BCD17

Conductivity Monitor

Operation Guide

Preface

Product warranty

The BCD17 Conductivity Monitor has a warranty against defects in materials and workmanship for three years from the date of shipment. During this period LTH will, at its own discretion, either repair or replace products that prove to be defective. The associated software is provided 'as is' without warranty.

Limitation of warranty

The foregoing warranty does not cover damage caused by accidental misuse, abuse, neglect, misapplication or modification.

No warranty of fitness for a particular purpose is offered. The user assumes the entire risk of using the product. Any liability of LTH is limited exclusively to the replacement of defective materials or workmanship.

Disclaimer

LTH Electronics Ltd reserves the right to make changes to this manual or the instrument without notice, as part of our policy of continued developments and improvements.

All care has been taken to ensure accuracy of information contained in this manual. However, we cannot accept responsibility for any errors or damages resulting from errors or inaccuracies of information herein.

Copyright and trademarks

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Manufacturing Standards

Electromagnetic compatibility

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom EMC Regulations S.I. 2016/1091 and the European EMC Directive 2014/30/EU using BS EN 61326-1: 2013.

Safety

This instrument has been designed to comply with the standards and regulations set down by both the United Kingdom Equipment Safety Regulations S.I. 2016/1101 and the European Low Voltage Directive 2014/35/EU using BS EN 61010-1: 2010.

Restriction of Hazardous Substances

This instrument has been produced to comply with the standards and regulations set down by both the United Kingdom Equipment Restriction of Hazardous Substances Regulations S.I. 2012/3032 and the European Restriction of Hazardous Substances Directive 2011/65/EU using BS EN IEC 63000 : 2018.

Quality

This instrument has been manufactured under the following quality standard:

ISO 9001:2015. Certificate No: FM 13843

Note: The standards referred to in the design and construction of LTH products are those prevailing at the time of product launch. As the standards are altered from time to time, we reserve the right to include design modifications that are deemed necessary to comply with the new or revised regulations.

Disposal

As per regulation S.I. 2012/3032 and directive 2012/19/EU, please observe the applicable local or national regulations concerning the disposal of waste electrical and electronic equipment.

Declaration of Conformity

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DECLARATION OF CONFORMITY

LTH Electronics Ltd

declare, accepting full responsibility, that the product(s)

BCD17, BCD17LV, BCD17A, BCD17LVA

conforms with all relevant United Kingdom regulations:

BS EN 61326-1 : 2013
(Electrical Equipment for Measurement, Control and Laboratory Use)

in accordance with the provisions of
the S.I. 2016/1091 (EMC) regulations.

BS EN 61010-1 : 2010 (Equipment Safety)

in accordance with the provisions of
the S.I. 2016/1101 (Equipment Safety) regulations.

BS EN IEC 63000 : 2018
(Electrical and Electronic Products)

in accordance with the provisions of
the S.I. 2012/3032 (RoHS) regulations.

Issued in the United Kingdom on
07th January 2021 for the company by:

Neil Adams
Managing Director

LTH Electronics Ltd

Directors:
N.Adams (Managing), S.Wotton, H. Thom
Registered Office: As Above
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the 2014/35/EU (Low Voltage) directive.

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(Electrical and Electronic Products)

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Managing Director

LTH Electronics Ltd

Directors:
N.Adams (Managing), S.Wotton, H. Thorn
Registered Office: As Above
Registered No. 908792 England
ISO9001:2015
BSI Registered, Cert. No. FM13843

Contents

Introduction

The BCD17 is a microprocessor controlled conductivity measurement instrument that can be used with a wide range of LTH conventional conductivity cells to measure and control a broad spectrum of solution conductivity. To achieve this, the instrument utilises a multifunction LCD to display the primary reading and temperature, show operational status and to provide an intuitive user interface.

As standard the instrument is a simple to install IP66 rated Wall-mount instrument, however with the addition of a suitable mounting kit it can either be installed as a Panel-mount or Pipe-mount instrument.

The instrument has two on-board volt-free normally-open relays with adjustable setpoint value and hysteresis. Either one can be set to activate if the conductivity or temperature is above or below the setpoint allowing the instrument to be used in a variety of dosing or bleeding applications. Other setpoint functions include activation on alarm, blowdown, time and pulse proportion, delayed activation, and dose alarm timer, whilst the status of the relays can be seen via the main screen of the instrument.

Additionally, the instrument features up to two industry standard, isolated, 0/4-20mA current outputs that features adjustable scaling, selectable on-error states and loop fault detection. Either allows the instrument to transmit the primary reading or observed process temperature for remote monitoring purposes.

Also fitted is a single contact input which allows the instrument to be remotely set to either an offline state that forces the relays to deactivate and the current output to a pre-defined state, or to change the whole configuration of the instrument by switching the setup to a preconfigured state.

Depending upon version purchased the instrument is powered by either 85-265V AC or 12-30V DC.

Conditivity Input Specification

Measurement Input	Any LTH conventional conductivity cell. Other manufacturer's cells can be accommodated.
Connection Cable	Up to 30 meters LTH 54D.
Ranges of Measurement	0-9.999 µS/cm to 0-999.9 mS/cm (K= 0.01 to 10.0). 0-99.99 KΩ/cm to 0-99.99 MΩ/cm (K= 0.01 to 1.0). 0-9.999 ppm to 0-99.99 ppt. (parts per thousand). See the following range / cell constant table for further information.
Cell Constant Adjustment	Fully adjustable from 0.005 to 15.00.
Cell Constant Calibration	± 50% of nominal cell constant.
Range Selection	Internal single or auto range.
Accuracy	± 0.5% of range.
Linearity	± 0.1% of range.
Repeatability	± 0.1% of range.
Operator Adjustment	±10 % slope (gain) adjustment for solution calibration.
Sensor Input Filter	Adjustable filter that averages the sensor input over a user selectable time (10sec – 5mins).
Temperature Sensor	Pt100 / Pt1000 RTD input. Up to 30 meters of cable. Temperature sensor can be mounted in the sensor or separately.
Range of Temperature Measurement	-50 °C to +300 °C (-58 °F to +572 °F) for full specification.
Temperature Accuracy	± 0.5 °C
Operator Adjustment (Temperature)	± 50 °C or ± 122 °F
Range of Temperature Compensation	-10 °C to +300 °C (+14 °F to +572 °F) for full specification.
Temperature Compensation Type	Automatic or manual, with fixed UPW curve plus variable slope - 0 - 9.99 %/°C
Temperature Compensation Base	Selectable at 20 °C or 25 °C.
Off-Line Facility	The relays are de-energised and the current output is held at a user defined level.
Ambient Operating Conditions	Temperature -20 to +55°C, Relative Humidity 5 to 95%, non-condensing.
Ambient Temperature Variation	±0.01% of range / °C (typical)

Display	3¾" 240x128 dot LCD Module
Display Backlight	Can be set to flash to indicate the instruments alarm status.
Buttons	5 tactile feedback micro-switched, silicone rubber
Digital Input	Single contact input for remote activation of user defined operations. Can be configured to operate in either normally open or normally closed modes.
Current Outputs Specification	Single current output as standard with option of two on advance models, selectable 0-20mA or 4-20mA into 750 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.
Current Outputs Adjustment	±0.01mA, 3 point 0/4-20 mA for remote monitor calibration.
Setpoints and Control Relays Specification	2 normally open fully configurable setpoints with volt free contacts for each relay. Rated at 5A @ 30V DC / 5A @ 250V AC.
Setpoint Modes	High, Low, Band, Latch High, Latch Low, Alarm, Blowdown High (Setpoint 1 only), Blowdown Low (Setpoint 1 only), Blowdown Timer (Setpoint 2 only), USP (Setpoint 1 only), USP Pre-Trigger (Setpoint 2 only),
	On/Off, Time Proportioning, Pulse Proportioning.
	Delay timer adjustable from 00:00 to 59:59 mm:ss.
	Hysteresis 0 to 9.99%.
	Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.
	Adjustable cycle time and proportional band in proportional modes.
	Flash backlight on setpoint trigger.
MicroSD Card Interface	Enables on site upgrading of instrument software. SD, SDHC and SDXC-FAT32 cards supported.
EMC	S.I. 2016/1091 & 2014/30/EU using BS EN 61326-1: 2013.
Safety / Low Voltage Directive	S.I. 2016/1101 & 2014/35/EU using BS EN 61010-1: 2010.
Power Supply	Universal 90-265V AC, 9W max.
	LV Option 12 – 30 V DC, 5W max.
Instrument Housing	UL 94-V0 PC/ABS.
Ingress Protection Rating (IEC 60529 Protection Rating)	IP66.
Weight	Maximum 800 grams (instrument only).
Dimensions	175 x 150 x 119 mm (H, W, D).

Range & Sensor Compatibility Tables

CONDUCTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 µS/cm	✓	✓	×	×
0 to 99.99 µS/cm	✓	✓	✓	×
0 to 999.9 µS/cm	×	✓	✓	✓
0 to 9999 µS/cm	×	×	Note 1	Note 1
0 to 9.999 mS/cm	×	×	✓	✓
0 to 99.99 mS/cm	×	×	Note 2	✓
0 to 999.9 mS/cm	×	×	×	Note 2

RESISTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 99.99 kΩ-cm	×	✓	✓	×
0 to 999.9 kΩ-cm	✓	✓	×	×
0 to 9.999 MΩ-cm	✓	✓	×	×
0 to 99.99 MΩ-cm	✓	×	×	×

TOTAL DISSOLVED SOLIDS RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 ppm	✓	✓	×	×
0 to 99.99 ppm	✓	✓	✓	×
0 to 999.9 ppm	×	✓	✓	✓
0 to 9999 ppm	×	×	✓	✓
0 to 99.99 ppt	×	×	✓	✓

Note 1: 0 to 9999 µS/cm range only available as a fixed range option.

Note 2: Maximum measurement range will be limited by solution temperature. With the temperature compensation slope set to 2%/°C derate linearly from full scale at 25°C to 50% of scale at 100°C.

Total Dissolved Solids in ppm = µS/cm * F, where F = TDS Factor (0.50 - 0.90)

Installation – Safety & EMC

This chapter describes how to install the instrument and how to connect the unit to a power source and auxiliary equipment.

Although today's electronic components are very reliable, it should be anticipated in any system design that a component could fail and it is therefore desirable to make sure a system will **fail safe**. This could include the provision of an additional monitoring device, depending upon the particular application and any consequences of an instrument or sensor failure.

Wiring Installation

The specified performance of the instrument is entirely dependent on correct installation. For this reason, the installer should thoroughly read the following instructions before attempting to make any electrical connections to the unit.

CAUTION ! : ALWAYS REMOVE THE MAIN POWER FROM THE SYSTEM BEFORE ATTEMPTING ANY ALTERATIONS TO THE WIRING. ENSURE THAT BOTH POWER INPUT LINES ARE ISOLATED. MAKE SURE THAT THE POWER CANNOT BE SWITCHED ON BY ACCIDENT WHILST THE UNIT IS BEING CONNECTED. FOR SAFETY REASONS AN EARTH CONNECTION MUST BE MADE TO THE EARTH TERMINAL OF THIS INSTRUMENT.

LOCAL WIRING AND SAFETY REGULATIONS SHOULD BE STRICTLY ADHERED TO WHEN INSTALLING THIS UNIT. SHOULD THESE REGULATIONS CONFLICT WITH THE FOLLOWING INSTRUCTIONS, CONTACT LTH ELECTRONICS OR AN AUTHORISED LOCAL DISTRIBUTOR FOR ADVICE.

To maintain the specified levels of Electro Magnetic Compatibility (EMC, susceptibility to and emission of electrical noise, transients and radio frequency signals) it is essential that the types of cables recommended within these instructions be used. If the installation instructions are followed carefully and precisely, the instrument will achieve and maintain the levels of EMC protection stated in the specification. Any equipment to which this unit is connected must also have the same or similar EMC control to prevent undue interference to the system.

❖ Terminations at the connectors should have any excess wire cut back so that a minimal amount of wire is left free to radiate electrical pick-up inside or close to the instrument housing.

N.B. The use of CE marked equipment to build a system does not necessarily mean that the completed system will comply with the European requirements for EMC.

Noise suppression

In common with other electronic circuitry, the instrument may be affected by high level, short duration noise spikes arising from electromagnetic interference (EMI) or radio frequency interference (RFI). To minimise the possibility of such problems occurring, the following recommendations should be followed when installing the unit in an environment where such interference could potentially occur.
The following noise generating sources can affect the instrument through capacitive or inductive coupling.

- Relay coils
- Solenoids
- AC power wires, particularly at or above 100V AC
- Current carrying cables
- Thyristor field exciters
- Radio frequency transmissions
- Contactors
- Motor starters
- Business and industrial machines
- Power tools
- High intensity discharge lights
- Silicon control rectifiers that are phase angle fired

The instrument is designed with a high degree of noise rejection built in to minimise the potential for interference from these sources, but it is recommended that you apply the following wiring practices as an added precaution. Cables transmitting low level signals should not be routed near contactors, motors, generators, radio transmitters, or wires carrying large currents.

If noise sources are so severe that the instrument's operation is impaired, or even halted, the following external modifications should be made, as appropriate:

- Fit arc suppressors across active relay or contactor contacts in the vicinity.

- Run signal cables inside steel tubing as much as is practical.

- Use the internal relays to switch external slave relays or contactors when switching heavy or reactive loads.

- Fit an in-line mains filter close to the power terminals of the instrument.

Enclosure

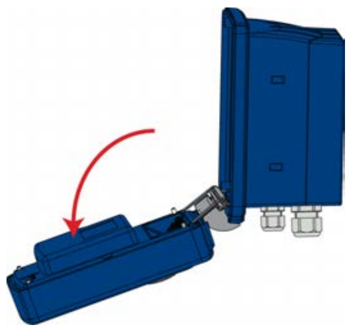
The BCD17 as standard is designed to be mounted on a wall or surface via the two holes located in the rear half of the enclosure. Alternatively, it can be mounted to a panel or a pipe using optional mounting kits.

BCD17 Overall Dimensions

The enclosure should be opened as following.

