



ICs for Consumer Electronics

MEGATEXT

M3L-Register Control Routines

Edition 10.94

MEGATEXT® M3L-Register Control Routines	
Revision History: Original Version 10.94	
Previous Releases:	
Page	Subjects (changes since last revision)

Data Classification

Maximum Ratings

Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

Characteristics

The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at $T_A = 25\text{ °C}$ and the given supply voltage.

Operating Range

In the operating range the functions given in the circuit description are fulfilled.

For detailed technical information about “**Processing Guidelines**” and “**Quality Assurance**” for ICs, see our “**Short Form Catalog**”.

Edition 10.94

This edition was realized using the software system FrameMaker®.

**Published by Siemens AG, Bereich Halbleiter, Marketing-Kommunikation,
Balanstraße 73, 81541 München**

© Siemens AG 1994. All Rights Reserved.

As far as patents or other rights of third parties are concerned, liability is only assumed for components, not for applications, processes and circuits implemented within components or assemblies.

The information describes the type of component and shall not be considered as assured characteristics.

Terms of delivery and rights to change design reserved.

For questions on technology, delivery and prices please contact the Semiconductor Group Offices in Germany or the Siemens Companies and Representatives worldwide (see address list).

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Siemens Office, Semiconductor Group.

Siemens AG is an approved CECC manufacturer.

Packing

Please use the recycling operators known to you. We can also help you - get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport.

For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

Contents	Page
1 Introduction	5
1.1 Environment	5
1.1.1 Hardware	5
1.1.2 Software	5
1.2 How to Use This Manual	5
1.3 MEGATEXT Memory Addresses	6
2 Module Description	8
2.1 Module Links	8
2.2 Include Files	8
2.3 External Calls	9
3 Subroutine Description	9
3.1 Basic Transmission Routines	9
3.1.1 MTX_READ	9
3.1.2 MTX_WRITE	10
3.1.3 MTX_READ_X	10
3.1.4 MTX_WRITE_X	11
3.1.5 READ_MTX_REGISTER	11
3.1.6 WRITE_MTX_REGISTER	12
3.1.7 READ_MTX_BYTE_INT	12
3.1.8 READ_MTX_BYTE_EXT	13
3.1.9 WRITE_MTX_BYTE_INT	13
3.1.10 WRITE_MTX_BYTE_EXT	14
3.1.11 WRITE_STRING_CODE	14
3.1.12 WRITE_STRING_IRAM	14
3.1.13 WRITE_STRING_XRAM	15
3.1.14 WRITE_PACKED_STRING	15
3.2 Arithmetic Functions	16
3.2.1 LOAD_MTX_ADDRESS_INT	17
3.2.2 LOAD_MTX_ADDRESS_EXT	17
3.2.3 LOAD_USER_ADDRESS	17
3.2.4 CONVERT_BYTE_POSITION	18
3.2.5 RECONVERT_BYTE_POSITION	18
3.3 MEGATEXT Register Functions	19
3.3.1 EXECUTE_MCI_COMMAND	19
3.3.2 SET_FREE_CHAP_CHAIN	20
3.3.3 SET_ADDRESS_POINTER_INT	21
3.3.4 SET_ADDRESS_POINTER_EXT	22
3.3.5 GET_ADDRESS_POINTER	23
3.3.6 SET_FREE_P80_CHAIN	24
3.3.7 SET_FREE_P40_CHAIN	25
3.3.8 SET_RGB_LEVEL	26
3.3.9 SET_RGB_GAIN	26
3.3.10 ALLOCATE_MEMORY	27
3.3.11 SET_PSEUDO_PACKETS	27
3.3.12 SET_PAGE_TRACE_ADDR	28

Contents (cont'd)	Page
4 Subroutines Overview	29
5 Abbreviations	30
6 Literature	31
7 Index	32

MEGATEXT® and SIESTA® are registered trademarks of Siemens AG.

Purchase of SIEMENS I²C components conveys a licence under the Philips' I²C patent to use the components in the I²C system provided the system conforms to the I²C specifications defined by Philips.

Copyright Philips 1983.

1 Introduction

SIESTA MEGATEXT software is a Siemens software tool to provide the programmer of the SDA 5273 (MEGATEXT) an easy access to basic functions. The following introductory chapter gives an overview of the development environment and how to use this manual.

1.1 Environment

It is assumed that your MEGATEXT software is written in 8051 assembler language. This is the most effective way to write software with optimized program and data memory consumption.

1.1.1 Hardware

The software development for 8051 based controllers should be done on an IBM PCXT, AT or compatible. At least 512 Kbytes of conventional memory are necessary. If more memory or a RAM disk are available, the assembly time may decrease. For testing the software, an in-circuit emulator (e.g. KONTRON KSC X51) provides an optimum of efficiency.

1.1.2 Software

The following software is needed to develop assembler software:

- INTEL AEDIT program editor (or any other program editor)
- INTEL ASM51 assembler
- INTEL RL51 linker

If an assembler or linker other than an Intel is used, the source files must be adapted (assembler and linker control commands might not work with other than Intel tools).

1.2 How to Use This Manual

This manual gives information about the subroutines contained in a module named 'MTXB'. The source code of this module is located in a file named 'MTXBASIC.A51'.

The subroutines are described in functional groups. A table of subroutines in alphabetic order is given in Chapter 4.

