G-STORM

G-STORM GS1

Instruction Manual

G-Storm - 2011

Release Information

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G-Storm

Somerton Biotechnology Centre

Ricksey Lane

Catcombe

Somerton

Somerset. TA11 7JH

England

Phone +44 (0) 7919 121510

Email: info@gstormdirect.com
Web: www.gstormdirect.com

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Trademark Information

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General Information

Policy Statement

It is the policy of G-Storm to improve products as new techniques and components become available. G-Storm reserves the right to change specifications at any time.

Warranty Statement

G-Storm Ltd guarantees that the thermal cycler you have received has been thoroughly tested and meets its published specification. This guarantee is valid for 24 months only if the product and functions have been used according to the instruction manual. No liability is accepted for loss or damage arising from the incorrect use of the thermal cycler. G-Storms liability is limited to the repair or replacement of the unit or refund of the purchase price at G-Storm's option. G-Storm is not liable for any consequential damages.

G-Storm thermal cyclers are for research use only.

Read the Instruction Manual carefully before using the thermal cycler to ensure that you obtain the best possible results from the machine.

G-Storm thermal cyclers should only be used by suitably qualified and trained people. If the thermal cycler is not used as specified in this manual, the protection provided by the equipment may be impaired.

1 Safety Warnings and Precautions

1.1 Before Operating the Instrument

Ensure that anyone involved with the operation of the instrument is instructed in both general safety practices for laboratories and specific safety practices for the instrument.

Always place the instrument in a location where, if necessary, the main power supply can be disconnected immediately.

1.1.1 Instrument Safety

Please read this section before operating the thermal cycler. Operators of this instrument must be trained in both general laboratory safety practices and the specific safety requirements of the thermal cycler. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

All functions performed within the context of preparing, performing and completing a run should be done with caution and care, and with general respect both to the instrumentation and to associated chemicals, samples and other devices.

1.1.2 Symbols and Conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

⚠	**CAUTION** This symbol indicates a potential risk and alerts you to proceed with caution
⚡	**CAUTION** This symbol indicates the presence of high voltage and warns the user to proceed with caution
♨	**CAUTION** This symbol indicates risks associated with hot surfaces

1.1.3 Potential Safety Hazards

1.1.3.1 ELECTRICAL

Standard electrical safety precautions should be applied.

- Ensure that the proper voltage is supplied before turning the instrument on for the first time.

- The device must be connected to a grounded socket.

- Do not touch any switches or outlets with wet hands.

- Switch the instrument off before disconnecting the AC power cord.

- Unplug the instrument prior to cleaning up any major liquid spills and prior to servicing any of the electrical or internal components.

Only qualified personnel should perform electrical servicing.

1.1.3.2 EXPLOSIVE SUBSTANCES

Explosive, flammable and reactive substances should never be cycled or incubated in any thermal cycler.

Do not operate the thermal cycler in a hazardous or potentially explosive environment.

You must observe the relevant safety regulations when handling pathogenic material, radioactive substances or other substances hazardous to health.

1.1.3.3 FLUIDS

Reaction vessels should be filled outside the cycler so that no fluids penetrate the instrument.
Do not submerge the instrument in any liquid.

1.1.3.4 DANGER OF BURNS

Thermal block, inner side of heated lid and reaction vessels quickly attain temperatures of greater than 50°C. **Do not touch – Risk of Burns!** Keep the heated lid closed until temperatures of 30°C or lower are reached.

Do not use any materials (plates, sealings, foils, mats), which are not sufficiently temperature-stable (up to 120 °C).

1.1.3.5 OPERATING ENVIRONMENT

Please ensure that the ventilation slots of the device remain free to vent at all times. A space of at least 10cm should be left around the thermal cycler

The ambient temperature should be between 10°C and 30°C, the humidity between 0% and 95%.

> **WARNING:**
>
> **G-Storm's service engineers must carry out all repair work!**
>
> **Only original G-Storm replacement parts must be used.**
>
> **Disconnect the instrument from the mains supply before opening.**

2 Installation

2.1 Requirements

The following steps must be followed for optimal and safe operation of the thermal cycler:

2.1.1 Site

- The thermal cycler should be placed on a rigid, flat, clean surface. Make sure that the instrument stands completely stable.

- Adequate ventilation is important. Make sure there is sufficient space so that the rear and side air slots are not covered and to allow cooling air to circulate freely around the instrument.

- There should be no paper under the device as this may block the ventilation path. The unit should always have at least **10cm** distance to the next wall or neighboring instrument.

- Gene Technologies Ltd thermal cycler instruments were developed for operation in laboratories in which there is normal ambient temperature and no explosive atmosphere. The ambient temperature should be between 10°C and 30°C the humidity between 0% and 95%.

2.1.2 Electrical

- The thermal cycler must be connected to a grounded socket.

2.1.3 Thermal Block

- Reaction vessels should be filled outside the thermal block so that no fluids penetrate the instrument.

- To prevent damage to the block and the heated lid make sure you use only recommended sample tubes. Unsuitable tubes can be damaged causing the escape of sample material. This may present a serious health hazard, especially when working with infectious materials.

- Make sure plates are positioned correctly in the block to prevent damage to the block and the lid.

- Ensure that the heated lid is closed when heating tubes in the block, otherwise tubes may burst due to high temperatures, causing the escape of sample material.

