

# **MiniMon**

User Manual

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# MiniMon

## User Manual

### Introduction

The idea of MiniMon is a tiny monitor program that is started via bootstrap loader to any C16x XC16x micro controller system. The monitor is initially located in the internal RAM, and therefore it works on any target hardware (bootstrap loader required), especially single chip applications. It can be relocated to any address (internal or external memory) at any time. The monitor has only a few simple commands (read memory, write memory, write word, jump segment...), all intelligence is provided by the front-end.

The front-end, which runs on Windows 95/98/Me, Windows NT and Windows 2000/XP, provides several functions:

- Hex editor functionality: load, save Intel Hex or binary files, modify, print
- Memory transfer functions: download, upload and compare any memory area
- Program, erase, (un)lock, (un)protect Flash/OTP/EEPROM areas
- View options: view memory as assembler code, 16 Bit or 32 Bit values
- Load and start user applications
- Call user subroutines
- SFR view: display and change SFR values, arranged in several register sets
- Terminal function: send and receive any data via RS232
- Scripting: A command can be selected either via menu or executed in scripts

The main advantages of Minimon is its compactness, its ability to locate free (without recompile/link) and its easy memory access functions. It works on a kind of „hardware“ level and has (nearly) no access restrictions.

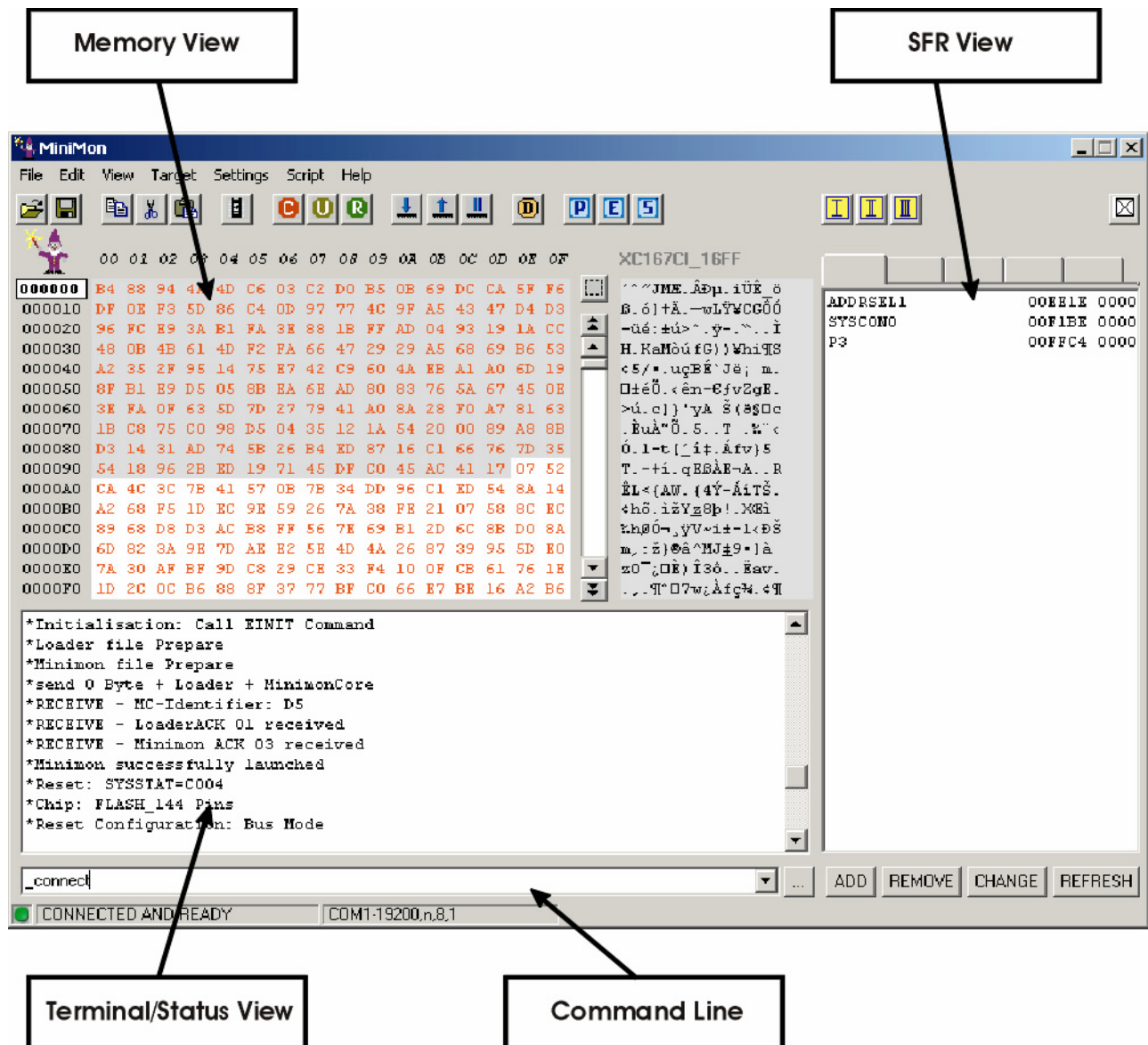
The front-end has a terminal view that shows all data received over the serial interface (e.g. debug outputs via printf).

The main applications of MiniMon are hex editing, memory dumps, Flash/OTP programming, tests of micro controller peripherals and external hardware, downloading and starting of user applications.

## Frontend Overview

The front-end of MiniMon consists of 4 parts:

- Memory view
- Terminal/Status view
- SFR view
- Command line



The memory view shows the current memory contents as hex values. Of course it is possible to change the values. The memory area has an ASCII-section, too.

The terminal/status view is used by the front-end to output status and error messages. It is also used to view received serial data while running an user application.

The command line (below the terminal/status window) is used to give commands to MiniMon (as text). It can be used to send any bytes or text strings (like a terminal), too.

The SFR view is used to display SFR register contents and to change them. SFR Registers can be arranged in up to 5 independent Register sets, where 1 set is displayed at a time.

## Memory View

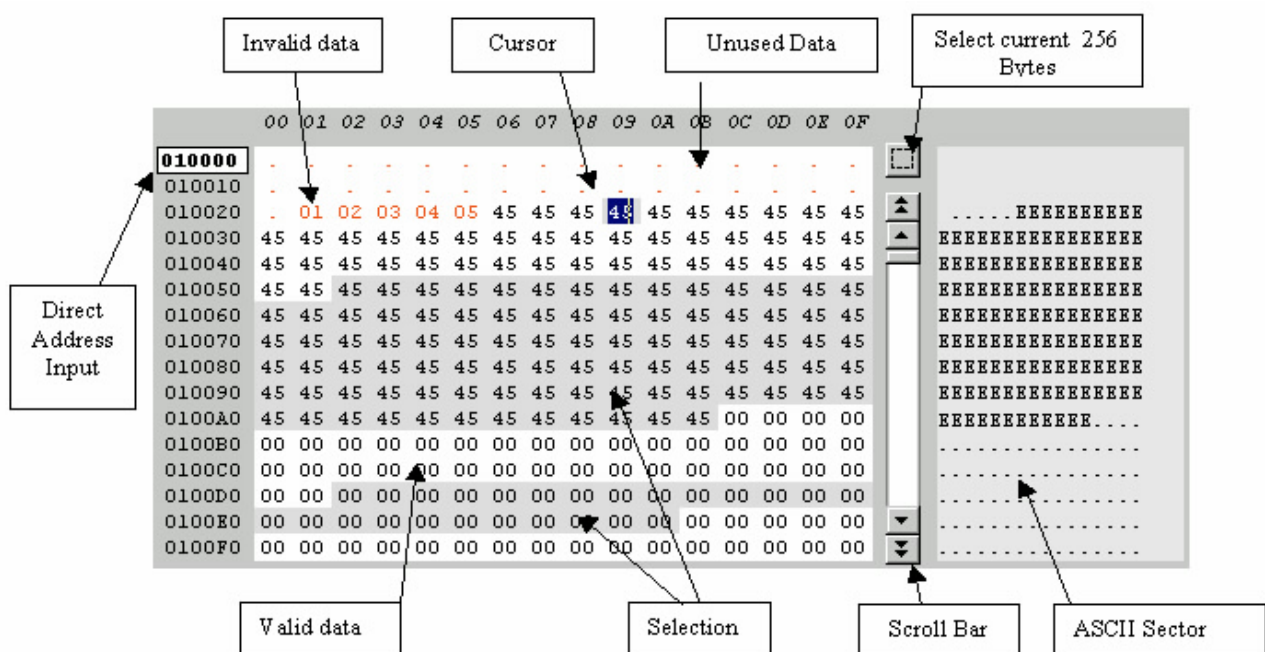
### *Representation of memory contents*

It is distinguished between used and unused memory areas. An unused memory byte is viewed as a blank character (initially a point, can be set by user). Used bytes are displayed as hexadecimal 8 Bit values.

Besides, the used memory areas can be distinguished further between valid and invalid data. Data that was just uploaded or (correct) downloaded is valid, changed values or loaded files are principally invalid, until they are downloaded or programmed.

This means, the target memory area is NOT corresponding 1:1 to the displayed memory contents. This is caused by the fact that Flash or OTP memory areas can't be written or changed transparent and instant.

Valid data is displayed by black hex numbers, invalid data is displayed by red hex numbers (initial values, can be set by user).



