

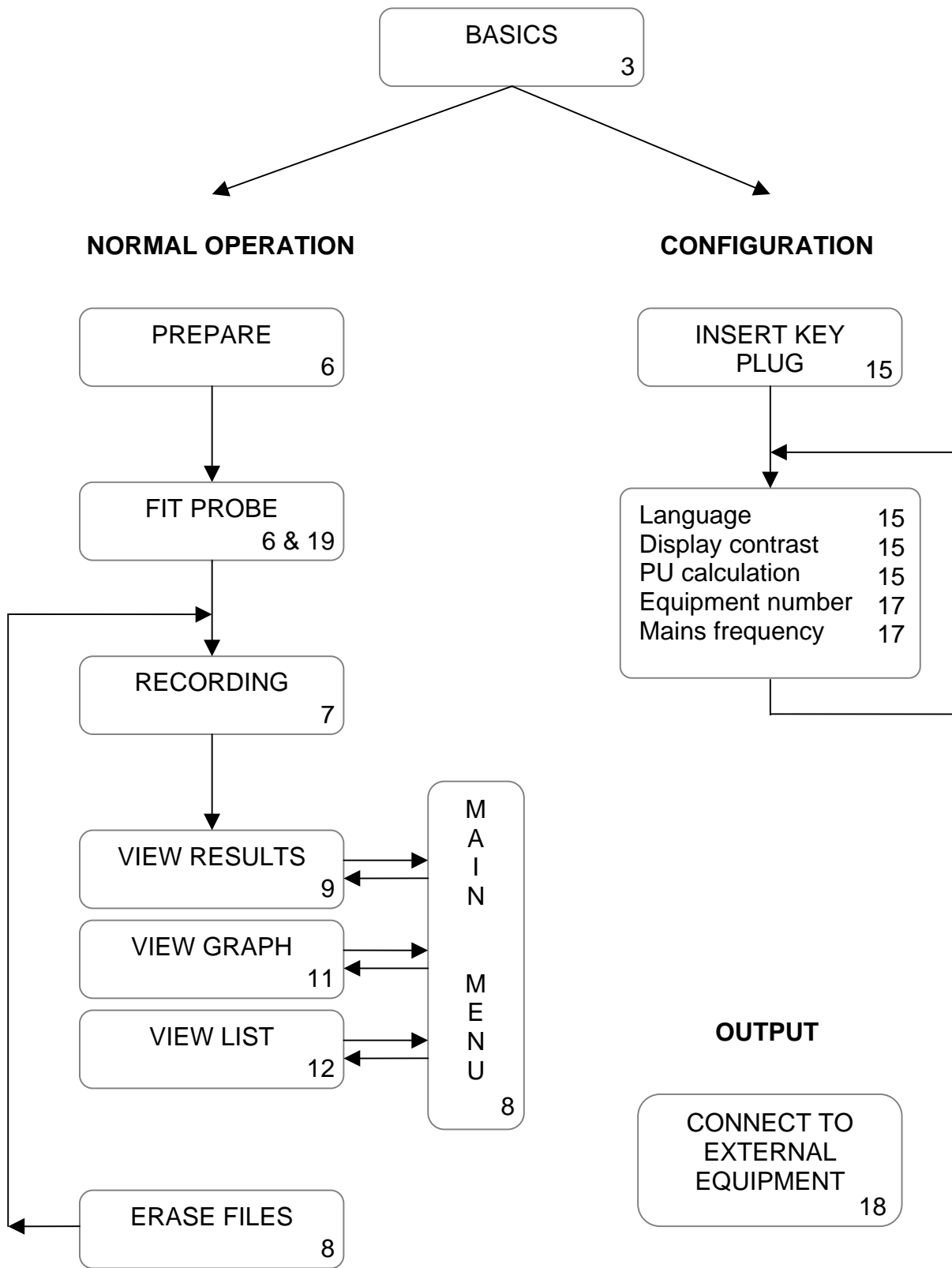
# **RPU-120+**

## **PU Monitor**

Operating manual

October 2003

# **REDPOST**



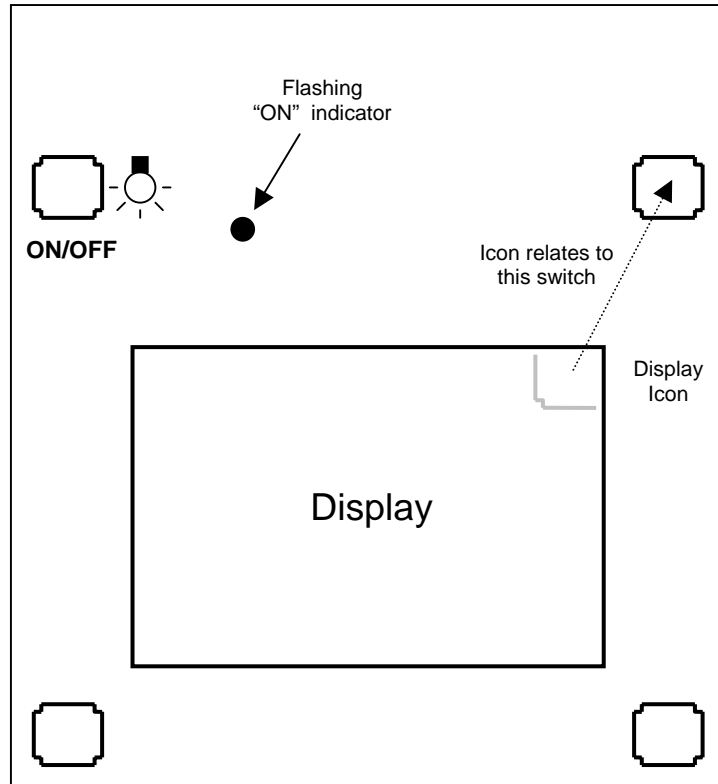
**Instrument operation related to page numbers in this manual.**

