TEXAS INSTRUMENTS

Consumer Products Family

UNIVERSAL TELETEXT SYSTEMS
'EUROTEXT'
Software Applications Guide

Draft 7

1. INTRODUCTION

Texas Instruments produce a range of teletext devices based on the EUROTEXT design. EUROTEXT teletext devices contain on-chip memory, character ROMs, and an on-chip RISC micro-controller. The RISC micro-controller reduces the amount of software required to control EUROTEXT. The on-chip memory is used to store four to eight teletext pages. The Character ROM is specially compressed to allow a single device to support a large number of languages. Further details of these chips are contained in the relevant EUROTEXT data sheet. This document covers the following EUROTEXT devices.

Part Number	Teletext memory on-chip	VPS	WSS	Device Identifier (hex)	Languages supported
CF70200	8 pages	no	no	10	Western and Eastern European
CF70203*	8 pages	Yes	no	18	Western and Eastern European
CF70204	4 pages	no	no	14	Western and Eastern European
CF70205*	4 pages	no	no	14	Western and Eastern European
CF70206	8 pages	Yes	Yes	16	Western and Eastern European
CF70209*	8 pages	Yes	no	17	Russian, Ukrainian and English
CF70210	8 pages	no	no	12	Hebrew
CF70211	8 pages	Yes	no	19	Cyrillic and Latin

Table 1 Eurotext Device Summary

* These devices are not recommended for new developments, for the CF70203 use the CF70206, for the CF70205 use the CF70204, for the CF70209 use the CF70211.

This document describes the control interface used to control EUROTEXT and how to write to and read from memory. Not all the commands contained in this document are available in all devices. This control interface allows the user to benefit from the advanced features of EUROTEXT with the minimum control software overhead. The software required to control EUROTEXT is very low because:-

- Important teletext functions are accessed by single byte commands mapped to typical hand-set commands. A simple code translation, only, is required in the system controller for basic applications.
- There is automatic selection of NORMAL, FASTEXT and TOP modes according to the broadcast signal (however, if required, the modes can be forced). These modes include automatic prompt row generation and colour key operation.
- All the teletext processing features of EUROTEXT (i.e. 'flicker free' packet 26 processing, capture latch management, packet 27 FASTEXT processing and TOP table processing) are invisible to the system controller.

An upgrade path from UNITEXT (CF70095A) to EUROTEXT is supported for simple applications through a common core of basic teletext commands. For more complex compatible designs, it is possible for the system controller to read a device identity code and adapt its operation according to whether it detects EUROTEXT or UNITEXT.

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Eurotext languages supported

Devices	Nation Options supported	Character set	Extra languages Supported
CF70200 CF70203 CF70204 CF70205 CF70206	English German Swedish Italian French Spanish Czech Polish Serbo-Croat Rumanian Turkish.	Latin Latin Latin Latin Latin Latin Latin Latin Latin Latin Latin	 Dutch Flemish Norwegian, Danish, Finnish, Greenland, Hungarian Basque, Portuguese, Catalan, Faroese, Icelandic Slovak Croat-Serbian, Slovenian, Croatian, Albanian
CF70210	Hebrew	Hebrew	
CF70209	Russian Ukrainian English	Cyrillic / Latin Cyrillic / Latin Latin	Bulgarian, Byelorussian
CF70211	English German Swedish Czech Polish Serbo-Croat Baltic Estonian Russian Ukrainian	Latin Latin Latin Latin Latin Latin Latin Latin Cyrillic / Latin Cyrillic / Latin	 Dutch Flemish Norwegian, Danish, Finnish, Greenland, Hungarian Slovak Croat-Slovak, Slovenian, Croatian, Albanian Lettish, Lithuanian Bulgarian, Byelorussian

Table 2 Eurotext Language support.

In addition packet 26 characters will be supported for each of these languages as necessary. All packet 26 processing is on chip without any external software.
The CF70209 and CF70211 support character set switching using the ESC character.

2.   MEMORY ORGANISATION

EUROTEXT has 8K (4K for the CF70204 and CF70205) of memory on chip. The internal organisation of the memory is split into blocks of 1K of memory. Each 1K of memory can store a complete teletext page with packet 26 characters and FASTEXT packets. These blocks of data can be addressed in their hardware location by addressing them as latches, or they can be addressed in their software location by addressing them as stores. These methods of addressing allow the external software simple access to the teletext data. For example, the display page is always located in store 0, but this page of memory may actually be in any of the latches. The data sheet for each device defines what pages are stored in which stores. Normally, when software read or writes to memory the teletext data is addressed as stores.

In EUROTEXT there is some additional internal memory that is used by the internal processor to store system information.

3. INTERFACE COMMANDS

The internal EUROTEXT software has been designed so that most of the basic teletext functions will only require a single byte of data to be sent to EUROTEXT. The interface commands to EUROTEXT are high level commands in the range 0 to 7F (hex). Only commands shown in the table below should be sent to EUROTEXT. This is to ensure upward compatibility with future devices.

Most commands require a single byte but a few commands will require a second or third byte to specify parameters for the command. These additional bytes **must** be sent with the command and the user should ensure that any unused bits are set to zero. This is to ensure upward compatibility with future devices.

	0-	1-	2-	3-	4-	5-	6-	7-
0		UPDATE *	DIG0 *	TEXP	MODE0	DRST *	SMENM	TV *
1	LGSEL *	SPAGE *	DIG1 *	BEXP	MODE1	A *	CMENM	TEXT *
2	SRST *	TIME *	DIG2 *	NEXP	LANG	I *	DMEN0	
3	INIT *	EXPAND *	DIG3 *		CURSOR		DMEN1	MIX *
4	CHNGE1 *	PPAGE *	DIG4 *		MODE2	S *	DTPGE	
5	CHNGE2	DPAGE *	DIG5 *		ROW24	SA *		BOX
6	CHNGE3	IPAGE *	DIG6 *		MPTR	SI *	CMEN0	
7	CHNGE4	BROWSE *	DIG7 *		SUBTITLE		CMEN1	
8	SETREG	SHOLD *	DIG8 *	RED *	SCLOCK	R *		AUTO
9		CHOLD *	DIG9 *	GREEN *	CCLOCK	RA *		NORM
A		THOLD *	DIGA	YELLOW *	TCLOCK *	RI *		FLOF
B			DIGB	CYAN *	CLKCOL			TOP
C		REVEAL *	DIGC	INDEX *	PLLMOD	RS *		FAVP
D	TEXTOFF	CSTAT	DIGD	R24PIC	LANG2	RSA *		
E	TEXTON	SSTAT *	DIGE		NOP *	RSI *		
F		TSTAT *	DIGF					

Table 2: Command Table

* Indicates commands that are compatible with UNITEXT.
The Sub-sections of section 3 of this document are arranged such that the numbers correspond with the command

3.0.   LGSEL, Initialisation commands, SETREG and Texton/off.

3.0.0   Command should not be used

3.0.1   LGSEL   LANGUAGE GROUP SELECT: 01(hex) (see also LANG)

[N.B. This command is included to provide compatibility with UNITEXT, it is recommended that the LANG command is used for new applications.]
This command only has effect if teletext data is displayed on the screen. It requires a second data byte to select the language groups. The operation of this command will depend upon the character set in the device.

The operation of the command for the following devices CF70200 CF70203 CF70204, CF70205 and CF70206 is:

Bits	7	6	5	4	3	2	1	0
2nd Byte	0	0	0	LG10	0	0	LG00	LG01
Default Value	0	0	0	0	0	0	0	0

The selected national option is a function of the language group flags (LG00, LG01 and LG10) and the received header language selection bits (C12, C13 and C14) as shown below. The header language selection bits can be

C12	C13	C14	LG00		LG01		LG10	
0	0	0	English	[P]	Polish	[S]	English	[P]
0	0	1	German	[S]	German	[S]	German	[S]
0	1	0	Swedish	[S]	Swedish	[S]	Swedish	[S]
0	1	1	Italian	[P]	Italian	[P]	Italian	[P]
1	0	0	French	[P]	French	[P]	French	[P]
1	0	1	Spanish	[P]	Serbo-Croat	[S]	Spanish	[P]
1	1	0	Czech	[S]	Czech	[S]	Turkish	[S]
1	1	1	English	[P]	Rumanian	[P]	English	[P]

overridden (see LANG). The letter in brackets denotes the page prefix letter (i.e. the letter that precedes the teletext page number) for each language.

This command has no effect on the following devices CF70210, CF70209, CF70211. To change the languages on these devices use the LANG command.

3.0.2   SRST   SOFTWARE RESET: 02: (hex)

This command clears all text features if a teletext page is displayed, and clears the clock display if it is in TV mode. It will also clear all pages of memory. This command is also initiated by a hardware reset.