### *Changing the displayed memory range*

The memory view can display 256 bytes of the memory contents at a time. Initially, the memory values from address 000000 to 0000FF is displayed. If a file is loaded, the first used address is displayed. To scroll the memory within the current segment, the scroll bar right of the memory view can be used. To step through the segments, the aligned double arrows can be used.

The second and recommended way to change the displayed memory range is to put the display start address directly into the white text field in the upper left corner of the memory view (Direct Address Input).

Scrolling can be applied by the keys PgUp and PgDown, too.

### *Changing the memory contents*

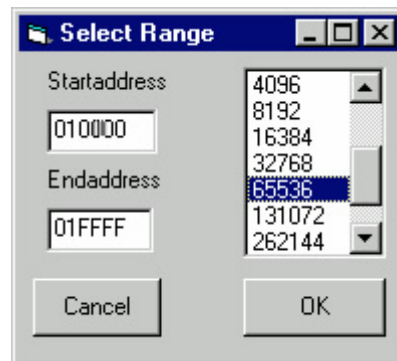
It is possible to change a memory value. Therefore it is necessary to click with the mouse into the according field and type in the value. To mark a selection as unread, the Del key is used

The arrow keys can be used to move inside the memory view.

### *Selections*

In the memory view, it is possible to select a memory range. Selection is important, because it's the base of most commands like upload, download, compare, program, disassemble, fill, unread, copy, cut, save. All these commands concern the selection.

A simple way to select a memory range is the menu: Choosing Edit / Add selection will ask for selection start and end address. Nevertheless, it is possible to input the start address and a given selection size, too:



The other way is to make a selection by the cursor. Move to the selection start address, press the SHIFT key and move to the end address. Any further move of the cursor without pressing SHIFT will remove all selections.

Nevertheless, a third way exists to make a selection within the current displayed memory range: it is done by mouse, pressing the left button at the selection start, move to the selection end and release the button.

Multiselections are done like described above, but additionally it is necessary to press the CTRL key. Otherwise, any cursor movement will remove all selections.

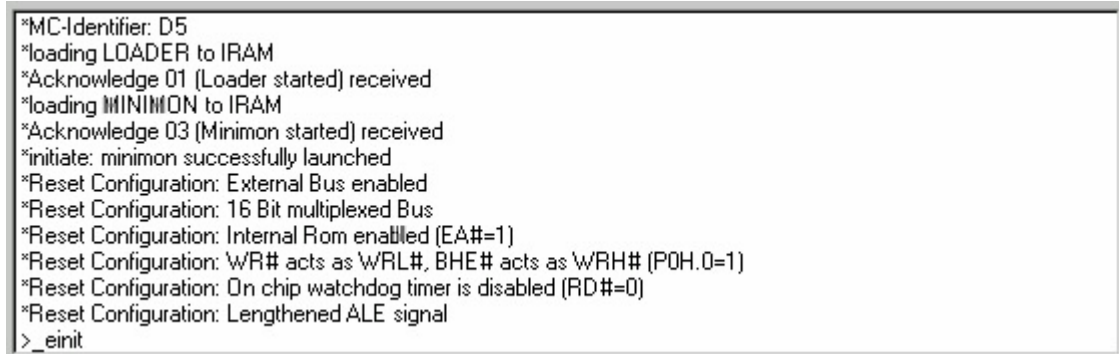
### *Clipboard*

It is also possible to use the clipboard to copy or move memory contents from one address to another. Besides, the copy command puts the currently selected memory contents to the Windows clipboard as text, for documentation issues and to reuse them in other programs.

Therefore, use the menu commands edit-copy, edit-cut, edit-paste. It is also possible to use the conventional short-keys CTRL-C, CTRL-X and CTRL-V. A third way of using the clipboard are the shell commands `_copy`, `_cut` and `_paste`.

## Terminal/Status view

The terminal/status view displays all MiniMon status and error messages (beginning with \*). It also repeats all shell commands (beginning with >).



```
*MC-Identifier: D5
*loading LOADER to IRAM
*Acknowledge 01 (Loader started) received
*loading MINIMON to IRAM
*Acknowledge 03 (Minimon started) received
*initiate: minimon successfully launched
*Reset Configuration: External Bus enabled
*Reset Configuration: 16 Bit multiplexed Bus
*Reset Configuration: Internal Rom enabled (EA#=1)
*Reset Configuration: 'WR#' acts as 'WRL#', 'BHE#' acts as 'WRH#' (P0H.0=1)
*Reset Configuration: On chip watchdog timer is disabled (RD#=0)
*Reset Configuration: Lengthened ALE signal
>_einit
```

After starting an user program, it displays all data received by the serial interface as hexadecimal or as ASCII Text (terminal display type can be changed by user).

It is possible to select any text in the terminal view and to copy it to the clipboard.

Double-clicking on an already executed command (leading ,>') puts this command to the command line again.



## Command line

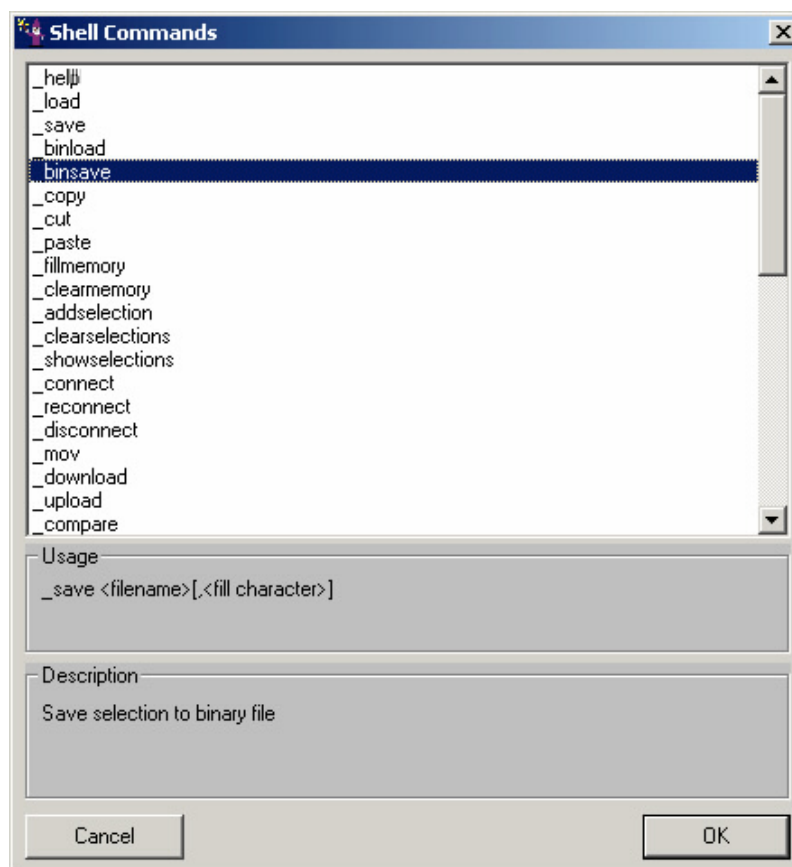
The command line is used to input commands. It is an alternative way to the menu and toolbar giving instructions. Besides, it can be used to send serial data directly, too (e.g. to application).



The last commands that were input to the command line are stored and available as command history. Use the list field to repeat a previously executed command.

### *Command selector*

To see all usable shell/script commands, use the comfortable command selector by pressing the corresponding button.



In the appearing command selector window, all valid commands are listed, with usage message and a short description.

## Commands

Additionally, all commands can be displayed by the command `_HELP`. The commands are the same as used in scripts.

The following commands are accepted:

COMMAND	PARAMETERS	DESCRIPTION
<code>_help</code>	-	displays help message in status/terminal view

### File commands

COMMAND	PARAMETERS	DESCRIPTION
<code>_load</code>	<filename>	loads Intel Hex file <Filename> into host memory
<code>_save</code>	<filename>, <recordsize> optional, <format> optional	saves selection into Intel hex file <Filename>
<code>_binload</code>	<filename>, <address offset> optional	loads binary file <Filename> into host memory, beginning at given address offset
<code>_binsave</code>	<filename>, <fill char> optional	saves selection into binary file <Filename>, at fragmented multiselections fill space with fill char

### Hex Editor commands

COMMAND	PARAMETERS	DESCRIPTION
<code>_copy</code>	-	copies selection into clipboard
<code>_cut</code>	-	cuts selection into clipboard
<code>_paste</code>	<start address>	pastes clipboard into memory, beginning at <start address>
<code>_fillmemory</code>	<fill value>	fills selection with byte or word value <fill value>
<code>_clearmemory</code>	-	mark selection bytes as unread
<code>_randomfill</code>	-	Fills current selection with random values

### Selection commands

COMMAND	PARAMETERS	DESCRIPTION
<code>_addselection</code>	<start address>, <end address>	adds selection from start address to end address
<code>_clearselections</code>	-	removes all selections
<code>_showselections</code>	-	lists the current selections and their range

### Target Connection commands

COMMAND	PARAMETERS	DESCRIPTION
<code>_connect</code>	NOPROMPT optional	connects to target, if parameter NOPROMPT is passed, no prompt window is displayed
<code>_reconnect</code>	-	looks if monitor is ready; can be used to reconnect
<code>_disconnect</code>	-	disconnects from target and closes comm port

**Target Transfer commands**

COMMAND	PARAMETERS	DESCRIPTION
_download	-	downloads selection into target memory
_upload	-	reads from target memory into selection
_compare	<filename> optional	compares selection with target memory, if filename is passed, results are written in <Filename>
_mov	<address>, <value>	writes word <Value> to memory at address or to SFR
_movseq	<address 1>, <data 1>, <address 2> optional, <data2> optional, .....	Several memory writes of independent data and addresses are done within one write sequence

**Target Execution commands**

COMMAND	PARAMETERS	DESCRIPTION
_srst	-	executes Software Reset
_jmp	<start address>	jumps to <Start Address>
_call	<start address>, <R8> optional, <R9> optional, <R10> optional, <R11> optional, <R12> optional, <R13> optional, <R14> optional, <R15> optional	calls driver/user subroutine at <Start address>

**Target Misc commands**

COMMAND	PARAMETERS	DESCRIPTION
_einit	-	executes the EINIT command
_movemonitor	<start address>	moves monitor to <Start address>
_setprotection	<security level>, <password>, <new password> optional	Enables or disables system register protection (XC family only)
_pllcon	<pllcon value>	Sets the register PLLCON (XC family only). The register PLLCON can not be set by the standard write commands, because it possibly changes the baudrate. Therefore, this separate command is provided.

