

**MODEL 4320 CONDUCTIVITY METER
OPERATING MANUAL**

SAFETY

Please read this information carefully prior to installing or using this equipment.

1. The units described in this manual are designed to be operated only by trained personnel. Any adjustments, maintenance and repair must be carried out as defined in this manual, by a person qualified to be aware of the hazards involved.
2. References should always be made to the Health & Safety data supplied with any chemicals used. Generally accepted laboratory procedures for safe handling of chemicals should be employed.
3. If it is suspected that safety protection has been impaired in any way, the unit must be made inoperative and secured against any intended operation. The fault condition should immediately be reported to the appropriate servicing authority.

MODEL 4320 CONDUCTIVITY METER OPERATING MANUAL

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EC Declaration of Conformity

MODEL 4320 CONDUCTIVITY METER OPERATING MANUAL

SECTION 1

INTRODUCTION

1.1 INSTRUMENT DESCRIPTION

The Model 4320 is a laboratory unit which incorporates many sophisticated features but also offers simplicity of operation.

The graphics mode liquid crystal display incorporated into this meter enables a menu based approach to each analysis and allows the user to easily select the relevant operating mode.

The meter incorporates both analog and digital interfacing capability along with high and low alarm set points. An internal data logging facility enables 100 results to be stored in non-volatile memory for either recall onto the instrument display or down loading via the RS232 port

1.2 SPECIFICATION

Conductivity

Ranges:	0 to 19.99S (using X10 cell) 0 to 1.999S 0 to 199.9mS 0 to 19.99mS 0 to 1.999mS 0 to 199.9 μ S 0 to 19.99 μ S 0 to 1.999 μ S
Resolution:	0.01S/ 0.001S/ 0.1mS/0.01mS/0.001mS/ 0.1 μ S/0.01 μ S
Accuracy:	\pm 0.5% \pm 2 digits

TDS

Ranges:	0 to 2000g/l 0 to 200g/l 0 to 20g/l 0 to 2000mg/l 0 to 200mg/l 0 to 20mg/l
Resolution:	1g/l/ 0.1g/l/0.01g/l/1mg/l/ 0.1mg/l/0.01mg/l
Accuracy:	\pm 0.5% \pm 2 digits

Resistivity

Range:	0 to 20M Ω ms
Resolution:	0.01M Ω ms

Temperature

Range:	-10 to +105 $^{\circ}$ C 14 to 220 $^{\circ}$ F
Resolution:	0.1 $^{\circ}$ C / 1 $^{\circ}$ F
Accuracy:	\pm 0.5 $^{\circ}$ C / \pm 1 $^{\circ}$ F

Salinity

Range:	0 to 99.9
Resolution:	0.1
Accuracy:	0 to 35 \pm 1 / 35 to 99.9 \pm 3 of reading

ATC Range: 0 to +100 $^{\circ}$ C

Cell Constant: Digitally settable 0.015 to 19.99

Reference Temp: 18, 20, 25 $^{\circ}$ C

Temperature Coefficient:	0.00 to 4.00%/°C linear and non-linear temperature coefficient characteristics associated with low conductivity water
Clock:	24 hour, hours/min/sec or day of month, month and year, leap year corrected
Platinising Socket:	Applying 10V a.c. 0.05Hz
Outputs:	Analog output with adjustable resolution RS232 Hi/Lo alarm outputs open collector 0.5A 50V d.c. max.
Datalogger:	100 result memory non-volatile
G.L.P.:	Calibration reminder with an interval of 1-999 hours from last calibration Timed printout with an interval from 1 second to 1 day
Display:	LCD Graphics
Power:	Power supply 9V a.c.
Size:	275(l) x 240(w) x 150(d)mm
Weight:	1.2Kgs

SECTION 2

INSTALLATION

2.1 UNPACKING

Remove the Model 4320 from the packaging and ensure the items within the package are as ordered.

Any shortages or damage should be reported to the Manufacturer or your local Distributor.

NOTE: Power Supply 021 033 is supplied with a moulded European plug. If this is not correct for your local supply it should be cut off and a suitable connector fitted noting the colours of the internal conductors as follows: Brown - Live Blue - Neutral

2.2 INSTALLATION

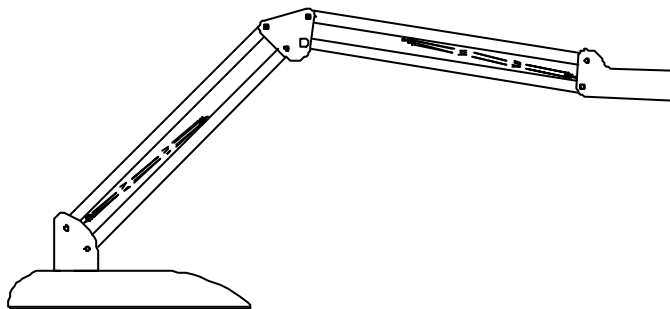
LCD CONTRAST

The LCD contrast can be set at any time. The LCD contrast potentiometer is accessible through the rear panel adjacent to the power socket.

