applied biosystems

GeneChip™ System 3000

Instrument Operation and Use

Publication Number MAN0028330
Revision B.0

For Research Use Only. Not for use in diagnostic procedures.

ThermoFisher SCIENTIFIC

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Summary of Safety and Performance

Available upon request.

Revision history: Pub No. MAN0028830

Revision	Date	Description
B.0	August 2023	Updated Instrument images and physical dimensions. Updated Laser Safety statement. Added additional Caution statements and a EMC Compliance statement.
A.0	December 2022	Initial release.

Important Software Licensing Information

Your installation and/or use of this GeneChip Data Collection (GCDC) RUO software is subject to the terms and conditions contained in the End User License Agreement (EULA) which is incorporated within the GCDC RUO software, and you will be bound by the EULA terms and conditions if you install and/or use the software.

Legal entity

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TRADEMARKS

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Contents

1 Introduction

Product overview

The GeneChip™ Instrument System is a fully integrated platform for conducting your research using GeneChip brand probe arrays. We offer three versions of this system: The GeneChip Scanner 3000 7G System, GeneChip Scanner 3000 7G Whole-Genome Association System and the GeneChip Scanner 3000 Targeted Genotyping System.

The GeneChip Scanner 3000 7G System includes the GeneChip Scanner 3000 7G, Fluidics Station 450, and Hybridization Oven 645i. This system can be purchased with or without a powerful computer workstation with quad-core Xeon processors loaded with the GeneChip Data Collection (GCDC) software and a GeneChip AutoLoader.

Instrument usage information

The expected life of the GCS 3000 system is at least eight years, provided the system is used and maintained according to manufacturer's recommendations. For optimal operational performance, please follow recommended maintenance and service schedules and permit only qualified service personnel to replace parts when required.

Other documentation

- GeneChip Data Collection User Guide (P/N MAN0026726)
- Online Help: Click the **Help** button to open the PDF of the User Guide.
- Tooltip Help: Place mouse cursor over an interface component to view its description or to un-truncate its data.

Terminology

- **Sample Registration file**: Unique record of an assay performed on a specimen. Repeated runs of the same specimen are represented by multiple test requests. Each test request is associated with a specific array cartridge.
- **Library Files**: The software that runs the assay, that includes library files, fluidics protocols, scanning, and parameters for gridding.
- **Assay**: Procedure that processes the specimen to produce a result, includes bench work and running through the GCS3000 workflow.

- **Array**: A microarray is a glass substrate with oligonucleotide probes. A plastic cartridge surrounds and protects the array and forms the array cartridge. Array also typically refers to the array cartridge.
- **Fluidics station** or **FS450**: GeneChip™ Fluidics Station 450.
- **Scanner**: GeneChip Scanner 3000 with AutoLoader.

Alerts

Alerts draw your attention to a particular piece of information. There are five types of alerts: Note, Important, Caution, Warning, and Danger.

- **NOTE:** Information that may be of interest or of help to a user but is not critical to the primary purpose of the text.
- **IMPORTANT**: Information that is essential to the successful use of a product or the completion of a procedure and is not safety related.
- **CAUTION**: An alert to the user of hazards that, if not avoided, can cause minor or moderate personal bodily injury and/or damage to an instrument or loss of data.
- **WARNING**: Alerts the user to hazards that, if not avoided, can cause serious bodily injury or death, or produce potentially incorrect data that could cause harm to a patient.
- **DANGER:** Dangers alert the user to an imminent hazard that, if not avoided, will cause serious bodily injury or death, or will produce a result that could cause serious harm to a patient.

Warnings and precautions

IMPORTANT! If a serious incident occurs while using the device, immediately report it to the appropriate site authority, device manufacturer, and Member State authority for the region.

IMPORTANT! Encrypt, pseudonymize, or anonymize personal data wherever possible following the requirements of your laboratory under GCPR (General Data Protection Regulation).

- Follow universal precautions for laboratory and assay procedures, and waste disposal.
- Follow local and within-country regulations.
- The physical and toxicological properties of the products in this kit(s) have not been thoroughly investigated. Follow prudent laboratory practices and use general laboratory safety equipment (eye protection, labcoat, and lab gloves) and good personal hygiene when working with laboratory reagents.
- If external reagents or consumables are used, it is recommended to check manufacturer's GHS labeling and SDS before handling.

General chemical safety

- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing).
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (a fume hood).
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's cleanup procedures.
- Comply with all local or national laws and regulations related to chemical storage, handling, and disposal.

Biological hazard safety

Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases. Follow all applicable local, state/provincial, and/or national regulations. Wear appropriate protective equipment, which includes but is not limited to: protective eye wear, face shield, clothing/lab coat, and gloves. All work should be conducted in properly equipped facilities using the appropriate safety equipment (for example, physical containment devices). Individuals should be trained according to applicable regulatory and company/institution requirements before working with potentially infectious materials. Read and follow the applicable guidelines and/or regulatory requirements in the following:

- U.S. Department of Health and Human Services guidelines published in Biosafety in Microbiological and Biomedical Laboratories (stock no. 017-040-00547-4; bmbl.od.nih.gov)
- Occupational Safety and Health Standards, Bloodborne Pathogens (29 CFR§1910.1030; www.access.gpo.gov/nara/cfr/waisidx_01/29cfr1910a_01.html)
- Your company's/institution's Biosafety Program protocols for working with handling potentially infectious materials Additional information about biohazard guidelines is available at: www.cdc.gov

Fluid safety

Reagent	Contains	Warnings/Precautions
Hyb Buffer 1	Tetramethylammonium chloride	Toxic if swallowed and in contact with skin; causes skin irritation, serious eye irritation; may cause respiratory irritation. Avoid breathing and avoid contact with skin or eyes; if contact occurs wash immediately. If skin irritation or rash occurs, seek medical advice.
Array Holding Buffer	Sodium azide (0.02%)	Exercise caution when disposing. Buildup of sodium azide in lead and copper plumbing can form highly explosive metal azides.
Stain Buffer 1	Sodium azide (0.01%)	Exercise caution when disposing. Buildup of sodium azide in lead and copper plumbing can form highly explosive metal azides.
Stain Buffer 2	Sodium azide (0.01%)	Exercise caution when disposing. Buildup of sodium azide in lead and copper plumbing can form highly explosive metal azides.

Equipment safety

WARNING! Watch out for frayed power cable(s), as they may result in electrocution/shock.

WARNING! Avoid fluid and reagent spills, as they may short out the instrument or cause electrocution/shock. Serious eye injuries may result when working with fluids and reagents. Always wear proper eye protection when using the instrument with any type of liquid.

WARNING! To avoid finger injuries, insert, remove, and close the autoloader carousel and its latch with caution. Do not manually remove a chip. Stay clear of exposed needles.

CAUTION! ⚠ Do not use a power supply cord with inadequate ratings. Only use the power supply cord provided by the manufacturer."

Disposal information and guidance

Precautions

IMPORTANT! Always follow universal precautions for laboratory and assay procedures.

IMPORTANT! Always follow all country, local and site regulations and restrictions.

WARNING! Contact your Environmental and Safety Officer for your site's approved procedures regarding array and waste disposal.

WARNING! Contact your Thermo Fisher Field Service Engineer (FSE) for instrument disposal information.

Customer support

Affymetrix, Inc.
3450 Central Expressway
Santa Clara, CA 95051
Phone: 408-731-5572
FAX: 408-731-5950
Customer Support
Email: support@thermofisher.com
Phone: 1-888-362-2447

Before contacting technical support for unresolved issues, see "Troubleshooting" on page 63.

For problems with the fluidics station or scanner, especially under any of the following conditions, **unplug the instrument** from the power source and contact technical support if:

- The power cord is damaged or frayed.
- The instrument does not perform to specifications AFTER service or calibration.

2 System overview

The GeneChip System 3000 (GCS 3000) consists of hardware and software components for processing microarrays based on assay parameters. The GeneChip Data Collection (GCDC) software manages assay workflows.

Hardware

Standard hardware components

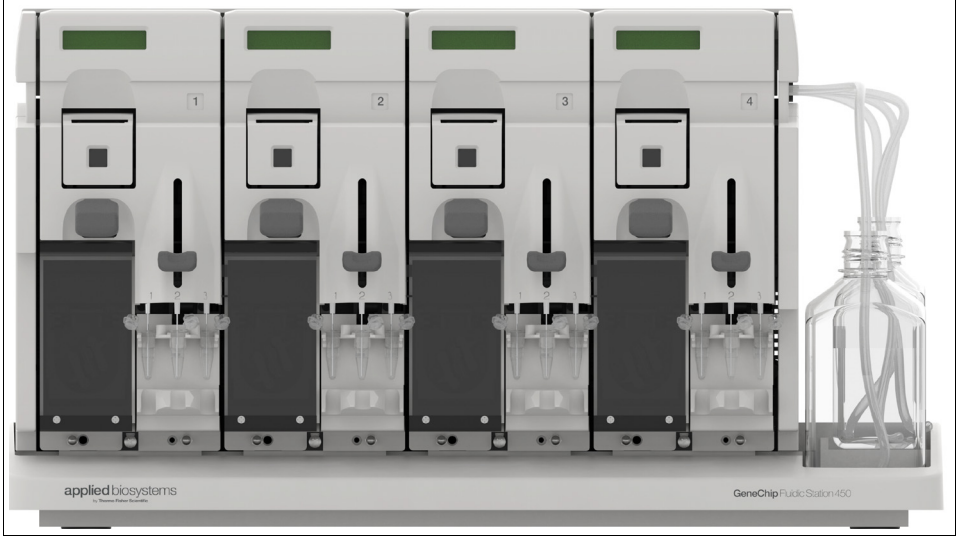
The GCS 3000 comes with these standard hardware components:

- System Workstation
  - The GCDC software is loaded on the workstation and provides the hardware interface to other system components.
- GeneChip Fluidics Station 450 (fluidics station)
- Hybridization Oven 645i
- GeneChip Scanner 3000 with AutoLoader (Figure 1)

Figure 1 GeneChip Scanner 3000 w/ AutoLoader

Fluidics station 450

Figure 2 Fluidics Station 450



The Fluidics Station 450 (Figure 2) consists of four modules installed in a single housing. Each module holds a single array and performs the hybridization, washing, and staining functions for that array. Up to eight stations can communicate with one system workstation. Each module controls the addition of target and staining fluids to the array cartridge and array washing. Each module contains a pump, valve, thermo-electric system, and LCD that are controlled by scripts. These scripts are automatically downloaded to each module and stored in its electronic memory.

Scanner 3000 with AutoLoader

The Scanner 3000 with Autoloader (Figure 1 on page 12) is a wide-field, epifluorescent, confocal, scanning laser microscope. It scans the chip after staining on the Fluidics Station 450. Array cartridges are loaded into the scanner by the AutoLoader (an automatic handler) before scanning and returned to the AutoLoader when scanning finishes.

GeneChip Hybridization Oven 645i

The GeneChip Hybridization Oven 645i automates the hybridization process for GeneChip Arrays. The oven holds up to 8 removable array carriers, each holding up to 8 arrays. Processing can be done for up to 64 arrays at the same time. The Hybridization Oven 645i provides precise temperature and rotation control to ensure successful hybridization.

Optional hardware components

Additional hardware components include:

- Barcode reader - The barcode reader is used to enter information from:
  - Array cartridge
  - Other identification information as attributes for the sample
- Uninterruptible power supply (UPS)

Note: Contact support for optional hardware requirements.

Software

GCDC

GCDC is the user interface for the system. It provides control of the instruments, assay workflow, and the data collection processes. When array finishes scanning, the data is processed by GCDC using the library file parameters. Data files are stored in the storage location (local or network) defined when configuring GCDC.

Library and Fluidics Protocol Files

Library and Fluidics Protocol files provide the necessary parameters for processing an array through its entire workflow. Library files contain the algorithms and reporting functions to produce the clinical result specific to that array and assay. Fluidics Protocol files have the information for washing and staining the cartridge array. Assay user manuals give detailed instructions that are unique to specific assays.

Note: If you have set up a network location for data storage, GCDC enables all files associated with the sample (including DAT and CEL files) to be moved to your defined network location for downstream analysis. Your network location must have ample storage and the correct access permissions for this feature to work.

GCDC Launcher

The GCDC Launcher (Figure 3) has all the components needed for processing an array through the workflow in one interface. It includes the software tools for sample registration, instrument control, installation of library and protocol files, configuring data output files, data viewing, and log collection.

Figure 3 GCDC Launcher window

Additional GCDC components work behind the scenes and include an Indexer. The Indexer is a service that tracks the files of the arrays that are being run and runs automatically.

Note: There may be instances when its configuration settings need to be changed. Make sure you contact Support before changing any Indexer settings.

Launcher modules

- **Fluidics:** Controls the Fluidics Station 450.
- **Scanner:** GeneChip Scanner 3000 (GCS3000) with Autoloader scanner software.
- **Array Registration:** Used to register samples and attributes.
- **Data Viewer:** Used for viewing image data and workflow status.
- **Install Protocol/Library:** A Fluidics scripts and library files installation tool that is required to process arrays.
- **Log Collector:** Used to collect log files from your system in cases when troubleshooting is required.
- **Configurator:** Installation of Fluidics Stations (and naming if desired), Scanner (naming if desired), setup of data storage locations and Language selection.
- **thermofisher.com:** Link to website.
- **Support:** Link to Support.
- **Help:** PDF of User Guide (Acrobat Reader required)
- **About:** GCDC version number.

GCDC workflow overview

How GCDC processes arrays

GCDC is used to process the arrays in your experiments. The recommended workflow for processing cartridge arrays enables you to include data about the sample and experiment, then easily track its processing steps.

1. **Sample/Array Registration:** Creation of ARR file with sample information.
2. **Hybridization of Sample to Cartridge:** This is **NOT** controlled by GCDC.
3. **Fluidics Station:** Washing and Staining of the Array after hybridization is complete.
4. **Scanner:** Array is scanned, and DAT file of the image is created.
5. **Data Viewer:** Review grid alignment, CEL file generation and any error messages.
6. **Analysis:** CEL file signal intensities are generated by GCDC. Analysis of these files is performed using other software packages. Analysis is not performed by GCDC.

How GCDC processes cartridge arrays

In the array processing workflow for cartridge arrays, you create a sample file as the first step, assigning sample attributes and the array barcode to the sample.

You then:

1. Hybridize the sample to the array
2. Wash and stain the array
3. Scan the array to create Image data (DAT) file

   GCDC aligns a grid on the DAT file and computes the intensity data generating a CEL intensity file for the array. The CEL file is created by the GCDC software for the sample and is used by subsequent data analysis software packages.

Registration

Registering the samples and arrays

In GCDC, the Sample file is the beginning of the data chain for a given experiment. The sample information is stored in a Sample file with an ARR extension. The arrays used in analysis and data files produced by analysis are linked to this Sample File. The information about the sample(s) and experiment(s) are collected as attributes.

Registering sample options

GCDC provides multiple ways to create Sample files.