**SFR View commands**

COMMAND	PARAMETERS	DESCRIPTION
_refreshsfr	ON OFF optional	can be used either to refresh values of SFR registers in current SFR set, or to generally activate or deactivate the refresh.
_addsfr	<SFR name>, <SFR set> optional	adds SFR register to current SFR set or to given SFR set
_removesfr	<SFR name>, <SFR set> optional	removes SFR register from current SFR set or from given SFR set

**Terminal / Comm commands**

COMMAND	PARAMETERS	DESCRIPTION
_send	<string> :<hex values>	sends the <send string> to RS232. Send string can be hexadecimal values, leaded by a :
_sendfile	<filename>	sends the binary file <filename> 1:1 to RS232
_setp	<signal>, 0 1	sets the signal to logical 0 or 1. Signal can be DTR or RTS
_setbaudrate	<baudrate>	changes the current interface baudrate

### Logfile commands

COMMAND	PARAMETERS	DESCRIPTION
_logfile	ON OFF	turns the log file writing on or off
_setlogfile	<filename>	changes the log file to <filename>
_writellogfile	<string>	writes string to log file

### Scripting commands

COMMAND	PARAMETERS	DESCRIPTION
_delay	<delay time>	delays for <delay time> seconds
_pause	-	pauses script execution and displays message box. Waits for confirmation (Button OK)
_message	<string> <SFR> <variable>,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional	pauses script execution and displays message box with messagestrings1-16. Waits for confirmation (Button OK)
_cmessage	<string> <SFR> <variable>,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional,<string> <SFR> <variable> optional	displays message box with messagestring1-16, but continues with script execution. Does not wait for any confirmation
_assign	<expression>	assigns a variable an expression. Valid variable names are %0 to %99. On the right side of the = either SFR registers

		or variables can be assigned. It is possible to execute simple arithmetic operations like +,-,*,/,& ,~. The value of a variable can be displayed via the _message or _cmessage command
_executescript	<filename>,<continue> optional	Executes the subscript <filename>. If the flag <continue> is set to ON, the script is continued even if an error occurs
_quit	-	Exits Minimon. If used, it is the last script executed.

### Flash commands

COMMAND	PARAMETERS	DESCRIPTION
_iprogram	-	Programs the current selection into flash. The used flash sectors are erased automatically by this command before programming.
_program	-	Programs the current selection into flash. The used flash sectors have to be erased manually before programming.
_erase	<device name>,<sector>	Erases the given <Sector> of the Flash Device <Device name>
_status	<device name>	Reads and displays the relevant flash status registers of the flash device <Device name>

### View commands

COMMAND	PARAMETERS	DESCRIPTION
_viewword	-	Views the current selection as 16 Bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewlong	-	Views the current selection as 32 bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewbyte	-	Views the current selection as 8 bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewassembler	-	Views the current selection as assembler code and writes to Terminal view as well as log file
_viewsfrs	<SFR set> optional	Views all SFRs of a given SFR set. If no SFR set is passed, the current SFR set is viewed. The output is done to the terminal view as well as the log file.

### Direct Sending via RS232

While running an user application, it is possible to make user inputs that are sent to the serial interface. Received data is displayed as hex values.

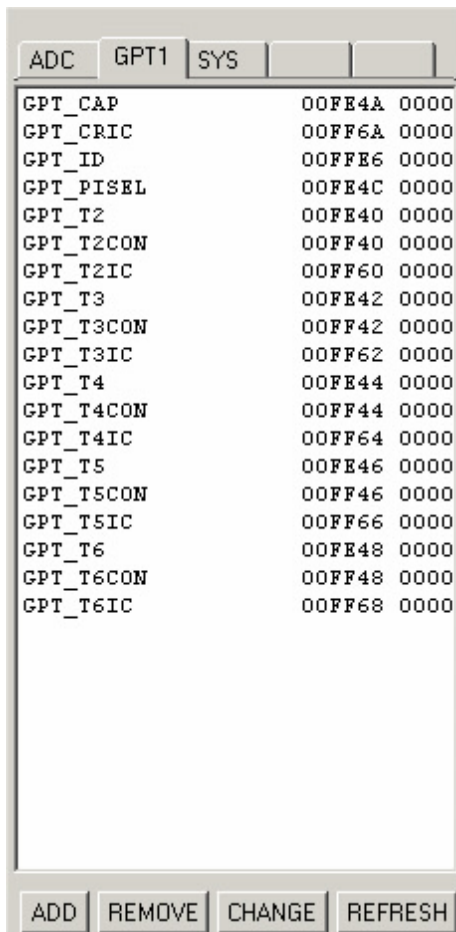
To send a single byte, input a colon and the hexadecimal value. (e.g. „:34“ to send the byte 34 hex).

To send an ASCII string, just input the string.

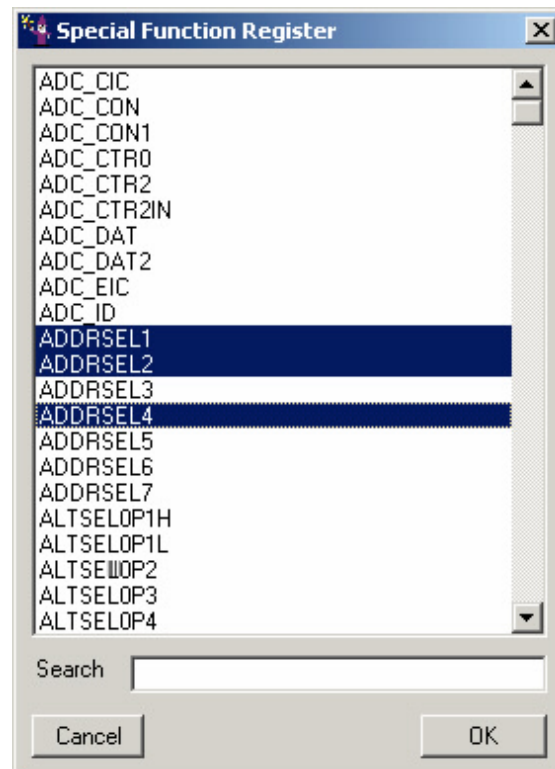
All inputs (commands, hex bytes or strings) have to be terminated by pressing the RETURN key.

## SFR view

The SFR view can display SFRs, grouped by up to 5 register sets. The list of displayed SFRs is fully adaptable.



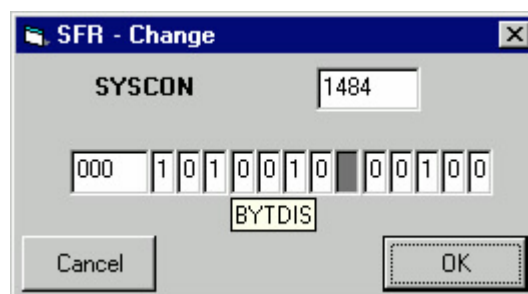
*SFR View*



*SFR Add*

The name, the physical address and the current value of the SFR are displayed in the list.

- The button ADD is used for adding SFRs to the SFR view.
- Use the REMOVE button to remove the selected SFRs from the SFR view. Multiselections can be applied.
- The Button CHANGE is used to change and display detailed information of the selected SFR:



The upper text field contains the hexadecimal value. Below, all bits and bitfields are displayed as binary values and can be changed either by double-click or directly by typing in the binary value.

Of course, each SFR can be displayed in one register set just one time, but the same SFR can be displayed in different register sets. The current provided SFRs are dependent of the selected micro controller type (see 8.)



## Menue and Toolbar

The menu provides one alternative way to the command line to execute commands. The most common commands are part of the toolbar, too.



### *File*

The File Menu contains all file transfer commands like loading and saving as well as the printing function.

- Load Intel Hex: Loads an Intel Hex File into the Hex editor.
- Save As Intel Hex: Saves current Selection to an Intel Hex file. Alternatively it is possible to input a memory range directly (start and end address). It is possible to change the output format, like 20 bit or 32 bit Intel Hex, and the record length in bytes.
- Load Binary File: Load a Binary file into the Hex editor. The start address offset can be set freely.
- Save Binary File: Saves the current selection into a binary file. At multi-selections, the space between selections is filled up with a user-defined fill character if needed.
- Print: Prints the current selection as hex (similar to the memory view), assembler code or ASCII-Text.
- Load preferences: Overrides the current Minimon settings by selecting and loading a different .ini – File.
- Save preferences: Saves the current Minimon settings into preferences (.ini) file
- Load SFR register set: Loads a SFR register set file (.mrs) into current selection.
- Save SFR register set: Saves the currently displayed SFR set into a register set file (.mrs).

