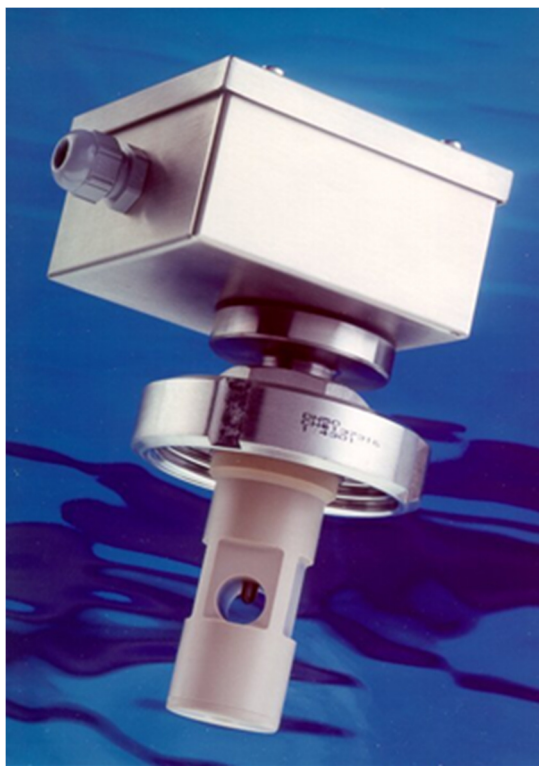# IET40

CONDUCTIVITY TRANSMITTER

QUICK START GUIDE

Preface

Product guarantee

This instrument has a guarantee against defects in materials and workmanship for a period of 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.

Limitation of guarantee

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

No guarantee 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.

There are no user serviceable parts, including fuses etc., within the unit. Any attempt to dismantle the instrument will invalidate the guarantee.

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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6th edition		21/04/2023
Part number: 6110	Telephone:	+44 (0) 1582 593693
LTH Electronics Ltd	Fax:	+44 (0) 1582 598036
Chaul End Lane	Email	sales@lth.co.uk
Luton LU4 8EZ	Web site	www.lth.co.uk
Bedfordshire UK		

# IET40 Conductivity Transmitter Installation

PRECAUTIONS TO BE TAKEN DURING INSTALLATION OF THE IET40

1. Site the instrument where access is possible for calibration.
2. Fit isolating valves if possible to permit removal for inspection.
3. Do not position the sensor where trapped air can collect.
4. Do not force sensor through an opening too small for it.
5. Allow enough space around the sensor for the fluid to circulate and to prevent field distortion (12mm radially, 25mm below).
6. Make sure the calibration resistor is removed from the sensor.
7. The Sensor is Factory Calibrated, check as required.
8. Route the cable away from power lines where possible.
9. Do not over tighten the sensor into the receptacle.
10. Leave sufficient cable for removing the transmitter if required.
11. Terminate the cable screen to Earth to prevent interference.
12. Do not leave long lengths of wire unscreened.
13. Outputs are not isolated from comms, power supply or each other.
14. The DC Supply must not go below 12 V for the Current Output drivers to work properly.
15. The DC Supply must not exceed 30 V to prevent damage to the Sensor electronics.
16. Only use a CE marked power supply unit of the correct current and voltage ratings.
17. Check that the cable gland which is used fully seals against liquid intrusion.
18. Check the top cover gasket and replace if necessary before tightening down the lid.
19. Installation of the IET40 should be made using a multi-core cable to the terminal blocks.
20. Use a cable with enough cores to make all of the required connections.
21. The 15 way D-type connection can be used separately or simultaneously for programming.
22. Serial Communication is via a 4-wire RS485 interface using a Modbus™ protocol.

TERMINAL BLOCK CONNECTIONS

(inside the sensor housing)