Undo four captive screws as highlighted

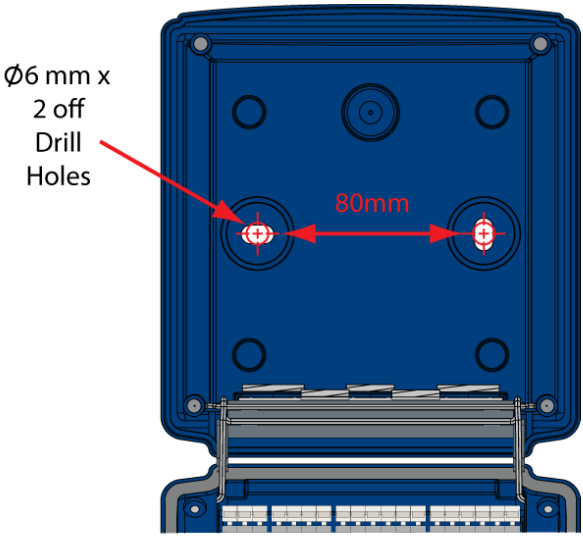
Lift front up and forward



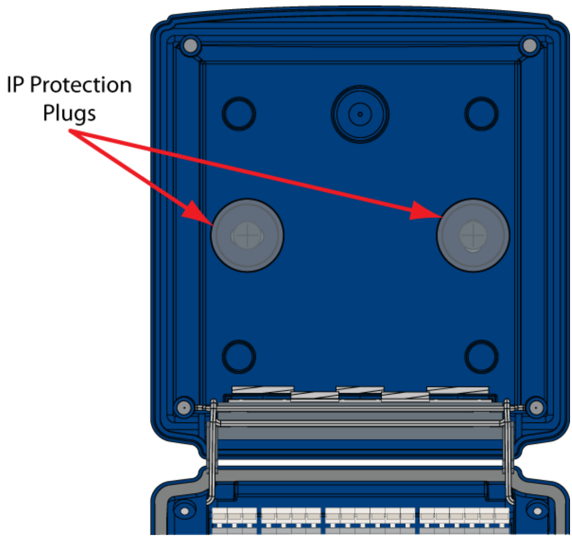
Rotate front down until hinge locks under the rear and front is supported

To close repeat process in reverse, folding the hinge into the rear.

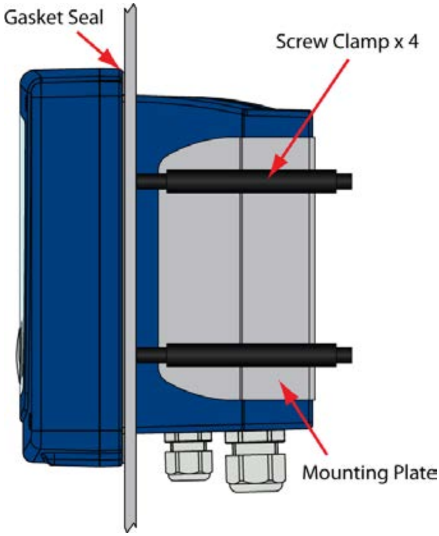
Surface-Mounting



- LTH recommends using No. 10 x 1¼ inch round head screws or similar for mounting.
- Care must be taken when fitting the instrument on uneven walls or surfaces.
- Once installed make sure accompanying IP protection plugs are installed over the mounting holes on the inside rear of the enclosure.

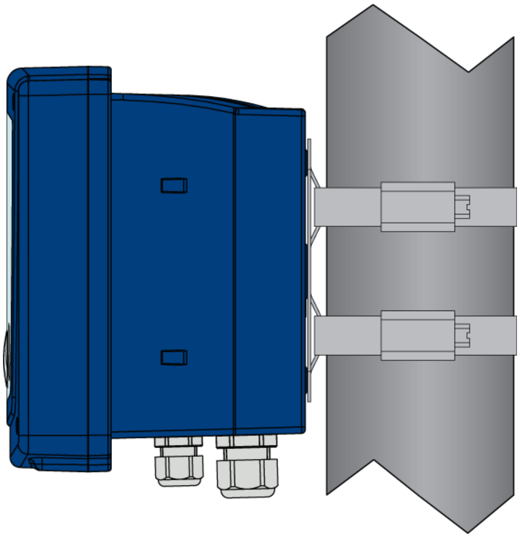


Panel-Mounting



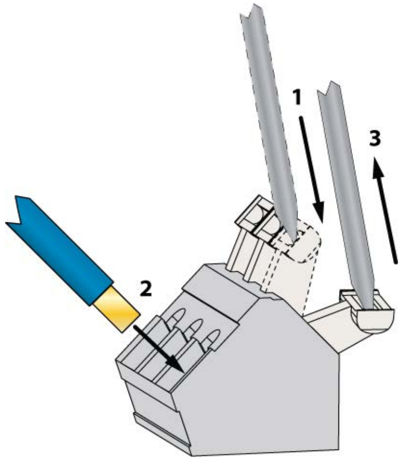
- 138.0mm Square Cut Out
- Uses Kit Part Number 6014.
- Fit the gasket seal into the grove on the back of the instrument front.
- Attach the Mounting Plate to the rear of the case with the supplied screws.
- To pass instrument rear through panel cut out remove cable glands.
- Use the 4 supplied screw clamps to affix the instrument to the panel.

Pipe-Mounting



- Fits pipe 50-100mm
- Uses Kit Part Number 6024.
- Attach the Mounting Plate to the rear of the case with the supplied screws.
- Pass supplied mounting straps through plate loops and tighten round pipe as required.
- Fit the accompanying IP protection plugs over the internal mounting holes on the inside rear of the enclosure.

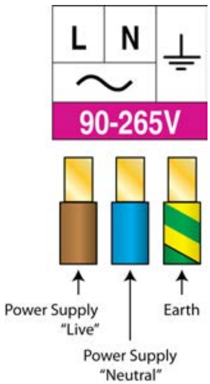
Terminal Operation



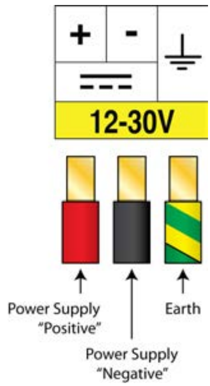
Whilst pushing terminal lever down using a 3.5mm Slotted Screwdriver, insert wire into opening and release level to retain.

Supply Voltage Connections

Depending upon version purchased BCD17 can be powered from either 90-265V AC or 12-30V DC supply voltage. **Refer to the label adjacent to the power supply terminals for the input voltage limits. Exceeding these limits may damage the instrument.**



90-265V AC
Power Connections

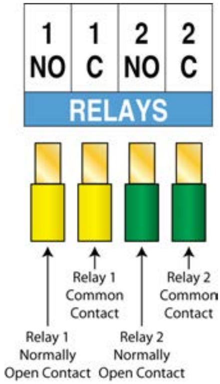


12-30V DC
Power Connections

The power supply should be taken from an isolated spur and fused to a maximum of 3 Amps. The incoming Earth connection must be connected to the Earth terminal.

Relay Connections

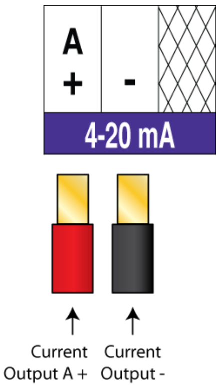
The BCD17 is supplied with 2 normally open volt free relays designated 1 & 2, The relay contacts are connected to the terminals only and are electrically isolated from the instrument itself. **They must be connected in series with a 5 Amp fuse.** A contact arc suppressor may be required to prevent excessive electrical noise, depending upon the load. To switch more than 5 Amps will require a slave relay.



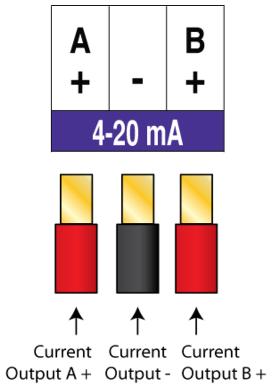
Relays 1 & 2 Connection Details

Current Output Connections

The BCD17 is supplied as standard with a single current output or as an option with two, either can terminate into a load resistance not exceeding 750Ω and are both galvanically isolated from the rest of the instrument. For best noise immunity use a screened twisted pair cable, with the screen connected to Earth at one end. Use a sufficiently large cable to avoid a high resistance in the overall current loop.



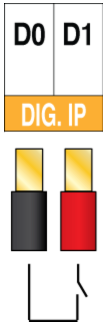
Basic Instrument Current Output Connection Detail



Advanced Instrument Current Output Connection Detail

Digital Inputs

The BCD17 features a single digital input, which can be used to initiate a user configurable instrument operation by use of a volt free link, switch or relay. The instrument can be configured to initiate the appropriate action when the contact either closes or opens.

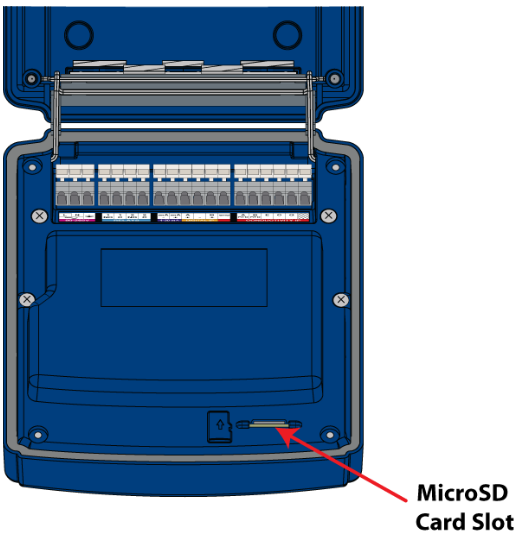


Current Output Connection Detail.

MicroSD Card Interface

The BCD17 features a MicroSD card interface which is compatible with SD, SDHC and SDXC formatted cards (N.B. SDXC cards may need formatted to Fat32 before use). Its primary function is to enable the upgrading of the instruments operating software

To insert the card, ensure that the side notch is on the right-hand side of the card, and then just push it all the way in to the socket. To remove the card push it in then release and the card should then come out of the socket. N.B. It may be required to pull the card out of the last bit of the socket.



Installation and Choice of Conductivity Sensors

The choice of the correct type of conductivity sensor, how and where to mount it, so that it has a representative sample of solution are probably the two most important considerations when installing a conductivity system.

The following criteria are of great importance during selection:

- The choice of the best method of measurement
- Selection of the correct (optimum) cell constant
- Use of the correct materials for corrosion resistance
- Position of sensor for robustness and service access
- Ensuring a representative, uncontaminated solution sample

The following tips might be useful. The range of measurement will determine the cell constant. The epoxy resin castings are extremely resistant to most acids and alkalis. Many sensors have stainless steel bosses and these should be avoided in the presence of chlorides, e.g. HCl.

There is also a growing tendency to passivate new water systems during commissioning, it is imperative that any sensors are removed from the pipework prior to this because it forms a non-conductive coating on the surface of the electrodes.

To ensure correct sensor mounting the following conditions should be observed:

- The solution between the cell electrodes or around the sensor is representative of the solution.
- A moderate flow is maintained to provide an “up to date” sample. Excessive flow rates, however, can cause cavitations and turbulence within the sensor, which will result in inaccurate readings.
- The sensor is mounted so that air bubbles do not lodge within it - displacing solutions and affecting the sample volume (air is not conductive).
- Similarly, it must be in a position so that sludge and particulate matter does not collect within the sensor.
- Conventional conductivity cells can suffer problems associated with direct electrical contact with the solution where large electrical currents may be flowing, for example in electroplating tanks.

It is not uncommon for a cell to require cleaning on a weekly or daily basis, due to the nature of chemicals used and the presence of scale in hard water areas, experience will determine the correct maintenance periods.

Care and Maintenance of Conductivity Sensors

Conductivity measuring systems are designed to be trouble free in use and reliable measurements can be expected during their operating life. However, some maintenance is required. In particular, the cell and cable connections should be checked for security and freedom from corrosion. The sensor will also require periodic cleaning, depending on the quality of the water passing through it and the type of sensor employed. A dirty sensor will always give a low conductivity reading.

The area of the cell which is sensitive to fouling is the electrode surfaces which must fully "wet" to ensure accurate measurements. Moulded cells are often used in applications where a high level of contamination may be expected.

Some of these contaminants do not contribute directly to the measured conductivity, e.g. organics, rust and suspended solids, but may form deposits on the electrode surface. In general, these may be cleaned with the bristle brush provided and a weak detergent solution mixed with scouring powder.

Problems may occur in hard water areas where the gradual formation of scale will reduce the active area of the electrodes. Simple brush cleaning alone will not remove a hard deposit from the electrode surface. If scaling is suspected the cell should be removed from the system and treated with a 10% solution of hydrochloric or formic acid. The presence of bubbles will indicate that scale is being dissolved. Cleaning is completed when bubbles cease and usually takes 2-3 minutes. The cell must be thoroughly rinsed to remove all traces of acid before it is replaced in the system.

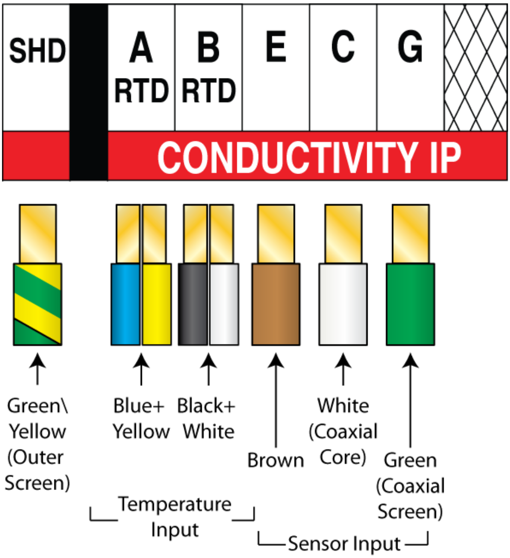
Note: Follow the supplier's data sheet when handling acids and dispose of as instructed by your local authority regulations.

Cells with stainless steel electrodes are generally used in applications where a low conductivity is combined with a low level of organic contamination and cleaning is rarely necessary. Errors in measurements can often be traced to faulty connections or incorrect setting on the instruments. However, if contamination is suspected the cell should be removed from the system and cleaned if necessary.

Handling of the cell electrodes will leave residues of oils and greases which will affect the wetting of the surfaces, leading to inaccurate readings. After touching the electrodes, wash them with a weak detergent solution and rinse thoroughly. After rinsing check that the surfaces 'wet' properly, that is, they maintain a complete film of water for approximately 10 seconds.

