XCS Inc.

Programmable

Digital Level PLUS

User Manual

3/09 (REV. D)

XTENDED CAMERA SUPPORT INC., 3976 CROSSRIDGE COURT, THOUSAND OAKS. CA 91360

WARNING AND PRECAUTIONS

PLEASE READ BEFORE USING THIS PRODUCT

THIS IS A PRECISION ELECTRONIC INSTRUMENT

It is designed to be rugged and weather resistant, but can be damaged or cause injury if not used properly. Observe the following precautions to maximize the useful life of the Programmable Digital Level.

* This sensor has a maximum mechanical shock rating of 200 G's and can likely withstand more. However, this unit is not intended for High-shock or High vibration applications.
* Do not drop this instrument.
* Do not immerse in water.
* Do not try to remove this instrument from its housing.
* Do not plug into any power source higher than 17 Vdc without the extended range option.
* Do not connect to any Alternating Current (AC) power.
* Do not use in location subject to hazardous gases or explosive gases.
* Do not use caustic solvents or abrasive cleaners on any part of the aluminum case.
* The P.D.L. is not waterproof. However it is designed to be used outdoors and in damp environments. Be sure to observe proper electrical safety precautions in damp environments.
* There are no user serviceable parts inside.
* We do not recommend the total wire length from sled to monitor to exceed 30" in length.
* If mounting the P.D.L. with alternative brackets other than what XCS Inc. provides, you must seal all open screw holes.

Warranty

Read this information before using your
Programmable Digital Level

Xtended Camera Support, Inc. will warranty this product for a period of one year from the original date of purchase in its original form.

No unauthorized modification of this product is permitted. This includes case, cables, and wire length. Any unauthorized service or repairs will void all warranties stated or implied. Buyer will be responsible for all shipping costs for service and warranty repairs. All products being returned to XCS must have an authorization number (RMA#). We can be reached at 805.531.0014 or www.xcsinc.com

Shipping address: Xtended Camera Support, Inc.
3976 Crossridge Court
Thousand Oaks, CA 91360
U.S.A.

STANDARD FEATURES

The Programmable Digital Level Plus is an easy to use microprocessor controlled sensor that produces a visual display. Like all our monitor display products it works with NTSC and PAL video formats with no user adjustments. The microprocessor automatically recognizes the signal input and adjusts to that format.

We use four pushbuttons labeled, **ZERO, SELECT, UP, DOWN**. With the aid of on screen text this allows the user to control all the functions of the P.D.L.

All settings of the P.D.L. are stored into nonvolatile memory. This allows the user to store all their choices of visual display, response rate, visual intensity, size, level sensitivity, position, black box, and tilt for both NTSC & PAL formats. You can change over to another visual **STYLE**, program your settings then revert back to previous **STYLE** and all functions will originally remain as you had left them.

Like all our products, we understand that lower power consumption is very important. This unit consumes 0.03 amps when a visual signal is present, and 0.01 when your video signal is absent.

Weight of this product is 3.3 ounces not including connectors

Connectors marked **SLED** and **MONITOR**, provide power and video to the P.D.L. from the sled, then through the P.D.L. to your monitor. *There must be a video signal present for the level to work.* You have the option of choosing the connector style and cable length at time of purchase. Any connector changes not done by XCS Inc. will void all warranties.

<u>Standard Features</u>
New digital chip sensor
High efficient 11-30 Vdc operation
Connects between the sled and monitor without any custom cables
Automatic signal recognition and setup for NTSC/PAL video
Non-linear scaling allows 8 times more range than linear level scales
All user settings are stored in nonvolatile memory
On screen text reinforcement of all adjustments
One touch re**ZERO**ing at any angle
Reverse polarity protected
4 pushbutton user controls:

ZERO	zeros (recenters) current position of the level
SELECT	scrolls through multiple user programmable **Menu** page
UP	adjusts **UP** or scrolls through your **SELECT**able settings
DOWN	adjusts **DOWN** scrolls through your **SELECT**able settings

USER SELECTABLE SETTINGS

Turning your P.D.L. Plus on for the first time.

Your level is shipped in the ON position.

Assuming it's plugged in and you have a correct video signal and power to the unit. Press the **SELECT** button scrolling through the menu pages until the on screen text box says **LEVEL** on the top line of your monitor screen text box. If the level image is not present on the monitor screen toggle the **UP & DOWN** arrows, until the bottom text says **LEVEL ON**. You will have 4 seconds before the microprocessor times out. If you are not finished programming that page simply press the **SELECT** button and the last edited page will appear on screen. With the level turned ON you are ready to program your menu pages.

