Instruction Manual

peqSTAR

Thermal cycler

peqSTAR 2X Double block thermal cycler
peqSTAR 96X, 384X and in situ X thermal cycler

peqlab
a VWR company

CONTENT

		page
1	System Overview	1
2	Safety instructions	1
3	License Notice	2
4	Installation	2
4.1	Content of delivery	2
4.2	Installing the thermal cycler	2
4.3	Operation of the thermal cycler	2
4.4	Connections of the thermal cyclers	3
5	General Operation	3
6	Main menu	4
6.1	Run	4
6.2	Programs	4
6.3	Diagnostics	4
6.4	GLPs	4
6.5	System	4
6.6	Help Button	4
7	Run dialogue	5
7.1	Run dialogue: Overview	5
7.2	Run dialogue: Operating elements	5
7.2.1	Incubation mode	5
7.2.2	Start	5
7.2.3	Stop	5
7.2.4	Pause	5
7.2.5	Info button	6
7.2.6	Lid lock / unlock	6
7.2.7	Select program	6
7.3	Select Program dialogue	6
7.4	Info Button	6
7.4.1	Steps	6
7.4.2	Program Options	7
7.4.3	Print	7
7.5	Lid lock / unlock	7
7.6	Starting a program	7
7.7	A program is running	8
7.7.1	General: 'Pause' and 'Stop' button	8
7.7.2	'Pause' button	8
7.7.3	'Stop' button	8
7.7.4	Status Display	8
7.7.5	Program window	9
7.7.6	Save GLP Report	9
7.7.7	Not create GLP Report	9
7.7.8	Switch off the GLP report query	9
8	Incubation mode	10
8.1	Run incubation	10
8.2	Setting the block and lid temperature	10
8.2.1	Stop	10
8.2.2	Lid lock / unlock	10
8.2.3	Timer	10
8.2.4	Block	10
8.2.5	Lid	10
9	Programs	11
9.1	Program selection	11
9.1.1	Open a program	11
9.1.2	Copy	11

9.1.3 New program 12
9.1.4 New folder 12
9.1.5 Delete 12
9.1.6 'Info' button 12
9.2 Operating elements of the 'Programs' dialogue 13
9.2.1 Entering a command 13
9.2.2 List view 13
9.2.3 Diagram view 13
9.2.4 New program 14
9.2.5 Open a program 17
9.2.6 Info-Button 17
9.2.7 Deleting a command from the program 17
9.2.8 Saving a program 17
9.2.9 Save & Run 17
9.2.10 Editing a command 17
9.3 Available commands (program steps) 18
9.3.1 Unlock 18
9.3.2 Lock 18
9.3.3 Heat Lid 18
9.3.4 Temperature 19
9.3.5 'Elongation Time' and 'Melting Temp.' 19
9.3.6 Gradient step 19
9.3.7 Cycle: 21
9.3.8 Start Cycle - Manual cycle beginning 21
9.3.9 Close Cycle - Manual cycle ending 21
9.3.10 Pause 21
9.3.11 Store 21
10 Diagnostics 22
10.1 Operation of the 'Diagnostics' dialogue 22
10.2 General view 23
10.2.1 Zones 23
10.2.2 Single view 23
10.2.3 Automatic scrolling active 23
10.2.4 Automatic scrolling inactive 23
11 GLPs dialogue 24
11.1 Displaying a GLP report 24
11.2 Operating elements of the 'GLPs' dialogue 24
11.2.1 Select GLP 24
11.2.2 Open GLP report 24
11.2.3 Printer 24
11.2.4 Delete 25
11.2.5 Copy 25
11.2.6 New folder 25
12 System 26
12.1 Time / Date 26
12.2 Show/Hide mouse cursor 26
12.3 User Call 26
12.3.1 Sound 26
12.3.2 Email 27
12.4 User Management 28
12.4.1 Change User 29
12.4.2 User Management 29
12.4.3 Setting up a new user group 30
12.4.4 User logout 31
12.5 Network Settings 32
12.6 Hardware 33

12.6.1 Overtemp test 33
12.7 Firmware 33
12.7.1 Control Unit 33
12.7.2 Power Unit 35
12.8 Print 35
12.9 Display 36
12.9.1 Brightness 36
12.10 Protocol 36
12.11 LAN Control 36
12.11.1 New Lan Connect 36
12.11.2 Lan Connect 37
12.11.3 Lan Disconnect 37
12.11.4 Zigbee Configure 37
12.11.5 Zigbee Connect 38
12.11.6 Zigbee Disconnect 39
12.12 USB Recovery 39
12.13 Service 39
13 Maintenance & repair of the Thermal cycler 40
13.1 Cleaning, maintenance and repair of the thermal cycler 40
13.2 Test of the overtemperature protection 40
13.3 Temperature check-up 40
13.4 Calibration 40
14 Warranty 40
15 Disposal Instruction 41
16 Technical data 41
16.1 General characteristics 41
16.2 Gradient feature (optional) 41
16.3 User interface/functions 41
16.4 Block capacity 42

1 SYSTEM OVERVIEW

The peqSTAR X thermal cyclers are the ideal PCR devices for all molecular biological and biochemical laboratories working in the field of basic research or routine diagnostic. The 250 °C HTR (High Temperature Range) Peltier technology allows quick changes in temperature up to 5 °C/sec (max). The individual monitoring and controlling of each of the eight or 16 Peltier elements per block equipped with 'Long Life Technology' ensure the tightest correlation of target and actual temperature across the entire thermal plate leading to highest reproducibility of the results. To avoid condensation each block is equipped with a heated lid (except for the in Situ block).
The peqSTAR X thermal cyclers are equipped with a touch-sensitive, graphic colored TFT display of the newest generation, allowing operation of the device by simply touching symbols and graphic elements on the screen. This leads to easy and intuitive handling and programming of the device. Additionally a mouse can be connected via USB.
Furthermore an Ethernet port is available to connect the devices with the Microsoft Windows® or Linux network. It is therefore possible to use an external server for archiving programs and GLP reports which will be available globally in the network (e.g. for other thermal cyclers).
Transfer of data can be done by using commercially available USB memory sticks enabling a nearly unlimited saving space for programs and GLP reports, which can be printed using a printer connected to the thermal cycler via the network.

Notice: The USB ports support only standard cable mice and standard USB sticks.
The maximum acceptable length of the connecting cable of the port is 3 m!

2 SAFETY INSTRUCTIONS

Before the first use of the thermal cycler please read the instruction manual entirely.

Special notice should be taken of the following

Caution of dangerous voltage
Please ensure the voltage indicated on the device exactly matches your local electrical supply.

Caution of dangerous explosive material
Explosive or reactive material mustn't be heated in the thermal cycler.

Caution - liquids
Ensure that no liquids can enter the device.
Reaction tubes must be filled outside of the thermal cycler.

Caution - hot surfaces
The thermal plate, the heated lid and the reaction tubes quickly reach temperatures above 50 °C. There is danger of burning! Keep the lid closed until the temperature reaches 30 °C or less. Only use materials (tubes, tube caps, plates and sealing films) which are heat resistant to 120 °C.

Caution – environment
The ventilation of the device must not be covered.

Note: If the thermal cycler is used in any manner not specified in these instructions, the intended protection of the user can not be guaranteed.

3 LICENSE NOTICE

This instrument is licensed for research and development and for uses other than human in vitro diagnostics under one or more of the following patens of Applera Corporation: U.S. Patent Nos. 5,656,493, 5,038,852, 5,333,675, 5,475,610 (claims 1-159 and 164-166), 6,703,236 (claims 7-10) and 7,238,517 or corresponding claims in their non-U.S. counterparts. No right is conveyed expressly, by implication or by estoppels under any other patent of Applera, including but not limited to U.S. Patent No. 6,814,934 and its non-U.S. counterparts, which describe and claim thermal cyclers capable or real-time detection.

4 INSTALLATION

4.1 Content of delivery

1 Thermal cycler
1 Power cord
1 Instruction manual
1 CD PC-software 'peqSTAR Manager'

Please check delivery for completeness and transport damage upon arrival. If any transport damage is noticed, contact your distributor or manufacturer immediately.
IMPORTANT NOTICE: IF YOU FIND ANY DAMAGE OF THE DEVICE, DO NOT USE THE DEVICE!

4.2 Installing the thermal cycler

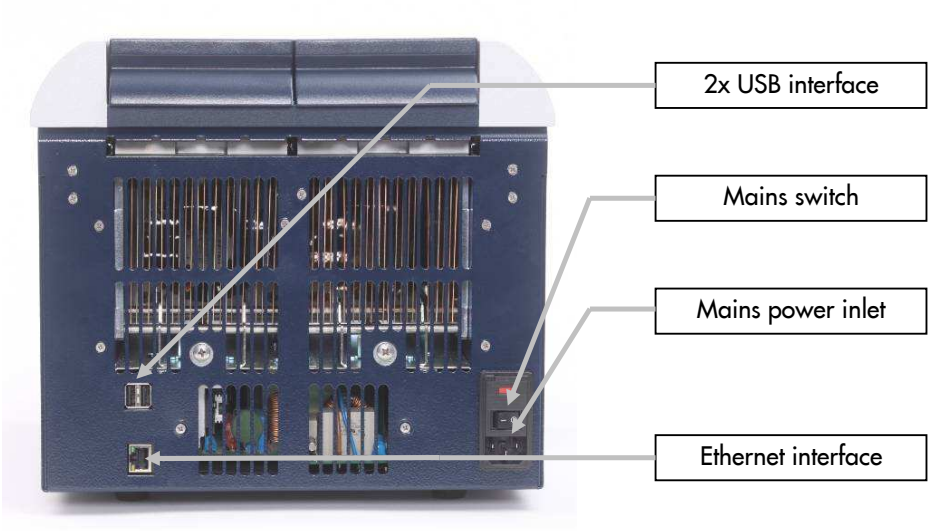
Check the packaging for any transport damage. Remove the packaging and place the thermal cycler onto a solid surface. The device should not be exposed to direct sunlight. There should be enough space to make sure that the ventilator grills on the front and back are not covered and sufficient ventilation is provided. The accessibility of the mains switch must be assured and not hindered. There should be a distance of at least 25 cm (10 inch) to the wall or the next device. Two thermal cyclers should not be placed back-to-back or back to front. Room temperature between 4 °C und 25 °C is advised.

All original packaging should be stored in case a need arises to return the instrument to the supplier.

4.3 Operation of the thermal cycler

Before starting up the thermal cycler for the first time make sure that your local power supply is matching the voltage and frequency range of the device. Plug in the mains plug of the thermal cycler to an electricity supply with PE connection. The outlet and the power switch are located at the back of the device. The mains switch serves as disconnection from the mains supply. The serial number is written onto a typed label at the bottom of the device. The device should only be used by authorized staff. To ensure this, a user management with appointing rights for specific users is available in the device.
More details about this and a detailed instruction manual can be found in the following chapters.

4.4 Connections of the thermal cyclers



5 GENERAL OPERATION

The operation of the thermal cycler can be run by the internal touch screen, either using the touch sensitive surface of the display or by using a mouse connected to a free USB port. Furthermore the thermal cycler can also be controlled by computer integrated to a net work or wireless ZigBee connection (option). The supplied application software offers the same functions as the internal software of the thermal cycler, except for some system settings.

If the user has to enter numbers or text the corresponding field has to be touched on the touch screen or clicked with the mouse. An appropriate keyboard will appear on the screen according to the expected entry.

All functions of the thermal cycler will be served by operating elements explained in the following chapters. An operating element is activated by touching or clicking with the mouse.

Operating elements which are not available in an actual operating mode are displayed in a grey color. Not all operating buttons are available in each operating mode.

6 MAIN MENU

The main menu consists of five dialogues, which can be selected via tabs at the right side of the screen. PeqSTAR 2X thermal cyclers offer two tabs 'L' (left) and 'R' (right) for choosing the desired block. This option is not available for peqSTAR 96X, 384X und in situ X systems. Each dialogue contains a help button for direct help function. The functions of the individual dialogues are explained below.

6.1 Run

This dialogue is used for selecting, executing and monitoring existing PCR protocols. A detailed description of the 'Run' dialogue is given in chapter 7. Additionally, the incubation mode can be activated here in order to manually program temperatures of the thermal plate and heated lid. This is useful for fast and easy incubations similar to a digital dry bath. Further instructions for the Incubation Mode are given in chapter 8.

6.2 Programs

This dialogue is used for creating, editing and organizing PCR protocols (see chapter 9).

6.3 Diagnostics

This dialogue is used for monitoring the actual temperature profile of the thermoplate. Also the temperature of the heated lid and the temperature of the cycler interior are displayed (see chapter 10).

6.4 GLPs

This dialogue is used for displaying and organizing GLP reports created by the thermal cycler (see chapter 11).

6.5 System

This dialogue is used for changing the general settings of the device and for the user management functions (see chapter 12). The 'System' dialogue is also used for checking serial and version numbers of hardware and software, respectively.

