INDI-PSD

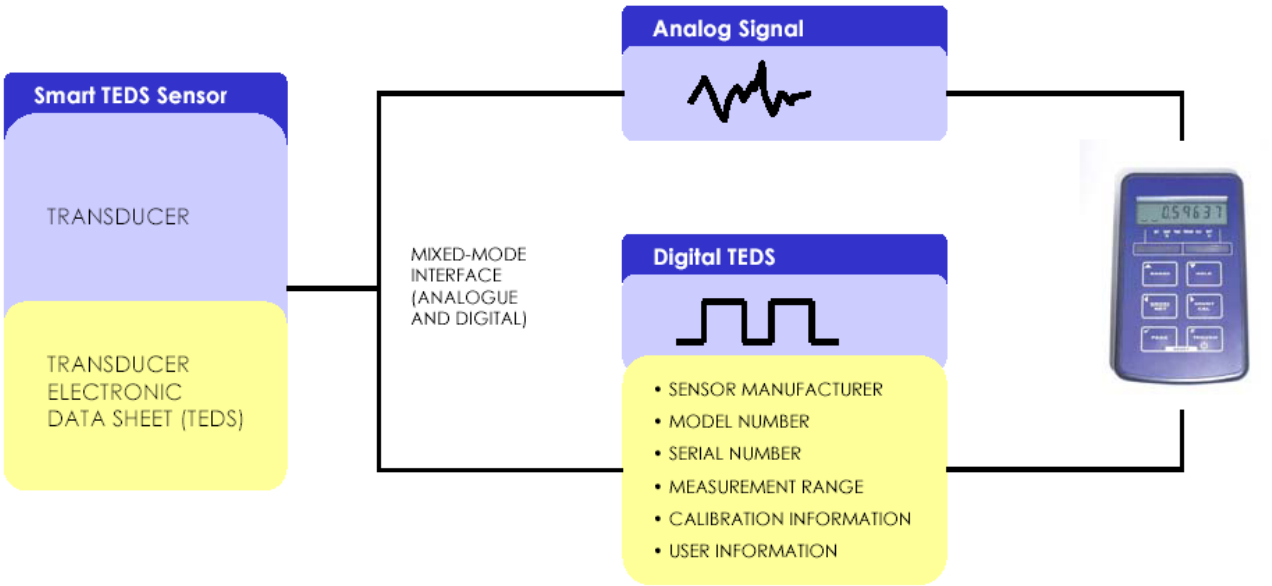
STRAIN GAUGE OR LOAD CELL HAND HELD DISPLAY
TEDs Enabled

1. WHAT IS TEDS?

"Plug and play sensor hardware and software make configuring a smart TEDS sensor as easy as plugging a mouse into a PC. The technology has greatly improved efficiency and productivity by completely eliminating manual sensor configuration."

1.1. Basic concept

TEDS is at the heart of the new universally accepted IEEE 1451.4 standard for delivering Plug and Play capabilities to analogue measurement and test instruments. In essence, information in a Transducer Electronic Data Sheet provides interfacing devices with the critical sensor calibration information in order to perform accurate and precise measurements every time.
TEDS works in a similar way in which USB computer peripherals immediately work as they are connected.
TEDS enabled equipment maybe swapped and changed without recalibration, saving time and money.
TEDS holds information such as a sensor manufacturer, model and serial numbers, and more importantly all the calibration settings determined by the manufacturer.



1.2. How it works

Plug and play is a data acquisition technology that can simplify the configuration of automated measuring systems by making a sensor's unique identification data available electronically. As implemented according to IEEE P1451.4, data in the form of a transducer electronic data sheet (TEDS) is burned on an electrically erasable programmable read-only memory (EEPROM) chip located on the sensor, so when a properly adapted signal conditioner interrogates the sensor, it can interpret the self identification data.
This technology provides a great benefit by eliminating the need for paper calibration sheets. In addition, it can simplify labeling and cabling problems, as well as inventory control issues; by letting you burn location data onto the chip when installing a sensor. And because all sensors produced according to the standard will carry the same basic identically formatted self-identification information, you will be able to mix and match sensors and applicable signal conditioners across manufacturers.