The **ZERO & SELECT** buttons are always active. Meaning anytime you wish to re**ZERO** your level, simply press the **ZERO** button, hold down for two seconds, on screen text tells you **ZERO WAIT** when memorized it will say **ZERO SET**.

Anytime you wish to scroll through the menu pages press the **SELECT** button.

The **UP & DOWN** buttons are active only when the **SELECT** button has been pressed first. The reason for this is you only need activation of these controls when you are editing your software. By automatically turning off the **UP & DOWN** buttons you will not accidentally change your settings.

By pressing the **SELECT** button your on screen text will appear. This will now allow you to edit your software (all push buttons are now active). The top line of the text box shows what page you will be editing; the bottom shows the current programmed setting of that page.

By pressing the **UP** or **DOWN** button, you can change the current setting of the page.

EXAMPLE: You want to move your visual display position higher on the screen.

With the level turned on, press the **SELECT** button. The on screen text box will appear. Press the button again until the **MOVE** page appears in the text box.

Then use your **UP** or **DOWN** buttons to move the displayed image across the screen.

The settings will be memorized automatically after 4 seconds (text box will disappear) or press the **SELECT** button to edit another page.

AVAILABLE SETTINGS

SELECT (on screen displays).	**UP/DOWN** (on screen text displays).
EDIT (LEVEL or +HAIR)	**LEVEL / +HAIR** (CROSS HAIR)
LEVEL	**ON / OFF**
RANGE	**+/- 1,2,3,4,8,16 = +/- 16,32,64,90**
REACT	**SNAIL / SLOW / MID / FAST / HYPER**
STYLE	**1 / 2 / 3 / 4**
SIZE	**SMALL / MED / LARGE / XL**
MOVE	**UP / DOWN**
BRITE	**LO / MID / HI / MAX**
ZERO	**HMODE / LMODE / OTHER**
SWEEP	**L TO R / R TO L**
BLACK	**OFF / HALF / FULL**
TILT	**ON / OFF**

Editing the Crosshair

To edit the **+ HAIR**, simply go to the start of the menu list where the on screen text box says, **EDIT** on the top line and **LEVEL** or **+ HAIR** on the bottom line.
Press **UP** or **DOWN** arrow until it says **+ HAIR** in the lower half of the text box. You are now in the **+ HAIR**'s editable pages. Here is a list of your editable **+ HAIR** menu pages and on screen text. Use your **SELECT** button to select your editable page, and your **UP/ DOWN** buttons to select your user programmable settings for that page.

SELECT (On screen text displays).	**UP / DOWN** (On screen text displays).
+ HAIR	**ON / OFF**
+ MOVE	**L**eft **TO R**ight
+ MOVE	**UP / DOWN ARROWS**
+ SIZE	**XL / LARGE / MED / SMALL**
+ LOOK	**WHITE / ZEBRA / BLACK**

When in the **+ HAIR** pages, the on screen text will always display a small **+** in the lower half of the text box. This is there to help you remember that you are editing the **+ HAIR** menu.

At anytime to exit the **+ HAIR** menu and go back to the **LEVEL** edit mode, simple press the **SELECT** button until the text box appears and says **EDIT/+ HAIR**, press either the **UP or DOWN** button and the text box will say **EDIT/LEVEL**. You are now in the **LEVEL** menu.

This **+ HAIR** was designed to cover the entire video field left to right on your screen. But only 40% of the screen top to bottom.

The **+ HAIR** will also not function when you are using a vertical level display. The **+ HAIR** will automatically turn itself off, and turn on again and display the **+ HAIR** when you go back to a horizontal level display.

Remember, the Programmable Digital Level must have a video signal fed through it in order to operate. Do not bypass the level with your video signal.

MOUNTING YOUR LEVEL

The Programmable Digital Level was designed to be mounted on either the left or right side of your sled, allowing the user to keep all controls in the same orientation.

It is important to note the **UP/FORWARD** designation on the front of the P.D.L. When mounting the level it needs to be mounted with the arrow in the **UP SLED** and **MONITOR** cables to come out the front of the level. If you mount it in reverse, and your cables come out the back of the level, you would simply change your **SWEEP** direction in the **SELECT**able user settings.

