NO: 86
ISSUE: A
2001

hitex
AUTOMATION ENGINEERING

hitex
DEVELOPMENT TOOLS

softing

Controller Area Networking 2001/2

CAN, USB & TCP/IP
CAN Microcontroller Starter Kits
PC CAN Interface Cards
CAN Analysers
CAN Application Layers
CAN Training

CAN

02476 692066
www.hitex.co.uk

Embedded Networking Overview

There are a large number of networking standards used in the embedded microcontroller and industrial control fields. As a company, Hitex supports the standards which are listed below, along with a short description of their capabilities.

I2C

As its name implies, Philips' Inter-Integrated Circuit (I2C) is designed to allow devices such as EEPROMs, Real time clocks and other discrete devices to communicate at relatively high speed (typically 100 KB/s) across a typical circuit board. Distances are usually no more than a few tens of centimetres. Devices can have individual addresses up to 32. I2C uses three lines – serial data in, serial data out and a clock. It is not as common as it once was and to some extent has been superseded by CAN, something which Philips also were involved with. Many 8-bit microcontrollers have built-in I2C peripherals.

SPI

SPI is similar in capabilities and has similar applications to I2C but is often used at up to several MB/s. It originated from Motorola but now used by almost all silicon manufacturers. Many microcontrollers have built-in SPI peripherals.

RS485

The classic multi-drop single-wire bus, based on open-collector drivers. Can run over distances of several hundred metres with many nodes. It has no built-in error handling or collision detection (unlike CAN) and requires considerable software to manage. RS485 is very common in industrial control but is being largely supplanted by CAN.

PROFIBUS

PROFIBUS is a (up to) 12MBaud polled protocol, with a layered architecture designed specifically for industrial control networks between PLCs. It originated in Germany where it is very popular, although it does occasionally turn up in the UK. Operations specific to industrial controls (such as Fail-Safe operation and globally coordinated Device Updates) are included in the protocol specification. Reliable operation is augmented by powerful error detection algorithms (CRC or Cyclic Redundancy Checking) and Watchdog timers.

PROFIBUS uses a twisted-pair transmission medium and industry standard RS-485 carrier levels which result in good noise immunity.

CAN

Controller Area Network originally from the automotive world but is now probably the leading embedded microcontroller network. It usually works over a twisted-pair differential bus, which is very noise-resistant. Unlike I2C, SPI etc., it includes built-in message rescheduling in the event of collisions, 5 types of error detection (CRC, bit stuffing, frame checking and others) and handling Very robust, easy to use and has non-destructive arbitration which priorities messages. CAN is able to run at 1MB/s over up to 10m or several km at 50KB/s. There are a number of application layers such as DeviceNET and CANopen that allow devices from different manufacturers to communicate. It is mainly used for high speed, deterministic latency data transfer between microcontrollers units that are usually within the same machine or factory. Many microcontrollers have built-in CAN peripherals and there are PC interface cards available.

For a detailed overview of CAN, see http://www.hitex.co.uk/can.

USB (Universal Serial Bus)

USB is a high speed bus designed to extend the PC plug and play concept to a network of external peripherals. USB can support a network of 127 peripherals with transfer rates of 1.5 Mbit/sec. (Low speed) or 12 Mbit/Sec (Full speed) and operates as a master-slave network, where the PC is always the master. USB devices are connected to the PC by logical connections called pipes of which there are four

types; control, interrupt bulk and isochronous each with different transfer characteristics which allow the USB connection to be 'tuned' to a peripherals requirements. There are an increasing number of microcontrollers available which have integral USB peripherals.

For a more complete introduction to USB, see http://www.hitex.co.uk/usb

TCP/IP - Transmission Control Protocol/Internet Protocol

The generic term "TCP/IP" usually means anything and everything related to the specific protocols of TCP and IP. It can include other protocols, applications, and even the network medium. Examples of these protocols and applications are listed below:

Protocol	Typical Application
ARP	translate Internet address to Ethernet address
BOOTP	used to auto configure network devices
DHCP	used to auto configure network devices
DNS	domain name lookups
Finger	get information from remote computer
Telnet	TTY user interface
FTP	transfer files between computers
HTTP	transfer Web pages
ICMP	network management
IP	basic network protocol used by TCP and UDP
PPP	point to point protocol, used to transfer data over serial lines
RARP	used to auto configure network devices
SNMP	remote device management
SMTP	send and receive electronic mail
TCP	stream protocol used by most other protocols
UDP	datagram protocol used by several other protocols

It is usually used on local area networks where Ethernet provides the physical and transport layers. Distances can be up to several km. Bit rates are commonly 10MB/s (10BaseT) or increasingly 100MB/s (100BaseT). However it can be implemented at lower speeds over RS232 or dial-up modems on the PSTN using PPP (point to point protocol). Besides the ubiquitous office network, TCP/IP + Ethernet is widely used in industrial networks over distances of several km where as in the office environment, its main role is to connect computers rather than microcontrollers. TCP/IP is also the protocol used for the Internet.

TCP/IP guarantees message delivery but not its latency, unless something like the VentruCom Real Time TCP/IP extension is used. UDP is a related protocol that is simpler and deterministic but does not ensure that the data was delivered. It is perhaps more common where embedded microcontrollers are involved.

