Congratulations !

You have purchased the latest in benchtop Conductivity-TDS-Temperature instrumentation. We trust that your new **lab*CHEM*-C** will give you many years of reliable service.

The **lab*CHEM*-C** is a breeze to operate. This manual has been designed to help you get started, and also contains some handy application tips. If at any stage you require assistance, please contact either your local TPS representative or the TPS factory in Brisbane.

The manual is divided into the following sections:

1. **Table of Contents**
   Each major section of the handbook is clearly listed. Sub-sections have also been included to enable you to find the information you need at a glance.

2. **Introduction**
   The introduction has a diagram and explanation of the display and controls of the **lab*CHEM*-C**. It also contains a full listing of all of the items that you should have received with your **lab*CHEM*-C**. Please take the time to read this section, as it explains some of the items that are mentioned in subsequent sections.

3. **Main Section**
   The main section of the handbook provides complete details of the **lab*CHEM*-C**, including operating modes, calibration, troubleshooting, specifications, and warranty terms.

4. **Appendices**
   Appendices containing background information and application notes are provided at the back of this manual.

labCHEM-C
Cond-TDS-Temp.
Meter
Version : 1.02
Date : 16-Jul-2003
Author : MS

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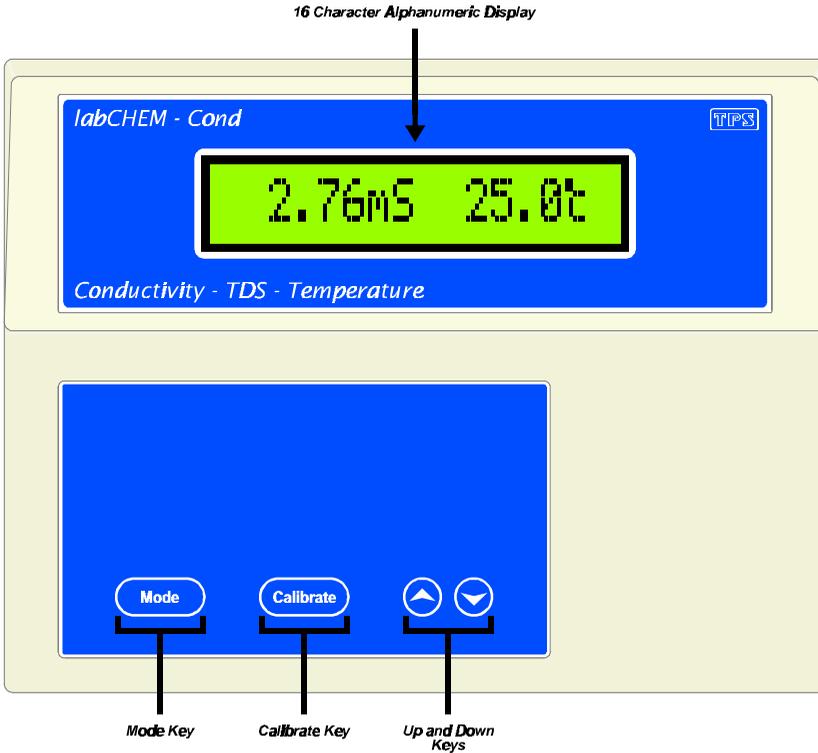International : 61 7   3808 4871

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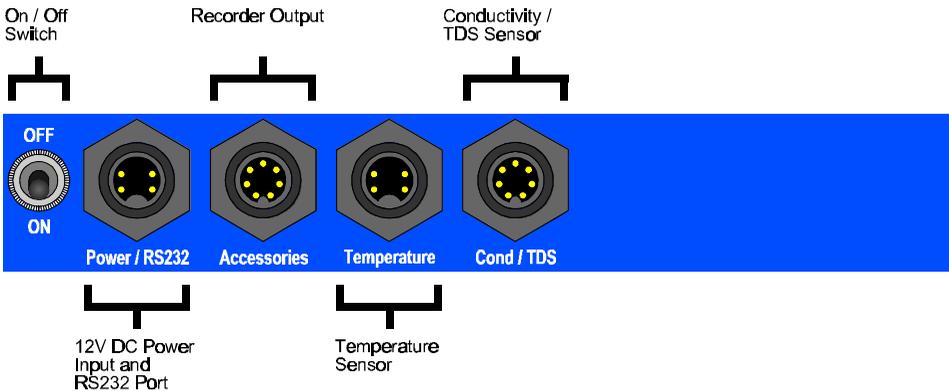Web   : www.tps.com.au

Contents

1. <u>Introduction</u>

1.1 lab*CHEM*-C Display and Controls

16 Character Alphanumeric Display

lab*CHEM - Cond*

TPS

2.76mS   25.0t

Conductivity - TDS - Temperature

Mode   Calibrate

Mode Key   *Calibrate Key*   *Up and Down Keys*

1.2 lab*CHEM*-C Rear Panel Connectors

On / Off Switch   Recorder Output   Conductivity / TDS Sensor

OFF

ON

Power / RS232   Accessories   Temperature   Cond / TDS

12V DC Power Input and RS232 Port   Temperature Sensor

1.3 lab*CHEM*-C Front Panel

Display

- 16 character alphanumeric LCD with 14.5 mm characters.

- Conductivity/TDS and Temperature can be displayed simultaneously.

- User friendly text prompts and error messages.

- Serial number is displayed after the model name when the unit is switched on.

(Mode) Key

- Switches between Conductivity, TDS, Temperature and 2 optional RS232 modes. See section 2.

(Calibrate) Key

- Used to calibrate Conductivity, TDS and Temperature. See sections 3, 4and 5.

