832 Temperature Regulator
User's Guide

Solutions at Work for You

GILSON
SOLUTIONS AT WORK FOR YOU

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Introduction 1

The 832 Temperature Regulator has many potential applications:

- cooling samples that are not stable at room temperature,
- heating samples when derivatizing, or during enzymatic and other types of reaction.

The 832 may be fitted with one or two Peltier Effect thermostating-cuvettes, which include a cable for connecting to the regulator's electronics.

This type of thermostating-cuvette has many applications using Gilson manufactured and other equipment. Although it was designed for use with XL Sampling Injectors, Liquid Handlers, ASPEC, you can use it with earlier versions of Gilson's equipment.

Only one thermostating-cuvette can be used with the small models (221, 231 and 234). With the larger models, two or three thermostating-cuvettes may be used, but they should not be placed side-by-side in adjacent rack positions.

Overview

User's Guide Description

The 832 Temperature Regulator User's Guide describes Gilson's system for controlling thermostating-cuvettes.

- *Chapter 1* contains an introduction to the 832 Temperature Regulator.

- *Chapter 2* describes the 832 Temperature Regulator and the thermostating cuvette.

- *Chapter 3* tells you how to install an 832 Temperature Regulator and thermostating cuvette.

- *Chapter 4* describes the screens used to set-up and control an 832 Temperature Regulator.

- *Chapter 5* contains maintenance and troubleshooting procedures.

- *Chapter 6* is an appendix containing GSIOC description, part numbers information and technical data.

Hardware Description

The 832 Temperature Regulator is an electronic device capable of controlling the temperature of two racks thermostating using the Peltier effect.

Any one of a variety of racks may be placed in each thermostating-cuvette. Hence, the temperature of vials contained within the rack is controlled with precision.

Unpacking

Inspection of the 832 Temperature Regulator should be done immediately, even if the unit is not to be used until later. The key components are as follows:

- 832 Temperature Regulator
- power cord
- spare fuses.

Upon receipt of your instrument, unpack the unit carefully, inspect it for possible damage, and check the contents of each carton against the list of parts and accessories given in Chapter 6. Report any loss or damage immediately.

Warranty

If the Temperature Regulator does not appear to function correctly, first verify the electrical connections are correct and that the instrument is switched on. Contact your Gilson distributor for technical advice or possibly a service visit. Any service required will be given within the warranty conditions assured by your Gilson distributor.

Customer Service

Gilson and its worldwide network of authorized distributors provide customers with four types of assistance: sales, technical, applications and service.

Customer Service personnel are able to serve you more efficiently if you provide the following information.

1) The serial number of the equipment involved.

2) Type of computer (if used), available memory, microprocessor and software version(s) in operation.

3) The installation procedure you used.

4) A concise list of the symptoms.

5) A list of operating procedures and conditions you were using when the problem arose.

6) A list of other devices connected to the system and a system diagram showing the conditions.

7) A list of other electrical connections in the room.

Safety

Read this Section carefully before installing and operating the equipment.

For safe and correct use of the instrument, it is essential that both operating and service personnel follow generally accepted safety procedures as well as the safety instructions given in the 832 Temperature Regulator User's Guide.

The instrument described in this User's Guide is a temperature regulator that should only be used in the laboratory or similar indoor environment for analytical purposes, by qualified personnel. If the instrument is used in a manner not specified by Gilson, the protection provided by the instrument may be impaired.

Voltages present inside the instrument are potentially dangerous. If there is a problem with the instrument, the power cable should be removed until qualified service personnel have repaired it. This is to prevent anyone from inadvertently using the instrument, thus causing possible harm to themselves or damage to the instrument itself.

The leakage current of this instrument is within the limits allowed by safety standards of laboratory equipment.

An efficient ground connection is imperative for the physical protection of the user.

Power supply cord reference 7080316106 is for use in France and Germany. Power supply cord reference 7080316105 is for use in the USA and Canada. For other countries contact your local Gilson representative. You must only use the type of fuse described and specified in this document: 2 Amp type "T" slow blow which is for use with power supplies between 100V and 240V.

Adequate protection including clothing and ventilation must be provided if dangerous liquids are used in the analytical work. If accidental spillage occurs, carefully clean-up the spillage, taking into account the nature of the spilled liquid, and all of the required safety precautions.

Cleaning, installation, dismantling, maintenance, adjustment and repair should only be performed by personnel trained in such work, and who are aware of the possible dangers involved.

This instrument must not be sterilized using an autoclave or any mechanical device. When you need to clean the instrument, use one of the following methods:

1 - A clean dry cloth.
2 - A cloth dampened with water.
3 - A cloth dampened with soapy water.

If a cloth dampened with soapy water is used to clean the instrument, only domestic soap may be used, no other form of detergent or chemical may be used.

The following symbols appear on the instrument:

Symbol	Explanation
~	Alternating current
⏚	PROTECTIVE CONDUCTOR TERMINAL
I	On (Supply switch)
O	Off (Supply switch)
⚡	Caution, risk of electric shock
⚠	Caution (refer to User's Guide)

Introduction 1

Description   2

This chapter describes the 832 Temperature Regulator and the thermostating-cuvette.

Operating Principle

A Peltier Effect Cell is a thermoelectric device, consisting of an assembly of semiconductor elements between two heat conducting plates. When an electric current is passed in one direction through such a device, the plate on one side is heated, and the plate on the opposite side is cooled. It is sufficient to reverse the direction of current flow to change from heating to cooling, and vice versa.

The thermostating-cuvette for use with the 832 Temperature Regulator incorporates Peltier Effect Cells. One side of each cell exchanges heat energy with the air, and the other side is used to heat or cool the thermostating cuvette, according to the direction of current flow. The current flow is carefully managed by the electronics of the 832 Temperature Regulator under software control. You control the software using the built-in keypad.

There are many potential applications, for example:

- Cooling samples that are not stable at room temperature.
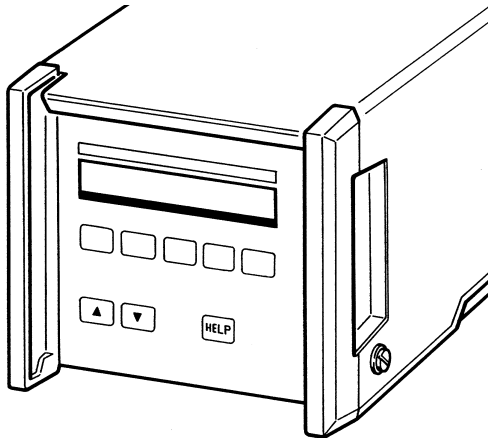
- Heating samples when derivatizing, or during enzymatic and other types of reaction.

Front Panel

The front panel includes a 48-character (2 lines of 24 characters) Liquid Crystal Display (LCD) screen located above a keypad.

The keypad includes five soft-touch keys, which are defined by the software, two arrow keys for changing values and settings, plus a HELP key.

