Congratulations !

Your new **pro*CHEM*-D** controller is the latest in simple, reliable process control instrumentation. With correct operation and maintenance, your **pro*CHEM*-D** will give you many years of reliable service.

The **pro*CHEM*-D** 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:

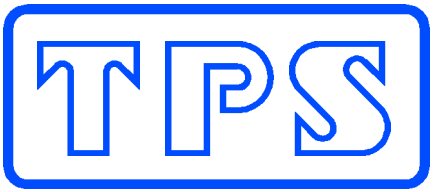
1. **Table of Contents**
   Each major section of the handbook is clearly listed. Sub-sections have also been included to enable you to find the information you need at a glance.

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

3. **Main Section**
   The main section of the handbook provides complete details of the **pro*CHEM*-D**, 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.

pro*CHEM*-D
Process Controller
Version : 1.0
Date : 01-Sep-2003
Author : MS



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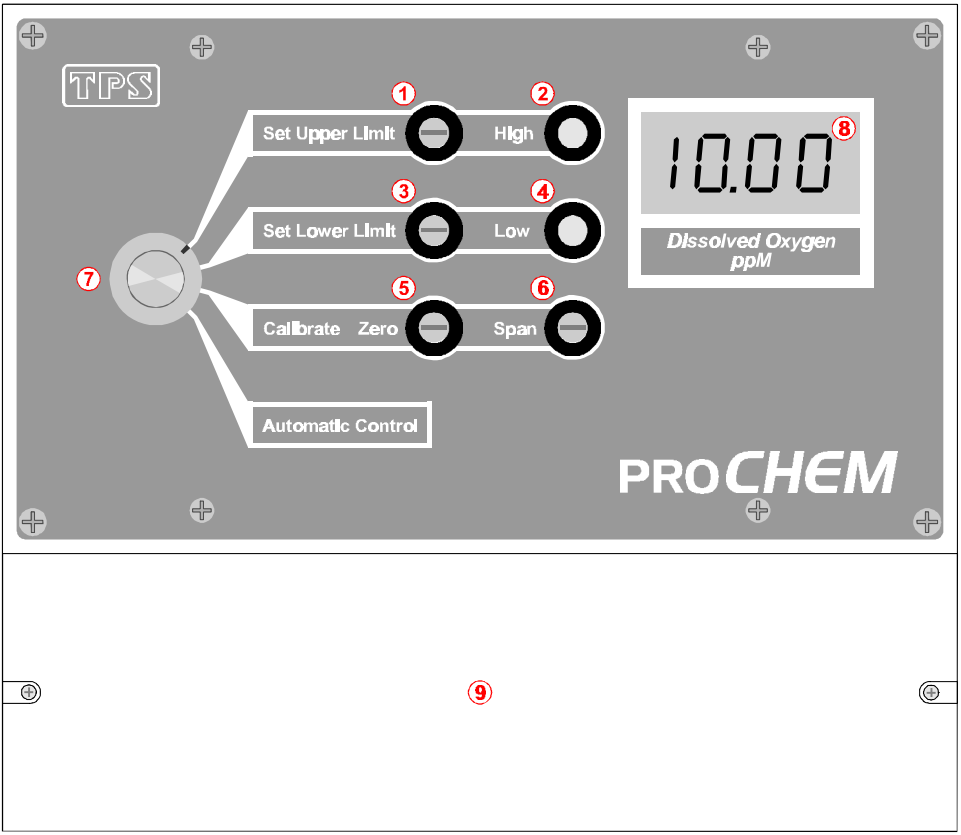
Contents

1. Introduction

1.1 pro*CHEM*-D Illustration



① **Set Upper Limit Control**
Adjust this control to the Dissolved Oxygen value at which the High LED and relay output are activated. Factory-set to activate when the reading is **above** the Upper Limit. See section 3.5.

② **High LED**
The High LED provides visual indication of when the Upper Limit has been exceeded. Factory-set to light up when the reading is **above** the Upper Limit. See section 3.5.

③ **Set Lower Limit Control**
Adjust this control to the Dissolved Oxygen value at which the Low LED and relay output are activated. Factory-set to activate when the reading is **below** the Lower Limit. See section 3.5.

④ **Low LED**
The Low LED provides visual indication of when the Lower Limit has been exceeded. Factory-set to light up when the reading is **below** the Lower Limit. See section 3.5.

⑤ **Zero Calibrate Control**
Adjust this control to calibrate the **pro*CHEM*-D** to Zero with the sensor in Sodium Sulphite solution. See section 4.

⑥ **Span Calibrate Control**
Adjust this control to calibrate the **pro*CHEM*-D** in air. See section 4.

⑦ **Function Switch**
The Function Switch is used to select the mode of operation. See section 2.

⑧ **Display Window**
The **pro*CHEM*-D** has a large, easy to read LCD display. The units of measurement are clearly shown in the window beneath the display.

⑨ **Terminal Cover**
The terminal cover provides easy access to all of the connections, relay output fuses, configuration jumpers and user-adjustable trimmers. The cover is water resistant to IP65.

1.2 Unpacking Information

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

	Part No
1. **pro*CHEM*-D** Process Controller	113122
2. **pro*CHEM*-D** Handbook	130050

Options that may have been ordered with your proCHEM-D:

TPS Dissolved Oxygen Sensor (submersible to 3 metres max)…

1. ED1M Dissolved Oxygen sensor (no cable)	123440
2. 5m cable for ED1M	123236
3. Extended cable (per metre)	130040

YSI Dissolved Oxygen Sensor and separate cable…

1. EDYSI Dissolved Oxygen sensor (no cable)	123204
2. 5m cable for EDYSI	123210
3. Extended cable (per metre)	130040

Instrument options…

1. 4-20mA loop-powered, remote LCD	130080
2. 12V DC Power Option	130072

Spares…

1. Membrane Kit for ED1M	123301
2. Membrane Kit for EDYSI	123300
3. Sodium Sulphite for Zero calibration	123302

1.3 Specifications

Ranges ..... 0 to 199.9 % Saturation
or 0 to 19.99 ppM (mg/L)
(Factory-set)

Resolution ..... 0.1 % Saturation
or 0.01 ppM (mg/L)

