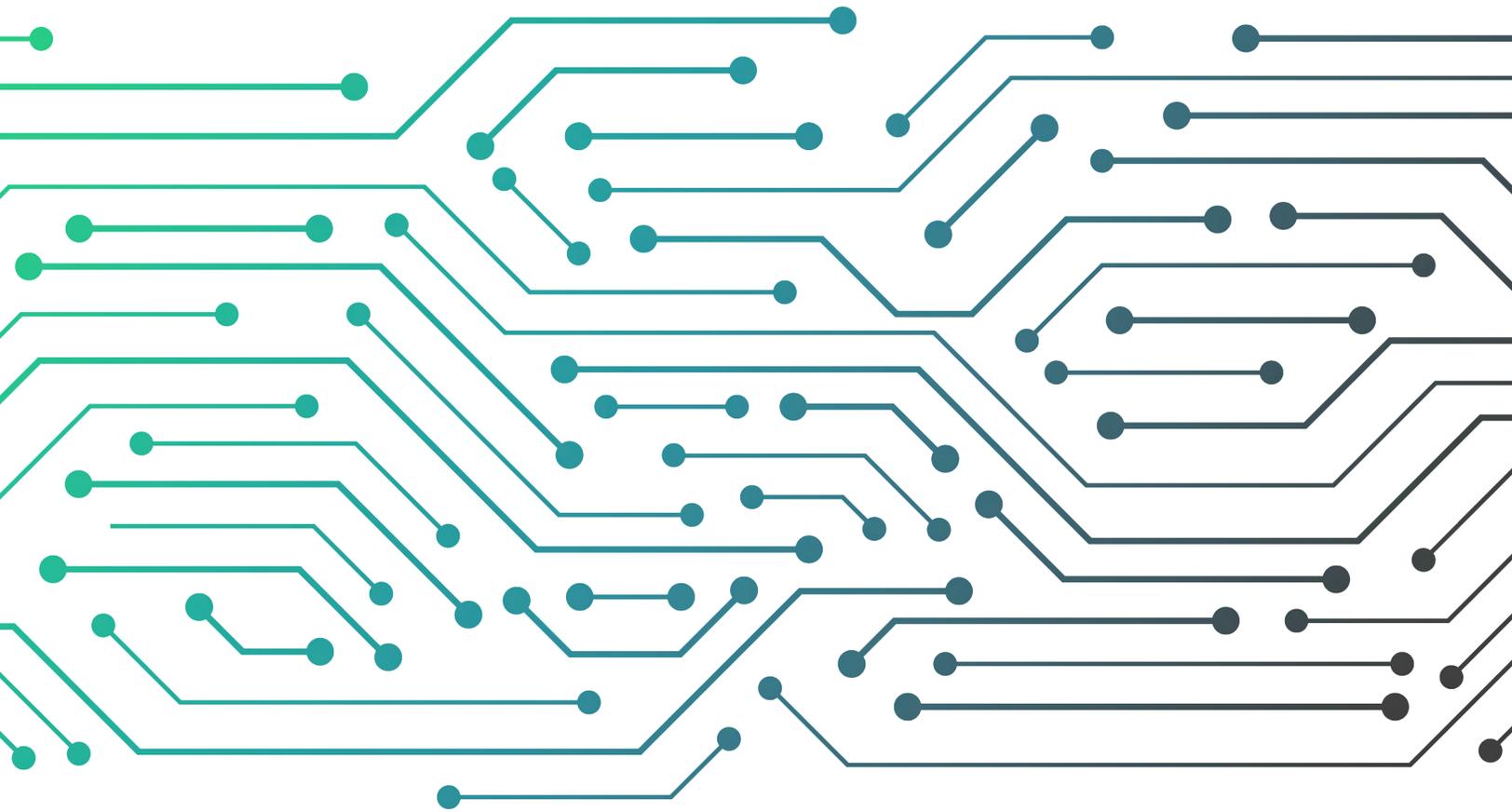




OhmX™ Analyzer Guide



Legal Notice

This document and its contents are proprietary to Nabsys 2.0 LLC and are intended for the proper use of the product(s) described herein by customers/collaborators. This document shall not be disclosed, distributed, reproduced or copied without written permission by Nabsys 2.0 LLC.