Each subroutine is classified by its name and by a description of input and output parameters. Generally, the accumulator, registers R0–R7 and the carry bit are used for parameter passing.

If it is necessary to describe the single bits of a byte, the following format is used:

b7	b6	b5	b4	b3	b2	b1	b0
-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------

b7 – b0 <significance>

The bit at the lefthand side of the figure (b7) is always regarded to be the most significant bit (MSB).

The bit at the righthand side of the figure (b0) always represents the least significant bit (LSB).

Numbers may be shown in three different formats: decimal, hexadecimal or binary.

Decimal numbers have no suffix, e.g. 1, 34, 255. 12345 are decimal numbers.

Hexadecimal numbers always have an 'H' suffix.

For example, 12_H, 0FF_H, 12AA_H are hexadecimal numbers.

Binary numbers use a 'B' as a suffix: 00101100_B, 11111111_B are binary numbers.

A list of abbreviations used is given in Chapter 5.

Chapter 6 shows literature on Siemens MEGATEXT. Chapter 7 contains an alphabetic index and will help you to find information in this manual quickly.

1.3 MEGATEXT Memory Addresses

MEGATEXT is able to address 24 Kbytes of its internal RAM as well as up to 2 Mbytes of external DRAM. For each memory type, internal or external, a different address type is used. As these address formats use packed data to address the different logical units (block, byte position, chapter, row, column), two corresponding formats (user formats) are defined in the MTXB module which allow the programmer of MEGATEXT to use more convenient addressing. The following tables describe the MEGATEXT and the user address formats in detail.

The byte at the top of the list is always the most significant byte. This is the byte which is stored at the lowest address in controller memory. All bytes must be stored in sequential order.

User address format for internal MEGATEXT RAM:

0	0	0	0	0	BP2	BP1	BP0
---	---	---	---	---	-----	-----	-----

0	0	0	0	0	0	BL1	BL0
---	---	---	---	---	---	-----	-----

0	0	0	R4	R3	R2	R1	R0
---	---	---	----	----	----	----	----

0	0	C5	C4	C3	C2	C1	C0
---	---	----	----	----	----	----	----

The bits have the following significance:

BPn	Byte position (binary number, 0 – 5)
BLn	Block number (binary number, 0 – 3)
Rn	Row number (binary number, 0 – 25)
Cn	Column number (binary number, 0 – 39)

MEGATEXT address format for internal MEGATEXT RAM:

0	0	0	0	BY5	BY4	BY3	BY2
BY1	BY0	0	BL1	BL0	R4	R3	R2
R1	R0	C5	C4	C3	C2	C1	C0

The bits have the following significance:

BYn	Byte position (decimal number, 0 – 5), only one of the BYn bits must be set to '1', the other ones must be set to '0'.
BLn	Block number (binary number, 0 – 3)
Rn	Row number (binary number, 0 – 25)
Cn	Column number (binary number, 0 – 39)

User address format for external MEGATEXT RAM:

0	0	0	0	0	B10	B9	B8
B7	B6	B5	B4	B3	B2	B1	B0
0	0	0	R4	R3	R2	R1	R0
0	0	C5	C4	C3	C2	C1	C0

The bits have the following significance:

Bn	Chapter number (binary number, 0 – 511)
Rn	Row number (binary number, 0 – 25)
Cn	Column number (binary number, 0 – 39)

MEGATEXT address format for external MEGATEXT RAM:

1	0	B10	B9	B8	B7	B6	B5
B4	B3	B2	B1	B0	R4	R3	R2
R1	R0	C5	C4	C3	C2	C1	C0

The bits have the following significance:

Bn	Chapter number (binary number, 0 – 2048)
Rn	Row number (binary number, 0 – 25)
Cn	Column number (binary number, 0 – 39)

2 Module Description

The MTXBASIC.A51 file contains the source code of the MTXB module: subroutines to execute basic functions and procedures for Siemens MEGATEXT.

2.1 Module Links

The MTXB module is unable to operate as a standalone program. Because of system modularity and flexibility it must be linked with the M3LH module, which is also contained in SIESTA MEGATEXT software. The source code for this module is contained in the following files:

- M3LHBASE.A51 (basic routines for M3L-Bus transmission, using 3-wire bus protocol).

Instead of the M3LH module a programmer could decide to use either the M3LS (M3L-Bus driver using a software interface) or the IICH or IICS module (I²C Bus drivers using hardware or software interface). Contact Siemens HL UE AT if you are interested in using other than the M3LH module which is contained on your distribution disk.

2.2 Include Files

MTXBASIC.A51 uses include files to define constant values and external symbols. The following include files (included by ASM51) must be contained in the same directory as MTXBASIC.A51 when working with the Intel assembler:

- REGISTER.INC (defines the names and addresses of the microcontroller's special-function registers. It is recommended to use one of the files contained on the Siemens SIESTA Software Utilities diskette 'SFR Definitions'). Your distribution disk contains a REGISTER.INC file for an SDA 30C162 microcontroller.
- MEGATEXT.INC (defines constant values for Siemens MEGATEXT, e.g. register addresses and command numbers).

2.3 External Calls

SIESTA MEGATEXT software offers an include file called MTXBASIC.INC which declares all public symbols of the MTXB module. So the line `$include (MTXBASIC.INC)` in the user's module(s) provides easy use of MEGATEXT routines. No further declaration of external symbols is necessary. However, if the number of external symbols in the user's module exceeds the capability of the linker (error message 'TOO MANY SYMBOLS'), it is recommended not to use the MTXBASIC.INC file but to declare the external symbols especially for the user module. So only the symbols which are really used in the module can be declared and the number of external symbols decreases.

