OBSERVATOR
instruments

User Manual
Analite NEP160
Portable Turbidity Meter

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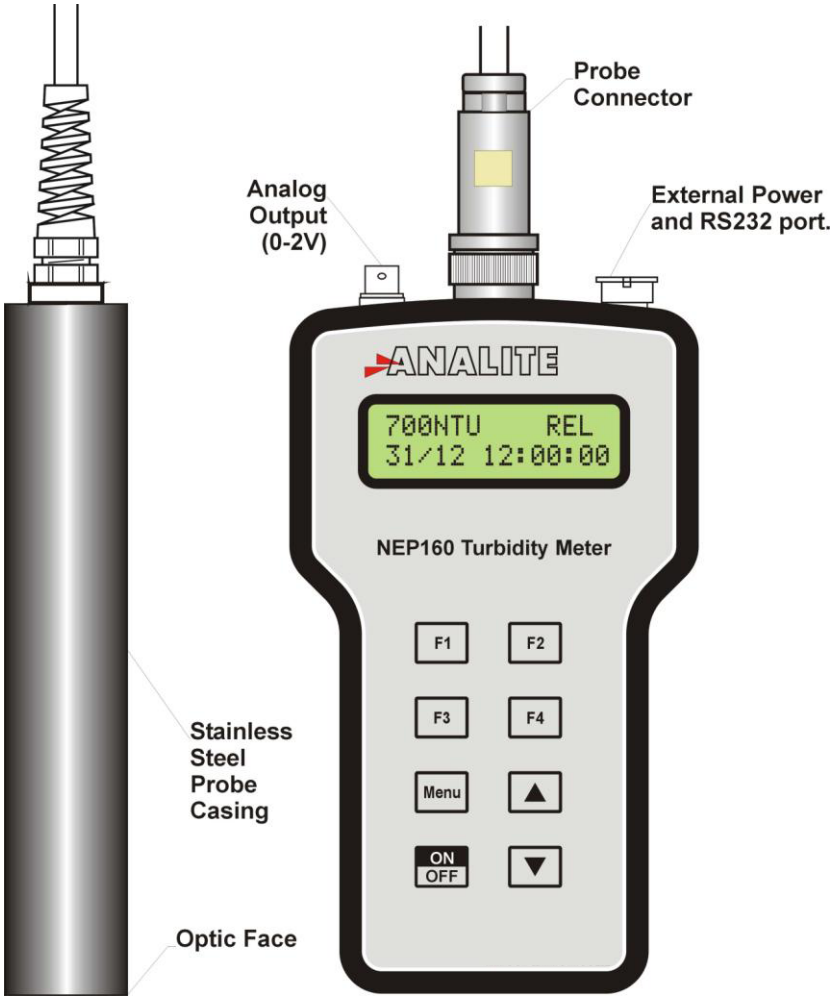
160 SERIES
MICROPROCESSOR BASED TURBIDITY METER

The ANALITE 160 turbidity meter is the latest of our range of turbidity measurement instruments.

It is designed to operate with either an ANALITE retro-scatter (180°) probe or an ANALITE ISO7027 90° probe. The ANALITE 160 turbidity meter allows the user to set up measurement parameters through a user-friendly menu system displayed on the in-built 2 line alphanumeric display.

Measurements can be read directly from the display at any time or downloaded to a computer/printer through the RS232 output at user selectable periodic intervals.

The NEP160 will power up automatically to its last settings whenever external power is applied making it ideal for logging applications when using the analogue output or RS232 port.



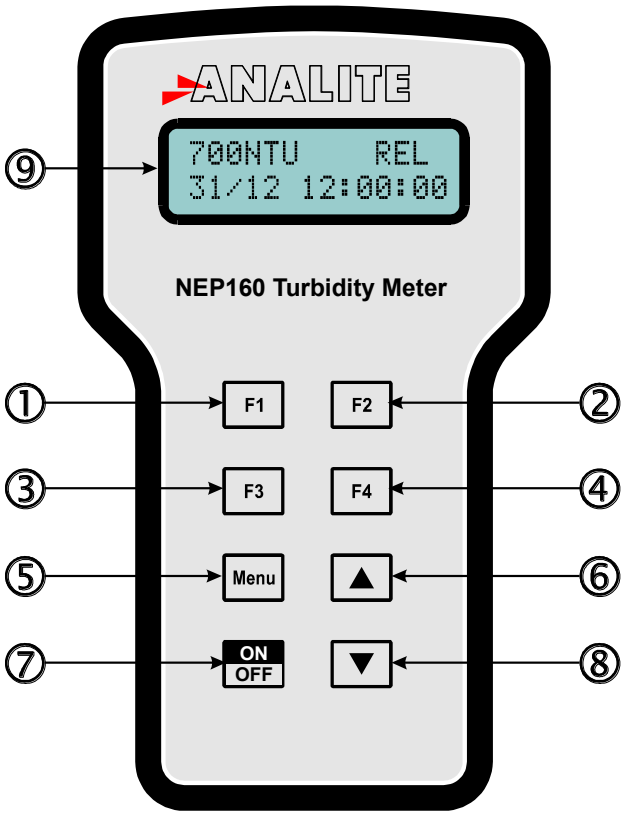
A NEP160 shown complete with ANALITE NEP260 probe.
(part number NEP160-3-05-R)

Specifications

Range:	0 to 30,000NTU (3,000NTU limit on NEP260, 90° probe) (over four ranges automatically determined).
Display:	2 line, 16-character dot matrix alphanumeric liquid crystal display.
Display Language:	English.
Parameters Displayed:	Turbidity (NTU) - default Relative Turbidity Reference (NTU) Relative Turbidity REL (Turbidity - Relative Turbidity Reference) Date/Time - default
Reading:	Updated approximately every 1 second.
Averaging period:	0.5 second or 8 seconds nominal – user selectable.
Auto Range Steps:	1 <0.1 to 20NTU 2 <1 to 200NTU 3 <10 to 2,000NTU 4 <100 to 20,000NTU (using NEP280, 180° probe only)
Resolution	1 0.02NTU 2 0.1NTU 3 1NTU 4 10NTU
Repeatability:	2% ± 1 digit on all ranges.
Data Logging:	User set for one reading every 1 to 90 seconds or minutes. All readings stored in the Notepad.
Notepad:	100 readings each with time and date.
Setup Procedures:	Menu driven, including: – Calibration – Automatic Logging – Analogue Output range selection – Reference Turbidity value – Setting date and time.
Setup Memory:	Non volatile EEPROM.
Clock:	Calendar clock displays date and time.
Good Laboratory Practice:	All readings as well as calibration constants are stored together with the Time and Date and can be recalled at any time.