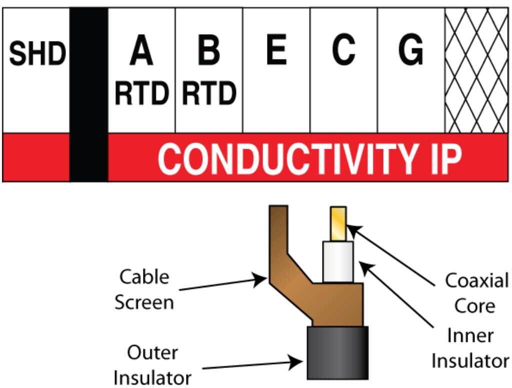
BCD17 Conductivity Input Connection Details

BCD17 Conductivity Input

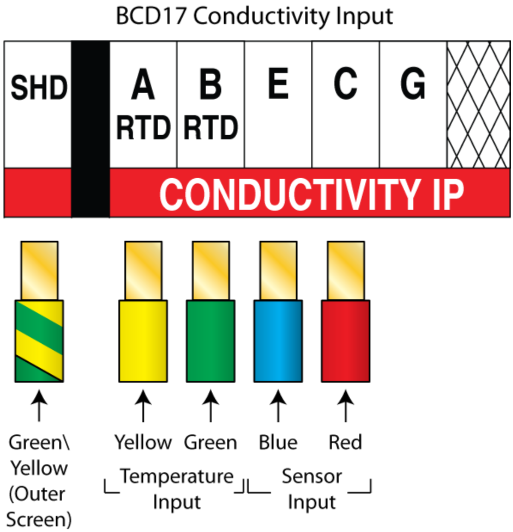


Conventional Conductivity 54D Cable Connection Details

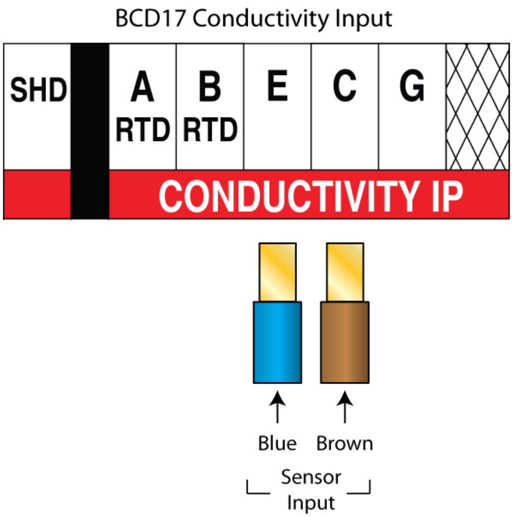
BCD17 Conductivity Input



Conventional Conductivity Coax Cable (CMC8/01 & CMC8/10) Connection Details

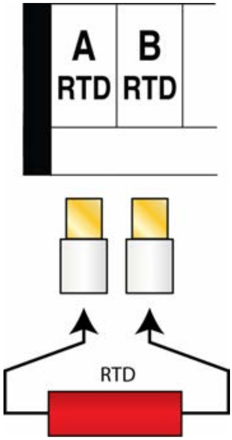
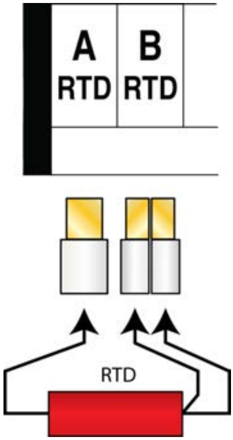
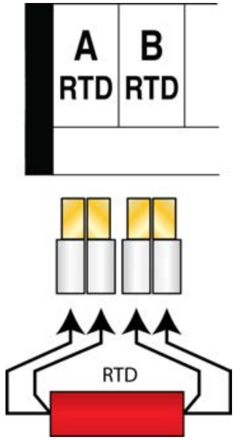


Conventional Conductivity Cable (CMC8/001) Connection Details

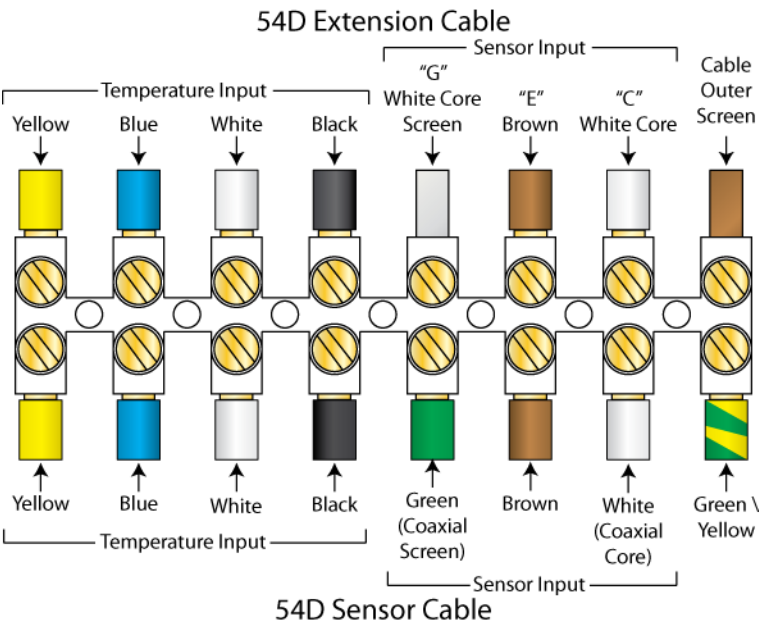


Conventional Conductivity Cable (No TC) Connection Details

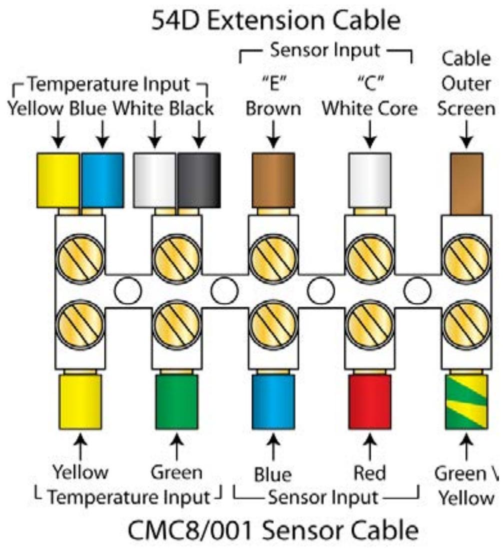
Temperature Sensor Connections

		
2 Wire RTD Temperature Connection	**3 Wire RTD Temperature Connection**	**4 Wire RTD Temperature Connection**

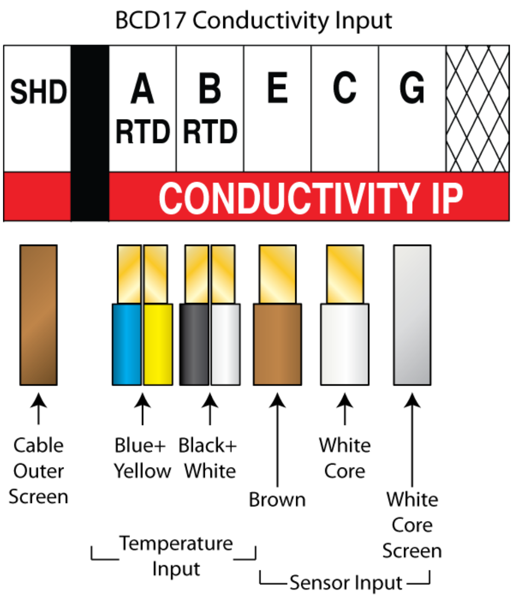
Extension Cable Connections



54D Sensor Cable To 54D Extension Cable Connection Details



CMC8/001 Cable To 54D Extension Cable Connection Details

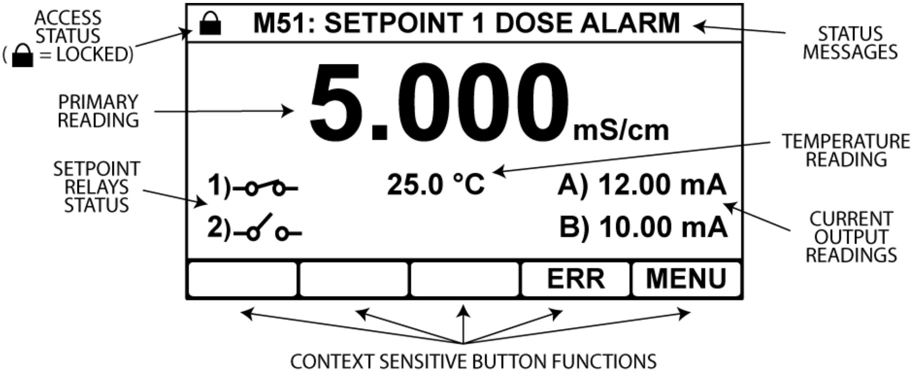


54D Extension Cable Connection Details

User Interface

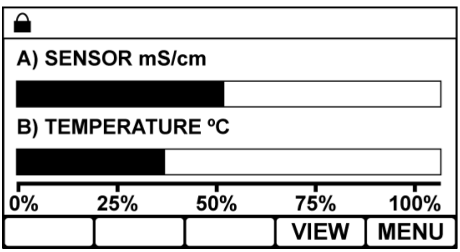
CAUTION! BEFORE PROCEEDING, ENSURE THAT THE INSTALLATION INSTRUCTIONS HAVE BEEN FOLLOWED CORRECTLY. FAILURE TO DO SO MAY RESULT IN AN ELECTRICALLY HAZARDOUS INSTALLATION OR IRREPARABLE DAMAGE TO THE INSTRUMENT.

The BCD17 uses a 3¾" 240x128 dot LCD Module to display the primary reading and temperature, show operational status and to provide an intuitive user interface. This is accompanied by 5 control buttons whose function varies depending upon which screen the user is viewing. The button function is indicated by the control section at the bottom of the display.

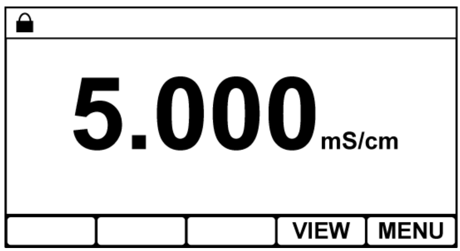


The Front Screen

Pressing the view button on the front screen cycles through 2 additional front screen options, note if an error occurs the instrument will return to the standard front screen.



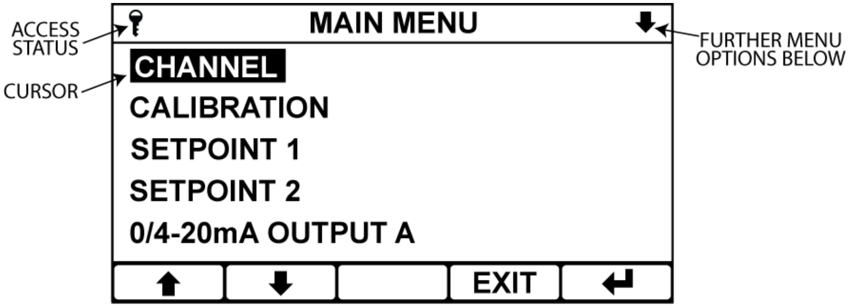
Current Output Bar Graph



Main Reading Only

Additional Front Screens

The instrument configuration is accessible by pressing the menu button on the front screen.



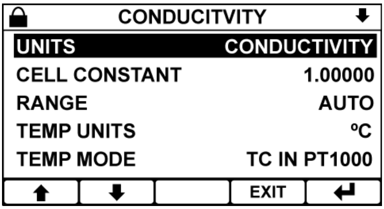
The main menu is split into two main sections. The top shows the current menu you are currently in the access status of the instrument and whether there are further menu options below. The bottom section shows the current options for that menu which may be selected by moving the cursor with the arrow buttons and pressing the enter button. The exit button is used to return to the previous menu. If no buttons are pressed after 2 minutes the instrument will default back to the front screen.

Security Code Access

To protect the instrument setup from unauthorised or accidental tampering, a security access code system is present. This is implemented via the instrument's menu system which operates in two modes, "locked" as indicated by a padlock symbol and "unlocked" as indicated by a key symbol. The locked mode allows the user to observe the instruments configuration but without the ability to change it. If the user wishes to change a setting then the "Security Code" menu will appear that will prompt them to enter the security code which will then change the instruments mode to "unlocked". Once unlocked, the user can change any setting without having to re-enter the security access code, however the instrument will automatically lock itself if no further buttons are pressed after 2 minutes 30 seconds.

The user can select their own access code in the set access code function of the configuration menu, or alternatively they can disable the security system permanently by changing the access code to 0000.

The default security access code is 1000

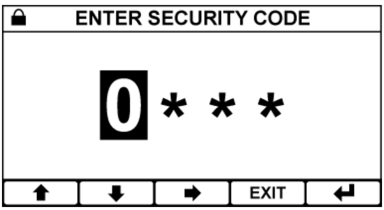


Select the option you wish to change and press enter to bring up the Security Code menu.

↑/↓ – Select Option

EXIT – Cancel

↵ – Chose Option



Enter the required Access Code.

If the code is incorrect the user will be prompted to try again.

If the code is correct the padlock at the top of the screen will turn to a key and the unit will be unlocked

↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

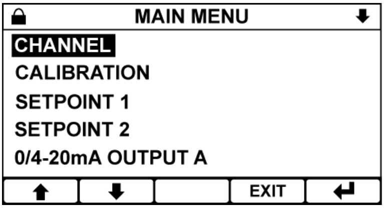
EXIT – Cancel

↵ – Enter Code

Conductivity Input Setup

The Channels Setup menu contains the basic configurations for the sensor's input.

The default security access code is <u>1000</u>



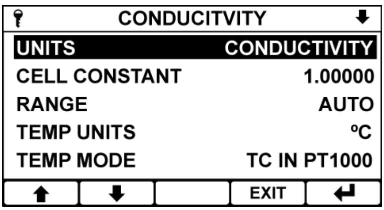
Main Menu

From the front screen press the menu button to show the main menu options.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



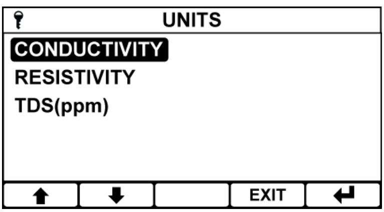
Channel Menu

From the main menu highlight "channel" and press the enter option button to show the channel menu options.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



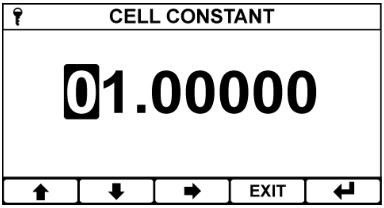
Units

The channel can be setup to display conductivity in Siemens/cm, resistivity in Ohms/cm or TDS (Total Dissolved Solids) in ppm.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



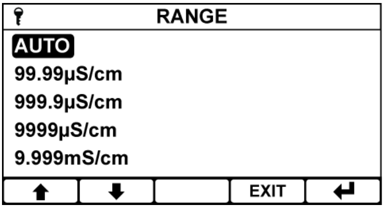
Cell Constant

The sensor input is designed to use any one of LTH conventional conductivity sensors. This menu item enables the user to enter the cell constant which should be marked on the sensor.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



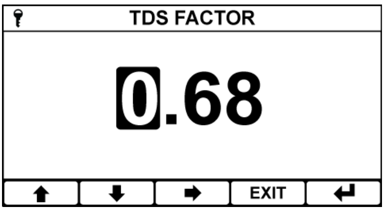
Range

Select the desired operating range for the input or select auto to let the instrument select the appropriate operating range. Available options depend upon the cell constant selected, see Range & Sensor Compatibility Tables for more details.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



TDS Factor

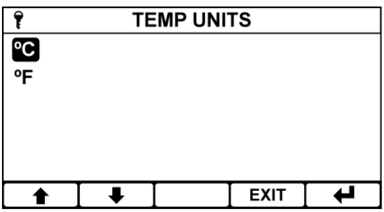
When TDS is selected as the operating units the instrument will display the conductivity as "ppm" using a factor which can be adjusted between 0.50 and 0.90.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



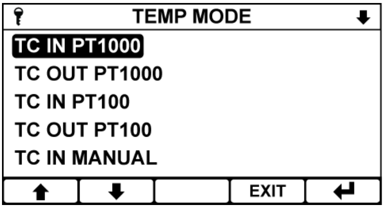
Temperature Units

Sets the temperature units used.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Temperature Mode

Temperature compensation is enabled by setting this to either TC IN PT1000, TC IN PT100 or TC IN MANUAL.

