GE Healthcare

Typhoon™

Operating Instructions

Original instructions

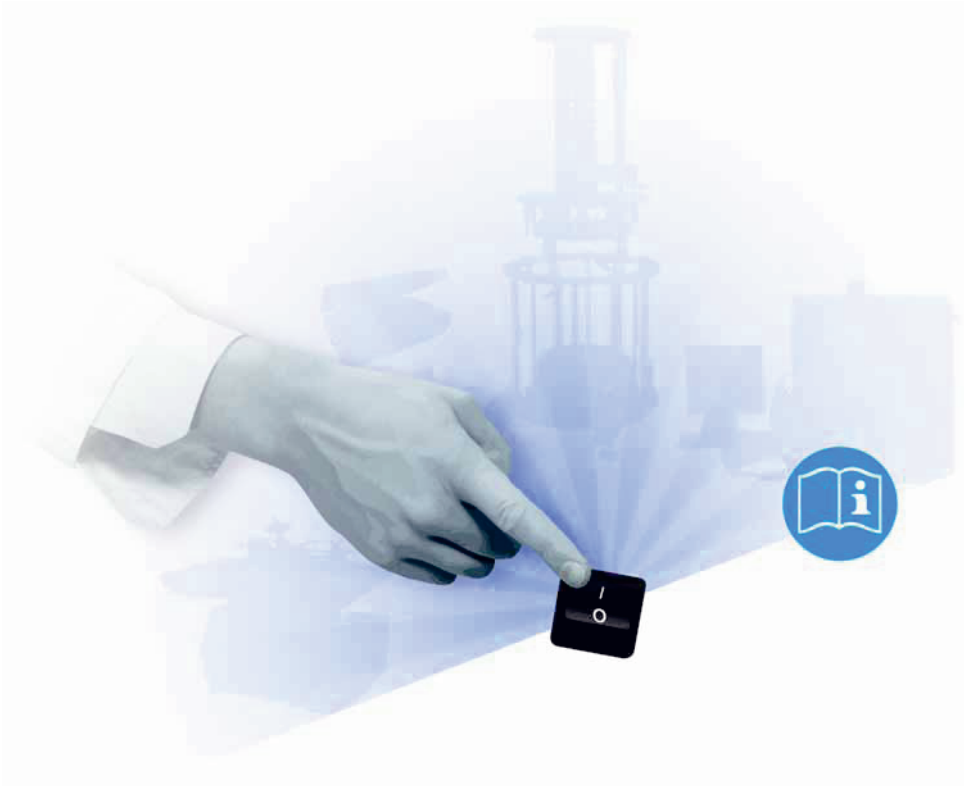


Table of Contents

1 Introduction

Purpose of the Operating Instructions

The Operating Instructions provides you with the instructions needed to handle the Typhoon systems 9200, 9210, 9400, 9410, Trio, and Trio+ in a safe way.

Prerequisites

In order to operate the Typhoon system safely and according to the intended purpose the following prerequisites must be met:

- You should have a general understanding of the use of a personal computer running Microsoft™ Windows™ in the version provided with your product.
- You should be acquainted with the use of general laboratory equipment and with handling of biological materials.
- You must read the Safety Instructions in Chapter 2 of these Operating Instructions.
- The system should be installed according to the instructions in Chapter 3 of these Operating Instructions.

In this chapter

This chapter contains important user information and a general description of the Typhoon system and its intended use.

1.1 Important user information

Read this before using Typhoon system

All users must read the Safety Instructions in Chapter 2 of these Operating Instructions before installing, using or maintaining the system.

Do not operate Typhoon system in any other way than described in the user documentation. If you do, you may be exposed to hazards that can lead to personal injury and you may cause damage to the equipment.

Intended use

The Typhoon instrument is a variable-mode imager that produces digital images of radioactive, fluorescent, or chemiluminescent samples. The Typhoon system is intended for research use only, and shall not be used in any clinical procedures, or for diagnostic purposes.

Safety notices

These Operating Instructions contain WARNINGS, CAUTIONS and NOTICES concerning the use of the product, with meanings as defined below.

WARNING
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It is important not to proceed until all stated conditions are met and clearly understood.

CAUTION
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It is important not to proceed until all stated conditions are met and clearly understood.

NOTICE
NOTICE indicates instructions that must be followed to avoid damage to the product or other equipment.

Notes and tips

Note: *A Note is used to indicate information that is important for trouble-free and optimal use of the product.*

Tip: *A tip contains useful information that can improve or optimize your procedures.*

Typographical conventions

Software texts and commands are identified by ***bold italic*** text. A colon is used to separate menu levels (e.g., ***File:Open*** refers to the ***Open*** option in the ***File*** menu).

1.2 Regulatory information

This section lists the directives and standards that are fulfilled by the Typhoon system.

Manufacturing information

Requirement	Content
Name and address of manufacturer	GE Healthcare Bio-Sciences AB, Björkgatan 30, SE 751 84 Uppsala Sweden
Name and address of person responsible for Technical File	Peter Löwendahl, Björkgatan 30 SE-751 84 Uppsala, Sweden
Name and ID of notified body	INTERTEK SEMKO AB, NB 0413
Place and date of declaration	Uppsala, Sweden, Nov 2009
Identity of person authorized to sign DoC	See EC Declaration of Conformity

CE Conformity

Directive	Title
2006/42/EC	Machinery Directive (MD)
2006/95/EC	Low Voltage Directive (LVD)
2004/108/EC	ElectroMagnetic Compatibility (EMC) Directive

International standards

Standard	Description	Notes
EN 61010-1, IEC 61010-1, CAN/CSA-C22.2 no. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use	
EN 61326-1	EMC emissions and immunity requirements for measurement, control and laboratory use	Harmonized with 2004/108/EC
EN-ISO 12100-1	Safety of machinery – Basic concepts, general principles and design	Harmonized with 2006/42/EC
EN-ISO 14121-1, 14121-2	Safety of machinery – Principles of risk assessment	Harmonized with 2006/42/EC

CE marking

CE

The CE marking and the corresponding Declaration of Conformity is valid for the instrument when it is:

- used as a stand-alone unit, or
- connected to other CE-marked instruments, or
- connected to other products recommended or described in the user documentation, and
- used in the same state as it was delivered from GE Healthcare, except for alterations described in the user documentation or explicitly authorized by GE Healthcare.

Regulatory compliance of connected equipment

Any equipment connected to Typhoon should meet the safety requirements of EN 61010-1/IEC61010-1 or relevant harmonized standards. Within the European Union, connected equipment must be CE-marked.

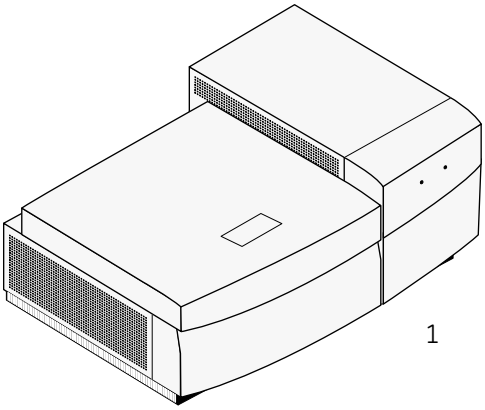
1.3 The Typhoon system

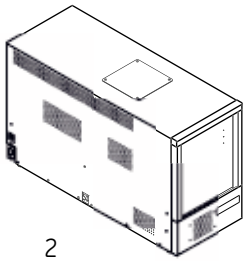
The Typhoon system hardware components

The Typhoon system hardware includes the following components:

- **Typhoon instrument**—Scans exposed Storage phosphor screens, fluorescent samples, and chemiluminescent samples.
- **Blue laser module**—Contains the blue laser and the power supply for the laser. (Typhoon 9400 and 9410 only)

In addition, the Typhoon system includes Ethernet cables, power cords, and tools.

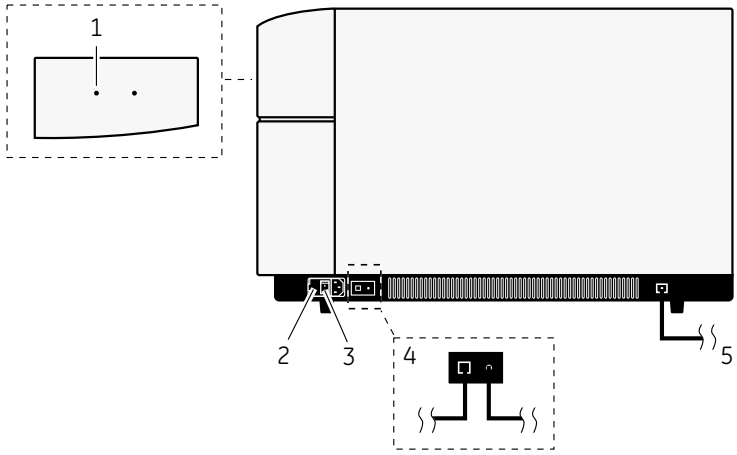




Part	Description
1	Typhoon instrument
2	Blue laser module (Typhoon 9400 and 9410 only)

Typhoon instrument

The illustration below shows the main parts of the Typhoon instrument. The right side of the instrument is shown.



Part	Description
1	Power indicator light
2	Fuse holder
3	Power switch
4	*Typhoon 9400 and 9410 only:* Cables to blue laser module
5	Ethernet connection to computer

Image eraser

The Image eraser is an optional accessory to the Typhoon system that is used to erase Storage phosphor screens for reuse. The illustration below shows the main parts of the Image eraser.

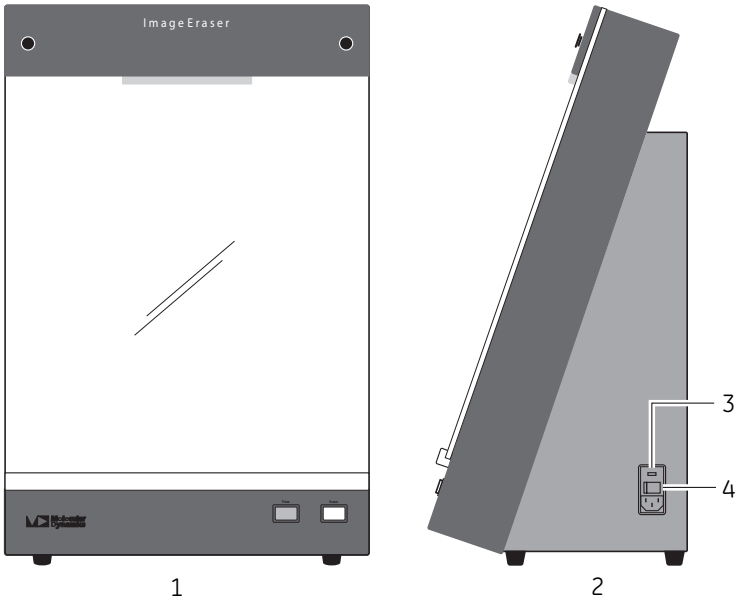


Figure 1-1. Main parts of Image eraser.

Part	Description
1	Front view
2	Side view
3	Fuse holder
4	Power switch

1.4 Control software

The Typhoon Scanner Control software is used for control and supervision of the Typhoon system. The software runs under the Microsoft Windows operating system.

2 Safety instructions

This chapter describes safety precautions, safety labels, emergency procedures and decommissioning information for Typhoon.

2.1 Safety precautions

Introduction

Before installing, operating or maintaining the system, you must be aware of the hazards described in the user documentation. Follow the instructions provided to avoid personal injury or damage to the equipment.

General precautions

WARNING
Do not operate the Typhoon instrument in any other way than described in the Typhoon manuals.

WARNING
Operation and user maintenance of the Typhoon instrument should be performed by properly trained personnel only.

WARNING
Do not use any accessories not supplied or recommended by GE Healthcare.

Personal protection

WARNING
Always use appropriate personal protective equipment during operation and maintenance of Typhoon system.

WARNING
Hazardous substances. When using hazardous chemical and biological agents, take all suitable protective measures, such as wearing protective glasses and gloves resistant to the substances used. Follow local and/or national regulations for safe operation and maintenance of the system.

Installing and moving the instrument

WARNING
Power cord. Only use power cords delivered or approved by GE Healthcare.