⊙ and ⊙ Keys

- Used for temperature calibration. See section 5.

- Press ⊙ to recall Zero and span values from the last successful Conductivity/TDS calibration.

- Press ⊙ to start and stop the Automatic Stability Function ("ASF"). See section 6.

- Used to select baud rate when optional RS232 port is fitted. See section 7.1.

- Used to select output "send" rate when optional RS232 port is fitted. See section 7.2

1.4 Unpacking Information

Before using your new **lab*CHEM*-C**, please check that the following accessories have been included:

                                                                                 Part No

1. **lab*CHEM*-C** Cond-TDS-Temp Instrument 122106
2. k=1.0 Conductivity/TDS Sensor.. 122230
3. Temperature Sensor... 121248
4. 2.76mS/cm Conductivity Standard, 200mL......................... 122306
5. 2.0 ppK TDS Standard, 200mL... 122307
6. AC/DC Power Adaptor... 130037
7. **lab*CHEM*-C** Handbook... 130050

Options that may have been ordered with your **lab*CHEM*-C**:

1. k=10 Conductivity/TDS Sensor... 122234
2. k=0.1 Conductivity/TDS Sensor.. 122232
3. Flexible arm type sensor holder... 130088
4. RS232 option (includes cable).. 130029
5. RS232 Communication software for Windows..................... 130086
6. Recorder output option (includes cable) 130028
7. Recorder PLUS RS232 option (includes cable) 130049

1.5 Specifications

	Ranges	Resolution	Accuracy
Conductivity	**k=0.1 Sensor** 0 to 2.000 µS/cm 0 to 20.00 µS/cm 0 to 200.0 µS/cm 0 to 2000 µS/cm **k=1.0 Sensor** 0 to 20.00 µS/cm 0 to 200.0 µS/cm 0 to 2000 µS/cm 0 to 20.00 mS/cm **k=10 Sensor** 0 to 200.0 µS/cm 0 to 2000 µS/cm 0 to 20.00 mS/cm 0 to 200.0 mS/cm	0.001 µS/cm 0.01 µS/cm 0.1 µS/cm 1 µS/cm 0.01 µS/cm 0.1 µS/cm 1 µS/cm 0.01 mS/cm 0.1 µS/cm 1 µS/cm 0.01 mS/cm 0.1 mS/cm	±0.5% of full scale of selected range at 25 °C
TDS	**k=0.1 Sensor** 0 to 1.000 ppM 0 to 10.00 ppM 0 to 100.0 ppM 0 to 1000 ppM **k=1.0 Sensor** 0 to 10.00 ppM 0 to 100.0 ppM 0 to 1000 ppM 0 to 10.00 ppK **k=10 Sensor** 0 to 100.0 ppM 0 to 1000 ppM 0 to 10.00 ppK 0 to 100.0 ppK	0.001 ppM 0.01 ppM 0.1 ppM 1 ppM 0.01 ppM 0.1 ppM 1 ppM 0.01 ppK 0.1 ppM 1 ppM 0.01 ppK 0.1 ppK	±0.5% of full scale of selected range at 25 °C
Temperature	-10.0 to 120.0 °C	0.1 °C	±0.2 °C

Additional Conductivity and TDS Specifications

Sensor Type........................... Glass body with two platinised platinum plates.
In-built ATC.

Temperature Compensation.. Automatic, 0 to 100 ^{O}C

Calibration .... Automatic zero and span calibration.

Standard Recognition .... **Conductivity**
14.94 µS/cm, 73.90 µS/cm, 150.0 µS/cm, 717.8 µS/cm, 1,413 µS/cm, 2.76 mS/cm, 6.67 mS/cm, 12.9 mS/cm, 24.8 mS/cm, 58.0 mS/cm, 111.9 mS/cm

TDS
69.5 ppM, 2.00 ppK, 8.0 ppK, 36.0 ppK

Sensor Span Range .... k=0.1 : k=0.075 to k=0.133
k=1.0 : k=0.75 to k=1.33
k=10 : k=7.5 to k=13.3

Additional Temperature Specifications

Sensor Type......................... Silicon Transistor

Offset Range......................... -10.0 to +10.0 ^{O}C

General Specifications

Waterproofing	Case, keypad and connectors rated to IP65
RS232 Output (optional)	200, 9600, 19200 or 38400 baud. 8 bits, No Parity, 1 stop bit, XON/XOFF Protocol.
Recorder Output (optional)	Cond : 0 to 2000 Counts for 0 to 2000 mV ie. 2.76 mS/cm = 276 mV
	TDS : 0 to 1000 Counts for 0 to 1000 mV ie. 36.0 ppK = 360 mV
	Temp: -10.0 to 120.0 ^{O}C for 0 to 2000 mV ie. 0.0 ^{O}C = 153.8 mV
	Output impedance approx 1000 Ohms.
Power	12V DC by AC/DC power adaptor.
Dimensions	240 x 180 x 105 mm
Mass	Instrument only : Approx 1.0 kg Full Kit : Approx 2.5 kg
Environment	Temperature : 0 to 45 ^{o}C Humidity : 0 to 90 % R.H.

2. <u>Operating Modes</u>

Press the (Mode) key to select the desired operating mode. The sequence is shown in the following table…

Conductivity plus Temperature Mode	`2.76mS    25.0°c`
Conductivity data is shown on the left and Temperature data is shown on the right. Select this mode to calibrate Conductivity.	

↓ (Mode)

TDS plus Temperature Mode	`2.00ppK  25.0°c`
TDS data is shown on the left and Temperature data is shown on the right. Select this mode to calibrate TDS.	

↓ (Mode)

Temperature Mode	`25.0°c`
Temperature data only is shown on the left. Select this mode to calibrate Temperature.	

