applied biosystems

GeneTitan™ Multi-Channel Instrument System

USER GUIDE

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Contents

About

Purpose

This user guide provides information about installing, using, maintaining and troubleshooting the Applied Biosystems™ GeneTitan™ Multi-Channel Instrument.

Documentation

The operation of the GeneTitan MC Instrument System requires familiarity with other user documentation. User guides that are relevant will depend on your system configuration. For the HT array system configuration, refer to "Documentation and support" on page 95 for further information.

Safety

Before using an instrument or device, read and understand the safety information regarding the proper operation of the instrument. Safety information is found in Appendix A, "Safety" on page 83.

Text alerts

Text alerts draw your attention to a particular piece of information provided in this user guide. There are five types of text alerts:

- 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.

1 Introduction to the GeneTitan™ Multi-Channel Instrument System

Overview

Applied Biosystems has designed the GeneTitan™ Multi-Channel (MC) Instrument System to serve a variety of users that include, but are not limited to, core laboratories and service providers, academic institutes, and high volume and industrial sites (Figure 1). This system supports 16-, 24-, 96, and 384-array format plates (Figure 2).

Figure 1 The GeneTitan™ Multi-Channel Instrument System

Figure 2 The 16-, 24-, and 96-array format plates (384-array format plate not shown)

The software of the GeneTitan MC Instrument System allows you to select different modes of operation to process an array plate. Each mode of operation performs one or

more process steps within the instrument. This system allows you to perform the following operations:

- Hyb-Wash-Scan.
- Wash-Scan
- Hyb-Wash
- Scan

The manual part of the operation requires that you load array plates, hybridization trays, consumables for fluidics wash/stain and scan trays. The process of Wash-Scan occurs with no user intervention.

The GeneTitan MC Instrument System requires a workstation equipped with the Applied Biosystems™ GeneChip™ Command Console (AGCC). The AGCC Launcher starts the GeneTitan MC Instrument System user interface. See the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for more details.

You can view the status of the array plate process through all instrument steps during operation from the GeneTitan MC Instrument System user interface. This includes the status of hybridization, fluidic wash and stain, and imaging processes.

The GeneTitan MC Instrument System updates the AGCC workflow monitor about the status of the array process at the beginning and at the end of a major process step such as hybridization, wash/stain or scan.

You can view all .dat files generated from the Imaging Device using the AGCC Image Viewer.

You can view the composite .cel file (all sub-array .cel files of an array) after imaging is completed using AGCC Image Viewer. You can also view individual sub array .dat files in the AGCC image viewer.

GeneTitan™ MC Instrument System specifications

Table 1, Table 2 and Table 3 list the important instrument specifications.

Table 1 The specifications of the GeneTitan™ Multi-Channel Instrument System

Item	Parameter	Value
Weight	**Free-standing (uncrated)** GeneTitan Hyb and Fluidics Station GeneTitan Imaging Device + Xenon Arc Lamp **Total weight**	 approx 182 lb (82.6 kg) approx 127 lb (57.6 kg) + 16 lb (7.26 kg) = 143 lb (64.9 kg) approx 325 lb (147.4 kg)
Dimensions	Width Depth Height	55” (139.7 cm) 33” (83.82 cm) 26” (66 cm)
Power (Imaging Device)	Power@Voltage/Current Line frequency	100 V/6.2 A 240 V/2.6 A 50 - 60 Hz
Power (Fluidics Station)	Power@Voltage/Current Line frequency	100 V/3.7 A 240 V/2.2 A 50 - 60 Hz
Working environment (**indoor use only**)	Temperature	41°F-75°F (5°C to 23.9°C)
	Humidity	Maximum relative humidity 80% for temperatures up to 75.2°F (24°C) Minimum humidity 30 ±7% relative humidity
	Clearance	6” (15.24 cm) in rear 12” (30.48 cm) on left side 25” (63.5 cm) on right side
	Pollution degree	2 environment
	Installation category	II
	Altitude	<2000m
Electrical supply	Provide voltage, frequency or power rating per unit label. Circuit breaker.	
Main supply voltage fluctuations	Mains supply voltage fluctuations up ±10% of the nominal supply voltage (Transient overvoltages typically present on the mains supply)	

Table 2 Lambda SC Controller cables

Cable	Connector type	Cable type	Cable max. length
*Smart*Shutter®	DB-9 male to DB-9 female	Minimum of 26 awg stranded wire with 500 Volt. Two ferrites are attached, one at each end.	10 feet (approx. 3 meters)
Serial	DB-9 female to DB-9 male	Connected to metal faceplates of connectors on both ends. One ferrite is attached at one end.	
USB	A to B	Dielectric separation of circuits. Foil shielding.	

Table 3 Lambda LS Xenon Arc Lamp System specifications

Parameter	Value
Output Range	320 to 700 nm (standard, ozone free bulb)
Radiant Output	50 watts (broadband, full beam) for 300W bulb
Lamp Type	300W Xenon, pre-aligned to produce collimated output
Lamp Life	lamp warranted for 500 hours; expected lifetime: 500 hours
Dimensions (H x W x D)	10.5” x 9.5” x 10” 26.7 cm x 24.1 cm x 25.4 cm
Weight	10.5 lb. 4.8 kg
Electrical	
Mains voltage	110V through 240V, 50 through 60 Hz
Maximum power consumption	300 W
Power cord	10A, 250V, with safety ground plug
Mains fuse (rear of cabinet)	5 Amp, 250V, 5 x 20mm, Time Delay fuse (EIC 60127-2) (Examples: Bussmann GDC-5A or S506-5A (RoHS), or Littelfuse 218.005 or 218.005.P (RoHS))

2 System Components

Introduction

This chapter describes the units that make up the GeneTitan™ Multi-Channel (MC) Instrument System and its auxiliary instrument components. The GeneTitan MC Instrument System by itself primarily consists of a high throughput Fluidics Station and a high throughput Imaging Device. A hybridization oven is a separate external instrument.

IMPORTANT! Removing or adding connections without the presence of an Thermo Fisher Scientific Field Service Engineer voids the instrument warranty.

Components of the system

The GeneTitan MC Instrument System is one of several components for processing array plates. Applied Biosystems provides the following system components as part of the high throughput system for array processing and imaging (Table 4).

Table 4 GeneTitan™ Multi-Channel Instrument System components

Component
GeneTitan™ Multi-Channel Instrument System
Workstation
External barcode reader
Applied Biosystems GeneChip Command Console Software (AGCC)
APC Smart UPS 1500
Lambda LS Xenon Arc Lamp System
Lambda SC *Smart*Shutter® Control System
Spare Xenon Lamp (Applied Biosystems Cat. No. 01-0740)
Glass bottles for Wash A, Wash B, DI water and waste
GeneTitan bottle rack

Components and Connections

⚠ **CAUTION!** The uninterrupted power supply (UPS) provided with the GeneTitan MC Instrument System should not supply power to any devices other than those associated with the GeneTitan Instrument System. Plugging a device such as a GeneChip™ Hybridization Oven 640/645 into the GeneTitan UPS will affect the power recovery modes for the GeneTitan Instrument System.

Front components

The GeneTitan Instrument (Fluidics Station) consists of the following items (Figure 3 on page 13).

1. Input/Output drawer 1
2. Input/Output drawer 2
3. Input/Output drawer 3
4. Input/Output drawer 4
5. Input/Output drawer 5
6. Input/Output drawer 6
7. Confirmation button for opening and closing drawers
8. Waste bottle for drained buffers and residual reagents
9. Wash A buffer bottle
10. Wash B buffer bottle
11. Rinse bottle containing deionized (DI) water
12. Fluidics Station
13. Trash bin door for waste chute for used materials (e.g., plate covers)
14. Connected to Imaging Device

⚠ **WARNING!** Please contact Thermo Fisher Scientific Technical Support when moving the workstation or adding/removing USB devices. You may damage the GeneTitan Instrument System or cause it to stop working if you do not follow adequate precautions and instructions

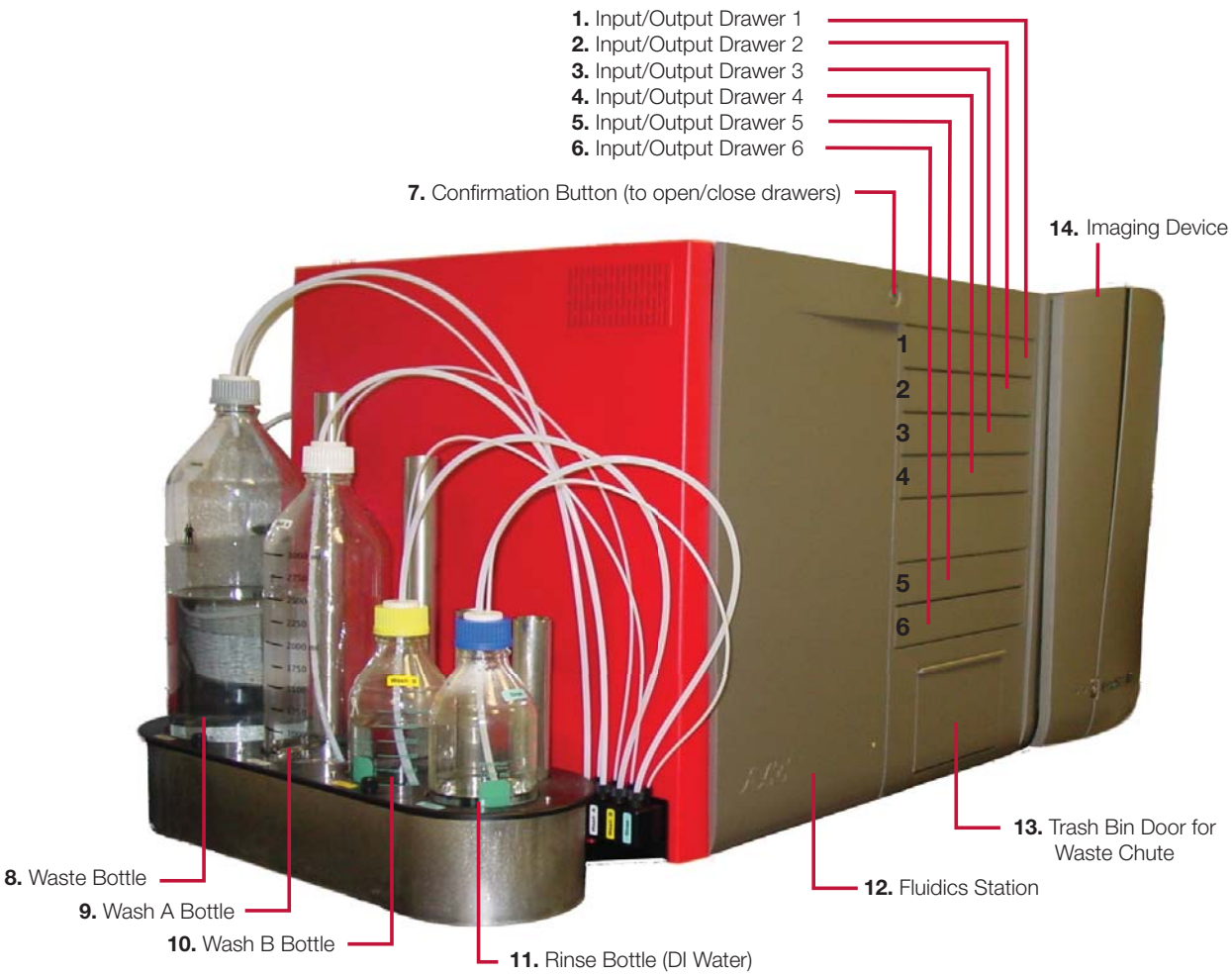


Figure 3 The GeneTitan™ Multi-Channel Instrument System components

GeneTitan Instrument (Fluidics Station) rear components and connections

Figure 4 shows the rear Fluidics Station connections.

1. Fluidics Station circuit breaker button
2. Fluidics Station air exhaust
3. Fluidics Station clean dry air supply
4. Fluidics Station USB cable for data communications
5. Fluidics Station power cable

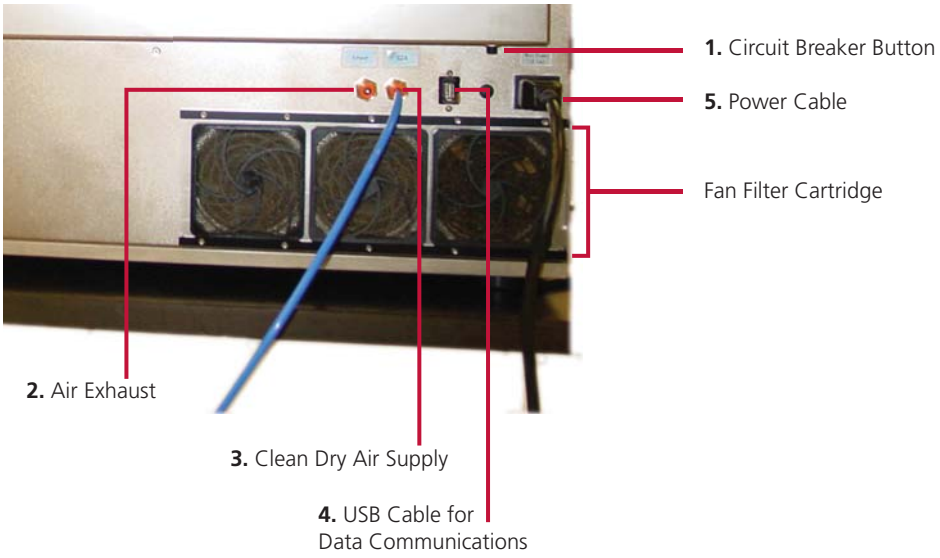


Figure 4 The GeneTitan™ Multi-Channel Instrument System—Fluidics Station rear connections

Imaging Device rear components and connections

Figure 5 and Figure 6 shows the rear Imaging Device connections.

1. The Imaging Device connections. See Figure 6 for detailed view.
2. The liquid light guide from the Lambda LS arc lamp
3. The Imaging Device circuit breaker button (see Figure 6)
4. The Imaging Device USB cable to *Smart*Shutter Controller (see Figure 6)
5. The Imaging Device TTL cable to *Smart*Shutter Controller (see Figure 6)
6. The Imaging Device FireWire® cable for CCD camera communications (see Figure 6)
7. The Imaging Device USB cable for data communications (see Figure 6)
8. The Imaging Device power cable (see Figure 6)
9. The Lambda LS xenon arc lamp power cable plug (see Figure 6)

(See Figure 6 for detailed view of connection area.)

Figure 5 The GeneTitan™ Multi-Channel Instrument System—Imaging Device rear connections location

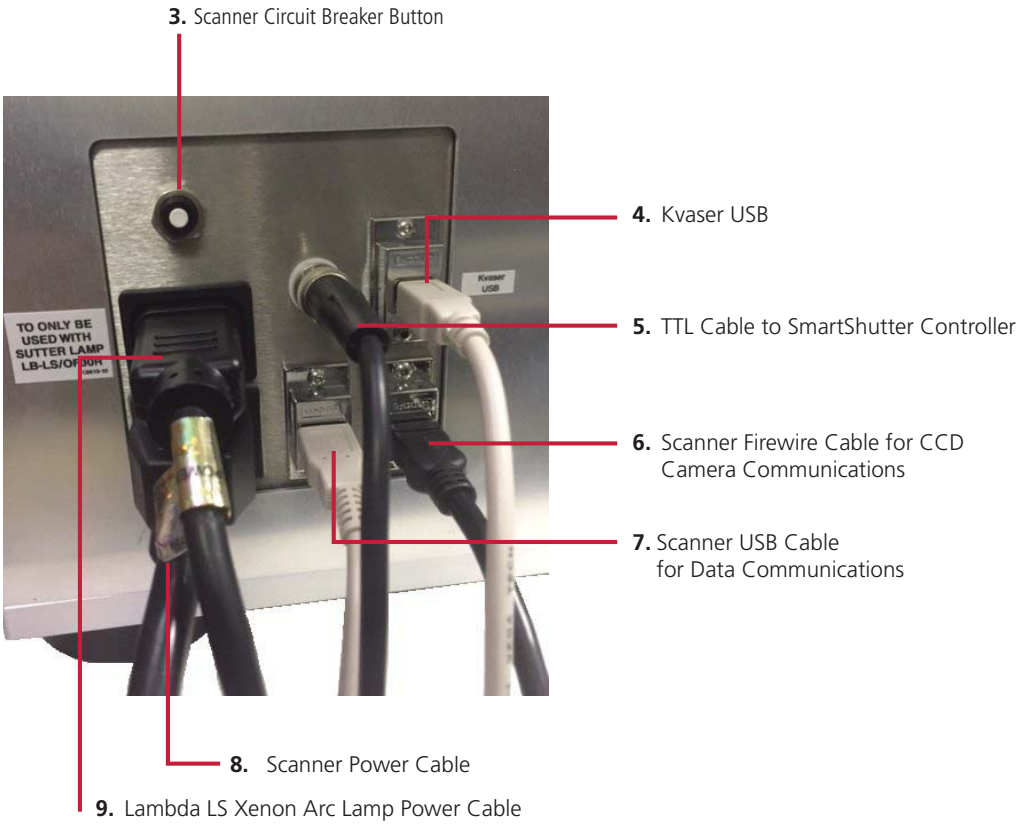
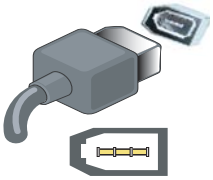


Figure 6 Rear Imaging Device connections

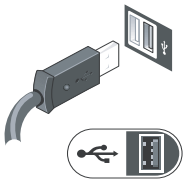
Work station and uninterrupted power supply connections

1. The power cord to the workstation
2. The FireWire cable from the Imaging Device
3. The server cable (for those systems with a server connection)
4. USB cables (one for the Imaging Device one for the Fluidics Station and other USB cables depending upon the system configuration)
5. USB cable from the UPS
6. USB connection on the UPS
7. UPS power outlets to workstation, Fluidics Station, Imaging Device and other devices depending upon configuration.
8. UPS power cord

IMPORTANT!
The FireWire (IEEE 1394 High Speed Serial Bus) cable is not a locking connector. Insure that the Firewire cable is plugged securely and in the correct orientation in both the Imaging Device and the workstation. Avoid snagging or pulling this cable during the Imaging Device operation. Maintain adequate (6”, 15.24 cm) distance in the rear.



IMPORTANT!
The USB cable is not a locking connector. Insure that the USB cable is plugged securely and in the correct orientation in both the Imaging Device and the workstation. Avoid snagging or pulling this cable during the Imaging Device operation. Maintain adequate (6”, 15.24 cm) distance in the rear.



Lambda LS and Smart Controller System

Lambda LS Xenon Arc Lamp System

The Lambda LS and associated hardware comes packed in a single carton. The following is a list of the components. The Lambda LS plugs into the power outlet of the GeneTitan Imaging Device. If you believe that any of these components are missing or show obvious signs of damage from shipping please contact Thermo Fisher Scientific Technical Support (Figure 7).

1. Lamp Cabinet with factory-installed lamp housing cold mirror and power supply
2. Support Base (1) and Mounting Rods (2)
3. Power Cord
4. Second filter wheel adapter with drop-in filter holder and drop-in filter receptacle
5. Small Zeus female dovetail
6. Liquid Light Guide dovetail with C-mount extension
7. Liquid Light Guide

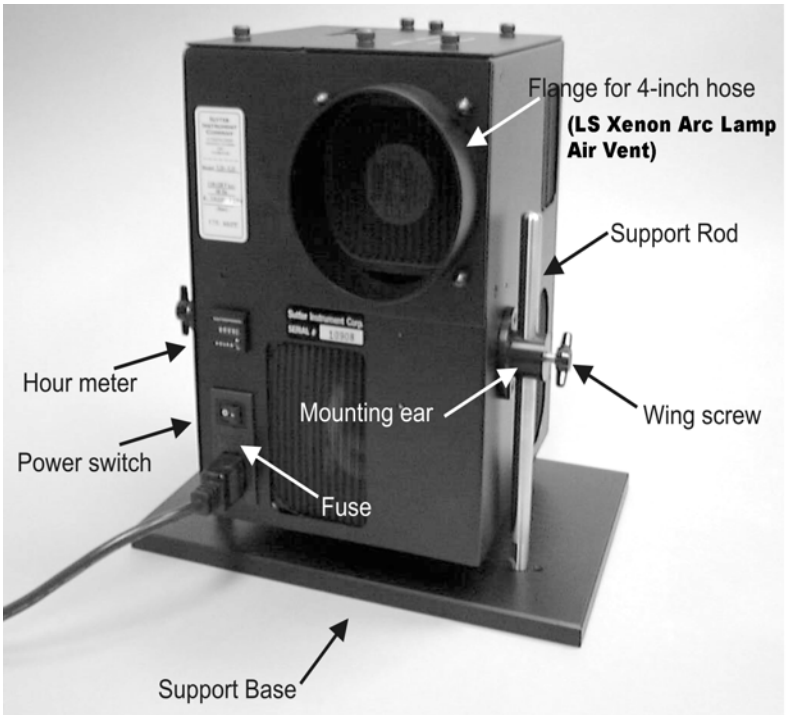


Figure 7 Lambda LS Xenon Arc Lamp back panel

Connections

The power cord of the Lambda LS Xenon arc lamp connects to the power plug at the rear of the Imaging Device.

1. The Lambda LS Xenon arc lamp serial connection from the Smart Shutter to the Lambda SC controller
2. The Lambda LS Xenon arc lamp power cord
3. The Lambda LS Xenon arc lamp light guide connection
4. The Lambda LS Xenon arc lamp liquid light guide

IMPORTANT! The liquid light guide is a fragile fiber optic cable. Do not kink or bend the cable to less than six inches (6″ or 15.25 cm) radius. Do not place objects on the light guide.