3.0.3   INIT   INITIALISE TEXT: 03(hex)

This command clears all text features if a teletext page is displayed, e.g. REVEAL, EXPAND SUB_PAGE, UPDATE and partial page number entry. It will not change modes between text and picture.

3.0.4   . CHNGE1   CHANGE CHANNEL 1: 04(hex)

This command causes a channel change initialisation. The display page is cleared and the initial page number is set to 100. If a packet 8/30 initial page number is received, this takes priority. All the pages in the memory are cleared of teletext, VPS and WSS data, and if the decoder is in auto mode, it will return to normal mode. The following functions are cleared:- EXPAND, HOLD, REVEAL, SUB-PAGE, UPDATE and partial page number entry

3.0.5   CHNGE2   CHANGE CHANNEL 2: 05(hex)

This command is the same as the CHNGE1 command above except that the display page is not cleared.

3.0.6   CHNGE3   CHANGE CHANNEL 3: 06(hex)

This command is the same as CHNGE1 except the page number is only changed if it detects a valid packet 8/30 initial page.

3.0.7   CHNGE4   CHANGE CHANNEL 4: 07(hex)

This command is the same as CHNGE2 except the page number is only changed if it detects a valid packet 8/30 initial page.

3.0.8   SETREG   SET REGISTERS: 08(hex)

This command allows the user to set some of the internal registers of EUROTEXT. The command is followed by two additional bytes. The second byte is the register number and the third byte is data of the register. Software should ensure that no other registers are addressed using this command. The following registers can be accessed using the SETREG command

Register	Description
07	Full screen colours
0D	PLL fine coefficients
0E	PLL course coefficients
0F	General purpose I / O.

SETREG + 07 (hex)   FULL SCREEN COLOUR

This command will set the border background colour of the screen not normally covered by teletext data. It can also be used to change the default background colour at the start of each teletext line. The default colour for the background is black. The border and default text background colour must be set to the same colour. This command requires a second byte to define the options.

Bits	7	6	5	4	3	2	1	0
3rd Byte	TXTBG	FRAME	0	0	0	FSC2	FSC1	FSC0
Default Value	0	0	0	0	0	0	0	0

TXTBG   Text background colour at start of line
            TXTBG=0   Black
            TXTBG=1   Defined by FSC0-2

FRAME   The area of the TV screen not normally covered by the teletext data
            FRAME=0   Black
            FRAME=1   Defined by FSC0-2

FSC1	FSC2	FSC0	Colour
0	0	0	Black
0	0	1	Red
0	1	0	Green
0	1	1	Yellow
1	0	0	Blue
1	0	1	Magenta
1	1	0	Cyan
1	1	1	White

SETREG + 0D(hex)   LOAD PLL FINE COEFFICIENTS

This command sets the course and fine digital PLL coefficients. One extra byte is required.

Bit	7	6	5	4	3	2	1	0
3rd Byte	0	0	K1L			K0L		
Default Value 3rd Byte	0	0	000			000		

The default value optimised for TV operation is 00(hex). The recommended value for VCR operation is 24(hex).

SETREG + 0E(hex)   LOAD PLL COURSE COEFFICIENTS

This command sets the course and fine digital PLL coefficients. One extra byte is required.

Bit	7	6	5	4	3	2	1	0
3rd Byte	0	0	K1U			K0U		
Default Value 3rd Byte	0	0	000			000		

The default value optimised for TV operation is 24(hex). The recommended value for VCR operation is 24(hex).

SETREG + 0F(hex)   GENERAL PURPOSE I/O

This command defines the operation of the two user defined flag pins of EUROTEXT. These are pins 27 and 28. A third byte is required to define their operation. Flag 2 (pin 28) can be programmed to output the 'Odd-Even' field signal which is generated within all Eurotext devices. On the CF70206, the Flag 1 (pin 27) can be programmed to output the window signal required by the Data Slicer CF72417 for reception of WSS signals (WIN23B) or a signal which is high during the whole of Line 23 of the incoming TV signal (WIN23A, for use with external WSS decoders).

Bit	7	6	5	4	3	2	1	0
3rd Byte	0	0	DDF2	DDF1	OMF1	OTF1	0	FLAG1
Default Value 3rd Byte	0	0	0	0	0	0	0	0

DDF2=0   General purpose input/output pin FLAG2 is configured as an input

DDF2=1   General purpose input/output pin FLAG2 is configured as an output. In this mode, this pin is high during an even display field and low during an odd display field. The operation of this feature is also dependent upon the value of the MODE2 register. This register defines if the signal is present all of the time or only when no picture is being displayed.

DDF1=0   General purpose input/output pin FLAG1 is configured as an input

DDF1=1   General purpose input/output pin FLAG1 is configured as an output, depending on the values of OMF1, OTF1 and FLAG1 - See Table below.

OTF1=0   If general purpose input/output pin FLAG1 is configured as an output, then its value is determined by by 0 (FLAG1) - See Table below.

OTF1=1   If general purpose input/output pin FLAG1 is configured as an output, then it will output WIN23A or WIN23B depending on the value of bit 3 (OMF1) - See table below

FLAG1=0   Sets pin 27 to '0' if DDF1=1, and OTF1=0

FLAG1=1   Sets pin 27 to '1' if DDF1=1, and OTF1=0

OMF1=0   Outputs WIN23A on pin 27 if DDF1=1, and OTF1=1

OMF1=1   Outputs WIN23B on pin 27 if DDF1=1, and OTF1=1

DDF1	OMF1	OTF1	FLAG1	Pin 27

0	X	X	X	INPUT
1	X	0	0	OUTPUT - 0
1	X	0	1	OUTPUT - 1
1	0	1	X	OUTPUT -WIN23A
1	1	1	X	OUTPUT -WIN23B

Table 3 - Control FLAG1

3.0.9   Command should not be used

3.0.10   Command should not be used

3.0.11   Command should not be used

3.0.12   Command should not be used

3.0.13   TEXTOFF   TELETEXT RECEPTION OFF: 0D(hex)

This command will inhibit teletext reception and will clear the teletext error count.

3.0.14   TEXTON   TELETEXT RECEPTION ON: 0E(hex)

This command is used to restart teletext after it has been inhibited using the TEXTOFF command. It will clear the teletext error count.

3.0.15   Command should not be used

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3.1.   Display control and Status Commands

3.1.0   UPDATE   UPDATE FUNCTION: 10(hex)

This command will only be valid if the teletext page is displayed, a complete page number has been entered and the decoder is not in hold mode. Eurotext will switch to picture mode and display a symbol in a box in the TOP left of the screen. The symbol indicates to the user that they are still in text mode even though a picture is being displayed. This symbol can be either the text symbol or the update symbol. This is selected by setting a bit in the command MODE1.

When the selected page is captured for the first time or captured with the update bit set, the page number will appear in this box replacing the text symbol. This indicates that the page is ready for display and can be displayed with the TEXT MIX or UPDATE command. If a new page number is entered while in update mode, the rolling header will appear in a box. When a page is captured, the page number is displayed in a box indicating that the page is ready for display.

The update function is cleared by the following commands:- TEXT, MIX, UPDATE, CHANG, INIT and SRST.

3.1.1   SPAGE SUB-PAGE MODE: 11(hex)

This command will only be valid if the teletext page is being displayed. It controls the movement between the sub-page and main-page modes. When sub-page mode is selected on the devices that have 8 pages of teletext memory, the next two sub-pages are stored in memory. On all devices a special Row24 is displayed with the coloured key functions redefined. The red key will select the sub-page - 1 and the green key will select the sub-page + 1. The yellow and cyan keys will have not function in this mode.

The sub-page mode is cleared by the following commands:-CHANG, INIT and SRST or if a new page is selected using the following commands:- PPAGE, INDEX.

There are two sub-page capture strategies that are selected using the MODE2 command.

3.1.2   TIME   SUB-PAGE MODE/ CLOCK: 12(hex)

This command implements the same function as SPAGE when the decoder is displaying teletext and will implement the CLOCK function if this command is received while the decoder is in picture mode. For more details on this command refer to the SPAGE or CLOCK command descriptions.

3.1.3   EXPAND   TOGGLE EXPAND: 13(hex)

This command will only be valid if the teletext page is being displayed. It is used to cycle the teletext display through expand top, expand bottom, and no expand. EUROTEXT can be set up using the MODE0 command to change the expand mode from expand bottom to expand top if a page digit is entered when the decoder is displaying teletext as expand bottom. Row24 is always displayed in single height during expand top and expand bottom.

3.1.4   PPAGE   PREVIOUS PAGE: 14(hex)

This command will only be valid if the teletext page is being displayed. It will display the previously selected page if this is in memory or will search for the previously selected page. This function will clear the sub-page mode.