WARNING
Protective ground. The equipment must always be connected to a grounded power outlet.

WARNING
Make sure that the instrument is placed on a stable flat bench with adequate space for ventilation.

WARNING
Access to power switch and power cord. The power switch must always be easy to access. The power cord must always be easy to disconnect.

WARNING
Supply voltage. Make sure that the supply voltage at the wall outlet corresponds to the marking on the instrument, before connecting the power cord.

CAUTION
Heavy object. The Typhoon instrument weighs approximately 160 kg. The instrument should be moved only by authorized Technical Support representatives using proper lifting equipment.

System operation

WARNING
Electrical shock hazard after spillage. If there is a risk that large volumes of spilled liquid may penetrate the casing of the Typhoon instrument, immediately switch off the instrument, disconnect the power cord, and contact an authorized service engineer.

WARNING
If the cover or doors of the Typhoon instrument become damaged, do not continue to use the instrument.

WARNING
(Typhoon 9400 and 9410) If the fiber-optic cable becomes damaged, do not continue to use the instrument.

WARNING
(Typhoon 9400 and 9410) If the covers of the blue laser module become damaged, do not use the instrument.

WARNING
Do not attempt to defeat the safety interlocks on the sample lid or try to gain access to the interior of the instrument through any other opening. Exposure to laser light can cause injury. For example, viewing the laser light directly can cause blindness.

CAUTION
Class 3B Laser radiation when open and interlock defeated. Avoid exposure to the beam.

Maintenance

WARNING
Electrical shock hazard. All repairs should be done by service personnel authorized by GE Healthcare. Do not open any covers or replace parts unless specifically stated in the user documentation.

WARNING
Disconnect power. Always disconnect power from the instrument before performing any maintenance task.

2.2 Laser light safety

The Typhoon instrument is a Class I laser instrument that houses two Class IIIB lasers inside the instrument. Under the specified operating procedures, the instrument does not allow operator exposure to laser light. The lasers, with power of 10–20 mW, are accessible in the interior of the instrument.

Typhoon 9400, 9410, Trio, and Trio+: The blue laser module contains one Class IIIB laser. The blue laser, with power at 30 mW, is accessible in the interior of the module.

The safety interlocks in the Typhoon instrument are designed to prevent you from being exposed to the laser beams. If you open the sample lid while the scanner is in operation, the laser shutter closes and blocks the light from the lasers.

WARNING
Do not attempt to defeat the safety interlocks on the sample lid or try to gain access to the interior of the instrument through any other opening. Exposure to laser light can cause injury. For example, viewing the laser light directly can cause blindness.

2.3 Labels

Labels on Typhoon instrument

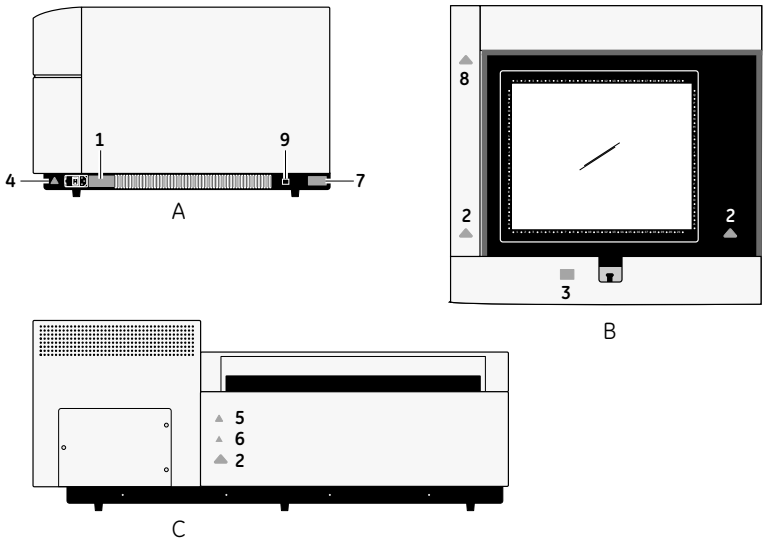
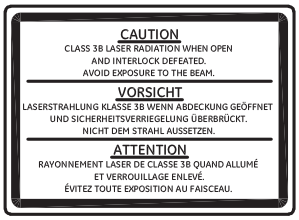
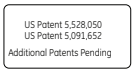


Figure 2-1. Labels on the Typhoon instrument. The instrument is shown from the right side (A), from above with sample lid open (B), and from the back (C) are shown.

Part	Label	Description
1	GE Healthcare Bio-Sciences AB 751 84 UPPSALA Sweden MODEL # TYPHOON ☐9200 ☐9210 100-240V~ 6,3A ☐9400 ☐9410 50/60Hz ☐TRIO ☐TRIO+ MANUFACTURED MONTH YEAR This product conforms to the applicable requirements of 21 CFR subchapter J at the date of manufacture.	Serial number certification label
2	CAUTION Laser Radiation when open. AVOID EXPOSURE TO BEAM.	**CAUTION!** Avoid exposure to the laser beam when the lid is open.

Part	Label	Description
3		**CAUTION!** Class 3B Laser product when open and interlock defeated. Avoid exposure to the beam. Do not attempt to defeat the safety interlocks on the sample lid or try to gain access to the interior of the instrument through any other opening. Exposure to laser light can cause injury. Viewing the laser light directly can cause blindness.
4		Fuse specification.
5		**WARNING!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
6		**WARNING!** Indicates that hazardous voltages are generated inside the instrument.
7		The Typhoon instrument conforms to the international standard IEC-60825.
8		**CAUTION!** Pinch hazard when closing the lid.
9		Patents

Labels on Blue laser module identification label

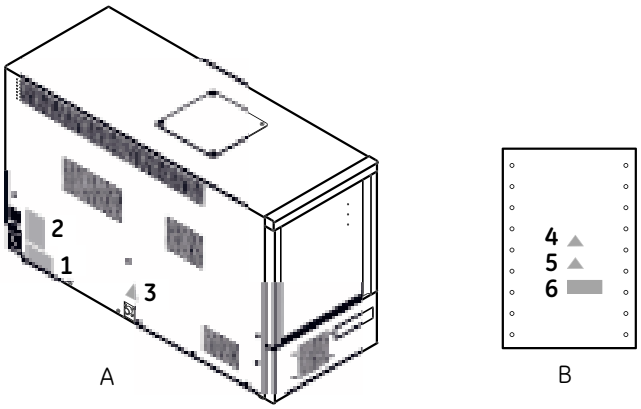


Figure 2-2. Labels on the Blue laser module. The Blue laser module is shown from the front (A) and from the back (B).

Part	Label	Description
1	GE Healthcare Bio-Sciences AB 751 84 UPPSALA Sweden MODEL # TYPHOON BLUE LASER MODULE 100-240V~ 2.2KVA 50/60Hz N12406 LR95284 MANUFACTURED MONTH YEAR This product conforms to the applicable requirements of 21 CFR subchapter J at the date of manufacture.	Serial number certification label.
2	CAUTION CLASS 3B LASER RADIATION WHEN OPEN AND INTERLOCK DEFEATED. AVOID EXPOSURE TO THE BEAM. VORSICHT LASERSTRAHLUNG KLASSE 3B WENN ABDECKUNG GEÖFFNET UND SICHERHEITSVERRIEGELUNG ÜBERBRÜCKT. NICHT DEM STRAHL AUSSETZEN. ATTENTION RAYONNEMENT LASER DE CLASSE 3B QUAND ALLUMÉ ET VERROUILLAGE ENLEVÉ. ÉVITEZ TOUTE EXPOSITION AU FAISCEAU.	**CAUTION!** Class 3B Laser product when open and interlock defeated. Avoid exposure to the beam. Do not attempt to defeat the safety interlocks on the sample lid or try to gain access to the interior of the instrument through any other opening. Exposure to laser light can cause injury. Viewing the laser light directly can cause blindness.

Part	Label	Description
3		**CAUTION!** Avoid exposure to the laser beam when the lid is open.
4		**WARNING!** Read the user documentation before using the system. Do not open any covers or replace parts unless specifically stated in the user documentation.
5		**WARNING!** Indicates that hazardous voltages are generated inside the instrument.
6		The Blue laser module conforms to the international standard IEC-60825.

Symbols used in safety labels

Label	Description
	The system complies with the requirements for electromagnetic compliance (EMC) in Australia and New Zealand.
	The system complies with applicable European directives.

Labels concerning hazardous substances

Label	Description
	This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
	This symbol indicates that the product contains hazardous materials in excess of the limits established by the Chinese standard SJ/ T11363-2006 Requirements for Concentration Limits for Certain Hazardous Substances in Electronics.

2.4 Emergency procedures

This section describes how to do an emergency shutdown of the Typhoon instrument. This section also describes the result in the event of power failure.

Emergency procedures

In an emergency situation, do as follows to stop the run:

Step	Action
1	In the Typhoon Scanner Control software, click ***CANCEL SCAN*** to abort the scan.
2	If required, press the power switch to the **OFF** position to turn the instrument off.

Power failure

Power failure to...	will result in...
Typhoon instrument	• The run is interrupted immediately, in an undefined state. • The data collected up to the time of the power failure is available in the file created when starting the scan.
Computer	• The computer shuts down in an undefined state. • The run continues, but data cannot be saved.

2.5 Recycling procedures

The equipment shall be decontaminated before decommissioning and all local regulations shall be followed with regard to scrapping of the equipment.

Disposal, general instructions

When taking Typhoon system out of service, the different materials must be separated and recycled according to national and local environmental regulations.

Recycling of hazardous substances

Typhoon instrument contains hazardous substances. Detailed information is available from your GE Healthcare representative.

Disposal of electrical components

Waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

3 Installation

This chapter provides information regarding installation of the Typhoon system.

For detailed information on installation, see *Typhoon Installation Instructions*.

3.1 Site requirements

Parameter	Requirement
Power supply	100-240 V AC, 50/60Hz
Ambient temperature	15°C to 30°C
Placement	Stable laboratory bench
Humidity	10% to 80%, non-condensing

3.2 Transport

CAUTION
Heavy object. The Typhoon instrument weighs approximately 160 kg. The instrument should be moved only by authorized Technical Support representatives using the proper lifting equipment.

If you need to move the instrument, contact Technical Support. See back cover for contact information.

3.3 Unpacking

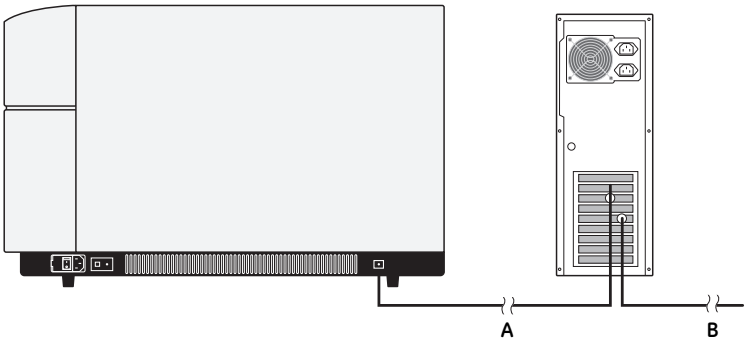
- Check the equipment for any apparent damage before starting installation.
- Document any damage carefully and contact your GE Healthcare representative.

3.4 Connections

Ethernet connections

NOTICE
Make sure to use the red crossover Ethernet cable provided in the Typhoon accessory kit to connect the Typhoon instrument to the computer.

Connect the Ethernet cable (A) between the computer and the Typhoon instrument. Connect the computer to LAN (B) using a second Ethernet cable.