↓ (Mode)

Back to Conductivity plus Temperature mode

The following modes are added when the optional RS232 port is fitted…

RS232 Send Rate	`Send Rate ↑    0↓`
Sets the Data output rate, in seconds. Press ⊖ or ⊖ to set this value from 0 to 3600 seconds.	

↓ (Mode)

RS232 Baud Rate	`Baud Rate↑19200↓`
Allows selection of the RS232 Baud Rate. Press ⊖ or ⊖ to select 1200, 9600, 19200 or 38400 baud.	

↓ (Mode)

Back to Conductivity plus Temperature mode

3. <u>Conductivity Calibration</u>

A " ＊ " in place of the decimal point indicates that the Conductivity readout is not calibrated, or a past calibration has failed. The " ＊ " will be removed once a Conductivity calibration has been successfully performed in Conductivity standard.

3.1 Calibration Procedure

1. Switch the **lab*CHEM*-C** on and select Conductivity plus Temperature mode (section 2).

2. Plug the Conductivity sensor into the **Cond / TDS** socket. The Temperature sensor is not required, as Automatic Temperature Compensation for Conductivity is done via the Conductivity Sensor.

3. Rinse the Conductivity electrode in distilled water. Shake off as much water as possible. Blot the outside of the electrode dry. DO NOT BLOT THE ELECTRODE SURFACES.

4. *<u>Zero Calibration</u>*

   Allow the Conductivity sensor to dry in air, then press Ⓒⓐⓛⓘⓑⓡⓐⓣⓔ.

   The Automatic Stability Function display now shows an X on the display, along with the message "Wait" to indicate that the **lab*CHEM*-C** is waiting for the Conductivity reading to stabilise before calibrating. For example…

   ```
   0.10uS X    Wait
   ```

   When the Conductivity reading has stabilised, the unit will calibrate itself.

   To calibrate immediately without waiting for complete stability, press ⊘ to disable the Automatic Stability Function.

   A " ＊ " will not be removed after a zero calibration.

5.   *__Standard Calibration__*

Allowable Conductivity standards are listed in the specifications in section 1.5, and should be selected according to your range of interest.

Place the electrode into a sample of Conductivity standard so that it is immersed at least to the vent hole in the body.

DO NOT place the electrode directly into the bottle of standard. Discard the used sample of standard after use. It is advisable to use a narrow sample vessel to minimise the use of standard solution.

6.   Press and hold the Ⓒⓐⓛⓘⓑⓡⓐⓣⓔ key for 1 second to calibrate.

The Automatic Stability Function display now shows an X on the display, along with the message "Wait" to indicate that the **lab*CHEM*-C** is waiting for the Conductivity reading to stabilise before calibrating. For example…

2.86mS X   Wait

When the Conductivity reading has stabilised, the unit will calibrate itself.

To calibrate immediately without waiting for complete stability, press ☺ to disable the Automatic Stability Function.

The * will now be replaced by a decimal point if calibration was successful.

7.   The **lab*CHEM*-C** is now calibrated for Conductivity and is ready for use in this mode.

Discard the used samples of standard.

3.2 Calibration Notes

1. A Zero calibration should be performed at least monthly. In low conductivity applications (where a zero error is particularly significant), a zero calibration may have to be done weekly.

2. A Standard calibration should be performed at least weekly. Of course, more frequent calibration will result in greater confidence in results.

3. Conductivity and TDS calibration data is stored separately in memory. Ensure that the **lab*CHEM*-C** has been correctly calibrated for the mode in which it will be used. The **lab*CHEM*-C** does not require re-calibration when alternating between Conductivity and TDS modes, providing the instrument has been correctly calibrated for both.

4. All calibration information is retained in memory when the **lab*CHEM*-C** is switched off, even when the power supply is removed.

3.3 Calibration Messages

1. If a Zero calibration has been successfully performed, the **lab*CHEM*-C** will display the Zero of the sensor and then return to Conductivity mode. For example…

> ```
> Zero OK, 0.1%
> ```

2. If a Span calibration has been successfully performed, the **lab*CHEM*-C** will display the k factor of the sensor and then return to Conductivity mode. For example…

> ```
> Cal OK, k=1.00
> ```

    Note that " ∗ " in the Conductivity reading has now been replaced by a decimal point, due to the successful calibration.

3. If a Span calibration has failed, the **lab*CHEM*-C** will display the following messages and then the failed k factor of the sensor before returning to Conductivity mode. For example…

> ```
> Calibrate Failed
> ```

             then:

> ```
> STD=2760uS  ?
> ```
    then:
> ```
> k=0.70, Fails
> ```

    Note that a " ∗ " replaces the decimal point in the Conductivity reading to indicate that Conductivity is not correctly calibrated.

    Check that the sensor is immersed at least to the vent hole in the body, and that the standard is correct before attempting calibration again.

4. TDS Calibration

A " $*$ " in place of the decimal point indicates that the TDS readout is not calibrated, or a past calibration has failed. The " $*$ " will be removed once a TDS calibration has been successfully performed in TDS standard.

4.1 Calibration Procedure

1. Switch the **lab*CHEM*-C** on and select TDS plus Temperature mode (section 2).

2. Plug the TDS sensor into the **Cond / TDS** socket. The Temperature sensor is not required, as Automatic Temperature Compensation for TDS is done via the TDS Sensor.

3. Rinse the TDS electrode in distilled water. Shake off as much water as possible. Blot the outside of the electrode dry. DO NOT BLOT THE ELECTRODE SURFACES.

4. ***Zero Calibration***

    Allow the TDS sensor to dry in air, then press Calibrate.