Instructions for use of the product(s) described herein should be strictly followed by appropriately trained personnel to ensure proper safety and use. Nabsys 2.0 LLC does not assume any liability for the improper use of product(s) described herein. The OhmX™ Analyzer Guide is subject to change and will be updated as necessary.

For research use only. Not for use in diagnostic procedures.

Copyright

© Nabsys 2025. All rights reserved. All trademarks are the property of their respective owners.

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Nabsys as governed by United States and international copyright laws.

Revision

OhmX™ Analyzer Guide | 755-00003-001 | Rev K | 202503



Manufactured by
Nabsys
60 Clifford St.
Providence, RI 02903

Warranty

The material contained in this document is provided “as is,” and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Nabsys disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Nabsys shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Nabsys and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Restricted Rights Legend

U.S. Government Restricted Rights. Software and technical data rights granted to the federal government include only those rights customarily provided to end user customers. Nabsys provides this customary commercial license in Software and technical data pursuant to FAR 12.211 (Technical Data) and 12.212 (Computer Software) and, for the Department of Defense, DFARS 252.227-7015 (Technical Data - Commercial Items) and DFARS 227.7202-3 (Rights in Commercial Computer Software or Computer Software Documentation).

Table of Contents

Chapter 1: Safety	4	Training Kit	19
Safety Alerts	4	OhmX VOLT™ Whole Genome Kit (Part #900-00076-001)	
Analyzer Markings	4	Shipping and Storage Conditions	20
Analyzer Safety	5	OhmX Detector	21
General Analyzer Safety	5	OhmX System Reagent Cartridge (orange label)	21
Chemical Safety	5	OhmX Sample Injection Diluent	21
Safety Data Sheets	5	OhmX System Flush Cartridge (blue label)	22
Chemical Safety Guidelines	6	User-Supplied Materials	22
Chemical Waste Safety	6	Automated Pipetting of HMW DNA	22
Chemical Waste Safety Guidelines	6	Chapter 4: OhmX Analyzer Installation	23
Electrical Safety	7	Site Preparation	23
Biological Hazard Safety	7	System Setup	23
Physical Hazard Safety	7	Unpack the System	23
Detector-Specific Safety and Disposal	8	Install the OhmX Analyzer	24
Chapter 2: OhmX™ Platform Overview	9	Chapter 5: Operate the OhmX Analyzer	26
Introduction	9	OhmX Analyzer Operation Overview	26
OhmX Platform Workflow	9	Step 1: Check OhmX Analyzer Status	26
Technical Specifications	10	Step 2: Empty Waste	26
OhmX Analyzer Specifications	10	Step 3: Load a Reagent Cartridge	27
OhmX Controller Specifications	10	Step 4: Load a Detector	28
Environmental Considerations	10	Step 5: Start the Sample Run	29
Network Connections	10	Step 6: Dilute the Sample	29
File Storage and Backup	10	Step 7: Inject the Sample	30
OhmX Analyzer Components	11	Step 8: Monitor Data Collection	31
Detector and Sample Compartments	11	Step 10: Storing the Analyzer	32
Reagent and Waste Compartments	11	Step 11: Data Analysis	33
Back Panel	11	Chapter 6: Maintenance	34
OhmX Software	12	Clean the Sample Injection Port	34
Home Screen	12	Replace the Sample Injection Port	34
Maintenance Screen	13	Clean the Detector Manifold	34
Settings - General	13	Clean the Reagent Cartridge Manifold	36
Settings - User Management	14	Insecure Reagent Tube Fitting	36
Settings - Support Files	17	Chapter 7: Troubleshooting	37
Chapter 3: Hardware and Consumables	18	System Issues	37
OhmX™ Analyzer and Controller	18	System Error Codes	37
Accessory Kit	18	Sample-Related Troubleshooting	40
System Consumables	19	Technical Support	41

Chapter 1: Safety

The OhmX™ Analyzer is a comprehensive genomics platform that provides fully integrated instrumentation, consumables, protocols, reagents, and analytical software. This chapter provides important safety information for the system with compliance and regulatory statements. Read this chapter before operating the OhmX Analyzer.