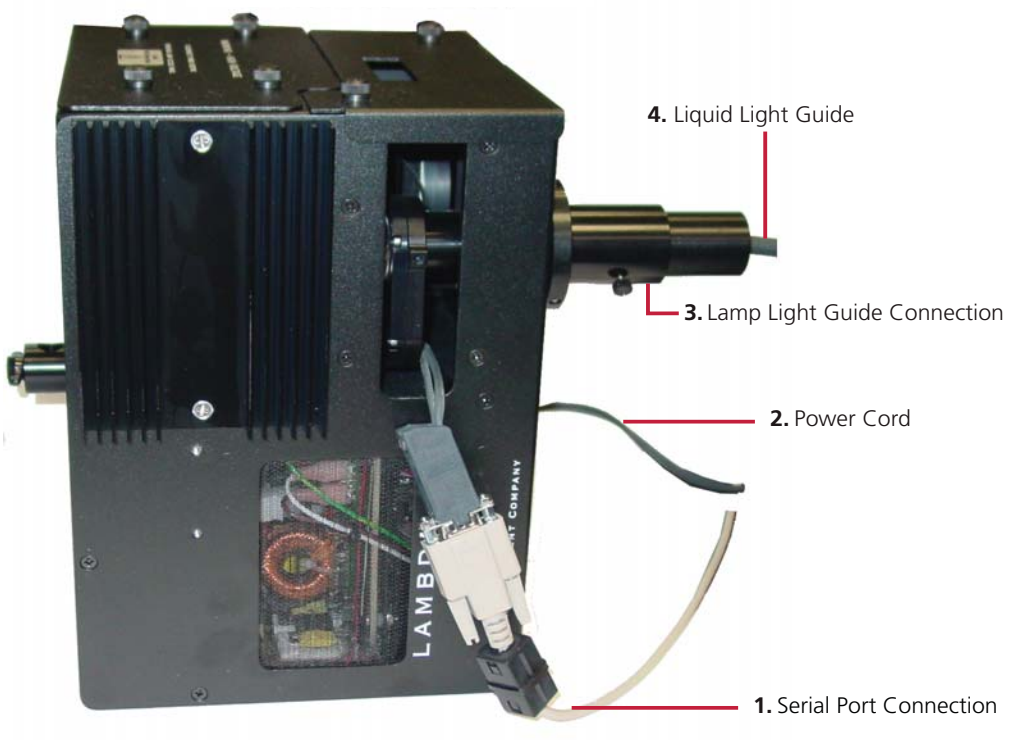


Figure 8 Lambda LS Xenon Arc Lamp connections

Lambda SC Control System

The Lambda SC *Smart*Shutter Control System (Figure 9) comprises the following components. The Lambda SC controller is operated remotely from a computer through the USB port. Remote operation allows you to select:

- Shutter position
- Shutter mode

Figure 9 Lambda SC *Smart*Shutter® Controller

*Smart*Shutter front components

- Power Light

  This lamp is lit while the controller is powered on.
- Shutter Light

  This lamp is lit while the SmartShutter is in the open state.
- Manual Shutter Control Switch (Open Auto Closed)

  This three-position switch is used to manually open or close the SmartShutter overriding programmed operation or external control (TTL signaling and/or remote host computer connected via RS-232 Serial or USB). The manual shutter control switch's middle position (labeled AUTO) places the Lambda SC controller into its normal mode of being under the control of its programming under TTL control or under the control of an externally connected host computer.

*Smart*Shutter rear connections

All electrical connections are all made on the rear panel of the Lambda SC (Figure 10 and Figure 11).

1. Lambda SC controller
2. 9-pin *Smart*Shutter to controller connecting cable
3. USB interface cable
4. Power cord

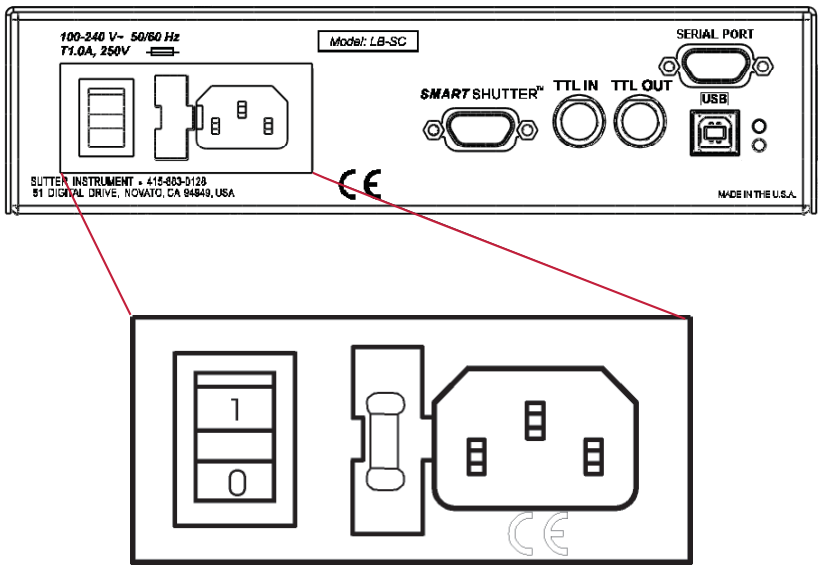


Figure 10 Lambda SC *Smart*Shutter® Controller

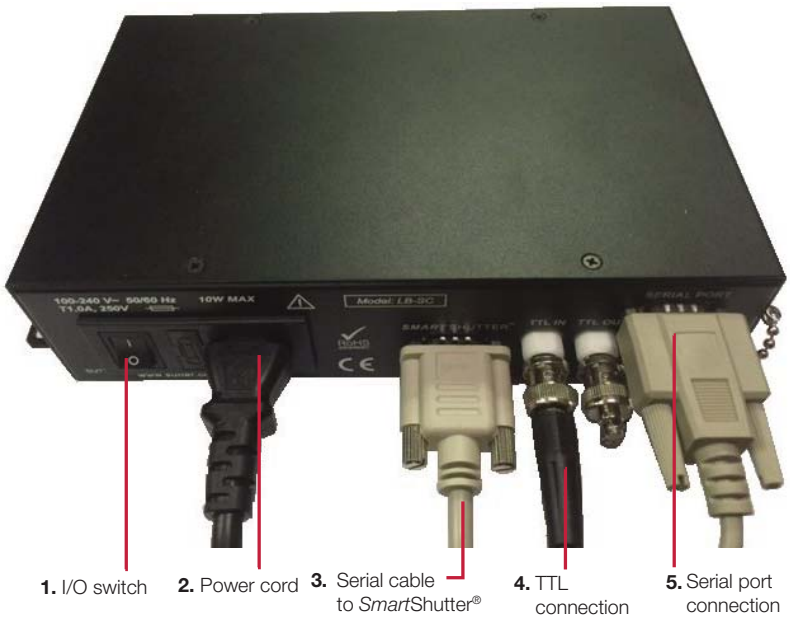


Figure 11 SmartShutter® SC Controller rear connections

SmartShutter

The port labeled SMARTSHUTTER is a 9-pin DSUB male connector used to link the Lambda SC controller with the *Smart*Shutter.

USB Port

The port labeled USB is a USB B type receptacle and is designed to accept the B type connector ("device") end of the USB cable provided. The other end of the USB cable is connected to a host computer for the purpose of remote controlling the Lambda SC.

Serial Port

The port labeled SERIAL is a 9-pin DSUB female receptacle used for establishing an RS-232 serial interface between the Lambda SC and a host computer using the cable provided.

TTL Input and Output

Two BNC receptacles are provided for TTL control of the connected *Smart*Shutter. The GeneTitan MC instruments do not use these receptacles.

Power Switch

The power switch located near the fuse and the power socket is used to turn the power on and off to the Lambda SC and attached *Smart*Shutter.

Line Power

The power socket is used to connect the supplied power cord to the Lambda SC.

Fuse Label

Information found here includes the model number of this instrument appropriate supply voltage and the type of fuse required for the supply voltage.

Fuse

Fuse compartment containing the supply voltage fuse and an extra fuse. Replace blown fuses with a fuse of the appropriate value as given on the fuse label (back panel of the controller).

Mains fuse (rear of cabinet) 5 x 20 mm glass tube

T1.0A 250V IEC 60127-2 Sheet III (such as a Bussmann GDC-1A or Littelfuse 218 001)

GeneTitan™ MC Instrument System controls and indicator lights

The GeneTitan MC Instrument System has three indicator lights and two buttons. (Figure 12).

1. The GeneTitan Instrument (Fluidics Station) confirmation button (to open/close drawers) In accordance with the AGCC software message press this to open and close a drawer.
2. The GeneTitan Instrument (Fluidics Station) status indicator (See Table 5)
3. The Imaging Device indicator (Yellow, see Table 5)
4. The Imaging Device indicator (Green, see Table 5)
5. I/O Button (not used in the GeneTitan MC Instrument)

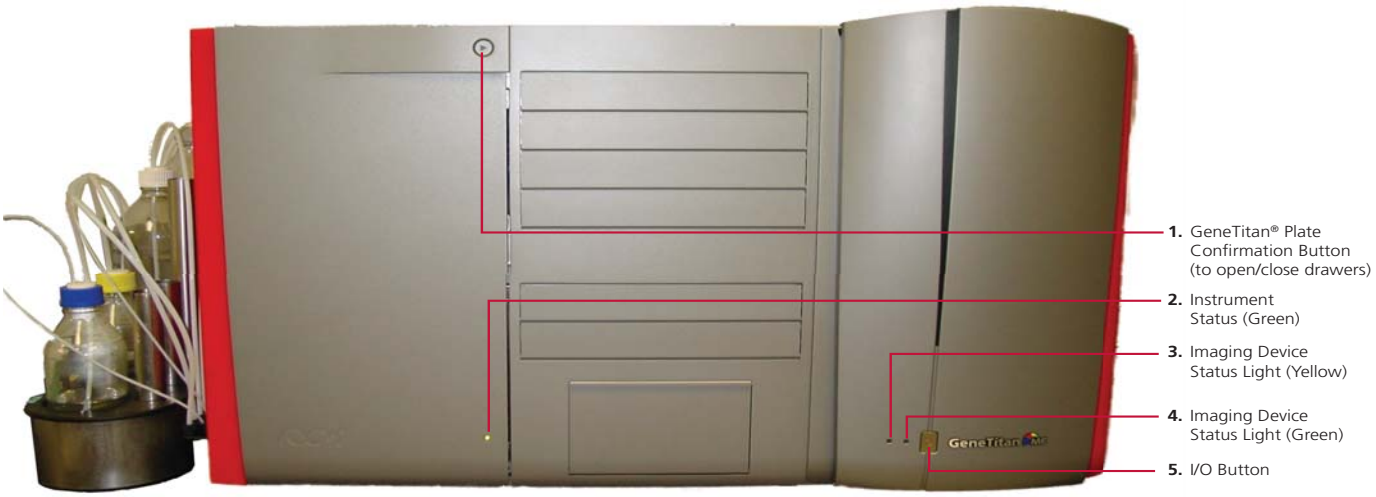


Figure 12 Lights and buttons of the GeneTitan™ Multi-Channel Instrument System

Array Plate Confirmation button: Press after completing certain steps for instrument setup, like adding fluids or adding trays and plates.

The button flashes blue when a step is pending.

Instrument System Status lights:

- Solid yellow—initialing/homing system
- Solid Green—processing/available to process
- Blinking green—normal operation message box is displayed and requires user input
- Blinking yellow—abnormal event informational message box requires user response

All power to the instrument is turned on when the AGCC GeneTitan Control software is started and turned off when the software is shut down. The I/O switch on the front of the instrument is inoperative when the instrument is being controlled using the software.

Table 5 Instrument System Status Indicators

Light/Color	Indication
Solid green (Instrument)	Instrument is ready and/or processing; operation is normal.
Solid yellow (Imaging Device)	Initializing/homing system.
Blinking green (Imaging Device)	Normal operation but the software displays a message box that requires your input.
Blinking yellow (Imaging Device)	Abnormal event has occurred and the software displays a message box that provides information on the event and requires your input.

Note: All power to the instrument is turned on when you launch the AGCC GeneTitan MC Control software and turned off when you shut down the software. When the instrument is under the control of the software the I/O switch on the front of the instrument is inoperative.

IMPORTANT! You should not use the I/O button on the Imaging Device. You can safely shut down the instrument using the "Shutdown" menu item on the instrument control software.

Principles of operation

This section describes the GeneTitan MC Instrument System and principles of operation.

Translation stage

The GeneTitan Instrument (Fluidics Station) has a 3-axis translation stage that holds the array plate. This has sufficient travel in X, Y, and Z in order to reach all tray locations during the operation to process the array plate. In case of power interruption or cycling of the power of the instrument or if you reboot the workstation or application all stages in the instrument will stop immediately and hold on to their positions

Plate gripper

The plate gripper consists of a motorized gripper capable of handling the array plate, tray cover, array plate/hybridization tray and array plate/scan tray. The plate gripper transfers the array plate from one location to another within the instrument.

The plate gripper has three position sensors. These include open, or closed, with part present and closed with part absent. The plate gripper can center the array plate front to back top to bottom while it is handling the array plate. It can maintain the parallelism of the array against the liquid surface in the stain tray, Wash A station, and Wash B station while it is handling the array plate

In the event of a power interruption the plate gripper will hold a plate in the closed position.

Input/Output drawers

The GeneTitan Instrument (Fluidics Station) has six input/output drawers which accept array plates/array plate covers, array plates/hybridization trays and array plates/scan trays. It also accepts combinations of stain trays and scan trays. See Figure 3 on page 13. A software enacted command opens and closes the input/output drawers via the gripper.

- Each input/output drawer holds two trays.
- Each tray sits in its tray pocket on the drawer.
- Each input/output drawer has a locking mechanism to secure the tray when it fully retracts inside of the instrument.
- Each of the input/output drawer can collect a small volume spillage to ensure the spillage does not drip to other drawers below it.
- Each of the input/output drawers has an optical sensor to detect the present or absence of a tray on the drawer.
- Each of the input/output drawers has fiducial pins that work in conjunction with the optical sensor of the plate gripper to define the position of the drawer relative to the home position of the stage in X, Y, and Z axes. During the operation of the instrument calibration, the software records this position into a configuration file.
- Each of the input/output drawers has a stationary flag to work in conjunction with the optical sensors on the plate gripper to provide a means of recovering the instrument from a power interruption.
- The instrument has a lighted circular confirmation button. This button confirms that you have completed the indicated action and inputs this into the system.

Bulk Fill/Drain system

Bulk Fill/Drain system comprises the Wash A buffer, Wash B buffer, deionized water and waste bottles. This system enables the instrument to fill and drain from two different sources of buffer solution automatically during the operation. See Figure 3 on page 13. The bottles are on the left side of the instrument.

Fluidics bottle rack

The bottle rack contains all the buffer solution the rinse and the waste collection sources of the instrument. It is located outside on the left side of the instrument. See Figure 15 on page 31.

Wash A buffer

The Wash A buffer has the following characteristics:

- Inside the Fluidics Station a wash reservoir holds the Wash A buffer. The wash reservoir accepts the array while it being handled by the plate gripper.
- This wash reservoir supply tubing has a fluid sensor to ensure the level and presence/absence of liquid during the fill cycle.
- This reservoir has a Wash A buffer source located on the bottle rack. A three-liter bottle located next to the Fluidics Station instrument contains this buffer source.
- The Wash A buffer shares the same waste collection source with the Wash B buffer. A five-liter bottle next to the Fluidics Station collects the waste.

Wash B buffer

The Wash B buffer has the following characteristics:

- The Wash B buffer source is a bottle located on the bottle rack.
- Inside the Fluidics Station a reservoir holds the Wash B buffer.
- The Wash B station has a heater to heat the wash B buffer inside the wash reservoir up to a specific temperature set point. You cannot set this specific temperature setpoint. A software protocol file controls the temperature.
- The Wash B station has a lid which has a built in heater to warm up the lid to minimize the condensation of the buffer during the operation. You cannot set this specific temperature setpoint. A software protocol file controls the temperature.

CDA interface

The instrument has an inlet port 3/8 inches OD to receive the facility clean dry air supply (CDA) supply source. This port is located at the back of the instrument. See item 13 in Figure 3 on page 13.

Clamp/unclamp station

The Fluidics Station has a motorized clamp/unclamp station that allows the plate gripper to place or remove the array plate/hybridization tray. The clamp/unclamp station has sensors to detect presence/absence of hybridization tray.

Hybridization Oven

The GeneTitan Instrument (Fluidics Station) has an on-board integrated hybridization oven. This oven has the following characteristics:

- The hybridization oven can hold up to two array plate combinations.
- The hybridization oven can achieve a a set point temperature from 37.0°C to 70°C in 0.1°C increments via the GeneTitan protocol.
- The hybridization oven can ramp up to the temperature set point within 15 minutes.
- Each shelf of the hybridization oven has a sensor to detect the presence/absence of trays.

Trash station

The GeneTitan Instrument (Fluidics Station) has a trash station which allows the plate gripper to throw away tray covers whenever they are no longer needed during the operation of the array plate processing. See Figure 3 on page 13.

The trash station accepts Applied Biosystems tray covers.

The trash station has optical sensors to detect whether the bin is empty or full. The system alerts you to empty the bin if the sensors detect that the bin is not empty at the beginning of each run.

The trash station has a sensor to ensure that the trash bin is fully inserted into the instrument. The trash station also has a locking mechanism to secure the trash bin after it is fully inserted in to the instrument. The software controls this locking mechanism to prevent you from accidentally unloading the bin during operation.

Email notification

The System can notify a user or a group of users via email regarding changes in the state of the system. The system can configure which system events shall initiate an email notification and to which user(s) this notification shall be sent. The email notification system is compatible with standard SMTP email systems only.

The Imaging Device

The array plate Imaging Device is an integral part of the GeneTitan MC Instrument System. It automatically receives and images GeneTitan array plates after processing by the Fluidics Station. This requires no user intervention.

The uninterrupted power supply unit

The system also uses an uninterrupted power supply (UPS) (Figure 13). This UPS can maintain power to the workstation, the gantry and the I/O modules of the Fluidics Station and the gantry of Imaging Device for approximately 2 to 5 minutes to safely perform the array plate recovery and the shutdown procedure in case of an power interruption.

The software/system provides the following functionality when attached to the UPS:

- When the instrument control software detects loss of main power the software shall log any power interruptions and messages to the log files.
- The software monitors the power loss for at least 1 minute before triggering any recovery procedure to recover the instrument or the array plate.
- During the power interruption event the UPS will provide enough power for the GeneTitan MC Instrument System to complete the appropriate recovery procedure.
- After completion of the operation(s) the software will hold all loaded plates on the drawers ready for unload when you respond to and initiate the unload operation.
- The software provides an alert when the battery level on the UPS falls to a critical level and will send an email to notify the user.

Note: UPS units may differ from that shown in the above photograph.

Figure 13 The Uninterrupted Power Supply (UPS)

Compressed dry air supply

The GeneTitan MC Instrument System requires a compressed dry air (CDA) source at 70 psi.

IMPORTANT! The air flow rate is 34 L/min (1.2CFM) at 70 psi.

Your facility must be equipped with a compressed dry air source and a regulator. Figure 14 shows the CDA regulator and source that Applied Biosystems uses. This need not be the same as that in your facility and is for illustration purposes only. See the *GeneTitan™ Multi-Channel Instrument Site Preparation Guide* (Pub. No. 08-0305) for preparing your facility for GeneTitan MC Instrument System installation.

1. The pressure adjustment knob
2. Clean dry air to GeneTitan MC Instrument System
3. Pressure gauge
4. Clean air source

Figure 14 The CDA regulator

Barcode reader

The GeneTitan MC Instrument System uses a barcode reader to read the barcode labels on the array plate, supplied by Applied Biosystems. The particular model used may change.

Workstation

The GeneTitan MC Instrument System is equipped with a Dell workstation with Windows® XP and the AGCC software application installed.

Lambda LS xenon arc lamp

The Lambda LS is a stand-alone xenon lighting system. The system consists of a Xenon-arc lamp housing cold mirror and power supply. The Lambda LS is designed for use with a liquid light guide that transmits remarkably flat intense illumination to the optical train of the GeneTitan MC Instrument.

Software interface

The GeneTitan MC Instrument System operate under the Applied Biosystems GeneChip Command Console (AGCC). The AGCC Launcher opens the user applications. See the *AGCC Installation Instructions* (Pub. No. 702567) for software installation instructions if you need to re-install the software and the *Applied Biosysems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for instructions on using the software.

You can view the status of the array plate process through all instruments steps during a plate run from the GeneTitan MC Instrument System user interface. This includes the status of hybridization workflow, fluidics wash/stain workflow and imaging workflow.

You can view the composite .cel file (all sub-array .cel files of an array) after imaging is completed using AGCC Image Viewer. You can also view the individual sub array .dat file and be able to tile all the sub array .dat files of an array into a single screen view.

3 Operating the GeneTitan™ MC Instrument System

Setting up the instrument

The Thermo Fisher Scientific Field Service Engineers will have set up and tested the instrument before your running an array plate. Our Field Service Engineers verify the proper system connections, but one of your important responsibilities is to ensure that the system maintains the proper connections and that the fluid levels (Wash A, Wash B, and rinse at the left side of the instrument) are within the proper levels (minimum 150 mL for Wash B and 300 mL for Wash A).

Powering up the Lambda LS xenon arc lamp

IMPORTANT! Due to the current draw during lamp ignition it is important to power up the Lambda LS first before other electronic and computer equipment especially when they are powered from or grounded to the same circuit. Failure to do so may reset microprocessor-based equipment and/or may destroy sensitive operational amplifier-based instrumentation.

Powering up

Once you understand these precautions, power the Lambda LS by turning on the power switch located on the back panel (see Figure 7 on page 18). The lamp should be expected to provide roughly 500 hours of service. The software application maintains and displays the remaining lamp life.

Operating the Lambda SC controller

The application software shuts down the Xenon lamp automatically after a predefined time (at the present, it is 120 minutes) if there are no plates being processed in the GeneTitan MC Instrument System.

IMPORTANT! Do not attempt to shut down the lamp using the power switch located in the back panel of the Lambda SC Controller

1. Turn on the power using the ON/OFF switch on the back panel of the Lambda SC controller cabinet. The attached *Smart*Shutter will automatically open and close as an indication that the unit has been powered on and has been initialized.
2. The Lambda SC will default to on-line at power-on or after a reset. If the unit is connected to a USB port with properly installed software the USB port will be selected as the default remote control interface.
3. The Lambda SC will be on-line at power on ready for USB port commands.

Maintaining proper fluid levels

Before turning on the instrument system

Before turning on the instrument you must ensure that you have the proper levels of Wash A, Wash B, and rinse fluids. The instrument detects if there is no fluid coming from the source bottle. However to run the GeneTitan MC Instrument System successfully and to ensure there is no splashing of the fluid onto the array plates you must maintain a minimum of 150 mL buffer (for Wash B) and 300 mL (for Wash A) in the appropriate bottles.

Note: Refer to the appropriate assay user guide for the volumes of buffer and rinse required to process an array plate on the GeneTitan MC Instrument System.

IMPORTANT! You must maintain a minimum level of 150 mL of fluid in the bottles even when not running an array. This volume of fluid is required to cover the dip tube filter to prevent splashing when the instrument pumps air into the bottle. DO NOT OVERFILL THE BOTTLES.

Filling the reagent bottles

The Applied Biosystems GeneChip Command Console (AGCC) software asks you to refill the reagent bottles at the beginning of every run (Figure 15). The bottles have color coded caps and labels that provide information on the particular reagent that goes into the bottle.

1. Remove the cap from the reagent bottle.
   - The instrument has a placeholder behind the bottle to place the cap with the tube. This prevents any reagent buffers in the tubes from leaking onto the table.
2. The excess fluid in the tube attached to the cap drains into the bottle holder.
3. Fill the bottle with the appropriate amount of reagent buffer.
4. Drain the waste bottle
5. Install the empty waste bottle.
6. Tighten the cap on the bottles.