Accuracy ..... ±0.2 % of full scale

Linearity ..... ±0.1 %

Repeatability ..... ±0.2 %

Ambient Drift ..... <0.05 % span per 1^{o}C change

Long term drift ..... <0.2% per year

Zero Range ..... ±10 %

Span Range ..... 70 to 130 %

Temperature Compensation ... Dual automatic temperature compensation system, 0 to 50 ^{O}C (sensor limit)

Enclosure ..... Polycarbonate, waterproof to IP65

Display ..... 12.7 mm LCD (optional remote 4-20mA loop powered display available)

Analogue Outputs ..... 4 to 20mA (500 Ohms max. loop resistance)
0 to 1 V DC (min. load 1000 Ω)
0 to 10 V DC optional (min. load 1000 Ω)

Control Outputs ..... 2 x Clean contact changeover relays, rated to 2A at 240V AC

Isolation ..... Galvanic isolation of sensor input

Power ..... 240V AC, 50/60Hz (120V AC optional)

Dimensions ..... 215 x 190 x 115 mm

Mass ..... Instrument only : Approx 900g
Full Kit : Approx 1.5kg

Operating Environment: ..... Temperature : 0 to 45 ^{o}C
Humidity : 0 to 95 % R.H.

2. Operating Modes

The function switch is used to select the required mode. The four operating modes available are…

1. **Set Upper Limit** : Switch to **Set Upper Limit** when setting the Dissolved Oxygen value at which the High LED and relay output are activated. The relay output is not operational in this mode.

   Factory-set to activate when the reading is **above** the Upper Limit. Can be user set to be a activate when the reading is **below** the Upper Limit. See section 3.5.

2. **Set Lower Limit** : Switch to **Set Lower Limit** when setting the Dissolved Oxygen value at which the Low LED and relay output are activated. The relay output is not operational in this mode.

   Factory-set to activate when the reading is **below** the Lower Limit. Can be user set to be a activate when the reading is **above** the Lower Limit. See section 3.5.

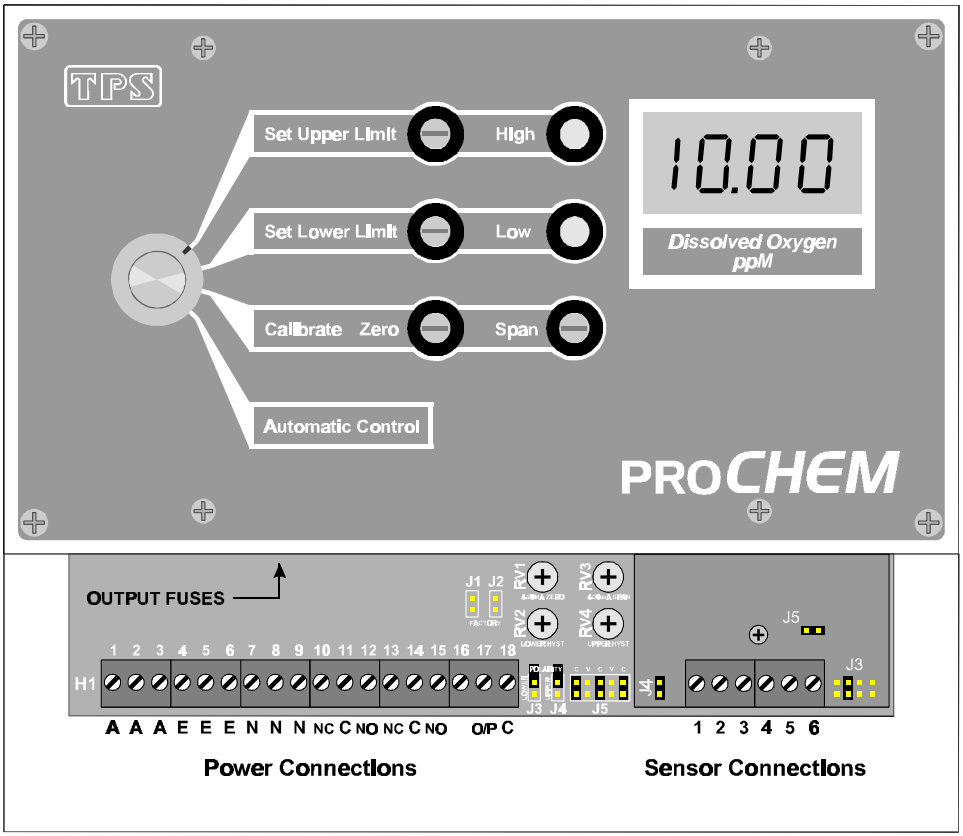
3. **Calibrate** : Switch to Calibrate mode to place the **pro*CHEM*-D** into standby (eg. when calibrating). This mode disables the two output relays to avoid chemicals being added when placing the sensor into calibration buffers.

4. **Automatic Control** : Switch to **Automatic Control** to enable the Alarm LED's and relay outputs. These will be activated when the Dissolved Oxygen is outside the Upper and Lower limit values. See section 3.5.

3. Installation and Set-up

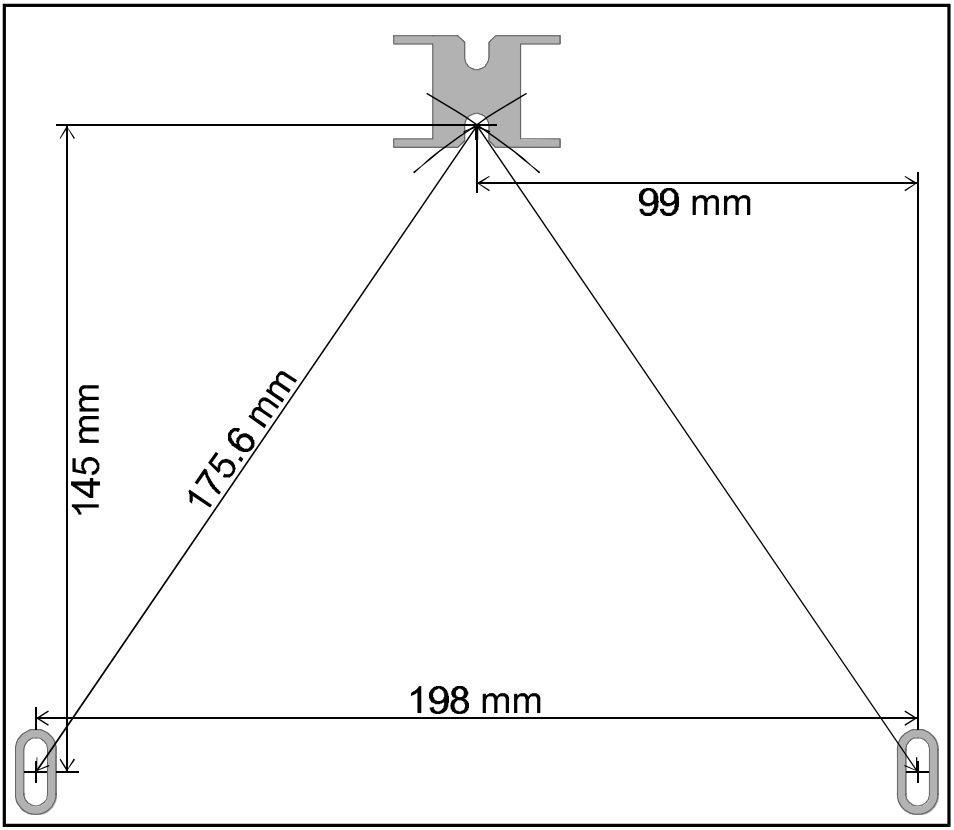
3.1 Connection and Configuration Diagram