This adjustment should only need to be made on receipt of the instrument. After initial adjustment the instrument will automatically adjust the contrast depending on the temperature of the glass.

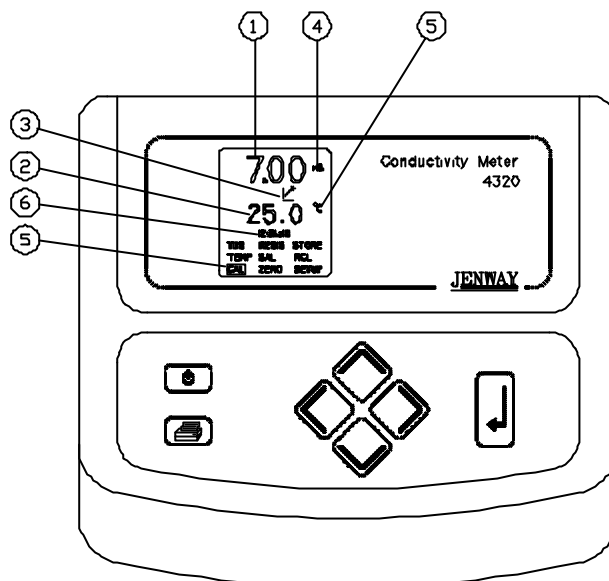
For instruments supplied with the swing arm electrode holder the following assembly instructions should be carried out:

1. Unpack the assembly and ensure the following items are present:
 - a) base block and b) swing arm. Assemble as illustrated. The moulded pivot is a tight push onto the pin.



2. Fit the electrode into the cut-out in the support block. The optional temperature probe, if supplied, should be placed into the small hole in the centre of the block. The cable(s) should be passed through the retaining clip on the holder and connected to the respective socket on the rear panel.

2.3 DISPLAYS



1. Primary display - provides direct readout of conductivity, total dissolved solids (TDS) and resistivity. If the primary reading is overrange this display will indicate “1” with all other digits blanked and the error message **OVERRANGE**.
If the primary reading is underrange this display will indicate “-1” with all other digits blanked and the error message **UNDERRANGE**.

Primary Ranges:

Conductivity 0 to 19.99S
TDS 0 to 2000mg/l
Resistivity 0 to 20Mohms

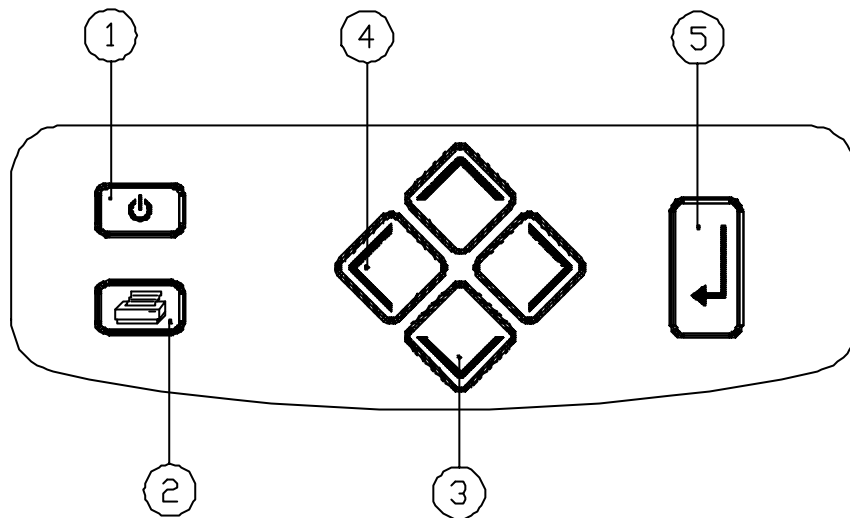
2. Auxiliary display - provides direct readout of temperature in °C or °F and salinity in g/l. If the auxiliary reading is overrange this display will indicate “1” with all other digits blanked. If the auxiliary reading is underrange this display will indicate “-1” with all other digits blanked.

Auxiliary Ranges:

Temp -10 to 105°C / 14 to 220°F
Salinity 0 to 99.9g/l

3. Endpoint Detection symbol - this is displayed once a stable reading is detected and is maintained until the input changes.
4. Primary mode measurement unit which is being used S, mS, μ S, g/l, mg/l or MOhms.
5. Secondary mode measurement unit °C, °F or g/l.
6. Real Time Clock giving continuous display of hours, minutes and seconds or day, month and year. All logged results are automatically time stamped.
7. Menu - used for selection of modes of operation. The selected mode is reverse highlighted. To select, highlight the appropriate mode of operation using the arrow keys, then press ENT.
NOTE: The menu wraps around. To exit to another mode, highlight the required mode using the arrow keys and press the enter key. To escape from a measurement sequence/mode move to the EXIT option and press the enter key. This will return the instrument to the start of the previously selected menu.