2.2 Unpacking the Thermal Cycler

2.2.1 Package Contents

The following parts are included in delivery:

	G-STORM GS1
Thermal Cycler	**X**
Power Cable 110 or 220V	**X**
Stylus (x3)	**X**
G-storm Ltd Thermal Cycler User Manual on CD or memory stick	**X**

2.2.2 Initial Inspection

All parts of the instrument were thoroughly inspected and tested before the unit was shipped, therefore the instrument should be in good operating order. Carefully inspect the instrument and its accessories for any physical damage sustained in transit.

If the instrument is received in a damaged condition, please file a claim with the transport carrier immediately and contact G-Storm for advice.

2.2.3 Thermal Block

The thermal block is shipped in separate packaging from the unit. It should be removed from its packaging and located into position in the instrument. Ensure that you push down the front and the rear of the block so that the block is fully engaged in its correct position.

Figure 2-1: G-Storm GS1 cycler - thermal block installation

2.3 Functional Overview

G-Storm Ltd thermal cyclers are automated instruments designed for carrying out methods for amplification of DNA templates.

Figure 2-2: G-Storm GS1 thermal cycler (profile view)

The G-STORM GS1 has a manually operated lid. The dial on the top of the lid should be turned to the fully closed position to apply adequate pressure to the sample vessels.

The G-STORM GS1 is operated via its own internal PC and a universal software application offering independent control of the thermal block.

Figure 2-3: G-Storm GS1 thermal cycler Main Screen/Home Page

2.4 Hardware Installation

2.4.1   Starting up the G-STORM

Once you have set up the G-STORM as explained in section 2.1 and 2.2 you can connect it to the mains.

- Plug the AC power cord into the main power connector at the rear of the instrument and connect the other end of the cable into a grounded AC outlet.

- Adjust the LCD display to an acceptable viewing position.

- Press the power switch on the side of the instrument.

- The cooling fan powers up and the thermal cycler will go through a short initialisation routine. Then, the Home Page appears providing access to the thermal cycler's navigation elements.

- Perform Cycler Tests.

  - o **Login** as an administrator

  - o Click **Settings** button

  - o Click **Browse** cycler management

  - o Click **Cycler Tests**

  - o Click Engine Test (Ensure a tube or plate is in the block for this test)

Cycler Test procedures include specific instrument tests to ensure correct installation and operation of the thermal cycler.

After the tests have been completed successfully, the instrument is installed, operational and ready for use.

2.4.2   Connecting Optional Devices

Optional input devices such as keyboard, mouse, printer and barcode reader can be connected to the the thermal cycler via a USB connection.

- Plug a USB cable into the USB port of the input device.

- Connect the other end of the USB cable to:
  - the USB port of the thermal cycler, **OR**
  - a USB hub, if you wish to connect several input devices to a G-STORM GS1
- When connecting several devices plug the cable connector of the USB hub into the USB port of the thermal cycler.
- For further configuration of the device consult the manufacturer's instruction manual.

2.5 AC Power Connection

2.5.1 Operating Power Requirements

All G-Storm Ltd thermal cycler models have self-regulating power.
See Instrument Specifications, Power & Dimensions for power specifications.

2.5.2 Fuses

WARNING: Disconnect the AC power cord before removing or installing a fuse to avoid the possibility of serious injury from electrical shock!

Fuse compartments are located on the rear of the instrument, above the main power connection. Check the voltage rating label to verify that the instrument is compatible with the AC voltage available at the installation site.

2.5.3 Grounding Requirements

DANGER: please read carefully!

To protect operating personnel, the National Electrical Manufacturers; Association (NEMA) recommends that the instrument be correctly grounded. The instrument is equipped with a 3 conductor AC power cord that, when connected to an appropriate AC power outlet, grounds the instrument. To preserve this protection feature, do not operate the instrument from an AC power outlet that has no ground connection.

3 Software Operation

3.1 G-STORM and GSPC Software

G-STORM thermal cyclers are operated via their own internal PC running under Windows and a universal software engine offering simple and intuitive instrument control.

The unique Program Wizard^{TM} function enables stepwise protocol definition, with no tedious calculations required. Drag-and-drop icon-based commands make all steps quick, clear and intuitive throughout. Optimised conditions from gradient protocols are converted to standard protocols with only a single point and click.

The programming software can be installed additionally on any laptop or desktop PC running WIN 2000 or XP. The memory stick supplied allows quick and easy data and program exchange between PC and the thermal cycler's internal PC.

3.2 Required Computer Skills

Users should have basic computing knowledge including using the mouse, selecting items, and drag and drop.

3.3 Main Screen

Upon power up of the system, the screen first displays a start-up routine followed by the Main Screen/Home Page.

Figure 3-1: G-STORM GS1 Main Screen with navigation elements

3.3.1 Command Buttons

The Home Page Window comprises command buttons which provide quick access to the functions that are available on the GS1.

Service and Support displays contact details for service and application support

Login opens the Login dialogue window.

Run Program opens file list, enabling users to select program to run.

New Program opens the Compose/Edit a Program dialogue.

View / Edit Program opens the file list to browse programs.

Incubate opens the incubate temperature screen.

Program Wizard opens the Program Wizard dialogue where you can define specific information.

Reports opens the report browser where you can search for stored reports.

