problems between multiple parallel running program routines. In order to minimize the influence of the system behaviour, only debug interfaces are used, which allow a transparent read-out of the system information in the background of the active program.

The visualization takes place by means of a two-dimensional graphical representation of multiple signals over a common time axis in a curve diagram. All necessary signal data can be extracted as a result of scanning: values from individual variables, elements from complex data structures or even via any complex combination from multiple single data. The option to compute complex physical values in real-time from program variables helps the user thereby, as far as possible, to simplify the interpretation and evaluation of the displayed diagrams.

The data is pre-processed in the **Universal Access Device 2** (UAD2) or U**niversal Access Device 2+** (UAD2+), which is connected directly to the target system. The UAD2 and UAD2+ were also designed by pls Programmierbare Logik & Systeme and thanks to an inherent 32-bit controller offer an extremely powerful communication equipment, which guarantees that even with complex expressions a minimum sampling period in the range of 1 millisecond (1 ms) is assured.

Following this, the computed data is buffered in the Universal Access Device. 32 MByte of main memory ensures that data with up to 30 minutes storage time are not lost until read-out by the UDE. Furthermore, the data can be stored in parallel in **XML-Format**, whereby a subsequent evaluation of the data via script or another program (e.g. Excel) is possible.

An optimal display of the recorded data is guaranteed by multiple selectable modes of the viewing window. Moreover, the graphical representation enables the use of additional functions - such as zoom, data cursor and switch able function markers - for the examination of details.

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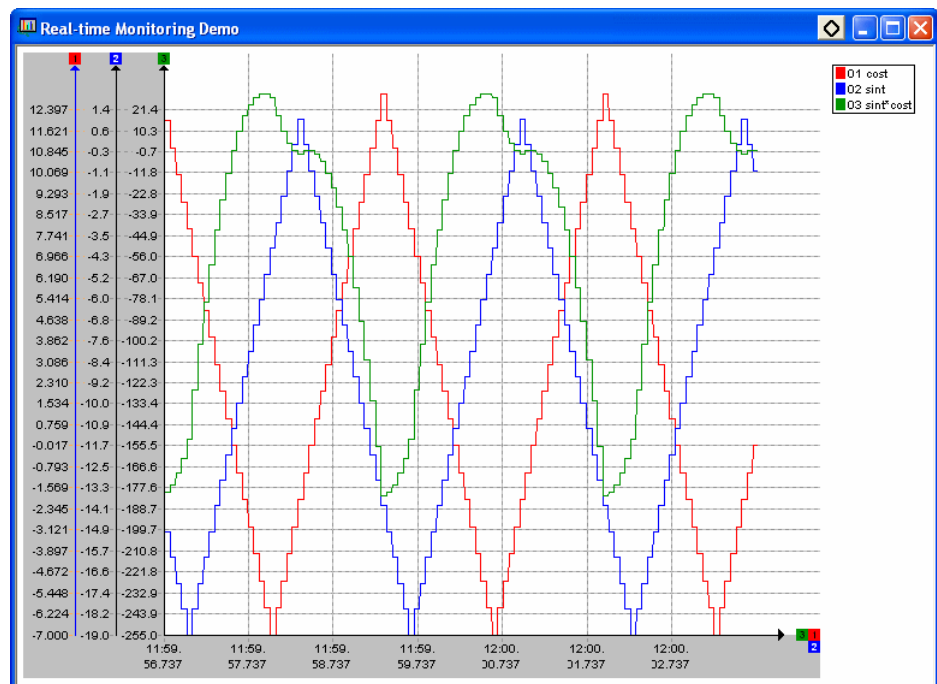
## UDE Profiling Support
### - Detect Performance Bottlenecks of your Target Application

**Evaluate Performance of Target Application**
The knowledge of CPU load distribution of the running target application is a basic requirement to optimize their real-time behaviour. UDE supports the profiling of code trace data from different sources:

- "IP - Snooping" trace - UAD2$^+$ polls instruction pointer of TriCore or XC16x CPU periodically with minimum poll period of 1 millisecond
- OCDS L2 trace / ETM code trace
- MCDS code trace
- ARM SoC-Designer PCP2 simulator trace

The instruction pointer trace data will be collected due their occurrence in the functions of the application. If the value cannot be assigned to any known function, it will be assigned to the known code section of the program (depends from availability of debug information)

The evaluation counts the trace hits of the appropriate ranges and calculates the execution time of the range due to execution time of the trace samples.

| Range | Range Type | Start Address | Length | Hits | CPU Time (%) - Hits | Execution time (ms) | CPU Time (%) - Exec.T |
|---|---|---|---|---|---|---|---|
| OS_TaskIdle | Function | 0xa0001328 | 0x0000002e | 771 | 79.32 | 1521 | 79.18 |
| OSTaskIdleHook | Function | 0xa00017a0 | 0x00000004 | 170 | 17.49 | 338 | 17.60 |
| <other> | Other | 0xffffffff | 0xffffffff | 21 | 2.16 | 42 | 2.19 |
| OSTaskStatHook | Function | 0xa00017a4 | 0x00000004 | 10 | 1.03 | 20 | 1.04 |
| Available ranges | 4 | | | | | | |
| Available hits | 972 | | | | | | |
| Trace start time | Sat Dec 30 00:00:00 UTC+0100 1899 | | | | | | |
| Trace stop time | Mon Sep 25 12:59:06 UTC+0200 2006 | | | | | | |
| Overall execution time | 1921.00 ms | | | | | | |
| Application path | J:\INSTALL\pls\ude\UDE_1_13_07\BUILD_1330 \SAMPLES\TriCore\TC1766\UCOS\OUTPUT\ucos.elf | | | | | | |

UDE profiling result table was created at 12:59:06 UTC+0200



Results from UAD2 Class IP Trace - created at 12:59:06 UTC
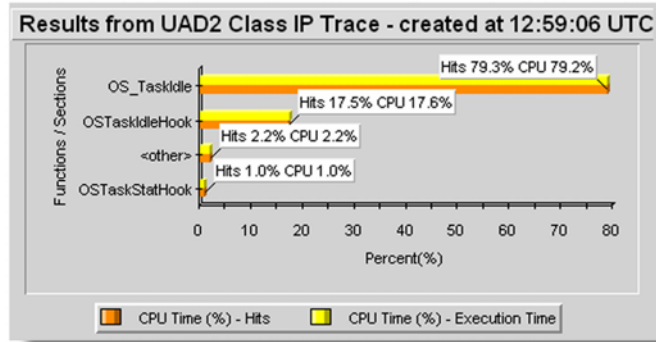
The results are available as chart diagram and as numeric result table. Additional the UDE profiling page enables, that the results can be saved in a free selectable XML base data sink for later processing. This data sink can be processed in a normal MS Excel 2003 environment or can be processed by Windows Script languages and MS XML parser function (which are installed by UDE). All functions to access to the generated profiling data are also available via UDE object model to allow creating internal and external script for automatic post-processing.

## Industry leading Debug Support for TriCore AUDO-NG Family (TC1796, TC1796ED and further derivatives)

UDE features a flexible and fast target access to TC1796. Beside the standard JTAG connection with maximum performance UDE supports CAN and serial interfaces. **Multi-core debugging** is a basic characteristic; it allows a debugging of several microcontroller cores or systems in one homogeneous environment. All on-chip debug resources and peripherals are supported in detail.

### Fastest FLASH/OTP Programming
Universal Debug Engine features the integrated FLASH/OTP programming of the TC1796. Exceeding short cycle times of **Erasing-Download-Programming-Verifying** are achieved. Speed and stability fulfils the hard requirements in production, test environments and in evaluation of microcontrollers.

### Fastest JTAG debug solution for TC1796
The access device family 'Universal Access Device 2' allows the increasing of the JTAG clock up to 50 MHz with a TC1796 target access. A maximum transfer rate up to 3,5 MByte/s can be achieved.

### Program trace without limits
With UDE program trace of TC1796 is possible up to a system frequency of 180 MHz. The trace view window enables the direct link from trace sample to the corresponding source code, view of running time on the base of time stamps and search functions.

*New*

## Universal Emulation Configurator – MCDS Support for TriCore Emulation Devices

### Support of AUDO-NG Emulation Device On-Chip Full Featured Emulator
The AUDO-NG family emulation devices implement a new-generation debugging solution called "Multi-Core-Debug-Support". This new full-featured emulator on-silicon opens a new age of debugging capabilities.

A new graphical user interface in UDE combines the intuitive use of user interfaces well-known from logic-analyzer user front ends with complete support of the whole observation and trace capabilities of the "Multi-Core-Debug-Support" unit.

The **Universal Emulation Configurator** is the hardware-independent tool for description of measuring tasks for on-chip emulators and is comparable with development environments for the hardware draft. With its assistance development engineers can describe measuring tasks and create configuration data for an on chip emulator without large expenditure of time and independently of the respective target hardware.

With the "Universal Emulation Configurator" the developer has a configuration tool on highest level for fastidious measuring tasks with on chip emulators …

- which makes a functional description on basis of a state machine possible,
- which is independent from the respective target- and emulator hardware,
- which makes possible a fast and simple definition of complex measuring tasks. This is done by joining pre-defined subtasks from expandable libraries and defines parameters.

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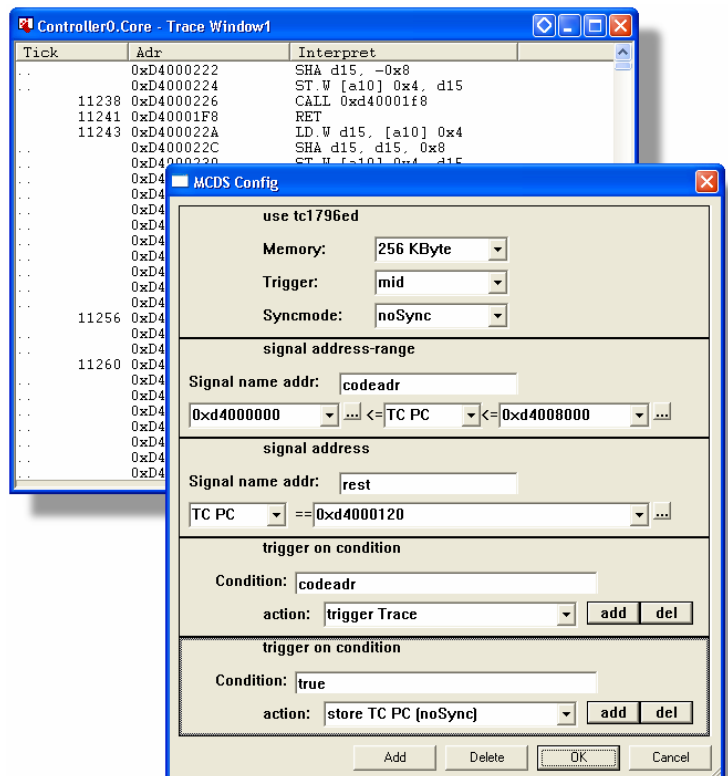
## Universal Access Device 2⁺ –
### Target Communication Accelerator Add-On for UDE

### Universal Access Device 2⁺

The access to the whole choice of C16x, C166CBC, C166S V2, TriCore, ARM7, ARM9, ARM11, XScale derivatives is supported with the **Universal Access Device 2⁺** (**UAD2⁺**) – a new add-on interface hardware for Universal Debug Engine.

The Universal Access Device 2⁺ offers state-of-the-art hardware support for debugging via JTAG and via a wide variety of target system access channels.

### Supported High-Speed Target Access Modes

The Universal Access Device 2⁺ is optimized for High-Speed Communication between the UDE on the Host PC and a target system. UAD2⁺ supports all access features of UDE in an optimized manner.

- Standard 16 pin Infineon JTAG/OCDS L1 connector (2,5V - 3,3V I/O ring voltage) supports C166CBC, C166S V2 and TriCore JTAG debug communication channel up to **50 MHz** shift clock - download rate up to **3,5 MByte/s**
- Standard 20 pin ARM JTAG connector (2,5V - 3,3V I/O ring voltage) supports ARM7, ARM9, ARM11 JTAG debug communication channel up to **25 MHz** shift clock - download rate up to **1 MByte/s**
- Flexible serial high-speed communication to a C16x, XC16x, ST10, TriCore and ARM target system via a serial D-Sub/Pin header connector.

**The following serial modes are available**:
1. Asynchronous serial RS232 interface
2. Asynchronous serial RS485 interface
3. Asynchronous serial TTL interface
4. Synchronous serial RS485 interface
5. Synchronous serial TTL interface
6. CAN interface

- 3Pin-Hardware interface saves target hardware resources to establish powerful debug communication channel to C16x, XC16x and ST10 target systems.

### Other Features

- **Galvanically isolated target interfaces** minimize the negative effects of potential differences between UAD2⁺ and the target
- The JTAG port is provided via a dedicated pod with drivers and cables
- Build-in JTAG extender technology features a maximal cable length of the JTAG cable between the UAD2⁺ and the target up to 50 cm (1 meter and longer on request)
- CAN bus D-Sub male connector (CiA pin assignment) as debugging communication channel to C167CR, XC167CI, ST10, TriCore and ARM CAN target systems
- **On-board high-speed CAN bus interface** driver for ISO-DIS 11898 standard
- Automatic firmware update via on-board FLASH programming possible.

### CAN Bus Analyzer

- Independent intelligent subsystem enables continuous trace of CAN bus messages
- CAN bus analyzing may run as background task of debug communication
- **CANopen** messages in standard and user-defined format can be decoded and visualized.