1.3. Advantages

Plug and play sensors are revolutionizing measurement and automation. With Transducer Electronic Data Sheets (TEDS), your data acquisition system can detect and automatically configure sensors. This technology provides:

- Reduced configuration time by eliminating manual data entry
- Better sensor tracking by storing data sheets electronically
- Improved accuracy by providing detailed calibration information
- Simplified asset management by eliminating paper data sheets
- Reliable sensor location by identifying individual sensors electronically

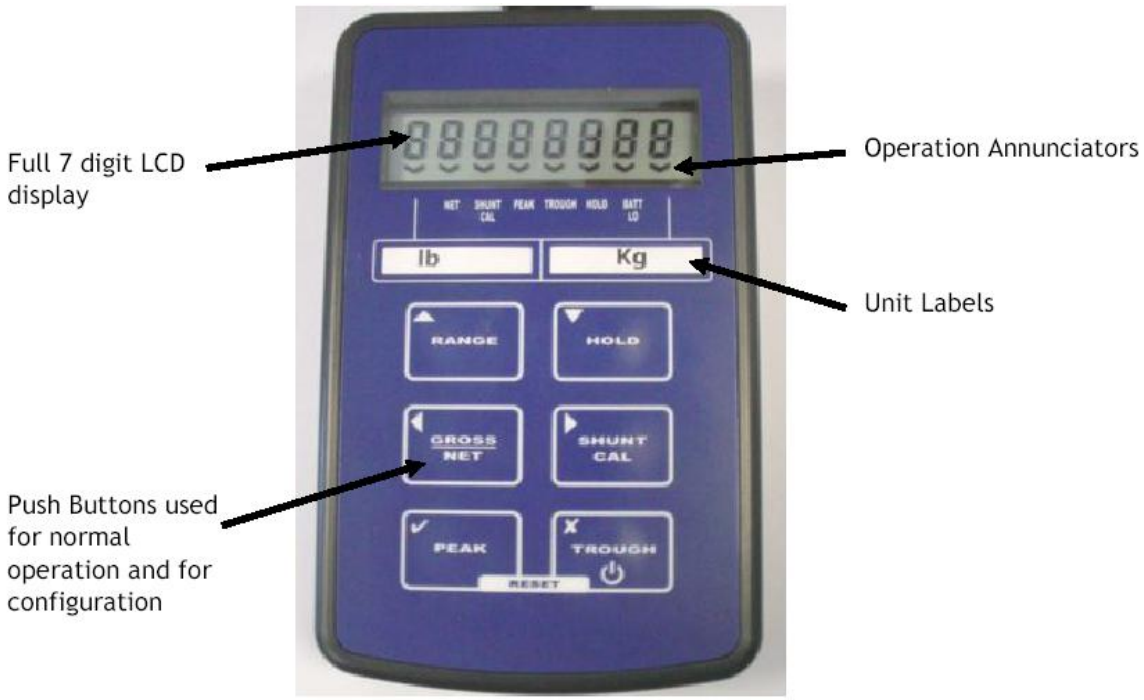
2. INTRODUCTION

The INDI-PSD Portable Strain Display Load Cell/Force transducer readout is a microprocessor based portable instrument designed to interface with any full bridge sensor with an output sensitivity of up to 50mV/V. Bridge resistances from 85Ω upwards can be used with the INDI-PSD.
Configuration and calibration of the INDI-PSD is achieved using the front panel push buttons to navigate through a very simple menu structure.
User functions available on the INDI-PSD include:

- Range Selection
- Display Hold/Freeze
- Gross/Net indication selection
- Peak Hold selection
- Trough Hold selection
- Shunt Cal check

The INDI-PSD is powered by two internal non-rechargeable AA alkaline batteries. There is an option to have rechargeable alkaline batteries, which can be charged without the need for removing them from the INDI-PSD.

3. USER OPERATION

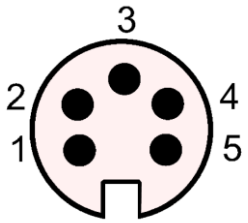


3.1. Electrical Connection Information

3.1.1. Sensor connections

The standard sensor connection is a 5 pin 723 series Binder connector.

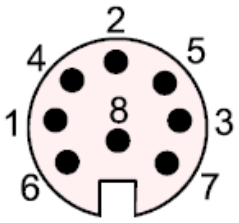
PIN 1	+ Excitation	Brown wire
PIN 2	- Excitation – TEDS Common	Yellow wire
PIN 3	+ Signal	Green wire
PIN 4	- Signal	White wire
PIN 5	TEDS	Pink wire