Analogue Output	0 – 2 volts full scale corresponding to preset measurement range. Output impedance 600 ohms nominal.
Power:	Internal: 6V NiMH rechargeable battery. External: 10 to 16V dc, 400mA max. incl. NiMH Charge current. External power connection is via jack plug male with 2.5mm pin. Centre pin is NEGATIVE polarity.
Power Management:	Automatic power down when operating from batteries after approx. 5 minutes may be selected. Automatic power up when powered externally. Continuous operation of at least 5 hours on a fully charged battery. For normal intermittent operation a full charge may last several days. Low battery indication prior to shut down.
Measurement Outputs:	Inbuilt LCD, analogue output and RS232 port.
RS232 Port :	The RS232 port can output readings on request or at preset intervals of time from 1 to 99 seconds or minutes. The Notepad memory can also be downloaded on request. 4800 baud rate, 8 bits, no parity, 1 stop bit, Xon/Xoff protocol.
Dimensions:	187mm x 110mm x 51mm (display unit).
Weight:	Display Unit 0.5kg. 180° Probe 0.4kg with 5m lead. 90° Probe 0.4kg with 5m lead.
Operating Temperature:	0° to 50°C.
Operating Humidity:	0 to 90% R.H.
Storage Temperature	-10° to 60°C.
Case Rating:	IP65 with all connectors sealed with dust caps (supplied) or probe properly connected and dust caps on remaining two connectors.
Ordering Information:	NEP160R Display unit only. NEP160-1-05R NEP160 with general purpose **NEP280** -180° probe. NEP160-2-05R NEP160 with high temperature **NEP285** -180° probe. NEP160-3-05R NEP160 with **NEP260** – ISO7027, 90° probe. All probes are supplied with 5 meters of cable unless otherwise indicated at time of order.

NEP160 Display and Controls



1. **F1** Press to record readings into memory.
2. **F2** Press to show or hide the date and time.
3. **F3** Press to view logging status or start or stop automatic logging.
4. **F4** Prints current reading to the RS232 port.
5. **Menu** Press to access the user-friendly menu system, which makes using the NEP160 a breeze to operate.
6. ▲ and 8. ▼ These keys are used when calibrating, setting the clock, or setting the automatic logging period and RS232 reading output interval.
7. **ON OFF** Switches the NEP160 ON and OFF.
9. Display. 32-character alphanumeric liquid crystal display with user-friendly menu and prompting system. Displays turbidity and the date/time simultaneously.

Packaging Information

The following are included with every ANALITE **NEP160** purchased:
1. The NEP160R Turbidity Meter Display Unit
2. The NEP160 Operation Manual

Depending on your order, some or all of the following may also be included:
1. Turbidity Probes (see below).
2. RS232 Interface and External Power cable assembly.
3. Battery charger lead for 12V automotive cigarette lighter socket.
4. Turbidity Standards Solutions (10, 40, 100, 400, 1000NTU).
5. AC adapter and battery charger (7PSU-2).
6. NEP16SHRD protective stainless shroud for the NEP260 probe.

Spares readily available include:
1. 6V NiMH Battery Unit.

Three turbidity probes are available that suit the NEP160R Turbidity Meter. They are:

ANALITE NEP280 — General Purpose retro-scatter probe capable of measuring turbidity level from 10 to 30,000NTU. The NEP280 can be submersed to a depth of 30m. Standard cable length is 5 meters unless otherwise indicated at time of order.

ANALITE NEP285 — High temperature retro-scatter probe capable of measuring turbidity level from 10 to 30,000NTU. The stainless steel probe shaft uses glass fibre optics and can sustain temperature of up to 125°C. The NEP285 can be submersed to a depth of 30m. Standard cable length is 5 meters unless otherwise indicated at time of order.

ANALITE NEP260 — High sensitivity 90° probe to ISO7027 capable of measuring turbidity levels from 0 to over 3,000NTU. The NEP260 can be submersed to a depth of 30m. Standard cable length is 5 meters unless otherwise indicated at time of order.

All the above probes have stainless steel housings and are normally supplied with a 5m cable and connector suited to the NEP160. Longer cable lengths can be accommodated but must be specified at time of order.

For more details on these probes contact your local ANALITE distributor or contact Observator Instruments.

Charging the NEP160 Internal Battery

1. Remove the dust cover on the External Power and RS232 Port connector on the NEP160R display unit.
2. Connect the multi-pin connector of the RS232 Interface and External Power cable assembly to the External Power and RS232 Port connector on the NEP160R display unit.
3. Connect the AC adapter output cable to the mating connector on the RS232 Interface and External Power cable assembly.
4. Plug the mains cable into the PSU-2 power supply and connect to the local mains supply. Charging should commence immediately but it may take a few seconds for this to be indicated on the NEP160R display.

Normal Operation

In Normal Mode pressing the Functions keys perform the following tasks:

F1 — Press to record the current data plus date and time into the notepad.

F2 — Press to show or hide the date and time on the display.

F3 — Press to view logging status or start and stop automatic logging.

F4 — Transmits (prints) the current reading to the RS232 port.

Probes

The probes designed to operate with the NEP160 display units are "smart probes" in that they each carry their own "signature", that is, calibration and characterization data. Consequently, probes can be connected to any NEP160 and the display unit is immediately informed of the necessary calibration constants for proper operation. This allows the operator to use more than one probe with the same display unit. Further, Observator Instruments can periodically calibrate the probes without the need to return the NEP160 display unit.

On power up the NEP160 will interrogate the probe socket to determine if a probe is connected and its parameters. If a probe is not connected the display will show:

```
SEEKING PROBE
```

After successful interrogation of a probe the display will show for a short period:

```
PROBE S/N xxxxx
```

Where xxxxx is the probe's serial number. This proves successful communication with the probe. Probes may be changed over at any time. Immediately another probe is connected the display will indicate the serial number of the probe to show proper communication has taken place and the NEP160 has the necessary probe information for accurate readings.

