

SIEMENS

ICs for Consumer Electronics

TVTEXT

Firmware and Command Interface Description Version 0.01

SDA 5251/5252 (1 Page) Firmware Version V1.7x

Target Specification 1996-12-01

SDA 5251/5252		
Revision History:		Current Version: 1996-12-01
Previous Version:		
Page (in previous Version)	Page (in current Version)	Subjects (major changes since last revision)
		For changed features in the firmware versions see the file read.me on the demo disk
	37	Change to Compiler 5.02 and linker 3.52.
	27	Constant Definition for the Update Mode Characters.
	37	Banking of the TVTEXT Firmware
	42	Firmware in memory model small and large
	39	Vertical user subroutine "user_function"
	23	New HOLD mode possibility in DISPLAY_MODE1
	25	p26_clear_c8 in DISPLAY_MODE2.
	26	osd_header_clock input parameter in DISPLAY_MODE3
	27	Hungarian language possible
	26	Row 24 control and switch with Display_mode3.2
	46	First Greek release
	48	OSD Overview
	48	Text Reception Quality
	49	Patents

Edition 1996-12-01

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

© Siemens AG 1996.
All Rights Reserved.

Attention please!

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.

Components used in life-support devices or systems must be expressly authorized for such purpose!

Critical components¹ of the Semiconductor Group of Siemens AG, may only be used in life-support devices or systems² with the express written approval of the Semiconductor Group of Siemens AG.

- 1 A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or effectiveness of that device or system.
- 2 Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health of the user may be endangered.

Table of Contents		Page
1	General Information	6
2	Command Directory	7
3	TCI Command Table	8
4	Command Description	10
4.1	Modified Display Registers	10
4.2	RESET_ACQ (No. 00)	10
4.3	OSD_ROW24 (No. 01)	10
4.4	PICTURE_MODE (No. 02)	11
4.5	TV_TEXT_MODE (No. 03)	11
4.6	MIX_MODE (No. 04)	11
4.7	UPDATE_MODE (No. 05)	12
4.8	INDEX (No. 07)	12
4.9	SUBPAGE_MODE (No. 08)	13
4.10	SIZE (No. 09)	13
4.11	HOLD (No. 10)	14
4.12	REVEAL (No. 11)	14
4.13	CLOCK (No. 12)	15
4.14	RED (No. 14)	15
4.15	GREEN (No. 15)	16
4.16	YELLOW (No. 16)	16
4.17	CYAN (No. 17)	17
4.18	PAGE_PLUS (No. 18)	17
4.19	PAGE_MINUS (No. 19)	17
4.20	SIZE_OFF (No. 20)	18
4.21	DIGIT0 (No. 23)	18
4.22	DIGIT1 (No. 24)	18
4.23	DIGIT2 (No. 25)	18
4.24	DIGIT3 (No. 26)	19
4.25	DIGIT4 (No. 27)	19
4.26	DIGIT5 (No. 28)	19
4.27	DIGIT6 (No. 29)	19
4.28	DIGIT7 (No. 30)	19
4.29	DIGIT8 (No. 31)	19
4.30	DIGIT9 (No. 32)	19
4.31	OSD (No. 33)	20
4.32	OSD_ROW0 (No. 34)	20

Table of Contents		Page
5	Setup Parameters .....	.21
5.1	ACQUISITION_MODE .....	.21
5.2	DISPLAY_MODE0 .....	.22
5.3	DISPLAY_MODE1 .....	.23
5.4	DISPLAY_MODE2 .....	.25
5.5	DISPLAY_MODE3 .....	.26
5.6	The Language User Set Table USER_LANGC[8] .....	.27
5.7	Constant Definitions for the Update Mode Characters .....	.27
6	Return Parameters .....	.28
6.1	VPS_DATA .....	.28
6.2	TEXT_MODE .....	.28
6.3	RETURN_1 .....	.29
6.4	RETURN_2 .....	.29
6.5	RETURN_3 .....	.30
7	Stored Format of a Page .....	.31
8	Stored Format of Packet 8/30 (x000) Format 1 .....	.33
9	Stored Format of Packet 8/30 (x100) Format 2 .....	.34
10	Format of the Row24 Titles .....	.35
10.1	Format of SIMPLE Title .....	.35
10.2	Format of Subpage Menu .....	.35
10.3	Format of Row24 Title in Newsflash Mode .....	.35
11	Development Environment .....	.36
11.1	Hardware .....	.36
11.2	Software .....	.36
12	Linker and Module Description of the Acquisition Demo .....	.37
12.1	Banking of the TVTEXT Firmware .....	.37
12.2	The Linker File (lk.dat) .....	.38
12.3	Description of the Files .....	.39
12.4	Description of the Additional Files for the Acq Demo .....	.41
13	XRAM Mapping .....	.42
14	DATA and IDATA Mapping .....	.42
15	Memory Model of the TVTEXT Firmware .....	.42
16	External Command Calls .....	.43

Table of Contents		Page
17	How to Start .....	.44
17.1	Initialization .....	.44
17.2	Reset_acq .....	.44
17.3	Acq_che1 .....	.44
18	Segment Name Conventions for Assembler Programs .....	.45
19	Data Pointer Select (DPSEL) Handling .....	.45
20	Appendix .....	.46
20.1	Greek Firmware Version .....	.46
20.2	Signal Quality Counter .....	.47
21	Application Notes .....	.48
21.1	Overview about the On Screen Display Possibilities for the1 page Version .....	.48
21.2	Text Reception Quality .....	.48
22	Patents .....	.49
23	Infrared Decoder for SIEMENS IR60 Code .....	.50
23.1	Infrared Keys for TVTEXT Commands in the Acquisition Demo .....	.53

1 General Information

TVTEXT software is a SIEMENS software package which provides the programmer of the SDA 5251 (TVTEXT) with an easy access to and control of teletext. The following introductory chapters give an overview about the development environment and how to use this manual. This manual gives an information about the modules, commands and the input and output parameters of the TVTEXT teletext software.

The SDA 5251 are a standard controller family with integrated hardware for teletext reception and display. Most of the teletext features are realized by software operations which are described in this specification. The interface is very simple so that the development time for integrating the text-firmware in the complete tv-software goes to zero.

After giving the RESET-command, the setup parameters are read and evaluated.

The complete page management is done on chip. FLOF detection and the following memory allocation is done automatically, as well as the acquisition of packet 8/30/1, 8/30/2 or VPS. The initial teletext page is set to 'page 100' unless modified by the user software or by a valid packet 8/30.

The user has different possibilities to enter a page request. One way is entering a page number for a new display page with the 'DIGIT' commands. It is also possible to enter a page request with the colour keys RED, GREEN, YELLOW, CYAN or the INDEX key. These keys have different meanings depending on the current request mode. In all cases only the new display page has to be entered and all following page requests are done automatically by the firmware depending on the current mode.

Some additional status information is also available (e.g. FLOF, Page found, ...) for generating individual messages like 'Page xxx not broadcasted' by the external controller.

For page acquisition 1 page is available. If OSD functions should be used 4 possibilities are available. After reset the SDA 5250 is in the 'SIMPLE Mode', that means the initial Page (Page 100) is requested. The processor will start with the PICTURE mode. Optionally it can be decided, whether VPS or TEXT reception in line 16 should have higher priority during the first few frames of data acquisition after reset.

In FLOF mode the four link pages and the index page of the display chapter given by X/27/0 can be requested by the colour keys.

Packets X/27/0 are compressed and stored in a special memory section.

The reception of Packets 8/30/0 and 8/30/1 is always enabled.

Special input parameter register control the commands, the acquisition and the display functions.

The subpage-, and the update mode is also supported.

2 Command Directory

This chapter contains a list of commands from the TVTEXT Command Interface TCI. The documentation for each command contains a statement about the command's purpose, a description of its input parameters with used parameter registers, and a description of its return values with used parameter registers. The documentation for some functions contains additional, important comments that a designer needs in order to use the command. How these commands are called is described in **chapter 16**.