The GeneTitan MC Instrument System control software prompts you to replace all three filters in the reagent buffer bottles if it detects incorrect fluid fill operations based on the fill time in the fluid dispense log.

See the section "Replacing the bottle filters" on page 47 for instructions on replacing the bottle filters as part of preventive maintenance or when you are prompted with a dialog box to replace filters.

IMPORTANT! The instrument pressurizes the reagent buffer bottles during operation. Tighten the caps firmly but gently. Open the bottles only when the instrument indicates that they are no longer pressurized.

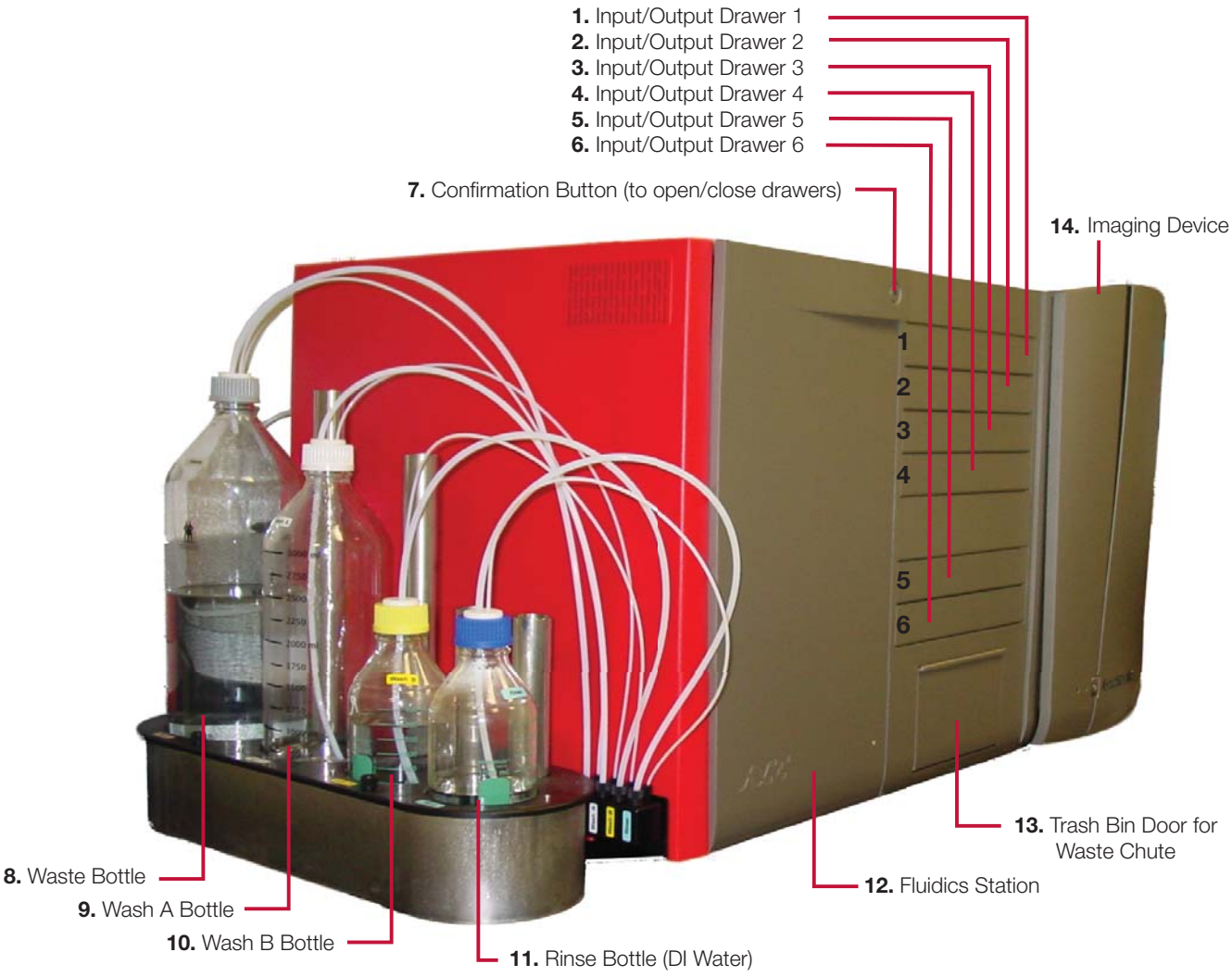


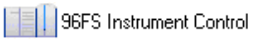
Figure 15 The GeneTitan™ Multi-Channel Instrument System reagent bottles

Starting the instrument system

This section shows you how to launch the AGCC software and turn on the GeneTitan MC Instrument System.

Note: Launching the AGCC Instrument Control software will turn on the integrated Fluidics Station and establish connection with the Imaging Device. You cannot run the Imaging Device without turning on the GeneTitan MC Instrument System.

Power On/Off procedure

1. To power on the system turn the workstation on.
2. Using the user interface log into the computer.
3. Launch the AGCC application. Click Microsoft® Windows® **Start** button → **Programs** → **Affymetrix** → **Command Console** → **AGCC GeneTitan Control** or click the AGCC GeneTitan Control icon 

on the AGCC Launcher.

   The following operations then occur:

   - The AGCC GeneTitan Control window opens (Figure 16).
   - The software turns on high power to the GeneTitan MC Instrument System.
   - All stages subsystem components in both the Fluidics Station and Imaging Device then initialize to their default state to ensure that each component in the instrument is functioning properly.
   - All stages of both Fluidics Station and Imaging Device instruments performs its homing routine to find its home position.
   - The Hybridization oven turns on and warms up to either to the initial temperature set point of 48°C or the temperature of the last executed protocol—which may differ from 48°C).

   If any of the steps above fail to execute during the startup procedure the software shall not complete its startup procedure. The software shall prompt the error dialog box to state the failure modes.

   See "GeneTitan™ MC Instrument System controls and indicator lights" on page 22 for information about the indicator lights.

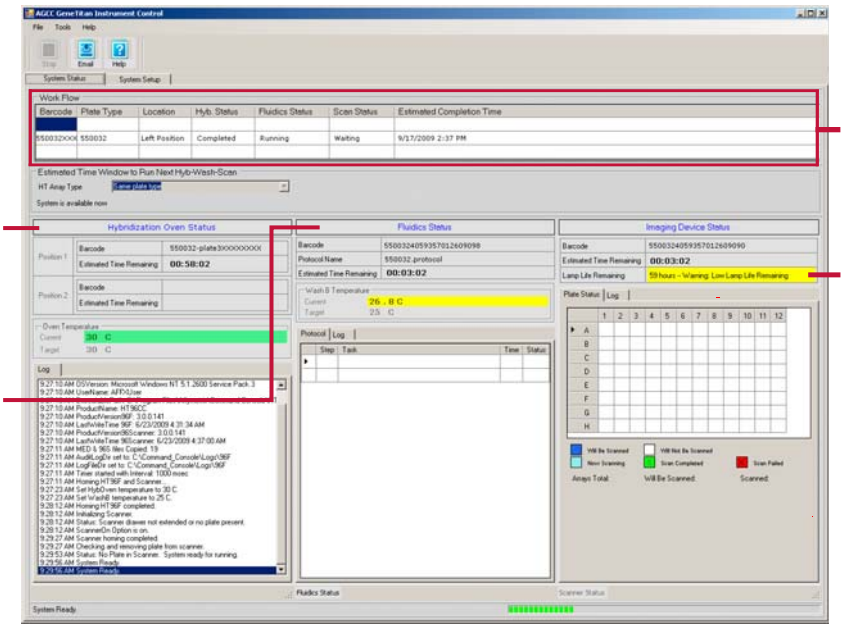


Figure 16 The AGCC GeneTitan™ Multi-Channel Instrument System control widow

4. To power off the GeneTitan MC Instrument System run the shutdown procedure exit and close the GeneTitan Control application. See Step 4 on page 40 for information about shutting down and array plates remaining in the instrument.

   During the closing or exiting of the AGCC application the software moves all the stages to their safe position. The software then closes.

Processing an array plate

This section tells you how to run an array plate from hybridization through the various modes of operation:

- Hyb-Wash-Scan
- Wash-Scan
- Hyb-Wash
- Scan

Hyb-Wash-Scan mode

The **Hyb-Wash-Scan** mode of operation performs the hybridization wash-stain and imaging processes of an array plate through the instrument.

You can specify either one or two plates to be processed through the instrument using this mode of operation. This section provides a summary of the operations for hybridization wash stain and imaging.

You must follow the directions in the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for detailed instructions.

Hyb-Wash-Scan mode: process description

The fluidic step (Wash-Stain) of the **Hyb-Wash-Scan** mode follows a pre-determined fluidic protocol.

IMPORTANT! Applied Biosystems determines the parameters of each fluidic protocol. You must not alter the set parameters.

Wash-Scan mode

The **Wash-Scan** mode of operation allows you to bypass the hybridization step and begin processing the array plate from the wash/stain and imaging steps without any user intervention. In this mode of operation you can process one array plate at a time.

You must follow the directions in the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for detailed instructions.

Hyb-Wash mode

Hyb-Wash Mode: process description

The **Hyb-Wash** mode of operation enables you to start the array process with the hybridization step and end the process with wash/stain step. This mode allows to bypass the Imaging step of the process workflow. You can process one array plate at a time.

Scan mode

Scan Mode: process description

The **Scan** mode of operation allows you to image the array plate on the Imaging Device. This mode allows you to bypass the hybridization and **Wash-Stain** step of the process workflow. You can image only one array plate at a time.

Unload plates

The **Unload Plates** function can be used to empty the GeneTitan drawers after performing an abort operation.

To unload loaded plates:

1. Select **Unload Plates** from the Setup Option drop-down list (Figure 16).

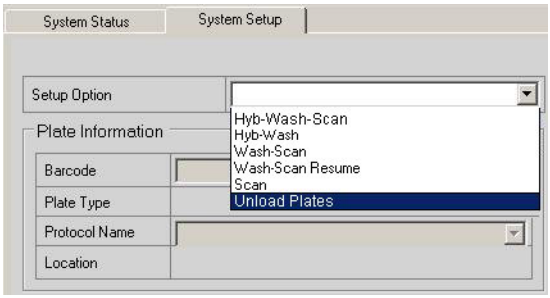


Figure 17 Selecting the workflow

The application prompts you to empty the cover trash bin.

2. Perform the following steps:
   a. Open the trash bin door.
   b. Remove and empty the trash bin.
   c. Return the trash bin and close the door.

3. Press the **Confirmation** button to proceed.

   The application prompts you to unload previously loaded plates and trays.

   For each loaded plate or tray:

   a. The appropriate drawer opens (Figure 16).

Figure 18 Unloading solution trays from drawer 5

   b. The status box prompts you to remove the tray or plate and the system layout indicates the array or tray to remove (Figure 19).

IMPORTANT! When running a series of array plates through the GeneTitan Instrument System, you must be careful to remove and load the proper array plate and trays and pay careful attention to the software prompts that tell you which side of the open drawer to remove or place a plate or tray.

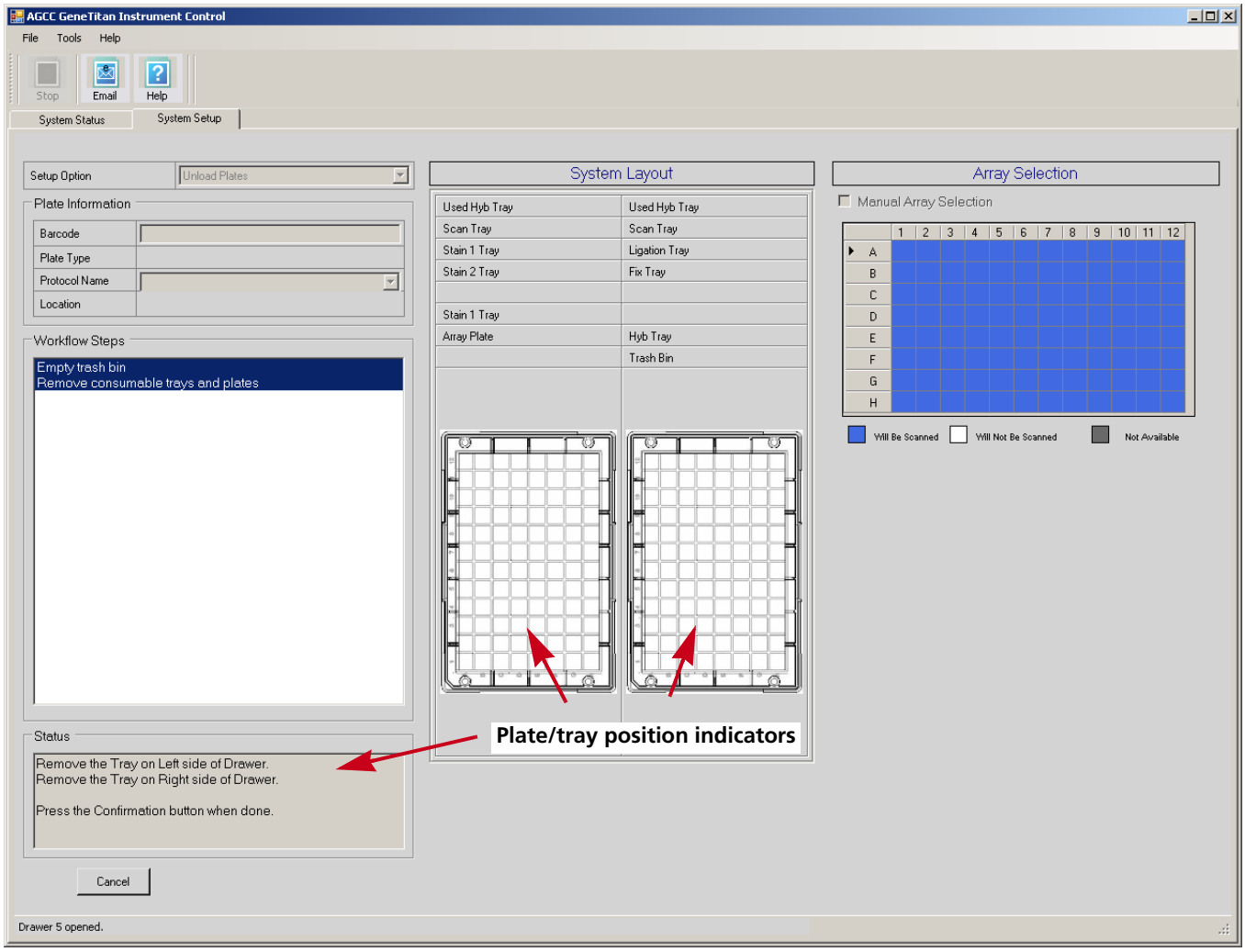


Figure 19 Unload tray(s)

c. Remove any plate, plate receptacle, or tray from the drawer (Figure 19), then press the **Confirmation** button on the front of the instrument.

d. When you have finished emptying the old plates and trays, the software prompts you to proceed to the next step.

Shutting down

You should perform the shutdown protocol at the end of a session. Do not keep the GeneTitan MC Instrument System **ON** if you will not use it again within the next 12 hours. This reduces the risk of salt buildup in the instrument.

Note: The shut down procedure requires that the instrument complete the processing of all the array plates that were loaded into the instrument. Do not attempt to shut down the instrument while array plates are in process.

Shut Down procedure

Refer to the See the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for further details.

1. On the System Setup window, open the Setup Options drop-down menu and select **Unload Plates**.
2. Unload all the consumables as prompted.
3. Power down the instrument.
4. Exit the AGCC software.

The Fluidics Station automatically performs a cleanout protocol.

IMPORTANT! To avoid contamination the DI water should be replaced with fresh DI water before performing a Fluidics run.

GeneTitan™ Multi-Channel Instrument System recovery procedure

The intent of the recovery procedure is to save the array plate when a power interruption (power blackout or emergency shutdown or the user cycles the power of the instrument) occurs or if the workstation and application unexpectedly freezes during the operation. The instrument software performs the appropriate recovery procedure based on the condition of the process when the event occurred.

If required, the AGCC application will prompt you to following certain procedures.

Recovering the instrument system from a power interruption

Recovering the process after a power interruption

You should have the GeneTitan MC Instrument System connected to a UPS to prevent power disruption. However if the power of the instrument cycles either by disconnecting the power cord or for some other reason the GeneTitan MC Instrument System can recover itself from its last position whenever you restore the power to the instrument and only when you initiate another run. This means that the GeneTitan MC Instrument System will automatically home all stages in the instrument without any hardware crashes or damage regardless of the positions of the stages at the time of the power interruption. If the power interruption occurs while the plate gripper is handling the array plate the instrument can home all of its stages without any damage to the array plate.

Note: Refer to the appropriate assay user guide or the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569) for detailed steps to recover or resume a process. The procedures listed here are summaries of the more detailed procedures.

Procedure for recovering a process

1. Resume power.
2. Initiate another run. For this procedure see the *Applied Biosystems™ GeneChip™ Command Console™ User Guide* (Pub. No. 702569).
3. If required the AGCC application will prompt you to remove the plates. Follow the unload plate procedure in the AGCC application.

Saving the Process

The connected UPS will maintain power to allow you to perform an appropriate recovery procedure to recover the array plate at the following certain process steps.

You can resume the process at the following process steps.

- At the hybridization step

  The instrument removes the array plate from the oven and places it on drawer 1 (Figure 3 on page 13). Plates remain in the drawers available for the user to initiate an unload process from the setup tab.
- At the wash/stain step

  The instrument unloads the array plate to its scan tray. Plates remain in the drawers available for the user to initiate an unload process from the setup tab.
- At the imaging step
- The instrument aborts the imaging. The Imaging Device unloads the array plate and transfers the array plate into the GeneTitan MC Instrument where they remain in the drawers available for the user to initiate an unload process from the setup tab.

If the GeneTitan MC Instrument System was processing two array plates during a power failure the instrument performs the combination of all three procedures above to recover all the array plates from the instrument.

IMPORTANT! If you cannot restore power to the GeneTitan MC Instrument System a trained service technician must manually recover the array plate. This recovery procedure may require the disassembly of the instrument such as the front or side panel to gain access to the instrument.

Resuming the process

If you were able to recover the array plate at the hybridization or imaging process steps the software will allow you to continue to process the array plate.

Note: Refer to the appropriate assay user guide for the resuming the process on the GeneTitan MC Instrument System. The information provided here is a brief summary of the actual resume process.

IMPORTANT! If you recovered the array plate at the Wash-Stain process steps you cannot resume the Wash-Stain process at the step where the power failure occurred.

UPS low battery condition

During a run if the UPS internal battery falls below 50% charge level, then any running processes are automatically aborted and the instrument moves the plates to the front of the system to wait for you to unload the plates and continue elsewhere.

If an array plate/hyb tray combo is in the hybridization oven the instrument moves it to the output location in drawer 1 (Figure 3 on page 13 position left or right). You will normally remove the plate to an offline hybridization oven and after hybridization

return the plate to the instrument and resume the run on the instrument using the **Wash-Scan** mode of operation on the GeneTitan system.

The instrument will move the array plate to the scan tray if the following conditions occur:

1. If the array plate is not attached to the hybridization tray and the plate is in a wash/stain process.
2. If you initiate an abort.
3. If a power outage (with the UPS battery level dropping below 50%) is detected.

then the instrument moves the array plate to the scan tray.

Final Wash A Situation

If the plate was in a final Wash A it is then possible for you to resume the run using the **Scan** mode only. You will need to use your judgment on this as to whether it is worth continuing the run.

IMPORTANT! The system does not have any resume capability from this condition.

Resuming the process from a workstation or application freeze

If the workstation has locked up you must reboot the workstation. If the application has crashed you must relaunch the AGCC application. These stages shall remain in the same positions as before the reboot or the relaunch. Follow these procedures.

1. If the Imaging Device freezes during the imaging of an array plate, relaunch the GeneChip Command Control (AGCC) application. After the application has opened you may initiate imaging of the unscanned wells.
2. If the Imaging Device freezes when the Imaging Device is imaging an array plate while the GeneTitan MC Instrument System is processing another plate, then:
   a. If the other plate is in a fluidic process:
      - Wait until the GeneTitan MC Instrument System completes the wash and stain protocol on the other plate (and ready to image).
      - Reboot the GeneTitan AGCC application.
      - Unload plates.
      - Relaunch and image both plates following the **Scan** mode procedure (See the section "Scan mode" on page 34).
   b. If the other plate is undergoing hybridization:
      - Reboot and relaunch the AGCC application to force the instrument to unload the plate from the oven and to transfer it to drawer 1.
      - Unload the hybridizing plate and finish hybridization offline.
      - Unload and reload the plate that was in the Imaging Device and image the remaining wells.

      IMPORTANT! Relaunching AGCC will cause the Imaging Device plate to eject back onto the drawer location from which it originated.
3. If the workstation or application freezes while the GeneTitan MC Instrument System is processing an array plate in the wash and stain procedure reboot the workstation and relaunch the AGCC application.

4. If the workstation or application freezes while one or two array plates are hybridizing in the oven the power to the controller will continue to maintain the oven temperature. Reboot the workstation or relaunch AGCC application. The software will offer the option of leaving the plates in the oven or removing them for offline hybridization. If you elect to leave the plate in the oven you will need to remove the plates at a later time by again relaunching the AGCC application and by removing the plates using the unload plate command. You can then resume the plate processing using **Wash-Scan** mode (See the section "Wash-Scan mode" on page 34).

Recovering and resuming of up to four plates during a workflow processing error

After a processing error, the recovery of a running process is only possible if you are notified via email, in a timely manner, that such an event has occurred. Make sure that you have enabled the AGCC software application email notification so that you will be notified in the event of a processing error while you are away from the system.

The GeneTitan system may have between 1 and 4 plates in process depending on the type of plates being run. Up to four plates may be in the system during ligation based processes, otherwise the maximum number of concurrent plates is two.

Plate recovery overview

Plate recovery may occur after you initiated a "controlled" abort or after the system experiences an unexpected error condition.

Once you have recovered a plate (removed it from the system), you may resume the process by using the standard modes of operation provided by GeneTitan Instrument Control.

It is important to follow a prescribed order to resume the recovered plates.

1. First resume a currently running fluidic process using **Wash-Scan-Resume** mode.

   Note: In the case where the application was not exited, AGCC 3.0 GeneTitan Instrument Control does not currently allow starting a fluidic process when two plates are already in the oven. If this is the case at least one plate in the oven will need to be aborted and moved to an offline oven to complete hyb and later resume with Wash-Scan mode.
2. Scan
   a. Scan a recovered plate now or
   b. If the scan will interfere with starting the fluidic process for a plate coming out of hyb hold it in cold storage until the end of these recovery/resume steps
3. Resume the "oldest" plate from a hyb recovery using **Wash-Scan** mode (only after hyb time is completed).
4. Resume the last plate from a hyb recovery using **Wash-Scan** mode (only after hyb time is completed).
5. Scan a recovered plate if skipped at step 2 due to time constraints.