Safety Alerts

This guide includes three safety words: **IMPORTANT**, **WARNING**, and **DANGER**. The words imply different levels of observation or indicate the actions for safe analyzer operation.



Indicates information necessary for proper system operation, accurate chemistry kit use, or safe use of a chemical.



Indicates a potentially hazardous event that, if not avoided, could lead to minor or moderate injury. It could also be used to alert against unsafe practices.



Indicates an imminently hazardous event that, if not avoided, will lead to death or serious injury. This alert word is limited to the most extreme situations.

Analyzer Markings



The OhmX Analyzer is labeled with the following compliance and regulatory markings:

UL 61010-1, Electrical equipment for measurement, control, and laboratory use.

UL 61010-2-081, Requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.



The following safety symbols or labels might appear on the analyzer. Each symbol appears alone or with text explaining the hazard.

Consult the guide for further information and proceed with caution.



The following environmental symbol or label might appear on the analyzer:

Do not dispose of the product as unsorted municipal waste. Follow the local municipal waste ordinances and regulations for proper disposal to reduce the environmental impact of waste electrical and electronic equipment (WEEE).

Analyzer Safety

General Analyzer Safety

**WARNING! PHYSICAL INJURY HAZARD**

Use the product only as specified in this document. Using the OhmX Analyzer in a manner not specified by Nabsys can result in personal injury or damage to the analyzer.

**WARNING! PHYSICAL INJURY HAZARD**

Do not attempt to lift or move the analyzer without assistance, appropriate moving equipment, and proper lifting techniques. Improper lifting can cause painful and permanent back injury. Moving or lifting the analyzer might require two people.

Consider the following safety protocols before lifting the analyzer:

- Make sure you have a secure, comfortable grip on the analyzer.
- Make sure the path from where the analyzer is to where it is being moved is clear of obstructions.
- Do not lift the analyzer and twist your torso simultaneously.
- Keep your spine in a neutral position and lift with your legs.
- Coordinate lifting and moving intentions with other participants.

**IMPORTANT!**

Anyone who operates the analyzer must meet the following qualifications:

- Received instructions in both general safety practices for laboratories and specific safety practices for the analyzer and chemistry.
- Read and understand all applicable safety data sheets (SDSs).

Chemical Safety

**WARNING! CHEMICAL HAZARD**

Before handling chemicals, reference the manufacturer-supplied SDSs and observe all relevant precautions.

**WARNING! CHEMICAL HAZARD**

Chemicals in the analyzer, including waste tubes, are potentially hazardous. Always determine what chemicals have been used in the analyzer before changing reagents or analyzer components. Wear appropriate eyewear, protective clothing, and gloves when working on the analyzer.

Safety Data Sheets

Chemical manufacturers supply current SDSs with shipments of hazardous chemicals to new customers. They also provide SDSs with the first shipment of a hazardous chemical to a customer after an SDS has been updated. SDSs provide the safety information you need to safely store, handle, transport, and dispose of the chemicals. Each time you receive a new SDS packaged with a hazardous chemical, make sure to replace the appropriate SDS in your files.

Chemical Safety Guidelines

To minimize the hazards of chemicals:

- Read and understand the SDSs provided by the chemical manufacturer before storing, handling, or working with any chemicals or hazardous materials.
- Minimize contact with chemicals. Wear appropriate personal protective equipment (PPE) when handling chemicals (e.g. safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the SDSs.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation. For additional safety guidelines, consult the SDSs.
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's cleanup procedures as recommended in the SDSs.
- Comply with all local, state, provincial, and national laws and regulations related to chemical storage, handling, and disposal.

Chemical Waste Safety



IMPORTANT! HAZARDOUS WASTE

Reference the SDSs and local regulations for waste handling and disposal.



DANGER: CORROSIVE REAGENTS

The analyzer produces waste that is corrosive, potentially hazardous, and able to cause injury, illness, or death.