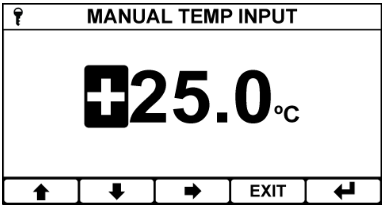
TC OUT PT1000 or TC OUT 100 sets the TC to out whilst still allowing the instrument to measure the temperature input allowing it to be used for the setpoints and current outputs.

To disable the temperature input set to DISABLED.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Manual Temp Input

The fixed temperature value used for manual temperature compensation.

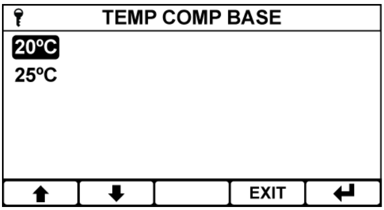
Only available when temperature mode is set to “TC IN MANUAL”.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



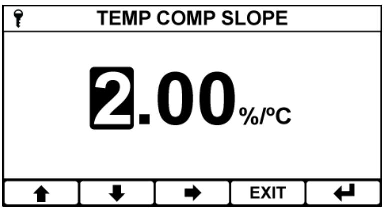
Temperature Compensation Base

Sets the temperature compensation base. See Appendix B - Temperature Coefficient, for more information. Only Available if Temperature Mode is set to TC IN PT1000, TC IN PT100 or TC IN MANUAL.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Temperature Compensation Slope

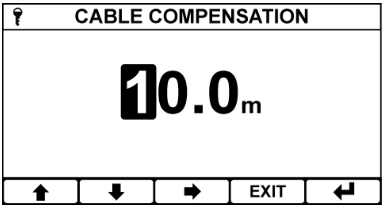
Sets the temperature compensation slope. See Appendix B - Temperature Coefficient, for more information. Only Available if Temperature Mode is set to TC IN PT1000, TC IN PT100 or TC IN MANUAL.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Cable Length Compensation

At high conductivities the series resistance in the cell connection cable can have a significant effect on the conductivity measurement. By entering the cable length here, the instrument can estimate the extra series resistance and subtract it from the displayed conductivity measurement.

This will greatly reduce the error, however to achieve even greater accuracy the user can do the following.

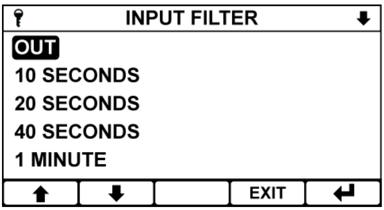
Attach a 10Ω resistor to the cable at the sensor end and set the cable length to zero. Observe the instrument reading (in mS/cm) and use that reading to determine the cable length using the following formula.
Cable Length= {[(1/Reading)-10]/0.0725}

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



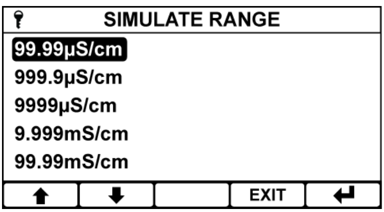
Input Filtering (Averaging)

When very noisy environments are encountered, this function will allow the user to filter the sensor readings by taking a running average over the time period selected (from 10 seconds to 5 minutes).

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



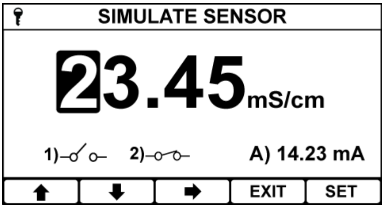
Simulated Range

If using auto range select the range over which the simulate sensor mode works.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Simulate Sensor

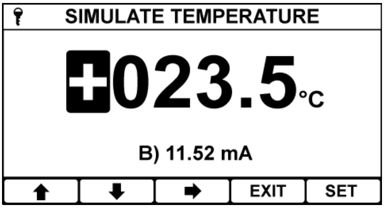
To help in commissioning of the instrument the user can use this menu to manually set the sensor reading and so test the operation of the setpoints and current outputs. Note, only setpoints or current outputs whose source is set to sensor will be shown.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

SET – Use Entered Value



Simulate Temperature

To help in commissioning of the instrument the user can use this menu to manually set the temperature reading and so test the operation of the current output. Note, only setpoints or current outputs whose source is set to temperature will be shown.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

SET – Use Entered Value

Calibration

Best Practice for Fine Tuning Conventional Conductivity Input

The BCD17 provides a facility for the operator to fine tune the calibration of the conductivity or resistivity measurement, the temperature measurement and the current output. The amount of adjustment is quite small because the factory calibration is accurate and with modern electronics, drift is very low. If it is found that during a calibration there is insufficient adjustment then it is probable that there is a problem with either the calibration procedure, or a fault with the instrument, sensor or cabling. The most common causes of inaccurate conductivity readings are contaminated electrode surfaces and air trapped within the cell. Both of these will always give a low conductivity (high resistivity) reading. Refer to the Care and Maintenance of Conductivity Sensors section for more information.

Calibration of Conductivity or Resistivity Readings

Conductivity measurements are very temperature dependent so it is essential that an understanding of the complex relationship between conductivity and temperature is understood when calibrations are made. It is possible to make several different types of calibration.

Resistance calibration of the instrument only

This is the most accurate method of calibrating the instrument but it will not take into account any variations due to the cell constant variation or coatings of contaminants. Calibration is at a single point only so a value close to the normal operating conditions is preferable. The resistance should be connected between the C and E terminals. (See the table of values on page 35). It is recommended that any extended lengths of cell cable are left in during this calibration, as cable resistance will have some effect on the overall calibration accuracy. This is increasingly significant at high values of conductivity (low resistivity).

The temperature compensation must be switched out when making these adjustments and the relevant cell constant noted. The resistance accuracy will determine the overall accuracy of the calibration. A non-inductive resistance must be used below 100 ohms.

Calibration with Standard Solutions

This calibration must be carried out under strictly controlled conditions due to the temperature effect on conductivity measurements and the possibility of contamination of the standard solution. The advantage of this calibration method is that the sensor and cable are an integral part of the calibration. LTH strongly recommends a lower limit of 500µS/cm for this type of calibration. Conductivity is a very sensitive measurement and even trace contamination of the standard solution will be detected, for example exposing the solution to air will add 1µS/cm to the standard solution due to absorption of CO_2.

Most standards are made up from a solution of KCl dissolved in high purity water. BS EN 60746-3 provides details of the concentrations of KCl necessary to produce industry standard conductivity solutions. Ready-made solutions are available from LTH with traceable certification if required.

Standard solutions will be supplied with a conductivity value quoted at a reference temperature. This temperature is the base temperature and the calibration should be performed at that temperature, with the temperature compensation switched out. Alternatively, the temperature compensation should be switched on and a temperature slope and base temperature equal to that of the calibration solution can be used to configure the instrument. For example, this would be 1.76%/°C for a KCl solution between 1000 to 10,000µS/cm. For more details on calculating the slope of a different solution, refer to Appendix B - Temperature Coefficient (page 68).

Calibration by Comparison with Another Instrument

This can provide the easiest method for in-situ calibrations but has the disadvantage of only being able to check a single measurement point. As measurements are made by comparison of the readings taken in the same solution, temperature effects are less critical. However, it is essential that settings for temperature compensation are the same on both instruments.

Calibration of the Cell Constant

LTH conductivity cells are supplied with a nominal cell constant value, e.g. 0.1, 1.0. The actual cell constant could be up to ±2% from this value. It is possible for LTH to measure the actual cell constant of each cell and provide traceable certification. The user can then program this value into the instrument eliminating the errors contributed by manufacturing variations in the cell geometry. Use the cell constant menu in the channel setup menu to enter the specified cell constant.

Table of calibration resistance values

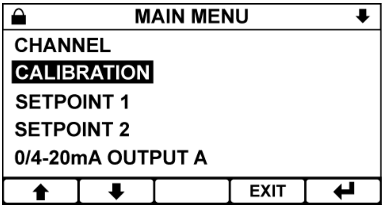
Conductivity Display Reading	Nominal cell constant K=0.01	Nominal cell constant K=0.10	Nominal cell constant K=1.00	Nominal cell constant K=10.0	Resistivity Display reading
0.050 µS/cm	200K				20.00 MΩ-cm
0.100 µS/cm	100K				10.00 MΩ-cm
0.200 µS/cm	50K				5.000 MΩ-cm
0.500 µS/cm	20K				2.000 MΩ-cm
1.000 µS/cm	10K	100K			1.000 MΩ-cm
2.000 µS/cm	5K	50K			500.0 KΩ-cm
5.000 µS/cm	2K	20K			200.0 KΩ-cm
10.00 µS/cm	1K	10K	100K		100.0 KΩ-cm
20.00 µS/cm	500R	5K	50K		50.00 KΩ-cm
50.00 µS/cm	200R	2K	20K		20.00 KΩ-cm
100.0 µS/cm	100R	1K	10K	100K	10.00 KΩ-cm
200.0 µS/cm		500R	5K	50K	
500.0 µS/cm		200R	2K	20K	
1000 µS/cm		100R	1K	10K	
2.000 mS/cm			500R	5K	
5.000 mS/cm			200R	2K	
10.00 mS/cm			100R	1K	
20.00 mS/cm			50R	500R	
50.00 mS/cm			20R	200R	
100.0 mS/cm			10R	100R	
200.0 mS/cm				50R	
500.0 mS/cm				20R	
1000 mS/cm				10R	

This list of calibration resistance values will allow the user to check or modify the calibration of the instrument. Temperature compensation **MUST** be turned off during the test or adjustment.

Calibration Menu

The calibration menu provides the facility to adjust the sensor inputs to the system in which it is operating.

The default security access code is <u>1000</u>



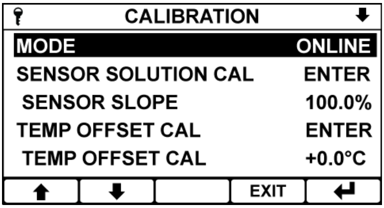
Main Menu

From the front screen press the menu button to show the main menu options.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



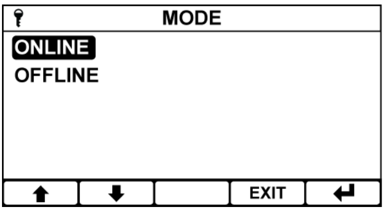
Calibration Menu

From the main menu highlight “calibration” and press the enter option button to show the channel menu options.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Mode

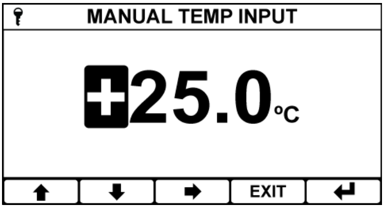
Selecting off-line causes any setpoints to de-energise and current outputs to go to their off-line state. Useful for when commissioning or calibrating the instrument.

When the instrument is placed in an off-line state “off-line” will appear on the front screen.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Calibration Manual Temperature Input

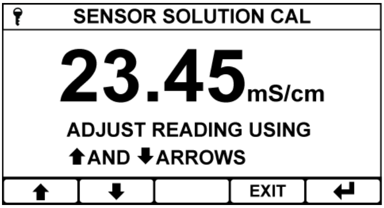
This setting allows a different fixed temperature value to be used when calibrating. Makes it easier to calibrate a standard solution at a different temperature to the process. Only Available if Temperature Mode is set to TC In Manual in the Channel Setup menu.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Sensor Solution Calibration

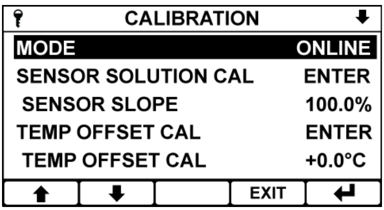
The sensor solution calibration enables the user to adjust the sensor reading to match a known input.

The current sensor reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated slope or offset, depending on the instruments units, are shown in the next menu entry.

⬆/⬇ – Adjust the Reading Up or Down

EXIT – Cancel

↵ – Save Calibration



Sensor Slope

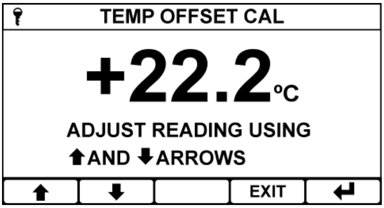
The sensor slope value currently being used. The value will change depending on the result of the sensor solution calibration.

Cannot be edited

A slope value of 100% indicates that no adjustment has been made to the sensor calibration.

A slope value of greater than 100% indicates that the sensor reading has had to be increased to match the known input.

A slope value of less than 100% indicates that the sensor reading has had to be decreased to match the known input.

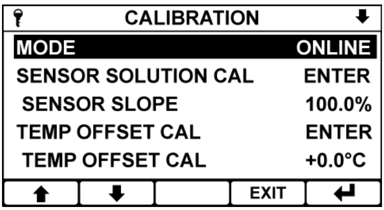


Temperature Offset Calibration

The temperature offset calibration enables the user to adjust the temperature reading to match a known input.

The current temperature reading can be seen in the pop-up window and is adjusted by pressing the up and down arrows. When the reading is correct press the enter button to store the calibration. The calculated offset is shown in the next menu entry.

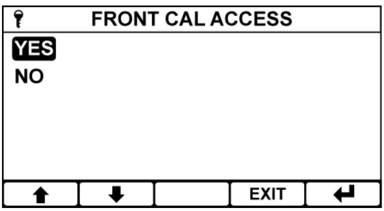
⬆/⬇	– Adjust the Reading Up or Down
EXIT	– Cancel
↵	– Save Calibration



Temp Offset Value

The temperature offset value currently being used. The value will change depending on the result of the temperature offset calibration.

Cannot be edited

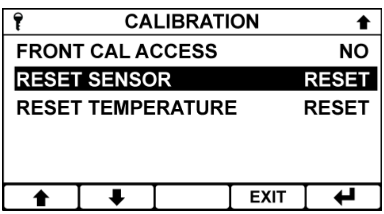


Front Screen Calibration Access Enable

When enabled front calibration access allows direct entry into the calibration menu from the front screen by pressing the “CAL” button.

