C511 / C513 Starter Kit

Getting Started

V 3.0

06’96

2. Features of the C511/C513 Starter Kit

- Evaluation of the Siemens SAB-C511/C513 8-Bit microcontrollers including the derivatives :

  SAB-C511/ SAB-C511A / SAB-C513 / SAB-C513A / SAB-C513A-H[1]

- Programming of the SAB-C513A-H E2PROM derivative (12k) , directly with the starter kit board.
- Programming of the SAB-C511/C513 synchronous serial interface (SSC).
- Dual-controller mode, using both controllers on the board (the starter kit board is equipped with 2 controllers working independently; data exchange is established via the SSC interface).
- 7-segment LED display for debugging purposes (the 7-segment LED display is connected to the SSC interface).
- SAB-C501 compatibility: the starter kit board can also be used with SAB-C501 microcontrollers
- Evaluation of the powerful development tools for Siemens 8-bit microcontrollers with restricted versions of the tool chains from BSO/Tasking and Keil Elektronik (C-Compiler, Assembler, Linker, Locator).
- Program debugging with restricted versions of the Windows HLL debuggers from BSO/Tasking and Keil Elektronik. Both debuggers are running with Windows 3.0.
- Program debugging with standard product versions of the Windows/DOS HLL debuggers from BSO/Tasking and Keil Elektronik. Standard product versions are not included in the starter kit but fully compatible with the starter kit board hardware and firmware.
- Siemens application example programming the E2PROM of the SAB-C513A-H.
- Siemens application example for programming a SSC data exchange between SAB-C513 master controller and SAB-C513A-H slave controller.
- Development of small application programs with BSO/Tasking and Keil Elektronik tool chains.
- Siemens I/O routines, linkable to user programs.
- Siemens CD-ROM with application notes and electronic manuals.
- Software update service via Siemens Microcontroller Mailbox.

[1] starter kit board can also be used with C501 microcontroller

3. Introduction

Welcome to the Siemens C511/C513 Starter Kit !

The C511/C513 Starter Kit package contains complete documentation, hardware, software and application notes for Siemens SAB-C511/513 microcontrollers.

The SAB-C511/513 members of the Siemens C500 family of 8-bit microcontrollers, are fully compatible with the 8051 standard with enhanced features compared to the standard. A complete overview of Siemens 8-bit microcontrollers can be found in the appendix.

FEATURES

All the special features of C511/C513 microcontrollers can be evaluated with the starter kit package:

⇒ On-Chip SSC Peripheral: synchronous serial interface, full-duplex/ half-duplex, master/slave, up to 1.5 MBaud

⇒ 12 MHz Clock Rate

⇒ Watchdog Timer

⇒ 12 Kbytes E2PROM : programming of E2PROM, program execution out of E2PROM

⇒ 256 Byte XRAM memory: programming of XRAM memory

DOCUMENTATION

The Starter Kit package contains a complete set of documentation for C511/C513 family of microcontrollers in written or electronic form :

⇒ User's Manual for SAB-C511/ SAB-C511A / SAB-C513 / SAB-C513A / SAB-C513A-H microcontrollers

⇒ Data Sheet for SAB-C511/ SAB-C511A / SAB-C513 / SAB-C513A / SAB-C513A-H microcontrollers

⇒ Application note for programming the SAB-C513A-H E2PROM memory

⇒ Application notes and programming examples

⇒ Development Tool List (Hardware/Software/Literature) : can be found on CD-ROM or APPLICATION DISK

⇒ SIEMENS CD-ROM

APPLICATIONS

The Starter Kit package contains application notes, application programs, programming examples and utilities:

⇒ Application program for programming E2PROM of SAB-C513A-H (PC user interface and monitor)

⇒ Source code for E2PROM programming monitor

⇒ Terminal program

⇒ Source code for I/O routines and data base conversion

⇒ C500 disassembler

⇒ Programming example for the SSC synchronous serial channel

Additional application notes are in preparation and will be available on the Microcontroller Mailbox:

⇒ Hexloader application

⇒ XRAM application

⇒ SSC application: serial E2PROM connection via SSC

HARDWARE

The Starter Kit package contains the KitCON-513 board for hardware evaluation. Special features of the board are:

⇒ Standard Evaluation Mode: KitCON-513 is used as standard evaluation board[2]

Features: SAB-C513A-RN, 32k RAM, 32k EPROM, RS-232 interface, 7-segment LED display

⇒ E2PROM Programming Mode: KitCON-513 is used as a programmer for the 12k E2PROM of SAB-C513A-H

Features: second socket on KitCON-513 board is used as programming socket for SAB-C513A-H

⇒ Dual-Controller Mode: Double the performance with two controllers and test your SSC communication software

Features: standard controller and controller in programming socket are working independent from each other; standard controller is using board resources (RAM, EPROM, RS-232); controller in programming socket is executing program from internal E2PROM and has access to internal XRAM; data exchange between both controllers can be executed via SSC interface

TOOLS

The Starter Kit package also contains evaluation versions[3] of the new Keil and Tasking tool chains:

⇒ KEIL PK51 Eval V5.02 package

Contents: C51 ANSI C-Compiler, A51 Macro Assembler, dScope HLL Source Level Debugger for Windows , Simulator, Utilities and Examples, on-line Help, uVision Integrated Software Development Platform

⇒ BSO/TASKING 8051 Tool Chain Demo V4.0

Contents: CC51 ANSI C-Compiler, ASM51 Assembler, xfw51r CrossView ROM Debugger for Windows, Utilities, Examples, Complete on-line Manuals, on-line Help

MISCELLANEOUS

Addresses for further information:

⇒ SIEMENS Distributor List

⇒ SIEMENS Microcontroller Mailbox Info

⇒ SIEMENS WWW Server: http://www.siemens.de

[2] C513A microcontroller can be exchanged with C511, C511A, C513 or C501 microcontroller

[3] restrictions of both versions can be found in the according documentation of both tool chains

4. Getting Started

4.1 Software Installation

SIEMENS Application Disk

Please copy the complete application disk to your harddisk (including directory structure) :

```
xcopy a:*.* c:\c511c513\*.* /s /e /v
```

The directories `..\applic\e2prom.prg` and `..\applic\term.prg` should be included into your search path.