# Contents

<b>Controls .....</b>	<b>3</b>
ON/OFF switch .....	3
Indicator .....	4
Display illumination.....	4
Switch functions and icons .....	4
Auto power on.....	4
Auto power off.....	4
Low battery condition .....	5
<b>Starting .....</b>	<b>6</b>
Preparing the instrument.....	6
Thermometer.....	6
Starting the recording.....	6
<b>Recording .....</b>	<b>7</b>
Stopping the recording.....	7
Display temperature .....	7
<b>Results .....</b>	<b>8</b>
Results displays.....	8
Calculated results .....	8
Erasing a file .....	8
<b>Calculated Results .....</b>	<b>9</b>
Total PU achieved.....	9
Unique ID number .....	9
Total recording time.....	9
Maximum temperature.....	9
Time within 2°C of maximum .....	9
Temperature at pasteuriser exit.....	10
PU cut-off temperature .....	10
Time adding PU's.....	10
Reason for stopping .....	10
<b>Graphical Review .....</b>	<b>11</b>
Cursor movement.....	11
Off scale records .....	11
Display backlight .....	11
<b>Full List .....</b>	<b>12</b>
Time line movement .....	12
Display backlight .....	12

<b>Battery Charging .....</b>	<b>13</b>
Battery information .....	13
Battery temperature.....	13
<b>Menus .....</b>	<b>14</b>
Moving the highlight.....	14
Selecting an item.....	14
Example .....	14
<b>Key Plug (Configuration) .....</b>	<b>15</b>
Language.....	15
Display contrast .....	15
PU calculation.....	15
PU cut-off temperature .....	16
PU calculation – Base .....	16
PU calculation – Z .....	16
Equipment number.....	17
Mains frequency.....	17
Leaving configuration.....	17
<b>Output .....</b>	<b>18</b>
Stand alone operation.....	18
Connection to RPC-42 & 44.....	18
Connection to RPC-80 .....	18
Connection to PC .....	18
<b>Temperature Probe .....</b>	<b>19</b>
Probe position .....	19
Choosing probe length .....	19
<b>Maintenance .....</b>	<b>20</b>
General.....	20
Probe socket.....	20
Probes.....	20
Battery.....	20
<b>Frequently Asked Questions .....</b>	<b>22</b>
Battery and battery charging.....	22
Controls.....	24
Results.....	24
<b>Specification .....</b>	<b>26</b>
<b>Safety and Conformity.....</b>	<b>27</b>
Safety warning .....	27

# Controls



There are four control switches arranged around the display screen. Operate the switches by touching one end of the actuator onto the glass above the marked area. Keep the actuator in position until you see a change in the display or the flashing indicator.

The two top switches are used for the main control functions. They take a few seconds to operate so that there is less chance of any accidental actions.

## **ON/OFF switch**

The top left switch is the on/off switch. Switch the instrument on by activating this switch. Switch the instrument off by activating and holding this switch for at least 10 seconds. Remove the actuator as soon as the instrument switches off.

If there is a recorded file you must hold the switch for longer and the file will be erased when you switch off. Print out important files or save them in some other way before you switch off.

You cannot switch the instrument off when the battery is charging from one of the Redpost printer/charger units or a Redpost battery charger.

## Indicator

The small red lamp on the panel flashes once per second to show that the instrument is operating. This lamp also flashes quickly five times to acknowledge the action of either of the two top switches.

## Display illumination

The on/off switch also turns on the backlight that lights up the display. When any switch is operated or there is any other activity, such as connecting the temperature probe, the backlight will turn on. It will turn off again after a short time to save battery power. Activate the on/off switch (for about half a second) to turn on the backlight without causing any other action. You can do this at any time even though the icon for this function is not always shown because of lack of space on the display.

If there is very little charge in the battery then the backlight will not turn on. This saves unnecessary battery drain.

## Switch functions and icons

For the other three switches the display will show a small “icon” to indicate the function of each switch. The icon is in the same corner as the switch it relates to. The switch icon becomes inverted (black for white) when the switch is operated. If a switch has no icon then it has no function at that time.

## Auto power on

The instrument will automatically switch on when it is connected to any of the Redpost printerchargers or Redpost battery chargers. This allows the battery charger to be controlled and the charging information to be displayed.

The on/off switch will not turn the instrument off while it is connected to a charger but it can still be used to turn on the display backlight.

## Auto power off

The instrument uses several methods to reduce battery power consumption. The automatic control of the display backlight is described above.

If the instrument is idle *before* recording a file it will automatically switch off after 15 minutes. The instrument is idle if no switches are activated, no data communication is taking place and it is not connected to an active battery charger.

If the instrument is idle *after* recording a file the power remains on as long as the battery has sufficient charge to correctly maintain the recorded file. After being idle for one hour the instrument goes into a power saving mode. In this state the screen is blank but the red indicator lamp still flashes once per second. To resume normal operation you must briefly activate any of the switches or connect the instrument to a Redpost battery charger.

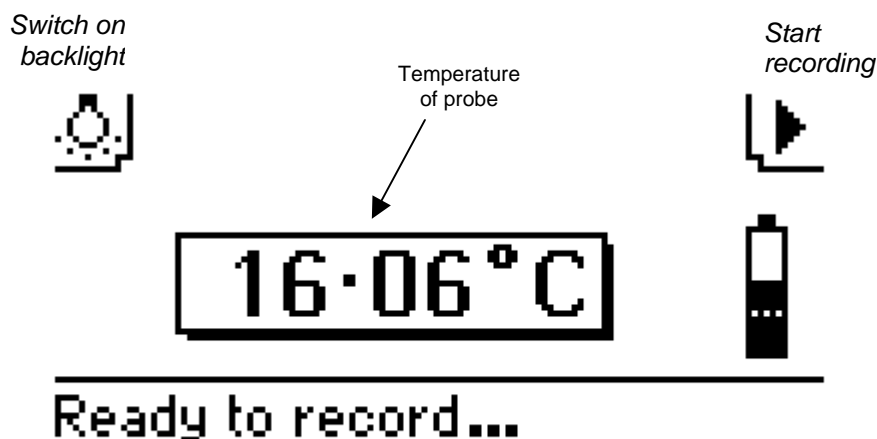
### **Low battery condition**

If there is less than 15% charge in the battery then the backlight cannot be switched on. This helps to reduce battery drain and ensures that any recorded files are saved for as long as possible. The backlight increases the battery drain by about 4 times.

At an even lower level of charge (below 5%) the whole instrument will turn off and any recorded file will be lost. If you switch it on again it will stay on for only a few seconds. Connect the instrument to a Redpost battery charger as soon as possible.