6.6 Help Button

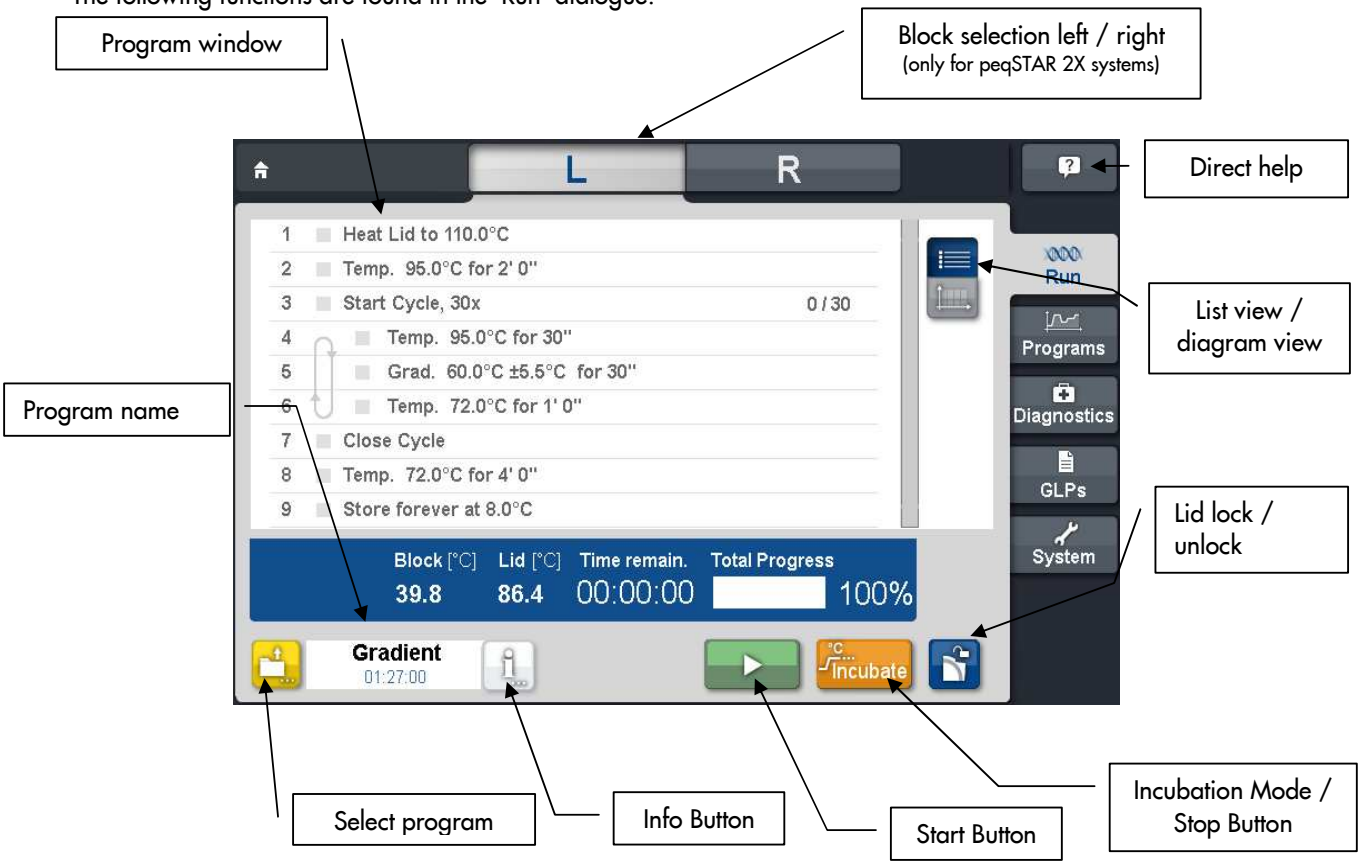
Use this button to activate (deactivate) the direct help mode. The help function is active, when the button appears pressed. If the mouse pointer is visible a question mark appears alongside. By touching a function button or other dialogue element the corresponding help window will appear. Closing the opened window or pressing the help button again, will deactivate the direct help mode and the system returns to normal operation.

7 RUN DIALOGUE

The Run dialogue is used for running and monitoring existing PCR protocols.

7.1 Run dialogue: Overview

The following functions are found in the 'Run' dialogue:



7.2 Run dialogue: Operating elements

7.2.1 Incubation mode

Using this button the incubation mode can be activated. In this mode block and lid temperatures can be adjusted manually (see chapter 8).

7.2.2 Start

Use this button to start a PCR protocol.

7.2.3 Stop

Use this button to stop a PCR protocol which is in progress.

7.2.4 Pause

Use this button to pause a PCR protocol which is in progress.

7.2.5 Info button

Use this button to display details of a PCR protocol (name, program options, author, settings, comments and program steps).

7.2.6 Lid lock / unlock

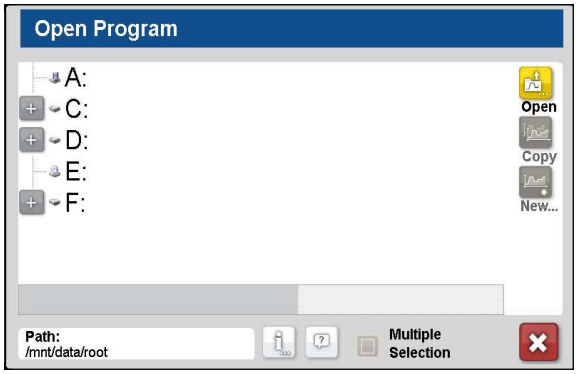
Use this button to lock or unlock the lid. Furthermore the button shows the current status of the lid.

7.2.7 Select program

Using this button a stored PCR protocol can be selected and loaded.

7.3 Select Program dialogue

Stored programs can be selected and loaded by using this button.
If a program is selected the adjoining window appears.
If a program is marked, the 'i' button appears.
By 'Open' the chosen program will be loaded in the run dialogue.



Further information on this dialogue can be found at chapter 9.1.1

7.4 Info Button

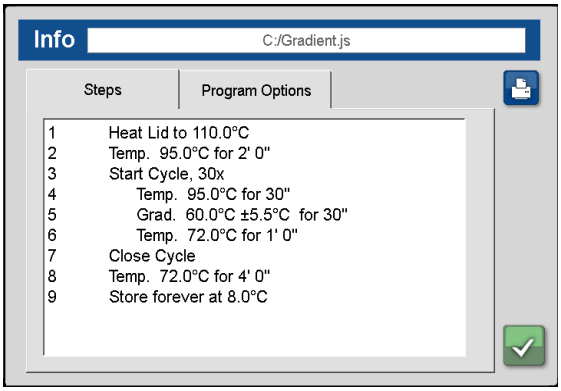
Using this button a new window will open, which shows detailed information of the chosen program. If wanted, this information could be printed. The header contains program name and the link to the program.

You will have the following options:

Steps

7.4.1 Steps

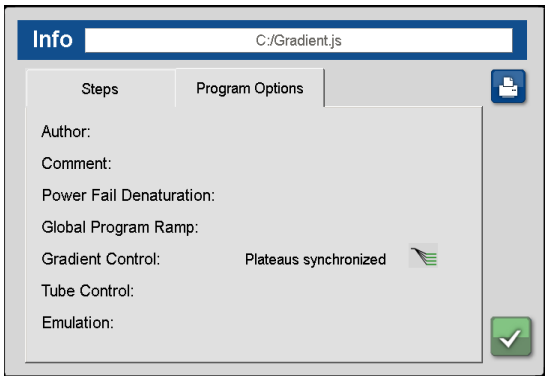
Using this tab, the single steps of the selected program are listed.



Program Options

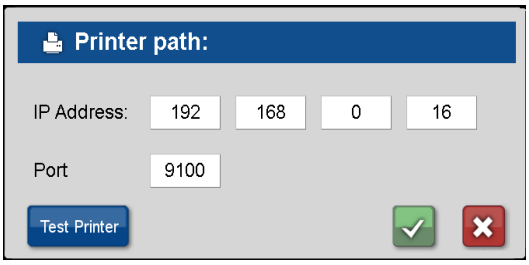
7.4.2 Program Options

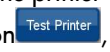
Using this tab, the settings of the selected program are shown.



7.4.3 Print

With peqSTAR X thermal cyclers, PCR programs and GLPs could be printed on a network printer. Using this dialogue, you can type in the path for a printer in the network.
Please refer to your local network administrator for the required settings.



If the path for the printer is already entered, simply click  for printing.
Using the button 

, a test printing will be performed to check the correct settings.

7.5 Lid lock / unlock

Use this button to lock or unlock the lid.
For systems with HPL lids(High Pressure Lid) there is the option to define the lid pressure in an opening dialogue.

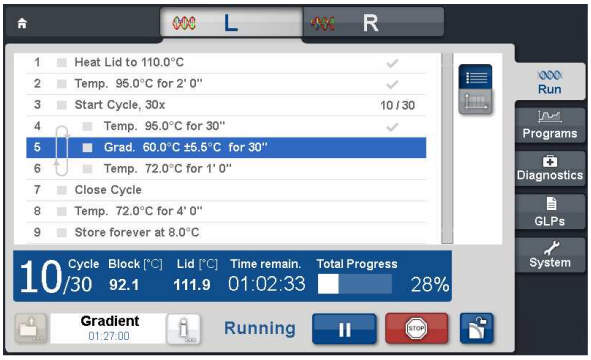
7.6 Starting a program

If a program is opened, the content of the program can be seen in the program window.
The loaded program is started by using the 'Start' button.

7.7 A program is running

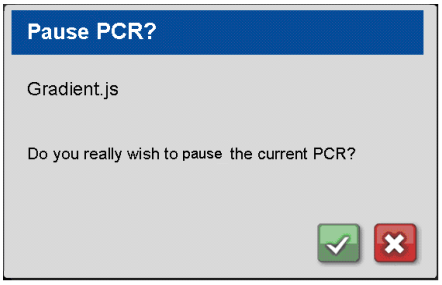
7.7.1 General: 'Pause' and 'Stop' button

After starting the chosen program, you can use these buttons to either pause or to stop the program.



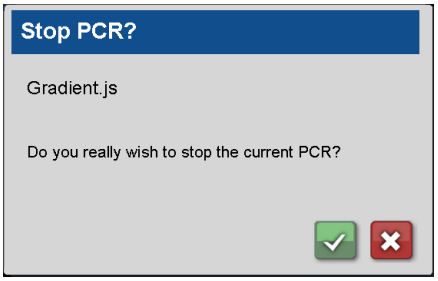
7.7.2 'Pause' button

If the 'Pause' button is pressed during the operating sequence, the adjoining window appears. If this request is confirmed, the program is paused and the 'Start' button appears which can be used to continue the program.
During the break the status 'Paused' is shown.



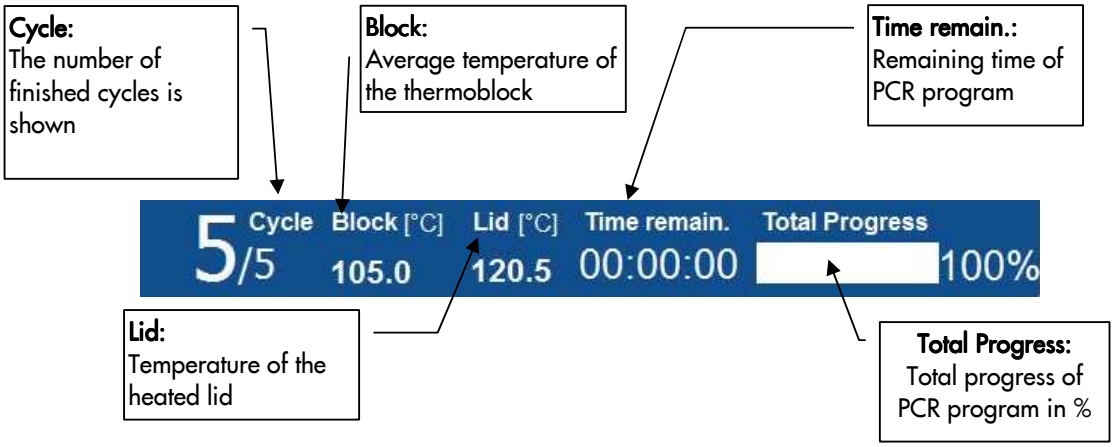
7.7.3 'Stop' button

If this button is pressed after starting a program, the adjoining security query appears.
By confirming the security query with 'Yes', the program will be stopped.



7.7.4 Status Display

In this window the following information on the status is shown during a run:



7.7.5 Program window

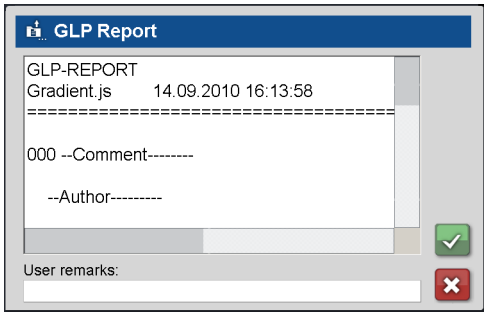
In the program window the blue flashing bar is showing the actual program step.

7.7.6 Save GLP Report

If stopping the program after the security query, the adjoining query to create a GLP report appears.

Note: The GLP report query also appears when a program is finished.

Will the query be confirmed by 'Yes', a GLP report will be created and shown on the display. It will be saved under the file name <program name>_<date>_<time>.glp if not deleted by the user. For this the adjoining window is shown.



The GLP report can be opened and printed in the 'GLPs' dialogue (see chapter 11).

7.7.7 Not create GLP Report

There will be no GLP report created for the aborted program. At the next run the GLP report query will appear again. You will return to the 'Run' dialogue, which shows the last chosen program, which can be started again.

7.7.8 Switch off the GLP report query

When you press this button, there will be no GLP reports created in the future. After the abort or end of a program no GLP report query will appear again. The setting can be reset in the system dialogue (see chapter 12.7.1.2).

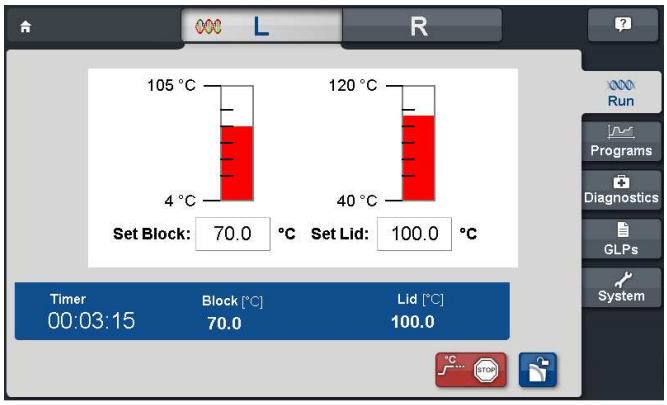
8 INCUBATION MODE

8.1 Run incubation

Use this button to set the device into the incubation mode. The temperature for the thermal plate and lid can be set manually.

8.2 Setting the block and lid temperature

Set temperatures of block and lid by entering the values of choice in the corresponding editor fields. By entering values < 40 °C the lid heating will be turned off.