It also disables the security access system within the calibration menu enabling the calibration functions without having to enter the security access code.

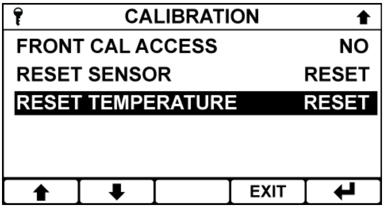
⬆/⬇	– Select Option
EXIT	– Cancel
↵	– Save Selection



Reset Sensor

Reset any sensor calibration that may have been performed.

⬆/⬇	– Select Option
EXIT	– Return to Main Menu
↵	– Enter Option



Reset Temperature

Reset any user temperature calibration that may have been performed.

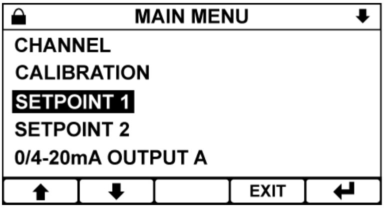
⬆/⬇	– Select Option
EXIT	– Return to Main Menu
↵	– Enter Option

Setpoints

The BCD17 is be fitted with two "Normally Open" setpoint relays designated Setpoint 1 and Setpoint 2. The Setpoint menu contains all of the necessary setup functions to configure the setpoint. The instrument indicates the status of the relay by means of a symbol on the front screen.

Indicates that the relay contact is open

Indicates that the relay contact is closed (if flashing indicates that a dose alarm has occurred).



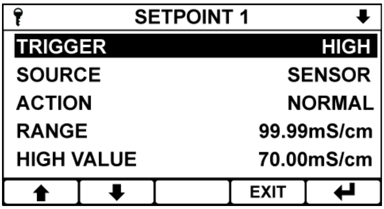
Main Menu

From the front screen press the menu button to show the main menu options and select the setpoint you wish to configure.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



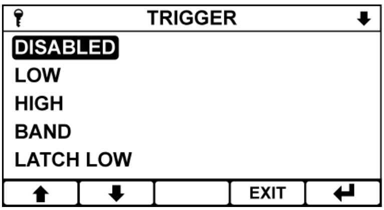
Setpoint Menu

Select the Setpoint function you wish to configure.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Trigger

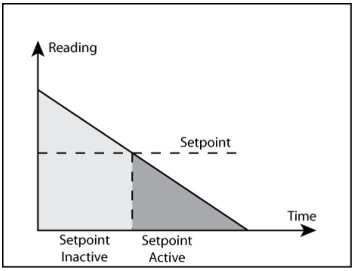
The setpoints can be configured to trigger in the following ways:

- Low
- High
- Band
- Latch Low
- Latch High
- Alarm
- Blowdown High (Available on Setpoint 1 Only)
- Blowdown Low (Available on Setpoint 1 Only)
- Blowdown Timer (Available on Setpoint 2 Only)
- USP (Available on Setpoint 1 Only)
- USP Pre-Trigger (Available on Setpoint 2 Only)

⬆/⬇ – Select Option

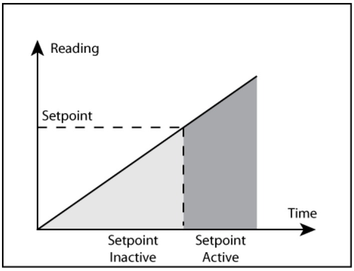
EXIT – Cancel

↵ – Save Selection



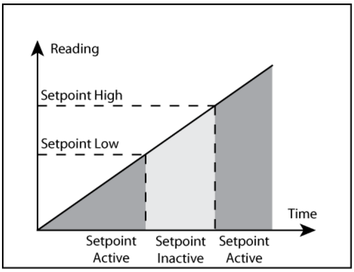
Low

The setpoint will activate when the sensor reading becomes less than the setpoint level.



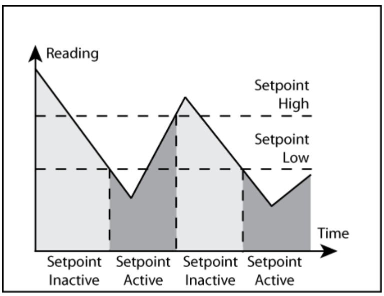
High

The setpoint will activate when the sensor reading becomes greater than the setpoint level.



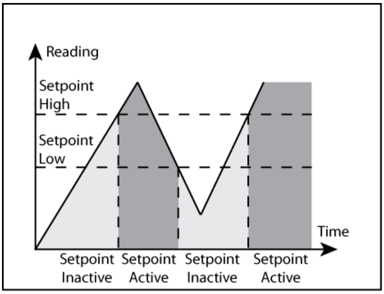
Band

The setpoint will activate when the sensor reading is either greater than the setpoint high level or less than the setpoint low level.



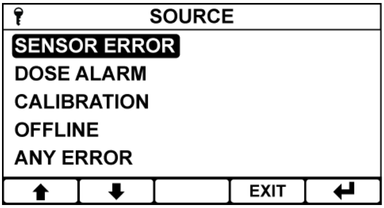
Latch Low

The setpoint will activate when the sensor reading is less than the setpoint low level and will remain active until the reading rises above the setpoint high level. It will then remain inactive until the reading level falls below the setpoint low level.



Latch High

The setpoint will activate when the sensor reading is greater than the setpoint high level and will remain active until the reading falls below the setpoint low level. It will then remain inactive until the reading rises above the setpoint high level.



Alarm

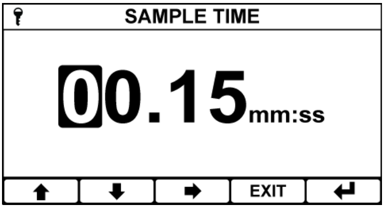
The setpoint will activate by one of the following sources.

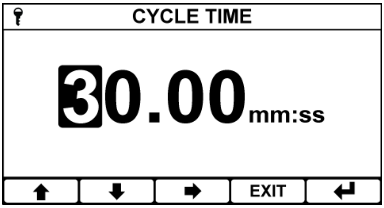
- Sensor Error – When a sensor related error is detected.
- Dose Alarm – When the dose alarm activates.
- Calibration – When a calibration is in progress.
- Offline – When the instrument is taken offline.
- Any Error – When any error is detected.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection





Blowdown High / Blowdown Low (Setpoint 1 Only)

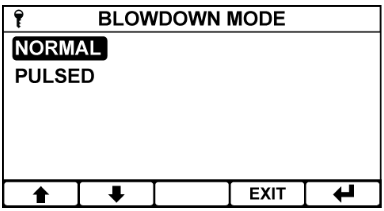
Useful for when the probe is mounted in the blowdown line or by-pass. This mode ensures the sensor measures the conductivity at boiler temperature.

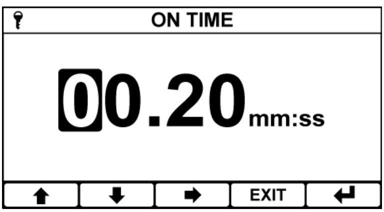
The sample (purge) time is the time setpoint is energised and hence the valve is open so enabling a representative boiler sample to reach the probe.

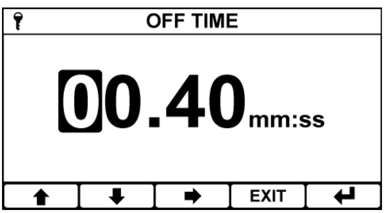
At the end of the sample time the sensor reading is compared to the setpoint and if higher or lower (depending on trigger selected) than the setpoint the blowdown relay will stay energised until the setpoint is satisfied.

Once the setpoint is satisfied the blowdown relay will turn off for a user selected time called Cycle Time. At the end of the Cycle Time the blowdown relay will once again go into the sample (purge) time and repeat the above.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value







Blowdown Mode (Setpoint 1 Only)

For smaller boilers where the capacity of the blowdown valve is relatively high compared to the boiler size, the blowdown mode can be set to a pulsed output. This slows the rate at which the boiler water is removed so that the level is not unduly affected, avoiding the risk of triggering a low water alarm.

Both the On and Off time of the pulsed mode relay can set.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value

Blowdown Time (Setpoint 2 Only)

Complementary to the blowdown high/low operation of setpoint 1. Allows the user to configure a secondary periodic blowdown to flush any accumulated sludge deposits from the boiler.

On and Off times allow the user to configure how long the setpoint is energised and de-energised for.

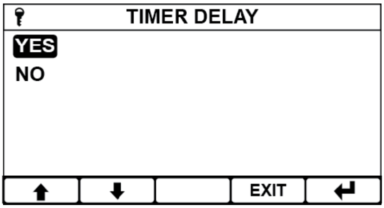
Whilst cycling the remaining on and off times are visible on the front measurement screen, and when energised “TIMER B-DOWN” text is also shown.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Blowdown Timer Delay (Setpoint 2 Only)

If enabled will prevent the setpoint 2 timer from energising until setpoint 1 is de-energised.

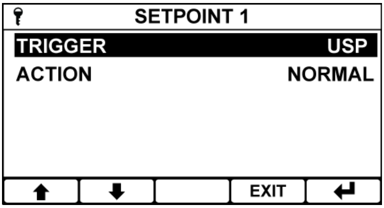
When setpoint 2 is being held from energising “TIMER DELAYED” will appear on the front measurement screen.

Whilst the setpoint is being delayed the user has an option to acknowledge the delay and move setpoint 2 to the de-energized phase, skipping any timer blowdown until the de-energised phase has once again been completed. This is accomplished by using the ACK button whilst on the front measurement screen.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



USP (Setpoint 1 Only)

US Pharmacopoeia is used by all pharmaceutical companies as a standard set of procedures to ensure that they will comply with FDA requirements. This is applied to conductivity measurements (Section 645), which are used to determine if the water used as either a washing solution or as part of the product being manufactured meets strict quality standards.

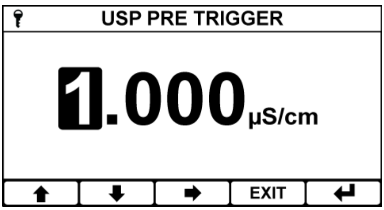
°C	µS/cm	°C	µS/cm	°C	µS/cm
0	0.6	30	1.4	60	2.2
5	0.8	35	1.5	65	2.4
10	0.9	40	1.7	70	2.5
15	1.0	45	1.8	75-90	2.7
20	1.1	50	1.9	95	2.9
25	1.3	55	2.1	100	3.1

The Directive

Conductivity is used as the first (Stage 1) test and can be an on-line measurement. The measurement is used to determine the maximum level of dissolved minerals that are in the solution, which it is ideally suited to do. However, the conductivity of a solution varies with temperature as well as the contaminants in it, and this temperature dependence varies with the type of contaminant. In order to compensate for this most conductivity instruments apply a temperature compensation factor, usually 2%/°C, but due to the wide variation in the quality of different manufacturers temperature compensation systems USP has specified that all measurements must be made uncompensated. The adjacent table lists the maximum allowed conductivity values at a series of different temperatures.

Setting the trigger to USP causes the setpoint to operate to the USP levels. Other than Action, All other setpoint menu functions will be unavailable.

Note. USP is only available when the following is set in the channel menu: Units set to Conductivity, Cell Constant is less than 0.05, Range is set to 0 to 9.999 µS/cm, and Temp Mode is set either TC OUT PT1000 or TC OUT PT100.

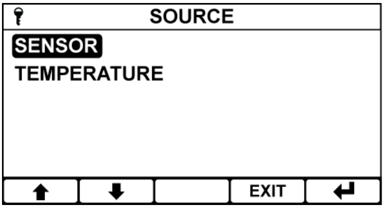


USP Pre-Trigger (Setpoint 2 Only)

When setpoint 1 is configured as USP setpoint 2 can be configured as a pre-trigger and will cause the setpoint to activate by the pre-trigger amount before the USP level.

Example. If the USP setpoint 1 was due to activate at 1.300µS/cm and the pre-trigger setpoint 2 was set to 0.200µS/cm then setpoint 2 would trigger at 1.100µS/cm.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value



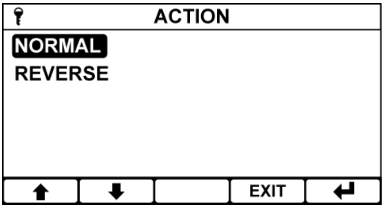
Source

Select the source for the setpoint. Note, the temperature option is only available if the Temp Mode option in the Channel Menu is set to either TC IN PT1000, TC IN PT100, TC OUT PT1000 or TC OUT PT100.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



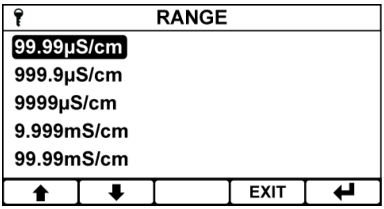
Action

Set the setpoint to work in the normal mode or reverse mode - which is akin to a normally closed relay except it will fall open if the power to the instrument is removed.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Range

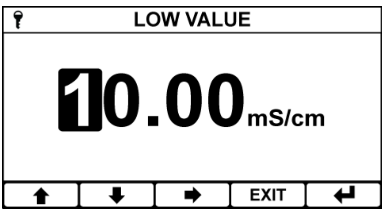
The setpoints operating range.

This is only available if sensor range in the channel menu has been set to Auto. Else the setpoint operates over the selected range of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Low Value

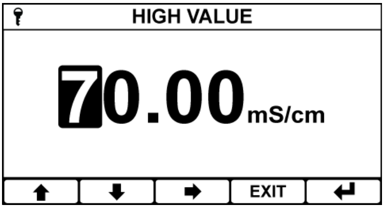
The Setpoint Low value.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

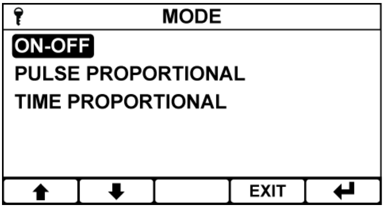
↵ – Save Value



High Value

The Setpoint High value.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value



Mode

The Setpoints can operate in one of three modes.

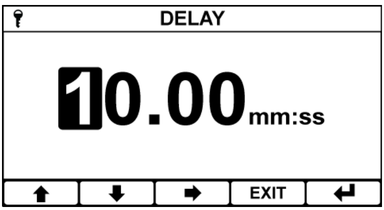
On-Off Mode – The setpoint energises when the setpoint is activated and de-energises when the setpoint is de-activated.

Pulse Proportional – See Setpoint proportional Mode Section (Page 51).

Time Proportional – See Setpoint proportional Mode Section (Page 51).

