

774 ENVIRONMENTAL MONITOR

USER MANUAL

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INTRODUCTION

Using the 774 measurements can be taken of the proportion of UV present as microwatts per lumen ($\mu\text{W}/\text{lumen}$), the total amount of UV as milliwatts per square meter (mW/M^2) and the amount of visible light present (Lux).

Most objects are also sensitive to temperature. The 774 also measures temperature as $^{\circ}\text{C}$ or $^{\circ}\text{F}$ and thermal radiation in W/M^2 or $\text{BTU}/\text{Hour}/\text{FT}^2$

The 774 can be left for extended periods to log the above parameters at a user set interval (10 seconds to 1 hour). The saved data can then be transferred to a computer for display, graphing etc.

We always want to improve our products. If you have any suggestions please send them to the manufacturer.

BASIC OPERATION

To take a reading the appropriate yellow button is pushed depending on the measurement required and the reading is taken.

UV= Ultra Violet ($\mu\text{W}/\text{lumen}$ or mW/M^2)

Vis= Visible light (Lux or Foot-candles)

T= Temperature (Centigrade or Fahrenheit)

IR= Thermal radiation (Infra Red)

The unit automatically turns off 10 seconds after the button is released unless a button is held down for over 5 seconds, this will cause readings to be taken continuously until a button is pressed.

If the T and UV buttons are pressed together then all parameters are displayed at the same time. Hold both the buttons down for over 5 seconds for a continuous readout.

Note that the buttons should be pressed firmly for a second or so to ensure reliable operation.

Typical display:

A	Lux
B	1234
C	Min: 1.2 21-08:14
D	Max: 3456 14-09:34
E	B H L 3/11/99 10:20

A: Units of measurement

B: Current reading

C: Minimum reading since last reset, day of month and time of minimum

D: Maximum reading since last reset, day of month and time of maximum

E: **H** shows that the reading is “held” and the unit will turn itself off after 10 seconds of inactivity. A round blob shows the unit is in continuous reading mode until a button is pushed, nothing here means that a single reading is being taken.

The **L** indicates logging is in operation, **W** is shown if logged data is wrapped.

The current time and date are also shown. Unless they are hidden by pressing Set\Clock\Hide-Unhide.

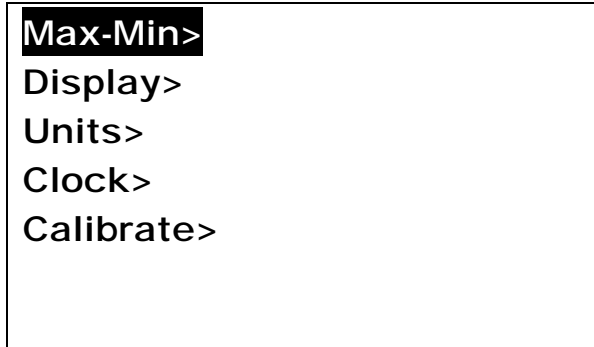
If a battery symbol appears at B it means that the batteries need to be replaced.

Min & Max are reset by pressing Set\Max-Min\Reset (Press Set 3 times)

The above format is slightly different for some parameters and can be altered by the user if required, see below.

Set Button

The blue Set button is used to access advanced functions, change units etc. If it is pushed once a menu similar to that below is shown:



The first menu item “Max-Min” is highlighted, different menu items can be highlighted using the **←** and **→** buttons. The wanted action is done by highlighting the appropriate menu item and pressing the **Set** button. To abort without doing anything press the **X** button. In some cases a further sub-menu is displayed with more choices.

Elsewhere in this manual directions in the form Set\item1\item2 are given. This means Press Set, select item1 in the first menu, press Set again, select item2 in the next menu and press Set.