After completing these steps the system is available to start normal workflow processing of up to 2 or 4 plates (depending on the product type).

User controlled abort of array plates in process

You may initiate a plate abort by using the GeneTitan STOP button (in the upper left corner of the GeneTitan Instrument Control application. Table 6 shows the array plate locations when you initiate an abort and when the system finally completes the abort.

Table 6 Plate locations during an abort

Plate location when abort is initiated	Plate location when abort completed
Oven position 1 or 2	**Drawer 1:** The clamped plate and sample will be placed onto drawer 1 (left or right side, refer to the System Status tab, Workflow grid under Location)
A gripped HTA plate after plate has been unclamped	**Drawer 2:** The unclamped plate will be placed into the scan tray assigned to the plate id (left or right side, refer to the System Status tab, Workflow grid under Location).
An HTA plate resting on the blue cover during the fluidic processing cover removal step	**Drawer 6:** blue cover - if the HTA plate is on the blue cover when the abort is initiated the plate is left on the blue cover. **Note:** It is recommended that you abort during (and from the end of) a wash or stain step while the plate is still held by the gripper. This will cause the plate to move to the holding buffer in the scan tray which is the preferred interrupt method.
Drawer 2 waiting to scan or in the scanner	**Drawer 2**

System initiated abort of array plates in process

The system may initiate a array plate (or all plates) abort when it detects a processing error such as:

- Improper plate or tray placement detected.
- Gripper failure during a plate or tray move.
- Failure to properly dispose of a tray cover.
- Plate unclamping error.
- Power interruption detected with UPS (battery backup) below 50% power remaining.
- Any other system malfunction.

Depending on the severity of the error detected, the system may try to move the aborted plate(s) to the normal abort locations outlined above (Table 6).

If the error condition is too severe, the plate(s) may be left where they currently reside. You can recover them by restarting GeneTitan Instrument Control after you have resolved the error condition.

Uncontrolled application exit of array plates in process

The GeneTitan Instrument Control application may exit due to unforeseen circumstances such as:

- Computer or instrument power loss.
- USB cable connecting computer to the instrument becomes unplugged.

- User aborts the control application using Windows Task Manager. This is the only option available if the equipment USB connection has been accidentally disconnected during a process.

In these cases the plates will reside wherever they were last placed in the system. A plate may also be in the gripper and in transition from a pick location to a place location. When GeneTitan Instrument Control restarts the plates will be recovered to the standard abort locations.

Recovering and resuming array plates

If the abort or error condition left plates in the system (i.e., not in a drawer and available for unload), then you can remove the plates from the system by restarting GeneTitan Instrument System and the software application.

Recovering and resuming a plate during fluidic processing

In a case where the system may have been interrupted abruptly, there may be Wash B or Wash A already filled when the system starts up. The Wash B may already be at the process temperature and draining would cause a process delay. As an aid to resuming the operation as fast as possible, you have the option to retain the current fills when the system starts up (Figure 20).

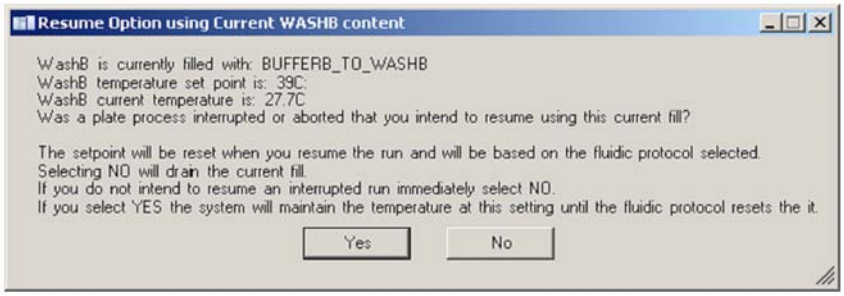


Figure 20 Resume option at Wash B

If you do not intend to resume the run immediately select **No** so the indicated reservoir will be drained. If restarting the run ensure that there is sufficient reagent in each bottle because this draining operation means the reagent will need to refill for the current operation.

The software application will display again this message and option to drain when you restart or resume the run. Select **Yes** if you want to restart the run immediately either in either **Wash-Scan** or **Wash-Scan-Resume** mode operation.

If you start a **Hyb-Wash-Scan** as the next operation, the system will dispose of any saved reagent in the Wash A or Wash B reservoir since the **Hyb-Wash-Scan** protocol starts a new run.

Plate recovery location

If the array plate is actively held by the gripper when the GeneTitan Instrument Control restarts, the system will move it to a scan tray with holding buffer.

If the array plate is on the blue cover when GeneTitan Instrument Control restarts, the system will leave it on the blue cover. You should manually place the array plate onto to a scan tray with holding buffer until ready to resume the process.

Resuming from fluidics

Use **Wash-Scan-Resume** mode to restart the fluidic process. When starting **Wash-Scan-Resume**, you will manually move the plate back from the scan tray to the blue cover for insertion into the system to resume.

Recovering a plate from the oven

Oven temperature

If AC power is supplied to the fluidic system the oven maintains its temperature even when GeneTitan Instrument Control is not running. If power was lost temporarily and then restored, the oven will continue to maintain temperature even before you restart the GeneTitan Instrument Control. The internal temperature controller for the oven resumes automatically as soon as you restore power.

The system opens the oven door only briefly when the gripper moves to pick or place a clamped tray set to/from and oven location. So long as the oven door was not opened when the initial error occurred and any power outage was brief, you may treat the oven temperature as having been maintained continuously throughout the time starting from the error event to the time of the recovery from the oven.

Application startup recovery

Restart the GeneTitan Instrument Control application. If needed you may restart the application twice to clean both plates (normally this will not be necessary and you can recover both plates with one restart). There are two types of plate recovery.

- Plate detected in oven during system startup—clear drawer 1

If the system has a plate on drawer 1, during this recovery the application will prompt you to remove the plate before the recovery can proceed (Figure 21).

Figure 21 Drawer Clearance Message

If you click **No**, the system will not remove the plate from the oven.

If you click **Yes**, the drawer will open for you to remove the plate. Before proceeding to unload the plate from the oven, the following message will be displayed (Figure 22).

Figure 22 Remove Plate Message

Remove all plates from drawer 1 and click **OK**. This will allow you to recover the plate in the oven from drawer 1. Once the system has moved the plate to drawer 1, use the normal Unload operation to unload the plate.

- Plate detected in oven during system startup—recover the clamped plate and sample tray

If the system detects a plate in the oven at startup, the software application displays a warning that there was an error initializing the hardware. This may occur if you used Task Manager to shut down the GeneTitan application or if the computer lost power during a process execution. The message will display the plate number (if known) and current oven settings.

If you click **NO** to the prompt "Do you want to leave the plate in the oven" (Figure 22), the system will move the plate to a target recovery location displayed in the error message (Figure 22). If there are two plates in the oven the system will perform the same process described here for each plate.

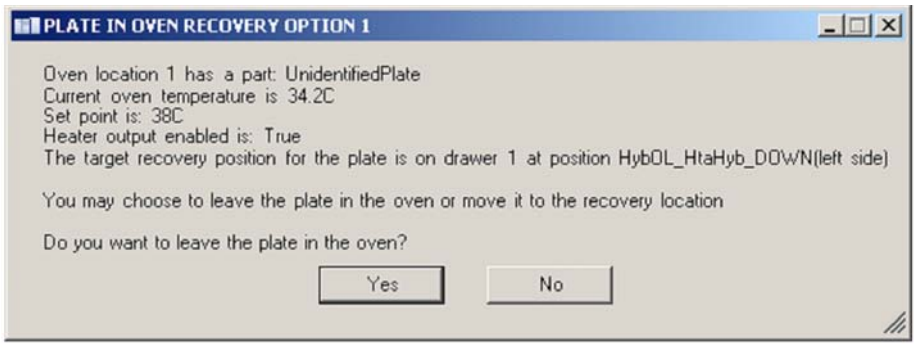


Figure 23 Plate Recovery Option 1

Solution 1—click Yes

- Click **Yes** if you have not resolved the circumstances that caused the malfunction or if you have no offline oven to complete the hybridization. The oven is the safest place to leave a plate while waiting to move on to fluidic processing.
- If you have enabled the oven output, the system will use the set point to bring the oven back into range.

  Note that if the oven itself did not lose power, it will normally retain all settings. The system will maintain temperature control even while the computer lost power from rebooting.
- If the oven lost power, when you restore power, the oven will automatically start to restore the settings displayed by this message (Figure 22) even if you have not launched the GeneTitan application.
- When you have resolved the problem that caused the interruption, restart the GeneTitan Instrument System and the application, and this time select **No** to remove the plate from the oven.

Solution 2—click No

- Click **No** to remove the plate from the oven after the system completes the full hybridization time or for removal to an offline oven.
- Make sure that the plate is finishing hybridizing for the full hybridization time before continuing the process using **Wash-Scan** mode operation.

⚠ **WARNING!** If you choose to leave a plate in the oven, the GeneTitan Instrument Control will not track the plate for you. You must manage and keep track of the plates in the oven and not start another hybridization until you have recovered all the plates from the oven.

Recovering and resuming an array plate in the Imaging Device

If the system detects a plate in the Imaging Device at startup, the system will move the plates from the scanner to drawer 2. If the required position on drawer 2 is not available, then you will be prompted to clear drawer 2 with the following messages (Figure 22).

Figure 24 Clear drawer messages

Use **Scan** mode operation to continue scanning arrays that have not yet been scanned.

4 Care and troubleshooting

GeneTitan™ Multi-Channel Instrument System care

This chapter provides instructions on caring for and maintaining the instrument and on troubleshooting if problems arise.

- Always run a **Shutdown** protocol when the instrument will be off or unused overnight or longer. This prevents salt crystals from forming within the Fluidics system.
- Always use deionized water to prevent contamination of the lines. Change buffers with freshly prepared buffer at each system startup.

The GeneTitan MC Instrument System should be positioned on a sturdy level bench away from extremes in temperature and away from moving air. See *GeneTitan™ Multi-Channel Instrument Site Preparation Guide* (Pub. No. 08-0305) for details.

IMPORTANT! Before performing maintenance turn off power to the instrument system to avoid injury in case of an electrical malfunction.

Cleaning and maintenance

The GeneTitan Multi-Channel (MC) Instrument System requires little in the way of customer maintenance. The instruments must be kept 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.

The following tasks should be performed regularly to ensure the Imaging Device remains in working order.

Monthly

Wipe down the outer surface of the Imaging Device with a dry cloth.

Every six months

Replace the cooling fan air filters at the rear of the instrument.

Replace the Micropore filters in the Wash A, Wash B, and Rinse bottles. Thermo Fisher Scientific will supply the current part number by email.

Servicing the outer enclosure fan filters

Cleaning schedule

The GeneTitan fan filter cartridge (Figure 25) should be cleaned at least every 90 days of service. Note that in some service locations, the presence of excessive dust or particulate matter may necessitate cleaning the cartridge more often than 90 days.

A plugged filter cartridge can cause excessive temperatures within the machine that can cause unwanted evaporation on test media.

Part details:

Applied Biosystems Cat. No.: 01-0669

Number of parts per assembly: 3

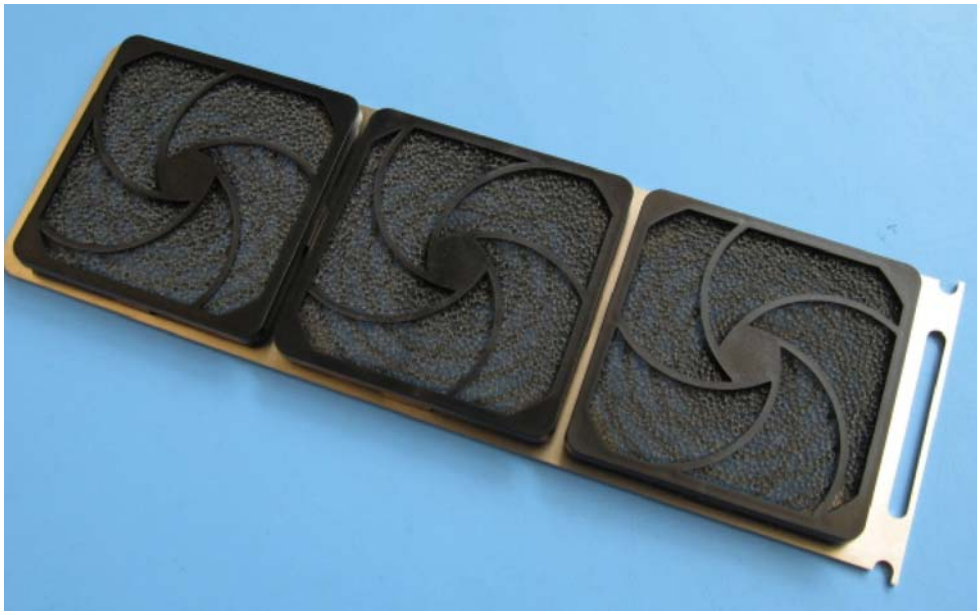


Figure 25 The GeneTitan filter cartridge

Cleaning procedure

1. Slide the filter cartridge from the fan filter cartridge at the rear of the GeneTitan Instrument System. See Figure 4 on page 14 for the location.
2. Submerse in clean DI water. Rinse and agitate gently to dislodge material.
3. Remove from water and dry with clean compressed air or towels.
4. When the filter cartridge is completely dry to the touch, re-install the cartridge.

Replacing the bottle filters

The procedure for replacing them is simple.

The GeneTitan MC Instrument System software is equipped with a filter monitor. The ability of the filters in the reagent buffer bottles, to properly filter the reagents and DI water is evaluated each time at application startup. If the application determines a flow rate problem that is the result of a dirty filter, the operator will be presented with a warning dialog box. While the operator is NOT prevented from using the GeneTitan application for further array plate processing, we strongly recommend that all three filters are changed when the filter status monitor detects a problem with the filters. Dirty filters can affect the data quality.

The monitor uses the record of time remaining before time-out for each dispense type operations from the Wash A, Wash B, or DI Water bottle to the appropriate reservoir. The software will log the time and date that the filters are replaced after the user follows the directions in the alert message boxes that are displayed when the system detects a problem with the filters.

The Warning message boxes are titled “Filter Change Required” with the appropriate dispense operation indicated in the message. The software will display a separate warning message for each of the 3 filters in the GeneTitan MC Instrument System. In

addition, the software will also trigger an email if the user has selected to receive email messages for "System Errors". Refer to the email configuration section to configure the email editor.

Part details:

Applied Biosystems Cat. No.: 01-0671

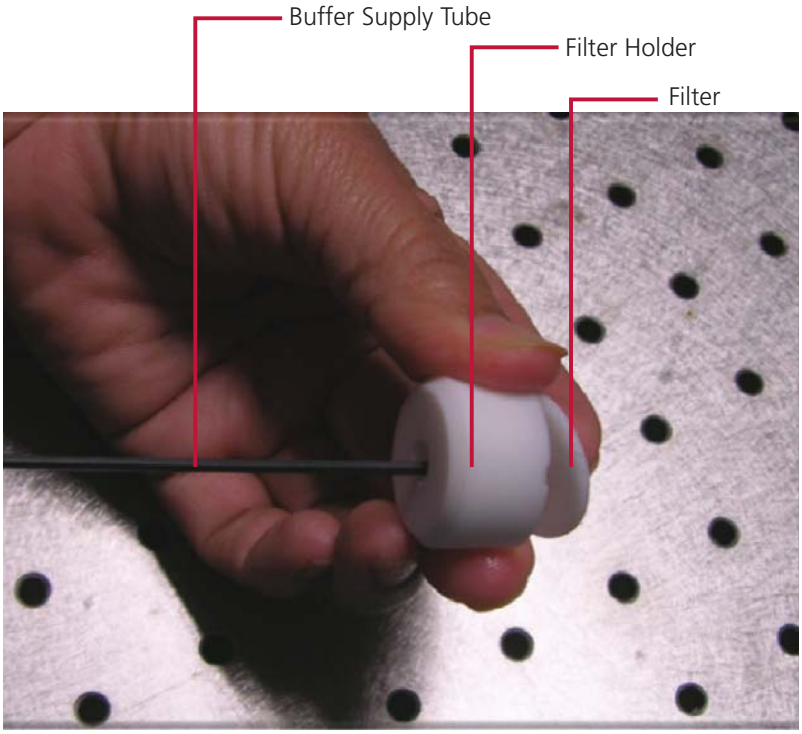


Figure 26 Replacing the Filter

Removing and inspecting the filter

1. Loosen and remove the cap on the bottle.
2. Carefully remove the filter from the end of the filter body.
3. Visually inspect the filter. If one of the filters appears to have a concentration of dirt or contaminate in it, discard it and obtain a new one.

Replacing the filter

1. Insert the filter into the end of the filter body.
2. Replace the cap onto the bottle and tighten it.
3. Repeat for each bottle.

IMPORTANT! Replace one filter at a time to ensure the correct connection of the buffer supply tube to its respective bottle. The color of the buffer supply tubing matches the bottle color code.

Troubleshooting

This section provides instructions on how to identify and solve simple problems with the GeneTitan MC Instrument System. If a problem or error occurs that is not listed in this chapter, contact Thermo Fisher Technical Support for assistance.

For software errors that do not involve hardware crashes the most common solution is to shut down the application and then restart it. If the same error occurs shut down both the application and the computer and then restart. If it still occurs shut down the GeneTitan MC Instrument System and then restart.

Log files

The log files are produced by different AGCC 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. These files may be requested by your Field Application Scientist (FAS), Field Service Engineer (FSE), or Thermo Fisher Technical Support.

AGCC log files

The following files apply to the GeneTitan Instrument Systems. All the AGCC log files from C:\Command_Console\Logs The different log files include:

Systemlog.XML	XML file with system information.
DEC.log	Text file with information on the use of the Data Exchange Console.
DECError.log	Text file with information on errors created while using DEC.
AGCC_LibFileImporter. log (with date and time code)	Text file with info on use of the Library File Importer.

Other AGCC files

Your FAS and/or FSE may request you to send the following files for troubleshooting:

1. Library files (*.PARAMS, *.MASTER, *.WORKFLOW, *.SMD, *.MEDIA) located in C:\Command_Console\Library, excluding the large analysis library files (CDF, PSI, GRC).
2. Provide a list of all sub folders and their contents under the library files folder located in C:\Command_Console\Library. Please ensure there are no duplicate library files, as these can cause problems.
3. AGCC system configuration file located at C:\Command_Console\Configuration\Calvin.System.config
4. Pending job order files located in C:\Command_Console\Jobs
5. Other AGCC related information, such as:
    a. The number of files under C:\Command_Console\Data, including sub directory.
    b. If the system is a networked system or a standalone system.
    c. Other applications installed on the system, such as antivirus application, MS Office, Internet Explorer versions.

AGCC Log Files for GeneTitan™ MC Systems

Log files for the GeneTitan MC Instrument Control processes are placed in subdirectories of the Command Console\Logs\ folder. Thermo Fisher Technical Support may need the following files for troubleshooting:

GeneTitan MC Fluidics

1. C:\Command_Console\Logs\96F\
   a. subdirectories named by date (e.g., Log7-29-2009)
      - Collect all dated directories and contents since the GeneTitan application was started, not just the date of the event (some logging goes into files from the date the application started so this can be critical for us).
      - Absolutely required are all the log directories from the date the run was started to the date of the event.
2. C:\Command_Console\Logs\96F\FluidicErrorLog - all files in this directory

GeneTitan MC Imaging Device

1. C:\Affymetrix\GeneChipHTScanControlMC\Log - collect all dated directories and contents since the GeneTitan application was started
2. C:\Affymetrix\GeneChipHTScanControlMC\RunLog - collect all dated directories and contents since the GeneTitan application was started

Problems and solutions

This section provides instructions on how to identify and solve problems with the unit.

If problems arise with the instruments use the following tables to locate the description that matches the problem. If you cannot find a solution contact Thermo Fisher Technical Support for assistance.

For software errors that do not involve hardware crashes the most common solution is to shut down the application and then restart it. If the same error occurs shut down both the application and the computer and then restart. If it still occurs shut down the entire unit and then restart.

Insufficient disk space notice

If there is not enough memory on the computer's drives to save the data from an array plate, a notice appears when:

- You first initialize the software and instrument.
- You select arrays for imaging.

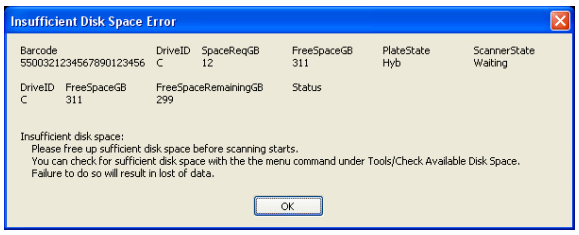


Figure 27 Insufficient Disk Space notice

If you see this notice, you will need to free up sufficient disk space before imaging starts.

Resetting the lamp life clock

The GeneTitan MC uses a xenon arc lamp system to provide illumination for imaging the array at two wavelengths. The xenon lamp has a limited lifetime and needs to be replaced at regular intervals.

The GeneTitan Instrument Control software provides a timer that indicates the remaining useful light of the bulb and notifies you when it requires replacement.

The replacement procedure is described in "Replacing the xenon lamp" on page 55. After replacing the bulb, you will need to reset the time, as described below.

If life of bulb is under a specified limit, the following notice appears when you open the software (Figure 28):

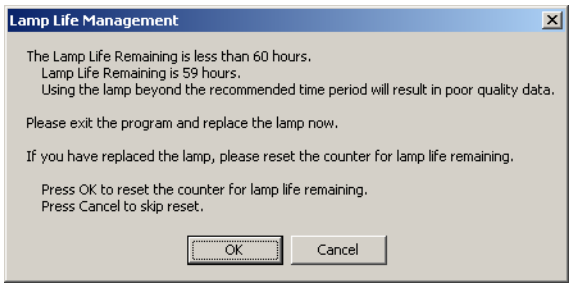


Figure 28 Lamp Life Management notice

If you click **OK**, the confirmation notice appears:

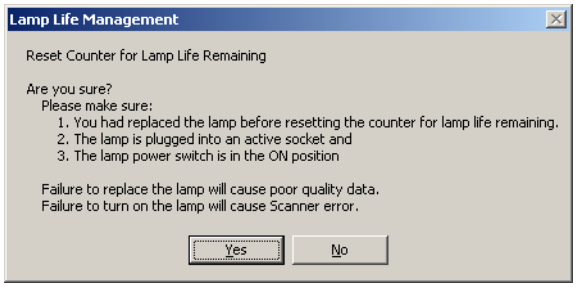


Figure 29 Reset dialog box

Click **Yes** to reset the lamp life timer to the specified time.