Menu only available when Trigger is set to either High or Low

⬆/⬇	– Select Option
EXIT	– Cancel
↵	– Save Selection

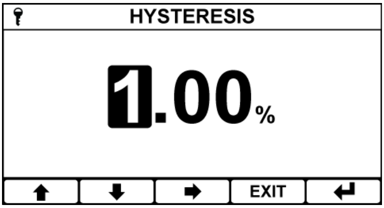


Delay

In order to prevent short duration changes at the input affecting the setpoint operation a delay can be set before the setpoint is energised. If the input is still the same after the delay, then the setpoint will be energised.

Note. Only available when Trigger is set to High, Low or Band and Mode is set to On-Off.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value



Hysteresis

A facility to apply hysteresis to the setpoint level allows the user to avoid setpoint "Chatter" when the reading level approaches the setpoint level.

"Chatter" is caused when the reading is sufficiently close to the set point value and noise on the signal repeatedly crosses the set point level, thus causing the relay to switch on and off rapidly.

The hysteresis level should therefore be set to be greater than the input noise level.

The Hysteresis value is a percentage of the setpoint value applied both + and – to the setpoint. For example, if the setpoint was 10.00 and the Hysteresis was 1% then the hysteresis band would operate from 9.90 to 10.10.

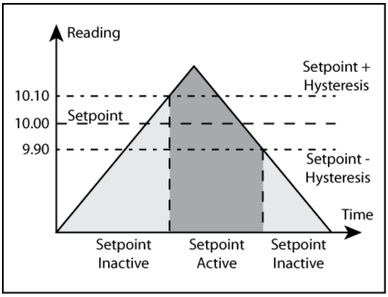
Hysteresis operates as follows:

Trigger High – The setpoint is inactive until the reading is greater than the Setpoint High + (Setpoint High X Hysteresis %). It remains active until it goes below Setpoint High – (Setpoint High X Hysteresis %).

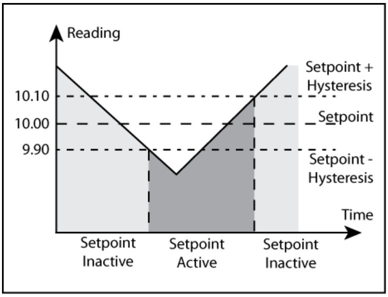
Trigger Low – The setpoint is inactive until the reading is less than the Setpoint Low – (Setpoint Low X Hysteresis %). It remains active until it goes above Setpoint Low + (Setpoint Low X Hysteresis %).

Trigger Band – The setpoint uses both high and low.

Note. Only available when Trigger is set to High, Low or Band and Mode is set to On-Off.



Setpoint Trigger: High – Hysteresis



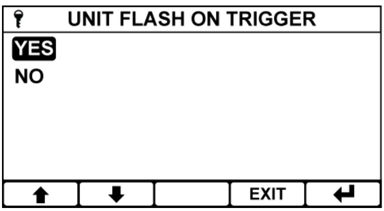
Setpoint Trigger: Low – Hysteresis

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Unit Flash on Trigger

When enabled the backlight of the unit will flash when the setpoint has been triggered.

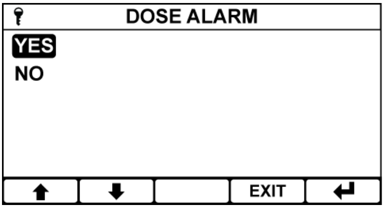
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Setpoint Dose Alarm

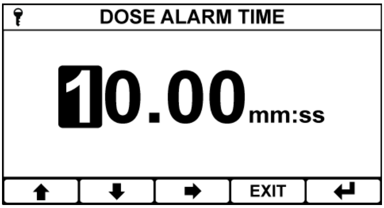
The dose alarm timer can be used to prevent overdosing under many different fault conditions, such as sensor failure or application problems.



Dose Alarm

Enable the dose alarm for the selected setpoint.

⬆/⬇	– Select Option
EXIT	– Cancel
↵	– Save Selection

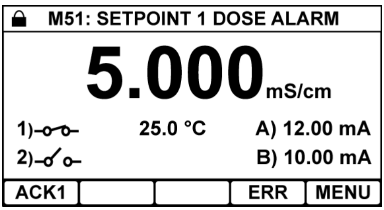


Alarm Time

Sets the time which if the setpoint is active for longer than causes the dose alarm to activate.

Note, when using Pulse or Time proportional mode the dose timer will only count once the reading is outside the proportional band.

⬆/⬇	– Increase / Decrease Digit
➡	– Select Next Digit
EXIT	– Cancel
↵	– Save Value



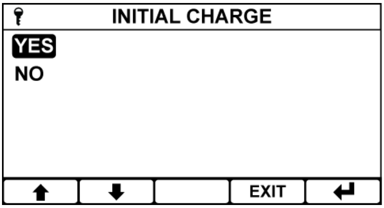
Dose Alarm Active

When the dose alarm activates the following happens:-

- The setpoint will de-energise.
- The associated front screen setpoint symbol will flash.
- The Dose Alarm error message will appear at the top of the front screen.
- ACK will appear as a function to acknowledge the setpoint on the front screen – press to clear the alarm.

Note – If, once cleared, the setpoint again remains energised for the length of the dose alarm timer then the dose alarm will once again activate. If this problem persists then a dosing problem will need to be investigated.

ACK 1	– Clear Setpoint 1 Dose Alarm
ACK 2	– Clear Setpoint 2 Dose Alarm
Menu	– Access Main Menu



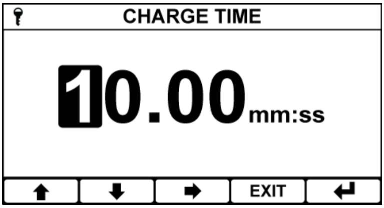
Initial Charge

This allows the user to have a onetime over-ride of the Dose Alarm to use for example when filling a tank for the first time.
The user enters a charge time and then initiates the charge time. The instrument will then disable the dose alarm until either the relay becomes inactive because the setpoint has been reached or the charge timer reaches zero in which event the instrument will automatically display enter a Dose Alarm state.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



Charge Time

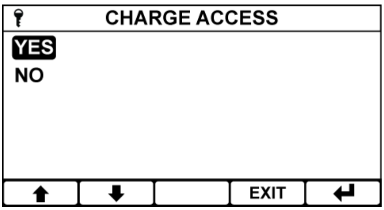
Sets the initial charge time.

↑/↓ – Increase / Decrease Digit

→ – Select Next Digit

EXIT – Cancel

↵ – Save Value



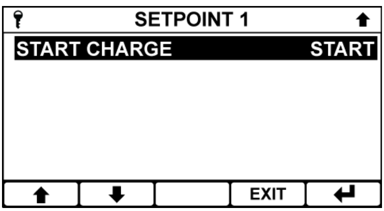
Charge Access

Enabling this allows the user to initialise the initial charge by means of a button on the front screen.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection



Start Initial Charge

The user can also start the initial charge via this option in the setpoint menu.

↑/↓ – Select Option

EXIT – Cancel

↵ – Save Selection

Setpoint Proportional Mode

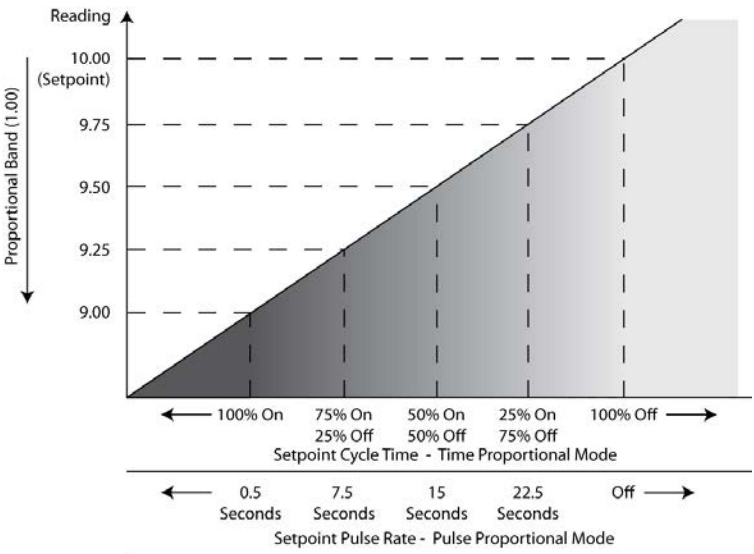
In addition to On/Off mode the instrument also provides two forms of pseudo proportional control, which can be used to control the levels to a defined value when used in conjunction with a pump or valve. When the reading deviates from the programmed set point level the relay pulses at a rate proportional to that deviation. Note – Only available when Setpoint Trigger is set to either High or Low.

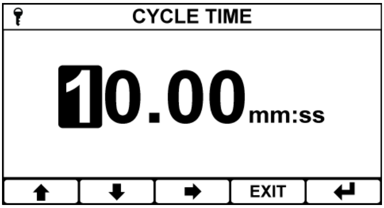
Pulse Proportional Mode

The Pulse Proportional mode is intended to drive solenoid type dosing pumps which have the facility to accept an external pulse input. The setpoint relay operates by producing a pulse of 0.25 seconds in duration and with a maximum period of one pulse per 30 seconds. The pulse rate increases as the measurement moves further from the set point, until it reaches the minimum period of one pulse per 0.5 seconds at the limit of the proportional band.
For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls just below 10.00 the setpoint will begin to pulse at its longest period of once per 30 seconds. As the reading falls further from the setpoint the period will decrease until it reaches its minimum of one pulse every 0.5 seconds at the limit of the proportional band. (See Setpoint Pulse Rate – Pulse Proportional Mode section on the diagram below.)

Time Proportional Mode

Time Proportional Mode allows a user defined cycle time to control any on/off device such as a solenoid valve or dosing pump over a user set proportional band.
For example if the user sets a proportional band of 1.00, the setpoint trigger to LOW, and a setpoint value of 10.00. When the reading falls below 9.00 the setpoint would be energised 100% of the cycle time. As the input rises and approaches the set point the setpoint starts to cycle on and off with the on time reducing and the off time increasing, respectively until it reached the setpoint and would be off for 100% of the cycle time. The cycle time is adjustable and is the sum of the on and off times. (See Setpoint Cycle Time – Time Proportional Mode section on the diagram below.)





Cycle Time

Sets the cycle time (sum of both On and Off periods)

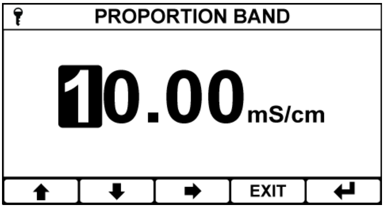
Only available when Mode is set to Time Proportional.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Proportion Band

Enter the size of the Proportion Band.

Only available when Mode is set to Pulse or Time Proportion.

⬆/⬇ – Increase / Decrease Digit

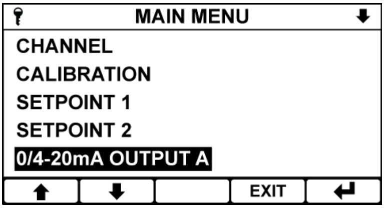
➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value

0/4-20mA Output

The BCD17 is fitted with two current outputs, either which can be used for the transmission of the primary variable or temperature. The current output menu contains all of the necessary setup functions to configure the current output sources. The instrument will display the status of the current output on the front screen, where --.--mA indicates that the output is disabled.



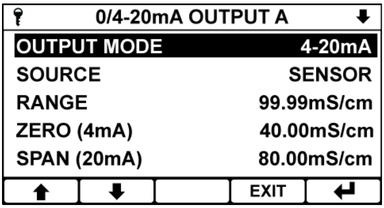
Main Menu

From the front screen press the menu button to show the main menu options and select the desired 0/4-20mA Output.

🡅/🡇 – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



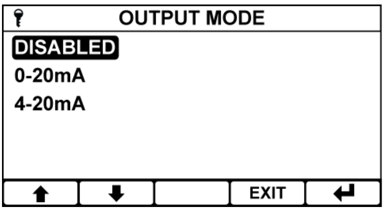
0/4-20mA Output Menu

Select the 0/4-20mA function you wish to configure.

🡅/🡇 – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



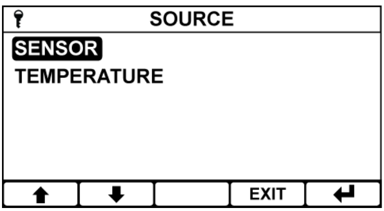
Output Mode

Enable the current output by selecting its output mode, either 0 – 20mA or 4 – 20mA.

🡅/🡇 – Select Option

EXIT – Cancel

↵ – Save Selection



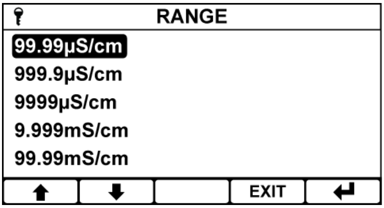
Source

Select the source for the current output. Note, the temperature option is only available if the Temp Mode option in the Channel Menu is set to either TC IN PT1000, TC IN PT100, TC OUT PT1000 or TC OUT PT100.

🡅/🡇 – Select Option

EXIT – Cancel

↵ – Save Selection



Range

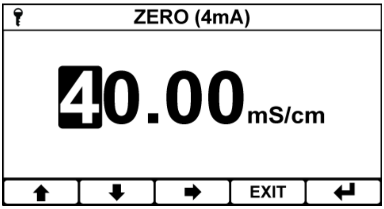
The current output's operating range.

This is only available if sensor range in the channel menu has been set to Auto. Else the output operates over the selected range of the channel.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Zero (0mA) / Zero (4mA)

Enter the desired sensor value to be represented by 0mA or 4mA (depends on current output mode). An inverse relationship can be achieved by setting the Zero greater than the Span.

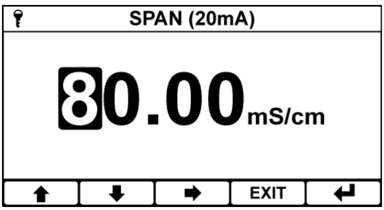
If the sensor reading falls outside this or the span value an error will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



Span (20mA)

Enter the desired sensor value to be represented by 20mA. An inverse relationship can be achieved by setting the Span less than the Zero.

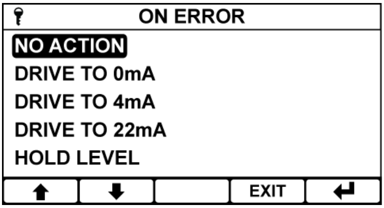
If the sensor reading falls outside this or the zero value an error will be activated.

