

ASIC Product Family

***ASICTEXT Custom Family
CF70095 'UNITEXT'
Software Applications Guide***

OBJECTIVES

The primary objective of the software interface is to provide the user with a self-contained teletext function and an on-screen-display capability which is easy to use and which minimises system controller software.

It is also an objective to provide as many additional features and as much flexibility for the user as possible where this does not impact the ease of use of the basic functions.

The interface aims to allow for future enhancements in a way that will enable upward compatibility of application software.

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1. INTRODUCTION

Central to the operation of 'UNITEXT' is its screen mapped display RAM. This is in two sections, a section containing 1000 bytes -the 'main screen RAM'- and a section containing 22 bytes -the 'parallel display RAM' (see Fig 1). These sections of memory can be written to in one of two ways, either by the self-contained teletext function contained in UNITEXT or by the TV controller via the control interface.

By writing characters to the RAM, the TV controller can make up customised on-screen-displays using teletext graphics and alpha-numeric display modes. The main screen RAM can store and display 25 rows by 40 columns of on-screen-display data or teletext data. The parallel display RAM can be used to store and display 1 row by 22 columns of on-screen-display data at the same time that teletext data is being received and written to the main screen RAM.

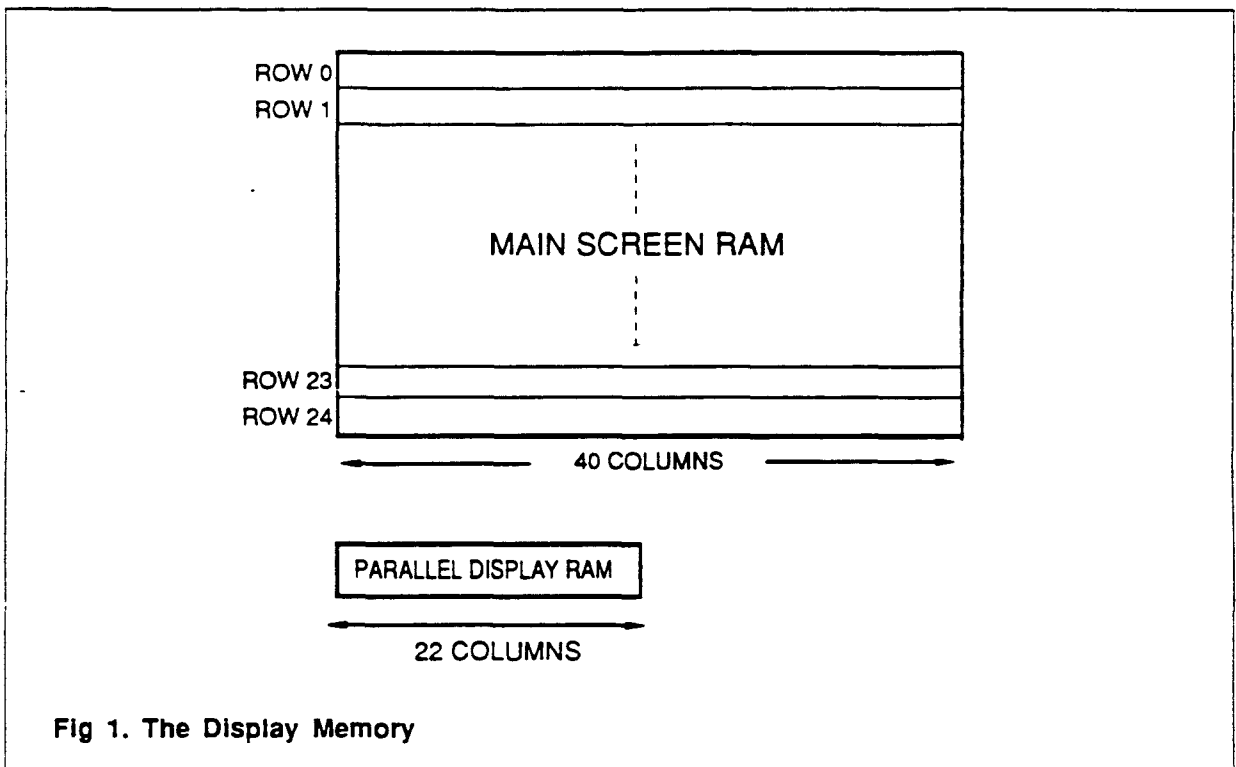


Fig 1. The Display Memory

The 'display mode' defines how the sections of memory are mapped to the screen and whether the teletext function is enabled (ie allowed to write to the main screen RAM).

The way in which the currently mapped display RAM is displayed is defined by the 'screen mode'. The various screen modes are PIC(picture), TXT(text), MIX and BOX. Communication via the UNITEXT control interface is via eight bit words.

2. SCREEN MODES

The various screen modes are differentiated by the action of the 'I' insert video output.

2.1 PIC (picture) mode

'I' is inactive, the tuner video signal is displayed over the whole screen.

2.2 TXT (text) mode

'I' is active, the display RAM data is displayed over the whole screen.

2.3 MIX mode

'I' is active when a foreground pixel is to be inserted over the tuner video. 'I' is also active during boxes defined by start and end box characters.

2.4 BOX mode

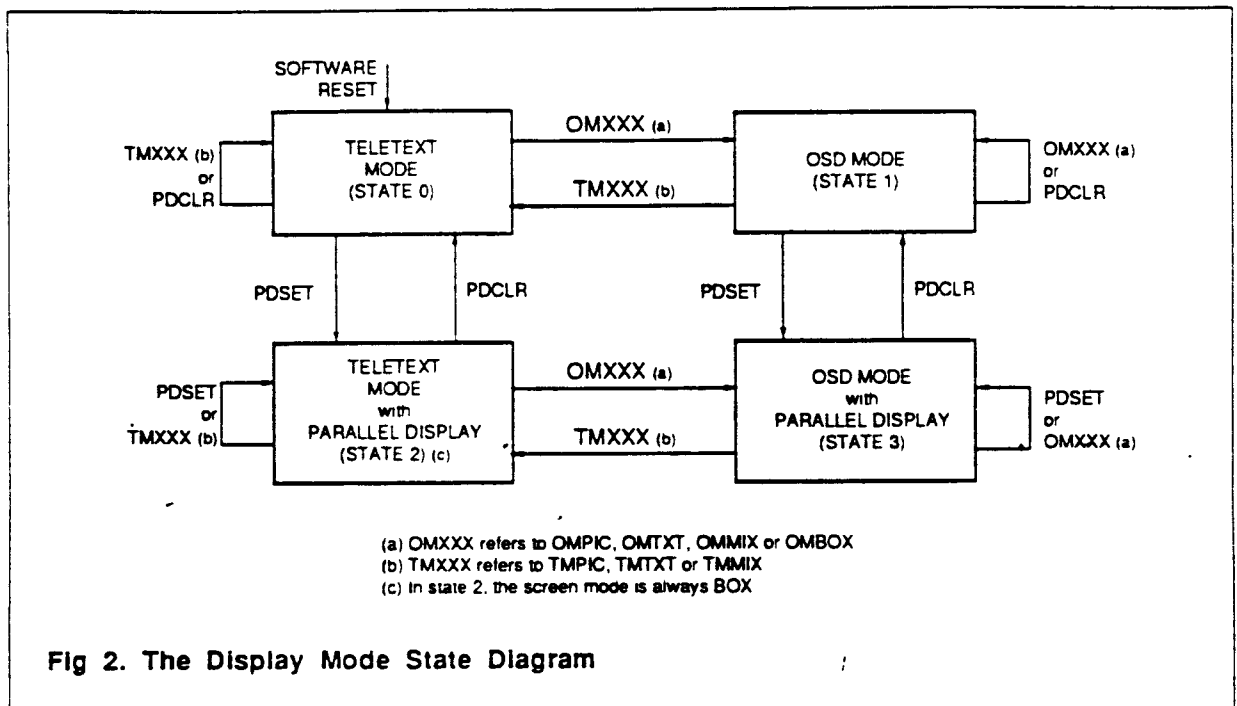
'I' is active during boxes defined by start and end box characters.