Thermostating Cuvette

Each 832 Temperature Regulator is used to control the temperature of one or two Gilson thermostating-cuvettes, each of which is equipped with an aluminum rack (codes 30, 31, 32, 33, 34, 37, and 38). Each cuvette is controlled independently.

When thermostating-cuvettes are used to cool samples below the ambient temperature, condensation forms on the surface of the rack and falls into the rack wells. This water can accumulate in the wells, forcing the vials to rise and subsequently damaging the needle.

Cover

Rack

Cuvette
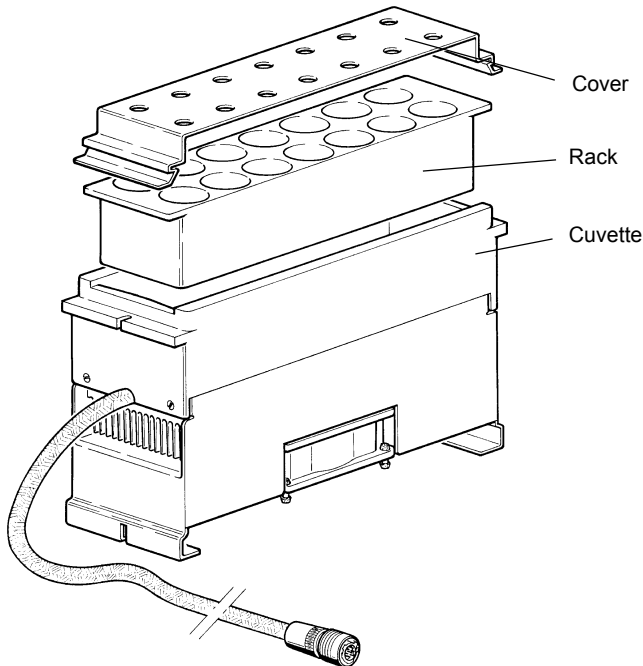
To prevent this from happening you must fit perforated covers to the racks that are being thermostated.

With reference to the figure, the stainless steel rack covers, which clip onto the aluminum racks, are available as additional accessories for rack codes 30, 31, 33, 34, 37, and 38.

Table - Suitable Vials

Instrument - System	Rack (Al)	Vials/ Rack	Suitable Vial Types (Dimensions)
All	30	4 x 15 = 60	2 ml glass or plastic (12 x 32 mm)
All	31	6 x 18 = 108	0.7 ml mini-vial (7 x 40 mm).
All	32	4 x 15 = 60	6 ml glass (13 x 75 mm).
All except for ASPEC XL	32	4 x 15 = 60	9 ml glass (13 x 100 mm)
All	33	2 x 7 = 14	20 ml glass or plastic scintillation (28 x 60 mm).
All	34	3 x 12 = 36	4 ml vial (15 x 45 mm).
234	37	56 + 1	2 ml glass or plastic (12 x 32 mm) + one 20 ml scintillation (28 x 60 mm).
234	38	96 + 1	0.7 ml mini-vial (7 x 40 mm) + one 20 ml scintillation (28 x 60 mm).

Rear Panel

The rear-view shows the following electrical items, and a vent for the fan used to cool the electronic components, which are contained within the 832:

- power receptacle and fuse-holder,
- ON/OFF switch,
- two 7-pin cuvette connection sockets,
- a 9-pin GSIOC socket,
- an 8-pin connector for relay outputs.

Cuvette Connection Sockets

Relay Output Connector

GSIOC Socket

Air Vent

ON/OFF Switch   Power Receptacle/Fuse Holder
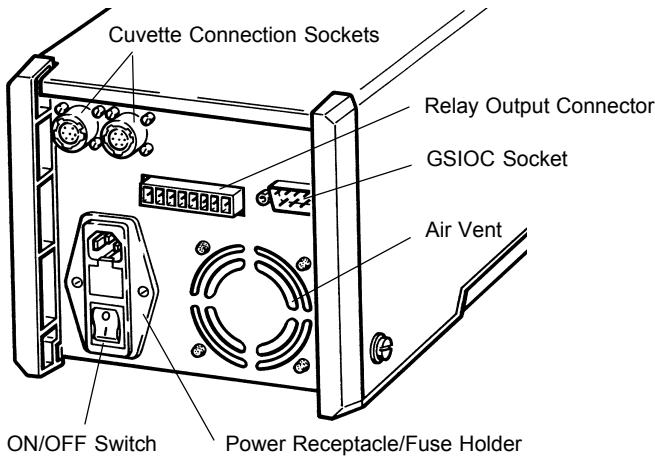
The 832 also contains the following key items, not accessible to the user:

- power supply board,
- logic board,
- keypad control board,
- cooling fan.

When operating the instrument, you must ensure that the fan works and that the ventilation slots are not obstructed in any way.

Installation 3

This chapter tells you how to install an 832 Temperature Regulator and thermostating-cuvette.

Thermostating-Cuvette

Thermostating-Cuvette

There are two types of rack holder available. For Gilson's larger models (232 XL, for example), a rack-holder is available as reference 2704473. For the small models (231 XL, for example) a rack-holder is available as reference 2704471M. When a code 32 rack is used, the thermostating-cuvette can also be placed on the polypropylene tray of the large and the small models.

Carefully install each aluminum rack in its thermostating- cuvette. A good contact between rack and cuvette is essential. Clean both the bottom of the aluminum rack and the inside of the thermostating-cuvette, to ensure that there is no particulate debris between them, before putting the rack into the cuvette. Then, you must correctly position the thermostating cuvette on the rack holder (see the opposite figure).

Although open vials may be used, the liquids to be thermostated must be contained in vials closed with septa, in order to guarantee the temperature specifications, which are valid for liquid contained in the lower part of the tube (i.e. the part that is wholly contained within the aluminum rack). The usable temperature range is linear from 4 to 40 °C. With closed vials, the temperature is accurate to ±1.5 °C

(stability ±0.5 °C) between filled vials placed anywhere in a rack. Improved accuracy can be expected (±1.0 °C) if you wet the contact between the bottom of the rack and the thermostated surface of the cuvette. This is done by putting a few drops of water into the cuvette before installing the rack.

When you use septa you need to fit a septum piercing needle to the arm of your sampling injector. Suitable vials for use with Gilson sampling injectors are listed in the table (page 17).

Thermostating-Cuvette
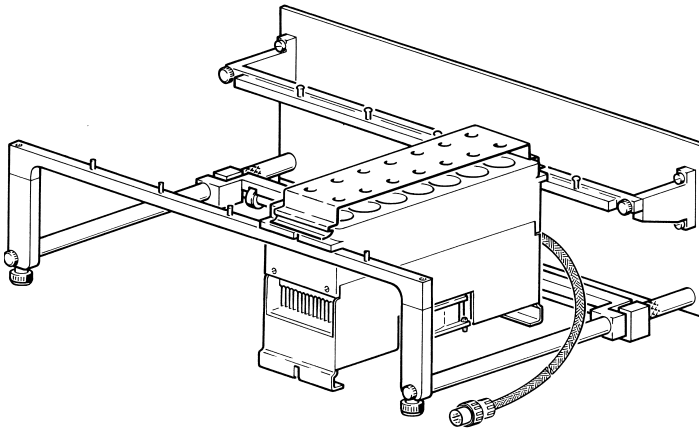
Temperature Regulator

The 832 Temperature Regulator may be used with or without a Gilson Work center. In either case, remember that you are limited by the length of the connecting cable (1.5 m). You must ensure that the temperature regulator is not placed in a position where the air flow around it, or to any of the thermostating-cuvettes, is restricted.