The NEP160 has two operating modes: absolute turbidity and relative turbidity. The default mode is absolute turbidity

Absolute turbidity displays the actual solution turbidity in NTU, whereas relative turbidity indicates the relative difference of the measured solution against some preset reference solution or NTU reference.

Normally the NEP160 will show the absolute value. This is evident on the top line of the display in that it is simply shown as NTU.

E.g. `700NTU`

When in the Relative Turbidity mode the measured value is followed by the REL icon,

E.g. `700NTU  REL`

Pressing F2 when in the Relative Turbidity mode will sequence the second line of the display to show:
- a blank line,
- the time and date, or
- the current Reference NTU value.

Normal day to day operation of the NEP160 is as simple as turning it on and start measuring. When a measurement is satisfactory press F1 to place the reading into memory for later retrieval. The time and date may be toggled on and off by merely pressing the F2 key.

The NEP160 uses Good Laboratory Practices (GLP) by recording each measurement into memory with the time and date. Calibration constants are also tagged with the time and date of last alteration.

The following sections describe how to set up the NEP160 through its user-friendly menu structure. Once set up the NEP160 offers an ease of measurement not known before in such a powerful portable turbidity instrument.

Battery Care and Maintenance

The ANALITE NEP160 is fitted with a NiMH battery that is charged using the in-built controller to maximise life and operating time between charges.

When shipped the battery will be in a discharged state and will require at least 12 hours charging before use. Thereafter a full charge will be achieved in less than 5 hours of charging.

If the instrument is to be stored for a long period of time (say more than 4 weeks), then it is best to fully charge the battery before storage and then recharge again for 12 hours prior to use. A few charge cycles may be required after extended periods of storage to properly reform the cells.

As shipped, the NEP160 is configured to shutdown after approximately 5 minutes when operating from internal battery power.

RS232 Port

The NEP160R is supplied with an integrated RS232 port. The External Power and RS232 Port connector on the NEP160R is a shared connector. To connect the NEP160R to a PC COM port you will need to connect the multi-pin circular connector of the RS232 Interface and External Power cable assembly supplied to the NEP160R and the DB9 connector on the cable assembly to a PC COM port (DB9 connector). The external power connector on the cable assembly may be connected to the AC adaptor (7PSU-2) to charge the internal NEP160R batteries.

More recent PCs may not have COM ports in which case a RS232/USB converter (not supplied) will be required to connect to the PC via a USB port.

Communication and data transfer between the NEP160R and the PC is done using communication software such as Windows® HyperTerminal.

Sending readings to the RS232 Port

Press **F4** when in normal display mode to send current reading to the RS232 port.

Readings can be sent directly to the RS232 port rather than stored in the Notepad memory during automatic logging (see section F4.4).

RS232 Protocol

The NEP160 RS232 protocol is 8 bits, no parity, 1 stop bit, Xon/Xoff at fixed 4,800baud.

RS232 Port Commands

The following commands can be sent to the NEP160 RS232 port.

<cr> denotes a carriage return and <lf> a line feed.

Action	Command	Notes
Request current reading	?D<cr>	Returns the current turbidity reading, mode, date and time. The log number returns is set to zero. Data format A.
Request logged readings	?R<cr>	Returns all logged records from the Notepad. The data ends with the message **ENDS**<cr>. Data format B.
Erase logged readings.	?E<cr>	Erases all logged readings from the NEP160 Notepad memory. Returns the message **ERASED**<cr> to confirm that all records have been erased.
Request status information	?S<cr>	Returns the model name, the Reference NTU value and number of logged readings in the Notepad. Data format D.
Request instrument information	?W<cr>	Returns the firmware version in the NEP160 followed by the display and probe (if attached) serial numbers. Data format E.

RS232 Port Data Format

Format	Structure	Notes
A	dd/mm/yy_hh.mm.ss_LLL_DDDDDD_NTU_MMM<cr><lf>	?D<cr>
B	dd/mm/yy_hh.mm.ss_LLL_DDDDDD_NTU_MMM<cr><lf> ENDS<cr>	?R<cr>
C	dd/mm/yy_hh.mm.ss_LLL_DDDDDD_NTU_MMM<cr><lf>	Automatic logging to RS232 (see section F4.4)
D	NEP160___999_RRRRRR<cr><lf>	999 number of logged readings right justified.
E	NEP160_Vx.x_D#####_P#####<cr><lf>	D = display serial no. P = probe serial no.

Where:

_	represents a space
LLL	is the log number, maximum 3 characters, right justified. LLL is always 000 when requesting the current reading using the ?D command.
DDDDDD	is the turbidity data, 6 characters including sign and decimal place, right justified.
RRRRRR	is the Reference NTU value, 6 characters including sign (always positive) and decimal place, right justified
NTU	is the text NTU to indicate the unit of measurement.
MMM	is the measurement mode: ABS for absolute data or REL for relative data.
dd/mm/yy	is the date/month/year each two digits. Where the date format is mm/dd/yy (see section F4.2) the format would be mm/dd/yy.
hh:mm:ss	is the time in hours:minutes:seconds format based on a 24 hours clock.
999	represents the total number of logged readings in the Notepad.
x.x	is the software version number, 3 characters with the middle being a period.
#####	represents a serial number, 5 characters, right justified.