For a more complete introduction to TCP/IP, see http://www.hitex.co.uk/tcpip

IEEE1394 (Firewire, I-Link)

IEEE1394 is a 4 wire bus that offers true plug and play, hot plugging, power provision over the bus, a 400MB/s transfer rate, a secure protocol and the possibility of a guaranteed bandwidth and latency. It is suitable for applications such as external hard disk drives, real time digital video and hi-fidelity audio where cable runs are only a few metres but transfer has to be at a very high speed. To date all IEEE1394 applications have between PCs and very high speed peripherals but it can also be used for connections between solely non-PC devices. Other features are the possibility of connecting 63 devices ("nodes") directly to a single bus (which itself can be expanded to 1024 busses), a large address space of 256 bytes per bus, scalable performance and low cost cabling. There are no microcontrollers with integral IEEE1394 but Philips, Sony and TI make external peripherals.

For a more complete introduction to IEEE1394, see http://www.hitex.co.uk/ieee1394

Hitex 8/16/32 Bit Embedded Networking Microcontroller Modules And Starter Kits

This is a list of starter kits and modules for microcontrollers that have a CAN, USB and TCP/IP capability. Due to our increasing range of support, your device may not be listed here so please contact us as we may have recently added it.

Starter kits comprise the basic elements required to allow you to write limited applications for a particular microcontroller that make use of an embedded networking technology. They are usually in Eurocard or half-Eurocard formats and generally have interfaces to a PC, restricted C-compilers, debuggers and various example programs. The microcontroller boards in the kits are not usually intended for inclusion in your own products, although we can advise as to their suitability.

Minimodules, nanomodules and Phycore microcomputing units are available as starter kits but are also suitable for small to medium volume production. The starter kit versions consist of the microcontroller module mounted on a baseboard which supplies regulated power, IO etc. For series production, the module is fitted to your own custom hardware design where it acts as the “digital processing engine” or “big chip”. Quantity pricing is available from Hitex in 2-4, 5-9, 10-19, 20-49, 50-99, 100-199, 200-499 and greater than 500 units price bands. Please contact us for a quotation in £ or Euro.

If you cannot find a starter kit based on the microcontroller you are using, please refer to our separate "Microcontroller Starter Kits And Modules Master List".

A Special Note On Getting Started With CAN

To get started with CAN networking, you will need a starter kit, based on the embedded microcontroller of your choice, plus a PC interface card. This will give you minimum necessary two nodes on your CAN network.

Upgrading To Full Specification Compilers And Debuggers

Starter kits will allow you prototype ideas and systems but to produce a real commercial product, you will need to upgrade the evaluation compiler and debugger included to the unrestricted versions. Please see http://www.hitex.co.uk/starterkits for details on how to do this.

C167CR: PHYCORE-167 starter kit KPCM-009
Quantity orders PCM-009

C167CS: PHYCORE-167CS starter kit KPCM-009-C1
Quantity orders PCM-009-C1

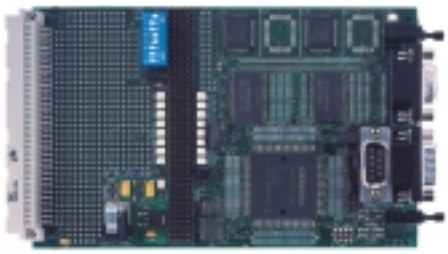
C161CS: PHYCORE-161CS starter kit KPCM-005
Quantity orders CM-005

C164CI: NANOMODULE164 starter kit KNM-164
Quantity orders NM-009

- Subminiature SBC 47 x 38 mm.
- Infineon C164CI controller (20 MHz)
- All C164 signals on 1.27 mm pitch pins at board edges
- 256 (to 1 MB) KB external SRAM
- 256 (to 1 MB) KB external Flash
- Bootstrap Loader enabling on-board Flash programming
- 8-channel A/D-converter with 10-bit resolution
- Full 2.0B CAN interface (max. 512 KB SRAM and
- 512 KB Flash if CAN interface active)
- RS-232 interface via UART, additional synchronous port
- Real-Time Clock and Watchdog Timer
- Various Timers supporting Capture/Compare, PWM
- 0° C to +70° C

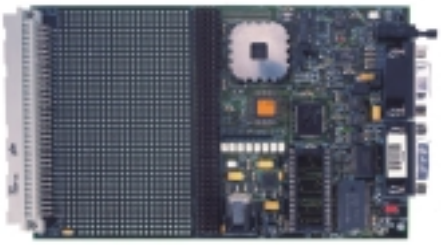
Hitex in-circuit emulator interface available to allow direct connection to Phycore modules - see http://www.hitex.co.uk/phycore

C167CR: KITCON167CR starter kit (64KB SRAM) KC-167
C167CS: KITCON167CS starter kit (64KB SRAM) KC-167-CS
C167CR: KITCON167CR starter kit (256KB SRAM) KC-167-1
C167CS: KITCON167CS starter kit (256KB SRAM) KC-167-CS-1
ST10F168: KITCONST10F168 starter kit KC-167-CT8 256KB SRAM)



- **Infineon C167CR or C167CS (ROMless)**
- **Alternative ST ST10F168**
- 64 KB (256KB) SRAM
- 256 KB external Flash
- on-chip Bootstrap Loader
- RS-232 DB-9 serial interface, RS-485/CAN DB-9
- CAN DB-9 interface (C167CS only)
- two status LEDs and 16 freely-programmable LEDs