The diagram below is provided as a reference for the terminal connections, configuration jumpers and user-adjustable trimmers that are discussed throughout this section.



3.2 Mounting the Enclosure

The **pro*CHEM*-D** can be wall-mounted with 3 screws. Two mounting points are located underneath the terminal cover, and are positioned so that they do not affect the waterproofing of the enclosure. The third mounting point is centrally located near the top of the rear of the enclosure, and has been designed to hook over a screw-head. The dimensions for the mounting screw centres are provided on the rear of the enclosure, and are also illustrated below…



3.3 Mounting the Sensor

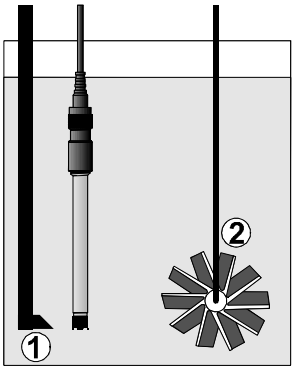
Mounting the sensor is a very important aspect of the installation, and is often done incorrectly. In automatic control situations, the sensor should always be mounted as close as possible to the injection point. This will cause the sensor to detect the added oxygen or chemicals immediately, and shut the addition off until mixing has taken place. For in-line mounting, it is important that oxygen or chemicals are injected upstream. Additionally, the line must be run through a mixing chamber, such as a large drum, to ensure that the injected oxygen or chemical has mixed in properly by the time the solution flows past the sensor. There must always be adequate flow of fresh sample past the sensor, for accurate monitoring. The diagrams below show typical mounting arrangements for “dip” mounting and in-line mounting.

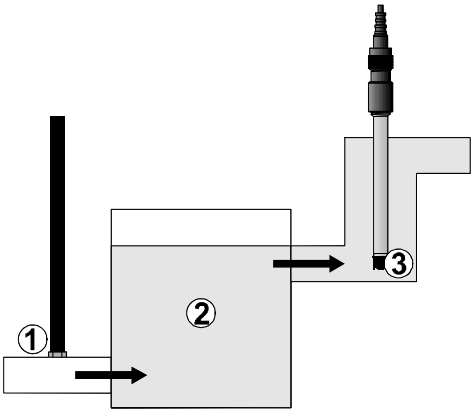
Dip Mounting

1. Injection point close to sensor.
2. Continuous stirring.

In-line Mounting

1. Injection point upstream from and close to sensor.
2. Mixing container after injection and before sensor.
3. DO_2 sensor mounted as close to vertical as practical, through a suitable gland fitting.





3.4 Terminal Connections

3.4.1 Power Connections

All power connections are on the main terminal block (H1), which has 18 terminals.

Note: The power connections detailed below are for normal mains power. Refer to section 9.6 for power wiring details when the 12V DC power option is fitted.

Terminal No.	Connection	Colour
1	220 / 240V AC Active input	Brown (standard colour)
2	Duplicate 240V AC Active contact.	Brown (standard colour)
3	Duplicate 240V AC Active contact.	Brown (standard colour)
4	220 / 240V AC Earth input	Green (standard colour)
5	Duplicate 240V AC Earth contact.	Green (standard colour)
6	Duplicate 240V AC Earth contact.	Green (standard colour)
7	220 / 240V AC Neutral input	Blue (standard colour)
8	Duplicate 240V AC Neutral contact.	Blue (standard colour)
9	Duplicate 240V AC Neutral contact.	Blue (standard colour)
10	Normally Closed contact of Lower relay output	Customer Defined
11	Common contact of Lower relay output	Customer Defined
12	Normally Open contact of Lower relay output	Customer Defined
13	Normally Closed contact of Upper relay output	Customer Defined
14	Common contact of Upper relay output	Customer Defined
15	Normally Open contact of Upper relay output	Customer Defined
16	No Connection	
17	+ve of current or voltage output	Customer Defined
18	-ve of current or voltage output	Customer Defined

3.4.2 Sensor Connections

All sensor connections are on the 6-way terminal block which is on the right hand side of the enclosure.

Terminal No.	Connection	Colour
1	ATC Sensor for ppM operation	Red *
2	ATC Sensor for ppM operation	Blue *
3	No Connection	
4	Common	Black
5	DO_2 Sensor Anode	Green
6	DO_2 Sensor Cathode	Yellow

***** The ATC connection to terminals 1 & 2 is only for when the unit is reading ppM (mg/L) units. **DO NOT** connect these for % Saturation readout.

3.5 Setting the Control Limit

The Upper and Lower control limits can both be set over the full scale of the **pro*CHEM*-D**. The unit is set up in the factory for the Upper Limit LED and relay to be activated when the reading rises **above** the Upper Limit. Similarly, the Lower Limit LED and relay are factory set to be activated when the reading drops **below** the Lower Limit.

See section 3.5.3 for details on how to re-set the Upper or Lower limits for the reverse of the default direction.

The hysteresis around the set point can be also be adjusted if necessary. See section 3.5.4 for an explanation of hysteresis.