- **Batch Registration:** Allows for multiple sample files to be created at the same time by uploading a spreadsheet containing sample and array information.
- **Quick Registration:** Creates single sample (ARR) files for cartridge arrays with basic information.
- **Edit Registration:** Enables updating or editing of a sample's attributes or adding attributes or barcode information for the sample.

Editing user attributes

User attributes are created dynamically during the registration of a sample and array. This enables you to create a quick note for a particular sample file.

Washing and staining cartridge arrays

Note: Hybridization of cartridge arrays is not controlled using the GCDC software.

The Fluidics Station 450 (FS450) is used to wash and stain the GeneChip arrays. The GCDC Fluidics Control software is used to control the FS450. A workstation with GCDC Fluidics Control software and a Sealevel card installed can control up to eight different fluidics stations.

Running the scanners

The array is scanned after hybridization, washing and staining, using the GCS300 Scanner with Autoloader (load up to 48 arrays for scanning without operator attention).

Note: The GCDC Scan Control software is used to control the scanner.

Tracking gridding and CEL file generation

After the array has been scanned, GCDC:

- Aligns a grid on the Image (DAT) file to identify the probe cells.
- Computes the probe cell intensity data for the array and creates a CEL file.
- Generates JPG (from DAT file) and RPT files.

Note: The GCDC Data Viewer enables you to track the progress of this step in the workflow

GCDC file types

Different types of information are collected by GCDC in different types of files:

- Information about the sample and experiment are collected in "Sample files".
- Probe array data generated during scanning and processing are collected in Data files of various types.
- Audit and "Log files"contain information about array processing and other processes.

Globally Unique Identifiers (GUIDs) are used to track the relationships between Sample files, physical arrays, and Data Files.

Sample files

The Sample (ARR) file collects two types of information:

Sample Attributes: information that you can use to interpret the experimental data. It can include information about the sample itself, the experimental conditions, or other information you may find useful.

Array Information: Information about the array(s) used with the sample. More than one array can be associated with the sample. This is useful for tracking replicates; in addition, it can be used to simplify tracking data for multi-chip arrays. Each array is assigned an array name during registration. The array name is used to identify the DAT, CEL, and CHP data files that are generated during analysis.

Log files

Log files are produced by different GCDC components. The logs provide a record of the tasks performed by different components, such as the migration tools and the installer. Log files can provide valuable troubleshooting information and may be requested by your Support person. For information on how to use log files, see Appendix B, "Collecting log files" on page 74.

Customer support

Visit thermofisher.com/support for the latest in service and support, including:

- Worldwide contact telephone numbers
- Product support, including:
- Product FAQs
- Software, patches, and updates
- Order and web support
- Product documentation, including:
- User guides, manuals, and protocols

3 System operation basics

Before you begin

Read this entire User Guide and familiarize yourself with the instrument, software, and procedure.

Start and shut down the system

Starting the workstation

Turn on the computer workstation to launch its Windows 10 Operating System.

Log onto the system using the username and password

Starting the GCDC software

1. Click **Start** → **Thermo Fisher Scientific GCDC Launcher** or double- click on the **GCDC Launcher** Desktop shortcut.

Starting the GeneChip fluidics station 450 and scanner

The Fluidics station and Scanner should be turned on if you will be processing arrays.
Note: The Scanner laser takes about 10 minutes to warm up.

WARNING!  Laser in use during scanning.

IMPORTANT! To preserve the lifetime of the scanner laser, turn off the scanner when it is not in use for an extended period of time, such as overnight or a weekend.

CAUTION! AutoLoader carousel is in motion during start-up sequence.

Shutting down/ restarting

1. Ensure all Fluidics protocols and Scans have been completed.
2. Close all applications in GCDC.
3. Close/Exit GCDC.
4. Shutdown/Restart the Operating system.

IMPORTANT! You should not restart or shutdown the instrument control software when fluidics or scans are in progress. Doing so will result in a loss of data.

Using the barcode reader

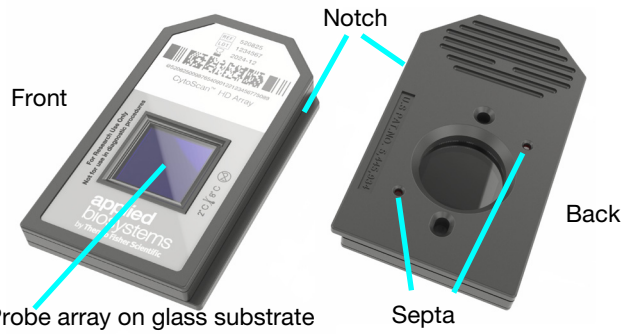
Use the barcode reader to:

- Enter the barcode for the array in registration
- Enter reagent lot numbers as attributes for a sample/array

How to hold array cartridges

Arrays come mounted in a plastic package to form an array cartridge (Figure 4). The array contains oligonucleotide probes on the inner glass surface. A chamber in the plastic package directly under the chip acts as a reservoir where hybridization and washing and staining occur.

Figure 4 CytoScan Array Cartridge



Although the inner glass surface is protected, any contamination or scratches on the outer surface of the glass can compromise the integrity of the scan.

IMPORTANT! Do not touch the surface of the glass with your fingers. Skin oils and other substances, such as lotions or ink, can fluoresce. If the array surface is dirty, carefully clean it with a nonabrasive laboratory tissue.

4 GeneChip Fluidics Station FS450

Before you begin

Familiarize yourself with the GeneChip Data Collection (GCDC) software interface before operating the Fluidics Station 450 (see Chapter 2, *System overview*). Also refer to the *GCDC User Guide (P/N MAN0026726).*

IMPORTANT! You must read and understand the contents of this manual before operating the Fluidics Station 450 (fluidics station).

Warnings and precautions

- Installation and de-installation of the system must be done by a trained Thermo Fisher representative. The system warranty may be voided if used in a manner not specified by the manufacturer.
- Ensure fluidics station is positioned on a sturdy, level bench and away from extremes in temperature and moving air.
- Follow Universal Precautions.
- Use a surge protector on the power line to the fluidics station.
- Disconnect the power cord of the fluidics station before replacing fuses.
- Always run a Shutdown protocol before turning off or not using instrument overnight or longer to prevent build-up of salt crystals.
- When not using instrument, leave sample needles in lowered position such that each needle extends into an empty vial to protect from damage.
- Always use deionized water to prevent line contamination.
- Use freshly prepared buffer to change buffers at each system startup.
- Do not send your instrument elsewhere for service or attempt to service it yourself. To protect your warranty and ensure safe operation, have instrument serviced only by Thermo Fisher or its representatives. If the instrument is not working correctly, go to: https://www.thermofisher.com/us/en/home/technical-resources.html
- Do not use the fluidics station in ways not specified by Thermo Fisher Scientific. Doing so may impair the protections provided by the fluidics station.

WARNING! Do not place hands or fingers inside cartridge holder. Under electrical load conditions, the area behind the cartridge holder can have temperatures that rise to 100°C or higher.

- The fluidics station requires two people to lift and handle it safely. Each person should firmly grasp the base of the instrument at the end opposite the other to lift.
- The instrument must be surrounded by adequate airspace. Slots and openings in the instrument and the electronics compartment covers are for ventilation. Do not block or cover them.
- Never push an object into the instrument ventilation slots; equipment damage or injury may result. Do not set liquids on top of the instrument.
- The fluidics station is intended for indoor, laboratory use in a controlled environment.
- If any unintended or unexpected event occurs or is observed, shut down the instrument and notify customer support.

CAUTION! The power supply cord is used as the main disconnect device. Ensure that the socket outlet is located and installed near the equipment and is easily accessible.

When to contact support

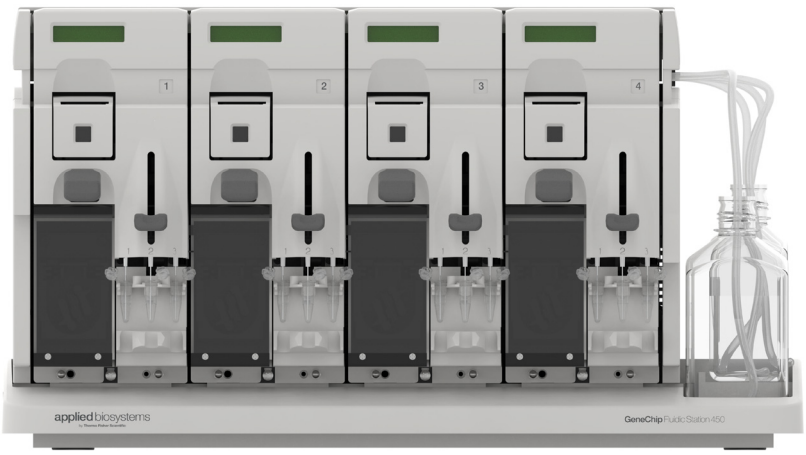
If any of the following occur, unplug the instrument and contact Customer Support.

- Power cord damaged or frayed.
- Liquid spilled onto instrument, or liquid has penetrated instrument.
- Instrument does not perform to specifications AFTER service or calibration.
- Instrument has been dropped or otherwise damaged.

About the instrument

The Fluidics Station 450 (Figure 5) is part of the GeneChip System 3000 (GCS 3000).

Figure 5 Fluidics Station 450



Modules

The fluidics station contains four modules. The software and computer workstation control each of the four modules independently of the others.

- Each module holds one array cartridge and up to three vials.
- Only one assay type (RUO) can be run on the same fluidics station.
- You can use any or all of the modules at the same time.
- The modules are numbered 1 through 4 (near the LCD screen)

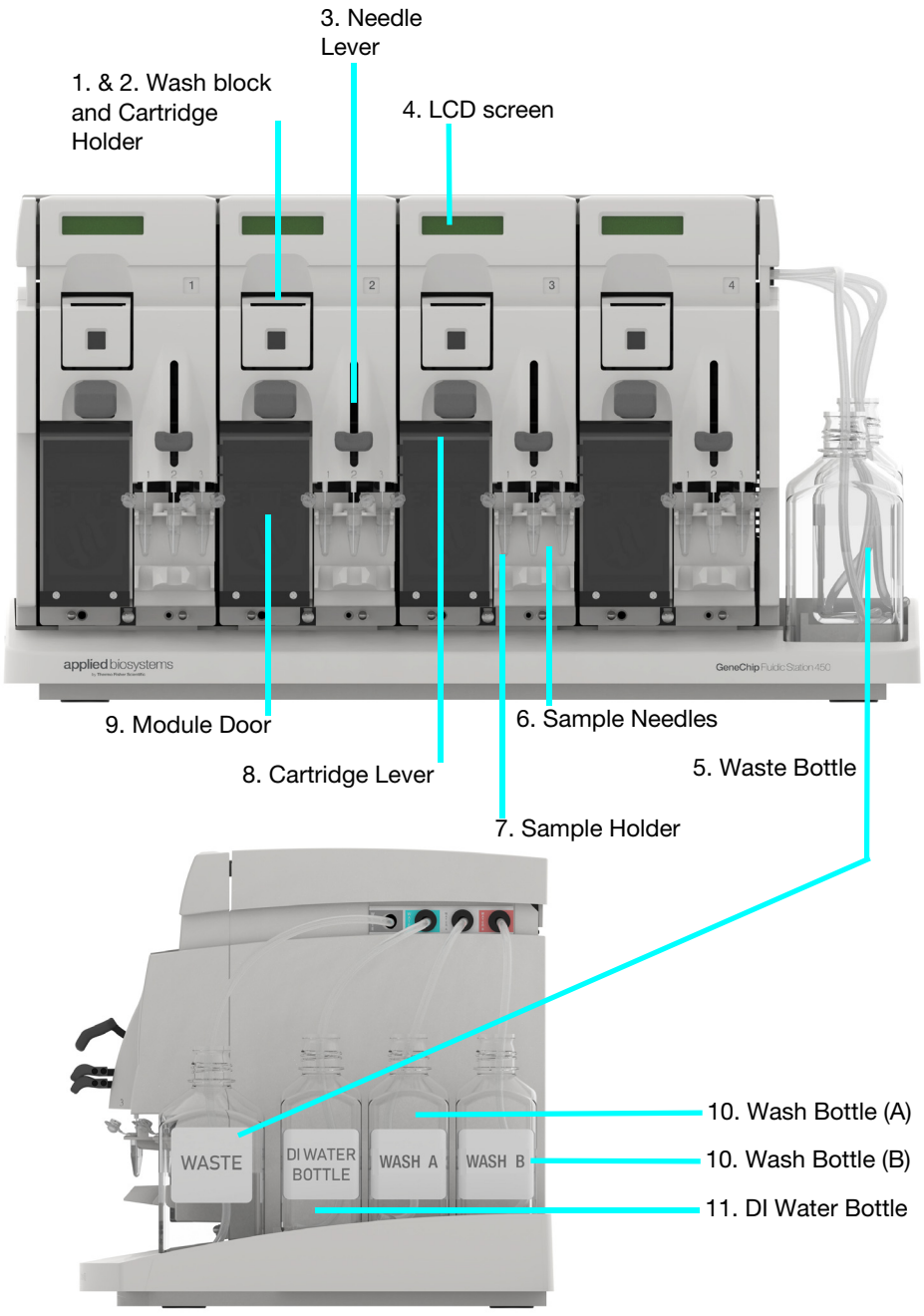
Components

IMPORTANT! Do not change fluidics station connections. Only a qualified Field Service Engineer (FSE) can service the instrument.

The fluidics station components shown on Figure 6 are:

1. **Washblock** – Part of the cartridge holder that completes the fluid path when a cartridge is not in place (used for cleaning out or draining the fluidics station).
2. **Cartridge Holder** – Holds cartridge during fluidics operation.
3. **Needle Lever** – Inserts needles into sample vials.
4. **LCD Screen** – Displays messages during processes.
5. **Waste Bottle** – Collects waste from hybridizations and washes.
6. **Sample or Vial Needles** – Extend into the sample vials and draw fluid.
7. **Sample Holders** – Hold up to three sample vials.
8. **Cartridge Lever** – Engages or releases the cartridge holder.
9. **Module Door** – Protective cover for peristaltic pump on module.
10. **Wash Bottles (A&B)** – Holds wash buffers and tubing that draws buffer through system.
11. **DI Water Bottle**–Holds deionized water and tubing that draws water through system.