3 TCI Command Table

The following table shows the command name/command number assignment:

Command Name	Command Number
RESET_ACQ	00
OSD_ROW24	01
PICTURE_MODE	02
TV_TEXT_MODE	03
MIX_MODE	04
UPDATE_MODE	05
	06
INDEX	07
SUBPAGE_MODE	08
SIZE	09
HOLD	10
REVEAL	11
CLOCK	12
	13
RED	14
GREEN	15
YELLOW	16
CYAN	17
PAGE_PLUS	18
PAGE_MINUS	19
SIZE_OFF	20
	21
	22

Command Name	Command Number
DIGIT0	23
DIGIT1	24
DIGIT2	25
DIGIT3	26
DIGIT4	27
DIGIT5	28
DIGIT6	29
DIGIT7	30
DIGIT8	31
DIGIT9	32
OSD	33
OSD_ROW0	34
	35

4 Command Description

4.1 Modified Display Registers

After the `reset_acq()` command the following display registers are modified by the firmware and the commands:

DTIM, DTCR, DMODE1, DMODE2, DCRP, LANGC, SCON

4.2 RESET_ACQ (No. 00)

This command resets the complete acquisition and should be given after each change of the program. After initializing the TVTEXT-page RAM and returning to the picture mode, the setup parameters are read and evaluated.

`Reset_acq()` enables also two acquisition interrupts. The first interrupt starts with the recognition of the vertical signal. In this short interrupt the function `userfunc` is executed. The second interrupt starts with the recognition of the line24 of every field.

In this interrupt the teletext data of the VBI buffer are processed, checked and stored.

Input parameters: SETUP PARAMETERS (see **chapter 5**).

Return values: all return parameters.

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	Never locked
Related I/O parameter	None	None

4.3 OSD_ROW24 (No. 01)

`Osd_row24` is a toggle command which switches on or off the on-screen display in row 24. The corresponding status bit is in `ACQUISITION_MODE.7` (disable row24). If `osd_row24` is switched on, the current content of the display chapter in row24 is stored in the background. The user has now the possibility, to write his own menu line in row 24 of the display chapter. If a TTX page is stored in this state, packet 24 will be stored in the background. Leaving this command (by giving it again) will restore the row 24 content (e.g. SIMPLE title, FLOF ...)

Input parameters: None.

Return values: `ACQUISITION_MODE.7` ('1' = `osd_row24` is ON, '0' is OFF)

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	OSD
Related I/O parameter	None	RETURN_3.4

4.4 PICTURE_MODE (No. 02)

Switches from any TEXT mode to TV mode. The switch is done by setting the whole screen to transparent. All acquisition tasks are done in background.

Input parameters: None.
Return values: RETURN_3.
Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	OSD
Related I/O parameter	None	RETURN_3.4

4.5 TV_TEXT_MODE (No. 03)

Switches from TV mode to TEXT mode. The switch is done by resetting all transparent background and foreground bits. Further any special text modes (i.e. double height, hold, reveal) are cleared.

Input parameters: None.
Return values: RETURN_3.3.
Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	OSD
Related I/O parameter	None	RETURN_3.4

4.6 MIX_MODE (No. 04)

This command toggles between TEXT background colour and transparent background colour. The switch is done by setting the appropriate transparent bits in the special function registers.

Input parameters: None.
Return values: RETURN_3.2.
Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.7 UPDATE_MODE (No. 05)

After giving this command the display is switched to transparent.

- If the page is running in (the header is active) the page number will be seen in the left top of the screen without flash.
- If the page is still being searched the characters from the update_code (see **chapter 5.7**) are displayed with flash until the page header is found.
- If the page is already found, the text sign will be displayed without flash, until the next page header is found. Then the page number is displayed.

In update mode the input of any page-related key as digit, red, green, ..., to start a new page request is possible.

Input parameters: None.
Return values: RETURN_3.0.
Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.8 INDEX (No. 07)

In FLOF mode there will be a change to the INDEX page of the FLOF broadcaster. If there is no INDEX page linked there will be a return to page 100 if no P8/30 init page is available.

- In SIMPLE mode the index page request will return to page 100 if no P8/30 init page is available.
- If packet 8/30 is available there will be a return to the initial page of this packet.
- If the init-page bit in DISPLAY_MODE1 is set, a page request of the user defined init page will be done (see also I/O parameter description).

This mode has the highest priority.

Input parameters: DISPLAY_MODE1.3.
Return values: None.
Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RRETURN_3.4

4.9 SUBPAGE_MODE (No. 08)

If this command is given the subpage mode is activated. That means that any subpage of the current basic display chapter can be requested. In that mode 4 digits must be given to specify a subpage. The subpage mode is terminated if this command is given again, or if any other page select method is used.

With the red and green keys the next and the previous subcode can be selected.

When subpage mode command is given, the subpage start value is '0001'.

Input parameters: None.

Return values: RETURN_3.6.

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.10 SIZE (No. 09)

This command switches between the three possible display sizes in the following order:

Normal size: Row 0 ... 24 are shown in normal height.

Double size upper half: Row 0 ... 11 are shown in double height, row 24 in normal height.

Double size lower half: Row 12 ... 23 are shown in double height, row 24 in normal height.

Input parameters: None.

Return values: SFR DMODE1.(bit 3 and 4).

Comments: Giving any page number related command (digit, colour key, index, p + ...)
TVTEXT will always return to normal size.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	Never locked
Related I/O parameter	None	None

4.11 HOLD (No. 10)

This command stops the reception of the actual display chapter. This feature can be used to watch 'running through' subpages. The time information is not effected by this command. If these memory locations should not be overwritten, the user has to set the 'TIME_OFF'-bit.

This command has a toggle function.

A new page request by any digit command will clear the hold function.

Input parameters: See description of DISPLAY_MODE1.5 for different hold modes

Return values: RETURN_2.7.

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3 (bit 3)	RETURN_3 (bit 4)

4.12 REVEAL (No. 11)

All hidden characters are revealed. Giving this command again, hides these characters again. If a new subpage runs in during subpage 'don't care' mode, hidden characters are concealed after each new subpage reception. This command has a toggle function.

Input parameters: None

Return values: SFR DMODE1.5

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3 (bit 3)	RETURN_3 (bit 4)

4.13 CLOCK (No. 12)

In picture mode this command shows the actual time from the last 8 characters of each header in serial TTX transmission mode. In parallel TTX transmission mode the clock is shown of the actual displayed magazine. The clock is shown in double height. The foreground and background colour can be selected in the setup parameters. If the command is given again, or TEXT mode is chosen the clock is switched off. The position of the clock can be influenced by changing the horizontal and vertical delay registers DHD and DVD.

Input parameters: DISPLAY_MODE0.

Return values: RETURN_3.5.

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.1	RETURN_3.4

4.14 RED (No. 14)

Depending on the current mode the display chapter is changed to the page number indicated by the red button.

- In FLOF mode it is the first link page of packet x/27 of the current display page.
- In SIMPLE mode it is the previous page in decimal order.
- IN SUBPAGE mode it is the subpage with next lower subpage number. If the subpage is '0000', the next decremented subpage will be '3979'.

After giving this command the new page request is automatically done.

Input parameters: None.

Return values: None.

Comments: Any other page selecting method quits this one. If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.15 GREEN (No. 15)

Depending on the current mode the display chapter is changed to the page number indicated by the green button.

- In FLOF mode it is the second link page of packet x/27 of the current display page.
- In SIMPLE mode it is the next page in decimal order.
- IN SUBPAGE mode it is the subpage with next higher subpage number.

After giving this command the new page request is automatically done.

Input parameters: None.

Return values: None.

Comments: Any other page selecting method quits this one. If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.16 YELLOW (No. 16)

Depending on the current mode the display chapter is changed to the page number indicated by the yellow button.

- In FLOF mode it is the third link page of packet x/27 of the current display page.
- In SIMPLE mode it is the next 10th page.
- In SUBPAGE mode this button is not defined.

After giving this command the new page request is automatically done.

Input parameters: None.

Return values: None.

Comments: Any other page selecting method quits this one. If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD, SUBPAGE_MODE
Related I/O parameter	RETURN_3.3	RETURN_3 (bit 6, 4)

4.17 CYAN (No. 17)

Depending on the current mode the display chapter is changed to the page number indicated by the cyan button.

- In FLOF mode it is the forth link page of packet x/27 of the current display page.
- In SIMPLE mode it is the next 100th page.
- In SUBPAGE mode this button is not defined.

After giving this command the new page request is automatically done.

Input parameters: None.

Return values: None.

Comments: Any other page selecting method quits this one.

If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD, SUBPAGE_MODE
Related I/O parameter	RETURN_3.3	RETURN_3 (bit 6, 4)

4.18 PAGE_PLUS (No. 18)

After giving this command, TVTEXT will request the next decimal page.

Input parameters: None.

Return values: None.

Comments: If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD, SUBPAGE_MODE
Related I/O parameter	RETURN_3.3	RETURN_3 (bit 6, 4)

4.19 PAGE_MINUS (No. 19)

After giving this command, TVTEXT will request the previous decimal page.

Input parameters: None.

Return values: None.