3.1.5   DPAGE   DECREMENT PAGE: 15(hex)

This command will only be valid if the teletext page is being displayed. It will display the current display page minus one if this is in memory or will search for it. If the decoder is in TOP mode, Normal mode, or favourite page mode, with the inventory page complete, the decoder will keep decrementing the page number until a page number is selected that is being transmitted. If the decoder is in sub-page mode it will decrement the sub-page number.

3.1.6   IPAGE   INCREMENT PAGE: 16(hex)

This command will only be valid if the teletext page is being displayed. It will display the current display page plus one if this is in memory or will search for it. If the decoder is in TOP mode, NORMAL mode, or favourite page mode, with the inventory page complete, the decoder will keep incrementing the page number until a page number is selected that is being transmitted. If the decoder is in sub-page mode it will increment the sub-page number.

3.1.7   BROWSE   CAPTURE RANDOM PAGE: 17(hex)

This command will only be valid if the teletext page is being displayed. It will display the next incoming teletext page with a decimal page number that does not have the sub-title bit set. This function will clear the sub-page mode. See also the command SUBTITLE that will search for the next incoming teletext page with a decimal page number that has the sub-title bit set.

3.1.8   SHOLD   SET HOLD: 18(hex)

This command will only be valid if the teletext page is being displayed. It will set hold mode. In this mode, only the teletext time is updated in the screen memory and the page number is replaced with the hold symbol or the word STOP, depending upon the value of the STOP bit in the MODE0 command. The capture of the background teletext page is not effected by this command.
This function is cleared by the following commands:- CHANG INIT and SRST or if a new page is selected using the following commands:- IPAGE, DPAGE, PPAGE, RED, GREEN, YELLOW, CYAN, INDEX.

3.1.9   CHOLD   CLEAR HOLD: 19(hex)

This command will only be valid if the teletext page is being displayed. It will cancel the HOLD mode. The teletext page will be displayed in either TEXT or MIX modes depending upon the last mode selected. The header will roll until the page is re-received.

3.1.10   THOLD   TOGGLE HOLD ON / OFF: 1A(hex)

This command will only be valid if the teletext page is being displayed. If hold mode is not set it will set HOLD mode as described in the SHOLD command otherwise it will clear the mode as defined in the CHOLD command.

3.1.11   Command should not be used

3.1.12   REVEAL   TOGGLE REVEAL: 1C(hex)

This command will only be valid if the teletext page is being displayed. 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 the erase bit (C4) set.
This function is cleared by the following commands:-TV, CHANG, INIT and SRST or if a new page is selected using the following commands:- IPAGE, DPAGE, PPAGE, RED, GREEN, YELLOW, CYAN, INDEX.

3.1.13   CSTAT   CLEAR PACKET 8/30 STATUS DISPLAY: 1D(hex)

This command has no action if the teletext page is being displayed. It disables the display of the packet 8/30 status field.

3.1.14   SSTAT   SET PACKET 8/30 STATUS DISPLAY: 1E(hex)

This command has no action if the teletext page is being displayed. It enables the display of the packet 8/30 status field. When this mode is set Row24 will be boxed in the screen and the incoming status information is written to the centre 20 locations of Row24. The characters are preceded by two start box characters and are succeeded by an end box character. This function is cleared by the following commands:- SRST, CSTAT. If EUROTEXT has not received a 8/30 format 1packet, it will not display a box on row 24 until a valid packet has been received.

3.1.15   TSTAT   TOGGLE PACKET 8/30 STATUS DISPLAY: 1F(hex)

This command toggles the display of the packet 8/30 status field as described in the two commands CSTAT and SSTAT.

3.2. Digit commands (0 thru Hex F)

3.2.0   DIG0   DECIMAL PAGE DIGIT 0: 20(hex)

3.2.1   DIG1   DECIMAL PAGE DIGIT 1: 21(hex)

3.2.2   DIG2   DECIMAL PAGE DIGIT 2: 22(hex)

3.2.3   DIG3   DECIMAL PAGE DIGIT 3: 23(hex)

3.2.4   DIG4   DECIMAL PAGE DIGIT 4: 24(hex)

3.2.5   DIG5   DECIMAL PAGE DIGIT 5: 25(hex)

3.2.6   DIG6   DECIMAL PAGE DIGIT 6: 26(hex)

3.2.7   DIG7   DECIMAL PAGE DIGIT 7: 27(hex)

3.2.8   DIG8   DECIMAL PAGE DIGIT 8: 28(hex)

3.2.9   DIG9   DECIMAL PAGE DIGIT 9: 29(hex)

3.2.10   DIGA   HEX PAGE DIGIT A: 2A(hex)

3.2.11   DIGB   HEX PAGE DIGIT B: 2B(hex)

3.2.12   DIGC   HEX PAGE DIGIT C: 2C(hex)

3.2.13   DIGD   HEX PAGE DIGIT D: 2D(hex)

3.2.14   DIGE   HEX PAGE DIGIT E: 2E(hex)

3.2.15   DIGF   HEX PAGE DIGIT F: 2F(hex)

Normally these commands, (20 - 2F hex) only have effect if teletext data is displayed or if the DETV bit is set in the MODE1 command, digits can be entered in text or picture modes.
The digits are used to select either a teletext main page or a sub-page depending whether sub-page mode is enabled. The decoder will display the digits on the screen when the command is received. Magazine number will be suppressed to 3 bits. Magazine 0 is displayed as 8.

3.3.   Expand T/B/N, FLOF coloured keys, and Row 24 control

3.3.0   TEXP   TOP EXPAND: 30(HEX)

This command will only be valid if the teletext page is being displayed. It causes the teletext page to be displayed in expand top mode

3.3.1   BEXP   BOTTOM EXPAND: 31(HEX)

This command will only be valid if the teletext page is being displayed. It causes the teletext page to be displayed in expand bottom mode.

3.3.2   NEXP   NO EXPAND: 32(HEX)

This command will only be valid if the teletext page is being displayed. It causes the teletext page to be displayed in normal size mode

3.3.3   Command should not be used

3.3.4   Command should not be used

3.3.5   Command should not be used

3.3.6   Command should not be used

3.3.7   Command should not be used

3.3.8   RED   Red key: 38(hex)

3.3.9   GREEN   Green key: 39(hex)

3.3.10   YELLOW   Yellow key: 3A(hex)

3.3.11   CYAN   Cyan key: 3B(hex)

3.3.12   INDEX   Index key: 3C(hex)

These commands will only be valid if teletext data is displayed. They will select a page assigned to the key. The function of each command will depend upon the mode of the decoder. Full details of the function of these commands can be found in the section on modes of operation in the data sheet.

3.3.13   R24PIC   ROW24 PICTURE: 3D(hex)

This command has no action if the teletext page is being displayed. It disables the display of the packet 8/30 status field.

3.3.14   Command should not be used

3.3.15   Command should not be used

3.4. Mode and Clock commands etc.

3.4.0 MODE0   SYSTEM MODE FLAGS 0: 40(hex)

This command will only be valid if the teletext page is being displayed. It requires a second byte to define system functions.

Bit	7	6	5	4	3	2	1	0
2nd Byte	DETO	CNR24D	CAEXP	SECO	SECD	PMNM	COOCD	STOP
Default Value	0	0	0	0	0	0	0	0

DETO   The header will automatically be displayed when the user enters a page digit, if the header is not already displayed on the current display page, i.e.. News flash or sub-titles. This defines the operation of the first digit entered.
      DETO=0   The first digit entered in this mode will cause the header to appear and will be used as the magazine number.
      DETO=1   The first digit entered in this mode will cause the header to appear, the second digit entered will be used as the magazine number.