2.4 CONTROLS



Switches the instrument on and to standby.



Print key. Provides a printout of the current reading with an incremental sample number. When pressed for the first time after a calibration the print out will give calibration information. The incremental sample number will be reset after a calibration. Prints stored readings when the instrument is in Recall (RCL) mode.



These keys are used to change a parameter.

1. Used when storing a reading to change the stored location index.
2. In recall (RCL) mode these keys are used to change the displayed stored location.
3. The keys are used to move vertically between menu options.
4. In Set-Up mode these keys are used to modify the set up parameters.

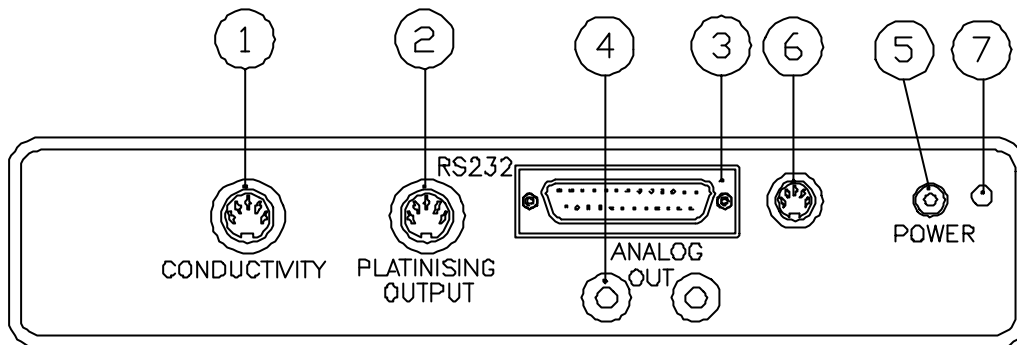


1. These keys are used to move horizontally between menu options.
2. In Set-Up these keys are used to select the part of the parameter required for modification.



The enter key is used to select the displayed menu option. It also places stored values in the selected location(s).

2.5 INPUTS/OUTPUTS



- | | | |
|----|-------------------------|---|
| 1. | 7 PIN DIN SOCKET | Connection socket for the standard cell supplied with the unit. |
| 2. | 7 PIN DIN SOCKET | Platinising socket |
| 3. | OUTPUT SOCKET | 25 way D type socket for RS232 and Alarm connections |
| 4. | ANALOG OUT | 2 x 4mm sockets. Analog output 1mV per digit |
| 5. | POWER IN | 2.1 x 5.5mm socket allowing the power supply to be connected to the unit. |
| 6. | STIRRER | Connection socket for optional stirrer |
| 7. | LCD | LCD contrast potentiometer |

SECTION 3

OPERATION

Connect the power supply appropriate to the supply being used to the instrument via the rear panel power socket. Connect the electrode(s) to the appropriate rear panel sockets. When power is applied to the instrument the screen will show the last mode used prior to switch off. The measurement mode will be indicated by displayed units. To change the mode or exit, move to the required mode by using the arrow keys and then press the enter key.

3.1 MENU OPTIONS

TDS	RESIS	STORE
TEMP	SAL	RCL
CAL	ZERO	SETUP

TDS	Total Dissolved Solids mode
RESIS	Resistivity mode
STORE	Used to store the displayed reading
TEMP	Temperature mode
SAL	Salinity mode
RCL	Recall mode for stored readings
CAL	Conductivity calibration mode
ZERO	Conductivity zero offset
SETUP	Used to set up mode specific parameters, instrument and clock set up and access G.L.P features

3.2 SET UP OPTIONS

3.2.1. SET UP MENU

EXIT	
CELL CONST	0.811
TEMP COEF(%)	1.91
REF TEMP(°C)	25
EC RATIO	0.60
CAL1 (mS)	1.000
CAL2 (mS)	10.000
CAL3 (mS)	100.000
PURE WATER	NO
INSTRUMENT SETUP	

EXIT	menu escape key.
CELL CONSTANT	this is the cell constant applied to the conductivity cell when performing a 1 point calibration.
TEMP COEFF (%)	used to set the temperature coefficient (in units of %/°C) value of the sample under test.
REF TEMP (°C)	used to set the temperature to which the conductivity measurements are referenced to.
EC RATIO	the ratio between Electrical Conductivity (EC) and Total Dissolved Solids (TDS) is a variable dependent upon the electrolyte balance of the solution under test. It is normal for this ratio to be between 0.55 and 0.7. The commonly accepted default value is 0.6.
CAL 1 (mS)	used to set the conductivity value when performing a 1 point calibration.
CAL 2 (mS)	used to set the second conductivity value when performing a 2 point calibration.
CAL 3 (mS)	used to set the third conductivity value when performing a 3 point calibration.
INSTRUMENT SET UP	used to select the next set up menu for instrument parameters.