To take a measurement without having to look at the display while the reading is taken (for example where the operators head may effect the reading) proceed as follows:

1. Position the monitor where the reading is to be taken.
2. Push the appropriate button for 1-2 seconds and release.
3. Hold the monitor in position for at least 2 seconds.
4. Without operating any buttons by mistake move the monitor so the reading can be noted before it turns itself off.

UNITS OF MEASUREMENT

Ultra-Violet (UV)

Traditionally UV has been measured in museums as the proportion of ultraviolet present. This result is useful for checking a particular lamp or window because the proportion of UV does not change with the distance from the light source. Using a simple rule the amount of UV on an object can be limited. It is usual to arrange that the proportion of UV should not exceed 75 μ W/lumen in museums and galleries, though some organisations try to keep UV levels below 25 μ W/lumen

The damage is done by the total amount of UV falling on the object so it is useful to be able to measure this directly, especially if non standard amounts of illumination are required. The amount of UV should be as little as possible but in general should not exceed 20mW/M², again some organisations keep the level below 6mW/M².

Both the above units are displayed when the UV button is pressed, one in large characters, the other smaller at the bottom of the screen. Which is displayed where can be swapped by pressing Set\Units\ μ W/Lumn-mW/M².

Visible Light

This can be displayed either in Lux or Foot-candles. To change the units press Set\Units\Lux-Footcandl.

A visible light readout is provided to control illumination and limit damage done by visible light. Normal museum light levels should be limited to 150-250 Lux.

Once measurements have been made the light level can be altered if necessary and UV filters can be fitted on windows, fluorescent tubes or other UV producing light sources as required. These filters often deteriorate over a period of years so it is essential to re-check them periodically.

Magazine reprints on the subject of museum lighting , UV etc can be obtained from the manufacturer.

Suggested light levels for various other purposes are given below:

Corridor, stairs etc	100/150 Lux
Warehouses, storage bays	100/150 Lux
General office work	300/500 Lux
Rough bench/machine work	300/500 Lux
Medium bench/machine work	500/700 Lux
Drawing offices	750/1000 lux
Fine bench work	1000/1500 Lux
Fine inspection	1500/3000 Lux
Minute work	3000/5000 Lux

Temperature

Temperature can be measured in degrees Centigrade or Fahrenheit. To change the units press **Set\Units\°C-°F**.

Thermal Radiation (Infrared)

Thermal radiation is measured using a thermopile. This is sensitive to all radiation from the near ultraviolet to the far infrared (to about 40μM wavelength). By default this is measured in W/M² (Watts per square Meter), readings can also be displayed in BTU/Hour/FT² (British Thermal Units per Hour per square Foot); see the Units menu.

One of the features of a thermopile is that it also detects radiation that is being emitted by the sensor due to its temperature (an unavoidable law of nature). This emitted radiation depends on the temperature of the thermopile. The obvious way to eliminate this effect is to maintain the sensor at a constant temperature; but the power required to do this makes it impossible on a battery operated instrument. The 774 compensates by measuring the temperature of the sensor and calculating a correction.

MAXIMUM AND MINIMUM

The maximum and minimum values for each unit are displayed along with the day of the month and time the maximum or minimum occurred.

The values can be reset by pressing Set\Max-Min\Reset (This equates to pressing Set 3 times).

To find the date when maxima & minima occurred press Set\Max-Min\Date or Time, repeat to display the times again.

The maximum and minimum values are also set when data logging is active.

DISPLAY

Contrast

The display contrast can be increased/decreased by pressing Set\Display\Contrast UP or DOWN. If this is done the menu continues to be displayed and the set button can be pressed repeatedly until the required contrast is achieved.

Backlight

The display backlight operation can be adjusted from the Set\Display menu as follows:

Menu item	Action
Lamp off	Backlight always off
Lamp mostly off	Backlight initially off, turns on if visible light is less than 10 Lux
Lamp mostly on	Backlight is initially on, turns off if visible light is more than 10 Lux
Lamp on	Backlight always on

The backlight uses a considerable amount of power, the more it is used the less time the batteries will last.