Comments: If a new page request is done, the actual page number will be written in row 0 col 0-6 of the display chapter.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD, SUBPAGE_MODE
Related I/O parameter	RETURN_3.3	RETURN_3 (bit 6, 4)

4.20 SIZE_OFF (No. 20)

This command will switch the display to normal height in any case.

Input parameters: None.

Return values: SFR DMODE1.(bit 3,4)

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	None
Related I/O parameter	None	None

4.21 DIGIT0 (No. 23)

The digit '0' is added to the page number and written to the actual column position of row 0 of the display memory. This command is used for numeric selection of a page. 3 digits (4 in subpage mode) must be given one after each other, to select a new page. After entering the third digit for the page number (the fourth in subpage mode) the display chapter will change and the page request of the complete page number will be executed.

Input parameters: None.

Return values: None.

Comments: Any other page selection method quits this one.
 Incomplete page numbers in the first 8 columns of the header are replaced by '-'. The first digit of the page number must be > 0 and ≤ 8.
 In subpage mode the 4 digits may not be higher than '3979'.
 For Format of the first 8 characters in row 0 of the display memory see **chapter 7**.

EXECUTION TABLE	Possible State	Locked at State
	TEXT	OSD
Related I/O parameter	RETURN_3.3	RETURN_3.4

4.22 DIGIT1 (No. 24)

This command has the same meaning as 'D_0' with the difference that the digit '1' is added to the page number.

4.23 DIGIT2 (No. 25)

This command has the same meaning as 'D_0' with the difference that the digit '2' is added to the page number.

4.24 DIGIT3 (No. 26)

This command has the same meaning as 'D_0' with the difference that the digit '3' is added to the page number.

4.25 DIGIT4 (No. 27)

This command has the same meaning as 'D_0' with the difference that the digit '4' is added to the page number.

4.26 DIGIT5 (No. 28)

This command has the same meaning as 'D_0' with the difference that the digit '5' is added to the page number.

4.27 DIGIT6 (No. 29)

This command has the same meaning as 'D_0' with the difference that the digit '6' is added to the page number.

4.28 DIGIT7 (No. 30)

This command has the same meaning as 'D_0' with the difference that the digit '7' is added to the page number.

4.29 DIGIT8 (No. 31)

This command has the same meaning as 'D_0' with the difference that the digit '8' is added to the page number.

4.30 DIGIT9 (No. 32)

This command has the same meaning as 'D_0' with the difference that the digit '9' is added to the page number.

Please note:

If row 0 is not visible in the display chapter, (e.g. a newsflash page is received), the first page request command like digit(), index() red(), green()... will only box row0.

The second page request command will start the command.

4.31 OSD (No. 33)

Stops the acquisition, but VPS, packet 8/30 1 and 2 are still received.

The user has now the complete chapter for on-screen display.

Note: A reset_acq is necessary, if one leaves this mode.

Input parameters: DISPLAY_MODE3.1 (Osd_Header_Clock).

Return values: RETURN_3.4.

Comments: NONE.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	Always possible
Related I/O parameter	None	None

4.32 OSD_ROW0 (No. 34)

If Osd_row0, is switched on, the user has 7 bytes for osd (row0, position. 0 ... 6) available.

Switching off osd row 0 by giving this command again, restores the row 0 information (page number, boxed ...).

A reset_acq() will switch off this mode.

Input parameters: None.

Return values: DISPLAY_MODE1.6 ('1' =osd_row0 is ON, '0' is OFF)

Comments: None.

EXECUTION TABLE	Possible State	Locked at State
	Always possible	Never locked
Related I/O parameter	None	None

5 Setup Parameters

The following table gives an overview of all possible setup parameters. Bits marked with an (*) are evaluated only in the command `reset_acq()` and may not be changed after this command. If these bits are changed, the `reset_acq()` command must be given. Other bits can be changed everytime.

5.1 ACQUISITION_MODE

7							0
Dis_R24	0	Ena_ Reset_ Acq	0	0	Ena_Flof *	0	Vps_Prir *

- Vps_Prir**
- 1: After the reset of the acq the reception of VPS has higher priority than the reception of teletext (in line 16). If after 10 fields no VPS data is received, TVTEXT will automatic switch to text reception in line 16.
 - 0: The reception of teletext in line 16 has higher priority than VPS.
- Ena_Flof**
- 1: The automatic reception of linked FLOF Pages is enabled.
 - 0: The automatic acquisition of FLOF pages is disabled.
- Ena_Reset_Acq**
- 1: This bit enables the automatic reset option of TVTEXT if the 'TEXT-INTER'-Bit is set (see return parameter RETURN_2.3).
 - 0: The automatic reset option is disabled.
- Dis_R24**
- This bit is a return parameter and toggled with the OSD_ROW24 command (see also command No. 1).
- 1: The reception of data in row 24 is disabled as well as the creating of subpage titles and simple menus. The status line can be used for user menus.
 - 0: Row 24 of the current display chapter must not be overwritten by the user.

5.2 DISPLAY_MODE0

7	Bg_ Clock_2	Bg_ Clock_1	Bg_ Clock_2	Fg_ Clock_2	Fg_ Clock_1	Fg_ Clock_0	Head_off	0 Clock_Off
---	----------------	----------------	----------------	----------------	----------------	----------------	----------	----------------

- Clock_Off**
- 1: Row0/col32 ... col39 of the display page are never overwritten and the time is not updated.
 - 0: These positions are overwritten by the acquisition with the time information of all incoming headers.
- Head_Off**
- 1: During the rolling header mode row0/col8 ... col31 are not overwritten.
 - 0: During the rolling header mode these positions are overwritten by the acquisition with all incoming headers in serial mode. In parallel mode only the headers of the selected magazine number are overwritten.
- Fg_Clock_2 ... 0**
- Define the foreground colour of the clock in command 'CLOCK' (serial colour control byte).
- Bg_Clock_2 ... 0**
- Define the background colour of the clock in command 'CLOCK' (serial colour control byte).

5.3 DISPLAY_MODE1

7							0
0	Osd_Row0	Hold_State	Hamm_Nocorr	Init_Page	0	0	0

Init_Page

- 0: Page 100 will be requested after reset_acq.
If a valid packet 8/30 was received and no user page request was done, an automatic page request with the init page of packet 8/30 will be started. A call of the command index will request the floc index, if not available the packet 8/30 index, and, if not available page 100.
- 1: The function of mode 0 is disabled.
The user has the possibility to define his own init page. The index command will request the user defined page. If this bit is set to '1', the following variables (Xdata) have to be set before reset_acq or index command is called:
The label is NEW_PAGE (array of 4 elements in data RAM)
NEW_PAGE(+ 0): the init page mag number
NEW_PAGE(+ 1): the init page page number
NEW_PAGE(+ 2): the init page subpage-minutes number
NEW_PAGE(+ 3): the init page subpage-hours number.
Note: If an init page with subpage 'do care' is desired, please set the bit 7 of NEW_PAGE(+ 2) to '1'.

Hamm_Nocorr

- 0: A one bit error of the magazine- and packet address will be corrected.
- 1: A one bit error of the magazine- and packet address will not be corrected.

Hold_State

If the HOLD() command was executed this bit has following effect:

0: The page request doesn't stop at once and the header is rolling. The page request for the display page stops after the requested page has been received and row 0 - 23 (except the clock) are not overwritten.

1: The page request for the display page stops at once. In any case row 0 - 23 (except the clock) are not overwritten.

If the Hold mode is active/inactive RETURN_2 bit 7 is set or cleared.

Any new page request e.g. with the colour keys, the index command, entering or leaving the subpage_mode or list_mode, a pagerequest by digits.... will clear the HOLD mode. A TV_TEXT() or a PICTURE() command will not clear the HOLD mode. An active HOLD mode can also be cleared by giving the HOLD() command again.

Osd_Row0

This bit toggled with the OSD_ROW24 command (see also the command No. 34).

1: The overwrite of data in row0 (pos. 0 ... 6) (e.g. boxed/non boxed page number, update sign) is disabled. This positions can be used for user characters.

0: Row 0 of the current display chapter must not be overwritten by the user.

5.4 DISPLAY_MODE2

7							0
P26_Clear_ C8	0	0	0	Act_ Update_ With_C8	Displ_News_ In_Update	Eo_P30	Eo_Vs

- Eo_Vs**
 - 1: Enabled ODD/EVEN output pin VS.
 - 0: Disabled ODD/EVEN output pin VS.

- Eo_P30**
 - 1: Enabled ODD/EVEN output pin P30.
 - 0: Disabled ODD/EVEN output pin P30.

- Displ_News_In_Update**
 - 0: The boxed characters of the newsflash page are not shown if the page is received.
 - 1: The boxed characters of the newsflash page are shown if the page is received. Switching off/on the update mode hides the boxed characters until the page is received again.

