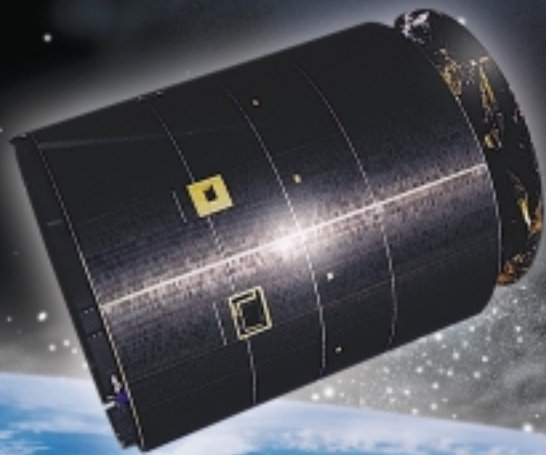


Serial communication with PCs

# Multi-COM

The intelligent 6-channel serial PC board



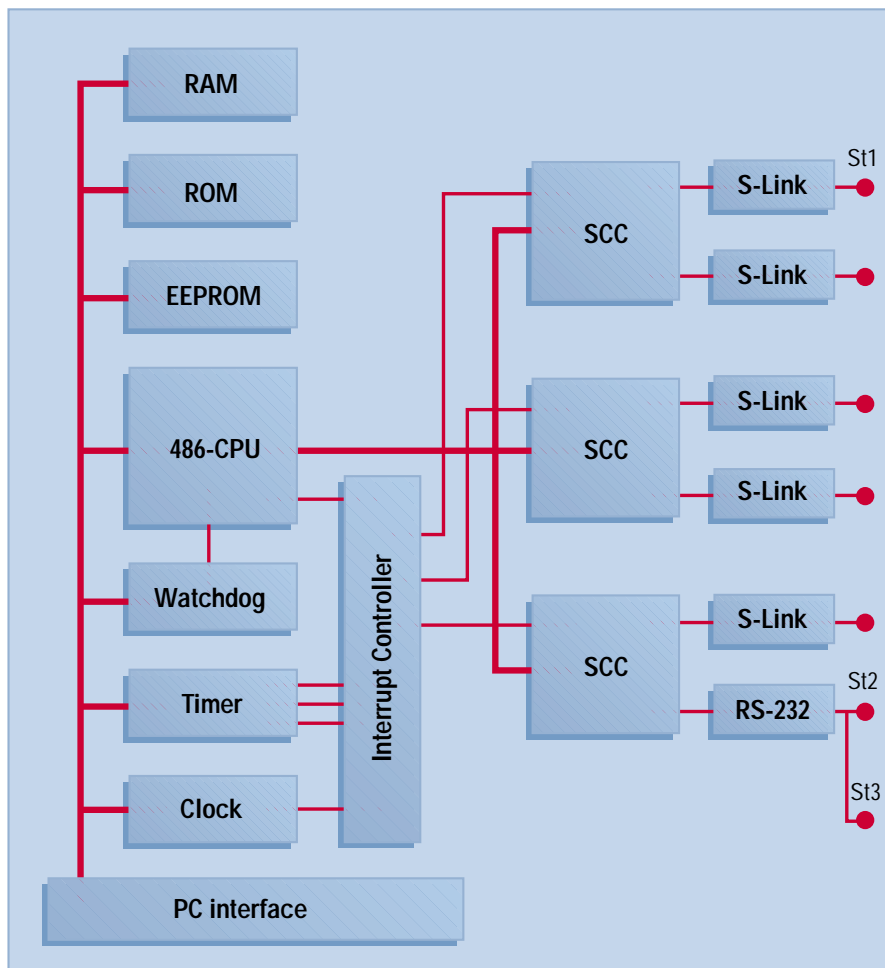
# Multi-COM

## The communication allrounder

Modern-day automation technology includes numerous tasks excellently suited for PC processing. However, the two lonely RS-232 standard interfaces with which a PC usually provides do not exactly predestine it for sophisticated communication services. Moreover, it is mostly the more powerful variants of the RS-422 or RS-485 type which are required for industrial purposes, with electrical isolation where necessary. In place of absolute voltage levels, these latter work with differential voltages, thus rendering them less susceptible to interference as well as enabling them to bridge significantly longer distances.

