GPS - Depth - Water Temperature Video Overlay Unit with Keyboard Interface

The GPSBOXKBD-XDT GPS - Depth - Water Temperature video overlay unit is a simple solution for displaying NMEA data from a GPS receiver (GPSR) and depth transducer over a camera's composite video signal combined with flexible text annotation. Please read the entire document before using the overlay unit.

GPSBOXKBDPLUS-XDT

GPSBOXKBD-XDT

GPSBOXKBD-XDT versions There are two versions of the unit which operate with different GPS receivers.	
GPSBOXKBDPLUS-XDT	Internal 1Hz GPS receiver supplied with external antenna suitable for vehicle mounting
GPSBOXKBD-XDT	External GPS receiver with NMEA 0183 RS232 output, 1Hz 4800 baud 8N1. Connection via PC cable.

Power supply

The GPSBOXKBDPLUS-XDT unit without keyboard draws approximately 150mA. The GPSBOXKBD-XDT unit draws approximately 50mA. Both versions are designed to be powered from a 9 - 12V DC regulated power supply. The power supply used should be capable of providing 300 - 500mA according to the requirements of the keyboard and camera being used with the overlay unit. The keyboard used should not have a current draw greater than 200mA. It is recommended that the keyboard is only connected to the unit when required for setting the display.

WARNING! It is important to ensure correct connection of the video text overlay to the power supply or battery. Failure to observe correct power supply connection polarity may result in the electronic failure of the unit or in the battery bursting to cause personal injury and damage. The power supply **must** have a regulated output. Connection to a non-regulated power supply, in particular direct connection to the cigar lighter socket of a vehicle, can cause the unit to fail. The warranty is void in such a case.

Connections

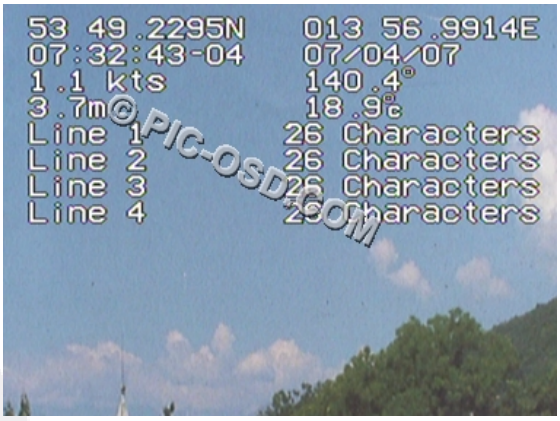
The video in and video out connections should be made before powering the system up. The unit requires a 9 - 12V DC regulated power supply connected via the 2.1mm power connector on the unit's front panel. The unit has a simple on / off power switch. There is no internal battery compartment. The active antenna supplied with GPSBOXKBDPLUS should be attached to the connector on the front panel of the enclosure. The antenna should be situated in a location with a relatively clear view of the sky. If testing the unit indoors this should be at least a window sill, preferably south facing. Optimal accuracy will result from the antenna being placed with a clear 360° view of the sky. Avoid mounting the units close to potential sources of electrical interference such as engine ignition coils, alternators or radio transmitters.

When required a PS/2 compatible USB keyboard should be connected to the socket on the front panel of the enclosure. The unit will only operate with standard USB keyboards that have PS/2 functionality. It will not operate with a USB only keyboard which requires PC operating system support. The keyboard is only required to set the screen display format and text. It is not needed for the GPS display function once the desired display has been set. The keyboard should be removed when not in use. If the keyboard is left connected when the unit is powered off, random characters can be generated which may disrupt the display set up.