    The Automatic Stability Function display now shows an X on the display, along with the message "Wait" to indicate that the **lab*CHEM*-C** is waiting for the Conductivity reading to stabilise before calibrating. For example…

    ```
    0.10ppMX    Wait
    ```

    When the TDS reading has stabilised, the unit will calibrate itself.

    To calibrate immediately without waiting for complete stability, press ⊙ to disable the Automatic Stability Function.

    A " $*$ " will not be removed after a zero calibration.

5. *__Standard Calibration__*

     Allowable TDS standards are listed in the specifications in section
     1.5, and should be selected according to your range of interest.

     Place the electrode into a sample of TDS standard so that it is
     immersed at least to the vent hole in the body.

     DO NOT place the electrode directly into the bottle of standard.
     Discard the used sample of standard after use. It is advisable to use
     a narrow sample vessel to minimise the use of standard solution.

6. Press and hold the (Calibrate) key for 1 second to calibrate.

     The Automatic Stability Function display now shows an X on the
     display, along with the message "Wait" to indicate that the
     lab*CHEM*-C is waiting for the TDS reading to stabilise before
     calibrating. For example…

`2.00ppK`X `Wait`

     When the TDS reading has stabilised, the unit will calibrate itself.

     To calibrate immediately without waiting for complete stability, press
     $\odot$ to disable the Automatic Stability Function.

     The $*$ will now be replaced by a decimal point if calibration was
     successful.

7. The **lab*CHEM*-C** is now calibrated for TDS and is ready for use in
     this mode.

     Discard the used samples of standard.

4.2 Calibration Notes

1. A Zero calibration should be performed at least monthly. In low TDS applications (where a zero error is particularly significant), a zero calibration may have to be done weekly.

2. A Standard calibration should be performed at least weekly. Of course, more frequent calibration will result in greater confidence in results.

3. Conductivity and TDS calibration data is stored separately in memory. Ensure that the **lab*CHEM*-C** has been correctly calibrated for the mode in which it will be used. The **lab*CHEM*-C** does not require re-calibration when alternating between Conductivity and TDS modes, providing the instrument has been correctly calibrated for both.

4. All calibration information is retained in memory when the **lab*CHEM*-C** is switched off, even when the power supply is removed.

4.3 Calibration Messages

1. If a Zero calibration has been successfully performed, the **lab*CHEM*-C** will display the Zero of the sensor and then return to TDS mode. For example…

> **Zero OK, 0.1%**

2. If a Span calibration has been successfully performed, the **lab*CHEM*-C** will display the k factor of the sensor and then return to TDS mode. For example…

> **Cal OK, k=1.00**

    Note that " ∗ " in the TDS reading has now been replaced by a decimal point, due to the successful calibration.

3. If a Span calibration has failed, the **lab*CHEM*-C** will display the following messages and then the failed k factor of the sensor before returning to TDS mode. For example…

> **Calibrate Failed**

    then:

> **STD=2000ppM ?**   then: **k=0.70, Fails**

    Note that a " ∗ " replaces the decimal point in the TDS reading to indicate that TDS is not correctly calibrated.

    Check that the sensor is immersed at least to the vent hole in the body, and that the standard is correct before attempting calibration again.

5. Temperature Calibration

The **lab*CHEM*-C** can take its temperature reading either from the Conductivity sensor or a separate stainless steel Temperature probe. If both are connected at the same time, the **lab*CHEM*-C** takes its reading from the Temperature probe. The advantage of the separate stainless steel temperature probe is that is has a faster temperature response.

A " * " in place of the decimal point indicates that the Temperature readout is not calibrated, or a past calibration has failed. The " * " will be removed once a Temp calibration has been successfully performed.

5.1 Calibration Procedure

1. Switch the **lab*CHEM*-C** on and select Temperature mode (see section 2).

2. Plug the temperature sensor (Part No 121248) into the **Temp** socket, or the Conductivity sensor into the Cond / TDS socket.

3. Place the sensor alongside a good quality mercury thermometer into a beaker of room temperature water. Stir the sensor and the thermometer gently to ensure an even temperature throughout the beaker.

4. Press Ⓒⓐⓛⓘⓑⓡⓐⓣⓔ to calibrate. The **lab*CHEM*-C** now enters temperature calibration after stating which sensor it is calibrating. For example…

   `Using Cond Probe`   then: `26*0°c     ↑ 25.0↓`

5. Press the ⊙ and ⊙ keys until the display shows the same temperature as the mercury thermometer.

6. Press the (Calibrate) key to calibrate the temperature readout.

   The Automatic Stability Function display now shows an X on the display to indicate that the **lab*CHEM*-C** is waiting for the Temperature reading to stabilise before calibrating. For example…

   ```
   24.0c  X  ↑  25.0↓
   ```

   When the Temperature reading has stabilised, the unit will calibrate itself.

   To calibrate immediately without waiting for complete stability, press ⊙ to disable the Automatic Stability Function.

   Alternatively, press the (Mode) key to abort temperature calibration.

5.2 Calibration Notes

1. Temperature calibration information is stored in memory when the meter is switched off, even when the power supply is removed.

2. Temperature does not need to be re-calibrated unless the Temperature sensor is replaced or the meter is initialised.

5.3 Calibration Messages

1. If a temperature calibration has been successfully performed, the **lab*CHEM*-C** will display the offset value of the sensor and then return to Temperature mode. For example…

| `Temp Cal. OK` | then: | `Offset=1.0°c` |

The " ∗ " is replaced by a decimal point in the Temperature reading to indicate that Temperature is correctly calibrated.