3.DISPLAY MODES

Four display modes can be selected:-

- teletext mode (state 0)
- OSD mode (state 1)
- teletext mode with parallel display (state 2)
- OSD mode with parallel display (state 3)

For ease of use, the commands which select a display mode (see Section 5) also define the screen mode required (eg PIC, TXT, MIX and BOX). This allows many operations to be completed with a single command.



3.1 Teletext Mode (state 0)

This is the normal teletext mode. When selected, the main section of screen RAM is mapped to the screen. The self-contained teletext function is enabled [see Section 10] and writes teletext data to the RAM. The teletext control commands are summarised in Fig 7. In this mode PIC (picture), TXT (text) and MIX screen display modes are available according to whether the mode is selected with a TMPIC, TMTXT or TMMIX command.

3.2 OSD mode (state 1)

This is the normal on-screen-display mode. When selected, the teletext function is disabled and does not write text data to the main screen RAM except when the decoder is in clock mode (see Section 7) or in status mode (see Section 9). The main screen RAM is mapped to the screen and characters can be downloaded to make up on-screen-displays. The OSD control commands are summarised in Fig 8. In this mode PIC (picture), TXT (text), MIX and BOX screen display modes are available according to whether the mode is selected with an OMPIC, OMTXT, OMMIX or OMBOX command.

3.3 Parallel Display Modes (states 2 and 3)

These modes are special display modes which allow on-screen-displays to be displayed in a small area of the display without interrupting the reception of teletext or the display of on-screen-displays in other parts of the screen. When either parallel display mode is selected (ie states 2 or 3), the parallel display screen RAM is mapped into the last 22 bytes of row 0 of the display.

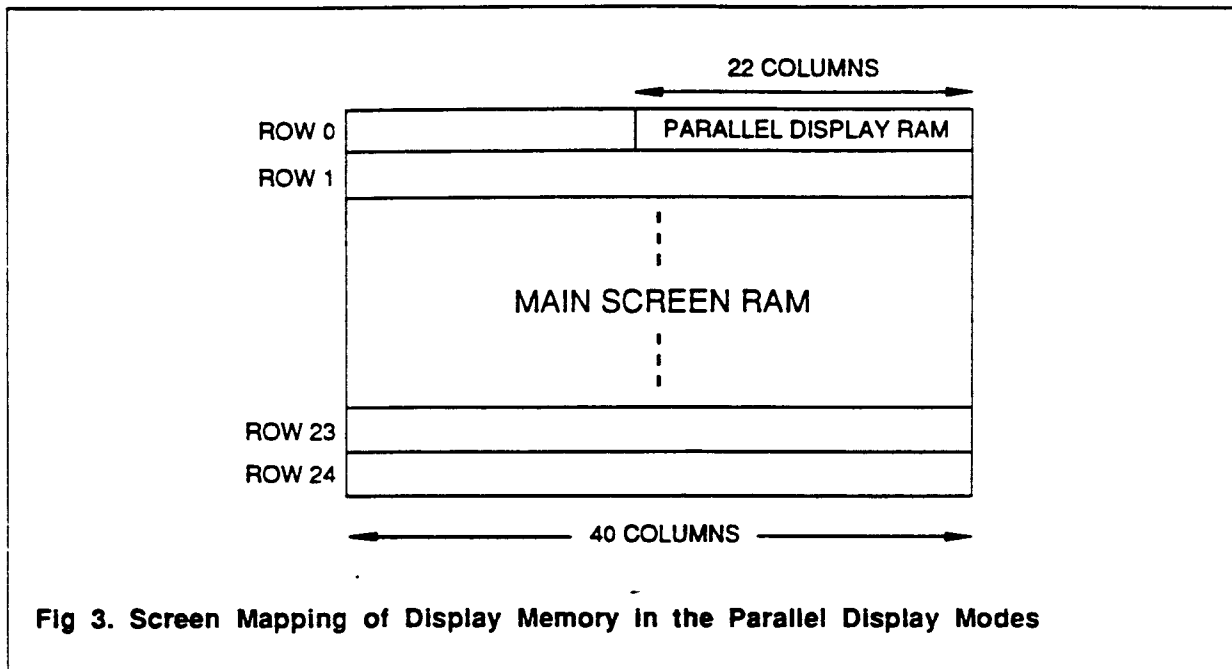


Fig 3. Screen Mapping of Display Memory in the Parallel Display Modes

An example of the use of a parallel display would be to display a timed out channel change graphic at the same time as the initial teletext page of the new channel is being captured and stored in the main display memory. If an OSD mode graphic (a mute graphic for example) is being displayed when the channel change occurs, it will not be affected by the time out of the channel change graphic.

The method of selecting the parallel display is designed for minimum TV MPU software overhead. The MPU can send the same commands to select and de-select the parallel display irrespective of whether the main screen RAM contains teletext or OSD information.

3.3.1 Teletext Mode with Parallel Display (state 2)

This mode is selected by sending a PDSET command (see Fig 2) while the decoder is in teletext mode (state 0) or a TMPIC, TMTXT or TMMIX command if the decoder is in OSD mode with parallel display (state 3) as shown in Fig 2.

The parallel display information will be displayed in box mode (the parallel display data must include start and end box characters as appropriate). The rest of the screen will normally be in picture mode (display of the stored teletext page is therefore inhibited). The exception is when the R24BOX mode is set when, for example, an analogue bar graph or packet 8/30 status information is being displayed. In this case row 24 will be displayed in box mode. The teletext information will continue to be updated.

When returning to state 0, The screen mode (ie PIC, TXT or MIX) is defined by the last TMPIC, TMTXT or TMMIX command.

The 22 bytes of the parallel display are mapped to last 22 bytes of row 0.

3.3.2 OSD Mode with Parallel Display (state 3)

This mode is selected by sending a PDSET command (see Fig 2) while the decoder is in OSD mode (state 1) or an OMPIC, OMTXT, OMMIX or OMBOX command if the decoder is in teletext mode with parallel display (state 2) as shown in Fig 2.

If selected using a PDSET command, the screen mode (ie PIC, TXT, BOX or MIX) remains the same as was previously set. This ensures that existing OSD mode displays are not altered.