⬆/⬇ – Increase / Decrease Digit

➡ – Select Next Digit

EXIT – Cancel

↵ – Save Value



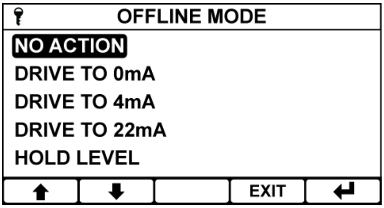
On Error

The current outputs can be programmed to output 0mA, 4mA, 22mA or Hold their value when an error is detected on the input source (i.e. Sensor Fault, Temperature Fault), to provide remote warning of error conditions or to ensure fail safe operation.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



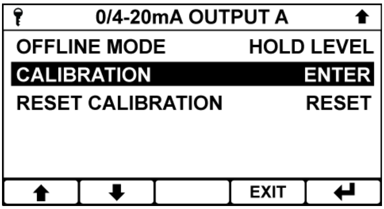
Offline Mode

The current outputs can be programmed to output 0mA, 4mA, 22mA or Hold their value when the instrument is put in an offline state.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



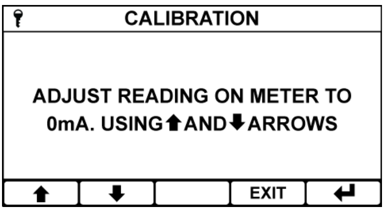
Calibration

Enter Menu to calibrate the 0/4-20mA

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Adjust 0mA Output

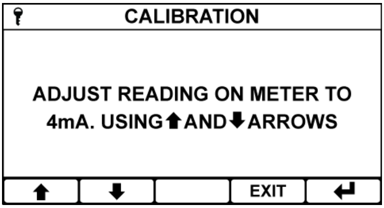
Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter. Please keep in mind that the current output cannot go below 0mA.

Only used when the mode is set to 0-20mA

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



Adjust 4mA Output

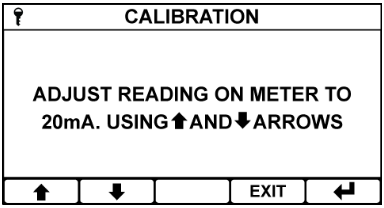
Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter.

Only used when the mode is set to 4-20mA

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



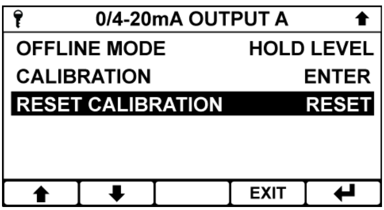
Adjust 20mA Output

Using the ⬇ and ⬆ buttons adjust the current output until it reads the desired value on your current meter.

⬆/⬇ – Adjust Output

EXIT – Cancel

↵ – Save Adjustment



Reset Calibration

Used to reset any user calibration applied to the 0/4-20mA Output

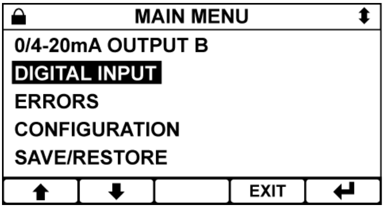
⬆/⬇ – Select Option

EXIT – Return to Calibration

↵ – Enter Option

Digital Inputs

The BCD17 is fitted with a single digital input. The digital input menu contains all of the necessary setup functions to configure the digital input sources. This input is intended to be switched using a volt free link, switch or relay. The user can select whether closing or opening the contact initiates the configured action.



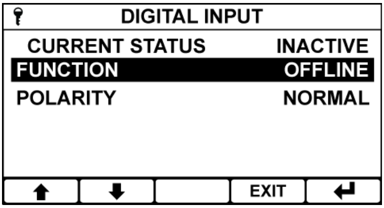
Main Menu

From the front screen press the menu button to show the main menu options and select digital input.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



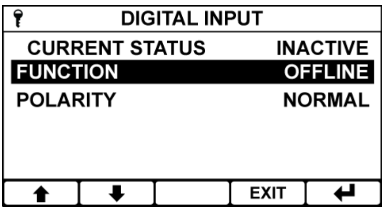
Digital Input Menu

Select the digital input function you wish to configure.

⬆/⬇ – Select Option

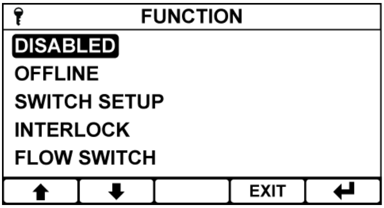
EXIT – Return to Main Menu

↵ – Enter Option



Current Status

Shows the current status of the digital input.
(Non-selectable)



Function

The digital input can be configured to operate in the following ways:

- ❖ Offline
- ❖ Switch Setup
- ❖ Interlock
- ❖ Flow Switch
- ❖ Tank Level

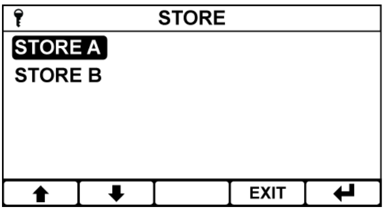
Offline, Interlock, Flow Switch and Tank Level – when active will take the instrument “offline”. This causes any active setpoints to de-energise, the 0/4-20mA output to change to its set offline state and the selected function message to appear on the front screen.

Switch Setup – when active the instrument will load an alternative Sensor Setup, Setpoint Setup and Current Output Setup that have been stored in one of the two internal save stores.
Whilst the digital input is active the instrument configuration cannot be changed.
The original configuration is restored upon the digital input going inactive.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



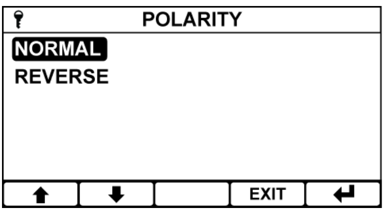
Store

Select which store the Switch Stores loads when active.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Polarity

Configure whether the digital input activates on the closing of circuit (normal) or the opening of the circuit (reverse).

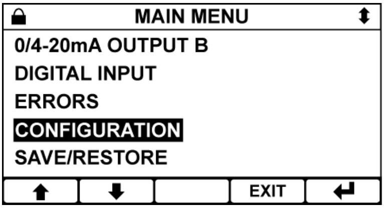
⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection

Configuration

The configuration menu enables the user to configure the basic operating parameters of the instrument.



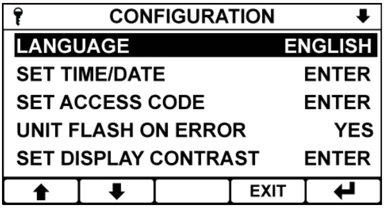
Main Menu

From the front screen press the menu button to show the main menu options and select Configuration.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



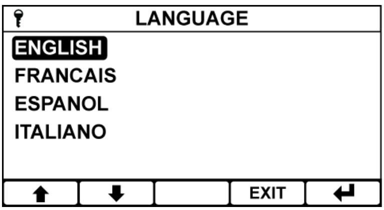
Configuration Menu

Select the function you wish to configure.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



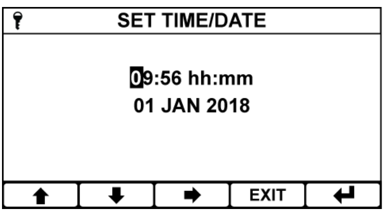
Language

The BXD17 Series has the ability to support multilingual menus. The language of choice can be selected from this menu.

⬆/⬇ – Select Option

EXIT – Cancel

↵ – Save Selection



Set Time/Date

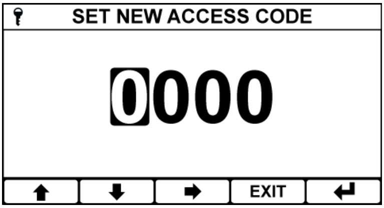
Sets the instruments time and date.

⬆/⬇ – Increase / Decrease Digit / Item

➡ – Select Next Digit / Item

EXIT – Cancel

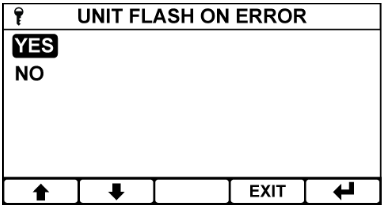
↵ – Save Time



Set Access Code

Sets the access code used by the instrument to prohibit changes to configuration by unauthorised personnel.

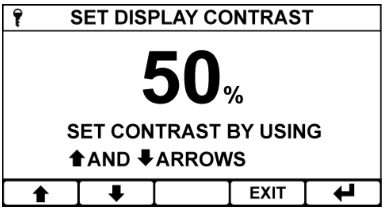
⬆/⬇	– Increase / Decrease Digit / Item
➡	– Select Next Digit / Item
EXIT	– Cancel
↵	– Save Time



Unit Flash On Error

Enables the flashing of the display backlight in the event of an instrument error.

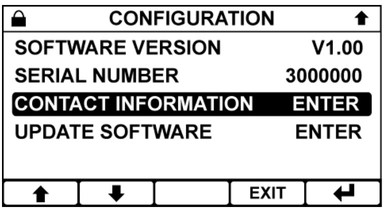
⬆/⬇	– Select Option
EXIT	– Return to Main Menu
↵	– Enter Option



Set Display Contrast

This allows the user to adjust the contrast of the display to compensate for environmental conditions that may affect the readability of the display.

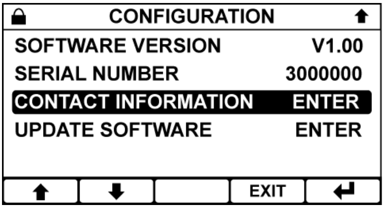
⬆/⬇	– Adjust Contrast
EXIT	– Return to Configuration Menu
↵	– Enter Option



Software Version

Displays the instrument's current software version number.

⬆/⬇	– Select Option
EXIT	– Return to Main Menu
↵	– Enter Option



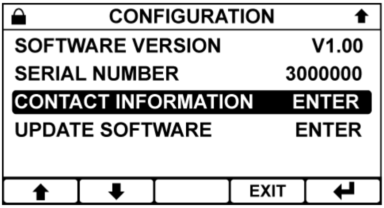
Serial Number

Displays the instrument's serial number.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option



Contact Information

Display the contact information.

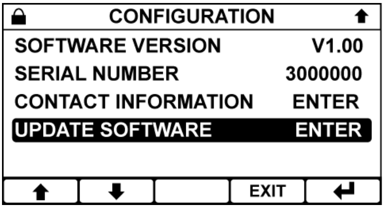
⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Enter Option

Update Software

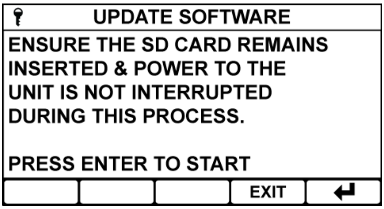
The BCD17 operating software can be upgraded by saving the latest version from LTH onto a micro SD card, inserting it into the instrument and following the instructions below. All three files must be present on the SD card for the update to work. The instrument supports SDHC and SDXC cards; however they must be formatted to fat32 which can be accomplished using a personal computer.



Update Software

Select the update software option from within the configuration menu.

↑/↓	– Select Option
EXIT	– Return to Main Menu
↵	– Enter Option



Update Software

If the instrument has verified that all of the required software is present on the micro SD card press enter to begin the update.

During the update the display will indicate the progress of the update.

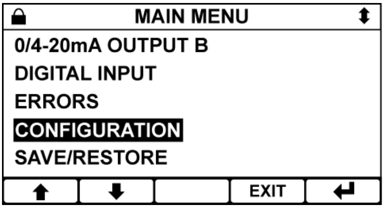
Once finished the instrument will restart automatically.

EXIT	– Return to Update Software Menu
↵	– Begin Update

Save, Restore & Reset

The BCD17 features the ability to save and restore the current configuration of the channel, setpoints, current outputs, and digital inputs to one of two stores "A and B".

The save and restore menu also features the ability to reset the whole instrument back to its factory settings.



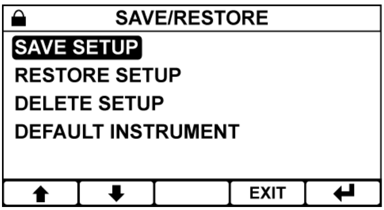
Main Menu

From the front screen press the menu button to show the main menu options and select Save/Restore.

⬆/⬇ – Select Option

EXIT – Return to Front Screen

↵ – Enter Option



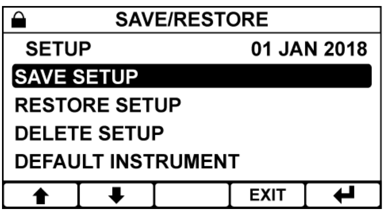
Save / Restore Menu

Select the operation you wish to carry out.

⬆/⬇ – Select Option

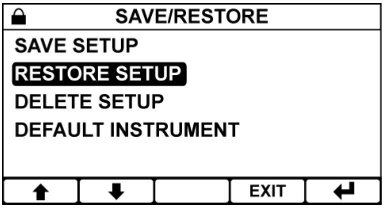
EXIT – Return to Main Menu

↵ – Enter Option



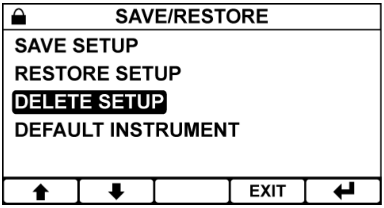
Save Setup

Save the current instrument setup to either of the two stores.



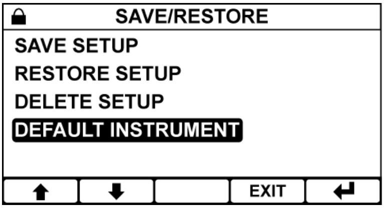
Restore Setup

Restore either of the previously saved setups.



Delete Setup

Delete the either of the previously saved setups.



Default Instrument

Reset the whole instrument back to its factory settings.

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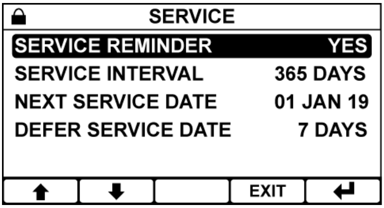
Service

The BCD17 features a service reminder system that will inform the user when the instrument is due its service.



Service Alarm

Service alarm configuration:

- Service Reminder – Turn the service alarm on or off. Requires service security code prior to use.
- Service Interval – Set the Service Interval. Requires service security code prior to use.
- Next Service Date – Sets the exact service date. Requires service security code prior to use.
- Defer Service Date – Only appears once the service interval has expired. Increases the service interval by an extra 7 days. Requires standard security code prior to use.

⬆/⬇ – Select Option

EXIT – Return to Main Menu

↵ – Edit Option

Appendix A - Ultra Pure Water

UPW cell positioning, flow rate and sampling

This summary of ASTM D5391-93, combined with LTH application notes applies to ultra-pure water applications only. These applications are very specific in nature and require great care to avoid errors in measurement.

Pure water conductivity or resistivity must be measured with a cell and temperature sensor in a flowing, closed system to prevent trace contamination from wetted surfaces and from the atmosphere. Specialised temperature compensation can be used to correct the measurement to a reference temperature of 20 or 25°C taking into account the temperature effects on the ionisation of water, the contaminates and interactions between the two.

The cell constant for the precision cell has been determined with a secondary standard cell that has a cell constant determined by ASTM D1125.