WARNING! CHEMICAL WASTE STORAGE HAZARD

Never collect or store waste in a glass container due to the risk of breaking or shattering. Reagent and waste bottles can crack and leak. Secure each waste bottle in a low-density polyethylene safety container with the cover fastened. Wear appropriate eyewear, clothing, and gloves when handling reagent and waste bottles.

Chemical Waste Safety Guidelines

To minimize the hazards of chemical waste:

- Read and understand the SDSs provided by the manufacturer of the chemicals before you store, handle, or dispose of any chemical waste.
- Provide 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, provincial, and local requirements for container storage.
- Minimize contact with chemicals. Wear appropriate PPE when handling chemicals (e.g., safety glasses, gloves, and protective clothing). For additional safety guidelines, consult the SDSs.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation. For additional safety guidelines, consult the SDSs.
- Dispose of the waste tube contents and OhmX Reagent Cartridges in accordance with good laboratory practices and state, provincial, and national environmental and health regulations.



IMPORTANT!

Biohazardous materials can require special handling and disposal limitations might apply.

Electrical Safety



DANGER! ELECTRICAL HAZARD

Grounding circuit continuity is vital for the safer operation of the analyzer. Never operate the analyzer with the grounding conductor disconnected.



DANGER! ELECTRICAL HAZARD

Use properly configured and approved line cords for the voltage supply in your facility.



DANGER! ELECTRICAL HAZARD

Plug the analyzer into a properly grounded receptacle with adequate current capacity.

Biological Hazard Safety



WARNING! BIOHAZARD

Biological samples such as tissues, body fluids, infectious agents, and the blood of humans and animals, have the potential to transmit infectious diseases. Follow all applicable local, state, provincial, and national regulations. Wear appropriate PPE, which includes but is not limited to protective eyewear, face shield, lab coat, and gloves. Conduct all work in properly equipped facilities using the appropriate safety equipment (for example, physical containment devices). Train individuals according to applicable regulatory, company, and institution requirements before working with potentially infectious materials.

Read and follow the applicable guidelines and regulatory requirements in the following publications:

- U.S. Department of Health and Human Services guidelines published in *Biosafety in Microbiological and Biomedical Laboratories* (stock no. 017-040-00547-4; bmb1.od.nih.gov).
- Occupational Safety and Health Standards, Bloodborne Pathogens (29 CFR §1910.1030; www.access.gpo.gov/nara/cfr/waisidx_01/29cfr1910a_01.html).
- Your company or institution's biosafety program protocols for working with and handling potentially infectious materials.
- Additional information about biohazard guidelines is available at www.cdc.gov.

Physical Hazard Safety



WARNING! PHYSICAL INJURY HAZARD

- Moving parts can crush and cut.
- Keep hands clear of moving parts while operating the analyzer. Disconnect the power before servicing the analyzer.
- Configure your workstation to promote neutral or relaxed working positions. Correct ergonomic configuration can reduce or prevent effects such as fatigue, pain, and strain.



WARNING! MUSCULOSKELETAL AND REPETITIVE MOTION HAZARD

Musculoskeletal and repetitive motion hazards are caused by potential risk factors that include but are not limited to repetitive motion, awkward posture, forceful exertion, holding static unhealthy positions, contact pressure, and other workstation environmental factors.

To minimize musculoskeletal and repetitive motion risks:

- Use equipment that comfortably supports you in neutral working positions and allows adequate accessibility to the keyboard, monitor, and trackpad.
- Position the keyboard and monitor to promote relaxed body and head postures.

Detector-Specific Safety and Disposal



Electrostatic Discharge (ESD) Precautions

1. Nabsys detectors are silicon-based devices attached to conventional printed circuit boards (PCBs). A silicon device contains 256 individual detectors, each of which contains a pair of nano-electrodes. Each electrode is individually wired (wire-bonded) to the PCB. A cover protects the detector and wire bonds and provides an integrated fluidic gasket.
2. Each PCB-mounted detector is packaged in a static shielding bag compatible with Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) EU Directive 2015/863 or later and protects the device under normal handling conditions.
3. When removing the detector from the ESD shielding bag, only grip the attached tab. When handling the detector, only touch the PCB edges. Do not touch the front surface of the PCB or the bare gold contacts on the back side of the PCB.