If selected using an OMPIC, OMTXT, OMMIX, or OMBOX command, the decoder will switch to the screen mode defined by the instruction.

The 22 bytes of the parallel display are mapped to the last 22 bytes of row 0.

4. CONTROL BYTE FORMATS

The effect of control bytes (i.e. any data byte transferred to UNITEXT through the simple serial or I²C interface) depends on whether UNITEXT is in COMMAND MODE or CHARACTER MODE. The COMMAND MODE is used to set up and control the decoder and the CHARACTER MODE is used to write characters to the display memory.

COMMAND MODE is set after a hardware or software reset, or when the ESC (hex code 1B) is received. If the I²C interface is enabled, COMMAND MODE will be set when UNITEXT is deselected from the bus.

CHARACTER MODE is set when UNITEXT is in COMMAND MODE and receives a control byte which contains a screen column address. This indicates that the next byte is a character to be written to the screen RAM. UNITEXT remains in CHARACTER MODE until the 'ESC' character (hex code 1B) is received or until UNITEXT is deselected from the I²C bus if the I²C interface is enabled.

4.1 Command Mode

When the decoder is in COMMAND MODE, control bytes received by the control interface are interpreted as a row [ROW] address, column [COL] address or as an instruction [INS] according to the most significant two bits as shown in Fig 4.

D7	D6	D5	D4	D3	D2	D1	D0	
0	INSTRUCTION WORD							INS
1	0	ROW ADDRESS						ROW
1	1	COLUMN ADDRESS						COL

Fig 4. Control Word Format

4.1.1 ROW and COL bytes

The decoder has separate row and column address pointers which are updated by ROW and COL words. The process of downloading characters to the display RAM is described in Section 4.2.

ROW format words are also used to pass data to UNITEXT for other purposes. For example, a ROW format word is used to set the cursor position for analogue bar graph displays.

A COL format control word sets UNITEXT to CHARACTER MODE.

4.1.2 INS bytes

There are eight command fields (illustrated in Fig 5) defined by the most significant nibble of the command word. The least significant nibble is either implemented as four flags (as with command field 6) or as sixteen instructions (as with command field 0). The groups of sixteen instructions are illustrated in Fig 6.

D7	D6	D5	D4	D3	D2	D1	D0	
command field								
0				TABLE 0 (SEE BELOW)				
1				TABLE 1 (SEE BELOW)				
2				TABLE 2 (SEE BELOW)				
3				TABLE 3 (SEE BELOW)				
4				TABLE 4 (SEE BELOW)				
5				HPOS	SYNC	INT	AFLD	Display Control Bits
6				C14	C13	C12	LM	Language Mode Control Bits
7				TABLE 5 (SEE BELOW)				

Fig 5. Instruction Word Format (1)

	TABLE 0	TABLE 1	TABLE 2	TABLE 3	TABLE 4	TABLE 5
	0X	1X	2X	3X	4X	7X
0		UPDT	DIG 0	DACBLK	CTEXP	TMPIC
1	PAGE	SPAGE1	DIG 1	DACRED	BOX0	TMTXT
2	SRST	SPAGE2	DIG 2	DACGRN	BOX24	
3	INIT/ P24OFF	TEXP	DIG 3	DACYEL	CBOX	TMMIX
4	CHNGE1/ P24ON	PPAGE	DIG 4	DACBLU	EXPT	
5	CHNGE2	DPAGE	DIG 5	DACMAG	EXPB	
6	CMSCN	IPAGE	DIG 6	DACCYN	CEXP	
7	CSCN	BROWSE	DIG 7	DACWHT	ORVL	
8	CROW	SHOLD	DIG 8	RED	SCLOCK	OMPIC
9	CPDSCN	CHOLD	DIG 9	GREEN	CCLOCK	OMTXT
A	TP26M	THOLD	DIG A	YELLOW	TCLOCK	
B	PDCLR	ESC	DIG B	CYAN	OMASET	OMMIX
C	PDSET	TRVL	DIG C	INDEX	OMGSET	
D	STOP	T24P	DIG D	R24PIC	O24P	OMBOX
E	SROLL	SSTAT	DIG E	R24MIX	SFLOF	
F	CROLL	TSTAT	DIG F	R24BOX	CFLOF	

Fig 6. Instruction Word Format (2)

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4.2.Character Mode

When the CHARACTER MODE is set, all control words are written to the display memory location pointed to by the ROW and COL pointers.

Screen address ROW=0, COL=0 is normally at the top left hand corner of the screen. Screen address ROW=24, COL=39 is normally at the bottom right hand corner of the screen. The exception to this is after the T24P or O24P commands have been received (see Section 5).

The parallel display characters are downloaded by writing to the 22 locations starting at the character location ROW=25, COL=0.

The column address will auto-increment after each character. If the current COL value is 39, COL will be set to 0 and ROW will be incremented so that succeeding characters will appear on the next line of the display.

To illustrate this, the sequence of instructions needed to display the characters 'BBC1' in a box in the parallel display RAM is as shown in the following table:-

Control Word	Hex Code	Mode (CHAR/COM)	Row Pointer	Col Pointer	Comments
ROW 25	99	COM	25	-	Set row pointer
COL 0	C0	COM	25	0	Set col pointer
START BOX	0B	CHAR	25	1	
START BOX	0B	CHAR	25	2	
'B'	42	CHAR	25	3	
'B'	42	CHAR	25	4	
'C'	43	CHAR	25	5	
'1'	31	CHAR	25	6	
END BOX	0A	CHAR	25	7	
ESC	1B	COM	25	8	Return to COM mode for a INS, ROW or COL word

5. INSTRUCTION DESCRIPTIONS

5.1 Instruction Summary (Figs 7, 8, 9, 10 & 11)

Fig 7. Teletext Instructions: Summary

	Description	Hex	Notes	Page
TMPIC	Teletext Mode PICture	70	2,8	11
TMTXT	Teletext Mode TeXT	71	2,8	"
TMMIX	Teletext Mode MIX	73	2,8	"
DIG0-DIGF	enter teletext page DIGit 0-F	20-2F	1,4	"
PPAGE	enter Previous teletext PAGE number	14	1,4	12
DPAGE	Decrement teletext PAGE number	15	1,4	"
IPAGE	Increment teletext PAGE number	16	1,4	"
BROWSE	capture random teletext page	17	1,4	"
TEXP	Teletext display EXPand	13	4	13
CTEXP	Clear Teletext display EXPand	40		"
UPDT	UPDaTe	10	4	"
TRVL	toggle Teletext display ReVeal	1C	6	"
SPAGE1	Sub-PAGE 1 (sub-page only)	11	1,4	14
SPAGE2	Sub-PAGE 2 (with toggle clock)	12	1	"
SHOLD	Set HOLD	18	4	"
CHOLD	Clear HOLD	19	4	"
THOLD	Toggle HOLD	1A	4	"
SFLOF	Set FLOF (see Section 10.3)	4E		15
CFLOF	Clear FLOF (see Section 10.3)	4F	8	"
RED	select RED link (see Section 10.3)	38	1,4	"
GREEN	select GREEN link (see Section 10.3)	39	1,4	"
YELLOW	select YELLOW link (see Section 10.3)	3A	1,4	"
CYAN	select CYAN link (see Section 10.3)	3B	1,4	"
INDEX	Select INDEX link (see Section 10.3)	3C	1,4	"
CHNGE1	CHaNGE channel 1 (do not clear HOLD)	04		"
CHNGE2	CHaNGE channel 2 (clear HOLD)	05		"
INIT	INITialise teletext	03	8	"
TP26M	Toggle Packet 26 Mode (Port/ Span pages only or all pages)	0A	8	"
P24OFF	Packet 24 OFF mode (inhibit packet 24 reception)	01, 03	7	16
P24ON	Packet 24 ON mode (clear P24OFF)	01, 04	7	"
STOP	STOP teletext	0D		"
CROLL	Clear ROLLing header (inhibit rolling header reception)	0F		"
SROLL	Set ROLLing header (clear CROLL)	0E		"
T24P	toggle Teletext display row 24 Position	1D		"