Click **No** to cancel.

Problems and solutions

The following tables list possible problems and their solution that you might encounter in the use of the GeneTitan MC Instrument System.

Problems with power

Table 7 lists common power problems and possible solutions.

Table 7 Common power problems and possible solutions

Problem	Probable cause	Possible solutions
The instrument cannot be powered up or does not start up properly.	**Cause 1** Power has been disconnected.	• Check the connections to facility power and UPS power. Confirm that they are secure. • Shut down and restart the application. • Shut down and restart the computer. • Shut down and restart the Imaging Device by unplugging and reconnecting the power cord on the back of the unit **Do not use the power switch located on the front of the Imaging Device.** • Shut down and restart the Fluidics Station by unplugging and reconnecting the power cord on the back of the unit.
	Cause 2 USB cables are unplugged or plugged into wrong USB port or USB memory stick placed on system by user	• Exit the application. • Properly eject any user-inserted memory stick that may have been inserted into the computer's USB ports. • Confirm that the USB connections to the labeled USB ports for the Imaging Device, Fluidics Station, and UPS are correct. • USB connections should be to the correct (labeled) USB port (the ports cannot be moved). • Verify drive G: is connected and the directory, G:\tasks appears in windows explorer. • Verify drive F: is connected and the directory F:\HT96 Fluidic Tasks appears in Windows explorer. • Verify the Windows Control panel>Device manager>Ports lists COM3 COM4 and COM5 where COM4 and COM5 are listed as a “Prolific USB to Serial Comm Port”. If all three ports do not show up recheck USB connections. Close and re-open device manager to refresh the IO list when new connections are made. **DO NOT** reassign port addresses using device manager. Contact Thermo Fisher Scientific Field Service Engineer if connections are verified but the ports do not appear as indicated. • Re-launch the user application.

Problems with plates

Table 8 shows possible problems dealing with the array plates. This includes what to do if a power failure or user initiated power shutdown leaves array plates in the instrument or if you have left a plate in the hybridization oven during the GeneTitan AGCC application startup.

Table 8 Recovering plates from the instrument system

Problem	Probable cause	Solution
Array plates are trapped in the instrument.	Power loss or abnormal application exit for any reason leaves plates in the system.	1. Exit and restart the GeneTitan AGCC application. 2. Wait for flashing blue light on the confirmation button to stop and homing to complete. 3. Respond to dialog box prompts and/or questions about plate disposition that may occur before, during or after the stage homing sequence. 4. At the end of the startup/homing routine the instrument will return all plates to the front of the system unless you select to leave a plate in the oven. When homing is complete, run **Unload Plates** from the setup tab to remove plates from the system.
Plates are left in the hybridization oven during the GeneTitan AGCC application startup.	If a plate is in the oven, the user is offered the option to remove the plate or leave it in the oven during application startup. In response to this prompt, the user may choose to leave plate(s) in the oven during the program startup homing routine (allowing hyb to complete in the oven). The plate hyb time is no longer controlled by the software.	1. Wait until the hybridization procedure has completed then re-start the application. 2. This time, select the option to remove the plate from the oven when the GeneTitan AGCC application prompts as part of the homing/ startup routine. 3. You may restart the GeneTitan AGCC application at any time to remove the plate and move the hybridization to an off-line oven to complete the hybridization process. 4. You may later resume the process by starting the plate in **Wash-Scan** mode (normal operation for off-line hyb mode processing).

Problems with Fluidics solutions

Table 9 shows possible problems dealing with the buffer and DI water bottles.

Table 9 Problems related to wash and rinse bottles

Problem	Probable cause	Solution
GeneTitan AGCC application reports that bottle pressure is too low during a run or at startup.	Missing reagent bottle or bottle cap not secure.	1. Verify that all bottle caps are installed on the correct bottle and that they are snug. 2. Check that the facility clean dry air supply (CDA) pressure is up and running. 3. Select **Retry** to continue processing or **Cancel** to abort the run.
GeneTitan AGCC application reports that the Prime has failed for Rinse, Wash A or Wash B	• Missing reagent bottle • or cap not secure • or low facility pressure • or reagent bottle empty • or clogged filter	1. Verify that all bottle caps are installed on the correct bottle and that they are snug. 2. Check facility CDA pressure is up and running. 3. Verify that the reagent bottle is not empty. 4. Replace the filter if all other options do not resolve the issue. 5. Select **Retry** to continue processing or **Cancel** to abort the run.

Lambda LS xenon maintenance

Replacing the Lambda LS xenon fuse

In the event that the lamp fails to power up when the power switch is turned on check the line power fuse to see if it has blown. The fuse is located in a pry-out holder on the power entry module on the back of the lamp (Figure 30).

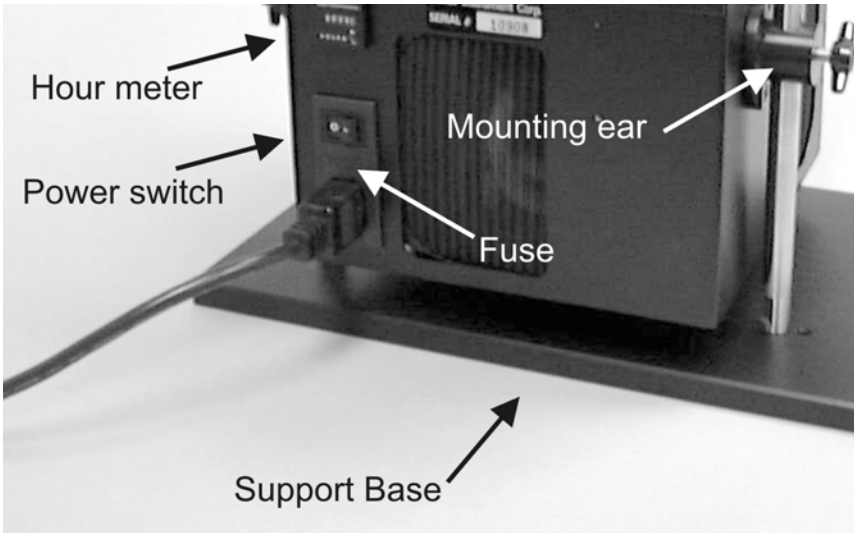


Figure 30 Lambda LS Xenon Arc Lamp back panel

1. Unplug the power cord from the power entry module. This will reveal a slot just under the edge of the fuse holder (Figure 30 and Figure 31).

2. Use a screwdriver to pry the holder straight out of the power entry module. The fuse that is readily visible in the fuse holder when you take it out is the one that is "active" when the holder is installed. A spare fuse is also stored within the fuse holder. It is concealed in a compartment as shown in the figure.
3. To remove the spare fuse press down on the end of the compartment and push it out of the other end. The old fuse can serve as a convenient tool for pushing the spare fuse compartment out.
4. Replace the active fuse with the spare and re-install the fuse holder and power cord. If the lamp fails to power up with the new fuse installed, call Thermo Fisher Scientific Instrument technical support personnel for assistance.
5. Replace with: 5 Amp 250V 5 x 20mm Time Delay fuse (EIC 60127-2). Examples: Bussmann GDC-5A or S506-5A (RoHS) or Littelfuse 218.005 or 218.005.P (RoHS)

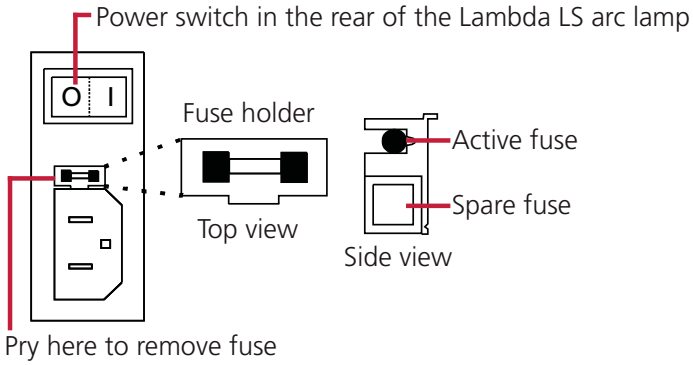


Figure 31 Removing the fuse

Replacing the xenon lamp

After the normal life expectancy of the lamp has expired the software application will alert you to the requirement to replace the lamp. This procedure is simple but you must follow good health and safety precautions.

Applied Biosystems Cat. No.: 01-0740

Lamp life/imaging device status notices

The Imaging Status pane displays lamp life and Imaging Device status notices for the GeneTitan MC.

In normal operation, the pane displays the hours of life left in the lamp:

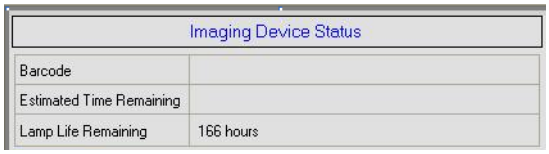


Figure 32 Lamp Life above tolerance

It displays a red or yellow notice when the lamp life is getting short:

Figure 33 Lamp Life above tolerance

It also displays a red notice when the Imaging Device is offline:

Figure 34 Imaging Device Off-line

Note: The 300 watt xenon lamp in the GeneTitan MC Instrument is warranted for 500 hours. To replace the lamp refer to the instructions in the GeneTitan Instrument user guide. After changing the lamp, it is necessary to reset the lamp life clock manually. See "Resetting the lamp life clock" on page 51 for more information about the clock.

⚠ **WARNING!** You must turn off the lamp using the power switch in the rear of the unit (Figure 30) and remove the power cord. Allow the lamp to cool before attempting to replace the lamp.

Removing the xenon lamp

1. Unscrew the four retaining bolts. They should be finger tight (Figure 35).

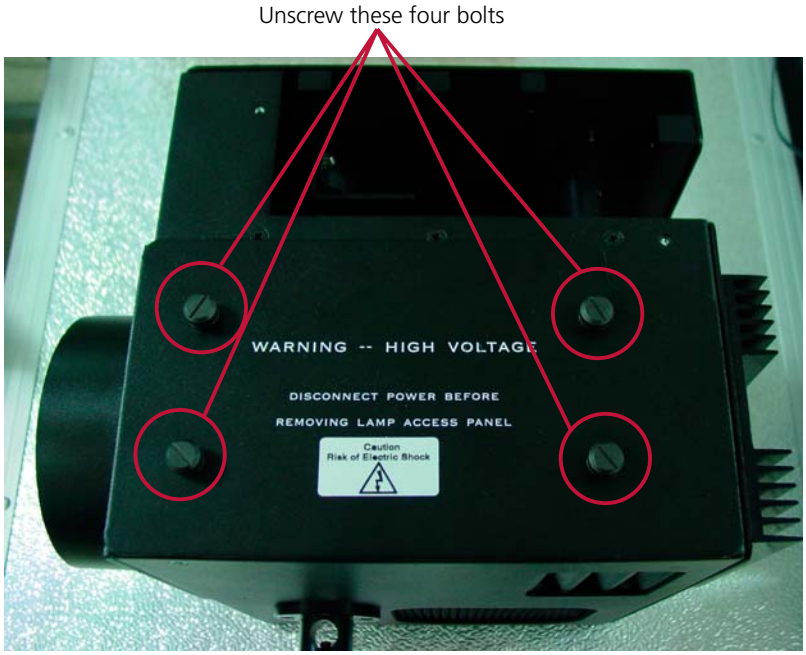


Figure 35 Unscrewing the bolts

2. Place each hand on each side of the blue plastic flange and lift out the lamp in a vertical motion (Figure 36). You must use both hands to remove the lamp successfully. Apply equal pressure on each side of the lamp and gently lift.

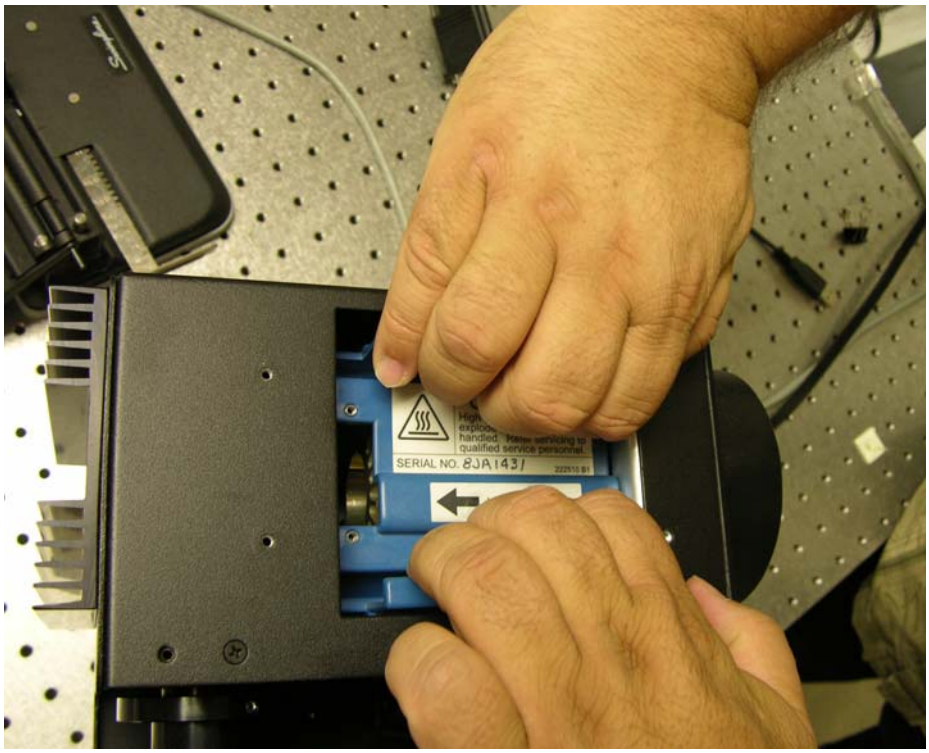


Figure 36 Lifting out the lamp

Replacing the lamp

⚠ **CAUTION!** Ensure that you install the lamp in the correct orientation.

1. Hold the lamp by the blue plastic flanges. Ensure that the lamp bulb faces inward toward the reflecting mirror (Figure 37) and vertically insert the lamp (Figure 38).
2. Replace the warning cover and hand tighten the bolts (Figure 35).

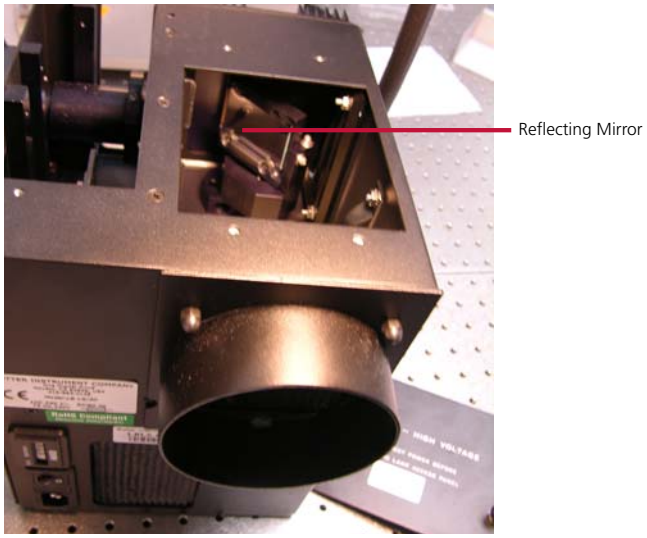


Figure 37 The reflecting mirror

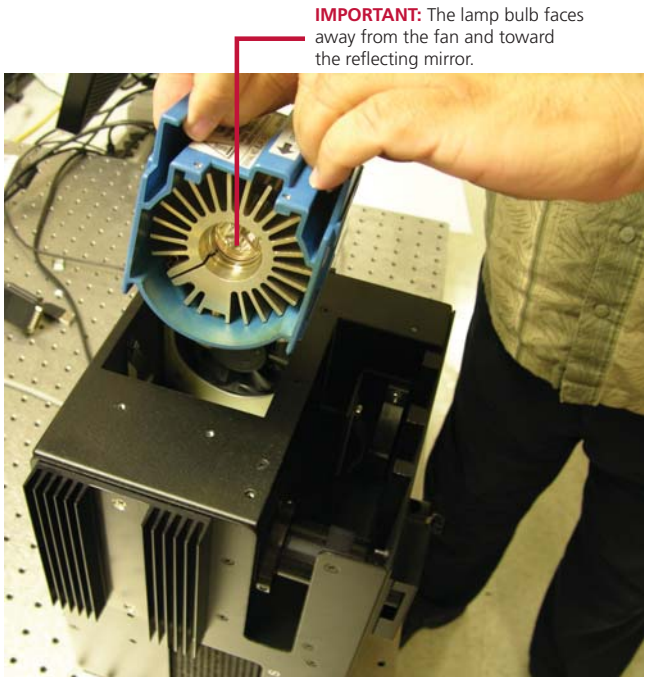


Figure 38 Inserting the lamp

Resetting the lamp counter

You must alert the software application that you have replaced the lamp so that the hours of the lamp counter are reset to zero.

1. On the software application click **Tools** → **Reset Counter for Life Remaining** (Figure 39).

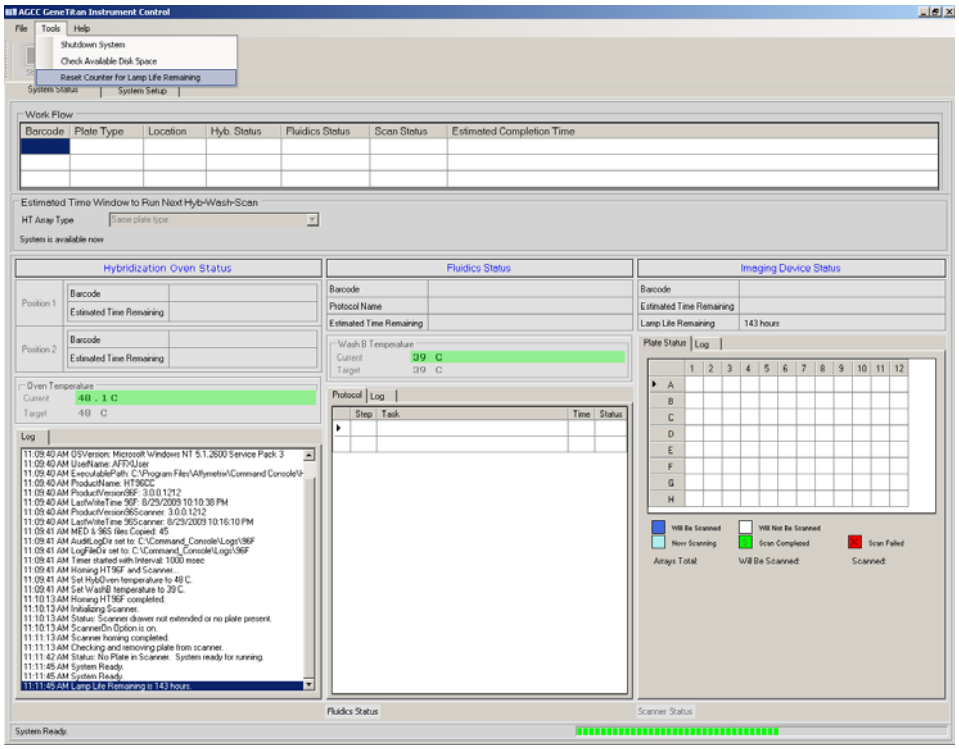


Figure 39 Inserting the lamp

2. The software will display a message that allows you to change your mind.

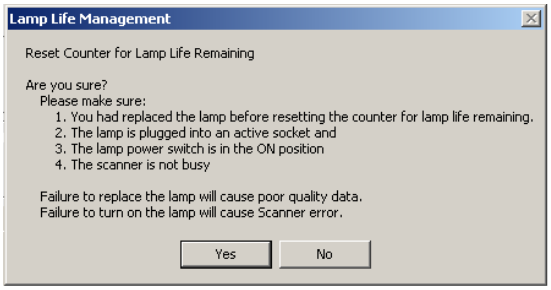


Figure 40 Are you Sure?

3. Click **Yes** if you want to reset the counter. The software will display a message that confirms that the software has reset the counter.

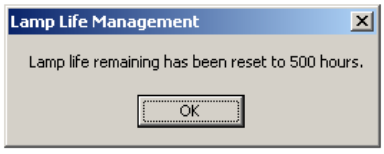


Figure 41 The counter is reset.

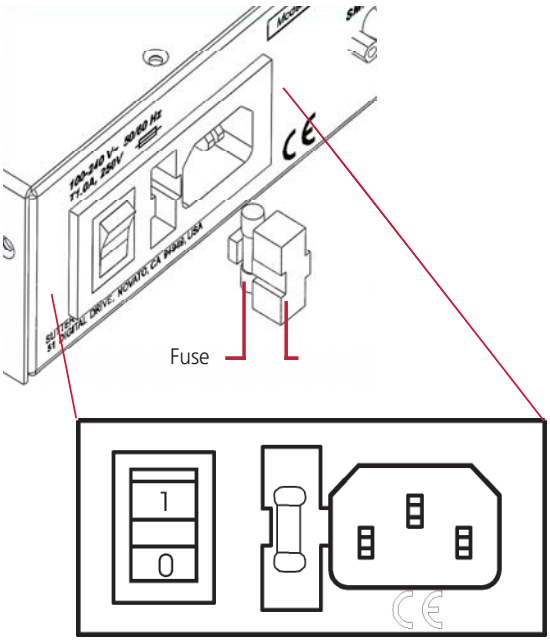
Lambda SC controller maintenance

Replacing the Lambda SC controller fuse

In the event that the controller fails to power up when the power switch is turned on check the line power fuse to see if it has blown. The fuse is located in the fuse holder on the power entry module on the back of the controller (Figure 42).

Use a fuse with the following specifications: 5 x 20 mm glass tube T1.0A 250V IEC 60127-2 Sheet III (such as a Bussmann GDC-1A or Littelfuse™ 218 001).

1. Remove the fuse holder by first unplugging the power cord from the power entry module. This will reveal a slot just under the edge of the fuse holder.
2. Use a screwdriver to pry the holder straight out of the power entry module. The fuse that is readily visible in the fuse holder when you take it out is the one that is "active" when the holder is installed.
3. A spare fuse is also stored within the fuse holder. It is concealed in a compartment as shown.
4. To remove the spare fuse press down on the end of the compartment to push it out of the other end. The old fuse can serve as a convenient tool for pushing the spare fuse compartment out.
5. Replace the active fuse with the spare and re-install the fuse holder and power cord. If the controller fails to power up with the new fuse installed call Thermo Fisher Scientific Technical Support personnel for assistance.



Power switch, fuse and power connection

Figure 42 Removing the fuse

Error messages

Table 10 lists various error messages. Messages may occur as a result of normal operation of the GeneTitan system and are also used to report error conditions to the user. This document outlines the most common message boxes the user may encounter (normal operation as well as potential errors). Practical recovery methods are detailed were recovery is possible by the user.