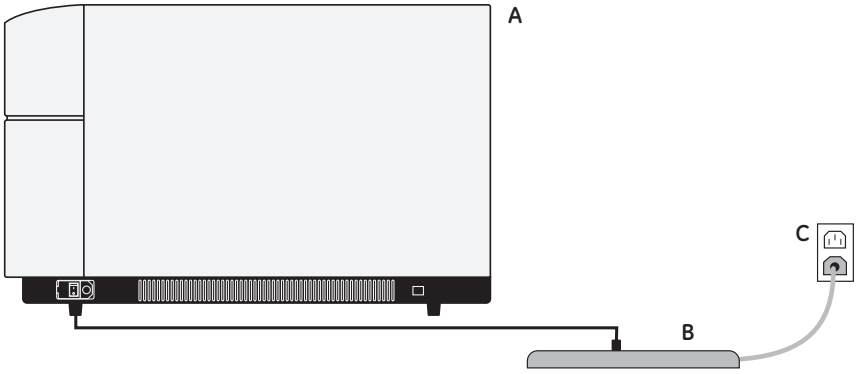


Electrical power

WARNING
Power cord. Only use power cords delivered or approved by GE Healthcare.

NOTICE
Use a surge protector to protect the instrument and your data from damage caused by power fluctuations and excessive noise on the electrical line.

Connect the power cord to the Typhoon instrument (A) (and optionally to the Image eraser), plug the cord(s) into a surge protector (B), and plug the surge protector into a grounded power outlet (C) specified in *Section 7.1 Specifications, on page 69*.



3.5 Spare parts and accessories

For correct up to date information on spare parts and accessories, visit www.gelifesciences.com/quantitative_imaging.

4 Operation

This chapter provides basic instructions for working with Typhoon. For detailed instructions in English, see the *Typhoon User´s Guide*.

4.1 Operation overview

There are three scanning options for Typhoon instruments:

- Storage phosphor screen scanning
- Fluorescent scanning
- Chemiluminescent scanning

A workflow for performing a scanning is described in the table below.

Step	Action	Instructions in
1	Start the instrument and Typhoon Scanner Control software	*Section 4.2*
2	Expose Storage phosphor screen to a sample	*Section 4.3* (Storage phosphor screen autoradiography option only)
3	Clean the instrument	*Section 4.4*
4	Place fluorescent or chemiluminescent sample or Storage phosphor screen in instrument	*Section 4.4*
5	Select scanning mode	*Section 4.4*
6	Set scanning parameters	*Section 4.4*
7	Scan fluorescent or chemiluminescent sample or Storage phosphor screen	*Section 4.4*
8	After scanning procedures	*Section 4.5*

Principle

Storage phosphor screen scanning

Performing Storage phosphor screen autoradiography is a two step procedure, first the Storage phosphor screen is exposed to the sample inside an Exposure cassette and, secondly, the Storage phosphor screen is scanned in the instrument. For information of available Storage phosphor screens and Exposure cassettes, see *Appendix A*.

Fluorescent and chemiluminescent scanning

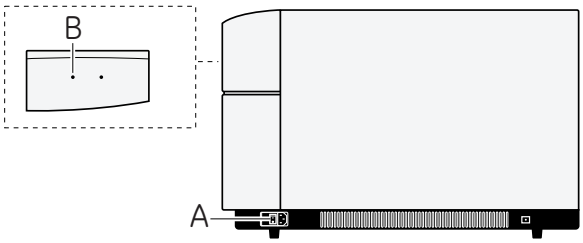
When scanning a fluorescent or a chemiluminescent sample, the sample is placed inside the instrument and is scanned directly.

For fluorescent scanning there are a standard set of emission filters available, see *Appendix A.3*. For fluorescent and chemiluminescent scanning beam splitters are available, see *Appendix A.4*.

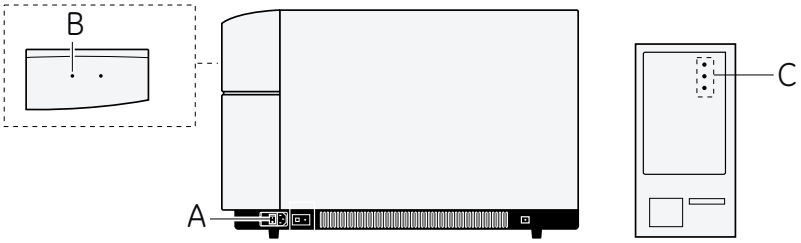
4.2 Starting the instrument and Typhoon Scanner Control software

1 Press the **Power** switch (A) on the lower right side of the instrument.

Typhoon instruments 9200 and 9210.



Typhoon instruments 9400 and 9410 with Blue laser module.



2 The **Power** light on the front of the instrument (B) turns on and remains red during the self-test sequence, which takes a few seconds.

3 During the initialization, the instrument **Power** light (B) flashes green for approximately 45 seconds. After initialization, the flashing green light turns solid green.

Note: *After you turn on the* Typhoon *instrument, wait approximately 30 minutes for the instrument to warm up before you start the first scan. Scanning before the instrument is warmed up can affect the accuracy of the collected data.*

4 *Typhoon 9400 and 9410 only:*
When the Typhoon instrument is started, the Blue laser module turns on automatically.

a) When power is available, the **Power** light (C, top) on the front of the Blue laser module turns green.

b) When the instrument is communicating with the Blue laser module the **Connection** light (C, middle) turns green.

c) When the Typhoon instrument completes the self-test the **Laser On** light (C, bottom) turns green. This takes approximately 1 minute.

5 Turn on the computer and monitor according to the manufacturer's instructions.

Note: *If the computer was already on when you turned on the Typhoon instrument, you must restart the computer*

6 Locate and double-click the Typhoon Scanner Control software shortcut icon on the desktop or select Typhoon Scanner Control software using the ***Start*** menu.

7 The Typhoon Scanner Control software opens.

4.3 Preparations before start

Sample recommendations

General sample handling recommendations

- Make sure the sample is free from dust and powder. Wear powder-free gloves when handling the samples.
- Dust and powder fluoresce and scatter light. This causes artifacts on the images and can interfere with the quantitation.

Storage phosphor screen sample handling recommendations

NOTICE
Do not use wet gels in combination with tritium (TR) screens.

NOTICE
Do not directly expose the Storage phosphor screen to wet chemicals of any kind, especially not to organic solvents.
Since organic solvents penetrate plastic, plastic wrap will not protect the Storage phosphor screens from organic solutions.

NOTICE
Neutralize alkaline denaturing gels and make sure the sample is free from acetic acid vapors and organic solvents.
These materials are harmful to the Storage phosphor screens and can penetrate plastic wrapping.

- Protect a general-purpose (GP) screen from contamination by separating a wet gel from the screen with a piece of plastic wrap or polyester film. Wrap the plastic wrap completely around the gel so that liquid cannot leak out.
  This precaution reduces screen contamination with minimum attenuation of the signal.
- Do not use scintillants or enhancers, such as PPO, EN3HANCE™, and Amplify™. These products interfere with the proper function of the screen.
- For recommendations of use of radioactive standards, see *Typhoon User´s Guide*.

Fluorescent sample handling recommendations

- Always rinse the gloves with distilled or tap water before handling the sample and before preparing the reagent.
- Handle filter solutions as follows
  - Remove dust particles by filtering all the stock solutions used to prepare the sample, sample matrix, and buffers.
  - Use clean, rinsed containers.
  - When diluting clean reagents to working concentration, use distilled water collected in a rinsed container so that you do not have to filter the solutions again.
  - If available use dust free reagents, such as fluorescent labels. They require no further filtration.
- Avoid fluorescent indicator dyes.
  Many of the commonly used electrophoresis tracking dyes fluoresce. Whenever

possible, put the tracking dye in a separate lane. Alternatively, dilute the indicator dyes as much as possible.

- Avoid excessive exposure to light.
  Fluorochromes differ greatly in their sensitivity to light-induced degradation (photobleaching). When working with sensitive fluorochromes and fluorescently labeled samples, use low-light conditions.

Recommendation for selecting the label for the fluorescence scanning

- Green-excited fluorescence
  Detects samples labeled with fluorochromes that are excited at 532 nm.
- Red-excited fluorescence
  Detects samples labeled with fluorochromes that are excited at 633 nm.
- Typhoon *9400, 9410, Trio and Trio+:* Blue-excited fluorescence
  Detects samples labeled with fluorochromes that are excited at 457 (Typhoon 9400 and 9410) or 488 nm (Typhoon 9400, 9410, Trio and *Trio+*).

  Note: *The laser power at 457 nm is much lower than the laser power at 488 nm.*
- Multilabel fluorescence
  Detects samples labeled with two, three, or four fluorochromes and creates a multichannel image. To minimize the spectral overlap from the fluorochromes, the emission peaks should be greater than 30 nm apart. Use one or more lasers and up to four different emission filters to create the multichannel image. The multichannel image contains one image for each fluorochrome. Use analysis software to view these images separately or overlaid.

  Note: *The instrument contains a built-in filter for the red and green lasers. The built-in filter blocks the laser light at 532 nm ±8 nm or 635 nm ±10 nm. For the* Typhoon *9400 and 9410 instruments, an additional built-in filter blocks all laser light below 500 nm. The* Typhoon *system automatically selects the appropriate built-in filter based on the color of the laser you selected. The built-in filters cannot be used simultaneously.*

Low-fluorescent sample handling recommendations

For fluorescent samples requiring high sensitivity or highly accurate quantitation, the material sources stated in *Table 4-1* have been tested and found to have low background.

Table 4-1. Material recommendations for low-fluorescent sample handling.

Material	Recommendation
Gels, general	Background fluorescence contributed by the gel matrix increases with gel thickness. Always use the thinnest gel practical for your experiment, especially for agarose gels. Make sure your glass plates are absolutely clean before you pour the gel. Grease and fingerprint oils from the plates can stick to the gel surface and attract dust and fluorescent dyes.
Agarose gels	Make sure the agarose is completely dissolved and well-mixed before pouring your gel. Also, avoid generating bubbles when mixing and pouring. Uneven agarose concentration and bubbles affect light scatter and can cause artifacts and interfere with quantitation.
Polyacrylamide gels	Polyacrylamide gels are usually clear and thin (less than 1 mm). The background contribution from the gel material is generally very low.
Solvents	Spectroscopic-grade solvents have the lowest autofluorescence.
Membranes	You should scan a test piece of each type of membrane you plan to use and check that the background is low enough for your purposes.
Transparency support	To avoid contaminating the glass platen and sample lid, you can place a sample, such as a membrane, between two pieces of transparency material. For detailed instructions, see the *Typhoon User´s Guide*.

Chemiluminescent sample handling recommendations

- Follow the manufacturer's guidelines for preparing membranes or microplates for chemiluminescence scanning.
- To avoid compromising the chemistry on the membrane, place the membrane between two pieces of transparency material or between sheet protectors. Alternatively, place the membrane in a plastic bag to keep the sample wet and surrounded by substrate.

Prepare Storage phosphor screen for exposure

Note: *This section is valid only when performing* Storage phosphor screen *autoradiography.*

Recommendations for erasing screens

NOTICE
The Storage phosphor screen consists of a relatively soft matrix. Handle the screen on the edges or back only. Do not touch the white phosphor surface.

NOTICE
Wear powder-free gloves to avoid contaminating the screen with skin oils or powder.

NOTICE
Do not fold or roll an unmounted screen.

- To avoid contaminating the screen or the Image eraser, make sure that both the screen and Image eraser are free from radioactive contamination before placing the screen on the Image eraser (see *Sections 5.4 and 5.6).*
- Erase the screen immediately before exposure as well as after scanning. Cosmic radiation creates background on screens left unused for long periods of time.
- Erase the screen until the recorded signal is fully removed.
- Because a TR screen is not possible to decontaminate, protect the Image eraser and the screen from possible contamination by placing plastic wrap or polyester film between the TR screen and the Image eraser surface.