KEIL 8051 Evaluation Kit

Please install the Keil Evaluation Kit according to the installation instructions given in appendix F.

BSO/Tasking 8051 Tool Chain Demo

Please install the Tasking Tool Chain Demo according to the installation instructions given in appendix E.

Please install first C51 package (C51 Compiler Evaluation Kit) and then XVW51 package (C51 ROM-Monitor Debugger).

Installation from CD-ROM

C511/C513 Starter Kit software will be available on SIEMENS Semiconductor Group CD-ROM's starting from release:

Edition 6.1	:	CD-ROM: Technical Product Information for Siemens Semiconductors
Edition 2.0	:	CD-ROM: Application Notes and User Manuals for Semiconductors

Starter kit software is located on both CD-ROM's in directory **\MCB\STARTKIT**[4]**.** Please install C511/C513 starter kit software according to the instructions given on the CD-ROM in the **README.TXT** files. Installation from the CD-ROM is an alternative. Please check starter kit software on the CD-ROM for completeness and actuality, compared to the set of disks, included in the starter kit.

The CD-ROM also contains 8-Bit software and application notes in directory **\MCB\8_BIT** and subdirectories:

\MCB\8_BIT\APNOTES	application notes for 8-Bit microcontroller
\MCB\8_BIT\UTIL	utilities, e.x. C500 / 8051 disassembler adis51
\MCB\8_BIT\3RDTOOLS	third party tool lists; overview about software, hardware, literature; the directory also contains demo and restricted version of development tools

Using C511/C513 Starter Kit board with standard product versions of Keil or BSO/Tasking development tools

If you want to avoid the restrictions of the evaluation versions of Keil and BSO/Tasking tool chains, you also can use the full blown commercial versions of both tool chains. No adaptations for the compiler and assembler are necessary. It is recommended to use the include files (sfr_513.h) for definition of the C513 special function registers and bits.

[4] TEBIS 7.x CD-ROM contains complete \MCB directory tree as pkzip archive file MCB.ZIP in directory \UTIL. For installation of \MCB directory tree, we refer to README.TXT file in \UTIL

Also standard comercial versions of Keil dScope debugger (Windows and DOS version) and Tasking CrossView debugger can be used without any modifications with KitCON-513 board. Selection of the firmware monitor is executed automatically.

Software updates from SIEMENS Microcontroller Mailbox

Software updates for the Starter Kit will be provided on the Microcontroller Mailbox, e.x. new application notes, new firmware and new documentation. Updates can be found in directory **\public\startkit\c511c513**.

Software updates for the Starter Kit are stored in a compressed pkzip-format on the mailbox system. After downloading, please use **pkunzip.exe** tool for extraction. The **-d** option restores the directory structure stored in the zip file, e.x. :

```
pkunzip -d ap513v10.zip
```

Using C511/C513 Starter Kit with Freeware/Shareware

Freeware assembler and shareware products can also be used with the C511/C513 Starter Kit. No support is given from Siemens or Siemens distributors for freeware products! No modification to the starter kit can be offered !

Possible sources for Freeware/Shareware:

Siemens Microcontroller Mailbox:	**\public\8bit\freeware**
Internet WWW (8051 Home Page):	**http://www.ece.orst.edu**

4.2 Initial Setup of KitCON-513 Board

Please setup the KitCON-513 starter kit board according the **User's Manual for KitCON-513**.

4.3 EXAMPLE 1 : SSC Demo Application (Keil Assembler, Terminal Program)

After complete installation of all software, a samll demo application can be started, demonstrating programming of the E2PROM memory and the communication between two microcontrollers via synchronous serial channel interface (SSC). The SSC application is also a control that programming of the E2PROM worked pretty well.

The SSC-application in the C511/C513 Starter Kit handles a simple master - slave protocol and is written in assembler A51. The idea is to show the user how to configure the SSC/USART peripherals and to use the integrated assembler I/O-routines in connection with a terminal program.
The program itself is started by using a terminal program at the PC and by typing in a ´s´ to the keyboard. It gets two hex values (each one byte) from the keyboard and transfers them via SSC to the slave controller. All data transferred from the master controller to the slave controller additionally will be displayed at the one byte wide hex display.
The slave controller performs a multiplication of the two input bytes and waits until the master controller fetches the two bytes result. The result then will be send to the PC-terminal program and displayed.

The SSC demo application consists of two parts, which are available on the application disk:

\APPLIC\EPROM\SSC\SOURCE\SLAVE	**slave.hex**	slave program to be programmed into E2PROM
	slave.a51	source file for slave program
\APPLIC\EPROM\SSC\SOURCE\MASTER	**master.a51**	source file for master program

The slave program is running on the SAB-C513A-H microcontroller, located in socket U5 of the starter kit board. The program is executed out of internal E2PROM.

The master program is running on the SAB-C513A-RN microcontroller, located in socket U1 of the start kit board. The program is already stored in internal EPROM of the starter kit board.

4.3.1 Programming the E2PROM

The **slave.hex** program can be programmed into E2PROM with **prg51x.exe** programming monitor[5].

\APPLIC\E2PROM.PRG	**prg51x.exe**	E2PROM programming monitor interface program

Programming can be executed with:

⇒ Erase E2PROM memory (command :**E**)

⇒ Load slave.hex program into RAM
(command : **L H \applic\eprom\ssc\source\slave\slave.hex**)