### Host Communication via USB2.0, IEEE1394 and 100 Mbit Ethernet

Host Connection via IEEE1394 (also known as Firewire™ or i.Link™),
- 400 Mbps communication speed
- Integrated hub function for optimal operating with other IEEE1394 devices

via USB2.0
- 480 Mbps communication speed

or via 100 Mbit Ethernet
- 100 Mbps communication speed
- TCP/IP protocol supported
- Fixed or DHCP assigned IP address

## Universal Access Device 2 - Smart Communication Accelerator

### Universal Access Device 2

The Universal Access Device 2 is the alternate smart member of the UDE target access device family. It offers fastest target access via JTAG and supports ASC and CAN bootstrap loader access to your target.
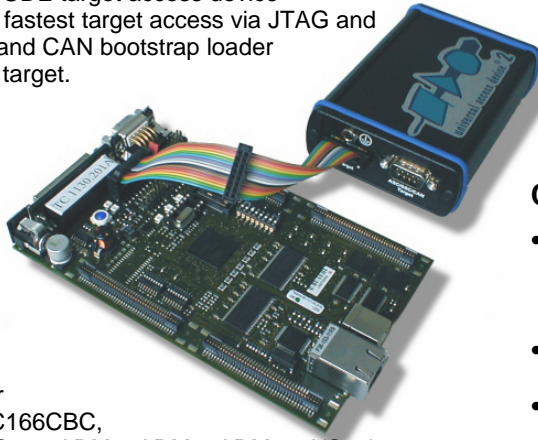


Accessing your
C16x / ST10, C166CBC,
C166S V2, TriCore, ARM7, ARM9, ARM11, XScale derivatives is now easier than ever.

### High-Speed Target Access Modes

The Universal Access Device 2 is optimized for High-Speed Communication between the UDE on the Host PC and a target system. UAD2 supports following access features of UDE in an optimized manner.

- Standard 16 pin Infineon JTAG/OCDS L1 connector (2,5V - 3,3V I/O ring voltage) supports C166CBC, C166S V2 and TriCore JTAG debug communication channel up to **50 MHz** shift clock - download rate up to **3,5 MByte/s**
- Standard 20 pin ARM JTAG connector (2,5V - 3,3V I/O ring voltage) supports ARM7, ARM9, ARM11 JTAG debug communication channel up to **25 MHz** shift clock - download rate up to **1 MByte/s**

### Universal Access Device 2$^{compact}$

Universal Access Device 2$^{compact}$ is a new member of the UDE Access Device family and offers a high-end solution at a starter price.
With a powerful 32bit communication unit, pls presents a rapid communication tool to access ARM7, ARM9, ARM11 and XC16x microcontrollers. By the preference on the JTAG communication channel to the target, the UAD2$^{compact}$ device is excellent value for money.

### Basic Features

- Support of ARM7, ARM9, ARM11 or XC16x derivatives with on-chip debug support and JTAG interface
- Hardware accelerated JTAG bus with up to 700 kByte/sec download speed
- Covers all features of OCDS L1 and EmbeddedICE
- Standalone communication device 12 x 7 x 3cm³

- Flexible serial high-speed communication to a C16x, XC16x, ST10 and TriCore target system via a serial D-Sub connector.

  The following serial modes are available:
  1. Asynchronous serial RS232 interface
  2. Asynchronous serial RS485 interface
  3. Synchronous serial RS485 interface
  4. CAN interface.

### CAN Bus

- CAN bus D-Sub male connector (CiA pin assignment) as debugging communication channel to C167CR, C164CI, XC161CJ, XC164CS, XC167CI, ST10 and TriCore CAN target systems
- Independent intelligent subsystem enables **continuous trace of CAN bus messages**
- **CAN bus analyzing** may run as background task of debug communication.

### Host Connection via USB2.0

- 480 Mbps communication speed
- Supported OS: Windows™2000 and Windows™XP

### Size Comparison UAD2$^+$ vs. UAD2



### Host Connection via USB 2.0

- 480 Mbps communication speed
- USB 1.1 supported with reduced efficiency
- Supported OS: Windows™2000, and Windows™XP.

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## Universal Access Device 2⁺ – Trace Support for OCDS L2 / ETM

### OCDS-L2 and ETM Trace Support

The trace board is an add-on for the Universal Access Device 2⁺ and allows the recording of trace information of a running program on the TriCore and ARM derivatives in real-time. Core, PCP, PCP2, DMA trace are supported when available.
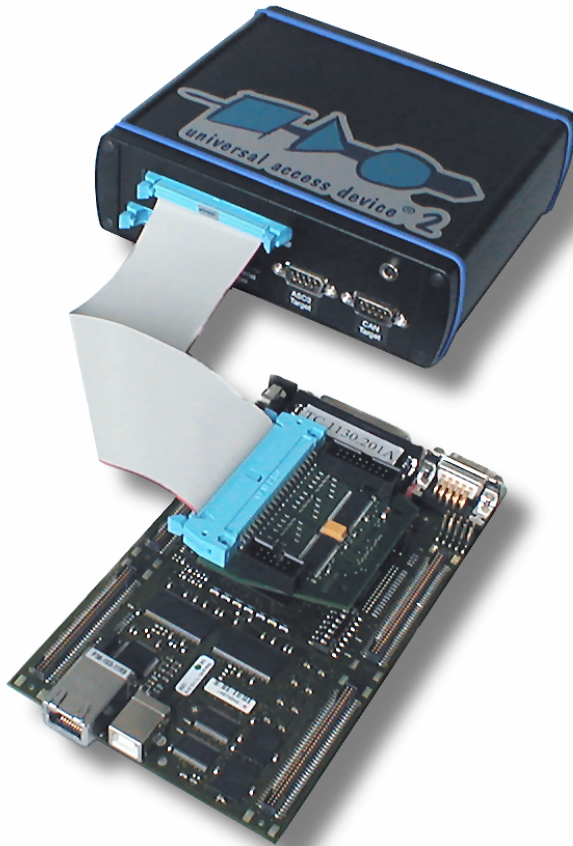


### UAD2⁺ Trace Board add-on

The system is an optimized solution to support the all features of the OCDS L2 and ETM trace port functionality in the best manner.

- Trace Ports supported **up to 180 MHz**
- 1M Sample trace depth
- Timestamp resolution 1/ $f_{MCU}$ (i.e. 10ns at $f_{MCU}$=100 MHz) on each second MCU step
- 40bit time stamp range
- Support the full OCDS L1 / ETM functionality for providing the trigger events for the tracing unit
- Intelligent trace filter for optimal trace utilization
- ARM and TriCore, PCP, PCP2, DMA trace
- **Additional 8 external trace lines** to observe peripherals and external signals
- LVDS interface to external connector supports 60 pin OCDS L2 High-Speed connector (proposed by

Infineon) and the 38 pin Mictor High-speed connector (proposed by ARM)
- Supported derivatives:
    - TC11IB, TC1130, TC1765, TC1775, TC1766, TC1796, TC1910, TC1920 and future devices
    - LPC21xx, AT91RM9200 and future devices.

### 60 Pin OCDS L2 High-speed Connector Pod

- Proposed by Infineon to support connection to OCDS L2 port of TriCore 1.3 systems (TC11xx, TC17xx, TC19xx and future derivatives)
- Connector system based on SAMTEC 60 pin high-speed connector **QSH-030-01-F-D-A**
- Prepared to use for systems up to 180 MHz system clock
- Supports 2,5V to 3,6V I/O ring voltage
- 80 pin cable to trace base board using LVDS interface to ensure high trace signal quality.

### 38 Pin ETM High-speed Connector Pod

- Proposed by ARM to support connection to ETM port of ARM systems (LPC21xx and further ARM7, ARM9, ARM11 derivatives)
- Connector system based on 38 pin high-speed connector **AMP-MICTOR**
- Supports 2,5V to 3,6V I/O ring voltage

### UDE Support of Trace Functions

The complete utilization of trace functionality by up to 4 setup modes:

- 2 standard modes to allow easy access to standard trace tasks
- 2 expert modes to allow full access to complex possibilities of trace system
- Full connection of trace setup to symbolic reference of source code
- Visualization of internal and external trace events
- Browse capability between trace output and C-language sources.
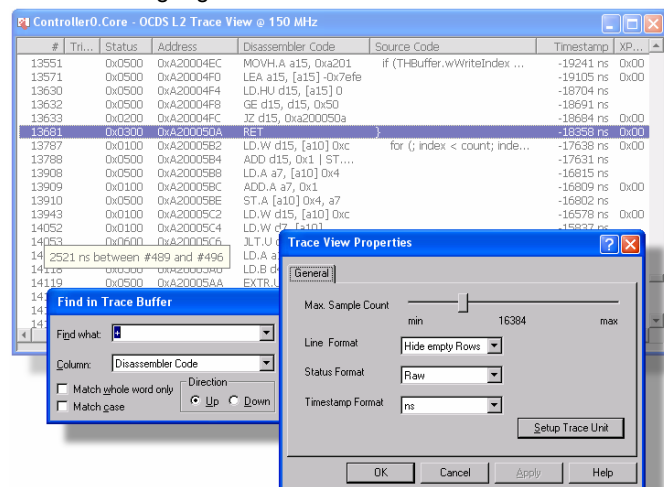
## UAD-JTAG Protector – ESD Protection for Universal Access Device

### Danger of ESD

Electrostatic Discharge (ESD) can damage a sensitive electronic component !

Under several conditions static electricity and ground potential differences between the Access Device and the user's target hardware can build up high voltages - over 10000 Volts (10 kV) in some cases. The electrostatic discharge of this build-up voltage results in fast high current waveforms and fast magnetic (H-field) or electrostatic (E-field) disturbances and can damage or destroy hardware components, resulting in failures and reduced reliability.

### UAD-JTAG Protector for UAD

The UAD-JTAG Protector is an add-on hardware for Universal Access Device and optimized for the communication between the Universal Debug Engine on the host PC and target microcontroller system equipped with the JTAG interface:

- Protection from the danger of over-voltage and ESD in hard production environments
- Complete JTAG Interface for OCDS debugging ( supports all TriCore and C166CBC / SDA6000 / C166S V2 (XC16x) derivatives with JTAG/OCDS module on-chip)

- Replaces the 16 pin flat ribbon cable delivered with the UAD originally, Cable length 20 cm
- Supports JTAG communication frequency to the target up to 10 MHz.

## UAD-JTAG Extender – Extend your JTAG-Cable

Because of the LVTTL compatible signal levels of the JTAG connection, this cable needs careful attention. The JTAG cable delivered with the UDE package has a maximum length of 20cm and fulfils the basic requirements of signal integrity.
In some cases it is desirable to use longer cables or the target environment requires an electrical protected connection. The active UAD-JTAG Extender is recommended to **extend the maximal cable length** of the JTAG cable between the UAD and the target up to 50 cm (1 meter and longer on request).
The UAD JTAG Extender provides a dedicated JTAG pod with drivers and cables.

**Supported JTAG Connectors**
- 16 pin shroud male header - Infineon connector
- 20 pin shroud male header - ARM connector
- customer's connectors on request
- Cable length 50cm - longer cable length on request
- Support of open-drain RESET#
- MCU I/O voltage 3,3V

- LVDS technology for highest performance and signal integrity.

## *fast*-PC67C and *fast*-PC276C High-Speed Communication Boards

The fast-PC67C and fast-PC276 cards are PC boards optimized for high-speed communication between the Universal Debug Engine Integrated Development Environment on the host PC and a C16x, XC16x and ST10 microcontroller systems. The boards allows fast and reliable communication under Windows™NT4.0, Windows™2000 and Windows™XP.

Featured by the integrated C167CR or ST10F276 microcontroller and 1 MByte of RAM the board may serve as hardware based simulator for C16x, XC16x and ST10 code development too.

- OEM Version for automatic test and production available based on UDE/OEM with COM
- Memory Extension Add-On available, extends the on-board RAM by 2 MByte static RAM
- CAN bus D-Sub male connector (CiA pin assignment) as debugging communication channel to C167CR, C164CI or equivalent ST10 CAN target systems
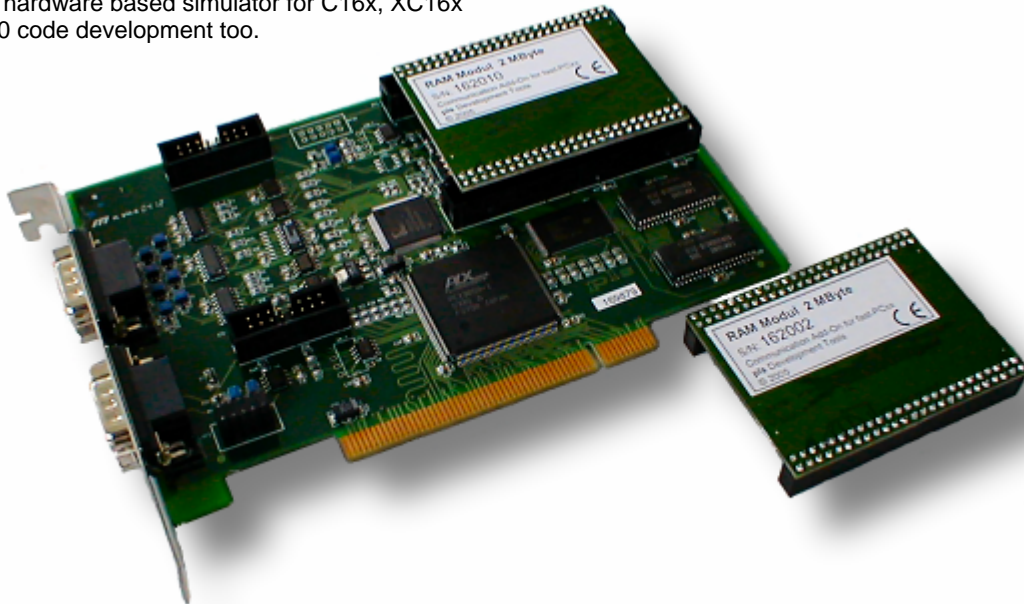


### Common Features

- available as
  - **ISA** bus PC board (not *fast*-PC276C)
  - **PCI** bus PC board
- C167CR microcontroller with 256 kByte or 1 MByte SRAM and up to 1 MByte FLASH-EPROM (256 kByte by default), 20 MHz or 24 MHz internal system clock

or

- ST10F276 microcontroller with 1 MByte SRAM and up to 1 MByte FLASH-EPROM, 40 MHz internal system clock.
- **Flexible serial high-speed communication** to a C16x, XC16x, ST10 and TriCore target system via a serial D-Sub connector. The following serial modes are available:
  1. Asynchronous serial RS232 interface
  2. Asynchronous serial RS485 interface
  3. Synchronous serial RS485 interface
  4. 10 Mbps high speed synchronous serial communications unit
  5. CAN interface
  6. 3Pin-Software-SSC interface

- On-board high-speed CAN bus interface driver for ISO-DIS 11898 standard
- Additional CAN bus interface standards may be used with add-on boards connected via the CAN add-on interface module
- 96 C167CR I/O pins are accessible via two 50-pin connectors
- **Automatic firmware update** via on-board FLASH programming possible
- Up to 192 kByte FLASH-EPROM for customer software available.