Settings opens the User Settings dialogue window where you can configure user settings such as defining the default start screen and manage cycler or user data.

3.3.2 Additional functions

G-STORM
Opens the Profile/Status screen for a program which is running on the instrument

Provides the operational status of the instrument (flashes green when the instrument is running)

User:
Provides information on current user

3.4 System Settings

Specific system settings can be defined by clicking on the **Settings** button when logged in as an Administrator.

3.4.1 Cycler Management

Browsing this option allows an Administrator to edit cycler settings and perform cycler validation tests.

3.4.2 User management

Browsing this option allows an Administrator to manage cycler users.

3.4.2.1 User Levels

Three different user levels are available:

- Administrator
- Registered User
- Guest User

Each level has specific user rights. Only administrators are authorised to set up new users and to change and/or assign user rights and passwords.

By default, the thermal cycler starts with Guest user rights.

User Rights	Functions allowed
Guest User	- Access rights to the Guest folder - Creating, copying, editing and executing programs stored in the Guest folder
Registered User	- Access rights to the Guest and personal user folders - Creating, copying, editing and executing programs stored in the Guest and personal folders - Access to GLP reports **denied**

Administrator	• Access rights to all Guest and user folders
	• Setup and maintenance of users
	• Setup and maintenance of cyclers
	• Archiving/maintenance of all reports

3.4.2.2 New Users

Only the administrator is authorised to set up new users and to change or assign user rights and passwords.

As a first-time user you will be logged in as "Guest" user, visible in the centre of the Home Page. Guest users usually have restricted user rights and work from the unprotected Guest folder, which can be accessed by all users.

Before you can operate the thermal cycler as a regular user, your administrator has to set you up as a new user. Once you are a registered user, you have a personal, encrypted file folder where you can administer your own program files.

3.4.2.3 Logging in as Administrator

After starting the thermal cycler, the Main Screen appears displaying the thermal cycler's navigation elements.

1. Click on the **Login** button on the screen.

2. Select *Administrator* from the **Username** drop-down list and enter the administrator password. **The default administrator password is admin**

3. Click **Login** to confirm your settings.

4. You are now logged in as Administrator (visible in the centre of the Home Page screen)

IMPORTANT: It is recommended that the factory-set login password be changed to prevent unauthorised access to the instrument

3.4.2.4 Adding or Modifying User Accounts

NOTE: Only the administrator can set up new users or modify existing user accounts.

To add a new user, click **New User** to open the **Add a new User** dialogue.

Assign a user name and password.

Select the required user level (Guest, User, Administrator) from the drop-down list.

Now you can define the user's script reading and writing privileges by checking the appropriate boxes:

Edit/Rename Script	The user has the right to edit or rename a program file
Delete Script	The user has the right to delete program files
Create Script	The user has the right to create program files

Once you have entered all data, click on **Create User** to save the settings. After successful setup, a confirmation message will be displayed and the new user name will be added in the **User Management** list.

To modify an existing user, highlight the user name and click **Edit User** to open the **Edit a User** dialogue.

Here you can modify user data such as name, user level, password, user privileges and script directory protection.

Click **OK** to save the changes.
A confirmation message will be displayed after successful update of the user data.

3.4.2.5 Deleting User Accounts

NOTE: Only the administrator can delete User accounts.

The **User Management** dialogue lists the available user names and corresponding user levels.

Select the user name you wish to remove.

Click on **Remove User** to remove the user name from the user list. It removes all user permissions that the user has and does not allow that user to access any the thermal cycler device. It also deletes all scripts and GLP reports associated with that user.

NOTE: The Remove User command also deletes all scripts and GLP reports associated with that user. The Administrator user account cannot be deleted.

3.4.3 Cycler Settings

Browsing this option allows an Administrator to edit date and time settings and select the language for the instrument. The Power Resume On/Off option determines whether a program should continue or not after a power failure.

4 Programming

4.1 Creating Programs

G-STORM and GSPC software offers two innovative ways of composing programs: *Drop-and-Drag Programming* (DND Programming) and the *Program Wizard*.

4.1.1 DND Programming

Drag-and-Drop programming (DND programming) is an easy and intuitive method for conveniently creating programs step-by-step.

The basic idea of DND programming is that you choose the required command from a command list, drag it into the program window and drop it into the desired program position. This opens a dialogue window where you can define further command-specific settings such as time, temperature, lid pressure, etc. In this way, you can create your program according to the planned programming sequence.

The command order can be changed easily by dragging the selected command to the desired position within the program window.

Once the program is started the cycler will process the commands from top to bottom according to the defined programming sequence.