8.2.1 Stop

Use this button to quit the incubation mode. Heating of the thermal plate and lid are then deactivated.

8.2.2 Lid lock / unlock

Use this button to lock or unlock the lid.
For systems with HPL lids(High Pressure Lid) there is the option to define the lid pressure in an opening dialogue.

8.2.3 Timer

The clock shows the time passed by in the incubation mode.

8.2.4 Block

Actual temperature of the thermal plate.

8.2.5 Lid

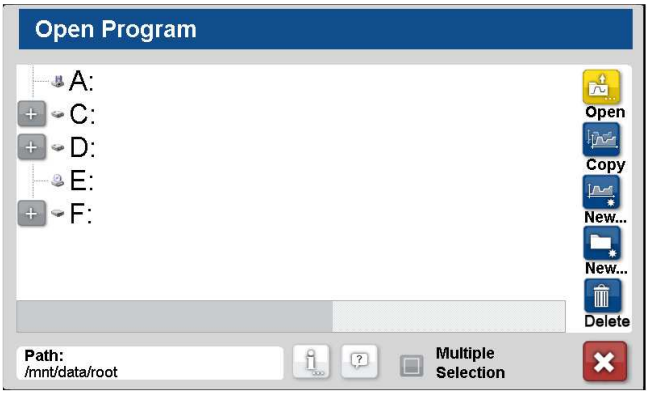
Actual temperature of the lid heat.

9 PROGRAMS

The 'Programs' dialogue serves for generating and editing PCR protocols (programs). This is a list of commands, which the thermal cycler performs in sequence after starting the program. The 'Programs' dialogue provides an editor for this purpose.

9.1 Program selection

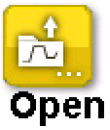
By touching the 'Programs' dialogue the selection dialogue shows up where a new program can be set or an existing program can be opened to edit.



The selection dialogue can be opened at any time in the program editor by using the adjoining button  .

Existing programs can be selected and opened for editing, folders can be created and new programs can be generated, copied and deleted.

The operation of the dialogue is as follows:

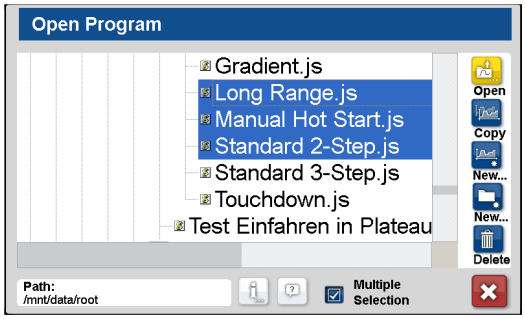


9.1.1 Open a program

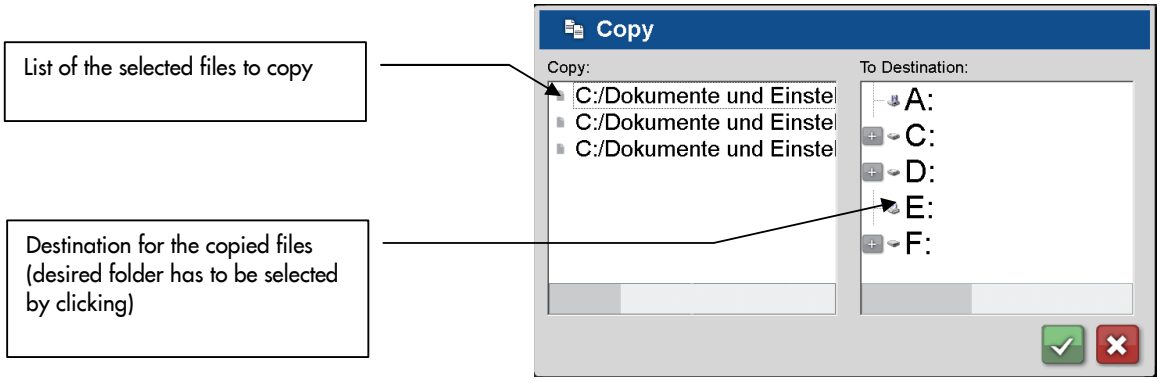
Saved programs can be selected with this button. By touching the desired program it will be selected of the file list and opened by using the 'Open' button. After this the thermal cycler returns to the 'Pograms' dialogue. After the selection of a program several operating elements are available, which are described in chapter 9.2 and 9.3.
Note: The command 'Open' is only active, when only one program is marked. Via 'Open' the chosen program will be loaded in the 'Programs' dialogue.

9.1.2 Copy

Pushing this button saved programs or folders can be copied. Several programs/folders can be marked via mouse click simultaneously if the option 'Multiple Selection' is chosen. Marked programs/folders are shown with a blue background.



By using the 'Copy' button the following dialogue appears:



In this dialogue the directory can be selected.
Copy the files with 'OK' or quit the operation with 'Cancel'.

9.1.3 New program

A new program can be generated, after pushing this button the program's name has to be defined. Optionally author, user, any comment and different program options can be entered. These data serve for information and can also be retrieved in the 'Run' dialogue.

9.1.4 New folder

Use this button to create a new subfolder after selecting an existing folder, in which the new subfolder should be created.

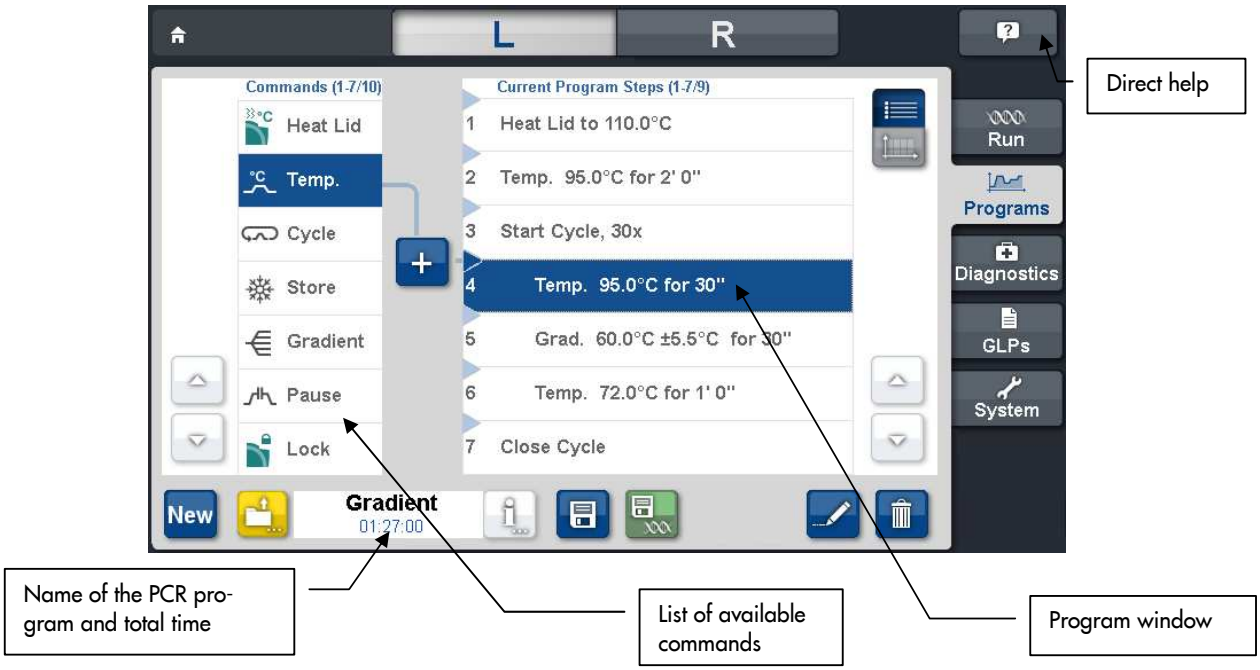
9.1.5 Delete

Programs or folders can be deleted with this button.

9.1.6 'Info' button

Further details at chapter 7.4.

9.2 Operating elements of the 'Programs' dialogue



The **'Program window'** displays the list of commands (steps) the program is composed of. The **'List of available commands'** is displaying all steps which can be entered into a program. The meaning of the single commands is explained in chapter 9.3. The **function buttons** serve for editing of programs and the administration of program files on the system and will be described in the following.

Function buttons of the 'Programs' dialogue:

9.2.1 Entering a command

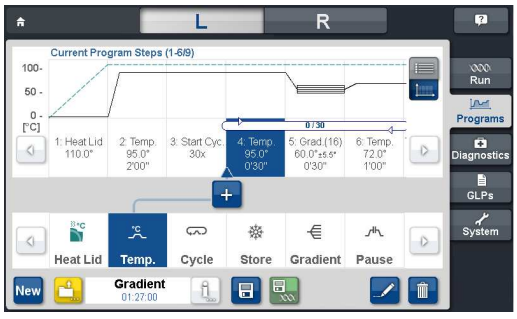
To enter a new command into a program the desired line has to be selected. From the left side of the program window a blue arrow will point on the desired line. After selecting the program command of the list in the left window it can be inserted into the desired place via the '+' button. Alternatively this can be made by double click on the program command. Thereupon the corresponding parameters will be asked. To enter a parameter the desired input field has to be touched. A keyboard will be shown on the screen.

9.2.2 List view

Pushing this button, the selected program will be displayed in the list view, like shown in chapter 9.2.

9.2.3 Diagram view

Pushing this button, the selected program will be displayed in the diagram view, like shown at the right.



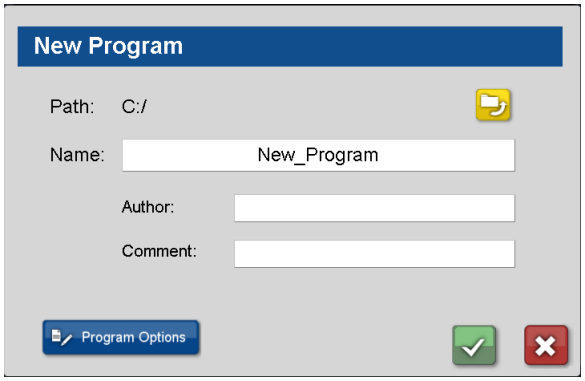
9.2.4 *New program*

A new program can be generated, after pushing this button the program's name has to be defined. Optionally author, user, any comment and the program options can be entered.

9.2.4.1 *New Cyclerprogram*

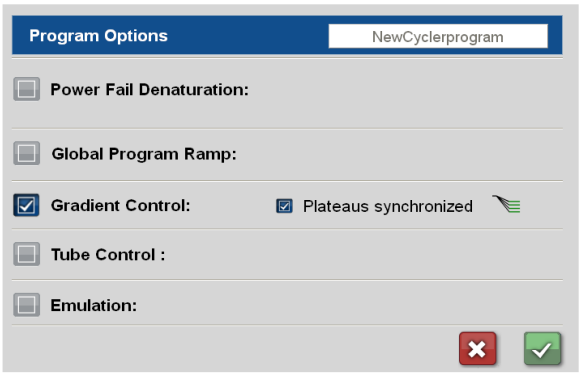
Enter the name of the PCR program, optionally also add name of the author and a comment.

'Path' shows you the directory where the program is stored. Over the button you could change the path.



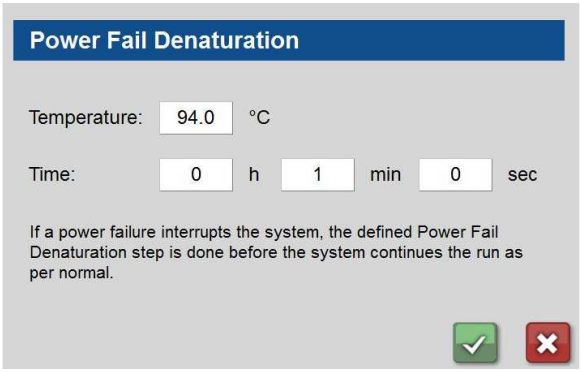
9.2.4.2 *Program Options*

Using the button Program Options the adjoining window appears:



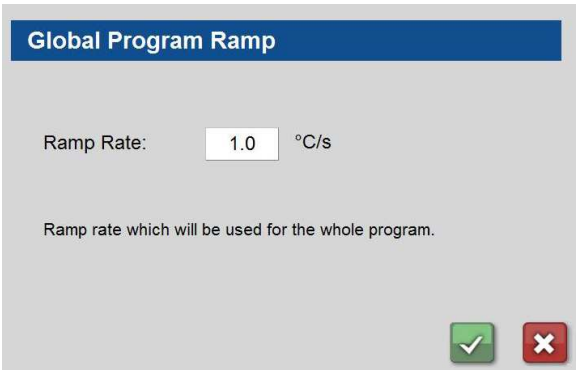
9.2.4.3 *Power Fail Denaturation*

If 'Power Fail Denaturation' is activated by pushing the 'checkbox' Power Fail Denaturation: the adjoining dialogue appears:
If a power failure had happened while a program was running the thermal cycler restarts the program at the point it was stopped as soon as the power returns (Autorestart after power failure).
Additionally, if the option 'Power Fail Denaturation' is activated the thermal block will heat to the stated temperature for the set time before continuing with the program.



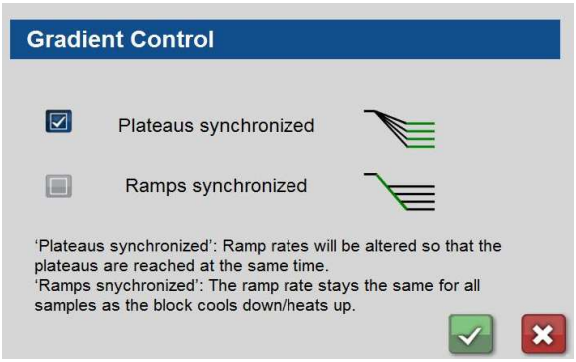
9.2.4.4 *Global Program Ramp*

Using the Checkbox Global Program Ramp: a global ramp rate in °C/s can be programmed. This global ramp rate will be used in all temperature and gradient steps of the PCR program, but could be changed in a single temperature or gradient step manually by entering the desired value at the step.