Dedicated device drivers ensure an optimized operating system access to the *fast*-PC67C boards.

For normal operation with Universal Debug Engine, no special communication card setup is required. All settings are done automatically by UDE. When using *fast*-PC67 for proprietary applications (*fast*-PC67/OEM), a dedicated Windows NT4.0 driver library is available.

## *fast*-PC65/PCMCIA High-Speed Communication Card

*fast*-PC65C/PCMCIA is a PCMCIA card optimized for high-speed communication between the UDE development environment on a portable PC and a C16x / ST10 family microcontroller system. The board allows fast and reliable communication to the target system under Windows™2000 and Windows™XP. The card feature is the same functionality as *fast*-PC67C.
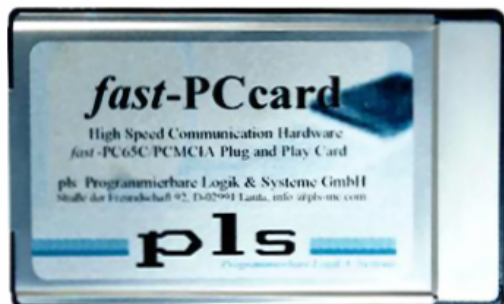


### Common Features

- 16bit PCMCIA I/O card.

- C165 microcontroller with 128 kByte SRAM and 128 kByte FLASH-EPROM, 20 MHz internal clock.

- Type II card in compliance with PCMCIA standard, Release 2.1.

- *fast*-PC65C/PCMCIA is accessible via 8 I/O addresses, it can be configured at 16 Byte address boundaries in the 200h to 3FFFh address range in the host PC I/O address space. The assignment is managed by the PCMCIA socket controller.

- *fast*-PC65C/PCMCIA requires one of the PC interrupt request lines 3,4,5,7,9,10,11,12 or 15 (IRQ line). The assignment is managed by the PCMCIA socket controller.

- Two special cables are part of the card's delivery package to connect the PCMCIA card pin I/O connector to standard 9pin D-sub male connectors. The first cable connects the serial high-speed communication channels to a C16x / XC16x / ST10 target system via the serial D-Sub male connector. Following serial modes are available:

  1. Asynchronous serial RS232
  2. Asynchronous serial RS485
  3. Synchronous serial RS485
  4. 10Mbps high-speed synchronous serial

The second cable converts the card's CAN bus pins to a D-Sub male connector (CiA pin assignment). The CAN bus can be used as a debugging communication channel to C167CR, C164CI, XC161CJ, XC164CS, XC167CI or ST10 equivalent target systems.

- **On-board high speed CAN bus interface** driver for ISO-DIS 11898 standard.

- Further CAN bus interface standards may be used with special adapters connected via the 15 pin PCMCIA I/O.

- Dedicated device driver ensures optimized operating system access to *fast*-PC65C/PCMCIA.

- Hot-plugging the *fast*-PC65C/PCMCIA is supported under Windows™2000 and Windows™XP.

*fast*-PC65C/PCMCIA has been successfully tested for PCMCIA Release 2.1 compatibility.

The usage of the *fast*-PC65C/PCMCIA card in desktop personal computers is possible and has been tested. The following adapter cards are recommended:

| Socket – Adapter cards | | |
|---|---|---|
| Description | P111 (Cardbus comp.) Single rear slot; Type I,II,III | P222 (Cardbus comp.) Dual rear slot; Type I,II,III |
| Hardware Requirements | empty **PCI** Slot | empty **PCI** Slot |
| Compatibility | | |
| Windows™2000 | yes | yes |
| Windows™XP | yes | yes |

For further information please contact our support team.

Additionally, pls offers an OEM version of the communication cards *fast*-PC67C and *fast*-PC65C/PCMCIA. These OEM versions are available with a Windows NT Driver Library to adapt customer-specific applications to the cards.

Please note that the OEM versions are not compatible with Universal Debug Engine.

# Communication Hardware

## JTAG / OCDS / EmbeddedICE Interface Debugging Capability

On-chip Debug Support (OCDS) represents a new technology of debug support for various 16- and 32bit microcontroller derivatives.

**UDE with Universal Access Device** supports all of the essential OCDS/ICE features like:
- Direct target system access for the host debugger via JTAG interface ( IEEE1149.1).
- On-chip debug operations supports emulator-like additional debug functionality.

Following emulator-like debug functions are available:
- Hardware Code Breakpoints
- Read or Write Access Data Breakpoints
- Real-Time Trace Operand Access.

Using these debug feature's, no additional hard- or software resources in the target system are required. Therefore, when using the JTAG/OCDS/ICE port for the debugger all other interfaces of the microcontroller are available to the application with no limitations and the system is ready for debugging over its whole lifetime.

Using JTAG/OCDS/ICE with UDE and Universal Access Device gives the following major advantages:

- **Download performance up to 25 times faster then the low-cost printer port solution!** Dramatically speeds up the turn-around cycles of debug sessions, especially of larger applications (1++ MByte).
- **No resident target monitor** in RAM or ROM required.
- **Hardware breakpoints available for stepping through program code in ROM or On-chip-FLASH/OTP.**

Furthermore, complex trigger conditions can be defined. Symbolic trigger conditions feature now enhanced definitions.

**With UDE and Universal Access Device, single-chip applications can be debugged via JTAG/OCDS without costly in-circuit emulators.**

## Bootstrap Loader / 3Pin Interface - The Perfect Solution for ROMless Debug Monitors

With the new Bootstrap Loader / 3Pin-Hardware interface supported by Universal Access Device 2[+], a plug-and-play-like target system access can be achieved.
Saving system resources in mind, this interface has been developed to free the RS232/ASC0 and any other controller peripherals which are often used by the application itself while maintaining the advantages of an uploadable high-speed monitor without the need for ROM and programming the ROM at the target system prior to debugging.

The target system is connected to Universal Access Device 2[+] (UAD2^{+}) via a standard RS232 link for downloading the 3Pin target connection monitor and three additional lines for the 3Pin interface. With the Bootstrap loader/3Pin-Hardware interface, a host-to-target **communication speed up to of 12 times faster then a standard PC-COM based RS232 interface** is supported.

- RS232/ASC0 for booting-up the target system. After downloading the monitor (<< 1 sec @ 115 kBaud), the RS232 interface is available for the application again without any external hardware or application software reconfiguration.
- About 3 kByte of target system RAM for the 3Pin monitor.
- Only 3 port pins of the C16x controller used.
- Optionally one timer for run-time measurement.

**Your advantage: No additional hardware has to be set-up - no additional monitor required !**

## Flexible CAN Bus Interface Capability

Add-on modules for CAN bus interface standards other than ISO-DIS 11898 may be plugged on fast-PC67C.

Therefore, fast-PC67C may be connected with a CAN bus based on the ISO-DIS 11519-1 CAN low speed standard. The Module CAN/LB032 LS TxBB (i+ME Actia) can be directly plugged into the fast-PC67C connectors. Other opto-isolated CAN interface modules may also be used with fast-PC67C.

# Monitor

## Monitor Development Kit – Add-On for Universal Debug Engine

### Your Universal Target System Access to C16x, XC16x, ST10, TriCore, ARM Hardware

The basic package of Universal Debug Engine includes target monitors for a number of evaluation boards and a generic bootstrap loader monitor.

The Monitor Development Kit provides a portable monitor development solution for Universal Debug Engine which allows creating application hardware specific monitors for C16x, XC16x, ST10, TriCore and ARM7, ARM9, ARM11 with on-chip CAN controller based target systems. Beside the ASC0/RS232, a number of additional serial interfaces are supported to achieve maximum flexibility in adapting the microcontroller hardware.

The monitor requires about 3 .. 18 kByte in ROM/FLASH and 100 .. 3000 Bytes in RAM. Except for CAN debugging which might be used in parallel to an application running the CAN, debugging via a particular serial interface disables this interface for the application.

The portable monitor development toolkit is available for the various compilers, e.g. for Tasking and GNU compiler.

### Package Contents

- Source code for various communication paths between target and host PC:
  1. Asynchronous serial RS232 interface.
  2. Asynchronous serial RS232 interface with bootstrap loader support.
  3. Synchronous serial interface (SSC Interface C165/C167).
  4. Synchronous serial interface (3Pin Interface).
  5. CAN (C16x, XC16x, ST10, TriCore and ARM7, ARM9, ARM11 derivatives with on-chip CAN controller). The CAN interface may be shared with the application.

  Not all interfaces are supported on all derivatives.
- Monitor Main Code in multiple object files for the C16x, XC16x, ST10, TriCore and ARM7, ARM9, ARM11 controller derivatives.
- Source examples for monitor reset code
- Manual
- Software is for free use in customer applications (no royalties), but not for resale as a development tool.
- **For your convenience, the first monitor adaptation to your target system is FREE of charge**.

### Ordering Conditions

Any order must include the Monitor Configuration Form (available from pls, pls' homepage or distributors). The specific demands of the customer will be accepted by acknowledgement of the order.

### Package Support

#### Basic version
Monitor software **including one fully configured adaptation** depending on the customer requirements. Support during start-up of the customized monitor via telephone or e-mail. An unlimited number of additional customer specific configurations may be generated by the user. Configuration services by pls available upon request.

#### Source included version
Additionally to Basic:
All sources for target routines including source updates via Internet and **unlimited number of customized adaptations for one year**.

### Access to Target (Communication Channels)

| Controller Peripheral | Interface | Transfer rate |
|---|---|---|
| ASC | RS232/TTL | up to 115 kbps |
| SSC | RS485/TTL | up to 5 Mbps |
| 3-Pin-Hardware | RS485/TTL | up to 1 Mbps |
| CAN (On-Chip CAN) | CAN-Bus | up to 1 Mbps |

Resources required by the monitor:

- 3 .. 18 kByte ROM (dep. from the used target)
- 100 Bytes .. 3 kByte of RAM (depending from the used target)
- debug interrupt; communication channel interrupt
- optional one timer
- CAN Monitor: 2 message objects, 4 identifier

### Special Solutions Available:

- Bootstrap loader + SSC / 3Pin / CAN combines availability of special interfaces with the convenience of ROMless debug target systems

- Service Monitors for all interfaces available for integrating into the product. Especially useful for on-site control and parametering the application.

Please ask for your monitor solution.

**pls** *Development Tools*

## Universal Debug Engine Derivatives Support Summary

| UDE Derivative Family | C16x | | | | | | ST10 | | | | | | | | C166 CBC | | | C166S V2 | | | TriCore | | | | | | | ARM7 ARM9 ARM11 XScale | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C161V/K/O/PI/RI/SI | C161CI/CS/JS | C163, C163-16F | C164CI/CL/CM | C165 | C167CR-16F/CS-32F | ST10F163, ST10F166 | ST10F167 | ST10F168, ST10F169 | ST10R172, ST10R272 | ST10F251, ST10F252 | ST10F269 | ST10F272, ST10F276 | ST10F280, ST10F282 | C161U, C165UTAH | EGOLD | SDA6000 | XC161CJ | XC164CS/CM/D/N/S | XC167CI | TC1100, TC1115, TC1130 | TC1161, TC1162, TC116x | TC1765, TC1775 | TC1762, TC1764 | TC1766, TC1766ED | TC1796, TC1796ED | TC1910, TC1912, TC1920 | ADuC70xx | AT91Mx, AT91SAMx | AT91RM9200 | AT91SAM926 | NET+ARM NS7520 | LPC2xxx | LPC3xxx | STR7xx, ST30F77xx | STR91x | TMS470, MAC71xx | iMX32 | XScale PXA255/27x |
| **Derivative supported by UDE for C16x** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Derivative supported by UDE for C166CBC** | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | |
| **Derivative supported by UDE for C166SV2 XC16x** | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | |
| **Derivative supported by UDE for TriCore** | | | | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | |
| **Derivative supported by UDE for ARM** | | | | | | | | | | | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Communication Channels - Target Monitor Interfaces** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASC-BSL / ASC | ✓[1] | ✓ | ✓[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | |
| ASC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | |
| ASC-BSL / SSC | | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| SSC | | | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| ASC-BSL / 3Pin | ✓[1] | ✓ | ✓[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | |
| 3Pin | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | |
| ASC-BSL / CAN | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| CAN-BSL | | | | | | | | | ✓ | | | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | |
| CAN | | ✓ | | ✓ | | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | ✓[2] | | ✓[2] | | | |
| JTAG/OCDS L1 | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | |
| OCDS L2 Trace | | | | | | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | |
| JTAG/EmbeddedICE | | | | | | | | | | | | | | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ETM Trace | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ✓ | | | ✓ | | | | ✓ | | ✓ |
| ETB Trace | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ✓ | | | |
| Service Monitor | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | ✓ | | | | | | | | | | | | | |
| **FLASH/OTP Programming Support** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Programming Internal FLASH/OTP | | | ✓ | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | ✓ | | | | ✓ | | ✓ | | ✓ | | |
| Programming External FLASH | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **3rd Party Tool Support** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CMX-RTX | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| µC/OS-II | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Nucleus | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | | | | | | | |
| PXROS | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| OSE / Illuminator | | | | | | | | | | | | | | | ✓ | ✓ | ✓ | | | | | | | ✓ | ✓ | | | | | | | | | | | | | | |
| StethoScope | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Tessy | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| EasyCODE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

✓[1] external BSL required   ✓[2] on request   ✓[3] in preparation

# FLASH Programming

## In System Memory Programming FLASH and OTP - UDE MemTool

**Speed up your turn-around cycle by programming the FLASH directly from within Universal Debug Engine! When using the debugger as a service and maintenance tool, firmware updates may be performed in just one step!**

### Usage

Tool for programming On-Chip or external FLASH/OTP EPROM's on the C16x, C166CBC, C166S-V2, XC16x, ST10, TriCore, ARM7, ARM9, ARM11 target system from within the Universal Debug Engine Integrated Development Environment.