C164CI: KITCON164CI starter kit KC-164-S



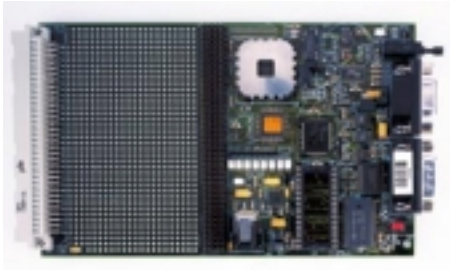
- **Infineon C164CI** 16-bit controller
- (20 MHz, QFP-100 package)
- 64 KB (to 1 MB) SRAM
- 256 KB (to 1 MB) Flash
- On-chip Bootstrap Loader
- On-board generation of programming voltage to program on-chip OTP memory
- 8-channel A/D-converter with 10-bit resolution
- RS-232 DB-9 serial interface
- RS-485/CAN DB-9 serial interface (CAN is only active)

KC-164-SK-164 kitCON-164
C164CI/20 MH/, 64 KB SRAM

C505C: KITCON505C starter kit KC-500-C05

- **Infineon C504 and C505C(A)** 8051-compatible controllers in 44-pin package
- 32 (to 160) KB SRAM 128 (to 512) KB Flash supporting easy on-board download of user code via RS-232 with FlashTools
- RS-232 DB-9 serial interface
- supplemental RS-485 DB-9 interface (C505C(A) only)
- supplemental CAN DB-9 serial interface (C505C(A))

C515C: KITCON515C starter kit KC-515

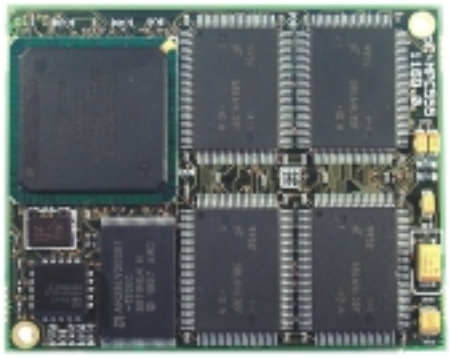


- Infineon 8051-compatible C515C controller (10MHz, QFP-80) offering Full 2.0B on-chip CAN
- 32 (to 160) KB SRAM
- 128 (to 512) KB Flash supporting easy on-board download of user code via RS-232 with FlashTools
- 2 status LEDs and 8 freely-programmable LEDs
- RS-232 DB-9 serial interface
- CAN DB-9 interface, optically isolated signals
- three free Chip-Select signals

Infineon C5xx starter kits are fitted with the Hitex ICEconnect51 in-circuit emulator interface, see http://www.hitex.co.uk/8051

MPC555: PHYCORE-MPC555 KPCM-001 256K ram
Quantity orders PCM-001

MPC555: PCM-001-440
(1M RAM, 512K FLASH)
Quantity orders PCM-001-440



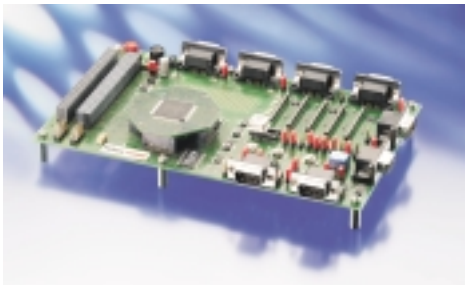
- Subminiature SBC (72 x 57 mm) with low EMI
- Motorola 32-bit MPC555 embedded controller (40 MHz.) in a 272-pin BGA package
- All signals and ports extend to high-density (0.635 mm.) Molex connectors on two sides of board
- 256 KB to 4 MB flow-through synchronous external
- BURST-SRAM (32-bit access, 0 Wait-States, 2-1-1-1 Burst Mode) to 4 MB (alternately 512 KB or 1 MB) optional
- External Flash-ROM memory to 512 byte optional I2C FRAM,
- alternately I²C SRAM or I2C-EEPROM
- I²C Real-Time Clock with Calender and Alarm functions
- Power-Down/Wake-Up Support via the RTC,
- Decrementer or external signal
- Dual Full 2.0B CAN with PCA82C250 transceiver support
- SPI and dual UART with RS-232 level-converters
- Dual 16-channel A/D-converters with 10-bit resolution
- BDM debug-interface
- 5 V/50mA and 3.3 V/400 mA
- 0° to 70° C or -40° to 85° C temperature ranges

80C591: PHYCORE-591 KPCM-002-SK-591
Quantity orders PCM-002-SK-591

89C51CC01: phyCORE-T89C51CC01 KPCM-0xx
Quantity orders PCM-0xx

- Philips 8-bit, 80C51-compatible P8xC591 mcrocontroller (PLCC-44, 12 MHz clock frequency) featuring CAN 2.0B on-chip via Philips PeliCAN
- Alternative Atmel 89C51CC01 CANary
- All ports and decoded interface available at edges of board
- Flexible address decoding and generation of three / CS-signals and different memory models
- 128 (to 512) KB external Flash with PHYTEC
- FlashTools download utility for in-system (ISP) Flash programming
- 128 KB external SRAM
- 1 (to 32) KB external serial I²C-EEPROM (alternatively I²C-SRAM or FRAM)
- RS-232 or RS-485 serial interface (jumper selectable)
- Philips 82C251 CAN transceiver
- 6-channel A/D-converter with 10-bit resolution
- I²C Real Time Clock with internal crystal
- Single 5V power supply
- 0°C to 70° C.