DATA LOGGING

Data logging is an optional extra. A standard unit can be upgraded to include data logging by returning it to the manufacturer. If data logging is not fitted then the relevant menu items are not displayed.

If data logging is fitted “Data logging” is one of the options when the Set button is pushed.

Wrap Data

If Wrap is set (press Set\Data logging\Wrap) then logging continues when the logger memory is full overwriting the oldest data.

If No wrap is selected (press Set\Data logging\No wrap) logging stops when the memory is full.

Show Status

To see how much data has been saved, when logging was started etc select Set\Data logging\Show status and the information is shown on the screen for 20 seconds. Press the X button to clear the screen sooner.

Start Logging

To start logging press Set\Data logging\Start and then select the log period and press Set again.

If logging is started then any previously logged data is lost, so be sure that saved data has been transferred before starting again.

The Log Period is how often readings are taken, if the log period is short then it will be less time until memory space runs out. The storage capacity is 10,900 readings of all 4 parameters (UV, Visible light, temperature and humidity). The other values (e.g. dewpoint and μ W/Lumen) are calculated from the 4 saved parameters.

Logging commences at a time so that measurements are taken at the start of each minute, 10 minutes, hour etc.

Log Period	Max Log time (Days, Hours:Mins)	Logging Commences
10 seconds	1, 6:16	Start of next minute
1 Minute	7, 13:40	Start of next minute
10 Minutes	75, 16:40 (about 2 ½ months)	Next whole 10 minutes past the hour
1 Hour	454, 4:00 (about 1 year 3 months)	Start of next hour

Logging will continue until the memory is full or a low battery condition is detected.

Stop Logging


To stop logging press Set\Data logging\Disable. This stops data being saved. The logged data is saved until logging is started again.

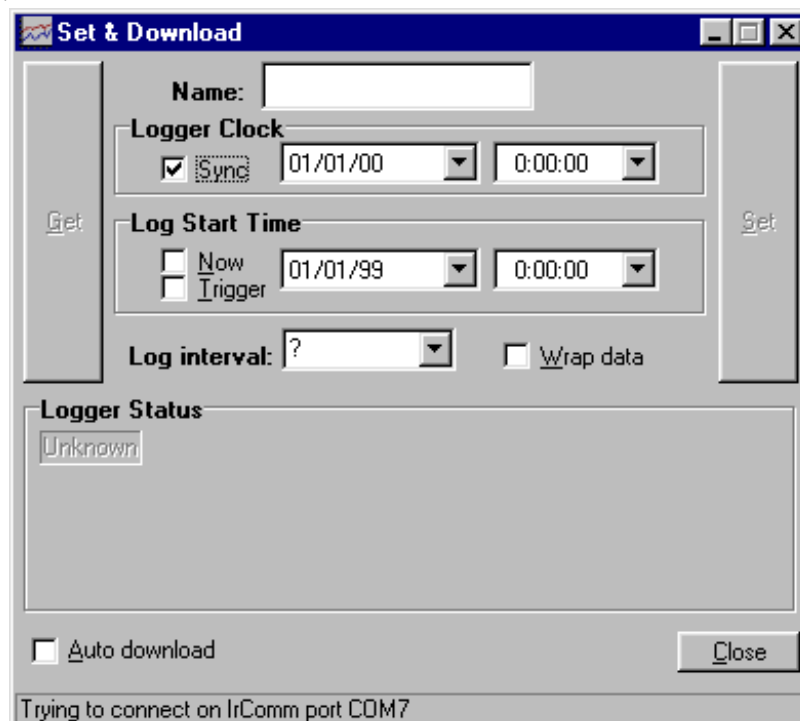
Re-Starting logging

Data is saved in non-volatile memory that retains data even if the batteries are removed. BUT the memory that retains information about when the next log time is and the clock itself require battery power. So if power is lost for any reason logging will not restart until both the time and the date have been set. After this is done logging will continue, leaving a blank in the memory for the data that was not recorded.