2. If a temperature calibration has failed, the **lab*CHEM*-C** will display the failed offset value of the sensor before returning to Temperature mode. For example…

| `Temp Cal. Fail` | then: | `Offset=11.0°c` |

Note that " ∗ " replaces the decimal point in the Temperature reading to indicate that Temperature is not correctly calibrated.

6. Automatic Stability Function (ASF)

ASF adds an extra level of versatility to the **lab*CHEM*-C**. When ASF is activated, the **lab*CHEM*-C** monitors all parameters that are currently in use. When **ALL** parameters become stable, the readings are frozen on the display.

ASF can be used in the following ways…

6.1 ASF During Normal Measurement

1. Press ⊖ in normal measurement mode. The X symbol appears in the display. For example…

    ```
    2.76mS  X  25.0°c
    ```

2. When ALL displayed readouts have stabilised, the X will change to a √. Both readings are now frozen. For example…

    ```
    2.76mS  √  25.0°c
    ```

3. The operator can now make a note of the reading as required.

4. **To unfreeze the display in order to take the next reading, press ⊖ again to re-start the ASF sampling process.**

5. Press ⊖ a second time, while the X symbol is being displayed, to turn ASF off.

6.2 ASF During Calibration

The Automatic Stability Function is automatically invoked during calibration. The stability parameters programmed into the **lab*CHEM*-C** have a finer tolerance during calibration than during normal measurement. This is done to ensure the most accurate possible calibration results.

Press ⊖ while the X symbol is being displayed during calibration to turn ASF off and calibrate immediately, before the reading has stabilised.

See the calibration sections of this manual for further details on the ASF function during calibration.

7. RS232 Port

This section is applicable if the optional RS232 port is fitted.

7.1 Setting the Baud Rate

1. Select RS232 Baud Rate mode (see section 2).

2. The currently selected baud rate is displayed. For example…

```
Baud Rate↑19200↓
```

   Press the ⊖ and ⊘ keys to scroll through the available baud rates of 1200, 9600, 19200 or 38400 baud.

   Ensure that the displayed baud rate matches the baud rate set on the printer or PC with which the **lab*CHEM*-C** is communicating.

3. Press the Mode key to return to Conductivity, TDS or Temperature mode as required.

7.2 Sending Readings to the RS232 Port

The **lab*CHEM*-C** can send readings to the RS232 port at a pre-set rate.

To set this Send Rate…

1. Select RS232 Send rate mode (see section 2).

2. The currently selected Send rate is displayed. For example…

```
Send Rate ↑    0↓
```

   Press the ⊖ key to increase the Send Rate.

   Press the ⊘ key to decrease the Send Rate.

   The Send Rate can be set from 0 to 3600 seconds.

   Set the Send Rate to Zero to allow the **lab*CHEM*-C** to accept commands from a remote computer.

3. Press the Mode key to return to Conductivity, TDS or Temperature mode as required.

7.3 RS232 Configuration

The **lab*CHEM*-C** RS232 configuration is 8 bits, No Parity, 1 Stop Bit, XON/XOFF Protocol.

7.4 Communication and Statistical Software

Communication between the **lab*CHEM*-C** and a PC can be handled with any RS232 communication software. A TPS communication software package for Windows® is optionally available (part number 130086).

Once the data is saved to disk, the next problem is how to use it. The data sent by the **lab*CHEM*-C** is formatted in columns that can be imported by programs such as Microsoft® Excel® and Lotus 123®.

Help on importing the data into Microsoft® Excel® is provided in section 7.7 and also the "excel.txt" file in the folder where you installed the WinTPS program.

7.5 Commands

The following command can be sent from a PC to the **lab*CHEM*-C**. Note that <cr> denotes carriage return and <lf> denotes a line feed.

Action	Command	Notes
Request current data	?D<cr>	Returns the current Conductivity/ TDS and Temperature data from the **lab*CHEM*-C**.
		The print rate must be set to zero (see section 7.2).

7.6 Data Format

Data is returned to the RS232 Port by the **lab*CHEM*-C** in the following format. A "•" shown anywhere in this section denotes one space.

`CCCCCCuuu•TTTTTuuu`

`CCCCCC`   is Conductivity or TDS data. 6 characters, right justified.

`uuu`   is the Conductivity/TDS unit description, which can be any one of the following…

`uS•`	for Conductivity readout in µS/cm
`mS•`	for Conductivity readout in mS/cm
`ppM`	for TDS readout in ppM
`ppK`	for TDS readout in ppK

`TTTTT`   is Temperature data, 5 characters, right justified.

`uuu`   is the Temperature unit description, sent as "`oC`".

When requested by a PC with the ?D command (section 7.5), the data is terminated with a carriage return.

When the data is sent by the **lab*CHEM*-C** using the Send function (section 7.2) the data ends with a carriage return and a line feed.

Notes:
1. Data corresponds to the Mode selected (ie. Conductivity + Temp, TDS + Temp or Temp only).

2. Conductivity or TDS data and units are replaced by spaces in Temperature Mode.

3. **+OVR** or **–OVR** is sent when the Data is over-range.

4. **BUSY**<cr> is sent when the **lab*CHEM*-C** is Busy (eg. in calibration, Baud Rate mode, Send rate mode etc.) or when data is not available.

7.7 Importing Data into Microsoft Excel

The following procedure details the method for importing a **lab*CHEM-C*** text data file into Microsoft® Excel®.

1. Start Microsoft® Excel® and select File → Open

2. In the "Files of type:" pull-down box, choose "Text Files (*prn; *.txt; *.csv)".

3. Navigate to the folder where your data file is stored and double-click it to start the Text Import Wizard.

   Note: The default data folder for the WinTPS software is "C:\My Documents\WinTPS".