### *Edit*

The Edit Menu provides clipboard, selection and fill capabilities.

- Copy: copies the (first) selection into an internal clipboard buffer (not to the system clipboard !)
  - Cut: copies the (first) selection into an internal clipboard buffer and marks selection as unread
  - Paste: pastes the clipboard contents into memory, beginning at the cursor position
- Remark: Only one closed memory range can be put to the clipboard. If multiple ranges are selected, only the first selection will be applied.
- Add Selection: adds a selection, given by start address or end address. Applied several times, mullet-selections are possible (see also 1.3.3)
  - Clear all Selections: all selections will be removed, the memory contents are left unchanged.
  - Fill Memory: fills the current selection with a constant value (given as hexadecimal number)
  - Random Fill: fills the current selection with random values
  - Clear Memory: marks all bytes in the current selection as unused

### *View*

The View Menu provide several alternate display options for the current memory selection:

- Word: Displays the current selected memory contents as 16 Bit values.

- Long: Displays the current selected memory contents as 32 Bit values.
- Disassemble: Displays current selection as assembler code.

### *Target*

The target menu contains all commands that concern the target hardware.

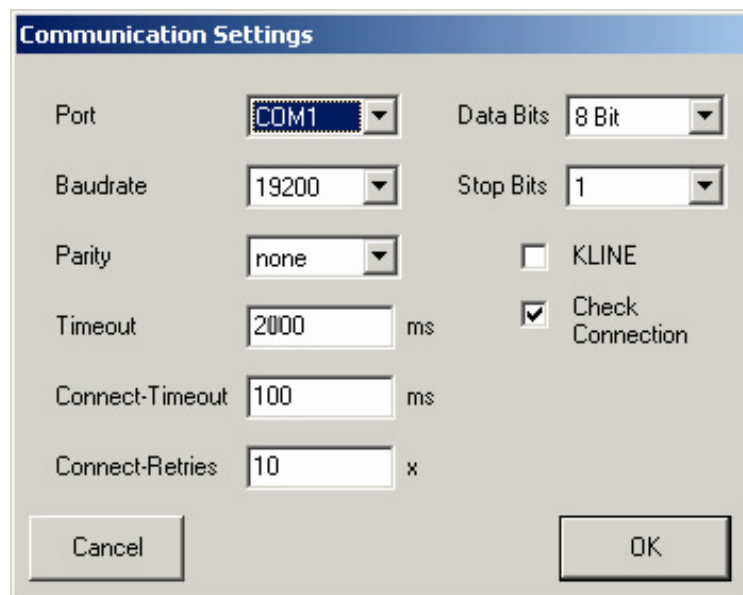
- Configuration: here the hardware (target) configuration is done. See 8.
- Connect: connects to target and executes all initialisation commands, according to hardware configuration
- Reconnect: reconnect to an already running monitor.
- Disconnect: disconnects the Minimon front-end from the kernel and closes the Comm port.
- Display Reset Configuration: Displays reset configuration, which was read at the last target connection
- Download: loads contents of current selection into target memory
- Upload: loads target memory into selection
- Compare: compares target memory with selection (e.g. previous loaded file)
- Relocate Monitor: MiniMon will be relocated to given start address. This is done by copying itself and jumping to new MiniMon start address.

Remark: the old and the new monitor locations must not overlap.

### *Settings*

This menu concerns the serial interface.

- Interface: Calls the dialog window to change the comm interface parameters.



Changing the values before connection, only the Host settings will be applied (the bootstrap loader automatically detects baudrate at connection time)

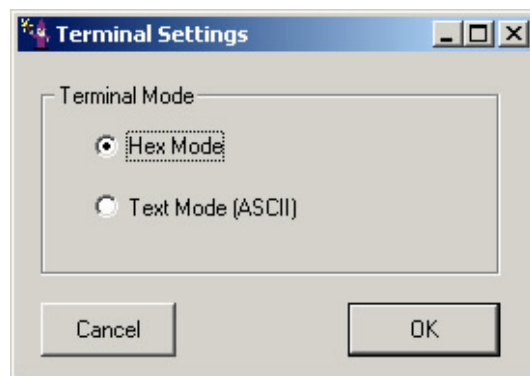
Changing the settings while being connected to the target will change both the host settings and the MiniMon settings (especially the baudrate).

K-LINE is a single wire interface type. For K-LINE, different loader and monitor files are needed and downloaded. The change of this feature requires a reconnect.

The check connection feature is used to periodically check the connection between the kernel and the frontend. If the connection is lost, this is shown in the status bar of the Minimon main window. If the check connection feature is used and a hardware reset is done while being connected, a second hardware reset is necessary.

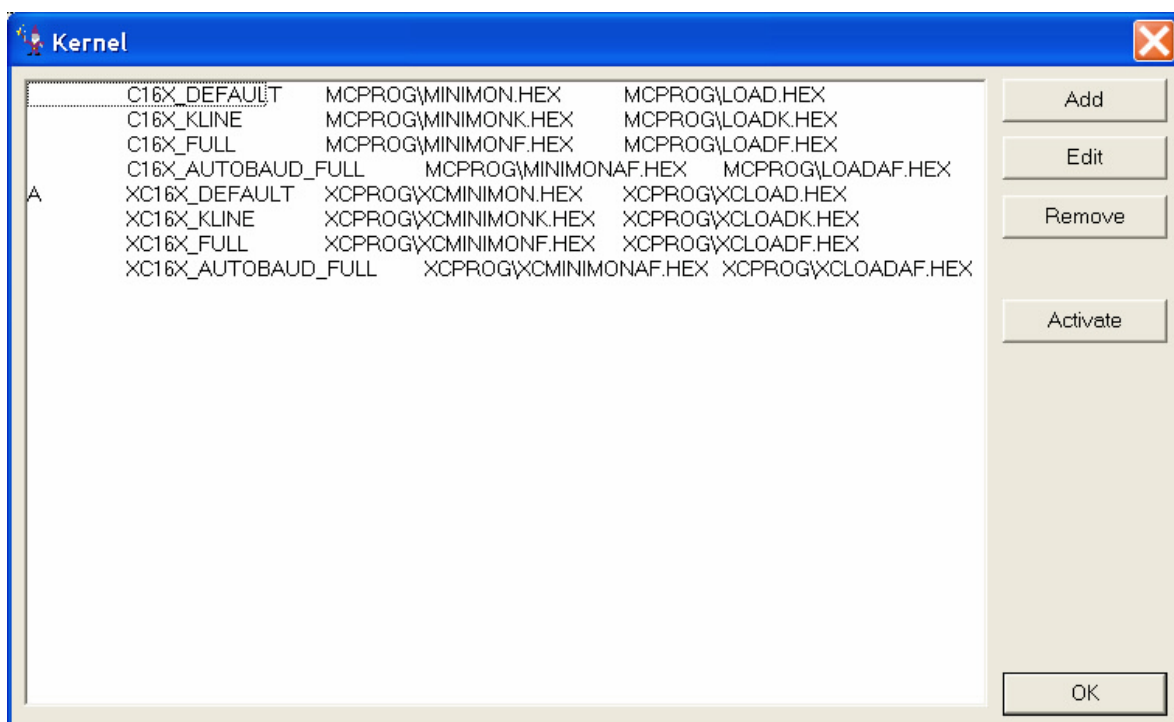
While the Value for Timeout can occur during normal communication, the connection timeout occurs only during connection. The connection start by sending the Zero-Byte can be repeated, the relevant parameter is the Connect-Retry value.

- Terminal: Sets the output format for received data in the terminal view.



If hex mode is selected, any received Data (e.g. from the application) is displayed in the terminal view as 8 Bit hexadecimal values. If Text/ASCII mode is selected, received Data is displayed as ASCII text.

- Kernel: Administrate and activate different default and user kernels



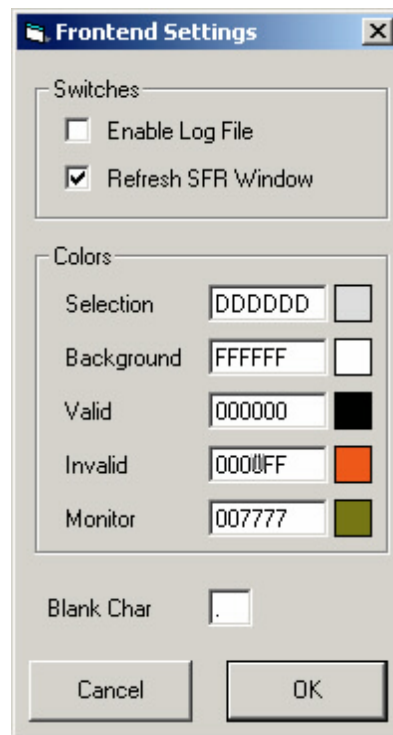
Minimon is delivered with 4 default kernels for C16x and XC16x each:

<i>Kernel</i>	<i>description</i>	<i>Start address</i>	<i>size</i>
C16X_DEFAULT	This is the default kernel for C16x controllers. It provides the standard features like writing and reading memory, calling subroutines/drivers, jump to user programs, software reset and einit	00FA60	392
C16X_KLINE	This kernel is the K-Line variant of the C16x default kernel. It provides the same features as the default kernel, but with k-line interface communication.	00FA60	394
C16X_FULL	The full kernel for the C16x controllers provides additionally to the default features the movseq capability	00FA60	426
C16X_AUTOBAUD_FULL	The autobaud full kernel for the C16x controllers provides the same features as the full kernel, but additionally with autobauding on the first connect. This kernel is thought for integration in user applications to automatically detect the baudrate.	00FA60	490
XC16X_DEFAULT	This is the default kernel for XC16x controllers. It provides the standard features like writing and reading memory, calling subroutines/drivers, jump to user programs, software reset and einit	E00024	392
XC16X_KLINE	This kernel is the K-Line variant of the XC16x default kernel. It provides the same features as the default kernel, but with k-line interface communication.	E00024	394
XC16X_FULL	The full kernel for the XC16x controllers provides all default features plus the features movseq, asc0 to asc1 and setprotection	E00024	586
XC16X_AUTOBAUD_FULL	The autobaud full kernel for the XC16x controllers provides the same features as the full kernel, but additionally with autobauding on the first connect. This kernel is thought for integration in user applications to automatically detect the baudrate.	E00024	658

Beside, it is possible to register and activate own user kernels in Minimon.