- Act_Update_With_C8**
 - 0: After first reception the update mode is controlled (page received or not) by every incoming header of this page.
 - 1: After first reception the update mode is controlled (page received or not) by every incoming header with C8 bit of this page.

- P26_Clear_C8**
 - 1: Packet 26 related characters in the page memory are cleared also, if the subcode of the in coming header is the same and the C8 update bit is set to 1 (C8=1).
 - 0: No effect with C8=1.

5.5 DISPLAY_MODE3

7							0
0	0	0	0	0	Row24_ Control	Osd_Header _Clock	0

Osd_Header_Clock

0: In the osd() command the row0 is not overwritten.
 1: In the osd() command the rolling header and the clock in row 0 are available (bytes 8-39), but can be switched off with the “clock off” or the “head off” bit in DISPLAY_MODE2.

Row24_Control

0: Recommended standard function.
 The declaration of the constants (e.g. red -, green +, yellow cyan) for row 24 in TOP, Simple, Subpagemode, Flof P+,- and boxed row24 is copied from the arrays of subpline, boxline, flopline and topline1 in the module ADR_IOP.C51.

1: The declaration of the constants (e.g. red -, green +, yellow cyan) for row 24 in TOP, Simple, Subpagemode, Flof P+,- and boxed row24 is copied from the arrays of user_subpline, user_boxline, user_flopline and user_topline1 in the module ADR_IOP.C51
 These array-labels must be changed and defined to the following lengths if they are used:
 user_subpline[1]; // must be set to [28] if used
 user_boxline[1]; // must be set to [10] if used
 user_flopline[1]; // must be set to [32] if used
 user_topline1[1]; // must be set to [16] if used

5.6 The Language User Set Table USER_LANGC[8]

Depending on the received C12-14 bits TVTEXT will switch to that language, which is written to USER_LANGC (xdata array[8]).

C14, 13, 12 7		0						
0 0 0	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
0 0 1	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
0 1 0	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
0 1 1	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
1 0 0	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
1 0 1	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
1 1 0	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0
1 1 1	0	LANGC.6	LANGC.5	LANGC.4	LANGC.3	LANGC.2	LANGC.1	LANGC.0

Possible language values for the TVTEXT standard version:

- 0x0d = French
- 0x2b = Scandinavian
- 0x39 = Turkish
- 0x00 = German
- 0x0e = Spanish
- 0x0c = Italian
- 0x0a = English
- 0x5a = Rumanian
- 0x5c = Tchechoslovacian
- 0x5d = Polish
- 0x5e = Serbian
- 0x5b = Hungarian

5.7 Constant Definitions for the Update Mode Characters

The only osd characters which are used by the firmware are in the update mode and depend on the osd character-set of the chip. The following 6 bytes must be defined in the user program as public code characters:

update_code[6] = {01B_H, 08_H, 60_H, 61_H, 20_H, 1B_H}; (example of C51)

If the osd text sign is on other character positions, the 2 bytes 60_H and 61_H must be replaced. In banked programs please locate these 6 bytes in the common area.

6 Return Parameters

The following tables give an overview of all possible return parameters.

6.1 VPS_DATA

7							0
VPS_5_7	VPS_5_6	VPS_5_5	VPS_5_4	VPS_5_3	VPS_5_2	VPS_5_1	VPS_5_0
VPS_11_7	VPS_11_6	VPS_11_5	VPS_11_4	VPS_11_3	VPS_11_2	VPS_11_1	VPS_11_0
VPS_12_7	VPS_12_6	VPS_12_5	VPS_12_4	VPS_12_3	VPS_12_2	VPS_12_1	VPS_12_0
VPS_13_7	VPS_13_6	VPS_13_5	VPS_13_4	VPS_13_3	VPS_13_2	VPS_13_1	VPS_13_0
VPS_14_7	VPS_14_6	VPS_14_5	VPS_14_4	VPS_14_3	VPS_14_2	VPS_14_1	VPS_14_0

VPS_i_j

The VPS data bytes (i = 5, 11, 12, 13, 14) are error checked and written to a buffer in the Xdata RAM. Their actual values can be read every time (i = 0, 1, 2, 3, 4, 5, 6, 7).

The received data are biphase decoded and only updated if all 5 relevant bytes are received without any errors. The VPS-received flag in RETURN_1 indicates, that after a program change the data in the buffer (VPS_i_j) is updated and valid again.

6.2 TEXT_MODE

7							0
X	X	X	X	X	FLOF_ MODE	X	SIMPLE_ MODE

SIMPLE_MODE

TVTEXT is in SIMPLE Mode.

FLOF_MODE

TVTEXT is in FLOF Mode.

6.3 RETURN_1

7							0
REC_8_30_2	REC_8_30_1	REC_TXT	REC_VPS	REC_TXT_16	NEWS_IND	X	FLOF_IND

- FLOF_IND** TVTEXT has stored a transmitted packet X/27/0.
- NEWS_IND** The current display page is a newsflash/subtitle page.
- REC_TXT_16** TVTEXT has recognized a transmitted teletextline in TV line 16.
- REC_VPS** TVTEXT has stored valid VPS-data in TV line 16.
- REC_TXT** TVTEXT has recognized any valid teletext header in any TV line.
- REC_8_30_1** TVTEXT has recognized packet 8_30_1.
- REC_8_30_2** TVTEXT has recognized a packet 8_30_2.

6.4 RETURN_2

7							0
HOLD	X	X	X	TEXT_INTER	X	PAGE_FOUND	SDC

- SDC** The current display page is in subpage 'don't care' mode.
- PAGE_FOUND** The current display page is received.
- TEXT_INTER** TVTEXT has recognized an interruption of text transmission of more than four frames.
- HOLD** The current display chapter is in hold mode. After a new page request the hold mode is automatically cleared.

6.5 RETURN_3

7							0
X	SUBPAGE_ MODE	CLOCK_ MODE	OSD_ MODE	TEXT_ MODE	MIX_ MODE	PICTURE_ MODE	UPDATE_ MODE

- UPDATE_MODE** TVTEXT is in UPDATE mode.
- PICTURE_MODE** TVTEXT is in PICTURE mode.
- MIX_MODE** TVTEXT is in MIX mode.
- TEXT_MODE** TVTEXT is in TEXT mode.
- OSD_MODE** TVTEXT is in OSD mode.
- CLOCK_MODE** The CLOCK command is active.
- SUBPAGE_MODE** The SUBPAGE mode is active.

7 Stored Format of a Page

Row	Column	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R0	C0	BOX-control (update mode) or space							
R0	C1	BOX-control (update mode) or space							
R0	C2	Magazine number (ASCII)							
R0	C3	Page tens (ASCII)							
R0	C4	Page units (ASCII)							
R0	C5	0	0	1	0	0	0	0	0
R0	C6	0	0	1	0	0	0	0	0
R0	C7	Foreground green or space							
R0	C8 ... C39	D7 0	D6 0	D5 0	D4 0	D3 D3	D2 D2	D1 D1	D0 D0
R1 ... R24	C0 ... C39	D7 0	D6 0	D5 0	D4 0	D3 D3	D2 D2	D1 D1	D0 D0
R25	C0 ... C3	Erase row bits.							
R25	Col4	0	0	0	0	0	M2	M1	M0
R25	Col5	PT3	PT2	PT1	PT0	PU3	PU2	PU1	PU0
R25	Col6	C4	MT2	MT1	MT0	MU3	MU2	MU1	MU0
R25	Col7	C6	C5	HT1	HT0	HU3	HU2	HU1	HU0
R25	Col8	C14	C13	C12	C11	C10	C9	C8	C7
R25	Col9	0	HEN	SDC	CH_1	CH_0	PBR	PBLF	FIRST
R25	Col10 ... 23	Reserved for internal use.							

Remarks:

- Column 2 ... 4 in row 0 are used for the page-number given by the infrared control.
- Column 0 ... 1 are used for the box control characters (for update mode).
- Column 5 ... 6 are set to 20_H.
- Column 7 is set to foreground green as long as the page is not received (rolling header).
- All bytes in column 8 ... 39 of row 0 and all bytes in row 1 are either parity or hamming checked (corresponding to the Enhanced Teletext Specification).