CNR24D   Display of Row24 when a page is received with the news flash or sub-titles bit set
      CNR24D=0   The Row24 will always appear in a box
      CNR24D=1   The Row24 will only appear in a box as follows:-

          a) for 5 seconds after the page has been newly selected

          b) if the header is rolling

          c) if an incomplete page number has been entered

CAEXP   Automatic selection of EXPAND TOP
      CAEXP=0   The decoder will set expand top if a page entry command is received while the teletext decoder is being viewed in expand bottom
      CAEXP=1   The decoder will not change the expand mode

SECO   Error count overflow
      SECO=0   The error count does not overflow when it reaches its maximum value of hex FF
      SECO=1   The error count is allowed to overflow
SECD   Error count display
      SECD=0   This function is disabled
      SECD=1   The error count is displayed in the page number field for system de-bug purposes

COOCD   In normal mode once the inventory page is complete, the decoder will warn the user if they try to select a page that is not being transmitted. This warning is the page number displayed in red between two brackets, i.e. >P100<.
      COOCD=0   The 'page out of cycle' display is enabled in NORMAL mode
      COOCD=1   The 'page out of cycle' display is disabled in NORMAL mode

PMNM   In normal mode EUROTEXT can display two versions of Row24. This command selects between the two modes. See data sheet.
      PMNM=0   The default NORMAL menu is selected
      PMNM=1   Plus/minus NORMAL menu selected

STOP   Controls the message to be displayed when a page is held.
      STOP=0   If a page is held, the page number will be replaced with the teletext hold symbol
      STOP=1   If a page is held, the page number will be replaced with the word "STOP"

3.4.1 MODE1   SYSTEM MODE FLAGS 1: 41(hex)

Bit	7	6	5	4	3	2	1	0

2nd Byte	IFRUN	ADDSTS	UPSYM	THRESH	FPPP	DETV	RKM	RIB
Default Value	0	0	0	0	0	0	0	0

IFRUN   Defines what the PLL should do when a 'bad' signal is detected
          IFRUN=0   The PLL free run coefficients are loaded
          IFRUN=1   The PLL coefficients are not changed so the PLL continues to try to lock

ADDSTS   Defines the number of status bytes that are transmitted after the decoder has been addressed using the I^{2}C read address
          ADDSTS=0   Additional status bytes disabled
          ADDSTS=1   Additional status bytes are inserted into the data sequence when data is read from EUROTEXT (See section 5)

UPSYM   Define the style of the symbol used when the decoder goes into update mode
          UPSYM=0   The teletext symbol is used. Characters (hex)88 and (hex)89
          UPSYM=1   The Update symbol is used. Characters (hex)89 and (hex)58 of OSD national options. Character national options for the header will be set to OSD.

THRESH   Defines the disabling of teletext with bad signals.
          THRESH=0   This function is disabled
          THRESH=1   If bad video is detected, any pages being received will be terminated

FPPP   Page number prefix
          FPPP=0   Forces the page prefix to a 'P' Page number prefix letter is a 'P' or an 'S' as defined by the language selected
          FPPP=1   Page number prefix is always a 'P'

DETV   Digit entry in TV mode (i.e. no teletext displayed)
          DETV=0   Disabled
          DETV=1   Enabled

RKM   Function of the red key in TOP mode
          RKM=0   It will search backwards in the TOP table for a page of the same type as the display page
          RKM=1   It will search backwards in the TOP table for the next page (any page)

RIB   Function of the yellow key in TOP mode.
          RIB=0   It will search forward in the TOP table for the next block or group page.
          RIB=1   It will search forward in the TOP table for the next group page. If a block page is detected it will start searching again at the start of the current block.

3.4.2   LANG   SET LANGUAGE MODE: 42(hex)

This command requires a second byte to control the national options character set that is selected when a teletext or a menu page is displayed. The operation of this command will depend on the character set in the device. On menu pages the national option used is always defined by this command.

CF70200, CF70203, CF70204, CF70205, CF70206 devices, the command will have the following format.

Bit	7	6	5	4	3	2	1	0
2nd Byte	FLM	0	LG1	LG0	C14	C13	C12	0
Default Value	0	0	0	0	0	0	0	0

FLM   Force Language mode
          FLM = 0   Display page language is defined by the C12 - C14 bit in the page header and LG0 and LG1 in this command.
          FLM = 1   Display page language is defined by this command. The language control bits in the header are overridden
LG0=1, LG1=1   OSD characters selected.

C12	C13	C14	LG0=0,LG1=0		LG0=1,LG1=0		LG0=0,LG1=1	
0	0	0	English	[P]	Polish	[S]	English	[P]
0	0	1	German	[S]	German	[S]	German	[S]
0	1	0	Swedish	[S]	Swedish	[S]	Swedish	[S]
0	1	1	Italian	[P]	Italian	[P]	Italian	[P]
1	0	0	French	[P]	French	[P]	French	[P]
1	0	1	Spanish	[P]	Serbo-Croat	[S]	Spanish	[P]
1	1	0	Czech	[S]	Czech	[S]	Turkish	[S]
1	1	1	English	[P]	Rumanian	[P]	English	[P]

The letter in brackets denotes the page prefix letter (i.e. the letter that precedes the teletext page number) for each language.

For the CF70210 the SET LANGUAGE command will have no effect.

For the CF70209 and the CF70211 the SET LANGUAGE command will have the following format.

Bit	7	6	5	4	3	2	1	0
2nd Byte	FLM	SWITCH	LG1	LG0	C14	C13	C12	G0
Default Value	0	0	1	1	0	0	0	0

FLM	Force Language mode	
	FLM = 0	Display page language is defined by the C12 - C14 bit in header and LG0 and LG1 in this command.
	FLM = 1	Display page language is defined by this command. The language control bit in the header are overridden
SWITCH	Enable character switching using ESC character on screen. Only valid if FLM = 1	
	SWITCH = 0	No character set switching
	SWITCH = 1	The character set will switch every time an ESC character is detected on the screen. The initial language at the start of each line will be defined by LANG bit. The first language will be selected by this command and the second language will be selected by the LANG2 command. The two languages must use different character set, i.e. Cyrillic and Latin. It is not possible to switch between two Latin character sets.
G0	This bit is only valid in FLM=1. This bit will define which G0 character set is to be used. If SWITCH=1 then this command defines the initial language at the start of each line.	
	G0 = 0	Latin character G0 set is used. National options are defined from this command. If SWITCH=1 then Latin characters are used at the start of each line
	G0 = 1	Cyrillic character G0 set is used. National options are defined in the LANG2 command If SWITCH=1 then Cyrillic characters are used at the start of each line
LG1, LG0 CF70209	These bits will have no effect on this device.	
LG1, LG0 CF70211	FLM=0	These bits will select which language group is to be used in conjunction with the C12 C13 and C14 bits that are transmitted in the header of the display page.
	FLM=1	These bits will select which language group is to be used in conjunction with the C12 C13 and C14 bits of this command. These bits are only used to select the Latin language. The language group of the Cyrillic language is selected using the LANG2 command.
C12, C13, C14	CF70209	These bits will select the language to be displayed if FLM=1. These bits can select between English, Russian and Ukrainian nation options. LANG 2 command on this device has no effect.
	CF70211	These bits will select the language to be displayed if FLM=1. Only Latin based characters can be selected via this command. Cyrillic languages can be selected by setting the G0 bit and selecting the language in the LANG2 command. If a Cyrillic language is selected using this command, the display will have Cyrillic national options and Latin G0 characters. This allows any Latin character set to be displayed with any Cyrillic character set.

LANG   SET LANGUAGE MODE: 42(hex) (cont.)

Languages supported by CF70209 device

C12	C13	C14	LG0=0,LG1=0		LG0=1,LG1=0		LG0=0,LG1=1		LG0=1,LG1=1	
0	0	0							English	[P]
0	0	1								
0	1	0								
0	1	1								
1	0	0							Russian	
1	0	1							Ukrainian	
1	1	0								
1	1	1								

Languages supported by CF70211 device

C12	C13	C14	LG0=0,LG1=0		LG0=1,LG1=0		LG0=0,LG1=1		LG0=1,LG1=1	
0	0	0	English	[P]	Polish				English	[P]
0	0	1	German	[S]	German				German	[S]
0	1	0	Swedish /Hungarian	[S]	Swedish /Hungarian	[S]	Hungarian	[S]	Estonian	
0	1	1							Lettish /Lithuanian	
1	0	0					Czech/ Slovakian	[P]	Russian	
1	0	1							Ukrainian	
1	1	0	Czech /Slovakian	[S]	Czech /Slovakian	[S]	Serbo-Croat	[S]	Czech /Slovakian	[S]
1	1	1	Reserved		Reserved					

The letter in brackets denotes the page prefix letter (i.e. the letter that precedes the teletext page number)for each language. Blank boxes will result in an undefined language being selected.

If Russian or Ukrainian language is selected by the control bits in the header, the SWITCH bit will be automatically set. The default language at the start of each line will be Cyrillic.

To force Eurotext to use the Russian or Ukrainian character set it is necessary to set the FLM and G0 bit in this command and to select the correct national options from the LANG2 command. Character set switching will only be enabled if the SWITCH bit is set to 1.

Further detail of language selection is given in the LANGUAGE EXAMPLES section of this document.

3.4.3   CURSOR   CURSOR CONTROL: 43(hex)

This command will only be valid if teletext data is displayed. It requires two additional bytes to define the row and column address of the cursor and to define the style of the cursor.

Bit	7	6	5	4	3	2	1	0
2nd Byte	STYLE	CON	0	ROW4	ROW3	ROW2	ROW1	ROW0
Default Value 2nd Byte	0	0	0	0	0	0	0	0
3rd Byte	0	0	COL5	COL4	COL3	COL2	COL1	COL0
Default Value 3rd Byte	0	0	0	0	0	0	0	0

STYLE   Defines the style of the display cursor
    STYLE=0   Defines block cursor.
    STYLE=1   Defines underline cursor

CON   Cursor display
    CON=0   Cursor is not displayed.
    CON=1   Cursor is displayed at the row and column position defined.