To call any one of the subroutines of MTXBASIC.A51 from another module, the user has only to load the subroutine input parameters into the appropriate registers and then insert the following command: `CALL <subroutine name>`.

Each subroutine may modify the contents of the accumulator, the registers R0 through R7, the data pointer (DPTR), the program status word (PSW) and the B register.

3 Subroutine Description

The following chapter describes all subroutines of the MTXB module.

3.1 Basic Transmission Routines

This subchapter describes routines for serial bus transmission.

3.1.1 MTX_READ

Name	MTX_READ
Function	Read a definable number of bytes from the SDA 5273. Data sink is the internal RAM of the controller (IDATA).

Input Parameters

R0	Pointer to data sink address. Points to an IDATA address. Allowed range: $8 \dots (255 - n + 1)$, where n is number of bytes to read. If more than one byte has to be read, the received bytes are stored in ascending order, beginning at the address in R0.
R1	Pointer to data source address. This address is the register address of MEGATEXT from which the data have to be read. Allowed range: all valid MEGATEXT register addresses. If more than one byte is read, the user has to regard the auto increment function of most MEGATEXT registers.
R4	Number of bytes to read. Allowed range: $1 - 247$.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.2 MTX_WRITE

Name	MTX_WRITE
Function	Write a definable number of bytes to the SDA 5273. Data source is the internal RAM of the controller (IDATA).

Input Parameters

R0	Pointer to data source address. Points to an IDATA address. Allowed range: 8 ... (255 – n + 1), where n is number of bytes to write. If more than one byte has to be written, the transmitted bytes are taken in ascending order, beginning at the address in R0.
R1	Pointer to data sink address. This address is the register address of MEGATEXT to which the data have to be written. Allowed range: all valid MEGATEXT register addresses. If more than one byte is written, the user has to regard the auto increment function of most MEGATEXT registers.
R4	Number of bytes to write. Allowed range: 1 – 247.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.3 MTX_READ_X

Name	MTX_READ_X
Function	Read a definable number of bytes from the SDA 5273. Data sink is the external RAM of the controller (XDATA).

Input Parameters

DPTR	Pointer to data sink address. Points to an XDATA address. Allowed range: 0 ... (65535 – n + 1), where n is number of bytes to read. If more than one byte has to be read, the received bytes are stored in ascending order, beginning at the address in DPTR.
R1	Pointer to data source address. This address is the register address of MEGATEXT from which the data have to be read. Allowed range: all valid MEGATEXT register addresses. If more than one byte is read, the user has to regard the auto increment function of most MEGATEXT registers.
R4	Number of bytes to read. Allowed range: 1 – 256.

Name	MTX_READ_X (cont'd)
-------------	----------------------------

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.4 MTX_WRITE_X

Name	MTX_WRITE_X
Function	Write a definable number of bytes to the SDA 5273. Data source is the external RAM of the controller (XDATA).

Input Parameters

DPTR	Pointer to data source address. Points to an XDATA address. Allowed range: 8 ... (65535 – n + 1), where n is number of bytes to write. If more than one byte has to be written, the transmitted bytes are taken in ascending order, beginning at the address in R0.
R1	Pointer to data sink address. This address is the register address of MEGATEXT to which the data have to be written. Allowed range: all valid MEGATEXT register addresses. If more than one byte is written, the user has to regard the auto increment function of most MEGATEXT registers.
R4	Number of bytes to write. Allowed range: 1 – 256.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.5 READ_MTX_REGISTER

Name	READ_MTX_REGISTER
Function	Read the contents of one MEGATEXT register.

Input Parameters

R1	MEGATEXT register address to read from. Allowed range: all valid MEGATEXT register addresses.
-----------	--

Name	READ_MTX_REGISTER (cont'd)
-------------	-----------------------------------

Output Parameters

ACC	Contents of the addressed MEGATEXT register.
CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.

Comments:

The READ_MTX_REGISTER routine verifies the result of the read operation for each MEGATEXT M3L-Bus register except the DATA_PORT_0 and the DATA_PORT_1 registers.

3.1.6 WRITE_MTX_REGISTER

Name	WRITE_MTX_REGISTER
Function	Write data to one MEGATEXT register.

Input Parameters

ACC	Data written to the MEGATEXT register addressed by R1.
R1	MEGATEXT register address to write to. Allowed range: all valid MEGATEXT register addresses.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

Comments:

The WRITE_MTX_REGISTER routine verifies the result of the read operation for each MEGATEXT M3L-Bus register except the DATA_PORT_0 and the DATA_PORT_1 registers.

3.1.7 READ_MTX_BYTE_INT

Name	READ_MTX_BYTE_INT
Function	Read the contents of one byte from the internal MEGATEXT memory.

Input Parameters

R4 – R7	Address of the byte to read in user address format.
----------------	---

Name	READ_MTX_BYTE_INT (cont'd)
-------------	-----------------------------------

Output Parameters

ACC	Contents of the addressed MEGATEXT memory byte.
CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.

3.1.8 READ_MTX_BYTE_EXT

Name	READ_MTX_BYTE_EXT
Function	Read the contents of one byte from the external MEGATEXT memory.