MCS9S12 starter kit **EVA-S12**
68HC912STAR12 evaluation board



- LEDs for output visualisation
- Pushbuttons (located at interrupt-capable inputs)
- DIP-switch for input simulation
- Support for single-chip and expanded modes
- Voltage regulator with integrated watchdog and inhibit input
- Inhibit control LEDs
- QC120 quad connector for easy connection of DProbeS12 emulator
- Background debug mode (BDM) interface for EEPROM programming/debugging
- LIN interface
- RS232 serial interface
- Up to five CAN interfaces with optional transceiver modules or on-board ISO/DIS 82C250 drivers
- Expansion connectors
- Wire wrap area

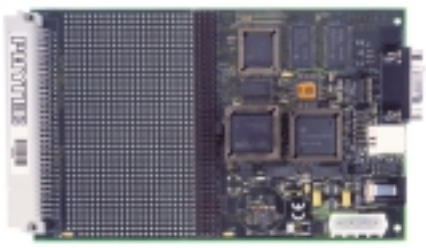
TC1775: starter kit **TQ1775B**
Quantity orders *Please call*

- Tricore TC1775B 32 bit microcontroller/DSP
- 160 x 100mm Eurocard format
- 40MHz TC1775B CPU
- 1MB x 32bit burst FLASH
- 1MB x 32bit SRAM
- Dual TwinCAN part 2.0B
- All IO available
- JTAG & OCDS2 connectors for JPROBE & DPROBE in-circuit emulators

C161U: **EASY161 starter kit**
C165UTAH: EASY165UATH **starter kit**

- Full-speed USB version 1.1compliant port
- RS232 interface on board
- JTAG & OCDS2 connectors for JPROBE & DPROBE in-circuit emulators
- 1 MByte XDATA RAM
- 512 kByte FLASH memory
- All controller signals bonded on pins
- Breadboard area
- Device driver for USB
- Infineon USB-Tool for easy USB-host traffic generation

C541U: **KITCON541 starter kit** **KC-541**
Infineon C541U 8051-compatible controller (12 MHz, PLCC-44) with on-chip USB



- 64 (to 160) KB SRAM
- 128 (to 512) KB Flash supporting easy on-board download of user code
- RS-232 DB-9 serial interface
- USB interface, configurable as Low Speed or High USB Speed device

ST72511: starter kit ST7CAN-DEMO

- CAN cell configuration
- CAN message transmission
- CAN bus monitoring
- ST72T511R9 microcontroller with CAN
- L9615D CAN line interface
- RS232 driver to interface to PC serial port
- Interface cable to serial port
- CAN cable
- “Getting Started” manual
- CD-ROM

SC410 PC/104: Windows CE Starter Kit HiCO486ST-CE300
Quantity orders HiCO486
See page 23 for more details

- HiCO486 embedded PC
- AMD ELAN SC410 processor / 66 MHz
- 16 MB DRAM; 16 MB Flash Disk
- VGA (320*240 to 1024*768)
- HiCOETS2 Ethernet adapter
- Microsoft® eMbedded Visual Tools 3.0
  + MS PlatformBuilder (evaluation edition)
- Windows® CE kernel, preconfigured
- Sample application, source code included
- Floppy drive
- Power supply
- Cable set
- Documentation

SC410 PC/104: VenturCOM ETS Starter Kit HiCO486ST-ET300
Quantity orders HiCO486
See page 22 for more details

- HiCO486 embedded PC
- AMD ELAN SC410 processor / 66 MHz
- 16 MB DRAM; 16 MB Flash Disk
- VGA (320*240 to 1024*768)
- HiCOETS2 Ethernet adapter
- VenturCom ETS real time edition
- Floppy drive
- Power supply
- Documentation
- Cable set

C167CR: Ethernet starter kit MCB167NET
See page 32 for more details

- Infineon C167CR CPU (or ST10F168)
- For US Software’s USNET and CMX’s MicroNET.
- Devices Supported Infineon C167CR, C167CS
- 1 MByte SRAM, 1 MByte FLASH
- 1x serial port (standard on-chip)
- 2x CAN ports (single or dual on-chip)
- Ethernet port using the Crystal CS8900A
- Prototyping Area (95mm x 50mm)
- 7.5-9 Volts DC, 300mA

Controller Area Network (CAN)

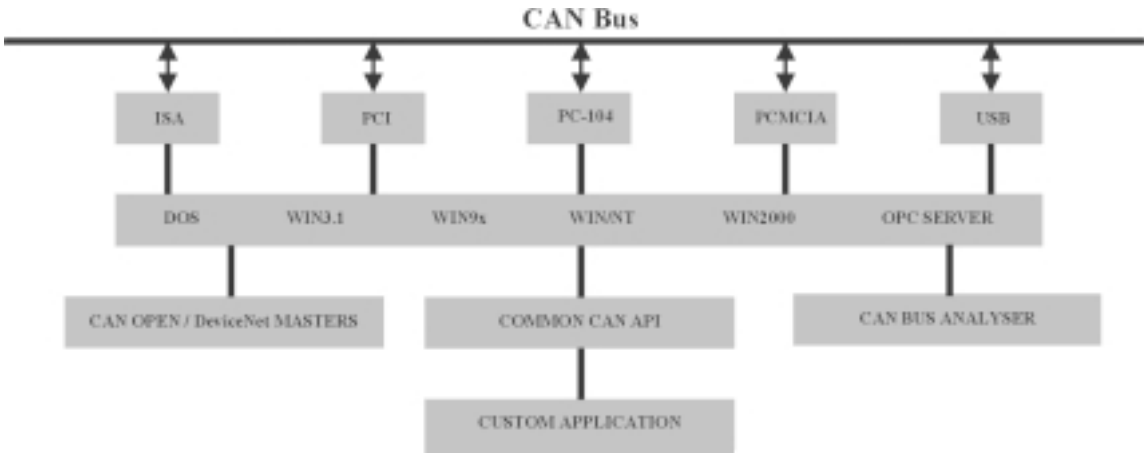
Controller Area Network (CAN) is now the commonest means for connecting microprocessing units. As a result of its automotive roots, it offers high data rates with robustness at low cost. Industry-specific application layers such as DeviceNET and CANopen ensure interoperatibility between products. Regular "Hands-On" CAN Tutorials held at our UK headquarters will give you the knowledge required to evaluate CAN for use in a future project or start work immediately in applying CAN in your current work.