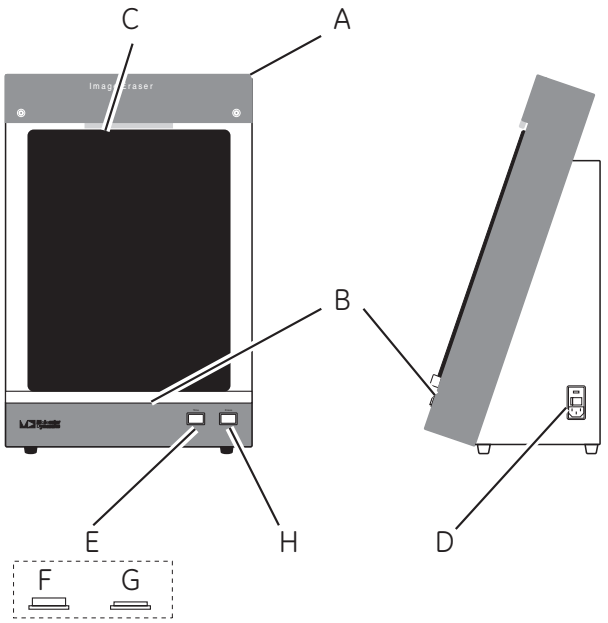
Preparation procedure

1 Clean the screen before exposure, see *Section 5.4* for cleaning instructions.

2 Erase the screen.
The Image eraser is used to erase any residual signal from screens.

a) Hold the screen by its edges with the white side facing the Image eraser.

b) Place the screen on the Image eraser (A) and rest the screen on the lip (B) of the Image eraser.



c) To erase two small screens at once, suspend an unmounted screen from the clip at the top of the Image eraser (C).

NOTICE
Do not use the clip on a TR screen. The clip can damage the surface of the screen.

d) Turn the Image eraser power switch on (D).

e) Set the Image eraser time by pressing the **Time** button (E).

- Select *Normal* (F) position (out) for standard samples. The Normal setting takes approximately 10 minutes.
- Select *Extended* (G) position (in) if the background or residual image is high (e.g., the original image contained readings of 104 counts and higher). The Extended setting takes approximately 20 minutes.

f) Press the **Erase** button (H).

3 Check for contamination of the screen between exposures or if the screen has not been used for several days.

a) Clean and erase the screen as described above.

b) Store the screen in a clean, light-tight box.

c) Provide enough time to register the contamination as an image on the screen.

d) After storage, scan the screen (see *Section 4.4 Performing a scanning, on page 39*) and examine the image.

- If contamination is still present, clean and erase the screen again and re-check for contamination.
- If no contamination appear on the image the screens is ready to use.

Storage phosphor screen exposure

Note: *This section is valid only when performing* Storage phosphor screen *autoradioagraphy*.

Recommendations for storage phosphor screen exposures

- Use an Exposure cassette to expose the screen to the sample.
- Expose thick samples, such as wet gels or TLC plates which are too thick to fit in an Exposure cassette, together with a screen in a light-tight drawer or similar.
- To expose multiple samples on the same screen, make sure the samples have the same thickness.
- It is important to place the screen on the sample correctly the first time. Adjusting the position of the screen can result in a double exposure.
- If you must adjust the position, remove the screen and erase it.

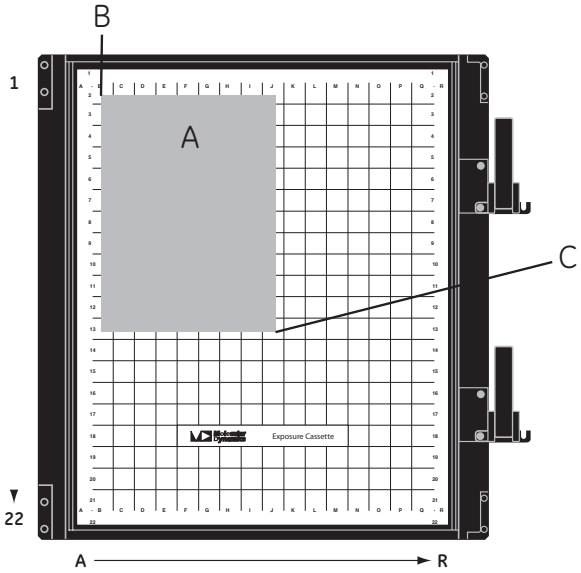
Exposure procedure

1 Select the Exposure cassette size and style that matches the Storage phosphor screen you want to use with the sample, see *Appendix A.2*.

NOTICE
Do not put uncovered wet gels in an Exposure cassette.

2 Use a damp cloth to clean the grid surface inside the Exposure cassette and remove any radioactive contamination.

3 Place the sample on the grid.

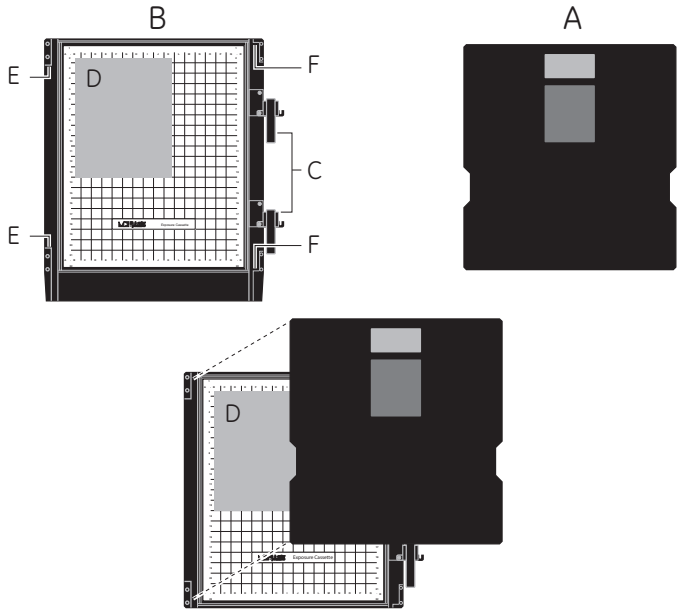


It is recommended to:

- place the sample (A) face up on the grid and in the upper left corner at least 1 cm from the edge of the screen (B).
- put the top of the sample (A) toward the top end of the cassette.
- If exposing multiple samples to one screen, place the samples close together.
- align the lanes and rows of the sample with the edges of the grid so that the scanned image will be straight.

4 Make a note of the coordinates of the upper left (B) and lower right (C) corners of the area you want to scan. The grid coordinates in the Exposure cassette match the coordinates in the *Typhoon* instrument.

5 Place a *mounted* screen (A) in an Exposure cassette (B)



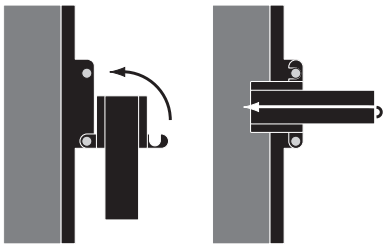
a) Make sure the clamp(s) on the cassette (C) are rotated out of the way.

b) The white side of the screen should face down, toward the sample (D).

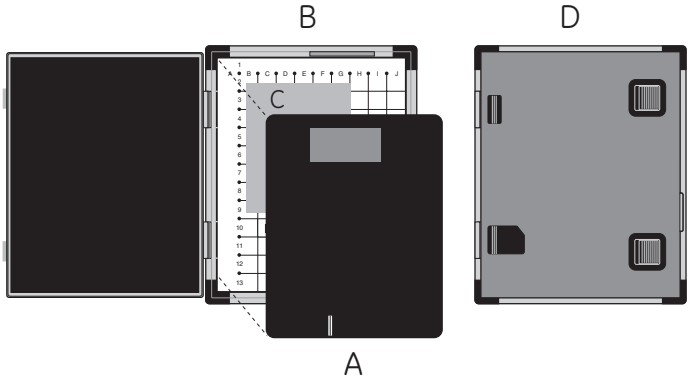
c) Place the edge of the screen into the groove (E) located along the side of the Exposure cassette opposite the clamp(s).

d) Gently lower the screen into place in the corner guides (F), making sure the screen fits into the guides correctly.

e) Close the Exposure cassette by rotating each clamp counterclockwise until it stops at the pin and then flipping the lever over to lock the screen into place.



6 Place an *unmounted* screen (A) in an Exposure cassette (B).



a) The white side of the screen should face down, toward the sample (C).

b) Gently lower the screen into place over the grid area in the cassette. The screen should be centered over the grid area and should lie straight and flat in the cassette

c) Close the Exposure cassette and press the lid shut until the lock clicks (D).

Sample Storage phosphor screen exposure

Note: *This section is valid only when performing Storage phosphor screen autoradiography.*

NOTICE
Condensation can destroy the screen. If you are exposing a screen to a frozen sample, place the screen in a sealed, dry environment, such as a sealed bag. After exposure, allow the screen to come to room temperature before removing it from the bag and scanning.

1 Perform Storage phosphor screen autoradiography at room temperature.

2 Estimate approximately one-tenth of the exposure time of an x-ray film when exposing Storage phosphor screens.

4.4 Performing a scanning

Note: *If radioactive samples are used the instrument should periodically be checked for contamination from radioactive samples. Check the glass platen and the surface of the inner lid according to Checking for contamination, on page 56.*

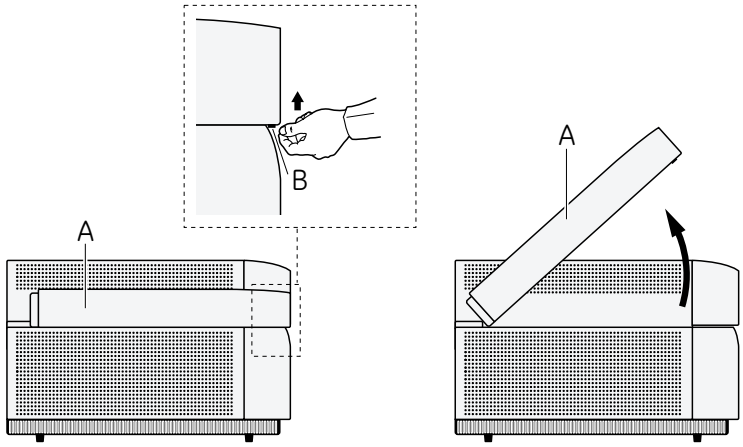
Scanning recommendations

If time is critical for the experiment, make sure the instrument is ready to scan by checking the instrument state *Typhoon instrument states, on page 43*.

- If the instrument state is ***Ready***, you can select the scan parameters, place the screen on the glass platen, and start the scan.
- If the instrument is in the ***Sleep*** state, click the ***Initialize Scanner*** button to bring the instrument to the ***Ready*** state. The Instrument will be in ***Warming Up*** state for approximately 5 minutes, during which the scan parameters can be selected *Set scan parameters, on page 44*.

Load sample or Storage phosphor screen to instrument

1 Open the sample lid (A) by grasping the lid release under the center front of the sample lid (B) and pull the release forward until the lid opens. Raise the lid all the way.



2 Inspect and clean of the instrument before use.

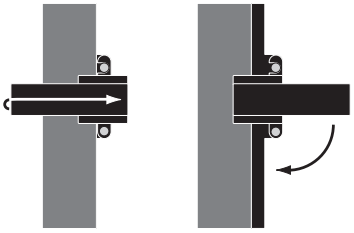
a) Clean the glass platens before and after every scanning, see *Cleaning, on page 56* for instructions.

b) Inspect and, if required, clean the sample lid inner surface according to *Cleaning, on page 56*.

3 *If performing* Storage phosphor screen *autoradioagraphy:*
Place a screen in the instrument.

a) Open the latch on the Exposure cassette.

- For *mounted* screens—Flip the lever(s) on the cassette and then rotate the clamp(s) clockwise so that they no longer cover the screen.



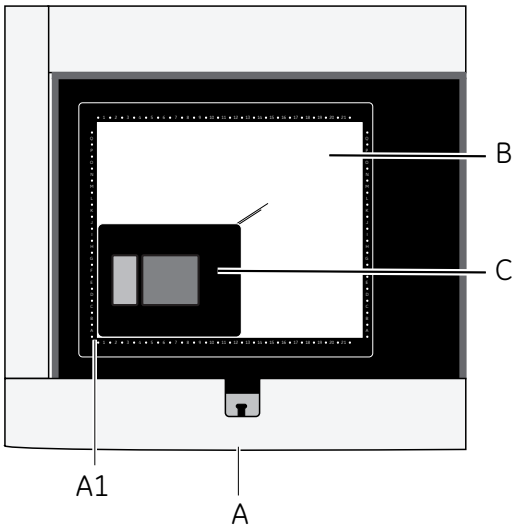
- For *unmounted* screens—Open the latch and raise the lid of the cassette.

b) Remove the Storage phosphor screen. If the sample sticks to the screen, gently peel off the sample.