Label	Connect to
RX-	Receive Negative Terminal
RX+	Receive Positive Terminal
TX-	Transmit Negative Terminal
TX+	Transmit Positive Terminal
0V	Rx / Tx Common
OP1	Channel 1 Output, 4 – 20 mA
OP2	Channel 2 Output, 4 – 20 mA
0V DC	Power Supply & Output Common
24V DC	Power Supply 12 – 30 Volts DC
EARTH	Multi-core cable screen
EARTH	Housing ground wire
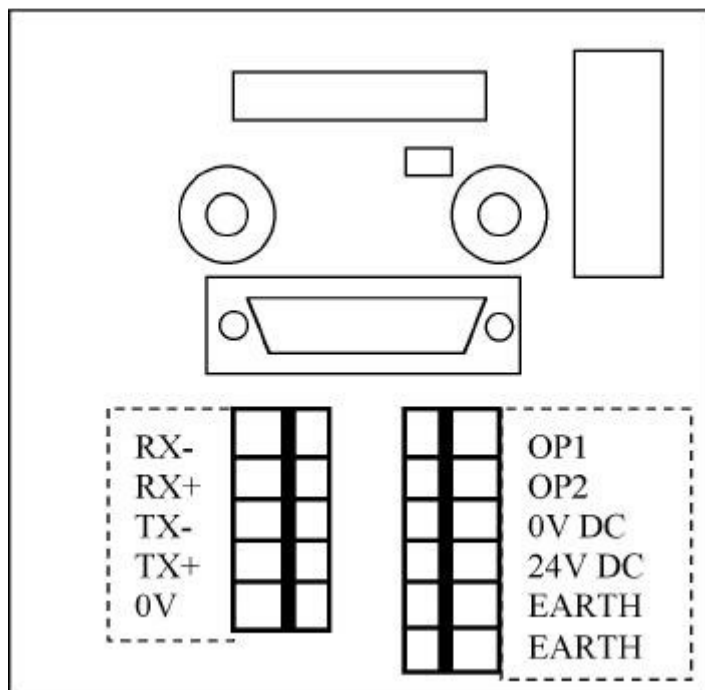
Typical Applications
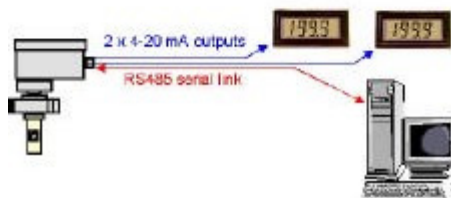
Configure, test, calibrate and monitor IET40 using the custom designed Smart Control Centre Windows 95 application software. The software is supplied on CD-ROM or is downloadable from www.lth.co.uk

Two industry standard analogue 4 – 20 mA current outputs can be used to monitor or form part of a control system. The outputs are electrically isolated from the liquid being measured, but not from the power supply or each other.

The Modbus™ protocol digital serial data output can be used with or without the analogue 4 – 20 mA current outputs to relay more complex information about the status of the sensor and solution being monitored.

IET40 CONTROL CENTRE SOFTWARE

To install the operating software, simply insert the CD-ROM into your Windows 95 / 98 PC or laptop. The Autorun feature will take you through the installation. If Autorun is disabled on your PC, use the START – RUN method and select Setup.exe on the CD. Continue as instructed.

Programme user access security codes are (unless changed by the user)…

For Configuration Access (Level 1 = minimum access), the password is 1

For Calibration Access (Level 2 = minimum access), the password is 2

For Installation Access (Level 3 = minimum access), the password is 3

Change these after Installing if others have access to the system to avoid unauthorised changes of setup.

MAIN WINDOW
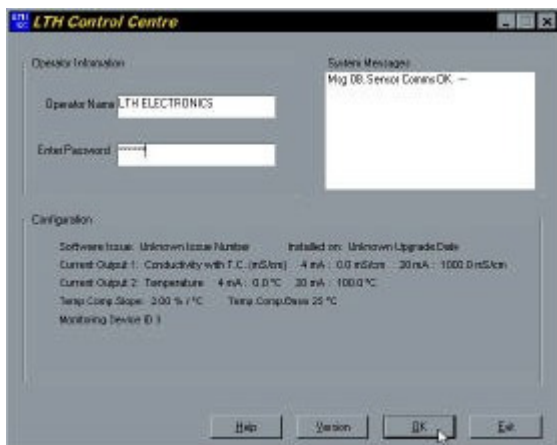
The LTH Smart Sensor Interface is a new way of configuring your instrumentation. The programme has been designed to maximise control over every aspect of the sensor's performance, from software loading and upgrading, to configuring and commissioning, through to monitoring the output of information from the sensor.

The Online HELP system will guide you effortlessly through setting up even the most complicated configuration to give optimum performance from your IET40 and control system.

The Smart Dialog Window is the Main Screen for the Control Application. After entering your Name and a current Password, each of the other main screens can be accessed as a series of property pages.

Designed from the outset to be Windows 95 compliant and to be instinctive for anyone familiar with traditional conductivity instruments. Any questions, look in the Help Index !

MONITOR PAGE
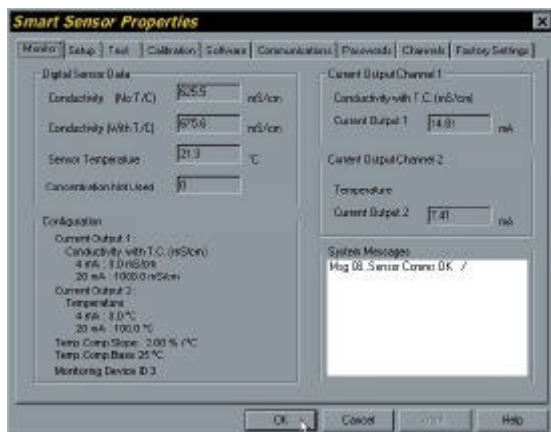
This Tab consists of three main Groups of Instrument Monitoring.