To generate a new program using DND, click on the Home Page. This will open the **Compose / Edit a Program** dialogue with its drag-and-drop functions:
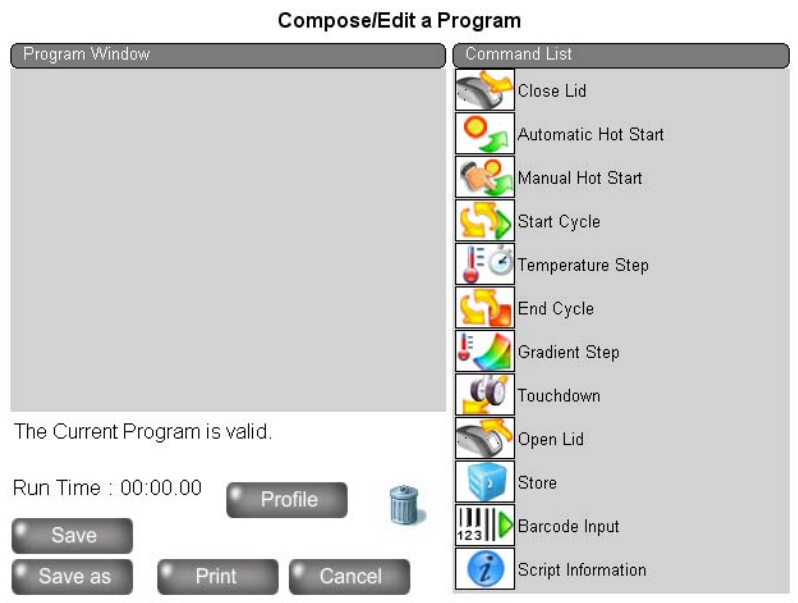
Figure 4-1: Compose / Edit a program *screen*

The *Compose / Edit a program* screen consists of the *Command List*, which contains all available program steps, and the *Program Window* where you can create or edit programs.

1. Select a command from the *Command List*, then drag and drop it into the *Program* Window. This will open the dialogue window of the selected command.

2. Enter your settings in the dialogue fields of the selected command.

3. Confirm your settings by clicking **OK**. This will return you to the **Compose / Edit a program** window.

To add another command to your program repeat steps 1–3 for each required command.

Click on **Profile**, if you wish to view a graphical representation of the defined temperature profile.

Once you have finished creating your program, save it by clicking on **Save As** and you will be prompted for a file name.

Name your file within Windows naming conventions.

4.1.1.1 Program Steps

The following program steps are available in the Command List for creating customised programs in the Program Window:

Barcode Input

Use this command to define barcode settings. When composing the program, it is recommended to place the barcode command at the beginning. During program run you will be asked to read the plate's barcode. You may do this with a handheld USB barcode scanner or by manually entering the barcode. If you use the barcode scanner, the barcode cannot be edited after reading.

The program will continue after you have placed the plate into the cycler and pressed *OK*. The barcode will be recorded in the GLP and LabBook report and displayed in the *Info* section of the Cycler screen.

Scan Using Barcode Entry: Barcode reading using the barcode scanner

Scan Using Keyboard Entry: Manual entry of the barcode via keyboard

Path for worklist: Specifies the path for the worklist.

Heated Lid

Use this command to set the required lid temperature.

Lid Temperature: The temperature may range from 112°C to 120°C. The minimum increment is 1°C.

Lid is ON: Select this option to activate lid heating.

NOTE: The heated lid automatically switches off at temperatures below 25°C.

Automatic Hot Start

Automatic Hot Start: This step should be incorporated into a program when using a hot start polymerase. Select the denaturation temperature and time. When running the program, the next command will be executed immediately after the denaturation time is elapsed.

Please also refer to the polymerase manufacturer's recommendations

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Manual Hot Start

Manual Hot Start: this step should be incorporated into a program when using a standard polymerase. Select the denaturation temperature and time. When running the program, the instrument will notify you after the denaturation time has elapsed. You will then be asked to open the lid and add the enzyme. The instrument timer is now on hold and will continue only after you have pressed **OK** in the displayed *Hot Start* information window.

Temperature Step

Use this command to select the required temperature (in °C) and to define the step duration.

Processing Temperature: Set the required temperature

NOTE: Temperature steps within a cycle must be greater than 30°C

Hold for: Set the required time in minutes and seconds. If the '*hold at this temperature'* is option is selected, the cycler will remain at the temperature

---

until the program is resumed. This allows the user to determine when to continue to the next step.

Temperature Ramp: Rate of change of the sample temperature. Rates can be from 0.1°C to 3°C per second. (Unit is defaulted to run at maximum ramp rate).

Temperature Increment: Temperature increment and decrement per cycle. Steps can be from 0.1 °C to 10 °C.

NOTE: For decrement use negative figures (e.g. -2)

Time Increment: Time increment per cycle in seconds.

Step Type: Indicates the selected step type for information purposes. The supplied step type information will then be displayed in the cycler monitor.

Touchdown

Touchdown is an advanced technique used to reduce non-specific binding. With the G-Storm thermal cycler, Touchdown is provided as a one-step command for easy implementation in the programming sequence.

Denaturation Temperature: Defines denaturation temperature.

Maximum Annealing Temperature: Sets the maximum annealing temperature.

Minimum Annealing Temperature: Sets the minimum annealing temperature.

Hint: The temperature difference is commonly between 5°C and 10°C starting with a temperature that is 2°C above the higher Primer melting temperature. Example: if Tm Primer 1 is 60°C and Tm Primer 2 is 54°C, the resulting Touchdown will be from 62°C to 52°C.

Elongation Temperature: Sets the elongation temperature.

Cycles: Number of required cycles for the Touchdown section.

Duration: Duration of the temperature step in seconds.

Gradient Step

Use this command to define settings for the gradient function. Just enter the required minimum and maximum temperature gradient and time. Gradient steps are not available in the USA, Japan and Germany

Minimum Temperature Gradient: To set the minimum temperature of the gradient step. Min. temperature must not be below 30°C.