Note: *To keep unmounted screens from moving and causing a double image, press down on one edge of the screen and then lift up the opposite edge of the screen.*

c) Protect the screen from direct light and proceed *immediately* to load the Storage phosphor screen into the scanner.

d) The figure below shows a top view of instrument with instrument front (A) and glass platen (B).



Load the Storage phosphor screen (C) on the instrument glass platen (B) with the white, phosphor side of the screen face down in the lower left corner (A1). Each lettered or numbered grid segment is marked by two dots.

e) Gently lower the screen on the glass platen.

Note: *An unmounted screen may not lie completely flat against the glass. When you initiate the scan, the instrument lowers the inner section of the lid to hold the screen flat.*

4 *If performing fluorescent or chemiluminescent scanning:*
To place a gel or a membrane sample in the instrument.
For information how to scan several samples simultaneously and how to scan sandwich gels and microarrays, please refer to the *Typhoon User´s Guide*.

Note: *Make sure you place the sample in the correct position when you first set it down. Any fluorescent or chemiluminescent material left on the glass platen when you move the sample can result in a double image.*

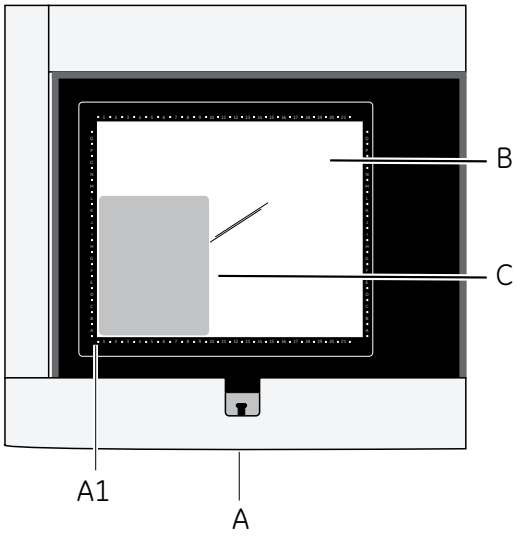
Before you load a sample, determine how to position it on the glass platen:

a) Sample orientation.
Determine whether to place the sample face up or face down on the glass platen. The *Typhoon* system illuminates the sample and collects data from underneath the sample. Make a note of the orientation of the sample.

- For a one-sided, opaque sample (such as a membrane or TLC plate), place the sample face down.

- For a transparent sample (such as a polyacrylamide gel), place the sample either face up or face down.
- If the sample is physically uneven on one side (such as an agarose gel), place the smooth side down. This allows the sample to lie flat.

b) Figure below shows a top view of instrument with instrument front (A) and glass platen (B).



The sample (C) should be positioned in the lower left corner (A1) of the scan area. Each lettered or numbered grid segment is marked by two dots.

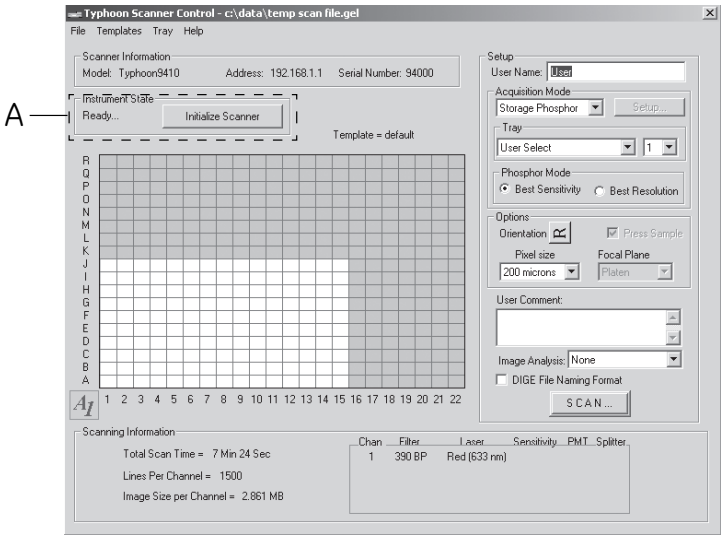
c) Align the lanes and rows of the sample with the edges of the grid on the glass platen so that the scanned image will be straight.

d) Make a note of the coordinates of the upper left and lower right corners of the area you want to scan (see step 4b in this instructions for an example). This information will be used when setting the scanning area.

5 Close the sample lid and press it down until the latch clicks. The screen or sample is now ready for scanning.

Typhoon instrument states

The Typhoon instrument can be in one of five states. The ***Typhoon Scanner Control*** window ***Instrument State*** area (A) displays the current instrument state (***Warming Up***, ***Ready***, ***Sleep***, ***Initialization*** or ***Scanning***) and an ***Initialize Scanne***r button.



1 ***Warming Up***

The ***Warming Up*** message is shown for 5 minutes after you turn on the system or click the ***Initialize Scanner*** button.

Note: *Complete warm-up takes 30 minutes when the instrument is turned on.*

2 ***Ready***

The instrument is ready to scan.

Note: *If you just turned on the instrument, the Ready message appears after approximately 5 minutes. However, for best performance, the instrument should be warm up for the full 30 minutes before scanning.*

3 ***Sleep***

The lasers have been shut off and the ***Sleep*** state message appears. This happens when the instrument has not been used for the preset time (default setting is 4 hours, change time by using the Typhoon Direct Instrument Access software).

4 ***Initialization***

After you click the ***Scan*** button, the ***Initialization*** state message appears. It remains displayed until the instrument begins scanning.
Initialization state takes approximately 1 minute if the prior instrument state was ***Ready***, and approximately 5 minutes if the prior instrument state was ***Sleep*** or ***Warming Up***.

5 ***Scanning***
The ***Scanning*** state message appears while the instrument is scanning.

Set scan parameters

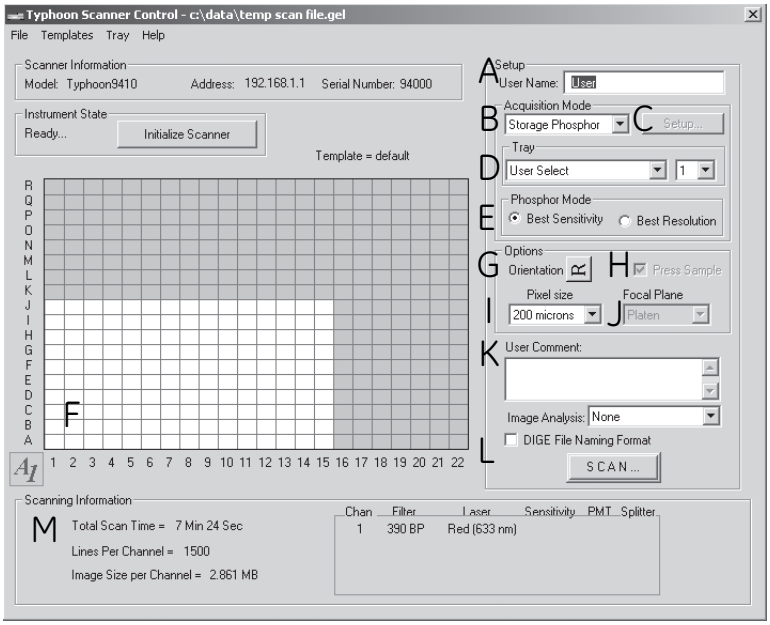


Figure 4-1. ***Typhoon Scanner Control*** window. Letters refer to specific steps in instruction below.

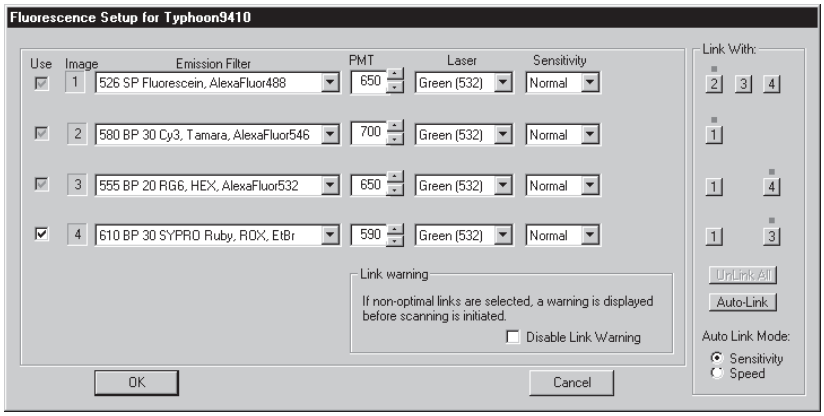
1 Enter desired ***User name*** in the ***Setup*** area (*Fig 4-1*, A).

2 Select desired scan acquisition mode in the ***Acquisition Mode*** list (*Fig 4-1*, B).

- ***Storage Phosphor*** to select Storage phosphor scan acquisition mode.
- ***Fluorescence*** to select fluorescence scan acquisition mode.
- ***Chemiluminescence*** to select chemiluminescence scan acquisition mode.

3 Select parameters for *fluorecsent* and *chemiluminescent* scanning by clicking ***Setup*** button (*Fig 4-1*, C).

If fluorescence scan acquisition mode was selected in step *2*, the ***Fluorescent Setup*** window opens.



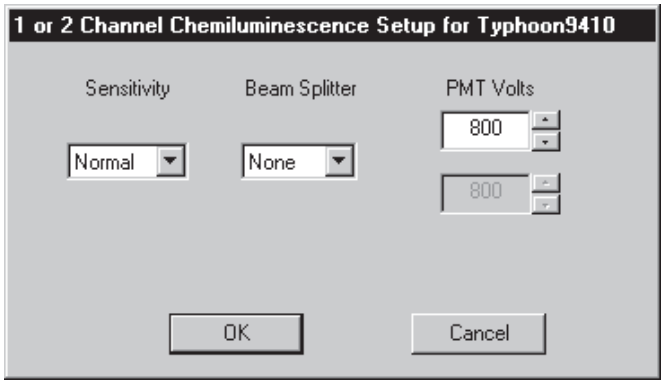
a) Select number of scans by ticking corresponding boxes under ***Use*** (1-4).

b) For each scan, select ***Emission Filter***, ***PMT*** voltage, ***Laser*** and ***Sensitivity***.

c) Link scans under ***Link With***.

d) Click ***OK***.

If chemiluminescence scan acquisition mode was selected in step *2*, the ***Chemiluminescent Setup*** window opens.



a) Select ***Sensitivity***.

b) Select ***Beam Splitter***.

c) Select ***PMT*** voltage.

d) Click ***OK***.

4 ***Tray*** list and Tray number list (*Fig 4-1*, D):

- To select a predefined scan area from the ***Tray*** list, select the tray definition that matches how the sample is placed in the instrument (*for* Storage phosphor screen *scanning,* how the sample is placed in the Storage phosphor screen for and how the Storage phosphor screen is placed in the instrument).
- Select the number in the Tray number list that corresponds to the number of samples you are scanning. The grid changes to reflect the number of scan areas you selected. For scanning more than 1 sample, see the *Typhoon User´s Guide*.
- To customize the scan area for multiple samples or manage tray definitions, see the *Typhoon User´s Guide*.
- To define a new scan area, see step *6* in this instructions.

5 Storage phosphor screen *scanning only:*
Phosphor Mode selection (*Fig 4-1*, E):

- ***Best Resolution***
  Use this parameter if you require higher resolution than sensitivity. Use ***Best Resolution*** with the 50- and 25-µm pixel sizes.
- ***Best Sensitivity***—Use this parameter if you require higher sensitivity (limit of detection) than resolution. Use ***Best Sensitivity*** with the larger pixel sizes (above 100 µm).

6 The grid in the ***Typhoon Scanner Control*** window (*Fig 4-1*, F) is used to select the scan area. The letter and number markings correspond to the markings in the Exposure cassette (if performing Storage phosphor screen autoradioagraphy) and on the glass platen of the *Typhoon* instrument. The white rectangle on the grid designates the area to scan. Use either the current scan area or select a new one.