This symbol confirms that this product is lead-free.



This symbol indicates that the product cannot be disposed of with household waste. Disposing of waste equipment separately from the municipal waste stream is your responsibility. The correct disposal of end-of-life equipment will help prevent potential negative consequences for the environment and human health.

Chapter 2: OhmX™ Platform Overview

Introduction

The **OhmX Platform** is a fully integrated solution for genome assembly and structural variant analysis, designed for efficiency and ease of use. It combines the OhmX genome preparation chemistry, OhmX Analyzer, and OhmX Detector to enable precise detection of sequence-specific tags on long DNA molecules using electronic genome mapping (EGM) technology. The workflow is optimized for minimal hands-on time, featuring a straightforward sample preparation process, automated sample run protocols, real-time data acquisition, and bioinformatics pipeline. Its high-resolution structural variant detection capabilities make it a powerful tool for applications in genome assembly, cancer research, rare disease studies, and cell and gene therapy development.

To ensure seamless operation, this guide provides detailed instructions for setting up the OhmX Analyzer and conducting experiments. It is important to use samples prepared from isolated high molecular weight (HMW) DNA for optimal results. Below is a list of documentation referenced throughout this guide:

Document	Document Number	Description
OhmX Analyzer Quick Start Guide	755-00018-001	Once fully trained on this guide, the quick start guide can serve as a reference for routine system operation.
OhmX Platform Site Preparation Guide	755-00020-001	Guidelines for successful placement of the OhmX platform within a laboratory environment.
DNA Isolation for OhmX Genome Preparation Guide	755-00017-001	Comprehensive protocols for extracting HMW DNA suitable for OhmX analysis.
OhmX VOLT™ Whole Genome Kit Guide	755-00011-001	Detailed instructions on using the OhmX VOLT™ Whole Genome Kit to prepare tagged samples for data collection using the OhmX Analyzer.
Nabsys Data Selector Installation and Usage Guide	755-00015-001	Instructions for using the Nabsys Data Selector tool for extracting data for further analysis tools.

By consulting these resources alongside this system guide, the user will be able to fully leverage the capabilities of the OhmX Platform.

OhmX Platform Workflow



1. HMW DNA isolation—HMW DNA is isolated from the sample of interest using the New England Biolabs® (NEB) Monarch® HMW DNA Extraction Kit for Cells & Blood and evaluated for purity, concentration, and length (see DNA Isolation for OhmX Genome Preparation Guide, 755-00017-001)
2. Genome preparation—Input HMW DNA is nicked, labeled, purified, tagged, and coated
3. Sample loading—Detectors are prepared for sample injection into the OhmX Analyzer (this guide)
4. Data collection—Automated run protocols detect tagged molecules and collect data (this guide)
5. Data analysis—Nabsys software, supporting a variety of applications, is used to analyze the data

Technical Specifications

OhmX Analyzer Specifications

Type	Specification
Dimensions	Height: 17 in (43 cm)
	Width: 5.1 in (13 cm)
	Depth: 17 in (43 cm)
Weight	35 lb (16 kg)
Electrical input:	100–240 VAC at 50-60 Hertz (grounded receptacle)
Power	Consumption ≤ 160 Watts
	Cord: 2 m, IEC 60320-C13 power cord compatible with local outlet requirements

OhmX Controller Specifications

Type	Specification
Core	Intel® i9 13 th Gen 2.0 Ghz (24 core)
Operating system	Windows® 11 Pro (64-bit)
Memory	64 GB DDR5 SDRAM (Max 128 GB)
Data storage	1 TB SSD (OS); 16 TB HD (Data)
Electrical input	100–240 VAC, 50-60 Hertz (grounded receptacle)
Power	Controller ≤ 750 Watts
	Monitor ≤ 51 Watts

Environmental Considerations

The OhmX Platform is designed for indoor use only. Keep the analyzer away from direct sunlight or heat sources. Do not place the analyzer directly under air conditioning vents.