Input Parameters

R4 – R7	Address of the byte to read in user address format.
----------------	---

Output Parameters

ACC	Contents of the addressed MEGATEXT memory byte.
CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.

3.1.9 WRITE_MTX_BYTE_INT

Name	WRITE_MTX_BYTE_INT
Function	Write one byte to the internal MEGATEXT memory.

Input Parameters

ACC	Data byte to write to the MEGATEXT memory.
R4 – R7	Address of the byte to write in user address format.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.10 WRITE_MTX_BYTE_EXT

Name	WRITE_MTX_BYTE_EXT
Function	Write one byte to the external MEGATEXT memory.

Input Parameters

ACC	Data byte to write to the MEGATEXT memory.
R4 – R7	Address of the byte to write in user address format.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.11 WRITE_STRING_CODE

Name	WRITE_STRING_CODE
Function	Copy a text string from the code memory to the MEGATEXT memory (via data port 1).

Input Parameters

R4	Length of the string in bytes. Allowed range: 1 – 256.
DPTR	Pointer to the first byte of the string in the code memory (16-bit address).

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.12 WRITE_STRING_IRAM

Name	WRITE_STRING_IRAM
Function	Copy a text string from the IDATA memory to the MEGATEXT memory (via data port 1).

Input Parameters

R4	Length of the string in bytes. Allowed range: 1 – 247.
DPTR	Pointer to the first byte of the string in the code memory (8-bit address). DPH is ignored by the subroutine, DPL must contain the string address ($7 < \text{DPL} < 256 - n$ where n is the string length contained in R4).

Name	WRITE_STRING_IRAM (cont'd)
-------------	-----------------------------------

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.13 WRITE_STRING_XRAM

Name	WRITE_STRING_XRAM
Function	Copy a text string from the XDATA memory to the MEGATEXT memory (via data port 1).

Input Parameters

R4	Length of the string in bytes. Allowed range: 1 – 256.
DPTR	Pointer to the first byte of the string in the XDATA memory (16-bit address).

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

3.1.14 WRITE_PACKED_STRING

Name	WRITE_PACKED_STRING
Function	Copy a packed text string from the code memory to the internal MEGATEXT memory (via data port 1). The address pointer is set before data transmission.

Input Parameters

DPTR	Pointer to the first byte of the string in the code memory (16-bit address). The format of a packed string is described below.
-------------	--

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

The following table describes the format of a packed string in the microcontroller's code memory. This format is also created by the Siemens ConvSDO tool, which creates files in assembler 8051 (ASM51) format from SDO files (output files of Siemens MEGATEXT Display Editor and Siemens MEGATEXT Assembler ASM5273).

```
<name of the string>:  
    dw    <number of bytes>  
    db    <block number>  
    db    <byte position>  
    db    <row number>  
    db    <column number>  
    db    <escape character>  
  
    db    <data>, ...
```

<number of byte> defines the number of bytes which are transmitted within one transmission sequence (min. 1, max. 1000). <block number>, <byte position>, <row number> and <column number> define the position in the internal MEGATEXT memory where the string is written to. The <escape character> may be used to reduce the amount of memorized data. If the <escape character> which is defined in the string header appears anywhere within the string, this character and the three subsequent characters are treated as an 'escape sequence'. An escape sequence is used to transmit one character multiple times (e.g. for display clear function). The following table shows the format of an escape sequence.

```
db    <escape character>  
dw    <number of transmissions>  
db    <repeat character>
```

The <number of transmissions> says how often the <repeat character> is written to the MEGATEXT memory.

Caution! Memory position and total number of characters of a string must be selected so that the string does not exceed the auto increment borders of MEGATEXT (row 24, column 39 and row 25, column 23 of each 1-Kbyte page).

3.2 Arithmetic Functions

This group of subroutines contains functions which do not directly influence the MEGATEXT device, but they are used for mathematical transformations which are necessary to serve the M3L-Bus registers.

3.2.1 LOAD_MTX_ADDRESS_INT

Name	LOAD_MTX_ADDRESS_INT
Function	Changes an internal MEGATEXT address from user format to MEGATEXT format.

Input Parameters

R4 – R7	Internal MEGATEXT RAM address in user address format.
----------------	---

Output Parameters

R1 – R3	Internal MEGATEXT RAM address in MEGATEXT address format (see above).
----------------	---

3.2.2 LOAD_MTX_ADDRESS_EXT

Name	LOAD_MTX_ADDRESS_EXT
Function	Changes an external MEGATEXT address from user format to MEGATEXT format.

Input Parameters

R4 – R7	External MEGATEXT RAM address in user address format.
----------------	---

Output Parameters

R1 – R3	External MEGATEXT RAM address in MEGATEXT address format.
----------------	---

3.2.3 LOAD_USER_ADDRESS

Name	LOAD_USER_ADDRESS
Function	Changes a MEGATEXT internal or external RAM address from MEGATEXT address format to user address format.

Input Parameters

R1 – R3	Address in MEGATEXT address format.
----------------	-------------------------------------

Output Parameters

R4 – R7	Address in user address format.
----------------	---------------------------------

3.2.4 CONVERT_BYTE_POSITION

Name	CONVERT_BYTE_POSITION
Function	Converts a byte position from user format (binary) to MEGATEXT format (decimal).