4. In step 1 of the Text Import Wizard select "Fixed width", as per the sample screen below, then press "Next >".

   Note that the data column headers in the first row and the date and time appear only when the data is downloaded using the WinTPS software.
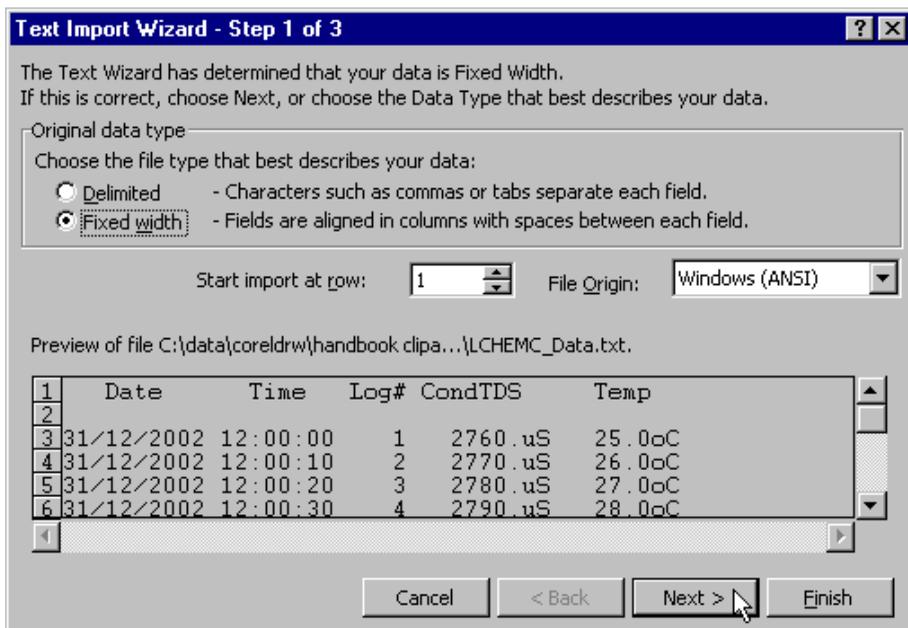
Continued over the page…

5. Step 2 of the Text Import Wizard allows you to select the points at which each data field will break into a new column. The sample screens below show where TPS recommends the breaks be inserted. There are two screens, as the width of the data requires the window to be scrolled over.

    Press "Next >" after the column breaks have been inserted.
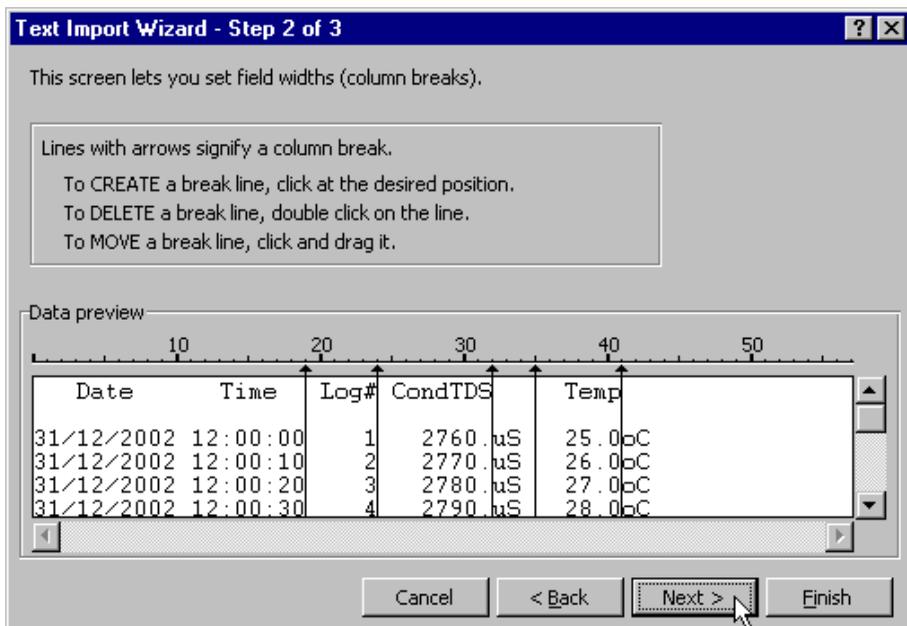
6. Simply press "Finish" at step 3 of the Text Import Wizard. TPS recommends that the data format for each column be set once the data is in spreadsheet format.

    For help on formatting the data columns, charting, graphing or other operations please consult the Microsoft® Excel® help file. Alternatively please contact TPS and we will try to provide further assistance.

8. <u>Recorder Output Option</u>

This section is applicable when the optional analogue recorder output is fitted. The recorder output corresponds to the currently selected display mode. There is no output in RS232 Send Rate or RS232 Baud Rate modes.

The output voltages are as follows:

Conductivity	: 0 to 2000 Counts for 0 to 2000 mV ie. 2.76 mS/cm = 276 mV Output
TDS	: 0 to 1000 Counts for 0 to 1000 mV ie. 36.0 ppK = 360 mV Output
Temperature	: -10.0 to 120.0 ^{O}C for 0 to 2000 mV ie. 0.0 ^{O}C = 153.8 mV Output
Output Impedance	: Approximately 1000 Ohms
Resolution	: Approximately 2 mV

9. **Initialising the lab*CHEM*-C**

If the calibration settings of the **lab*CHEM*-C** exceed the allowable limits, the unit may need to be initialised to factory default values. This action may be required if the sensor is replaced.