ANALink 2 PC Software

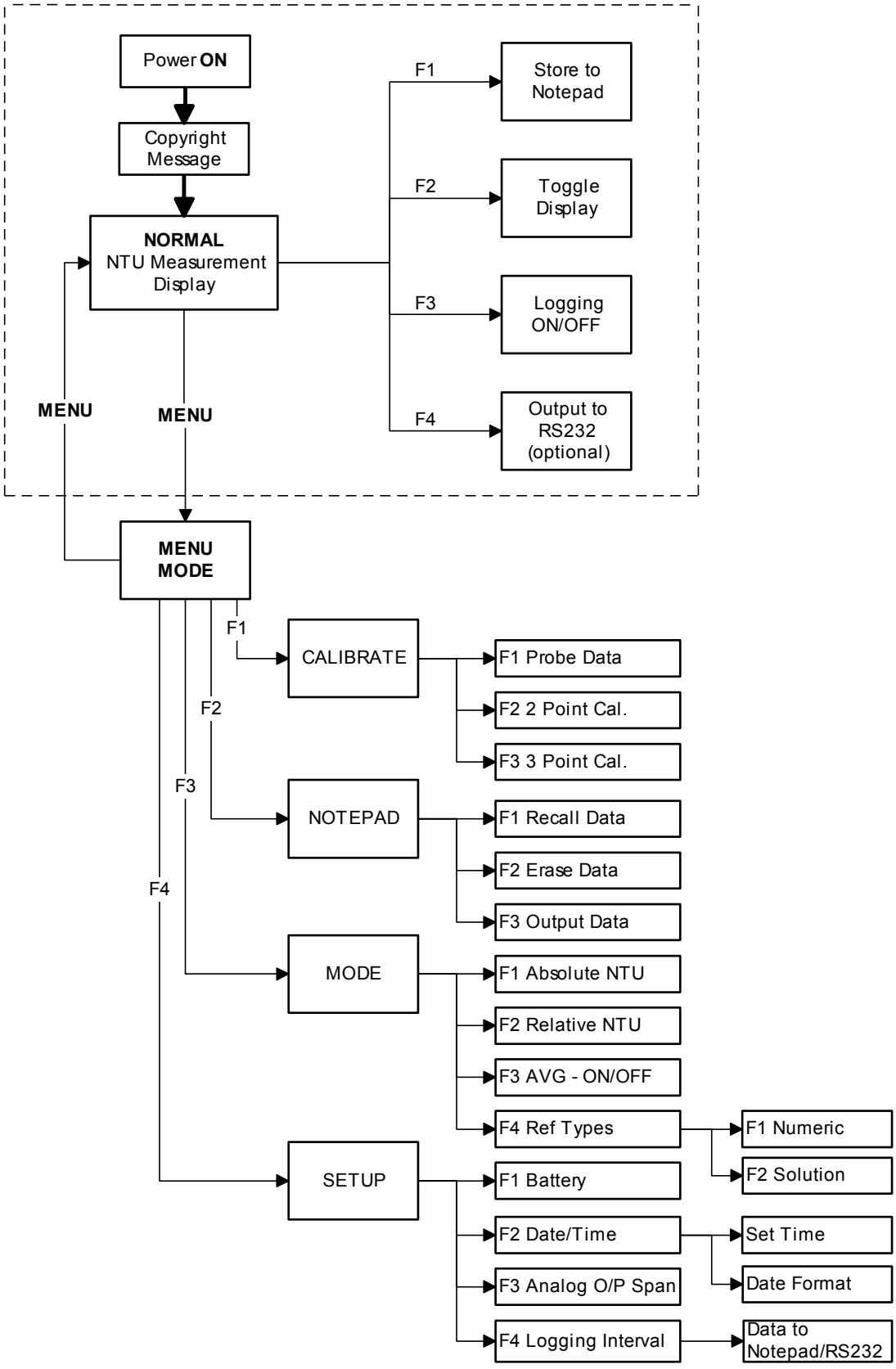
A simple MS Windows based program called ANALink 2 is available from Observator Instruments. ANALink 2 allows simple interfacing between an ANALITE NEP160 and a PC operating Windows 95/98/NT/2000/XP/7. The program is approximately 2.5Mbytes in size.

ANALink 2 allows all commands to be sent to the NEP160 with the results shown on the PC display as well as immediate and logged turbidity readings

No claims or warranty is offered on the ANALink 2 program and is made available only on an "as-is" basis. Observator Instruments claims copyright on the ANALink 2 PC software.

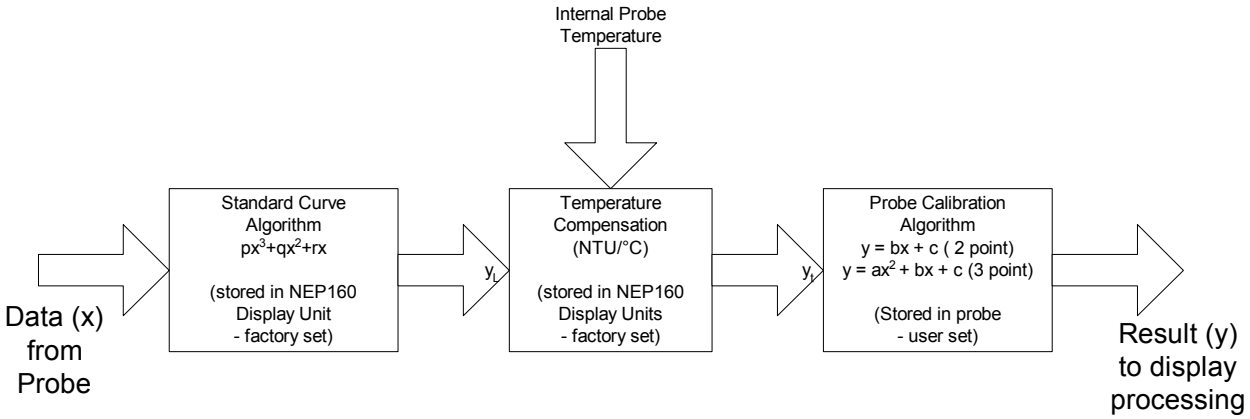
NEP160 Menu Structure

A quick reference of the NEP160 operation structure is shown below. Pressing the Menu key evokes the menu structure. Each of the Menu Functions is described in detail elsewhere.



F1 Calibration

The probe connected to the NEP160 display unit will determine how the information collected is displayed. But in every case the mathematical treatment is the same as shown schematically below:



Three standard curve algorithms are stored in the NEP160:

1. NEP260 - 90° probe (3,000NTU max)
2. NEP280 - 180° probe (30,000NTU max)
3. NEP900 - Custom probe (custom software)

The probe attached to the NEP160 can be calibrated at any time using a two point or three point technique. When calibration is complete the time and date of the calibration will also be recorded against the calibration constants.

Probe information including the current calibration constants can be reviewed at anytime.