3.1.2. RS232 Port Connections

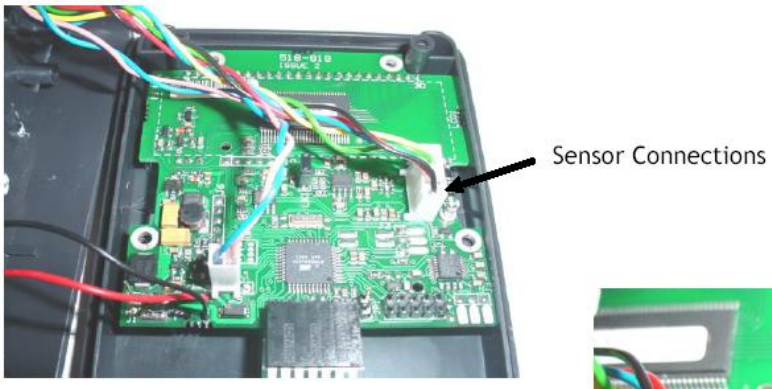
If the INDI-PSD has been ordered with the optional RS232 output, then this will be available via a 7 pin 723 series Binder connector. The wiring for this is as detailed below:

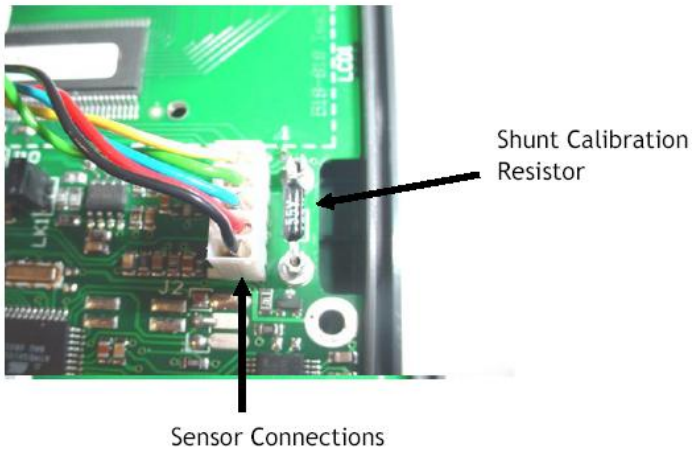
PIN 1	Tx
PIN 2	Rx
PIN 3	Gnd

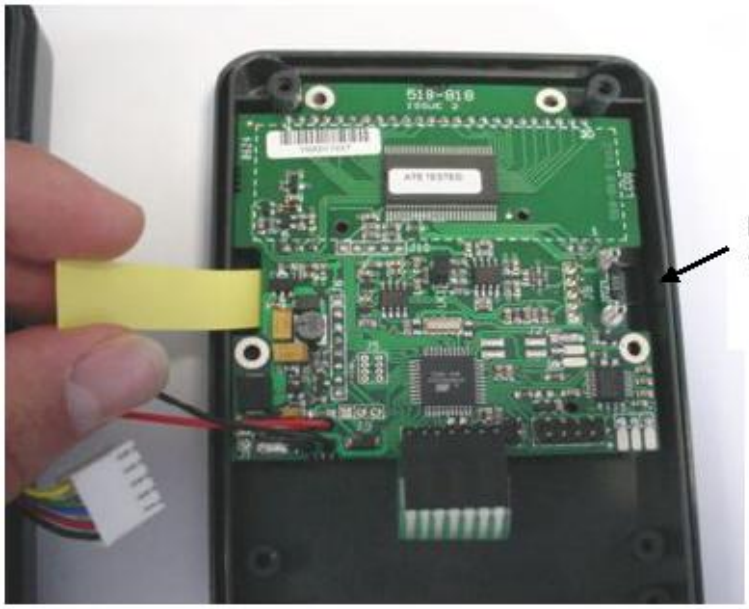


3.1.3. Internal Connections

It may be necessary from time to time to know what the internal connections are. For example, if you disturb some of the connections whilst trying to insert the range legends, or if you need to change the internal shunt calibration resistor. These are shown below for reference only:







3.1.4. Buttons

There are six push buttons on the front panel of the INDI-PSD, which are available for use in normal operation. The display can be: the instantaneous, peak or trough values. It is also possible to hold the display value (this only operates when not in peak or trough mode). The display update rate, decimal point position and resolution can be set to suit. The INDI-PSD has two independent ranges. All values set in one range are totally independent from the other.

BUTTONS	FUNCTION OF BUTTON IN NORMAL OPERATION MODE
TROUGH ⏻	To switch the INDI-PSD ON or OFF press and hold the ⏻ button for 3 seconds. It is also possible to set an Auto-off value in the configuration menu.
RANGE	The **RANGE** button allows the user to toggle between two independent scales. The range that has been selected is highlighted by an annunciator. Each range has totally independent setups, in the calibration menu and configuration menu. If using **TEDS**, only one range can be used.
HOLD	The **HOLD** button allows you to hold/freeze the current display value when the button is pressed. Pressing the **HOLD** button again releases the display. The HOLD annunciator is illuminated when in the **HOLD** mode, and the display will flash, to alarm further that the user is not viewing instantaneous display values. The **HOLD** mode is not available in **PEAK** or **TROUGH** mode.
GROSS NET	The **GROSS/NET** button, when pressed, allows the user to toggle between displaying the **Gross** or **Net** display values. This can be useful in many applications where it is necessary to display the change in display value from a certain part of the measurement range. When in **NET** mode the **NET** annunciator is lit. When in **GROSS** mode, it's not.