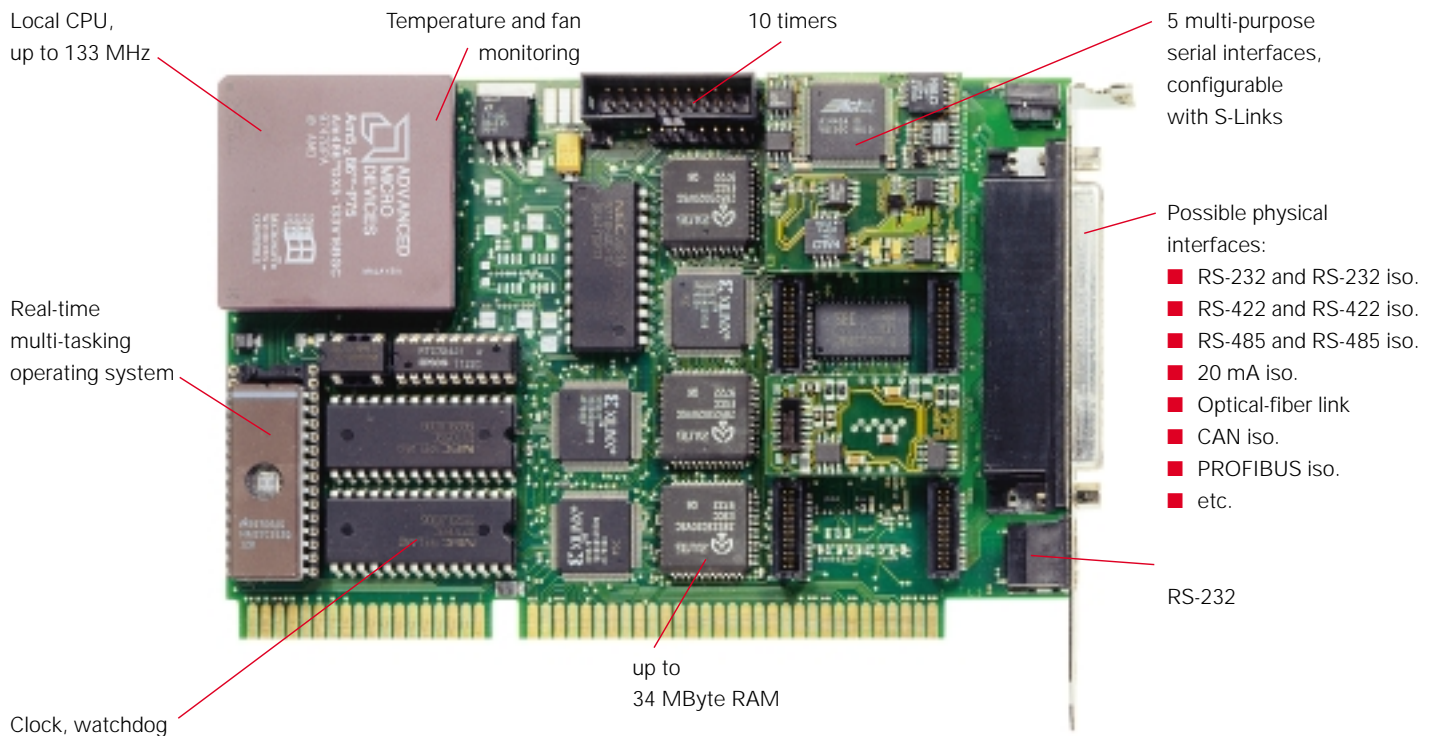
Sophisticated protocol handling may substantially downgrade a PC's performance, especially when more than one interface has to be served simultaneously. If in addition to this, real-time requirements also apply for certain processes, the usual PC standard hardware/operating system configuration will definitely soon come up against its limits. In cases like this, the most expedient technical option is to assign time-critical tasks and communication sequences to a subsystem operating in parallel, thus freeing sufficient computing capacities on the PC for the user interface to save, evaluate and graphically edit the results.