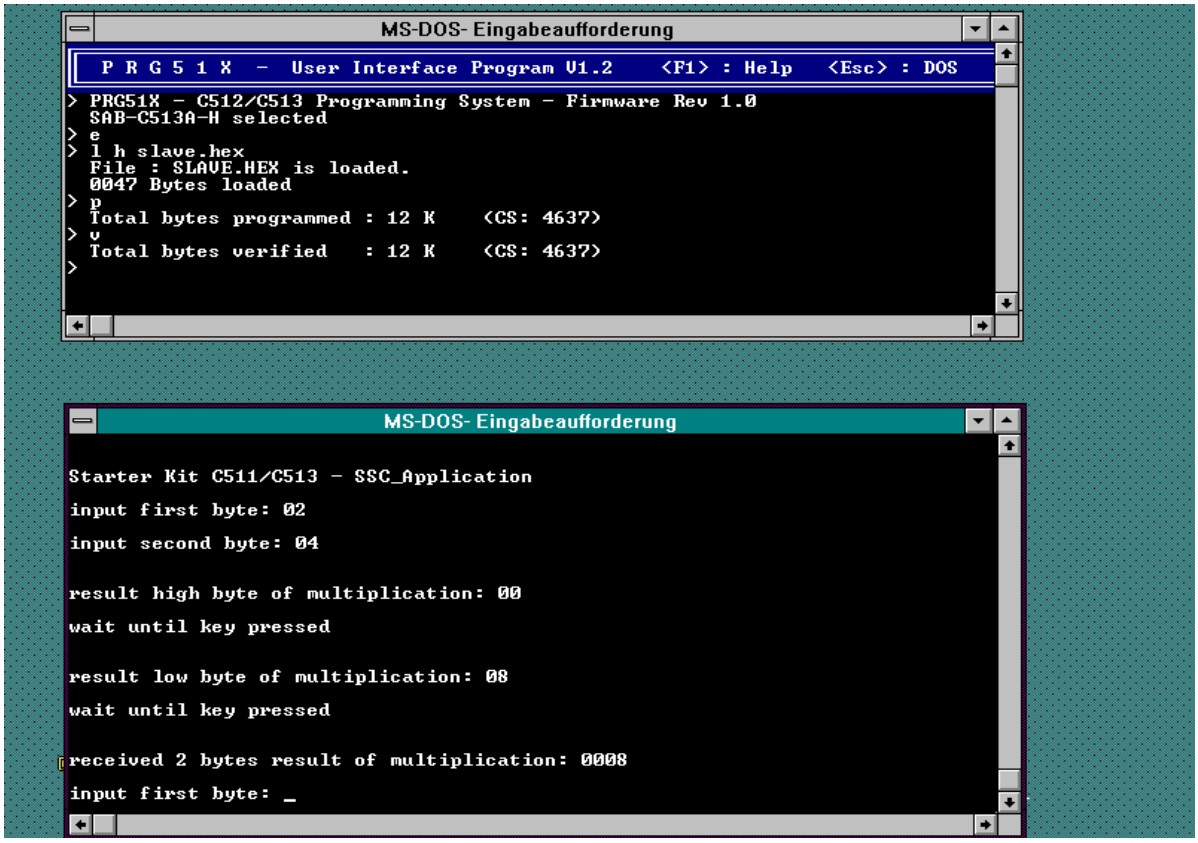
⇒ Program E2PROM (command :**P**)

⇒ Verify E2PROM (command :**V**)

⇒ Quit programming monitor (command : <ESCAPE>)

⇒ push reset button of starter kit board

prg51x.exe : programming slave.hex



term.exe : SSC application

4.3.2 Running the SSC Demo Application

The SSC slave controller is now programmed and the SSC demo application can be started:

The SSC master application is already stored in the EPROM of the starter kit board. Select the SSC program inside the firmware by sending **'s'** from the terminal program **term.exe** which is running on a PC, connected via RS-232 to the starter kit board. The terminal program is located in directory **\APPLIC\TERMINAL.PRG** of the application disk.

[5] see also charpter 5.1 and 6

4.4 EXAMPLE 2: SSC1 Application

(C-Code for Keil Compiler, Keil dScope Debugger)

The next example also demonstrates SSC communication between master and slave controllers. The example consists of two C programs, written for the Keil C-Compiler. Both programs can be compiled with the Keil evaluation package, included in the starter kit. The master program can be debugged with the Keil dScope debugger.

A complete introduction to the Keil evaluation package kit is given in the **Keil User's Guide for the 8051 Evaluation Kit** (see appendix).

4.4.1 Compiling Slave Application

\APPLIC\C_KEIL\SSC1\SLAVE	**ssc1_sl.c**	SSC slave program
	ssc1_sl.bat	batch for compilation

The slave application can be compiled with batch file **ssc1_sl.bat**. If problems occur, please check your path and environment settings.

4.4.2 Compiling Master Application

\APPLIC\C_KEIL\SSC1\MASTER	**ssc1_ma1.c**	SSC master program, module 1
	ssc1_ma2.c	SSC master program, module 2
	ssc1_ma.bat	batch for compilation

The master application can be compiled with batch file **ssc1_ma.bat.**

4.4.3 Programming Slave Application into E2PROM

The linker output file **ssc1_sl** can directly be loaded from **prg51** programming monitor interface program with command '**L O \applic\c_keil\ssc1\slave\ssc1_sl**'. Before programming the new application, the E2PROM should be erased.

4.4.4 Running / Debugging of SSC1 Application with Keil dScope Debugger

Keil dScope debugger can be started with a double click to icon **dScope** in program manager window **Keil PK51 Eval Kit**.

dScope is activated as a target debugger for the starter kit board with downloading **mon51.dll** with command '**File | Load CPU driver**'.

The next step is to load the SSC master application **ssc1_ma** with command **'FILE | Load object file**'.

Before you start the application, you should open the serial window for simulated input/output with command '**View | Serial window**'.

Also the debug window should be opened in a similar way, e.x. for HLL, mixed or assembly mode.

Setting a breakpoint at '`main`' with command '**bs main**' and issuing a go command with '**g**' starts program execution and stops at '`main`'.