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Fig 8. OSD Instructions: Summary

Code	Description	Hex	Notes	Page
OMPIC	OSD Mode PICture	78	2,8	16
OMTXT	OSD Mode TeXT	79	2,8	"
OMMIX	OSD Mode MIX	7B	2,8	"
OMBOX	OSD Mode BOX	7D	2,8	"
PDSET	Parallel Display SET	0C	2,8	17
PDCLR	Parallel Display CLear	0B	2,8	"
SCLOCK	Set CLOCK mode (see Section 7)	48		"
CCLOCK	Clear CLOCK mode (see Section 7)	49		"
TCLOCK	Toggle CLOCK mode (see Section 7)	4A		"
DACBLK	black analogue bar graph (see Section 8)	30	5,8	"
DACRED	red analogue bar graph (see Section 8)	31	5,8	"
DACGRN	green analogue bar graph (see Section 8)	32	5,8	"
DACYEL	yellow analogue bar graph (see Section 8)	33	5,8	"
DACBLU	blue analogue bar graph (see Section 8)	34	5,8	"
DACMAG	magenta analogue bar graph (see Section 8)	35	5,8	"
DACCYN	cyan analogue bar graph (see Section 8)	36	5,8	"
DACWHT	white analogue bar graph (see Section 8)	37	5,8	"
OMASET	set up OSD display screen colours in alpha mode	4B	3	18
OMGSET	set up OSD display screen colours in graphics mode	4C	3	19
SSTAT	Set STATus mode (see Section 9)	1E	8	"
TSTAT	Toggle STATus mode (see Section 9)	1F	8	"
R24BOX	Row 24 BOX mode	3F	8	"
R24MIX	Row 24 MIX mode	3E	8	"
R24PIC	Row 24 PICture mode (clear R24BOX, R24MIX)	3D	8	"
BOX0	BOX row 0 of OSD displays	41		"
BOX24	BOX row 24 of OSD displays	42		"
CBOX	Clear BOX (clear BOX0, BOX24)	43		20
EXPT	EXPand Top of OSD displays	44		"
EXPB	EXPand Bottom of OSD displays	45		"
CEXP	Clear EXPand (clear EXPT, EXPB)	46		"
ORVL	toggle OSD ReVeAL mode	47		"
O24P	toggle OSD display row 24 Position	4D		"

Fig 9. General Instructions: Summary

Code	Description	Hex	Notes	Page
SRST	Software ReSeT	02	8	20
PAGE	PAGE onto extended instruction set	01		"
CSCN	Clear SCreeN RAM (main screen RAM and parallel display RAM)	07	3,8	"
CMSCN	Clear Main SCreeN RAM	06	3,8	"
CPDSCN	Clear Parallel Display SCreeN RAM	09	8	"
CROW	Clear ROW	08	8	21
ESC	ESCape	1B		"

Fig 10. Display Control Bits: Summary

Control Bit (see Fig 5.)	Description	Notes	Page
AFLD	Asynchronous FieLD (312/312)		21
INT	INTerlace		"
SYNC	SYNC switch control		"
HPOS	Horizontal POSition		"

Fig 11. Language Mode Control Bits: Summary

Control Bit	Description(see Fig 5.)	Notes	Page
LM	Language Mode		21
C12, C13, C14	national option selection bits	8	22

- Notes:
- 1) Page entry command.
 - 2) Display mode select command.
 - 3) No action in states 0 and 2.
 - 4) No action if teletext is not displayed (i.e.no action if not in state 0 in TXT or MIX screen display mode).
 - 5) No action if teletext is displayed (i.e. no action if in state 0 in TXT or MIX display mode).
 - 6) No action in states 1,2 & 3.
 - 7) Page 2 command must be preceded by PAGE.
 - 8) 'Long' command.

5.2 Teletext Instruction Descriptions

- TMPIC Teletext Mode PICture
 Enable teletext in picture.
- TMTXT Teletext Mode TeXT
 Enable teletext in text.
- TMMIX Text Mode MIX
 Enable teletext in MIX.
- DIG 0 Enter teletext page DIGit 0

5.2 Teletext Instruction Descriptions-continued

- DIG 1 Enter teletext page DIGit 1
- DIG 2 Enter teletext page DIGit 2
- DIG 3 Enter teletext page DIGit 3
- DIG 4 Enter teletext page DIGit 4
- DIG 5 Enter teletext page DIGit 5
- DIG 6 Enter teletext page DIGit 6
- DIG 7 Enter teletext page DIGit 7
- DIG 8 Enter teletext page DIGit 8
- DIG 9 Enter teletext page DIGit 9
- DIG A Enter teletext page DIGit A
- DIG B Enter teletext page DIGit B
- DIG C Enter teletext page DIGit C
- DIG D Enter teletext page DIGit D
- DIG E Enter teletext page DIGit E
- DIG F Enter teletext page DIGit F

PPAGE enter Previous teletext PAGE number
There will be no action if the teletext page is not being displayed. Otherwise, this command starts a search for the previously entered main page number. The sub-page mode is cleared if set.

DPAGE Decrement teletext PAGE number
There will be no action if the teletext page is not being displayed. If the teletext page is being displayed, and if a complete page has been entered, then the decoder will search for the current page minus one. The sub-page mode is cleared if set.

IPAGE Increment teletext PAGE number
There will be no action if the teletext page is not being displayed. If the teletext page is being displayed, and if a complete page has been entered, then the decoder will search for the current page plus one. The sub-page mode is cleared if set.

BROWSE capture random teletext page
There will be no action if the teletext page is not being displayed. Otherwise, this command captures the next incoming teletext page which has a decimal page number. There is no action if the last page number has not been completely entered. This command resets the sub-page mode.

5.2 Teletext Instruction Descriptions-continued

TEXP Teletext display EXPand

There will be no action if the teletext page is not being displayed. This command is used to cycle the teletext display through expand top, expand bottom, and no expand modes.

CTEXP Clear Teletext display EXPand

This command clears the expand top and expand bottom display modes of the teletext display if set by the TEXP instruction.