Block diagram of the Multi-COM board



### Special characteristics

- **Intelligent PC board with its own CPU and peripherals**
- **The board's local CPU works in parallel with the PC's CPU**
- **Available with 486 or 586 CPU, up to 133 MHz**
- **Up to 34 MByte RAM: DRAM (8 or 32 MByte) and bufferable SRAM (512 kByte or 2 MByte)**
- **Watchdog, NMI and RAM buffering logic on-board**
- **10 timers, each with interrupt capability**
- **Time and date (real-time clock)**
- **6 serial interfaces:**  
async, sync, HDLC, monosync, bisync, and other protocols possible (baudrate generator and DPLL for each channel)
- **5 hardware interfaces individually configurable (customer-specific as well):**  
RS-232, RS232 iso., RS-422, RS-422 iso., RS-485, RS-485 iso., 20 mA iso., CAN iso., PROFIBUS iso., optical-fiber link
- **1 RS-232 interface**
- **OsX real-time multi-tasking operating system on-board (in the EPROM or in the Flash EPROM)**
- **Drivers for MS-DOS, Windows 3.x, Windows 95, 98 and NT included in the package**
- **Communication protocols available, e.g. 3964/R**
- **Libraries for developing user protocols included in the scope of delivery**
- **100 % compatible with MODULAR-4/486 with 2 or 3 M-COM-2 modules**
- **Short PC board for 16-bit ISA slot, option for stand-alone operation (without PC)**



### Intelligent basis

The Multi-COM board for the ISA bus contains a complete computer with comprehensive peripherals on a PC expansion board. The board can work independently of the PC, meaning genuine parallel processing is possible (up to 8 boards in one PC).

A 486 or 586 CPU (clock frequencies currently up to 133 MHz) operates on the Multi-COM board; this CPU can be used for processing communication protocols, for example. A static and/or dynamic RAM serves for storing the communication programs and for buffering transmit/receive data. The board is available with a max. RAM size of 34 MByte. An EPROM contains the Multi-COM board's operating system. A watchdog timer, monitoring features for the fan, CPU-temperature and operating voltage ensure an appropriate response to any error occurring. For example, important data can still be saved in the event of a power loss. 10 timers, each with interrupt capability, are also provided, as is a real-time clock for date and time (likewise bufferable). The Multi-COM board can also be run in stand-alone mode.

### Configurable interfaces

The board contains a total of 6 serial communication interfaces and can be used for even the most complex communication jobs. For instance, it can be equipped with RS-232, RS-422, RS-485, CAN, etc. since the communication interfaces can be configured channel by channel using plug-on micro-modules, also referred to as S-Links. There is likewise

an option for implementing a fiber-optic interface. The S-Links' job is to match the respective signal levels and to provide electrical isolation for the interfaces. A total of five S-Links can be plugged on.

### S-Links for the Multi-COM

- RS-232, RS-232 iso.
- RS-422, RS-422 iso.
- RS-485, RS-485 iso.
- 20 mA (current loop)
- Optical fiber
- CAN iso. (CAN-controller incl.)
- PROFIBUS iso. (Slave-controller incl.)
- SSI iso. (2 channels)

The sixth serial interface is a complete RS-232 interface with all modem control lines. Each interface possesses its own baudrate generator and a DPLL, with the following operating modes: asynchronous, synchronous, HDLC, SDLC, monosync, and bisync. A basic program for buffered serial communication is available for synchronous and asynchronous communication tasks. And numerous communication protocols are already available, too, such as 3964/R, etc.

### Compatible with MODULAR-4/486

A special advantage, particularly for those users already familiar with the programming

of SORCUS boards, is the Multi-COM board's compatibility with the widely used MODULAR-4/486 boards from SORCUS. The Multi-COM board basically corresponds to a MODULAR-4/486 board, which is fitted with three M-COM-2 communication modules. The serial interfaces have been implemented with a total of 3 SCC building blocks (Z85C30 resp. Z85230; extended version with larger FIFOs). And a programmable quartz oscillator for the communication interfaces is additionally provided on the Multi-COM.

Thus all existing programs are compatible, and can also be used on the Multi-COM board.

The board's EPROM contains a real-time multi-tasking operating system for up to 1024 tasks. This operating system is used on all SORCUS boards and is excellently suited not only for communication jobs but also for other functions as well: for example, in addition to communication activities, further real-time programs for open- and closed-loop control as well as monitoring functions can be utilized, such as digital PID controllers, Fast-Fourier transformations, etc. There is an option for writing your own programs intended to run as a task on the Multi-COM, using the familiar PC development environments, without the need for a specific development tool.