ROW0 - 4   Row pointer for the cursor 0-24

COL0 - 5   Column pointer for the cursor 0-39

3.4.4   MODE2 SYSTEM MODE FLAGS 2: 44(hex)

BIT	7	6	5	4	3	2	1	0
2nd Byte	MUTE	0	0	0	0	ROW24	O/E	SPMODE
Default Value	0	0	0	0	0	0	0	0

SPMODE   In sub-page mode this bit defines which pages are stored. This command is only valid on 8 page decoders
    SPMODE=0   The decoder will capture the next two numerical sub-pages above the display page
    SPMODE=1   The decoder will capture the next two sub-pages that are received without reference to the sub-page number.

O/E   ODD / EVEN operation
    O / E = 0   The ODD / EVEN output on pin 28 will be enabled at all times
    O / E = 1   The ODD / EVEN output will only be active when no picture is being displayed on the screen.

ROW24   Display of row24 in normal mode when the inventory page is not complete. This command is only valid on the following versions of Eurotext, CF70200C, CF70205B, CF70204 CF70209, CF70203. Earlier version will not support is command.
    ROW24 = 0   EUROTEXT will display the next four page numbers in four coloured boxes if the PMNM bit in MODE0 is not set.
    ROW24 = 1   EUROTEXT will blank the row24 until the inventory page is complete, if the PMNM bit in MODE0 is not set. When the inventory page is complete, the next four page numbers in the inventory page will be displayed in four coloured boxes on row 24

MUTE   Polarity of the MUTE pin
    MUTE = 0   The output of the mute pin (pin 13 DIL package) will be high when teletext is selected and EUROTEXT detects a bad video signal.
    MUTE = 1   The output of the mute pin (pin 13 DIL package) will be low when teletext is selected and EUROTEXT detects a bad video signal.

3.4.5 ROW24   ROW24: 45(hex)

This command defines the reception, display and generation of Row24 of the display page. When this command is received it will regenerate the Row24 display. A second byte is required to define the options. This command can be used to update to Row24 display after Favourite pages have been changed.

The language selection bits of this command (LG1 LG0 C12 C13 C14) are only valid on the following devices,CF70200, CF70203, CF70204, CF70205.

Bit	7	6	5	4	3	2	1	0
2nd Byte	R24EN	R24OSD	LG1	LG0	C14	C13	C12	APIN
Default Value	0	0	0	0	0	0	0	0

APIN   Display of automatic prompts produced by EUROTEXT. These include prompts for FASTEXT, TOP, Normal, and sub-page modes. On devices that support 8 teletext page the original row24 will be stored internally. On four page devices this packet is not stored.
         APIN=0   Display enabled
         APIN=1   Display disabled (row 24 will not be cleared when a new page is received.)

R24EN   This bit controls the reception and clearing of Row24 data. This bit is only valid if the APIN bit is set
         R24EN=0   Row24 reception is disabled
         R24EN=1   Row24 reception is enabled

R24OSD   Row24 On Screen display. This bit will disable the display of rows 0 to 23 when the bit is set. This bit allows Row24 to be used for OSDs while eight pages of teletext are being received (N.B. Row24 can be mapped to row 0 using the R24TOP bit in the PLLMOD command).
         R24OSD=0   Function is disabled. Row24 is part of the received teletext page
         R24OSD=1   Function is enabled. Row24 is independent of received teletext page

LG1-0   These bits select which group of national option characters are used in the display of Row24 (see LANG command). These are only valid if the APIN bit is set. These bits will have no effect on the following devices, CF70209, CF70211

C14-C12   These bits define which national option character set is used in the display of Row24 (see LANG command). These bits are only valid if the APIN bit is set. These bits will have no effect on the following devices, CF70209, CF70211

On the CF70209 and CF70211 the row24 character national option will always be the same as the rest of the page.

3.4.6 MPTR   MEMORY POINTER: 46(hex)

This command is used to read from and write to memory. The command is described in more detail in the memory section. The command requires two addition bytes of data.

Bit	7	6	5	4	3	2	1	0
2nd Byte	LOS2	LOS1	LOS0	ROW4	ROW3	ROW2	ROW1	ROW0
Default Value 2nd Byte	0	0	0	0	0	0	0	0
3rd Byte	LTC	0	COL5	COL4	COL3	COL2	COL1	COL0
Default Value 3rd Byte	0	0	0	0	0	0	0	0

This command initialises the memory pointer for read or write data transfers. The EUROTEXT memory contains either 4K or 8K bytes of RAM. These are arranged in 1K separate memory banks. Each memory bank has a latch to capture a page of teletext data. The internal software will assign a store number to each of these latches whenever the display page number changes. The memory can be either addressed by the store number or by the latch number. The latch number is the physical location in memory and the store number is a flexible location that is referenced to the display page (see section 4 menu page mode).

LOS2-0   Latch or store number for data transfer

ROW4-0   Row pointer

LTC   Latch or store pointer
         LTC=0   LOS2-0 is pointing to a store
         LTC=1   LOS2-0 is pointing to a latch

COL5-0   Column pointer

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3.4.7　SUBTITLE　　CAPTURE SUBTITLE PAGE: 47(hex)

This command will only be valid if the teletext page is being displayed. It will display the next incoming teletext page with the sub-title control bit set in the header. This function will clear the sub-page mode. This command is only valid on the following versions of Eurotext, CF70200C (or later), CF70203, CF70205A, CF70204 CF70209 and CF70211A. Earlier versions will not support is command.

3.4.8　SCLOCK　　SET CLOCK MODE: 48(hex)

This command turns on the display of the clock. It is cleared by the following commands :- TCLOCK, CCLOCK.
The clock mode function allows the teletext header time display to be superimposed on the TV video providing the viewer with accurate time information. When the decoder is in clock mode, only the last eight locations of the header row are updated in the main screen RAM. 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 character on a blue background. The display of the clock is dependent upon the broadcasters transmitting the time information in the header row.

3.4.9　CCLOCK　　Clear CLOCK MODE: 49(hex)

This command clears the CLOCK mode

3.4.10　TCLOCK　　TCLOCK MODE: 4A(hex)

This command is not valid if teletext data is being displayed. This command toggles the display of the clock as described by the SCLOCK command.

3.4.11　CLKCOL　　CLOCK COLOURS: 4B(hex)

This command requires a second byte to define the colours of the foreground and background of the clock display. The default clock display is yellow foreground and blue background.

Bit	7	6	5	4	3	2	1	0
2nd Byte	0	Background colour			0	Foreground colour		
Default Value	0	1	0	0	0	0	1	1

The colours are defined as follows:-

msb		lsb	Colour
0	0	0	black
0	0	1	red
0	1	0	green
0	1	1	yellow
1	0	0	blue
1	0	1	magenta
1	1	0	cyan
1	1	1	white

3.4.12   PLLMOD   PLL MODE: 4C(hex)

This command sets up the internal digital PLL modes. A second byte is required to define the options.

Bit	7	6	5	4	3	2	1	0
2nd Byte	MUTEM	R24TOP	HPOS	FSYNC	UEL	AFLD	ISYNC	INT
Default Value	0	0	0	0	0	0	0	0

MUTEM   Operation of the MUTE pin
          MUTEM=0   The MUTE pin is high when the sync switch is switched to internal sync and bad video is detected
          MUTEM=1   The MUTE pin is high when bad video is detected
R24TOP   Position of Row24 display.
          R24TOP=0   At the bottom of the display
          R24TOP=1   At the top of the display
FSYNC   Force SYNC   [see below]
ISYNC   Internal Sync   [see below]
HPOS   Horizontal position of the teletext data
          HPOS=0   The display is position 'normal'
          HPOS=1   The display is positioned one character to the right of 'normal'
UEL   Unlocked extra line
          UEL=1   Unlocked extra line
          UEL=0   Unlocked no extra line
AFLD   Asynchronous Field   [see below]
INT   Interlace   [see below]

FSYNC	ISYNC	DISPLAY MODE	GOOD / BAD	SYNC SOURCE
0	X	PIC	X	EXTERNAL
0	0	MIX/BOX	X	EXTERNAL
0	1	MIX/BOX	GOOD	EXTERNAL
0	1	MIX/BOX	BAD	INTERNAL
0	X	TEXT	X	INTERNAL
1	0	X	X	EXTERNAL
1	1	X	X	INTERNAL

AFLD (Asynchronous Field), INT (Interlace),

AFLD	INT	Internally generated sync in text mode
0	0	312/313
0	1	312.5/312.5
1	0	312/312
1	1	X

N.B.   If the decoder is not in text mode, the internally generated sync will be 312.5/312.5.