UPDT UPDaTe

There will be no action if the teletext page is not being displayed, if a complete page number has not been entered or if the decoder is in hold mode. Otherwise the decoder will switch to picture mode. When the selected page is captured for the first time, or captured with the update bit set, the page number will appear in a box in the top left hand corner of the screen indicating that the page is ready for display. The updated page can then be displayed with a TMTXT or TMMIX command. If a new page number is entered while in update mode, the rolling header will appear in a box. When the page is captured, the page number only is displayed in a box indicating that the page is ready for display. Again, the complete page can be displayed by sending a TMTXT or TMMIX command. The update mode is cleared by all of the display mode select commands (See Fig 6).

TRVL toggle Teletext display ReVeAL

If the teletext page is being displayed, this command toggles the display of concealed characters in the teletext display. The reveal mode is cleared on the first capture of a page or if the page is received with the update bit (C8) or erase bit (C4) set.

If the teletext page is not being displayed, this command allows a text page to be searched for while viewing the tuner video. There is no action if the decoder is in states 1, 2 or 3 or if the decoder is in clock mode. Otherwise the user will be prompted for a text page number with 'P--' appearing in a box at the top left hand corner of the screen. The R24BOX, R24MIX and sub-page modes are cleared if set. When a complete page number is entered, a rolling header will appear in a box. When the page is captured, the page number only is shown in a box indicating that the page is ready for display. The page can be displayed by sending a TMTXT or TMMIX command. The update mode is cleared by all the display mode select commands (See Figs 7 & 8).

5.2 Teletext Instruction Descriptions-continued

SPAGE1 Sub-PAGE1 (sub-page only)

There will be no action if the teletext page is not being displayed. If the teletext page is being displayed, this command controls movement between the sub-page and main-page modes. Sub-page mode will be selected if the decoder is not already in sub-page mode and a complete page number has been entered. If sub-page mode is already set then this command returns the decoder to main-page mode. If a sub-page number has been partially entered when the display of the text page is turned off (by the TMPIC instruction for example), the sub-page mode will be cleared. The sub-page mode is also cleared by the following commands:- INIT, CHNGE1, CHNGE2, PPAGE, DPAGE, IPAGE and BROWSE. The sub-page mode can also be cleared by RED, GREEN, YELLOW, CYAN and INDEX (see Fig 7).

SPAGE2 Sub-PAGE2 (sub-page with toggle clock)

This command is included for simple applications of the sub-page and clock functions. If the teletext page is being displayed, this command will act as SPAGE1. If the teletext page is not being displayed, this command will act as TCLOCK.

SHOLD Set HOLD

There will be no action if the teletext page is not being displayed. Otherwise the hold mode is set. In this mode only the teletext time is updated in the screen memory and the page number is replaced with the hold symbol. Other messages can be displayed by downloading characters to the appropriate locations. In hold mode the current page number is not changed by the CHNGE1 instruction. The hold text mode is cleared by the following commands:- SRST, INIT, CHOLD, THOLD, CHNGE2, OMXXX, text page entry commands (eg PPAGE).

The held page can be preserved during channel changes if the CHNGE1 instruction is used. The hold mode normally remains set while the decoder is in states 0 or 2 whether text is displayed or not. However, the hold mode will be cleared if the decoder is in clock mode with the teletext page not displayed. This is necessary as control characters are written to the header row to form the clock display, so part of the held page is lost.

CHOLD Clear HOLD

There will be no action if the teletext page is not being displayed or if the hold mode is not set. Otherwise, this command searches for the current selected page, displaying the page number at the top left hand side of the display.

THOLD Toggle HOLD

This command is included for simple applications of the hold function. (is used instead of SHOLD and CHOLD). There is no action if teletext is not being displayed. Otherwise, if the hold mode is set, then the action of this command will be the same as CHOLD. If the hold mode is not set, then the action of this command will be the same as SHOLD.

5.2 Teletext Instruction Descriptions-continued

SFLOF	Set FLOF mode (see Section 10.3)
CFLOF	Clear FLOF mode (see Section 10.3) This command clears the FLOF mode. If teletext is enabled and the FLOF mode is enabled, row 24 will be cleared.
RED	Select RED link (See Section 10.3) There is no action if the teletext page is not being displayed.
GREEN	Select GREEN link (See Section 10.3) There is no action if the teletext page is not being displayed.
YELLOW	Select YELLOW link (See Section 10.3) There is no action if the teletext page is not being displayed.
CYAN	Select CYAN link (See Section 10.3) There is no action if the teletext page is not being displayed.
INDEX	Select INDEX link (See Section 10.3) There is no action if the teletext page is not being displayed. N.B. FLOF link sub-pages are not stored. Links with page FF are considered null.
CHNGE1	CHaNGE channel 1 (do not clear HOLD). If not in hold mode, search for the default initial page (P100) and enable reception of packet 8/30 initial page (this will overwrite P100 if received).
CHNGE2	CHaNGE channel 2 (clear HOLD) Clear hold mode if set, search for the default initial page (P100) and enable reception of packet 8/30 initial page (this will overwrite P100 if received).
INIT	INITialise teletext Clear the main screen RAM and search for the default initial page (P100). Enable reception of packet 8/30 initial page (this will overwrite P100 if received).
TP26M	Toggle Packet 26 Mode (Port/ Span pages only or all pages) This command toggles between two packet 26 reception modes:- <ol style="list-style-type: none">Portugese/ Spanish pages only Packet 26 reception is enabled when the received page is displayed with Portugese/ Spanish language national options (see Section 5.6). This mode is set after a hardware reset or a SRST instruction.All pages In this mode, packet 26 reception is always enabled, it is not affected by the selected national options.

5.2 Teletext Instruction Descriptions-continued

- P24OFF** Packet 24 OFF mode - (inhibit packet 24 reception).
When 'Packet 24 OFF' mode is set, received packet 24 data is not written to the screen RAM. The action of RED, GREEN, YELLOW, CYAN and INDEX is unchanged by this mode. The 'Packet 24 OFF' mode is cleared by a P24ON instruction or by a SRST instruction. The P24OFF instruction is preceded by a PAGE command (hex code 01).
- P24ON** Packet 24 ON mode - (clear P24OFF).
This instruction clears the 'Packet 24 OFF' mode, received packet 24 data is written to the screen RAM if the decoder is in the FLOF mode. The P24ON instruction is preceded by a PAGE command - (hex code 01).
- STOP** STOP teletext
This command inhibits the reception of teletext data apart from the time field (the last eight columns of the header). It can be used to ensure that the teletext page is not overwritten during data transfers from the screen RAM to the I²C host. It is cleared with the SROLL command.
- CROLL** Clear ROLLing header (inhibit rolling header reception)
This command prevents rolling headers from being received. The rolling header will be re-enabled if a complete page number is entered or if a SROLL command is received.
- SROLL** Set ROLLing header (clear CROLL)
This command clears the STOP mode. If a complete page number has been entered, a rolling header will be displayed and the currently entered teletext page will be re-captured.
- T24P** toggle Teletext display row 24 Position
This toggles the position of row 24 of the teletext display (state 0) between the top and the bottom of the screen. Row 24 is set to the bottom on software reset.