Digital Sensor Data. This Group shows Digital information coming back from the sensor via the digital communications link. If a concentration range has been selected on any channel, including current output ranges, the Concentration box will show the calculated

Solution Concentration.

Current Output Data. This shows both of the Ranges selected for the two current outputs, and the Output Currents being transmitted by them. Sensor Configuration Information. This Text Only feature gives the 4 mA (Zero) and 20 mA (Span) points of the two Current Outputs.

SETUP PAGE
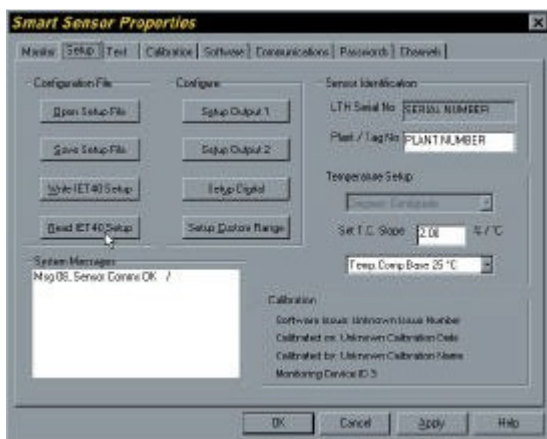
The Sensor Setup Tab is the lead in screen for configuring the majority of the IET40 options.

Standard and specific configurations can be saved and loaded from the hard disk drive to enable Users to maintain a database of setup files. These can be used to rapidly configure a new sensor without having to painstakingly go through and check each setting individually.

In addition a Configuration Display and Print Button have been added and will be implemented later. Sensor Identification is shown in the form of a Manufacturers Serial Number and a User Plant or Tag Number.

Temperature Compensation is configured in this page. Temperature Compensation Units and Base Temperature apply to all operating ranges and cannot be set differently for different channels. If a standard Concentration Range has been selected on one of the current output or digital channels the compensation slope entered by the User is overridden by the software with the correct compensation slope for that chemical. The User slope applies to Conductivity or Special Range measurements.

Three Buttons take the User into the setup Windows for each of the Current and Digital output channels.

A Text Only panel shows the Software details of the Programme currently installed in the Sensor, including the name of the installer, the date of the installation and the Issue / version of software loaded.

TEST PAGE
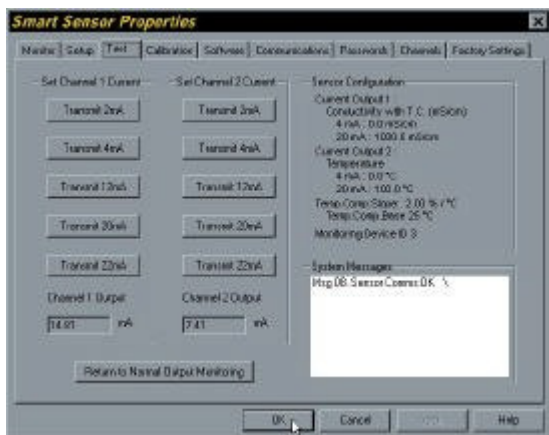
The Test Tab gives the user a series of buttons which force the sensor current outputs to fixed levels of 2mA, 4mA, 12mA, 20mA, or 22mA for each of the two channels. Both are independent and can be set the same or different in this mode.

The 2mA setting tests low level fault or error current, 4mA is the "zero " or minimum output level,
12mA is the mid-point check current, 20mA is the "span" or full scale output and 22mA tests the high level fault or error current.

The fixed current outputs are cleared (cancelled) when the programme is terminated or the communication link is broken, which means the sensor can't accidentally be left in this state.

CALIBRATION PAGE
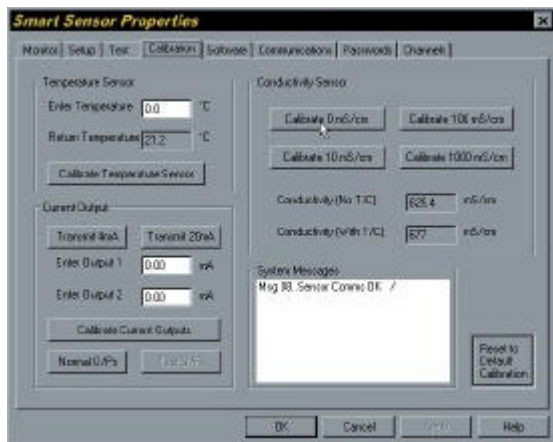
The three main calibration operations are grouped together on this Tab.

Temperature Calibration Group:

Conductivity Calibration Group:

Current Output Calibration Group:

As the IET40 is Factory Calibrated, it is not usually necessary to re-calibrate it. Should a re-calibration be required, see details in the section on Calibration.