Administration and Modification of Kernel registration is done in the kernel settings menu.

- Front-End: Change Front-End appearance settings



The Front-End settings window is used to change the default settings for different colors of the memory view. The blank char, which is displayed for unused data areas, can be chosen, too.

Beside these optical appearance settings, it is possible to enable the file logging as well as the automatic refresh of the SFR view.

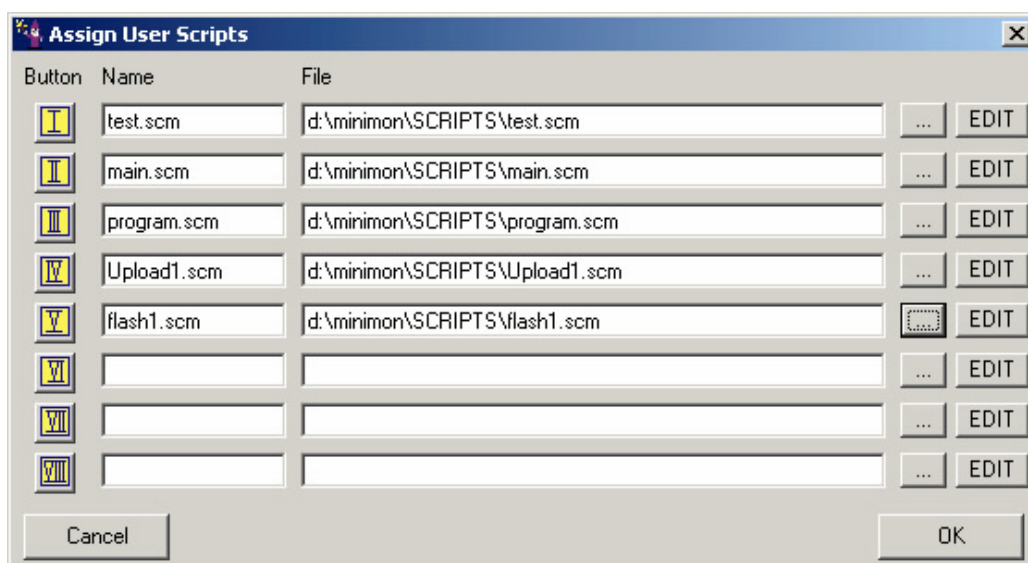
### *Script*

The script menu concerns the loading and execution of scripts. It contains the following functions:

- Execute: executes a script file after selecting it in a file menu.

Remark: script files are nothing but text files with a list of shell/script commands (see also 5). These commands are executed sequentially. On errors the script execution will be stopped.

- User script: assign and name user scripts to up to 8 user script buttons



Any of the 8 Buttons can be named individually. An assignment is removed by deleting the file path

- List of the last 16 used scripts: This provides a fast script re-calling functionality

Script example:

```
_connect  
_clearselections  
_addselection 10000,1ffff  
_upload  
_save ul.hex
```

This script connects to the target, selects the range from 10000-1FFFF, uploads the contents into the front-end memory and saves it to the Intel Hex file ul.hex

## Hardware Configuration

The Hardware Configuration is used to describe the target hardware and initialise registers after connection.

**Configure**

**Initialize register**

<input checked="" type="checkbox"/>	SYSCON0		h
<input checked="" type="checkbox"/>	SYSCON1		h
<input checked="" type="checkbox"/>	SYSCON3		h
<input checked="" type="checkbox"/>	RSTCON		h
<input checked="" type="checkbox"/>	EBCMOD0		h
<input checked="" type="checkbox"/>	EBCMOD1		h
<input checked="" type="checkbox"/>	TCONCS0		h
<input checked="" type="checkbox"/>	FCONCS0		h
<input checked="" type="checkbox"/>	TCONCS1		h
<input checked="" type="checkbox"/>	FCONCS1		h
<input checked="" type="checkbox"/>	TCONCS2		h
<input checked="" type="checkbox"/>	FCONCS2		h

Addr.

☒ Generic 1    0801    h    00E006    h

☐ Generic 2       h       h

**Controller type**

XC167CI\_16FF    Clk rate    20000000    Hz

**Memory**

A	M	
X		SFR : 00FE00-00FFFF
X		ESFR : 00F000-00F1FF
X		DUALPORTAM : 00F600-00FDFF
X		PSRAM : E00000-E007FF
X		DATASRAM : 00C000-00CFFF
X		TCAN : 200000-2007FF
X		PROGRAMFLASH : C00000-C01FFF
		: C02000-C03FFF
		: C04000-C05FFF
		: C06000-C07FFF
		: C08000-C0FFFF
		: C10000-C1FFFF

Add Edit Remove

**Initial command calls**

☒ EINIT

Clear Cancel OK

### Controller type

Several Controller types can be selected. This information is needed by the front-end to know the correct SFR and memory definitions.

The clock rate is needed for baudrate initialisation, if the baudrate is changed while being connected.

### Initialize Register

This Section can contain up to 12 SFRs that can be set after connection. The registers can be chosen freely. The values they are set to are given in the according text fields. A marked register means that it will be initialized.

Two generic register definitions can be used free for any register known by its physical address.

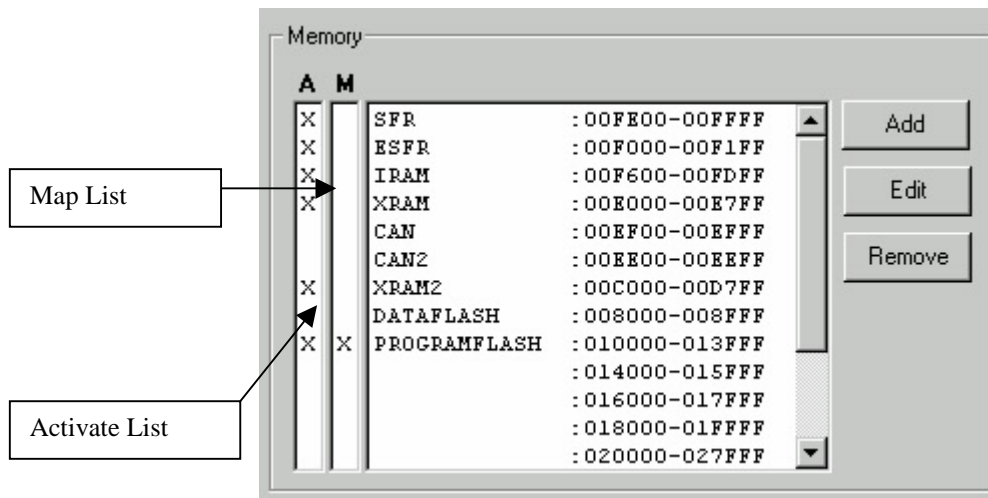
### Initial command calls

Similar to register initialisation, after connection specific command calls can be executed.

If marked, the command EINIT can be executed as final action of initialisation. Remark: EINIT can be called at any time later by the shell command `_einit`, too.

## Memory

This section is used to describe all memory devices or modules that are used.



This includes chip internal memory modules like internal RAM, XRAM, internal Flash or OTP. Xperipherals and SFR areas are included, too. If the controller type is changed, all default memory modules of this type can be loaded.

