# Texas Instruments

# UNITEXT TELETEXT DECODER

# Evaluation Boards and Software

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**TEXAS INSTRUMENTS**

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## 1 General Information

This document describes how to use the UNITEXT evaluation board and the software to control the board. It is assumed that the user has version 3.0 of the software and the UNITEXT Evaluation board issue 2. If you have not received version 3 of the software please contact your local sales office. The user should refer to the UNITEXT data sheet for detailed information on the programming of the UNITEXT device.

### 1.1 System Overview

The UNITEXT evaluation board may be controlled via an IIC or simple serial interface. Software is enclosed on the disk to control the evaluation board via the IIC bus or the simple serial interface. Connection between the controlling PC and the evaluation board is by means of a single 25way ribbon cable between the printer port of the PC and the evaluation board.

### 1.2 Software

One software program is included on the disk plus various data and batch files. The program is a software compiler for UNITEXT commands. This is run by entering "UNITEXT" followed by RETURN. The software also allows the user to build whole screen "On Screen Displays". The user is advised to make a backup copy of the original disk before use. As the software uses a lot of disk accesses it is advisable to transfer all the files from the floppy drive to a hard disk to improve the speed performance of the software. Appendix A lists the contents of the floppy disk.

### 1.3 PC Hardware

The software should run on any IBM XT, AT or 100% compatibles. The screen editor requires a colour monitor and a minimum of a CGA graphics board. The software compiler can be used with any graphics card. A colour display is recommended. The PC should not have a printer connected to the printer port as this port is used to communicate with the UNITEXT evaluation board. The program should automatically detect the correct printer port, on some PC this is not possible so the user will have to force the program to use a specific port.

### 1.4 Power Requirements

The UNITEXT evaluation board should be powered from a regulated +5V supply. The board draw 150mA.

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## 2 Unitext software compiler

### 2.1 Introduction

This compiler is designed to allow a user of the UNITEXT decoder to easily write a program to control the device. Once the user is satisfied with the operation of the software, the program can generate a hex listing for each operation for insertion into the target application software. In addition to the control section of the program, a screen editor is included.

Either simple serial or IIC communication can be used to control the UNITEXT decoder.

The program has Four modes:-

- MODE1: "DIRECT UNITEXT COMMAND ENTRY"

This allows the user to control the UNITEXT decoder directly. When a command is entered on the screen it is sent directly to the UNITEXT decoder.

- MODE2: "KEYBOARD DEFINITIONS"

This allows the user to assign groups of commands to selected keys on the keyboard.

- MODE3: "UNITEXT CONTROL MODE"

This allows the user to use the keys defined in MODE2 to control the UNITEXT decoder. This mode is intended to mimic a remote control key board for simulation of the end application.

- MODE4: "SCREEN EDITOR"

This allows the user to load a teletext page from disk or UNITEXT into memory and edit the page.

The UNITEXT software compiler has been designed to run on an IBM PC or AT or 100% compatible machines. It requires MS-DOS Version 3.0 or later. A single parallel port is used (normally LT1). If a PC is used ensure that the number lock is off to access the editor keys.

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## 2.2 Introduction

The UNITEXT software compiler is run by typing UNITEXT. The compiler uses three data files:

    UNIDATA.DAT
    MACRO.DAT
    KEY.DAT

All three files are supplied on the floppy disk. If the files are copied to a hard disk the data files must be kept in the same directory as the main program. None of these files should be edited directly. You are advised to keep a copy of the original version of MACRO.DAT as this file is overwritten when the editor is used. In addition to the above files, the program may use some extra data files called "DATA*.DAT" where *=0 to 9. These data files are only used if a key requires a large amount of data. These data files are made up of a number of two character hex numbers separated by a space, 20 per line. The numbers should be terminated by a semi-colon. To access data from one of these data files use the "FILE*" command in any of the three modes. This command will read in the data file DATA*.DAT and transfer it to the UNITEXT device. Teletext pages are also stored in different *.DAT files to be used by the screen editor.

When the compiler is run it automatically backs up the current version of MACRO.DAT to the file MACRO.BLK. This is to protect the old key definitions in case of computer crash or edits made in error.