### Supported Controller Derivatives

- ADuC70xx On-Chip FLASH
- XC16x On-Chip FLASH
- C16x-xxF On-Chip FLASH
- 88C166 On-Chip FLASH
- ST10F1xx On-Chip FLASH
- ST10F2xx On-Chip FLASH
- ST30F77 On-Chip FLASH
- STR7xx On-Chip FLASH
- STR9xx On-Chip FLASH
- LPC21xx, LPC22xx On-Chip FLASH
- MAC71xx On-Chip FLASH
- TC1766, TC1796 On-Chip FLASH

- Latest TriCore Derivative's On-Chip FLASH
- Latest ARM7TDMI Derivative's On-Chip FLASH
- Latest ARM9TDMI Derivative's On-Chip FLASH
- Latest ARM11 Derivative's On-Chip FLASH

### Supported external FLASH-EPROM's

- M29Fxxx, M29Wxxx Family and 100% compatible external FLASH
- AT29Cxxx Family external FLASH
- SST39VFxxx, SST39LFxxx Family external FLASH
- M58BWxxx Family external FLASH
- i28Fxxx Family external FLASH
- I2C 24LC xx Family external FLASH
- further devices under preparation or on request.

### Features

- Easy-to-Use: FLASH programming is integrated in the debugger-to-target program download.
- Transparent Erase Mode
- Automatic adaptation of data to be programmed to the smallest memory block size by automatic read operations

### Operation

Automatic activation during downloading an application into target if write access onto the FLASH is required. In a dialog box all areas to be programmed are displayed. Programming may be started or cancelled manually.

### Communication between Host PC and Target System

All communication channels supported by UDE, as ASC bootstrap loader, CAN bootstrap loader, ASC, SSC, 3Pin, CAN and JTAG, can be used. Requirement is the usage of appropriate interface hardware. The standalone MemTool offers also the host-target communication via bootstrap loader BSL-ASC mechanism of the C16x, ST10, XC16x derivatives and a standard RS232 host interface (COMx). Beside RS232, the usage of the K-Line interface is possible.

MemTool is using On-Chip RAM only for execution (IRAM; XRAM when available).

### Standalone MemTool

The UDE standalone MemTool comes with a separate front-end interface as standalone tool outside of UDE. All programming functions are available also via standard COM automation interfaces. Using these interfaces, the features of MemTool may be integrated into automatic production and test systems or can be executed via scripts.

With a full-custom MemTool, even more advanced features can be included into MemTool (e.g. integration into automatic production and test systems). Please contact us for specification and quotation.

### Communication devices supported between Host PC and Target System

| Target MCU and Communication interface | Universal Access Device 2+ | Universal Access Device 2 | fast-PC6x Interface Card | Host Serial RS232 | Host Parallel EPP |
|---|---|---|---|---|---|
| C16x, XC16x, TriCore via **ASC bootstrap loader** | ✓ | ✓ | ✓ | ✓ | |
| C16x, XC16x, TriCore via **K-Line interface** | ✓[1] | ✓[1] | ✓[1] | ✓[1] | |
| ST10F276, XC16x, TriCore via **CAN bootstrap loader** | ✓ | ✓ | ✓ | | |
| C166CBC, XC16x, TriCore, ARM7, ARM9, ARM11 via **JTAG** | ✓ | ✓ | | | ✓[2] |

[1] external K-Line adapter required    [2] JTAG on-board wiggler required

**pls** *Development Tools*

# C16x, XC16x, TriCore and ARM Compilers - An Essential Part of Your Development Environment to Create Embedded Applications

We offer all of the major cross compiler packages for the **C16x/ST10, XC16x, TriCore and ARM** families – Tasking, Keil, GNU. The compilers are fully supported by UDE. Using Universal Debug Engine, you will be enabled to optimize the flexibility and efficiency of the selected compiler. Please find below a description of the compilers. As each of them has its own characteristic features please contact us if you have special development / system requirements.

## ▊ TASKING  C166/ST10, XC16x, TriCore or ARM C/C++ Compiler
*Embedded software development from Altium.*

The Tasking compiler is designed for all derivatives of the C16x, ST10, XC16x, TriCore and ARM microcontroller families. All special features and peripherals of the controllers are accessible in C. ANSI-C is supported completely.
The generated program code shows compact size and excellent performance.

### C166, ST10, XC16x Architecture Support

All derivatives of the C16x, ST10 and XC16x architecture are supported.

- 6 different memory models to fit your requirements.
- Memory keywords: near, far, huge, system and iram
- C-level access to Special Function Registers
- C-level access to special MCU instructions
- Special data types like bit and bitword
- C-level interrupt functions, register banks and PEC.
- User stack model for function calls supported (to speed up RTOS task switches)
- New level of optimization for code size and speed by VX technology
- Industry standard ELF / DWARF3.0 and IEEE-695 output formats.

### TriCore Architecture Support

- PCP assembler support for the TriCore's PCP
- Enhanced MCU functional problem handling
- ISO C'99 and ISO C++ 14882-1998 compliant
- Infineon Technologies TriCore EABI compliant
- A wealth of Embedded/DSP/TriCore language extensions
- Protected libraries, tuned per TriCore derivative
- New level of optimization for code size and speed by VX technology
- Industry standard ELF / DWARF3.0 output format.

### ARM Architecture Support

- ISO C'99 and ISO C++ 14882-1998 compliant
- Industry standard ELF / DWARF3.0 output format
- ARM Mode and Thumb Mode Code Generation.

### Other Compiler Features

- Efficient pointer arithmetic

- C-level interrupt functions
- Inline Assembly
- Inline C functions
- IEEE floating-point operations
- Re-entrant code and libraries
- Multiple heaps supported.

### C++ Compiler

- C++ features like Dynamic Allocation of Objects, Passing References, Operator Overloading, Default Values, Inline Functions, Rigorous Type Checking, Encapsulation, Data Hiding and Inheritance are supported
- C166 compiler to include STLport C++ library.

### Library Set

- C interface and runtime library (compiled versions)
- All library sources written in C or Assembly
- Floating point libraries
- CAN libraries as well as Infineon CAN protocol software sources.

### Debugging Support

- When using UDE the complete symbolic information is used for C-level high-performance debugging.

### The C Compiler Package Includes:

- Assembler
- C/C++ Compiler
- Linker / Locator
- Intel Hex Converter
- Library Manager
- Make Utility

### RTOS Support

- Nucleus PLUS (Accelerated Technology)
- CMX-RTX (CMX Company)
- OSE (Enea)

Support and updates for 6 months are included.

## CA166 Compiler

The Keil compiler is designed for all derivatives of the C16x, ST10 and XC16x microcontroller families. All special features and peripherals of the controllers are accessible in C. ANSI-C is supported completely.
The generated program code shows compact size and excellent performance.

### C166/ST10, XC16x architecture support

- 7 memory models with 64 kByte near data each
- Full pointer support for the 16K page architecture
- Memory keywords: near, far, huge, sdata and idata
- C-level access to Special Function Registers
- C-level access to special MCU instructions
- Special data types like bit and sfr
- C-level interrupt functions, register banks and PEC
- User stack model is not supported.

### Other Compiler Features

- Inline Assembly
- IEEE floating-point operations
- Re-entrant code and libraries.

### Library Set

- C-interface and runtime library (different models)
- Floating point libraries.

### Debugging Support:

- When using UDE the complete symbolic information is used for C-level high-performance debugging .

### The C Compiler Package Includes:

- ANSI C-Compiler
- Embedded C++ Compiler
- Assembler, Linker/ Locator
- Library manager

### RTOS Support

- RTX 166 (Keil)
- CMX-RTX (CMX Company)

Support and updates for 1 year are included.

## RealView MDK-ARM Compiler

The RealView MDK-ARM C/C++ compiler is designed for all derivatives of the ARM7, ARM9, ARM11 and Cortex-M3 microcontroller families. All special features and peripherals of the controllers are accessible in C. ANSI-C is supported completely.
The generated program code shows compact size and excellent performance.

### ARM architecture support

- All ARM7, ARM9, ARM11 and Cortex-M3 derivatives are supported
- ARM Mode and Thumb/Thumb2 Mode Code Generation
- Function Attributes for Hardware Support
- C-level interrupt functions.
- User stack model for function calls supported (to speed up RTOS task switches).
- Industry standard ELF / DWARF3.0 output format.
- Little-endian and big-endian format supported.

### Other compiler features

- Inline assembly and C functions
- IEEE floating-point operations

### Library Set

- C-interface and runtime library (different models)
- Floating point libraries
- Re-entrant Run-time Library
- Thread-safe Floating-point Operations.

### Debugging Support:

- When using UDE the complete symbolic information is used for C-level high-performance debugging .

### The C Compiler Package Includes:

- ANSI C-Compiler
- Assembler, Linker/ Locator
- Object file converter
- Library manager

### RTOS Support

- ARTX-ARM (Keil)

Support and updates for 1 year are included.

**pls** *Development Tools*

## GNU C/C++ C16x, XC16x, TriCore or ARM7 Compiler

The GNU C/C++ Compiler for the C166, ST10, XC16x, TriCore or ARM architecture is based on the GNU software.
It was ported and modified by HighTec Systeme GmbH.

### C166/ST10 architecture support

- 4 memory models to fit your requirements
- Full pointer support for the 16K page architecture
- C-level interrupt functions
- User stack model for function calls supported (to speed up RTOS task switches).

### TriCore architecture support

- All TriCore derivatives are supported
- C-level interrupt functions
- Fast and flexible TriCore interrupt/trap interface
- TriCore-optimized DSP support library (C++)
- Generates code for TriCore v1.2 and v1.3.

### XC16x architecture support

- All derivatives of the XC16x architecture supported.

### ARM7 architecture support

- All derivatives of the ARM7 architecture supported
- Support of ARM Procedure Call Standard
- 32bit ARM and 16bit Thumb instruction code
- Little-endian and big-endian format supported.

### Other compiler features

- Inline assembly and C functions
- Fast and flexible IRQ/Trap Interface
- IEEE floating-point operations
- Re-entrant code and libraries
- Supports the ISO C standard.

### Library Set

- C-interface and runtime library (different models)
- Floating point libraries.

### Debugging Support:

- When using UDE the complete symbolic information is used for C-level high-performance debugging .
- C++ support by UDE

### The C Compiler Package Includes:

- GNU Pre-processor
- GNU Assembler
- GNU C/C++ Compiler
- GNU Linker / Locator, Object File Converter
- GNU Library Manager, Make Utility
- GNU Object File Utilities

Support and updates for 1 year are included.

*New*

## Wind River C/C++ TriCore Compiler

The Wind River Compiler combines industry leading optimization technology with the flexibility and control needed to fully exploit today's complex CPUs. The Wind River Compiler design is based on a modular architecture that results in proven reliability, flexibility for embedded applications, and interoperability with other development tools.

### TriCore architecture support

- Latest support with version 5.3.1.0

### Compiler features

- Industry leading optimization technology
- Performance and code size
- Target specific optimizations
- Designed for demanding embedded requirements
- Strict adherence to standards
- 100% C++ ANSI compliance
- Interoperability with other development tools
- Modular architecture
- Provides stability and reliability
- Comprehensive documentation
- Professional support.

# RTOS Support

## Need a Real-Time Operating System for Your Application ?
### Universal Debug Engine supports it.

For completing your Integrated Development Environment we offer Real-Time Operating Systems from different manufacturers supported by UDE.

## CMX COMPANY CMX-RTX™ for C167, XC167, ST10, TriCore, ARM

The CMX-RTX™ Real-Time Operating System (RTOS) is a fully pre-emptive operating system with a powerful set of system functions, very moderate memory requirements and fast system response time.

Manufacturer: CMX Company

- CMX-RTX™ Real-Time Kernel.
- CMXBug™ Task Level Debugger (in the CMX-RTX package included).
- CMXTracker™ CMX System activities logger.