Calibration Practices

Because a turbidity probe is inherently an optical device, care must be taken during calibration to ensure that external effects are kept to a minimum. This is best implemented by placing calibration solutions in dark, leakproof bottles with a non-reflective finish such as Nalgene® 2106 bottles in amber. These are available with wide necks and a nominal capacity of 1,000ml.

Another important factor is cleanliness. Any debris or water that makes its way into the calibration solutions will affect its value and adversely affect the proper calibration of an instrument. It is therefore a good practice to have an ample supply of distilled de-ionized water and a means of properly drying the probe end (clean compressed air is ideal). Probes should be flushed in two containers of distilled water with thorough drying in between and before insertion into a calibration solution. Also calibration should commence at a lower value (usually zero) and work up in value to further minimize the effects of cross contamination.

Analite turbidity probes are best calibrated using AMCO Clear solutions, as they are stable and safe. Other solutions may be used such as formazin but these are normally not as stable and should be treated with caution as they may contain carcinogens.

When inserting the ANALITE probe into the calibration solution ensure that the optic face of the probe is at least 50mm from the base and all sides of the bottle. This is particularly important for low turbidity solutions below 200NTU. Hold the probe a few degrees from the vertical and gently tap it on the bottle rim so as to dislodge any air bubble on the optic face. If the probe is properly placed the value indicated will not vary if the probe is gently moved a few millimeters in any direction.

F1.1 Reviewing Probe Information

1 Select the Setup menu by pressing **Menu** and then **F1**.`Cal`

2 Select **F1** `Probe`
The display should now look something like this:
`Type NEP260`
`S/N 76340  F2:>`

3 Press **F2** to see the date and time of the last probe calibration.
`24/02/99  13.38`
`FACTORY  F2:>`
The display will indicate "**FACTORY**" if the last calibration was a factory calibration during manufacture or "**USER**" if the last calibration was done after the factory calibration.

4 Press **F2** to see the last user calibration date and time.
`24/02/99  13.38`
`FACTORY  F2:>`

5 Press **F2** select which calibration constants will be used.
`Use user  cal`
▲▼`:set  F2:>`
Use ▲▼ to toggle from factory calibration constants to user calibration constants

7 Press **F2** to quit and implement selected calibration constants and return to normal operation

F1.2 Calibration - 2 point

A two-point calibration is normally all that is needed when the anticipated results are centred about a common value (e.g. 80NTU). Under these circumstances it is best to calibrate the second point near or just above the anticipated readings. In the above example 100NTU would be a good second calibration point.

1 Connect the desired Probe to the ANALITE NEP160 Turbidity Meter

2 Press the **ON** button to power the ANALITE NEP160 ON.

3 Select the Setup menu by pressing **Menu** and then press **F1**.`Cal`

4 Select **F2** `2pnt`
Place the Probe into a 0NTU solution reference solution. Ensure proper calibration procedures are met.
The display should now look like this:
`x.xxNTU  pnt 1/2.` (where x.xx is a low number).
Wait until the reading settles and stabilizes.
"Grab" the zero by pressing the **F2** button, `F2:grab`
Comment: The NEP160 assumes that the first point of any calibration is always ZERO NTU

5 The display should now look like this:
`0.00NTU  pnt 1/2`
Press **F2** to accept the new zero value, store it and move to the second calibration point.
`(F2:OK).`
Comment: When the F2 button is pressed it is normal for the display to return to the original reading and not zero NTU.

6 Remove the probe from the 0NTU standard reference solution and dry off the probe.
Place the probe into a known turbidity standard solution (eg. 100NTU)
The display will now look like this:
`xxx.xNTU  pnt2/2` (where xxx.x is a value near to 100).
Wait until the reading settles and stabilizes, then grab the stabilized value by pressing the **F2** button.
`(F2:grab)`

7 The display will now look like this: `xxx.xNTU  pnt2/2`

8 Use the ▲ ▼ buttons to adjust the displayed reading to match the value of the turbidity standard solution e.g. 100.

9 Press **F2** to select the selected calibration constant, quit and return to normal operation.
Comment: When F2 is pressed the display will return to the calibrated NTU reading, e.g. 100±0.5NTU typically.

10 Remove the Probe from the second reference solution, wash in de-ionized water and dry.

11 This completes a two-point calibration process.

F1.3 Calibration - 3 point

A three-point calibration is recommended when operating the ANALITE NEP160 over a wide range (say 0 to 10,000NTU) or where exceptional linearity is demanded over a nominal range (say 0 to 100NTU). For purposes of example only, we are using 50NTU and 100NTU as the calibration reference solutions when explaining the three-point calibration procedure below. Normal practice would be to select a second point value at the anticipated values of measurement and the third point of calibration being the highest measurement value anticipated (or a little higher).

1 Connect the desired Probe to the ANALITE NEP160 Turbidity Meter

2 Press the **ON** button to power the ANALITE NEP160 ON.

3 Select the Setup menu by pressing **Menu** and then **F1**.`Cal`

4 Select **F3** to select the 3 point calibration **`.(F3:3pnt)`**

5 Place the Probe into the 0NTU standard reference solution.
The display should now look like this:
`x.xxNTU pnt1/3` (where x.xx is a low number)
Wait until the reading settles, then "grab" the zero reference by pressing **F2**
`(F2:grab)`
Comment: The NEP160 assumes that the first point of calibration is always ZERO NTU.

6 The display should now look like this:
`0.00NTU pnt1/3`
Press the **F2** button to accept and store the zero value and move to the second calibration point
`(F2:OK)`
Comment: When the F2 button is pressed it is normal for the display to return to the original reading, i.e. not zero.

7 Remove the Probe from the 0NTU solution and dry the Probe.

8 Place the probe into a known turbidity standard solution (e.g. 50NTU)
The display will now look like this:
`xx.xNTU pnt2/3` where xx.x is normally a value near to 50.
Wait until the reading settles, then "grab" the stabilized value by pressing **F2**
`(F2:grab)`

9 The display will now look like this:
`xx.xNTU pnt2/3`

10 Use the ▲ ▼ buttons to adjust the displayed reading to match the solution value reading e.g. 50.

11 With the display adjusted press **F2** to accept and store the reading and move to the third calibration point.
Comment: When F2 is pressed the display will return to the original NTU reading.