Input Parameters

ACC	Byte position in user format (binary). Allowed input range: 0 – 5.
------------	--

Output Parameters

ACC	Byte position in MEGATEXT format (decimal). Allowed input range: 0 – 5. The following table gives all valid combinations of user and MEGATEXT format.
------------	--

No.	User Format	Megatext Format
1	00000000 _B	00000001 _B
2	00000001 _B	00000010 _B
3	00000010 _B	00000100 _B
4	00000011 _B	00001000 _B
5	00000100 _B	00010000 _B
6	00000101 _B	00100000 _B

3.2.5 RECONVERT_BYTE_POSITION

Name	RECONVERT_BYTE_POSITION
Function	Converts a byte position from MEGATEXT format (decimal) to user format (binary). See above for more information about byte position formats.

Input Parameters

ACC	Byte position in MEGATEXT format (decimal). Allowed input range: 0 – 5.
------------	--

Output Parameters

ACC	Byte position in MEGATEXT format (decimal). Allowed input range: 0 – 5. The following table gives all valid combinations of user and MEGATEXT format.
------------	--

3.3 MEGATEXT Register Functions

This subchapter describes routines for MEGATEXT register control. Additionally to the subroutine function and the input/output parameters a quick reference to the relevant MEGATEXT registers is shown.

Some register write routines will set MEGATEXT M3L registers or bits to a fixed value. In this case the fixed value is shown in brackets [] after the register or bit name in the reference list, e.g. **RWINC_OFF [0]**.

Register values all appear in hexadecimal format, bit values are either '0' or '1'.

3.3.1 EXECUTE_MCI_COMMAND

Name	EXECUTE_MCI_COMMAND
Function	Starts execution of an MCI (MEGATEXT Command Interface) command and waits until command execution is finished by the MEGATEXT PU. If the command is not finished within 500 ms, the routine breaks and returns with an error flag.

Input Parameters

ACC	Command number of the command to execute. Allowed input range: all valid MEGATEXT PU commands. See [2] for a list of all valid command numbers.
------------	---

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
ACC	Error code. ACC = 0: No errors. ACC = 1 – 254: Not defined. ACC = 255: MEGATEXT PU failure. Command was not finished within 500 ms.
R7	Command status byte (contents of register MCI_3_1). Format of the command status byte depends on the executed command. See [2].

M3L Registers

MCI_COMMAND
MCI_3_1

3.3.2 SET_FREE_CHAP_CHAIN

Name	SET_FREE_CHAP_CHAIN
Function	Sets the free chapter chain control registers of MEGATEXT. Defines the first free pointer to the chapter chain and the number of free elements in this chain.

Input Parameters

ACC	Memory type. ACC = 0: first free pointer points to internal MEGATEXT RAM. ACC = 1: first free pointer points to external MEGATEXT RAM.
R4, R5	Start element of free chapter chain in user format (without row and column). Depending on the ACC contents, these bytes define an internal (ACC) or external (ACC = 1) MEGATEXT memory address. An internal address consists of byte position (R4) and block number (R5). An external address consists of a chapter number (range: 0 – 2047) where R4 carries the High byte of the number.
R2, R3	Number of free elements in the chapter chain (R2 = High byte). Allowed input range: 0 – 2065 (if 2 Mbytes external RAM are available). The passed number of chapter elements is allocated in the MEGATEXT RAM.
CY	End of chain. If CY = 0, the pointer points to the first free chain element. If CY = 1, the pointer does not point to any chain element, the address and number passed in registers R4 – R7 is irrelevant.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

FFP_CHAP_2 – FFP_CHAP_0
NF_CHAP_1, NF_CHAP_0

M3L Bits

NF_C_11 – NF_C_0

3.3.3 SET_ADDRESS_POINTER_INT

Name	SET_ADDRESS_POINTER_INT
Function	Sets one of the two available address pointers to an address located in the internal MEGATEXT RAM.

Input Parameters

R4 – R7	Internal MEGATEXT RAM address in user address format.
ACC	Number of address pointer. Allowed range: 0 – 1. Defines which address pointer is loaded.
R3	Auto increment mode. See below. Used to switch automatic increment of rows and columns on or off.

R3: Auto increment mode

0	0	0	0	0	0	RI	CI
----------	----------	----------	----------	----------	----------	-----------	-----------

RI row increment ON/OFF (0 = ON)

CI column increment ON/OFF (0 = ON)

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

ADDRESS_POINTER_02
ADDRESS_POINTER_01
ADDRESS_POINTER_00
PORT_0_CONTROL

ADDRESS_POINTER_12
ADDRESS_POINTER_11
ADDRESS_POINTER_10
PORT_1_CONTROL

M3L Bits

EXT_MEM [0]
BI_ADR [0]
RWINC_OFF
CLINC_OFF
BYT_5 – BYT_0
BLK_2 – BLK_0
ROW_4 – ROW_0
COL_5 – COL_0

3.3.4 SET_ADDRESS_POINTER_EXT

Name	SET_ADDRESS_POINTER_EXT
Function	Sets one of the two available address pointers to an address located in the external MEGATEXT RAM.

Input Parameters

R4 – R7	External MEGATEXT RAM address in user address format.
ACC	Number of address pointer. Allowed range: 0 – 1. Defines which address pointer is loaded.
R3	Auto increment mode. See below. Used to switch automatic increment of rows and columns on or off.