### Features
- Pre-emptive multitasking.
- Scalable execution time.

- Source code included !
- Implemented as C library .
- Very small kernel code (approx. 5 kByte only) !
- Fast context switch and interrupts.
- Task execution management.
- Task communication and synchronization management.
- Handling for dynamically allocated memory objects.
- Timer management.
- FREE System Level Debugger CMXBug™ !
- Compiler support: KEIL, TASKING.
- **No royalties for embedded code !**

## µC/OS-II The Real-Time Kernel MicroC/OS - II Support for C167, TriCore, ARM

µC/OS-II, The Real-Time Kernel is a portable, ROMable, scalable, pre-emptive real-time, multitasking kernel for microprocessors and microcontrollers. µC/OS-II can manage up to 63 application tasks.

Manufacturer: Micriµm

### Features
- Semaphores and Event Flags.
- Mutual Exclusion Semaphores (to reduce priority inversions).

- Message Mailboxes and Queues.
- MISRA C Compliance.
- Source Code included !
- Task Management (Create, Delete, Change Priority, Suspend/Resume etc.)
- Fixed Sized Memory Block management.
- Time Management.
- **No royalties for embedded code !**

## Accelerated Technology INCORPORATED Nucleus PLUS for C167, TriCore, ARM

Nucleus PLUS for C167 or TriCore is a portable, scalable, well-documented and robust Real-Time Operating System (RTOS) for time-critical applications running on C167, TriCore, ARM7, ARM9 microcontrollers.

Manufacturer: Accelerated Technology, Inc.

- Nucleus PLUS Real-Time Kernel.
- Nucleus DBUG+ Task Level Debugger for Nucleus PLUS.

### Features
- Pre-emptive multitasking.
- Scalable execution times.

- No interrupt locking for task switches !
- Source code included !
- approx. 95% written in ANSI-C.
- Implemented as C library.
- Small kernel code (21…45 kByte).
- Task execution management.
- Task communication and synchronization management.
- Handling for dynamically allocated memory objects.
- Timer management.
- Opt.: System Level Debugger DBUG+.
- Compiler support: TASKING, GNU.
- **No royalties for embedded code !**

pls
*Development Tools*

## PXROS Real-Time Kernel for C167, TriCore, ARM

PXROS stands for **P**ortable e**X**tendable **R**eal-Time **O**perating **S**ystem. PXROS is a sophisticated Real-Time Operating System ported to run on C16x, ST10 and TriCore microcontrollers. PXROS allows you to design modern, object-oriented applications with independent tasks and associated handlers for high priority actions.

Manufacturer: HighTec EDV Systeme

### Integration in Universal Debug Engine:

Special debugger version of Universal Debug Engine supports the PXROS system level debuggers PXmon and PXmon-RT. This allows to display and control the PXROS objects (e.g. tasks, mailboxes and memory pools).
Universal Debug Engine supports also the required User Stack Model of the TASKING C16x, ST10, TriCore, ARM7 compiler package.

- PXROS Real-Time Kernel.
- PXmon/ PXmon-RT Task Level Debugger.
- PXcal CAN Application Layer Functionality
- PXfile DOS / UNIX file system
- PXtcp TCP / IP functionality.

### Features
- Pre-emptive multitasking.
- Scalable execution time.
- No interrupt locking for task switches !
- Implemented as C library
- Small kernel code (7...14 kByte)
- Task execution management
- Task communication and synchronization management
- Handling for dynamically allocated memory objects
- Timer management
- Exception handling supported
- Powerful product line for PXROS optional
- Compiler support: GNU, TASKING.

## OSE Real-Time OS for C167, TriCore, ARM

The OSE Real-Time Operating System (RTOS) is a fully pre-emptive operating system for C16x, ST10, TriCore, ARM7, ARM9 microcontrollers. The kernel shows excellent performance due to its optimized handling of interrupts, dispatches and memory allocation.

Manufacturer: Enea OSE Systems AB

- OSE Real Time Operating System.
- OSE Simulator.
- OSE System Level Debugger

### Integration in Universal Debug Engine:

Special debugger version of Universal Debug Engine is required to support the TASKING compiler's User Stack Model.
Supports **Illuminator in Runmode** for C166CBC JTAG/OCDS.

### Features
- Pre-emptive multitasking.
- Scalable execution time.
- No interrupt locking for task switches !
- Basic set of 6 system calls, sufficient for the majority of applications
- Full compatible with other kernels in the OSE family
- Very compact kernel code (6 kByte only) !
- Four different types of OSE processes to meet different system requirements
- Timer management
- OSE interprocess communication management
- Handling for dynamically allocated memory objects
- Automatic error handling supported
- Optional Simulator and System Level Debugger
- Compiler support: TASKING.

**BKR SOFTWARE**

## CASE Tools - From Design to Visual Debugging
## Using One Uniform Graphical User Interface

Forced to save time in development ? Well, who doesn't... Just take a CASE tool and you will get immediate overview about your embedded application. And it even supports you when documenting the project !

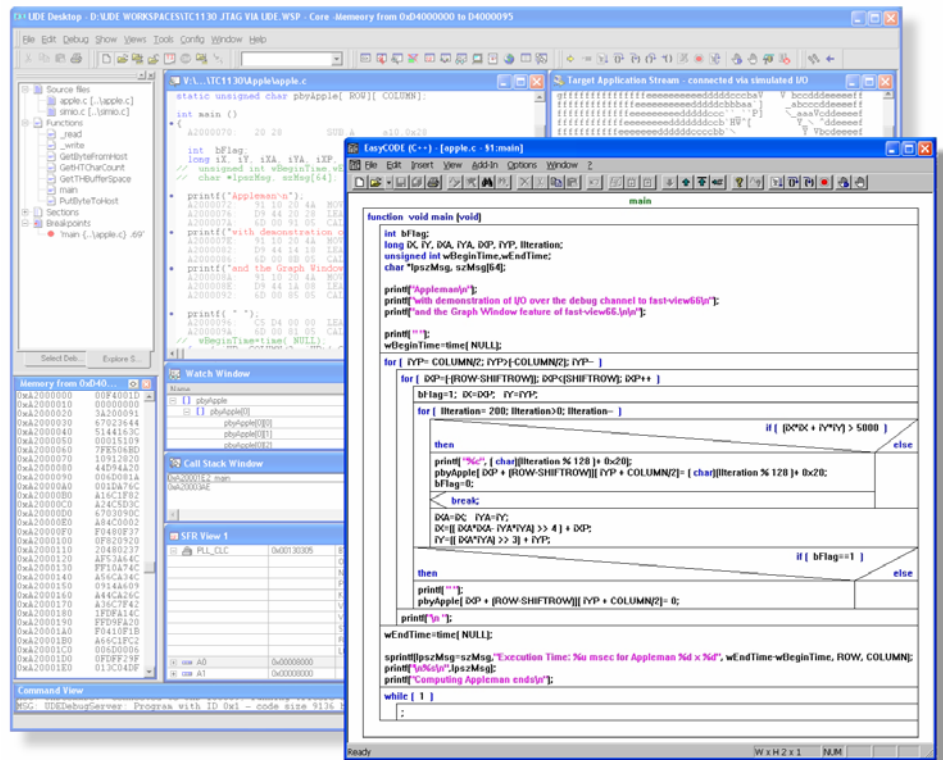| Design and Design Recovery | Coding and Code Review | Reverse and Roundtrip Engineering | Documen-tation and Maintenance | **Visual Debugging** |
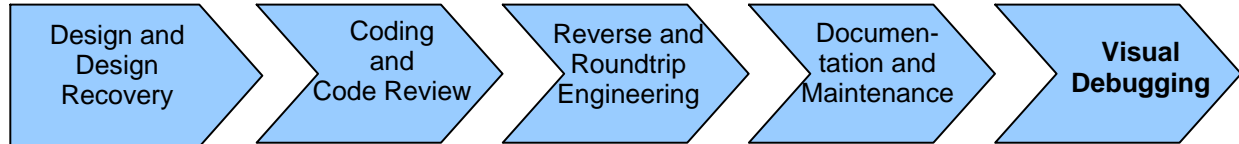
### EasyCODE - CASE Tool Editor for Advanced Nassi Shneiderman Charts (ANSC)

With EasyCODE, developers can write C/C++ programs at the graphical level of Advanced Nassi Shneiderman Charts. EasyCODE generates C/C++ source code from structogram input. EasyCODE can read any C/C++ source file and display it at structogram level too.

Additional hierarchy data is stored as C/C++ comment lines. This way, the developer works with one consistent file even if it is modified by a simple text editor.

Even using 'ancient' C/C++ source files created without EasyCODE is possible!

Additionally, EasyCODE offers a considerable number of printing and documentation features. With OLE, structograms may be embedded in your program documentation. If the program code is modified the documentation will be adjusted - automatically !



- Structured Programming based on ANSC
- Full C/C++ Support
- Convenient Graphical Structogram Editor
- In-place Text Editor
- Source Code Generator
- Source Code Analyzer
- Powerful print functions (Hierarchical Print, Fit To Page, Enhanced Preview)
- OLE support for documentation
- Compiler / Browser / Help  Interface
- C/C++ source code format
- **Programmable Debugger Interface.**

The Universal Debug Engine and EasyCODE are optimum integrated tools for **Structured Programming** AND **Visual Debugging** based on ANSC !
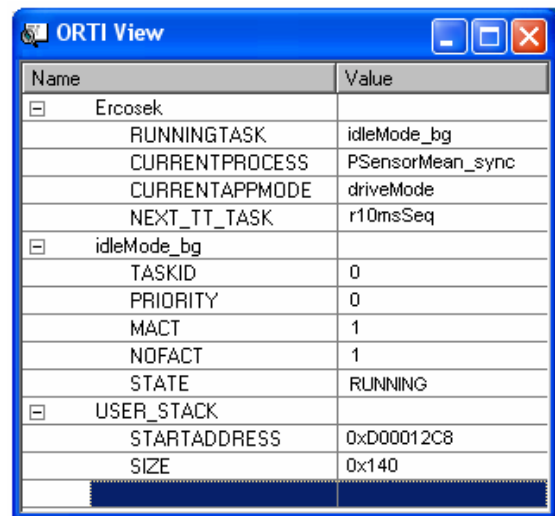
**pls** *Development Tools*

## ORTI, the OSEK Run-Time Interface, supported by UDE

The specification of the OSEK operating system is to represent a uniform environment which supports efficient utilization of resources for automotive control unit application software. The OSEK operating system is a single processor operating system meant for distributed embedded control units.

The OSEK Run Time Interface (ORTI) is defined as a universal interface for development tools to the OSEK Operating System.

This interface allows the evaluating and displaying information about the OSEK operating system, its state, its performance, the different task states, the different operating system objects etc. The object information will be provided via an ASCII text file. Since OSEK implementations are configured statically, this data will be available at compilation. Additionally the ORTI file contains dynamic information as a set of attributes that are represented by formulas to access corresponding dynamic values. Formulas for dynamic data access are comprised of constants, operations, and symbolic names within the target file.

| ORTI View | | |
| --- | --- | --- |
| Name | | Value |
| ⊟ Ercosek | | |
| | RUNNINGTASK | idleMode_bg |
| | CURRENTPROCESS | PSensorMean_sync |
| | CURRENTAPPMODE | driveMode |
| | NEXT_TT_TASK | r10msSeq |
| ⊟ idleMode_bg | | |
| | TASKID | 0 |
| | PRIORITY | 0 |
| | MACT | 1 |
| | NOFACT | 1 |
| | STATE | RUNNING |
| ⊟ USER_STACK | | |
| | STARTADDRESS | 0xD00012C8 |
| | SIZE | 0x140 |

### Support by Universal Debug Engine

UDE, the Universal Debug Engine, feature's the debugging on kernel level. The ORTI support of UDE allows an easy access to the OSEK operating system objects from within the debugger environment. UDE interprets the symbol information's from the ORTI file and shows the available objects separately in a view.

The Universal Debug Engine realizes the ORTI view as ActiveX control and demonstrates the simple integration of new components into UDE via the COM technology.

**User Input Files** → **Generator**

**Appl. Files** | **OSEK OS** | **OSEK Conf.** → **ORTI ASCII File**

**Compiler**

**Target** ↔ **Universal Debug Engine**
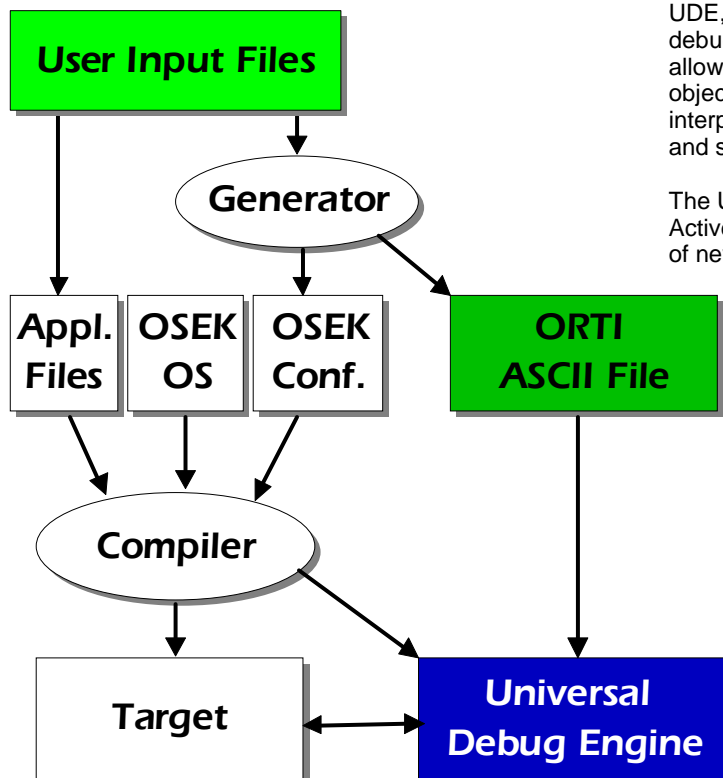
# StethoScope

## UDE Real-time Graphical Monitoring Tool

**StethoScope** is the real-time graphical monitoring tool for **Universal Debug Engine** (UDE).

StethoScope gives you a window into the very heart of your application, presenting a live analysis of your program while preserving real-time performance. You can immediately see the effects of code changes, parameter changes, or external events. With Universal Debug Engine and StethoScope together, you can make your system work.