12 Remove the Probe from the 50NTU solution, wash in de-ionized water and dry.

13 Place the probe into a known turbidity standard solution (e.g. 100NTU)
The display will now look like this:
`xx.xNTU pnt3/3` where xx.x is normally a value near to the value of the turbidity standard solution e.g.100.
Wait until the reading settles, then "grab" the stabilized value by pressing **F2**
`(F2:grab)`

14 The display will now look like this:
`xx.xNTU pnt3/3`

15 Use the ▲ ▼ buttons to adjust the displayed reading to match the solution value reading e.g. 100.

16 With the display adjusted press **F2** to accept and store the reading and exit calibration.
Comment: When F2 is pressed the display will return to the calibrated NTU reading e.g. typically 100±1NTU.

17 Remove the Probe from the 100NTU solution, wash in de-ionized water and dry.

18 This completes a three-point calibration.

Notes on Calibration

The NEP160 measures turbidity in NTU. Other units often used are FTU, JTU (Jackson Turbidity Unit) and mg/L (suspended solids). The conversion table below shows the relationship between these units.

	NTU	**FTU**	**JTU**	**mg/L (SiO_2)**
NTU	1	1	0.053	0.13
FTU	1	1	0.053	0.13
JTU	19	19	1	2.5
mg/L (SiO_2)	7.5	7.5	0.4	1

F2 Notepad Function

F2.1 Recording Readings into the Notepad.

To record readings into the Notepad memory:

1 Press F1 in normal display mode. The display should change to show typically:

```
700NTU      #005
F1:Yes    F2:No
```

The top line of the display indicates the reading 700NTU and the following characters #005 indicates the record number of the reading. On the bottom line, the F1: indicates wish to continue, and the F2 : to quit recording

2 If you press F1 again, the turbidity reading, time and date will be recorded into the Notepad and labeled as record number 5.

If you press F2, the recording of the reading will be aborted with a return to NORMAL operation.

3 Repeat steps 1 and 2 as often as required. The maximum number of readings that can be stored is 100.

F2.2 Recalling Records from the Notepad.

To recall records from the Notepad memory.

1 Select the Notepad menu by pressing Menu and then F2.

2 Select Recall F1 from the menu.

3 Record number 1 is now displayed, typically:

```
700NTU
#001   F2:more
```

4 Press F2 to toggle display between time and date or the data for this record.

5 Press ▲ and ▼ to move forward or back through the records. Press and hold ▲ and ▼ to scroll rapidly through the records.

F2.3 Erasing Records from the Notepad

To erase all records from the Notepad memory.

1 Select the Notepad menu by pressing Menu and then F2.

2 Select Erase F2 from the menu.

3 The NEP160 now asks if you are sure you wish to erase **all** the records.

```
Erase, You Sure?
F1:Yes     F2:No
```

4 Press F1 to erase **all** records from the Notepad or F2 to quit without erasing records.

F2.4 Printing Records from the Notepad to the RS232 Port

This function is only available when the RS232 port is fitted.

1 Connect the plug of the RS232 cable into the Charger/RS232 socket of the NEP160. The charger or optional car battery lead can be connected into the socket of the RS232 cable if required.

2 Connect the DB9 socket on the RS232 cable to an RS232 printer, or to COM1 or COM2 of a PC.

3 Ensure that the baud rate setting of the printer or PC is the same as that set for the NEP160 (4,800baud). The NEP160 uses Xon/Xoff protocol, so ensure the printer or PC is set accordingly.

4 Select the Notepad menu by pressing Menu then F2.

5 Select F3 `Print` from the menu. The word `Printing` is displayed until the transfer to the printer or PC is completed.

F3 Mode

F3.1 To set Absolute Turbidity measurement mode.

1 Select the Mode menu by pressing **Menu** and then **F3**.

2 Select **F1** **Abs NTU**

3 Display will revert to normal, and all measurement will be in absolute NTU. This is confirmed by ensuring the displayed measurements are **not** followed by the characters **REL**

F3.2 To set Relative Turbidity measurement mode

1 Select the Mode menu by pressing **Menu** and then **F3**.

2 Select **F2** **Rel NTU**

3 Display will revert to normal, and all measurement will be in relative NTU. This is confirmed by ensuring the displayed measurements are followed by the characters **REL**

F3.3 To set up the Reference NTU value.

The reference NTU value is the reference point from which all Relative Turbidity measurements are made. If for example the reference is set up as 100NTU, then the display will show - **10NTU REL** in a 90NTU solution and **+10NTU REL** in a 110NTU solution. The default value is 0NTU when supplied from the factory.

The Reference NTU value can be read at any time during measurement in the relative mode by pressing **F2**.

1 Select the Mode menu by pressing **Menu** and then **F3**.

2 Select F4 **SET Ref** If you know the NTU value you want set as a reference select **F1** **Number** or **F2** **Soln Ref** if you wish to use an actual solution as a reference.

3 If **F1** **Number** is selected. Select the digit to be set using **F1** or **F2**, change the digit value by pressing ▲ and ▼. Press and hold ▲ and ▼ to scroll rapidly to the desired value. Continue the above steps with each digit until the desired Reference NTU value is displayed. Pressing **F2** after all digits have been set, will scroll the cursor to the right and exit. This will store the reading as the Reference NTU value.

If **F2** is selected, place the probe into the solution and allow the reading to stabilize. Pressing **F4** will store the reading as the Reference NTU value. To cancel the operation, press **Menu** , the NEP160 will quit and revert to normal display mode

4 The NEP160 will revert to normal display mode.

F4 Setup

F4.1 Battery Saver

The NEP160 is equipped with a battery saver function. When operating under battery power and if no button has been for approximately five minutes, the unit will beep and the display will flash for 20 seconds, thereafter it will shut off. This function can be disabled for continuous use under battery power.

To enable or disable the battery saver function:

1 When in normal display mode select Setup by pressing **Menu** and then **F4** `Setup`

2 Select **F1** `Batt`

3 The display now indicates battery and battery saver status, typically:

```
Batt Saver ON ▲▼
!!!!!   F1:OK
```

The ON indicates the current battery saver selection. The bar graph indicates the approximate level of charge remaining in the battery.