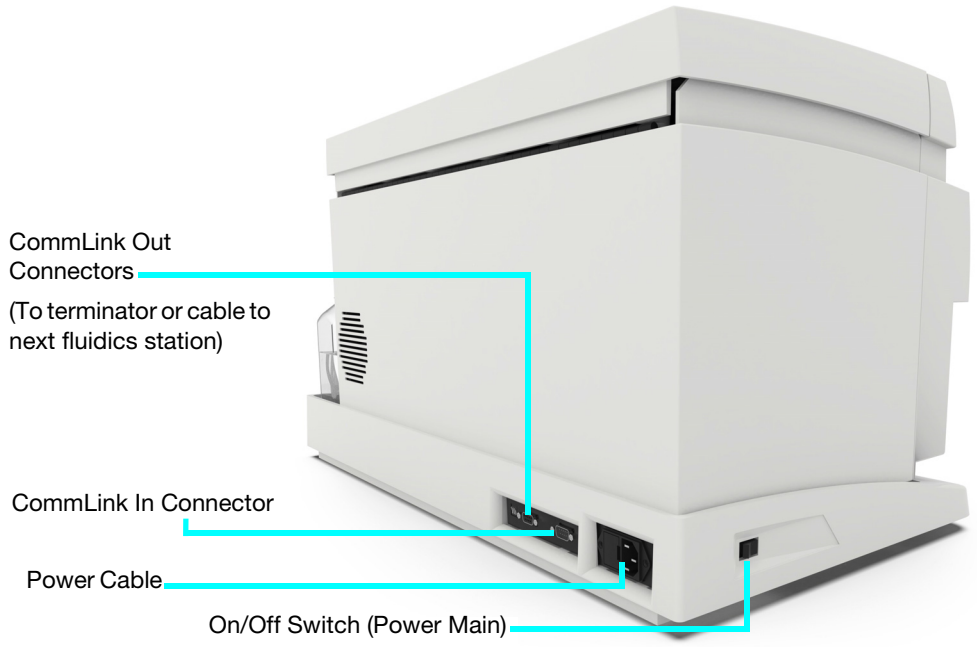
Figure 6 Fluidics Station 450 and components



Connections

Communication connections are shown in Figure 7.

Figure 7 Location of the serial ports and On/Off switch



Using the fluidics station 450

Assay documentation

You must configure the fluidics station for the type of assay you run.

Make sure you refer to the relevant documentation for the fluidics station configuration requirements for the assay you are going to run, as the fluidics station must be correctly configured for each specific assay.

Fluidics station 450 protocols

The library files and fluidics protocols must be installed prior to processing the array on the fluidics station.

Fluidics station operation

The information in this section is general because the number and types of steps required to process an array vary, as does the specific design of the assay and the contents of its array.

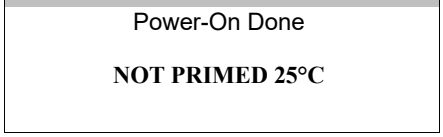
IMPORTANT! Do not lower needles or engage the washblock until prompted by the fluidics station LCD.

Starting the fluidics station

1. Make sure fluidics station is plugged in to power.
2. Make sure fluidics station is connected to the workstation. (Figure 8)
3. Turn fluidics station switch **On** (left side of fluidics station).

   The LCD screen message opens.

Figure 8 Error message



Priming fluidics station

IMPORTANT! You must prime the fluidics station before you run assay protocols.

You also must prime the fluidics station:

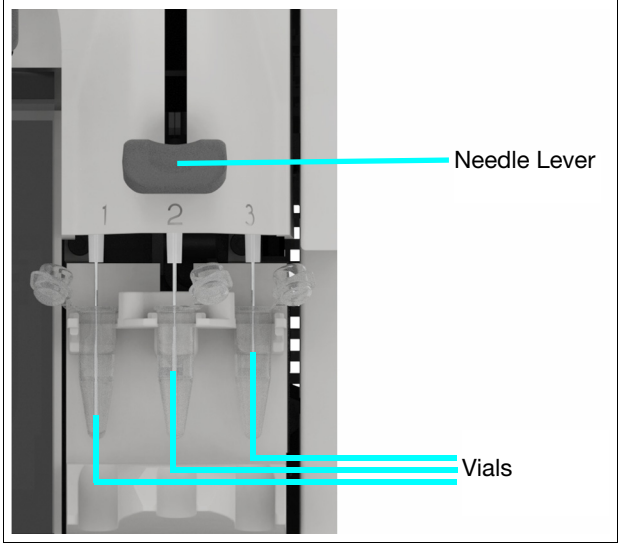
- When you first start it.
- Before you process a cartridge.
- When you change wash buffers.
- When you change the assay associated with a fluidics station.
- If LCD screen or any alert instructs you to run a prime protocol.

Priming the fluidics station

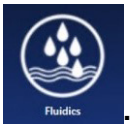
1. Make sure all wash lines are in correct wash bottles.

   Note: Refer to array package insert in cartridge kit for correct wash buffer solutions or contact customer support.
2. Load three 1.5-mL tubes in sample holders for each module to be primed, as shown in Figure 9.

Figure 9 Sample vials on sample holder with needle lever down. Note the orientation of vial caps



Fluidics control

1. At the Launcher window, double-click on 

.

   The Fluidics Control window appears. (Figure 10)

Figure 10 Fluidics Control window

Fluidics Control window

Menu bar: Use to access to Fluidics Control functions.

Tool bar: Quick access buttons to frequently used functions.

Master controls: (Figure 11) (Left pane) Use to select a single protocol to run on multiple stations and/or modules.

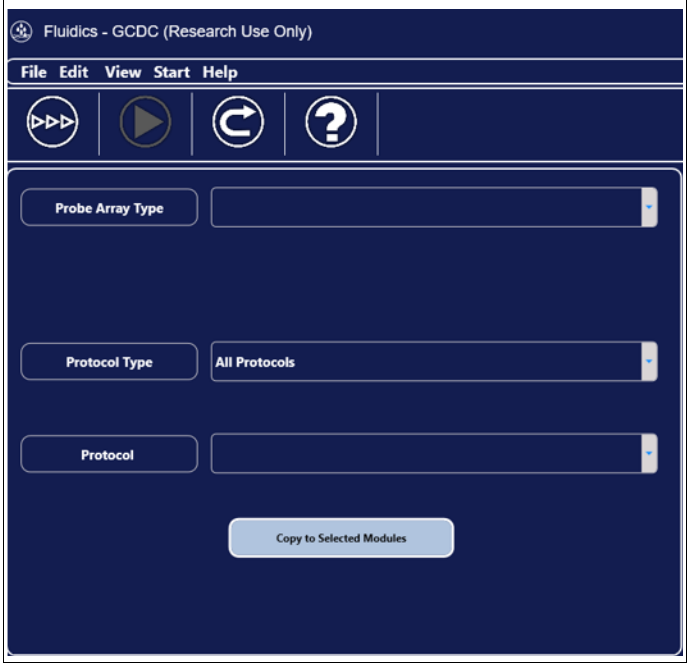
Station controls: (Figure 12) (Right pane) Use to select different protocols to run on different modules in a station.

Status window: (Figure 13) (Bottom pane) Displays list of arrays in process with information on their status.

Master controls

- Run a priming or maintenance protocol on any or multiple stations and modules.
- Run a fluidics protocol on any or multiple stations.

Figure 11 Master Controls - Left pane

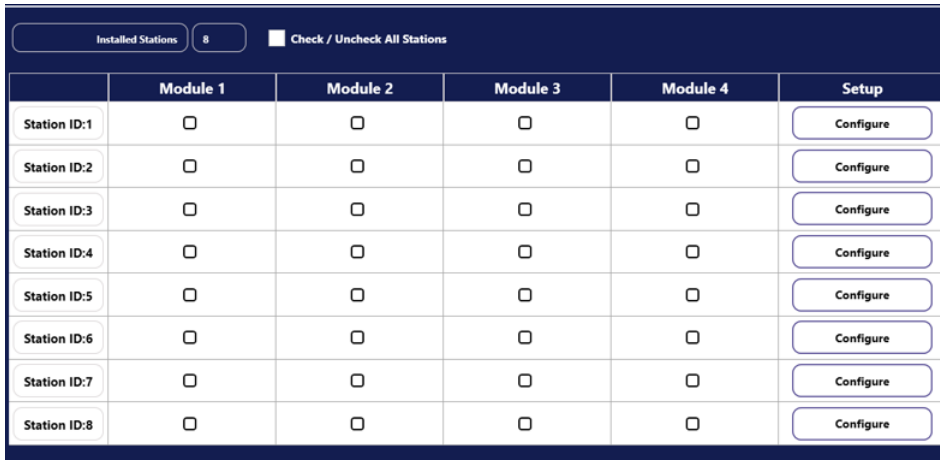


Station controls

Use the Station Controls (Figure 12) to:

- Select arrays and protocols for each module of a station(s).
- Select a specific array for processing using these parameters:
  - Sample File Name
  - Array Name
  - Probe Array Type
- Select a specific protocol for the array.

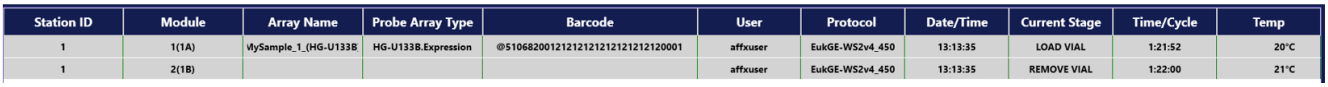
Figure 12 Station Controls



Status window

The Status window (lower pane) displays 11 columns of status, as shown in Figure 13.

Figure 13 Status window



Station ID	Module	Array Name	Probe Array Type	Barcode	User	Protocol	Date/Time	Current Stage	Time/Cycle	Temp
1	1(1A)	MySample_1_(HG-U133B	HG-U133B.Expression	@510682001212121212121212120001	affxuser	EukGE-WS2v4_450	13:13:35	LOAD VIAL	1:21:52	20°C
1	2(1B)				affxuser	EukGE-WS2v4_450	13:13:35	REMOVE VIAL	1:22:00	21°C

- **Station ID**: Fluidics station in operation.
- **Module**: Current module in operation.
- **Array Name**: Assigned array name.
- **Probe Array Type**: Assigned array type.
- **Barcode ID**: The probe array barcode.
- **User**: Creator of the Sample file.
- **Protocol**: Protocol used for the fluidics run.
- **Date Time**: Current data and time when a protocol is running, or date and time when completed.
- **Current Stage**: Fluidics protocol stage currently running.
- **Time/Cycle**: Remaining time of current stage or current wash cycle number.
- **Temp**: Temperature used for current stage.

Running protocols

Fluidics Control offers different options for selecting and running protocols.

Priming fills the fluidics station lines with wash buffers and/or deionized water. The GeneChip Fluidics Station must be primed before it can be used to run assay protocols.

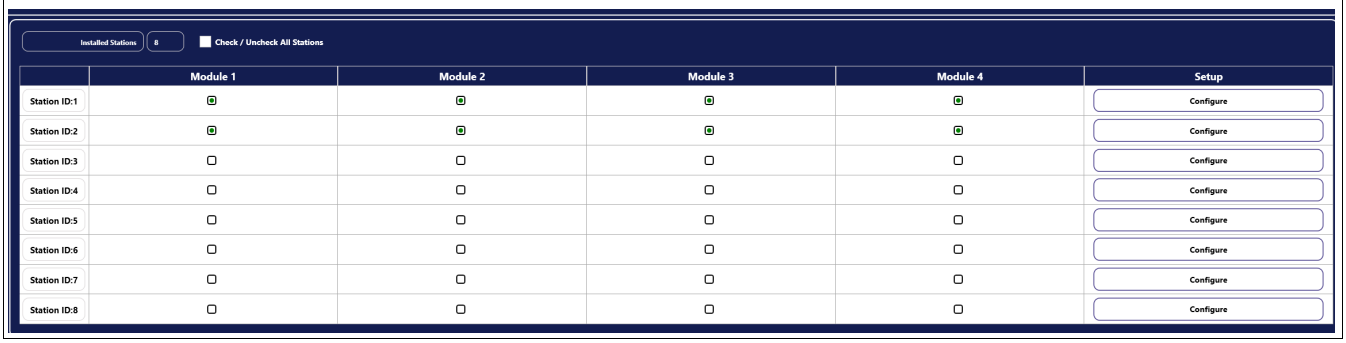
Prime the fluidics station when:

- The fluidics station is first turned on.
- A wash solution is changed.
- The fluidics station is to be used again after a shutdown has been performed.
- A module LCD window informs you that the module is not primed.

Priming the fluidics station

1. From the Master Control (left pane), select **Maintenance Protocols**.
2. Select **PRIME_450** or another maintenance protocol.
3. From Station Control (right pane), click the boxes of the modules you want to prime, as shown in Figure 14.

Figure 14 Modules to be primed



In the Station Control window (right pane) you can:

- Select individual check boxes for each module. A **green** dot denotes a selected module.
- Click Check/Uncheck all Stations and Modules to select/deselect every station and module.

4. Click the **Copy to Selected Modules** button.

   The selected protocol (PRIME_450) is applied to the selected stations and modules.

5. Fill the intake buffer reservoirs A and B with the appropriate priming buffer. (Refer to the appropriate GeneChip probe array package insert).
6. Empty the waste bottle and fill the water reservoir with deionized water.
7. Load an empty, standard 1.5 mL microcentrifuge tube in the sample holder of each module to be primed.

8. Click the **Run All** button.
9. Monitor the prompts in the Status window (also shown in the module LCD window).

   The fluidics station is ready to use when priming is completed and **Priming done, Ready** appears in the module LCD window.

Running a fluidics station protocol

Note: The following is a general procedure, as your protocol may be different. Refer to the GCDC Software User Guide for more information.

1. Make sure all wash lines are in the correct wash bottles and the Fluidics station is Primed. Refer to the array package insert for correct wash buffer solutions or contact Support.
2. Select **Fluidics** in the GCDC Launcher.
3. Select **Configure** for the Station ID that runs the protocols.
4. Load array cartridge into module washblock. Do not engage the washblock until prompted by the LCD on the fluidics station. (Figure 15)
5. Scan the barcode on the array cartridge or select the Sample file name in the drop-down menu.
6. Confirm the protocol is the correct protocol for the array type.
7. Click on **Start** to begin the fluidics protocol.

Figure 15 Inserting the cartridge into the cartridge holder. Note orientation of the array label.

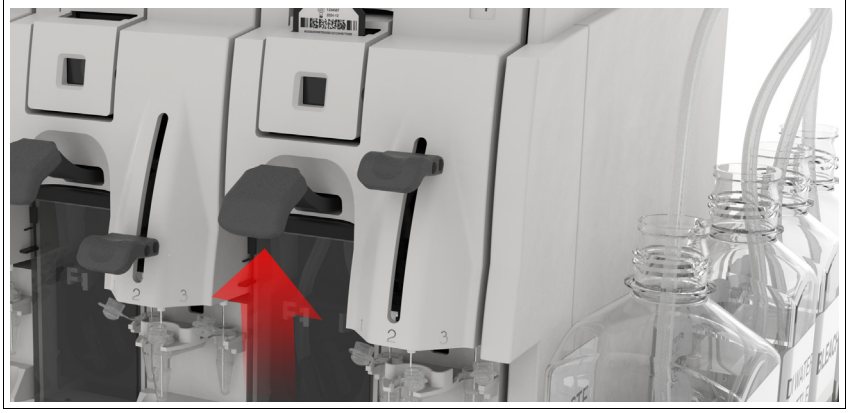
8. Do not engage washblock until prompted by fluidics station LCD.
9. Follow fluidics station LCD screen instructions.
10. Follow the prompts.

    If you are prompted to:

    - **Load Vials:** Load 1.5-mL vials into sample holder of fluidics station.