3.5.1 Setting the Upper Limit value

1. Switch the **pro*CHEM*-D** to **Set Upper Limit**.
   The Upper Limit value is now displayed. Note that the Alarm LED and output relays are now disabled. The 4-20mA or 0-1V outputs are still active, and proportional to displayed value.
2. Adjust the **Set Upper Limit** control until the display reads the desired set point value.

3.5.2 Setting the Lower Limit value

1. Switch the **pro*CHEM*-D** to **Set Lower Limit**.
   The Lower Limit value is now displayed. Note that the Alarm LED and output relays are now disabled. The 4-20mA or 0-1V outputs are still active, and proportional to displayed value.
2. Adjust the **Set Lower Limit** control until the display reads the desired set point value.

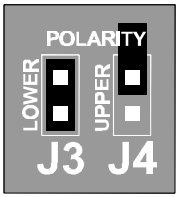
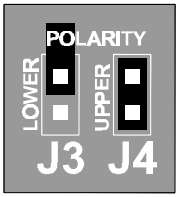
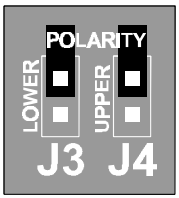
3.5.3 Reversing the default control direction

The Upper Limit control action can be reversed to activate the Upper Limit LED and relay when the reading drops **below** the Upper Limit.

Similarly, the Lower Limit control action can be reversed to activate the Lower Limit LED and relay when the reading rises **above** the Lower Limit.

Having two Limits acting in the same direction can be very useful for processes where the readings always drift in one direction. It allows the operator to set the first Limit as a control point (eg to start an aerator), and the second limit beyond that as an alarm point, in case the control action was not effective.

The **pro*CHEM*-D** must be switched OFF before changing jumper settings.

To reverse the action of the Lower Limit, and have two Limits that activate the High and Low LED's and relays when the reading rises **above** the Limits, set the J3 and J4 jumpers as shown.	
To reverse the action of the Upper Limit, and have two Limits that activate the High and Low LED's and relays when the reading drops **below** the Limits, set the J3 and J4 jumpers as shown.	
To re-set the action of the Upper and Lower limits to factory defaults, set the J3 and J4 jumpers as shown	

3.5.4 Adjusting the Hysteresis

The hysteresis is the Dissolved Oxygen range over which the alarm/control output remains switched on, once the trip point has been exceeded.

For example, if the limit is set to 10.00 ppM, as a “too low” trip point, with a hysteresis of ±0.10 ppM, the alarm/control output is switched ON when the reading goes to 9.90 ppM(i.e. 10.00 - 0.10). The output is not switched OFF until the reading goes back up to 10.10 ppM (i.e. 10.00 + 0.10).

The hysteresis stops the relay “chattering” around the set point, by providing a buffer between the points at which the output is switched ON and OFF. This feature can significantly increase the life of aerators, solenoid valves etc.

The factory-set hysteresis is approximately ±0.10 ppM, as in the example above. The hysteresis can be increased to as high as ±2.00 ppM with the relevant **LOWER HYST** (RV2) or **UPPER HYST** (RV4) trimmers in the terminal area. For units set up for % Saturation, the factory-set hysteresis is approximately ±1.0 % Saturation, which can be adjusted to ±20.0 % Saturation.

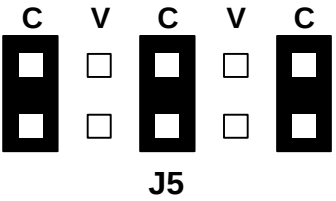
TPS DOES NOT recommend that this setting be altered, unless it is absolutely necessary.

The hysteresis trimmer should only be adjusted a little at time. The process being controlled should then be closely monitored over a time to ensure that the desired control is being achieved.

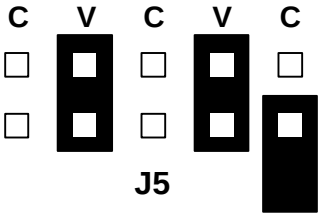
3.6 Selecting Current or Voltage Output

The **Current/Voltage Output** jumpers in terminal section can be user-set for either 4 to 20mA or 0 to 1V DC output. The **pro*CHEM*-D** must be switched OFF before changing jumper settings.

The jumper settings for 4 to 20 mA output are:



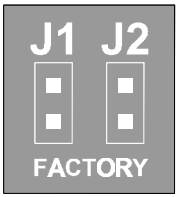
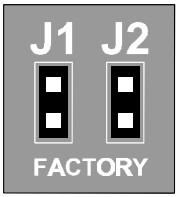
The jumper settings for 0 to 1V DC output are:



Note that the spare jumper has been fitted to a spare **Current/Voltage Output** jumper pin. This is a safe place to keep it, in case the **pro*CHEM*-D** needs to be reset to current output in the future.

3.7 Selecting Standard or Custom 4 to 20 mA Output

The **pro*CHEM*-D** is normally supplied to provide 4 to 20 mA for the full scale of the readout. If a custom 4 to 20 mA output (eg. 4 to 20 mA output for 700 to 1000 counts) is supplied, the user can still change between this custom output and the normal 4 to 20 mA output for full scale.

The jumper settings for the standard 4 to 20 mA output are…	
The jumper settings for the custom 4 to 20 mA output are…	

3.8 Calibrating the 4 to 20mA Output

The 4 to 20mA output of the **pro*CHEM*-D** is factory calibrated. However, TPS has provided calibration controls for the 4mA and 20mA points in case this requires adjustment in the field.

Calibrating the 4 to 20mA output…

1. Connect a Digital Milliamp Meter between terminals 17 and 18.
2. Switch the **pro*CHEM*-D** to **Set Upper Limit**.
3. Adjust the **Set Upper Limit** control until the display reads 0.00 (for the standard 4 to 20mA output) or the Dissolved Oxygen that corresponds to 4 mA (for a custom 4 to 20 mA output).
4. Adjust the **4-20mA ZERO** (RV1) trimmer in the terminal area until the Digital Milliamp Meter reads 4 mA.
5. Adjust the **Set Upper Limit** control until the display reads 19.9 ppM or 199.9% Saturation (for the standard 4 to 20mA output) or the Dissolved Oxygen that corresponds to 20 mA (for a custom 4 to 20 mA output).
6. Adjust the **4-20mA SPAN** (RV3) trimmer in the terminal area until the Digital Milliamp Meter reads 20 mA.