3.2.2 INSTRUMENT SET UP MENU

```
EXIT
LANGUAGE ENGLISH
TEMPERATURE °C
STIRRER O/P 0%
REC 1mV
G.L.P.
ALARM POINTS
PRINTOUT TIMER
CLOCK SETUP
```

EXIT	menu escape key
LANGUAGE	used to set preferred language option
TEMPERATURE	used for selection of measurement in °F or °C
STIRRER O/P	used to set stirrer speed
REC 1mV	used to set the recorder output sensitivity
G.L.P.	used to select the G.L.P. menu (refer sub menu)
ALARM POINTS	used to select alarm set up menu (refer sub menu)
TIMED PRINTOUT	used to set timed printout (refer sub menu)
CLOCK SET UP	used to select clock set up menu

3.2.3 G.L.P. SUB-MENU

```
EXIT
CAL REMINDER OFF
INTERVAL (HH) 10

LAST CALIBRATED
12:08:24 08/02/96
```

EXIT	menu escape key
CAL REMINDER	setting to ON will prompt re-calibration setting to OFF will suppress the message
INTERVAL (HH)	allows interval to be set between 1 and 999 hours from the last calibration to prompt
LAST CALIBRATED	indicates when the instrument was last calibrated

These products support Good Laboratory Practices (G.L.P.) by displaying a CALBRATION DUE message in measurement modes when the time elapsed from the last calibration exceeds the interval set in the G.L.P. menu. The interval can be set from 1-999 hours from the last calibration by moving the cursor to the INTERVAL (HH) menu option and pressing the enter key and then adjusting the interval with the arrow keys. The CALIBRATION DUE message can be suppressed by setting the CAL REMINDER menu option to OFF. The G.L.P. menu displays the time and date of the last calibration.

3.2.4 ALARM SUB MENU

EXIT
COND HIGH 1.999E+1
COND LOW 0.000E+0
TDS HIGH 1.999E+3
TDS LOW 0.000E+0
RES HIGH (MΩ) 5.0
RES LOW (MΩ) 0.0

EXIT	menu escape key
COND HIGH	if COND reading exceeds this value an alarm warning will appear on the display and the high output alarm will become active
COND LOW	if COND reading exceeds this value an alarm warning will appear on the display and the low output alarm will become active
TDS HIGH	if TDS reading exceeds this value an alarm warning will appear on the display and the high output alarm will become active
TDS LOW	if TDS reading exceeds this value an alarm warning will appear on the display and the low output alarm will become active
RESIS HIGH (M)	if Resistivity reading exceeds this value an alarm warning will appear on the display and the high output alarm will become active
RESIS LOW (M)	if Resistivity reading exceeds this value an alarm warning will appear on the display and the low output alarm will become active

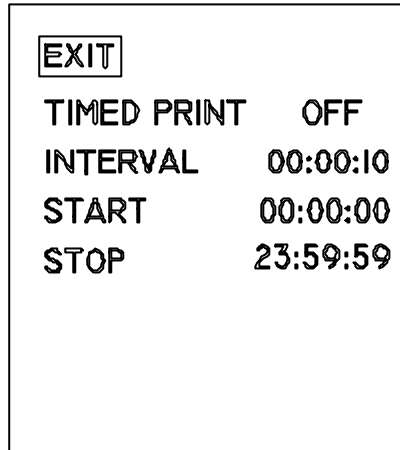
The alarm point menu displays the high and low alarm thresholds for all measurement modes. These can be set by moving the cursor to the required menu alarm point option and pressing the enter key and then adjusting the alarm point with the arrow keys.

If a measured value exceeds the high alarm setting, then a warning message is displayed and the high alarm signal is activated. Similarly, if a measured value falls below a low alarm setting, then a warning message is displayed and the low alarm signal is activated.

When setting the alarm points, the high alarm must be higher than the low alarm point. If this condition is not met, then the instrument will reset the last alarm point adjusted to the upper or lower limit range as required.

Conductivity alarms are displayed in Siemens
TDS alarms are displayed in g/l¹

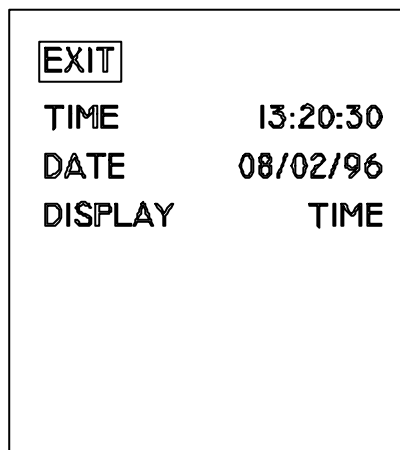
3.2.5 TIMED PRINTOUT SUB MENU



EXIT	menu escape key
TIMED PRINT	turns this function on or off
INTERVAL	can be set for hours, minutes and seconds. A printout will be initiated at that interval
START	start time set
STOP	stop time set

These units can be set to print out displayed readings at a preset interval between any two times each day. This is analogous to pressing the print key at the preset interval, and thus will only print out in a measurement mode. This feature can be disabled by setting the TIMED PRINT menu option OFF. The interval is set in hours:minutes:seconds. The START time sets the time at which the timed print out will begin printing. The STOP time sets the time after which the timed print out will stop printing. It will resume printing on the next day when the time reaches the start time.