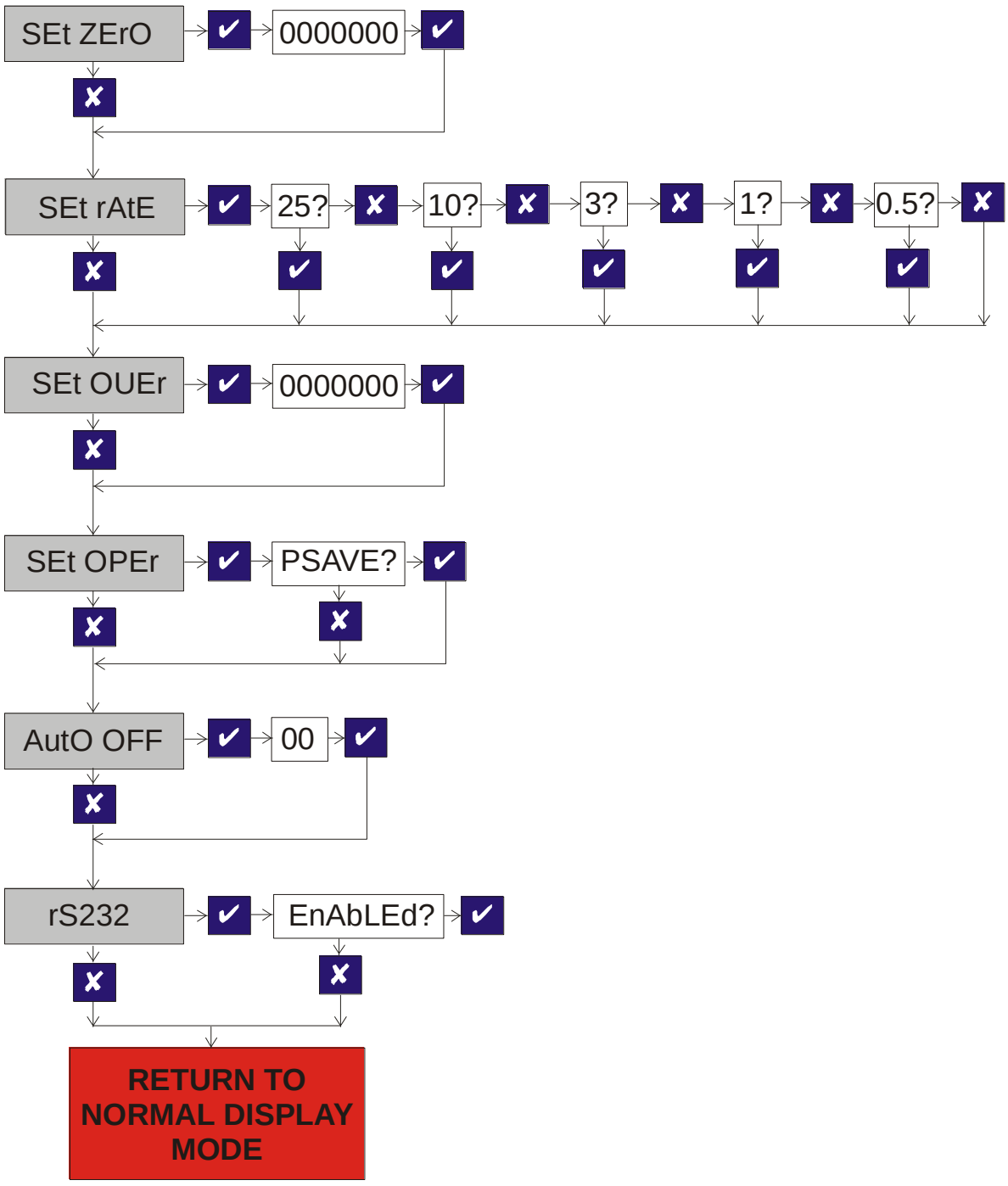
BUTTONS	FUNCTION OF BUTTON IN NORMAL OPERATION MODE
	The **SHUNT CAL** button allows the user to press this at any point in time. The standard unit shunts a 100kΩ resistor across the negative excitation and negative signal connections. If this is performed at the end of the calibration procedure, then a figure can be noted, so the user can check calibration accuracy or connection integrity. The button has to be held down to operate. When held down the **SHUNT CAL** annunciator is lit and the display will flash, to alarm further that the user is not viewing instantaneous display values. The shunt calibration resistor can be changed to suit specific requirements. It is suggested that a 15ppm ±0.1% tolerance resistor is used.
	When the **PEAK** button is pressed the display will show the last Peak reading. To reset the Peak readings press the **PEAK** and **TROUGH** buttons simultaneously. When in **PEAK** mode the **PEAK** annunciator will be lit and the display will flash, to alarm further that the user is not viewing instantaneous display values. To turn off Peak mode press the **PEAK** button.
	When the **TROUGH** button is pressed the display will show the last Trough reading. To reset the Trough readings press the **TROUGH** and **PEAK** buttons simultaneously. When in **TROUGH** mode the **TROUGH** annunciator will be lit and the display will flash, to alarm further that the user is not viewing instantaneous display values. To turn off the Trough mode press the **TROUGH** button