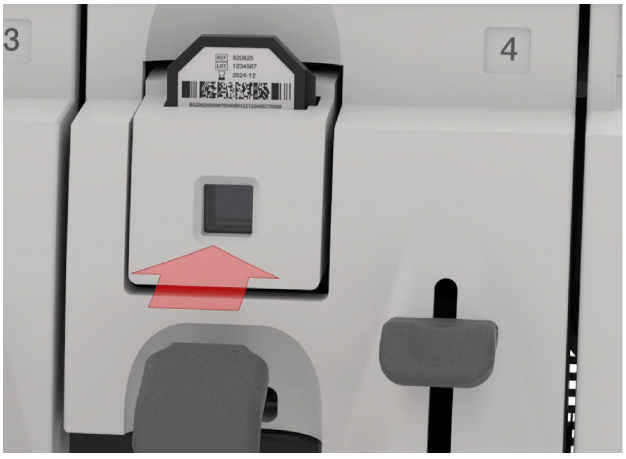
- **Load Cartridge:** Flip cartridge lever up to engage cartridge septa needles into the septa (Figure 16). LCD screen indicates when cartridge engagement is correct.

Figure 16 Flip the cartridge lever up to engage the cartridge septa needles into the septa, as shown.



Note: To minimize array damage, the door closure forces are controlled. If you cannot get proper engagement, press on the cartridge holder to complete the action, as shown in Figure 17. Do not force the cartridge lever up.

Figure 17 Cartridge Lever



11. Load Vials 1-2-3-Place 3 1.5-mL sample vials containing reagents into sample holders 1, 2 and 3 on fluidics station with the Needle Lever in the Up position, as shown in Figure 18. Place vials with the vial caps toward you and that the vials seat evenly and snugly.

Figure 18 Needle lever and vials

When vials are loaded, gently but firmly press down on needle lever to insert the needles into the vials. **Run** commences automatically, as shown in Figure 19 and Figure 20.

Figure 19 Press down on the needle levers to start the protocol.

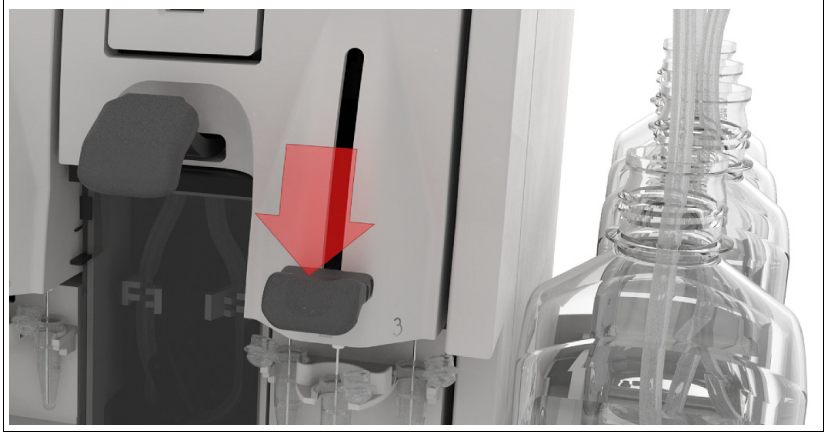


Figure 20 The sample vials on the sample holder with the needle lever down. Note the orientation of the vial caps.

12. After the fluidics protocol completes, you are prompted to:
    - **Eject Cartridge:** Flip cartridge lever down and remove and inspect cartridge.

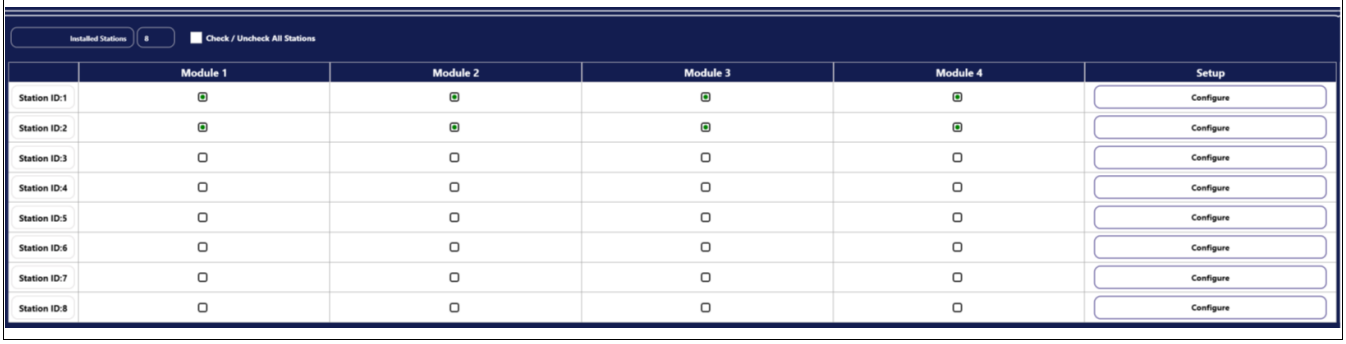
      Note: If air bubbles are present in cartridge, return to cartridge holder. Load cartridge by pulling up on cartridge lever to closed position. Fluidics station drains cartridge and fills it with fresh volume of last-used wash buffer. When LCD screen indicates, eject cartridge and remove and inspect for bubbles. If no bubbles present, it is ready to scan. Engage washblock to continue. If bubbles are still present, return the cartridge to the washblock for debubbling.
    - **Engage Washblock:** Flip cartridge lever up to re-engage washblock.
    - **Remove Vials:** Lift up needle lever. Replace used vials with new, empty vials, then lower needle lever.

Shutting down the fluidics station

Perform the Shutdown protocol at the end of a session.

1. From the Master Control (left pane), select **Maintenance Protocols**.
2. Select **SHUTDOWN_450**.
3. From the Station Control (right pane), click the boxes of the modules you want to shutdown, as shown in Figure 21.

Figure 21 Modules to be shut down



- In the Station Control pane, you can:
  - Select individual check boxes for each module. A **green** box denotes a selected module.
  - Click **Check/Uncheck All Stations** to select/deselect all displayed stations and modules.

4. Click the **Copy to Selected Modules** button.

   The selected protocol (SHUTDOWN_450) is applied to the selected stations and modules.

5. Fill the intake buffer reservoirs A and B and the water reservoir with Deionized Water.
6. Empty the waste bottle.
7. Load an empty, standard 1.5 mL microcentrifuge tube in the sample holder of each module for shutdown.
8. Click the **Run All** button.
9. Monitor the prompts in the Status window (also shown in the module LCD window).
10. After the shutdown protocol is finished, turn the switch on the fluidics station to **OFF**.

Fluidics station care and maintenance

IMPORTANT! To maintain the cleanliness of the fluidics station and obtain the highest quality image and data possible, perform a weekly bleach protocol (see Fluidics station bleach protocol).

Instrument care

Follow these procedures:

- Disconnect the power cord of fluidics station before replacing fuses.
- Use a surge protector on the power line to the fluidics station.
- Always run a Shutdown protocol when the instrument is off, unused overnight, or longer. This prevents salt crystals from forming in the fluidics station.
- When not using the instrument, leave the sample needles in the lowered position. Each needle should extend into an empty vial. This protects them from accidental damage.
- Always use deionized water to prevent contamination of the lines. Change buffers with freshly prepared buffer at each system startup.
- Place the fluidics station on a sturdy, level bench away from extremes in temperature and away from moving air.

Fluidics station bleach protocol

This protocol removes residual SAPE-antibody complex that may be present in the fluidics station tubing and needles. This protocol takes approximately one hour and forty minutes. Run this protocol weekly.

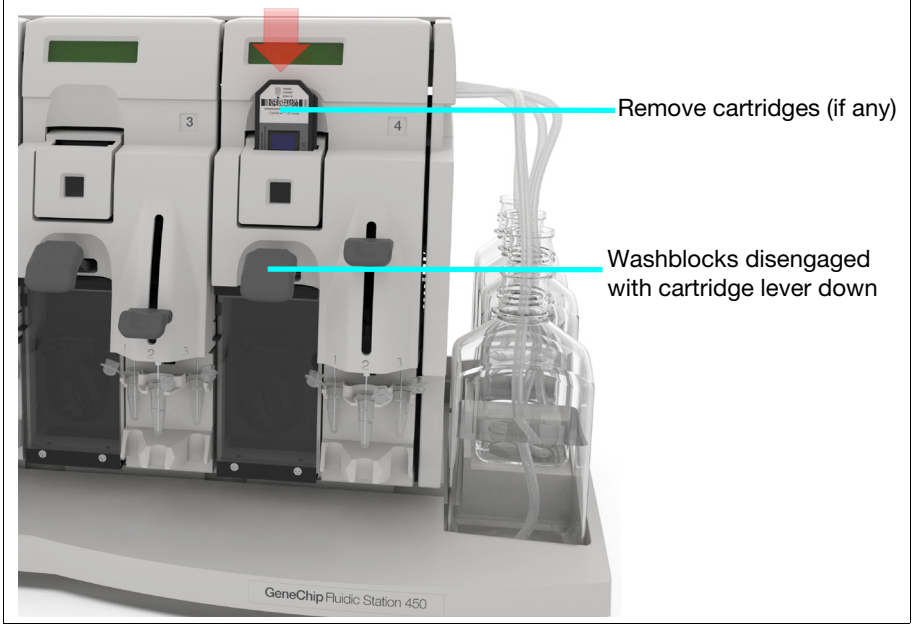
Use dedicated bottles for bleach and DI water to prevent cross-contamination.

Part Number	Description
400118	Media Bottle, SQ, 500mL
400119	Media Bottle, SQ, 1000mL

Bleach cycle

1. Disengage cartridge holder for each module by pressing down on the cartridge lever. Remove any array cartridges. (Figure 22)

Figure 22 Disengaged washblocks showing cartridge levers in the down position; remove any cartridges



2. Prepare 500 mL of 0.525% sodium hypochlorite solution using deionized water.
   a. In a 1-liter graduated cylinder combine and mix:
      - Commercially available bleach
      - Deionized water
   b. Pour solution into 500-mL plastic bottle.
   c. Shake well.

IMPORTANT! Avoid using “Super”, “Ultra” or “Splashless” bleach, as missing fluid errors may occur.

Note: The shelf life of this solution is 24 hours. After this period, you must prepare a fresh solution.

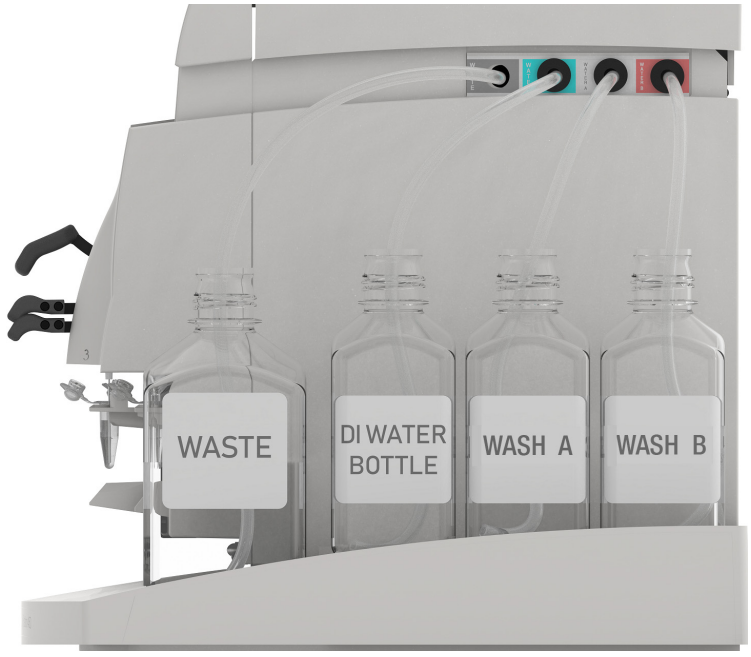
3. Place plastic bottle on the fluidics station.

   Note: Each fluidics station with four modules requires 500 mL of the 0.525% sodium hypochlorite solution.

4. Place on fluidics station:
   - One empty 1-liter waste bottle
   - One 500-mL bottle of bleach solution (from Step 2)
   - One 1-liter bottle of DI water

5. Insert waste line into the waste bottle. (Figure 23)

Figure 23 Immerse the tubes into the 0.525% sodium hypochlorite solution. The waste line remains in the waste bottle.



6. Immerse all three wash and water lines of the fluidics station into the 500-mL bottle of bleach solution (Figure 23). **Do not immerse waste line into bleach.**

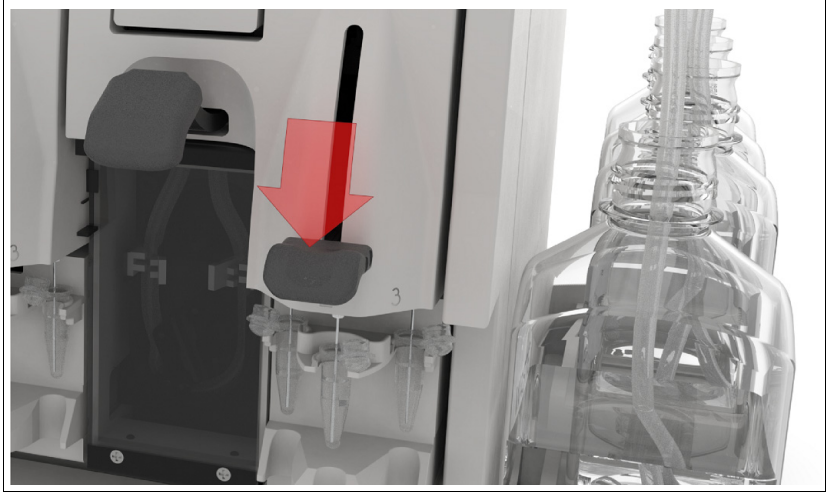
IMPORTANT! The bleach protocol requires approximately one liter of deionized water.

7. In the GCDC Master Control of the Fluidics Interface (left pane), select **Maintenance Protocols** and from the drop-down select **Bleachv3_450**.
8. Copy the protocol to the Stations/Modules that will be bleached
9. Click **Run All** or **Start** → **Run All** to begin the bleach protocol.

CAUTION! Temperature ramps up to 50°C.

10. You are prompted to press down the needle levers. (Figure 24)

Figure 24 Press down on the needle levers to start the bleach protocol



The fluidics station begins the protocol. After approximately 30 minutes, the LCD prompts you when the bleach cycle is over and the rinse cycle is about to begin.

11. Continue to follow prompts on LCD screen.

Rinse cycle

The rinse cycle is essential to remove all traces of bleach from the system. **Failure to complete this step can result in damaged arrays.**

1. When prompted on the LCD for each module, lift up on the needle levers and remove the bleach vials.
2. Load clean, empty vials onto each module.
3. Remove the three wash and water lines from the bleach bottle and transfer them to the DI water bottle. (Figure 25)

Figure 25 Immerse the three wash and water lines in the DI water bottle. **Note:** The waste line remains in the waste bottle.

4. Press down on the needle levers to begin the rinse cycle.

   When the rinse is completed (approximately 1 hour), the fluidics station brings the temperature back to 25°C and drains the lines with air. The LCD display reads "CLEANING DONE."