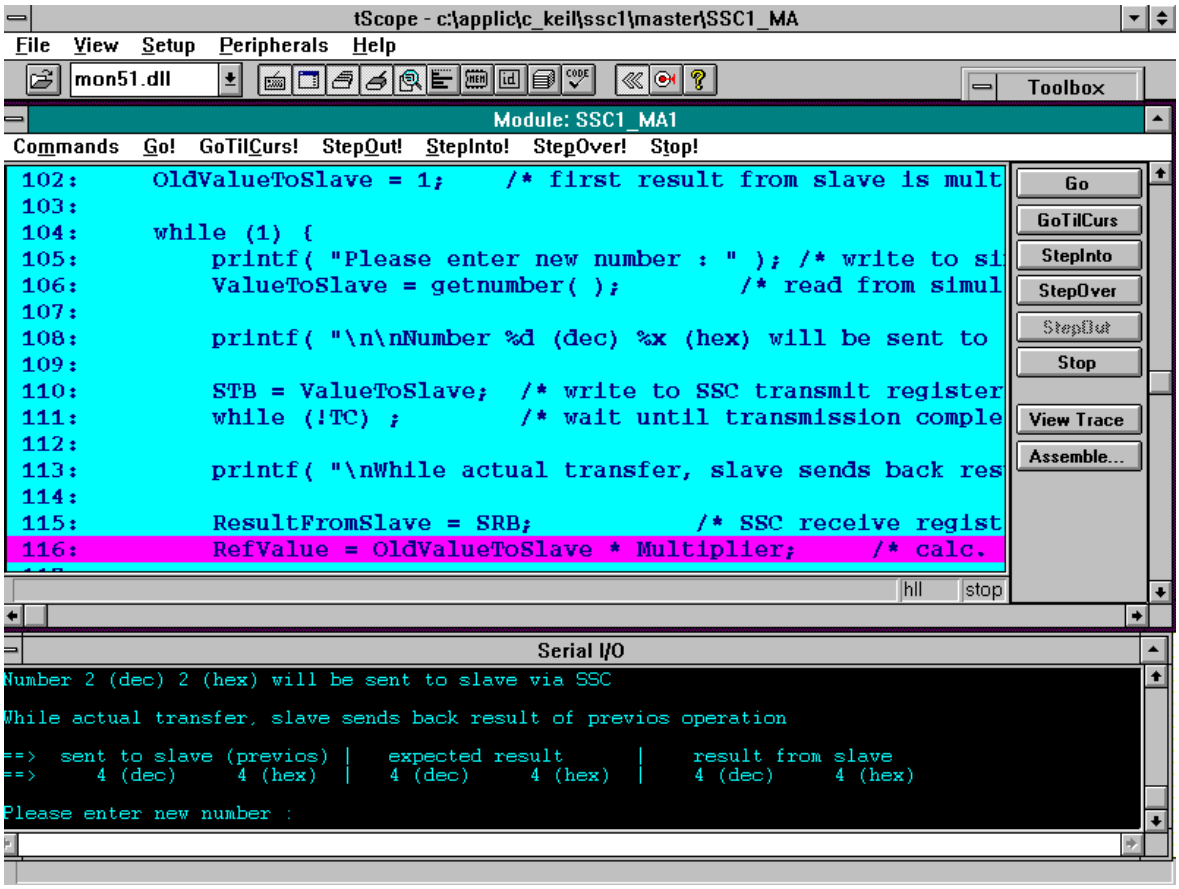
You can now tep now through the SSC initialization code or run the complete application with the ‘g’ command.

Like application example 1, SSC1 application handles input/output from the user interface to the SSC master application via serial channel. dSope debugger provides the possibility to use the simulated input/output feature, even if the serial interface is already used from the dScope debugger[6].

If string ‘**`Please enter multiplier`**’ occurs, select the serial window of dScope and enter a number. The number is sent via SSC interface to the slave controller. All the numbers which follow the prompt ‘**`Please enter new number`**’ are sent to the slave and multiplied with the first number. The slave sends back in full duplex mode the result of the preceding calculation while the actual number is transferred from master to slave. At the first transfer, the slave sends back the multiplier. Then all data sent to the SSC slave controller is displayed at the 7-segment LED display.

A complete overview about dScope commands can be found in the on-line help of dScope.

Further examples can be found in the **`EXAMPLES`** directory of the Keil evaluation package.



Keil dScope : ssc1_ma application

[6] using library function printf () for simulated IO may exhaust code size limit of evaluation package

4.5 EXAMPLE 3 : SSC_LED Application

(C-Code for BSO/Tasking Compiler, BSO/Tasking CrossView Debugger)

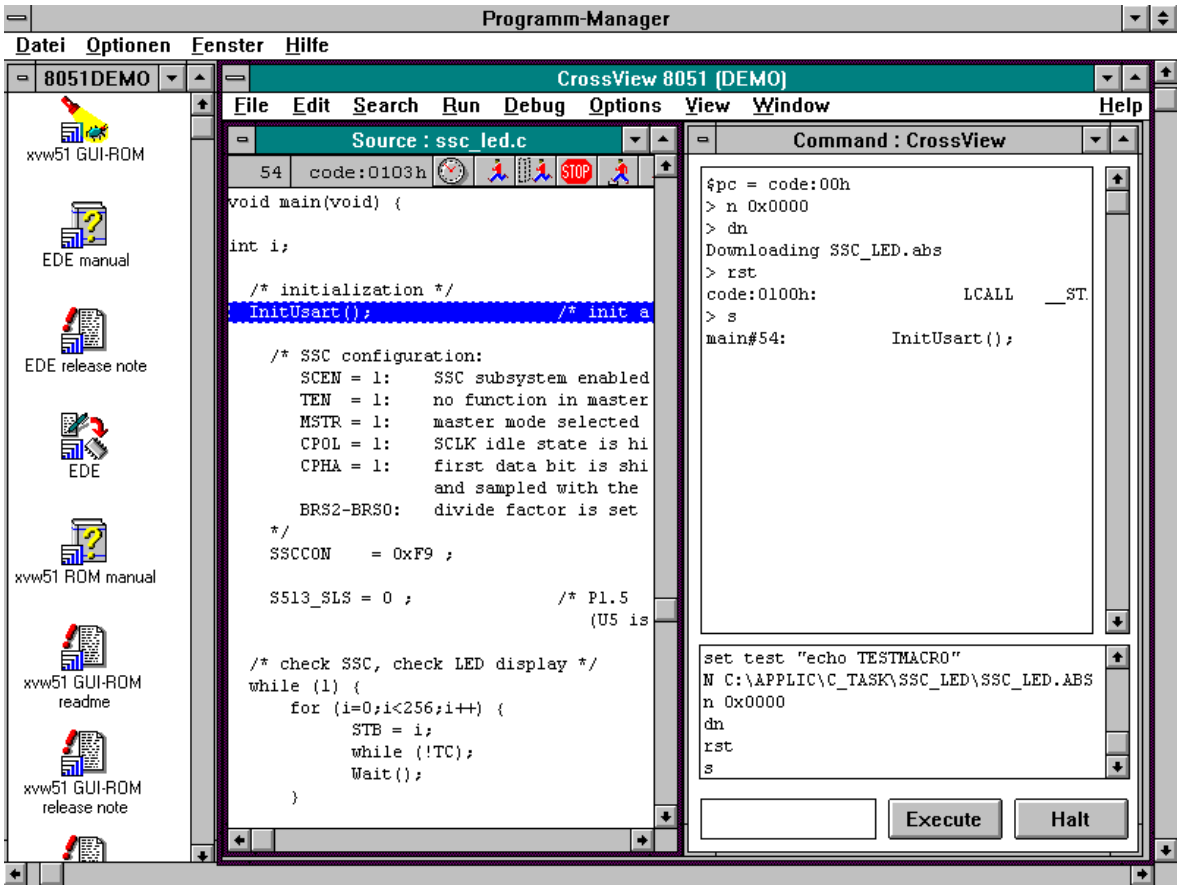
The next example demonstrates the Tasking Tool Chain with a small application which counts up one variable in an endless loop and writes the variable to the 7-segment LED display via SSC interface. The example consists of one C programs, written for the Tasking C-Compiler. The program can be compiled and debugged with the Tasking demo package, included in the starter kit.