In the event of a failed Calibration, Error messages will alert you to the particular problem area, leading to a swift resolution of your problem.

SOFTWARE PAGE
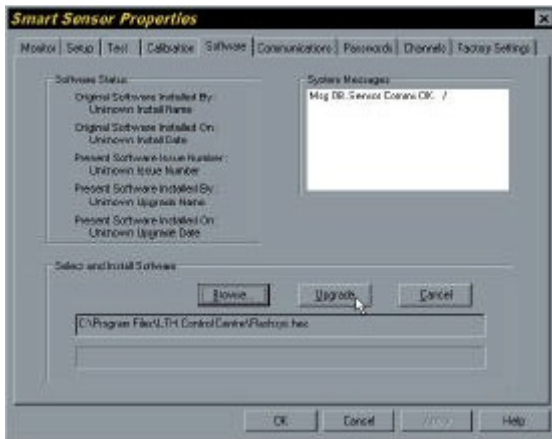
The upgrade files required to carry out a software update will be available on the LTH Web site, and will be free to download. Also on floppy disk (at a pinch) the updated files are simply copied into the "\Program Files\LTH Smart" folder and the Smart Sensor Programme is executed as normal.

Press the Install Software Button to access the Install Window.

Use the Dropdown Menu to select the new software file. If it does not appear, search for it using the Browse Button, which calls the Windows Open File Dialog. The Programme files are of the type *.HEX. When the correct file has been located and selected, Press the Install Button. The file will begin to download ina few seconds. The Install Progress Indicator gives a visual indication of the data transfer. The Software Status Panel updates to indicate a change of software has occurred.

COMMUNICATIONS PAGE
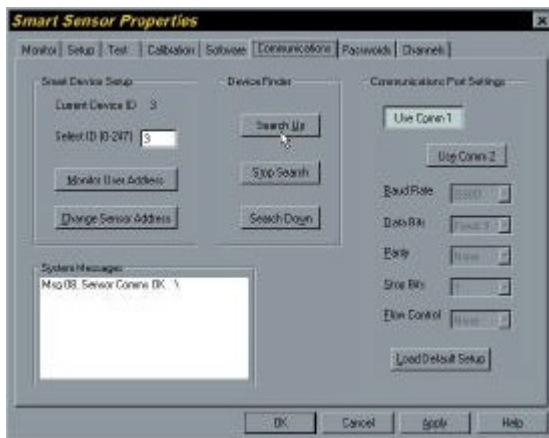
There are many different computers capable of using this software, so LTH have built in the ability to tweak the basic serial data settings if you wish to do so.

Our advice is don't muck about with it, unless you know what you are doing, just use the standard Modbus settings. These can easily be restored in the event of corruption or unauthorised fiddling. Simply Press "Modbus" to restore the Modbus Default Communications settings. The new settings will be stored automatically on exiting

the programme. The early releases of software and sensors will only use the default settings.

PASSWORDS PAGE
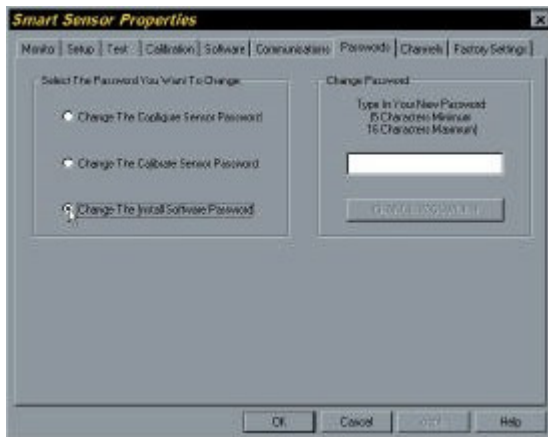
Four levels of access provided by the programme. Open Access to the front screen enables the Operator to enter a Username and Password.

Three Password levels are available to the user.

The Configure Password gives access to all Configuration options for all channels. The Calibrate Password gives all the above and the Calibration Window.

The Install Password gives all the above and enables the User to update the Sensor Operating Programme from a PC or laptop.

A fourth Password is used to access a Factory Setup Page which is not available to customers. The upgrade files will be available on the LTH Web site http://www.lth.co.uk/ in due course, and will be free to download on demand.

CHANNELS PAGE

This Tab consists of 5 Groups of Instrument Monitoring Windows. It allows the operator to view up to 5 Sensors at the same time. No programming or modifications can take place in this mode. It is only active when this page is being displayed by the application. The Computer interrogates each Sensor in sequence and its data boxes are updated. Six Data measurements are extracted from the sensor as follows. Non Temperature Compensated Conductivity (in mS/cm) Temperature Compensated Conductivity (in mS/cm) Temperature (in degrees C or F) ; Solution Concentration (in % or p.p.t. for sea water or TDS ranges) Channel One Current Output (in milliamps) Channel Two Current Output (in milliamps).