Element	Specification
Temperature	Maintain a lab temperature of 19°C (66°F) to 25°C (77°F).
Humidity	Maintain a noncondensing relative humidity of 20–80%.
Elevation	Place the analyzer at an altitude below 2,000 m (6,500 ft) above sea level.
Ventilation	Do not block the analyzer fans.
Air Quality	Operate the analyzer in a Pollution Degree II environment or better as defined by the International Electrotechnical Commission (IEC).

Network Connections

The OhmX Controller connects to the OhmX Analyzer and your network via Ethernet connections.

File Storage and Backup

The OhmX Controller can store ~40 experiments worth of raw data (~360 GB per experiment). Raw data are the files collected for each experiment. The default location for file storage is the data drive on the controller (D drive). Experiments are organized into folders within D:\SharedData\Samples.

The OhmX Platform does not provide backup capabilities. You can use a third-party backup solution.

A sample run will error if insufficient drive space is available to collect an overnight run. If the controller runs out of storage space during a sample run, the sample run will error. The user will have 1 hour to clear drive space and continue the run. If the user does

not address the issue, the sample run will end and the analyzer will be automatically flushed with water.

OhmX Analyzer Components

Detector and Sample Compartments

1. **Sample door**—Manually lifts to provide access to the sample injection port.
2. **Sample injection port**—Contains a self-sealing septum that allows sample introduction using a standard-bore pipette tip. The sample passes through the port and into the fluidic manifold and detector.
3. **Detector drawer**—Automatically controlled with the OhmX software for detector loading and allows access to the fluidic manifold. Do not attempt to open the drawer manually.



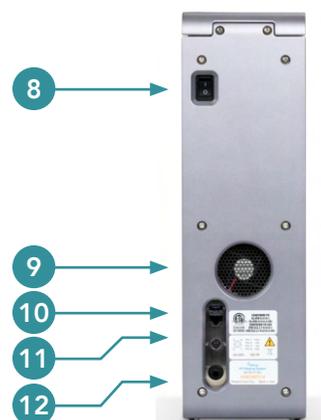
Reagent and Waste Compartments

4. **Reagent door**—Manually lifts to access the reagent compartment and controls movement of reagent cartridge in and out of the analyzer.
5. **Reagent compartment**—Holds the reagent cartridge during system operation.
6. **Waste drawer**—Manually slides open to access the waste collection tubes.
7. **Waste collection tubes**—Collects reagent waste from the analyzer.



Back Panel

8. Power switch
9. Exhaust fan
10. Host connection
11. DC power connection
12. Drain



OhmX Software

Home Screen

OhmX Software can be opened by double clicking the icon from the desktop. The home screen is shown below.



1. **Navigation**—Buttons to navigate the OhmX Software screens.
2. **Abort**—Cancels current analyzer protocol.
3. **Login**—Change the current user of the analyzer.
4. **User ID**—Current user logged into the software.
5. **System**—Provides information about the system status, data processing status, current step in a running protocol, loaded detector part number and identification number, reagent cartridge install and expiration dates, and status of reagent and waste levels.



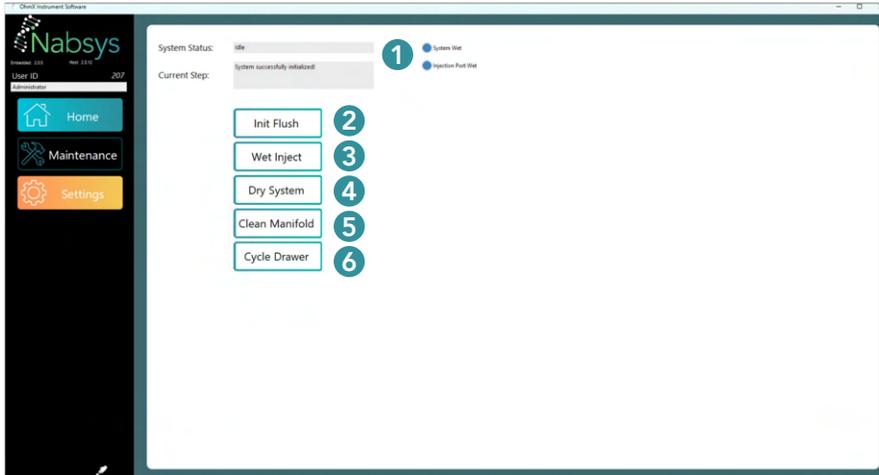
Orange shading indicates the waste level. A red outline (right icon) indicates that the waste level is high and must be emptied. Mousing over the icon provides waste volume in each individual waste tube.