The instrument continuously monitors its own battery use and battery charging to gauge the amount of charge that remains in the battery. If the battery voltage falls to a low level unexpectedly it may indicate that the battery is not correctly holding its charge. This can happen after several years of use. If this problem occurs the display will warn you that the battery may need to be replaced. More information can be found in the Maintenance section.

## Starting



### Preparing the instrument

Set up the bottle or can in the correct size holder and fit the correct length temperature probe. This process is described in the “Temperature Probe” section.

Switch on the instrument.

If there are any problems, such as insufficient charge in the battery, the display will give the information you need.

### Thermometer

When the instrument is ready to record the temperature of the probe is shown on the display, updated every second.\* In this form the instrument can be used as a highly accurate thermometer.

### Starting the recording

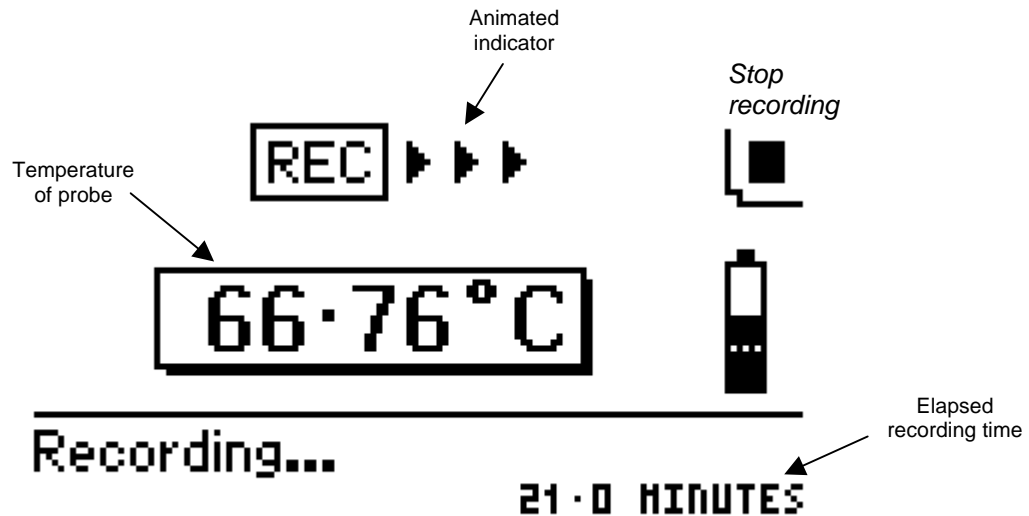
When you are ready to put the instrument into the pasteuriser, start recording by activating the top right switch.

---

\* The illustration shows the English language version. The text changes according to the language selected for the display.



## Recording



The temperature of the probe and the elapsed recording time are shown on the display throughout the recording run.\*

### Stopping the recording

When the instrument exits from the pasteuriser you can stop the recording by activating the top right switch or by unplugging the temperature probe. Recording will also stop after the maximum time (4 hours) or if the charge in the battery becomes too low.

As soon as recording stops the results are displayed.

### Display temperature

The display will switch off if the instrument is too hot (above 70°C). This avoids damage to the screen. Recording will continue normally under these conditions and the flashing red indicator lamp shows that the instrument is operating. Normal display operation will resume as soon as the instrument has cooled.

The instrument should never be operated at temperatures above the maximum ambient temperature shown in the specifications.

---

\* The illustration shows the English language version. The text changes according to the language selected for the display.

# Results

The calculated results are displayed as soon as recording stops. They are set out on three “pages” with 3 items on each page. The right hand switch below the screen is used to move to the next page and then from the final page back to the first.

## Results displays

There are three different results displays and they can be selected from the results menu.

- The calculated results such as the total PU achieved.
- The graphical review showing a graph of the file with a movable cursor that allows you to select one record to be shown in detail.
- The full list of all records in detail.

## Calculated results

1. The total PU value achieved
2. The unique ID number of the file
3. The total recording time
4. The maximum temperature recorded
5. The total time during which the temperature was within 2°C of the maximum
6. The temperature at the exit from the pasteuriser
7. The PU cut-off temperature
8. The total time accumulating PU’s while at or above the PU cut-off temperature
9. The reason for stopping recording

All these results are calculated wherever possible. If the file contains any off-scale records (outside the recording scale of the instrument) then some results may be invalid. A warning is shown if this is the case and some items may be shown as “unknown”.

## Erasing a file

When a file is no longer required you can erase it by activating and holding the on/off switch for 10 seconds. After the file has been erased you can release the switch and the instrument will be ready to record another file. If you continue to hold the on/off switch the instrument will switch off after a further 10 seconds. The display shows you what is happening. You cannot switch off if the instrument is connected to an active battery charger.

When you use the RPU-120+ with the RPC-80 printer charger unit you can erase the file, after it has been printed, by using the control panel of the RPC-80.

# Calculated Results

## **Total PU achieved**

The total number of Pasteurisation Units accumulated during the recording run. This is calculated using the chosen definition of PU and cut-off temperature. You can change the PU calculation by using the key plug. More details of the calculation are given in the section describing the key plug and instrument configuration.

Your packaging specification will normally set the PU definition and a target PU value for each product to ensure sufficient pasteurisation.

## **Unique ID number**

This file identity number is a combination of the instrument serial number and a running number that advances for each recording. It is therefore unique to the file.

## **Total recording time**

The total elapsed time from the moment you start recording by activating the switch until recording stops. Recording may be stopped in a variety of ways either under your control or automatically. The reason for stopping is given as the final result.

## **Maximum temperature**

The maximum recorded temperature.

Your packaging specification may call for a certain maximum product temperature and exceeding it could produce unacceptable flavour changes.

## **Time within 2°C of maximum**

The total time during which the temperature was within 2°C of the maximum. This gives an approximate value for the time the product was within the pasteuriser holding zone.

## **Temperature at pasteuriser exit**

The moment that the instrument leaves the pasteuriser is judged by a rise in light level from the relatively dark interior. Inspection lights inside the pasteuriser may prevent this result from being calculated. The light sensor can be seen on the front panel above the two top control switches, don't cover this area with tape or adhesive labels.

Your packaging specification may call for a maximum product exit temperature. If the product leaves the pasteuriser at too high a temperature the flavour may be impaired.