StethoScope is developed by Real-Time Innovations, Inc. (RTI). RTI is a leading developer of new tools for the growing real-time software market.

StethoScope allows you to look at any variable or memory location in your system. You can watch any set of variables, see peak values and glitches you would otherwise miss, trigger collection on specific events, and save all data to disk.
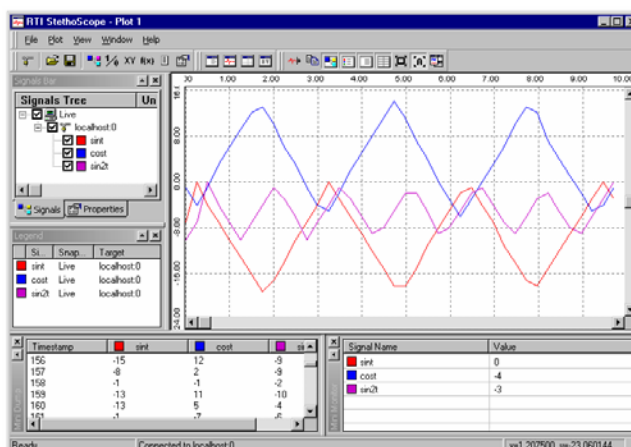


## StethoScope Highlights

- Explore any running process with minimal intrusion.
- Plot live time histories and X vs. Y plots.
- Add new variables to collect while your application is running.
- Find noise, glitches, or problems in any signal on your system.
- Trigger data collection on user-specified events to collect just the data you need.
- Save or export data from any memory location in a variety of formats like MATLAB, MatrixX, or ExcelMonitor.
- Start StethoScope at any time; no recompilation required.
- Make on-screen measurements, pan, zoom.
- Display local static variables.
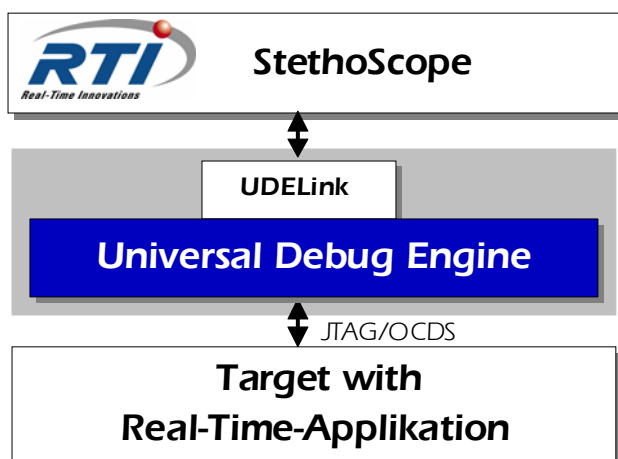


## How StethoScope Works

While your program runs, UDE captures the variables you want to monitor using the debug communication channel. StethoScope uses the object model of UDE to gather the variables you want to monitor.

With StethoScope, you can plot your program variables against time or any other variable. You can open multiple windows and compare current runs with previous results. You can freeze the display, zoom in on areas of interest, and take on-screen measurements.

## Features

- **Easy to Use** - StethoScope requires no special compilation. It can analyze already-running code. Its intuitive graphical user interface gives you direct access to all the options and capabilities with just a few clicks.
- **Get the Whole Picture** - Because it requires no special compilation, StethoScope can analyze code you didn't write, including the operating system and external third-party libraries.
- **Minimal Intrusion** - Like all of the RTI ScopeTools™, StethoScope has minimal impact on the execution speed of your program.
- **Fully Integrated with UDE** - StethoScope is fully integrated with Universal Debug Engine. It works on all UDE architectures.

## Supported Platforms

StethoScope supports Universal Debug Engine (UDE) on various 16/32 bit target architectures, especially JTAG- based MCUs like **XC16x** and **TriCore**.

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## Test automation with Universal Debug Engine

You can build your own application specific automated test system by using the COM interfaces of UDE.

The test system Tessy from Razorcat offers automated module testing of C code directly on the target system using Universal Debug Engine (UDE) debugging technology from pls. It supports the whole unit testing cycle and works transparently on all target platforms currently supported by UDE.

As a client to UDE, Tessy builds up the complete test driver including the necessary module environment and controls the testing process. It allows systematic and reproducible testing in batch mode as well as step by step execution using test data from the Tessy database.

Since UDE is the underlying debug engine, all debugging features are available during execution of the test. This allows debugging based on input data from the test database.
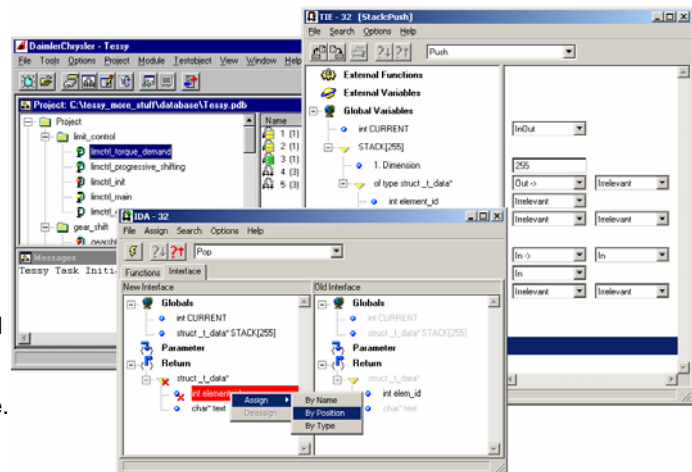
Tessy analyses the source code and recognizes the usage of variables and their respective types.
The interface information is stored separately from the test data and expected values.
This enables Tessy to use browser editors for interface settings and data input. On interface changes (during regression testing of new builds), test data may easily be re-used after assignment of the changed to the old interface.
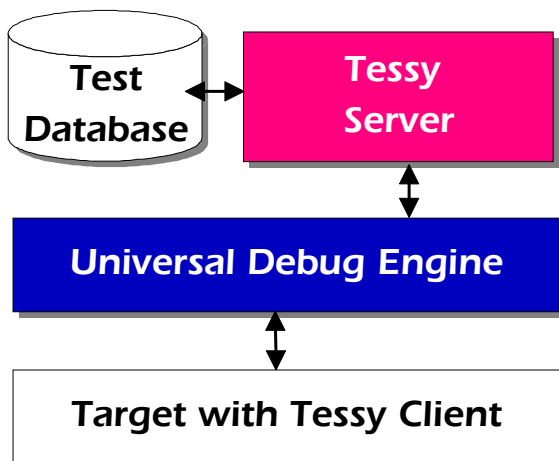
### Advantages with Tessy

- **Systematic test case design** using the classification tree method: Intuitive, easy to learn graphical representation of test specifications.
- **Quick overview** of test objects interface and variable usage within interface browser tools.
- Easy creation of module environment: Definition of unresolved references and all necessary stubs.
- **Automatic test driver generation**, test execution and evaluation of test results.
- Test driver in client/server technology allows **unlimited number of test cases** and minimum code/data requirements on the target system.

Powerful **support for regression testing**: An interface browser tool shows both old and changed interfaces and provides comfortable interface assignment which allows automatic re-usage of test data.

## Curious About What Universal Debug Engine
## Can Do for Your Application Development?

### Interested in a Crash Course or
### Special C16x / ST10 / TriCore Universal Debug Engine Classes?

Are you interested in gaining expert's knowledge about development systems for the C16x, ST10 and TriCore? Are you looking for support in configuring and launching your development environment ? Are you getting stuck in problems with your embedded application and need help?

In close cooperation with our partners in education we offer classes for all C16x, ST10 and TriCore related products. The contents of the classes may be fully adapted according to your special requirements. This way, immediate success is guaranteed when you start developing your application! You will be enabled to use all the tools of your embedded development tool chain efficiently right from the beginning - without the hassle of time-consuming, self-educating trial-and-error methods...

### WILLERT SOFTWARE TOOLS ■ Independent
### Tool Selection Seminars

Our partner Willert Software Tools GmbH is holding tool selection seminars on a regular basis. During these seminars you will be given the chance to install the previously purchased development environment and to start working with it under assistance. Usually, with the knowledge gained from such class you may easily save a couple of days when launching your new project (depending on your previous knowledge on the subject).

For your questions and problems, at all times an instructor on duty is available.

We would be pleased to send you detailed information. Just fill in the Request Form on the last page of this booklet or give us a call.

### pls Development Tools **pls Special Classes**

You name your special questions or problems and we will set up contents for an individual training class for you or your entire department.
For example, you could be taught using the development tool chain by one of our experienced staff members - and save an enormous amount of time when back on your desk. Or you may obtain technical consulting when working on your project.

Together we can force solutions - with an experienced support engineer on your side!
Our goal is to enable you to work successfully with your development workbench and to use all advanced features in a highly efficient way.

Time and location of the classes may be scheduled according to your needs. We offer in-house classes at your site as well as courses in our headquarter in Lauta, Germany.

Please contact us! Just fill in the Request Form on the last page of this booklet or give us a call. We would be glad to offer you a customized quotation.

### MICROCONSULT
### MICROELECTRONICS CONSULTING & TRAINING GMBH **Debugging with UDE**

This one-day class is held in cooperation with MicroConsult at their Munich / Germany headquarters or in-house at the customer. The class is especially intended for engineers and technicians employed in planning and development preparing and realizing complex embedded applications.

Based on your experience in application development with the C16x, ST10 and TriCore architecture, you will be enabled to rate the feature's and performance of a debugger and to use it efficiently for development, test and maintenance.

Beside theory, you will also be presented hands-on how the Universal Debug Engine Integrated Development Environment is configured and adapted to a C16x target system hardware.

We would be pleased to serve you with detailed information about the agenda and upcoming classes. Just fill in the Request Form on the last page of this booklet or give us a call.

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# Product List

## Integrated Development Environment for the Microcontroller Families C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11

### HLL Debugger Universal Debug Engine - Ordering Codes

| UDE Access Device / Target MCU Communication | UAD2+ Host: USB2.0, IEEE1394, Ethernet | UAD2 Host: USB2.0 | UAD2compact Host: USB2.0 | fast-PC6x or fast-PC65/PCMCIA [2] Host: PCI or PCMCIA |
|---|---|---|---|---|
| **C16x, ST10** | | | | |
| ASC-Bootstrap Loader / ASC | UDE-C16x/UAD2+ | UDE-C16x/UAD2 | | UDE-C16x/PCI |
| ASC-Bootstrap Loader / SSC | UDE-C16x/UAD2+ | UDE-C16x/UAD2 | | UDE-C16x/PCI |
| ASC-Bootstrap Loader / CAN | UDE-C16x/UAD2+ | UDE-C16x/UAD2 | | UDE-C16x/PCI |
| ASC-Bootstrap Loader / 3Pin | UDE-C16x/UAD2+ | | | |
| CAN-Bootstrap Loader [1] | UDE-C16x/UAD2+ | UDE-C16x/UAD2 | | UDE-C16x/PCI |
| ASC-ROM Monitor | UDE-C16x/UAD2+ + UDE-Mon | UDE-C16x/UAD2 + UDE-Mon | | UDE-C16x/PCI + UDE-Mon |
| SSC-ROM Monitor | UDE-C16x/UAD2+ + UDE-Mon | UDE-C16x/UAD2 + UDE-Mon | | UDE-C16x/PCI + UDE-Mon |
| CAN-ROM Monitor | UDE-C16x/UAD2+ + UDE-Mon | UDE-C16x/UAD2 + UDE-Mon | | UDE-C16x/PCI + UDE-Mon |
| 3Pin-ROM Monitor | UDE-C16x/UAD2+ + UDE-Mon | | | |
| **XC16x** | | | | |
| ASC-Bootstrap Loader | UDE-XC16x/UAD2+ | UDE-XC16x/UAD2 | | UDE-XC16x/PCI |
| CAN-Bootstrap Loader | UDE-XC16x/UAD2+ | UDE-XC16x/UAD2 | | UDE-XC16x/PCI |
| JTAG / OCDS L1 | UDE-XC16x/UAD2+ | UDE -XC16x/UAD2 | UDE-XC16x/UAD2C | |
| **C166CBC** | | | | |
| JTAG / OCDS L1 | UDE-CBC/UAD2+ | UDE-CBC/UAD2 | | |
| **ARM7, ARM9, ARM11, Xscale** | | | | |
| JTAG | UDE-ARM/UAD2+ | UDE-ARM/UAD2 | UDE-ARM/UAD2C | |
| JTAG / ETM | UDE-ARM/UAD2+ + UDE-ARM ETM | | | |
| **TriCore** | | | | |
| ASC-Bootstrap Loader | UDE-TC/UAD2+ | UDE-TC/UAD2 | | UDE-TC/PCI |
| CAN-Bootstrap Loader | UDE-TC/UAD2+ | UDE-TC/UAD2 | | UDE-TC/PCI |
| JTAG / OCDS L1 | UDE-TC/UAD2+ | UDE-TC/UAD2 | | |
| MCDS UEC | UDE-TC UEC | UDE-TC UEC | | |
| CAN-ROM Monitor / OCDS L1 | UDE-TC/UAD2+ + UDE-TriCoreMon | UDE-TC/UAD2 + UDE-TriCoreMon | | |
| JTAG / OCDS L2 | UDE-TC/UAD2+ + UDE-TC L2 | | | |