Blue shading indicates the reagent level. A red outline (left icon) indicates when the reagent level is low and a new reagent cartridge must be installed. Mousing over the image provides the cartridge level % fill.

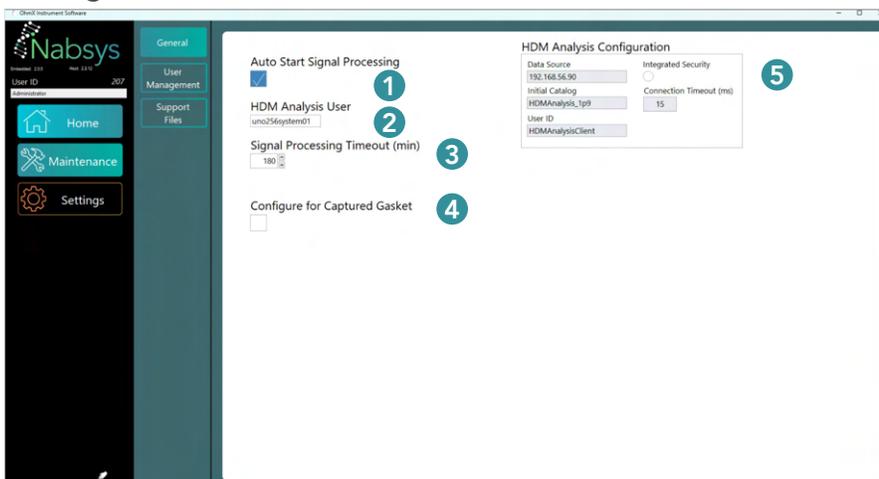
6. **DNA Signal**—Displays real-time raw signal from one channel during a sample run. Arrows on the right change the active channel being observed during a sample run.
7. **Protocol**—Basic protocols for loading a detector, cleaning a detector, running a sample, and properly storing the OhmX Analyzer post-run. Run metrics below the sample protocol buttons display number of molecules, number of filtered molecules, molecule rate, total filtered length, data collection time, estimated coverage, and percent channel activity. Filtered length and estimated coverage provide initial data estimates and are later refined through formal time-to-distance conversion in the analysis software.
8. **Data Histogram**—Real-time histogram displaying the DNA length (kb) distribution during data collection.

Maintenance Screen



1. **System Status**—Indicates whether the system has been fluidically initialized.
 - a. **System Wet**—Initial Flush has been successfully completed.
 - b. **Injection Port Wet**—The injection post has been successfully wetted using the Wet Inject process.
2. **Init Flush**—Process used to introduce reagents to the fluidic system when the system is in the dry state.
3. **Wet Inject**—Process used to wet the injection port. Users must have OhmX Sample Injection Diluent available for injection.
4. **Dry System**—Process used to dry the system for long-term storage or shipping.
5. **Clean Manifold**—Access (detector) manifold.
6. **Cycle Drawer**—Open/close detector drawer.