CURRENT OUTPUT CHANNEL 1 PAGE
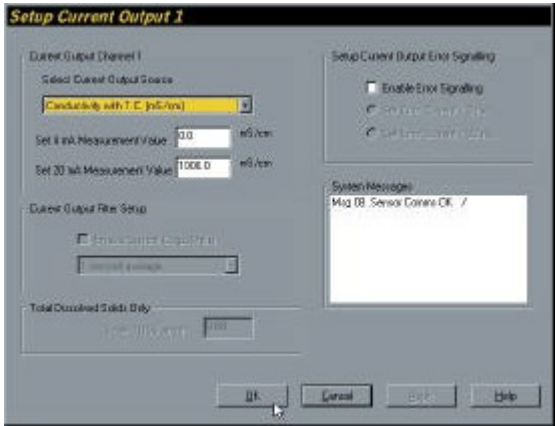
To Setup the Channel One Current Output, first select an Operating Range or Source from the List Box. Then set the

4 mA and 20 mA values from within the selected range.

If either the T.D.S. or Special Ranges have been selected, then other items are revealed as a consequence and will have to be setup. A digital Filter can be

activated which then reveals a Dropdown List of filter periods. Error messages can be activated in the current loops by driving the output low (2 mA) or high (22 mA) on detection of a serious fault. The second output channel is identical in features and operation to this channel, but is completely independent. The Output currents share a common power supply so a loop isolator may be required for one channel if the installation experiences earth loop problems.

CURRENT OUTPUT CHANNEL 2 PAGE

As per channel 1 above.

DIGITAL OUTPUT DATA PAGE

To Setup the Digital Data Output, first select an Concentration Range if required from the List Box. It can be disabled by selecting Concentration Not Required.
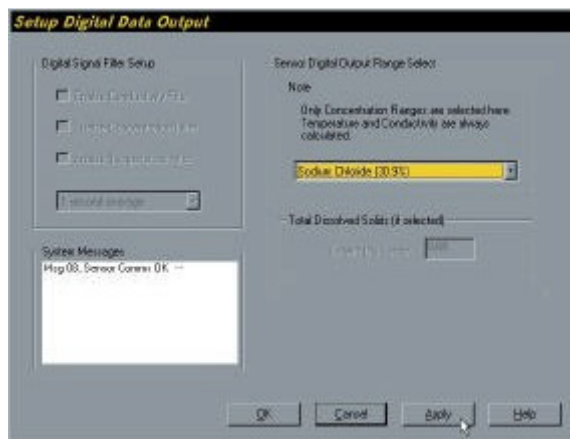
If either the T.D.S. or Special Ranges have been selected, then other items are revealed as a consequence and will have to be Setup correctly.

Temperature, Conductivity (both with and without Temperature Compensation) are always calculated and available through the digital data stream and therefore do not need to be selected by the User.

Three different digital Filters can be activated which then reveals a Dropdown List of filter periods.

CUSTOM RANGE SETUP PAGE
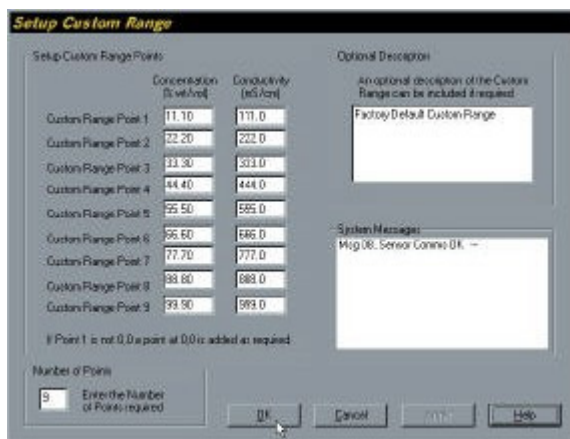
This feature will be implemented in second generation software issues.

This feature enables the sophisticated user to programme a customised range relating Conductivity and Concentration for chemical combinations not featured in our standard ranges.

Simply set the required number of points in the curve, then enter the conductivity and concentration values into the available points in the table. If necessary, only one point need be entered, then the system assumes a starting point of 0,0. Remember to set the Temperature Compensation Slope to get the right results.

SENSOR CALIBRATION

The Sensor is supplied Factory Calibrated, so these procedures are only necessary
in the event of doubt concerning the validity of the
calibration. Any part of the Calibration procedure
below can be performed independently without the
need to re-calibrate everything. Power up 10 minutes
prior to calibration to stabilise the Sensor electronics.
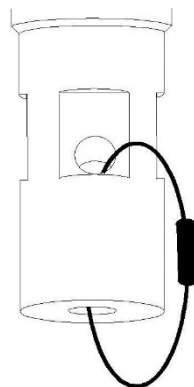
Preparing for Calibration

1) Unscrew and remove the instrument housing cover.
2) Connect the monitor cable to the 15 way D-type connector (if needed).
3) Launch the LTH Windows Interface on the PC.
4) Check Communications in the LTH Interface Message Box.
5) If not, is Modbus ID on Sensor = ID on Comms Page.
6) Is cable connected to correct PC port, & port selected on Comms Page ?
7) Select the LTH Smart Interface Calibration Page.