4 Press ▲▼ to toggle the battery saver function.

5 Press **F1** to quit the battery saver function in the mode indicated.

6 The battery bar graph will flash when the battery voltage falls below 5.5V. At 5.0V the NEP160 will automatically shut itself down.

Comments on battery care.

The battery in the NEP160 is a 5-cell NiMH unit. When you first receive the NEP160 or after an extended period of storage the instrument it should be charged for at least 12 hours to allow proper forming and charging of the cells.

The state of battery charge is best read with the AC adapter disconnected. After disconnecting the AC adapter and with the NEP160 switched on, press **Menu**, then **F4** (setup) and then **F1** (Battery). The battery charge status will be shown.

From time to time it is desirable to cycle the battery from complete discharge to charge to ensure it maintains its energy capacity. This is implemented by firstly turning OFF the Battery Saver feature and then leaving the instrument on until the battery is discharged. Recharge the instrument. After long periods of inactivity this procedure may need to be done two or three times to re-establish the battery's energy capacity. The battery life is nominally 2 – 3 years with regular use.

F4.2 Clock

Selecting the Date Format

The NEP160 allows the date to be expressed in either dd/mm/yy or mm/dd/yy format.

1 When in normal display mode select Setup by pressing **Menu** and then **F4** `Setup`

2 Select **F2** `Clock`

3 The display now shows the current date and time. Typically:

```
dd/mm/yy    hh:mm
^v:Set  F1<  F2>
```

4 If the date format is not as required press format the ▲ and ▼ keys to toggle the format. The date format should be seen to change accordingly.

5 Press **Menu** to exit with displayed format and return to the normal display mode,

Or **F2** If setting of the clock is required

Setting the Clock

1 When in normal display mode select Setup by pressing **Menu** ,
then **F4** `Setup,` and then **F2** `Clock`

2 Select **F2** from the Date format display

3 The display now shows the current date and time. Typically:

```
31/12/97    12:00
^ v :Set   F1<   F2>
```

The cursor starts under the day.

4 Press the ▲ and ▼ keys until the day is correct.

5 Press **F2** to move to the month. Press the ▲ and ▼ keys until the month is correct.

6 Press **F2** to move to the year. Press the ▲ and ▼ keys until the year is correct.

7 Press **F2** to move to the hour. Press the ▲ and ▼ keys until the hour is correct.

8 Press **F2** to move to the minutes. Press the ▲ and ▼ keys until the minutes are correct.

9 Check that the date and time are correct. Press **F2** to save the settings. If changes are required, press the **F1** key to move left to the desired position.

10 Press **Menu** to return to the normal display mode.

Displaying or Hiding the Clock

The date and time are normally displayed along with the turbidity readings. Press **F2** in normal display mode to alternatively display or hide the clock display. When in Relative Turbidity mode, pressing the **F2** key will include in the sequence the current Reference NTU value.

F4.3 Setting the Analogue Output range

The analogue output has a full-scale output of 2.0V corresponding to the range selected. The available ranges are 20NTU, 200NTU, 2,000NTU and 20,000NTU.

1 Select the Setup menu by pressing **Menu** and then **F4** `Setup`

2 Select **F3** `Analog` and the current full scale value will be displayed.

3 Press the ▲ and ▼ keys until the desired full scale range is displayed (20, 200, 2,000 or 20,000NTU)

4 Press **F2** to accept the desired range and return to the normal display.

F4.4 Automatic Data Logging

The NEP160 can automatically log records into the Notepad. A maximum of 100 records can be logged into the Notepad. To set up for automatic logging, the logging period must first be programmed. Automatic logging can then be started and stopped as required.

1. Select the Setup menu by pressing **Menu** and then **F4** `Setup`
2. Select **F4** `LOG`
   The display should now look like this if the period is currently zero:
   `5 Min  F2:unit`
   `^ v :Set  F1:OK`
3. Set the logging period time by pressing ▲ and ▼ to obtain the desired number. Press **F2** to set the selected logging period in seconds or minutes. For example, if the period was set to 5, then pressing **F2** will toggle the logging period from 5 seconds to the logging period of 5 minutes. Press **F1** if the unit is OK. The log period will be saved and the next setup window will be displayed.
4. The display will ask if the logged records are to be stored in the Notepad or sent directly to the serial RS232 port. Press **F1** when selection is OK
5. The NEP160 will revert to normal display mode. The automatic logging function is now programmed and can be started and stopped as required.
6. To start logging press **F3** in normal display mode. When logging to the Notepad the NEP160 display will typically look like:
   `Logging  5m #019`
   `F4:stop  F3:OK`
   The log number will increment with each logged reading and the NEP160 will beep each time a reading is recorded. A maximum of 100 records can be stored in the Notepad. When the Notepad is full logging will automatically stop.