To select a new scan area:

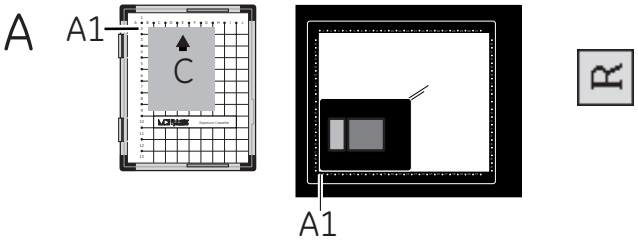
a) Place the pointer in the grid square corresponding to the lower left corner of the area you want to scan (A1 in the example in *Fig 4-1*,).

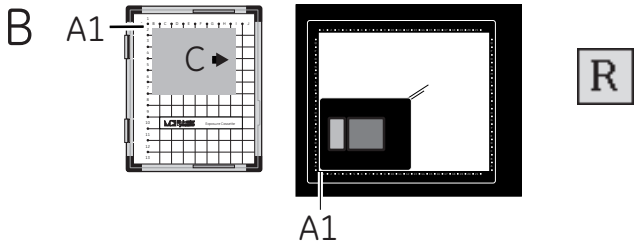
b) Drag the pointer to the grid square corresponding to the upper right corner of the area you want to scan (J15 in the example in *Fig 4-1*).

c) Release the mouse button. The scan area selected appears in white.

7 Set sample orientation by selecting desired ***Orientation*** button (*Fig 4-1*, G).
There are 8 possible orientations and the selection determines how the scanned image will be displayed in the image analyzing software.

Note: *When performing* Storage phosphor screen *scanning one must consider both the sample orientation in the* Exposure cassette *and the orientation of the exposed screen in the instrument in order to define the sample orientation, see two examples (A and B) below for samples (C) in face up position..*





Symbol	Sample orientation
R	The top of the sample is face up, toward the backside of the instrument.
R	The top of the sample is face up, toward the right side of the instrument.
R	The top of the sample is face up, toward the front of the instrument.
R	The top of the sample is face up, toward the left side of the instrument.
R	The top of the sample is face down, toward the backside of the instrument.
R	The top of the sample is face down, toward the right side of the instrument.
R	The top of the sample is face down, toward the front of the instrument.
R	The top of the sample is face down, toward the left side of the instrument.

a) Click the ***Orientation*** button

b) Click the button that represents how the sample is oriented.

c) During the scan, the Typhoon Scanner Control software maps the pixels to display the image of your sample face up and top-end up.

8 *Optional for fluorescent samples:* ***Select Press Sample*** parameter (*Fig 4-1*, H).

Tick the ***Press Sample*** check box if a sample that does not lie flat against the glass platen of the instrument, such as a dry membrane or filter paper, is to be scanned. The inner lid of the *Typhoon* instrument will go down to press the sample flat.

Note: *Do not select* ***Press Sample*** *if you are scanning wet membranes, wet gels, or soft samples. Pressing wet or soft samples can damage the instrument. In addition, pressing a soft sample can distort the scanned image.*

Note: *In the* ***Storage phosphor scan*** *acquisition mode, the* ***Press Sample*** *parameter will always be used.*

9 Select pixel size from the ***Pixel size*** list (*Fig 4-1*, I).

Pixel size (µm)	Recommendations
1 000	For a very low resolution scan of the screen. Produces 10 data points per centimeter and 20 data lines per grid square. ***Note:*** *The 1 000-µm pixel size produces very rough data that is not recommended for quantitative analysis.*
500	For a low resolution scan of the screen. Produces 20 data points per centimeter and 40 data lines per grid square.
200	For most standard electrophoresis samples. Produces 50 data points per centimeter and 100 data lines per grid square.
100	For samples requiring high resolution (such as DNA sequences). Produces 100 data points per centimeter and 200 data lines per grid square.

Pixel size (µm)	Recommendations
50	For samples requiring a higher resolution (such as whole body autoradiography). Produces 200 data points per centimeter and 400 data lines per grid square. ***Note:*** *For Chemiluminescent scanning the amount of time required to scan using this pixel size could exceed the signal intensity of the chemiluminescent sample.*
25	For samples requiring a very high resolution (such as high-density macroarrays). Produces 400 data points per centimeter and 800 data lines per grid square. ***Note:*** *For Chemiluminescent scanning the amount of time required to scan using this pixel size could exceed the signal intensity of the chemiluminescent sample.*
10	For samples requiring the highest resolution (such as microarrays) Produces 1 000 data points per centimeter and 2 000 data lines per grid square. Available for Typhoon 9210, 9410 and *Trio+* only. ***Note:*** *Because of file size limitation, there is some limitation regarding scanning, see Typhoon User´s Guide for information.* ***Note:*** *For Chemiluminescent scanning the amount of time required to scan using this pixel size could exceed the signal intensity of the chemiluminescent sample.*

10 ***Focal Plane*** list (*Fig 4-1*, J):

- In the ***Storage phosphor scan*** acquisition mode, the ***Platen*** parameter is pre-selected so that the Typhoon instrument scans the area just above the glass platen.

11 Optional: Enter user comments (*Fig 4-1*, K).

If desired, comments to the scan can be entered in the ***User Comment*** box. The comments are for reference only and do not affect the scan.

12 Optional: Tick the ***DIGE File Naming Format*** box (*Fig 4-1*, L), to save scanning samples in the DIGE file naming format. It is possible to create a separate image file for each channel in each scan area. See the *Typhoon User´s Guide* for instructions.

13 The ***Scanning Information*** area (*Fig 4-1*, M) displays the approximate image file size, the approximate scan time, and the number of lines per channel.

14 Typhoon Scanner Control software saves the scan parameters with the image. It is possible to view, but not change, these parameters in analyzing software.

15 Optional: Use a template.
Using a template is a quick way to retrieve scan parameters used frequently. The template contains the scan parameters for the selected instrument. Comments in the ***User Comment*** box are not saved with the template. See *Typhoon User´s Guide*. for instructions how to create and use a template.

16 Close the sample lid and press it down until the latch clicks. The sample or screen is ready to scan.

Starting a scan

NOTICE
Never turn off the *Typhoon* instrument or disconnect the SCSI cable while scanning. You can severely damage the internal mechanism of the instrument.

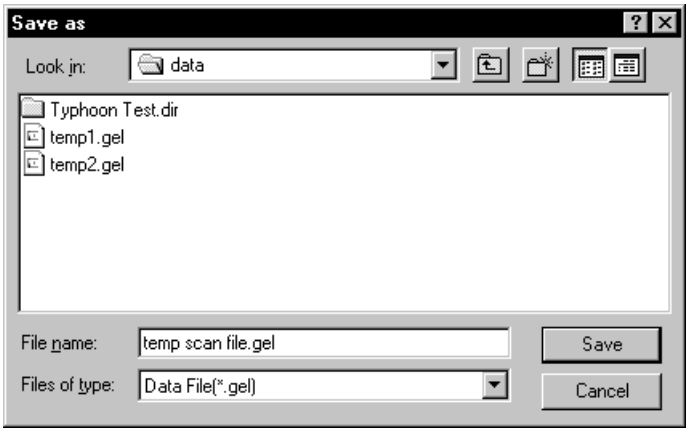
Note: *Keep the sample lid closed while scanning. Opening the lid shuts off the light source, aborts the scan, and saves the data already collected.*

Note: *For starting a scan of multiple samples and scan areas, see Typhoon User´s Guide.*

1 Make sure that the Storage phosphor screen is in place, the sample lid is shut, and all the parameters are correct in the ***Typhoon Scanner Control*** window.

2 Click the ***Scan*** button in the ***Typhoon Scanner Control*** window.

3 The ***Save As*** window appears.



a) Type a name for the scan in the ***File name*** box. Typhoon Scanner Control software creates an image file and stores it using the Data File (.gel) type.

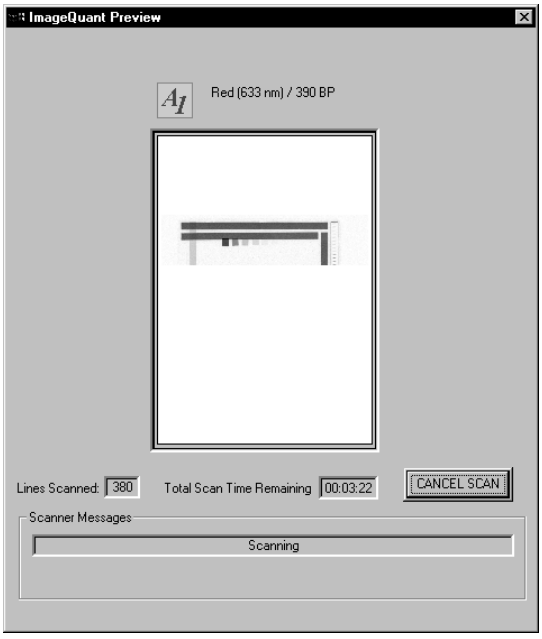
b) Optional: Change folder location of the file. Default folder is the ***data*** folder.

Note: *Saving the scanned data to a folder located on a removable media disk drive can cause a loss of data. It is recommended to use a folder on the computer hard drive. Move the image file to the removable media after scanning is completed.*

c) Click ***Save*** to start the scan.

d) Before the Typhoon instrument begins the scan, an initialization process occurs. Depending on the state of the instrument and the scan parameters you selected in Scanner Control, the initialization can take as long as 5 minutes. A timer displays the time estimated for initialization. The timer counts down as the initialization proceeds.

4 Monitoring the scan progress.



After you start the scan, the ***ImageQuant Preview*** window appears, and the green **Scan** indicator light on the top of the instrument blinks.

- To abort the scan, click ***Cancel Scan*** in the ***Scan in Progress*** window. A message appears asking if the data file should be deleted.

5 A ***More Info*** button appears in the ***ImageQuant Preview*** window when the Typhoon instrument reports errors. Click the ***More Info*** button to view the error message.

- If the error is a nonfatal error, the instrument continues to scan, and Scanner Control saves the file when the scan is finished. Check the image in ImageQuant to make sure the data are not corrupted.
- If the error is a fatal error, the instrument aborts the scan, and Scanner Control saves the data collected before the fatal error occurred. Check the image in analysis software. Depending on where the fatal error occurred in the scan, you might be able to use the data.

6 Check the preview image for saturated data.
While the instrument is scanning, an image appears showing the part of the sample that has been scanned in the ***ImageQuant Preview*** window. Saturated data appear in red in the image. It is not possible to perform quantitative analysis on the portions of the image that are saturated. A saturated image can be used only for viewing the shapes and positions of the spots on the sample.

4.5 Procedures after scanning

After scanning procedures

After scanning

1 Typhoon Scanner Control software saves the image using the file name you selected in the ***Save As*** window.

2 The ***Scan in Progres***s window displays a ***Complete*** message.
Saturated data appear in red in the Scan in Progress window. If the image appears too saturated, you might not be able to analyze the image correctly.

Note: *Before repeating the scan, verify in analyzing software that the image is not too saturated to analyze.*

Note: *If scanning a* Storage phosphor screen *use a clean* Storage phosphor screen *to re-expose the original sample or to a new sample. since the scanning process destroys the signal on the used* Storage phosphor screen, *To avoid saturation of the data, expose the screen for a shorter time.*

3 The Scan indicator light on the *Typhoon* instrument turns off.

4 Open the sample lid on the instrument.

5 Remove the fluorescent sample or Storage phosphor screen.
Storage phosphor screens:

- Avoid touching the white side of the screen.
- To pick up a large mounted screen from the glass platen, use the small tabs attached to the metal back. If your screen does not have tabs or the tabs are damaged, contact GE Healthcare Technical Support.
- To lift a large mounted screen, pull up on the round tabs attached to the metal plate, and then slide a finger under the edge of the metal backing.

Fluorescent samples:

- Dispose of the sample using the established procedure in your laboratory.

6 Check the glass platen and sample lid for contamination and clean the glass platen and sample lid of the *Typhoon* instrument (see *Section 5.3*).