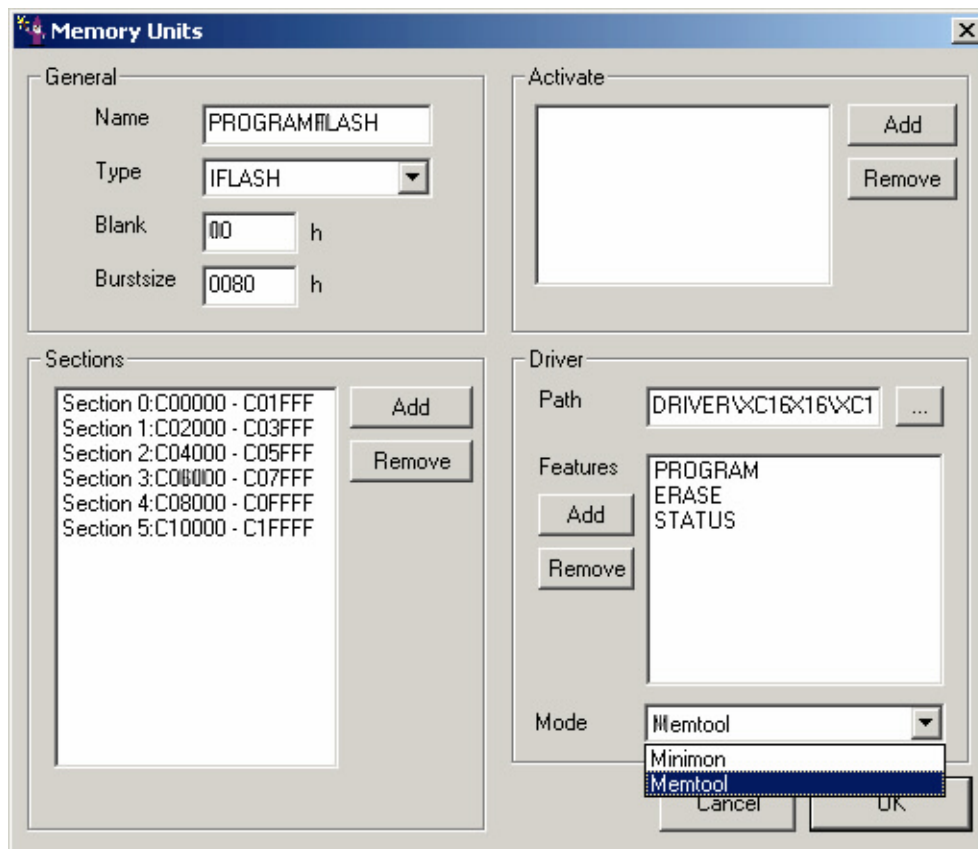
Some modules are possible to activate (or deactivate), therefore the according Line in the Activate List (A) can be marked by clicking it. A cross (x) will appear.

Some parts (regions) of a module are mapable (e.g. the first sector of internal ROM/Flash/OTP). To map a region, mark the corresponding Map List line (M).

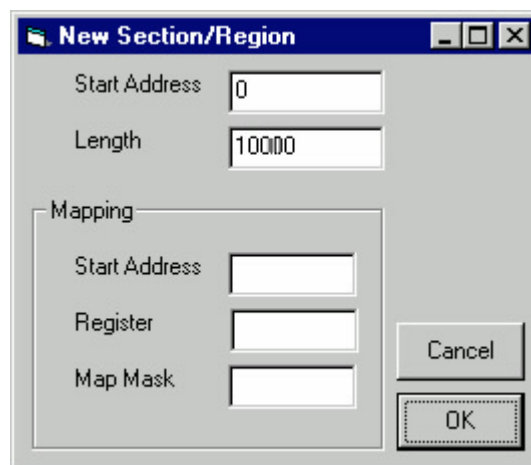
Of course, all memory unit activations, mappings and entries are used on the next connect .



Beside, external devices can be defined, too. Therefore the ADD button has to be clicked and the Memory Unit Add/Edit window will appear:

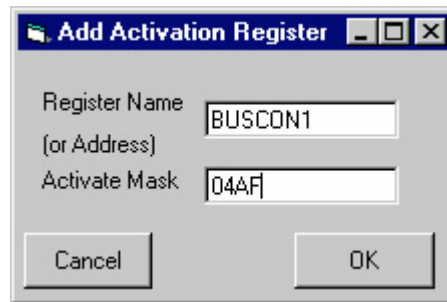


In our example an external flash memory device is added to the current memory configuration. It is necessary to type in the name and select a type first. The blank value is needed to fill unused areas, because it is possible to program the device blockwise. The programming block size has to be input as hexadecimal value at Burstsize.



Each memory device consists of at least one section. The sections define where the device is located. Therefore at Sections the ADD button is used to add a section and Startaddress and Length of the Section have to be typed in as hexadecimal values:

If it is necessary to activate the device, several activation registers and masks can be input at the section Activate. In our example chip select 1 is used, and the registers ADDRSEL1 and BUSCON1 have to be initialized. The initialization is done by reading the register, applying an logical OR with the mask and writing it back. Instead of an SFR register, a hexadecimal address can be typed in, too:



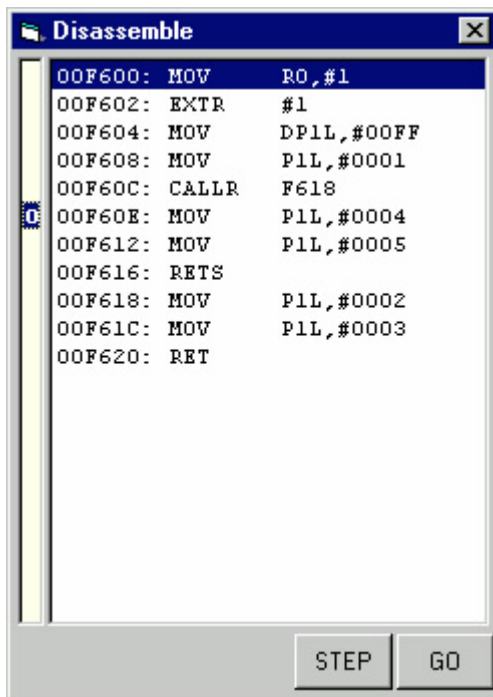
If no activation registers are typed in, the device is seen as always activated.

For programming devices like Flash or Otp, an external Driver is needed. The driver name (Intel Hex file, including path) has to be typed in at the Path field. To describe the features of the driver (the implemented functions), they can be added by the ADD button.

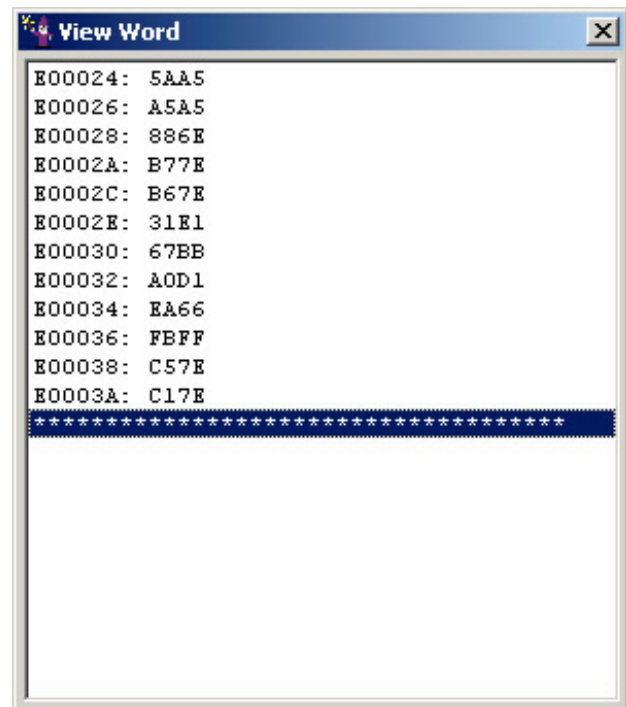
If the device is not a programming device (e.g. external Ram), the features Blank, Burstsize and the section Driver is not used.

## Views

It is possible to display a selected memory range in different view variants: as assembler code, as 16 Bit values or as 32 Bit values.



*View – Disassemble*



*View – Word (16 Bit)*

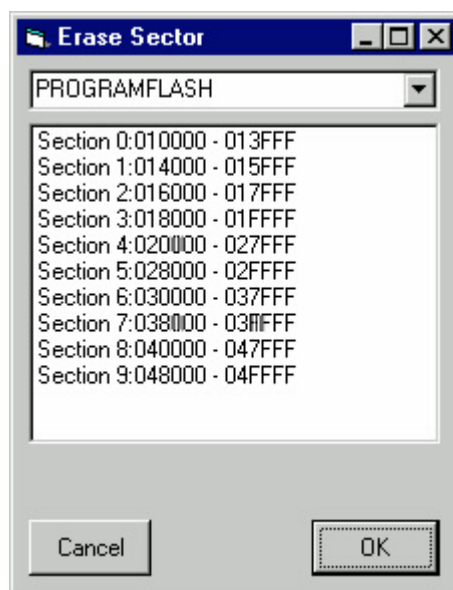
## Flash Operations

According to the features of the driver (see ch.8), several Flash/OTP operations may be available.

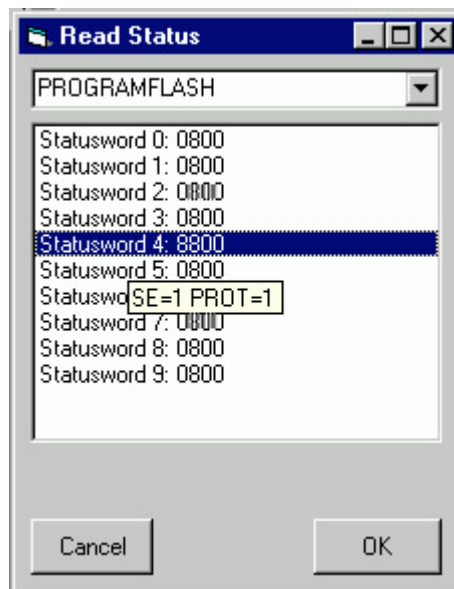


All Operations can be accessed via toolbar:

- **Program:** Program the current selection into according Flash or OTP memory unit. The program routine downloads the needed driver, erases automatically the used sections before writing and programs the selection contents burstwise. Program does detect the according memory module automatically
- **Erase:** Erase one sector of the selected flash.



The Erase Sector Window contains a dropdown field where it is possible to select the module (Of course, MiniMon supports more than one module). According to this module, the sectors are displayed below. One or more sectors can be selected. After pressing the OK button the selected sectors (sections) are erased. In necessary, the driver will be downloaded.



- Status: Read all status words from the selected memory module/unit.
- Protect, Unprotect, Lock, Unlock: Similar, but passwords have to be typed in (delimited by a comma).