5.3 OSD Instruction Descriptions

Commands which select the OSD modes (state 1 or state 3) and set a screen mode (see Fig 2) are:-

- OMPIC** OSD Mode PICture
Select OSD mode in PICture
- OMTXT** OSD Mode TeXT
Select OSD mode in TeXT
- OMMIX** OSD Mode MIX
Select OSD mode in MIX
- OMBOX** OSD Mode BOX
Select OSD mode in BOX

5.3 OSD Instruction Descriptions-continued

PDSET	Parallel Display SET This command maps the parallel display memory to the last 22 bytes of row 0 [see Section 3.3].
PDCLR	Parallel Display CLear This command removes the mapping of the parallel display memory to row 0 of the display. If the decoder is in states 0, 1 or 3 the screen mode will not change. If the decoder is in state 2 then the screen mode will be defined by the last TMXXX instruction [see Section 3.3].
SCLOCK	Set CLOCK mode (see Section 7)
CCLOCK	Clear CLOCK mode (see Section 7)
TCLOCK	Toggle CLOCK mode (see Section 7)
DACBLK	black analogue bar graph (see Section 8)
DACRED	red analogue bar graph (see Section 8)
DACGRN	green analogue bar graph (see Section 8)
DACYEL	yellow analogue bar graph (see Section 8)
DACBLU	blue analogue bar graph (see Section 8)
DACMAG	magenta analogue bar graph (see Section 8)
DACCYN	cyan analogue bar graph (see Section 8)
DACWHT	white analogue bar graph (see Section 8)

5.3 OSD Instruction Descriptions-continued

OMASET set up OSD display screen colours in alpha mode

This command sets the background and foreground colours of a user defined part of the screen by writing the appropriate control codes to the first three locations of each row in the defined area. The alpha mode is set. This is achieved with a sequence of three control words. The first control word is ROW format and defines the colours as shown below.

D7	D6	D5	D4	D3	D2	D1	D0	
1	0	BACKGROUND COLOUR			FOREGROUND COLOUR			ROW word

D0-D2 / D3-D5	COLOUR
0	BLACK
1	RED
2	GREEN
3	YELLOW
4	BLUE
5	MAGENTA
6	CYAN
7	WHITE

The second control word is also ROW format and contains the row address which points to the bottom row of the area for which the colours are being defined.

D7	D6	D5	D4	D3	D2	D1	D0	
1	0	BOTTOM ROW OF DISPLAY						ROW word

The third control word is the OMASET instruction itself. When this is received, the decoder sets the defined background and foreground colours from the top of the screen to the row indicated by the second control word. For example, the sequence of instructions to set the top 10 rows of the display to green background and red foreground would be:-

Control Word	Hex Code	Mode (CHAR/COM)	Row Pointer	Col Pointer	Comments
ROW 17	91	COM	17	-	set colours
ROW 9	89	COM	9	-	set bottom row
OMASET	48	COM	9	-	set display colours

5.3 OSD Instruction Descriptions-continued

- OMGSET** set up OSD screen display colours in graphics mode
This command is the same as OMGSET except that the graphics mode is set.
- SSTAT** Set STATus mode (see Section 9)
- TSTAT** Toggle STATus mode (see Section 9)
- R24BOX** Row 24 BOX mode.
This command enables row 24 to be used for box mode on-screen-displays when teletext reception is enabled (ie the decoder is in states 0 or 2). When the R24BOX mode is set, the BOX screen display mode will be set for row 24 if the teletext page is not being displayed. If the FLOF mode is set, the FLOF prompt row will be cleared and reception of further prompt rows will be disabled while the R24BOX mode is active. This mode is automatically set by the DACXXX commands and when the status mode is set [see Sections 8 & 9]. The R24BOX mode is cleared when the teletext page is displayed and by the R24PIC and R24MIX commands.
- R24MIX** Row 24 MIX mode.
This command enables row 24 to be used for mix mode on-screen-displays when teletext reception is enabled and the parallel display mode or clock modes are not set. When the R24MIX mode is set, the MIX screen display mode will be set for row 24 if the teletext page is not being displayed. If the FLOF mode is set, the FLOF prompt row will be cleared when the R24MIX mode is set and reception of further prompt rows will be disabled while the R24MIX mode is active. The R24MIX mode is cleared when the teletext page is displayed and by the R24PIC and R24BOX commands.
- R24PIC** Row 24 PICture mode.
This command clears R24BOX and R24MIX modes. If these modes are set, then row 24 of the main screen RAM will be cleared. The analogue bar graph and status mode displays will therefore be removed. If the FLOF mode is set and teletext is enabled, the reception of the FLOF prompt row will be re-enabled.
- BOX0** BOX row 0 of OSD displays
This command displays row 0 as if the whole row was contained within box characters. This enables a box to start at column 0 of row 0. This mode is only valid if the decoder is in state 1 without the clock mode set.
- BOX24** BOX row 24 of OSD displays
This command displays row 24 as if the whole row was contained within box characters. This enables a box to start at column 0 of row 24. In FLOF mode, the BOX24 mode is set when the decoder is in states 1 or state 3. Otherwise, the BOX24 mode is valid in states 1, 2, 3, and 4.

5.3 OSD Instruction Descriptions-continued

- CBOX** Clear BOX (clear BOX0, BOX24)
Reset BOX0 and BOX24 modes
- EXPT** EXPand Top of OSD displays
This command expands the top of OSD displays including the clock and parallel mode displays. The display of teletext pages is not affected (expanded display of teletext pages is controlled by the TEXP command).
- EXPB** EXPand Bottom of OSD displays
This command expands the bottom of OSD displays. The display of teletext pages is not affected (expanded display of teletext pages is controlled by the TEXP command).
- CEXP** Clear EXPand (clear EXPT, EXPB)
Clear EXPT or EXPB if set.
- ORVL** toggle OSD ReVeAL mode
This command toggles the display of hidden characters in OSD displays and parallel displays (states 1,2 and 3). It can be used to inhibit the display of parts of an on-screen-display even though the display has been downloaded.
- O24P** toggle OSD row 24 Position
This command toggles the position of row 24 between the top and the bottom of the display for OSD displays. The display of teletext pages is not affected (the row 24 position for teletext page displays is controlled by the T24P command). For example, this command can be used to lower the position of the parallel mode display by one line by placing row 24 at the top of the screen and thereby moving the other rows down by one line.

5.4 General Instruction Descriptions

- SRST** Software ReSeT.
Clear mode flags, select the teletext mode display in picture mode and initialise text (see 'INIT' command). A software reset is also initiated by a hardware reset.
- PAGE** PAGE onto extended instruction set.
This instruction is sent before page 2 commands (i.e. P24OFF and P24ON).
- CSCN** Clear SCreeN RAM (main screen RAM and parallel display RAM).
There is no action if teletext reception is enabled (states 0 and 2). This instruction clears the main screen RAM and the parallel display RAM.
- CMSCN** Clear Main SCreeN RAM (rows 0 to 24).
There is no action if teletext reception is enabled (states 0 and 2).
- CPDSCN** Clear Parallel Display SCreeN
This command will clear the contents of the parallel display RAM.