To initialise the **lab*CHEM*-C**…

1. Switch the **lab*CHEM*-C OFF** and wait for 5 seconds.

2. Press and hold the ⊖ key while switching the **lab*CHEM*-C** back on.

3. The following messages are now displayed…

```
Initializing
```

then:

```
labCHEM-C  V1.0s
```
then:
```
labCHEM-C  S1234
```

(The "**s**" after "**V1.0**" is shown when the optional RS232 port is fitted.)

4. The **lab*CHEM*-C** now goes on to Conductivity mode. Note that a " ∗ " replaces each of the decimal points in the Conductivity, TDS and Temperature readings, indicating that the unit requires calibration.

Note: When the optional RS232 port is fitted, the Baud Rate is set to 19200 and the Send Rate is set to zero. See sections 7.1 and 7.2 for details if these settings need to be altered.

10. <u>Troubleshooting</u>

10.1 General Error Messages

Error Message	Possible Causes	Remedy
`Not Factory Cal.` (displayed at turn-on**)**	The EEPROM chip which contains the factory calibration information has failed.	Switch the **lab*CHEM*-C** off, wait 5 seconds, and try switching on again. If message persists, then the unit must be returned to TPS for service.

`EEPROM WriteFail`
then:
`Contact Factory`
(displayed at calibration or set-up).
	Storage of user calibration settings to the EEPROM has failed.	Switch the **lab*CHEM*-C** off, wait 5 seconds, and then switch the unit on again.
		
		Attempt calibration/setup again.
		
		If message persists, then the unit must be returned to TPS for service.

10.2 Conductivity and TDS Troubleshooting

Symptom	Possible Causes	Remedy
Unit fails to calibrate, even with new electrode.	Calibration settings outside of allowable limits due to previous failed calibration.	Initialise the unit. See section 9.
Unit attempts Span calibration instead of Zero calibration.	Electrode has Zero error.	Thoroughly rinse electrode in distilled water and allow to completely dry in air before attempting zero calibration. If instrument does not calibrate at Zero with electrode disconnected, then the instrument is faulty.
Standard calibration fails, and k factor is greater than 0.133, 1.33 or 13.3 (depending on k factor of sensor).	1. Electrode is not immersed deeply enough. 2. Electrode may have a build-up of dirt or oily material on electrode plates. 3. Platinum-black coating has worn off. 4. Standard solution is inaccurate. 5. Electrode is faulty. 6. Faulty instrument.	Immerse electrode at least to the vent hole in the glass body. Clean electrode, as per the instructions detailed in section 11.1. Electrode requires replatinisation. Return to the factory, or see details in section 11.2. Replace standard solution. Return electrode to factory for repair or replacement. Return instrument to factory for repair.
Unit displays "**No Probe**" instead of Conductivity or TDS reading	1. Conductivity / TDS sensor is not connected. 2. Conductivity / TDS sensor is connected, but connector faulty.	Connect a TPS Conductivity / TDS sensor to the **Cond/TDS** socket. Return sensor to factory for repair or replacement.

Continued over the page…

Conductivity and TDS Troubleshooting, continued…

Standard calibration fails, and k factor is less than 0.075, 0.75 or 7.5 (depending on k factor of sensor).	1. Standard solution is inaccurate.	Replace standard solution.
	2. Electrode may have a build-up of conductive material, such as salt.	Clean electrode, as per the instructions detailed in section 11.1.
	3. Electrode is faulty.	Return electrode to factory for repair or replacement.
	4. Faulty instrument.	Return instrument to factory for repair.
Inaccurate readings, even when calibration is successful.	1. Electrode may have a build-up of dirt or oily material on electrode plates.	Clean electrode, as per the instructions detailed in section 11.1.
	2. Platinum-black coating has worn off.	Electrode requires replatinisation. Return to the factory, or see details in section 11.2.
Readings drift.	1. Electrode may have a build-up of dirt or oily material on electrode plates.	Clean electrode, as per the instructions detailed in section 11.1.
Readings are low or near zero.	1. Electrode may have a build-up of dirt or oily material on electrode wires.	Clean electrode, as per the instructions detailed in section 11.1.
	2. Electrode is not immersed deeply enough.	Immerse electrode at least to the vent hole in the glass body.
	3. Electrode is faulty.	Return electrode to factory for repair or replacement.
	4. Faulty instrument.	Return instrument to factory for repair.

10.3 Temperature Troubleshooting

Symptom	Possible Causes	Remedy
Meter reads "**OverR**" in Temperature mode.	Conductivity or Temperature sensor is connected, but is faulty.	Check the sensor connector, and replace if necessary. Replace Conductivity or Temperature sensor if problem persists.
Meter displays Temperature with an "**m**", even when temperature sensor is plugged in.	1. Faulty connector. 2. Incorrect Temperature sensor. 3. Faulty Conductivity or Temperature sensor.	Check the connector and replace if necessary. Fit new Temperature sensor, part number 121248. Fit new Conductivity or Temperature sensor.
Temperature inaccurate and cannot be calibrated.	1. Faulty connector. 2. Faulty Conductivity or Temperature sensor.	Check the connector and replace if necessary. Fit new Conductivity or Temperature sensor.

11. <u>Appendices</u>

11.1 Care, Cleaning and Maintenance of Conductivity Sensors

11.1.1 Care of Conductivity Sensors
The conductivity section of the electrode supplied with your **lab*CHEM*-C** consists of two platinum plates that are plated with a layer of "platinum-black". This is quite a soft layer and is required for stable, accurate measurements. In time, the platinum-black layer may wear off in some applications, at which time the electrode will require replatinising (see section 11.2). You can help to maintain the platinum-black layer by following these simple rules:

1. **NEVER** touch or rub the electrode wires with your fingers, cloth etc.
2. Avoid using the electrode in solutions that contain a high concentration of suspended solids, such as sand or soil, which can abrade the electrode wires. Filter these types of solutions first, if possible.
3. Avoid concentrated acids. If you must measure acids, remove the electrode immediately after taking the measurement and rinse well with distilled water.