- M(i), PT(i), PU(i), MT(i), MU(i), HT(i), HU(i)** The bits in row 25/column 4 ... 5 contain the absolute magazine number and the page number.
 Col 5..8 contain the page subcode and the control bits of the received page of this chapter if PBLF = '0'.
- HEN** 1: Automatic hold of page acquisition after next end of page. The last eight positions of the header of the display page (clock) are always updated. To switch them off use the bit CLOCK_OFF.
 0: Automatic hold is disabled.
- SDC** 1: This page is in subpage 'don't care' mode.
 0: This page is in subpage 'do care' mode.
- PBLF** 1: Page being looked for.
 0: Header of the page is found.
- PBR** 1: Page being received.
 0: Page not being received.
- FIRST** 1: The page is received for the first time.

CHECK Modes

The check bits indicate the checks to be done by acquisition.

CH_1	CH_0	Mode
0	0	Normal page check: Header bytes 6 ... 13 are 1-byte hamming checked. All other bytes of the page are parity checked.

8 Stored Format of Packet 8/30 (x000) Format 1

PACK_8_30_1

i	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	PAG_ER	0	0	0	0	M2	M1	M0
1	PT3	PT2	PT1	PT0	PU3	PU2	PU1	PU0
2	0	MT2	MT1	MT0	MU3	MU2	MU1	MU0
3	0	0	HT1	HT0	HU3	HU2	HU1	HU0
4	Network identification (see byte 13 WST)							
5	Network identification (see byte 14 WST)							
6	Time offset code (see byte 15 WST)							
7	Modified julian date 1. byte (see byte 16 WST)							
8	Modified julian date 2. byte (see byte 17 WST)							
9	Modified julian date 3. byte (see byte 18 WST)							
10	Universal time coordinated 1. byte (see byte 19 WST)							
11	Universal time coordinated 2. byte (see byte 20 WST)							
12	Universal time coordinated 3. byte (see byte 21 WST)							
13	Short program label 1. byte (see byte 22 WST)							
14	Short program label 2. byte (see byte 23 WST)							
15	Short program label 3. byte (see byte 24 WST)							
16	Short program label 4. byte (see byte 25 WST)							
17 ... 36	20 bytes parity coded for 'Status Display'							

Remarks

**M(i), PT(i), PU(i),
MT(i), MU(i),
HT(i), HU(i)**

The bits in column 0 ... 3 contain the absolute magazine number, the page number and the page subcode of the initial teletext page.

PAG_ER

- 1: The initial teletext page number is not completely received.
- 0: The initial teletext page number was received without any errors.

9 Stored Format of Packet 8/30 (x100) Format 2

PACK_8_30_2

i	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	PAG_ER	0	0	0	0	M2	M1	M0
1	PT3	PT2	PT1	PT0	PU3	PU2	PU1	PU0
2	0	MT2	MT1	MT0	MU3	MU2	MU1	MU0
3	0	0	HT1	HT0	HU3	HU2	HU1	HU0
4	Reserved				Byte 13 of format 2			
5					Byte 14 of format 2			
6					Byte 15 of format 2			
7					Byte 16 of format 2			
8					Byte 17 of format 2			
9					Byte 18 of format 2			
10					Byte 19 of format 2			
11					Byte 20 of format 2			
12					Byte 21 of format 2			
13					Byte 22 of format 2			
14					Byte 23 of format 2			
15					Byte 24 of format 2			
16	Byte 25 of format 2							
17 ... 36	20 bytes parity coded for 'Status Display' (see WST)							

Remarks

**M(i), PT(i), PU(i),
MT(i), MU(i),
HT(i), HU(i)**

The bits in column 0 ... 3 contain the absolute magazine number, the page number and the page subcode of the initial teletext page.

PAG_ER

- 1: The initial teletext page number is not completely received.
- 0: The initial teletext page number was received without any errors.

10 Format of the Row24 Titles

10.1 Format of SIMPLE Title

For normal text mode, the firmware will create a simple title in row 24 of the current display chapter.

C0 ... C12	C13 ... C24	C25	C26	C27	C28 ... C39
Red page minus, green page plus	Next 10 th page	06 _H	1D _H	00 _H	Next 100 th page

10.2 Format of Subpage Menu

In subpage mode in row 24 a menu is offered which shows the user which subpage is selected. This menu has a white background and a blue foreground colour. The following shows an example of this menu.

C0 ... C12	C13 ... C23	C24 ... C31	C32 ... C39
Red page minus, green page plus	20 _H	Page/subpage number	20 _H

10.3 Format of Row24 Title in Newsflash Mode

If the actual display page is in newsflash mode row 24 is displayed boxed in SUBPAGE and SIMPLE mode if the rolling header is active or any page request digit is typed in the 1st time.

C0	C1	C2 ... C3	C4 ... C12	C13 ... C39
01 _H	1D _H	0B _H	Red page minus, green page plus	Rest of the row24 title

11 Development Environment

11.1 Hardware

The Software development tool should be a PC 80386 or higher with MS-DOS. For testing the software, an in-circuit emulator (e.g. KONTRON) provides an optimum of efficiency.

11.2 Software

The following tools were needed to develop the software:

- INTEL ASM51 assembler or Keil A51 assembler
- KEIL C51 compiler
- KEIL L51 linker.
- KEIL BL51 bank linker.

12 Linker and Module Description of the Acquisition Demo

The following chapter gives an information about the necessary files needed to link teletext to a TV-system controller software. All necessary module file names are stored in the 'lk.dat' file and explained in the next chapter.

Note: To link the acquisition files with any TV controller program, the modules must be compiled or assembled with Intel Asm51, Keil A51 assembler or Keil C51 compiler.

The following linker versions are valid for the TVTEXT firmware:

- Keil linker V3.52.

From firmware V2.0 on all modules are compiled with the Keil compiler V5.02, older versions with the compiler V4.06. It is not possible to mix modules compiled with V4.06 and V5.02. If the TV-controller software is developed only with the Intel assembler, the necessary linker V3.52 can be ordered together with the TVTEXT firmware. If the TV-controller software is developed with a C51 compiler which is older than V5.02, an update must be ordered at the Keil company.

12.1 Banking of the TVTEXT Firmware

Banking of the firmware is possible. For banking the new C51 Keil compiler V5.02 and the bank linker BL51 X3.53 is necessary.

With the 'OC51.exe' tool from Keil this 'bank linked module' must be converted to the bank hex files. The complete firmware and the code constants of TVTEXT shall be in the same bank.

See also the example linker file 'BLK.DAT' on the demo disk.

If the TVTEXT firmware is linked with port pin banking, the complete firmware modules must be located in the COMMON area.

12.2 The Linker File (lk.dat)

Please add the following files and linker commands to your TV-system controller software linker file:

```
(*acq_mai1.obj, &
(*acq_che1.obj, &
(*acq_flo1.obj, &
(*acq_com1.obj, &
(*acq_han1.obj, &
(*adr_vb1.obj, &
(*adr_di1.obj, &
(*adr_p271.obj, &
(*adr_io1.obj, &
dat_sto1.obj, &
userfunc.obj, &
hammfun1.obj, &
xdata(0F6EBH,?xd?adr_di1(0C000H), &
?xd?adr_vb1(0f400H), &
ramsize(256)
```

TVTEXT acquisition demo contains the following (for the TV-program not necessary) additional files:

```
(*acqdem1.obj, &
(*chardem1.obj, &
(*ifrdem1.obj, &
startup.obj, &
init.obj, &
(*irir60.obj
```

Files marked with a (*) are written in c51 language, the remaining are written in assembler 51. The ?xd? linker commands are described in section XRAM mapping.

Mix of firmware modules with firmware modules of older versions is not allowed.

12.3 Description of the Files

acq_mai1.obj

It is the interrupt service routine for the vertical interrupt at CVBS signal line 24. The interrupt address is 002B_H.

This subroutine decodes the fly-back buffer and handles the complete acquisition.

acq_che1.obj

This subroutine must be called by main loop in the TV controller program with either call acq_chec (in asm) or acq_chec() (in C51). Here the acq_status e.g. switch to FLOF is cyclically controlled and switched if possible.

acq_flo1.obj

All subroutines for the FLOF mode.

acq_com1.obj

In this file all the possible TVTEXT commands e.g. red, green, mix_mode, size, ..., are implemented.

acq_han1.obj

Contains all subroutines for the acquisition-, and chapter handling.

adr_vb1.obj

Contains the declaration for the fly_back buffer xram.

adr_di1.obj

It contains the declaration for the display buffer xram.

adr_io1.obj

It contains the declarations for the INPUT and OUTPUT parameters according to the specification

adr_p271.obj

It contains the declarations for the OUTPUT parameters packet 27 and P8/30 format 1 and 2.

dat_sto1.obj

The file contains all subroutines for a 'fast store' of hamming, parity, biphasic or no checked bytes to the display buffers.

userfunc.obj/a51

This subroutine is called at every vertical sync interrupt AVIRST= '1'.
It is executed after the ACC, Registers and DPTR's are pushed by interrupt.
A timer can be started/stopped here to detect the vertical frequency (50/60 Hz).
The max. execution time (with call and ret) for this subroutine is 1 ms which are 3000 cpu cycles.
See also source file 'userfunc.a51'.

hammfun1.obj

In this file the subroutines for the 3 and the 1 byte hamming check are stored.