To ensure that edited data is always stored on disk, always exit the compiler from the main menu using the ESC key. To abort the changes the "Q" option may be used.

Data is sent to the UNITEXT decoder using either IIC bus or the serial bus. This may be selected from the main menu. The address of the teletext decoder is defined in the program. Some sections of the program will only run if the interface box is fitted.

It is not possible to use the parallel printer interface for printing if the interface box is fitted. A serial printer should work at all times.

## 2.3 Unitext Commands

The mnemonics used to define a command for the UNITEXT decoder are the same as those listed in the UNITEXT data sheet. The UNITEXT commands can be listed from the main menu.

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The UNITEXT decoder can operate in two modes - COMMAND and DATA modes.

### 2.3.1 Command Mode

In this mode the data sent to the UNITEXT decoder are commands.

When the decoder is in this mode, the compiler will allow the user to enter UNITEXT mnemonics, eg. "RED" "TMTXT" etc.

Commands may also be entered using their hex number. If the number is less than 9F it may be entered directly from the keyboard followed by RETURN, otherwise it must be pre-fixed with either the "&" or "TAB" characters.

If the UNITEXT decoder received a COL command, the decoder will switch to DATA mode. Similarly, the software will also switch to DATA mode.

### 2.3.2 Data Mode

In this mode, the data sent to the UNITEXT decoder are character data for display.

When in DATA mode the user enters normal ASCII characters in three ways:-
-by pressing the relevant key on the keyboard,
-by entering the hex number of the key by prefixing it with the TAB key
-by using one of the function keys.

The COMMAND mode is returned to by pressing Control F8. This sends an escape character to UNITEXT decoder.

Note that certain keyboard characters that correspond to the Teletext language national option characters will change on-screen when the language control bits (C12, C13, C14) are changed. If one of these characters is required to be displayed independently of the  language control bits, it must be accessed as an eight bit character by using the hex number.

On the keyboard, only the 96 keys that correspond to the standard  teletext character set are valid. Using other keys will result in  wrong characters being displayed on the teletext screen.

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Function keys are defined as

| F1 | END BOX |
| F2 | START BOX |
| F3 | NORMAL HEIGHT |
| F4 | DOUBLE HEIGHT |
| F5 | BLACK BACKGROUND |
| F6 | NEW BACKGROUND |
| F7 | HOLD GRAPHICS |
| F8 | RELEASE GRAPHICS |
| F9 | SEPARATED GRAPHICS |
| F10 | CONTIGUOUS GRAPHICS |

| Control F1 | GRAPHICS RED |
| Control F2 | GRAPHICS GREEN |
| Control F3 | GRAPHICS YELLOW |
| Control F4 | GRAPHICS BLUE |
| Control F5 | GRAPHICS MAGENTA |
| Control F6 | GRAPHICS CYAN |
| Control F7 | GRAPHICS WHITE |
| Control F8 | CONCEAL |
| Control F9 | COMMAND MODE |
| Control F10 | GRAPHICS BLACK |

| ALT | F1 | ALPHA RED |
| ALT | F2 | ALPHA GREEN |
| ALT | F3 | ALPHA YELLOW |
| ALT | F4 | ALPHA BLUE |
| ALT | F5 | ALPHA MAGENTA |
| ALT | F6 | ALPHA CYAN |
| ALT | F7 | ALPHA WHITE |
| ALT | F8 | FLASH |
| ALT | F9 | STEADY |
| ALT | F10 | ALPHA BLACK |

2.4 System Operation

When the program is run the software will try and locate the corect printer port. A PC can be fitted with upto three different printer ports, if only one port is fitted it can be addressed at any one of the three locations. On majority of the PC's the software will be able to locate the correct port. If it fails to find the correct port or the UNITEXT board is not connected it will

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stop the program and report the error. The software can be forced to use a particlar port by typing "MAIN 2" or "MAIN 1" or "MAIN 3".

From the main menu, the four modes of operation can be selected.

3 MODE1 (Direct UNITEXT Command Entry)

In this mode, commands entered on the screen are sent directly to the UNITEXT decoder. This gives an easy way to try out different commands so as to be able to see their direct effect on the UNITEXT decoder.