3.2.6 CLOCK SET UP MENU



EXIT	menu escape key
TIME	real time clock set up
DATE	date set up
DISPLAY	used to select display of time, date or none

3.3 CONDUCTIVITY MODE

This gives a direct readout of the conductivity of the sample under test. The auto ranging facility will give the optimum display resolution with units of S, mS or μ S.

3.4 TOTAL DISSOLVED SOLIDS MODE

This gives a direct readout of the total dissolved solids (TDS) contained within the sample under test. The auto ranging facility will give the optimum display resolution with units in g/l or mg/l.

3.5 RESISTIVITY MODE

This gives a direct readout of the resistivity of the sample under test to a resolution of 0.01M Ω ms.

3.6 CALIBRATION

The 4320 has three methods of calibration available. The method of calibration used is determined by the level of accuracy required.

PREPARATION OF CONDUCTIVITY STANDARDS

Suitable conductivity standards are available commercially or these can be made up as required from A.R. reagents with reference to the relevant physical tables.

Method for general purpose conductivity standard

- 1) Accurately weigh out 0.746 grammes of dried A.R. grade Potassium Chloride (KCl).
 - 2) Dissolve in 1 litre of good quality deionised water.
- This produces a 0.01N solution with a conductivity of 1413 μ S @ 25°C.

Storage





This solution must be stored in a plastic container and the air space should be kept to an absolute minimum. The shelf life of 1 week can be increased by storing below 4°C, but where any doubt exists about the viability of stored solution a fresh batch should be prepared.


CALIBRATION:



a) WITH KNOWN CELL CONSTANT




This method is the most basic and least accurate.

Enter into the SET UP mode by selecting the SET UP menu option and pressing the  key.


Select the CELL CONST menu option using the  keys. Once highlighted, adjustment of the cell constant proceeds by pressing . The first part of the parameter is highlighted and can be adjusted to the required value using the  keys. If further precision adjustment is required move the highlighted cursor to the next adjustable position using the  key and adjust as required. Continue moving across the parameter until full adjustment








has been made. To confirm set value press  key until the CELL CONST menu option is re-highlighted.




Move to the EXIT option using the   keys and press the  key.




Zero the cell by selecting the ZERO option using the   keys. Hold the cell in free air, once the reading has stabilised i.e. the endpoint symbol has appeared, press the  key. This will cause the primary display to read zero. Should the instrument detect that the offset required to zero the cell is too great ($>2\mu\text{S}$) a CAL OUT OF RANGE error will be displayed for approx. 2 seconds and the instrument will not perform the zero calibration.


b) WITH STANDARD SOLUTION

Prior to entering the calibration routine the standard solution value must be entered. Enter into the SET UP mode by selecting the SET UP menu option and pressing the  key.


Select the CAL1(mS) menu option using the   keys. Once highlighted, adjustment of the standard solution proceeds by pressing . The first part of the parameter is highlighted and can be adjusted to the required value using the   keys. If further precision adjustment is required, move the highlighted cursor to the next adjustable position using the  key and adjust as necessary. Continue moving across the parameter until full adjustment has been made. To confirm set value press .

Move to the EXIT option using the   keys and press the  key.



Zero the cell by selecting the ZERO option using the   keys. Hold the cell in free air, once the reading has stabilised i.e. the endpoint symbol has appeared, press the  key. This will cause the primary display to read zero. Should the instrument detect that the offset required to zero the cell is too great ($>2\mu\text{S}$) a CAL OUT OF RANGE error will be displayed for approx. 2 seconds and the instrument will not perform the zero calibration.

Calibration is performed by moving the cursor to the CAL menu option by using the arrow keys, and then pressing the  key. The screen will then change to show the calibration mode.

Select the CAL menu option using the  key. Immerse the conductivity cell into the prepared standard.


Once the reading has stabilised, i.e. the endpoint symbol has appeared, press the  key. This will cause the primary display to read the value of conductivity contained within the brackets adjacent to the CAL1 menu option. The pointer will then move to the CAL2 position.






Should the instrument detect that the cell constant calculated from the standard solution is outside the limits of 0.015 to 19.99 a CAL OUT OF RANGE error will be displayed for approx. 2 seconds and the instrument will not perform the calibration.


Move to the EXIT option using the  key and press the  key.


c) WITH STANDARD SOLUTIONS



To achieve optimum linearisation of the cell up to a 3 point calibration can be performed.



Prior to entering the calibration routine the standard solution values must be entered. Enter into the SET UP mode by selecting the SET UP menu option and pressing the  key.


To enter the first standard solution value select the CAL1(mS) menu option using the  keys. Once highlighted, adjustment of the standard solution proceeds by pressing . The first part of the parameter is highlighted and can be adjusted to the required value using the  keys. If further precision adjustment is required move the highlighted cursor to the next adjustable position using the  key and adjust as necessary. Continue moving across the parameter until full adjustment has been made. To confirm set value press .