Logger-PC Communications

See below for information on installing the reception software on your computer..

1. Start the PC program ('RView') on the computer.
2. Open the Set & Download window by pressing the  button or selecting "Logger/Set & Download" from the menu. Something similar to the following is displayed:



If "Auto Download" is checked then any new data is downloaded as soon as contact is made with the logger.

3. Select Set\Data logging\Transmit on the 774.

4. Within 10 seconds place the monitor with it's black end window (the end with the temperature sensor) facing directly at the computer's infrared port, within 30-60cm (1-2 feet). When contact is made with the logger the computer requests the logger status and something similar to the following is shown:

Set & Download

Name: **Logger28** **Connected**

Logger Clock
☒ Sync 01/01/00 0:00:00

Log Start Time
☐ Now 01/01/99 0:00:00
☐ Trigger

Log interval: ? ☐ Wrap data

Logger Status
10796 Records, Period=10 Sec, Duration=1 day 5:59:20
29/01/00 14:06:00 to 30/01/00 20:05:10

408 Lux 31.7 mW/M² UV 24.6 °C 80.2 %RH

Download Close

Connected COM7

If "Auto Download" was checked then any new data is downloaded automatically. Otherwise, if required, click on the Download button to start transmission. The infrared link is closed after all data has been sent.

Information on any logged data and the current readings (updated every 5 seconds) are shown under "Logger Status".

The Get button can be clicked to check the current logger settings (Clock, log start time etc).

If "Wrap data" is checked logging will continue when the memory is full overwriting the oldest data.

If Sync is checked then the logger clock will be set from the PC when the Set button is clicked. Otherwise it can be set using the 774 Clock controls.

If "Now" is checked the logger will start as soon as possible after "Set" is clicked, otherwise any start time and date can be set.

"Trigger" is not used by the 774.

The logger name can be changed. This effects where the downloaded data is stored.

The Set button sends the settings on the PC (Logger Clock, start time, interval, name etc) to the logger. This also terminates the connection. The Set button is enabled when a valid log interval is chosen.

The infrared link can be closed by pressing the 'X' key on the 774 or closing the "Set & Download" window on the PC. If the 774 is just taken away without the link being officially terminated the computer will complain that it has lost communication, this does not matter.

Notes:

After the link is established (“Connected” is shown on the 774 and the PC), if transmission is interrupted (e.g. by blocking the path between the 774 and the computer infrared receiver) transmission will re-start from where it left off only if communication is re-established within 15 seconds. If communication is blocked for longer than this then the link is broken and the process must be re-started from step 1. If all the data is not transferred for any reason the procedure can easily be repeated, though see the information on file names above.

If power has been lost then the 774 may forget how many records it has saved and no data will be transferred. It is possible to force the 774 to transmit data by selecting “File\Get Data” from RView, the user then has to specify how many records are required and they are transmitted whether they are valid or not.

If battery power gets low during transmission a warning message is displayed but transmission continues for as long as possible but may not complete. If this happens the battery should be replaced and the data retrieved using the method described in the paragraph above.

Installing the Software

At the time of writing Rview have been tested with Microsoft Windows 98 and 2000.

To install the software run the installation program that is provided on a floppy disc or that has been downloaded from our web site (www.elsec.co.uk) and follow the instructions given. The installation file is called Rview21.exe or similar.

Viewing the Results using RView

For more detailed information on RView see the help file.

When RView is started an empty window is shown. One or more data files can be opened by selecting File\Open on the menu or pressing the appropriate button on the toolbar.

When a data file is opened the information is displayed as a graph in it's own window. More than one graph can be open at any time.

The graph can then be manipulated in the following ways:

Change the graphed parameters. If 'Show' is selected on the menu a list of parameters that can be plotted is shown with the current selection ticked. The various items can be ticked/unticked to change what is shown.