5. Discard the vials used for the bleach protocol.
6. Follow instructions in Table 1 after bleach protocol finishes.

Table 1 Using the fluidics station after a bleach protocol

If you are:	Then do this:
Planning to use the system immediately	When bleach protocol finishes, remove DI water supply used in rinse phase and install appropriate reagents for use in your next staining and washing protocol (including fresh DI water). Perform a prime protocol before loading arrays. Failure to run prime protocol results in irreparable damage to the loaded hybridized arrays.
Not planning to use the system immediately	System is already well purged with water, so you do not need to run an additional shutdown protocol. Remove old DI water bottle and replace with fresh bottle.
Not planning to use the system for an extended period of time (>1 week)	Remove DI water and perform a "dry" protocol shutdown. This removes most of the water from the system and prevents unwanted microbial growth in the supply lines. Also, remove pump tubing from peristaltic pump rollers.

Peristaltic tubing maintenance

You must periodically replace the peristaltic tubing because of wear, contamination, or to avoid salt buildup. Inspect the tubing on a weekly basis and use the following procedure when needed.

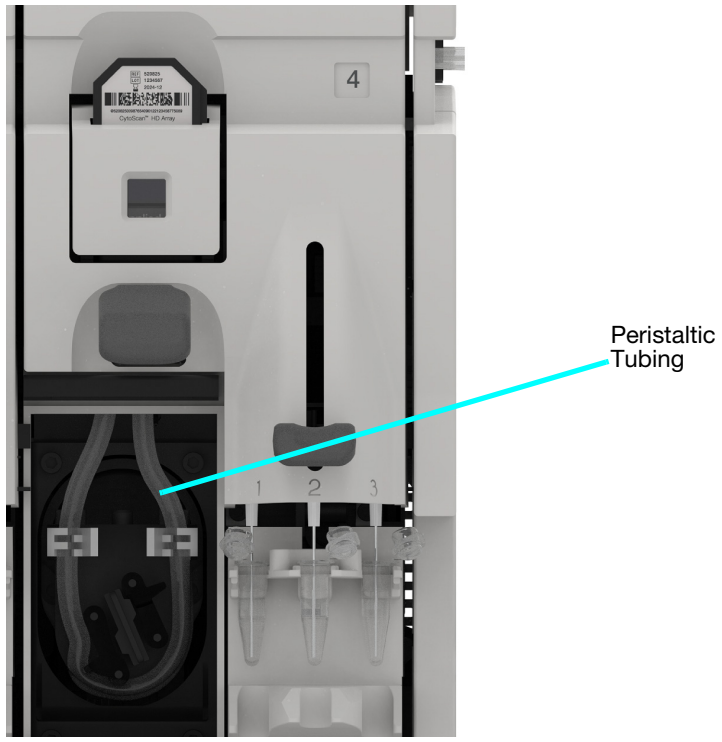
CAUTION! Wear gloves when changing tubing. Do not allow fluid from old tubing to spill onto surfaces.

IMPORTANT! For systems in routine use, replace silicone peristaltic tubing monthly (PN 400110). To ensure proper performance, use only Thermo Fisher tubing.

Replacing the peristaltic tubing

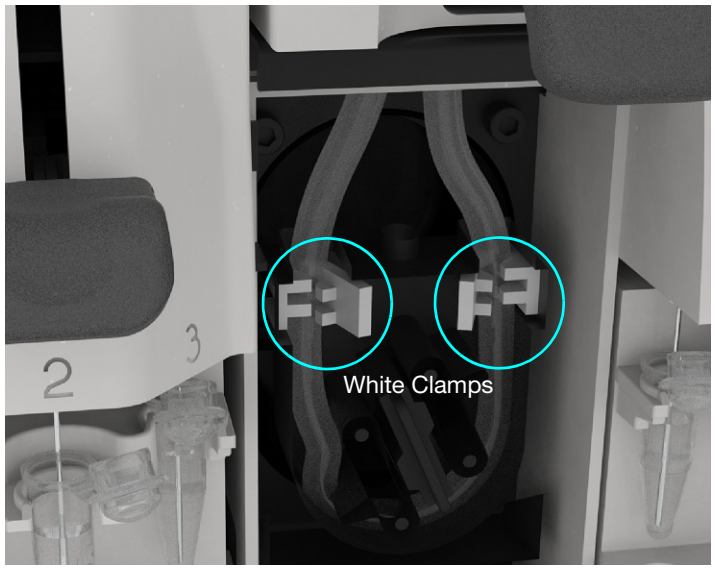
1. Open module door, as shown in Figure 26 and Figure 27.

Figure 26 Module door open showing peristaltic tubing



2. Open the white clamps to release tubing on both sides. (Figure 27)

Figure 27 Releasing the peristaltic tubing



IMPORTANT! Do not remove the module. Do not attempt to replace tubing where the module has been removed from the fluidics station case–this can damage the motor driver circuitry.

3. Pull tubing off while gently turning the peristaltic pump head and discard old tubing.
4. Replace tubing with new peristaltic tubing from accessory kit.
   a. Attach one end of new tubing to fitting at top right of pump enclosure.
   b. Insert tubing into clamp under the fitting without stretching the portion of the tubing between the fitting and the clamp. There should be a small amount of slack in that portion of the tubing.
   c. Work tubing into the pump head while slowly turning the pump.
   d. Insert free end of tubing into other clamp and attach to other fitting.
5. Close the drop-down module door.

Fluidics station troubleshooting and assistance

If problems arise with the fluidics station, use the following tables to locate the description that matches the problem. If you cannot find a solution, call customer support for assistance.

Troubleshooting decision tree

Use the following flowcharts (Figure 28 and Figure 29) to begin troubleshooting the fluidics station for a Missing Fluid Error (MFE).

Figure 28 Troubleshooting decision tree, page 1

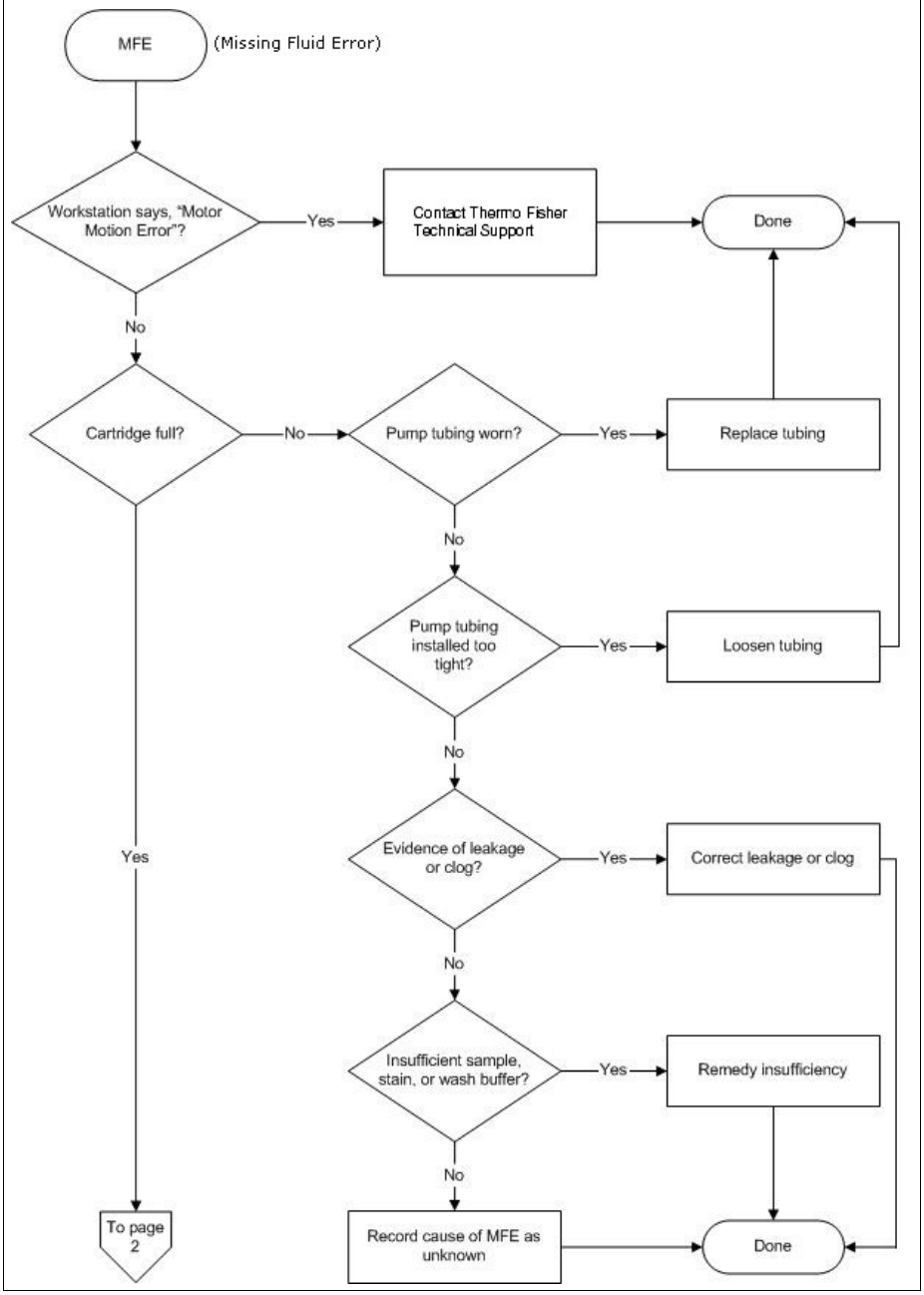
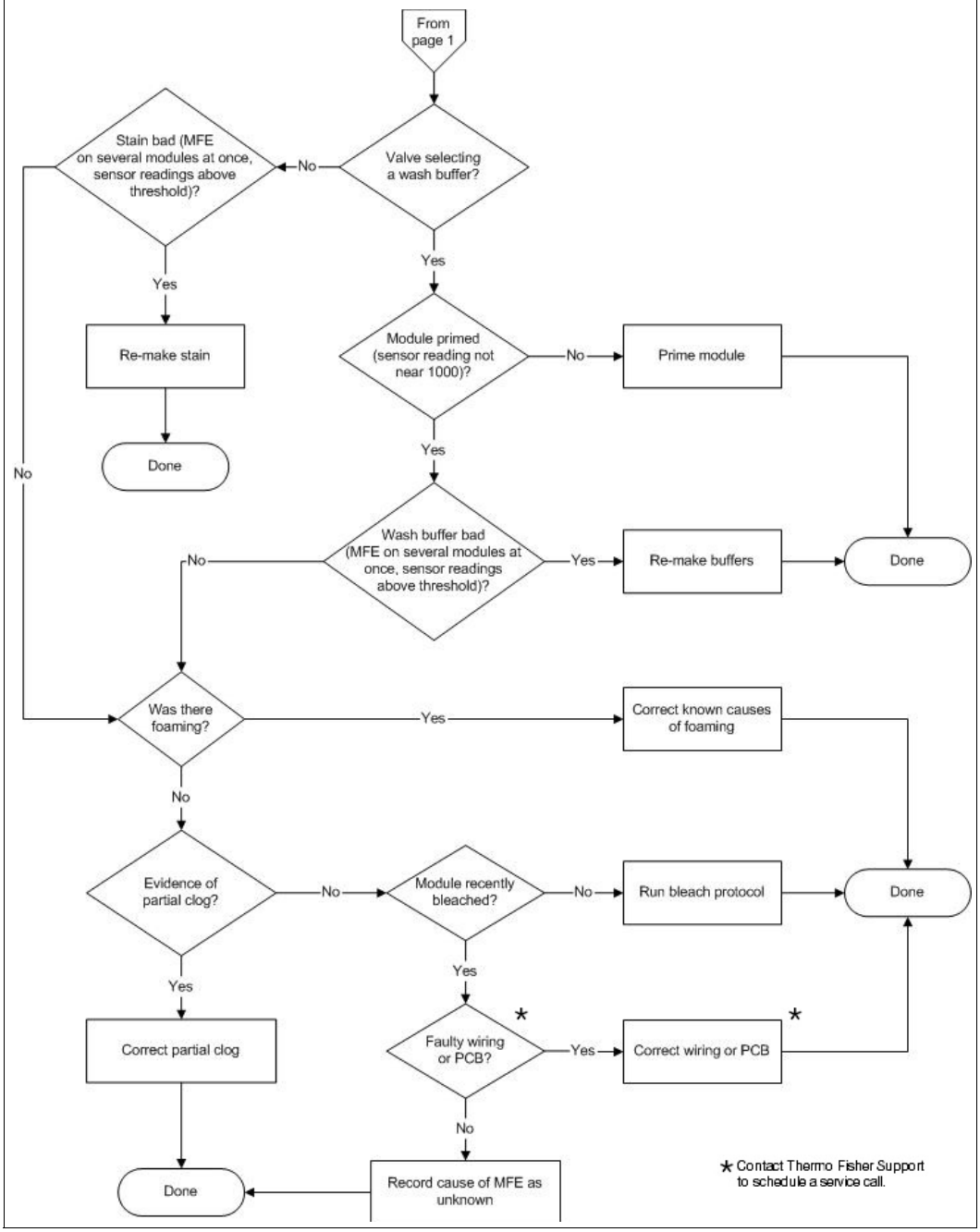


Figure 29 Troubleshooting decision tree, page 2



Problems and solutions

The table below lists alert messages. To resolve these alerts, follow the recommended resolution in the current Worklist screen on the alert pane.

Error Message	Problem	Possible Cause	Possible Solution
Missing Fluid Error	Cartridge not filling completely with sample solution or buffer during initial stages of hybridization wash or staining protocol.	Possible holes in the septa of the cartridge. Sample or staining solution not in place properly.	Follow the recommended resolution. Make sure sample or stain vial is in the sample holder.
		Blocked sampling tube or line of the fluidics station. Failure of one of the fluidics sensors. Pump tubing stretched too tightly around the pump.	Call customer support for service. Follow the recommended resolution. You may need to loosen the tubing clamps, allow tubing to relax, close the clamps.
		Insufficient volume of sample or staining solution (500 µL). Blocked sampling tube or line of the fluidics station.	Follow the recommended resolution. You may need to run a Shutdown script with fresh deionized (DI) water to flush out salt blockage.
	Cartridge not filling completely with buffer during wash script	Buffer bottle empty.	Fill buffer bottles.
	System detects improper conditions while filling. Note where in protocol error occurred.	Missing or insufficient stain or antibody in vial? Wash empty? Air bubbles in line? Leaks?	Record what step in protocol the error occurred. Record numbers on LCD screen of module. Follow resolution given in status window.
	Recovered less sample than initial input during Recover script.	Loose tubing attachments inside the fluidics station.	Call customer support for service.
Fluidics Station X Does Not Respond	Fluidics Station does not respond.	Power not switched on at the fluidics station. Loose cables.	Turn fluidics station power on, and then try to connect again. Firmly connect cables to fluidics station.
Sensor Timeout	“Sensor Timeout” error message on workstation.	No user response to “Remove Vial” prompt or other prompt.	Follow the recommended resolution.