## Shell and Script Commands

COMMAND	PARAMETERS	DESCRIPTION
_help	-	displays help message in status/terminal view

### File commands

COMMAND	PARAMETERS	DESCRIPTION
_load	<filename>	loads Intel Hex file <Filename> into host memory
_save	<filename>, <recordsize> optional, <format> optional	saves selection into Intel hex file <Filename>
_binload	<filename>, <address offset> optional	loads binary file <Filename> into host memory, beginning at given address offset
_binsave	<filename>, <fill char> optional	saves selection into binary file <Filename>, at fragmented multiselections fill space with fill char

### Hex Editor commands

COMMAND	PARAMETERS	DESCRIPTION
_copy	-	copies selection into clipboard
_cut	-	cuts selection into clipboard
_paste	<start address>	pastes clipboard into memory, beginning at <start address>
_fillmemory	<fill value>	fills selection with byte or word value <fill value>
_clearmemory	-	mark selection bytes as unread
_randomfill	-	Fills current selection with random values

### Selection commands

COMMAND	PARAMETERS	DESCRIPTION
_addselection	<start address>, <end address>	adds selection from start address to end address
_clearselections	-	removes all selections
_showselections	-	lists the current selections and their range

### Target Connection commands

COMMAND	PARAMETERS	DESCRIPTION
_connect	NOPROMPT optional	connects to target, if parameter NOPROMPT is passed, no prompt window is displayed
_reconnect	-	looks if monitor is ready; can be used to reconnect
_disconnect	-	disconnects from target and closes comm port

### Target Transfer commands

COMMAND	PARAMETERS	DESCRIPTION
_download	-	downloads selection into target memory

_upload	-	reads from target memory into selection
_compare	<filename> optional	compares selection with target memory, if filename is passed, results are written in <Filename>
_mov	<address>, <value>	writes word <Value> to memory at address or to SFR
_movseq	<address 1>, <data 1>, <address 2> optional, <data2> optional, .....	Several memory writes of independent data and addresses are done within one write sequence

**Target Execution commands**

COMMAND	PARAMETERS	DESCRIPTION
_srst	-	executes Software Reset
_jmp	<start address>	jumps to <Start Address>
_call	<start address>, <R8> optional, <R9> optional, <R10> optional, <R11> optional, <R12> optional, <R13> optional, <R14> optional, <R15> optional	calls driver/user subroutine at <Start address>

**Target Misc commands**

COMMAND	PARAMETERS	DESCRIPTION
_einit	-	executes the EINIT command
_movemonitor	<start address>	moves monitor to <Start address>
_setprotection	<security level>, <password>, <new password> optional	Enables or disables system register protection (XC family only)
_pllcon	<pllcon value>	Sets the register PLLCON (XC family only). The register PLLCON can not be set by the standard write commands, because it possibly changes the baudrate. Therefore, this separate command is provided.

**SFR View commands**

COMMAND	PARAMETERS	DESCRIPTION
_refreshsfr	ON OFF optional	can be used either to refresh values of SFR registers in current SFR set, or to generally activate or deactivate the refresh.
_addsfr	<SFR name>, <SFR set> optional	adds SFR register to current SFR set or to given SFR set
_removesfr	<SFR name>, <SFR set> optional	removes SFR register from current SFR set or from given SFR set

**Terminal / Comm commands**

COMMAND	PARAMETERS	DESCRIPTION
_send	<string> :<hex values>	sends the <send string> to RS232. Send string can be hexadecimal values, leaded by a :
_sendfile	<filename>	sends the binary file <filename> 1:1 to RS232

_setp	<signal>, 0 1	sets the signal to logical 0 or 1. Signal can be DTR or RTS
_setbaudrate	<baudrate>	changes the current interface baudrate

**Logfile commands**

COMMAND	PARAMETERS	DESCRIPTION
_logfile	ON OFF	turns the log file writing on or off
_setlogfile	<filename>	changes the log file to <filename>
_writelogfile	<string>	writes string to log file

**Scripting commands**

COMMAND	PARAMETERS	DESCRIPTION
_delay	<delay time>	delays for <delay time> seconds
_pause	-	pauses script execution and displays message box. Waits for confirmation (Button OK)
_message	<string> <SFR> <variable>, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional	pauses script execution and displays message box with messagestrings1- 16. Waits for confirmation (Button OK)
_cmessage	<string> <SFR> <variable>, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional, <string> <SFR> <variable> optional	displays message box with messagestring1-16, but continues with script execution. Does not wait for any confirmation
_assign	<expression>	assigns a variable an expression. Valid variable names are %0 to %99. On the right side of the = either SFR registers or variables can be assigned. It is possible to execute simple arithmetic operations like +,-,*,/,& , ~. The value of a variable can be displayed via the _message or _cmessage command
_executescript	<filename>,<continue> optional	Executes the subscript <filename>. If the flag <continue> is set to ON, the



		script is continued even if an error occurs
_quit	-	Exits Minimon. If used, it is the last script executed.

**Flash commands**

COMMAND	PARAMETERS	DESCRIPTION
_iprogram	-	Programs the current selection into flash. The used flash sectors are erased automatically by this command before programming.
_program	-	Programs the current selection into flash. The used flash sectors have to be erased manually before programming.
_erase	<device name>, <sector>	Erases the given <Sector> of the Flash Device <Device name>
_status	<device name>	Reads and displays the relevant flash status registers of the flash device <Device name>

**View commands**

COMMAND	PARAMETERS	DESCRIPTION
_viewword	-	Views the current selection as 16 Bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewlong	-	Views the current selection as 32 bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewbyte	-	Views the current selection as 8 bit hexadecimal numbers and writes them to Terminal view as well as log file
_viewassembler	-	Views the current selection as assembler code and writes to Terminal view as well as log file
_viewsfrs	<SFR set> optional	Views all SFRs of a given SFR set. If no SFR set is passed, the current SFR set is viewed. The output is done to the terminal view as well as the log file.

Additionally, it is possible to implement script loops (either finite or infinite). A script (even in a loop) is aborted on occurrence of an error or by pressing ESC.

DO

<Command>

....

LOOP [UNTIL <Number>]

## MiniMon Communication Protocol

```

(function code) →
(acknowledge 1=AAh) ←
(parameters) →
(return parameters) ←
(acknowledge 2=EAh) ←

```

<i>Name</i>	<i>Funct.C.</i>	<i>Parameters</i>	<i>Return Parameters</i>
Write Word	82h	3 Bytes address (LSB first) 2 Bytes value (LSB first)	None
Write Block of Bytes	84h	3 Bytes startaddress (LSB first) 2 Bytes length, (LSB first) <length> bytes values	None
Read Block of Bytes	85h	3 Bytes startaddress, (LSB first) 2 Bytes length (LSB first)	<length> bytes values
Monitor Ext. Interface* (Call Subroutine)	9Fh	3 Bytes program start address (LSB f.) 8 Word parameters R8-R15 (LSB f.)	8 Word parameters R8-R15 (LSB f.)
Simple Go Command	41h	3 Bytes program start address (LSB f.)	None
Execute EINIT	31h	None	None
Execute SWRESET	32h	None	None
Get Checksum	33h	None	1 Word checksum
Test of Communication	93h	None	None
ASC0 to ASC1	CCh	None	None
Read Word	CDh	3 Bytes startaddress, (LSB first)	2 Bytes value (LSB first)
Write Word Sequence	CEh	3 Bytes buffer start address (LSB f.) 1 Byte buffer length	None
Set protection	D1h	1 Byte password 1 Byte new password 1 Byte protection level	None

**Monitor Extension Interface for User Subroutines/Drivers**

<i>Feature/Function</i>	<i>R8</i>	<i>Parameters R9-R15</i>	<i>Return Parameters</i>
Program	0h	R9..source block length, R10..source block start address low R11..source block start address high R13..destination address low R14..destination address high	R15..error code
Erase	1h	R14..sector number	R15..error code
Status	6h	R14..status byte number (sector number)	R9..status byte, R15..error code
Protect	20h	-	R15..error code
Unprotect	21h	R9..password length, R10..password address low, R11..password address high	R15..error code
Lock	10h	R14..sector number	R15..error code
Unlock	11h	R9..password length, R10..password address low, R11..password address high, R14..sector number	R15..error code
Set Timing	04h	R9..programming pulse length code, R10..max.number of programming pulses R11..erasing pulse length code R12..max.number of erasing pulses	

## Memory Management

Minimon follows a fully flexible memory management concept for all microcontroller software components:

### *Monitor*

The monitor `minimon.hex` has no absolute memory references (jump, call or data). It uses only relative Jumps and internal General Purpose Registers (R0-R7). Therefore it is possible to locate the monitor anywhere in internal or external memory. Of course, it is possible to write the monitor in external flash or eeprom, too.

The initial start location of the monitor is at 00FA60h for the C16x family and E00024h for the XC16x family. This location is in internal Ram which is supported by all 16 Bit controllers.

To relocate the monitor, the shell command `_relocatemonitor <startaddress>` is provided. A menu command exists, too.

The Relocation of the monitor is done by downloading the monitor code to the new location and making an absolute jump to the start address. That means: the monitor moves itself. Of course, the old and the new location must not overlap.

### *Driver*

Like the monitor, all included driver routines for flash/OTP programming have no location restrictions. They can be located and moved anywhere. By default, they are located in internal Ram or XRAM, depending on the type capabilities.

### *Data Exchange*

The data exchange between monitor and the driver is done via internal RAM. By default this data block starts at FC80.