Conductivity Calibration

A resistance box may be used in place of loop resistors. It should be of a low-
inductance type with a short thick piece of wire. Note that the sensor calibrates as if
it were uncompensated.

1) Have the IET40 in air & nothing close to it (product, loop resistors, surfaces)
2) Click the "**Calibrate 0 mS/cm**" Button, and confirm it with the "**Yes**" Button.
3) In about 10 secs, the Control Centre System Message window displays Msg 0x61 to confirm the ZERO calibration.
4) Pass a 600 ohm loop resistor through the sensor and connect the ends together.
5) Click the "**Calibrate 9.25 mS/cm**" Button, and confirm it with the "**Yes**" Button.
6) In about 5 secs, the Control Centre System Message window displays Msg 0x61 to confirm the **1st** SPAN calibration.
7) Replace the 600 ohms with a 60 ohm loop resistor and connect the ends together.
8) Click the "**Calibrate 92.5 mS/cm**" Button, and confirm it with the "**Yes**" Button.
9) In about 5 secs, the Control Centre System Message window displays Msg 0x61 to confirm the **2nd** SPAN calibration.
10) Replace the 60 ohms with a 6 ohm loop resistor and connect the ends together.
11) Click the "**Calibrate 925 mS/cm**" Button, and confirm it with the "**Yes**" Button.

12)   In about 5 secs, the Control Centre System Message window displays Msg 0x61 to confirm the **3rd** SPAN calibration.

Calibration Point	LTH Loop resistor	Resistance value
9.500 mS/cm	Red / Yellow	600.0 ohms
95.00 mS/cm	Red / Orange	60.00 ohms
950.0 mS/cm	Red / Blue	6.000 ohms

Temperature Calibration

1) Measure the true Temperature of the Sensor with the required accuracy.
2) This can be in-situ using an independent method of measurement.
3) Or it could be achieved by placing the Sensor in a Temperature controlled bath.
4) Wait until the Sensor has stabilised, say 10 minutes at Calibration Temperature.
5) Enter the Measured Temperature in the "**Enter Temperature**" Box of the Calibration Page.
6) The Temperature being returned by the Sensor appears in the "**Return Temperature**" Box.
7) Click "**Calibrate Temperature Sensor**" Button, confirm with the "**Yes**" Button.
8) In about 5 secs the Control Centre System Message window displays Msg 0x62 to confirm Temperature calibration.

Current Output Calibration

1) Click the "**Transmit 4mA**" Button.
2) Accurately measure the Actual Output Current on both channels.
3) Enter these values in the "**Enter Output 1**" & "**Enter Output 2**" Boxes.
4) Click the "**Calibrate Outputs**" Button, and confirm it with the "**Yes**" Button.
5) In about 5 secs the Control Centre System Message window displays Msg 0x63 to confirm the 4mA Output calibration.
6) Both Current Outputs should be transmitting 4mA, confirm this on the meter(s).
7) Click the "**Transmit 20mA**" Button.
8) Accurately measure the Actual Output Current on both channels.
9) Enter these values in the "**Enter Output 1**" & "**Enter Output 2**" Boxes.
10) Click the "**Calibrate Outputs**" Button, and confirm it with the "**Yes**" Button.
11) In about 5 secs the Control Centre System Message window displays Msg 0x63 to confirm the 20mA Output calibration.
12) Both Current Outputs should be transmitting 20mA, confirm this on the meter(s).

On Completion of Calibrations

1) Remove 15 way D-type connector and re-place the housing cover.
2) The transmitter is now ready for operation.

SENSOR SETUP

This is a check list to remind you of the options which may need to be setup for your Sensor to work correctly. Not all options will be valid for all installations, so ignore those which don't apply in your case.

Page or Sheet	Settings to Check
Setup Page	Temperature Compensation Base and Slope
Setup Output 1 Sheet	Source, Zero and Span values, Filtering, Error Signaling
Setup Output 2 Sheet	Source, Zero and Span values, Filtering, Error Signaling
Setup Digital Sheet	Source Parameter, Filtering
Setup Special Sheet	User curve points as required
Communications Page	PC Serial Port, Sensor Device Address

SYSTEM MESSAGES

The IET40 provides the user with Setup and Installation Diagnostic Messages using an encoded system of two digit numbers. If the Control Centre System Message window displays shows any of these messages, they should be interpreted as follows…

If the error code is not listed in the table below, obtain a more up to date copy of this Guide (http://www.lth.co.uk/). The Windows Application Help File also contains more details.