The GPSBOXKBD-XDT unit is designed to be used with an external GPS receiver (GPSR). The unit is compatible with any GPSR that transmits GPS data according to the NMEA 0183 standard RS232 serial data format at 4800 baud, 8 data bits, no parity, 1 stop bit with a once per second update rate. The GPSR's PC data cable should be connected to the upper, male DB9 serial connector labelled GPS in. Before connecting your GPSR to the unit please ensure that it has been correctly set up to transmit NMEA data. If you are doing this for the first time refer to the GPSR manufacturers instructions for the method to select NMEA output. If in any doubt we recommend that you connect your GPSR to a PC and open a PC terminal window, settings as above, and check the output data format. The table below shows the NMEA data sentences required. You may need to individually select the output of each sentence or a number of data sentences may be transmitted by your receiver once NMEA output is enabled. The GPSBOXKBD-XDT unit requires the $XXRMC data sentence to generate the display of position, time, date, speed, and heading. The $XXVTG data sentence is optionally required to display the speed in kilometres per hour. The unit ignores all other data sentences so it is recommended that all other NMEA data sentences are disabled.

Copyright © PIC-OSD.COM The BlackBoxCamera™ Co. Ltd. 2023 All rights reserved

GPS data row 1	LATITUDE	LONGITUDE	**NMEA data sentences required by GPSBOXKBD-XDT**
GPS data row 2	TIME	DATE	$GPRMC,123358,A,5130.2473,N,00004.5788,W,13.902,24.1,010506,2.6,W*73
GPS data row 3	SPEED	HEADING	$GPVTG,24.1,T,26.7,M,13.902,N,25.746,K*41
GPS data row 4	DEPTH	TEMPERATURE	$XXDBS,35.7,f,10.9,M,5.9,F or $XXDBT,25.9,f,7.9,M,4.3,F or $XXDPT,7.9,3.0
			$XXMTW,14.3,C*02



The output of the depth transducer should be connected to the lower male DB9 connector, labelled AUX. The depth in metres displayed by the GPSBOXKBD-XDT unit is taken, in order of precedence, from either the $XXDBS, $XXDBT or $XXDPT data sentence. The GPSBOXKBD-XDT unit will default to display the depth from the $XXDBS if this is present. If $XXDBS is not present then the depth from $XXDBT will be displayed if this is present, otherwise $XXDPT would be displayed. The water temperature in degrees centigrade is taken from the $XXMTW data sentence if this is present.

Program Operation

The program runs immediately the unit is connected to a power supply and the text display will appear within approximately 5 seconds. Without a video input signal the text display will be shown over a dark grey background video signal generated by the unit. The unit can automatically detect when a camera is connected and the text display will then be shown over the video signal from the camera. If the camera is disconnected the unit will automatically switch back to its internal video signal. The unit can also be set to default to its internal video signal regardless of whether a camera is connected. The unit will automatically detect the video standard, PAL or NTSC, at the time the unit is switched on. It will not detect a change in the video standard while the unit is powered, i.e. you cannot hot swap PAL and NTSC cameras. Disconnect the power, connect the new video input signal and connect the power again to select the new video standard. The font and text size are fixed and cannot be changed.

The video overlay display is composed of two sections, the GPS data and the text block. The GPS data is displayed on four data rows laid out as shown above left. The data on each row is fixed. Each row can be moved to different line positions on the screen display using the keyboard control to configure the display as required.

Initially, before the GPS receiver has a fix, the message “GPS BAD” will be displayed on data row 1. The time and date will be displayed on data row 2. The time and date may be incorrect until the receiver has a fix. Once a fix has been achieved the GPS data rows will be displayed in the positions on the screen previously set. If the GPS position fix is lost the GPS data rows will be cleared and the “GPS BAD” message will be displayed on row 1. The time and date will remain on screen if row 2 is selected for display. The time taken to achieve a fix depends on the placement of the antenna and its resulting the view of the sky, combined with the relative position of the visible satellites together with the time and distance the receiver has moved since the last valid fix. Initialisation of the internal GPS receiver takes approximately 15 seconds, after which the time and date is displayed.