Using AGCC Email notification with GeneTitan™ MC Instrument System

Email notification

Once you configure the email with contact and notification information, the software sends the email notification concurrently as the software displays the dialog box.

Message boxes that occur when the user is already present generally are not sent out through AGCC email since the user is already present to be notified by a dialog box prompt. Messages that occur as a result of an error while processing on GeneTitan are usually sent out via email configured through the AGCC email configuration editor. Since the user is not likely present this is the best way to alert the user to a problem in a timely manner.

It is strongly urged that users keep at least one "on call" email contact in the AGCC email configuration editor to respond to an event requiring user intervention.

Email contact can include a cell phone to receive the email as a text message (e.g., 4151234567@att.mms.txt).

Context specific messages

Context specific error messages exist in the software that will be tailored to an error condition occurring in specific process steps. It is not possible to list all possible combinations of events here.

In certain cases the error message will be shown to alert the user but the process may attempt to continue without waiting for acknowledgment. This is done to try to ensure that a condition occurring on one plate will not affect processing for other plates.

If the error requires a specific user response processing for all plates may suspend at the next logical "pause" point for each plate being processed.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages

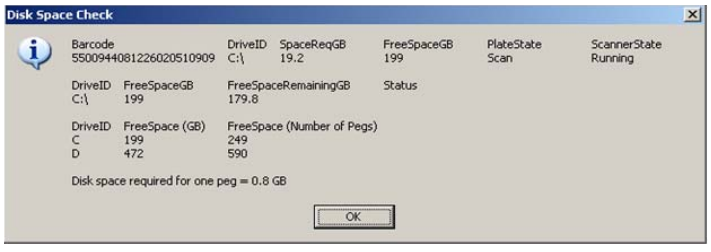
Message	Meaning
MachineName: 3380-GT-J67FBK1 OSVersion: Microsoft Windows NT 5.1.2600 Service Pack 3 UserName: AFFXUser ProductName: HT96CC ProductVersion: 3.0.0.1212 Application launch: 9/3/2009 11:42:18 AM	Help About
	Disk Space Check

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

Message	Meaning
	F drive missing Symptom: The system gives a warning that the F: drive was not found when the GeneTitan application starts up. The following message will appear. “Close the GeneTitan application immediately (there is no need to wait for scanner initialization to complete). • Make sure all USB connections are made between the scanner, fluidic system, computer and UPS power backup. • Remove any external USB memory drives that are not normally connected to the system. • Reboot the computer. • Verify the F: drive is mapped and the directory F:\HT96FluidicTasks, exists. If it does not, relay this information to field service. • Verify the file named F:\HT96FluidicTasks\Affymetrix\HT96FluidicTasks.CSV exists. If it does not, relay this information to field service. **WARNING:** When using the Windows “Safely Remove Hardware” feature to remove a memory stick, never select the F: or G: drive. F: is required by the fluidic system. G: is required by the scanner.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

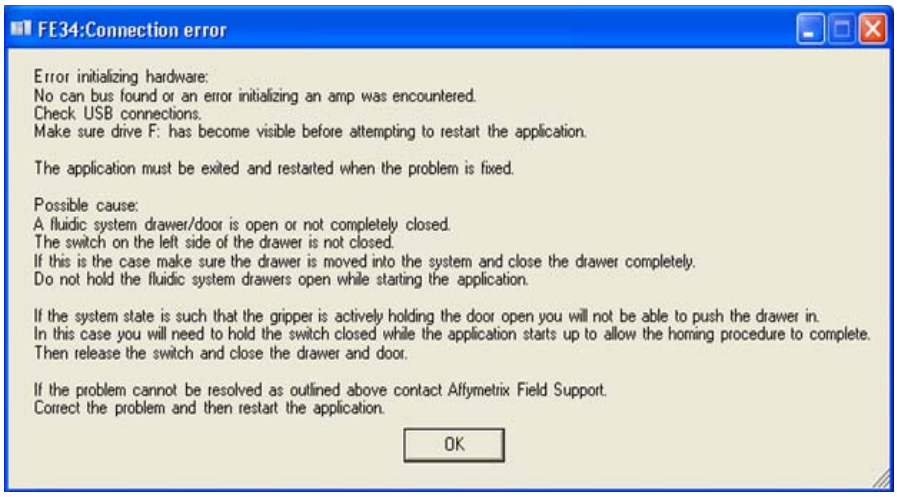
Message	Meaning
	Error initializing hardware Symptom: The system gives a warning that there was an error initializing the hardware when the GeneTitan application starts up. The following message will appear (note: formatting of this message produces a message box larger than the screen and will be corrected in a future release). Other more specific error messages will normally present after this general error message. They are for field service reference if the solution listed below is unable to resolve the startup issue. Likely cause: USB disconnected, no power or a safety mechanism (front panel door switch open or trash bin missing Solution: • Close the GeneTitan application immediately (there is no need to wait for scanner initialization to complete). • Make sure all USB connections are made between the scanner, fluidic system, computer and UPS power backup. • Remove any external USB memory drives that are not normally connected to the system. • Reboot the computer. • Log into the AffxUser account. • If the trash bin has been removed from the system, replace it into its normal location. • If a drawer is visibly open before the GeneTitan Instrument System starts up, hold down the switch on the left side of the drawer while starting the GeneTitan Instrument System.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

Message	Meaning
	Temperature Controller failed to Initialize This message may appear after the “error initializing hardware” message box. It can usually be cleared following the instructions above. If this message appears by itself without any of the other stage initialization errors being displayed, then there may be a problem with the temperature controller com port. If this is the case contact, Thermo Fisher Scientific Field Support Engineer.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

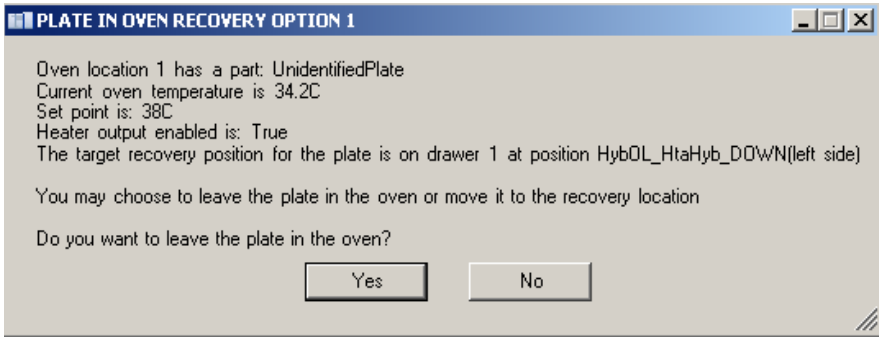
Message	Meaning
	Plate detected in oven during system startup Symptom: The system gives a warning that there was an error initializing the hardware when a plate is detected in the oven at startup. This may occur if the user used task manager to kill the GeneTitan application or the computer lost power during process execution. The message will display the plate number (if known) and current oven settings. A target "place" location is shown where the plate will be moved to when the user selects **No** to the prompt "*Do you want to leave the plate in the oven*." If there are 2 plates in the oven, the process described here will be performed for each plate. Solution 1 (select **Yes**): • Select **Yes** if you are not ready to deal with the circumstances that caused the malfunction or if you have no offline oven to complete the hyb. The oven is the safest place to leave a plate while waiting to move on to fluidic processing. • If the oven output is enabled, the set point will be used to bring the oven back into range. • Note that if the oven itself did not lose power, it will normally retain all settings and temperature control would have been maintained even while the computer lost power from rebooting. • If the oven lost power, then when power is restored, the oven will automatically start to restore the settings displayed by this message even if the GeneTitan application is not launched. • When the problem that caused the interruption is resolved, restart the GeneTitan Instrument System and this time select **No**.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

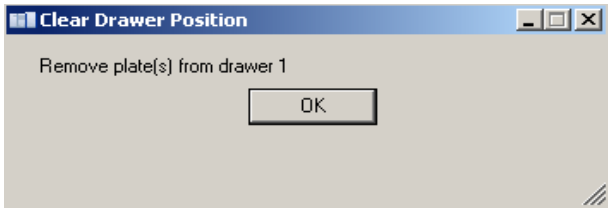
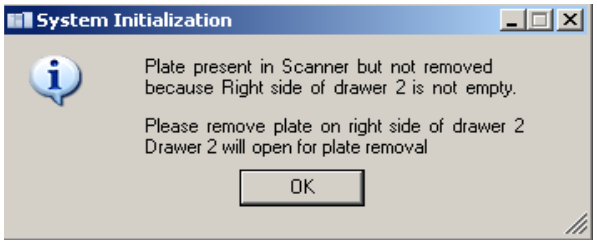
Message	Meaning
(Continued)	Solution 2 (select **No**): • Select **No** to remove the plate from the oven after the full hyb time is completed or for removal to an offline oven. • Make sure the plate is finishing hybing for the full hyb time before continuing the process using **Wash-Scan** mode operation.
 	Plate detected in oven during system startup. If the system has a plate on drawer 1 during this recovery, the user will be prompted to remove the plate before the recovery can proceed. The adjacent message is displayed. If **No** is selected, the plate will not be removed from the oven. If **Yes** is selected, then the drawer will be opened and the following message will be displayed. Remove all plates from drawer 1 and select **OK** to resume recovery of the plate in the oven to drawer 1. Once the plate is in drawer 1, use the normal Unload operation to unload the plate.
 	Scanner drawer needs to be cleared at startup If a plate is detected in the scanner at startup, the system will move the plates from the scanner to drawer 2. If the required position in drawer 2 is not available, then the user will be prompted to clear drawer 2 with the adjacent messages.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

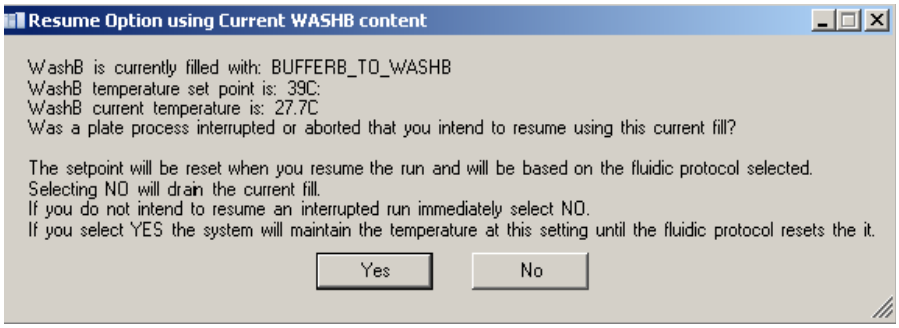
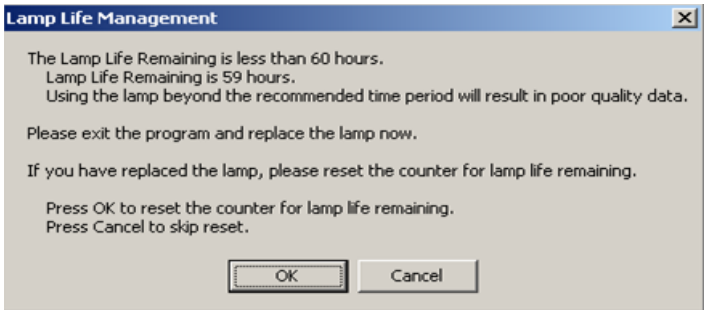
Message	Meaning
	Resume option for filled Wash A or Wash B detected at startup. In a case where the system may have been interrupted abruptly, there may be Wash B or Wash A filled already when the system starts up. The Wash B may already be at the process temperature and draining would cause a process delay. As an aid to resuming the operation as fast as possible, the user is provided the option to retain the current fills when the system starts up. If you do not intend to resume the run immediately, select **No** so the indicated reservoir will be drained. If restarting the run, be sure there is sufficient reagent in each bottle since this draining operation means the reagent will need to refill for the current operation. This message and option to drain will be presented again when the run is restarted or resumed. It only makes sense to select **Yes** if you will restart the run immediately either in either **Wash-Scan** or **Wash-Scan-Resume** mode operation. If a **Hyb-Wash-Scan** is started as the next operation, any “saved” reagent in the Wash A or Wash B reservoir will be disposed of since **Hyb-Wash-Scan** starts a new run.
	Lamp life remaining less than 60 hours. This message will be displayed when the lamp life is expiring. Click **OK** if you changed the lamp prior to starting the GeneTitan Instrument. This resets the lamp life counter. Click **Cancel** if you have not replaced the lamp.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

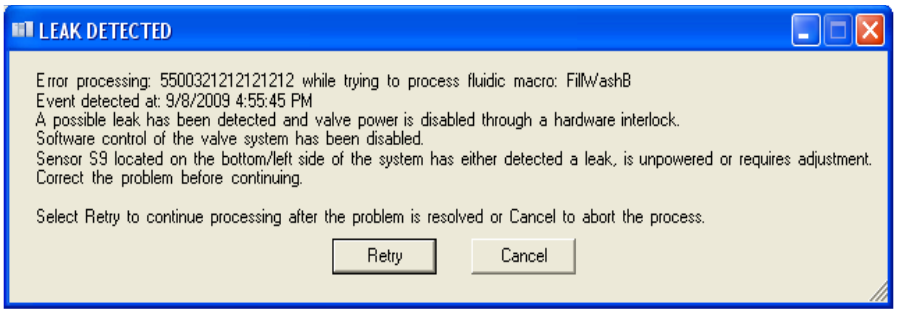
Message	Meaning
	Leak Detected. Leak checks are performed at application startup and any time a fluidic process (priming, filling, draining etc.) is performed. The leak detection is a hard wired sensor, which will shut off fluid flow without software control. Leaks are normally confined to the drip pan located inside the system. Causes: System malfunction caused by the user killing the application using task manager during a fill operation resulting in application exit without stopping flow. Solution: Contact Thermo Fisher Scientific Field Service Engineer. The system cannot be used for any fluidic processing until this is resolved.
	Normal exit. If the user attempts to exit the GeneTitan Instrument System when no processes are running, the normal application exit message will be displayed:
	Exit while processes running. If the user attempts to exit the GeneTitan Instrument System when processes are running, the user is prevented from exiting. Before attempting to exit the running, processes should be aborted using the STOP button.
	Running Shutdown. The Shutdown menu available from the tools menu drop-down explains the special steps it takes before closing the application.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

Message	Meaning
	Shutdown while processes running. If the user attempts to shut down the GeneTitan Instrument System when processes are running, the user is prevented from exiting. Before attempting to exit, the running processes should be aborted using the STOP button.
	Abnormal application exit. If the application exits unexpectedly quits in a controlled manner, the reason for the exit will be included in the message below. Typically, this message will be oriented to a software developer and not be GeneTitan-application specific. If this happens, get a screen capture of the message box and note the circumstances leading up to the event. Report the failure to Thermo Fisher Scientific Field Service Engineer. **Note:** reason will appear in the message box. Solution: – Reboot the computer. – Launch the GeneTitan System. – Perform appropriate resume and recovery operations as required. • Hyb can be completed off line or by restarting the GeneTitan System and choosing to leave the plate in the oven. • Fluidic process can resume using **Wash-Scan-Resume** mode operation.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

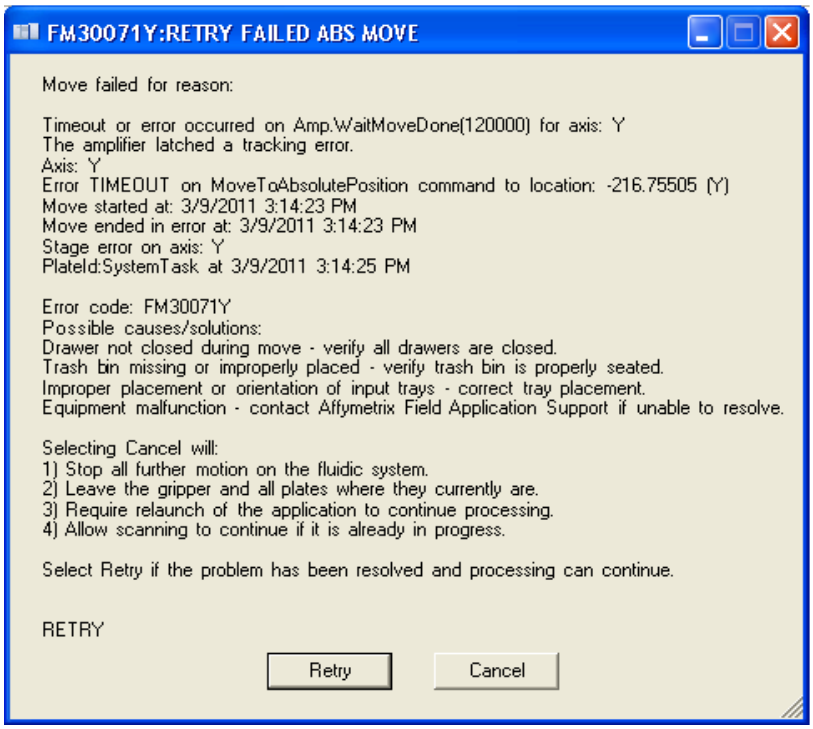
Message	Meaning
	Motion/movement error. Movement that cannot be completed, is reported as an error. Many things can cause a motion error and may be resolved to continue the run. Possible causes and solutions are listed below: • Cause: Drawer opened by user and safety switch stops motion. – Solution: Close the fluidic system front panel drawer and select retry. • Cause: Trash bin is not positioned properly. – Solution: Verify the trash bin is seated and select retry. • Cause: Wrong tray type or wrong orientation. – Solution: Select Cancel and/or use the STOP button to abort the plate and restart the run. • Cause: System malfunction due to improper plate placement or gripper mishandling. – Solution: In some circumstances the GeneTitan Instrument System will continue to process by trying to automatically re-home the motion system. Follow on-screen prompts which may lead you to unload plates as part of the recovery process. If the machine cannot clear the error automatically, exit and re-launch the GeneTitan application. If the “homing” operation done at system startup does not clear the error, Contact Thermo Fisher Scientific Field Service Engineer.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

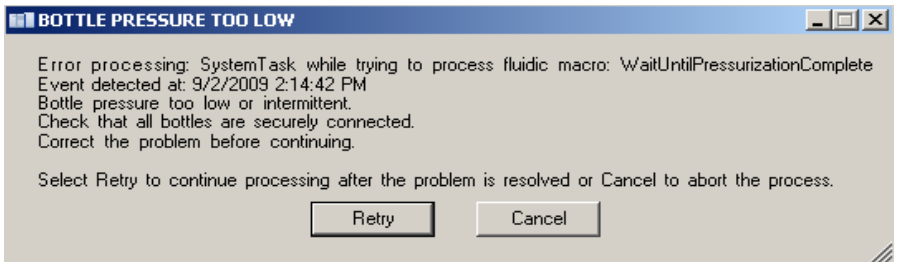
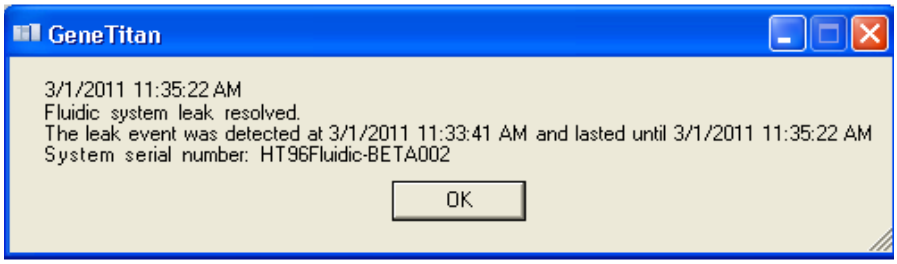
Message	Meaning
	Bottle pressure too low. Symptom: Message box similar to that shown here is displayed. If you choose to **Cancel**, the fluidic process being performed will stop but you may still need to abort the overall plate process using the STOP button (or Cancel button during a plate setup operation). Solution: • Verify facility line pressure into the system is ON. • Verify all bottle caps are secure and that no bottle cap is crimping a supply line. • Do not refill bottles or empty waste except when prompted by the GeneTitan application.
	This message is displayed when the leak is resolved (meaning the sensor LED is lit up again). If the original leak detected message was not acknowledged, it will be automatically removed from the GUI and replaced by the adjacent message. It will remain displayed until another leak is detected or the user acknowledges it by pressing **OK**. To resolve this issue, complete the following tasks: • Verify all internal and external tubing is connected and clean. • Verify wash reservoirs are clean. • Verify all bottle caps are secure and that no bottle cap is crimping a supply line. • Verify vacuum is working properly. • Do not refill bottles or empty waste except when prompted to by the GeneTitan application. • Contact your facility group to ensure CDA is supplied to your GeneTitan system. Contact Thermo Fisher Scientific Field Service Engineer to have the sensor adjusted or replaced if the problem persists.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

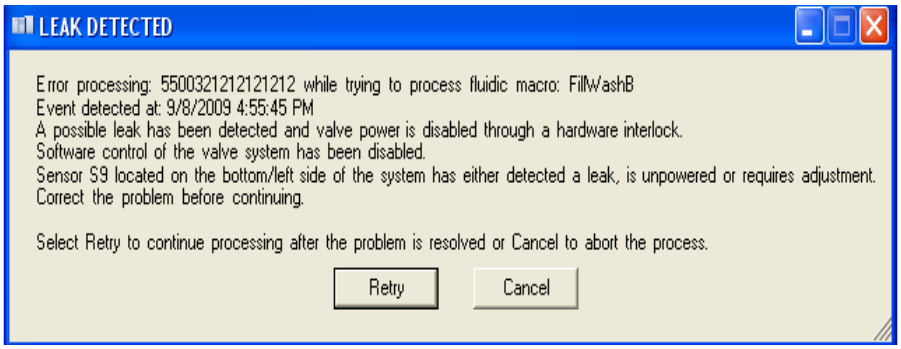
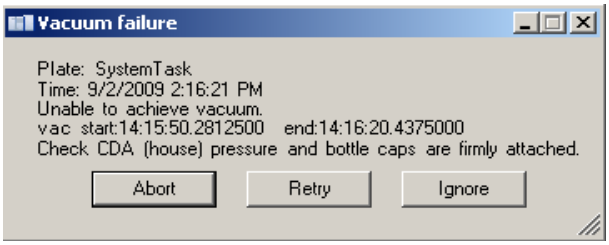
Message	Meaning
 	Leak Detected. Leak checks are performed at application startup and any time a fluidic process (priming, filling, draining, etc.) is performed. The leak detector is a hard wired sensor which will shut off fluid flow without software control. Leaks are normally confined to the drip pan located inside the system. Causes: • System malfunction • User killing the application using task manager during a fill operation resulting in application exit without stopping flow. Solution: Contact Thermo Fisher Scientific Field Service Engineer. The system cannot be used for any fluidic processing until this is resolved.
	Vacuum failure. Symptom: Message box similar to that shown here is displayed. If you choose to Abort, the fluidic process being performed will stop but you may still need to abort the overall plate process using the STOP button (or Cancel button during a plate setup operation). Solution: • Verify facility line pressure into the system is ON. • Verify all bottle caps are secure and that no bottle cap is crimping a supply line. • Do not refill bottles or empty waste except when prompted by the GeneTitan application.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