*In the event that the **LIMIT** control does not have sufficient adjustment to reach 0.00 or 19.9 / 199.9, calculate the expected output level and use this for calibration. Remember that the difference between 0 and 19.9 / 199.9 is to be made 16mA.*

4. Calibration

4.1 Calibration Procedure

1. Switch the **pro*CHEM*-D** on and ensure that the Dissolved Oxygen sensor is correctly connected (see section 3.4.2).
2. Set the function switch to **Calibrate**, to ensure that the relay outputs are not activated during calibration.
3. Rinse the Dissolved Oxygen sensor in distilled water and blot dry.

Zero Calibration

4. (a) Place the sensor into an oxygen-free solution. This solution may be prepared by dissolving 2g of Sodium Sulphite in 100mL of distilled water. A 50g bottle of Sodium Sulphite powder is supplied with new ED1M and EDYSI sensors for this purpose (part number 123302).
   (b) Allow the reading to stabilise at or near zero. This may take 2-3 minutes.
   (c) Adjust the **ZERO** control until the display reads 0.00 ppM or 0.0 % Saturation.
5. Rinse the Dissolved Oxygen sensor in distilled water and blot dry.

Span Calibration

6. Hang the Dissolved Oxygen sensor in air. The tip of the sensor should be pointing downwards. Allow the reading to stabilise. After a zero calibration, this may take up to 5 minutes.
7. (a) For % Saturation readout, adjust the **SPAN** control until the display reads 100.0.
   (b) For ppM readout, adjust the **SPAN** control for the ppM (mg/L) Dissolved Oxygen value at the current air temperature, and the expected salinity value of the sample solution. A table is provided in section 9.1 for this purpose.

   If the expected salinity value of the sample solution is quite high, there may not be enough adjustment in the **SPAN** control to calibrate the readout. If this is the case, please see section 0 for details on how to set the internal jumpers to allow for higher salinities.
8. The **pro*CHEM*-D** is now calibrated and ready for Dissolved Oxygen measurements.

4.2 Calibration Notes

1. A Span calibration should be performed at least weekly. In applications where the sensor can become dirty or coated, such as sewage effluent, mining slurries etc, a Span calibration may have to be done daily.
2. The Zero calibration is quite stable long term. Monthly Zero calibration is recommended, mainly as a routine check.
3. Both a Zero and a Span calibration need to be performed when the membrane is replaced.

5. Process Monitoring

Once the **pro*CHEM*-D** has been installed, connected and calibrated, it can be used for continuous monitoring. To monitor the process, WITHOUT any control or alarm functions switch the function switch to **Calibrate**.

6. Automatic Control

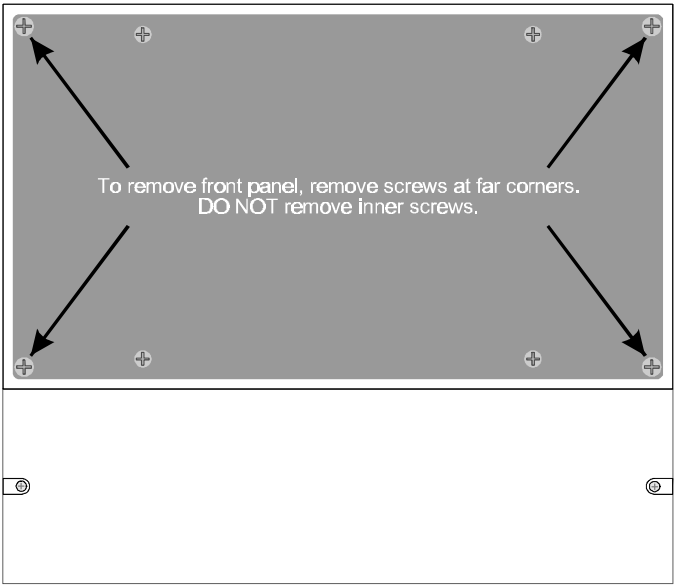
For Automatic Alarming or Control, switch the function switch to **Automatic Control** to enable the Alarm LED's and the relay outputs. These will be switched ON while the Dissolved Oxygen exceeds the limit value, and will switch OFF once the Dissolved Oxygen is back within the limit.

7. Fuse Replacement

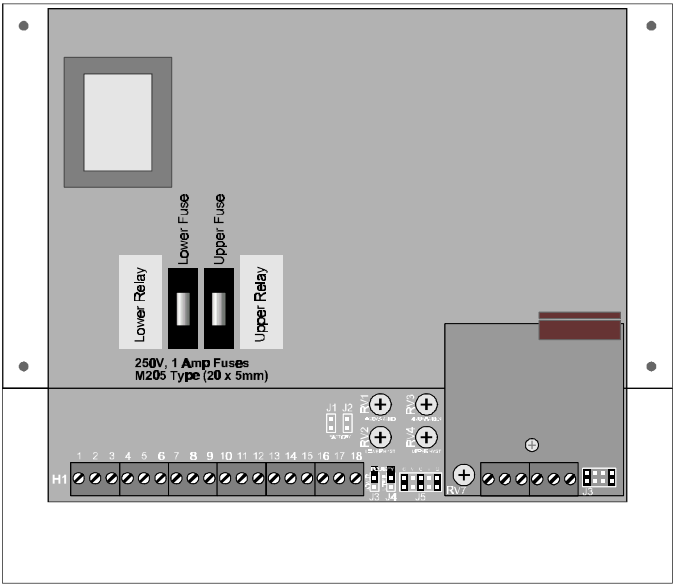
If the current drain from any device connected to the output relay exceeds 1 Amp, the output protection fuse will blow.

To replace the fuse…

1. SWITCH THE **pro*CHEM*-D** OFF.
2. Remove the main front panel by unscrewing the 4 screws at each corner and pulling out. Caution : The front circuit board is connected to the rear circuit board with a ribbon cable, so care must be taken.


To remove front panel, remove screws at far corners.
DO NOT remove inner screws.

3. Locate the fuse holders, and pull out the black fuse carrier of the blown fuse.



4. Replace the blown fuse with a 250V 1 Amp, M205 type. M205 fuses are 20 x 5 mm.
5. Push the fuse carrier with the new fuse back into place.

ALWAYS REPLACE THE FUSE WITH A 1 AMP, 240V FUSE. USING A FUSE WITH HIGHER CURRENT RATING MAY DAMAGE YOUR CONTROLLER, VOIDING THE WARRANTY.