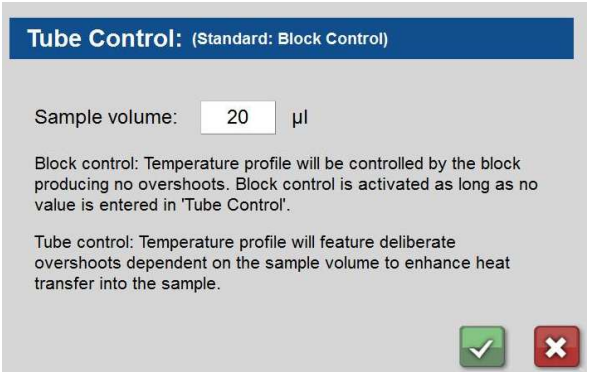
9.2.4.5 Gradient Control

Using the Checkbox **Gradient Control:** you can decide whether in a gradient step the plateaus (Plateaus synchronized) or the Ramps (Ramps synchronized) should be synchronized for all rows.



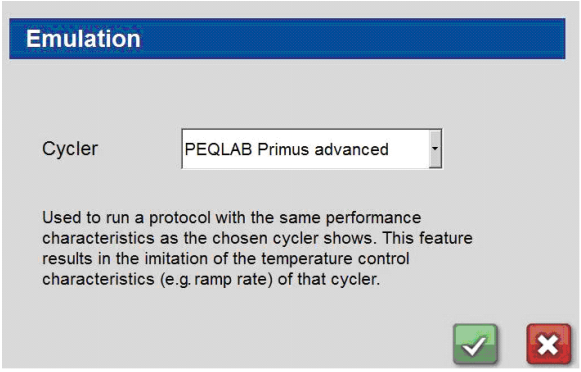
9.2.4.6 Tube Control

With the Checkbox **Tube Control :** you have the possibility to adjust temperature regulation for a temperature step accordingly to sample volume. If necessary, the temperature regulation will perform short-term deliberate overshoots and undershoots depending on the entered sample volume during PCR run.



9.2.4.7 Emulation

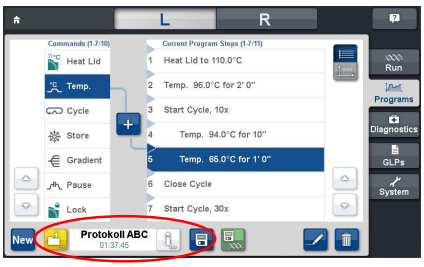
Using the Checkbox **Emulation:** the thermal cycler will perform PCR like the chosen cycler, emulating its performance. This function could be useful if a PCR program should be transferred to the peqSTAR from another type and model of thermal cycler.



How to emulate a protocol ABC from cycler XY on a peqSTAR in the right way?

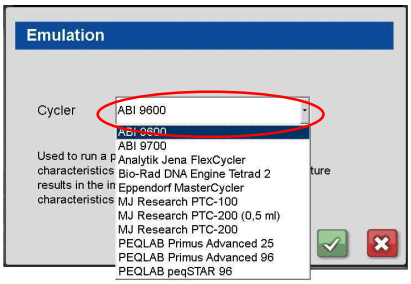
Program:

Enter the protocol ABC in the program editor of the peqSTAR the same way you did it on the cycler XY.



Emulation:

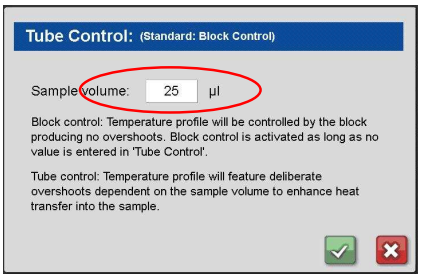
Go to ‚Program Options' => ‚Emulation' and choose the cycler XY that you have used previously.



Tube Control:

Did you had to enter a volume setting in your cycler XY (Tube Control mode)?

If yes, please enter the same volume in the peqSTAR in the ‚Program Options' under ‚Tube Control'.

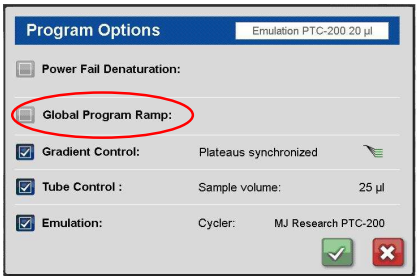


Ramp Rate:

Have you worked on cycler XY with a reduced ramp rate?

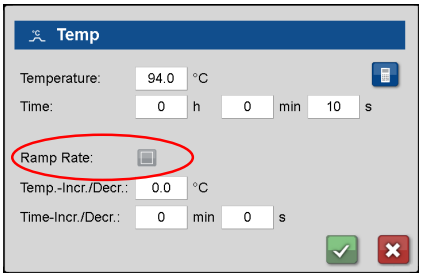
Throughout the whole protocol?

Then you could adjust the ramp rate in the ‚Program Options' under ‚Global Program Ramp' for the whole protocol.



Only for single steps in the protocol?

Then you could adjust the ramp rate for each single temperature or gradient step.



9.2.5 Open a program

See chapter 9.1.1.

9.2.6 Info-Button

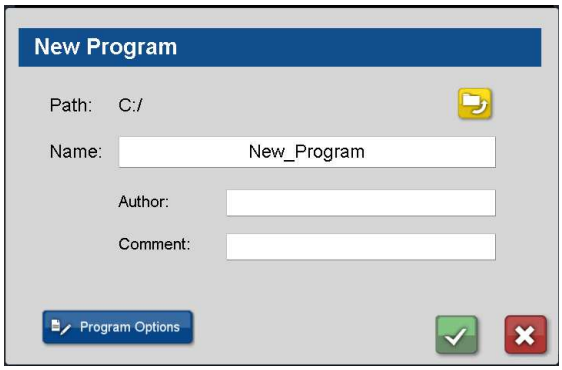
See chapter 7.4.

9.2.7 Deleting a command from the program

The command has to be selected by marking it and then pushing the 'Delete' button.

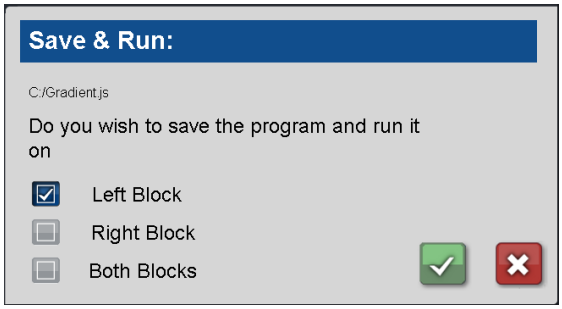
9.2.8 Saving a program

Use this button to save a program. The adjoining window appears and the corresponding information can be entered or changed in the dialogue window. Further information regarding program options can be found at chapter 9.2.4.2.



9.2.9 Save & Run

A program can be saved and run immediately using this button. In advance there will be a security check which needs to be confirmed with 'Yes'. The program is then loaded to the 'Run' tab and started.
At the peqSTAR 2X the desired block can be chosen by using this dialogue.



9.2.10 Editing a command

The parameters of a command can be modified by touching the corresponding command line of the program and changing it with the 'Edit' button. (The same function has a double click on the command line).

9.3 Available commands (program steps)

9.3.1 Unlock

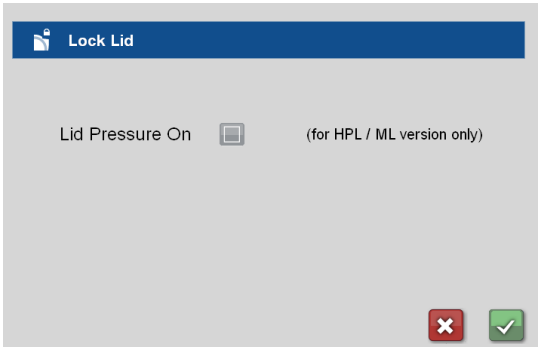
Unlock

Use this command to unlock the lid in case that it has been locked in a previous program step.

9.3.2 Lock

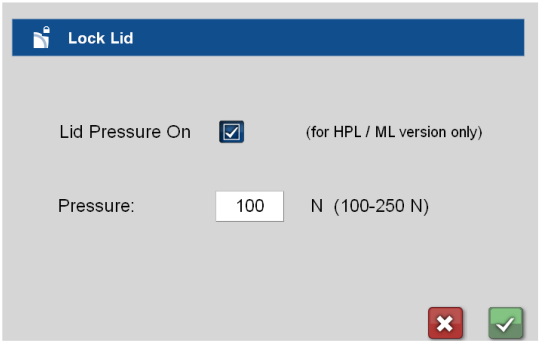
Lock

Use this button for lid locking in order to avoid accidental opening while a program is running. Using this command, the adjoining window appears.



9.3.2.1 Lid Pressure On

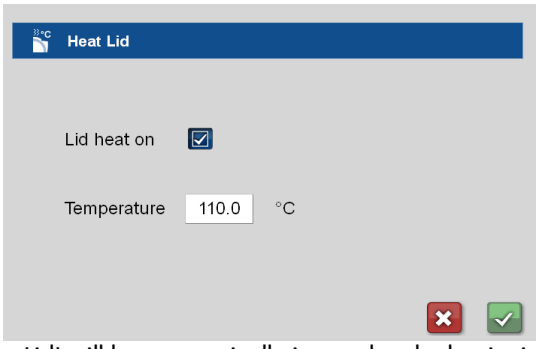
By activating you can set lid pressure on the samples between 100 – 250 N. When using a thermal cycler without High Pressure Lid (HPL) the inserted pressure value will be ignored. When using a thermal cycler with HPL and not inserting any pressure value, the lid will automatically set the pressure on the samples to 50 N.



9.3.3 Heat Lid

Heat Lid

Using this command you can activate or deactivate lid heat and the adjoining window appears.
By activating 'Lid heat on' it is possible to insert the desired lid temperature. The temperature needs to be in a range of 40 - 120 °C. When 'Lid heat on' is not activated, the lid heat is switched off.



When creating a new program, the step 'Heat Lid' will be automatically inserted at the beginning of the PCR. This stetting can be changed at the tab System (see chapter 12.7.1.2).

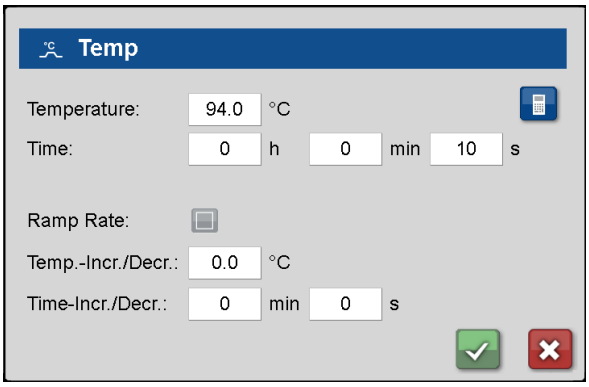
Please note:

- When reaching a 'Store'-Step the 'Heat Lid' is deactivated automatically.
- Furthermore the 'Heat Lid' is deactivated automatically during temperature steps < 30 °C. When temperature steps ≥ 30 °C will follow, the 'Heat Lid' is reactivated automatically in case it was activated before the temperature step < 30 °C.

Temp

9.3.4 *Temperature*

Use this button to insert a temperature step in the PCR program.



9.3.4.1 *Temperature*

Set the temperature, which should be held during the step.

9.3.4.2 *Time*

Set the time how long the desired temperature should be held.

9.3.4.3 *Ramp-Rate*

When activating the checkbox a ramp rate can be set. The setting here will overwrite the 'Global Program Ramp' in the program options.

9.3.4.4 *Temp-Incr./Decr*

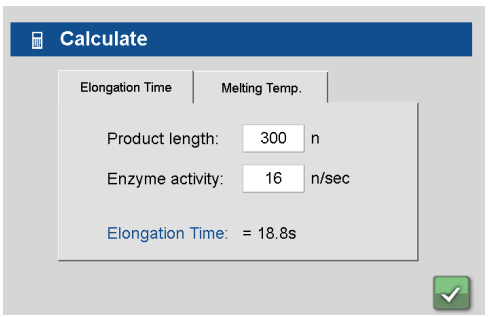
Change of temperature within a program cycle. The sign indicates, whether the temperature will be increased or decreased.

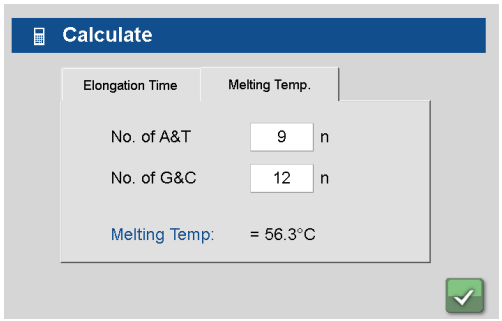
9.3.4.5 *Time Incr./Decr*

Change of time within a program cycle. The sign here defines whether the time will elongate or reduce.

9.3.5 *'Elongation Time' and 'Melting Temp.'*

The elongation time and the melting temperature of the primers can be calculated by using this button. They have to be considered as guideline values. Depending on the application of the user further optimization might be necessary. Typically the optimal annealing temperature is about 3 °C lower than the calculated melting temperature.

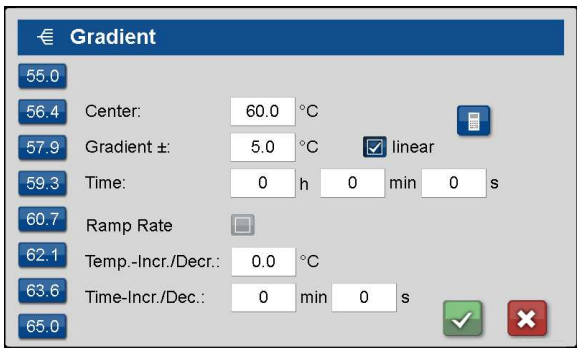




Gradient

9.3.6 *Gradient step*

Use this button to enter a temperature gradient.
The following dialogue appears:



9.3.6.1 *Center*

The temperature desired in the middle of the Gradient can be set in 'Center Temperature'.