A introduction to the Tasking demo package is given in the **`BSO/Tasking 8051 Tool Chain Demo`** (see appendix). The complete set of documentation for Tasking C-Compiler, Assembler, Utilities and CrossView debugger is also available on-line as Windows Help file !

4.5.1 Compiling the SSC_LED Application with BSO/Tasking Compiler

`\APPLIC\C_TASK\SSC_LED`	**`ssc_led.c`**	source code for ssc_led example
	`makefile`	makefile for compilation

The application can be compiled with Tasking makefile **`mk51`**. Please enter directory **`..\C_TASK\SSC_LED`** and type **`mk51`**. If problems occur, please check your path and environment settings.



BSO/Tasking on-line manuals and CrossView debugger : ssc_led application

4.5.2 Running / Debugging of SSC_LED Application with Tasking CrossView Debugger

Tasking CrossView debugger can be started with a double click to icon **xvw51 GUI-ROM** in program manager window **8051 DEMO**.

The SSC application **ssc_led.abs** can be loaded with **File | Load Application** menu. After loading the application, a reset should be executed with **Run | Program Reset**. Opening the source window with **View | Source | Intermixed** displays assembly and C-code of the application. For stepping through the application, you can use **<F8>** function key. A complete overview about CrossView commands is available in the Windows on-line manuals, e.x. in chapter 14 **XVW Command Reference** (icon: **xvw51 ROM manual**).

An alternate application example for the starter kit board is demo application **demo.c** which is located in directory **..\DCC51\EXAMPLES\XVW**. The application is already compiled for small memory model and the MCB-517 board layout (linker invocation : `mcb-517.ctl`). The absolute file **demo.sm** can directly be used for the starter kit board. After loading the application **demo.sm** a reset should be executed.

5. Modes of the C511 / C513 Starter Kit Board

5.1 Programming Mode

Programming mode is used for programming of the 12 k E2PROM of the SAB-C513A-H. The default configuration of the KitCON-513 facilitates programming mode. No modifications of the controller or jumper settings have to be done. The E2PROM controller is located in socket U5 of the starter kit board . The second controller SAB-C513A-RN, which is located in socket U1, controls programming. The second controller is connected via serial interface with the PC, which is running the user interface program PRG51X. The programming mode is selected automatically after board-RESET if the default configuration is jumpered and the user interface program PRG51X is started .

PRG51X starts up with the message:

```
PRG51X - User Interface Program V1.2      < F1 > : HELP     < ESC > : DOS
```

If the connection to the KitCON-513 is established correctly, the monitor response is displayed:

```
>     PRG51X - C512/C513 Programming System - Firmware Rev. 1.0

      SAB-C513A-H selected
```

Both 7-segment displays in socket U14/U15 display 0, if PRG51X is started.

For details about programming, we refer to the on-line help (F1) .

5.2 Single-Controller Mode

In single-controller mode, the controller, which is located in socket U1 is active. The second controller in socket U5 is disabled. The second controller in U5 is disabled via activating of the hold signal U5_RES at P1.6 port pin of U1-controller.

The default configuration of the KitCON-513 facilitates single-controller mode with SAB-C513A-RN in U1. On-board RAM and EPROM is accessible (see mapping mechanism).

In single-controller mode, both dots of the 7-segment displays in socket U14/U15 are not illuminated. The default display is 0.

If the E2PROM controller is located in socket U1 and jumper J2 is set to '1+2', program code from the internal E2PROM can be executed.

5.3 Dual-Controller Mode

Dual-Controller Mode is automatically selected if second controller in U5 is not held in a reset state via U5_RES signal.

The second controller works independently from the first controller. The first controller has access to the on-board resources EPROM and RAM., the second controller has access to internal 12-k E2PROM only.

The second controller can be reset with control signal U5-RESET.

The dual-controller mode can be used to establish a synchronous serial connection for data exchange between both controllers. The first controller in socket U1 is the SSC-master, the second controller is the SSC-slave.

6. Programming the SAB-C513A-H

Features of the Evaluation Programming System

The C511/C513 Starter Kit board can be used as an evaluation programming system for

SAB-C513A-H E2PROM devices.