Msg	Meaning of Displayed Message		Msg	Meaning of Displayed Message
01	Msg 01..Data Reply Overdue		48	
02	Msg 02..Data Reply Timed Out		49	
03	Msg 03..Message Acknowledge Overdue		50	
04	Msg 04..Resetting Communications		51	Msg 51..EE Cksum A Error
05	Msg 05..Transmit or CRC Error		52	Msg 52..EE Cksum B Error
06	Msg 06..Receive or CRC Error		53	Msg 53..EE Cksum C Error
07	Msg 07..Function # Completed OK		54	Msg 54..EE R/W Error
08	Msg 08..Sensor Comms OK <<O>>		55	
09	Msg 09..Receiving Data Block # of #		56	
10	Msg 10..Download Issue Not Returned		57	
11	Msg 11..Temp Comp Err		58	
12	Msg 12..Cond Over-rng		59	
13	Msg 13..Cond Under-rng		60	
14	Msg 14..Temp Over-rng		61	Msg 61..Cond Rng 1 Z L Err

15	Msg 15..Temp Under-rng		62	Msg 62..Cond Rng 2 Z L Err
16	Msg 16..User Cond.Error		63	Msg 63..Cond Rng 3 Z L Err
17	Msg 17..User Conc.Error		64	Msg 64..Cond Rng 4 Z L Err
18	Msg 18..User No.Points Error		65	Msg 65..Cond Rng 1 Z H Err
19			66	Msg 66..Cond Rng 2 Z H Err
20			67	Msg 67..Cond Rng 3 Z H Err
21	Msg 21..Output 1 > 22 mA		68	Msg 68..Cond Rng 4 Z H Err
22	Msg 22..Output 1 < 2 mA		69	
23	Msg 23..Output 1 Fault		70	
24	Msg 24..Output 1 Cal.Err		71	Msg 71..Cond Rng 1 S L Err
25	Msg 25..Output 2 > 22 mA		72	Msg 72..Cond Rng 2 S L Err
26	Msg 26..Output 2 < 2 mA		73	Msg 73..Cond Rng 3 S L Err
27	Msg 27..Output 2 Fault		74	Msg 74..Cond Rng 4 S L Err
28	Msg 28..Output 2 Cal.Err		75	Msg 75..Cond Rng 1 S H Err
29			76	Msg 76..Cond Rng 2 S H Err
30			77	Msg 77..Cond Rng 3 S H Err
31	Msg 31..Preparing Software Download		78	Msg 78..Cond Rng 4 S H Err
32	Msg 32..Erasing Sensor Flash Memory		79	
33	Msg 33..Flash Download Starting		80	Msg 80..Non Specific Error
34	Msg 34..Flash Block <<BLOCK#>> Transmitted		81	
35	Msg 35..Sensor Is Now Restarting		81	
36	Msg 36..Requesting Download <<O>>		83	
37	Msg 37..Faulty Download Acknowledge Message		84	
38	Msg 38..Flash Block <<BLOCK#>> Download Error		85	
39	Msg 39..Faulty Sensor Restart Message		86	
40			87	
41	Msg 41..Setting New Modbus ID << ID#>>		88	
42	Msg 42..Start Modbus Scan ID << ID#>>		89	
43	Msg 43..Restore Last Modbus ID <<ID#>>		90	
44	Msg 44..Scanning Modbus Device ID <<ID#>>		91	Debugging Message
45	Msg 45..Waiting for User Input		92	Debugging Message
46			93	Debugging Message

47			94	Debugging Message

UPGRADING THE SOFTWARE

Full Instructions, the latest software Flash upgrades and the most recent version of the LTH Windows™ Smart Interface Application will be available from the LTH Web site at http://www.lth.co.uk/ A password may be necessary and is obtained by using the online registration facility. Until the website is setup to distribute this information, the latest files can be e-mailed on request, and guidance in carrying out the upgrade is available in the LTH Control Centre Help Files. Contact LTH Electronics for further information.

MODBUS FUNCTIONALITY

To use the Modbus features of the IET40 it is necessary to know the structure of the messages, so they may be used to interrogate or setup the IET40.   For general information, refer to the Modicon Modbus Protocol Reference Guide or similar. The IET40 uses RTU framing mode. It only operates at 9600 baud. The IET40 does not use standard Modbus Function Codes as the complexity of the IET40 requires much more data to pass between the device and controller than is available in the standard messages. If you wish to use the system in this way, contact LTH Electronics for further information.