The temperature setting is continuous from 4°C to 40 °C with an increment of 1°C. A vial filled rack at room temperature reaches its working temperature setting in less than one hour. These performances are guaranteed with an ambient temperature between 18°C and 25°C. For rack code 33 the target temperature is reached in just over an hour (typically 75 minutes).

Connecting the Control Cable

Each thermostating-cuvette is fitted with a control lead, which must be plugged into either of the 7-pin sockets at the rear of the 832.
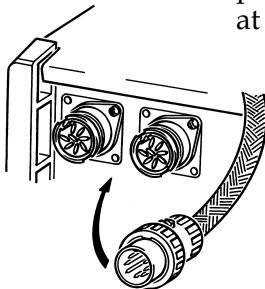
After this is done, the system is ready for use as soon as the power is connected (see below). However, as part of an analytical system you may also have to make other electrical connections (GSIOC or contact) to coordinate

with external equipment.

Take care when plugging the control leads into their sockets. Firstly, the large key-way on the plug **must** be lined up with the corresponding key-way on the socket, then the plug must be pushed gently into the socket. When correctly aligned, the plug clicks into place, where it is held by a retaining ring.

To disconnect, you must first pull back on the retaining ring before you can pull the plug from its socket.

Electrical Power Connections

The 832 Temperature Regulator is designed to operate where mains power supply voltage is between 90 Vac and 240 Vac (50 to 60 Hz.). You have only to insert the fuses supplied with your instrument and then connect the power cord. Remove the power cord if you have any reason to change the fuses.

Inserting or Changing the Fuses

For safety reasons (concerning the internal construction), the power block is installed up-side down. So, the fuse holder is situated below the power cord socket. The fuses are contained behind a small door (see figure opposite).

Fuse holder

ON/OFF switch

Temperature Regulator
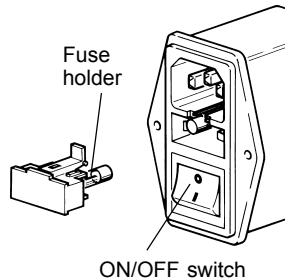
To change the fuses:

1) Carefully pry open the door by inserting a small screwdriver into the access slot at the top of the door.

2) Swing the door upwards.

3) Pry out the old fuses and insert the new ones.

4) Close the door by pushing it firmly inwards until it snaps shut.

System Control and Output Contacts

Introduction

The 832 Temperature Regulator has four output-contact relays, which are electrically isolated from one another and from ground. The output contacts are used to coordinate with other equipment.

Connections are made to the 8-pin connector on the rear panel of the temperature regulator. A barrier strip connector is provided for this purpose, as part of the standard accessory package. With reference to the table below, pin # 1 is at the left-hand side of the connector and pin # 8 at the right.

Table - Output Contacts for 832 Temperature Regulator

Function	Type	Pin #	Comment
Ready A	Output # 1	1 and 2	Temperature stable
Alarm A	Output # 2	3 and 4	Temperature out of limits.
Ready B	Output # 3	5 and 6	Temperature stable.
Alarm B	Output # 4	7 and 8	Temperature out of limits.

The 'Ready' (temperature stable) outputs can be used, under software control, to enable a controlling system to start. The 'Alarm' (temperature out of limit) outputs, which switch off the temperature regulation, can be possibly used to activate a safety file in a pump.

System Examples

The first diagram shows an example of a basic system; the 832 Temperature Regulator is set-up and controlled using its integral keypad. Gilson's 720 Keypad Software is used to control the XL Sampler, which is programmed to wait for contact closure signals before starting.
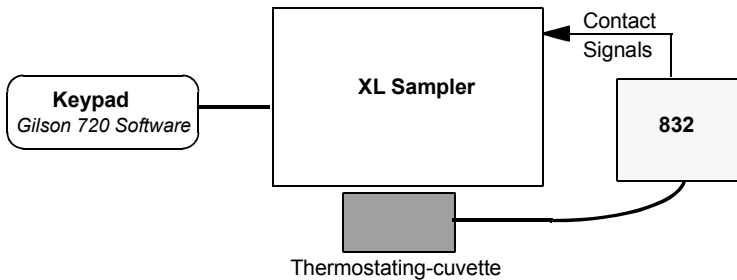
If 720 V2.00 (or higher) is used, the 832 can be connected to the XL Sampler through GSIOC. The WAIT task can be programmed to wait until the 832 has stabilized, before running the 720 application.

The second diagram shows a similar system where the XL sampler is controlled by a computer using Gilson's 735 Software. You should refer to the relevant Gilson User's Guides for connection and programming details.

Contact
Signals

RS232C

XL Sampler

Cable

832

Master Computer (PC)
Gilson 735 Software

Thermostating-cuvette
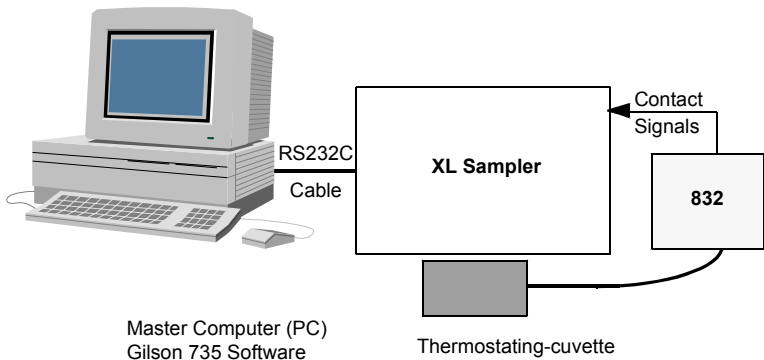
Output-Contact Relay Functionality

The figure shows one of the four output-
contact relays in different conditions.
The other output-contact relays
operate in exactly the same way, but
relate to different functions - see the
table on page 25. Each of the output-
contact relays has two terminals that
are factory set to normally open (no).