## **PU cut-off temperature**

At or above this temperature PU's are accumulated. Below this temperature they are not. The cut-off temperature can be adjusted by using the key plug. More details of the cut-off and the PU calculation are given in the section describing the key plug and instrument configuration.

Your packaging specification may call for a particular PU cut-off temperature to ensure that pasteurising conditions are correct.

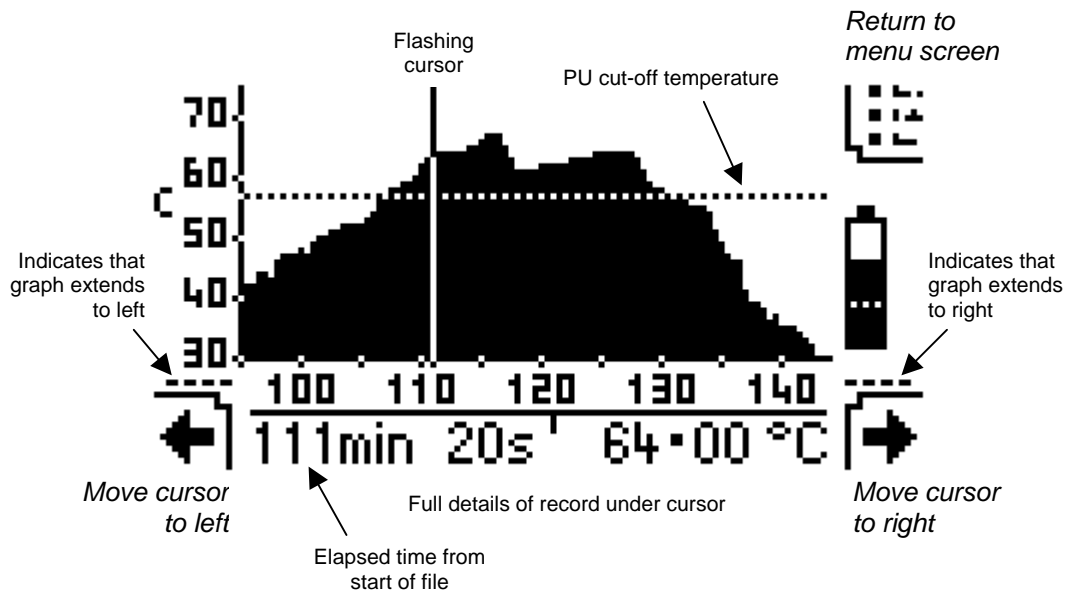
## **Time adding PU's**

The total time during which the product temperature was high enough for PU's to be achieved and added to the total. The product temperature was at or above the cut-off temperature for this length of time.

## **Reason for stopping**

You can stop recording by activating the switch or by unplugging the temperature probe. Recording will also stop after the maximum time (4 hours) or if the charge in the battery becomes too low.

# Graphical Review



## Cursor movement

The record under the cursor is shown in detail below the graph. The two switches below the screen are used to move the cursor. Moving the cursor to the right moves it towards the end of the file.

The cursor moves by one record as soon as you operate the switch. If you hold the switch for a short time then the cursor starts to move continuously, slowly at first and then faster, for as long as the switch is held. When the cursor reaches the last record in the file the switch outline becomes dim and it no longer has any effect.

Moving the cursor to the left (towards the start of the file) works in a similar way.

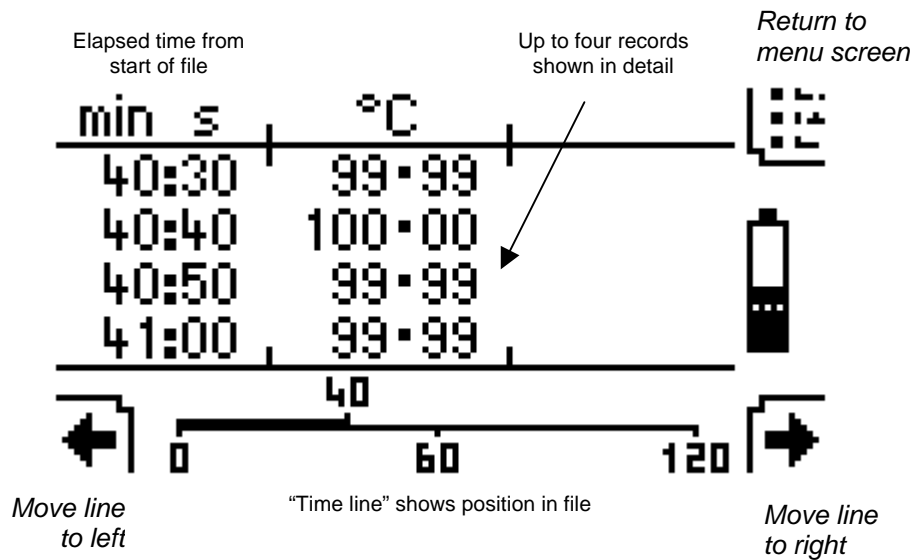
## Off scale records

The vertical scale adjusts automatically so that the maximum reading is on the graph. A record that is above the top of the recording scale is shown as a dot at the top of the graph area with no solid chart below it. A record that is below the graph area or below the bottom of the recording scale leaves a gap in the graph.

## Display backlight

Although there is no space on the display to show the “lamp” icon you can use the top left switch at any time to turn on the display backlight.

# Full List



## Time line movement

Four records from the file can be shown in detail on the screen. The time line shows the position of these records in relation to the whole file. The two switches below the screen are used to move the time line. Moving the line to the right shows records nearer to the end of the file.

The line moves by one record as soon as you operate the switch. If you hold the switch for a short time then the line starts to move continuously, slowly at first and then faster, for as long as the switch is held. When the line reaches the last record in the file the switch outline becomes dim and it no longer has any effect.

Moving the line to the left (towards the start of the file) works in a similar way.