When this mode is selected, the UNITEXT decoder is automatically set to COMMAND mode by the sending an ESCAPE character.

"ESC" key is used to return to the main menu.

The commands can be entered either by typing the mnemonic or by entering the hex number of the command. Hex numbers should be proceeded by a '&' or 'TAB' key.

The UNITEXT decoder is set into DATA mode by sending a COL command. Data can then be sent by pressing one of the ASCII characters on the keyboard or by pressing a function key. (see section 3.2)

(for more information on UNITEXT modes please refer to the UNITEXT data sheet).

To allow eight bit characters (or characters not on the keyboard) to be entered, the hex number of the character can be input by preceding it with the TAB key.

4 MODE2 (Keyboard Definition)

MODE2 and MODE3 are used to make the PC keyboard act like a TV remote control keyboard. MODE2 is used to assign sets of UNITEXT commands (macros) to selected keys. The defined keys can then be used to emulate remote control keys in MODE3.

The software compiler includes a number of pre-defined keys. These keys can be edited or deleted using the standard editor. They are included as examples of the capability of the UNITEXT decoder, rather than as a rigid definition.

In MODE2, the user is first prompted to select the key to be edited. This key can either be a pre-defined key as listed on the screen or a new key. Only the "ESC" key cannot be defined.

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The program will regard upper and lower keys as different keys. ALT and CTRL can also be used to define mode keys. The program will support up to 50 key definitions.

Once the key has been selected, the following keys are valid in the construction of the macro:

"UP ARROW"        Moves the cursor up one line

"DOWN ARROW"   Moves the cursor down one line

"PgUp"               Moves the cursor to the top of the macro

"PgDn"               Moves the cursor to the bottom of the macro

"HOME"             Allows the user to redefine the name of the MACRO

"DEL"                Delete the whole macro

"END"                This allows the user to copy another key macro to the currently defined key. It will overwrite the currently defined key.

"SPACE BAR"       The defined macro may be tested by single stepping through the macro, sending a command on each press of the space bar.This may be exited at any time by pressing the "ESCAPE" key.

"INSERT"            Invokes the macro editor

4.1 Macro Editor

This editor allows the user to insert and delete lines from the selected macro. Cursor movements are the same as above. Commands are always entered above the current position of the cursor. All commands below the cursor are moved down one line. Commands are entered as mnemonics or hex codes in the same way as for MODE 1 (see section 4.1). In addition to the UNITEXT commands, a wait state can be inserted, by typing "WAITx" where x is the time in seconds between 1 and 9.

If the maximum number of commands (50) is exceeded, the program will not allow the user to enter any more commands. A command may be deleted using the "DEL" key.

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5 MODE3 (UNITEXT Control Mode)

The list of MODE2 pre-defined keys is shown on the screen and in this mode only these keys are valid - entering any other key will result in an error message.

"ESC" returns the user to the main menu.

On selecting a pre-defined key, the PC will send the commands directly to the UNITEXT decoder via the selected bus and will execute any wait states included in the macro.

Status messages may appear in the bottom part of the screen indicating the state of the serial/IIC bus.

Commands that read data from the UNITEXT device are only valid if IIC bus is being used. If the simple serial bus has been selected then it may only be used to send data to the UNITEXT device, and any MODE3 command intended to read data will be ignored.

5.1 Example Key Definitions

The UNITEXT software compiler has been pre-programmed with typical UNITEXT commands. These show how simple it is to program the UNITEXT device to work as a teletext decoder.

In addition to the standard teletext commands the following are predefined:

- the 'F' key will download a complete 1K page to text to the decoder

- the 'G' key displays the complete ROM of the UNITEXT decoder.

## 6 "SCREEN" UNITEXT Screen Editor

### 6.1 Introduction

This program is design enable a full teletext page to be edited to produce a full page on screen display for the UNITEXT device. The software can be run either connected to the UNITEXT evaluation board or in stand alone mode. If the evaluation board is not connected the interface should be disabled using the "I" option from the main menu. The program requires that the datafile UNIDATA.DAT is in the same directory as the main program. When the interface is first enabled, the UNITEXT command OMTXT is sent to change the UNITEXT device into OSD text mode. If the user requires a different set up, by using the direct command mode new UNITEXT commands can be easily sent. These could include boxed, mixed or picture modes in both OSD or text mode or display control commands eg. double height or reveal.