Conductivity electrodes can be stored dry. Ensure that the electrode is stored in a covered container, to avoid dust and dirt build-up.

11.1.2 Cleaning of Conductivity Sensors
Platinised platinum Conductivity electrodes can only be cleaned by rinsing in a suitable solvent. **DO NOT wipe the electrode plates**, as this will remove the platinum-black layer.

1. Rinsing in distilled water will remove most build-ups of material on the electrode wires.
2. Films of oils or fats on the electrode wires can usually be removed by rinsing the electrode in methylated spirits.
3. Stubborn contamination can be removed by soaking the electrode in a solution of 10 parts distilled water TO 1 part Concentrated HCl. The electrode should not be soaked for more than approximately 5 minutes, otherwise the platinum-black layer may start to dissolve.
4. If all of these methods fail, then the last resort is to physically scrub the electrode plates, which will remove the contaminant and the layer of platinum-black. Use only a cloth or nylon scouring pad. DO NOT USE STEEL WOOL. The electrode will then need to be cleaned in HCl, as per step 3 and replatinised, as per section 11.2.

11.2 Replatinising Conductivity Sensors

There are several ways to replatinise Conductivity electrodes.

1. The simplest way is to return the electrode to the TPS factory. We can fully clean the electrode, replatinise it and test all aspects of its performance.

2. An automatic replatiniser is available from TPS, along with replatinising solution. This will plate the electrodes for the right amount of time at the correct current. Ordering details are as follows…

   Automatic Conductivity Electrode Replatiniser   Part No 122160

   20mL Platinising Solution (for approx 30 uses)   Part No 122300

3. Conductivity electrodes can be manually replatinised, according to the following procedure…

(a) Soak the electrode in a solution of 1 part Concentrated HCl and 10 parts distilled water for approximately 5 minutes.

(b) Rinse the electrode well in distilled water.

(c) Immerse the electrode in platinising solution at least to the vent hole in the glass body. Platinising solution is available from TPS (part no 122300). Alternatively, platinising solution can be prepared by dissolving 1g of Hydrogen Chloroplatinate (H_2PtCl_{16}) in 30mL of distilled water, and including about 0.01g of Lead Acetate (($CH_3COO)_2Pb$) and a drop or two of concentrated HCl.

(d) Apply a direct current of 10mA between pins 1 and 5 of the electrode plug, as per the diagram below. Reverse the polarity every 30 seconds. After approximately 8 minutes (4 minutes per electrode plate), they should have an even "sooty" appearance. Avoid excess current as this will cause incorrect platinising.

(e) After platinising, rinse the electrode well in distilled water.

(f) If you have any doubts about any of these steps, then you should consider returning the electrode to the factory. The cost of replatinising is quite low, and you will be guaranteed of the best possible result.
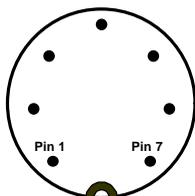
Sensor Connector

12. <u>Warranty</u>

TPS Pty. Ltd. guarantees all instruments and sensors to be free from defects in material and workmanship when subjected to normal use and service. This guarantee is expressly limited to the servicing and/or adjustment of an instrument returned to the Factory, or Authorised Service Station, freight prepaid, within twelve (12) months from the date of delivery, and to the repairing, replacing, or adjusting of parts which upon inspection are found to be defective. Warranty period on sensors is three (3) months.

There are no express or implied warranties which extend beyond the face hereof, and TPS Pty. Ltd. is not liable for any incidental or consequential damages arising from the use or misuse of this equipment, or from interpretation of information derived from the equipment.

Shipping damage is not covered by this warranty.

PLEASE NOTE:
A guarantee card is packed with the instrument or sensor. This card must be completed at the time of purchase and the registration section returned to TPS Pty. Ltd. within 7 days. No claims will be recognised without the original guarantee card or other proof of purchase. This warranty becomes invalid if modifications or repairs are attempted by unauthorised persons, or the serial number is missing.

<u>PROCEDURE FOR SERVICE</u>
If you feel that this equipment is in need of repair, please re-read the manual. Sometimes, instruments are received for "repair" in perfect working order. This can occur where batteries simply require replacement or re-charging, or where the sensor simply requires cleaning or replacement.

TPS Pty. Ltd. has a fine reputation for prompt and efficient service. In just a few days, our factory service engineers and technicians will examine and repair your equipment to your full satisfaction.

<u>To obtain this service, please follow this procedure</u>:
Return the instrument AND ALL SENSORS to TPS freight pre-paid and insured in its original packing or suitable equivalent. INSIST on a proof of delivery receipt from the carrier for your protection in the case of shipping claims for transit loss or damage. It is your responsibility as the sender to ensure that TPS receives the unit.

Please check that the following is enclosed with your equipment:

- **Your Name and daytime phone number.**
- **Your company name, ORDER number, and return street address.**
- **A description of the fault. (Please be SPECIFIC.)
  (Note: "Please Repair" does NOT describe a fault.)**

Your equipment will be repaired and returned to you by air express where possible.

For out-of-warranty units, a repair cost will be calculated from parts and labour costs. If payment is not received for the additional charges within 30 days, or if you decline to have the equipment repaired, the complete unit will be returned to you freight paid, not repaired. For full-account customers, the repair charges will be debited to your account.

- **Always describe the fault in writing.**
- **Always return the sensors with the meter.**