Relay

(a) Not Energized   Software closes relay   Relay   Not Energized   **(b)**

Energized   Energized

Internal link

no   nc   no   nc

1   2   1   'Ready A'   2
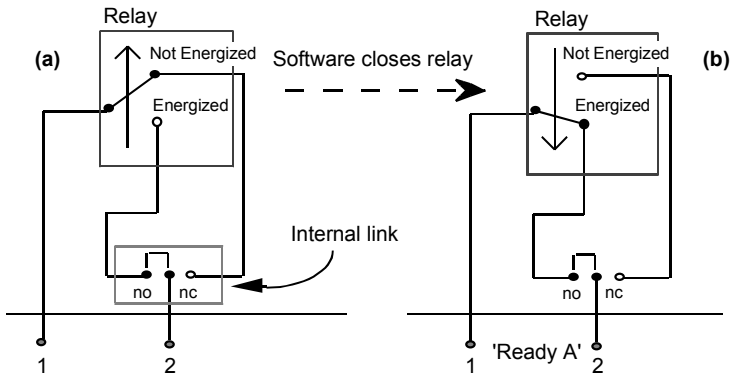
(a) and (b): factory default setting (normally open)

System Control and Output contacts
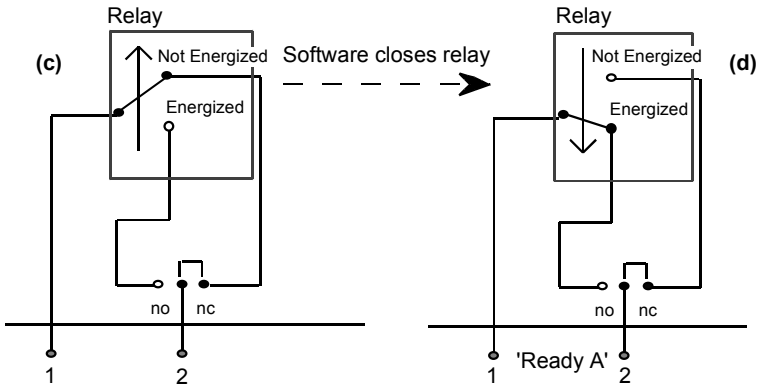
(c) and (d): optional setting (normally closed)

When the internal software of the 832 Temperature Regulator (or external GSIOC command) causes the relay to be energized, the status of the contact is changed from open (a) to closed (b). This status is maintained as long as the relay remains energized.

The default setting of these contacts can be changed by your Gilson agent to normally closed (nc) if required. This is done by changing the position of the internal links. In this case, the status of the contact is changed from closed (c) to open (d).

Control by GSIOC

Introduction

The Gilson Serial Input Output Channel (GSIOC) is a bi-directional bus that connects the system controller (computer, pump, etc.) with as many as ten slave devices with RS422A specifications, or thirty-two slave devices with RS485 specifications. GSIOC is a communications channel for linking Gilson modules and, as is often the case, a computer via a Gilson interface.

Each device connected to the computer via GSIOC has its own identification number (0-63), which may be set using that device's hardware or software. As part of a complete system (see example), the GSIOC unit is selected by the software via the user interface.

The **identification number** of an 832 Temperature Regulator is **set at the factory to 46**; however, it may be changed using the regulator's internal software.

For direct control from a computer, Gilson has developed hardware and software interfaces for IBM personal computers. The system controller sends commands to the various devices within the system. A set of GSIOC commands specific to the 832 Temperature Regulator is given in Chapter 6.

The GSIOC connector is a 9-pin male SUB-D socket, situated on the rear panel of the 832 Temperature Regulator. This input, which is an EMC protected serial channel, uses the GSIOC communications protocol (electric standard RS485).

¤ 1   reserved

¤ 2 - data from slave

¤ 3 - data from master

¤ 4 - clock from master

¤ 5   reserved

¤ 6   reserved

¤ 7 + data from slave

¤ 8 + data from master

¤ 9 + clock from master

The pin-out is as follows:

System Example

Before running a system from a computer you need to connect the devices and install the software. The example represents an isocratic HPLC system with two thermostatically controlled cuvettes. The system is controlled by the computer, linked to the 506C interface with an RS232C cable. GSIOC cables are used to connect the interface and all modules in the system (including for contact control purposes), except the thermostating-cuvettes, which are linked to the 832 Temperature Regulator by their own special cables.

You can start and stop the thermostating process from the computer via GSIOC, or directly from the 832 Temperature Regulator's integral keypad (providing

you first send an 'unlock' command
from the computer).

Master Computer (PC)
Gilson Controller Software

Thermostating-cuvettes
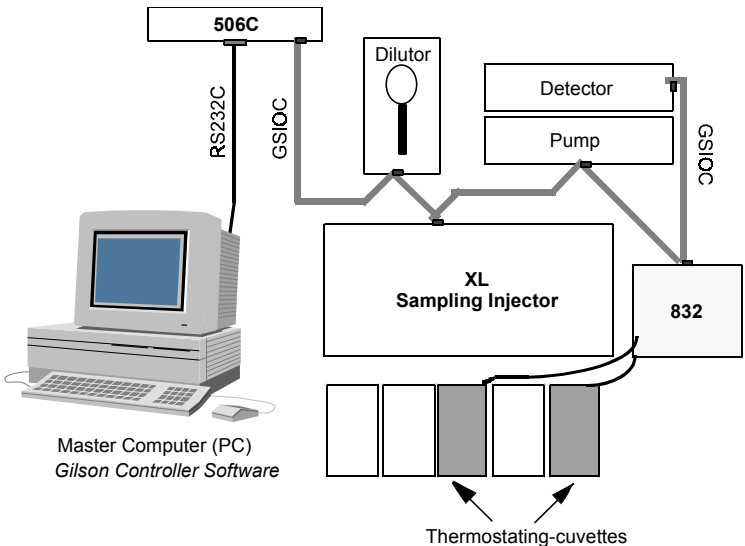
Normally, the system waits for the
target temperature to be reached
before starting the run. However, you
may **initiate** a run before the target
temperature is reached. The system
stops if the temperature goes out of a
user-set security gap (defaults to ± 2
degrees).

Installation 3

Setting-Up and Operating 4

The purpose of the 832 Temperature Regulator is to control the temperature of samples contained in one or two racks. Each rack must be placed in a Gilson Peltier-Effect Thermostating-cuvette.

The 832 Temperature Regulator can be operated manually or under the control of a master device (system controller).

Switching-On

Press the toggle switch mounted on the rear panel of the 832 Temperature Regulator to turn it on (I = on, O = off).

MODEL 832 VX.XX

The following display, indicating the currently installed software version, appears for three seconds:

Using the Keypad

Soft-Keys

There are five white soft-keys situated below the 48-character display unit (two lines each of 24-characters). The bottom line of the display unit is used to indicate the soft-key options. Pressing one of the white soft-keys selects the option displayed directly above that key. The soft-keys perform different functions according to the screen being displayed. (Refer to 'Setting-Up'.)

Arrow Keys

This pair of keys perform the following functions:

Up Arrow: increases a numeric value by one unit* or switches between options.

Down Arrow: decreases a numeric value by one unit* or switches between options.

* The value steps one unit each time the key is pressed, but you can make the values change continuously by continuing to press the key.

HELP Key

This key provides you with on-line help messages, when in the ready-to-run mode or in the set-up mode. To access this facility, press the **HELP** key.