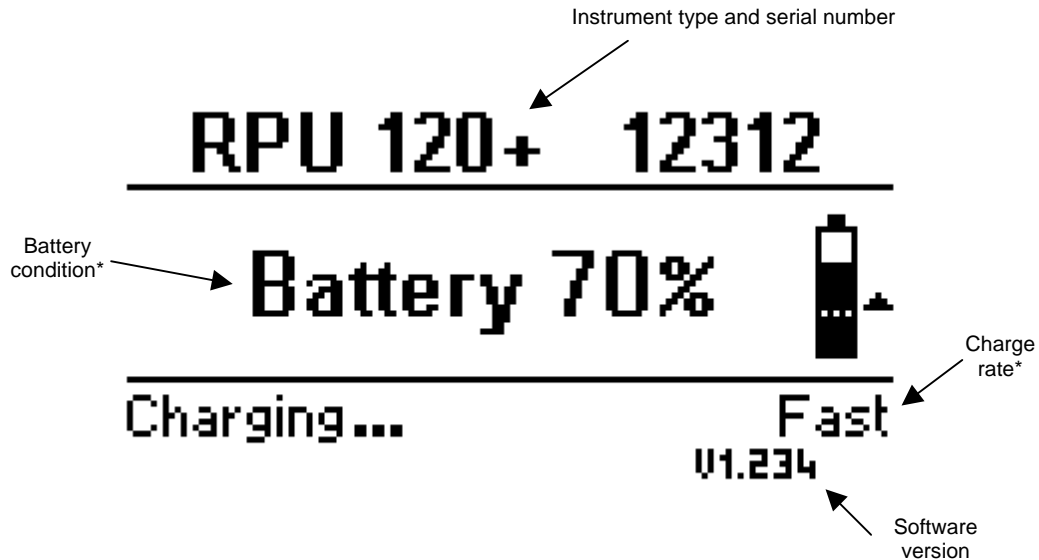
The time line is not shown for very short files (under 1 minute).

## Display backlight

Although there is no space on the display to show the "lamp" icon you can use the top left switch at any time to turn on the display backlight.

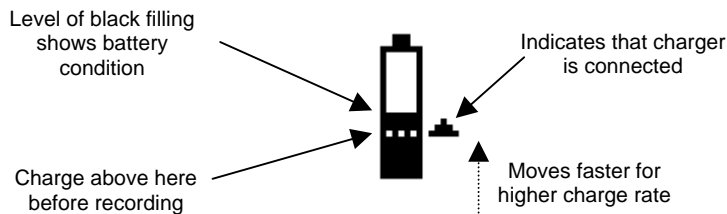
# Battery Charging

The battery in the instrument is re-charged whenever you connect it to one of the Redpost printer/charger units or to a Redpost battery charger. Do not leave the battery on charge continuously for more than 24 hours. If you connect to the charger before recording a file you see the complete charging information on the screen.\*



## Battery information

All the other display screens show the battery condition using just the small battery image from the complete diagram. This shows when the battery is being charged by an arrow head that moves up the battery image. The speed of movement shows the charge rate. The dotted line shows the minimum level of charge needed to start recording.

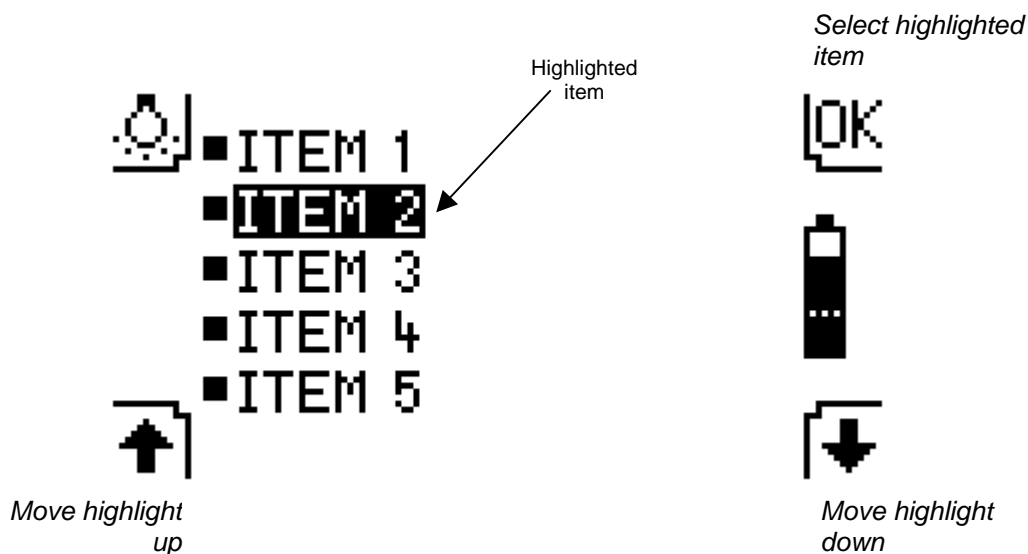


## Battery temperature

The charge rate is controlled by several factors including battery temperature. The battery will not charge if it is too hot and in that case the arrow head in the battery diagram will be stationary. Charging will resume as soon as the battery has cooled.

\* The illustration shows the English language version. The text changes according to the language selected for the display.

# Menus



There are stages in the operation and configuration of the instrument when you need to choose an action etc. from a menu list. A menu shows all the possible choices or items in a vertical list. The method of operation is the same in every case although there can be as few as 2 and as many as 6 items in the menu list.

## Moving the highlight

The two switches below the screen are used to move the highlight over the item in the list that you wish to select.

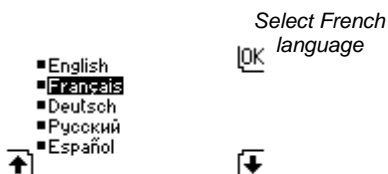
The highlight moves down by one item as soon as you operate the right hand switch. If you hold the switch for a short time then the highlight starts to move down continuously for as long as the switch is held. When the highlight reaches the bottom item the switch outline becomes dim and it no longer has any effect.

Moving the highlight up with the left switch works in a similar way.

## Selecting an item

Operate the top right switch to select the item you have highlighted.

## Example





## Key Plug (Configuration)

The key plug can be inserted into the probe socket and puts the instrument into configuration mode; this allows you to change the way the instrument operates. The key plug restricts access to this mode so that changes are not made unintentionally. You can use the key plug only when there are no recorded files in the instrument.

The parameters you can change are presented on a series of screens. Each screen shows the symbol of a key at the bottom. Operate the lower control switches if you need to change the present value which is shown when the screen appears. Sometimes you choose from a menu, sometimes change the value directly. When the value is correct then activate the top right (OK) switch.