4. MENU STRUCTURE

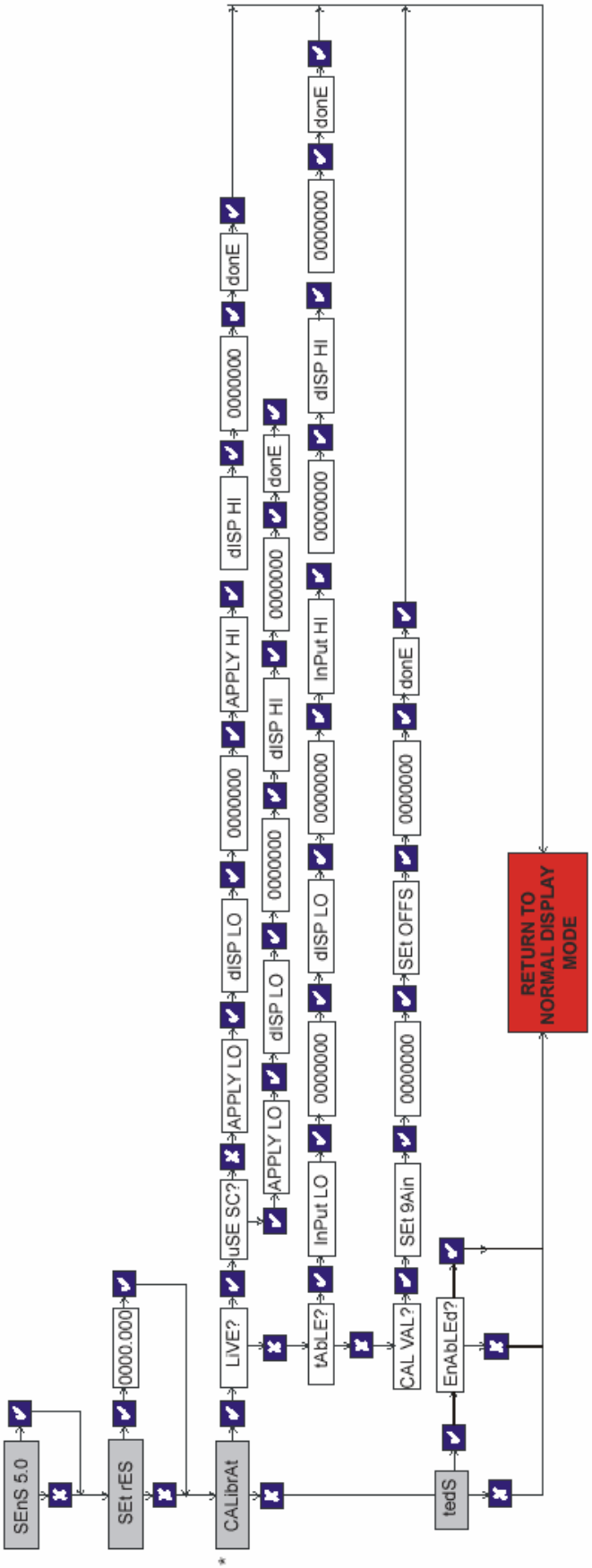
The INDI-PSD has two menus.

- ✓ A configuration menu, which enables the user to tailor the operation to meet a specific application requirement. The values selected in this menu are completely independent for each range.
- ✓ A calibration menu, which is used to calibrate each of the two ranges with independent scales, as well as setting the display resolution for each range.