3.4.13   LANG2   Language selection 2: 4D(hex)

This command defines the Cyrillic language for the CF70211. A table of languages supported is shown in the LANG command. Latin languages should not be selected using this command.

The command is only valid on the following devices,CF70211. This command will have no effect on the CF70209 but should not be sent to other devices.

Bit	7	6	5	4	3	2	1	0
2nd Byte	0	0	LG1	LG0	C14	C13	C12	0
Default Value	0	0	0	0	0	0	0	0

LG1-0   These bits are used to select the language group for the Cyrillic character set. These are only valid if the FLM bit in the LANG command is set.

C14-C12   These bits define which national option character set is used for the Cyrillic G0 character set. The languages are shown in the LANG command. This command should only be used to select Cyrillic character sets. If a Latin character set is selected, the Latin national option characters will be used and the Cyrillic national options.

3.4.14   NOP   NO OPERATION: 4E(hex)

This command has no effect on the EUROTEXT device. It has been included to allow users of both UNITEXT and EUROTEXT to send the command to UNITEXT to set the FASTEXT mode, without have to detect which chip is connected to the micro-controller.

3.5.   Commands to keep Unitext Compatibility

Note

The following (3.5.X) commands are included to provide compatibility with UNITEXT. However, it is recommended that DISPLAY and PLLMOD are used for new applications.

3.5.0	**DRST**	**DISPLAY RESET: 50(hex)**	
3.5.1	**A**	**ASYNC FIELD: 51(hex)**	
3.5.2	**I**	**INTERLACE: 52(hex)**	
3.5.3	**Command should not be used**		
3.5.4	**S**	**SYNC MODE: 54(hex)**	
3.5.5	**SA**	**SYNC MODE, ASYNC FIELD: 55(hex)**	
3.5.6	**SI**	**SYNC MODE, INTERLACE: 56(hex)**	
3.5.7	**Command should not be used**		
3.5.8	**R**	**RIGHT SHIFT: 58(hex)**	
3.5.9	**RA**	**RIGHT SHIFT, ASYNC FIELD: 59(hex)**	
3.5.10	**RI**	**RIGHT SHIFT, INTERLACE: 5A(hex)**	
3.5.11	**Command should not be used**		
3.5.12	**RS**	**RIGHT SHIFT, SYNC MODE: 5C(hex)**	
3.5.13	**RSA**	**RIGHT SHIFT, SYNC MODE, ASYNC FIELD: 5D(hex)**	
3.5.14	**RSI**	**RIGHT SHIFT, SYNC MODE, INTERLACE: 5E(hex)**	
3.5.15	**Command should not be used**		

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3.6. Menu Page commands

Note: Commands relating to menu pages 60(hex) to 67 (hex) are only valid on 8 page devices

3.6.0   SMENM   SET MENU PAGE MODE: 60(hex)

This command initialises stores 6 and 7 for use as menu pages. Teletext reception to these stores is inhibited. In this mode, store 7 can be used to store extension packets, VPS data, WSS data, or as a menu page. Store 6 is always set to be a menu page. The controlling micro-controller can easily read and write to these menu pages. To enable the menu pages a second byte is required. Further details of this mode of operation are described in the section on Menu Page Mode.

Bit	7	6	5	4	3	2	1	0
Default Value	0	0	0	0	0	0	0	0
2nd Byte	P830F2	P26	VPS	WSS	RVL	CFU	EXPT	EXPB

P830F2   Control of packet 8/30 format 2
                P830F2=0   Do not capture packet
                P830F2=1   Capture packet
P26   Control over packet 26 for PDC applications
                P26=0   Do not capture packet
                P26=1   Capture packet
VPS   Control of VPS data (this bit is only valid on VPS devices).
                VPS=0   Do not capture VPS data
                VPS=1   Capture VPS data
WSS   Control of capture and storage of WSS data (this bit is only valid on WSS devices).
                WSS=0   Do not capture WSS data
                WSS=1   Capture WSS data
RVL   Menu page display feature
                RVL=0   Concealed characters are not displayed
                RVL=1   Concealed characters are displayed
CFU   Menu page clock field
                CFU=0   Clock field of menu page is not updated
                CFU=1   Clock field of menu page is updated
EXP   Menu page expand options

EXPT	EXPB	
0	0	Menu page display is normal size
0	1	Menu page display is expand bottom
1	X	Menu page display is expand top

3.6.1   CMENM   CLEAR MENU PAGE MODE: 61(hex)

It will re-initialise stores 6 and 7 for teletext reception. All data stored in stores 6 and 7 will be lost.

3.6.2   DMEN0   DISPLAY MENU PAGE 0: 62(hex)

This commands displays store 6 as a menu page.

3.6.3   DMEN1   DISPLAY MENU PAGE 1: 63(hex)

This commands displays store 7 as a menu page.

3.6.4   DTPGE DISPLAY TELETEXT PAGE: 64(hex)

This command causes the decoder to display the current teletext page after a menu page has been displayed. The data in stores 6 and 7 is left intact.

3.6.5   Command should not be used

3.6.6   CMEN0   CLEAR MENU PAGE 0: 66(hex)

If the decoder is in menu page mode, this command sets the memory allocated to store 6 to 20 (hex). If the decoder is not in menu mode this command will have no effect.

3.6.7   CMEN1   CLEAR MENU PAGE 1: 67(hex)

If the decoder is in menu page mode, this command sets the memory allocated to store 7 to 20 (hex). If the decoder is not in menu mode this command will have no effect.

3.7. Text, Mix, Picture commands etc.

3.7.0 TV   TV MODE: 70(hex)

This command will turn off the display of all teletext data and menu pages. The blanking output will be low for the whole of the TV line. This command clears the reveal command.

3.7.1 TEXT   TEXT MODE: 71(hex)

The teletext data will be displayed with foreground and background colours. The Blanking signal will be high during each line except when a 'NEWS FLASH' or 'SUBTITLE' page is being received, when the decoder will automatically switch to box mode. This command will clear the following commands:- UPDATE, MIX.

3.7.2 Command should not be used

3.7.3 MIX   MIX MODE: 73(hex)

The teletext data will only be displayed using foreground colour. The background colour will be replaced with picture. The blanking signal will only go high when a teletext foreground colour is displayed. If the display contains any boxing characters, the characters between two start box characters and an end box character will be displayed using foreground and background colours.

3.7.4 Command should not be used

3.7.5 BOX   BOX MODE: 75(hex)

The display will only consist of those characters that are enclosed by two start box characters and either the end of the line or an end box character. These characters will be displayed using foreground and background colours. The blanking signal will go high during this period only.

The following commands select which mode of operation the decoder will operate in. For more information the different modes of operation refer to the page capture mode section in the data sheet.

3.7.6 Command should not be used
3.7.7 Command should not be used

3.7.8 AUTO: AUTOMATIC NORMAL/FASTEXT/TOP MODE SELECTION: 78(hex)

In AUTO mode, the decoder will automatically select NORMAL, FASTEXT or TOP according to the received teletext signal after each channel change. The AUTO mode is set after a reset and is cleared by NORM, FASTEXT, TOP or FAVP (these commands will 'force' a page capture mode).
The decoder will be forced into Automatic mode (the power up default). In particular, it will be forced **out** of FLOF or TOP mode.

3.7.9 NORM   FORCE NORMAL MODE: 79(hex)

The decoder will be forced into normal mode and will not change mode.

3.7.10 FLOF   FORCE FLOF/FASTEXT MODE: 7A(hex)

The decoder will be forced into FASTEXT mode and will not change mode. If FASTEXT is not transmitted the decoder will switch to normal mode

3.7.11 TOP   FORCE TOP MODE: 7B(hex)

The decoder will be forced into TOP mode and will not change mode. If TOP is not being transmitted the decoder will switch to normal mode.

3.7.12 FAVP   FAVOURITE PAGE MODE: 7C(hex)

The decoder will be forced into Favourite Page mode and will not change mode

4.   MENU PAGE MODE

Menu page mode is only available on EUROTEXT devices that can store eight teletext pages. This mode can be selected from any of the main modes of operation using the SMENM command. EUROTEXT reserves two pages of memory for uses other than receiving teletext. The memory can be used for:-
•   Menu pages and on-screen-displays
•   packet 8/30 format 2 data storage and packet 26 storage for PDC applications
•   general purpose storage
•   VPS data
Menu page 0 and menu page 1 can be cleared using the CMEN0 and CMEN1 command respectively.
EUROTEXT is switched back to the original text mode using the CMENM command.
Teletext data can be displayed in menu page without clearing the menu pages using the DTPGE command.
When the menu mode is set, menus and on-screen-displays can be made in either menu page 0 (store 6) or menu page 1 (store 7) by writing the appropriate characters into the teletext memory.
Menu page 0 is displayed using the DMEN0 command and menu page 1 is displayed using the DMEN1 command.