AVAILABLE MODBUS COMMANDS FOR IET40

Function 0x31:   Reset Non-volatile memory to default setup

Function 0x34:   Read Miscellaneous Information from Sensor

Function 0x35:   Read Conductivity, Temp., Current Outputs, Error Messages

Function 0x30:   Scan for other IET40 devices on the Network

Function 0x40:   Set Current Outputs to fixed values

Function 0x50:   Write Temperature Compensation Coefficient

Function 0x51:   Write Channel1 Current Output Settings

Function 0x52:   Write Channel2 Current Output Settings

Function 0x53:   Write Digital Data Output Settings

Function 0x55:   Write Special Concentration

Function 0x56:   Write Special Conductivity

Function 0x57:   Write Special Range Text (1st half)

Function 0x58:   Write Special Range Text (2nd half)

Function 0x60:   Copy All Data (16 Blocks) From Sensor to Control Centre

Function 0x61:   Calibrate Conductivity

Function 0x62:   Calibrate Temperature

Function 0x63:   Calibrate Current Output

Function 0x64:   DO NOT USE

Function 0x65:   Reset All Calibrations to Default values

Function 0x66:   Force IET40 to Reset

Function 0x67:   DO NOT USE

Function 0x68:   DO NOT USE

Function 0x69:   DO NOT USE

Function 0x70:   Write Slave Address to IET40

Function 0x71:   DO NOT USE

Function 0x72:   Write Tag Or Plant Number TO IET40

Function 0x73:   DO NOT USE

Function 0x74:   DO NOT USE

Function 0x75:   Calibrate Temperature Zero

Function 0x76:   Calibrate Temperature Span

Default response to all others: return exception ILLEGAL_FUNCTION

The Complete Message structure is too complex to include here, please apply to LTH Electronics if you would like further information.

<u>SPECIFICATION</u>

Mounting	Insertion into line (screw in). Sanitary fittings
Environmental	Sensor and housing IP67 (submerged to 1 meter).
Dimensions	125mm x 125mm x 185mm approx.
Storage temp.	Maximum -40 °C to + 125 °C. Serious damage will occur outside these limits
Working temp.	Sensor 0°C to +100°C & short bursts to +135°C for sterilizing. Housing / electronics -20°C to +70°C
Input range	AGC optimizes the range of the unit: 1 mS/cm to 1000 mS/cm.
Analogue outputs	Conductivity 1mS/cm to 1000 mS/cm. TDS, ppm. Salinity 40ppt. Concentration (% wt/vol.) ranges to 16.0% NaOH, 30.0% NaCl, 15% HCl, 25% H_2SO_4, 25% H_3PO_4 .Special range curve.
Temperature measurement	Using on-board Pt1000 film element, Class A with digital signal transmission. Normal Operating Range of 0 to 130 °C
Temperature compensation	Programmable using internal Pt1000: in or out, base 20°C or 25°C, variable slope 0.0 - 3.9 % / °C over 0 to 100°C.
Configuration	PC based Windows 95 software
Calibration	All Calibrations carried out through the Windows Interface.
Accuracy	Reading +/-1% of range, Temperature +/- 0.2°C
Ambient variation	0.01 % / °C span typical
Current Output	Isolated (2kV liquid to electronics) 4-20 mA loop into 750 ohms.
Messages & Diagnostics	Current output to transmit 2 or 22 mA on detection of fault (if selected by the User). Digital messages can be read through the Serial Port.
Comms	Via RS 485 serial link through a converting device to PC RS232 Serial Port
Operating Software	Upgradable in the field, with the sensor in-situ, using a laptop PC running Windows 95
EMC	Immunity standard BS EN 50082 -2:1995 Emissions standard BS EN 50081-1:1992
Low Voltage Directive	Safety standard BS EN 61010-1:1993
Test methods	Test standard BS 1427
Power Supply	Supply 12 to 30 Volts DC, nominal 100 mA. (load impedance reduces with lower supply voltage).

EC Declaration of Conformity

LTH   Electronics   Ltd

declare, accepting full responsibility, that the product

IET 40 Conductivity Transmitter

to which this declaration relates, conforms with the following standards:

EN 50081 - 1 : 1992   (Generic Emissions)

EN 50082 - 2 : 1995   (Generic Immunity) in

accordance with the provisions of

the   89 / 336 / EEC   (EMC) directive.

(and as amended by 92 / 31 / EEC)

BS EN 61010 - 1 : 1993   (Equipment Safety)
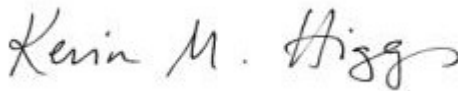
in accordance with the provisions of

the   72 / 23 / EEC   (Low Voltage) directive.

The equipment is exempt (because there are no moving parts)

from the   89 / 392 / EEC   (Machinery) directive.

Issued in the United Kingdom on 04 / 05 / 2000

for the company by:

Kevin M. Higgs   C. Eng.   (Technical Manager)

Chaul End Lane

Luton

Bedfordshire

LU4 8EZ

England

Tel : +44 (0)1582 593693

Fax : +44 (0)1582 598036

Website www.lth.co.uk

Email   sales@lth.co.uk