R3: Auto increment mode

0	0	0	0	0	0	RI	CI
----------	----------	----------	----------	----------	----------	-----------	-----------

RI row increment ON/OFF (0 = ON)

CI column increment ON/OFF (0 = ON)

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

ADDRESS_POINTER_02
ADDRESS_POINTER_01
ADDRESS_POINTER_00
PORT_0_CONTROL

ADDRESS_POINTER_12
ADDRESS_POINTER_11
ADDRESS_POINTER_10
PORT_1_CONTROL

M3L Bits

EXT_MEM [1]
BI_ADR [0]
RWINC_OFF
CLINC_OFF
CHP_10 – CHP_0
ROW_4 – ROW_0
COL_5 – COL_0

3.3.5 GET_ADDRESS_POINTER

Name	GET_ADDRESS_POINTER
Function	Reads the position of a page cursor from an address pointer register.

Input Parameters

ACC	Number of address pointer. Allowed range: 0 – 1. Defines which address pointer is read out.
------------	---

Output Parameters

ACC	Memory type. ACC = 0: internal MEGATEXT RAM. ACC = 1: external MEGATEXT RAM. ACC = 2: error, address pointer does actually use binary addressing and not row/column addressing.
R4 – R7	Internal or external MEGATEXT RAM address in user address format.
CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.

M3L Registers

ADDRESS_POINTER_02
 ADDRESS_POINTER_01
 ADDRESS_POINTER_00
 PORT_0_CONTROL

 ADDRESS_POINTER_12
 ADDRESS_POINTER_11
 ADDRESS_POINTER_10
 PORT_1_CONTROL

M3L Bits

EXT_MEM
 RWINC_OFF
 CLINC_OFF
 BYT_5 – BYT_0
 BLK_2 – BLK_0
 CHP_10 – CHP_0
 ROW_4 – ROW_0
 COL_5 – COL_0

3.3.6 SET_FREE_P80_CHAIN

Name	SET_FREE_P80_CHAIN
Function	Sets the free P80 chain control registers of MEGATEXT. Defines the first free pointer to the P80 chain and the number of free elements in this chain.

Input Parameters

ACC	Memory type. ACC = 0: first free pointer points to internal MEGATEXT RAM. ACC = 1: first free pointer points to external MEGATEXT RAM.
R4 – R6	Start element of free P80 chain in user format (without column). Depending on the ACC contents, these bytes define an internal (ACC) or external (ACC = 1) MEGATEXT memory address. An internal address consists of byte position (R4), block number (R5) and row number (R6). An external address consists of a chapter number (range: 0 – 2047) where R4 carries the High byte of the number, and row number (R6).
R2, R3	Number of free elements in the P80 chain (R2 = High byte). Allowed input range: see [3]. The passed number of P80 elements is allocated in the MEGATEXT RAM.
CY	End of chain. If CY = 0, the pointer points to the first free chain element. If CY = 1, the pointer does not point to any chain element, the address and number passed in registers R4 – R7 is irrelevant.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

FFP_P80_2 – FFP_P80_0
NF_P80_1, NF_P80_0

M3L Bits

NF_8_15 – NF_8_0

3.3.7 SET_FREE_P40_CHAIN

Name	SET_FREE_P40_CHAIN
Function	Sets the free P40 chain control registers of MEGATEXT. Defines the first free pointer to the P40 chain and the number of free elements in this chain.

Input Parameters

ACC	Memory type. ACC = 0: first free pointer points to internal MEGATEXT RAM. ACC = 1: first free pointer points to external MEGATEXT RAM.
R4 – R6	Start element of free P40 chain in user format (without column). Depending on the ACC contents, these bytes define an internal (ACC) or external (ACC = 1) MEGATEXT memory address. An internal address consists of byte position (R4), block number (R5) and row number (R6). An external address consists of a chapter number (range: 0 – 2047) where R4 carries the High byte of the number, and row number (R6).
R2, R3	Number of free elements in the P40 chain (R2 = High byte). Allowed input range: see [3]. The passed number of P40 elements is allocated in the MEGATEXT RAM.
CY	End of chain. If CY = 0, the pointer points to the first free chain element. If CY = 1, the pointer does not point to any chain element, the address and number passed in registers R4 – R7 is irrelevant.

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

FFP_P40_2 – FFP_P40_0
NF_P40_1, NF_P40_0

M3L Bits

NF_4_15 – NF_4_0

3.3.8 SET_RGB_LEVEL

Name	SET_RGB_LEVEL
Function	Adjusts RGB level. A DC level is superposed on the RGB outputs.

Input Parameters

ACC	RGB level. Allowed range: 0 – 7.
------------	----------------------------------

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

RGB_CONTROL

M3L Bits

RGB_LVL_2 – RGB_LVL_0

3.3.9 SET_RGB_GAIN

Name	SET_RGB_GAIN
Function	Adjusts RGB gain (RGB-signal amplitude).

Input Parameters

ACC	RGB gain. Allowed range: 0 – 31.
------------	----------------------------------

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

RGB_CONTROL

M3L Bits

RGB_GAIN_4 – RGB_GAIN_0

3.3.10 ALLOCATE_MEMORY

Name	ALLOCATE_MEMORY
Function	Allocates memory in the internal MEGATEXT RAM or in the first 24 Kbytes of the external MEGATEXT RAM for special purposes. Memory which is allocated is not used by the MEGATEXT PU for chapter chain, P40 chain and P80 chain.