### 6.2 Main Screen

The main screen displays the current text page on the left of the screen and menu options on the right. Options available are

| | |
|---|---|
| E | Edit page |
| D | Direct control of UNITEXT (same as mode1 in the compiler) |
| F | File transfer |
| C | Clear page (clears the current text page to spaces) |
| I | Enable/disable interface to UNITEXT. Disabled on power up |
| TAB | Changes the interface between IIC and serial. |

The program is exited by pressing escape.

### 6.3 Screen Editor

This is a full screen editor. The cursor is moved around the text screen using the cursor keys or the mouse. When any characters are typed they overwrite the characters at the current cursor position. All edits to the screen are mimicked on the UNITEXT screen if the board is connected and the interface enabled. Single characters can be deleted or inserted with the **delete/insert** keys. Complete rows can also be inserted or deleted by using the **HOME** or **END** keys. If a row is inserted the whole screen below the current row is moved down one row and the current row is copied to the row below it. The this row is copied to ensure that screen colours are kept consistent. The last row is deleted.

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All characters entered are copied to the UNITEXT device is the interface is enabled. Characters can be entered by the keyboard, as direct hex numbers by pre-fixing the characters with the "TAB" key or by using one of the function keys.

If a line has a graphics character before the character position, and lower case characters entered will appear on the screen as '*'. If the UNITEXT interface is enabled, these character will appear as the correct graphics characters on the UNITEXT display. Graphics characters are not displayed on the PC to allow the program to run on a machine with a CGA graphics board.

In addition to adding characters to the screen, the editor support two other mode of operation;-

### 6.3.1 Full Screen Colours

The colour of the foreground and background of the screen can be defined. The operation of the software operates in the same way as the OMASET and OMGSET commands for the UNITEXT device. Pressing shift-TAB evokes a new menu requesting the colours of the foreground and the background. Only the first letter of the colour is required to define the colour except black and blue when the first three letters are required. It is also possible to select between setting the foreground colour in graphics or text mode. The user must specify the last line number that the colours are to be defined to. The screen is always defined from line 1 to the line specified.

### 6.3.2 Graphics Mode

If a character is a graphics character it can be changed by tying over it with another character. Alternatively the character can be edited in bit mode using the graphics editor. This is entered by pressing CTR F9 from the editor menu. In These mode the six keys

```
7    8
4    5
1    2
```

are used to toggle one of the six bits of the character. After each key press, the cursor is not incremented. This allows the user to paint a picture on the screen. Control character can not be entered in this mode. The cursor keys or the mouse are used to move around the screen

### 6.3.3 File transfer

Data is stored on disk in data files with the ".DAT" extension. This menu is used to store and retrieve files. The user is only required to entre the name of the file, the extension is added

automatically. The current selected directory may be changed using the "C" option. Standard notations are used in naming directories.

### 6.3.4 File Compatibility

Data files made using the screen editor can be read into the software compiler as complete data files. When the file is save with the software compiler, use the name "DATA*" file name, where * is and number 0 to 9. This file can be used in the software compiler using the command "FILE*" when defining a macro. * is a number 0 to 9 corresponding to the file name of the saved screen page.

Note: in the supplied software, file DATA5 is used to store the ROM contents.

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## 7 Unitext Evaluation boards

### 7.1 Introduction

The UNITEXT evaluation board allows a user to write and debug software for the UNITEXT decoder. The board has been designed to emulate a complete teletext system including the data slicer. The equivalent circuit for the UNITEXT device is shown in the UNITEXT data sheet.

The board has been designed as two boards connected together by jumpers. The first board contains the application circuit for the UNITEXT chip and the data-slicer. The second board contains the interface circuit to the PC and the SCART socket.

If the board is to be used with a TV set and controlled by a PC the user need not refer to section @@@. This section covers all the connections to both boards.

### 7.2 Input and outputs (PC controlled)

The inputs to the board are :

#### 7.2.1 Power

A regulated power supply of +5V +- 0.5V is required. The board draws approximately @@@.