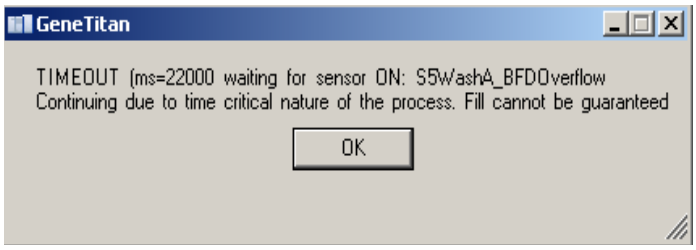
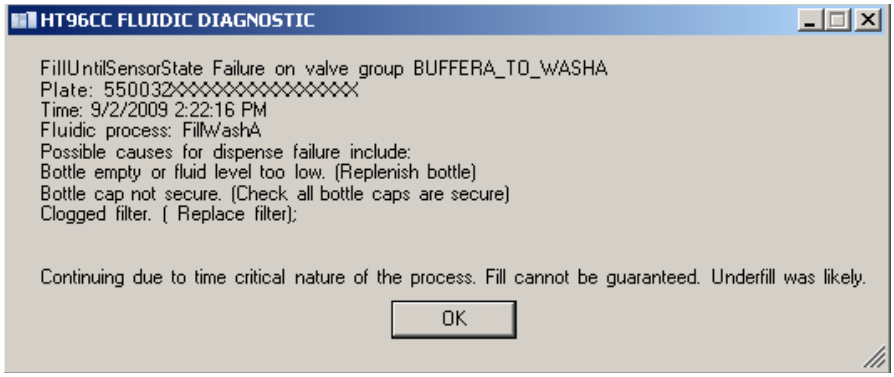
Message	Meaning
 	Timeout waiting for fill. During processing in the fluidic system, the process does not stop if a timeout occurs while trying to fill a wash reservoir. In this case, the timeout means the sensor that should have detected reagent flowing in the overflow drain did not turn on and stay on long enough. The error will be reported similar to the messages shown to the left. The message(s) typically come in two separate boxes. Solution: • Ensure there is sufficient reagent loaded when the run is started. • Verify facility line pressure into the system is ON. • Verify all bottle caps are secure and that no bottle cap is crimping a supply line. • Do not refill bottles or empty waste except when prompted by the GeneTitan application. • Contact Thermo Fisher Scientific Field Service Engineer to have the sensor adjusted or replaced if the problem persists.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

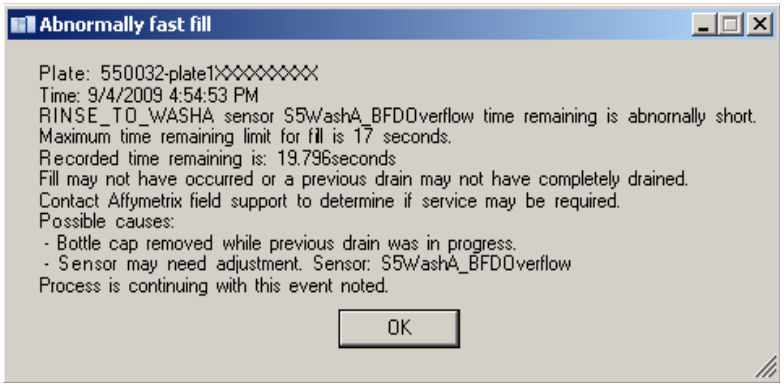
Message	Meaning
	Abnormally fast fill. During processing in the fluidic system, the process does not stop if an abnormally fast fill occurs while filling a wash reservoir. Abnormally fast means the sensor detected the reservoir as being full in an impossibly short period of time starting from when the reagent flow to the reservoir was initiated. When this happens, the result is that the reservoir is under-filled and that particular process step is a likely cause of plate failure. An error similar to the message shown will be reported. This message is an indication a previous drain was incomplete or that a sensor is malfunctioning or out of adjustment. The problem is usually intermittent and the plate currently running may complete without additional problems. Do not start any additional plates on the system until the problem has been addressed. Solution: • Allow the current plate to finish processing if no other system is available. • Contact Thermo Fisher Scientific Field Service Engineer to have the sensor adjusted or replaced. • Do not start any new plates until the problem is resolved.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

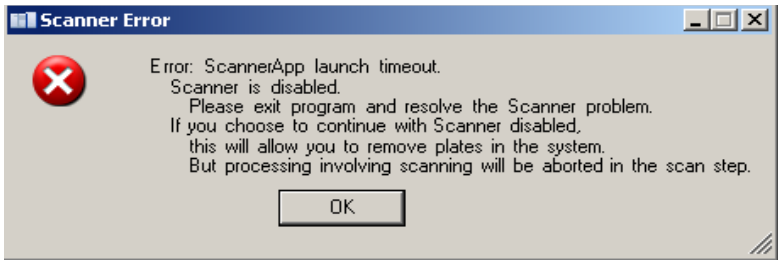
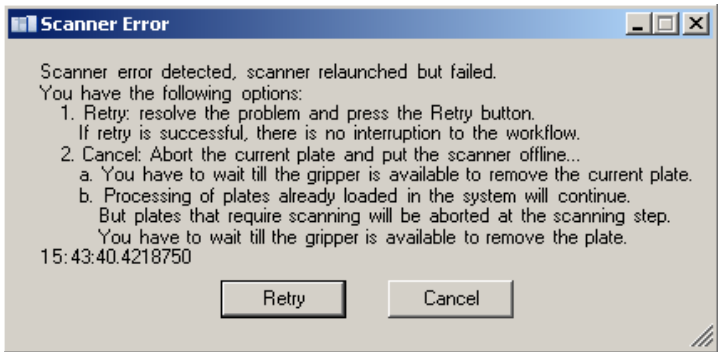
Message	Meaning
	Scanner launch timeout. If the following message is received, hyb and fluidic operations will be enabled but plates will stop processing without going into the scanner. Solutions: • Exit the GeneTitan Instrument System. • Verify all cable connections including USB and fire wire between the scanner and the computer. It is critical that the USB cable is inserted into the proper (labeled) location on the computer. • Unplug the scanner, wait 10 seconds and plug the scanner back in. • Reboot the computer. • Wait for the USB drive in the scanner to become visible (G: drive). If the G: drive does not become visible in Explorer, contact Thermo Fisher Scientific Field Service Engineer to correct the configuration problem. • Restart the GeneTitan Instrument System.
	Scanner re-launch failure. If a scanner failure is detected the scanner application is “killed” and re-launched. If it still fails, then the user has an opportunity to be informed and correct the problem and then press **Retry**. If the problem cannot be corrected, the scanner is placed offline. Any plate currently in the scanner will stay in the scanner until the GeneTitan Instrument System can be re-launched. Any plates moving through the system will automatically be “aborted” after fluidic processing completes (they will not attempt to move into the scanner).

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

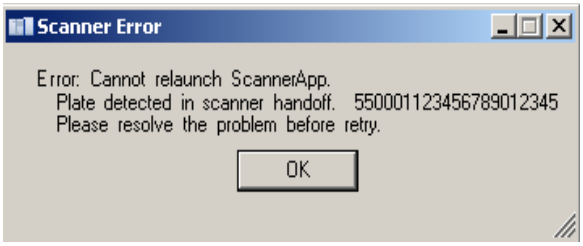
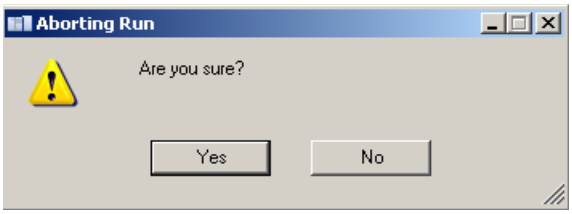
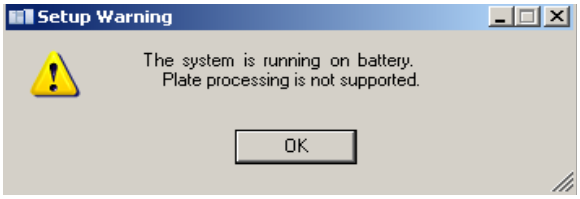
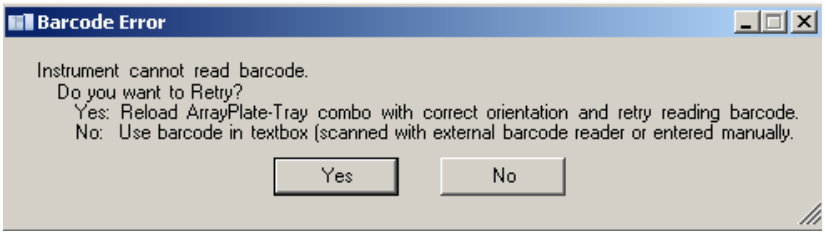
Message	Meaning
	Plate detected in scanner handoff. If the GeneTitan Instrument System cannot clear a plate detected in the scanner handoff, the scanner application cannot be started. Solution: • Re-launch the GeneTitan System. • If the problem persists contact Thermo Fisher Scientific Field Service Engineer.
	Processing plates. Aborting a run confirmation. When the user selects a plate to abort from the STOP button the following confirmation is presented.
	Running on battery/unable to start process. When the GeneTitan system detects that it is running on battery, its an indication that the facility power is currently down. If the user attempts to start a run, the following message will appear. Solution: • Verify the UPS has not been accidentally unplugged from the facility power • Wait for the power out condition to end. When the UPS is once again “online” the run can be started.
	When starting a new process setup, the barcode must be entered. If the user fails to enter the barcode (either by using the hand held bar code reader or typing it in), the user will be prompted to register the plate with the following message.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

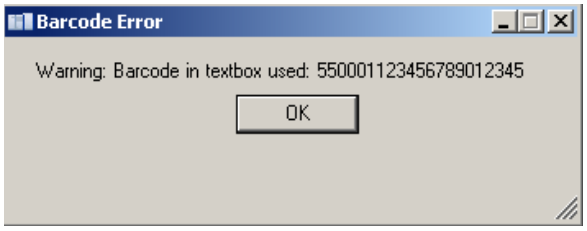
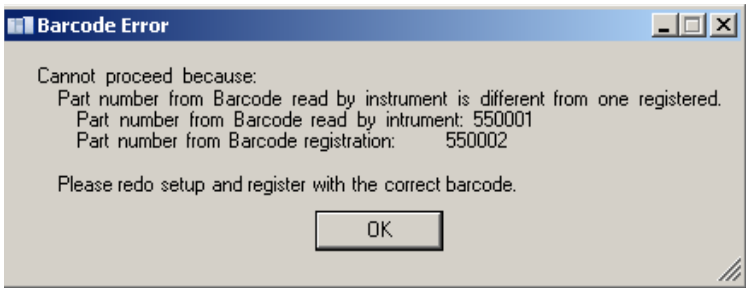
Message	Meaning
	Array plate barcode read error Unreadable bar code. After the HTA plate has been loaded into the system, the Fluidic system tries to read the plate bar code using its internal bar code reader. This is to verify that the correct plate was loaded and that the plate was loaded in the correct orientation. If the bar code read by the system does not exactly match the bar code entered by the user, the following message is displayed. It is also displayed if the bar code is unreadable by the system. Solution: • If you are certain that correct plate was loaded in the correct orientation select **No**. The system will continue processing using the bar code you typed (or scanned with the external bar code reader). • If you are unsure that you loaded the correct plate in the correct orientation select **Yes** to retry loading the plate. If **No** is selected, the user is given the following message to acknowledge that the barcode being used was provided by the user (not verified by the internal bar code reader). Setup will continue when the user selects **Ok**.
	If the GeneTitan system successfully reads a bar code and it does not match the bar code entered by the user, the system will force you to reload the plate. The following message is displayed.
	If the barcode being set up matches any actively running plate in the system, the user must re-enter a barcode that is not already in use. The following message is displayed.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

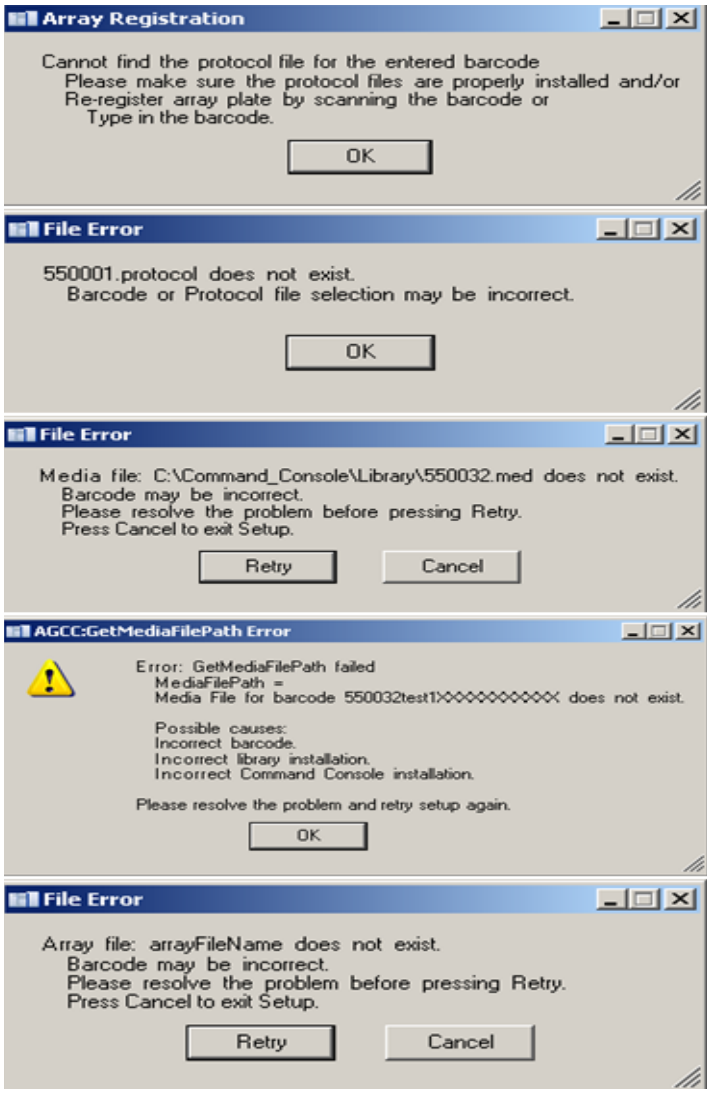
Message	Meaning
	Missing library and/or protocol files. If any of the prompts shown below appear, then a library file for the product is either not installed or missing some components. Solution: • Use the Library file installer available via the Affymetrix Launcher to load the library files required for the product you are running. • Re-launch the GeneTitan Instrument System after installing the library files.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

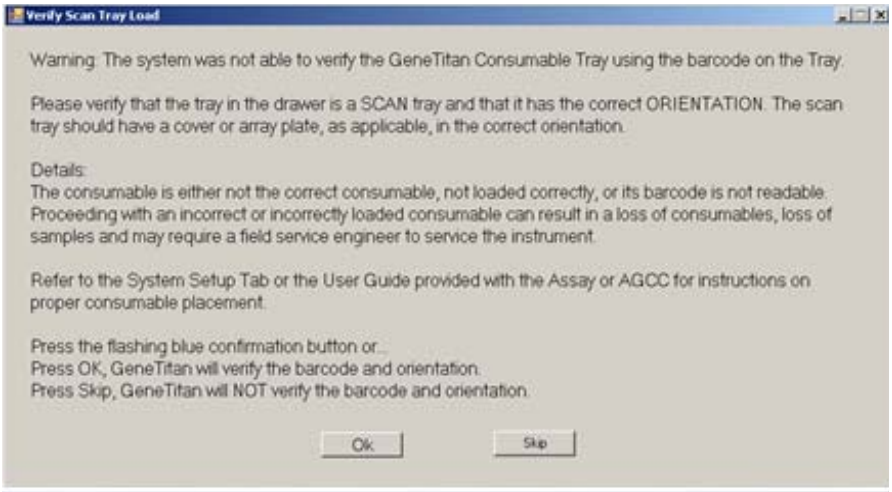
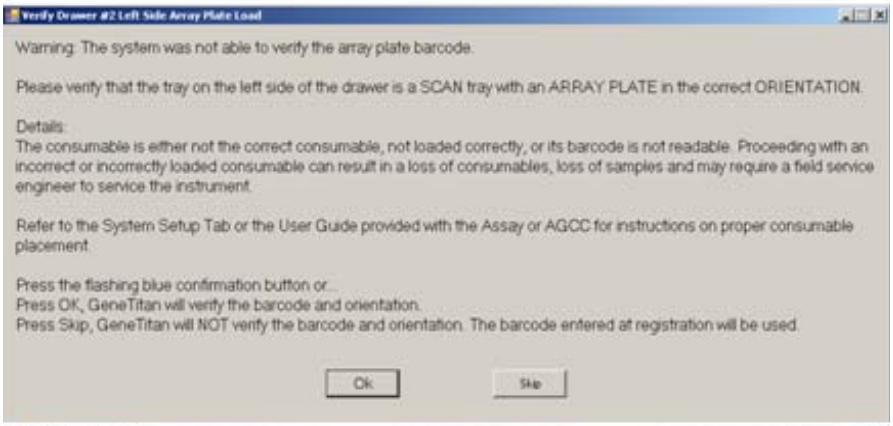
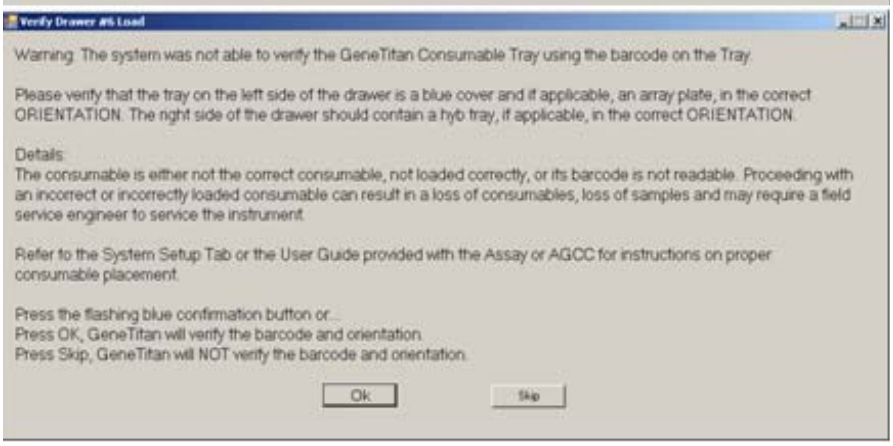
Message	Meaning
  	Barcode read failure for scan stain or hyb tray. During the reagent load steps (plate setup), each reagent tray has a bar code which is read by the system to verify the correct tray type is loaded and that it has been loaded in the correct orientation. The bar code does not verify tray content. The verification is repeated every time the drawer is closed, whether it is a load or an unload operation. If the bar code is unreadable or not present, the drawer opens and the user is prompted to verify the tray type and orientation. The system expects the trays. Solution: • Be sure to verify plate type is a scan tray • Verify correct orientation before pressing **Ok**. When **Ok** is selected, the system will continue processing without re-verifying the barcode. This will allow processing to continue in the case where the barcode is unreadable or not present. Be sure to verify plate orientation before pressing **Ok**.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

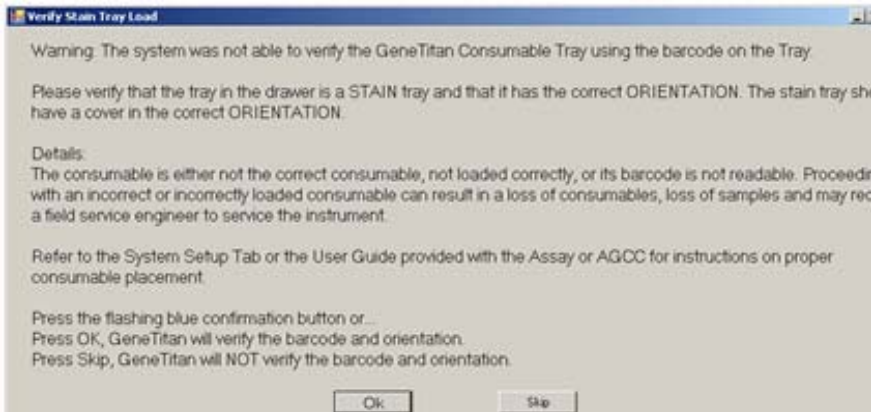
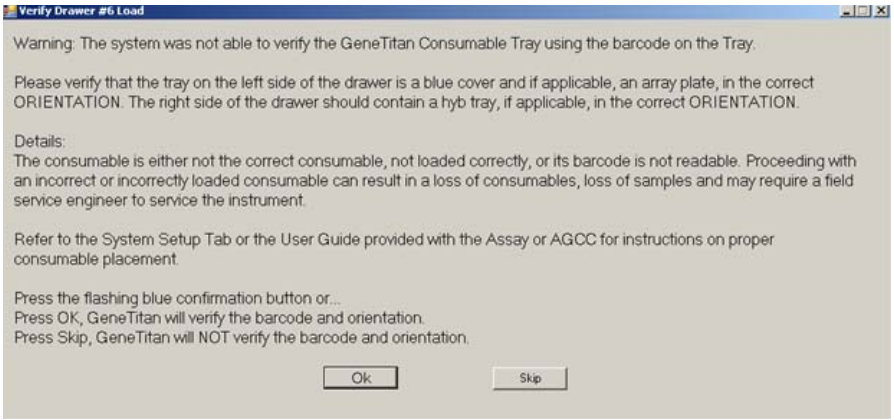
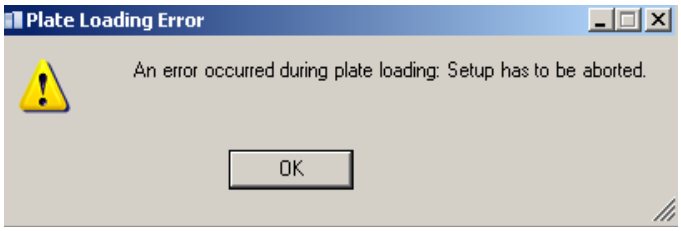
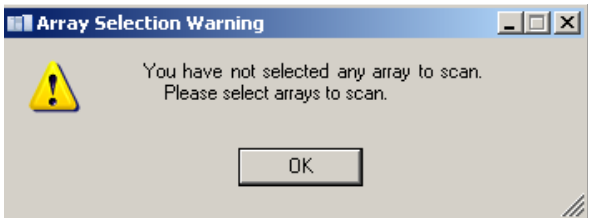
Message	Meaning
	Verify Stain Tray Load for drawer 3, 4, or 5. Cause: Stain tray bar code not detected. Solution: • Be sure to verify plate type is a stain tray • Verify correct orientation before pressing **Ok**. When **Ok** is selected, the system will continue processing without re-verifying the barcode. This will allow processing to continue in the case where the barcode is unreadable or not present. Be sure to verify plate orientation before pressing **Ok**.
	Verify drawer 6 load. Cause: Hyb tray bar code not detected or a wrong tray placed where the blue cover should reside on the left side. Solution: • Be sure to verify plate type is a hyb tray on the right (is required for the current process). • Verify correct orientation before pressing **Ok**. When **Ok** is selected, the system will continue processing without re-verifying the barcode. This will allow processing to continue in the case where the barcode is unreadable or not present. Be sure to verify plate orientation before pressing **Ok**.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

Message	Meaning
	Setup failure or abort during WashB preheat. Failure or user abort during a setup preheating operation will result in the following message to inform the user. Solution: If the user did not abort the preheating step, then reset the system: • Exit the GeneTitan application. • Disconnect power from the fluidic system for 10 seconds. • Reconnect power and wait 30 seconds. • Reboot the computer. • Launch the GeneTitan Instrument System. • Continue processing. If the problem persists contact Thermo Fisher Scientific Field Service Engineer.
	Error during plate unloading. Unexpected plate detected. The user placed a plate on the drawer or failed to remove the plate during an unload step. Solution: remove the requested plate and select **Ok**.
	Unexpected plate or tray removal. The user removed a plate (or tray) required by some other plate process during an unload step. The wrong plate was probably removed (left vs. right side). Solution: Return the plate (or tray) that was accidentally removed to its proper location and orientation. If the tray had a cover when it was removed, it should continue to have a cover. If the system had already removed the cover, return the tray to the system without a cover. **Note:** this may be left or right side.