Maximum Temperature Gradient: To set the maximum temperature of the gradient step. Max. temperature must not exceed 80°C.

NOTE: The maximum / minimum gradient span is 30°C / 4°C.
Hold for: Duration of the Gradient step.

Convert Gradient Step to a standard temperature step: The Gradient step can be converted easily to a temperature step after the annealing temperature optimisation experiment. To do so, just check the checkbox and select the temperature column with the best result of your optimisation experiment. The converted gradient step will then automatically use the temperature of this best-performing column.

> **NOTE: Resulting temperature steps may be reconverted to gradient steps any time by disabling the *Conversion* option**

Start Cycle

Starts a cycle.

Cycle Name: Enter the name of the cycle.

Number of cycles: Enter the required number of cycles.

End Cycle

Insert this command to terminate a cycle.

> **NOTE: All programs with a Start Cycle, must have an End Cycle.**

Store

Cools the thermal cycler down to a temperature between 4°-12°C for a specified period of time.

Store Temperature: Storage temperature in °C.

Hold for: Duration of the Store step.

Infinite: Holds the specified temperature for an unlimited period of time.

> **NOTE: When executing the *Store* command, the lid pressure is set to zero Newton**

Script Information

Use this command to record your comments about the program.

4.1.2 Program Wizard

The Program Wizard^{TM} is a unique feature that makes it easy for first-time users to write their own protocol. The Program Wizard utilises biological data to generate a program. Enter primer and template information e.g. Primer sequence or melting temperature, template length and origin of DNA.

The Program Wizard is also an ideal tool for first shot reactions as it uses proven calculations, e.g. for the Annealing Temperature.

To generate a new program click on **Program Wizard** in the Main Screen.

1. **Primer Information:** Enter either primer sequences or melting temperatures. Sequences can be uploaded from a .txt file on a memory stick. Click **Browse** in the Sequence Primer One/Sequence Primer Two section and browse for the required files in the **Upload Sequence from USB Memory Stick** dialogue window. Select the desired file and click **Open** to upload the file to the thermal cycler.

2. **Product Length:** Enter the length of your product either manually or using the slide bar

3. **DNA Source Information:** Select from Bacterial, Eukaryotic or Plasmid

4. **Specials:** Select any special requirements that your program may require, e.g. type of enzyme, high AT, GC content.

5. After you have supplied all required data click on **Generate Program**. The **Compose / Edit a program** dialogue window opens where you can view and edit the program steps.

To edit a program step, double-click the respective command.

To view a graphical representation of the defined temperature profile, click **Profile**.

4.2 General Programming Guidelines

To ensure a correct run, the following guidelines should be followed when composing a new program:

- A program must contain at least one *Temperature Step*.

- Cycles cannot be nested. A started cycle must have an *End Cycle* command before starting the next *Start Cycle* command.

- *Barcode Input* commands cannot be programmed inside a cycle.

- Only a single *Script Information* command is valid within a program.

The following commands or command combinations are considered "stages":

- Automatic Hot Start
- Manual Hot Start
- A string of up to ten single Temperature steps
- Single Gradient steps
- A complete cycle including Temperature or Gradient steps within a start cycle / end cycle pair.
- A Touchdown command
- A Store command

When using these stages in a script, the following rules apply:

- The maximum number of stages within a script must not exceed 10.

- The maximum number of Temperature and Gradient commands inside a cycle must not exceed 10.

- The maximum number of cycles within a stage is 99.

4.3 Editing Programs

4.3.1 Editing Program Parameters

You can edit the parameters of existing programs and store the program with the same name or rename the edited program.

To edit an existing program, click on the Home Page

Depending on your user level (guest or registered user), the specific user directory or guest directory is displayed listing all existing program files.

Select the program you wish to edit.

- Click **Open**.
  Opening the file automatically loads the program and the program steps are displayed in the Program Window of the **Compose / Edit a program** *screen.*

- Double-click the command you wish to edit. This will open the dialogue window of the respective command.

- Edit the parameters as needed.

- Click **OK** to save your changes and to return to the **Compose / Edit a program** screen.

- After you have modified all data, click **Save** in the **Compose / Edit a program** screen, if you wish to store your changes in the existing program.

- Click **Save As**, if you wish to rename the program. You will then be prompted for a file name.

4.3.2 Deleting a Program Step

To remove a program step from the program drag it from the Program

Window and drop it into the recycle bin icon located below the
Program Window.

Save the program as described above.

4.3.3 Converting a Gradient Step

A gradient step can be converted to a standard temperature step with a few
mouse clicks.

- After performing the gradient experiment, have a look at the gel image
  and select the best-performing column.

- Double-click the Gradient Step command to open its dialogue window.

- Select the **Convert Gradient Step to a standard temperature step**
  checkbox.

- Select the appropriate column from the drop-down list in the
  Conversion section.
  The thermal cycler software will now convert the gradient step into a
  temperature step and automatically select the right temperature in the
  chosen column.

**NOTE: If it is required to repeat the gradient experiment, the converted
temperature step can be set back to a gradient command just by unchecking
the Conversion option**

4.4 Deleting Programs

To delete an existing program, click on the Home Page.

Depending on your user level (guest or registered user), the specific user
directory or guest directory is displayed listing all existing program files.