The evaluation programming system provides the following features for programming the C513 E2PROM:

- Programming System with a RS232 interface for connection to a PC via serial interface
- PC user interface program provides
  - Load HEX/OBJ and BIN data into programming RAM
  - Display / change content of programming RAM
  - Program and verify EEPROM with programming RAM content
  - Read EEPROM(s) content into programming RAM
  - Save programming RAM content as BIN data file
  - Erase EEPROM
  - Check programmability of EEPROM

The evaluation programming system features all functions typically implemented in a programmer system. The absolute data file formats which can be handled by the evaluation programming system are the “Intel Absolute Object Format” (referenced as OMF-51 or OBJ) and the “Intel Absolute Hex File Format” (referenced as HEX). Additionally a BIN file format (bytewise storage of the RAM/EEPROM content without any address information) can be handled (read and written).

User Interface Program

The SAB-C513A-H evaluation programming system includes two software parts : the host controller firmware for the host controller hardware and the MS-DOS user interface program (PRG51X.EXE), which is the human interface to the evaluation programming system. Both software parts communicate together via a RS232 standard asynchronous serial data interface. Therefore, a well defined software protocol must be handled between both software parts . For details we refer to the application note PRG513AH.ZIP, available on the Siemens Microcontroller Mailbox.

The user interface program is command line orientated and provides typical programmer commands. It requires two parameters for operation : the number of display lines (25 or 43/50 lines) and the number of the PC-host COM port (1 or 2) used for communication. These two parameters are stored in a small configuration file. This configuration file (PRG51X.CFG) is created by the user interface program itself if it does not already exist in the current directory.

For proper operation of PRG51X.EXE the serial interface of the PC (especially its interrupts) must be correctly configured. The user interface program uses the interrupt feature of the COM ports for the reception of data bytes from the host controller hardware. At the PC-host, COM1 must be connected to IRQ4 or COM2 must be connected to IRQ3.

Commands of the User Interface Program

Command Type	*Command Syntax*	*Description*
Display Programming RAM	<D> <adr> <D> <adr1> <T> <adr2>	Display single RAM address Display RAM from “adr1” to “adr2”
Substitute/Change Programming RAM	<S> <adr> <S> <adr1> <T> <adr2> <W> <val>	Sequential change of RAM content beginning at address “adr”; a “,” selects next location, incrementing the address. Substitute RAM from “adr1” to “adr2” with “val”
Load Programming RAM with HEX/OBJ/BIN File	<L> <H> <filename> <L> <O> <filename> <L> <B> <filename> <S> <adr>	Load data of HEX-File “filename” into RAM Load data of OBJ-File “filename” into RAM Load data of BIN-File “filename” into RAM at start address “adr”
Save Programming RAM as BIN File	<T> <adr1> <T> <adr2> <I> <filename>	Save RAM data from “adr1” to “adr2” in BIN-File “filename”
Program EEPROM from RAM	<P> <adr1> <T> <adr2> {E} {V} <P> {E} {}V}	Program EEPROM with RAM content from address <adr1> to address <adr2> with optional erase or verify Program total EEPROM with optional erase or verify
Verify EEPROM to RAM	<V> <adr1> <T> <adr2> <V>	Verify EEPROM with RAM content from address <adr1> to address <adr2> Verify total EEPROM with RAM content
Read EEPROM into RAM	<R> <adr1> <T> <adr2> <R>	Read EEPROM content from address <adr1> to address <adr2> into RAM Read total EEPROM content
Erase EEPROM	<E>	Erase EEPROM
Reset Programmer	<X>	Software reset

The **“Display Programming RAM”** command displays the contents of the programming RAM on the screen of the PC. A single RAM byte or a specified RAM address range can be displayed. The screen output can be stopped by pressing the Ctrl-S key and proceeded again by the Ctrl-Q key.

The **“Substitute/Change Programming RAM”** command alters the programming RAM contents, bytewise with incrementing addresses or blockwise with a specific data value.

The **“Load Programming RAM with HEX/OBJ/BIN File”** command is used to transfer the absolute located data file, which are typically created by the 8051 family compiler, assembler, and locator programs, into the programming RAM. In case of HEX or OBJ file format, the user interface program scans the specified data file for absolute code information and transfers it into the programming RAM. In

case of BIN file format selection, the bytes of the specified data file are transferred sequentially into the programming RAM starting at the address which is specified in the command line.

The **"Save Programming RAM as BIN File"** command saves the contents of a specific area of the programming RAM in a BIN file. This file contains the data from the specified area byte by byte and can be loaded again as a BIN file into the programming RAM by the "Load programming RAM" command.

The **"Program EEPROM from RAM"** command programs a specified area of the SAB-C513A-H EEPROM or the with the content of the programming RAM. An erase EEPROM operation may optionally preceed the programming operation. A verify EEPROM operation may optionally follow the programming operation if selected in the command line.

The **"Verify EEPROM to RAM"** command is used to verify the content of a specified area of the SAB-C513A-H device with the content of the programming RAM. If a verify error is detected, an error message is displayed and the verify operation can be continued or aborted.

The **"Read EEPROM into RAM"** command is used to transfer (read) a specified area of the EEPROM of the SAB-C513A-H device into the programming RAM.

The **"Erase EEPROM"** command erases the complete EEPROM.

The **"Check EEPROM Device"** command checks the complete EEPROM for programmability. This check includes an erase, a write 00H data, a write 55H data, and a write AAH data operation. After the completion of the command a pass/fail message is displayed and the EEPROM is erased.

The **"Reset programmer"** command puts the evaluation programming system into an initial state (software reset operation). This command also selects the device type SAB-C513A-H.

Further Features of the User Interface Program

During the programming operation the Host generates a 16-bit (word) modulo-2 checksum (CS) over the data bytes which are read from the programming RAM. This checksum is displayed when the program command is terminated. During a verify operation, the Host also generates a CS checksum over the data bytes which are read from the programming RAM. So, if a verify after programming is selected, programming and verify CS checksum should be identical.
This feature checks whether data in the programming RAM is disturbed or changed during programming.

The last command which was executed, is stored and can be executed again by pressing the "Cursor-up" key.

For debugging purposes, it is possible to display the bytes which are transferred between Host and PC on the screen. This debugging mode invokes the User Interface Program by <PRG51X /D>. The bytes displyed in yellow are those bytes transferred from the monitor to the PC-host. The bytes displayed in cyan are those bytes transferred from the PC-host to the starter kit monitor.