Each of the GPS data rows may be individually hidden or displayed as required using the F9 and F10 commands. See the following keyboard command tables. Hidden rows cannot be on the same line as displayed rows or text. The position of each of the GPS data rows can be independently set using the F11 command. A normal PAL CRT monitor will give 14 line positions for the GPS data rows. An LCD panel monitor which displays close to the full video frame will give 15 line positions. An NTSC system will give 11 or 12 line positions respectively. The position of the display area on the monitor can be controlled with the F3 command. This allows the visible text display to be moved up and down, left or right so that it can be positioned as desired on the monitor. The display position can be restored to its defaults with the F4 command. All GPS settings are stored in the unit.

The time is displayed with a time zone offset from the GPS derived UTC time. Use F7 to select the desired time zone offset between -12 and +12. For example select -04 for EDT or +01 for CET. The time shown on the display will update as you select each offset if valid GPS data is being received. See the keyboard command tables for the commands which set the other GPS parameters.

The date can be displayed in either the DD/MM/YY standard format and the North American MM/DD/YY format. The speed can be displayed in either knots or kilometres per hour. The depth is displayed in metres. The water temperature is displayed in degrees Celsius.

The text block has four lines of text, each of 26 characters, which can be displayed to identify and annotate the video footage. These four lines can be moved together as a block to any line position on the screen. Visible text cannot be placed on the same line position as a hidden GPS data row. The basic operation of the text overlay unit is straightforward. A flashing underscore cursor indicates the current screen position. This cursor can be moved around the text block by the keyboard cursor keys. The cursor will wrap around the text block left and right, top and bottom. If no key is pressed then the cursor will disappear after approximately 2 seconds. While the keyboard is being used the GPS display will pause. The video text overlay unit uses the standard UK keyboard mapping when

Copyright © PIC-OSD.COM The BlackBoxCamera™ Co. Ltd. 2023 All rights reserved

ordered from the UK. Otherwise the standard US English keyboard mapping is used. There is no provision for the keyboard mappings of other countries or languages other than English. The alphanumeric characters in the QWERTY section of the keyboard and the keys of the numeric keypad can be typed directly to the screen as would normally be expected. Each alphabetic character key is normally lowercase. Uppercase characters can be typed by holding down the shift key or pressing the CAPS LOCK key. The keyboard's LED indicators will not be lit by the unit. To exit CAPS LOCK mode press the key again. If the unit remains in uppercase press the ESC key.

To remove a character from the screen use the backspace key. This will replace the character immediately to the left of the current cursor position with a blank space and move the cursor to that position. The Delete key has no function. The Home and End keys move the cursor position to the left and right of the current line of the text block. The Return key moves the cursor to the beginning of the next line.

Each text character can be displayed with a background, blink and / or an invert attribute. These attributes can be set to control how the text characters are displayed using the F1 & F2 keys as shown in keyboard command table 1. Once set each attribute is applied to all characters subsequently typed until the attribute is unset. Each attribute affects each character which is typed while it is set individually. The setting of the text attributes does not affect the background setting for the GPS data rows which is controlled via F12.

The video text overlay unit operates in two modes. In the first mode the text is overlaid over the video input signal. When the video signal is removed the unit automatically switches to generating its own internal dark grey background video signal and will switch back to the external video when this is reconnected. In the second mode the unit generates its own video signal internally, but ignores the external video signal. All keyboard commands operate in the same way in both modes. To switch between modes use the F1 key as shown in the command table 1.

Keyboard Command Tables

Before using the SHIFT⇑, CTRL or ALT control keys, press the ESC key to clear any previous setting. When using the SHIFT⇑, CTRL or ALT control keys in conjunction with the alphabetic or the function keys the control key must be pressed and held first, then the required alphabetic or function key must be pressed and released, before the control key is released. If the SHIFT⇑, CTRL or ALT key is pressed or released simultaneously with another key then the correct control function may not be recognised by the unit. If you find that the unit behaves as if one of the SHIFT⇑, CTRL or ALT control keys were still being pressed, use the ESC key to clear the previous setting.