Changes you make on a screen are only saved when you activate the OK switch for that screen.

### Language

You can select the language used for the text on the display. The decimal point symbol used for numerical output is also changed according to the language you select. English will use the point, other languages the comma.

### Display contrast

You can adjust the appearance of the display to give the best contrast. This is set during manufacture and will seldom need changing. Adjust so that the background “off” dots become just visible compared to the clear glass at the edges of the screen. Adjusting for the darkest “on” dots will not give the best contrast.

The changes you can make are intentionally kept quite small. You can however set the maximum + or – value, save it with the OK switch and then repeat the adjustment for greater changes. See “Leaving configuration” below.

### PU calculation

The Pasteurisation Unit (PU) is defined as relating to the sterilising effect observed when the product is held for one minute at a temperature termed the Base value. At this temperature therefore, 1 PU per minute is achieved.

Experiments on various mixtures of the common brewery biological contaminants showed that at temperatures over about 50°C there is an approximately ten-fold increase in sterilising effect for every 7°C increase in temperature. For example, if the time required to kill a population of micro-organisms at 60°C is found to be 5 minutes then

if the temperature were to be increased to 67°C the time required would be only 0.5 minutes. The increase in temperature required to produce a ten-fold increase in kill rate is termed the Z value. The Z value in this case is therefore 7°C.

For beer the PU is normally defined by a Base value of 60°C and a Z value of 7°C. The same definition is often used for soft drinks and other beverages. Where there is any possibility of spore-forming bacterial contamination being present (for example in tomato juice) very much higher temperatures are required for pasteurisation. In these situations the definition of Base value 80°C and Z value 10°C is often used. Other definitions are also in use outside the brewing industry.

At product temperatures below about 50°C it is doubtful that any significant sterilising effect is achieved even though from a strictly mathematical point of view the correct PU total could still be obtained, given enough time in the pasteuriser. For this reason it is desirable to set a temperature level below which no PU's are added to the total calculated by a PU monitor. This is termed the PU cut-off temperature.

Set the PU cut-off temperature at least 5°C lower than the planned product temperature in the holding zone of the pasteuriser. Higher values will give a very conservative figure for PU achieved and will reduce the repeatability of the result because the product temperature will be changing only slowly as it crosses the cut-off temperature threshold. For beer the cut-off is not normally set below 50°C.

The next three screens allow you to adjust the PU calculation.

### **PU cut-off temperature**

You can change the cut-off temperature in steps of 0.1°C.

### **PU calculation – Base**

You can select a Base value of 60, 70 or 80°C.

### **PU calculation – Z**

You can select a Z value of 7 or 10°C.

If you set a PU definition other than the standard for beer (i.e. other than Base = 60°C and Z = 7°C) the results display will show the calculation you have chosen.

## **Equipment number**

This screen allows you to set your own equipment number or identification for the instrument. This can consist of up to 15 letters or numbers and will be printed with the results by the Redpost printer/chargers. This identification may be required for ISO9000 schemes.

The screen first shows the present equipment number or a series of blank spaces if nothing has been set yet. If you wish to change or add to the number then activate the lower right (+/-) switch otherwise move on by activating the OK switch.

You change the first character position of the number using the lower switches. A flashing indicator appears under the character you are changing. When that is correct use the top right arrow switch to move to the next character position and so on. You can leave a character blank by moving straight to the next position. When you have moved past the last character position you must save the changes you have made by activating the OK switch.

## **Mains frequency**

Choose 50 or 60 Hz according to the nominal frequency of your local mains supply. This setting helps the instrument to reject interference.

After you activate the OK switch for this screen you have finished the configuration cycle.

## **Leaving configuration**

Remove the key plug if you have made all the changes you need. You can continue through another configuration cycle if you need to make more changes. You can remove the key plug at any time or switch the instrument off using the on/off switch but remember that any changes you make on a screen are only saved when you activate the OK switch for that screen.

# Output

The RPU-120+ instrument can be used as a stand alone PU monitor or it can be connected to a variety of other equipment so that the recorded files can be permanently saved and/or printed.

The settings you make on the final output device (such as an RPC-80 or a PC) will take priority over the settings in the RPU-120+ when results are calculated for display or printing.

## Stand alone operation

With its detailed display of calculated results, graph and full list of all records it is possible to obtain all the information about a file directly from the display of the instrument. The only other equipment required is a Redpost RPC-50 battery charger.

## Connection to RPC-42 & 44

The instrument connects to the Redpost RPC-42 or RPC-44 printer/chargers and operates in exactly the same way as the 100 series PU monitors. The printed results are re-calculated to comply with the 0.1°C resolution and 30 second recording interval of the earlier instruments. Printed output from the RPC-42 is in English language only.

A status report for the instrument can be printed on the RPC-42 by calling for a full printed list when no file has been recorded. Print a status report with the RPC-44 by holding down switches 1 and 3 while pressing the print switch. (See RPC-44 manual.)

## Connection to RPC-80

The instrument connects to the Redpost RPC-80 printer/charger and operates in exactly the same way as the 200 series PU monitors. Printed results are available with full resolution. Connection to a PC is possible using the serial port on the RPC-80.

## Connection to PC

It is possible to connect the instrument directly to a PC using the Redpost RPC-50 battery charger. (See RPC-50 manual.)

Recorded files can be copied and carried to a remote PC using an optional hand-held infrared data transfer unit.

# Temperature Probe

## Probe position

It is generally accepted that a slow circulation takes place in the beverage container, driven by the temperature difference between the hot container wall and the cooler body of liquid inside. This implies that the product will not be well mixed in the container during pasteurisation and so we must assume that there will be variations in the treatment received between individual contaminant cells and micro-organisms. We might try to measure the value of PU achieved for the average contaminant cell but we cannot tell which place in the container will receive the average treatment. Neither can we guarantee that some portion of the product will not receive considerably less treatment than the average, resulting in the survival of a significant number of the micro-organisms we are intending to remove.