Drivers for MS-DOS, Windows 3.x, Windows 95, 98 and Windows NT are also included in the Multi-COM board's scope of delivery, as are libraries and DLLs for all commonly used high-level languages.

# Multi-COM

## Technical data

<b>CPU</b>	586 (133 MHz) or 486 DX2/66	
<b>RAM</b>	Max. 34 MByte static: 512 kByte or 2 MByte (battery-bufferable) dynamic: 8 MByte or 32 MByte	
<b>ROM</b>	EPROM or Flash-EPROM, up to 512 kByte	
<b>EEPROM</b>	128 words, serial	
<b>Timers</b>	3 timers with a width of 16 bits, programmable input frequency 1 MHz, 2.5 MHz or 10 MHz, with interrupt capability; 6 timers in the SCCs and one in the real-time clock	
<b>Serial interfaces</b>	6, of which 5 configurable with S-Link (to 62-pin D-Sub connector); 1 RS-232 with all modem control lines (to 3-pin Mini-DIN plug connector and 20-pole plug connector) SCC 85C30 resp. ESCC 85230, programmable quartz oscillator	
<b>Max. Baudrate</b>	1.2 MBaud (async.), 5 Mb/s (sync.), applies for EM-2224 and for EM-2592, see last page	
<b>S-Link slots</b>	5	
<b>Interrupts</b>	Max. 15, some of them also available externally	
<b>Voltage monitoring</b>	Two response thresholds (4.8 and 4.65 V), NMI-triggering, buffering of RAM and real time clock	
<b>Temperature monitoring</b>	The CPU temperature is measured and monitored (with interrupt triggering)	
<b>Fan monitoring</b>	Speed monitoring with interrupt triggering and software-based fan control	
<b>PC interface</b>	16-bit parallel, bidirectional, with interrupt capability (locally and to the PC)	
<b>Clock</b>	Date (day, month, year, weekday) and time (hours, minutes, seconds) bufferable with external battery, interrupt capability (1/64 sec., 1 sec, 1 min., 1 h)	
<b>Multi-tasking operating system</b>	Included in the board's EPROM With real-time capabilities, max. 1024 tasks, interrupt tasks, timer-initiated tasks, and non-interrupt tasks	
<b>Power consumption</b>	+5 V (measured with 586-133 MHz, fan and LED off, without S-Links)	1.8 A
	+12 V	0.2 mA
	-12 V	0.2 mA
	-5 V	not connected
<b>Dimensions</b>	Board (measured without slot plate and D-Sub plug connector)	106 mm x 158 mm
<b>Compatibility</b>	Temperature (optional)	0 to 55 °C (70°C)
	Humidity (not condensing)	5 to 95 %

# S-Links for Multi-COM

The Multi-COM provides five slots for S-Links. S-Links are plug-on micro-modules with a standard connection pattern for serial interfaces, which enables all commonly used signal levels to be configured. Installation and/or replacement of S-Links can be performed by the customer. S-Links are available with or without electrical isolation. And there is also an option for plugging on a fiber-optic S-Link. S-Links are automatically recognized by the Multi-COM board, and the serial interfaces concerned are initialized appropriately.

## SL-232S



- RS-232 up to 220 kBaud
- Modem control lines: TMT, RCV, RTS, CTS, DTR, DSR, RI, DCD
- Additional functions:
  - RI as clock input
  - CTS as clock input
  - RTS as clock output

## SL-232i



- RS-232 isol. up to 220 kBaud
- Isol. modem control lines: TMT, RCV, RTS, CTS
- Additional functions:
  - CTS as clock input
  - RTS as clock output

## SL-232A/i



- RS-232 up to 220 kBaud
- Modem control lines: TMT, RCV, RTS, CTS, DTR, DSR, RI, DCD
- Additional functions:
  - Additional EXT RS-232 line as clock input 1
  - RI as clock input 2

## SL-232A/o



- RS-232 up to 220 kBaud
- Modem control lines: TMT, RCV, RTS, CTS, DTR, DSR, RI, DCD
- Additional EXT RS-232 line as clock output

## SL-422



- RS-422 up to 10 MBaud
- Modem control lines: TMT, RCV, RTS, CTS
- Additional functions:
  - CTS as clock input
  - RTS as clock output

## SL-422i



- RS-422 isol. up to 10 MBaud
- Modem control lines: TMT, RCV, RTS, CTS
- Termination resistors can be switched into circuit on the S-Link
- Additional functions:
  - CTS as clock input
  - RTS as clock output