12.4 Description of the Additional Files for the Acq Demo

(These files are also available as C51 source code on the demo disc).

acqdem1.obj

It is the main loop for the acquisition.

chardem1.obj

The file contains the demo pictures after power-on and the demo rows for OSD in text.

init.obj and startup.obj

The Reset initialization programmed by C51 conventions.

(See KEIL C51 manual.)

ifrdem1.obj

There are examples implemented, how all TVTEXT commands can be called and handled.

A small demo program shows the usage of on-screen display as a block in a ttx page and osd in row 24 or row 0.

In this module is also the subroutine Adjust_horizontal is implemented:

To correct the horizontal position, caused by an external LC circuitry tolerance, there is a function, written in C51 source in the file IFRDEMO.C51 on the demo disc.

For further information please read the header of the function 'Adjust_horizontal' of this file.

irir60.obj

The infrared interrupt program at pin EX1 with a special IFR compare timer. With this module you can decode a Ir60 word in < 600 μ s. For more detailed description see **chapter 23**.

Note: The TVTEXT firmware sets no interrupt priority register. Please set the infrared interrupt to any higher priority than the TTX interrupt.

13 XRAM Mapping

The XDATA RAM has 2 KBytes and must be linked with the above mentioned ?xd? link file

and has the following start addresses:

?xd?adr_di1 (display buffer) start address: 0C000_H length: 1024 bytes

?xd?adr_vb1(fly_back buffer) start address: 0F400_H

and the XDATA RAM of the main program start address: 0F6EB_H.

Note: If you define your own xdata variables set them at a relocatable address which is higher than 0F6EB_H.

For the free XRAM size and location see the linker information.

Please note, that all INPUT and OUTPUT parameters described in the target firmware specification are located in the XDATA RAM with the exception of the RETURN_1, 2, 3 and the TEXT_MODE parameters, which are in the DATA area.

Please note, that for the large model the xdata memory of the 1 page version ends at address 0xf7ff.

14 DATA and IDATA Mapping

Please note that a part of the 256 bytes data and idata RAM in the TVTEXT is used for the acquisition. For the free RAM size see the linker information of the M51 file.

15 Memory Model of the TVTEXT Firmware

The functions of the TVTEXT firmware are all compiled with the compiler 'small' directive (void FUNCTION(void) small;). There are two versions possible with the 'small' and the 'large' directive in the global #pragma statement. Depending on the delivered firmware the user has the possibility to choose either the small or the large memory model for his own software.

16 External Command Calls

To execute a TCI (TVTEXT Command Interface) command you have the choice of calling it directly or indirectly with the command number:

(See also source file 'ifrdemo.c51'.)

e.g. for the red key

Direct Call

in 8051 assembler language:

- lcall red

in 8051C language:

- red()

Indirect Call with the Command Number

in 8051 assembler language:

- mov r7, #14d
- call _execute_acq_command

in 8051 C language:

- execute_acq_command(14).

As an example for these command calls please see also the source code file ifrdem1.c51 on the firmware demo disk.

17 How to Start

This chapter gives you an overview, how to start TVTEXT acquisition after an 'error free linking' as described in **chapter 12**.

17.1 Initialization

Note: After the hardware reset (power ON) a clear of the complete internal and external RAM (Data and Xdata) is necessary (see also description of the Keil start-up module).

The clock divider control bit in the special function register AFR must not be set, if the TVTEXT firmware is used.

After program reset all input parameters have to be initialized with the Xdata variables DISPLAY_MODE0, 1, 2, 3 and ACQUISITION_MODE before calling reset_acq. Furthermore the languages for the C12 ... 14 bits have to be set. Depending on the hardware the H-V mode or the SSC mode must be selected and the interrupt priority for infrared must be a higher level than the acquisition interrupt.

As an example for this initialization please see also the start-up sequence of the source code file acqdem1.c51 on the firmware demo disk.

17.2 Reset_acq

After program start of TVTEXT (reset) or after every channel change you have to initialize the TVTEXT acquisition by giving this command.

Reset_acq will also enable the acq-interrupt (IE.5) (see also **chapter 4.2**).

Note: It is not allowed to start any TVTEXT command before the input parameters are set and before the reset_acq command is executed.

The TVTEXT will start in PICTURE,- and SIMPLE_MODE. All other modes (subpage, list, clock, osd's, top, floc, update, ...) are left by reset_acq.

17.3 Acq_che1

In the TV controller program endless loop the command acq_chec must be added.

Acq_chec controls the complete acquisition that means:

- automatic reset_acq if enabled and no teletext receive for more than 4 half-fields
- switch to FLOF request if enabled and write FLOF titles if enabled
- update of the RETURN and TEXTMODE parameters.

18 Segment Name Conventions for Assembler Programs

To ensure the overlay process of the variables of the L51 linker, the segment names must be defined in C51 Keil compiler conventions in the external assembler programs.

Examples:

?PR?FUNCTION?MODULE SEGMENT CODE	for program code in function
?DT?FUNCTION?MODULE SEGMENT DATA	for local variables in function
?BI?FUNCTION?MODULE SEGMENT BIT	for local bit variables in function

Note: To ensure, that the linker can generate a complete program flow analysis, the main program must have the segment name ?pr?main.

Please see also C51 Keil compiler manual.

19 Data Pointer Select (DPSEL) Handling

The TVTEXT firmware uses several data pointers (DPTR selected with DPSEL).

The acquisition interrupt stores and restores these data pointers. But the TVTEXT commands need DPTR0 as start value for a correct function. If the external TV controller software uses another data pointer than DPTR0, it is necessary to set DPSEL to '0' before any acquisition command is called or before acq_che1 is executed.

When the acquisition command or acq_che1 is finished the return value of DPSEL is '0'.

20 Appendix

20.1 Greek Firmware Version

Most modules of the greek version are the same as modules of the TVTEXT 1 page version. The greek specific differences are generated by the compilerswitch "greek". The features for the standard TVTEXT firmware version are also valid for the greek version.

The changed linker filenames for Greek (file grlk.daton demo disk):

```
acdm_gr1.obj, acmn_gr1.obj, acq_che1.obj, &
acq_flo1.obj, accm_gr1.obj, achd_gr1.obj, chdm_gr1.obj, ifrdem1.obj, &
adr_vb1.obj, adr_di1.obj, adr_p271.obj, adio_gr1.obj, startup.obj, &
init.obj, userfunc.obj, dast_gr1.obj, hammfun1.obj, irir60.obj&
TO "LINKER_OUTPUT_NAME"&
xdata(0f6ebh,?xd?adr_di1(0c000h), ?xd?adr_vb1(0f400h)) ramsize(256)
```

The bank linker filenames for Greek (file bgrlk.dat on demo disk):

```
COMMON{startup.obj, init.obj, acdm_gr1.obj},
BANK0 {chdm_gr1.obj},
BANK1{acmn_gr1.obj, acq_che1.obj, acq_flo1.obj,
      accm_gr1.obj, achd_gr1.obj, adr_vb1.obj, adr_di1.obj, adr_p271.obj,
      adio_gr1.obj, userfunc.obj, dast_gr1.obj, hammfun1.obj},
BANK2{ifrdem1.obj,irir60.obj}
TO ACQBANK
BANK0 (?CO?CHARDEM1(1000H))
      xdata(0f6ebh,?xd?adr_di1(0c000h),?xd?adr_vb1(0f400h)) RAMSIZE(256)
BANKAREA (1000H, 0FFFFH) IBANKING DEBUGPUBLICS DEBUGSYMBOLS
DEBUGLINES
```

The initialization is nearly the same as for the standard version with the following exceptions:

1. These primary languages are supported and must be initialized in the array `USER_LANGC[8]` with the following numbers:

- 00 = German
- 0a = English
- 42 = Turkish *
- 43 = Greek *
- 2b = Scandinavian
- 0c = Italian
- 0d = French
- 0e = Spain

At languages which are marked with a "*" the twist mode is allowed to a language, which is also marked with a "*".

Please see also `acqdem1.c51` source file on the demo disk.

Please refer to those parts which belong to the compilerswitch "greek".