We recommend that the tip of the temperature probe, which is its most sensitive part, should be positioned at the cold spot of the container. This is approximately 10 mm to 20 mm up from bottom of the container and exactly on the central axis. Choosing the cold spot gives the minimum result for PU achieved; in fact every contaminant cell may have been warmer than the cold spot at some time during the process, so that we can be certain that we are measuring a safe, conservative value. The recorded PU total varies very little with probe height just at the cold spot and so this position also gives the best repeatability of PU measurement.

## Choosing probe length

As a starting point, for bottles, choose a standard length temperature probe that is between 5 mm shorter and 15 mm longer than the outside height of the bottle. For cans choose one that is between 5 mm shorter and 5 mm longer than the outside height. For situations where a standard length is unsuitable, special lengths can be supplied.

Temperature probes fit into the container in a way that allows some adjustment by way of a threaded insert in the seal. This allows the tip to be positioned at the correct height above the bottom of the container and on the central axis. The adjustment is 40 mm for bottle probes and 10 mm for can probes.

For cans and small bottles the tip of the probe should be 10 mm to 15 mm from the bottom of the container. For larger bottles (over 250 mm high) the tip of the probe should be 15 mm to 20 mm from the bottom of the bottle.

# Maintenance

## General

To maintain the accuracy and reliability of the equipment we recommend that it is serviced and re-calibrated (with the probes) at regular intervals. Under light conditions of use this should be carried out at least every 1500 recording runs. When the equipment is heavily used, particularly where high pasteuriser temperatures are involved as with fruit juices, then the service and re-calibration should take place every year.

If this work is done by the manufacturers or an approved agent then the calibration and service details can be recorded in the equipment and are available via the status report. (See the Output section of this manual.)

The regular service will replace the probe socket and the battery (see below) and so ensure reliable operation.

## Probe socket

The probe socket should be lubricated after every 50 recording runs using the contact treatment grease supplied. This protects the socket from corrosion and greatly extends its service life. A lubrication reminder is shown on the display at the correct times.

If the equipment has not been serviced as recommended above then after about a year of heavy use (or two years of light use) the probe socket should be replaced as a precaution. The circular panel, with a socket and all wiring fitted to it, is available as a spare part. Full fitting instructions are enclosed with the new part.

## Probes

The probes do not require routine maintenance. Handle them with care. When re-calibrating the equipment always re-calibrate all the probes at the same time.

## Battery

Always switch the instrument off when it is not in use. If the instrument is idle after recording a file it will not switch off automatically but after one hour it goes into a power saving mode. In this state the screen is blank but the red indicator lamp still flashes once per second. This state could be mistaken for the “off” state.

Do not leave the battery on charge continuously for more than 24 hours.

If the equipment has not been serviced as recommended above then as the battery ages it will not hold as much charge. The instrument can detect this and when the problem becomes severe it can give a warning on the display that the battery should be replaced. After about a year of heavy use (or two years of light use) the battery should be replaced as a precaution. Full fitting instructions are enclosed with the new battery.

If you unplug the battery and then reconnect it the instrument will assume you have fitted a new battery. **Never unplug the battery** unless you intend to replace it with a new one.

If you plan to store the instrument unused for more than 6 months you should first fully re-charge the battery. If possible give the battery a few hours charge every 3 months during storage.

# Frequently Asked Questions

## **Battery and battery charging**

---

*Sometimes the battery charge percentage seems to go down even though the instrument is connected to the charger. What's wrong?*

Nothing's wrong. When the battery is too hot to charge more quickly the charge rate is lowered to the "trickle" charge rate which has to be set to a low level so that charging conditions are safe. This low charge rate is not always enough to replace the charge being used by the instrument, especially when the display backlight is on. The charge percentage may therefore fall slowly. When the instrument has cooled down the charge rate will increase and refill the battery. The heat may have come from outside, for example from the pasteuriser or from inside from the process of charging the battery itself.

If the instrument is very hot then no charging is possible.

When the battery is full it will also be trickle charged and the instrument will occasionally increase the charge rate to "slow" to make up for any gradual losses. The battery is quickly refilled and may very briefly show 100%. The charge rate then goes back to trickle charge. This cycle repeats as long as the instrument is connected to the charger. Do not leave the battery on charge continuously for more than 24 hours.

---

*When I switch the instrument on it always has less charge in it than when I switched it off. Why?*

When the instrument is switched off and left unused the battery gradually loses charge by a process known as "self discharge". Because the instrument has no way of measuring how much charge has been lost in this way it compensates by subtracting a small, fixed value from the charge percentage when it is next switched on.

For maximum battery life when working continuously you should retain the previous file until ready for the next run, erase the file without switching off and then start the next recording at once.

---

*How long should I leave the instrument connected to the charger?*

There is no need to leave the instrument on the charger after the battery shows 99% which is full charge. You should not leave the charger connected for more than 24 hours.



---

*How long will the battery last?*

The specification shows examples of the instrument running time that can be expected from a fully charged battery.

The service life of a battery will depend on the conditions of use. Giving an exact life time is difficult. Heavy use at high pasteurising temperatures such as used for fruit juices will reduce the life. Under such conditions a battery might be expected to last for about a year. With light use and at beer pasteurising temperatures the battery might last for 2 years.

---

*How is battery charging controlled?*

The instrument continuously monitors its own battery use and any battery charging to gauge the amount of charge that remains in the battery. This allows the percentage charge to be displayed either as a number or as the black fill level on the battery information diagram.

Whenever the charger is connected the charge rate is controlled by the instrument taking into account the state of charge and temperature of the battery and the total charging time. Charging can be fastest when the battery is empty and cool but must be slower when the battery is nearly full or is hot. The aim is to replace the charge as quickly as possible without overcharging or overheating the battery. This ensures a long service life for the battery.

---

*The display tells me that a new battery has been installed. I haven't fitted a new battery, what's going on?*

If you unplug the battery and then reconnect it the instrument will assume you have fitted a new battery. **Don't unplug the battery** unless you intend to replace it with a new one. See the Maintenance section of the operating manual.

If the battery voltage falls to a low level and then recovers it may appear as though the battery was removed and replaced by a new battery. This can happen if the battery is failing to hold its charge after a year or two of use. It might also happen if the instrument has been switched off and left unused for a long period (six months or more).

A new battery must be fully charged before use and so the instrument must be connected to the charger for several hours. The instrument display gives information about this commissioning process.