## SL-485



- RS-485 up to 12 MBaud
- Switchover from transmit to receive either under software control, or automatically (e.g. for SDLC/HDLC)

## SL-485i



- RS-485 isol.
- Up to 12 MBaud
- Suitable for PROFIBUS
- Additional TTL output indicates transmit/receive, e.g. for ext. transceiver

## SL-20MA



- 20 mA isol. up to 38.4 kBaud
- Current loop
- 2 constant-current sources provided by the S-Link
- Can be passively or actively configured (if passively, then electrically isolated)

## SL-LWL



- Connection for plastic (SL-LWL/P) or glass fiber-optic link (SL-LWL/G)
- Cable length up to 1000 m
- JIS plug connector system from Toshiba

## SL-CANi



- With its own Intel CAN controller
- Transmission rate of up to 1 Mbits/s
- 11-bit and 29-bit identifiers
- Electrically isolated from the CAN bus
- Including software

# Programming

## High-level-language libraries and real-time

### Protocols

All the Multi-COM's communication interfaces can be operated with a wide variety of protocols. Those available from SORCUS include, for example, 3964/R, GE Fanuc, and Bosch LSV2.

There is also an option for developing your own protocols. Each serial interface provides its dedicated baudrate generator and a DPLL. The possible operating modes are as follows: asynchronous, synchronous, HDLC, SDLC, Monosync, and Bisync. When the appropriate S-Links are plugged on, PROFIBUS and CAN can also be implemented. For this purpose, SORCUS supplies ready-to-use communication programs, which facilitate integration into the software.

- 5 to 8 data bits
- 1, 1.5 or 2 stop bits
- With or without parity (even or odd)
- Handshake per XON/XOFF or with RTS/CTS
- Baudrates of 110 to 115,200 Baud
- Size of the transmit and receive buffers can be set

An application program or a superimposed protocol software package accesses the basic communication facility with function calls. Basic communication functions can be utilized both by PC and real-time programs on the board. All the requisite commands are included in the high-level-language libraries supplied with the board. You can use similar

libraries for the Multi-COM board as for the MODULAR-4/486 board.

### High-level-language libraries

These offer the operator a user-friendly interface for communicating from the PC with Multi-COM boards and are available for a variety of programming languages, like C, Pascal and BASIC, and for

different operating systems, such as MS-DOS, Windows 3.x, Windows 95, 98 and Windows NT. You can serve up to eight boards from one library.

The libraries handle the following tasks:

- configuring the board
- loading real-time programs onto the board
- data exchange between board and PC
- error handling
- interrupt handling

### Portability

The functionality of the libraries is the same for the various PC operating systems, which means that a particular application program (once it has been developed) can easily be ported onto a different operating system.

### Scope of delivery

All high-level-language libraries, plus the corresponding drivers, are included in the boards' scope of delivery. The current library versions are also available at any time in the Internet ([www.sorcus.com](http://www.sorcus.com)), free of charge. The operating systems and compilers supported are included in the listing below, together with their versions. If the compiler you're using is not mentioned there, please get in touch with SORCUS.



The SL-CANi CAN bus S-Link

### Synchronous and asynchronous communication

A basic program (CQ6) for buffered serial communication is available for synchronous and asynchronous communication jobs. You can implement user-specific protocols very easily on the basis of this software. Basic communication is set up on the PC using a utility program, and installed on the Multi-COM board. At the bottommost level, the CQ6 supports the following settings (e.g. for asynchronous communication):

### Operating systems and programming languages supported:

#### MS-DOS

- Borland C (as from Version 3.1)
- Microsoft C (as from Version 8.0)
- Watcom C (as from Version 10.0)
- Borland Pascal (as from Version 6.0); also Protected Mode

#### Windows 3.x

- Borland C (as from Version 3.1)
- Borland Pascal (Version 7.0)
- Borland Delphi (as from Version 1.0)
- Microsoft Visual Basic (as from Version 3.0)
- Microsoft Visual C (as from Vers. 1.0)
- Watcom C (as from Version 10.0)

#### Windows 95, 98 and Windows NT

- Microsoft Visual C (as from Vers. 4.0)
- Borland C (as from Version 5.0)
- Microsoft Visual Basic (as from Vers. 4.0)
- Borland Delphi (as from Version 2.0)
- DASylab

#### Under preparation:

- LabView drivers (1Q99)

# programming, protocols, CAN

## Real-time programming

All SORCUS boards provide their own micro-processor running an operating system with real-time capabilities: OsX. This enables genuine parallel processing with the PC to be implemented, which is more or less essential if data are to be acquired and processed in real time, especially when modern-day PC operating systems like Windows 98 or NT are being used. Data-acquisition and communication tasks can be run on the board in complete independence of the PC, thus freeing your PC to handle other tasks, like visualization and storage jobs.