Input Parameters

ACC	Memory type. ACC = 0: allocate memory in the internal MEGATEXT RAM. ACC = 1: allocate memory in the external MEGATEXT RAM.
R5 – R7	Bit map for allocation of chapters in the internal or external MEGATEXT RAM (depending on memory type passed in ACC). The contents of R5 – R7 are loaded to the IAT_2 – IAT_0 (ACC = 0) or the XAT_2 – XAT_0 registers of MEGATEXT. See [1] for a detailed description of the bit map. R5 is copied to IAT_2 (XAT_2), R6 is copied to IAT_1 (XAT_1) and R7 is copied to IAT_0 (XAT_0).

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

IAT_2 – IAT_0
XAT_2 – XAT_0

M3L Bits

ABLK_3_5 – ABLK_0_0
ACHP_23 – ACHP_0

3.3.11 SET_PSEUDO_PACKETS

Name	SET_PSEUDO_PACKETS
Function	Enables/disables storage of received pseudo packets X/25, X/26, X/27, X/28.

Name	SET_PSEUDO_PACKETS (cont'd)
-------------	------------------------------------

Input Parameters

ACC	<p>Pseudo packet storage mode. Must be a combination of one or more of the following codes:</p> <table> <tr><td>0</td><td>no pseudo packet stored</td></tr> <tr><td>1</td><td>packet X/25 stored</td></tr> <tr><td>2</td><td>packet X/26 stored</td></tr> <tr><td>4</td><td>packet X/27 stored</td></tr> <tr><td>8</td><td>packet X/28 stored</td></tr> </table> <p>For example, if packets X/26 and X/27 are stored on reception, you have to pass $2 + 4 = 6$ in the ACC.</p>	0	no pseudo packet stored	1	packet X/25 stored	2	packet X/26 stored	4	packet X/27 stored	8	packet X/28 stored
0	no pseudo packet stored										
1	packet X/25 stored										
2	packet X/26 stored										
4	packet X/27 stored										
8	packet X/28 stored										

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

PSEUDO_PACKET_ENABLE

M3L Bits

EN_X_28

EN_X_27

EN_X_26

EN_X_25

3.3.12 SET_PAGE_TRACE_ADDR

Name	SET_PAGE_TRACE_ADDR
Function	Defines the address in the MEGATEXT RAM where the page trace is located. The page trace always occupies one complete chapter, beginning at binary address 000 0000 0000 _B .

Input Parameters

ACC	<p>Memory type.</p> <p>ACC = 0: page trace located in internal MEGATEXT RAM.</p> <p>ACC = 1: page trace located in external MEGATEXT RAM.</p>
------------	---

Name	SET_PAGE_TRACE_ADDR (cont'd)
-------------	-------------------------------------

Input Parameters

R4, R5	Chapter address (internal or external MEGATEXT RAM, depending on ACC contents) of the page trace, given in user format. In case of internal RAM (ACC = 0), R4 carries the byte position, R5 defines the block number. In case of external MEGATEXT RAM (ACC = 1), R4 defines the High byte of the chapter number (range: 0 – 2047), R5 defines the Low byte.
---------------	--

Output Parameters

CY	Error flag. Is set to '1' if an error occurred during transmission on the serial bus.
-----------	---

M3L Registers

PT_ADR_2 – PT_ADR_0

4 Subroutines Overview

The following table gives an overview of all available subroutines of the MTXB module in alphabetic order.

No.	Name of Subroutine	Page
1	ALLOCATE_MEMORY	27
2	CONVERT_BYTE_POSITION	18
3	EXECUTE_MCI_COMMAND	19
4	GET_ADDRESS_POINTER	23
5	LOAD_MTX_ADDRESS_EXT	17
6	LOAD_MTX_ADDRESS_INT	17
7	LOAD_USER_ADDRESS	17
8	MTX_READ	9
9	MTX_READ_X	10
10	MTX_WRITE	10
11	MTX_WRITE_X	11
12	READ_MTX_BYTE_EXT	13
13	READ_MTX_BYTE_INT	12
14	READ_MTX_REGISTER	11
15	RECONVERT_BYTE_POSITION	18

No.	Name of Subroutine (cont'd)	Page
16	SET_ADDRESS_POINTER_EXT	22
17	SET_ADDRESS_POINTER_INT	21
18	SET_FREE_CHAP_CHAIN	20
19	SET_FREE_P40_CHAIN	25
20	SET_FREE_P80_CHAIN	24
21	SET_PAGE_TRACE_ADDR	28
22	SET_PSEUDO_PACKETS	27
23	SET_RGB_GAIN	26
24	SET_RGB_LEVEL	26
25	WRITE_MTX_BYTE_EXT	14
26	WRITE_MTX_BYTE_INT	13
27	WRITE_MTX_REGISTER	12
28	WRITE_PACKED_STRING	15
29	WRITE_STRING_CODE	14
30	WRITE_STRING_IRAM	14
31	WRITE_STRING_XRAM	15

5 Abbreviations

The following table gives an overview of all abbreviations used.