To enter the second standard solution value select the CAL2(mS) menu option using the  keys. Once highlighted, adjustment of the standard solution proceeds as per the first standard solution.



To enter the third standard solution value select the CAL3(mS) menu option using the  keys. Once highlighted, adjustment of the standard solution proceeds as per the first standard solution.


Move to the EXIT option using the  keys and press the  key.

Zero the cell by selecting the ZERO option using the  keys. Hold the cell in free air. Once the reading has stabilised, i.e. the endpoint symbol has appeared, press the  key. This will cause the primary display to read zero. Should the instrument detect that the offset required to zero the cell is too great ($>2\mu\text{S}$) a CAL OUT OF RANGE error will be displayed for approx. 2 seconds and the instrument will not perform the zero calibration.


Calibration is performed by moving the cursor to the CAL menu option by using the arrow keys then pressing  key. The screen will then change to show the calibration mode.

Select the CAL menu option using the  key. Immerse the conductivity cell into the first prepared standard. Allow the reading to stabilise (the endpoint symbol will be displayed) prior to pressing the  key. The display will update to the value next to the CAL2 menu option . The pointer will then move to the CAL 2 position.


If a one point calibration only is required select the EXIT option by using the  key and pressing  .
Rinse the conductivity cell in deionised water.

If a two point calibration is required the conductivity cell should be rinsed and then placed into the second prepared standard. Allow the reading to stabilise (the endpoint symbol will be displayed) prior to pressing  .
The display will then update to the value, set as CAL2. The pointer will then move to the CAL 3 position.


If a two point calibration only is required select the EXIT option by using the  key and pressing  .



If a three point calibration is required the conductivity cell should be rinsed and then placed into the third prepared standard. Allow the reading to stabilise (the endpoint symbol will be displayed) prior to pressing  .
The display will then update to the CAL3 value. The instrument will return to the main display.




At any point during the calibration, should the instrument detect that the linearised slope calculated from the standard solutions is outside the limits of 0.015 to 19.99 a CAL OUT OF RANGE error will be displayed for approx. 2 seconds and the instrument will not perform the calibration.

Calibration mode can be exited at any time by moving to the EXIT option using the arrow keys and pressing  .

3.7 STORING RESULTS

The STORE menu is used to store the displayed readings in any measurement mode. Select the STORE menu by using the arrow keys and pressing . When the STORE key is pressed the display will show the main and auxiliary readings, the previous menu options will be replaced by a new set containing the menu option ABORT NN (NN is the first available free location for the displayed reading).

To store the displayed reading at the current index number the  key should be pressed. If no key is pressed within 5 seconds the reading will be automatically stored in this location. The instrument will then return to the previously selected mode. If the reading is not to be stored, moving to the ABORT option using the arrow keys and pressing  will return the instrument to the previously selected mode without storing the reading.


To store a reading in a specific location use the   keys to select the required location and then press . If no other key is pressed within 5 seconds the reading will be automatically stored in this location. The instrument will then return to the previously selected mode.





NOTE: Automatic storage after 5 seconds is only instigated after the last key press. If a key is pressed and held down the timer is disabled until the key is released. At this stage the 5 second timer is re-initialised.

The non-volatile storage area has the facility to store 100 readings. If however, an attempt is made to store a reading with all locations full, the highlighted message MEMORY FULL will be displayed for approximately 2 seconds, returning the highlighting to the ABORT option. If it is necessary to store the reading the location will have to be selected within the index option using the arrow keys.





NOTE: Storing a reading when the memory is full will overwrite any previous data stored in the selected location.


3.8 RECALLING STORED READINGS


To recall a stored reading select the RCL menu option by using the arrow keys and then pressing . The display will update to the stored reading and the stored index number will be shown at the bottom of the display. If no stored reading is present the display will give the message NO RECORD STORED.


To select a specific stored reading, select the INDEX: option using the arrow keys and press . To select the required location use the   keys. The display will update to the selected reading. To exit the RCL mode select the EXIT option and press . The instrument will return to the previous display.

3.9 CLEARING STORED READINGS


To clear an individual stored reading select the RCL mode using the arrow keys and press . Select INDEX: by using the arrow keys and press . Select the specific location to be deleted using the  keys. Move to the DELETE menu option by using the arrow keys and press . The display will clear and then update to show the message NO RECORD STORED, returning the highlighting to the location number.

Selecting the EXIT option and pressing  will return the instrument to the previous display.



To clear all stored readings select the CLR/ALL menu option using the arrow keys and then pressing . The display will momentarily display the message DELETING... The display will then update to show the message ALL RECORDS DELETED.







Selecting the EXIT option and pressing  will return the instrument to the previous display.

3.10 DOWNLOADING STORED READINGS

To download or print stored readings press the  key from within the RCL mode.