5.4 General Instruction Descriptions

- CROW** Clear ROW.
Clear the row pointed to by the last ROW data.
- ESC** ESCape.
The character 'ESC' when received in CHARACTER MODE will return the decoder to COMMAND MODE. There is no action if 'ESC' is received when the decoder is already in COMMAND MODE.

5.5 Display Control Bits

- AFLD** Asynchronous FieLD(312/312)
The asynchronous field (312/312) mode is set (the default is a synchronous field (312/313) display). This mode is reset by SRST.
- INT** INTerface
Interlace mode is set for TXT screen mode displays (the default is a non-interlaced display). This mode is reset by SRST.
- SYNC** SYNC switch control
The SYNC bit effects the display of BOX and MIX mode displays when the video quality is not good enough to lock the CF70095 phase locked loop.
When SYNC is not set and 'bad' video is present, BOX and MIX mode displays will not appear stationary on the screen because the PLL cannot lock on to the bad video. When SYNC is set and bad video is present, the internal sync switch is set so that the output at SYNC (pin 2) is derived from the free running phase locked loop. The TV deflection circuit will lock onto this signal so that BOX and MIX displays are stationary on the screen.
This mode is reset by SRST.
- HPOS** Horizontal POSition
The horizontal position of the display is moved one character to the right.

5.6 Language Mode Control Bits

- LM** Language Mode
- LM=0** The language mode of the teletext page is updated by the language control bits in the header.
- LM=1** The language mode of the teletext page is set to the option defined by this command and is not updated by the language control bits in the header.

5.6 Language Mode Control Bits-continued

C12, C13,

C14 national option selection bits

These control bits correspond to the C12, C13 and C14 of the teletext header. They define the language option that will be set in the OSD mode and when the parallel display is selected.

6. I²C HOST READ FUNCTIONS

The I²C interface on UNITEXT enables the host to read status information and received teletext data via the bus. The first byte of a host read data transfer is a status word. The second and successive bytes are the characters currently stored in the screen memory.

6.1 Status Word Format

MSB				LSB			
D7	D6	D5	D4	D3	D2	D1	D0
LKENT	POFF	P24	BAD	C14	C13	C12	SRCH

LKENT LinKENTered.

A link has been entered. This flag is set if the last FLOF command (RED, GREEN, YELLOW, CYAN or INDEX) resulted in a search for the linked page (See Fig 7).

POFF PictureOFF.

This flag is set when the 'I' signal is active over the whole field and no picture video is displayed. This flag will be cleared, for example, when a subtitle or newflash page is captured.

P24 Packet 24 received.

A packet 24 has been received since the last SRST, INIT, CHNGE1, or CHNGE2 command indicating that there is a row 24 display on the current channel. Received packet 24s will be downloaded to row 24 if the FLOF mode is set. When text is displayed and the FLOF mode is set, the display of row 24 is controlled by the row 24 display flag included in packet 27.

BAD BAD video.

The quality of the video signal is not adequate to lock the phase-locked-loop, it is therefore free running at its centre frequency.

C12,13,14 Language flags.

These flags indicate the language in which teletext is being displayed. This will correspond to the C12, C13 and C14 bits of the header of the last captured page unless a language selection command has been sent with the LM bit set high [see Section 5.6].

SRCH SeaRCHing for page.

This flag is set in the period between a teletext page being entered and the capture of the page (the period when the header is rolling).

6.2 Host Read of Screen RAM

To carry out a transfer of teletext data to the host via the I²C bus, it is first necessary to point to the location of the first byte to be transferred using ROW and COL format control words. The host then addresses UNITEXT in host read mode and reads a sequence of bytes. The first byte will be the status word. The second byte will be the contents of the screen RAM location pointed to by the ROW and COL format control words. The addressed location in the screen memory auto-increments after each byte transfer so that the third byte will be the contents of the next location in the screen memory. The host can continue the byte transfers until the whole teletext page has been transferred if required.

For example, the sequence of instructions to download a teletext page from the top left hand corner would be:-

Control word	Hex Code	Mode (char/com)	Row Pointer	Col Pointer	Comments
ROW 0	80	COM	0	-	set row pointer
COL 0	C0	COM	0	0	set col pointer

Host selects UNITEXT in host read mode:-

Bus Event	Byte Contents	Row Pointer	Col Pointer	Comments
1st data read	status word	0	0	
2nd data read	byte at row 0, col 0	0	1	
3rd data read	byte at row 0, col 1	0	2	
Repeat until end of transfer				

7. CLOCK MODE

The clock mode function allows the teletext header time display to be superimposed on the TV video providing the viewer with accurate time information. This function can be turned on and off using one instruction (TCLOCK) and therefore can be implemented with minimal MPU software. Alternatively, the clock mode can be simply implemented using the SPAGE2 command. This command acts as TCLOCK when the teletext page is not being displayed.

When the decoder is in clock mode, only the last eight locations of the header row are updated in the main screen RAM. These bytes are updated in all display modes (states 0,1,2 and 3). When the clock mode is selected, certain control characters are automatically written to the six locations preceding the time display in the main screen RAM. These set up the clock display colours and place the time display in a double height box. The default colours are yellow characters on a blue background. However, this can be altered by downloading different control characters to these locations. The time display therefore occupies the last 14 columns on row 0 of the main screen RAM.

	COL 26					COL 31		COL 39
	DBLE HGHT	ALPHA BLUE	NEW BACK	ALPHA YELL	START BOX	STARTB OX	8 CHARS OF HEADER TIME FIELD	
ROW 0	0D	04	1D	03	0B	0B		

If the parallel display is set (states 2 and 3), the parallel display will have precedence over the clock display. The time information will continue to be updated for correct display when the parallel display mode is de-selected. When the decoder is in teletext mode with no parallel display (state 0), the clock display is only valid when teletext is not being displayed (ie in picture mode). In this case, the teletext clock will appear even though PIC (picture mode) has been set.

When the decoder is in OSD mode with no parallel display (state 1), the clock display will appear if the MIX or BOX screen modes have been set.

8. ANALOGUE BAR GRAPH DISPLAYS

The analogue bar graph display commands allow analogue levels to be displayed to a high resolution with two instructions. Row 24 of the main screen RAM is used for the display so that the reception of the main teletext page is not interrupted. If the FLOF mode is set, the FLOF prompt information will be overwritten by the display. The prompt row will be re-captured on the next occasion that the page is received after the analogue bar graph has been cleared.

There is no action if a analogue bar graph display command is sent while the teletext page is displayed. Otherwise the analogue bar graph commands will automatically set the R24BOX mode so that the bar will be displayed while teletext is enabled (ie in states 0 or 2). If the decoder in states 1 or 3, then the analogue bar graph will be displayed if the display mode is set to BOX or MIX.

The analogue bar graph display commands allow analogue bar graphs to be displayed in eight colours. The display consists of a bar of colour across the bottom of the screen with a vertical line indicating the level. To set the level indicated on the display, a ROW format command word is sent before the analogue bar graph command.