A message is displayed on the first line of the display unit. Press **Next,** one or more times, to view the rest of the message:

```
Top line is status line
                     Next     Quit
```

```
Ready, 10 to 60 minutes
                     Next     Quit
```
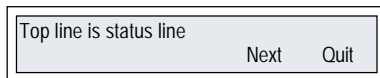
Pressing **Quit** returns you to the normal modes of display.

Setting-Up

Setting-Up

```
┌─────────────────────────────┐
│                             │
│       MODEL 832 VX.XX       │
│                             │
└─────────────────────────────┘
```

Switch on the 832 and this screen displays for 3 seconds, then the next appears.

1)   2)   3) 4)

```
┌─────────────────────────────┐
│ TA     xxx/aaa U   Ready   ┐│
│ 1°        Menu     R_B   Go ││
└─────────────────────────────┘
```

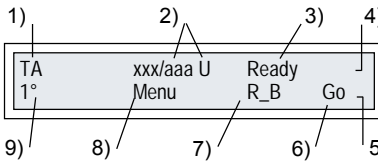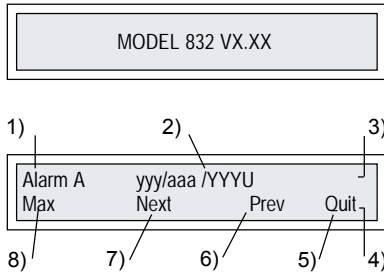9)   8)   7)   6)   5)

A description of each item is given in the following table.

1) Rack Indicator	This indicates the thermostating-cuvette (rack) to which the temperatures relate (A or B).
2) Temperature Indicators[1]	'xxx' represents the actual temperature of the thermostating-cuvette. 'aaa' represents the target temperature[2] for thermostating-cuvette A. 'bbb' represents the target temperature[2] for thermostating-cuvette B. 'U' indicates the temperature units, see below (9).
3) Status Indicator	'Ready' indicates the temperature of the thermostating-cuvette is stable at the target value. 'Heating' indicates that the temperature of the thermostating-cuvette is below the target value. 'Cooling' indicates that the temperature of the thermostating-cuvette is above the target value.
4) Status Line	Tells you the status of the selected thermostating-cuvette.
5) Soft Key Labels	Tell you the function of the soft-touch keys for this screen (see below).
6) Go/Stop Key[3]	Press **Go** to start controlling the temperature of the thermostating-cuvette. Press **Stop** to stop controlling the temperature of the thermostating-cuvette - the power is cut of to the selected rack.
7) Rack Change Key	To display the status line relating to the second rack under the control of the same 832.
8) Menu Key	Push this key to display the alarm set-up screen and change to the set-up mode, enabling you to change other parameters and options.
9) Change Temperature Units	Push this key one or more times to change the displayed temperature units: °F = Fahrenheit, °C = Celsius, K = Kelvin

[1] If either A or B is not connected, the information about the temperatures is not displayed; instead, **after pressing 'Go'**, the message 'Rack A(B) absent' appears alternately on the status line.

[2] Some dashes appear under the target temperature, which can be set with the up and down arrow keys.

[3] When **Go** is pressed, 'Stop' appears and the status is updated. When **Stop** is pressed, 'Go' appears.

Alarm Screen

Starting from the ready-to run screen, press the **Menu** soft-key to access the alarm set-up screen. You can adjust the minimum and the maximum temperatures for which the alarm is set. This is done for both of the thermostating-cuvettes (racks).

```
┌──────────────────────────────────────┐
│           MODEL 832 VX.XX            │
└──────────────────────────────────────┘

1)              2)                    3)

┌──────────────────────────────────────┐
│  Alarm A       yyy/aaa /YYYU         │
│  Max           Next        Prev  Quit│
└──────────────────────────────────────┘

8)        7)         6)         5)   4)
```

1) Alarm Indicator	This indicates the thermostating-cuvette (rack) to which the temperatures relate (A or B).
2) Temperature Indicators	'yyy' represents minimum alarm temperature[1] of the thermostating-cuvette. 'YYY' represents maximum alarm temperature of the thermostating-cuvette A. 'aaa' represents the target temperature for thermostating-cuvette B. 'bbb' represents the target temperature for thermostating-cuvette B. **You may set different alarm limits for each rack.** 'U' indicates the temperature units, (°C, °F, or K).
3) Alarm Status	Identifies the thermostating cuvette (rack) and indicates the temperature limits.
4) Soft Key Labels	Tell you the function of the soft-touch keys for this screen (see below).
5) Quit	Press **this key to return to the ready-to-run screen.**

6) Prev	This key is used to return to the previous screen accessed, except for the first screen, the ready-to-run display is returned.
7) Next	This key is used to skip to the next screen, except after the last screen, the ready-to-run display is returned.
8) Change Limits	Press this key to toggle between the maximum and minimum[2] alarm values.

[1] Some dashes appear under the alarm temperature, which can be set with the up and down arrow keys.

[2] Press **Max** to access the maximum value (tmax), the flashing cursor shows under YYY ('Min' then shows above the soft touch key). Use the up and down arrow keys to adjust the alarm temperature value. Press **Min** to access the minimum value (tmin), yyy ('Max' then shows above the soft touch key). Use the up and down arrow keys to adjust the alarm temperature value.

The alarm temperatures may be set at any value between 2°C and 42°C. If the target temperature changes, tmin is reset by default to target minus 2°C and tmax is reset by default to target plus 2°C.

Options Set-Up Screen

Starting from the alarm set-up screen, press the **Next** soft-key to access the first of the option set-up screens. You can access all of the screens shown in the set-up, which shows how to get from one screen to another; arrows show the viable routes. You move from one screen to another by pressing selected soft-keys, which are fully described above.

After entering the option set-up menu, **Next** and **Prev** are used to move from one screen to the next. You can change any, all, or none of the screens.

A flashing cursor appears beneath the parameters that may be changed. Press **Quit** to leave the set-up menu at any point in the procedure.

Options:

These screens relate to the 832 itself. Use either of the arrow keys to toggle between 'Yes' and 'No'.