3.11 REAL TIME CLOCK SET UP

Real time clock set up is performed by entering into the INSTRUMENT SET UP mode, selecting CLOCK SET UP using the  keys and pressing the  key.

Select the real time clock parameter to be changed using the  keys, once highlighted, adjustment of the parameter proceeds by pressing . The first part of the parameter is highlighted and can be adjusted to the required value using the  keys. If further adjustment is required move the highlighted cursor to the next adjustable position using the  key and adjust as required. Continue moving across the parameter until full adjustment has been made. To confirm new time or date press  or press  key until the selected parameter is re-highlighted.

3.12 GOOD PRACTICE GUIDELINES

1. The presence of particulate matter in the sample can lead to unstable and non-reproducible results. If necessary filter, or allow the particles to settle prior to immersion.
2. Ensure no air bubbles are trapped in the measuring cell. Gentle agitation of the cell should ensure that bubbles are purged.
3. The entire plate area must be immersed in the solution under test. The slots in the side of the sensor should be below the surface.
4. Whilst the 4-plate construction minimises the effect of fouling it is still advisable to clean the sensor if contamination is evident. This should be approached in a progressive manner, beginning with deionised water and progressing to other solvents or a soft air brush if the deposits persist. The carbon plates can be damaged and should not come into contact with anything which is likely to abrade their surface.
5. The temperature coefficient is very dependent on the solution being measured and its concentration level. The effect of temperature change on conductivity can be very significant, and if the temperature coefficient is not known it is wise to measure all samples at the same temperature.
6. Both the salinity and TDS modes display results which have been calculated from the measurement of conductivity. The salinity mode assumes that the major constituent responsible for the conductivity of the solution is sodium chloride. If significant quantities of other conductive species are present then the displayed results could be inaccurate. Likewise, the TDS mode assumes some knowledge of the electrolyte balance of the analyte. The EC ratio parameter found in the set up routine allows selection of a factor suitable for the solution under test. Most analysers which do not offer this option use a default value of 0.6.

SECTION 4

MAINTENANCE

4.1 GENERAL

The Model 4320 is designed to give optimum performance with minimum maintenance. It is only necessary to keep the external surfaces clean and free from dust. To give added protection when the unit is not in use the unit should be disconnected from the mains supply and covered with the optional dust cover (544 008). For longer term storage or re-shipment it is recommended that the unit be returned to the original packing case. All conductivity cells should be thoroughly rinsed after use and stored in deionised water. Do not attempt to clean the surface of the plates as this could result in damage to the black platinised surface.

4.2 PROBE RE-PLATINISATION

Probe types 027 013 and 027 113 have a black platinum film on the cell plates. Deterioration of this film will be apparent either visually or functionally by causing a low reading to be obtained, particularly on conductive solutions.

Should this occur the following procedure should be carried out:

WARNING - THE CHEMICALS USED IN THIS PROCEDURE ARE CORROSIVE. ALL NORMAL SAFETY PRECAUTIONS SHOULD BE OBSERVED.

Solution

1.5 grammes Chloroplatinic Acid

0.015 grammes Lead Acetate

Deionised Water

The chemicals should be placed in a suitable container and made up to 50ml using the deionised water.

PROCEDURE

- 1) Connect the probe to the rear panel platinising socket.
- 2) Rinse the cell thoroughly in deionised water to ensure it is clean and free from contamination. In extreme cases rinsing in Chromic Acid may be necessary.
- 3) Completely immerse the plates in the platinising solution.
- 4) The probe should be left in the solution for a period of no greater than 10 minutes. At the end of this time the plates should have an even black appearance.
- 5) Carefully remove the cell from the platinising solution and wash in deionised water.
- 6) Completely immerse the plates in a 1M Sulphuric Acid solution and leave for a period of 10 minutes.
- 7) Rinse the probe in deionised water and recalibrate the probe.

SECTION 5

OPTIONAL ACCESSORIES

5.1 OPTIONAL ACCESSORIES

The following list of items are available for use with the Model 4320:

543 001	40 Column Printer
060 287	Printer Paper Roll
060 288	Printer Ribbon
050 002	Jensoft Software 3½" disk
050 001	Jensoft Software 5¼" disk
542 009	Interface Cable Kit

Electrodes

027 013	Conductivity Cell with ATC K=1
027 113	Conductivity Cell with ATC K=0.1
027 114	Conductivity Cell with ATC K=1 (flow through)
027 211	Conductivity Cell with ATC K=0.1 Epoxy
027 212	Conductivity Cell with ATC K=1 Epoxy
027 213	Conductivity Cell with ATC K=10 Epoxy

Calibration Standards

025 138	1413µS Standard (500ml)
025 156	12.88mS Standard (500ml)
025 164	84µS Standard (500ml)
025 139	10µS Standard (500ml)
025 165	1382ppm TDS Standard (500ml)

Power Supplies

021 030	U.K. 230V Power Supply
021 031	European 230V Power Supply
021 032	U.S. 115V Power Supply
021 033	230V leaded Power Supply

Stirrers

555 001	Bench Stirrer
556 001	Overhead Stirrer

SECTION 6

INTERFACING

Analogue

All units are provided with 2 x 4mm sockets, marked as ANALOG OUT, on the rear panel. An analogue output voltage of 1mV per least significant digit is available from these sockets.