The command list shown on the previos page can be read on-line with the help feature **<F1>** of the user interface program.

7. C511 / C513 Starter Kit Firmware, Mapping Mechanism and Memory Layout

The SAB C511/C513 Starter Kit contains a 32 kByte RAM and a 32 kByte EPROM. Aftert reset, the location of the EPROM is repeated twice in the address range (0x0000 - 0x7FFF and 0x8000 - 0xFFFF). The Starter-Kit board contains mapping logic which maps the RAM to location 0x0000 - 0x7FFF. The mapping mechanism is controlled with the /MODE control signal. The MODE signal is set directly after reset (see program listing **`select.a51`** on the application disk (directory: **`\applic\eprom\select`**).

EPROM Contents

The EPROM contains following programs:

- selection routine for USART initialization and branching to one of the following EPROM programs
- Siemens E2PROM programming monitor for programming of the SAB-C513A-H
- Siemens SSC application program
- Tasking monitor for operation with the Tasking CrossView-51 Debugger running on the PC-host
- Keil monitor for operation with the Keil dScope-51 Debugger running on the PC-host

USART Initialization

The selection routine initializes SAB-C513 USART to 9600 baud @12 MHz, using timer T2

(reload value: -39 dec., FFD9 hex.).

Configuration:	SCON :	#05Ah
	RC2L :	#0D9h
	RC2H :	#0FFh
	TL2 :	#0D9h
	TH2 :	#0FFh
	T2CON :	#034h

Program Selection

The selection routine jumps to the EPROM program, depending on the identification byte, sent from the PC-host via the serial interface. The debugger programs and the E2PROM programming interface send different identification bytes.

Program Type	*Address*	*Identification Byte*	*PC Program*	*Comment*
LJMP instruction **'LJMP 08003h'**	8000h - 8002h			before mapping of RAM to addresses 0000h-7FFFh, EPROM is also mapped to addresses 0000h-7FFFh
RAM/EPROM mapping **'CLR P3.5'**	8003h			RAM mapped to 0000h - 7FFFh EPROM mapped to 8000h - FFFFh
selection routine	8005h - 80FFh			branches to selected EPROM program, depending on the identification byte, sent from the PC
SIEMENS I/O routines	8100h - 84FFh			character/string I/O, conversion prog., BCD calculation
SIEMENS **SSC application example**	8500h - 8FFFh	73h ASCII: 's'	usable with any terminal program	first the identification byte 73h has to be entered on the terminal program side for branching to the SSC application in the EPROM (type 's')
Tasking monitor	9000h - AFFFh	03h	CrossView 51	restricted demo version of the Tasking debugger
Keil monitor	B000h - BFFFh	11h	DScope 51 TS51.EXE	restricted demo version of the Keil debugger
SIEMENS **E2PROM programming monitor**	D000h - E000h	22h	C513A-H E2PROM programming interface PRG51X.EXE	
SIEMENS	E000h - FFFFh			reserved for further applications

8. Port Signals

Pin	*Bit Addr.*	*Alternate Function*	*Starter Kit Function*	*Starter Kit* *Single Controller Mode (U1)*	*Starter Kit* *Dual Controller Mode (U1/U5)*	*Starter Kit* *Prog. Mode*
P1.0	90h	T2	PCS#	free	free	PCS#
P1.1	91h	T2EX	PRES	free	free	PRES
P1.2	92h	SCLK	SCLK	free	SCLK	free
P1.3	93h	SRI	SRI	free	SRI	SRI
P1.4	94h	STO	STO	free	STO	free
P1.5	95h	SLS#	SLS#	free	SLS#	free
P1.6	96h	-	U5_RES	U5_RES	U5_RES	U5_RES
P1.7	97h	-	U5_EA#	free	U5_EA#	U5_EA#
P3.0	B0h	RxD0	RxD	RxD	RxD	RxD
P3.1	B1h	TxD0	TxD	TxD	TxD	TxD
P3.2	B2h	INT0	INT0	INT0	INT0	INT0
P3.3	B3h	INT1	PROG#	free	PROG#	PROG#
P3.4	B4h	T0	not used	free	free	free
P3.5	B5h	T1	MODE#	MODE#	MODE#	MODE#
P3.6	B6h	WR	WR#	WR#	WR#	WR#
P3.7	B7h	RD	RD#	RD#	RD#	RD#

Pin	*Bit Addr.*	*Alternate Function*	*Starter Kit* *Keil Debugger* *Dual Controller Mode (U1/U5)*	*Starter Kit* *Keil Debugger* *Single Controller Mode (U1)*	*Starter Kit* *Tasking Debugger* *Single Controller Mode (U1)*[7]
P1.0	90h	T2	free	free	free
P1.1	91h	T2EX	free	free	free
P1.2	92h	SCLK	SCLK	free	free
P1.3	93h	SRI	SRI	free	free
P1.4	94h	STO	STO	free	free
P1.5	95h	SLS#	SLS#	free	free
P1.6	96h	-	U5_RES	U5_RES	U5_RES
P1.7	97h	-	U5_EA#	free	free
P3.0	B0h	RxD0	RxD	RxD	RxD
P3.1	B1h	TxD0	TxD	TxD	TxD
P3.2	B2h	INT0	INT0	INT0	not available
P3.3	B3h	INT1	free	free	free
P3.4	B4h	T0	free	free	free
P3.5	B5h	T1	MODE#	MODE#	MODE#
P3.6	B6h	WR	WR#	WR#	WR#
P3.7	B7h	RD	RD#	RD#	RD#

Explanation of signal names can be found in KitCON-513 User's Manual

[7] Dual-Controller mode can not be selected with Tasking debugger because INT0 is used by CrossView

9. Assembly Routines

The starter kit board firmware contains assembly routines for input/output and base conversions.

Source code of the routines is available in directory **\APPLIC\EPROM\IO_UTIL** in file **io.a51**.