The OsX multi-tasking operating system enables more than one process (task) to be executed simultaneously on a single board. Real-time programs running as tasks on the board are very easy to program for you as the

user, since you can access Borland's and Microsoft's standard compilers (Pascal or C++) during programming. A specific development environment is not necessary.

## Developing your own programs

To develop your own real-time programs, you have to proceed in three steps:

1. Enter and compile the real-time program concerned under Microsoft or Borland C++ or Borland Pascal.
2. Transfer the program onto the Multi-COM board.
3. Test and debug the real-time program with the Borland source code debugger (remote debugging).

## Structure of real-time programs

A real-time program's structure resembles that of a DOS program, except that the program code has been subdivided into what are called task procedures. Task procedures can be called from other tasks on the board or from the PC as well, e.g. to start or abort transmit or receive functions. In addition to the task procedures, the program also comprises what are called the parameter area and the data area. The parameter area will normally contain configuration and parameterizing data definable by the user, like baudrate, parity, etc. The data area can be used to accommodate the user data.

As with the task procedures, here too, other tasks on the board and the PC can very easily access parameters and data. The Multi-COM board's libraries provide a variety of functions for this purpose.

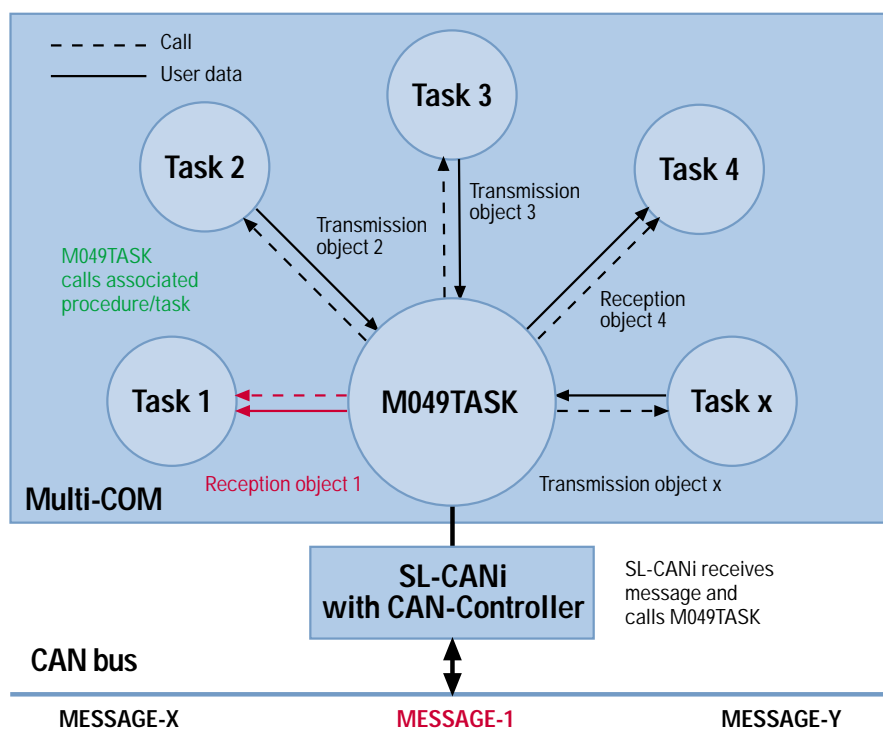
The completely compiled real-time program can be transferred onto the Multi-COM board either with the PC utility programs supplied or from one of the user programs by means of the PC libraries supplied.

## Debugging real-time programs

You can use the 'Turbo-Debugger' from Borland to test the real-time program developed exhaustively. This debugger enables a real-time program to be debugged just like a PC program, at the source code level. All the Turbo-Debugger's features, such as breakpoints, watch variables, etc. are of course available for this purpose.

