PIC - STV5730A Project board

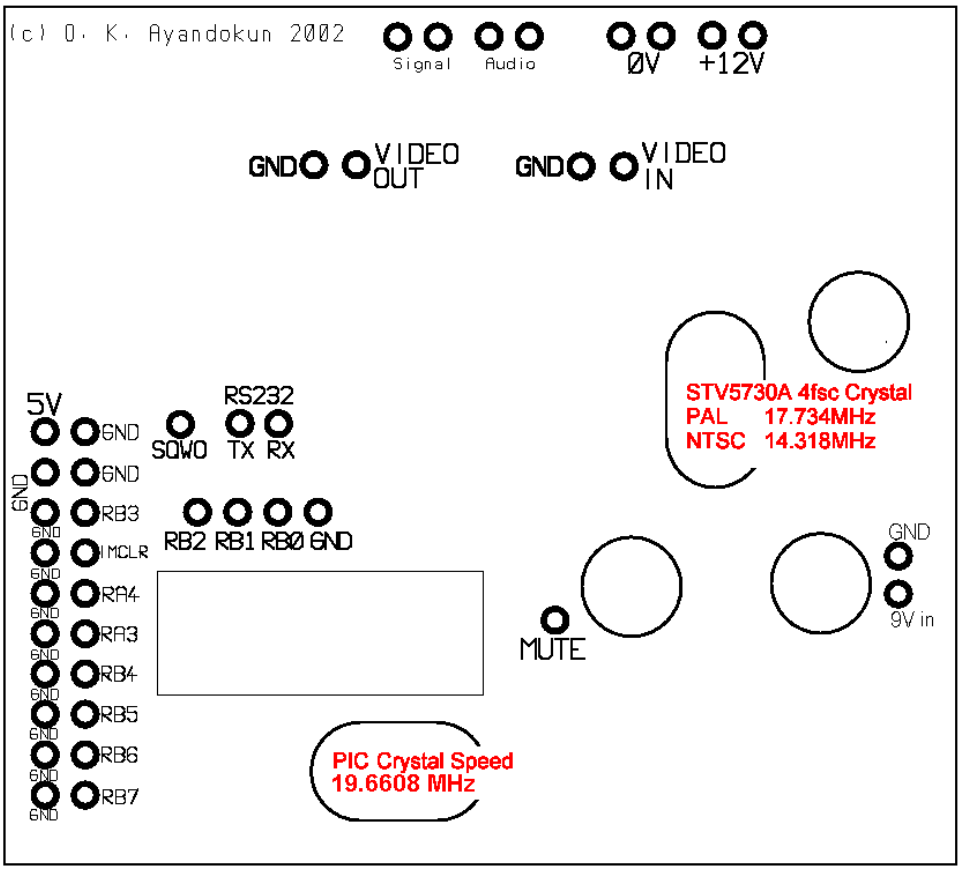
The PIC - STV5730 project board provides a simple platform for the development of PIC driven text over video applications. The PIC is provided programmed with the serial interface example program. Connect the serial line, video in and video out before powering the system up. The program should run immediately that power is applied to the board and the text display will appear after approximately 1 second. When in mixed mode if the board is powered up before a video in signal is connected the display may be a fuzzy, rolling picture. In this case the STV5730A has not synchronised to the video in signal. Power off, connect the video in signal and power on again to clear this problem. **Do not remove or replace the 3.5mm serial connector while the unit is powered.** See overleaf for serial example program operation.

The diagram below shows the pin out of the connectors on the project board. Most of the signals are self explanatory. The PIC uses RA0..2 to connect to the STV5730A. RB1..2 the TTL level serial i/o pins. They are connected to the DS275 used for the RS232 level serial interface. The remaining i/o pins are available via the 20-way header on the left of the board. MUTE allows connection to pin 10 of the STV5730A. The signal on this pin indicates if a video signal is present on the chip's video input pin. Refer to pg 13 of the STV5730A data sheet for details.

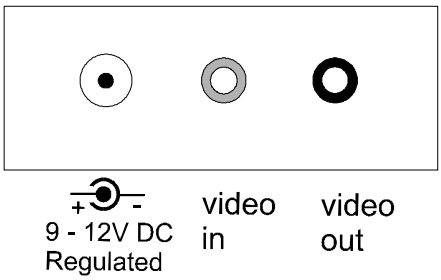
Power supply

The board is designed to be powered from a 12V dc regulated power supply. This can be connected via the 2.1mm power connector on the enclosure or directly to the project board. A 9V PP3 battery can also be connected. This can either be used as the main supply or as a backup for applications requiring volatile data protection.