## Used Resources

One goal of Minimon is to use as less resources as possible. This concerns memory usage for program code, data, stack and registers.

### *Kernel*

The Minimon kernel is loaded into the internal RAM of the microcontroller.

Minimon is delivered with some kernels for C16x and XC16x – 4 for each type. Due to different controller types and functionality, they have different locations and sizes. The following table lists the default locations of the Minimon kernel for each type:

<i>Kernel</i>	<i>Size in bytes</i>	<i>Start address</i>	<i>end address</i>
C16X_DEFAULT	392	00FA60	00FBE7
C16X_KLINE	394	00FA60	00FBE9
C16X_FULL	426	00FA60	00FC09
C16X_AUTOBAUD_FULL	490	00FA60	00FC49
XC16X_DEFAULT	392	E00024	E001AB
XC16X_KLINE	394	E00024	E001AD
XC16X_FULL	586	E00024	E0026D
XC16X_AUTOBAUD_FULL	658	E00024	E002B5

These are the default locations for the kernels. Nevertheless, it is possible to relocate the kernel to a different location. Of course, the size keeps the same.

Furtherly, the Minimon kernel can be integrated in a user application. In this case, the memory location of the kernel can differ to the default locations.

### *Drivers*

Drivers do not have a pre-defined location and size. Each driver has different memory needs for program and eventually data.

Beside the program and data memory space, drivers can use additionally an transfer buffer to exchange data between the kernel and the driver. Especially flash drivers use such buffers for exchange of the data to be programmed. The default start location for the buffer is the addresss 00FC80, the default size is 128 bytes.

### *Registers*

Minimon uses only one Register bank. It does not change the register bank location. Therefore, the calling application has to provide the register bank or take care to save the contents before if needed afterwards. Normally, Minimon uses the default register bank which is defined by the reset value of CP.

The Minimon kernel uses R0 to R7 for operation. R8 to R15 are used to pass parameters when calling a driver or subroutine.

### *Stack*

Minimon uses the system stack but no additional user stack. The Minimon kernel itself does not change the stack size and stack memory location. Therefore, the stack is used as delivered. In the most cases, the default stack settings after reset are used (reset values).

The System Stack is only used for calling subroutines within the kernel as well as for calling driver routines. No further push and pop operations are done. The kernel itself needs not more than 16 Bytes.  
The stack usage of drivers is not specified and depends on the driver implementation.

## Connect with the Target monitor

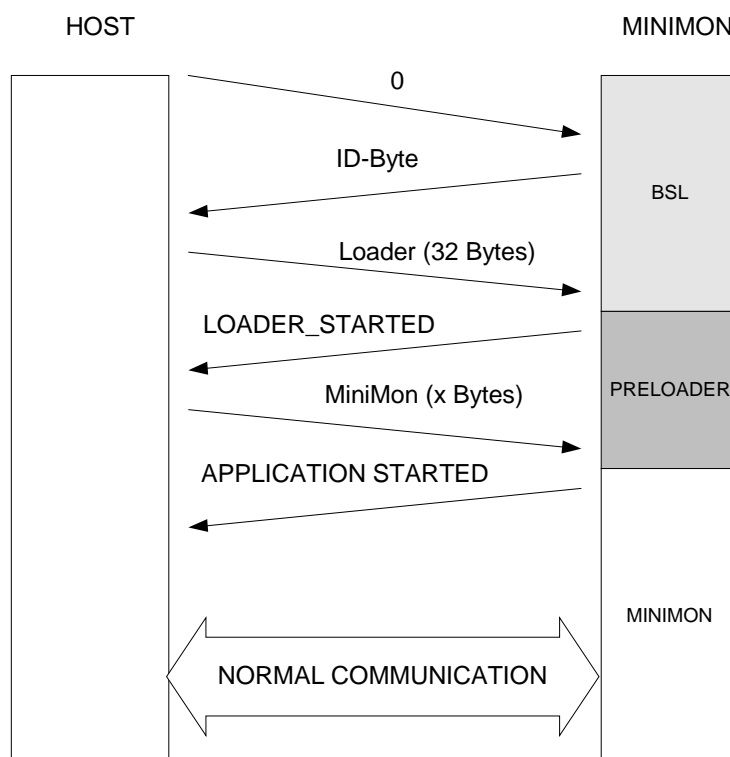
Minimon expects either a 16 Bit Microcontroller (C16x) with a bootstrap loader oder an already downloaded and running monitor.

If the monitor is already running, a simple reconnect command is used to establish connection.

If not so, the connection of host and target starts by sending a zero byte to the target. The target determines the baudrate and sends back its ID to the host. Then, 32 bytes loader program is sent from host to target.

After the reception of the 32th byte the loader is started and sends the acknowledge `LOADER_STARTED` to the host. The loader receives the monitor program. The length of MiniMon is known by the loader because both loader and minimon are linked together.

Finally, the MiniMon is started and sends the acknowlegde `APPLICATION_STARTED` to the host.



Remark: Both the loader and the monitor program can be replaced by user programs. Their length is known by the host because of their hex file contents. So it is possible to adapt the monitor for individual needs. If adaption is needed, notice that loader and monitor have to be linked together.

## The target monitor

To keep the monitor small and flexible, the monitor program accepts only a little set of commands, like write and read memory blocks. These Commands can be used for all other operations, e.g. initialisation of SFRs, download of user programs or drivers, upload of specific memory blocks and even monitor relocation. The write and read commands are done bitwise and with Data Page Pointer 2. The EXTS command is not used because of compatibility reasons to 80C166. Because in many cases it is not possible to write to SFR registers bitwise without interfering the other part of the SFR, it is necessary to provide a wordwise command for writing into SFR registers.

### *Initialisation*

The Monitor does not any initialisation commands and transfers except the disabling of the watchdog timer (DISWDT). If needed (e.g. call EINIT or set SYSCON), this can be done in the Host Program (see Menu Target-Configuration). The monitor does not distinguish between initialisation commands and normal execution or transfers. So it is possible to call the EINIT command at any time later.

The initialisation of the serial interface is done by the bootstrap loader and is changed by a simple data transfer command to S0BRS (host intelligence). Therefore no extra command is needed.

### *Start a user program*

To provide the ability of user program starts, it can make an intersegment jump to a given start address. The intersegment jump is done by pushing Startaddress (1 Word Segment and 1 Word Address) to the stack, and executing a RETS command. RETS pops the previous pushed values as CSP and IP at the same time.

This ‚jmp‘ command is used by SYSCON initialisation and monitor relocation, too. In both cases, the jump address is the monitor start address.

For starting applications, a software reset command is provided, too.

### *Drivers*

MiniMon has an extension interface, where any user subroutine can be downloaded and called. This interface can be used for drivers (e.g. flash programming drivers), but also for user subroutines. Therefore the host has to download the driver and instruct the monitor to call the driver start address. The monitor does not know anything about the driver except his start address. Parameters are passed via Registers R8-R15.

The host software handles the memory organisation of the driver, too. The user subroutine or driver can be located anywhere in memory, its last command is the RETS command to return to the monitor.

This concept provides a modular software system that is easy maintainable and adaptable. For example, the driver subroutines are independent of any communication operation and implement only the parts that are definitely necessary.

## External files

All ,dynamic‘ Data needed by the frontend software is stored in external (text) files. This provides a high maintainability and makes it possible to fit new microcontroller types.

The following data is stored in external files:

### *Preferences:*

All settings in windows like paths, filenames, save settings, communication settings, the last script filenames but also the actual target configuration settings can be stored and recalled in preference files. If minimon is closed, it saves all these settings in the file DEFAULT.INI.

When minimon is launched, DEFAULT.INI is loaded and all settings are done like the program was closed.

It is possible to create user preference files, too. This can be used to store different hardware configurations or test tasks separately.

### *Definition files:*

Several definition files exist to meet with high maintainability, especially to integrate new microcontroller types.

MCTYPES.DAT: This file contains all microcontroller types. A controller type is written in []. For each type exist a link to the corresponding memory definition file and register definition file.

Example

```
[C167CR]
REGDEF=SFRDEF\C167CR.SFR
MEMDEF=MEMDEF\C167CR.MEM
```

KERNEL.DAT: This file contains all kernels currently provided by Minimon.

Example

```
KERNELNAME(0)=C16X_DEFAULT
LOADERPATH(0)=MCPROG\LOAD.HEX
MINIMONPATH(0)=MCPROG\MINIMON.HEX
FEATURES(0)=RELOCATABLE,WRITEWORD,WRITEBLOCK,READBLOCK,CALL,JMP,EINIT,SWRESET,GE
TCHECKSUM,TEST,READWORD
STARTADDRESS(0)=00FA60
ENDADDRESS(0)=00FBE7
PATCHSTARTADDRESS(0)=00F660
```

### *Register Definition file:*

For each microcontroller type a SFR definition file exist. This file contains information about all Special Function Register of the corresponding type, like Name, Bitnames and Address.

The SFR definition files are standardized and maintained by INFINEON. That means, any new controller is supported by minimon (nearly) automatically.

All register definition files are located in the subdirectory SFRDEF in the actual minimon application directory.

### *Memory Definition file:*



Like the SFR definition files, a for each controller type a description file of all internal memory regions exist. These files contain information about name, location, size, and type of each internal ,memory unit‘. For flash/OTP devices, they additionally contain information about driver file location and driver functionality (driver features).

All memory definition files are located in the subdirectory MEMDEF in the actual minimon application directory.