Configuration menu:



Calibration menu:



5. CONFIGURATION MENU

To enter the configuration menu, press and hold RANGE and GROSS NET buttons for 3 seconds.
To move in this menu, this buttons will be useful:

- Press ✖ to skip to the next menu item.
- Press ✔ to validate a value or a modification and get to the next menu item.
- ◀ and ▶ to select a digit.
- ▲ and ▼ to increase or decrease the value of a digit.

PARAMETER	SET-UP INFORMATION
SEt ZEro	It allows the removal of fixed display offset values from the display, so that the **GROSS** and **NET** features can operate from a zero point. This may also be considered as a manual tare facility. To zero the display, simply enter the value that you wish to subtract from the display. Values between -9999999 and +9999999 can be entered. Set Zero may also be set by pressing **GROSS/NET** and **HOLD** at the same time.
SEt rAtE	This allows the user to set the display update rate, the options available is the update rate of the display in Hz. When you choose to change the update rate you will be prompted whether you want to select 25Hz, if you do not press ✖ you will then be prompted to select any of the other values, which in order, are 10Hz, 3Hz, 1Hz, 0.5Hz. Please note that the 25Hz update is only available in **PEAK** or **TROUGH** mode. When in normal display mode it has been limited to a 3Hz update, as the digit fluctuations are impossible to view with the human eye. The INDI-PSD when it leaves the factory is set at 3Hz.
SEt OUEr	This parameter allows the user to set a visual alarm. The value that is entered is the display value that you want the alarm to activate at. When the alarm is activated the word OUErLOAd appears on the screen. To remove the alarm, the display value must be reduced to a value that is lower than that set in the SEt OUEr parameter Values between -9999999 and +9999999 can be entered. 0000000 disables the alarm.
SEt OPEr	The INDI-PSD has a special power saving mode, which can be enabled or disabled within this parameter, pressing ✔ when asked whether you wish to select *P SAvE?* will put the INDI-PSD into power save mode for the RANGE selected. Pressing ✖ will de-activate the power save facility. When the power save facility is activated, battery life is conserved by pulsing on the excitation voltage to the sensor. As a result the accuracy is reduced, as is the update rate. When in this mode, the quickest update rate is 3Hz and the accuracy of the display is reduced to 1 digit in 20000. It is important to note these limitations when deciding whether to use the power save facility. However, it is also possible to set one RANGE with power save activated and the other without. The benefit is that the battery life, based on a 350Ω sensor bridge being connected, increases from 45 hours to 450 hours. It is also important to remember that when the INDI-PSD is re-calibrated with a sensor, the power save facility will be automatically turned off. The power save facility will therefore need to be reactivated after calibration has been completed.

PARAMETER	SET-UP INFORMATION
AUtO OFF	This enables the setting of an auto power off value. The value entered is in minutes. If no front panel buttons are pressed for the time set here, then the indicator will automatically power off, to conserve battery life. Values between 05 and 99 can be entered (00 leaves the INDI-PSD permanently powered).
rS232	This parameter allows the user to enable the RS232 output form the INDI-PSD, by pressing ✔ when prompted by *EnAbLEd?* On the display, pressing ✘ will disable the RS232. To conserve battery life, it is suggested that the RS232 output is disabled, when it is not required. The output format is ASCII. The display value is passed to the RS232 port each time the display updates, with a carriage return at the end of each data string. The string information is as follows: Baud Rate = 9600 baud Stop bits = 1 Parity = None Data bits = 8