4.0.   Packet 8/30 format 2 data storage for PDC applications

When packet 8/30 format 2 storage is selected, each of the four possible interleaves are stored separately in menu page 1 as follows:-

Store 7	COL0	COL 1
ROW 0	Packet Count	13 Bytes of Hamming decoded data interleave 0
ROW 1	Packet Count	13 Bytes of Hamming decoded data interleave 1
ROW 2	Packet Count	13 Bytes of Hamming decoded data interleave 2
ROW 3	Packet Count	13 Bytes of Hamming decoded data interleave 3

If an un-correctable Hamming error is detected, the msb of the stored byte will be set. In the four page EUROTEXT devices, packet 8/30 format 2 data for country and the network ID are stored in a different place. For further details see the end of this section.

4.1.   Packet 26 storage for PDC applications

When PDC packet 26 storage is selected, all the packet 26 triplets that are not used in the automatic on-chip language processing are stored in menu page 1. These are:-
•   All row format triplets
•   column format triplets with mode values of 0, 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14.
These include all forms of packet 26 triplet that can be used for PDC.
Each triplet is Hamming decoded and stored in three successive bytes (address, mode and data). If an un-correctable Hamming error is detected, the msb of the address byte will be set. If this bit is set, the triplet should not be processed further.
A row in menu page 1 is reserved for each possible packet 26 designation code value. The first byte (column zero) of each row contains the number of PDC bytes received from packets 26 with the designation code relating to that row. This indicates the number of bytes of valid packet 26 data that can be read from the row. (This number may be less than 13 if the packet 26 has been terminated or if one or more of the triplets have been used for internal language processing.)
The format of storage in menu page 1 is as follows:-

Store 7	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7 - Col 38	Col 39
Row 4	Byte		1st Triplet			2nd Triplet			13th
(DC=0)	Count	Address	Mode	Data	Address	Mode	Data	Etc.	Triplet
Row 5	Byte		1st Triplet			2nd Triplet			13th
(DC=1)	Count	Address	Mode	Data	Address	Mode	Data		Triplet
Row 6 - Row 18				Etc.					
Row 19	Byte		1st Triplet			2nd Triplet			13th
(DC=15)	Count	Address	Mode	Data	Address	Mode	Data		Triplet

4.2. VPS data storage .

This feature is only available on devices that support VPS data and are using a data slicer that supports VPS data.

When VPS storage is selected and the decoder is in menu page mode, the VPS data will be stored as 12 nibbles in 12 bytes of data. An error flag is stored in each upper nibble. This data can be cleared using the CMEN1 command.

Store 7	COL0	COL 1	COL 12
ROW 20	Packet Count	12 Bytes of decoded data	

If an un-correctable error is detected, the msb of the stored byte will be set.

4.3. WSS data storage .

This feature is only available on devices that support WSS data and are using a data slicer that supports WSS data.

When WSS storage is selected and the decoder is in menu page mode, the WSS data will be stored as 18 bytes of data. This data can be cleared using the CMEN1 command.

Store 7	COL0	COL 1	COL 12
ROW 21	Packet Count	18 Bytes of undecoded (raw) ELEMENTS (6 elements = 1 WSS bit).	

Note that this data will include a portion of the WSS run-in plus the Start Code preceding the WSS group data elements. The number of WSS run-in bits present will depend on signal conditions, consequently the Start Code position will vary slightly within the bytes, and will need to be detected by the external micro-processor software in order to align the data decode. Each WSS data bit read via the I^2C bus will consist of 6 binary elements. The packet count is 8 bits, with roll-over after HexFF.

For more WSS software information, see under the sections: SETREG (Section 3.0.8), Status byte 2 (Sect 6.3.), and SMENM (Sect 3.6.0).

4.4. General purpose storage

The control processor can read and write bytes to the menu pages and can therefore use them for general purpose storage if required.

4.5.   4.5 Packet 8/30 format II data on four page Eurotext

The four page version of Eurotext can store the country code and the network identifier data that is transmitted in packet 8/30 format II. This data is stored in latch 7 row 25 column 17 to 22.

Latch 7 Row 25	Format II data
Column 17	Byte 4
Column 18	Byte 5
Column 19	Byte 10
Column 20	Byte 11
Column 21	Byte 12

Example - To read the country and network identifier

<	I2C start condition
$22	EUROTEXT write address
$46	MPTR command
$F9	Latch 7 row 25
$91	Column 17 plus latch bit set
<	I2C start condition
$23	EUROTEXT read address
1st Byte	Status byte 1
2nd Byte	Device ID
3rd Byte	Byte 4 Packet 8/30 format II
4th Byte	Byte 5 Packet 8/30 format II
5th Byte	Byte 10 Packet 8/30 format II
6th Byte	Byte 11 Packet 8/30 format II
7th Byte	Byte 12 Packet 8/30 format II(no ack)
>	I2C stop condition

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5.   LANGUAGE EXAMPLES

The following examples are given to show how to set up the decoder to display different languages, either by using the transmitted header bit or by forcing the language bits.

<   =   I2C start condition
>   =   I2C stop condition

All numbers are in hex.

CF70200, CF70203 and CF70204 devices.

Using the transmitted header bits. note these regions overlap each other

Region	Lang command	Notes
Eastern European	<$22,$42,$10>	
Western European	<$22,$42,$00>	Default Language group
Turkish area European	<$22,$42,$20>	

CF70211 devices.

Using the transmitted header bits. note these regions overlap each other

Region	Lang command	Notes
CIS countries	<$22,$42,$30>	Default language.
Eastern European	<$22,$42,$20>	
Western European	<$22,$42,$00>	
Northern European	<$22,$42,$10>	

Examples of how to select a language directly on the CF70211. The following commands are needed.

Language	Command	Notes
English	<$22,$42,$80>	One Latin character set
Polish	<$22,$42,$90>	One Latin character set
Ukrainian	<$22,$42,$81,$4D,$3A>	One Cyrillic character set
Russian	<$22,$42,$81,$4D,$32>	One Cyrillic character set
Russian / English	<$22,$42,$F1,$4D,$32>	Russian default language Switch Enabled
Russian / English	<$22,$42,$F0,$4D,$32>	English default language Switch Enabled
Ukrainian / Polish	<$22,$42,$D0,$4D,$3A>	Polish default language Switch Enabled

This command is made up by setting the following bits. (Languages in same order)

Language	LANG command								LANG 2 command				
	FLM	SWITCH	LG1	LG0	C14	C13	C12	G0	LG1	LG0	C14	C13	C12
English	1	0	0	0	0	0	0	0	X	X	X	X	X
Polish	1	0	0	1	0	0	0	0	X	X	X	X	X
Ukrainian	1	0	X	X	X	X	X	1	1	1	1	0	1
Russian	1	0	X	X	X	X	X	1	1	1	0	0	1
Russian / English	1	1	1	1	0	0	0	1	1	1	0	0	1
Russian / English	1	1	1	1	0	0	0	0	1	1	0	0	1
Ukrainian / Polish	1	1	0	1	0	0	0	0	1	1	1	0	1

6.   DATA TRANSFERS TO AND FROM THE TELETEXT MEMORY

6.0.   Writing data to teletext memory

EUROTEXT has two interface modes, Command Mode and Character Mode. When in the decoder is in Command Mode, the bytes received by the control interface are interpreted as commands or command operand. When the decoder is in Character Mode, bytes received by the control interface are written to the teletext memory.
To write data to the teletext memory, the MPTR command is first used to define the initial memory location. MPTR automatically sets the decoder to Character Mode. Subsequent bytes are written to the teletext memory. The memory pointer is automatically incremented after each byte. EUROTEXT is set to Command Mode after a hardware reset and after each occasion that EUROTEXT is addressed on the I2C bus.

6.1.   Reading data from teletext memory

The data sequence that is read by the host consists of two parts. The first part is a number of system status bytes and the second part consists of a sequence of data read from the teletext memory. There are two selected sequences of status bytes defined by the ADDSTS (additional status) bit (see MODE1). **The user should ensure that all of the status bytes are read from the decoder.** If additional status bytes are enabled, the master must read at least 8 bytes of data, or if the additional status bytes are not enabled, then the master must read at least two bytes.

If ADDSTS=0 the data sequence is:-
•   status byte 1
•   device identity byte
•   teletext RAM data

If ADDSTS=1 the data sequence is:-
•   status byte 2
•   teletext error count
•   number of teletext lines received per VBI
•   packet 26 capture flags 1 (designation codes 0 to 7)
•   packet 26 capture flags 2 (designation codes 8 to F)
•   status byte 1
•   device identity byte
•   teletext RAM data

When all the selected status bytes have been read, the decoder will send a sequence of bytes read from the teletext memory. The MPTR (memory pointer) command is first used to define the initial memory location, the memory address is auto-incremented after each byte is read.