Select the program you wish to remove.

Click **Delete**. This will remove the program from the script folder.

4.5 Incubate temperature

To run the cycler for incubations or ligations utilise the **Incubate** temperature
function. Click

- Select the temperature that you require
- Select the time you require

OR

- Select infinity (Cycler will run until you **Stop** the program)

5 Run / Operation

5.1 User Login

5.1.1 Guest Users

When powering up the instrument the default user level is Guest. If you wish to continue to operate the cycler with Guest user rights, no special login procedure is required. In this case you can access the unrestricted Guest folder and operate the cycler as described in the relevant chapters.

5.1.2 Registered Users

Once the administrator has set you up as a registered user (see 3.4.2.4), you can operate the thermal cycler using your personal data and file folders.

To log into the system as a registered user proceed as follows:

- Click on **Login** – the **Login** dialogue opens.

- Select your user name from the Username drop-down list and enter your password.

- Click on the **Login** button. This will log you into the system giving you reading and writing rights as specified for your user level.

- After successful login your user name is displayed in the top status bar.

NOTE: In case a user forgets his or her password, the logged-on administrator can assign him/her a new one.

5.2 Changing Users

In order to log into the system when another user is already logged in, proceed as described in section *Registered Users* above.

5.3 Viewing Script Temperature Profiles Prior to Run

Before starting a run, you can view the temperature profile of a new or stored program.

Click on **Profile** in the **Compose / Edit a program** dialogue window.
An information screen is displayed detailing all the parameters of the selected program.

5.4 Opening and Closing the Lid

The lid can be opened and closed manually at any stage.

5.5 Loading the Cycler

> **WARNING:**
>
> ⚠ **Danger of Burns! The thermal block, test tubes and plates may reach temperatures as high as 100°C! Before loading or unloading the cycler, keep hands away until temperature reaches 30°C or less**

5.5.1   Loading Plates

Depending upon the thermal block installed, the thermal cycler can be loaded with one 96-well plate or one 384-well plate.
Put your plate on the block and ensure that it is correctly positioned in the provided space.

5.5.2   Loading Tubes

G-STORM thermal cyclers can be loaded with up to 96 tubes (0.2 ml) or 48 tubes (0.5 ml) when using the 96-well combi block.

5.6 Setting the Lid Pressure

Close the lid and turn the knob until firm contact is made between the heated lid and tube or plate.

5.7 Program Execution

5.7.1 Starting a Run

To start a run, click on the Home Page

Your personal file folder will open or, if you are logged in as a guest, the guest folder opens displaying all available programs.

Select the program you wish to run.

Click **Run selected** on the right-hand side of the window, enter your sample volume (5-150ul), and click **OK** to start the selected program.

5.7.2 Viewing Current Program Step Information

After a run has started, a graphical representation of the temperature parameters is displayed on the Profile Screen. In addition, detailed program and instrument information can be viewed using the **Program** or **Info** buttons located in the right-upper corner of the information screen.

Click **Program** to display the program steps of the running protocol. The executed step is highlighted.

Click **Info** to view detailed instrument information such as temperature status, lid status, remaining time and step time or GLP file name.

During a run, it is possible to return to the Home Page by clicking on the **Home** button. To return to the Profile Screen, click on the **G-Storm** logo in the centre of the Home Page.

5.7.3 Terminating a Run

To stop a program manually before it completes, click the **Stop** button on the Profile Screen.

Alternatively, use the **Stop Program** button on the Home Page (changes from **Run Program** during a run)**.**

The manual cancel of the program will be recorded in the GLP and lab book reports

5.8 Reports

5.8.1 Viewing Reports

Depending on the assigned user level, you are allowed to view and archive LabBook reports stored in the following file folders:

User rights	File folder	Action
Guest users	Guest folder	Viewing and archiving Lab Book reports The access to GLP reports is **denied**.
Registered users	Guest folder & Personal file folder	Viewing and archiving Lab Book reports The access to GLP reports is **denied**
Administrator	All guest and user folders	Viewing and archiving Lab Book reports Access to GLP reports **permitted**

To view reports proceed as follows:

Click **Reports** in the home page. This will open the **Browse Generated Reports** window listing the generated reports.

Group the displayed reports by selecting one of the sorting criteria below:

Group by Date: Sorts records in ascending order by date.

Group by Cycler: Sorts records by cycler name.

Group by Program: Sorts records by program name.

For viewing GLP and/or LabBook reports select one of the following options:

Show GLP: Displays the generated GLP records (only for users with administrator rights)

Show LabBooks: Displays the generated LabBooks

5.9 Language Selection

G-Storm thermal cyclers can be operated in English (Default) and French.

To change the default langauge:

- Login as an administrator

- Click **Settings** in the Main Screen

- Click **Browse** on Cycler Settings

- Select the language you require

- Click OK

The unit will then remain in the selected language.

5.10 Switching Off the Instrument

The unit can be switched off at any time during operation using the power button at the side of the instrument. There is no need to exit the thermal cycler software prior to switching off the instrument

6 USB Memory Stick Operation

6.1 Importing and Exporting Files

You can import Primer sequences and programs created on a different thermal cycler or on a PC to the G-STORM thermal cycler and GSPC software, or export programs and reports that have been created using a USB memory stick.