In your case the instrument has wrongly sensed a battery change. You should follow the instructions on the display and fully charge the battery as if it were new. If the same problem occurs again within a short time then the battery is beginning to fail and you should fit a new one.

---

*The charge rate shown on the RPC-80 is not the same as that shown on the PU monitor. Which is correct?*

The RPC-80 is compatible with the 100+ series of PU monitors but it was designed for use with equipment that has a different battery type. The definitions of the charge rates are not exactly equivalent but charging will take place correctly. Refer to the display on the PU monitor for the correct charging information.

## **Controls**

---

*Which switches control the display backlight?*

The display backlight is switched on by any of the following actions: activating any switch (even those that have no other function at the time), plugging anything into the socket, unplugging anything from the socket or starting any communications activity that causes a message to be displayed. The backlight will switch off again after one minute unless another action keeps it on.

If you only wish to switch on the backlight you should use the on/off switch because then there is no chance of the switch causing any other unwanted operation (unless you hold it for more than 10 seconds!).

The same actions that light the backlight will “reawaken” the instrument from its power saving mode when it is holding a recorded file and has been idle for more than one hour.

## **Results**

---

*If the product temperature is exactly equal to the cut-off temperature will any PU's be achieved?*

Yes, PU's will be achieved and added to the total. The precise definition of the PU cut-off (see Results section) is as follows: “At or above this temperature PU's are accumulated. Below this temperature they are not.”

This definition also applies to the timing result displayed as “Adding PU's” but often printed as “Time above cut-off”. The definition of the result has always been the same but in printed results the headings used in the past were not always so precise. Unfortunately we must retain these same headings in some cases for compatibility with older equipment. Thus the heading “Time above cut-off” in some printed results should actually read “Time at or above cut-off”

---

*The PU value displayed by the RPU-120+ is not the same as that printed for the same run by the RPC-80. Why?*

The RPC-80 recalculates the results from the raw data based on values you choose when setting up the RPC-80. This makes it easy to maintain a plant-wide standard for PU calculations and to change that standard without making modifications to all the monitors. When using the RPU-120+ with the RPC-80 you must be aware that

different standards for PU calculation (including PU cut-off temperature) may apply to the displayed and printed results.

When using the RPC-42 or RPC-44 the printed results are recalculated to comply with the 0.1°C resolution and 30 second recording interval of older instruments. Slight differences may therefore appear between some of the displayed and printed results in this case also. The PU value is not recalculated in this case.

---

*Why is the exit temperature sometimes not included in the results?*

The moment that the instrument leaves the pasteuriser is judged by a rise in ambient light level from the relatively dark interior. If there are inspection lights inside the pasteuriser or if for any other reason the light level is too high inside the pasteuriser or too low outside it (where the instrument exits) then the result may not be calculated. It may be necessary to improve the lighting at the exit end of the pasteuriser particularly during night shifts.

The sensing sequence is triggered by the temperature of the product first rising above the PU cut-off temperature and then falling below it again before the exit from the pasteuriser. If this does not happen then the result is not calculated.

The light sensor can be seen in the centre of the instrument's front panel above the two top control switches, don't cover this area with tape or adhesive labels.

# Specification

## Technical Specification : RPU-120+ PU Monitor

### Storing data

- max No. of files : 1 (a single recording run)
- max No. of fields : 1440 (a field is one channel record)
- recording timer setting : 4 hours (the maximum recording run)
- recording interval setting : 10 seconds

### Recording inputs

- temperature
- nominal range : -5 to +105 °C \*
- actual indicating range : -4.98 to +104.98 °C
- resolution : 0.02 °C

\* Note that the RPC-80 playback unit can show results in alternative units if required.

### Measuring accuracy - worst case, all errors, including sensors

- temperature : ± 0.25 °C (sensor in range 40 to 80 °C) \*
- : ± 0.4 °C (over rest of range)

\* All sensors are interchangeable within the accuracy specification

### Operating conditions - operation outside these limits may cause permanent damage

- instrument : -10 to +85 °C
- temperature sensor : -30 to +150 °C

### Battery life - from a fully charged battery

- example (a) 1 maximum run : record 4 hours, display 15 minutes, hold file 3 days
- example (b) 15 typical runs : record 1 hour, display 5 minutes, hold file 20 minutes

Assumes that the instrument does not switch off between recordings

### Dimensions

- in frame : (Length x Width x Height)

: 375 x 175 x 160 mm

### Weight

: 6.4 kg including frame and one bottle holder

### Materials

: Stainless steel, toughened glass.

~~~~~  
Calculation of pasteurisation units (PU) can take place in the RPU-120+

- accuracy : better than ± 0.001% for calculation alone \*
- range : 0 to 9999.9 PU
- resolution : 0.1 PU

\* Note that a temperature measurement error of ± 0.25 °C represents ± 8% error in PU value.

Jan 2002

# Safety and Conformity

## Safety warning

Always follow basic safety precautions when using this equipment to reduce risk of injury. Before using the equipment, read and understand the operating instructions in this manual.

This equipment is intended to monitor the pasteurisation process in tunnel pasteurisers. It should not be used for any other purpose.

The equipment should only be connected to other equipment intended for the purpose and manufactured by Redpost Electronic Products Ltd. Suitable battery chargers are RPC-42, RPC-44, RPC-50, RPC-80. Battery chargers from other manufacturers should not be used, they may result in danger.

The equipment may remain hot for some time after being taken from the pasteuriser. Wear protective gloves when carrying.

Always place the equipment on a level, stable surface. Do not place on shelves above eye level.



Equipment: PU Monitor type RPU-120+

Manufacturer: Redpost Electronic Products Ltd.,  
The Old Pumping Station, Toft Rd.,  
Bourn, Cambridge. CB3 7TT U.K.

Directives: 89/336/EEC "Electromagnetic compatibility"  
92/31/EEC amends above  
73/23/EEC "Electrical safety"  
93/68/EEC "CE marking"

Standards applied: EN 50081-1:1992 emissions  
EN 61000-6-2:1999 immunity  
CFR 47:1998 EMC (USA)  
EN 60825-1:1994 LED safety

I certify that this apparatus conforms with the requirements of the above directives.

*Eward F. Aldred*

*4<sup>th</sup> Jan 2001*

E.F.Aldred  
Director  
Redpost Electronic Products Ltd

Date