Error Message	Problem	Possible Cause	Possible Solution
Error While Draining Error While Filling	Cartridge is not filling or draining properly.	Defective septa in cartridge. Insufficient sample or stain volume. Excessive bubbling in cartridge. Buffer conductivity too low. Failure of one of the fluid sensors.	Follow the recommended resolution. You may need to use a new cartridge. Add more sample solution to sample vial. Change the buffer, reduce detergent Use fresh buffer Call customer support for service.
Error While Filling	System detects improper conditions while filling. Note where in protocol error occurred.	Missing or insufficient stain or antibody in vial? Wash or DI water empty? Air bubbles in line? Leaks?	Identify if chip is filled: Follow the recommended resolution.
Invalid Command	Communication error detected Note where in protocol error occurred.		Follow the recommended resolution. You may need to: Identify if chip is filled. Contact customer support for service.
Temperature Timeout	Temperature does not reach specified temperature.	Temperature has not reached required level in expected time if ambient temperature is within operating specifications (15 to 30 degrees C).	Contact customer support for service.
Valve Motion Error			Follow the recommended resolution. If problem persists, contact customer support for service.
Valve Not Homed			Run **Home_450** on the module with the error If problem persists, contact customer support for service.
Valve Out of Position			Run **Home_450** on the module with the error. If problem persists, contact customer support for service.

Error Message meanings

The table below lists common error messages and meanings. To resolve these alerts, follow the recommended resolution in the current Worklist screen on the alert pane.

Error Message	Meaning
Temperature Timeout	The Re-attempt command timed out before the set point temperature was reached.
Sensor Timeout	The Await Sensors command timed out before the anticipated sensor pattern was seen.
Valve not Homed	The Home command did not result in the valve reaching it HOME position.
Valve Motion Error	The Valve command did not result in the valve reaching it target valve position.
Valve out of Position	According to the outer valve encoder, the valve did not reach a valid position when it was last rotated.
Error while Filling	While filling the cartridge, the AwaitMotor command terminated because of the step count not the expected sensor pattern, and that the same error had occurred several times consecutively.
Error while Draining	While draining the cartridge, the AwaitMotor command terminated because of the step count not the expected sensor pattern, and that the same error had occurred several times consecutively.
Missing Fluid Error Examples: “Stage C” “WashA” “Sense/Threshold” “960/890”	“Stage C” “WashA” “Sense/Threshold” “960/890” The Pump command completed its step count before the conductivity sensor determined that the cartridge contained a solution with conductivity below the set threshold value. The Missing Fluid Error (MFE) Display not only gives a visual notification of an error condition to the operator, but gives you information that enables you to determine the cause of the error. It does this by displaying information about the sensor value and the fluid that caused the error. It shows this internal information in a continuous loop until the machine is powered down or a script is started. For example: Missing Fluid Error for 4 seconds Stage A valvePos WashA for 4 seconds Sense/Threshold 820/600for 4 seconds

Other problems and solutions

The table below lists other problems and their solutions. Follow the recommended resolution in the current worklist screen on the Alert pane.

Problem	Possible Cause	Possible Solution
Air bubbles left in cartridge at the end of a hybridization-wash script.	Air bubble in wash line	You may need to perform a Cleanout procedure or a Priming procedure.
Buffer leaking inside the fluidics station.	Loose tubing attachments inside the fluidics station.	Call customer support for service.
	Washblock requires replacement.	Call customer support for service.
	Salt buildup in the lines of the fluidics station.	Run the Shutdown script with fresh DI water to flush out salt blockage.
Cartridge needles of the fluidics station not engaging with the cartridge.	Possible defective septa on the cartridge.	Use another cartridge.
	Extra flashing on the cartridge.	Use another cartridge, or call customer support for service.
	Salt buildup on the cartridge needles.	Run the Shutdown script with fresh DI water to flush out salt blockage. Clean cartridge needles with a wet cotton swab.
	Cartridge holder aligned and attached to the fluidics station improperly.	Call customer support for service.
	Cartridge holder not properly engaged to the fluidics station.	Place the cartridge into the cartridge holder. Push the holder door shut, and firmly lift the lever to engage the cartridge needles.
Sample needles do not properly enter vial.	Bent sample needle	Replace sample needle.
	User may be pressing the needle lever down to quickly or with too much force.	Engage sample needle lever more slowly and/or with less force.

When to contact support

Under any of the following conditions, unplug the instrument from the power source and contact support:

- When the power cord is damaged or frayed.
- If any liquid has been spilled into the instrument.
- If the instrument has been penetrated by water.
- If, after service or calibration, the instrument does not perform in accordance with the specifications.
- If the instrument has been dropped or otherwise damaged.
- If the instrument must be returned for repair, call customer support.

Fluidics station LCD messages

The table below lists common messages that appear on the fluidics station LCD during fluidics station operation.

Message	Meaning
Changing -->	Wait for temperature to reach set point
Draining to Waste	Empties cartridge.
Purging with A	Purges chip with ~ 1mL of buffer A at 25°C from bottom to top then to waste.
Draining to Vial 1	Recovers stain to Vial #1 for reuse or disposal.
Draining to Vial 2	Recovers stain to Vial #2 for reuse or disposal.
Draining to Vial 3	Recovers stain to Vial #3 for reuse or disposal.
Filling with A or Filling with B	Drains and fills cartridge with last wash solution used, if any.
EJECT WASHBLOCK	Disengage washblock.
LOAD CARTRIDGE	Prompt for loading cartridge.
REMOVE PREVIOUS VIALS	Prompt to remove vials.
LOAD VIALS 1-2-3	Prompt for loading vials 1, 2, and 3.
LOAD VIALS 1& 2	Prompt for loading vials 1 and 2.
LOAD VIALS 1& 3	Prompt for loading vials 1 and 3.
LOAD VIAL 1	Prompt for loading vial 1.
LOAD VIAL 2	Prompt for loading vial 2.
LOAD VIAL 3	Prompt for loading vial 3.
Filling with A	Empty, fill with wash-A, mix by drain-and-fill, repeat, leave cell full.
Filling with B	Empty, fill with wash-B, mix by drain-and-fill, repeat, leave cell full.

Message	Meaning
Draw 1st Stain	Empty, draw sample to both sensors.
Draw 2nd Stain	Empty, draw sample to both sensors.
Draw 3rd Stain	Empty, draw sample to both sensors.
EJECT CARTRIDGE	Prompt for removal of cartridge.
ENGAGE WASHBLOCK	Prompt for engagement of washblock.
DO CLEAN CYCLE	Begin cleaning cycle.
REMOVE STAIN VIALS	Prompt to remove stain vials, if present.
LOAD 3 EMPTY VIALS	Prompt to load vials.
Purging with water	Purge with 5mL water to clean line.
Washing needle 1	Performing wash needle #1 procedure.
Purging with air	Purge with air.
Washing needle 2	Performing wash needle #2 procedure.
Washing needle 3	Performing wash needle #3 procedure.
Washing Lines	Wash tube from valve to waste.
Prime Lines	Equilibrate tube from valve to waste with wash A.
REMOVE ALL VIALS	Prompt to remove vials.
LOAD SAMPLE VIAL IN LOC 1	Prompt for loading sample vial in location 1.
Flushing with WashA	Flushing with wash solution A.
Filling with WashA	Empty, fill with wash-A, mix by drain-and-fill, repeat, leave cell full.
A washes D/F	Wash with A by mixing using drain-and-fill procedure.
Flushing with Wash	Flushing with wash solution B.
B washes D/F	Wash with B by mixing using the D/F (drain-and-fill) procedure.
REMOVE SAMPLE VIAL	Make sure sample vial is removed.
LOAD EMPTY VIAL IN LOC 1	Make sure empty vial is present.
Flushing with Wash	Flushing with wash solution B.
Draining to Waste	Drain waste.
needle 1 w/Wash	Flush needle 1 with Wash B.
Washing needle	Wash needle with water.
REMOVE VIAL	Prompt to remove vial.
Washing done	Completion of washing.
READY	System is ready.

5 GeneChip Scanner 3000 with AutoLoader

Before you begin

Familiarize yourself with the GCDC software interface (see Chapter 2, *System overview*) before operating the GeneChip Scanner 3000 (Scanner 3000). Also refer to the *GeneChip Data Collection User Guide (P/N MAN0026726)*

IMPORTANT! You must read and understand the contents of this manual before operating the scanner.

About the instrument

The Scanner 3000 with AutoLoader (Figure 30) is designed expressly for scanning multiple array cartridges. The scanner can scan up to 48 arrays automatically without operator presence.

Figure 30 GS3000 with AutoLoader

Safe operation

WARNING! Do not remove the external case or skin or scanner cover of the AutoLoader. Use the scanner only as instructed in this manual. Do not attempt to service the instrument. Only qualified service engineers can open and service the scanner. There are no customer serviceable parts. Removing the case exposes the customer to laser and electrical shock hazards.

WARNING! Only authorized personnel are permitted to service this equipment. The Scanner 3000 contains an incorporated Class 3B laser. Use of controls or adjustments or performance of procedures other than those specified may result in hazardous radiation exposure.

IMPORTANT! To preserve the lifetime of the internal laser, turn the scanner Off when it is not in use for any extended period of time, such as overnight or a weekend.

Precautions

- Read this section completely before operating the instrument.
- Do not attempt to service this instrument. Any attempt at unauthorized service may damage the instrument and/or void the warranty.
- The instrument weight is approximately 100 pounds (45.4 Kg). Do not place it on an unstable cart, stand, or table. Failure to properly support the instrument may cause serious damage or injury and may void the warranty.

CAUTION! Heavy object. Two people are required to lift the scanner.

- The instrument must be surrounded by adequate airspace. Slots and openings in the instrument and the electronics compartment covers are for ventilation. Do not block or cover them.

CAUTION! Never push an object into the instrument ventilation slots–equipment damage or personal injury may result.

- Do not set liquids on top of the instrument.
- The instrument has an AC receptacle with a safety ground appropriate for the country of destination. The plug is designed to connect only to a 3-prong ground receptacle. Do not compromise this safety feature. If the instrument AC plug does not mate with the available power source receptacle, consult a licensed electrician to install a correct plug.

Laser safety

The laser is equipped with an automatic shutter that inhibits its output beam and ensures safe operation under conditions encountered in normal operation. The instrument covers, the array access port, and protective shutters ensure that during instrument operation no directed or stray laser light leaves the instrument. **The scanner is a Class 1 laser product when the laser is enclosed in scanner case. The laser itself is a Class 3B laser product.**

WARNING! Laser radiation when open. Avoid direct exposure to laser beam. The lasers can cause serious injury if the instrument is not operated in accordance with instructions in this user guide.

IMPORTANT! Scanner is a Class 1 laser product when the laser is enclosed in the scanner case. The laser itself is a Class 3B laser product.

CAUTION! Use laser safety glasses when servicing. *Do Not Stare Into Laser Beam*

Class 1 Laser Product

The green laser is a 532-nm solid-state laser. This is a Class 3b laser and has visible outputs greater than 5 mw but not more than 500 mw. It must never be operated in an exposed manner. Any object in the direct path of the laser beam may be damaged. Eyes and skin can be seriously damaged by direct exposure to, specular reflections from, or diffuse reflections from this laser. If improperly used, a laser of this type can cause fires. When used according to the instructions in this guide and when all covers are in place, the Scanner is classified as a Class 1 Laser. This device complies with 21 CFR 1040.10 and 1040.11, except for conformance with IEC 60825-1:2014 (Ed. 3), as described in Laser Notice No.56, dated May 8, 2019.

Always take note of laser safety labels, as they indicate areas where exposure to laser beams may be hazardous.

Location of safety symbols

Figure 31 Safety symbols - Left panel

Figure 32 Safety symbols - Back panel

On Back Panel 12-0008
64-0177 Label personnel warning
64-0178 Label Heavy Object

Figure 33 Safety symbols - Right panel

On Right Panel 10-0196
Label 64-0034 UL Label Combo
Label 64-0998 Caution Class 3b Laser

Electrical safety

The scanner is designed for input voltage from 100 to 240 VAC nominal, 50/60 Hz.

Note: The scanner power supply auto-detects input voltage and configures itself.

CAUTION! ⚠ The power supply cord is used as the main disconnect device. Ensure that the socket outlet is located and installed near the equipment and is easily accessible.

CAUTION! ⚠ Do not use the scanner in a manner not specified in this manual. To do so may impair the protection provided by the equipment.

CAUTION! ⚠ Do not use a power supply cord with inadequate ratings. Only use the power supply cord provided by the manufacturer.

IMPORTANT! Do not confuse your company network connections with the dedicated ethernet port of the scanner-workstation. The correct scanner connection is located near the top of the workstation. This 10/100 Base T Ethernet communications port is dedicated to the scanner-workstation interface. You cannot connect the scanner to your company ethernet communications network.

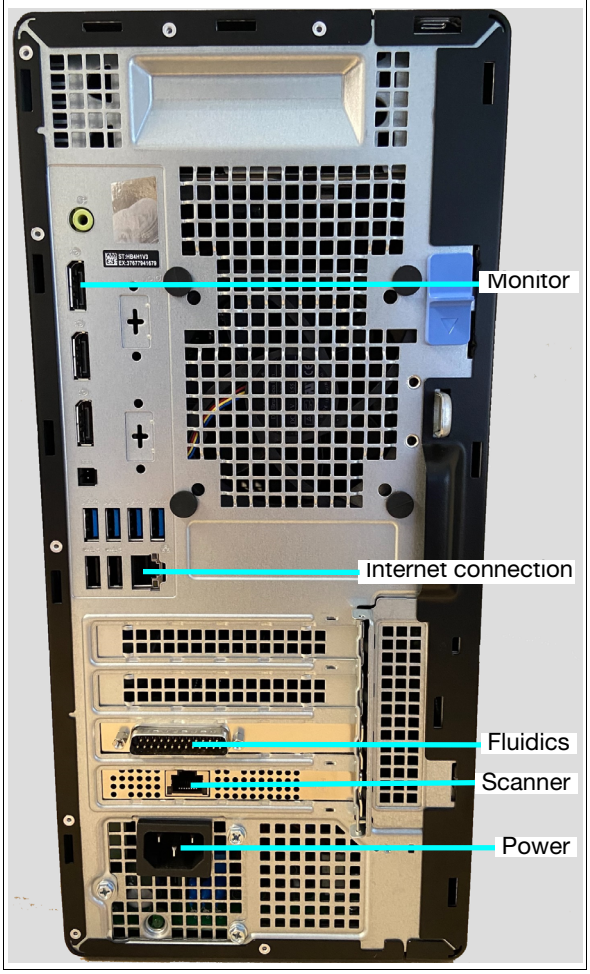
IMPORTANT! The reset button is the scanner's circuit breaker. The breaker switch trips whenever the scanner experiences an electrical fault condition. Press to reset. If you cannot reset this switch, contact customer support.

Connections

IMPORTANT! Permit only an field service representative to service or change the instrument cable connections (see Figure 34 and Figure 35).