Conductivity or resistivity can be used for detecting trace amounts of ionic contaminants in water. It is the primary means of monitoring the performance of demineralisation and other high purity water treatment operations.

It is used to detect ionic contamination in boiler waters, microelectronics rinse waters, pharmaceutical process waters and to monitor and control the level of boiler and power plant cycle treatment chemicals.

Exposure of the sample to atmosphere will cause changes in the conductivity or resistivity due to loss or gain of dissolved gases. CO_2 can reach an equilibrium concentration in water of about 1 mg/l and add up to 1 µS/cm to the conductivity due to the formation of carbonic acid. This process is quite fast, depending upon conditions.

Cell, flow chamber and sample line surfaces will slowly leach trace ionic contaminates, evidenced by increasing conductivity readings with very low or zero flow rate. There must be sufficient flow to keep these contaminates from accumulating to the point where they can significantly affect the measurement. The large and convoluted surface of platinised cells precludes their use for high purity measurements for this reason.

Samples containing dissolved gases must have sufficient flow through the cell so that bubbles cannot accumulate and occupy sample volume within the cell, causing low conductivity (high resistivity) readings.

High purity conductivity measurement must not be made on a sample downstream of pH sensors due to the possible contamination of the sample with traces of reference electrolyte salts. Use a dedicated sample line or place the conductivity cell up stream from the pH sensors.

Conductivity cells mounted downstream from ion exchangers are vulnerable to catching ion exchange resin particles between the cell electrodes.

Resin particles are sufficiently conductive to short circuit the cell and cause high off scale conductivity or extremely low resistivity readings.

Resin retainers must be effective and the cell must be installed so that it is accessible for cleaning. If this is a problem with the CMC26/001/PT43 cell use the CMC34/001/PT43 which has wider spaced electrodes of greater than 1.5 mm. This has been found to be less likely to trap such particles.

Conductivity cells if subjected to de-mineraliser regeneration reagents require excessive rinse time to obtain satisfactory results, therefore, locate the cell where it will be isolated during regeneration. The cell should not be used to measure high ionic content samples of greater than 20 µS/cm (less than 0.05 MΩ.cm) since it can retain ionic contaminates and require excessive rinse down time for valid measurements.

The instrument incorporates an electronic guard to minimise the effect of cable capacitance and a 4 wire temperature measurement system to allow accurate measurements. LTH 54D or similar cable must be used to ensure correct operation.

The cell must be located in an active flowing part of the piping. Stagnant areas or dead legs must be avoided to ensure a representative sample and prevent any bubbles from adhering to the cell surfaces.

Sample lines must be designed to maintain sample integrity. Do not expose the sample to atmosphere to prevent absorption or loss of gases, particularly $C0_2$ which will affect conductivity.

The sample should be continuous at a stable flow rate of at least 100 ml/min and should be maintained to enable sample line wetted surfaces to reach equilibrium with sample conditions. Do not make measurements following changes to sample flow rate for the period of time required to recover from transient effects on the particular sampling system.

Appendix B - Temperature Coefficient

Calculating the temperature coefficient of a solution
If the temperature coefficient of the solution being monitored is not known, the BCD17 can be used to determine that coefficient. You should set the conductivity input channel to a suitable range and the temperature coefficient to 0.0%.

The following measurements should be made as near to the normal operating point as practical, between 5°C and 70°C for the highest accuracy. Immerse the measuring cell in at least 500 ml of the solution to be evaluated, allow sufficient time to stabilise, approximately one or two minutes, and then record both the temperature and conductivity readings. Raise the solution temperature by at least 10°C and again record the temperature and conductivity readings. Using the following equation, the temperature compensation slope can be calculated in percentage terms:

$$\alpha = \frac{(Gx-Gy) \times 100\%}{Gy(Tx-25) - Gx(Ty-25)}$$

(base temperature 25°C)

Note: If base temperature is set to 20°C, then replace 25 with 20 in the above equation.

Term	Description
Gx	Conductivity in µS/cm at temperature Tx
Gy	Conductivity in µS/cm at temperature Ty

Note: One of these measurements can be made at ambient temperature.

Set the temperature compensation slope to the calculated value. The temperature compensation is now set up for normal operation.

If it is difficult or impossible to evaluate the temperature compensation slope using this method, a 2.0 % / °C setting will generally give a good first approximation until the true value can be determined by independent means.

Temperature Data

The table below lists approximate resistance values of temperature sensors that may be used with the BCD17.

Temperature (°C)	Pt1000 RTD	Pt100 RTD
0	1000.0Ω	100.0Ω
10	1039.0Ω	103.9Ω
20	1077.9Ω	107.8Ω
25	1097.3Ω	109.7Ω
30	1116.7Ω	111.7Ω
40	1155.4Ω	115.5Ω
50	1194.0Ω	119.4Ω
60	1232.4Ω	123.2Ω
70	1270.7Ω	127.1Ω
80	1308.9Ω	130.9Ω
90	1347.0Ω	134.7Ω
100	1385.0Ω	138.5Ω

Appendix C - Error Messages

Switch On Diagnostic Errors

E01	**Read/Write Error** Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E02	**Data Error** The instrument configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the Default Instrument function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
E03	**Storage Error** The save setup configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the delete setup function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.
E04	**Factory Error** The factory configuration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists, consult with your supplier, as this unit may require to be returned for repair.
E05	**User Cal Error** The instrument user calibration has for some reason become corrupted. Try switching the unit off and then on again. If the message persists use the Default Instrument function in the Save/Restore menu or consult with your supplier, as this unit may require a repair.

Sensor Input Errors

E21	**Sensor Open Circuit** The sensor input is at open circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E22	**Sensor Short Circuit** The sensor input is at short circuit, check sensor condition and connections. If the message persists please consult with your supplier.
E23	**Sensor Over Range** The sensor reading is greater than the specified upper limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E24	**Sensor Under Range** The sensor reading is less than the specified lower limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.
E31	**Temperature Over Range** The temperature reading is greater than the specified upper limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.

Sensor Input Errors Continued

E32	**Temperature Under Range** The temperature reading is less than the specified lower limit, check channel settings, Sensor condition and connections. If the message persists please consult with your supplier.

Setpoint Status

M51	**Setpoint 1 Dose Alarm**
M52	**Setpoint 2 Dose Alarm**
	The dose alarm for the setpoint is active.
M53	**Setpoint 1 Sampling**
	The setpoint is in the Sampling phase of Blowdown cycle.
M54	**Setpoint 1 Blowdown**
	The setpoint is in the Blowdown phase of the Blowdown cycle.
M55	**Setpoint 1 Cycling**
	The setpoint is in the Cycling phase of the Blowdown cycle.
M90	**Setpoint 1 Triggered**
M91	**Setpoint 2 Triggered**
	The setpoint has been triggered. (Only shows when setpoint flash on trigger is enabled.)

Current Output Errors

E61	**Output A Hardware**
E71	**Output B Hardware**
	The current output circuit has detected an error in the current output loop; this is most commonly due to either a broken loop or too large a load resistor.
E62	**Sensor < OP A Zero**
E72	**Sensor < OP B Zero**
	The sensor input level is below that set for the current output zero.
E63	**Sensor > OP A Span**
E73	**Sensor > OP B Span**
	The sensor input level is greater than that set for the current output span.
E64	**Sensor > OP A Zero**
E74	**Sensor > OP B Zero**
	The sensor input level is greater than that set for the current output zero.
E65	**Sensor < OP A Span**
E66	**Sensor < OP B Span**
	The sensor input level is below that set for the current output span.

Service Messages

M80	**Service Due** The Planned Service interval for this unit has expired. Please contact LTH Electronics at the details below: LTH Electronics ltd Chaul End Lane Luton Beds LU4 8EZ Tel. 0044 (0) 1582 593693 Fax 0044 (0) 1582 598036 Email sales@lth.co.uk NB. LTH overseas users should contact their LTH distributor – See www.lth.co.uk for details.
M81	**Calibration Due** The user entered calibration interval has expired.
M82	**Service Mode Active** The unit is currently in service mode, the setpoints and current outputs may not respond as configured. Please contact LTH Electronics at the details below: LTH Electronics ltd Chaul End Lane Luton Beds LU4 8EZ Tel. 0044 (0) 1582 593693 Fax 0044 (0) 1582 598036 Email sales@lth.co.uk NB. LTH overseas users should contact their LTH distributor – See www.lth.co.uk for details.

Fault Finding

NOTE: THERE ARE NO USER SERVICEABLE PARTS INSIDE THE UNIT

The BCD17 has been designed to include a wide range of self-diagnostic test, some of which are performed at switch on, and some on a continuous basis. This guide aims to provide a route to diagnosing and correcting any faults that may occur during normal operation. The table shown previously in this section gives a list that the BCD17 generates, along with their probable causes. If the fault has not been cleared after these checks have been made contact LTH. Please have as much of the following information available as possible in any communication with LTH, to enable quick diagnosis and correction of the problem.

- Serial number of the instrument.
- The approximate date of purchase.
- Details of the program settings and application.
- Electrical environment and supply details.
- Circumstances under which the fault occurred.
- The nature of the fault or faults.
- Any error messages that are displayed.
- The sensor type, cable length and type.
- Current output configuration.
- Relay connection configuration.
- Digital Input Configuration.

It is often worthwhile to check the measurement by an independent method, for example using a handheld meter.

The Instrument Appears Dead
Check that power is available to the unit. Using a voltmeter, set to AC or DC, check the power supply voltage at the connector. The design of the BCD17 allows the unit to accept from 90 to 265V AC, an alternative option allows operation from 12 to 30V DC, check the connection label for voltage specification. Check that the power cable is securely and correctly attached. There are no user serviceable fuses fitted within this unit.

The Access Code Does Not Work
It is probable that the access code has either been changed or the operator does not recall the code correctly. Contact LTH or your local distributor should this problem arise.

The Sensor Reading Is Constantly Over-range or Under-range

- Ensure that the sensor and temperature inputs are correctly connected (see Installation and Choice of Conductivity Sensors, page 20) and that the sensor is not faulty or damaged.
- Check that the correct range and Cell Constant has been selected within the Channel Setup menu if in doubt set to Auto Range (see Conductivity Input Setup, page 29.)
- Check the temperature compensation state (see Channel Setup page 31). If the compensation is set to "TC IN Manual" check that the fixed temperature is at the correct level. If the compensation is "TC IN PT1000" or "TC IN PT100" check that the temperature reading on the main display is correct.
- Check the sensor using a hand-held meter.
- Check that the sensor is "seeing" a representative sample, trapped air will give a low reading.
- Ensure the input is correctly connected and the sensor is not faulty or damaged.
- Check the sensor and its cable for possible short circuits. Consider the fact that the conductivity may be higher than the range of the instrument.
- Check the Pt100 / Pt1000 RTD temperature sensor connections.
- Check that any in-line junction boxes and extension cables have been fitted and wired up correctly.

The display reads zero

- Check for open circuit sensor (conductivity or TDS modes)
- Check for short circuit sensor (resistivity mode)
- Check for damage to the connecting cable.
- Check that all input connections are secure.
- Check the sensor is wired up correctly.
- Check that the sensor bore is not blocked or completely filled with air.
- Check the sensor is immersed in the correct solution.

Instrument display appears to malfunction

- Switch the instrument power off and on again.
- Check that the display back-light is on, indicating power is reaching the unit.
- See that it displays meaningful text (Issue number etc.) in its start-up sequence, indicating processing activity.

The Sensor Reading Is Incorrect

- Low reading due to incomplete immersion or contamination of the electrodes.
- There may be some trapped matter within the sensor bore.
- High conductivity readings caused by a short circuit or leakage of liquid contamination into the sensor moulding.
- The sensor should be checked, when dry, with an ohmmeter. Disconnect it at the instrument and check the resistance between the E and C terminals. It should be greater than 50 MΩ between E & C. Check the leakage from E & C in turn to the terminated screens (inner and outer). Again, 50 MΩ should be the minimum isolation resistance between them all.
- Low conductivity can be caused by accumulation of trapped air or gas coming out of solution. Check that no "air traps" exist in the sensor installation.
- High conductivity readings caused by leakage of solution into the sensor. This usually indicates that the sensor material has been fractured and the sensor must be replaced.
- First check that the temperature resistance is correct, otherwise the temperature compensation circuit will cause false or erratic readings. Temporarily switching out the temperature compensation can help to show if this is the cause of the problem.
- If another conductivity sensor is available, this can be used to determine whether the fault lies with the instrument or the sensor.
- Check that the sensor cable is not damaged or broken and that the outer screen does not make contact with any other terminals or metal work.
- Check that the inner screen (G) does not contact any other terminals or metalwork at the sensor end. It should not be grounded.
- Check that the sensor cable is sufficiently distant from power cables or electrical noise sources.
- Check that the correct sensor type has been installed.
- Check that the correct range has been selected.
- Check that the correct sensor calibration values have been used.
- Check that the calibration procedure has been followed precisely.
- Check that the temperature compensation has been set up as required.
- Check that the sensor cable does not exceed the maximum specified length (sensor 5m + extension 25m).

The Temperature Reading Is Incorrect

- Check that the temperature sensor is correctly attached. (See Temperature Sensor Connections, page 24)
- Check that the temperature sensor type is correctly selected in the Channel Setup menu.
- Where practical check the temperature sensor resistance against the table in Temperature Data, page 68.

Current Output is Incorrect or Noisy

- Check that the maximum load for the current loop has not been exceeded. (750Ω).
- Check that the terminals have been wired correctly.
- Check that the cable screen is attached to Earth at one end and that the cable does not pass too close to a power cable.
- Check that the current output has been configured properly.

Relays Appear to Malfunction

- Check that the unit is "On-Line" (Page 26)
- Check that the set point has been configured properly.
- If the relays are vibrating or "chattering" as they pass the set point, check the hysteresis setting and increase if necessary.
- Ensure that the relays are connected properly and that the voltage/current levels are not exceeding 5A @ 30V DC or 5A @ 250V AC.
- Check that the instrument input cables are not picking up excessive noise.

Guarantee and Service

Products manufactured by LTH Electronics Ltd are guaranteed against faulty workmanship and materials for a period of three years from the date of despatch, except for finished goods not of LTH manufacture, which are subject to a separate agreement.

All sensors made by LTH Electronics Ltd are thoroughly tested to their published specification before despatch. As LTH have no control over the conditions in which their sensors are used, no further guarantee is given, although any complaints concerning their operation will be carefully investigated.

Goods for attention under guarantee (unless otherwise agreed) must be returned to the factory carriage paid and, if accepted for free repair, will be returned to the customer's address free of charge. Arrangements can also be made for repair on site, in which case a charge may be made for the engineer's time and expenses.
If any services other than those covered by the guarantee are required, please contact LTH direct.

N.B. Overseas users should contact their LTH nominated representative. Special arrangements will be made in individual cases for goods returned from overseas.

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