CTRL	F1	Set internal video mode
ALT	F1	Set external video mode
SHIFT	F1	Turn the text background setting off
	F1	Turn the text background setting on
CTRL	F2	Turn the text invert setting off
ALT	F2	Turn the text invert setting on
SHIFT	F2	Turn the text blink setting off
	F2	Turn the text blink setting on
CTRL	F3	Shift display down
ALT	F3	Shift display up
SHIFT	F3	Shift display left
	F3	Shift display right
CTRL	F4	Unused
ALT	F4	Unused
SHIFT	F4	Unused
	F4	Reset display X - Y position

Keyboard Command Table 1.

CTRL	F5	Set default layout 4
ALT	F5	Set default layout 3
SHIFT	F5	Set default layout 2
	F5	Set default layout 1
CTRL	F6	Hide the text lines
ALT	F6	Clear the text lines
SHIFT	F6	Display the text lines
	F6	Move text lines down 1 line
CTRL	F7	Display speed as knots
ALT	F7	Display speed as kph
SHIFT	F7	Unused
	F7	Advance UTC time zone offset
CTRL	F8	Unused
ALT	F8	Unused
SHIFT	F8	Display Date as DD/MM/YY
	F8	Display Date as MM/DD/YY

Keyboard Command Table 2.

CTRL	F9	Display GPS data row 4
ALT	F9	Display GPS data row 3
SHIFT	F9	Display GPS data row 2
	F9	Display GPS data row 1
CTRL	F10	Hide GPS data row 4
ALT	F10	Hide GPS data row 3
SHIFT	F10	Hide GPS data row 2
	F10	Hide GPS data row 1
CTRL	F11	Move GPS data row 4 down
ALT	F11	Move GPS data row 3 down
SHIFT	F11	Move GPS data row 2 down
	F11	Move GPS data row 1 down
CTRL	F12	Unused
ALT	F12	Hide all GPS data rows
SHIFT	F12	Display all GPS data rows
	F12	Toggle GPS data row background
	ESC	Clear SHIFT, CTRL, ALT and CAPS settings

Keyboard Command Table 3.

Copyright © PIC-OSD.COM The BlackBoxCamera™ Co. Ltd. 2023 All rights reserved

Display set up Example

Please note that the example shown below refers to the data display of the GPSBOXKBD units which arrange the data on the GPS data rows differently and do not include depth. However the basic functionality is identical. The unit is delivered with default GPS data row layout 1 selected as shown below, top left. To change to any of the other default data row layouts use F5.

The four default GPS data layouts can be selected with F5

To set the position of the text block use F6 to move the block down the screen, below top left. The block position will wrap to the top of the screen when the bottom is reached. In this example we want our text on the bottom of the screen so we edit the last line of the text block. The remainder of the text is erased using the backspace key, below top right. We want the latitude and longitude on the next line from the bottom so we use F11 to move GPS data row 1 down to this position. Then use SHIFT+F11 to move GPS data row 2, time and date, down to the third line from the bottom of the screen, below bottom left. We do not require the altitude or heading so we use ALT+F10 to hide GPS data row 3. To place the speed on the top line of the screen, below bottom right, we use CTLR+F11 to move GPS data row 4 down the screen until it wraps to the top of the screen. When the GPS data row passes through the position of the text line the text will disappear as the text block is not automatically refreshed. To display the text again use SHIFT+F6. Visible text cannot be placed on the same line position as a hidden GPS data row.

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 Ltd. 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 Ltd. 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.

The BlackBoxCamera™ Company Limited, Office 126, 275 New North Road, London, N1 7AA, UK
Phone: 0844 504 7934 Fax: 0844 504 7935 EMAIL: sales@pic-osd.com www.pic-osd.com

Copyright © PIC-OSD.COM The BlackBoxCamera™ Co. Ltd. 2023 All rights reserved