The 4320 allows the recorder output sensitivity to be fixed, so that it is independent of the display auto-ranging function.

From INSTRUMENT SETUP mode on the 4320, place the cursor on the REC 1mV menu option and then press the enter key. The arrow keys can then be used to scroll through the various sensitivity options for the recorder output, as shown below:

Instrument Setup from Conductivity Mode

0.001 μ S
0.01 μ S
0.1 μ S
0.001mS
0.01mS
0.1mS
0.001S
0.01S

Instrument Setup from TDS Mode

0.001mg l^{-1}
0.01mg l^{-1}
0.1mg l^{-1}
1mg l^{-1}
0.01g l^{-1}
0.1g l^{-1}
1g l^{-1}

For example, if you set the recorder level (REC 1mV) to 0.001mS, then a displayed reading of 1.245mS will give a recorder output of:

$$\frac{1.245 \times 10^{-3} \times 1\text{mV}}{0.001 \times 10^{-3}} = 1245\text{mV}$$

Similarly, if the reading changes to 10.35 μ S, then the recorder output will give:

$$\frac{10.35 \times 10^{-6} \times 1\text{mV}}{0.001 \times 10^{-3}} = 10\text{mV}$$

RS232

The Bi-directional RS232 interface is available on the rear panel 25 way D type connector.

The connections are as follows:

TXD 2	- INPUT TO 4320
RXD 3	- OUTPUT FROM 4320
RTS 4	- LINKED TO CTS
CTS 5	- LINKED TO RTS
DSR 6	- OUTPUT FROM 4320
DCD 8	- OUTPUT FROM 4320
DTR 20	- INPUT TO 4320 (must be active)
GND 7	

Suggested interconnections are detailed below:

4320		IBM PC XT (25 way "D")
TXD 2	_____	2 TXD (From PC)
RXD 3	_____	3 RXD (To PC)
RTS 4	_____	4 RTS (From PC)
CTS 5	_____	5 CTS (To PC)
DSR 6	_____	6 DSR (To PC)
DCD 8	_____	8 DCD (To PC)
DTR 20	_____	20 DTR (From PC)
GND 7	_____	7 GND

4320		IBM PC XT (9 way "D")
TXD 2	_____	3 TXD (From PC)
RXD 3	_____	2 RXD (To PC)
RTS 4	_____	7 RTS (From PC)
CTS 5	_____	8 CTS (To PC)
DSR 6	_____	6 DSR (To PC)
DCD 8	_____	1 DCD (To PC)
DTR 20	_____	4 DTR (From PC)
GND 7	_____	5 GND

The RS232 communications parameters on the computer or printer need to be set to match those of the Model 4320, as detailed below:

1200 Baud
7 Data Bits
Odd Parity
1 Stop Bit

The Model 4320 supports both hardware (DTR/DSR) flow control and software XON/XOFF flow control.

Pressing the PRINT key outputs from the RS232 interface (as shown in the printout overleaf).

Sending an ASCII "D" to the 4320 causes a printout of the current displayed reading plus sample number.

Sending an ASCII "C" causes a printout of the last calibration parameters (same as printout after performing a calibration).

Sending an ASCII "P" causes downloading of stored readings.

ALARM CONNECTIONS

Open collector alarm outputs capable of linking up to 0.5A are available on the 25 way D connector.

High Alarm	-	pin 12
Low Alarm	-	pin 13

Both outputs will link current to the common line (pin 7) i.e. the emitters of both alarm transistors are connected to pin 7.

NOTE: The open circuit voltage on pin 12 or pin 13 must not exceed 50V d.c. with respect to pin 7.

4320 Sample Printout:

```
=====
4320          16:43:08 14/02/96

OPERATOR          .....
CAL1(mS)         1.41  25.1°C
CAL2(mS)         12.88 25.1°C
CAL3(mS)         200.00 25.1°C
K                 0.875
TEMP COEF(%)     2.00
REF TEMP(°C)     25.0
LAST CALIBRATED   16:42:54 14/02/96
=====
 1 0.201S 25.1°C 16:43:12 14/02/96
 2 12.90mS 25.1°C 16:43:44 14/02/96
 3 6.45g/l 25.1°C 16:43:52 14/02/96
```

EC Declaration of Conformity

JENWAY Model 4320 Conductivity Meter complies with the following European Standards:

EN 50081-1:1992 Electromagnetic compatibility - Generic emission standard

EN 50082-1:1992 Electromagnetic compatibility - Generic immunity standard (Performance criterion B)

EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control and laboratory use

Following the provision of:

EMC Directive - 89/336/EEC and Low Voltage Directive - 73/23/EEC

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