WARNING It is important to ensure correct connection of the project board to the power supply and/or battery. Failure to observe correct power supply connection polarity may result in the failure of the project board or in the battery bursting to cause personal injury and damage. **The warranty is void in such cases.**



Connector pin out diagram



Front panel connectors

DB9 cable signals		
Female Socket No.	Male Pin No.	Signal
Socket 2	Pin 3	Serial data out RS232 TX TTL RB2
Socket 3	Pin 2	Serial data in RS232 RX TTL RB1
Socket 5	Pin 5	Ground

WARRANTY

The BlackBoxCamera™ Company Ltd. warrants its products to be free of defects in materials and workmanship under normal use and service for a period of twelve months from the date of original purchase. The obligations of The BlackBoxCamera™ Company shall be limited within the warranty period, at its option, to repair or replace the product or any part thereof. The company shall not be responsible for dismantling and/or installation charges. To exercise the warranty the product must be returned carriage paid and insured. Under this limited warranty the maximum liability of The BlackBoxCamera™ Company shall not in any case exceed the purchase price of the product, which shall be fixed as liquidated damages and not as a penalty, and shall be the complete and exclusive remedy against The BlackBoxCamera™ Company. **This warranty does not apply in the following cases:** Improper installation, misuse, failure to follow installation and operating instructions, alteration, abuse, accident or tampering, and repair by anyone other than The BlackBoxCamera™ Company.

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PIC - STV5730A Project board serial interface example program

The PIC STV5730A serial interface example program demonstrates simple control of the project board's video text overlay from a PC serial terminal program. When the project board has been connected to power and video as described overleaf connect the serial cable between the PC serial port and the 3.5mm jack socket at the right of the enclosure. The video screen will display the text string at the screen position, and with the attributes, previously stored in EEPROM memory. The default settings of the STV5730A are for mixed mode, unblinking text displayed without background, all rows visible, text size 1 on all rows. Start your PC serial terminal program and set the communication settings for 2400 baud, 8-N-1. A hyperterminal file with the correct communications settings, stv.ht, can be downloaded from our website and is also supplied with the serial example program source code. 2400 baud is the unit's pre-set default baud rate. It can be set to 2400, 4800, 9600, 19200 or 38400 baud using the **Wnn↵** command, see the command set table. When the project board and the PC are connected typing return in the terminal program should be answered by the PIC's command line prompt '>' being displayed in the terminal window. The serial program has been tested with a PC serial port at normal typing speed. It has not been tested with any other serial equipment. All the serial program commands take variable times to execute. It is therefore important that any PC or microcontroller software application communicating with the project board uses receipt of the '>' character to indicate that a command has been completed before it sends the next command.

The example program commands consist of an upper case ASCII character, which identifies the command, followed by parameters, if any, and the return character ↵, hexadecimal 0x0D. The return character tells the PIC that a command has been entered. When a command requires a numerical parameter, shown as nn in the command set table, this parameter is entered as two ASCII numeric characters in the range 00 to 99. So 1 is entered as 01. The character string display and storage commands **S** & **F** display strings up to 28 characters long. The T command puts the system into typewriter mode. In typewriter mode the characters are displayed on the screen as they are typed on the keyboard until a return is entered. The PIC converts the following characters directly from ASCII to the corresponding STV5730A character. Other ASCII characters are displayed as spaces. The backspace key will only delete characters back to the start of a line on the screen.

0 - 9	a - z	A - Z	?	:	.	/	*	-	=	SPACE

Other characters in the STV5730A character set can be displayed by entering them numerically using the ALT key and the PC's numeric keypad while in numeric mode. See command **J**. This only applies to display command parameters. Commands and other parameters are always entered as ASCII. If you are using a laptop ensure that you follow the procedure for emulating the numeric keypad.