Make the graph bigger/smaller. Use the standard window controls on the top right of the graph window and/or drag the edges of the graph as required.

Zoom to see part of the data in more detail. Move the mouse cursor to one corner of the area of interest, click and hold the left mouse button while moving the mouse cursor so that the area of interest has a box drawn round it. When the mouse button is released the graph is redrawn showing only the selected area.

Change the temperature units. Select 'Show' on the menu and the current units are shown (°C or °F) click on this to change the units.

Move the Legend. When the graph is first drawn the legend box may hide part of the data. This can be moved by clicking on the box and dragging it to a new location. If it changes to a free floating window it can be removed completely or put back on the graph by clicking on it again.

Check the time/value of a point on the graph. Move the mouse cursor to the point of interest, the time and value represented by the position is shown on a status bar at the bottom of the window.

Add/Change the title of the graph. Press the Titles button on the toolbar and enter the title as required.

Print the graph. Select File/Print on the menu.

Copy the Graph to the Clipboard. Select edit/copy on the menu or press the appropriate button on the toolbar. The saved image can now be pasted into other programs, documents etc.

CLOCK

The 774 has a built in clock, this is used to show the time of maximum and minimum values and for data logging. The date functions are valid until January 2098 so the unit is completely year 2000 compliant.

Setting the Time

To set the time proceed as follows, the procedure can be abandoned at any time by pressing the X button:

1. Press Set\Clock\Set time. The display shows the current time with the hours highlighted.
2. Use **←** and **→** buttons to adjust the hours to the correct value and press the Set button.
3. The minutes are now highlighted. Repeat 2 above to set the minutes, when the set button is pressed the seconds are set to zero.

Setting the Date

To set the date proceed as follows, the procedure can be abandoned at any time by pressing the X button:

1. Press Set\Clock\Set date. The display shows the current date as Day-Month-Year with the day highlighted (note that the date is *always* shown in this order regardless of the date format setting as described below).
2. Use **←** and **→** buttons to adjust the day to the correct value and press the Set button.
3. The month is now highlighted. Repeat 2 above to set the month.
4. The year is now highlighted, repeat 2 above to set the year.

Date Format

The time and date are shown at the bottom of the display with every reading. The date is normally displayed as day-month-year, this can be changed to the American format (month-day-year) by pressing Set\Clock\DMY or MDY. The format can be restored to day-month-year by repeating this.

Hiding the Clock

If the date and time are not needed they can be hidden by pressing Set\Clock\Hide-Unhide. Repeat to unhide.

MAINTENANCE

The sensor windows should be kept clean and grease free. Grease and finger marks that look clear may be opaque to UV. Ensure that solvents do not come into contact with plastic parts, especially the perspex window over the visible (left-hand) sensor.

Battery

The batteries should be replaced as soon as the battery symbol is seen on the bottom left of the display. Any 1.1 to 2.5 volt AA style battery can be used, though it is preferable to use alkaline cells because of their longer life and much reduced tendency to leak.

The battery compartment can be accessed by removing the single screw in the bottom centre of the case.

Suggested battery types (2 off required):

MANUFACTURER	TYPE
Duracell	MN1500
Ever Ready	LR6B4

Nickel Cadmium rechargeable types can be used but they cannot be charged inside the instrument.

Mains Power Supply

The optional external mains power supply can be connected to the power input socket on the right hand side of the instrument. This socket is only fitted if requested with order because the hole required compromises the moisture seal on the casing.

Software Version

The internal software version is displayed when the 774 is turned on. A typical start-up message might be “ELSEC 774 V2.1”, in this case the software version is 2.1

CALIBRATION

The calibration information is kept in non-volatile EEPROM. If this fails the instrument displays “Mem Fail” when turned on and will load default calibration values and future readings may be 25% in error. If this happens a question mark “?” is displayed on the top right of the display with suspect readings.