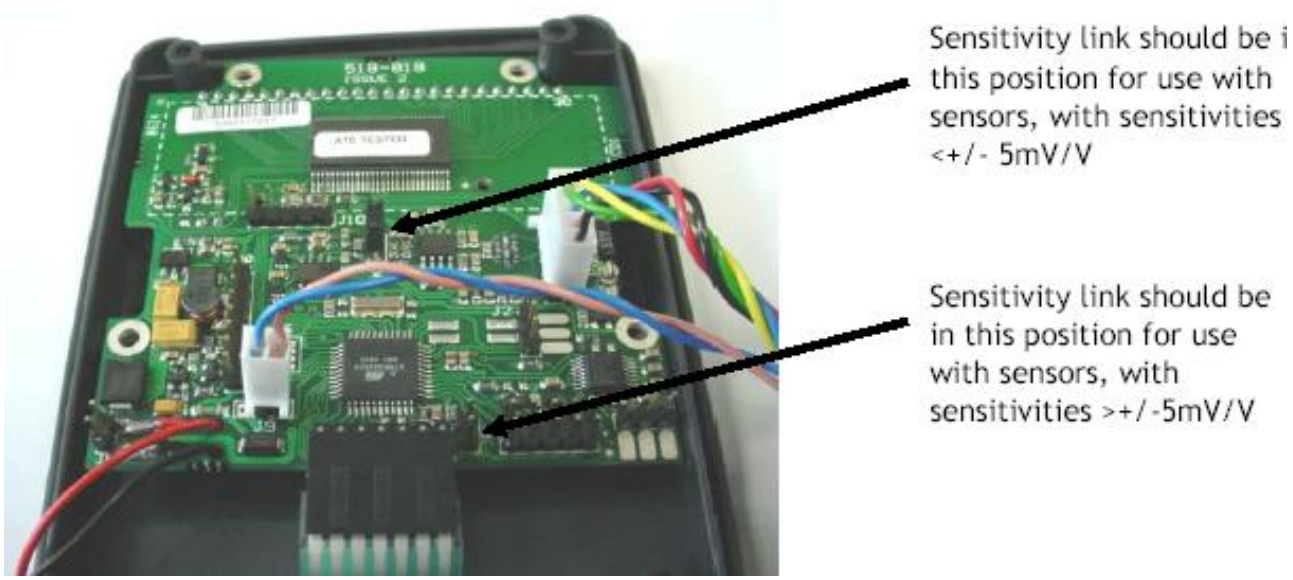
6. CALIBRATION MENU

To enter the calibration menu, press and hold RANGE and HOLD buttons for 5 seconds
To move in this menu, this buttons will be useful:

- Press ✘ to skip to the next menu item.
- Press ✔ to validate a value or a modification and get to the next menu item.
- ◀ and ▶ to select a digit.
- ▲ and ▼ to increase or decrease the value of a digit.

PARAMETER	SET-UP INFORMATION
SEnS 5.0	This allows the calibration engineer to change the sensitivity range of the INDI-PSD, when connecting to sensors with a sensitivity of greater than 5mV/V. The INDI-PSD is factory set for 5mV/V. To ensure the unit is set to 5mV/V press ✔ To select 50mV/V you need to power down the unit and access the internal circuit board. Move link LK1 and place it onto JP1 (see the end of the paragraph). Power on the INDI-PSD and return to this point of the calibration menu. You will notice that the menu parameter has changed to SEnS 50.0, press ✔ to change the sensitivity to 50mV/V and move on to the next parameter. It will now be necessary to re-calibrate any sensors that you may previously have calibrated to this instrument. TEDS should only be used with 5mV/V as 50mV/V is not factory calibrated

PARAMETER	SET-UP INFORMATION
SEt rES	This parameter sets the decimal point position for the display and the resolution, i.e. a value of 000.005 would display the reading to 3 decimal places and the readings will change in steps of 0.005. The decimal point position is moved one place to the right each time you press the ▲ and ▼ together. Any value can be entered for the resolution, using the ◄ and ► arrows to select a digit and the ▲ and ▼ arrows to increment or decrement the digits. Press ✔ to accept the value and move onto the next parameter.
CALibrAt	THIS MENU IS DISABLED IF TEDS ARE ENABLED. This parameter is used to calibrate and scale the INDI-PSD with a sensor. There are two basic methods of calibration available. These are LiVE and tAbLE. If you have chosen to enter the calibration routine you will be prompted whether you want to select LiVE, if you do not press ✘, otherwise press ✔. You will then be prompted for the tAbLE calibration press ✔. There is also a third parameter, which can be used for maintenance and recording purposes. This parameter is CAL VAL. This method can be viewed after a calibration has been completed and will show the offset and gain figures from any stored calibration. If these figures are noted, they can be used to reenter at a later date, if calibration data is lost for any reason, or if the calibration data from a sensor needs to be transferred to another INDI-PSD. For more detailed calibration information, please refer to the calibration section of the manual.
tedS	ENABLING TEDS DISABLES CALIBRATE MENU If you have chosen to enter the TEDS you will be prompted whether you want to select EnAbLEd? if you do not press ✘, otherwise press ✔. This parameter automatically calibrates the INDI-PSD with the data from the TEDS chip. The two annunciators appear when active connection with a TEDS peripheral has been made. When there is a loss of connection these annunciators flash. When changing a sensor the INDI-PSD should be power cycled as this is when the TEDS data is read. Calibration Procedures are not available when TEDS is enabled. For more detailed TEDS calibration information, please refer to the TEDS section of the manual.



7. CALIBRATION PROCEDURES

The best method of calibration, if it is possible to do so, is the LiVE calibration, as this reads in the sensor signal at two calibration points and scales the INDI-PSD automatically. If this is not possible, then the sensitivity figure (in mV/V) from the sensor calibration certificate can be used to scale the INDI-PSD, by using the tAbLE calibration. This may be the only option available if you are unable to apply a known stimulus to the sensor, which quite often is the case.