6.1.1 Exporting Program Files to a memory stick

- Make sure the USB memory stick is inserted in the USB slot on the side of the instrument.
- Click **View & Edit Files** to display your personal file folder. Select the desired program.
- Click **Save As** to open the **Save Program** dialogue window.
- Enter the name of the program.
- Activate the **Save to USB** checkbox. The file is then saved to the USB archive.

NOTE: the lock button on the memory stick may prevent data access. Please ensure the lock button is in the unlocked position.

6.1.2 Importing Program Files from a memory stick to the GS1

- Make sure the USB memory stick is inserted in the USB slot on the side of the instrument.
- Click **View & Edit Files** to display your personal file folder. Click **View USB** to access the USB archive.
- Select the desired file from the archive.
- Click **Save As** to select a file name and path.

- Confirm with **OK** to save the file.

6.1.3 Uploading Primer Sequences from a memory stick

The Program Wizard [TM] function offers the option to upload primer sequences stored in an external memory stick.

- Click the **Program Wizard** button.

- Click **Browse** in the Sequence Primer One/Sequence Primer Two section and browse for the required files in the **Upload Sequence from USB Memory Stick** dialogue window.

- Select the desired file and click **Open** to upload the file to the thermal cycler.

NOTE: Primer Sequence files must have *.txt file format.

7 Maintenance

7.1 Cleaning

G-Storm Ltd thermal cyclers are designed to require a minimum amount of maintenance by the user. They can be cleaned using water or a mild laboratory-cleaning agent.

The instrument should not come into contact with organic solvents or aggressive solutions. Ensure that no liquid enters the thermal cycler. For safety reasons, the device must be switched off and disconnected from the power supply prior to cleaning.

The electrical safety fuses are located above the main power switch and the main power plug at the rear of the device. Before the fuses are replaced, the device must be switched off and disconnected from the mains supply. Only fuses with the correct voltage values may be used.

Only qualified service personnel should perform servicing of the thermal cycler.

No warranty obligation is assumed by G-Storm Ltd in the event of damage caused by unauthorised servicing.

8 Trouble-Shooting

8.1 If a Power Failure Occurs

All G-Storm Ltd thermal cyclers are equipped with an auto power fail restart function that allows for power failures and safe continuation of a run after resumption of power if set to do so in the Cycler Settings.

The autopower fail restart function restarts the script from the beginning of the temperature step in which it failed.

The following table lists the three power failure scenarios and the actions the instrument takes if the power is interrupted during operation.

Observation	Explanation / Remedy / Actions
The computer fails but the thermal cycler unit still has power	In this case the thermal engine will continue to execute the script without any interruption.
The thermal cycler fails but the computer still has power	The execution of the script will be affected and will halt whilst the power is off. Once the power resumes, restart the unit and the script will resume from the beginning of the step it was executing when the power failed.
Both the computer and the thermal cycler unit lose power	The execution of the script will be affected and will halt whilst the power is off. Once the power resumes the script will resume from the beginning of the step it was executing when the power failed. **Corrective action:** Restart the application and the connection will be restored.

8.2 Troubleshooting Information

Refer to the following table for a description of potential problems and recommended actions that you should take.

Observation	Explanation / Remedy / Actions
No actual temperature displayed	Block not correctly inserted in the machine. Check that the block is inserted correctly and reboot the machine.
Poor experimental yield	1. Run Thermal Engine OQ test [1] to check that thermal engine operation is within specification. 2. If transferring protocol from a different make of thermal cycler, use TAS [2] system to determine new protocol parameters.
Program does not start	Block not correctly inserted in the machine. Check that the block is inserted correctly and reboot the machine.
Tubes are crushed	Applied pressure too high.
Condensation in tubes during a run	Condensation will appear naturally at the end of a run and has no deleterious effects. Simply spin or flick the liquid back to the bottom of the tube and continue with the post reaction steps. However, condensation during a run will result in sub-optimal cycling. If this is experienced try increasing the lid temperature.
Sealed microplate losing sample volume	Poor quality microplate/sealing system or inadequate pressure.
USB devices including memory stock and barcode scanner not recognized	Reboot machine.
Machine does not power up and power light is not illuminated	Check power is on at supply. Check fuses at rear of instrument above power inlet.
Blank Display lit but showing no information	Reboot machine. If the problem persists there is an internal connection problem: call Technical Support.
Abnormal block heating/cooling performance	Run Thermal Engine OQ test [1] to check performance.

(1) Please refer to the thermal cycler IQ/OQ Protocol document for instructions on performing instrument qualification tests.

(2) The Cycler Validation System (CVS) can be purchased separately from G-Storm

9 Block Exchange

Block exchange can be performed within seconds. No tools are required for this purpose.

Removing the Block

Remove the block by simply holding it with two hands on the left and right side and lift it up.

Figure 9-1: Exchanging the block

Inserting the Block

Hold the block with two hands on the left and right side, with the block connector at the back of the block, and place it into position in the the thermal cycler.