For a full technical introduction to Controller Area Networking, see http://www.hitex.co.uk/can.

Softing PC To CAN Interface Cards

The Softing CAN PC cards are available in all popular bus formats including ISA, PCI, PCMCIA, PC/104 and USB. Each card hosts a powerful 16-bit microcontroller with dual ported buffer memory and one or 2 channels of CAN bus protocol.

All of the cards are capable of sustaining the full 1Mbit bus rate without overloading the host PC. The on board dual port memory can be used as a simple FIFO buffer or as an object buffer. In object buffer mode you can define up to 2K of message objects where each object is a receive or transmit CAN message. All communications tasks are handled by the on board microcontroller leaving the PC application to treat the CAN bus as a distributed database.



All Softing PC cards come with an API which provides a library of functions to allow easy configuration and communication over the CAN bus. This API is common to all the Softing CAN cards so code written for one PC format may be easily ported to a different format. The library is written in C and is available for DOS and Win 3.11 or with DLL support for Win 9x/NT and Win 2000. Application examples for all popular development tools are available on request.

As a high performance PC CAN card the Softing CAN application cards have long been the choice of interface card for high end CAN bus tools such as CAN bus analysers, application layer development tools, simulation tools and process control applications.

Free Sample Software And Documentation

For a free copy of the API manual and sample software please goto http://www.hitex.co.uk/softing for more details on how to get these.

The Ultimate in High Performance CAN Interface Cards

ISA CAN Interface Card

	Order Code
Single channel	CAN-AC1
Single channel with device net interface	CAN-AC1-DN
Dual Channel	CAN-AC2
Analysis hardware only required for Vector CAN analyser	OPT-CAN-AC2/ANA
Add on module for CAN 2.0B (29 bit ID's)	OPT-CAN-AC2/527

PCI CAN Interface Card

	Order Code
Part 2.0B CAN	
Single channel	CAN-AC1-PCI
Single channel with device net interface	CAN-AC1-PCI-DN
Dual Channel	CAN-AC2-PCI
Analysis hardware only required for Vector CAN analyser	OPT-CAN-AC2-PCI/ANA

PC/104 CAN Interface Card

	Order Code
Win CE support available	
Part 2.0B CAN	
Single channel	CAN-AC1-104
Single channel with device net interface	CAN-AC1-104\DN
Dual Channel	CAN-AC2-104
Dual channel extended temperature	CAN-AC2-104\E

PCMCIA CAN Interface Card

	Order Code
Dual Channel only	CANcard2
Analysis hardware only required for Vector CAN analyser	OPT-CAN-AC2-PCI/ANA
Part 2.0B CAN	

USB CAN Interface Card

	Order Code
Ideal mobile computing solution	
Single channel only	CANusb
Part 2.0B CAN	

PROFIBUS

Please contact directly us for Softing Profibus interface cards

CANanalyzer

You can rent a CANalyzer at www.hitex.co.uk/rent

The Vector **CANanalyzer** software is the ultimate tool for CAN bus analysis. The analyser gives you complete visibility of all bus activity which may be replayed to the network or analysed off line.

The **CANanalyzer** also supports the periodic generation of CAN messages and error frames. The "CAPL" C-like scripting language allows a 'virtual prototype' of a CAN node to exist within the analyser so its effect on a real network may be examined before the real node is implemented. The **CANanalyzer** also supports application layers such as **DeviceNet** SDS and **CANopen**.

Features:

- Real-time trace of CAN bus activity including error frames
- Display of individual message rates
- Periodic or manual generation of messages
- Logging of bus activity to hard disk, filtering of CAN bus messages
- Optional application layer support
- Bus statistics, watch window for individual messages
- Periodic or manual generation of CAN error frames
- Gateway between two buses including manipulation capability
- Replay of log files in on-line or off-line modes
- **CAPL CANanalyzer** programming language for simulation of CAN nodes available in CANalyzerPRO versions

Delivery:

- **CANanalyzer** standard (11-bit identifier)
  ORDER CODE: CANALYZERFUNSWIN
- Order Code: CANalyzerPROSwin
- **CANanalyzer** extended (11 & 29-bit identifier)
  ORDER CODE: CANALYZERFUNEWIN
- Order Code: CANAlyzerPROEwin
- Application layer support
  ORDER CODE: OPT-CANALYW/DN-FOR-DEVICENET
  ORDER CODE: OPT-CANALYW/SDS-FOR-SDS
  ORDER CODE:OPT–CANALYW/OPN-FOR-CANOPEN

(*N.B. The **CANanalyzer** software requires a Softing card fitted with the analysis extension)*

For example a **CANanalyzer** for 11 and 29-bit identifier with the CAPL script language using the PCMCIA **CANcard2** would require the following items;
CANCARD2 PC card +
OPTCANCARD/ANA Analysis Hardware +
CANALYZERPROEWIN Vector Software

CANalyzer for CANopen Analysis

CANalyzer for CANopen enables clear communication
monitoring at the application level. The CAN message traffic is displayed in a Trace window. The protocol information contained is decoded, and the parameters of the services are evaluated and displayed in plain-language text. These include all CANopen services such as NMT, LMT, SDO, PDO, EMCY, etc.