7 If Storage phosphor screen *autoradiography scanning:*
After each scan:

a) Remove the sample from the Exposure cassette and dispose of the sample using the established procedure in your laboratory.

b) Check the Storage phosphor screen for contamination (*Checking for contamination, on page 58*).

c) Clean the Storage phosphor screen (*Cleaning, on page 58*).

d) Erase the Storage phosphor screen (*Prepare Storage phosphor screen for exposure, on page 33*).

e) Check the Image eraser for contamination and clean the Image eraser (*Section 5.6*).

f) *For storage of Storage phosphor screens.*
Store screens after cleaning, decontamination (if required), and erasure:

- At room temperature.
- Away from sources of radiation, such as strong beta or gamma emitters or x-ray machines.
- In a protective box or in a clean Exposure cassette. Damaged screens are unusable and must be replaced.

g) Check the Exposure cassette for contamination and clean the Exposure cassette (*Section 5.5*).

Analyzing or preprocessing the scanned image

When the scan is completed, open the image in the analysis software for further analysis

Turn off Typhoon Scanner Control software and instrument

NOTICE
Never turn off the *Typhoon* instrument while scanning. The internal mechanism of the instrument can be severely damaged.

1 Select ***File:Exit*** to exit the Typhoon Scanner Control software.
If you want to scan again, start the Typhoon Scanner Control software as described (*Section 4.2 Starting the instrument and Typhoon Scanner Control software, on page 28*).

2 Press the **Power** switch on the lower right side of the *Typhoon* instrument to the off position to turn off the *Typhoon* instrument. The power indicator light turns off.

Note: *You can continue to use the computer after you turn off the Typhoon instrument. However, if you want to use the instrument again, you must follow the procedures described in Section 4.2 Starting the instrument and Typhoon Scanner Control software, on page 28.*

3 Save and close any open files in the computer.

4 Close all the running applications in the computer.

5 Turn off the computer.

5 Maintenance

This chapter provides instructions for routine maintenance and also a maintenance schedule. Regular maintenance of the Typhoon system is essential for reliable results.

5.1 General

Keep the instrument dry and clean. Wipe regularly with a soft damp tissue. Let the instrument dry completely before use.

WARNING
Disconnect power. Always disconnect power from the instrument before performing any maintenance task.

5.2 User maintenance schedule

Interval	Instructions/reference
Periodically	Check the instrument for radioactive contamination, see *Section 5.3*.
Before and after each scan	Clean the instrument, see *Section 5.3*.
	Check the Storage phosphor screen for contamination, see *Section 5.4*.
	Clean the Storage phosphor screen, see *Section 5.4*.
	Clean the Exposure cassette, see *Section 5.5*.
	Clean the Imager eraser, see *Section 5.6*.

5.3 Typhoon instrument

Checking for contamination

Periodically, you should check the glass platen and the surface of the inner lid for contamination from radioactive samples.

To check the instrument for radioactive contamination, follow the instruction below.

1 Use a Storage phosphor screen that is erased and free from radioactive contamination.

2 Place the white side of the screen on the glass platen of the Typhoon instrument.

3 Leave the screen in the instrument overnight.

4 Scan the screen (*Section 4.4*).

- If an image that looks like a gel or blot appears in the ***Scan In Progress*** window, the instrument is contaminated.
- If a white or gray image appears, the image was probably created by background contamination and the instrument is not contaminated.

5 To decontaminate the instrument, follow the instructions below to clean the glass platen.

Cleaning

Clean the glass platen

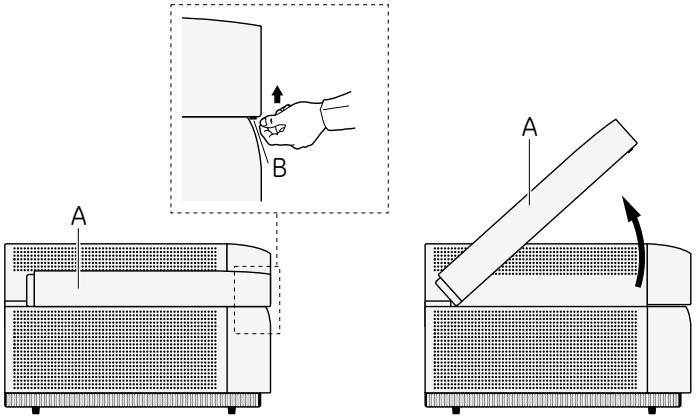
Clean the glass platen according to this instructions before and after you scan each sample.

Recommendations:

- Wear powder free gloves to protect your hands and to avoid transferring oils from your hands onto the glass platen.
- Do not use window cleaners. They contain ingredients that can fluoresce.
- The use of acetone or the excessive use of ethanol can shorten the lifetime of the instrument.
- Protect the glass from scratches. Scratches interfere with accurate imaging and quantitation.

To clean the glass platen, follow the instruction below.

1 Open the sample lid (A) by pushing up on the lid release (B) under the center front of the sample lid until the lid opens.



2 *Optional:* If the instrument has been used for fluorescent scanning and fluorescent material has come in direct contact with the glass platen, moisten a lint-free cloth with 10% hydrogen peroxide and wipe the glass several times.

3 Clean the glass with distilled water and a clean, lint-free cloth or paper. If visible spots remain, clean the glass first with 75% ethanol and then with distilled water.

Clean the sample lid

Under normal circumstances, the surface of the inner lid should not come in contact with contaminants. However, it is good laboratory practice to check the surface periodically for contamination. For example, you can perform a wipe test, or use the procedure that you used to check the glass platen (*Checking for contamination, on page 56*) except place the screen in the instrument with the phosphor side up.

If necessary, clean the surface with a damp (not saturated) cloth moistened with a small amount of distilled water. If visible spots remain, clean the surface first with 75% ethanol and then with distilled water.

NOTICE
Use liquid sparingly when cleaning, excess liquid may leak into the equipment and damage it. Use damp cloth only, do not pour or spray liquid onto the equipment.

Note: Wear gloves to protect your hands when cleaning the sample lid using 75% ethanol.

Note: To prevent liquid from seeping inside the lid or rolling down onto the glass platen, do not spray liquid on the lid.

5.4 Storage phosphor screen

Checking for contamination

Recommended to perform between exposures or if the screen has not been used for several days.

1 Clean and erase the screen (*Cleaning, on page 58* and *Section 4.3 Preparations before start, on page 29*).

NOTICE
Before you erase the screen, check the Image eraser for contamination from radioactive samples. To clean the Image eraser, see *Cleaning, on page 58*.

2 Store the screen in a clean, light-tight box.

3 Provide enough time to register the contamination as an image on the screen.

4 After storage, scan the screen (*Section 4.4*) and examine the image.

- If contamination is detected clean and erase the screen again and re-check for contamination.
- If no contamination appear on the image the screens is ready to use.

Cleaning

GP screens

Use a soft cotton cloth and an intensifying screen cleaner (for example, Kodak™ Intensifying Screen Cleaner). Follow the manufacturer's instructions.

Alternatively, use a small amount of alcohol and distilled water.

Do not use a powdered detergent. Any undissolved particles can scratch the surface of the screen.

1 This cleaning procedure removes dust, fingerprints, static electricity, and mild contamination from radioactive samples.

TR screens

Use a gentle gas stream or soft brush to remove any particulate matter from the unprotected surface of the screen.

NOTICE
To avoid damaging the TR screen, do not expose the screen to liquids of any sort.

5.5 Exposure cassette

To protect the Exposure cassettes from contamination and damage, observe the following precautions and cleaning procedure:

- Do not place uncovered wet gels in the Exposure cassette. Wet gels can permanently contaminate the cassette. For information on using wet gels, see *Sample recommendations, on page 29*.
- Do not place sharp or heavy objects inside the cassette. A crease or dent in the cassette lining causes uneven pressure on the sample.
- Keep the foam inside the cassette dry.
- Immediately before placing the sample in the cassette, clean the grid surface of the cassette with a damp cloth moistened with a small amount of distilled water. If visible spots still remain, clean the surface first with 75% ethanol and then with distilled water.

NOTICE
Use liquid sparingly when cleaning, excess liquid may leak into the equipment and damage it. Use damp cloth only, do not pour or spray liquid onto the equipment.

5.6 Image eraser

The surface of the Image eraser must be clean and free of radioactive contamination when you erase screens. Otherwise, the screens will be exposed to radioactive contamination during the erasure process.

To clean the Image eraser, follow the instruction below.

WARNING
Because the Image eraser uses high voltage, always turn off and unplug the eraser before cleaning the surface.

1 Turn off the Image eraser and disconnect the power cord.

2 Clean the surface of the eraser with a damp cloth moistened with a solution of totally rinsable laboratory detergent. Do not use powdered detergents. Any undissolved particles can scratch the surface of the Image eraser.

NOTICE
Use liquid sparingly when cleaning, excess liquid may leak into the equipment and damage it. Use damp cloth only, do not pour or spray liquid onto the equipment

3 Verify that the eraser surface is free from radioactive contamination.

4 Connect the power cord to a grounded mains outlet and turn on the Image eraser.

5.7 Replacement of fuses

General

WARNING
Disconnect power. Always disconnect power from the instrument before replacing fuses.

Refer to *Section 7.1 Specifications, on page 69* for information about the fuse types and rating.

WARNING
If a fuse requires repeated replacement, do not continue to use the instrument. Contact an authorized service engineer.

WARNING
For continued protection from fire hazard, replace only with same type and rating of fuse.

Note: *Typhoon 9400 and 9410 only: You cannot change the fuses in the Blue laser module. If the Blue laser module does not power on, contact Technical Support.*

Changing fuses in the Typhoon instrument

You can use the Typhoon instrument with either a 220–240 V (230 V) power source or a 100–120 V (115 V) power source. The power supply in the instrument switches to the correct voltage automatically. The fuse box is located to the right of the power switch (*Typhoon instrument, on page 10*).

To change a fuse in the Typhoon instrument, follow the instruction below.

1 Turn off the Typhoon instrument and disconnect the power cord.

2 Place the end of a small flathead screwdriver into the groove (*Fig 5-1 A*) to the left of the fuse box and pry to open the fuse box.

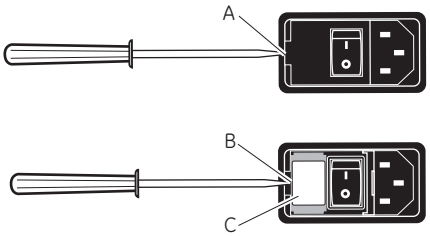


Figure 5-1. Opening the fuse box of the Typhoon instrument.

3 Place the screwdriver in the groove (*Fig 5-1 B*) to the left of the fuse holder (*Fig 5-1 C*) and pry out the fuse holder. When the holder is loose, pull it out of the fuse box.

4 One or both fuses might be blown. Replace the blown fuse(s) with new fuse(s) of the same type and rating. Fuse specifications are listed in *Section 7.1* and on the label located on the underside of the sample lid.

5 Insert the fuse holder into the fuse box.

6 Snap the cover of the fuse box back into place.

7 Reconnect the power cord and turn on the Typhoon instrument.

Changing fuses in the Image eraser

You can use the Image eraser with either a 220–240 V (230 V) power source or a 100–120 V (115 V) power source. The selected operating voltage of the Image eraser appears in the fuse window on the right side of the Image eraser, next to the power switch (*Image eraser, on page 11*).

To change a fuse in the Image eraser, follow the instruction below.

1 Turn off the Image eraser and disconnect the power cord.

2 Note the voltage (115 V or 230 V) showing in the fuse window (*Fig 5-2 A*).

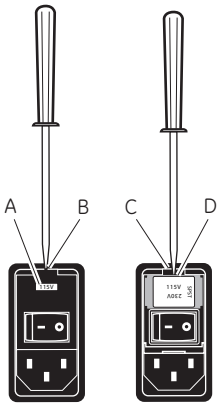


Figure 5-2. Opening the fuse box of the Image eraser.

3 Place the end of a small flathead screwdriver in the small groove (*Fig 5-2 B*) above the fuse window and pry to open the fuse box.

4 Place the screwdriver in the groove (*Fig 5-2 C*) on the upper edge of the fuse holder (*Fig 5-2 D*) and pry out the fuse holder. When the holder is loose, pull it out of the fuse box.

5 One or both fuses might be blown. Replace the blown fuse(s) with new fuse(s) of the same type and rating. Fuse specifications are listed in *Section 7.1* and on the label located on the unit.

6 Insert the fuse holder into the fuse box making sure the correct voltage rating for your power supply is right side up.