Appendix

Instrument Specifications

Thermal Blocks

Block Materials	Modular anodised aluminium blocks with 4 sensors
Traceability	NIST traceable temperature calibration
Blocks Available	- 96 well gradient block: For 96 well plates or 96x 0.2 ml tubes
	- 96 well gradient combi block: For 96 well plates, 96 x 0.2 ml tubes
	- Or 48 x 0.5 ml tubes
	- 384 well high throughput block: for 384 well plates
	- 48 well block: for 48 x 0.2 ml tubes

Heated Lid

Lid Temperature Range	112°C-120°C, user selectable in 1°C increments
Ambient temperature	10°C to 30°C
Relative Humidity	0% to 95%

User Interfaces

Screen Type	6.4-inch TFT colour touch-screen, stylus supplied.
System Input	Touchscreen, external keyboard (Optional) & mouse (USB) (Optional), barcode scanner (USB) (Optional)
Temperature Display	Real-time graphical display of actual & set block temperatures
Communication Interfaces	1x USB side (personal memory stick, keyboard, barcode reader, mouse, USB hub)

User & File Management

User Level Management	3 levels: Administrator, User with administrator selectable restricted rights, Guest
User File Protection	Yes, for programs and reports
File Organization	Windows® Explorer, user-defined folders & subfolders
Program Storage	Minimum 99 (internal memory or USB stick). Circa 500. Unlimited PC program storage

Reports and Validation

Report Function	Encrypted GLP report, LabBook report
Validation	Internal auto validation prior to each program start
	Thermal engine validation function

Barcode Option

Barcode Option	Barcode documentation via handheld barcode scanner

Thermal Engine Characteristics

Temperature Control	4°C - 99°C with simulated volume dependent control algorithm
Sample Volume Range	5-150µl
Sample Accuracy	+/- 0.4°C (20-99°C), +/- 1°C (4-20°C)
Sample Homogeneity	+/- 0.4°C
Heating	Up to 3°C per second
Cooling	Up to 3°C per second
Sample Overshoot	< 1°C
Gradient Temperature Range	30°C - 80°C
Maximum/minimum Gradient Span	30°C / 4°C

Power & Dimensions

Electronic Power Supply	100V to 240V (frequency 48 to 62Hz)
Dimensions (LxWxH)	465mm x 337mm x 265mm
Weight	12kg approx
Operating conditions	10°C - 30°C, 0 - 95% relative humidity
Regulatory	CE, UL, CSA compliant
Warranty	2 years on all systems

Compatible Barcodes

The following barcodes are compatible with G-STORM's documentation system:

- 2 of 5 interleaved

- Codabar

- Code 128

- Code 39

- Code 39 full ASCII

- Code 93 full ASCII

- EAN-13, EAN -13 with 2 supplement, EAN -13 with 5 supplement

- EAN-8, EAN -8 with 2 supplement, EAN -8 with 5 supplement

- EAN-128

- UPA, UPA -13 with 2 supplement, UPA -13 with 5 supplement

- UPE, UPE -13 with 2 supplement, UPE -13 with 5 supplement

- MSI

- C.I.P

Compatible Plate Formats

Cat. No.	Product description
96 plates	
GSR0960/C	GS RIGID 96 clear frame, clear wells
GSR0961	GS RIGID 96, black frame, white cells
GSR0384/C	GS RIGID 384, clear frame, clear wells
GSR0385	GS RIGID 384, black frame, white cells
G-Seals	
GS-0500	Adhesive Clear Seal
GS-0521	Peelable Foil Heat Seal
GS-0536	Piercable Foil Heat Seal
GS0541	Clear Heat Seal
GS-0550	Adhesive Foil Seal

The following plate formats are compatible with G-Storm thermal cyclers:

Manufacturer	Cat. No. & Product Name	Type
BioPlastics		
	B70511 96 Well thin wall plate	96 well, non skirted
	B70661 96 Well thin wall plate	96 well, semi-skirted
	B70521 384 Well thin wall plate	384 well skirted
Abgene		
	AB 800	96 well, skirted
	AB 900	96 well, semi-skirted
	AB 1111	384 well
	TF-0384	384 well
Bilatec		
	THERMOSPRINT® 96 PP, transparent, 311296; only w/o workstation	96 well, non-skirted
	THERMOSPRINT® 384 PP, transparent, 310384	384 well
NUNC		
	Art. No.: 240600, 96 well, non-skirted.	96
	Art. No.: 230013, 96 well, semi-skirted	96
	Art. No.: 230012, 96 well, skirted	96
	Art. No.: 230584, 384 well	384
Eppendorf		
	Art. No.: 0030 128.648, twin tec plate, 96 skirted	
	Art. No.: 0030 128.575, twin tec plate, 96 semi-skirted	
	Art. No.: 0030 128.508, twin tec plate, 384	
Corning		
	Thermowell®96 Well Polypropylene Microplate, Natural (#6551)	
	Thermowell™ 96 Well Polycarbonate Microplate, Model M (#6511)	
	Corning® 384 Well Polyproplyene Microplate (#6500)	
	Corning® 384 Well Polyethylene Microplate (#6502)	

Order Information

Cat. No.	Product Description
Thermal Cycler	
GS00001	G-STORM GS1 Thermal Cycler
Thermal Blocks	
GSB00096	96 well block
GSB09660	Combi block - 96 / 60 well
GSB00384	384 well block

Sales & Service

G-Storm Ltd.

Somerton Biotechnology Centre

Ricksey Lane

Catcombe,

Somerton,

Somerset

TA11 7JH

Phone +44 (0) 7919 121510

E-Mail   info@gstormdirect.com

Visit our website: www.gstormdirect.com

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