In addition to the trace window, the application data and statistic windows of CANalyzer are available for analyzing the CANopen data traffic. CANopen devices can be emulated or selectively tested in a very easy manner using the CAPL programing language.

Interfaces
Data exchange with configuration and engineering tools as well as master implementations is possible via the standardized EDS and DCF device description formats. The project database containing the editor CANdb is an integral component of CANalyzer for CANopen.

CANalyzer for DeviceNet Analysis

CANalyzer for DeviceNet offers symbolic object-oriented communication monitoring. Information such as source and target address, service request and response plus the fragmentation protocol can be displayed in a trace window. The CANalyzer software simulates a state machine for every DeviceNet object so that the DeviceNet frames can be properly interpreted. The information necessary for setting the state machines is gained from the bus traffic upon start-up of the network. The configuration determined in this manner can be stored and re-loaded for later measurements on the running system. Moreover, the application data and statistic windows of CANalyzer are available for analysing the DeviceNet data traffic. The CAPL programming language has been enhanced by DeviceNet-specific commands, allowing emulation of DeviceNet nodes in a very easy manner.

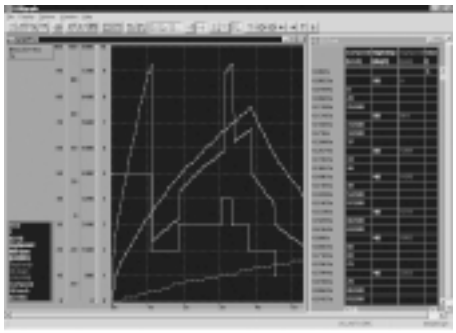
Interactive services

With the aid of the DeviceNet Message Builder integrated in CANalyzer, the user is able to produce and send DeviceNet messages along with the associated parameters.

Interfaces

The project database containing the editor CANdb is also an integral component of CANalyzer for DeviceNet.

CANgraph



The **CANgraph** software performs a graphical analysis of the data logged by the **CANanalyzer**. The graphical display includes search and zoom facilities and symbolic names may be added to individual CAN identifiers or data segments. Several files may be opened simultaneously and can be correlated with each other or to data calculated within the **CANgraph** software.

Features:

- Graphical display of CAN bus data
- Flexible graphical editor
- Addition of symbolic names
- Conversion formula can be applied to CAN data
- Display of multiple files
- Combined calculation and correlation between files

Delivery:

- **CANgraph** software
- User manual

ORDER CODE: CANGRAPH

CAN In Industrial Control

The CAN network protocol provides the layer 2 (Data link layer) of the ISO 7 layer network model communication between nodes. In a closed system, the layer 7 (application layer) can be freely defined by the developer. However for industrial control, interoperability between different manufacturers equipment is necessary. To ensure compatibility between different nodes, a number of application layer standards have been developed of which the most widely used are Device Net and CAN Open.

DeviceNet is an open network standard based on the can bus protocol. It is designed to provide a flexible communication system for I/O and simple field devices such as PLC's. Softing has been providing development tools for DeviceNET since its inception in 1992. The Softing AC1 and AC2 PC cards were used by Allen Bradley engineers while developing the original DeviceNet specification

Device Net Master API

Software libraries for Softing CAN cards to support development of PC based Device net master applications.

Device Net Slave development tool

Device Net slave development and testing tool for use with the Softing Can-AC2 (ISA) card only

Device net analyser

(Demonstration version available)
Optional extension to the Vector or WCT analyser to provide full symbolic analysis of a Device net network

Device Net slave source code

Device Net slave source code for embedded nodes, supports type two slaves. Please contact Hitex for a list of supported microcontrollers

CAN Open

CANopen unleashes the full power of CAN by allowing direct peer-to-peer data exchange between nodes in an organized and, if necessary, deterministic manner. Common device profiles allow well defined systems with ample scope for vendor specific features.

CAN Open Master API

Software libraries for Softing CAN cards to support development of PC based CAN Open master applications.

CAN Open analyser

(Demonstration version available)
Optional extension to the Vector or WCT analyser to provide full symbolic analysis of a CAN open network.