When mounting the **P.D.L.** remember to place the sensor as close to the center point of the post as you can. This will give you the most accurate readings. The removable sticker on the **P.D.L.**'s case indicates the location of the sensor inside. This will help you with your alignment.

Please do not mount your level in front or out on the monitor. The further away from the center of the center post the more inaccurate your readings will become. In fact if you like to prove this theory to yourself you can temporally attach it out on the monitor. And move around, pan/tilt your level will be reading inertial forces induced into it and not level readings. So you maybe perfectly level but your level will show you are not. This is true for all current level designs.

If you're not an **XCS Ultimate Sled** owner here are a few mounting options.

PRO SYSTEM OWNERS

Pro version 1. The **P.D.L.** has two 4-40 screw holes through the case. These through holes are used to firmly mount the **P.D.L.** to the sled. Pro 1 sled owners can remove any two of the six 4-40 screws that hold the battery contacts in on either the left or right side. Insert the two screws provided with the **P.D.L.** through the level into the side of the sled. Plug in Lemo connectors into the sled and monitor.

Pro 2 sled owners have two options.

Option 1 is to purchase an adaptor bracket to mount the **P.D.L.** on the sled.

Option 2 is to have two holes drilled and tapped using the 4-40 screws provided.

MASTER SERIES OWNERS

The **P.D.L.** has two 4-40 screw holes through the case.
You will need the **optional K section adaptor dovetail**.

This is a 1.5" diameter circle .3125" plate. You need only to slide the K section dovetail onto your existing dovetail plate. It fits both on the left or right side of your lower junction box. Tighten down 4-40 cup point screws provided with the adaptor plate, then insert the two 4-40 screws provided through the level and into the adaptor plate. Plug in the connectors to the sled and monitor.

SATCHLER OWNERS

Two 4-40 screw holes are provided on sled.

III, IIIA, EFP OWNERS

Two holes will have to be drilled and tapped using the 4-40 screws provided.

DESCRIPTION OF PUSHBUTTON FUNCTIONS

Four push buttons control all the **P.D.L.**'s functions. The **ZERO & SELECT** buttons are always functional when the level is turned on. To edit any of the levels pages you must first press the **SELECT** button. When this is done a box will appear on screen with two lines of text. The top line displays the current page you are editing.
*Example: if you press the **SELECT** button, the top line may say **RANGE** or **TILT**.*

Scroll through the menu pages by repeatedly pressing the **SELECT** button until you come to your page. You will see the top line of the on screen display showing the current page you have selected.

The second line of the display shows you the current setting of that page.
*Example: You have selected the page labeled **RANGE**; you now wish to set the sensitivity range of the level.*

Currently the screen says **RANGE** on the top line, and **+/-16** on the second line. You wish to set the sensitivity to **+/- 2** degrees. Simply press the **UP or DOWN** button until the screen display shows the setting you wish. The setting will automatically be stored into nonvolatile memory when the text box disappears in 4 seconds, or if you press the **SELECT** button again to edit another page.

To go back to your last page, simply press the **SELECT** button and it will appear on screen, showing its current settings.

Easy way to remember the buttons.

The **ZERO** button re**ZERO**'s your level at any angle and is always operational.

SELECT button scrolls you through the menu pages that can be edited.
The text box must be on screen to edit any of the pages.

UP & DOWN buttons scrolls you through the available settings for that menu page.

4 Pushbutton controls: Zero, Select, Up, Down.

ZERO: The **ZERO**ing process requires the **ZERO** pushbutton to be pressed and held in for about 2 seconds. This is a safety feature to prevent accidental resetting. By pressing the **ZERO** button, immediately a message will appear on screen saying **ZERO WAIT**, after 2 seconds of being depressed, the message will say **ZERO SET**, the bubble will align to the center tick mark. If the button is released before the **ZERO SET** message appears, nothing will happen. The **ZERO**ing button is functional at all times.

SELECT: The **SELECT** pushbutton scrolls through a list of user controls (pages). With each press of the button, your on screen text box will display the current selected menu page on the top line.
*Example: the top line may read – **RANGE, TILT, MOVE, REACT**.*
The bottom message line shows the current setting for this page.

UP / DOWN: Allows you to control the setting available on the **SELECT**ed page when the visual text box is on screen.

User Selectable MENU pages and Programmable Settings:
LEVEL:ON / OFF. Pressing the **UP** or **DOWN** button turns the level on/off.