A/D	Analog-to-digital
ACC	Accumulator (8051)
addr	Address
CRC	Cyclic redundancy check
CVBS	Color video blanking sync
CY	Carry (8051)
D/A	Digital-to-analog
DC	Direct current
DPTR	Data pointer (8051)
ext	External
HSYNC	Horizontal sync
int	Internal
LSB	Least significant bit
MCI	MEGATEXT Command Interface
MSB	Most significant bit
MTX	MEGATEXT
NPRD	Non-page-related data
PDC	Program delivery control
PLL	Phase-locked loop

Abbreviations (cont'd)

PRQ	Page request
PSW	Program status word (8051)
PTT	Page trace table
PU	Processing unit
RGB	Red green blue
S/P-C	Serial/parallel conversion
seg	Segment
TCS	Text composite sync
TTX	Teletext
TV	Television
V-Delay	Vertical delay
VPS	Video programming system
VSYNC	Vertical sync

6 Literature

The following list gives an overview of literature available on Siemens MEGATEXT and on teletext.

- | | |
|--|--|
| <p>[1] Höck, G.
SDA 5273 M3L-Bus Registers
Programmer's Reference
Siemens AG, HL UE PD 23
Munich, 1992</p> | <p>[5] Mirthes, R.
MEGATEXT Display Register Overview
Siemens AG, HL UE PD 23
Munich, 1991</p> |
| <p>[2] Höck, G.
SDA 5273 MCI Description
Siemens AG, HL UE PD 23
Munich, 1992</p> | <p>[6] Mirthes, R.
SIESTA MEGATEXT
Display Register Control Routines
Siemens AG, HL UE AT 23
Munich, 1992
(in preparation)</p> |
| <p>[3] Englert, U.
SDA 5273 ACQ Reference Manual
Siemens AG, HL UE PE 11
Munich, 1992</p> | <p>[7] Mirthes, R.
SIESTA MEGATEXT
MEGATEXT Command Interface
Control Routines
Siemens AG, HL UE AT 23
Munich, 1992
(in preparation)</p> |
| <p>[4] Roessler, W.
MEGATEXT Display Functions
Siemens AG, HL UE AT 23
Munich, 1992</p> | <p>[8] N. N.
World System Teletext and
Data Broadcasting System
Technical Specification
Department of Trade and Industry
London, 1988</p> |

7 Index

A

Accumulator 5, 9, 30
 Address formats 6, 7, 8, 12, 13, 14, 17, 21, 22, 23
 Address pointers 15, 21, 22, 23
 AEDIT 5
 Arithmetic functions 16
 ASM51 5, 8, 16
 Assembler 5, 8, 16

B

B register 9
 Binary numbers 6
 Block number 6, 7, 16, 20, 24, 25, 29
 Byte position 6, 7, 16, 18, 20, 24, 25, 29
 Byte position format 18

C

Chapter number 7, 8, 20, 24, 25, 29
 Column number 6, 7, 8, 16
 Command number 8, 19
 Command status 19

D

Data pointer 9, 30
 Decimal numbers 6, 7
 Development environment 5
 DPTR 9, 10, 11, 14, 15, 30

E

External calls 9
 External symbols 8, 9

F

Free chapter chain 20
 Functions 5, 8, 16, 19, 31, 34

H

Hardware 5, 8
 Hexadecimal numbers 6

I

In-circuit emulator 5
 Include files 8, 9
 Introduction 5

L

Linker 5, 9

M

M3L bits
 ABLK 27
 ACHP 27
 BI_ADR 21, 22
 BLK 21, 23
 BYT 21, 23
 CHP 22, 23
 CLINC_OFF 21, 22, 23
 COL 21, 22, 23
 EN_X_25 28
 EN_X_26 28
 EN_X_27 28
 EN_X_28 28
 EXT_MEM 21, 22, 23
 NF_4 25
 NF_8 24
 NF_C 20
 RGB_GAIN 26
 RGB_LVL 26
 ROW 21, 22, 23
 RWINC_OF 19, 21, 22, 23

Index (cont'd)

M3L registers

ADDRESS_POINTER 21, 22, 23

FFP_CHAP 20

FFP_P40 25

FFP_P80 24

IAT 27

MCI_COMMAND 19

NF_CHAP 20

NF_P40 25

NF_P80 24

PORT_CONTROL 21, 22, 23

PSEUDO_PACKET_ENABLE 28

PT_ADR 29

RGB_CONTROL 26

XAT 27

M3LHBASE.A51 8

MEGATEXT address format 7, 8, 17

MEGATEXT memory 6, 12, 13, 14, 15,
16, 20, 22, 24, 25

MEGATEXT register 9, 10, 11, 12, 19

MEGATEXT.INC 8

Memory 5, 6, 12, 13, 14, 15, 16, 20, 23,
24, 25, 27, 28, 29

Module 5, 6, 8, 9, 29

Module links 8

MTXB 5, 6, 8, 9, 29

MTXBASIC.A51 5, 8, 9

MTXBASIC.INC 9

P

Packed string 15, 16

Page trace 28, 29, 31

Procedures 8

Program status word 9, 31

Pseudo packets 27

PSW 9, 31

R

Read 9, 10, 11, 12, 13, 23, 29

Register address 8, 9, 10, 11, 12

Register functions 19

REGISTER.INC 8

RGB gain 26

RGB level 26

RGB outputs 26

RGB-signal amplitude 26

RL51 5

Row number 6, 7, 8, 16, 22, 24, 25

S

Software 5, 8, 9

Special-function registers 8

Subroutines 5, 8, 9, 16, 29

T

Text string 14, 15

U

User address format 6, 7, 12, 13, 14, 17,
21, 22, 23

W

Write 5, 10, 11, 12, 13, 14, 15, 19, 29, 30