Temperature

The 774 is fitted with a solid state temperature sensor that should not normally require calibration.

The unit can be checked by putting it together with another, known accurate, temperature measuring device for at least an hour. Make sure that the two sensors are within 2cm (1") of each other and that neither are close to anything hot or cold, sunlight etc..

If the units do not agree the 774 can be adjusted by selecting Set\Calibrate\Temperature, this allows the user to change the temperature offset with the **←** and **→** buttons before pressing the Set button. Pressing "X" leaves the offset unchanged.

The offset is the temperature (always in Centigrade) that is added to the measured temperature.

Example: Correct temperature is 20.4°C, 774 indicates 20.1°C, current offset is -0.2°C
The offset should be changed to +0.1°C

UV & Visible Light

The 774 calibration should not drift with time but to be sure of accuracy the instrument can be returned to the manufacturer for a calibration check every 2-5 years.

The 774 has a very carefully defined frequency response (i.e. which wavelengths of light it is sensitive to). Other light meters are often more sensitive to infra red light than they should be and so will give a higher reading with light sources that contain infrared (e.g. ordinary filament light bulbs).

Because the 774 has a cosine angular response it may give different readings to a type 762 which is relatively directional. In other words the 774 is more sensitive to light coming at an oblique angle than the 762.

Note that the human eye has a logarithmic response, this means that if two luxmeters are placed side by side they may give different readings even if it looks like they are getting a similar amount of light. To compare the readings on 2 meters they each need to be placed in the exactly same position under exactly the same lighting conditions with the operator being very careful not to shade the meters differently.

SERVICE AND SUPPORT

For support and repairs contact:

Littlemore Scientific Engineering
Railway Lane
Littlemore
Oxford OX4 4PZ
UK

Tel: 01865 747437

Fax: 01865 747780

Email: support@elsec.co.uk

<http://www.elsec.co.uk>

SPECIFICATIONS

Method of radiation detection	Twin silicon photodiodes connected to microprocessor.
Visible wavelength range	400-700nm (CIE response). No correction required for different light sources.
Visible power range	0.1 - 200,000 Lux (0.1 – 20,000 Foot-candles)
UV wavelength range	300-400 nm
UV power range	2 - 50,000 mW/M ²
UV proportion range	0 - 10,000 µW/Lumen
Thermal radiation sensor	Bismuth/Antimony thermopile with KBr window
Thermal radiation range	0-1000W/M ²
Display resolution	Lux: 0.1 up to 100 then 1 Foot-candles: 0.1 up to 100 then 1 UV: 0.1 up to 100 then 1 Proportion of UV: 1 µW/Lumen Temperature: 0.1°C or °F Thermal radiation: 0.1 up to 100 then 1
Accuracy	Light: 5% ±1 displayed digit UV: 15% ±1 displayed digit Temperature: ±0.5°C (±0.9°F) Thermal radiation: 5% + 10 W/M ²
Angular response	Cosine (Light, UV & thermal radiation)
Readout	8 line graphical Liquid Crystal Display with automatic backlight
Data logging time intervals (Time till full)	10 seconds (30 hours), 1 minute (7½ days) , 10 minutes (75 days), 1 hour (454 days)
Data logging storage capacity	10,900 readings of all 4 parameters
Computer Interface	IrDA compatible wireless infra-red link.
Date functions	Display as day-month-year or month-day-year.
Batteries	2 off alkaline AA type.
Battery Life	Approx 100 Hours continuous use or 12,000 readings taking 30 seconds each. Battery life will be less if the display backlight is used
External Power Supply (If available)	4.0-5.2V DC, 100mA A suitable mains power supply can be provided as an optional extra (please specify mains voltage required).
Operating Temperature	0-50°C
Dimensions	150 x 65 x 25mm 5.9 x 2.5 x 1 inches Including Temperature probe
Weight	165g (5.6 oz) with batteries.