20.2 Signal Quality Counter

Three counters at the xdata label `ACQ_OUPUT[4]` count the following values:

Meaning of the `ACQ_OUTPUT` parameters:

`ACQ_OUTPUT(+0)`: `NU_HE_7 ... NU_HE_0` number of detected headers

`ACQ_OUTPUT(+1)`: `SQC_0.7 ... SQC_0.0` correctable hamming errors

`ACQ_OUTPUT(+2)`: `SQC_1.7 ... SQC_1.0` non correctable hamming errors

`ACQ_OUTPUT(+3)`: Not used

`ACQ_OUTPUT[0,..., 2]` is set to '0' with the `reset_acq` command.

The signal quality can be found out (after `reset_acq`) by the relation of the found headers and the number of hamming errors.

Please note that each of these counters is stopped, when it has reached the value 255.

21 Application Notes

21.1 Overview about the On Screen Display Possibilities for the 1 page Version

At the positions of row 0 col 0-6, row 0 col 32-39 and row 24 col 0-39 OSD can be realized in the active display chapter without disturbing the text reception.

- **OSD in row 0 col 32-39:** by setting the clock_off bit in DISPLAY_MODE0.0.
When this bit is cleared the next incoming header overwrites the row 0 col 32-39.
- **OSD in row 24 col 0-39:** call of the command `osd_row24()`. These positions are now not overwritten by the firmware and can be used for OSD. If this mode is left (call `osd_row24()` again), row 24 is updated by the firmware again.
- **OSD row 0 col 0-6:** call of the command `osd_row0()`. These positions are now not overwritten by the firmware and can be used for OSD. If this mode is left (call `osd_row0()` again), row 0 col 0-6 is updated by the firmware.
- **OSD row 0 to row 24:** call of the command `osd()`. The complete display page is not overwritten by the firmware and can be used for OSD. A special function for row 0 in this mode is the bit `Osd_Header_Clock` (see DISPLAY_MODE3). Please note: If the current text page and osd rows are displayed together, the text row before the osd row or the last osd row could contain a control character for double height from the broadcaster.
In this case these rows should be erased.

Software examples for all above mentioned OSD displays are a part of each firmware version in the files IFRDEM1.C51 on the demo disk.

21.2 Text Reception Quality

Several TV set manufacturers use their own test pages during production to check the text reception performance of the TV sets.

One of the standard test pages is a so called clock_cracker page, which consists of an alternating pattern of data bytes which leads to a minimum number of edges in the data stream.

This is the worst condition, which can occur under real text reception conditions. Every device should decode this page correctly.

If a non-standard test page (similar to the clock cracker page) is to be used, only a few parity fails are allowed. This is required for a correct frequency control. If a data line consists of a longer sequence of "00000000" bytes (parity error!), the required frequency adjustment is not longer possible and decoding errors may occur (depending of the actual PLL stability of a certain device and of the signal stability).

The behavior regarding this non-standard test pages has no correlation to the reception quality of real teletext signals.

22 Patents

Dear Software User,

you may appreciate the integrated circuit SDA 525x (TV-TEXT) as an advanced teletext processor for comprehensive teletext information treatment. In order to benefit from its hardware features we prepared a number of firmware options for you disposal.

For this reason, we would like to draw your attention to relevant intellectual property rights that might be in conflict with the firmware routines. Especially, please consider the following patents/patent applications:

1. TOP-Teletext - European Patent EP 0 264 565 / German Patent DE 36 34 757 from Thomson Multimedia:

The patents refer to the use of the TOP-basic-table from the transmitting station when the "next page"-key is operated. We have been informed that Thomson already started licensing activities.

2. Page trace - German Patent DE 36 22 308 from Thomson Multimedia:

The patent refers to the "page trace"-firmware option that collects the page numbers of all receivable pages. Through "page trace" the TOP-basic-table may be replaced.

3. Remote control - European Patent EP 0 145 677 from EDICO:

The patent refers to a tv-set comprising a remote control including a "+/-"-key for scrolling through teletext pages.

4. Favorite pages - European Patent EP 0 438 185 from EDICO:

The patent refers to the memory organization for storing page numbers for favorite teletext pages.

5. Meshing - European Patent Application EP 0 553 910 from Philips:

The patent application refers to superimposing text on a television picture through a display window with transparent background colour.

When using one of the above mentioned firmware routines in a TV set please make sure that you are not in conflict with the patents/patent applications and obtain a license from the patent holder if necessary.

Please bear in mind that there may be additional protective rights in further countries originating from the above patents/patent applications. You may understand that we cannot guarantee for the above mentioned list being complete.

Generally, we do not undertake any liability for claims from intellectual property rights which may be held by third parties other than Siemens being related to the implementation of firmware routines made available through Siemens.

23 Infrared Decoder for SIEMENS IR60 Code

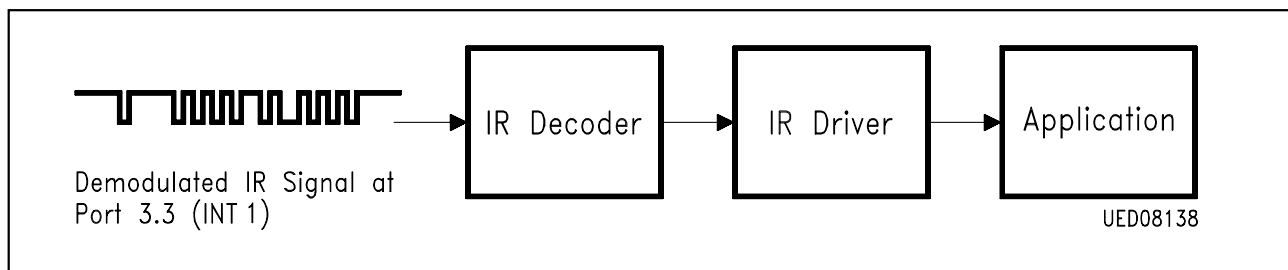


Figure 1
Description of the IR Decoder

Every edge of the IR signal at port 3.3 is starting the interrupt service routine (ISR) with the function name 'Irlsr()'. Simultaneously the value of the IR timer is captured into the Capture Register CAPL and CAPH and the IR timer is autoreloaded with '0' by hardware. The ISR saves the Capture Registers into two variables 'TL' and 'TH' and checks if these captured timer values are within specified time intervals. In case of a valid timer value the signal will be decoded, the information will be stored and the ISR will be left. In case of no valid value the information variables will be reinitialised so that the next edge will understood as the first bit of the next command.

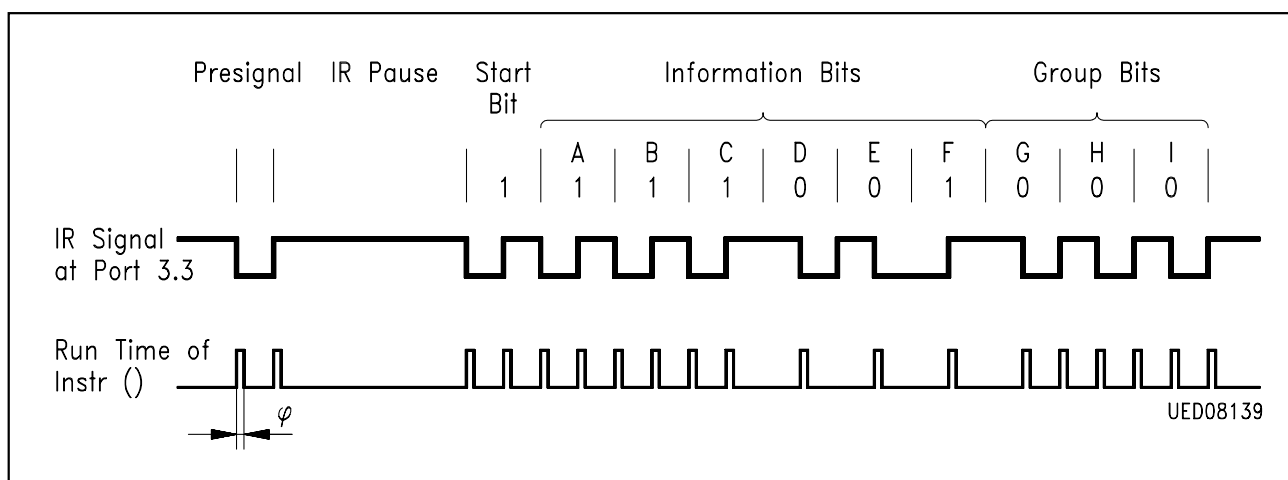


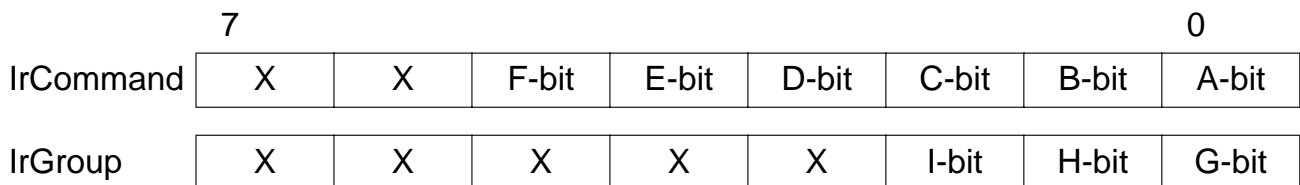
Figure 2
Timing Diagram of IR Decoder

Test Conditions

Controller type	SIEMENS SDA 5250-E
Crystal frequency of Controller	18 MHz
IR Receiver type	SIEMENS SFH 506.33
IR Transmitter type	SIEMENS SDA 2218
Crystal frequency of IR transmitter	500 kHz ± 10 %