9.3.6.2 *Gradient ±*

The field 'Gradient ±' shows the difference in temperature between the middle and the right and left side of the thermal plate. The resulting temperatures in the 8 rows are given on the buttons at the left side of the window.

9.3.6.3 Time

Set the duration of this step in the field 'Time'.

9.3.6.4 Ramp Rate

When activating the checkbox a ramp rate can be set. The setting here will overwrite the 'Global Program Ramp' in the program options. This command will only be available, if 'Ramps synchronized' was activated in the program options under 'Gradient Control'.

9.3.6.5 Temp-Incr./Decr.

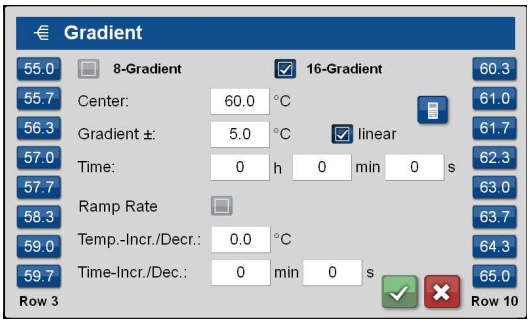
Change of temperature within a program cycle. The sign indicates, whether the temperature will be increased or decreased.

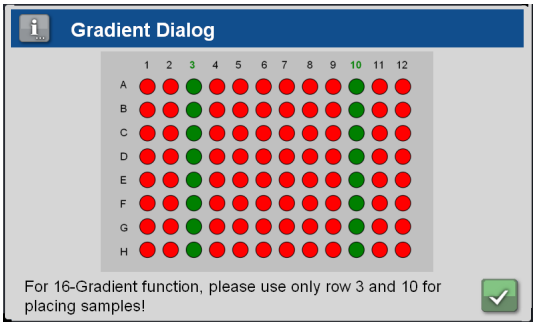
9.3.6.6 Time-Incr./Decr.

Change of time within a program cycle. The sign here defines whether the time will elongate or reduce.

For the peqSTAR 2X the gradient is realised over the 8 rows of the block from the top to the bottom (as displayed in 9.3.6.1).

This is also the default setting for gradients in the peqSTAR 96X, where the complete row (from well 1 to well 12) has the same temperature.
Furthermore there is the possibility of a 16 gradient distribution. Different temperatures are regulated in the left and right half of the block leading to a gradient within a single row from the left to the right. The temperatures displayed in the software window are only reached in rows 3 and 10, so the user is asked to put the tubes only in the specified wells, when programming or using a program with such a gradient step.

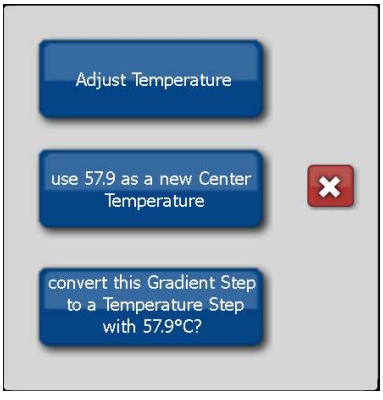




By selecting one of the temperature buttons different options will be available:

When the checkbox 

was deactivated before, the single temperatures of each row can be adjusted within a special range using the button 'Adjust Temperature'. Moreover the selected temperature can be used as new center value or the gradient step can be changed in a temperature step using the selected temperature. These two functions are independent of the settings regarding gradient linearity.

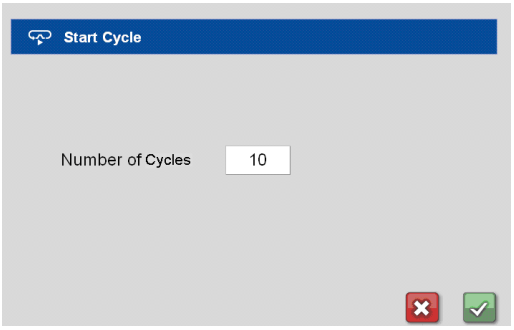


9.3.7 *Cycle:*

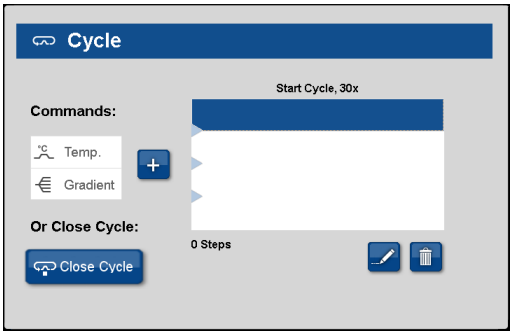
Cycle

Use this button to define a program cycle (loop), consisting of several individual program steps.

In the field 'Number of Cycles' the amount of cycles is entered.



In the following dialogue the commands 'Temp' and 'Gradient' can be entered in the cycle. The corresponding values are explained in chapter 9.3.4 and 9.3.6. When all steps of the cycle are programmed, the dialogue could be left using the button 'Close Cycle'.



9.3.8 *Start Cycle - Manual cycle beginning*

Start Cycle

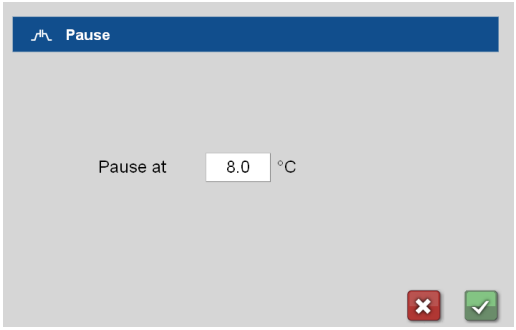
9.3.9 *Close Cycle - Manual cycle ending*

Close Cycle

9.3.10 *Pause*

Pause

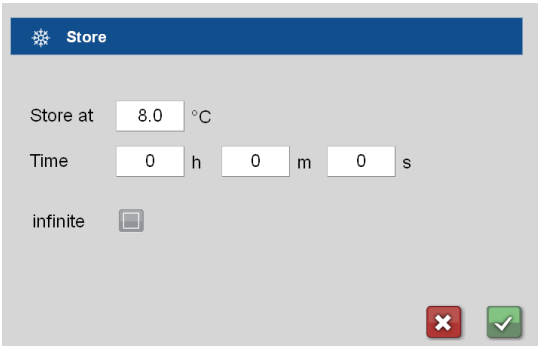
Use this button to interrupt the running program temporarily.
The adjoining window appears where you can enter a temperature value for the pause



9.3.11 *Store*

Store

This command keeps the thermal plate temperature on the set value.
Automatically the lid heat is turned off.
This command usually is the last program step, and is used to store the samples at a constant temperature until removal.
If the exact time of sample removal is uncertain activate the 'Infinite' field to store for an infinite time.

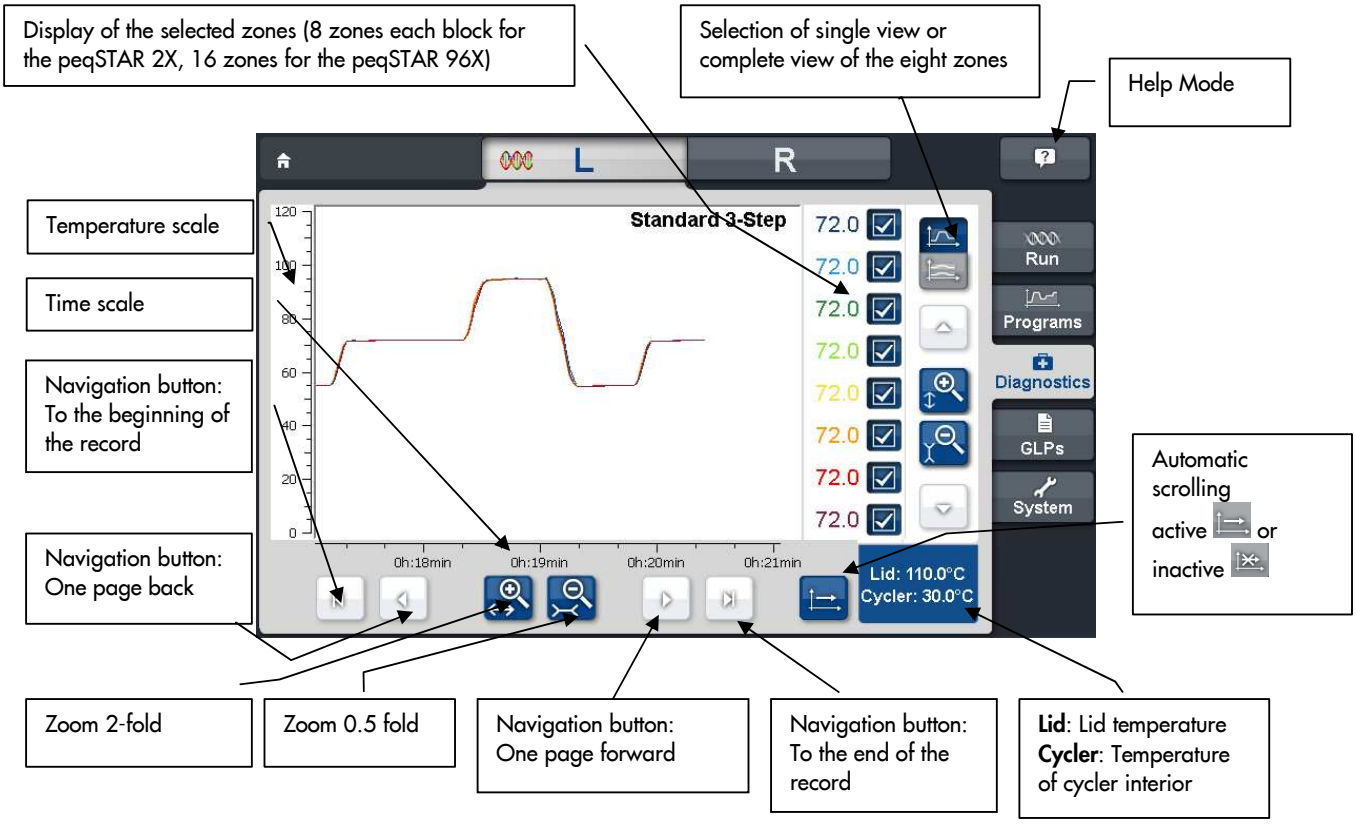


10 DIAGNOSTICS

The 'Diagnostics' dialogue visualizes the temperature profile of the thermal plate. The actual values will be shown for lid and cycler temperature. While a PCR protocol or incubation is running, the thermal cycler automatically records all temperatures. The record will be finished as soon as the PCR program or the incubation has been stopped.

10.1 Operation of the 'Diagnostics' dialogue

Different operating elements for indication and navigation within a diagram are available:



10.2 General view

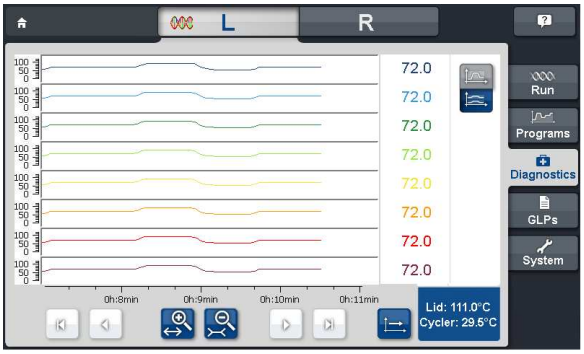
General view of the zones of the thermal plate showing the temperature profile of the eight or 16 zones in one combined diagram (see 10.1) when choosing the 'Diagnostics' dialogue. The temperature profile of the single zones is shown in one window lying upon another.

10.2.1 Zones

By selecting the chosen zones these will be shown or hidden in the general view. Hidden zones won't be shown in the diagram window anymore, but the record of the corresponding temperatures will be continued.

10.2.2 Single view

By pushing the button  the single view of the zones will be shown.
Using the single view of the zones the temperature profile of each zone will be shown in separate diagrams. The arrangement of the single diagrams match to the arrangement of the zones on the thermal plate.



10.2.3 Automatic scrolling active

10.2.4 Automatic scrolling inactive

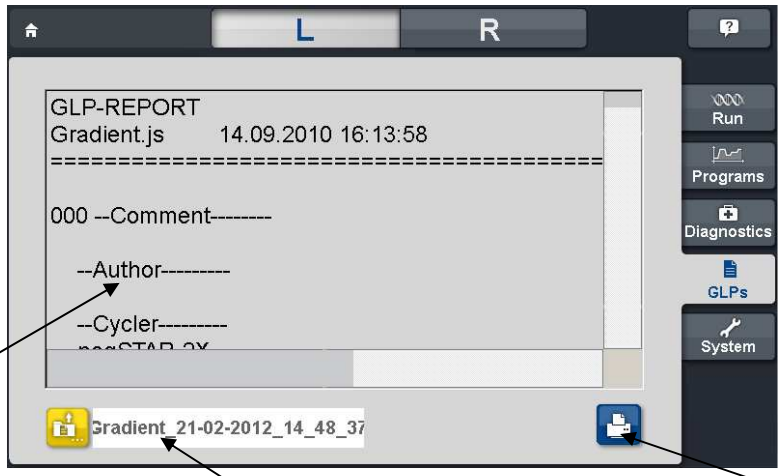
For convenient view of the PCR record the automatic scrolling can be inactivated. Using this function, already recorded parts of the diagram can be looked at without automatic screen scrolling.

11 GLPS DIALOGUE

The 'GLPs' dialogue is used for the administration, viewing and printing of the GLP reports generated by the thermal cycler.

11.1 Displaying a GLP report

After pushing the GLP button a dialogue appears to select a GLP report, which will be directly shown. The dialogue can also be opened by pushing the button  .



This window shows the content of the GLP report.

Shows the name of the selected GLP report. The name of the GLP is composed of the name of the PCR program, date and time.

Printing of the GLP report.

11.2 Operating elements of the 'GLPs' dialogue

11.2.1 Select GLP

Select a GLP report (shown in the adjoining text window). GLP reports can also be copied or deleted and a new folder can be created for GLP reports.