[1] ST10F2xx only   [2] not recommended for new projects

# Product List

## Package Content - HLL Debugger Universal Debug Engine

| | |
|---|---|
| **UDE-xx/UAD2+** | Universal HLL-Debugger with **Universal Access Device 2+** Communication System |
| | target interface: see table 'Ordering Codes', galvanically isolated |
| | host interfaces: USB2.0, IEEE1394 (FireWire™), Ethernet (TCP/IP) |
| | manual engl., software CD, Universal Access Device, JTAG Extender ( cable +  pod ), power supply |
| | support & updates: 1 year included (Windows 2000, XP) |
| **UDE-xx/UAD2** | Universal HLL-Debugger with **Universal Access Device 2** Communication System |
| | target interface: see table 'Ordering Codes', host interface: USB2.0 |
| | manual, software CD, Universal Access Device, JTAG cable, opt. 3-Pin Port cable, power supply, |
| | support & updates: 1 year included (Windows 2000, XP) |
| **UDE-xx/UAD2compact** | Universal HLL-Debugger with **Universal Access Device 2compact** Communication System |
| | target interface: see table 'Ordering Codes', host interface: USB2.0 |
| | manual, software CD, Universal Access Device, JTAG cable, power supply, |
| | support & updates: 1 year included (Windows 2000, XP) |
| **UDE-xx/PCI** | Universal HLL-Debugger with *fast*-PC67C/PCI or *fast*-PC276C/PCI Communication System |
| | target interface: see table 'Ordering Codes', host interface: PCI, optionally PCMCIA instead |
| | of fast-PC6x/PCI |
| | manual engl., software CD, optionally CAN / ASCx cable |
| | support & updates: 1 year included (Windows NT4, 2000, XP) |

## Universal Debug Engine Add-Ons

| | |
|---|---|
| **UDE-xx_A+** | Architecture upgrade to TriCore or C16x/ST10 or XC16x or C166CBC or ARM7/9 |
| **UDE-xx_V+** | Add-On for UDE-xx |
| | Support of OSEK Run Time Interface ORTI or |
| | Support of PXROS or |
| | Support of Nucleus  or |
| | Support of CMX or |
| | Support of Illuminator (OSE) |
| **UDE-MemTool** | FLASH/OTP Standalone Memory Programming Tool, Add-On of UDE, |
| | custom specific configuration, |
| | manual engl., support & updates: 1 year included |
| **UDE-TC L2** | OCDS L2 TraceBoard, Hardware Add-On of UDE/UAD2+ |
| | manual engl., support & updates: 1 year included |
| **UDE-ARM ETM** | ETM TraceBoard, Hardware Add-On of UDE/UAD2+ |
| | manual engl., support & updates: 1 year included |
| **UDE-TC UEC** | Universal Emulation Configurator - Multi Core Debug Support for TC17x6ED Emulation Device, |
| | Add-On of UDE, manual engl., support & updates: 1 year included |

*New*

## Support / Service

| | |
|---|---|
| **UDE-SRVC** | Maintenance and Support for additional one year via pls Hotline and free |
| | updates for **Universal Debug Engine** UDE-xx |

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# Product List

## FLASH/OTP Standalone Memory Programming Tool

| | |
|---|---|
| **MemTool/ASC/EPP** | FLASH/OTP Standalone Memory Programming Tool via COMx / ASC or LPTx / JTAG onboard wiggler, custom specific configuration, manual engl., support & updates: 1 year included (Windows NT, 2000, XP) |
| **MemTool/UAD2-xx** | FLASH/OTP Standalone Memory Programming Tool via ASC, CAN, JTAG Universal Access Device 2, serial cable, custom specific configuration, manual engl., support & updates: 1 year included (Windows 2000, XP) |
| **MemTool/PCI-xx** | FLASH/OTP Standalone Memory Programming Tool via ASCx, CAN, fast-PC67C/PCI card, serial cable, custom specific configuration, manual engl., support & updates: 1 year included (Windows NT, 2000, XP) |
| **MemTool-Custom** | FLASH/OTP Standalone Memory Programming Tool, custom specific extension, Development Service |

## C/C++ Cross Compiler

| | |
|---|---|
| **Tasking C166** | C166/C167/XC167 Compiler Package, incl. C Compiler, Macro Assembler, Linker/ Locator, CrossView Pro Simulator, manual engl., support & updates: 6 months |
| **Tasking C166/C++** | C166/C167/XC167 Compiler Package, incl. C/C++/EC++ Compiler, Macro Assembler, Linker/ Locator, CrossView Pro Simulator, manual engl., support & updates: 6 months |
| **Tasking TriCore** | C/C++/EC++ Compiler Package for TriCore, incl. C Compiler, Macro Assembler, Linker/Locator, manual engl., support & updates: 6 months |
| **Tasking ARM** | C/C++/EC++ Compiler Package for ARM, incl. C Compiler, Macro Assembler, Linker/Locator, manual engl., support & updates: 6 months |
| **CA166** | C166/C167/XC167 Standard Developers Kit: C166 Compiler, A166 Macro Assembler, RTX-166 Tiny, support & updates: 1 year (Keil) |
| **PK166** | C166/C167/XC167 Professional Developers Kit: CA C166 Compiler incl. µVision3, support & updates: 1 year (Keil) |
| **A166** | A166 Macro Assembler, Utilities (L166, LIB166, OH166) incl. µVision3, support & updates: 1 year (Keil) |
| **MDK ARM** | C Compiler for ARM, Assembler, support & updates: 1 year (Keil) |
| **GNU C/C++ C16x** | C/C++ Compiler for C166/C167/XC167 and ST10, Assembler, Linker/ Locator, support & updates: 1 year, manual engl. (HighTec) |
| **GNU C/C++ ARM** | C/C++ Compiler for ARM, Assembler, Linker/ Locator, support & updates: 1 year, manual engl. (HighTec) |
| **GNU C/C++ TriCore** | C/C++ Compiler for TriCore, Assembler, Linker/ Locator, for TriCore incl. TriCore-optimized DSP support Library and virtual I/O, support & updates: 1 year, manual engl. (HighTec) |

# Product List

## Hardware Add-Ons for Universal Access Device

| | |
|---|---|
| **UAD-JTAG-PROT-16** **UAD-JTAG-PROT-20** | UAD/JTAG Protector for Universal Access Device, JTAG adapter with ESD/overvoltage protection, for Infineon based targets (**-16** pin header) or ARM based targets (**-20** pin header) |
| **UDE-JTAG-EXT-16** **UDE-JTAG-EXT-20** | **Extender for UAD-JTAG-Connector** Cable for **-16** JTAG/OCDS-L1 16 pin header **-20** JTAG/ARM 20 pin header, extender device, extender cable 50 cm, manual engl. |
| **IEEE1394-PCI** | IEEE1394-PCI -host adapter EX-6450 for Universal Access Device for DesktopPC |
| **IEEE1394-Cardbus** | IEEE1394-cardbus extender EX-6600 for Universal Access Device for Notebook |
| **Cable PC** | IEEE1394-cable 6/6pol, 2m length, desktop PC |
| **Cable NB** | IEEE1394-cable 4/6pol, 1.5m length, notebook |

## RTOS / CASE

| | |
|---|---|
| **PXROS System** | Real-Time Operating System for C16x and ST10 or TriCore, PXROS development platform, including GNU C/C++, PXmon-RT, PXemu, PXutil, supported compilers: GNU/Tasking |
| **PXROS Webserver** | PXROS embedded ProWeb/HTTP Server for C16x and ST10, supported compilers: GNU/Tasking |
| **PXROS Basis Communication** | Basis Communication package for C16x and ST10, including TCP/IP socket, PPP and drivers, supported compilers: GNU/Tasking |
| **CMX-TriCore** | Real-Time Operating System for TriCore, CMXBug, no royalties, supported compilers: Tasking / Keil |
| **CMX-ARM** | Real-Time Operating System for ARM, CMXBug, no royalties, supported compilers: Keil |
| **CMX-RTX RTOS** | Real-Time Operating System for C16x and ST10, CMXBug, no royalties, supported compilers: Tasking / Keil |
| **CMX-RTXS RTOS** | Real-Time Operating System specially adapted to the C16x and ST10, incl. CMX-RTX, no royalties, supported compilers: Tasking / Keil |
| **CMX-TRACKER** | Real Time Log for CMX-RTX |
| **FR C166** | RTX166 Full V4.0 RTOS for C16x and ST10 ( incl. CAN libraries) support & updates: 1 year (Keil) |
| **EasyCODE-STD** | EasyCASE(C++) / EasyCODE(C++) Standard, CASE Tool for Structured and Object-Oriented Programming with C and C++ Structograms, incl. Project and Editor |
| **EasyCODE-PRO** | EasyCASE(C++) / EasyCODE(C++) Professional, incl. Project, ProjectBrowser and Editor Modules |
| **EasyCODE-DEV** | EasyCASE(C++) / EasyCODE(C++) Developer, incl. Project, ProjectBrowser, Documentation and Editor Modules |
| **SrcSf/1C** | Microsoft SourceSafe Project-Oriented Version Control, network-ready, first license, manual engl., software CD |

**For further information and tools selection please give us a call or email your special configuration needs. We would be glad to serve you when selecting components for your complete C16x, ST10, XC16x, TriCore, ARM7, ARM9, ARM11 and XScale Development Environment.**

Volume discounts, conditions for educational institutions and further configurations upon request. All products suitable for PC/AT and up running Microsoft Windows™NT4, Windows™2000, Windows™XP (certain restrictions may apply to select products).
Customer specific adaptations and manufacturing upon request. Prices excl. VAT and S/H. Payment terms: 30 days net. The German "Allgemeine Bedingungen für Lieferungen und Leistungen der Elektroindustrie" (General Conditions for Supplies and Services in the Electronics Industry) apply. Previous price lists void upon appearance of this catalogue. Above data is not considered complete and is intended for information only. Due to price adjustments parts of this list may be out of date. Please request your personal quotation.

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## Evaluation License and Boards

| | |
|---|---|
| **UDE-EVAL** | Evaluation License **Universal Debug Engine** (valid for 1 month) |
| | The evaluation fee will be credited if UDE is purchased after evaluation, |
| **UDE-STK/XC16x** | Microcontroller Starterkit based on Evaluation board XC16x |
| | including Starterkit version of **Universal Debug Engine** |
| **UDE-STK/C16x** | Microcontroller Starterkit based on Evaluation board C16x / ST10 |
| | including Starterkit version of **Universal Debug Engine** |
| **UDE-STK/ARMxx** | Microcontroller Starterkit based on Evaluation board ARM7/ARM9/ARM11 |
| | including Starterkit version of **Universal Debug Engine** |
| **UDE-STK/TCxx** | Microcontroller Starterkit based on Evaluation board with TriCore TC1130, TC1796 |
| | or TC1920 including Starterkit version of **Universal Debug Engine** |
| **UDE-STK/TC1766ED** | Microcontroller Starterkit based on Evaluation board with TriCore TC1766ED |
| | including Starterkit version of **Universal Debug Engine / Universal Emulation Configurator** |

*New*

### For supporting you while choosing tools for your development environment, we have set up complete packages of optimally matching components to provide a quick and hassle-free project launch. Please request your personal quotation.

### Educational Package for TriCore TC1130

| | | |
|---|---|---|
| Universal Debug Engine | Integrated Development Environment for TriCore, HLL Full Screen Debugger with parallel port support for the Starterkits from Infineon (Windows NT4, 2000, XP) | **Special Package Features** FLASH Programming Can be upgraded to an advanced |
| C/C++ Compiler | TriCore – C/C++ Compiler, Assembler, Linker/ Locator *without* support / printed manual (GNU) | or a professional development package. *Support via E-Mail only (excl. compiler)* |
| TriBoard TC1130 | Infineon Starter Kit with TC1130 Evaluation Board | |

### Advanced Package for XC16x or ARM

| | | |
|---|---|---|
| Universal Debug Engine | Integrated Development Environment for TriCore, HLL Full Screen Debugger, Communication Hardware Universal Access Device, manual engl., software CD (Windows NT4, 2000, XP) | **Special Package Features** JTAG/OCDS Debugging, FLASH Programming, RTOS ready |
| Universal Access Device 2 | Communication system for flexible target system access via JTAG/OCDS host interfaces: USB 2.0 incl. serial cable, power supply (110/220V AC) | Easy adaptation to your specific target system hardware via JTAG/OCDS and Universal Access Device. |
| C/C++ Compiler | Compiler Package incl. C/C++ Compiler, Macro Assembler, Linker/ Locator | Tasking or ARM industry-standard compiler! Support and update service 1 year. |
| Starterkit board | Starter Kit with XC16x or ARM Evaluation Board | Evaluation Board with CAN! |

### Professional Package for TriCore

| | | |
|---|---|---|
| Universal Debug Engine | Integrated Development Environment for TriCore, HLL Full Screen Debugger, Communication Hardware Universal Access Device, manual engl., software CD (Windows NT4, 2000, XP) | **Special Package Features** JTAG/OCDS Debugging, FLASH Programming, Professional RTOS included! |
| Universal Access Device 2+ | Communication system for flexible target system access via JTAG/OCDS L1 and L2 trace host interfaces: IEEE1394 (FireWire™), USB2.0, Ethernet, incl. serial cable, power supply (110/220V AC) | Easy adaptation to your specific target system hardware via JTAG/OCDS and Universal Access Device! |
| C/C++ Compiler | TriCore-Compiler Package incl. C/C++ Compiler, Macro Assembler, Linker/ Locator (GNU or Tasking) | GNU or Tasking industry-standard compiler! |
| PXROS | Real-Time Operating System for TriCore, PXROS development platform, including GNU C/C++, PXmon-RT, PXemu, PXutil, supported compilers: GNU/Tasking | |
| TriBoard TC1766ED | Infineon Starter Kit with TC1766ED Evaluation Board | Support and update service 1 year. |

## Update and Upgrade

When you purchase a Universal Debug Engine Integrated Development Environment, you get a FREE Update Service for the Universal Debug Engine HLL Debugger and the monibc66 Portable Monitor Development Kit for 12 months. The Update Service includes approximately two new software releases of the products including documentation, regular product news and updates or upgrades of other development environment components (compiler, editor, evaluation hardware...) at a favourable price.