IrIsr() Output Parameter (global variables) given to IR Driver

Name of Parameter	Data Type	Explanation
IrReady	Bit	Will be set to '1', if a new command has been received, must be cleared by IR driver software after getting the new command.
IrCommand	Unsigned char (bit 0 ... 5)	Bits 0 ... 5 are holding actual complete received IR command if IrReady is set to '1', bit 0 contains the A-bit and bit 5 the F-bit of the SIEMENS IR60 Code.
IrGroup	Unsigned char (bit 0 ... 2)	Bits 0 ... 3 are holding actual complete IR group if IrReady is set to '1', bit 0 contains the G-bit and bit 2 the I-bit of the SIEMENS IR60 Code.



Timing Diagram of IrReady Bit

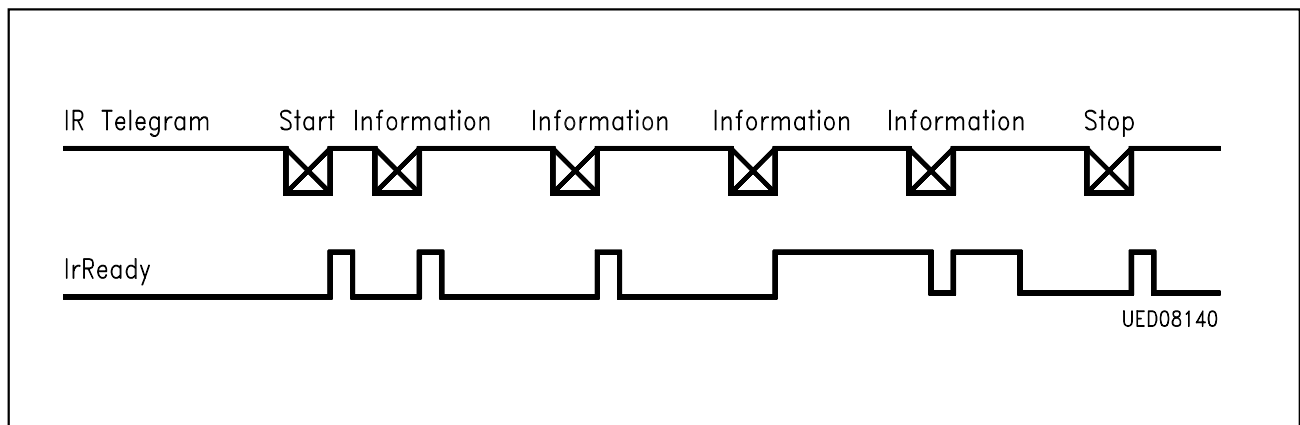


Figure 3

The IrReady bit will be set by the IR decoder if a complete command has been received and must be cleared by the IR driver software after getting the group and command information from the variables 'IrCommand' and 'IrGroup'. The command information must be got before a new complete command has been received. Otherwise the last received command information will be lost.

Files of the IR Decoder

To run Irlsr() following files are necessary:

File Name	Content
IRIR60.OBJ, IRIR60.C51	Function IrlsrInit() Function Irlsr()
IRIR60.H	Extern declaration of – global variables needed by Irlsr() – function IrlsrInit()

Implementation of IR Decoder modules into TV Application

- Include IRIR60.H in every module where output parameters of the IR decoder will be used (e.g. in IR driver)
- Include IRIR60.H in that module where initialization of IR decoder should occur.
- Initialization of IR Decoder must be done by calling the function 'IrlsrInit()'. Ensure that bit EA (enable all interrupts) will be set to '1'.
- The IR driver must be programmed.
- To adjust 'Irlsr' for different IR transmitter crystal frequencies the IR timing constants in file IRIR60.C51 must be modified.

23.1 Infrared Keys for TVTEXT Commands in the Acquisition Demo

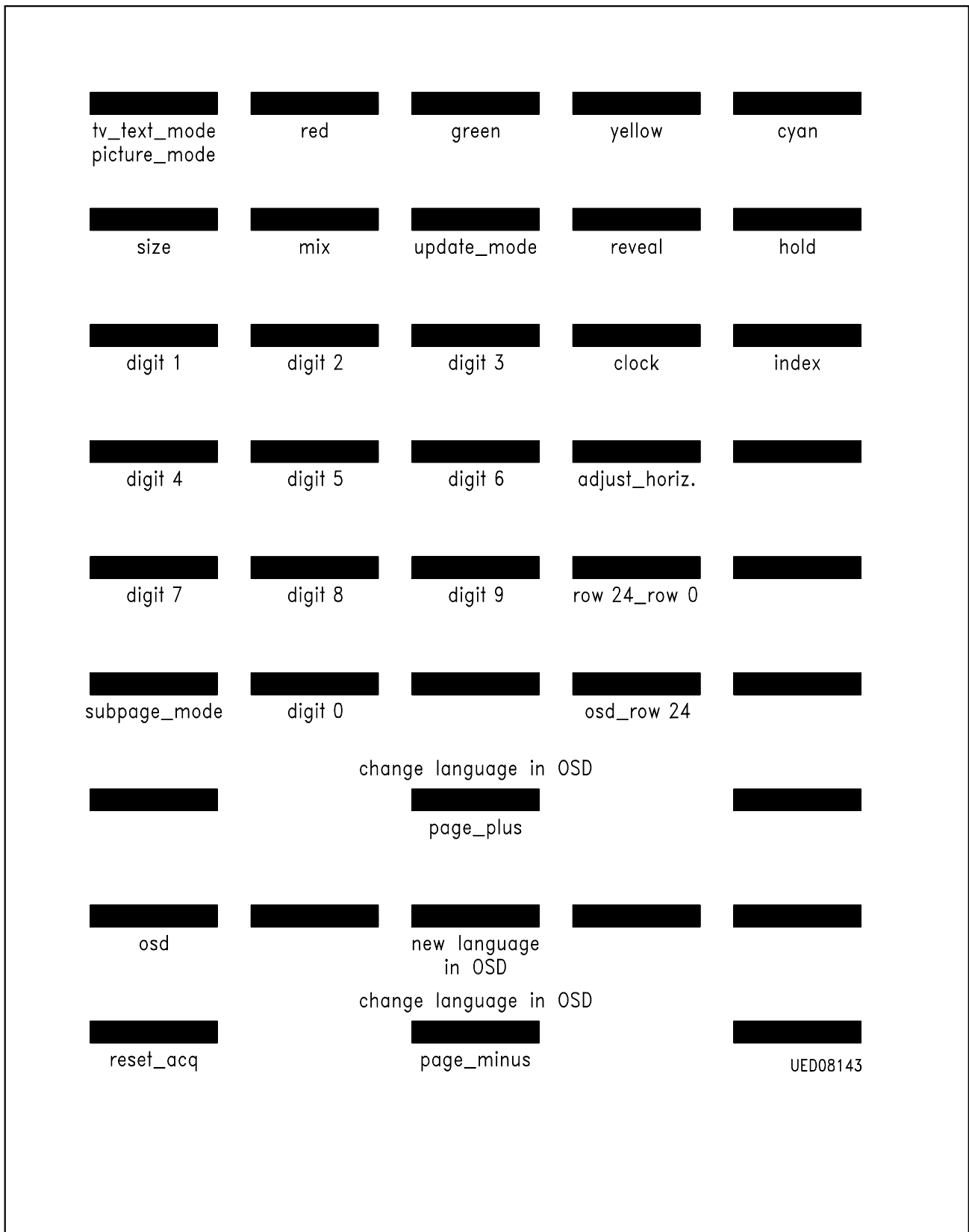


Figure 4