D7	D6	D5	D4	D3	D2	D1	D0	
1	0	CURSOR POSITION						ROW word

The six lower bits of the ROW word set the level as follows:-

6 bit value in ROW	Indicated Level
0 to 4	min level
5	min level + 1
6	min level + 2
.	.
.	.
.	.
62	max level - 1
63	max level

The analogue bar graph is cleared by sending a R24PIC command, or by displaying the teletext page. In both cases the R24BOX mode is cleared. If the status mode is enabled, the status display will overwrite the analogue bar graph display.

9. STATUS DISPLAY

This function allows the display of the packet 8/30 status field. Row 24 of the main screen RAM is used for the display so that the reception of the main teletext page is not interrupted. If the FLOF mode is set, the FLOF prompt information will be overwritten by the display. The prompt row will be re-captured on the next occasion that the page is received after the status mode has been cleared.

There is no action if the SSTAT or TSTAT commands are sent while the teletext page is displayed. When in status mode, the R24BOX mode is automatically set so that the status information will be displayed while teletext is enabled (ie in states 0 or 2). If the decoder is in states 1 or 3, then the status information will be displayed if the display mode is set to box or mix. When the status mode is set, incoming status information is written to the centre 20 locations of row 24. The characters are preceded by two start box characters and are succeeded by an end box character. It is possible to modify the colours of the status display by transferring the appropriate control codes to the section of row 24 of the screen RAM to the left hand side of the status display.

The status display will be inhibited when an INIT, CHNGE1 or CHNGE2 command is received as these commands imply that the current status information may not be valid. The display will be re-enabled when a new packet 8/30 is received.

The status mode is cleared by sending a R24PIC command, or by displaying the teletext page. In both cases the R24BOX mode is cleared. If a analogue bar graph command is received, it will clear the status mode and overwrite the status display.

10. TEXT FUNCTION OPERATION

10.1 Page Entry and Capture

When enabled, the text function is either in search, capture or partial page entry states.

In the search state a complete page number has been entered but not yet captured. A 'rolling header' is displayed in green. If in serial magazine mode the display characters of all the incoming headers are displayed. If in parallel magazine mode the characters of the headers of the selected magazine are displayed. If the screen mode is mix, the teletext header row will appear in a box.

When a header from the new page is received, the screen mapped RAM is cleared of the old page. The decoder is now in the capture state and the header characters of the selected page are displayed in white. The screen RAM is not cleared in the capture state unless a header of the selected page is received with the erase bit (C4) set.

In the partial page entry state, the existing header characters are displayed in white and page search is disabled until a complete page number has been entered. If the screen mode is mix or box, the page number will appear in a box. Page numbers can only be entered if text is being displayed. If a page number has been partially entered when the display of the text page is turned off, the decoder will revert to the previous page number. If a partial sub-page number has been entered when the display of the text page is turned off, the sub-page mode will be cleared.

The time field of the header is always updated.

10.2 Page Number Display and Header Colour Control

The first eight characters of the header row are used by the teletext function to display the current page number and set the header colour.

The page number is displayed in columns 2 to 5. If in normal page mode (ie sub-page mode not selected) the three digit number is prefixed according to the current national option:-

ENGLISH	P
GERMAN	S
SWEDISH/FINNISH	S
ITALIAN	P
FRENCH	P
PORTUGUESE/SPANISH	P

Columns 0 and 1 are used for start box characters and column 6 is used for an end box character. The page number is placed in a box during the partial page entry and search modes (see 'Page Entry and Capture'). This makes the page number more visible in box and mix display modes (the box characters have no effect in text or picture screen display modes). Column 7 is used to set the header to white or green.

10.3 FLOF Mode

When FLOF mode is selected the decoder will implement FLOF as described in 'User Friendly Page Access (FLOF): A Code of Practice' (Ref1, Appendix 5). The factors which affect the action of the FLOF commands are:-

- has a packet 24 been received for the current page?
- has a packet 27 been received for the current page?
- was the row 24 display flag contained in the packet 27 set?
- is the link a 'null' link?

The way in which these factors affect the operation of the FLOF commands is illustrated in Fig 12

STATUS OF TELETEXT RECEIVED				ACTION OF FLOF COMMAND	
PACKET 24 RECEIVED?	PACKET 27 RECEIVED?	DISPLAY ROW 24 FLAG	NULL LINK?	RED, GREEN, YELLOW, CYAN	INDEX
NO	NO	-	-	1	2
NO	YES	X	X	1	3
YES	NO	-	-	1	2
YES	YES	0	NO	1	3
		1	NO	3	3
		X	YES	1	2

- '-' -not applicable
- 'X' -don't care
- '1' -clear hold mode, no change to current selected page, clear LKENT status flag
- '2' -clear hold mode, enter default page 100 and enable packet 8/30 initial page reception, clear LKENT status flag, clear sub-page mode.
- '3' -clear hold mode, search for linked page (the sub-page is treated as 'dont care'), set LKENT flag, clear sub-page mode.

Fig 12. Operation of FLOF Commands In FLOF Mode

When FLOF is not selected, characters can be downloaded to row 24 of the screen RAM to implement user specific displays (eg favourite page indexes). Row 24 can be switched between the top and the bottom of the screen using the T24P (toggle Teletext row 24 Position) command.

There is no action if RED, GREEN, YELLOW or CYAN commands are received while FLOF is not enabled. However, the operation of INDEX is independent of whether FLOF is selected or not. This means that INDEX will still work if FLOF is disabled while row 24 is used for non-FLOF displays. If the INDEX command is received on a non-FLOF channel, the decoder will search for page 100.

ASIC Product Family

ASICTEXT Custom Family
'UNITEXT'
Software Applications Guide Supplement

OBJECTIVES

*This document is a supplement to "ASICTEXT Custom Family
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This document is a supplement to the CF70095 'UNITEXT' Software Applications Guide describing the CF70195. The CF70195 is a level 1 teletext decoder for Eastern Europe which is fully hardware compatible with the CF70095.

The CF70195 software interface is identical to the CF70095 with the addition of two new instructions described below.

The table below shows the languages supported by the CF70095/ CF70195 family.

Character Set option bits			CF70095	CF70195 (Polish Mode)	CF70195 (English mode)
C12	C13	C14			
0	0	0	English	Polish	English
0	0	1	German	German	German
0	1	0	Swedish/Finnish /Hungarian	Swedish/Finnish /Hungarian	Swedish/Finnish /Hungarian
0	1	1	Italian	X	X
1	0	0	French	X	X
1	0	1	Portuguese/ Spanish	Serbo-Croat	Serbo-Croat
1	1	0	X	Czech	Czech
1	1	1	X	X	X

'X'- language not supported, decoder defaults to English

Languages supported by the CF70095 and CF70195

The CF70195 has two software selectable modes which determine whether Polish or English is displayed when the character set option C12=0, C13=0, and C14=0 is received. Two additional commands (SENG and CENG) have been added to the CF70195 to switch between Polish mode (the default mode) and English mode.

The three digit teletext page number is prefixed by a character which depends on the displayed language. The prefix characters are:-

Displayed Language	Page Number Prefix
English	P
German	S
Swedish/ Finnish/ Hungarian	S
Italian	P
French	P
Portugese/ Spanish	P
Polish	S
Serbo-Croat	S
Czechoslovakian	S