7.1. LiVE Calibration Procedure

When CALibrAt is displayed press ✔
LiVE ? will now be displayed, press ✔
You will be prompted uSE SC ?, this can be selected if you wish to use the shunt calibration figure from a sensor calibration certificate (care should be taken that the shunt calibration resistor used originally with the sensor is the same as is fitted in the INDI-PSD). If you wish to use this press ✔ otherwise press ✘
You will then be prompted APPLY LO. At this point ensure that the low calibration stimulus is applied to the sensor and allow to settle of approx. 3 seconds, then press ✔
You then be prompted with dISP LO. Press ✔ to enter the display value required with the low stimulus applied to the sensor. The value can be entered by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔
You will then be prompted with APPLY HI (unless you chose to uSE SC ?, in which case jump to the next stage) At this point ensure that the high calibration stimulus is applied to the sensor and allow to settle of approx. 3 seconds, then press ✔

You then be prompted with dISP HI. Press ✔ to enter the display value required with the high stimulus applied to the sensor. The value can be entered by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔
You should now see donE displayed. This means the calibration was successful, press ✔ to the INDI-PSD to normal operation mode, with the new calibration data stored.

If you see FaiLEd, then you will need to repeat the calibration, checking that you have completed the procedure in the correct order, and that the sensor is connected correctly.

7.2. tAbLE Calibration Procedure

When CALibrAt is displayed press ✔
LiVE ? will now be displayed, press ✘
tAbLE ? will now be displayed, press ✔
You will be prompted with InPut LO, press ✔
Now enter the zero offset sensitivity of the sensor by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔. If you do not know this, simply enter all zeros.
You will be prompted with dISP LO. Press ✔ to enter the display value required for the low input figure entered. The value can be entered by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔
You will be prompted with InPut HI, press ✔
Now enter the sensitivity figure supplied for the sensor by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔.
You then be prompted with dISP HI. Press ✔ to enter the display value required for the high input figure entered. The value can be entered by using the ◀ and ▶ button to select a digit and the ▲ and ▼ buttons to change the digit. When the value has been set press ✔
You should now see donE displayed. This means the calibration was successful, press ✔ to the INDI-PSD to normal operation mode, with the new calibration data stored. If you see FaiLEd, then you will need to repeat the calibration, checking that you have completed the procedure in the correct order, and that the sensor is connected correctly.

8. SPECIFICATIONS

Performances	Input type	Strain Gauge Full Bridge Sensors	
	Input range	Up ±5mV/V	
		±50mV/V can be supplied, with factory set option	
	Non linearity	±0.005% FSD	
	Thermal drift	<25 ppm/°C	
	Excitation voltage	5Vdc (±4%), 59mA maximum current	
	Minimum bridge resistance	85Ω (4 off 350Ω sensors in parallel)	
	Internal battery	2off AA size alkaline, access via sealed rear compartment	
	Battery life	45 hours (Typical 450 hours in low power mode), with 350Ω sensor	
	Update rate	Up to 40mS (can be set in configuration menu)	
Indication	Display type	7½ digit LCD display, 8.8mm high digits	
	Display resolution	1 part in 250,000 at 1Hz update rate	
		1 part in 65,000 at 10Hz update rate	
	Annunciators	Low Battery warning	
		Peak	
		Trough	
		Hold	
		Net	
		Shunt cal	
		Range	
Control Variables	Front Panel User Keys	*Tactile Keys with recessed rims for:*	
		ON/OFF	Switches INDI-PSD power on/off
		RANGE	Selects between two ranges
		HOLD	Hold the current display value, press again to release
		GROSS/NET	Zero's display (±100% range)
		SHUNT CAL	Generates simulated input for indicator testing
		PEAK	Enables peak hold
		TROUGH	Enables valley/trough hold
	Settable Parameters	Tare/Zero value	
		display resolution/decimal point position	
		display update rate	
		low power mode	
		auto power off	
Mechanical	Electrical Connection	5 pin Binder socket (mating plug supplied)	
	Physical Size	See drawing below	
	Weight	260 grams	
	Legends	Insert legends for engineering unit identification	
Environmental	Operating Temperature	-10°C to +50°C	
	Environmental Rating	IP65 (when mating plug fitted)	
	Enclosure Type	ABS, dark grey (Leather Carry Case Optional)	
	European EMC Directive	2004/108/EC	
		BS EN 61326—1:2006	
		BS EN 61326>2>3:2006	

9. MECHANICAL DIMENSIONS