Command Usage Examples

The text screen generated by the STV5730A is 28 characters by 11 lines. To set the position at which text will written use the **Xnn↵** and **Ynn↵** commands, where nn is the desired character position 00 to 27 and line position 00 to 10 respectively. For example to display a string in the middle of the screen type **X05↵** then **Y05↵** followed by **SYour String Here↵** at the prompt. The string length used with the **S** and **F** commands is limited to 28 characters. If you type more than 28 characters the 29th will be interpreted as a return and the first 28 characters will be displayed, and stored. As you type you may use the backspace key to correct any errors you make. Your string will appear on the screen in the position you defined with the X and Y commands. A single line of text can be stored to provide a start up message. Initially the message "Go to www.stv5730a.co.uk" will be displayed when the unit is powered. The initial position for the display of the stored string is character position 00 on row 10. To define the position which the stored string will appear use the **Cnn↵** and **Rnn↵** commands to set the character and row position. Type **FStored String Here↵**. The string is displayed and stored in the EEPROM memory of the 16F628, with its position, and will be displayed whenever the system is powered up.

To clear the screen of text use the clear screen command, **A↵**. This command clears the visible text and leaves the stored string unchanged in the EEPROM of the 16F628. Each text character displayed on screen has a background and a blink attribute which can be individually set to control how the character is displayed. To turn on the background attribute of subsequent text use the **ZH↵** command. To turn off the background attribute of subsequent text use the **ZI↵** command. The background attribute of text already written to the screen is not changed by these commands. The **B↵** command, which toggles the state of the background attribute is provided for backwards compatibility. When the background setting is off text will be displayed with solid characters. When the background setting is on the text characters are translucent with a grey translucent background. The change from solid to translucent text and background has immediate effect on text already displayed. This means that you may also display translucent text without a background and solid text with a solid background although these settings will not be stored. To turn on the blink attribute of subsequent text use the **ZJ↵** command. To turn it off use the **ZK↵** command. The **D↵** command toggles the blink attribute on or off. To display your stored string with the changed background and blink attributes, type the stored string display command **E↵**. The string will be re-written to the screen with a background and / or blinking.

To type directly to the screen first select the attributes desired for the text with the background and / or blink commands. Then select the character and row start position for the text with the **X** and / or **Y** commands. Enter the **T↵** command. All the characters you type in the terminal window will now be displayed. To leave typewriter mode type ↵ again. To insert a character from STV5730A character set enter the numeric mode command **J↵**. You may either enter the numeric value of the character via the PC's numeric keypad or enter the equivalent ASCII character from the keyboard. For example the STV5730A heart character hexadecimal 71 can either be entered as **ALT + 0113** or by typing **q**. For an ASCII table visit www.asciitable.com. To go back to ASCII mode use the **K↵** command. The character position in typewriter mode is advanced automatically, but this does not affect the stored string position. Please note that typewriter mode should not be used to write to the screen from a PC or microcontroller application as the baud rate may exceed the rate at which characters can be displayed. Use the string display command.

All program commands operate in the same way in mixed and full page modes, except for those which control the colour of the screen elements which only work in full page mode. The STV5730A uses a non-standard method to generate its colour signal in full page mode. Some video monitors are unable to pick up this colour signal and will only display the full page mode screen in monochrome. To switch to full page mode type **N↵**. The video signal displayed will then be generated by the STV5730A. A blue screen background will be displayed with white text outlined in black with a red background. Changing the character background colour in full page mode does not affect the character background shade of grey in mixed mode. To change the screen background colour to red type **H04↵**. To set the character background to blue type **G01↵**. To set the character border to green type **I02↵**. These settings will be stored as they are made and have a global effect across all screen pages. To reset the parameters to their original values you may either reverse each change or use the reset command, **U↵**. This will reset all the stored STV5730A parameters to their default values. Note that since the system defaults to mixed mode if you are in full page mode when you use the reset command you will need to change to full page mode again with the **N↵** command. In full page mode the colour of the characters can be set using the **ZEnn↵** command. Use **ZE02↵** to set the character colour attribute to green, then **E↵** to display the stored string.

Individual rows of text on the screen display can be hidden so the text is not displayed but remains in the memory of the STV5730A. To hide a row first use the row position command to set the row number to the desired row. Then type **P↵** and the row will vanish from the screen. Note that the text is not protected by being hidden and any subsequent commands which write to a hidden row will overwrite any text there although changes on a hidden row will not be seen until the show row command **O↵** is used. To show all hidden rows at the same time use the **Q↵** command. An offset can be added to each line relative to the line above it with the **ZGnn↵** command. The command parameter ranges from 00 to 31 for the maximum positive offset. Values from 32 to 40 give a negative offset. The default row offset is 4 for PAL, 0 for NTSC. The changes to row attributes affect text on the screen, but are not stored when the unit is switched off .