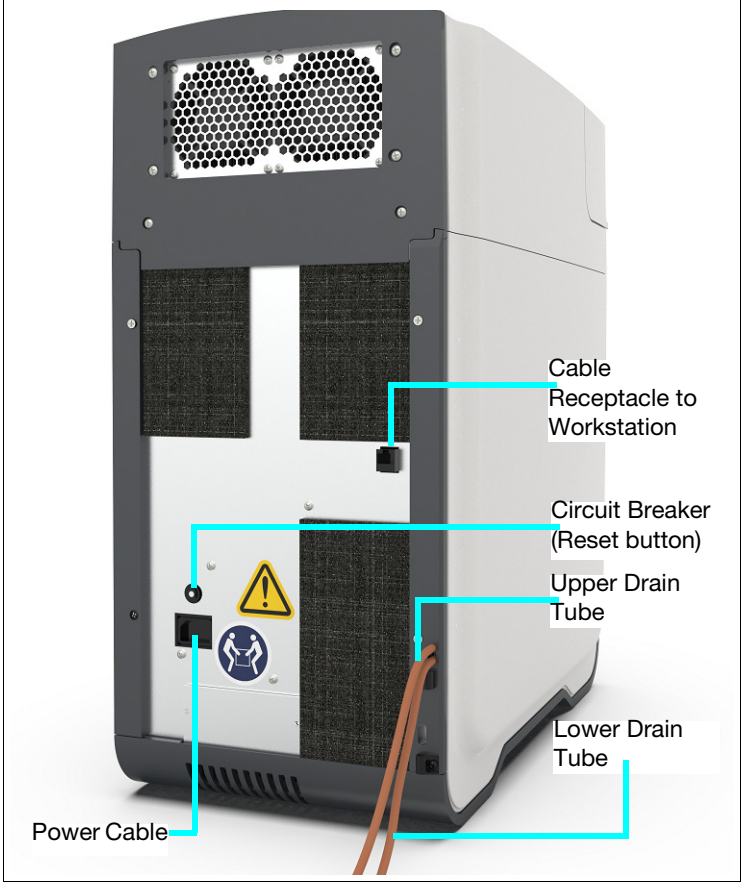
Workstation connections

Figure 34 Workstation cable connections



Scanner connections

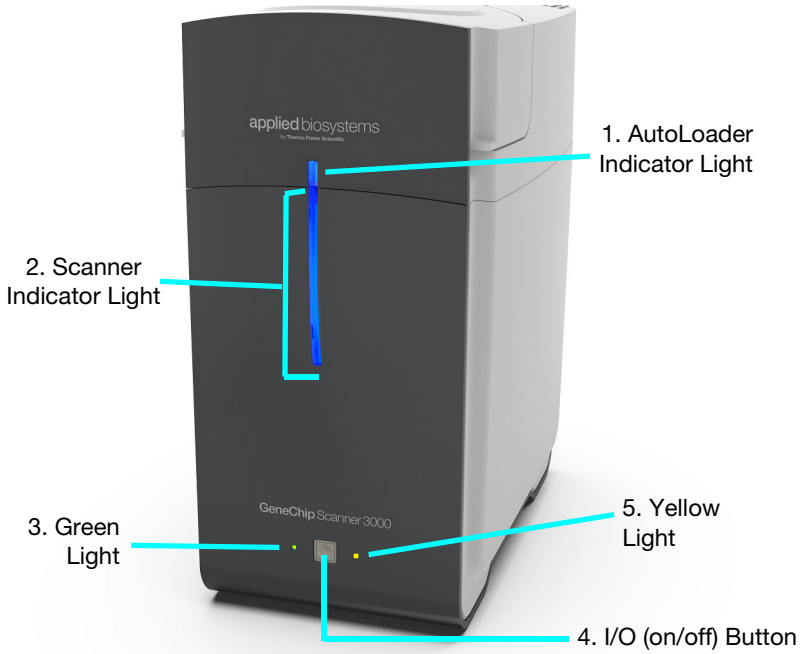
Figure 35 Scanner connections



Scanner indicator lights and on/off button

The front panel buttons and indicators as shown in Figure 36.

Figure 36 Scanner 3000 Indicator Lights



Buttons and indicators

1. **AutoLoader Indicator Light:** On AutoLoader, running vertical at front center. When on, a blue light indicates that AutoLoader door is closed and locked. It turns off when the door is unlocked.
2. **Scanner Indicator Light:** On the scanner body, running vertical at front center. This blue light extends to the bottom of the scanner and is always on when the scanner is on.
3. **Green Light:**
   - **On**: System is ready to scan (yellow off)
   - **Flashing**: Scan is in progress
4. **I/O (On/Off) Button**: In the center. When yellow light is:
   - **On**: Idle, laser is warming up (laser not ready, green off)
   - **Off**: System ready, no errors (green on)
   - **Flashing**: Error
5. **Yellow Light**

Indicator lights summary table

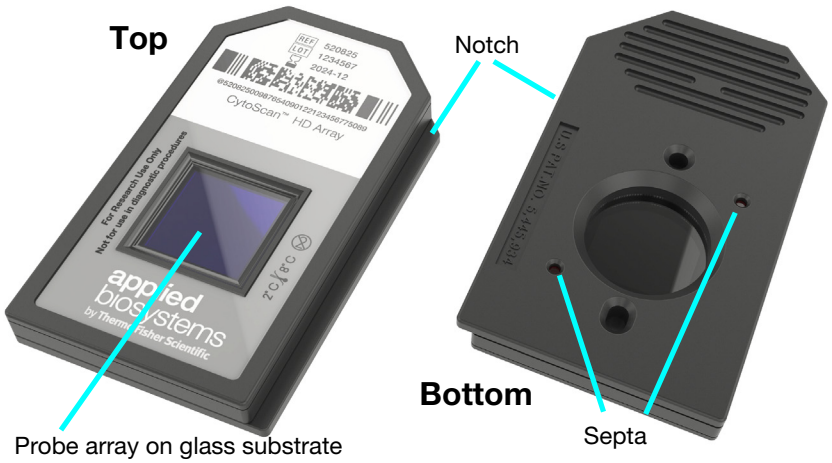
Table 2 Light colors and meanings

Condition	Green Light	Yellow Light	Blue Scanner Indicator Light	Blue Scanner Indicator Light	Meaning
Initial boot up	Off	Off	On	Off	Initial power up; embedded PC takes control
Scanner boot up	On	On	On	Off	Embedded PC takes control of scanner boot up
Laser warm up	Off	On	On	Off	Software enabled and laser is warming up
System ready	On	Off	On	Off	Scanner ready for use and scanner door is unlocked waiting to receive a carousel
Error	Off	Flashing	On	Off	Fatal error, reboot scanner and software, scanner door is unlocked to remove carousel if necessary
Scanning	Flashing	Off	On	On	Scanning is in progress and scanner door locked
Scanning	Flashing	Off	On	Off	Scanning is in progress and scanner door is unlocked

Scanning arrays

This section shows you how to scan multiple arrays using the AutoLoader. The arrays are similar to those in Figure 37.

Figure 37 Example of the array, or cartridge:- Make note of the notch, as the array can only be inserted into the AutoLoader one way.



Use of Tough-Spots™ to prevent leaks

Tough-Spots are chemically inert polyvinyl labels that adhere to all plastics. Use 3/8-inch circle diameter Tough-Spots to prevent leakage from the array cartridge septa.

Before you load the array cartridge in the scanner, remove old Tough-Spots and apply new as follows.

1. On back of array cartridge, clean excess fluid from around septa. (Figure 38)

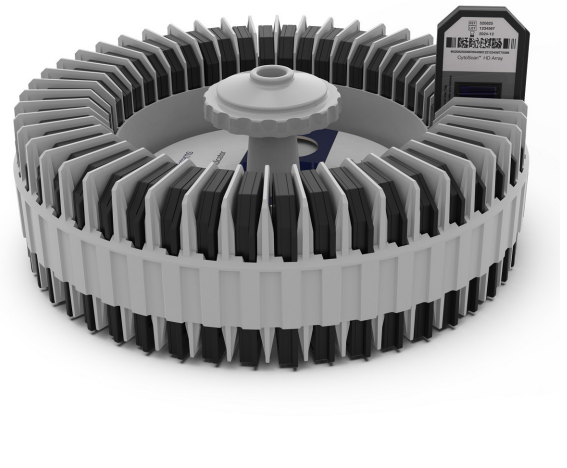
Figure 38 Applying Tough-Spots to array cartridge septa

2. Carefully apply one Tough-Spot over each of the two septa and press to ensure that the spots remain flat. **Note**: If a Tough-Spot does not apply smoothly and there are bumps, bubbles, tears, or curled edges, do not attempt to smooth them out. Remove the spot and apply a new one.

Loading arrays into carousel

1. Load up to 48 arrays into the carousel, starting with slot 1, as shown in Figure 39.

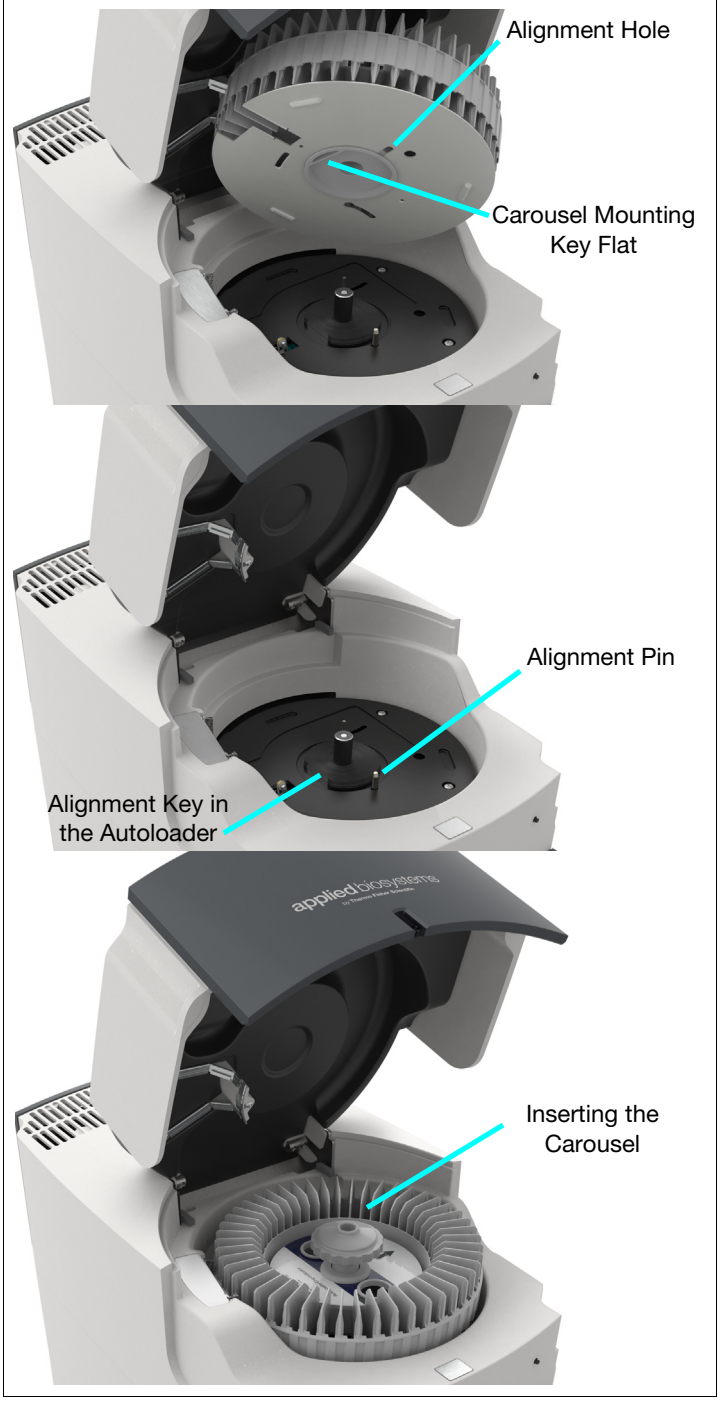
Figure 39 Loading arrays. Each slot is numbered 1 through 48. Each array fits only one way (as shown).



- Always start processing with the array in slot 1.
- Maximize scanner performance–remove scanned arrays and place an unscanned array in slot 1. Avoid empty slots.

2. Load Carousel into AutoLoader and turn carousel until alignment pin seats into alignment hole. (Figure 40)

Figure 40 Loading the carousel into the AutoLoader



3. Turn carousel clockwise until carousel mounting key flat seats gently into the AutoLoader alignment key (Figure 41) and close AutoLoader door.

Figure 41 Inserting and turning the carousel. The carousel must be seated and flush with the housing.

Note: You may have to turn the carousel several times before it seats into the alignment pin and alignment key. When seated properly, the carousel is flush with the AutoLoader housing. The seating of the key flat is confirmed by a gentle falling of the carousel into the key.

CAUTION! AutoLoader door does not remain open unassisted. When opening door, do not release until hands and fingers are clear.

Starting the scanner

1. Press the **I/O** button on the front panel.
2. Wait 10 minutes for the scanner to warm up.

Shutting down the scanner

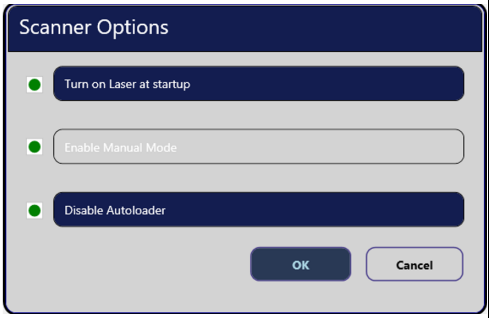
Press the **I/O** button on the front panel to turn off the instrument.

IMPORTANT! Request a professional service call for maintenance and qualification on a semi-annual basis. Contact customer support for details.

Using GCDC with the AutoLoader disabled

1. If you have a working scanner but the AutoLoader is not operating, you can still use the scanner, but you must check the **Disable AutoLoader** option in the Scanner Options dialog window (Figure 42). This disables the AutoLoader and enables you to use the scanner in manual mode.

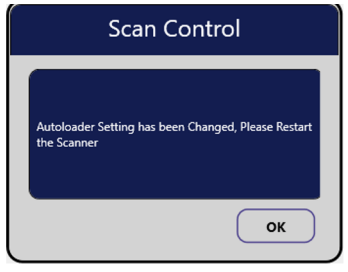
Figure 42 Scan Options - Disable AutoLoader



2. Click **OK.**

   A dialog window appears prompting you to restart the scanner. (Figure 43)

Figure 43 Scan Control - Restart Scanner



3. Click **OK** to acknowledge the message.
4. Press the scanner front panel **I/O** button once to turn off the scanner. Wait a few moments, the press the **I/O** button to turn on the scanner.
5. Open the AutoLoader door.
6. Manually load a probe array into the slot.
7. Close the AutoLoader door.
8. Scan the probe array in the same manner as the AutoLoader in manual mode.

   After scanning the probe array, remove the probe array from the AutoLoader.

Cleaning and maintenance

Keep the scanner clean and free of dust. Dust buildup can degrade performance. Wipe the exterior surfaces clean using a mild dish detergent solution in water. Do *not* use ammonia-based cleaners or organic solvents, such as alcohol or acetone, to clean the system because they may damage the exterior surfaces.