The SSC demo application **master.a51** in directory **\APPLIC\EPROM\SSC\SOURCE\MASTER** can be used as an example for the usage of the I/O routines. Interface to the user application is a jump table, located at address 8100h.

```
OUT_CHAR          display byte
OUT_CHAR1         display byte (with CTRL-S and CTRL-Q)
IN_CHAR           read in char
OUT_STRING        display string
OUT_BYTE_ASCII    display byte as 2 ASCII chars
OUT_WORD_ASCII    display word as 4 ASCII chars
VALID_HEX         test of valid hex value '0 ...F'
ASCII_HEX         change '0'-'9' -- 00H-09H
HEX_ASCII         change 00H-09H -- '0'-'9'
BINBCD            change binary --> 2 BCD-bytes
BCDBIN            change BCD-byte --> binary
ADD_BINBCD        binary/BCD addition
SUBB_BINBCD       binary/BCD subtraktion
CPL_BINBCD        2/10 complement
```

Appendix B : Siemens Distributors

AVNET E2000 GmbH
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Fax (089) 4 51 10-129
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Fax (069) 7 38 07 12
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Stuttgart
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D-12165 Berlin
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85386 Eching
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FAX:089/3193510

Eurodis Enatechnik
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Pascalkehre 1
D-25451 Quickborn
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Fax (05 11) 61 59 798
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Fax (0 75 31) 6 72 60
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Neuss
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Fax (0 21 31) 91 89 30
Nürnberg
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Herrenberg
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FAX: 0039-51-6320220

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Göllnergasse 15	FAX:	0043-17-1711-6110
A-1031 Wien		

Switzerland:

Siemens Albis	Tel.:	0041-1-495-5383
Freilagerstr. 28	Fax:	0041-1-495-5050
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Scandinavia:

GLSI Elektronik AB	Tel.:	0046-8751-8900
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Schweden		
Farnell	Tel.:	00358-0-739100
Työpajakalu 5	FAX:	00358-0-7018131
SF-00580 Helsinki		
Finnland		

Spain:

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C/. Enamorados, 38, bajos	FAX:	0034-3-246 63 01
E-08013 Barcelona		
Anatronic	Tel.:	0034-1-542 44 55
Avda. d. Valladolid, 27	FAX:	0034-1-559 69 75
E-28008 Madrid		

Appendix C : Literature

User's Manual	SAB-C511/SAB-C511A SAB-C513/SAB-C513A-H C513A-H	B158-H6841-X-X-7600	LZF
Data Sheet	SAB-C511/SAB-C511A SAB-C513/SAB-C513A-H C513A-H	B158-H6842-X-X-7600	LZF
SIEMENS CD-ROM	Technical Product Information for Siemens Semiconductors	B192-H6641-X3-7400	LZF
SIEMENS CD-ROM	Application Notes and User Manuals for Semiconductors	B193-H6900-X-X-7400	LZF
Application Note	SAB-C512A-H / SAB-C513A-H Evaluation Programming System	Rel. 2'95	available on Application Disk

How to order Literature

Ordering of Literature: (applies only orders placed in Germany)

Send your order to

SIEMENS AG
LZF - Semiconductor Book Shop
P.O.B. 2352
90713 Fürth-Bislohe
Tel. + 49 - 911 - 6544 - 220/224
Fax. + 49 - 911 - 6544 - 238

Appendix D : Siemens Microcontroller Mailbox

Siemens Microcontroller Mailbox Services

- Download of application notes and articles for 8-/16-Bit microcontrollers
- Download of application programs for 8-/16-Bit microcontrollers (eg. bootstrap loader program, FLASH programming, EEPROM programming , ...)
- Download of up-to-date status information for 8-/16 microcontrollers (eg. errata sheets)
- Download of demo or restricted versions of third party tools
- Overview of SIEMENS European distributors
- Information updates on 8-/16- bit microcontrollers

Prerequisite

All you need is a modem and a terminal program, e.g. Procomm, Telemate, Telix, Windows terminal program

Your modem should be set to 8N1 (8 data bit, no parity bit, 1 stop bit), hardware flow control XON-XOFF should be enabled.

The mailbox modem accepts connections with V.22 (1200 bit/s), V.22bis (2400 bit/s), V.32 (9600 bit/s), V32.bis (14400 bit/s) and V32.terbo (19.200 bit/s).

Error Corrections and Compression due to V.42, V42.bis, MNP1-MNP5 are also accepted and strongly recommended !

The mailbox software supports X-Modem, Y-Modem and Z-Modem transfer protocol. You should select Z-Modem transfer protocol if your terminal software supports this type of protocol.

Phone Number

The Siemens Microcontroller Mailbox is available 24 hours, 7 days a week at mailbox number:

+ 49 - 89 - 498431	**(international)**
089 - 498431	**(Germany)**

Account

A special starter kit account is installed for you. The account provides you full access to nearly all mailbox directories. You will also get additionally update information at login time.

Login:	**c511c513**
Password:	**startkit**

Main Command Level Overview

After successfull login, following commands are available at main level :

• **?**	Display all available commands at main level
• **help** under	Entry to help menue command level. Help can be selected for items, listed Topic?
• **help upload**	Entry to help menue, topic 'upload'
• **help download**	Entry to help menue, topic 'download'
• **contents**	Display file listing of the complete download area
• **files**	Switch to file up/download command level (see 8.)
• **errata16**	Status information: 16-bit errata sheets
• **errata8**	Status information: 8-bit errata sheets
• **notes16**	Information on 16 bit microcontroller and development tools
• **disti**	Siemens distributor list
• **exit**	Exit mailbox

File Up/Download Command Level Overview

After execution of **files** command at main level, following sub-commands are available:

?	Display all available sub commands for **files** command
• **d** (ir)	Display directory contents
• **l** (og)	Change directory
• **.**	Change directory (one level up)
• **p** (rotocol)	Select transfer protocol (Z-Modem / Y-Modem / X-Modem)
• **r** (eceive)	Start uploading
• **s** (end)	Start downloading
• **n** (ew)	Search for new files since date specification (e.x. ' **n** 24-jan-95')
• **f** (ind)	Search for files (e.x. '**f** flash*.exe')
• **v** (iew)	View files; this command s hould be used for ASCII files only
• **q** (uit)	Quit **files** command level, switch to main command level