7 Snap the cover of the fuse box back into place. Check that the correct voltage rating for your power source appears in the voltage window. If the voltage is incorrect for your power source, remove the fuse holder, rotate the holder 180° so that the correct voltage rating is right side up, and reinsert the fuse holder.

8 Reconnect the power cord to a grounded mains outlet and turn on the Image eraser.

NOTICE
Before you turn on the Imager eraser after you change the fuse, make sure that the correct operating voltage appears in the fuse window. Selecting the wrong voltage can severely damage the eraser.

5.8 Replacement of bulbs

The Image eraser contains four warm-white compact fluorescent bulbs. When any one of the bulbs fails, replace all four bulbs to provide uniform light intensity across the screen. To order replacement bulbs, contact GE Healthcare Technical Support or your local distributor (see the manufacturer part number on the bulb). See back cover for contact information.

NOTICE
If you are replacing the bulbs shipped with the Image eraser, you must order replacement bulbs and fixtures from GE Healthcare Technical Support. The bulbs shipped with the Image eraser are epoxied to the fixture to avoid damage during shipment. The replacement fixture and bulbs are not epoxied.

To replace the bulbs, follow the instruction below.

1 Turn off the Image eraser and disconnect the power cord.

2 Unscrew the two thumbscrews (*Fig 5-3 A*) that hold the clip support (*Fig 5-3 B*) and diffuser screen (*Fig 5-3 C*) in position.

3 Lift off the clip support and diffuser screen.

4 Unscrew the bulb and fixture from each receptacle (*Fig 5-3 D*).

5 Screw a bulb and fixture into each receptacle.

6 Replace the front diffuser screen and clip support, and screw the two thumbscrews.

7 Verify in the fuse window that the fuse voltage is correct.

8 Connect the power cord to a grounded mains outlet and turn on the Image eraser.

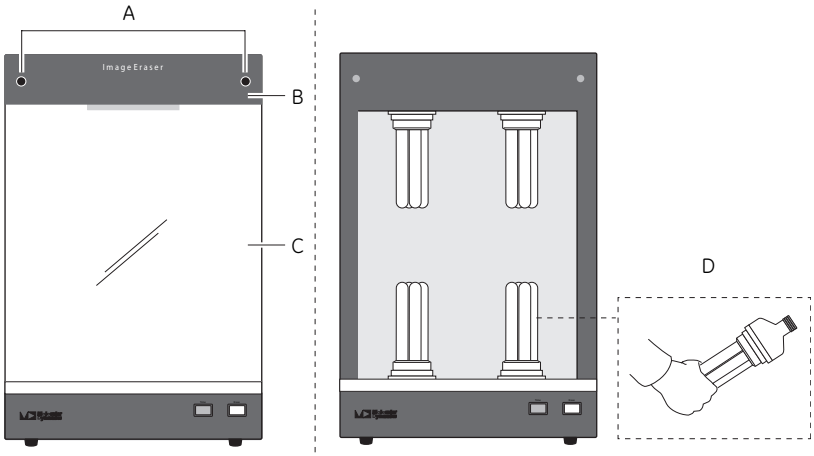


Figure 5-3. Replace bulbs in the Image eraser.

6 Troubleshooting

This chapter gives a brief guide of how to solve instrument-related problems that might occur when using Typhoon.

If you are experiencing problems that you cannot correct, contact your local service representative.

6.1 Power and communication

Error symptom	Possible cause	Corrective action
The power indicator lamp does not turn on.	The instrument is not plugged in, or the surge protector is turned off.	Plug in the instrument or turn on the surge protector.
	Faulty wall outlet.	Check the outlet or try another one.
	Fuses have blown.	Change the fuses, see *Section 5.7*.
The instrument is on but cannot communicate with the computer.	Usage of wrong type of Ethernet cable or faulty Ethernet cable.	Make sure to use the red Ethernet cable supplied with the instrument.
	The Ethernet cable is not properly plugged into the computer or the instrument.	Check the connections and make sure they are plugged in and are securely fastened.
	If the ***New TCP IP Address*** window appears when you open Typhoon Scanner Control software, the IP address has changed.	Type the correct address in the ***IP Address*** box and click ***OK***. If you do not know the IP address, check with your network administrator.

Error symptom	Possible cause	Corrective action
Typhoon 9400 and 9410 only: The Typhoon instrument is on, but the external Blue laser module is off or the **Connection** light on the instrument is not lit.	The laser communication cable is not connected between the instrument and the Blue laser module, or the cable is of wrong type.	Make sure to use the blue Ethernet cable supplied with the instrument.
	The Blue laser module is not plugged in or the wall outlet is faulty.	Check the connections and the wall outlet.
Typhoon 9400 and 9410 only: The **Laser On** light on the Blue laser module is not lit.	The laser is not turned on.	Check the instrument state in the ***Typhoon Scanner Control*** window. If it is in the ***Sleep*** state, click ***Initialize Scanner*** to turn on the laser.
	Faulty laser.	If the light is not on 30 seconds after you turn on the instrument or click ***Initialize Scanner***, contact Technical Support.
Typhoon 9400 and 9410 only: The Blue laser module does not turn off when you turn off the instrument.		If the Blue laser module does not turn off several minutes after you turn off the instrument, contact Technical Support.
Typhoon Trio and Trio+: An error message is displayed, stating: Failed Communication with Internal Laser Unit.	Communication with the internal blue laser failed.	Turn off the power to the instrument, wait a few seconds, and the turn the instrument back on. If the problem occurs repeatedly, contact Technical Support.

6.2 Scanning

Error symptom	Possible cause	Corrective action
The instrument does not scan, and a warning message displays, stating that the sample lid is up.	The sample lid is not completely closed.	Make sure you press the lid all the way down until the latch clicks.
During a scan, the ***ImageQuant Preview*** window remains unchanged for at least three minutes, and the pointer does not respond when you move the mouse.	The computer has stopped functioning.	Restart the computer using the manufacturer's instructions. Then open the Typhoon Scanner Control software, reselect the scanner parameters, and start the scan again.
The software aborts a scan, and either— • The software displays the message: ***Scan aborted—hardware error, please try to scan again***, or a message that does not give instructions for resolving the problem. • The red scan indicator light blinks.	PC communication failed.	Restart the scan as follows: 1 Close the ***Typhoon Scanner Control*** window. Leave the computer on. 2 Turn off the power switch on the right side of the Typhoon instrument. Wait a few seconds and turn it on again. 3 Open the Typhoon Scanner Control software, reselect the parameters, and rescan. If the problem occurs repeatedly, contact Technical Support.
Typhoon 9400 and 9410 only: The instrument does not scan using the blue laser.	Faulty connections to the Blue laser module.	Make sure the Blue laser module is plugged in and the cables are connected to the instrument. If the instrument is in state ***Ready*** or the instrument is scanning, all three lights on the front of the module are lit. If the instrument still not scans using the Blue laser module, contact Technical Support.

6.3 Image

For troubleshooting regarding image-related problems, refer to *Typhoon User´s Guide*.

7 Reference information

This chapter contains technical data, regulatory and other information.

7.1 Specifications

Parameter	Value
Ingression protection	IP 20
Supply voltage	100-120 V AC or 220-240 V AC, 50 to 60 Hz
Power consumption, Typhoon 9200, 9210, Trio and Trio+	< 500 W
Power consumption, Typhoon 9400 and 9410	< 2000 W
Power consumption, Blue laser module	< 1500 W
Fuse specification, Typhoon instruments	T6.3 AL, 250V
Fuse specification, Blue laser module	T1.6 AL, 250V
Dimensions, Typhoon instruments (h × w × d) [cm]	48 × 118 × 78
Dimensions, Blue laser module (h × w × d) [cm]	48 × 30 × 78
Weight, Typhoon instruments [kg]	160 kg
Weight, Blue laser module [kg]	29.5 kg
Acoustic noise level	< 70 dB A
Ambient temperature, Typhoon 9200, 9210, 9400, 9410, and Blue laser module	15ºC to 30ºC
Relative humidity tolerance, Typhoon 9200, 9210, 9400, 9410, and Blue laser module	10% to 80%, non-condensing
Ambient temperature, Trio and Trio+	4ºC to 40ºC
Relative humidity tolerance, Trio and Trio+	< 80% for 4ºC to 31ºC, decreasing linearly to 50% for 31ºC to 40ºC

7.2 Literature

For further information regarding the Typhoon, refer to the following:

- *Typhoon User´s Guide*
- *Typhoon Trio, User´s Guide Addendum*
- *Typhoon Installation Instructions*

7.3 Ordering information

For ordering information visit www.gelifesciences.com/quantitative_imaging.

Appendix A Accessories

A.1 Storage phosphor screens

Storage phosphor screens detect the beta and gamma ionizing radiation from most isotopes. There are two types of Storage phosphor screens available:

- General-purpose (GP) Storage phosphor screen
- Tritium (TR) Storage phosphor screen

Table A-1. Available sizes and types of Storage phosphor screens

Screen size (cm)	Screen type	
	General-purpose (GP)	Tritium (TR)
19 × 24	Not available	Mounted/unmounted
20 × 25 (small screen)	Mounted/unmounted	Not available
35 × 43 (large screen)	Mounted/unmounted	Not available

A.2 Exposure cassettes

In general, the Storage phosphor screens are exposed to a sample in an Exposure cassette. Four styles of Exposure cassettes are available:

- Small cassette for small mounted screens
- Small cassette for small unmounted screens
- Large cassette for large mounted screens
- Large cassette for large unmounted screens

A.3 Emission filters

The Typhoon instrument contains a standard set of emission filters and can accommodate a total of 14 emission filters. The instrument uses emission filters to reject reflected and scattered excitation light and background fluorescence while allowing the emitted light from the sample to pass through to the PMT. *Table A-2* lists the standard set of emission filters used with fluorescence scanning.

Table A-2. Standard set of emission filters.

Emission filter	Description
520-nm band-pass filter (520 BP 40) (Typhoon 9400 and 9410 only)	Transmits light between 500 nm and 540 nm and has a transmission peak centered at 520 nm. Use this filter with fluorochromes, such as Cy2 and ECL Plus™, or with fluorescein when scanning with the 488-nm wavelength of the blue laser.
555-nm band-pass filter (555 BP 20)	Transmits light between 545 nm and 565 nm and has a transmission peak centred at 555 nm. Use this filter with fluorochromes, such as R6G and HEX.
580-nm band-pass filter (580 BP 30)	Transmits light between 565 nm and 595 nm and has a transmission peak centred at 580 nm. Use this filter with fluorochromes, such as TAMRA and Cy3.
610-nm band-pass filter (610 BP 30)	Transmits light between 595 nm and 625 nm and has a transmission peak centred at 610 nm. Use this filter with fluorochromes, such as ROX, EtBr, SYPRO™ Red, and SYPRO Ruby.
670-nm band-pass filter (670 BP 30)	Transmits light between 655 nm and 685 nm and has a transmission peak centred at 670 nm. Use this filter with fluorochromes, such as Cy5.
526-nm short-pass filter	Transmits light below 526 nm. Use this filter with fluorochromes, such as fluorescein when scanning with the green laser. ***Note:*** *When using the blue laser, the 520 BP 40 might provide better results.*
560-nm long-pass filter	Transmits light above 560 nm. Use this filter with fluorochromes, such as TRITC.
390-nm band-pass filter	This filter is used for storage phosphor scanning and is not normally used for fluorescence scanning.

For more information on emission filters, see the GE Healthcare publication *Fluorescence Imaging principles and methods*.

A.4 Beamsplitters

The Typhoon instrument contains three standard beamsplitters and has a slot for one additional custom beam splitter. You can use the beamsplitters with multilabel fluorescent samples to create multichannel images. *Table A-3* lists the three standard beamsplitters.

Table A-3. Standard beamsplitters.

Beamsplitter	
560-nm dichroic	Reflects light of wavelengths shorter than 560 nm and passes light longer than 560 nm
580-nm dichroic	Reflects light of wavelengths shorter than 580 nm and passes light longer than 580 nm.
630-nm dichroic	Reflects light of wavelengths shorter than 630 nm and passes light longer than 630 nm.

For local office contact information, visit
www.gelifesciences.com/contact

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28-9623-56 AA 11/2009