**Take the easy way to keep your development environment up-to-date. Only the latest software releases guarantee efficient and state-of-the-art application development which is the base for competitive products - so don't take chances and send in your completed Service Form today!**

General Conditions for the Updates Service:

- The Update Service is available for pls products only.
- Updates/Upgrades for Universal Debug Engine and *mon*ibc66 can not be separated for technical reasons.
- The warranty for pls products is one (1) year beginning with the day of purchase. During this time, the Update Service is free of charge without limitation.
- The Update Service starts when the Service Form is delivered to pls.
- After the first year, the Update Service and Support charge is 20 per cent of the current list price of the products to be under Update Service and Support for each consecutive year.
- If the Updates Service time is expired and not immediately renewed then for the next Updates Service period an additional service re-entry fee of 10 per cent of the list price of the products to be under Update Service and Support is charged.
- pls delivers software and documentation updates on CD, disk or via e-mail. Printed documentation updates are available upon request.
- Necessary updates for other (non-pls) products to the latest version (e.g. Compiler, CodeWright, EasyCODE,...) are not included and may be purchased separately.

Please call us for your personal quotation.

*Simply ONE Support Hotline for the Development Environment.*

For questions or problems we offer you our Technical Support Hotline. We specialize in supporting your whole development environment including interaction between the tools. Just give us a call, send a fax or email and have the following information handy:

- problem description (as detailed as possible)
- tool names, their version and serial numbers
- host platform operating system, PC type and make
- sample data or files to reconstruct the problem at pls.

You send your files causing the trouble by Email or FTP and we process your query usually within one day. Of course, all your sensitive data is protected against unauthorized access. Additionally, the latest technical information about our whole product spectrum is available on our Website.

**How You May Contact Our Tech Support Hotline:**

Phone:  TollFree: (877) 77DEBUG (U.S. only)
        +49-35722-384-0
Fax     +49-35722-384-69
eMail:  support@pls-mc.com
WWW:  www.pls-mc.com

General Conditions for Obtaining pls Technical Support:

- The pls Technical Support is available for pls and non-pls products purchased at pls and authorized distributors only.
- Getting Technical Support by pls requires a valid and current Update Service (Maintenance) contract at the conditions described there.
- The warranty for pls products is one (1) year beginning with the day of purchase. During this time, the Technical Support is free of charge without limitation. Non-pls products may have different support periods which we are obliged to observe.
- The Technical Support is available from the day of purchase.
- Technical Support covered by this Maintenance Contract is available via telephone, fax, email and internet only. On-site technical support is not part of the Maintenance contract - please ask for a quotation if required.
- For obtaining Technical Support it is required that the latest releases of the Integrated Development Environment components are installed.
- Due to the given complexity it is not possible to provide comprehensive application development support for a particular customer's project.

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# Your Hardware Jump-start: Evaluation Boards for the C16x, XC16x, ST10, TriCore, ARM7, ARM9, ARM11, XScale

## TQ-Components (C16x, TriCore)

| Board | Remarks | Controller | Clock | RAM | ROM/max | Interfaces |
|---|---|---|---|---|---|---|
| TQM164C | Size: 54x41 | C164CI | 20 MHz | 256kByte | 128k/256k FLASH | 1xCAN, internal RTC |
| TQM167C | Size: 54x82 | C167CR | 20 MHz | 256k/1MByte | 256k/1MByte FLASH | 1xCAN |
| STK-TC1775 | Size: Euro | TC1775 | variable | 1MByte | 4MByte | 2xRS232, 2xCAN |

## PHYTEC (C16x, XC16x, TriCore, ARM7, ARM9, ARM11)

| Module | Remarks | Controller | Clock | RAM/max | ROM/max | Interfaces |
|---|---|---|---|---|---|---|
| miniMODUL-167 | Size: 60x53 | C167CR | 20 MHz | 256k/2MByte | 256k/2MByte FLASH | 2xRS232, 1xCAN |
| phyCORE-ST10F269/276 | Size: 60x53 | ST10F269 ST10F276 | 20 MHz | 256k/1MByte | 256k/2MByte FLASH | 2xRS232, 2xCAN 1xETH, 1xRTC |
| phyCORE-167 | Size: 60x53 | C167CS | 20 MHz | 256k/1MByte | 256k/2MByte FLASH | 2xRS232, 2xCAN |
| phyCORE-XC161 | Size: 60x52 | XC161CJ | 40 MHz | 1MByte | 2MByte FLASH | 2xRS232, 2xCAN, 1xRTC, 1xJTAG/OCDS |
| phyCORE-TC1775 | Size: 72x58 | TC1775 | 40 MHz | 1M/8MByte | 1MB/8MByte FLASH | 2xRS232, 2xCAN, 1xETH |
| phyCORE-LPC3180 | Size: 60x53 | LPC3180 | 208 MHz | 16M/64MByte SDRAM | 128MByte NAND-FLASH | 3xRS232, 1xUSB, 2xCAN, 1xRTC, 1xETM |
| phyCORE-AT91M55800A | Size: 60x53 | AT91M55800A | 20 MHz | 2M/8MByte | 16MByte FLASH | 3xRS232, 2xCAN, 1xETH |

## Infineon (C166CBC, XC16x, TriCore)

| Board | Remarks | Controller | Clock | RAM/max | ROM/max | Interfaces |
|---|---|---|---|---|---|---|
| SK-167 | Size: Euro | C167CR C167CS | 20 MHz | 64kByte | 256kByte | 2xRS232, 2xCAN |
| SK-XC164 Industrial | Size: Euro | XC164CS | 40 MHz | 1MByte | 1MByte FLASH | On-board Wiggler, 1xRS232 |
| SK-XC167CI Easy Kit | Size: 80x100 | XC167CI | 40 MHz | 1MByte | 512kByte FLASH | 2xRS232, 2xCAN |
| TriBoard TC1130 | Size: Euro | TC1130 | variable | 256k/1MByte or 4MB SDRAM | 512k/4MByte FLASH | On-board Wiggler, 1xRS232, 1xETH, 1xUSB |
| TriBoard TC116x | Size: Euro | TC1161 TC1162 TC1163 TC1164 TC1165 TC1166 | 80 MHz | internal | internal | On-board Wiggler, 2xRS232, 2xCAN |
| TriBoard TC176x | Size: Euro | TC1762 TC1766 | 80 MHz | internal | internal | On-board Wiggler, 2xRS232, 2xCAN |
| TriBoard TC1766ED TriBoard TC1796ED | Size: Euro | TC1766ED TC1796ED | variable | 256kByte | 512kByte FLASH | On-board Wiggler, 1xRS232 |
| TriBoard TC1796 | Size: Euro | TC1796 | variable | 4MByte SDRAM | 4MByte FLASH | On-board Wiggler, 1xRS232 |

## Keil (ARM7, ARM9)

| Board | Remarks | Controller | Clock | RAM/max | ROM/max | Interfaces |
|---|---|---|---|---|---|---|
| MBC2130 MBC2140 | Size: 100x100 | LPC2138 LPC2148 | 60 MHz | internal | internal | 2xRS232, 1xETM, 1xSDCard |
| MBCSTR730 | 100x110 | STR730 | variable | internal | internal | 2xRS232, 2xCAN |
| MBCSTR9 | 100x160 | STR912 | variable | internal | internal | 1xETH, 1xUSB, 1xLCD, 1xSDCard |

Further configurations upon request. Due to short-term hardware changes by the respective manufacturers the above given information may be out of date. Please contact us for your special hardware configuration requirements.

# Reference List

| | |
|---|---|
| Agfa-Gevaert AG | Gera |
| Auerswald GmbH | Cremlingen |
| Beckhoff Industrie Elektronik GmbH | Verl |
| Bizerba GmbH & Co. KG | Balingen |
| Carl Zeiss Jena GmbH | Jena |
| Conti Temic microelectronic GmbH | Nürnberg |
| Deutsche Telekom CardService GmbH | Malsch |
| Eppendorf Instrumente GmbH | Hamburg |
| Hauni Maschinenbau AG | Hamburg |
| Heidelberg Finishing GmbH | Ludwigsburg |
| Infineon Technologies AG | München, Düsseldorf |
| LEAR Automotive Electronics GmbH | Kronach |
| Melitta System Service GmbH & Co. KG | Minden |
| Metz Werke GmbH & Co. KG | Zirndorf |
| Micronas Munich GmbH | München |
| ORGA Kartensysteme GmbH | Flintbek |
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| Securiton AG | Zöllighofen, Schweiz |
| Sick AG | Reute |
| Siemens AG | Fürth |
| Sony-Wega Produktions GmbH | Stuttgart |
| Voith Turbo GmbH & Co. KG | Heidenheim |
| Vector Informatik | Stuttgart |
| Volkswagen AG | Wolfsburg |
| Woodward Governor Company | Stuttgart |

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## What Can We Do For You? Your Success Is Our Goal.

**pls Programmierbare Logik & Systeme GmbH** is one of the leading manufacturers of development tools for 16/32bit microcontroller applications. Specialized in the Infineon Technologies (formerly Siemens Semiconductors) C16x and TriCore MCU-DSP architecture as well as the STMicroelectronics ST10 and ARM7, ARM9, ARM11 derivatives, pls provides the following products and services:

- Consulting service in the tools selection phase to assemble a complete development environment for fast project start-up.

- The pls product line incorporates all the hardware and software tools for a complete development environment including HLL Debugger, Make tool, Compiler, Assembler, Monitor Development Toolkit, Emulators, Version Control System, professional editor, Real-Time Operating System.

- Classes including hands-on training are being held in cooperation with MicroConsult, Munich/Germany and Willert Software Tools, Bückeburg/Germany to ensure a quick and hassle-free project launch even if the controller architecture is unknown yet to your developer team.

- All tools purchased at pls are supported by pls too - a one-hand solution guarantees you a one-stop support for your whole project development.

As we at pls understand that tools are part of a complex system for application engineering, we offer our customers advanced one-stop support to guarantee successful application development. This way, our customers save on development time - an essential qualification to meet time-to-market requirements!

For instant start-up, complete development tools packages containing all necessary components are offered to enable our customers an optimum development tools suite.

Our team of experienced and highly-motivated engineers is constantly improving the quality of our products and support - just test us!
Considering the Universal Debug Engine Integrated Development Environment, a dependable base for future 32bit embedded development tools including such for the advanced Infineon TriCore architecture is available.

The products of pls - especially Universal Debug Engine - are tested by Infineon Technologies (formerly Siemens AG, Semiconductor Division), for compatibility with tools of different manufacturers. The proven quality of pls products is documented by adding our company to the Infineon C16x, TriCore and ARM Third-Party Support List.

By in-house development and direct sales, a permanent contact to the customer and feedback for further product development beside short response times to special customer needs are guaranteed.

pls is certified of the quality management system in accordance with DIN EN ISO 9001:2000.

pls products and services are available world-wide through our head office in Germany and the numerous distributors.

## Just contact us - We look forward to help you !

Please visit our home page
**http://www.pls-mc.com** for the latest information about pls products.

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**Any questions? Or do you need further information?**
**May we send you a quotation?**
**For faster service, please fill in the request form and fax it today!**

| |
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☐    Please contact me for detailed information.

☐    Please send me information about the topics checked below.

☐    Please send a quotation about the topics checked below.

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| Name: | _____ | Fax: | _____ |
| Department: | _____ | Email: | _____ |
| Address: | _____ | | |
| City / State: | _____ | | |
| Country / ZIP: | _____ | | |

☐ Universal Debug Engine
☐ Universal Access Device

☐ JTAG / OCDS L1 On-chip Debug Support
☐ Debugging via CAN
☐ OCDS L2 / ETM / ETB Trace Debug Support
☐ Programming FLASH/OTP In-System
☐ UDE-Mon Monitor Development Kit

☐ TriCore Support: .................................... derivative?
☐ C16x, ST10 Support: ............................. derivative?
☐ C166CBC Support: ................................ derivative?
☐ C166S V2 (XC16x) Support: ................. derivative?
☐ ARM7TDMI Support: ............................. derivative?
☐ ARM9TDMI Support: ............................. derivative?
☐ ARM11 Support: .................................... derivative?
☐ XScale Support: .................................... derivative?

☐ Tasking  C/C++ Compiler
☐ GNU  C/C++ Compiler, HighTec
☐ Keil  C Compiler

☐ RTOS-Support Nucleus
☐ RTOS-Support CMX-RTX
☐ OSE Illuminator Support

☐ Evaluation Boards
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☐ Emulator

☐ StethoScope

☐ EasyCASE / EasyCODE, X32
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