11.2.2 Open GLP report

Use this button to open a stored GLP report. Select the desired GLP report of the file list and open it by pushing the button 'Open'. The GLP report is shown as displayed in chapter 11.1.

11.2.3 Printer

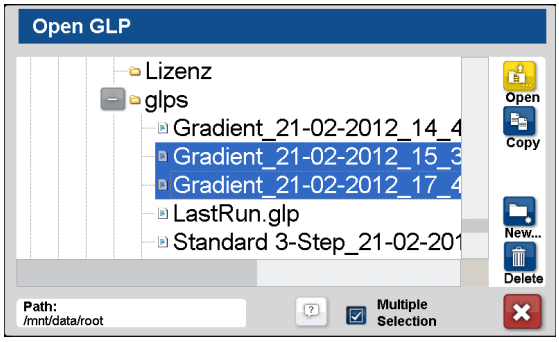
Use this button to print out the selected GLP report.

11.2.4 Delete

Use this button to delete a GLP report.

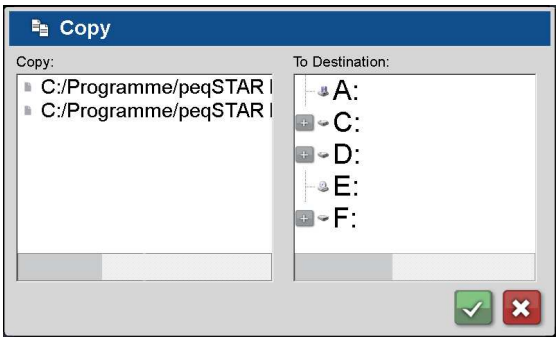
11.2.5 Copy

Pushing this button saved GLP reports or files can be copied. Several GLP reports/files can be marked via mouse click simultaneously if the option 'Multiple Selection' was chosen. Marked GLP reports/files are shown with a blue background.



By using the 'Copy' button the adjoining dialogue appears.

Pushing 'OK' the files will be copied; the operation can be aborted with Cancel.



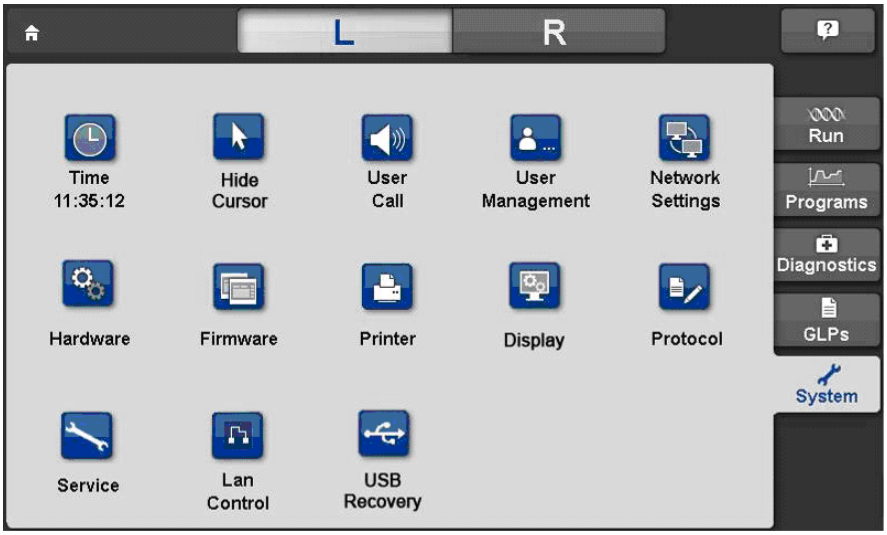
11.2.6 New folder

A new folder can be created using this button.

12 SYSTEM

In this dialogue the configuration and settings of general parameters of the device can be carried out.

Elements of the 'System' dialogue: Overview



Having selected one of the symbols the function is called up and the corresponding settings can be executed or changed as explained in the following dialogue.

12.1 Time / Date

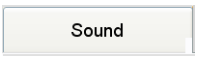
Setting of actual time and date:
By pushing the clock button, the adjoining window appears and time and date can be set.

12.2 Show/Hide mouse cursor

Use the button to show or hide the cursor on the screen.

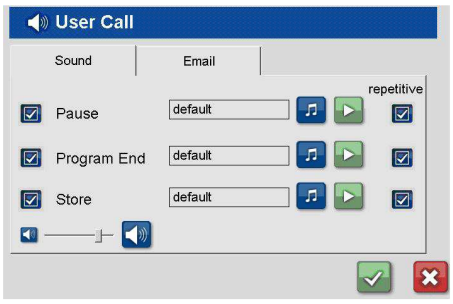
12.3 User Call

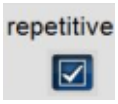
Using this button different user calls can be set.



12.3.1 Sound

Selecting the tab 'Sound', the adjoining window opens and the settings for sounds can be changed: For activating the appropriate sound mark the checkbox. It can be chosen between single (standard setting) or repetitive signal in case of occurrence of an event.





12.3.1.1 Repetitive

When this checkbox is activated, the user call will be repeated periodically as long as the event is open.

12.3.1.2 Sound intensity:

Set the desired sound intensity.

12.3.1.3 Select sounds

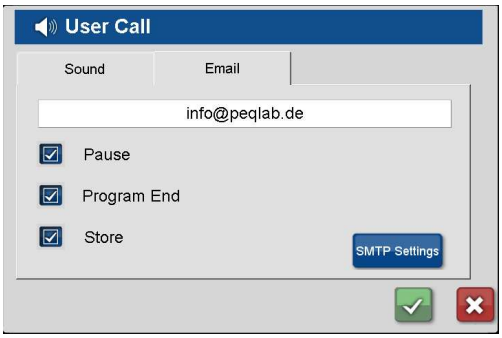
By pushing the button  a selection window will appear. Different MP3 sounds can be chosen and stored for the events 'Pause', 'Store' and 'Program End'.

12.3.1.4 Play melody

The selected sound can be listened to when pushing this button.

12.3.2 Email

By selecting the tab 'Email' the adjoining window appears. When activating a checkbox the cycler will send an Email in case of occurrence of the corresponding event.

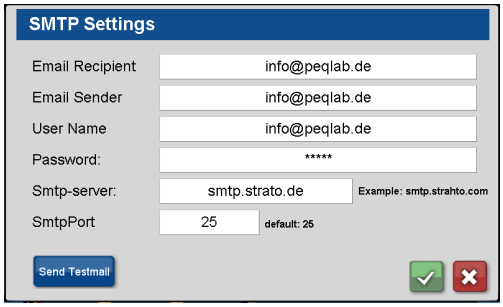


Note: The peqSTAR X needs to be installed in a network with access to the internet so that it can send an email to the user when needed. Please check settings under System → Network, as for example the entry of the DNS Server is necessary for sending emails.

Please ask the administrator for the required settings.

By pushing the button 

the settings could be entered.



12.3.2.1 Email Recipient:

Please enter the email address where the info should be sent to from the cycler in case of occurrence of an event.

12.3.2.2 Email Sender:

Here you could enter the name of the email sender, e.g. the cycler name or the same email address as for 'Email Recipient':

12.3.2.3 User name

Please enter the user name of the used email account. Please note that you have to enter the SMTP settings here. In case you have defined different user names for incoming and outgoing mail server in your account settings, enter here the user name for the outgoing mail server.

12.3.2.4 Password

Please enter the email password of the used email account. Please note that you have to enter the SMTP settings here. In case you have defined different passwords for incoming and outgoing mail server in your account settings, enter here the password for the outgoing mail server.

12.3.2.5 SMTP-Server:

Please enter the outgoing mail server which should be used for sending the email.

12.3.2.6 SMTP Port:

Please enter the SMTP port which should be used for sending the email. Standard setting for the port is 25.

12.3.2.7 Send Testmail:

By pushing this button a test mail is sent, to check whether the settings are correct and emails could be send by the cycler.
In case the test mail could not be sent successfully, please ask your network administrator for the required settings.

12.4 User Management

In the user accounts management, user groups or single users can be configured and their settings e.g. right of access (reading programs, edit programs etc.) will be administered. The users are assigned to given or predefined user groups which are assigned to rights of access.

Important: the thermal cycler supports the assignment of rights of access to certain user groups. This means that rights for the operation of functions are given or refused to certain user groups. In the user administration, user groups are configured and equipped with rights. Single users of those groups are limited to the appropriate rights.

Rights are not assigned to single users but user groups. Users of a certain user group inherit the rights of the related group.

The name of a user appears in the program header of a program generated by the user as well as in the GLP report of a program run by the user.

After pressing the  button the adjoining dialogue appears:

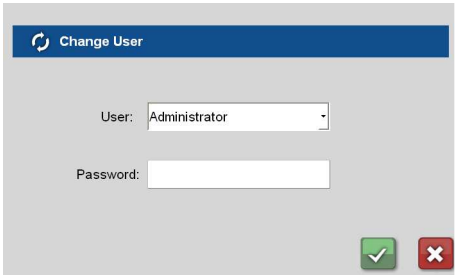
To call up the user administration the user has to log in with his password. The user (in general the administrator) must have the appropriate right for the administration of users. At the state of delivery (condition) an 'administrator' with the required access is configured.

Using the 'Logout' button the current user can log out. The user 'Guest' is then automatically logged in, who has only minimal rights as factory settings. The administrator can change these settings (see 12.4.3.1 and 12.4.3.3).

At 'Cycler options' you could activate the function 'Login on startup' with the checkbox. Is this option activated, when turning on the instrument, an obligatory Login request appears. By using the checkbox 'Auto logout after' the user can define a time span when the logged in user is automatically logged out.

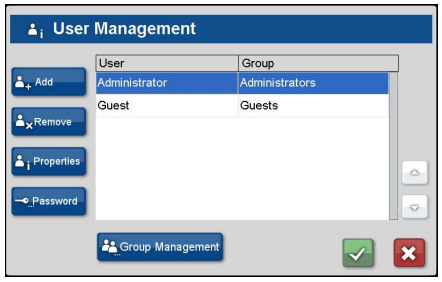
Originally the password for the 'administrator' is admin.

12.4.1 Change User



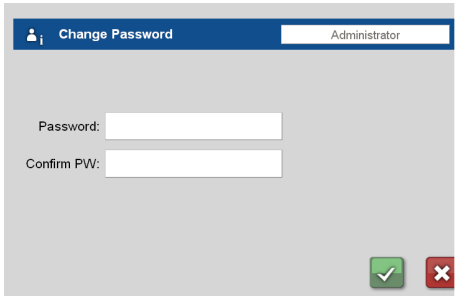
Using this dialogue window, users can be changed.
Please select the user and enter the appropriate password.
Originally the password for the 'administrator' is **admin**.

12.4.2 User Management



The adjoining dialogue window appears. In this dialogue single users can be added, changed or deleted. Use the button 'Group Management' to call up the administration of groups.

12.4.2.1 Change Password

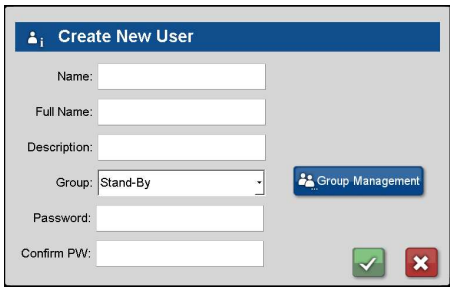


In case that any user forgot his password or wants to change it, the administrator can allocate a new password. This could also be done by a user with the right for 'User Management'. Select the user and allocate a new password by pushing the button 

.

12.4.2.2 Set up a new user and assign a password

Use this button to set up a new user. The adjoining dialogue window appears where several data can be added.



Save the data with the button  and the newly set up user is displayed in the user list among the related user group.

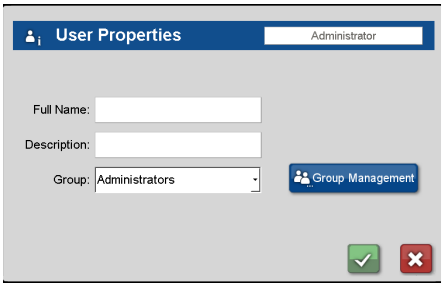
Important: If a new user should only have limited rights, it might be useful to set up a new user group with the appropriate rights to access. (see chapter 12.4.3)

12.4.2.3 Administration of user groups

See chapter 12.4.3.

12.4.2.4 User Information

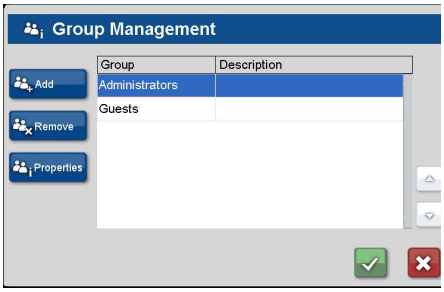
Use this button to get further information on the user (user name, full name, description and group membership).



12.4.2.5 Delete a user

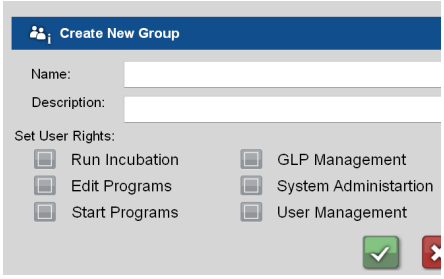
Select a user and remove it with this button. For safety reasons a query appears if the user should be removed for sure.

12.4.3 Setting up a new user group



12.4.3.1 Add a new user group

Using this button a new user group and its description can be set up.
It is possible to allow/refuse access to certain functions of the instrument.



List of available rights:

Run incubation	Run incubation mode
Edit programs	Edit programs
Start programs	Start programs
GLP management	Watch GLP reports
User management	Administrate user and user groups
System administration	Modify/administrate configurations

12.4.3.2 Delete a group

Select the group and delete it using this button.
For safety reasons a query appears if the group should be removed for sure.