RANGE: **+/- 1,2,4,8,16** degrees. Each press of the **UP** or **DOWN** button scrolls you to the next setting up to **+/- 16** degrees. It does not roll over to **+/- 1**. You must use the **DOWN** button.

BRITE: LO / MID / HI / MAX. Each press of the **UP** or **DOWN** button sets the next higher or lower setting of video brightness. The four settings **LO / MED / HIGH / MAX**, correspond approximately to 50 / 100 / 150 / 200 percent of the current white level. This is here to boost the levels visual intensity through the border intensity control on the DUO DIGITAL FRAME LINER.

SIZE: **SMALL / MED / LARGE / XL.** Using the **UP / DOWN** buttons allows you to adjust the bubble levels visual size.

MOVE: UP / DOWN. When in a horizontal level display, allows you to move the level over the entire video field. When in a vertical level display, allows you to move the level left and right over the entire field.

ZERO: HMODE, LMODE, OTHER. There are three levels of programmable memory. Every time you press the re**ZERO**ing button, your level setting has been stored on one of your selected levels of memory – **HMODE, LMODE,** or **OTHER**. You choose which memory level you wish to store your level setting on. If you wish to store a level setting on a specific memory level, use the up and down push buttons to bring up the memory level you wish to save it in **HMODE, LMODE,** or **OTHER**, a text box will appear on your monitor screen. Press the re**ZERO**ing button. In approximately 2 seconds the text box will say **ZERO SET**. To bring back a stored level setting, simply use the up or down buttons to bring up the memory level you previously saved. The level will automatically bring up that stored setting. You do not have to press the re**ZERO**ing button. Do not forget to change the sweep direction when you go from high mode to low mode or your level direction will be reversed.

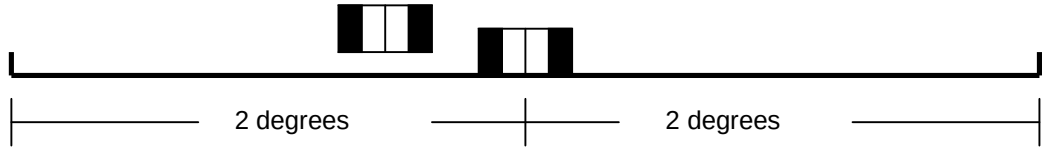
SWEEP: **L ____ R / R ____ L.** Toggling the **UP / DOWN** buttons results in the reversal of the on screen levels bubble orientation between left & right, and right & left. Selecting the **R ____ L** re-establishes to proper orientation for both the bubbles travel and the bubbles **TILT** orientation.
In low mode you can reverse your sweep direction from high mode. This will maintain the proper bubble orientation.

REACT: **SNAIL / SLOW / MID / FAST / HYPER.** Using the **UP / DOWN** buttons you can adjust the bubble levels rate of response time to off axis movements. Using this dampening control in conjunction with the **RANGE** control, you will be able to find a nice physical & visual response of the level for yourself.

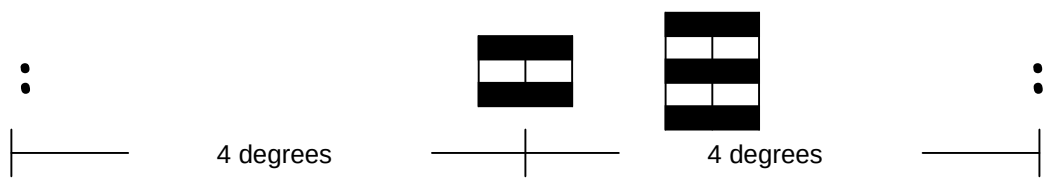
STYLE:1 / 2 / 3 / 4. Use the **UP / DOWN** buttons to choose between four different visual display styles. Two horizontal, and two vertical displays. On the horizontal displays, you will notice one center point (middle point or **ZERO**ed) and tick marks at the end of the visual display. These tic marks represent the +/- **RANGE** setting of the level. The bubble will travel beyond these marks, up to +/- 90 degrees from center. The tic marks represent your programmed **RANGE** setting **+/- 1, 2, 4, 8, 16** degrees. This is a great benefit of nonlinear software designing. Larger sensitivity range 5-8 more sensitivity range than other linear level designs.

Example:

Visual **STYLE** 1
You have programmed the **RANGE** to be set at +/-2 degrees.