Before switching the **pro*CHEM*-D** back to **Automatic Control** mode, ensure that the cause of the blown fuse has been eliminated.

If the current drain of the device connected to the relay output is greater than 1 Amp, an external contactor should be used. Please consult an electrical contractor or TPS for details.

8. Troubleshooting

8.1 Instrument Function Troubleshooting

Symptom	Possible Causes	Remedy
No display	1. Mains power input not switched on.	Switch power ON.
	2. Mains power input incorrectly connected.	Check connections (see section 3.4.1).
	3. Instrument is faulty.	Return to TPS for repair.
Alarm LED or relay output do not operate when limit is exceeded.	1. Limit not set correctly for “too high” or “too low” alarm/control.	Set the **J3** or **J4 Polarity** jumpers correctly (see section 3.5.3).
	2. Hysteresis too large.	Check and adjust the Hysteresis trimmer (see section 3.5.4). If in doubt, set this to minimum level.
	3. Fuse has blown.	Check and replace fuse if necessary (see section 7).
	4. Instrument is faulty.	Return to TPS for repair.
Incorrect analogue output signal.	1. **Current/Voltage Output** jumpers incorrectly set for required output.	Check that the Current/Voltage Output jumpers are correctly set for 4-20mA or 0-1V, as per requirements. Adjust if necessary (see section 3.6).
	2. 4-20mA loop resistance too high.	Ensure loop resistance does not exceed 500 Ohms.
	3. Load on 0-1V DC output is too low.	Ensure load is 1000 Ohms minimum.
	4. 4-20mA output is not calibrated.	Calibrate 4-20mA output (see section 3.8).
	5. Instrument is faulty.	Return to TPS for repair.

8.2 Dissolved Oxygen Troubleshooting

Symptom	Possible Causes	Remedy
• Zero calibration fails (Zero is greater than 10%) • Air calibration fails (Span is less than 70% or greater than 130%). • Unstable or inaccurate readings.	1. Membrane is leaking or broken.	Replace membrane and refill sensor.
	2. Gap between membrane and gold cathode is dry.	ED1M: Undo the barrel 3 turns, then re-tighten to re-flush the filling solution. EDYSI: Gently pump the pressure compensation diaphragm to re-flush the filling solution.
	3. Incorrectly fitted membrane.	Membrane should be smooth and convex with no wrinkles. Re-fit membrane if necessary.
	4. Sensor is empty.	Replace membrane and re-fill electrode.
	5. Sensor is faulty.	Return sensor to factory for repair or replacement
Blackened Silver anode wire	Electrode has been exposed to sulphides or other chemical poisoning.	See section 9.4 for the sensor cleaning procedure. If no improvement, return to the TPS factory for cleaning and service.
Tarnished or scratched Gold cathode.	Sensor has been chemically poisoned or physically damaged.	Return to the TPS factory for cleaning and service.
Meter reads "**1.** " (over-range reading).	1. Sensor has not yet polarised.	Wait for 2-3 minutes for the electrode to polarise after the **pro*CHEM*-D** is switched on.
	2. Electrode is faulty	Return electrode to factory for repair or replacement.

9. Appendices

9.1 ppM (mg/L) Calibration Table

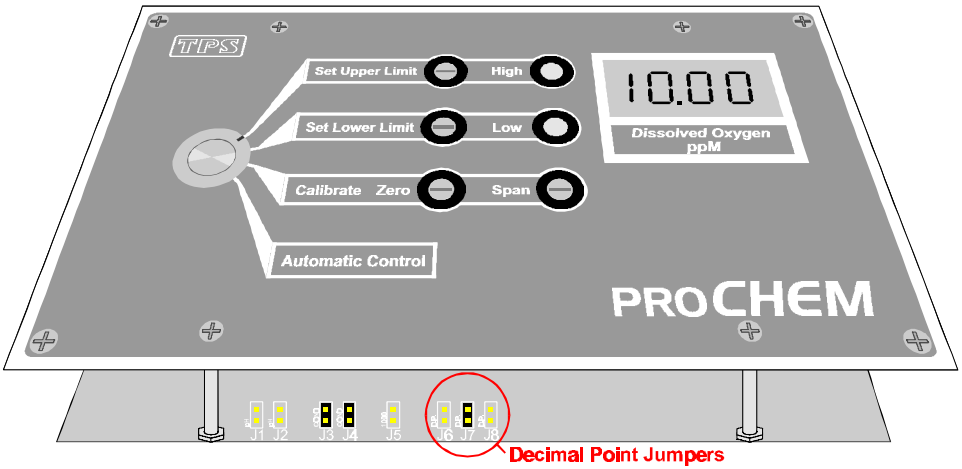
Salinity					
g/L Cl^-	0	4	8	16	20
ppK NaCl	0	6.6	13.2	26.4	33
Temp ^OC	**Dissolved Oxygen, ppM (mg/L)**				
0	14.57	13.91	13.26	11.94	11.29
1	14.17	13.54	12.90	11.63	11.00
2	13.79	13.18	12.56	11.33	10.72
3	13.43	12.83	12.24	11.05	10.45
4	13.08	12.50	11.93	10.78	10.20
5	12.74	12.19	11.63	10.52	9.96
6	12.42	11.88	11.34	10.27	9.73
7	12.11	11.59	11.07	10.03	9.51
8	11.81	11.31	10.81	9.80	9.30
9	11.53	11.04	10.56	9.58	9.09
10	11.26	10.79	10.31	9.37	8.90
11	10.99	10.54	10.08	9.17	8.72
12	10.74	10.30	9.86	8.98	8.54
13	10.50	10.07	9.65	8.79	8.37
14	10.27	9.86	9.44	8.62	8.20
15	10.05	9.65	9.25	8.45	8.04
16	9.83	9.44	9.06	8.28	7.89
17	9.63	9.25	8.87	8.12	7.74
18	9.43	9.06	8.70	7.97	7.60
19	9.24	8.88	8.53	7.82	7.46
20	9.06	8.71	8.36	7.67	7.32
23	8.55	8.22	7.90	7.25	6.93
24	8.39	8.07	7.76	7.12	6.80
25	8.24	7.93	7.61	6.99	6.68
26	8.09	7.78	7.47	6.86	6.55
27	7.95	7.64	7.34	6.73	6.42
28	7.81	7.51	7.21	6.60	6.30
29	7.68	7.38	7.07	6.47	6.17
30	7.55	7.25	6.95	6.34	6.04
31	7.42				
32	7.30				
33	7.18				
34	7.07				
35	6.95				

9.2 Selecting % Saturation or ppM (mg/L) Readout

Switch the pro*CHEM*-D OFF before changing any jumper settings.