12.4.3.3 Show and change group information

12.4.4 User logout

If a user logs out by using the button 'Logout' the user 'Guest' is automatically logged on. The user 'Guest' initially does not have any rights. This is to make sure that a new user, who wants to work with the peqSTAR X, must log in first. The Administrator or other users with the right 'User Management' can assign more rights to the user 'Guest' if required (see 12.4.3.1).

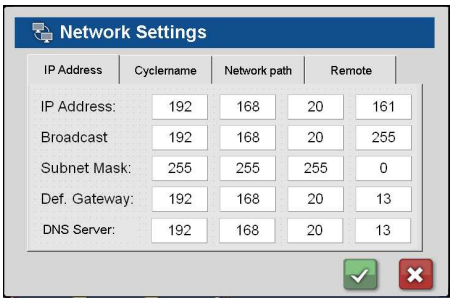
12.5 Network Settings

Using this button, network settings can be changed.

IP Address

At the tab IP Address the adjoining dialogue appears and the required settings for network integration can be entered.

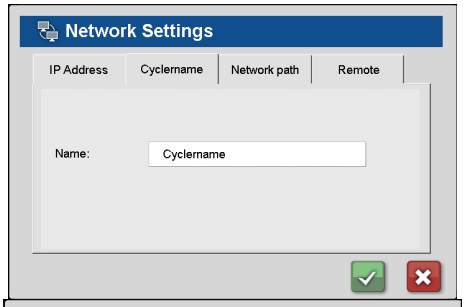
Please ask your network administrator for the required settings.



Cyclername

At the tab Cyclername the adjoining dialogue appears:

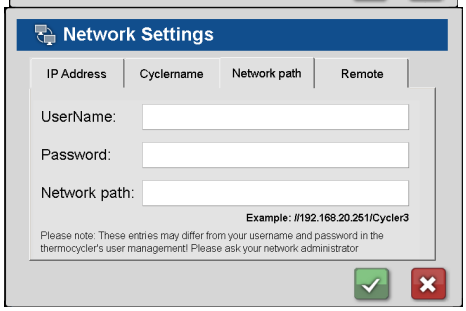
The entered cycler name appears when using the email user call in the sent mail notification.



Network path

At the tab Network path the adjoining dialogue appears and the required settings for access to a released network device can be entered.

Username: to log on the network
Password: to log on the network
Network path: which is available for the user as additional path for cycler programs and GLP reports after the successful network connection.

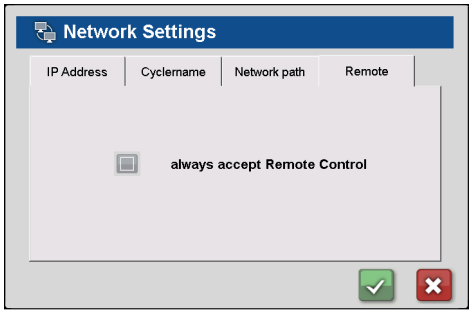


This path is assembled of:
//<IP address, where release network path is located>/<directorypath>
Please note that there need to be the corresponding access authorities (write and read access) for the indicated path.
Please ask the administrator for the required settings.

Remote

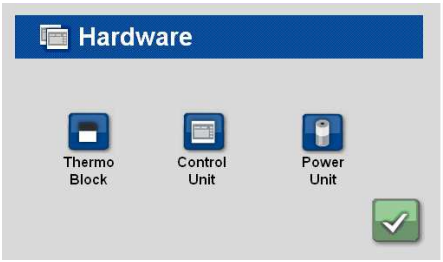
At the tab Remote the adjoining dialogue appears:

By activating the checkbox 'always accept remote control', it is not necessary any more to confirm cycler access when performing PC or master/slave control.



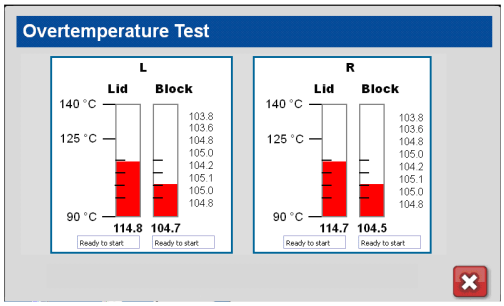
12.6 Hardware

Shows actual version of thermal block, control and power unit.
Changes can only be made by authorized technical service.

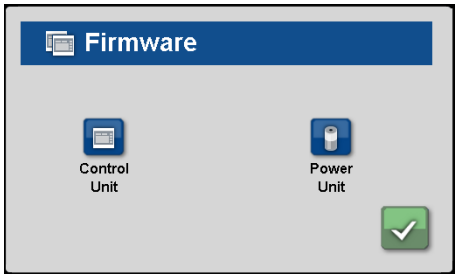


12.6.1 Overtemp test

At Hardware => Thermo Block => Overtemp Test a periodical test (e.g. every month) of the overtemperature protection can be found according to the following procedure:
First the result of the last check of the overtemperature protection is reported. To continue with the test, confirm the dialogue with 'Yes'. Initialization and overtemperature test is done automatically for both blocks at the peqSTAR 2X.
Press OK after the test has finished.
If one or both results are not "OK", the overtemperature protection is damaged. **In this case, the thermal cycler must not be used anymore and must be sent back to the manufacturer for a check.** (see chapter 13.1).



12.7 Firmware



12.7.1 Control Unit

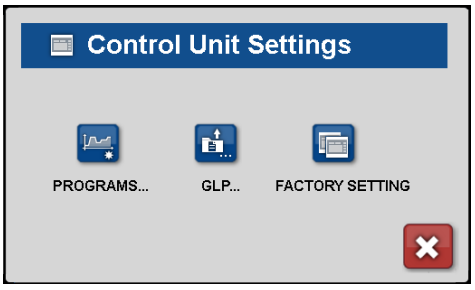
Display and administration of the firmware versions of the control unit with the adjoining dialogue.

12.7.1.1 Info Button

Shows the current version of the control unit firmware.

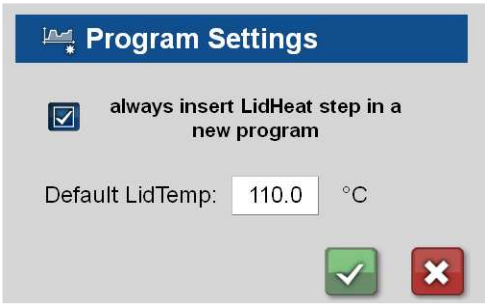
12.7.1.2 Settings

Pushing this button the adjoining dialogue appears. The following menu items are available: 'Programs…', 'GLP…' and 'Factory Settings'.



12.7.1.2.1 Programs Settings

Setting a check mark in this box, a 'Lid Heat' step will be automatically inserted as first step when generating a new program. In the field next to 'Default LidTemp' the temperature can be entered which shall appear as preset value within the insertion dialogue of a new temperature step. This value can be changed manually in the PCR program.

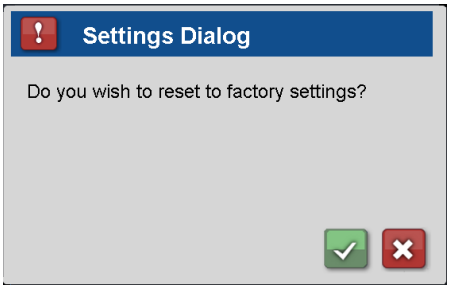


12.7.1.2.2 GLP Settings

Setting a check mark in this box, a GLP report will be created after every run after the query. If the box is not marked, no GLP report will be created. No according query will appear.

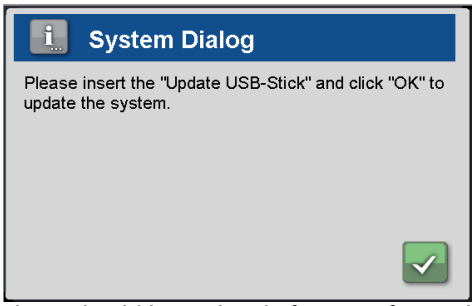
12.7.1.2.3 Factory Setting

The configurations set under Firmware > Control Unit >Settings can be changed to the factory settings.



12.7.1.3 Update

Updates the firmware of the control unit. The firmware must be available on a USB memory stick connected to the device.

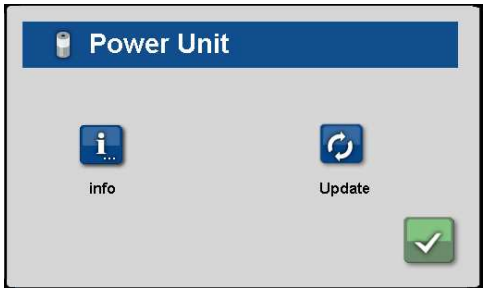


Next it will be asked whether the software of control unit should be updated. If you confirm with 'Yes' the update starts.

Important:
The USB memory stick may not be removed during update process!
After a successful update the display shows the corresponding message and the software starts again. The USB memory stick can be removed then.

12.7.2 Power Unit

Display and administration of the firmware version of the power unit. The adjoining dialogue appears.



12.7.2.1 Info

Shows the current version of the power unit firmware.

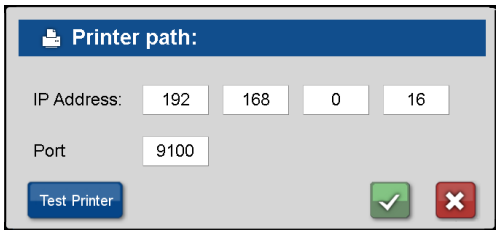
12.7.2.2 Update

Updates the firmware of the power unit. The firmware must be available on a USB memory stick connected to the device.

Next it will be asked whether the software of power unit should be updated. If you confirm with 'yes' the update starts.
Important:
The USB memory stick may not be removed during the update process!
After a successful update the display shows the corresponding message and the USB memory stick can be removed then. After the successful update the instrument has to be switched off and on again.

12.8 Print

The peqSTAR X thermal cyclers can print PCR programs and GLPs on a network printer. Using this dialogue, the path for the network printer, which the peqSTAR X should use, can be entered.



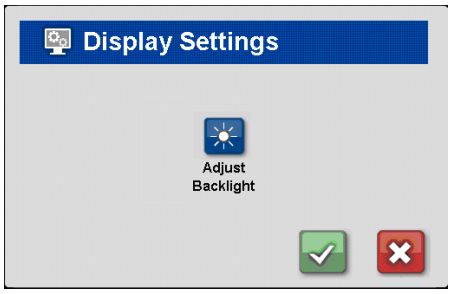
Please refer to your local network administrator for the correct printer path.

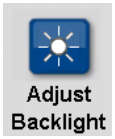
Using the button 

a test printing will be performed to check the correct settings.

12.9 Display

Pushing this button, the adjoining window opens:

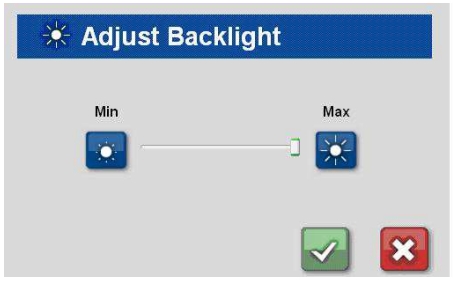




12.9.1 Brightness

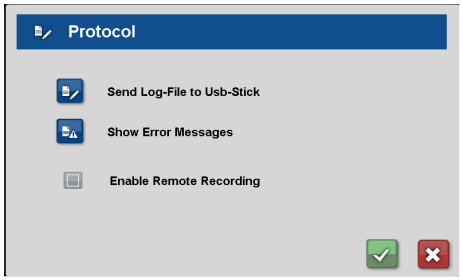
The following dialogue appears after pressing the button:

By pressing the  and  buttons or moving the roll bar the backlight of the display can be adjusted.



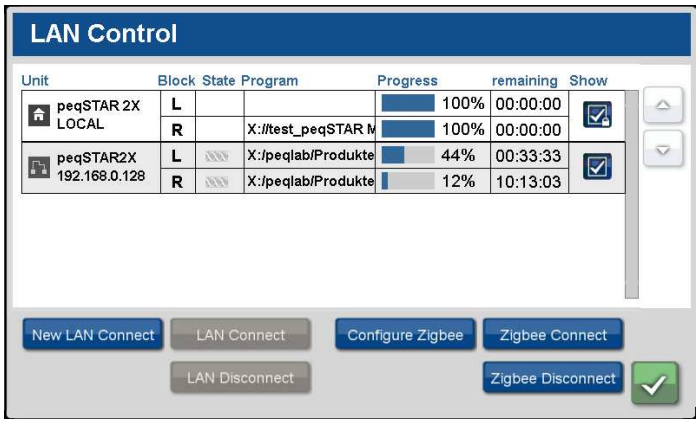
12.10 Protocol

For troubleshooting, the thermal cycler can record its own internal communication. The protocol file „log.txt“ can be stored on a USB stick. By using the button 'Send Log-File to Usb-Stick' the protocol file 'log.txt' can be saved on a USB stick. Alternatively possible error messages can be shown by pressing the button 'Show Error Messages'.



12.11 LAN Control

This dialogue is used to connect with a thermal cycler via network or zigbee, to be able to remote control the instrument.
When instruments should be available using the instrument button at the top of the display, the checkbox under 'Show' needs to be activated.



The following command buttons are available:

12.11.1 New Lan Connect

Using this button a LAN connection to a new cycler for remote control can be set up. Enter the IP address of the cycler, which should be available for remote control, in the input box.

The following message appears, when the connection starts:

'The connection to *IP Address Remote Cycler* will be done as soon as the other part confirms the request.'

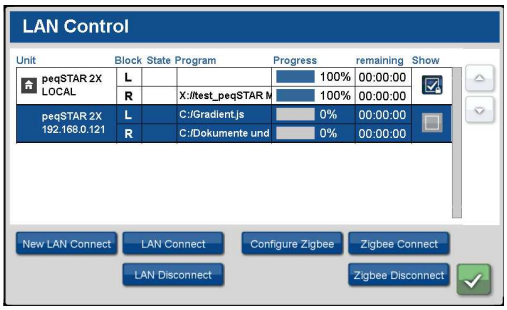
The cycler which should be available for remote control shows the following message:
'Do you want to accept connection to *IP Address Control Unit*?'
If this message will be confirmed with 'Yes' and the remote control accepted, the display of the control unit shows the following message then:
'User from *IP Address Remote Cycler* has accepted LAN remote.'