IMPORTANT! The GCS3000 requires semi-annual maintenance and qualification by authorized Thermo Fisher personnel to ensure system performance. Failure to maintain the system as recommended may result in the failure of the system to perform in accordance with specifications. Contact your Thermo Fisher Scientific representative for more information.

Troubleshooting

Scanner troubleshooting table

Problem	Possible Cause	Corrective Action
No image when scanning	Power off or cable loose	Check all connections and power.
	Loss of laser power	Contact technical support.
Intermittent problems scanning	Loose cable	Check all rear connections.
Scanner fails with array inside	Power failure	Manually extract array. Check all connections to scanner. Turn scanner on, then restart the software.

Scanner operation issues table

Issue	Explanation
If communications are interrupted during a scan. For example, by a faulty cable connection or power being lost.	GCDC notes the failure and opens an alert that says “Cannot connect to scanner” or something similar. However, there are two issues to note. First, GCDC reports such a failure only after a network time-out of about 30 seconds. Second, rarely, if communications have been lost, GCDC and the scanner may not be able to automatically restore communications once the problem is rectified, and both may become unresponsive. To restore proper operation, verify that the scanner is on and that communication cables are properly connected. You may need to close GCDC and restart the scanner, then restart GCDC. If the system remains unresponsive, disconnect and reconnect power to the scanner, restart the scanner normally, close and restart screens and GCDC.
Laser warm-up lasts for ten minutes, during which time the “Turn Laser On” button remains unchanged and GCDC Scan Control displays the status message “Warm-up”.	Simply note that this is normal operation.
Autofocus fails if salt deposits accumulate on the array.	Use Tough-Spots to prevent leaks in the array. See the quick reference card, PN 08-0076, or the section, *Use of Tough-Spots™ to prevent leaks* on page 58.

Scanner diagnostic table

Problem	Possible Cause	Corrective Action
Intermittent problems scanning	Loose cable	Check all rear connections.
Scanner fails with array inside	Power failure	Manually extract array. Check all connections to scanner. Turn scanner on, restart software.
Carousel does not automatically home	Check for stuck array Carousel not seated on D ring Alignment Pin not engaged in Carousel Door is open or ajar Door is open when blue LED is off.	
Carousel does not rotate	Door is open or ajar System is warming up, array in heater Carousel not seated on D ring Alignment Pin not engaged in Carousel Laser in scanner is warming up. GCDC has **Start** grayed out in this case	
AutoLoader misses next array	Array UP sensor not working, call technical support.	
Stuck array		See the section, "Removing a lodged array cartridge manually" on page 65
AutoLoader freezes up	Door is open or ajar	

Problem	Possible Cause	Corrective Action
Scanner overheats	Heater Failure TE failure TE hot fans vent blocked	Call technical support. Call technical support.
Autofocus routine fails to conclude	Salt buildup on array cartridge substrate	Check for salt on chrome border. Use Tough-Spots to prevent leaks in the array. See the quick reference card, PN 08-0076, or "Use of Tough-Spots™ to prevent leaks" on page 58.
The array does not descend into scanner.	Carousel not seated correctly Door is open or ajar Heater is waiting until array is at temperature.	

Scanner error messages

The following Scanner error messages indicate a serious malfunction of the scanner. *Your arrays, or the data generated from them, may be at risk.* Shut down the scanner and remove the carousel. Do *not* continue to use the scanner in Automode. Contact technical support.

Message	Meaning
HEATER_LOW	"Warning: The warming chamber temperature is low. Refer to the troubleshooting guide."
COLD_CHAMBER_LOW	"Warning: The cold chamber temperature is low. Refer to the troubleshooting guide."
COOL_HOTSIDE_HIGH	"Warning: The cooler hot-side temperature is high. Refer to the troubleshooting guide." Note: Before calling technical support, check around the ventilation vents to ensure that nothing is blocking them.
COLD_CHAMBER_HIGH	"Warning: The cold chamber temperature is high. Refer to the troubleshooting guide." Note: Before calling technical support, check the scanner door to ensure that it is not open.
HEATER_HIGH	"Warning: The warming chamber temperature is high. Refer to the troubleshooting guide."

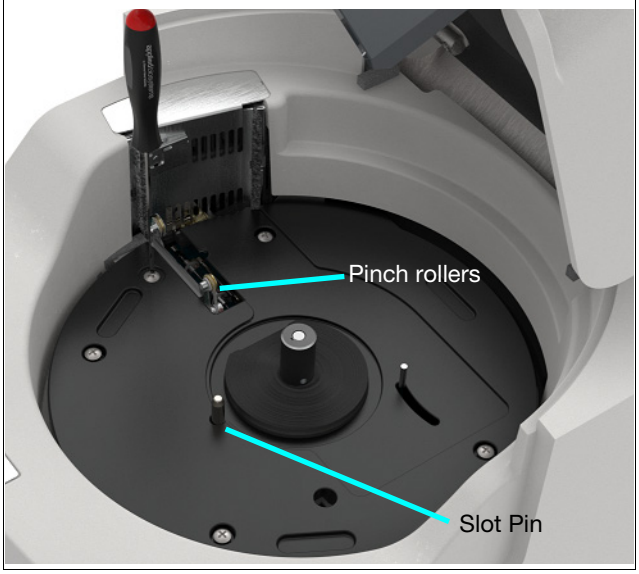
Removing a lodged array cartridge manually

1. Turn scanner off and remove power cord from back of the unit.
2. Open AutoLoader door on top of unit.
3. Remove carousel. Keep arrays in carousel and at correct temperature while recovering the array still in the AutoLoader.
4. Remove hole plug, just in front of the array slot in the base piece of insulation, then insert the screwdriver into this hole. (Figure 44)

Figure 44 Hole plug

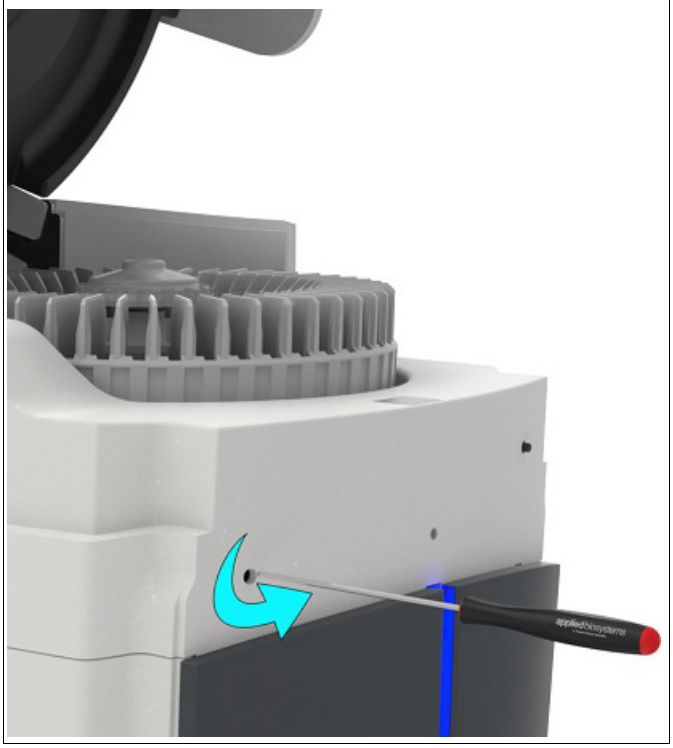
5. Use a standard, flat (-) screwdriver and gently slide it down through the hole making sure not to damage the shaft and spring that are protruding into the hole. When the screwdriver stops, it should be in contact with the Scanner Y stage screw. Slowly turn the screwdriver until you feel it engaging the slot on the screw of the scanner Y stage.
6. Slowly turn the screw clockwise until it hits a hard stop and cannot turn further. *Do not try to turn it further or use excessive force because it breaks the Y stage in the AutoLoader*. The Y stage has now ascended to its maximum position.
7. Using your fingers, slowly slide the slot pin, which is sticking through the slot in the base piece of insulation, to the right until it stops (Figure 45). You should see the little pinch rollers near the array slot close a little as you do this.

Figure 45 Slot pin and pinch rollers



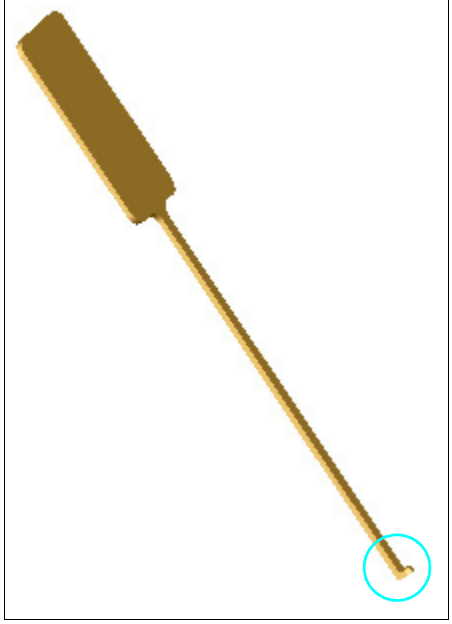
8. Insert a 3/16-inch hex driver into the hole that is located on the front of the AutoLoader housing on the left. You should feel it engage a coupling.
9. Turn the hex driver counterclockwise until you see the array appear through its opening (Figure 46). (The array should stay up if you stop turning the hex driver). If you do not see the array after turning the hex driver for 10 seconds - go to step 11.

Figure 46 Hex driver



10. Grab and hold the array with your fingers. Using your other hand slowly slide the slot pin (Step 7) back to the left. This should open up the pinch rollers. Pull the array out.
11. If you do not see the array after turning the hex driver for 10 seconds, stop.
12. Using tool (Figure 47) with the hook down and toward the back, slide it vertically down against the front of the array opening about 1.5 inches. **Note:** There is a small groove made for this tool in the middle of the front array guide.

Figure 47 Tool (P/N 13-0256)



13. Pull the top finger grip of the tool toward the front of the unit, and then pull it up while still putting pressure towards the front. The array should come up with the tool. When you see it, grab the array and pull it out of the unit.
14. If you cannot get the array out using this procedure, call customer support.
15. Put the hole plug back into the hole in the base piece of insulation.
16. Plug the scanner back in and turn it on.
17. Load the carousel after the scanner boots up.
18. If arrays continue to become lodged in the AutoLoader, call technical support.

When to contact support

Under any of the following conditions, unplug the instrument from the power source and Technical Support support:

- When the power cord is damaged or frayed.
- If any liquid has been spilled into the instrument.
- If the instrument has been penetrated by water.
- If, after service or calibration, the instrument does not perform in accordance with the specifications.
- If the instrument has been dropped or otherwise damaged.
- If the instrument must be returned for repair, contact Technical Support.

A Specifications and labeling information

Specifications

GeneChip fluidics station 450

Table 3 **Fluidics Station 450 Specifications**

Height	15.8 inches (40.2 cm)
Width	28 inches (71.1 cm)
Depth	16.1 inches (41 cm)
Weight	80 pounds (36.3 kg)
Voltage	100-240 VAC, 3 A; 300 watts
Operating Temperature Range	15 to 30°C
Operating Humidity Range	10 to 90% RH (non-condensing)
Operational	1 to 3 vials per module Auto-sampling up to 3 vials per module Configured with 2 or 4 modules

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulation.

Cet appareil numerique de la classe A respecte toutes les exigences du Reglement sur le materiel broullier du Canada.

This equipment complies with emission and immunity requirements of IEC 61326-2 6:2021 intended for a professional healthcare environment.

Scanner

WARNING! The GeneChip Scanner 3000 contains an incorporated Class 3B laser with these specifications:
Wavelength=532 nm ±1 nm
Beam Divergence (full angle) =<8 mrad
Output Duration=Continuous Wave
Maximum Power Output=500 mW

Table 4 **Scanner 3000 Specifications**

Height with AutoLoader (door closed)	24.6 inches (62.5 cm)
Width	13 inches (32 cm)
Depth	21.3 inches (54 cm)
Weight with AutoLoader	105 pounds (47.6 kg)
Line (Mains) Voltage	100-240 VAC, 50/60 Hz
Current	4-2 Amps
Excitation wavelength	532 nm (green) laser, 10 mW maximum
Emission Filter	570 nm, Long-Pass
Autoloader	48 microarrays per carousel
Cooled Environment	Average temperature = 15°C

EMC compliance

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulation.

Cet appareil numerique de la classe A respecte toutes les exigences du Reglement sur le materiel broullier du Canada.

This equipment complies with emission and immunity requirements of IEC 61326-2-6:2021 intended for a professional healthcare environment.

Hybridization oven

Depending on the type of assay, you may need a hybridization oven to prepare arrays for testing.

Table 5 **Hybridation Oven 645i Specifications**

Requirement	Description
Input Voltage	100–120 VAC, 5 Amp maximum or 220–240 VAC, 2.5 Amp maximum 50/60 Hz maximum
Rotisserie Rotation Speed	10–80 RPM, programmable to 1 RPM
Oven Temperature Set Point Programmable Range	30–70 °C, programmable to 0.1°C
Time to Temperature	30 minutes from ambient to 60°C
Oven Temperature Accuracy	±1.0°C from 35–60°C
Communications	Not applicable.

Labeling symbols

Symbol/Label	Statement/Meaning
	Part/Catalog Number
	Read Safety Data Sheet
	Unique Device Identifier
	Lot Number
	Expiration Date (YYYY–MM) **Note:** Kit expires on the last day of the month.
	Temperature Limitation
	Contains Sufficient for **<n>** tests
	Hazards

Symbol/Label	Statement/Meaning
	Irritant
	Consult Instructions for Use
	Manufacturer
	Indicates conformity with safety requirements for Canada and U.S.A.
	Indicates conformity with China RoHS requirements.
	Indicates conformity with Australian standards for electromagnetic compatibility.

B

Collecting log files

Using the log collector

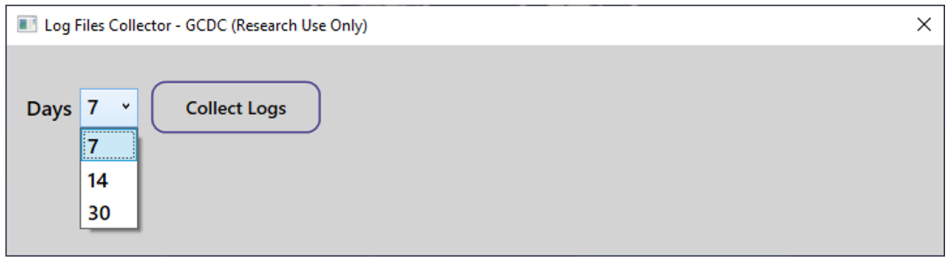
Log files are produced by different GCDC components. The logs provide a record of the tasks performed by different components, such as the migration tools and installer. These log files provide useful information for troubleshooting problems and may be requested by your support person.

1. At the GCDC Launcher window, double-click on 

.

   The Log Files Collector window appears. (Figure 48)

Figure 48 Log Files Collector window



2. Click the **Days** drop-down to select the number of days (minimum 7) worth of log files to be collected.
3. Click **Collect Logs**.

   A **Please wait... collecting logs** message and progress bar appears.

   In a few moments, a window appears stating the logs have been completed and a zip file containing your logs was placed on your Desktop.