CAN Open OPC server and configurator

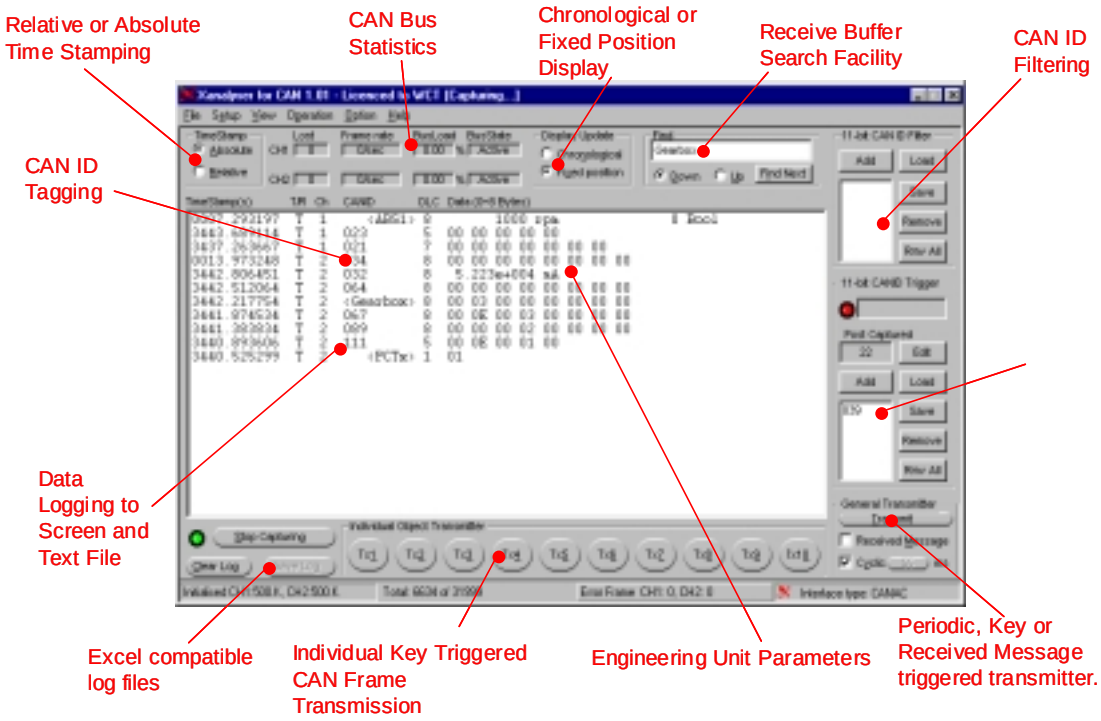
(Demonstration version available)
The OPC (Object linking for process control) provides standard interface to data existing on CANOpen networks for HMI and SCADA tools. The OPC toolset consists of a server application, configurator and client development kit for custom applications.

CAN Open slave source code

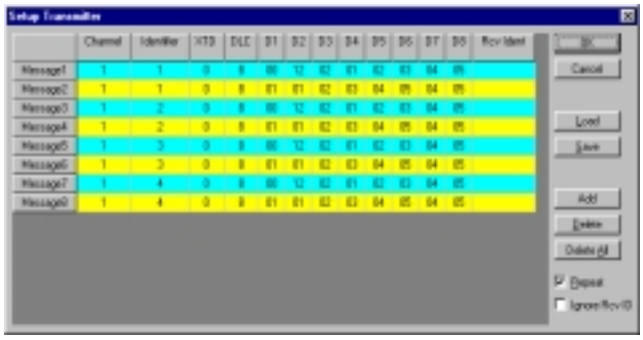
CAN Open slave source code for embedded nodes. Please contact Hitex for a list of supported microcontrollers

WCT Xanalyser - CAN Bus Analyser

The Xanalyser is a versatile analysis tool for CAN Bus protocol 2.0A and 2.0B. The Xanalyser includes a fully time-stamped trace of all bus activity, bus trigger tools message generator and calculation of bus statistics.



The message generator allows a user to transmit individual messages or groups of messages either by a predefined key stroke or periodically form a built in timer.



A user can also tailor the trace buffer display to a specific application. Messages can be filtered out of the display to reduce clutter; the numerical CAN identifier's may be replaced by user defined 8 character names and the raw CAN data may be converted to engineering units by user-defined arithmetic formulae. These features are essential for the quick and easy analysis of CAN bus traffic.

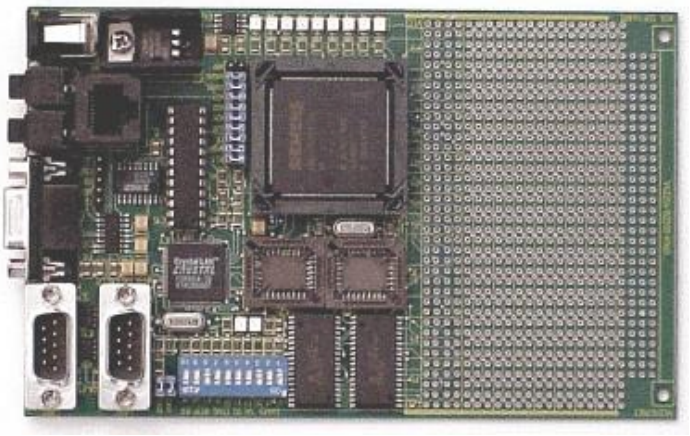
The Xanalyser may also be upgraded with basic Layer 7 support. Support is currently available for DeviceNET and CANOpen.

Xanalyser works with all Softing application controller cards, including the CANusb. Please make sure you include its serial number when ordering the Xanalyser for an existing Softing card.

You can rent a Xanalyzer at www.hitex.co.uk/rent

Embedded TCP/IP + CAN Starter Kit (C167/ST10)

The Keil MCB167NET evaluation board introduces you to the Infineon C167CR microcontroller, CAN, and TCP/IP (via the Crystal CS8900A Ethernet interface). This evaluation board includes a 4K-limited copy of the Keil C166 development tools.



The Keil MCB167-NET single-board computer is an evaluation board for the Infineon C167CR Microcontroller. The MCB167-NET evaluation board allows you to create C16x, CAN, and TCP/IP internet applications with the Keil development tools. The board provides a capable prototyping platform for your C167 projects.

The MCB167-NET TCP/IP kit includes the following components.