If a check mark is set at 'Always accept remote control' under 'System' => 'Network Settings' => 'Remote' the link connection is carried out without any further queries.

The cycler will then be entered in the display overview and is marked with the LAN sign , which confirms the active LAN connection.

When the instrument should be available using the instrument buttons at the top of the display, the checkbox under „Show" needs to be activated.
As soon as the cycler is displayed, it can be remote controlled by the control unit.

12.11.2 Lan Connect



As soon as a cycler was once remote controlled via LAN connection, it will be displayed in the LAN control window (in our example: peqSTAR 2X 192.168.0.121) and marked as non connected.
For a new LAN connection with this cycler, mark it in the overview and use the button 'LAN Connect' to start a new connection.

12.11.3 Lan Disconnect

For disconnect a LAN connection with a cycler, mark the chosen unit in the overview and use the button 'LAN Disconnect'. The cylcer could then be controlled again via touch screen. Alternatively the LAN connection will be stopped when the cycler will be switched off or in case that the software at the PC will be closed.

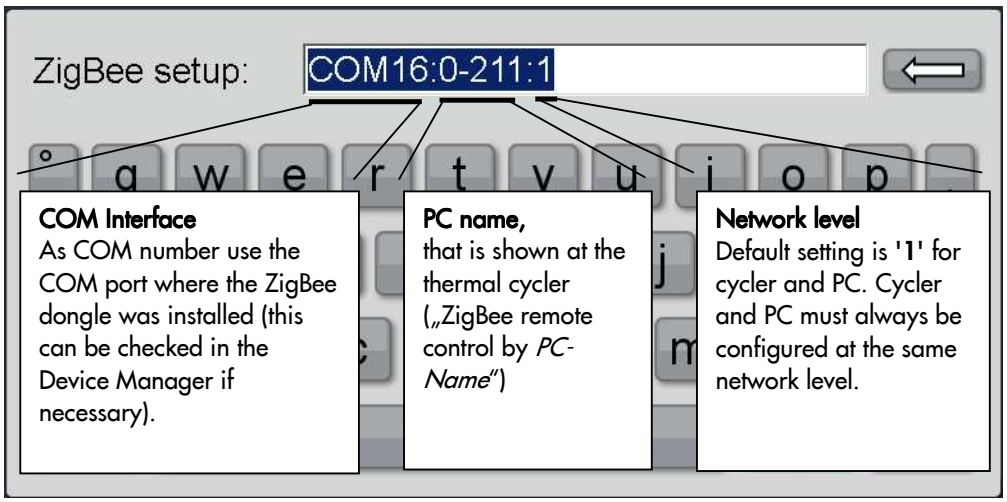
12.11.4 Zigbee Configure

The optional available ZigBee module is needed for wireless remote control (order number: 95-0ZIG). It consists of one module which is installed in the remote cycler and a ZigBee dongle for the PC as control unit.

To start a connection between the remote cycler and the PC as control unit, both ZigBee modules need to be configured.

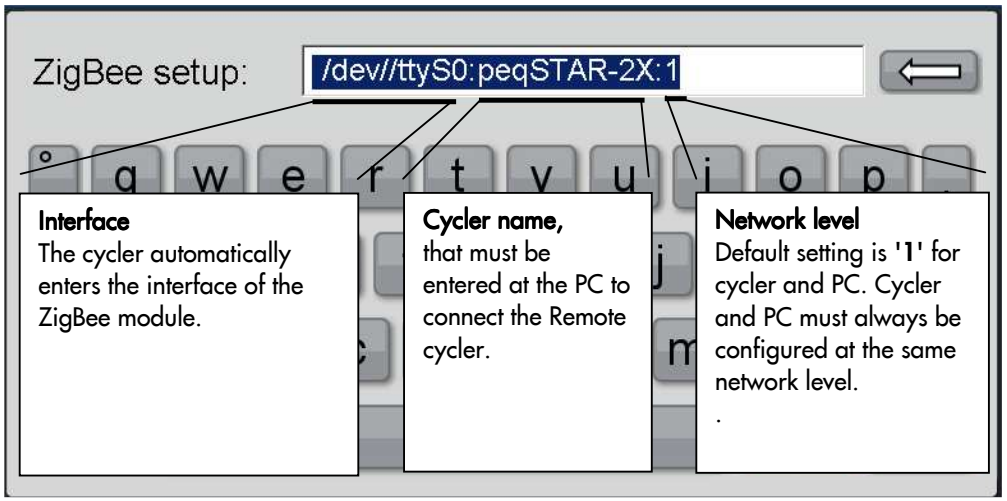
At the PC:
The message 'ZigBee dongle detection' appears if the peqSTAR Manager' software is opened while the ZigBee dongle is connected or will be connected subsequently. The message also shows at which COM port the ZigBee dongle is installed at the PC.
To configure the ZigBee dongle choose 'ZigBee Configure' at 'System' => 'LAN Control' in the 'peqSTAR Manager' software. A dialogue will appear with an automatic Setup window that might/must be adapted accordingly.

Enter: COM#:PC name:Network level
Example: COM16:0-211:1



At the Remote Cycler:
To configure the ZigBee dongle choose 'ZigBee Configure' at 'System' => 'LAN Control' in the 'peqSTAR Manager' software. A dialogue will appear with an automatic Setup window that might/must be adapted accordingly.

Enter: Interface:Cycler name:network level
Example: /dev/ttyS0:peqSTAR-2X:1



The adresses for PC and remote cycler need to be different.

12.11.5 Zigbee Connect

To start the wireless connection between PC and remote cycler, push the button 'ZigBee Connect' at the PC.
Enter the name of the remote cylcer, e.g. 'peqSTAR-2X'.
If the connection is successful the following message appears:
'The connection to *IP Address Remote Cycler* will be done as soon as the other part confirms the request.'
Then the following message appears on the system that shall be controlled:
'Do you want to accept connection to *IP Address Control Unit*?'

If this message is confirmed with 'Yes' and therefore the remote control authorized, the following message appears on the control unit.
'User from *IP Address Remote Cycler* has accepted LAN remote.'

If a check mark is set at 'Always accept remote control' under 'System' => 'Network Settings' => 'Remote' the link connection is carried out without any further queries.

The cycler will then be displayed in the overview and is marked with the ZigBee sign  , which shows the active wireless connection.

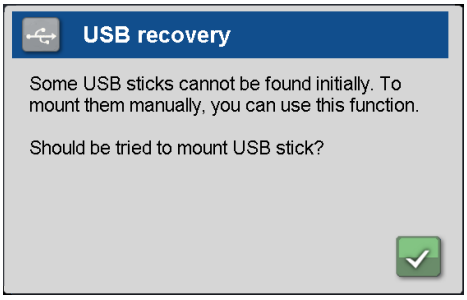
If the system shall be addressed directly through the buttons at the top of the screen, a check mark must be set at 'Show'. As soon as the cycler is displayed, it can be controlled via operating software as usual.

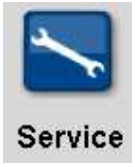
12.11.6 Zigbee Disconnect

To disconnect a ZigBee connection with a cycler, mark the chosen unit in the overview and use the button 'Zigbee Disconnect'. The cylcer could then be controlled again via touch screen. Alternatively the LAN connection will be stopped when the cycler will be switched off or in case that the software at the PC will be closed.

12.12 USB Recovery

USB sticks are differently formatted by manufacturers. The actual type of format is not obvious to the customer. Therefore some USB sticks are not automatically detected by the peqSTAR X system. In this case the USB stick can be manually mounted by using the function 'USB recovery'.





12.13 Service

Use of the service function is restricted to authorised, technical service. Access to this function is therefore password protected.

13 MAINTENANCE & REPAIR OF THE THERMAL CYCLER

13.1 Cleaning, maintenance and repair of the thermal cycler

For safety reasons the device must be switched off and the mains plug pulled before cleaning is carried out!
The surface of the thermal cycler can be wiped off with a damp cloth or ethanol. **Do not use aggressive or scouring cleaners or organic solvents for cleaning. The device must be protected from aggressive chemicals. Make sure that no liquid penetrates into the interior of the device.** If sample liquids penetrates into the drill holes of the thermal cycler clean them immediately with mild soap followed by distilled water. **You can use mild disinfectants for decontamination.**
Maintenance (test of the overtemperature shutdown and temperature check-up see 13.2. and 13.3) should be carried out regularly to detect possible technical failures.
The electric fuses are placed at the back of the device between the power switch and the mains plug. After pulling off the mains plugs and pushing upwards a safety catch the fuses can be changed. Use only fuses with correct values (indications about the fuse type are placed at the back of the device).
The device may only be opened by a qualified specialist. Unauthorized work on the device voids the warranty. All kinds of repairs may only be carried out by authorized persons using original replacement parts.
The replacement of single components of the device must not be done by the user but exclusively by authorized specialists. Therefore the device must be sent to the manufacturer. **The surface of the device should be decontaminated with a lint free cloth soaked with 70 % ethanol before sending.** The drill holes of the thermoblock shall be cleaned with a 1.5 % hypochlorite solution with the help of a cotton bud. **Please fill in and sign the decontamination certificate and send it to the manufacturer together with the device.**

13.2 Test of the overtemperature protection

A periodical test of the overtemperature protection is recommended (see chapter 12.6.1).

13.3 Temperature check-up

Maintenance of the temperature at regular intervals is recommended. The thermometer for use should be equipped with wired sensing devices (e.g. Pt1000) and should have an accuracy of measurements of 1/10 class B (ΔT = ±0.03 °C) in the range of 0 to 100 °C. While processing the temperature control the room temperature should be 25 °C at maximum.

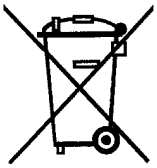
13.4 Calibration

If there is a reasonable suspicion that the device has deviated from the calibration range, because the variations of the temperature check-up are considerably out of the acceptable tolerance, a new calibration must be carried out by the manufacturer. Please contact your local distributor.

14 WARRANTY

The period of warranty for the product at hand is 24 month from date of purchase. The warranty does not apply for defects caused by incorrect, improper or inappropriate use. The customer has to check up on obvious defects promptly upon receipt of the device and send a written report. Otherwise the claim for warranty expires. The manufacturer reserves the right to carry out changes to the thermal cycler or to the technical documentation of the thermal cycler on the basis of product development or improvement without prior notice.

15 DISPOSAL INSTRUCTION



This product is subject to the WEEE disposal regulations and cannot be disposed of with regular waste.
Please contact PEQLAB Biotechnologie GmbH or your local distributor for disposal of peqSTAR X thermal cyclers. Old electronic equipment is not useless waste. Environmentally friendly disposal can help to retrieve valuable resources. Thereby you contribute to the protection of the environment and human health.

16 TECHNICAL DATA

16.1 General characteristics

- 2 x 8 or 16 Peltier elements with Long-Life-technology and 2 x 8 or 16 control circuits with Pt 1000 temperature sensors, respectively
- Maximal heating and cooling rate: 5 °C/s
- Block uniformity (at 72 °C): ± 0.2 °C
- Temperature range thermoblock: 4 to 105 °C
- Control accuracy thermoblock: ± 0.1 °C
- Variable ramping: 0.1 to 3.0 °C/s
- Increment/Decrement time: 0:00:01 to 9:59:59
- Increment/Decrement temperature: 0.1 to 9.9 °C
- Lid heating temperature range: 40 to 120 °C
- Programmable Lid locking mechanism
- 4 x USB, 1 x Ethernet interfaces (MS Windows® or Linux), maximal length of USB cords 3 m!
  Note: USB interfaces only support standard USB sticks, cord mouse and keyboards!
- Dimensions (B x H x D): 30 x 28 x 38 cm
- Weight incl. block: 13.3 kg
- Electrical power supply: 90 – 264 V AC, 50 – 60 Hz, 850 VA
- Fuse: 10 A time lag
- Pollution rate: 2
- Environmental temperature range: +10 °C to +30 °C
- Max. relative humidity: 70 %
- Maximum height above sea level: 2000 m
- For indoor use only!
- Noise level: < 37 dB (A)

16.2 Gradient feature (optional)

- Maximal gradient range over 8 or 16 columns, respectively: 30 °C (± 15 °C)
- Temperature range Gradient: 35 to 105 °C
- Gradient accuracy: ± 0.1 °C

16.3 User interface/functions

- Touch sensitive TFT-Display (VGA, Graphic, 65535 colours), operation via USB mouse possible
- Direct help function, Tm- and elongation time calculator
- Internal flash memory for 500000 typical PCR programs in free configurable folders/subfolders
- Unlimited number of programs via network PC or USB memory stick
- Free PC software for the generation of PCR programs on the computer
- Unlimited number of steps per program
- Password protected user accounts with variable access rights
- GLP reports for complete recording of all runs
- Quickstart function of the last used program

- Automatic restart after power failure, Power-Fail-Denaturation, Instant Incubation
- Remote control and monitoring of instruments via PC-software
- MP3 sounds free of choice
- User call per email
- Master-/Slave-control (optionally also wireless available)

16.4 Block capacity

peqSTAR 2X/2X Gradient:
Two 48 well Universal blocks with: lid heating and automatic height adaption for 48 x 0.2 ml tubes, 48 well PCR plates or 24 x 0.5 ml tubes with flat caps.

peqSTAR 96X/96X Gradient:
96 well Universal block with: lid heating and automatic height adaption for 96 x 0.2 ml tubes, 96 well PCR plates or 48 x 0.5 ml tubes with flat caps.

peqSTAR 96X HPL/96X HPL Gradient:
96 well block with High Pressure lid (HPL, 100 – 250 N) for the safe sealing of 96 well PCR plates

peqSTAR 384X HPL:
384 well block with High Pressure lid (HPL, 100 – 250 N) for the safe sealing of 384 Well PCR plates

peqSTAR In situ X:
In situ block with integrated buffer reservoir, for up to 4 microscope slides

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