For the beeper if 'No' is selected, the beeper does not sound when an alarm condition occurs.

```
Beeper                              Yes
              Next        Prev      Quit
```

For 'auto-restart' if 'No' is selected, the auto-restart function, after a power failure, is suppressed.

```
Alarm cut power                     Yes
              Next        Prev      Quit
```

```
Auto restart                        Yes
              Next        Prev      Quit
```

For 'GSIOC', use either of the arrow keys to change the Unit ID (identification number). You may enter a value between 0 and 63. Normally, this number is left at the default value of 46. Press arrow keys to change values.
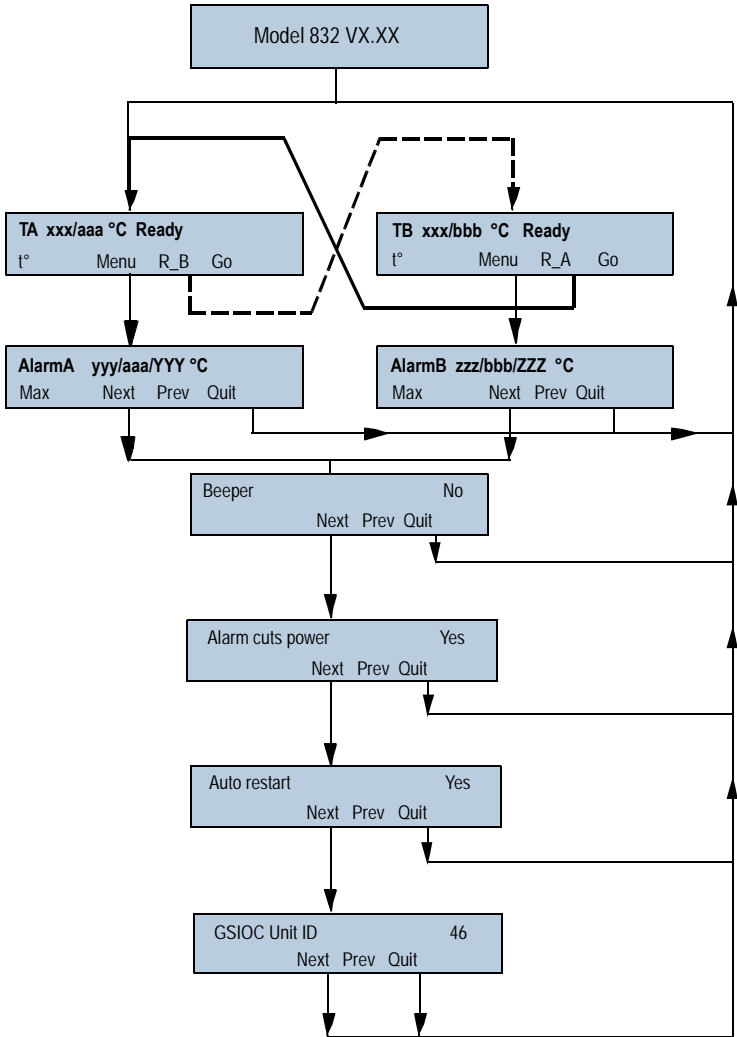
```
GSIOC Unit ID                        46
              Next        Prev      Quit
```

The value of the GSIOC baud rate is factory set to 'external', but may be changed by your supplier to: 300, 600, 1200, 2400, 4800, 9600, or 19200.

Setting-Up

Model 832 VX.XX

TA xxx/aaa °C Ready			
t°	Menu	R_B	Go

TB xxx/bbb °C Ready			
t°	Menu	R_A	Go

AlarmA yyy/aaa/YYY °C			
Max	Next	Prev	Quit

AlarmB zzz/bbb/ZZZ °C			
Max	Next	Prev	Quit

Beeper	No
	Next Prev Quit

Alarm cuts power	Yes
	Next Prev Quit

Auto restart	Yes
	Next Prev Quit

GSIOC Unit ID	46
	Next Prev Quit

Operating

Setting the Target Temperatures

1) Switch on the power to the 832.

2) Wait 3 seconds for the ready-to-run screen to appear.

3) Select the rack to regulate (press **R_A** or **R_B**).

4) Select the temperature units to display (press **t°**).

5) Use the up and down arrow keys to change the temperature.

6) Set the alarm temperatures (and options). To access the set-up menu, press **Menu**.

7) Repeat for the second rack (if controlled by this regulator).

Manual Sart-Up

To operate an 832 Temperature Regulator as a stand alone unit, assuming that the set-up parameters are defined, you should:

1) Switch on the power to the 832.

2) Set the target temperature.

3) Press the **Go** key; 'Heating' or 'Cooling' is displayed, or 'Rack A(B) Absent', if not connected.

4) Wait until the target temperature stabilizes; 'Ready' is displayed.

You must wait, as a minimum, 10 minutes for conditions to stabilize. In some cases it can take up to 60 minutes for the ready state to be reached, depending on the conditions.

The graph (obtained empirically) shows the time required for the target temperature to be reached from an ambient temperature (T_{amb}) of 25° C. For example, the time required to attain a stable 13°C, when the ambient temperature is 25°C, is about 30 minutes. Similar curves can be plotted for other ambient temperatures.

Please note that the overall time taken to achieve a stable target temperature depends on the difference between the ambient and target temperatures.
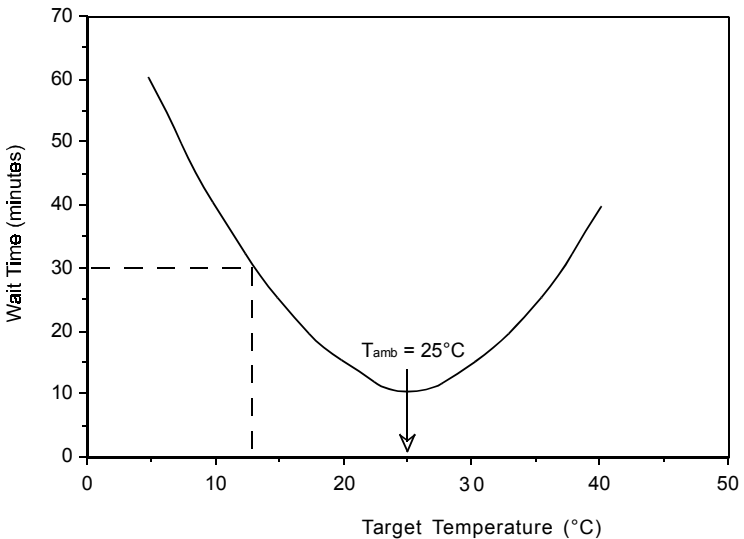
However, because the thermostating process is not linear with time, you may observe that while the temperature is being regulated the early changes in temperature take place more rapidly than those towards the end of the process. In fact, the temperature may appear to have been reached for some minutes before the ready signal is given.

Manual Shut-down

1) Press the 'Stop' key; 'Cooling' or 'heating' is displayed (power to the racks is cut off).

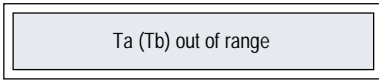2) Switch of the power to the 832 Temperature Regulator.

External Control

As part of a larger system, the 832 Temperature Regulator can be controlled externally by a master device. You may emulate the keypad, start and stop regulating the temperature using GSIOC commands. If the 832 Temperature Regulator is under control of a computer, the screen displays 'Keyboard locked' on the lower line. To operate the 832 Temperature Regulator again as a stand alone unit, the regulator's keypad must first be unlocked at the controlling device, using the Unlock command (see GSIOC Commands).

Operating

Alarm Conditions

Temperature Out of Range

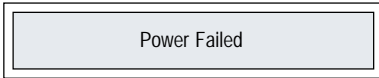If the measured temperature of either of the thermostating- cuvettes reaches either the maximum or minimum alarm temperatures, the following **flashing** message is displayed at the 832 Temperature Regulator:

> Ta (Tb) out of range

The beeper sounds (if selected). Stop by pressing any key.