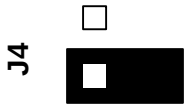
The diagram below shows the location of the jumper blocks which set the decimal point position. This is accessed by removing the front panel of the unit (as described in section 7, Fuse Replacement). The circuit board does not need to be separated from the panel, as there is sufficient clearance to change the jumper settings.

Attach spare jumpers off single unused pins for safe storage.

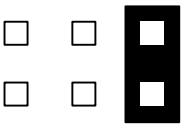


9.2.1 % Saturation Configuration

1. Set the **J4** jumper in the terminal area to be open. Fit the jumper to one of the pins, as shown below, in case it is needed later.



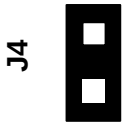
2. Set the **Decimal Point** jumpers as shown below.



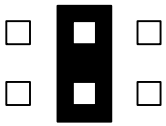
3. Ensure that the Red and Blue of the sensor cable ARE NOT connected to terminals 1 and 2 (see the connection details in section 3.4.2).

9.2.2 ppM (mg/L) Configuration

1. Set the **J4** jumper in the terminal area to be closed, as shown below.



2. Set the **Decimal Point** jumpers as shown below.



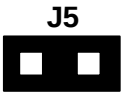
3. Ensure that the Red and Blue of the sensor cable ARE connected to terminals 1 and 2 (see the connection details in section 3.4.2).

9.3 Selecting YSI or ED1M Dissolved Oxygen Sensor

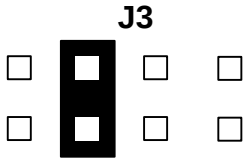
Switch the pro*CHEM*-D OFF before changing any jumper settings.

9.3.1 YSI Dissolved Oxygen Sensor Configuration

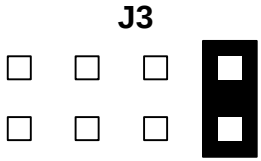
1. Set the **J5** jumper in the terminal area to be closed.



2. (a) Set the **J3** jumper in the terminal area across the second jumper (from the left).

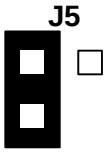


(b) When the **pro*CHEM*-D** is set to ppM readout and the samples have a high salinity, there may not be enough adjustment available with the **SPAN** control to calibrate the unit. If this is the case, set the **J3** jumper to the following setting…

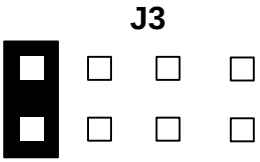


9.3.2 ED1M Dissolved Oxygen Sensor Configuration

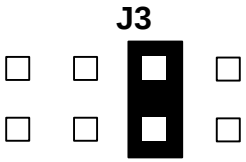
1. Set the **J5** jumper in the terminal area to be open. Fit the jumper to one of the pins, as shown below, in case this is needed later.



2. (a) Set the **J3** jumper in the terminal area across the first jumper (from the left).



(b) When the **pro*CHEM*-D** is set to ppM readout and the samples have a high salinity, there may not be enough adjustment available with the **SPAN** control to calibrate the unit. If this is the case, set the **J3** jumper to the following setting…



9.4 Cleaning the Dissolved Oxygen Sensor

If the silver anode of a Dissolved Oxygen sensor becomes contaminated with materials such as sulphide, the electrode will become poisoned. This will cause calibration to become more difficult and eventually impossible. The following procedure can be used for less serious poisoning.

1. Ensure that the electrode is actually the faulty part of the system, by trying a different electrode, cable or meter. If any of these items are not available, check all cable connections and the condition of the membrane. If the membrane is loose, has bubbles underneath it or is dirty or greasy, replace it and try the probe again.
2. If you have determined that the probe is the faulty part…
   (a) For the ED1M, completely unscrew and remove the barrel. The silver anode is the wire wrapped around the sensor stem.
   (b) For the EDYSI, remove the membrane and the pressure compensation pump assembly (refer to the YSI instruction leaflet). The silver anode is the triangular block inside the tip of the sensor.

   The usual indication of poisoning of the silver anode is blackening.
3. Rinse the sensor to remove any loose particles.
4. Soak the electrode for 10 minutes in 5% Ammonia solution.
5. Rinse well under a tap.
6. If an ultra-sonic cleaning bath is available, add a few drops of detergent (eg: dishwashing liquid) to the water so that it covers the silver anode. Turn on the cleaner for approximately 5 minutes.
7. Rinse well under a tap.
8. Re-assemble the sensor, re-fill the electrode and fit a new membrane, as per the instructions supplied with the sensor.
9. If the electrode still fails to calibrate or read correctly, TPS can attempt further cleaning by electrolysis. This procedure removes the outmost layer of the anode and actually reduces its size. Whilst the procedure is hard on the sensor, it does often restore the probe's performance.
10. If poisoning is a problem for the EDYSI, then please refer to the YSI instruction leaflet and TPS appendix to the leaflet regarding correct fitting of the membrane.

9.5 Maintenance of the Membrane

The membrane does not require replacement as long as it remains intact. If punctured or suspected of leaking around the edges, it must be replaced.

To replace the membrane of the EDYSI sensor, see the separate leaflet with which it is supplied.

To replace the ED1M membrane…

1. Unscrew the lower barrel and carefully remove it from the probe. Ensure that the internal stem is not touched with the fingers, as the metallic surfaces are easily contaminated.
2. Remove the plastic cap and membrane from the end of the barrel.
3. Cut a 30 mm square (approx.) piece of membrane material from your probe maintenance kit. Hold this over the end of the barrel, and push the plastic retaining cap back into place evenly. A little moisture on the outside of the membrane will let the cap slip on easily. The excess membrane may be trimmed off with a razor blade.
4. Pour enough 0.1 Molar KCl solution into the barrel to fill only 1/3.
5. Push the barrel carefully onto the internal stem. As this is done, check for leaks on the membrane. The internal stem can be used to gently "pump" the membrane to check for leaks.
6. If no leaks can be seen, screw the outer barrel into place, so that the membrane is evenly and smoothly stretched over the gold internal cathode (gold bead at end). DO NOT OVER-TIGHTEN.