- MCB167-NET Evaluation Board,
- MCB167-NET User's Guide,
- Keil PK166 Evaluation C Compiler,
- PC 9-pin Serial Cable.

System Requirements

- PC with one available serial port,
- Windows 95/98/NT/2000,
- One 3.5 inch, 1.44MB disk drive,
- One CD-ROM drive.

Evaluation Software Included

The MCB167-NET Evaluation Board comes with a 4K-limited version of our PK166 Professional Developer's kit. This lets you get started writing programs to test the microcontroller and its capabilities. Example TCP/IP applications included are ARP and PING plus an embedded web server.

Technical Specifications

- Infineon C167CR CPU
- Devices Supported Infineon C167CR, C167CS
- ST Microelectronics ST10-167/168
- 16-bit non-multiplexed bus
- Up to 50 MHz (selected via DIP switch)
- 0 Wait States
- Power Supply 7.5-9 Volts DC, 300mA
- 1 MByte RAM
- 1 MByte high-speed (25ns)
- 1 MByte FLASH (sockets for AMD27C040)
- Standard on-chip serial port
- 2 single or dual on-chip
- 1x Ethernet ports 1 using the Crystal CS8900A
- 95mm x 50mm prototyping area

Upgrading MCB167NET To Full Specification Software Beginning Your Commercial Embedded TCP/IP Project

The MCB167NET TCP/IP starter kit will allow you prototype ideas and systems but to produce a real commercial product, you will need to upgrade the evaluation compiler and debugger included to the unrestricted versions. In addition, you will need to consider which TCP/IP stack you require. There are a number of factors to take into account in this decision which will have a major influence on your project so please do not hesitate to call us to discuss your specific requirements. Additional help is available our "Embedded TCP/IP Training Seminars", held regularly at our offices in Coventry - see http://www.hitex.co.uk/tcpip for seminar dates.

USB Introductory Training Seminar

Whilst from the user's viewpoint, USB devices are very easy to install and use, for the developer, it can pose some serious technical challenges, particularly in the control of the USB port from Windows.

Our USB tutorial aims to teach engineers the basics required to get USB up-and-running. Delegates are equipped with an USB microcontroller (Infineon C161U) and a PC. The theory of the various parts of USB is presented which is then put into practice using real hardware and software. At the end of the session, delegates will have constructed a real USB system from scratch and be well placed to implement it in their own projects.

Part 1: USB Theory
Examples of USB Enumeration and a simple OUT Pipe example with and without EPEC (extended PEC)
IN pipe with EPEC transfer
STALL and SUSPEND examples

Part 2: USBIO Windows driver configuration
USBIO OUT and IN Pipe examples
Integrating USBIO to external tools (i.e. Visual basic)

Booking Details
The tutorial starts at 10:00 and ends at approximately 16:30. The cost is £125, including refreshments.

USB Tutorial Dates In 2001
See http://www.hitex.co.uk/usb

Embedded TCP/IP Training

We run regular training sessions on embedded TCP/IP, based on the C167/ST10. Delegates are guided through how to produce a working TCP/IP+Ethernet system using either the CMX MicroNET or the US Software USNET suite. Embedded email and webseversare also covered.

The session occupies a full day and costs £125, including refreshments.

Booking Details
Please contact lbarnes@hitex.co.uk

TCP/IP Training Dates In 2001
See http://www.hitex.co.uk/tcpip

An Introduction to CAN Training Course

Hitex has been using and supporting the CAN bus for many years in the UK. This wealth of experience available as a training course based at our offices at The University of Warwick Science Park.

Our practical CAN experience is available as a half-day hands-on training course presented in conjunction with Infineon. The course covers the theory of the CAN bus protocol and includes practical exercises to familiarise a designer with real CAN systems. By the end of the course all the participants will have programmed their own CAN node.

Content:
- CAN operating principles and concepts
- Choosing the sample and baud rate
- Calculating the bit timing parameters
- Transmitting CAN messages
- The Remote Request Mode

Dates & Cost:
- See http://www.hitex.co.uk/can for dates in 2001
- £75 (+vat) to cover materials and refreshments

DeviceNet Developers' Training Course

An introductory course to the **DeviceNet** protocol. The objective of this training is to provide the necessary background to implement your first **DeviceNet** product/system.

Content:
- Overview of Industrial Control Networks
- General features of device net
- **DeviceNet** physical layer and media
- CAN overview
- **DeviceNet** communication model
- **DeviceNet** application model design
- Overview of **DeviceNet** Development tools
- **DeviceNet** configuration
- **DeviceNet** conformance testing
- Tour of **DeviceNet** demonstrator and conformance test facilities

Location:
- University of Warwick, Coventry

Dates & Cost:
- For further details Please contact
  Richard McLaughlin
  Tel: 024 76524711
  Fax: 024 76523387

hitex
DEVELOPMENT TOOLS

The following user groups provide current CAN information and development support.

CiA CAN in Automation
Am Weichselgarten 26
D-91058 Erlangen, Germany
Tel.: +49 9131 601 091
Fax: +49 9131 601 092

Warwick Manufacturing Group
University of Warwick, Coventry
Contact Richard McLaughlin
Tel.: +44 (0) 24 7652 4711
Fax: +44 (0) 24 7652 3387

Hitex (UK) Ltd. University of Warwick Science Park, Coventry CV4 7EZ
Tel: 024 7669 2066 Fax: 024 7669 2131 sales@hitex.co.uk http://www.hitex.co.uk