The controlling device is alerted (if external).

Power Supply (Mains) Failed

If the power fails while operating an 832 Temperature Regulator, the beeper sounds (if selected) and the following message is displayed on the keyboard unit, when the power is restored:

> Power Failed

Press any key to acknowledge and remove this message.

Safety Files (with Gilson Equipment)

When an alarm situation occurs, the controlling device is alerted by contact closure signals or GSIOC. In either case, you may program a safety file to respond in the appropriate manner; for example, to stop pumps.

Maintenance and Troubleshooting   5

This chapter contains maintenance and troubleshooting procedures.

Maintenance

Maintenance

The 832 Temperature Regulator is designed to require a minimum level of maintenance. In practice maintenance is limited to keeping the units clean.

Troubleshooting

Warning Messages

The warning messages are displayed alternatively with the current display. If the alarm is on, the beeper sounds.

The key warning messages are:

- After a power failure occurs, the message 'Power failed' appears (whether auto restart is ON or OFF) until you press a key.
- When the measured temperature is out of range (tmax/tmin) and the 832 Temperature Regulator is ready, or fails to achieve the target temperature after more than one hour, the message ' TA or (TB) out of range' appears.
- The 'Keypad locked' message appears when the 832 Temperature Regulator is under external control via GSIOC.

You can stop the beeper of the alarm by pressing any key on the front-panel.

Error Messages

If a rack is not connected, a flashing message 'Rack A(B) absent' appears on the first line of the main menu. This message appears only if you press the **Go** soft-key. When an error occurs, a flashing message is displayed describing the error.

The possible errors are:

Problem	Message
EPROM checksum error	'EPROM checksum error'
RAM error	'RAM error'
PELTIER failure	'Peltier A(B) failed'
No information from probe	'Probe A(B) failed'

Electrical Problems

If the 'ready-to-run' display does not appear within a few seconds of switching on the 832 Temperature Regulator, check that the mains supply is switched on and then check for the following possible causes.

If the measured temperature is outside pre-set limits, the power supply to the unit is switched off automatically. Check that the air inlets to the rear and bottom of the cuvettes are not obstructed, and that the fan mounted on the rear panel of the regulator is operating before calling the service agency.

Problem	Possible Cause	Solution
Does not operate	Power cord unplugged or fuse blown or temp. out of safety limits	Check for power See Section 3.2. Check service agency
Rack does not regulate	Cord not connected	Plug in cord

Appendices 6

This chapter contains GSIOC description, part numbers and technical data (specifications).

Microcomputer Control (GSIOC)

Introduction to GSIOC

There are two basic command types that the controller can sends to a slave device: buffered commands (B), and immediate commands (I). Slave instruments execute buffered commands as background processes. Immediate commands have a higher priority; the slave interrupts the execution of a buffered command to execute an immediate command.

Below is the list of available commands in alphabetical order. This list can be used as quick reference guide. All commands are detailed below with their function. Immediate commands also have their response format described. Comments are added where necessary.

Command Descriptions

Below is the list of available commands in alphabetical order. This list may be used as a quick reference guide.

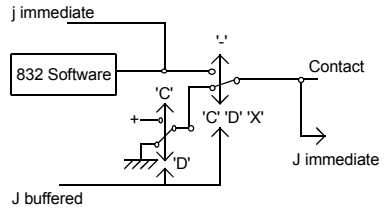A detailed description of each command is given after the table.

Appendices 6

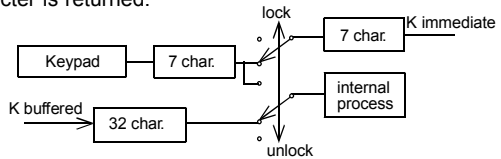| Command	Type	Function
$	I	Perform master reset.
%	I	Request module identification.
?	I	Request status.
J	B	Write contact outputs.
J	I	Read contact outputs.
j	I	Read contact output buffer.
K	B	Simulates front panel keystrokes.
K	I	Read key entry.
L	B	Lock keypad display.
P	B	Assign a value to a parameter.
P	I	Read parameter value.
S	B	Start/stop temperature control.
T	I	Read temperature value(s).
t	I	Read temperature probe signal.
U	B	Unlock keypad display.
W	B	Write to keypad display.
W	I	Read keypad display.
w	I	Read display buffer.0°C.

Immediate Commands

Command	**%**
Function	Request module identification
Response format	'832Va.bc'
Where	Va.bc identifies the software version
Command	**?**
Function	Request status
Response format	'abcdeabcde'
Where	a is the start/stop status: 'R' for running, 'S' for stop.
	b is the regulation status: 'R' for ready, 'H' for heating, 'C' for cooling, '|' if not running.
	c is the control status: 'U' for unlocked, 'L' for locked.
	d is the temperature alarm: 'N' for no alarm, 'T' for alarm.
	e is the rack concerned: 'A' for rack A, 'B' for rack B, '|' if rack absent
Command	**$**
Function	Perform master reset
Response format	'$' is echoed

Command	**J**
Function	Read contact outputs
Response format	'abAabB'
Where	'abA' is channel A
	'abB' is channel B
For each output	'C' if closed and connected from software
	'c' if closed and disconnected from software
	'D' if open and connected to software
	'd' if open and disconnect from software

Command	**j**
Function	Read contact output buffers
Response format	'abAabB'
Where	'abA' is channel A
	'abB' is channel B
For each output	'C' if closed and connected to software
	'c' if closed and sisconnected from software
	'D' if open and connected to software
	'd' if open and disconnected from software

| **Command**	**K**
Function	Read key entry
Response format	'xx...x'
Where	'xx...x' is an ASCII string, 1 to 7 characters long, encoding the keys pressed (see table with K buffered, page 54)
Comments	If no key is pressed, or if the keyboard has not been disconnected by a buffered 'L' command, the '|' character is returned.

Command	**P**
Function	Read value of parameter
Response format	'nn = mmm'
Where	'xx..x' is an ASCII
	'nn' identifies the parameter (see table with P buffered, page 55)
	'mmm' is its value

Comments	Use the 'Pnn' command to first indicate the parameter to be reviewed.