   If the probe is washed off and put in fresh water, then, by viewing obliquely in a strong light, it is possible to see electrolyte "streaming" from the tip if it is leaking (even slowly). The effect is one of differential refractive index and is quite sensitive.

   If the response is low, or zero impossible, or reading over-ranged, fit a new membrane.

9.5.1 Dissolved Oxygen Sensor Storage

The Oxygen probe should be kept moist when not in use to prevent the thin film of electrolyte behind the membrane from drying out. To achieve this, the probe can be stored with the tip in water.

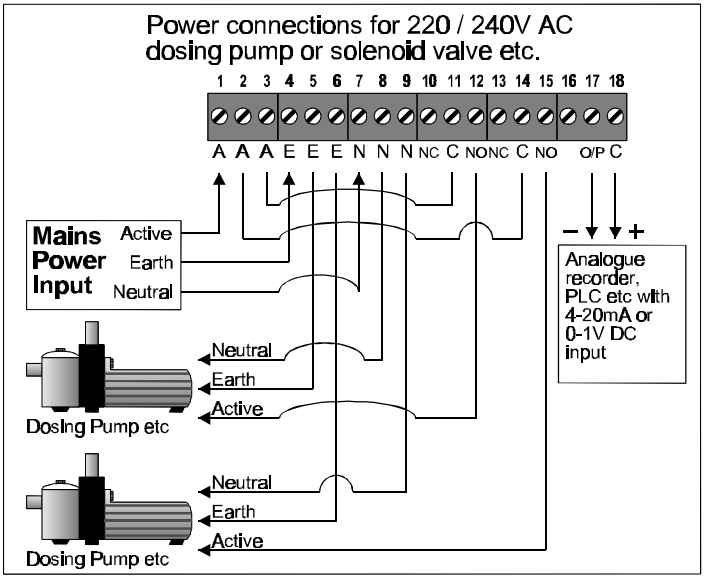
For long term storage of several weeks or more, remove and empty the barrel. Replace the barrel with the membrane intact. When the electrode is stored in this way, the membrane should be replaced and the electrode refilled before use.

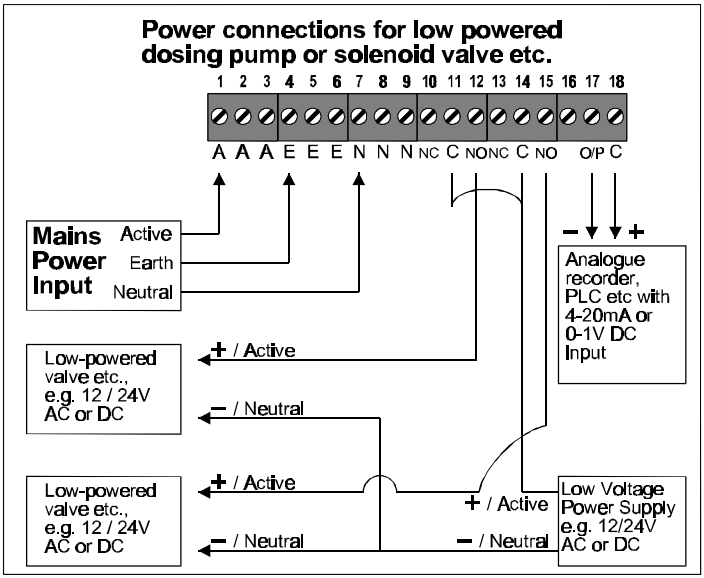
9.6 Power Terminal connections when 12V DC option is fitted

Terminal No.	Connection
1	Negative of 12V DC Input
2	No connection for 12V DC version.
3	No connection for 12V DC version.
4	No connection for 12V DC version.
5	No connection for 12V DC version.
6	No connection for 12V DC version.
7	Positive of 12V DC Input
8	No connection for 12V DC version.
9	No connection for 12V DC version.
10	Normally Closed contact of Lower relay output
11	Common contact of Lower relay output
12	Normally Open contact of Lower relay output
13	Normally Closed contact of Upper relay output
14	Common contact of Upper relay output
15	Normally Open contact of Upper relay output
16	No Connection
17	+ve of current or voltage output
18	-ve of current or voltage output

9.7 Relay Output Wiring Examples for mains powered units

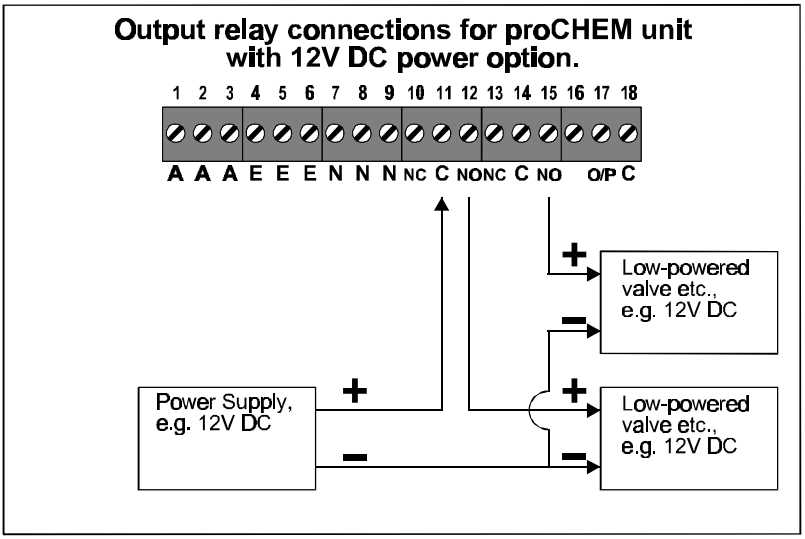
The diagrams below provide some examples of wiring the relay outputs for standard mains powered **pro*CHEM*-D** units.





9.8 Relay Output Wiring Examples for 12V DC powered units

The diagrams below provide some examples of wiring the relay output for **pro*CHEM*-D** units with the 12V DC power option.



10. Warranty

TPS Pty. Ltd. guarantees all instruments and electrodes 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 Agent, 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 electrodes 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 electrode. 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.

PROCEDURE FOR SERVICE

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 electrode 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.

TO OBTAIN THIS SERVICE, PLEASE FOLLOW THIS PROCEDURE:
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.**