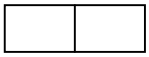


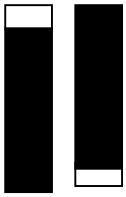
Visual **STYLE** 2



Visual **STYLE** 3 & 4
STYLE 3 & 4 are vertical level styles.
Range setting at +/-4 degrees.

The vertical level indicator has no tic marks. You cannot **BLACK** or **TILT** the visual indicator. It produces its own black box as it stretches out to visually show you're off level. If you are perfectly level, the indicator will look like a white rectangular box. If you go off level, it will stretch into a black rectangular box with white indicators going in opposite directions.

Level: 

Off level: 

BLACK: **OFF / HALF / FULL.** The **BLACK** function turns on / off a black background behind the level. It can be set to **HALF**, which is just the bubble height and length of the indicator. **FULL** which is the bubble, grid & length of the indicator across the screen. This allows an extremely high degree of viewability with a low level of (**BRITE**) intensity.

TILT: **ON / OFF.** Pressing **UP** or **DOWN** button results in toggling **ON / OFF** of the bubble tilting feature. When **ON** a tilted bubble gives a definitive indication of the sled deviation from true vertical. This may be helpful in the operator response time representing the orientation of the sled position and their need to tilt back in the other direction to bring it back to level.

EDIT: **LEVEL / +HAIR.** Pressing the **UP** or **DOWN** button allows you to choose between editing the **LEVEL** menu pages or the **+HAIR** (crosshair) menus pages.

Hidden Features:

At any time when the level is on, press and hold the **UP** button down. Then, while pressing on the **UP** button, press the **SELECT** button. An on screen display will appear showing the Programmable Digital Level's serial number (#0000), and the current firmware "REV C".

This is a great safety feature that we started on the TB-6. This will allow anyone to track a stolen piece of equipment. The serial number cannot be removed, and have the unit still function.

Your level and your monitor, if you're already a TB-6 owner, are reverse polarity protected. We have incorporated a self-resetting fuse.

PERFORMANCE SPECIFICATIONS

Range: Visual goal posts	+/- 1, 2, 4, 8, 16 degrees.
Range: Limits	+/- 90 degrees.
Nominal Accuracy: At 1 degree	0.03 degrees.
Power: Nominal	12 Vdc
Minimum / maximum	9.8 / 28.0 Vdc.
Current draw:	30 mA under nominal conditions.
	10 mA with no video input.
Fuse:	Self-resetting fuse, diode protected for reverse polarity.

Physical

Size:	2.7" W x 2.7" H x .8125" D.
Enclosure:	Aluminum, black hard coated finish.
Weight:	3.3 ounces connectors.
Video:	NTSC / PAL automatic signal recognition and setup.
	All settings are memorized separately for NTSC and PAL.
Video Input:	Composite video 1v Peak to Peak / 75 ohm

Programmable Digital Level Wire Colors and Definitions

Wire color	Signal
Black	Ground
Red	Power +12 VDC
Orange	Video signal
Yellow	Video ground
Green ,Blue, Violet, White	Not connected

Resetting your PDL to Factory settings.

If your level has stopped working and you are not seeing the level display but are seeing the video image, your level microprocessor may have browned out (frozen). You may be able to bring it back to life by a quick factory reset.

1) With all power turned off, press and hold down the **UP** pushbutton on the PDL. You must continue to hold down the **UP** button throughout the process.
2) With a video signal present power up your system. In approximately 15 seconds your PDL's level sensor will reset and turn itself back on. At this time you can release the **UP** pushbutton. Reset of the level is complete.

To view your PDL's serial number at anytime when a video signal is present. Press and hold down the **SELECT** & **UP** pushbuttons simultaneously. The serial number will appear on screen.

By-passing of the PDL's 75-ohm resistor

Under all normal circumstances the PDL's internal resistor should never be by-passed. **Unfortunately** if you have purchased a sled design that does not comply with video industry standards which is every sled made except XCS and Tiffen designs, and are over loading your video signal terminating. Every piece of equipment plugged into your video system will suffer. If your system is one that does not comply with video industry standards, and your level is not locking up (unstable on screen PDL image display) instead it appears to be jumping because the lack of a video sync pulse or low sync pulse. You can remove the levels internal jumper and by pass the 75-Ohm resistor.
This may help your unbalance video system, and stabilize your PDL. The follow image will show you how. Simply remove the PDL's cover and place the jumper on ONE of the contacts instead of on both of the contacts.