Command	**T**
Function	Read rack temperature value
Response format	'nnnXnnnX'
Where	'nnn' is the temperature value in °C
	'X = A' for rack A, 'X = B' for rack B

Command	**t**
Function	Read temperature probe signal
Response format	'nnnnXnnnnX'
Where	'nnnn' is the value of the temperature probe converter (up to 255)
	'X = A' for rack A, 'X = B' for rack B

Command	**W**
Function	Read display
Response format	'Wn=xx..xx'
Where	'n' is the line number
	'xx..xx' is a 24-character alphanumeric string
Comment	The first line to be returned is the last entered by the buffered W command. If the write commands has not been used, the upper line of the display is read at the first occurence of the read command.
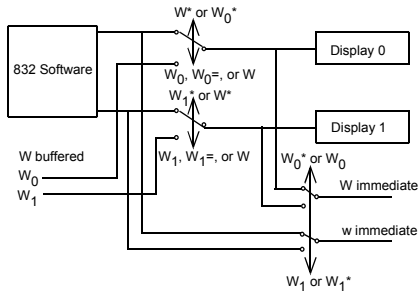
w disconnect both lines   w* reconnect both lines
w_0 disconnect line 1 w_1 disconnect line 2
w_0* reconnect line 1 w_1* reconnect line 2

w_0=   xx..x disconnect and write xx..x+<spaces..> on line 1
w_1=   xx..x disconnect and write xx..x+<spaces..> on line 2
Care !w_0= nothing, erase line 1,
         w_1= nothing, erase line 2.

Command	**w**
Function	Read display buffers
Response format	'Wn=xx..xx'
Where	'n' is the line number
	'xx..xx' is a 24-character alphanumeric string
Comment	The reading mechanism is the same as immediate W. The response is the image of the related display line as it would be if not connected to the GSIOC bus. This is also the line restored to the display after a reconnect line command.

Buffered Commands

Command	**J**
Function	Write contact outputs
Response format	'Jabc'
Where	'a' is the ready output
	'b' is the alarm output
	'c = A' for rack A, 'c = B' for rack B
Parameters	'C' to close
	'D' to open
	'X' to leave unchanged
	'-' to reconnect to internal software.

Command	**K**		Key	Code
Function	Simulates front panel keystrokes		F1	'a'
Syntax	'Kxx..x'		F2	'b'
	up to 32 ASCII codes per command		F3	'c'
	'xx..xx' is a 24-character alphanumeric string		F4	'd'
Parameters	ASCII codes as follows		F5	'e'
			↑	'f'
			↓	'g'
			HELP	'H'

Command	**L**
Function	Lock keypad
Syntax	'L'
Comment	This commands locks the keypad. 'Keypad locked' is shown on the lower line of the display.

Command	**P**
Function	Assigns a value to a parameter
Syntax	'Pnn=mmm'
Where	'nn' is the parameter code (see table)
	'mmm' is the value assigned to the parameter
	The following table identifies the code (nn) assigned to each of the parameters. It is also lists the range of values (mmm) that can be entered.

Code (nn)	Parameter	Value (mmm) Min	Max
00	Temperature target rack A °C	4	40
01	Min temperature rack A °C	0	50
02	Max temperature rack A °C	0	50
03	Temperature target rack B °C	4	40
04	Min temperature rack B °C	0	50
05	Max temperature rack B °C	0	50
06	Proportional coeff. (heating)	0	xxxx
07	Proportional coeff. (cooling)	0	xxxx
08	Integral coeff. (heating)	0	xxxx
09	Integral coeff. (cooling)	0	xxxx
10	Differential coeff. (heating)	0	xxxx
11	Differential coeff. (cooling)	0	xxxx

Comment	The command 'Pnn' sets the parameter pointer to the specified parameter, where 'nn' identifies the code assigned to the parameter. If the value is omitted or out of range, the command is ignored.

Command	**S**
Function	Start/Stop regulating
Syntax	'SnX'
Where	'n = 0' for stop, 'n = 1' for start
	'X = A' for rack A, 'X = B' for rack B.

Command	**U**
Function	Unlock keypad
Syntax	'U'
Comment	This command unlocks the keypad. The lower line of the display is restored.

Command	**W**
Function	Write display
Syntax	'Wn=xx..xx''
Where	'n' = line number, 0 for the upper line, 1 for the lower line
	'xx..xx' is an alphanumeric string up to 24 characters long, non-ASCII characters are not allolwed (i. e. codes above 127). Extra characters may cause an unpredictable result. If less than 24, string is padded with trailing spaces.
Comment	When this command is sent, the designated line is disconnected from the internal software. Lines may be individually reconnected to the software by sending W_0 or W_1. Sending W alone reconnects all of the display. The sign '°' is replaced by '│' in all W commands. Characters shown on display unit may differ from those sent from controller.

Part Numbers and Accessories

Part Numbers

Part Number	Item	Qty
LT801224	User's Guiide	1
6730204007	Fuses 2 Amp type 'T' slow blow	5
7080316106	Power cord, 220-240 Volts	1
7080316105	Power cord, 100-120 Volts	1

Additional Accessories

Part Number	Item	Qty
2759550	Peltier Effect Thermostating-cuvette	1
2704473	Rack holding kit for use with Thermostating-cuvettes on **large** samplers/sampling injectors	1
2704471M	Rack holding kit for use with Thermostating-cuvettes on **small** samplers/sampling injectors	1
27044307	Rack cover (SS) for code 30 (Al) racks	1
27044317	Rack cover (SS) for code 31 (Al) racks	1
27044337	Rack cover (SS) for code 33 (Al) racks	1
27044347	Rack cover (SS) for code 34 (Al) racks	1
27044377	Rack cover (SS) for code 37 racks	1
27044387	Rack cover (SS) for code 38 racks	1
638308512	Barrier strip connector for electrical control (8 pin)	1

Technical Data

Temperature Regulator

Type: Microprocessor Controlled

Size and Weight: 29 x 16 x 14 cm.
3.8 kilograms.

Temperature:
Range: 4 °C to 40 °C. Increment: 1 °C.
Accuracy: ± 1.5 °C*. Stability: ± 0.5 °C.
Unit: °C, °F, or K.

± 1.0 °C can be achieved, see Chapter 3.

User Interface: 2 x 24-character LCD display, soft touch keypad. Built-in help messages.

Safety Features:
Permanent display of temperature.
Temperature out of limit contact outputs.

Electrical Interfaces:
Control cable (length 1.5 m).
Gilson Serial Input Output Channel (GSIOC) ID#46.

Power Requirements: 90-240 Vac, 50-60 Hz, 250 VA.

Line Frequency: 47 to 63 Hz.

Humidity: Up to 80 %.

Altitude: Up to 2000 m.

Pollution: Pollution degree 2.

Installation: Category II

Technical Data

Conformity to Norms *(From serial 168001)*:

Electrical equipment for measurement control and laboratory use, EMC requirements. Gilson's 832 Temperature Regulator conforms to EEC Directive 89/336/EEC for electromagnetic compatibility:
Standard EN 50081-1 (1992) for emission,
Standard EN 50082-1 (1998) for immunity.

Gilson's 832 Temperature Regulator conforms to EEC Directive 73/23/EEC for safety:
Standards EN 61010-1 (1993 including AMD A2 1995),
UL 3101-1 (1993), and
CAN/CSA 1010-1 (1992 including MOD2 1997).

Each 832 is subjected to a Dielectric Test (1500 V between live/neutral and earth) and an Earth Bonding Impedance Test (≤ 0.1 Ω).

Thermostating-Cuvettes

Type: Peltier Effect Cell.

Size and Weight: 24 x 8 x 14,5 cm.
3 kilograms.