The size of the text on the screen can be set to one of four sizes in three separate zones, the top row, the middle 9 rows and the bottom row. See the text size command parameters table below. To set the text on the top row to size 2 enter **V01↵**. Then enter **V02↵** followed by **V03↵** to see the remaining text sizes. Enter **V05↵** to change the text on the middle rows to size 2. The text sizes you set are stored in EEPROM memory as they are made. To reset all values at the same time you may use the reset command, **U↵** which will restore all the system defaults.

Serial Interface Program Command Set	
Command	**Action**
A↵	Clears the entire screen. All character locations on the screen are filled with the space character
B↵	Toggles the character background display on and off. Current state stored in eeprom memory
Cnn↵	Sets the character position along the selected row (X axis) nn = 00..27. This value is stored in the eeprom memory of the 16F628
D↵	Toggles the character blink attribute on or off. Current state stored in eeprom memory
E↵	Displays the string stored in the eeprom memory at the character and row positions stored in the eeprom memory
Fc0..c27↵	Stores the string entered in the eeprom memory. Up to 28 characters c0..c27 can be typed before entering a return character. The string is also displayed on the screen. The stored string is automatically displayed at start up and when the E command is entered.
Gnn↵	Sets the character background colour in full page mode only. nn = 00..07. 01 = Blue, 02 = Green, 04 = Red
Hnn↵	Sets the screen background colour in full page mode only. nn = 00..07
Inn↵	Sets the character border colour in full page mode only. nn = 00..07
J↵	Switches the system into numeric mode. Characters sent to the 16F84 are not converted from ASCII to the STV5730A character set before they are displayed when using the S, F & T commands. Characters from the full STV5730A character set can be displayed using the ALT key and the numeric keypad. The B cannot be displayed as its value in the STV5730A character set is equivalent to the ASCII carriage return character
K↵	Switches the system into ASCII mode. Characters entered are converted from ASCII before they are displayed. Only a subset of the STV5730A character set is available
L↵	Moves character position to the next line, character position 00
M↵	Sets the STV5730A to mixed mode
N↵	Sets the STV5730A to full page mode
O↵	Show row. Change attribute of the current row so the row is displayed
P↵	Hide row. Change attribute of the current row so the row is hidden
Q↵	Reset all the row attributes so all rows are displayed
Rnn↵	Sets the character row position nn = 00..10 This value is stored in the eeprom memory of the 16F628
Sc0..c27↵	Displays a string of up to 28 characters. The characters typed are only displayed when return is entered
T↵text↵	Enters typewriter mode. Text characters entered are displayed immediately on the screen until a return character is entered to exit typewriter mode
U↵	Reset the STV5730 registers to default values
Vnn↵	Set the Zoom register values that control the size of text on the screen. The text on row 0, rows 1-9, and row 10 can be set independently to four different sizes. See Command V parameters table below
Wnn↵	Change baud rate. 00 = 2400, 01 = 4800, 02 = 9600, 03 = 19200, 04 = 38400
Xnn↵	Sets the character position along the selected row (X axis) nn = 00..27. This value not stored in the eeprom memory of the 16F628
Ynn↵	Sets the character row position nn = 00..10 This value is not stored in the eeprom memory of the 16F628
Z	Not used
ZA↵	Not used
ZB↵	Not used
ZC↵	Not used
ZD↵	Not used
ZEnn↵	Set the character colour 00 = black, 01 = blue, 02 = green, 03 = cyan, 04 = red, 05 = magenta, 06 = yellow, 07 = white
ZFnn↵	Not used
ZGnn↵	Set the row offset. nn = 00 to 31 for positive offset, 32 to 40 for a negative offset.
ZH↵	Turn the background attribute of subsequent text on
ZI↵	Turn the background attribute of subsequent text off
ZJ↵	Turn the blink attribute of subsequent text on
ZK↵	Turn the blink attribute of subsequent text off

Text size command V parameters				
	Size 1	Size 2	Size 3	Size 4
Row 0	nn = 00 (default)	nn = 01	nn = 02	nn = 03
Row 1 - 9	nn = 04	nn = 05	nn = 06	nn = 07
Row 10	nn = 08	nn = 09	nn = 10	nn = 11