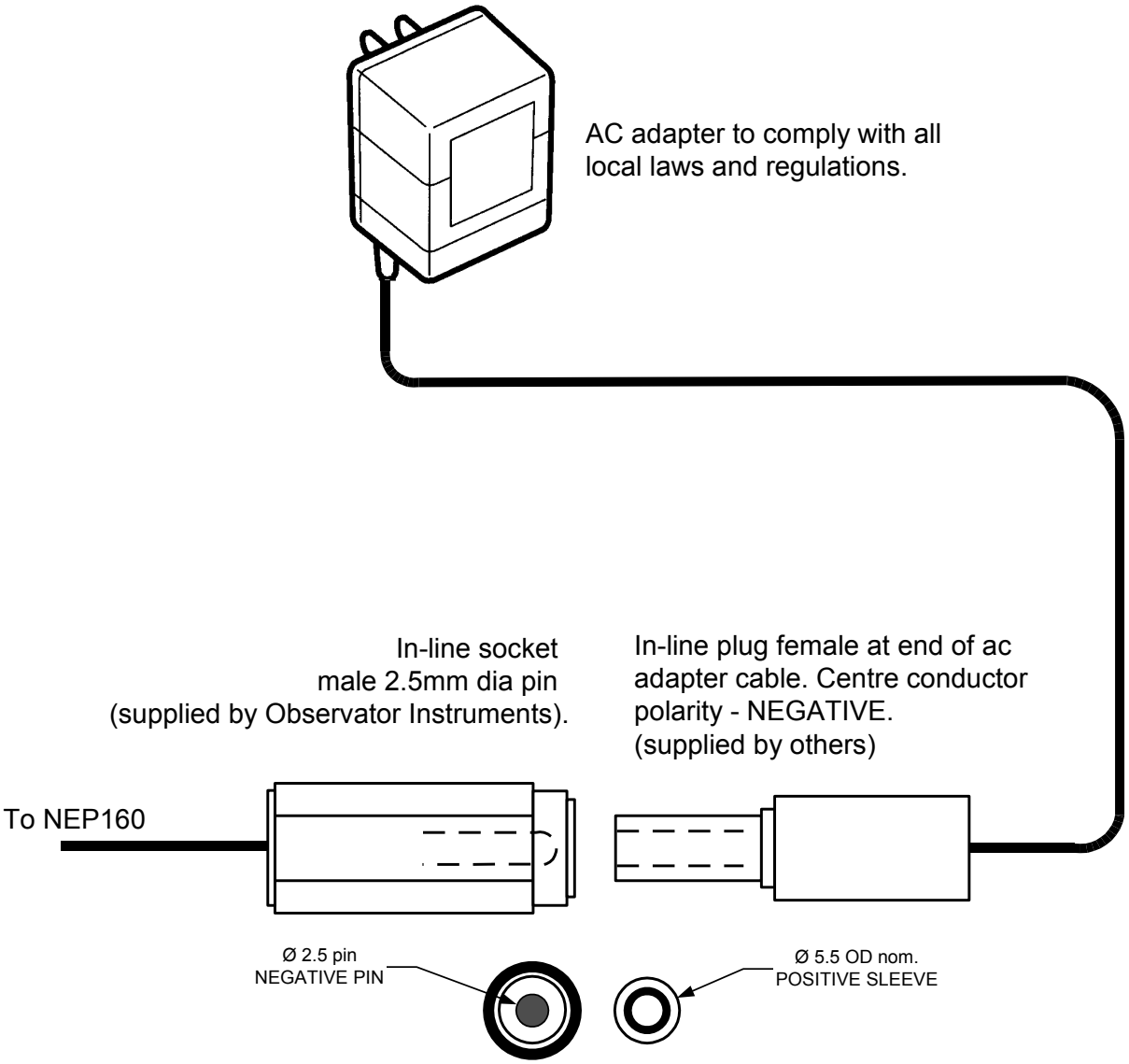
   When logging to the RS232 port the display will typically look like:
   `Sending`
   `#019  12:00:00`
   The NEP160 will beep each time a record is sent to the RS232 port. There is no limit to the number of records that can be sent to the RS232 port.
7. Press **F3** again to stop automatic logging at anytime.
8. **NOTE**: The clock must be set before the NEP160 will allow automatic logging to start. The message `Clock Not Set` is displayed if the clock is not set.

ANALITE NEP160
AC ADAPTER (CHARGER) REQUIREMENTS

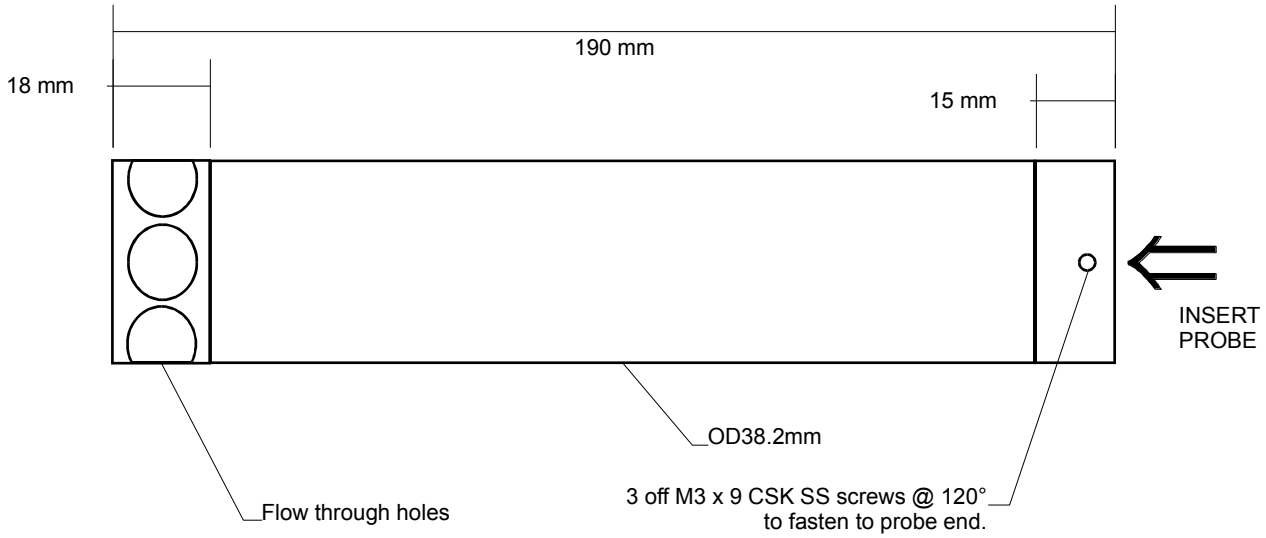
Specifications:

The AC adapter shall have the following specifications to ensure proper operation of the ANALITE NEP160 whenever it is powered by the AC adapter. Operation also includes the charging of the internal 6V NiMH battery assembly.

Output Voltage:	10Vdc (min) to 16Vdc (max) over output current range.
Output Current:	Not less than 400mA capacity. Output voltage must remain between 10Vdc and 16Vdc over current range 0 to 400mA.
Connection:	In-line plug female for 2.5mm centre pin (see drawing below).



OPTIONAL ANALITE PROTECTIVE SHROUD - NEP16SHRD
for ANALITE NEP260 probes.



FITTING

Insert the NEP260 probe into the shroud as shown.
Ensure end of probe is against internal stop at other end of shroud. Rotate the probe in the shroud so as to give the lowest possible output when in clear water.
Fasten the M3 screws onto the probe end.
(Do not over tighten).
Re-zero the instrument with the shroud fitted.