## CAN

You must install the M049TASK driver software supplied on the Multi-COM for operating the SL-CANi S-Link. Together with the CAN controller on the S-Link, M049TASK ensures that messages are received and transmitted over the CAN bus. The application software communicates with M049TASK by function calls, which can be made both from the PC and from the board (in real-time).



Messages are sent via the CAN bus. SL-CANi receives and transmits messages. The messages are supplied from and to M049TASK. M049TASK passes on the user data received from the associated applications, or forwards user data to the associated applications.

# Fax Order Form to ++49-(0) 62 21-32 06-66

Company _____	Date _____
Name/Department _____	Please print name _____
P.O.Box/Street _____	Ordering No. _____
City/Post Code _____	Signature/Stamp _____

Ordering No.	Qty.	Brief description	Price/piece	Total price
<b>Multi-COM with 6 serial interfaces</b> (S-Links must be ordered separately.)				
EM-2140		Multi-COM: intelligent PC board with a 486-DX2 CPU (66 MHz internal), 512 kB static RAM, including fan, manual and connector		
EM-2173		Multi-COM: intelligent PC board with a 586-133 CPU (133 MHz internal), 2 MB static RAM, including fan, manual and connector		
EM-2224		Multi-COM: intelligent PC board with a 586-133 CPU (133 MHz internal), ESCC 85230, 10 MB RAM (2 MB static and 8 MB dyn.), including fan, manual and connector		
EM-2592		Multi-COM: intelligent PC board with a 586-133 CPU (133 MHz internal), ESCC 85230, 34 MB RAM (2 MB static and 32 MB dyn.), including fan, manual and connector		
<b>S-Links for Multi-COM</b>				
FM-2230		SL-20MA: S-Link for a 20-mA serial interface, current loop active or passive (if passive, then electrically isolated)		
FM-2231		SL-232S: S-Link for an RS-232 serial interface		
FM-2324		SL-232A/i: S-Link for an RS-232 serial interface, additional CLK-input		
FM-2325		SL-232A/o: S-Link for an RS-232 serial interface, additional CLK-output		
FM-2232		SL-232i: S-Link for an RS-232 serial interface, electrically isolated		
FM-2233		SL-422: S-Link for an RS-422 serial interface		
FM-2234		SL-422i: S-Link for an RS-422 serial interface, electrically isolated		
FM-2237		SL-485: S-Link for an RS-485 serial interface		
FM-2238		SL-485i: S-Link for an RS-485 serial interface, electrically isolated		
FM-2268		SL-DPSi: S-Link for a PROFIBUS-DP slave connection, electrically isolated		
FM-2269		SL-CANi: S-Link for CAN bus, electrically isolated		
FM-2270		SL-2SSli: S-Link for 2 synchronous serial interfaces ('Stegmann' compatible, 2 channels)		
FM-2585		SL-TEST: S-Link for testing all other S-Links		
<b>Manuals and Software</b> (One FM-2226 Manual is included in the board's scope of delivery.)				
FM-2181		Additional User Manual for the Multi-COM (German)		
FM-2226		Additional User Manual for the Multi-COM (English)		
SW-1442		3964/R protocol (Siemens S5), single licence (general licence on request)		
MA-1529		User Manual for the SCC (85C30 and 85230) (English)		
<b>Accessories for Multi-COM</b> (One FM-2229 plug connector is included in the board's scope of delivery.)				
K2-6259		Shielded cable, 1.5 m long, for the Multi-COM, one end with 62-pole D-Submin. plug connector, the other end with five 9-pole D-Submin. plug connectors		
K3-6260		Shielded cable, 3.0 m long, for the Multi-COM, one end with 62-pole D-Submin. plug connector, the other end with five 9-pole D-Submin. plug connectors		
FM-2229		Additional 62-pole D-Submin. plug connector with hood for the Multi-COM		
K2-4003		Serial connection cable for Interface B (debug cable), 1.5 m long, 3-pole Mini-DIN to 9-pole D-Sub.		
K3-5003		Serial connection cable for Interface B (debug cable), 3.0 m long, 3-pole Mini-DIN to 9-pole D-Sub.		

**Your local distributor:**

Total amount
+ dispatch charges
+ VAT
Sum total of invoice

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