Table 10 GeneTitan™ Multi-Channel Instrument System error messages (Continued)

Message	Meaning
	Error during plate loading. An error caused by improper loading of plates or a motion system error may cause the plate loading process to exit setup and display the following error message. Solution: • Perform a new setup being careful to load the proper plates in the correct orientation. • If restarting setup does not clear the problem, re-launch the GeneTitan application. Contact Thermo Fisher Scientific Field Service Engineer if the problem persists.
	No arrays selected for scan. When running a Hyb-Wash-Scan, Wash-Scan, Wash-Scan-Resume, or Scan, at least 1 array must be selected for scan. If no arrays are selected when the user selects **Next**, the following message is displayed. The user can continue the array selection process after selecting **Ok**.

A Safety

⚠ **WARNING! GENERAL SAFETY**. Using this product in a manner not specified in the user documentation may result in personal injury or damage to the instrument or device. Ensure that anyone using this product has received instructions in general safety practices for laboratories and the safety information provided in this document.

- Before using an instrument or device, read and understand the safety information provided in the user documentation provided by the manufacturer of the instrument or device.
- Before handling chemicals, read and understand all applicable Safety Data Sheets (SDSs) and use appropriate personal protective equipment (gloves, gowns, eye protection, etc). To obtain SDSs, see the "Documentation and support" section in this user guide.

Symbols on this instrument

Symbols may be found on the instrument to warn against potential hazards or convey important safety information. In this document, the hazard symbol is used along with one of the following user attention words:

- CAUTION! – Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.
- WARNING! – Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
- DANGER! – Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

Symbol	Meaning
	Caution, risk of danger Consult the user guide for further safety information.
	Caution, risk of electrical shock
	Moving parts
	Caution, hot surface
	Potential biohazard
	Ultraviolet light
	Potential slipping hazard
	On
	Off
	On/Off
	Standby
	Earth (ground) terminal
	Protective conductor terminal (main ground)
	Terminal that can receive or supply alternating current or voltage
	Terminal that can receive or supply alternating or direct current or voltage
	Do not dispose of this product in unsorted municipal waste  **CAUTION!** To minimize negative environmental impact from disposal of electronic waste, do not dispose of electronic waste in unsorted municipal waste. Follow local municipal waste ordinances for proper disposal provision and contact customer service for information about responsible disposal options.

Conformity symbols

Conformity mark	Description
TÜV SÜD NRTL C US	Indicates conformity with safety requirements for Canada and U.S.A.
CE	Indicates conformity with European Union requirements for safety and electromagnetic compatibility.

Regulatory and conformity

GeneTitan™ MC Instrument System compliance

The Applied Biosystems GeneTitan MC Instrument System and associated Workstation with software, is manufactured in the United States of America, with U.S. and Non-U.S. components.

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 numérique de la classe A respecte toutes les exigences du Règlement sur le matériel broullier du Canada.

Regulatory approval

This device has been approved by the following regulatory agencies (Table 11).

Table 11 Regulatory approval

Regulatory agency	Certification
CE	EU EMC Directive 2014/30/EU EU Low Voltage Directive (LVD) 2014/35/EU
TÜV SÜD NRTL C US	IEC 61010-1 and EN 61010-1 CAN-CSA C22.1010.1:2012 (Canada) UL 61010-1:2012 (USA) EN 61010-1:2010 (EU) EN and IEC 60825-1 (except for deviations pursuant to Laser Notice No. 50 dated June 24, 2007)
	Compliant with WEEE Directive 2012/19/EU

Chemical safety

⚠ **WARNING! GENERAL CHEMICAL HANDLING.** To minimize hazards, ensure laboratory personnel read and practice the general safety guidelines for chemical usage, storage, and waste provided below, and consult the relevant SDS for specific precautions and instructions:

- Read and understand the Safety Data Sheets (SDSs) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. To obtain SDSs, see the "Documentation and support" section in this document.
- 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 (for example, fume hood).
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's cleanup procedures as recommended in the SDS.
- Handle chemical wastes in a fume hood.
- Ensure use of primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- After emptying a waste container, seal it with the cap provided.
- Characterize (by analysis if necessary) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
- Ensure that the waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.
- **IMPORTANT!** Radioactive or biohazardous materials may require special handling, and disposal limitations may apply.

Biological hazard safety

WARNING! Potential Biohazard. Depending on the samples used on this instrument, the surface may be considered a biohazard. Use appropriate decontamination methods when working with biohazards.

WARNING! BIOHAZARD. Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases. All work should be conducted in properly equipped facilities using the appropriate safety equipment (for example, physical containment devices). Safety equipment also may include items for personal protection, such as gloves, coats, gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles. Individuals should be trained according to applicable regulatory and company/ institution requirements before working with potentially biohazardous materials. Follow all applicable local, state/ provincial, and/or national regulations. The following references provide general guidelines when handling biological samples in laboratory environment.

- U.S. Department of Health and Human Services, *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*, 5th Edition, HHS Publication No. (CDC) 21-1112, Revised December 2009; found at: **www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf**
- World Health Organization, *Laboratory Biosafety Manual*, 3rd Edition, WHO/ CDS/CSR/LYO/2004.11; found at: **www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf**

Instrument safety

This section deals with safety issues and hazards concerning the instrument during regular operation. To ensure safe operation of the GeneArion Microarray Processor, read this section completely before operating the instruments.

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.

ATTENTION

Le cordon d'alimentation est utilisé comme interrupteur general. La prise de courant doit être située ou installée a proximité du materiel et être facile d'accés.

ACHTUNG

Zur sicheren Trennung des Gerätes vom Netz ist der Netzstecker zu ziehen. Vergewissern Sie sich, daß die Steckdose leicht zugänglich ist.

Safe operation

- The GeneTitan MC Instrument System is intended for indoor, laboratory use in a controlled environment.
- Do not attempt to service the instruments. Any attempt at unauthorized service may result in injury or damage the instrument and/or void the warranty.
- Failure to properly support the instruments may cause serious damage or injury and may void the warranty.

- The instruments must be surrounded by adequate airspace. Slots and openings in the instruments 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 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. This safety feature should not be compromised in any way. If the instrument AC plug does not mate with the available power source receptacle, consult a licensed electrician to install one that does.
- Do not open the instrument electrical cabinets. These contains electrical hazards.

Mechanical hazards

⚠ **WARNING!** Do not open the instrument mechanical cabinet or stick fingers into the instrument. Moving the Fluidics Station unit and Imaging Station tray assemblies can cause a risk of pinch or crush hazards! Be aware of the placement of all trays, array plates and other consumables before starting a run.

IMPORTANT! Make sure the instrument's enclosure is secure before beginning a run; if it is not, make sure no one is working inside the system. Do not wear loose clothing or hanging jewelry while working with the instrument. Tie back long hair. Read, understand, and follow the safety information contained in this manual prior to operating or using this equipment. Pay close attention to all safety labels.

IMPORTANT! Heavy object. At least two people (four is optimal) are required to lift the GeneTitan MC Instrument System. Do not move the GeneTitan Instrument System without the presence of an Thermo Fisher Scientific Field Service Engineer. You should use a lift to move the instrument.

Electrical Hazards

Do not use the instruments if you see damaged or frayed electrical cords. Tag and report them as unsafe.

Do not place any liquids or containers holding liquids on or near electrical systems.

Ergonomic Hazards

The workstation has a user interface that may pose ergonomic issues. To avoid fatigue or muscle pain, follow basic precautions including the following:

- Read, understand, and follow your workplace ergonomic recommendations.
- Move user interface so that you can use it comfortably.
- Take short, regular breaks away from the instruments.
- Make sure the area is well-lit and you are able to see the information on the screen clearly.

Laser Safety

The GeneTitan Instrument (the Fluidics Station unit) is equipped with an internal laser barcode reader. The laser complies with IEC 60825-1 and US 21 CFR 1040.10 and 1040.11 (except for deviations pursuant to Laser Notice No. 50 dated June 24, 2007).

⚠ **WARNING!** The GeneTitan MC Instrument contains an internal Class 2 laser barcode reader. Class 2 laser radiation exposure if the GeneTitan Instrument cover is opened. Do not look into barcode laser reader beam.

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

Hazards of the GeneTitan™ MC Instrument

The following sections and Table 12 describe possible hazards present in this GeneTitan MC Instrument and Lambda LS Xenon arc lamp.

IMPORTANT! If you use the GeneTitan MC Instrument in a manner not specified in this user guide, you may impair the protection provided by the equipment.

Table 12 GeneTitan™ MC Instrument hazards

Hazard	Present?	Description
Chemical	No	
Control	No	Control software
Electrical	**Yes**	100-240V power
Ergonomic	**Yes**	User interface
Gas	No	
Mechanical	**Yes**	Instrument weight (heavy instrument)
Laser	**Yes**	Hazard present if you remove the system enclosure. Also present with external barcode reader.
Noise	No	
Pneumatic	**Clean Dry Air** (CDA) for operating the Fluidics Station unit in the system	
Radiation	**Yes**	The infrared radiation (and ultraviolet radiation) generated by this lamp can cause significant skin burns and eye damage.
Temperature	**Yes**	Integrated hybridization oven and fluidics station unit
Ultrasonic	No	
Vibration	No	
Heat	**Yes**	Maximum heat generated is 300W
E-Fields	No	
H-Fields	No	
Explosion	**Yes**	1. High internal pressure exists in any xenon arc lamp. 2. Buffer and DI Water bottles are pressurized to 5 psi.
Ozone	No	

Lambda LS Xenon Arc Lamp and Lambda SC Controller safety

Fuse replacement

⚠ **WARNING!** For the Lambda LS arc lamp replace fuse only with the same type and rating: 5 Amp, 250V, 5 x 20 mm, Time Delay fuse (EIC 60127-2) Examples: Bussmann GDC-5A or S506-5A (RoHS), or Littelfuse 218.005 or 218.005.P (RoHS)

⚠ **WARNING!** For the SC *Smart*Shutter®, replace fuse only with the same type and rating: 5 x 20 mm glass tube, T1.0A, 250V, IEC 60127-2, Sheet III. Examples: Bussmann GDC-1A or Littelfuse 218 001.

A spare fuse is provided, located in the power input module. See "Replacing the Lambda LS xenon fuse" on page 54 and "Replacing the Lambda SC controller fuse" on page 60 for details.

Personnel safety

⚠ **WARNING!** To Avoid Physical Injury while Powered Up and Emitting Light DO NOT LOOK DIRECTLY INTO THE LIGHT GUIDE! The output of the light or the light guide should be directed into the Imaging Device using the appropriate adapters, directed away from anyone's eyes, and not directed toward any reflective surface.

- INFRARED RADIATION: The infrared radiation (and ultraviolet radiation) generated by this lamp can cause significant skin burns and eye damage.
- EXPLOSION: High internal pressure exists in any Xenon arc lamp.
- HIGH VOLTAGE: High ignition voltages, which exist inside the cabinet, can be lethal.

Electrical shock

Always use the grounded power supply cord set provided to connect the unit to a grounded outlet (3-prong). This is required to protect you from injury in the event that an electrical hazard occurs.

Do not disassemble the unit. The only user serviceable parts are the line fuse, the Xenon bulb. The line fuse is accessible from the outside of the unit. The bulb is accessible via separate panels on the top of the unit. Bulb replacement and filter wheel installation/ removal are covered in separate sections of the manual and should only be attempted with the power cord disconnected.

To prevent fire or shock hazard do not expose the unit to rain or moisture. The original manufacturer of the Xenon lamp and power supply used in the Lambda LS provides the additional safety information on the following page. It is intended to amplify the information given above.

Xenon lamp hazards

Xenon arc lamps and systems

Proper use and safe operating practices are the responsibility of equipment users. All lamps are under pressure and must be handled with care. Take appropriate safeguards to protect personnel from harm due to operation and/or failure of the lamp.

Safe operating instructions

Do not operate this lamp except in accordance with proper operating instructions and within recommended operating specifications. Direct questions regarding lamp operation or safety to your lamp supplier.

Lamp disposal

CERMAX lamps do not have reclaimable parts. Take care to discard the lamp in a landfill and not an incinerator.

Safety hazards

The operation of lamps involves one or more of the following hazards. In the absence of safe operating practices and precautions, any one of these hazards could result in injury.

EXPLOSION—The lamps are filled with Xenon gas at very high pressure. Lamps must be handled with the same care and caution given any vessel containing these levels of pressure. A hazard exists if the window or ceramic fractures and may cause explosive mechanical failure. Face shields or proper safety glasses are recommended during all handling operations.

HIGH VOLTAGE—Ignition voltage of some lamp models is very high and can be deadly. Do not expose the lamp circuits. The input power must be disconnected from the power source before attempting any service to the lamp.

INFRARED OR ULTRAVIOLET RADIATION—Do not look directly at operating lamps orb reflected light. Infrared and ultra violet radiation generated by the lamp can cause skin burns and permanent eye damage.

HOT SURFACES—Portions of the lamp can reach temperatures of several hundred degrees centigrade and cause serious burns if touched even after the lamp is turned off.

The *Smart*Shutter is not a safety shutter

The Lambda LS is equipped with a Sutter Instrument Co. *Smart*Shutter. It is important for you to know that the *Smart*Shutter is not intended to be a 'safety shutter.' A safety shutter usually closes automatically in the event of a power failure and is designed with the primary goal of ensuring that it will not allow any unintended exposure. The *Smart*Shutter was designed for high performance and durability, but without certain features that would be desirable in a safety shutter application.

Precautions

Operate the Lambda LS using 110V AC, 60 Hz or 220V AC., 50 Hz line voltage.

Operate only in a location where there is a free flow of fresh air on all sides.

NEVER ALLOW THE FREE FLOW OF AIR TO BE RESTRICTED.

The lamp should not be operated in an orientation where the output of the CERMAX lamp faces within 45° of straight upward. To do so may cause arc instability and the possibility of damage to the front window of the CERMAX lamp. Note that the lamp output is towards the heat sink mounted on the side of the cabinet.

The LAMBDA SC *Smart*Shutter Controller is designed for the specific use of controlling the open and closed state of a shutter (specifically, a SmartShutter), and no other use is recommended. This instrument is designed for use in a laboratory environment. It is not intended for, and should not be used in, human experimentation or applied to humans in any way. This is not a medical device.

Do not open or attempt to repair the instrument. Extreme heat and high voltages are present and could cause injury.

Do not allow unauthorized and/or untrained operatives to use this device.

Any misuse will be the sole responsibility of the user/owner and Thermo Fisher Scientific, Inc. assumes no implied or inferred liability for direct or consequential damages from this instrument if it is operated or used in any way other than for which it is designed.

Removing or adding connections without the presence of an Thermo Fisher Scientific Field Service Engineer voids the instrument warranty.

Removing or adding connections without the presence of an Thermo Fisher Scientific Field Service Engineer voids the instrument warranty. The UPS provided with the GeneTitan Instrument System should not supply power to any devices other than those associated with the GeneTitan Instrument System. Plugging a device such as a hybridization 640/645 oven into the GeneTitan UPS will affect the power recovery modes for the GeneTitan Instrument System.

Exhaust/venting requirements

The assays used on the GeneTitan Instrument System use reagents that may require your facility to determine if any industrial hygiene monitoring is necessary to meet your local regulatory requirements and if engineering controls, such as local exhaust/fume hoods are required. Please refer to the safety data sheets (SDS) for the appropriate Applied Biosystems assay for information on the reagents and stains used in the assay.

IMPORTANT! It is important to ensure that the fans inside the instrument are always working properly and the air is venting outside the instrument. You should be able to feel the airflow coming out of the instrument. That airflow should be unrestricted and should direct air away from any benchtop scientist working in the laboratory. Refer to Chapter 4, "Care and troubleshooting" on the preventive maintenance activities required to ensure airflow from the instrument is not blocked.

Recycling plastic consumables

The GeneTitan plastic consumables used for array processing are made from LEXAN® HP1-1H112 resin (polycarbonate). Please follow appropriate recycling practices for the array plate consumables to meet your local regulatory requirement.

Other warnings and precautions

- The GeneTitan MC Instrument System is for research use only. It is not for use in diagnostic procedures.
- All biological specimens and materials with which the operator may come into contact should be handled as if capable of transmitting infection and disposed of with proper precautions in accordance with federal, state, and local regulations—including adherence to the OSHA Blood Borne Pathogens Standard (29 CFR 1910.1030) for blood-derived and other samples governed by this act. Never pipet by mouth. Avoid specimen contact with skin and mucous membranes.
- Wear gloves when using the GeneTitan MC Instrument System.
- Exercise standard precautions when obtaining, handling, and disposing of potentially carcinogenic reagents.

- Do not send your instrument elsewhere for service or attempt to service it yourself. To protect your warranty and ensure safe operation, the instrument should be serviced only by Thermo Fisher Scientific or its representatives. If the instrument is not working correctly, please contact your Thermo Fisher Scientific Technical Support representative.
- Do not use the GeneTitan MC Instrument System in ways not specified by Thermo Fisher Scientific. Doing so may impair the protections provided by the GeneTitan MC Instrument System.
- The GeneTitan MC Instrument System requires at least two people to lift and handle it safely. Four people would be optimum. Each person should firmly grasp the base of the instrument at the end opposite the other to lift. Use OSHA standards for lifting techniques. Thermo Fisher Scientific strongly recommends the use of a lift to move the instrument.
- The GeneTitan MC Instrument System is intended for indoor, laboratory use in a controlled environment.

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

Mechanical safety

⚠ **WARNING! Crushing Injury Hazard.** xxxx.

⚠ **WARNING! Crushing Injury Hazard.** Do not open the instrument mechanical cabinet or stick fingers into the instrument. Moving components in the instrument can create pinch or crush hazards! Be aware of the placement of all array cartridges, reagents and consumables before starting a run.

IMPORTANT! Heavy object. Do not move the XXXX without the presence of an authorized Thermo Fisher Scientific Field Service Engineer.

IMPORTANT! Make sure the instrument's enclosure is secure before beginning a run; if it is not, make sure no one is working inside the system. Do not wear loose clothing or hanging jewelry while working with the instrument. Tie back long hair. Read, understand, and follow the safety information contained in this manual prior to operating or using this equipment. Pay close attention to all safety labels.

Electrical safety

⚠ **WARNING! Crushing Injury and Electrical Shock Hazards.** Do not attempt to service the instrument. Removing the outer covers or opening the instrument lid exposes you to electrical shock and crushing injury hazards.

⚠ **WARNING!** Ensure appropriate electrical supply. For safe operation of the instrument:

- Plug the system into a properly grounded receptacle with adequate current capacity.
- Ensure the electrical supply is of suitable voltage.
- Never operate the instrument with the ground disconnected. Grounding continuity is required for safe operation of the instrument.

⚠ **WARNING! Power Supply Line Cords.** Use properly configured and approved line cords for the power supply in your facility.

⚠ **WARNING! Disconnecting Power.** To fully disconnect power either detach or unplug the power cord, positioning the instrument such that the power cord is accessible.

Precautions

Do not allow unauthorized and/or untrained operatives to use this device.

Any misuse will be the sole responsibility of the user/owner and Thermo Fisher Scientific assumes no implied or inferred liability for direct or consequential damages from this instrument if it is operated or used in any way other than for which it is designed.

Unauthorized modifications or connects to the instrument without prior authorization by a Thermo Fisher Scientific service representative will void the instrument warranty.

Documentation and support

Related documentation

Document	Publication number	Description
GeneTitan™ Multi-Channel Instrument Site Preparation Guide	08-0305	Provides guidance on creating and maintaining the proper environment required for the GeneTitan Multi-Channel Instrument.
Applied Biosystems™ GeneChip™ Command Console™ User Guide	702569	Instructions for using Applied Biosystems GeneChip Command Console Software (AGCC); instrument control software for GeneChip systems. Command Console Software provides an intuitive set of tools for instrument control and data management used in the processing of GeneChip arrays.

Customer and technical support

Thermo Fisher provides technical support to all licensed users. If the instrument must be returned for repair, contact Thermo Fisher Technical Support. Under any of the following conditions, unplug the instrument from the power source and contact Technical Support:

- when the power cord is damaged or frayed.
- if any liquid, such as scan buffer, 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 capabilities stated in the specifications.
- if the instrument has been dropped or otherwise damaged.
- if, after service or calibration, the instrument does not perform to the specifications stated in Table 1 on page 9.

Visit **thermofisher.com/support** for the latest in services 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
  - Certificates of Analysis
  - Safety Data Sheets (SDSs; also known as MSDSs)

Note: For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

Limited product warranty

Life Technologies Corporation and/or its affiliate(s) warrant their products as set forth in the Life Technologies' General Terms and Conditions of Sale found on Life Technologies' website at **www.thermofisher.com/us/en/home/global/terms-and-conditions.html**. If you have any questions, please contact Life Technologies at **thermofisher.com/support**.

For support visit **thermofisher.com/support** or email **techsupport@lifetech.com**

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16 May 2017