6.2. Status byte 1

7	6	5	4	3	2	1	0
TOP	POFF	FLOF	BAD	C14	C13	C12	SRCH

TOP   Basic TOP table has been received. This bit will not be set in FASTEXT mode as the decoder is not searching for the basic TOP table.

POFF   Picture Off.

        POFF=0   TV picture occupies some of the screen. The sync output will be interlaced and locked to the incoming video signal if the signal is good enough

        POFF=1   The screen only contains teletext information. The sync output will depend upon the setup of the digital PLL.

FLOF   A valid packet 27 for the display page has been received.

BAD   BAD video. The quality of the video signal is not adequate to lock the PLL, it is therefore free running at its centre frequency.

C12-C14   Language Flags. These flags indicate the language in which the display page is being displayed. This will correspond to the C12-C14 bits of the header of the last captured page unless a language selection command has been sent with the FLM bit set.

SRCH   Searching for display page. This bit is set in the period between a teletext page being entered and the capture of the teletext page, (the period when the header is rolling).

6.3. Status byte 2

7	6	5	4	3	2	1	0
Undefined		WSS	VPS	NNSP	NSP	FLAG2	FLAG1

FLAG1   Value of pin 27.
FLAG2   Value of pin 28.
NNSP   The next next sub-page has been received. This bit is only valid when the decoder is in sub-page mode.
NSP   The next sub-page has been received. This bit is only valid when the decoder is in sub-page mode.
VPS   The decoder has received a VPS packet since the last channel change. (This bit is undefined on CF70200, CF70205, CF70204.)
WSS   The decoder has received data on line 23 since the last Channel change. (CF70206 only)
Undefined bits in status register 2 will be used for future devices. Software should not assume that these bits will be zero.

6.4. Device Identifier

This is an eight bit number that can be used to detect which Eurotext device is connected. A list of device identifiers is given at the beginning of this document

6.5.   Packet 26 flags

The packet 26 status 1 and 2 are bytes that contain a flag for each packet 26 designation code. If the decoder is in PDC mode, these bits indicate which packets 26 have been received for the display page and are ready to be read from store 7 (menu page 1). The allocation of the flags is as follows:-

Bit	7	6	5	4	3	2	1	0
Status 1	DC7	DC6	DC5	DC4	DC3	DC2	DC1	DC0
Status 2	DC15	DC14	DC13	DC12	DC11	DC10	DC9	DC8

DC   Packet 26 Designation Code

6.6.   Error count.

This count will be incremented by one whenever a hamming byte in the row or magazine position of the packet can not be corrected. The byte will either return to 0 when it reaches FF(hex) or will stay at FF(hex) depending upon the bit set in the MODE0 command. This byte is set to zero after a channel change. The error count can also be used in conjunction with the number teletext lines in the VBI for system tuning.

6.7.   Teletext lines in VBI.

This contains the current number of teletext lines received in the last VBI period. This signal will be reduced if the signal is not tuned correctly.

6.8.   Packet 8/30 Format 1 data storage data.

Packet 8/30 format 1 data and the status display from either packet 8/30 format 1 or format 2 is stored in an area of teletext page memory that is not displayed. This data can be read from memory using the MPTR command to the appropriate latch and setting the LTC bit.

The location of the data is as follows:-

	Col 17	Col 18	Col 19	Col 20	Col 21	Col 22	Col 23
Latch 0 Row 25	P count						
Latch 1 Row 25		Packet 8/30 Format 1 Data					
Latch 2 Row 25	Undefined						
Latch 3 Row 25		Packet 8/30 Status Information Format 1 or Format 2					
Latch 4 Row 25							

P count   This byte contains a number that will be incremented each time that a packet 8/30 or VPS packet is received. The count will be a modular 256 number. I.e. when the count is incremented from 255 it will return to 0. The count is also cleared by a hardware reset and by the following commands:-
SRST,INIT,CHNGE1,CHNGE2,CHNGE3.

7.   Programming Favourite pages

The four favourite page numbers are programmed by writing to two areas in memory using the MPTR command. This system allows the user to both read and write the page numbers. The two memory allocations are shown below.

Latch 5 Row 25	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Col 17	Dash	Space	0	0	0	Red Magazine Digit		
Col 18	Dash	Space	0	0	Red Page Tens Digit			
Col 19	Dash	Space	Inverse	DA1	Red Page Unit Digit			
Col 20	Dash	Space	0	0	0	Green Magazine Digit		
Col 21	Dash	Space	0	0	Green Page Tens Digit			
Col 22	Dash	Space	Inverse	DA1	Green Page Unit Digit			

Memory location of the first two favourite page numbers.

Latch 6 Row 25	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Col 17	Dash	Space	0	0	0	Yellow Magazine Digit		
Col 18	Dash	Space	0	0	Yellow Page Tens Digit			
Col 19	Dash	Space	Inverse	DA1	Yellow Page Unit Digit			
Col 20	Dash	Space	0	0	0	Cyan Magazine Digit		
Col 21	Dash	Space	0	0	Cyan Page Tens Digit			
Col 22	Dash	Space	Inverse	DA1	Cyan Page Unit Digit			

Memory location of the second two favourite page numbers.

If a memory location has not been defined by the external controller after a channel change or a reset, each digit in the favourite page number will be set to 80(hex), thus displaying '- - -'.

DASH   If this bit is set, the digit will be displayed as a dash rather than the digit contained in memory. This feature can be used by the external controller to allow the user to enter page numbers directly into a favourite page without the need to generate a display.

SPACE   If this bit is set, the digit will be displayed as a space rather than the digit. If both DASH and SPACE are set, the page number will be regarded as invalid and the coloured button will not operate.

INVERSE   This bit will display the page number in Row24 as inverse video. The function will only be operative if a partial page number has been entered.

DA1   Disable automatic inverse.
             DA1 = 0   This page number in Row24 will be inverted if it matches the page number.
             DA1 = 1   This page number in Row24 will only be inverted if the inverse bit is set.

The Row24 display will be updated when a new page is received or if the user sends the FAVP commands.

Example - To program the red favourite page with page number 123.

<	I2C start condition
$22	EUROTEXT write address
$46	MPTR command
$B9	Latch 5 row 25
$91	Column 17 plus latch bit set
$01	Magazine number
$02	Page tens digit
$03	Page units digit
>	I2C stop condition
<	I2C start condition
$22	EUROTEXT write address
$45	FAVP command to update Row24 display.
>	I2C stop condition

Example - To read the value of the green favourite page with page number.

<	I2C start condition
$22	EUROTEXT write address
$46	MPTR command
$B9	Latch 5 row 25
$94	Column 20 plus latch bit set
<	I2C start condition
$23	EUROTEXT read address
1st Byte	Status byte 1
2nd Byte	Device ID
3rd Byte	Magazine number
4th Byte	Page tens digit
5th Byte	Page units digit (no ack)
>	I2C stop condition

Note

All the favourite page numbers will be erased after a reset or a channel change command has been received. It is the responsibility of the external controller to store the page numbers for different channels and while the device is powered down.

$ = Hex number

8.   PROGRAMMING EXAMPLE

The EUROTEXT interface has been designed to be very simple to use and to allow the user access to a wide variety of functions. Listed below are the most common teletext functions implemented on a TV, with the necessary EUROTEXT commands. For a standard TOP and FASTEXT decoder for the whole of EUROPE, this is all the software that is required.

<	=	I2C start condition
$22	=	EUROTEXT I2C address
>	=	I2C stop condition
$	=	Hex number

Power up	<$22,$4C,$XX>	XX = manufacture's choice of PLL functions
Channel Change	<$22,$04,	Channel Change command
	$1E,$00>	Display P8/30 status information
	wait 5 secs	
	<$22,$1D>	Clear P8/30 status information
TEXT	<$22,$71>	Set TEXT mode
TV	<$22,$70>	Set Picture mode
MIX	<$22,$73>	Set mix mode
EXPAND	<$22,$13>	Toggle EXPAND command
UPDATE	<$22,$10>	Update command
SUB-PAGE	<$22,$11>	Sub-page command
HOLD	<$22,$1A>	Hold command
RED	<$22,$38>	Red command
GREEN	<$22,$39>	Green command
YELLOW	<$22,$3A>	Yellow command
CYAN	<$22,$3B>	Cyan command
INDEX	<$22,$3C>	Index command
NUMBER	<$22,$XX>	XX depends on number pressed $20 - $29 for keys 0 - 9
REVEAL	<$22,$1C>	Toggle reveal command
PAGE UP	<$22,$16>	Increment page number
PAGE DOWN	<$22,$15>	Decrement page number