#### 7.2.2 Video

The video signal is taken from the SCART socket. This signal should be a 1V p-p video signal. It is terminated with 75 ohms by R60.

A separate video signal can be connected to the evaluation board BNC socket J3 if the link 'VID' is lifted. If this socket is used, the video signal must be 2V p-p. It is not terminated on the board.

#### 7.2.3 Red, Blue, Green

These three outputs are connected to the SCART socket. If terminated with 75R they are 0.7Vp-p signals.

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### 7.2.4 Sync

This signal is connected to the SCART socket. The output of this signal is as described in the UNITEXT data sheet. If terminated with 75R its amplitude is 0.7V p-p.

### 7.2.5 Blank

This output connected to the SCART socket is a 2V signal.

The connections on the SCART socket are:

PIN   FUNCTION

| | |
|---|---|
| 21 | GND |
| 20 | Sync out |
| 19 | Video in |
| 17 | GND |
| 16 | Blanking |
| 15 | Red |
| 13 | GND |
| 11 | Green |
| 9 | GND |
| 7 | Blue |

### 7.2.6 Control

All control signals for the UNITEXT decoder are connected using a 25 D type. The following pins are used on the D-type.

2,3,4,10,11,12 pin 20 is ground.

All other pins should be left unconnected as they may be test pins.

### 7.3 Input and Outputs (system not controlled by PC)

If the evaluation board is to be controlled by an external microcontroller, it is possible to only board containing the UNITEXT chip. The same power connector is used but all input and outputs are labeled on the PCB. For more information about these signal please refer to the UNITEXT or data slicer data sheets.

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Holes used

| | | |
|---|---|---|
| CEN | (pin 16 UNITEXT) | |
| SDA | (pin 18 UNITEXT) | IIC Bus |
| SCL | (pin 17 UNITEXT) | IIC Bus |
| I2CEN | (pin 9 UNITEXT) | |
| | +5V IIC or 0V serial | |
| Vcc | +5V | |
| Gnd | | |
| Blank | (pin 19 UNITEXT) | Blanking output |
| RED | (pin 23 UNITEXT) | Red output |
| Green | (pin 22 UNITEXT) | Green output |
| Blue | (pin 20 UNITEXT) | Blue output |
| CSYNC | (pin 2 UNITEXT) | Sync output |
| Video | (data slicer) | Video input 2V p-p |
| Video Gnd | (data slicer) | Video Ground. |

7.4 Links

The board can be fitted with one link JP1. If the board is being controlled via the PC, this link must not be fitted. If the PC is not being used connect the centre pin to either of the outside pins to select between IIC control or simple serial control.

7.5 Setup Procedure

The board should be set up when delivered but in case of problems the following procedure should be applied.

L2 setup

-Connect a good video signal to the board
-Put the UNITEXT device into text mode
-Adjust L2 until the text is locked
-Adjust L2 until the connection between C20 R16 & R17 is 2.5V marked as TP1.

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8 PC Control interface

The board allows the PC to act as a serial transmitter only to the UNITEXT board or as a IIC MASTER transmitter/ receiver.

The PC software is not designed to work in an IIC multi-master system. It will transmit data if the bus is free but it will not respond to any commands sent to it.

The speed of the IIC bus is dependent upon the speed of the PC. On a 12MHz PC the IIC bus will operate at about 15K bits/second.

The cable (supplied) should be connected between the interface board and the printer port of the PC. It may not work if a dongle is also inserted into the printer port, and when the interface board is fitted, the printer port cannot be used for printing.

The interface should work with standard printer driver boards for IBM compatible PCs.

Note

All inputs and outputs of the interface board connected to the PC are protected. However, connection is at the user's discretion and TI will not be held liable for any damage caused as a consequence.

APPENDIX A

Contents of the floppy disk (Version 3.0)

Below is a list of the minimum of the files that must be present on the disk to run the software compiler and screen editor. Additional files may be present, these will generally be extra data files containing screen displays

    MACRO.DAT
    UNIDATA.DAT
    KEYS.DAT
    BOOT.EXE
    MAIN.EXE
    UNITEXT.BAT    Software compiler
    DATA0.DAT
    DATA5.DAT
    Plus various data files which contain same teletext pages.

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