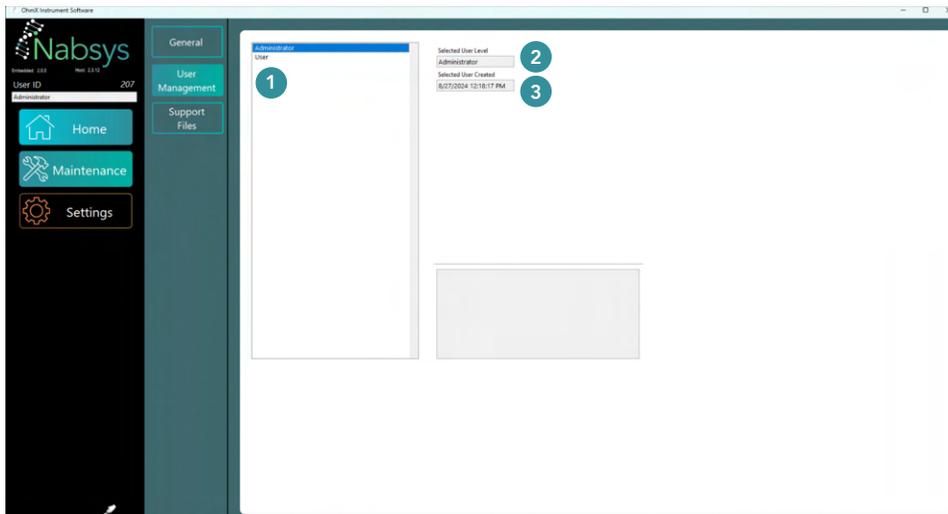
Settings - General



1. **Auto Start Signal Processing**—With this option selected, HDM Analysis completes signal processing as new data files are generated during a sample run. This option should be selected unless manual signal processing through HDM Analysis is desired.
2. **HDM Analysis User**—User name utilized by HDM Analysis to complete signal processing.

3. **Signal Processing Timeout**—Time allotted for HDM Analysis to complete processing on a new data file.
4. **Configure for Captured Gasket**—With this option selected, the detector loading protocol is set for Detectors with integrated gaskets. With this option de-selected, the detector loading protocol is set for detectors with non-integrated gaskets.
5. **HDM Analysis Configuration**—(Read Only) Shows the connection configuration of the HDM Analysis database.

Settings - User Management

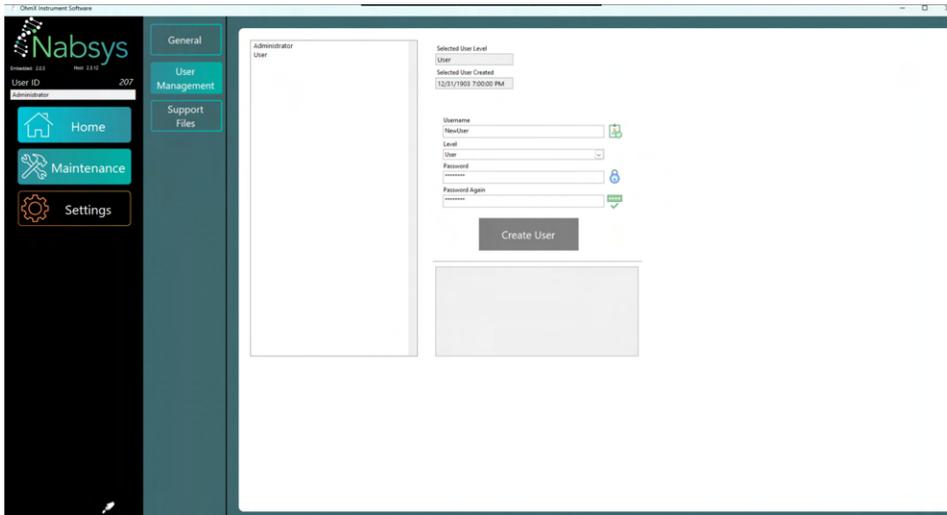


1. **User List**—List of the users available on this system.
2. **Selected User Level**—The user level of the user currently selected.
 - a. **User**—Allows basic operation of the system. Access to Home and Maintenance screens.
 - b. **Manager**—Same as User with addition of the ability to create more accounts at or below the same level.
 - c. **Administrator**—Same as Manager with addition of access to the Settings screen.
3. **Selected User Created**—Date and time the user was first created.

Create New User

1. Log into a user account that allows access to the **Settings** screen.
2. Right click on the user list and select **Create User**.

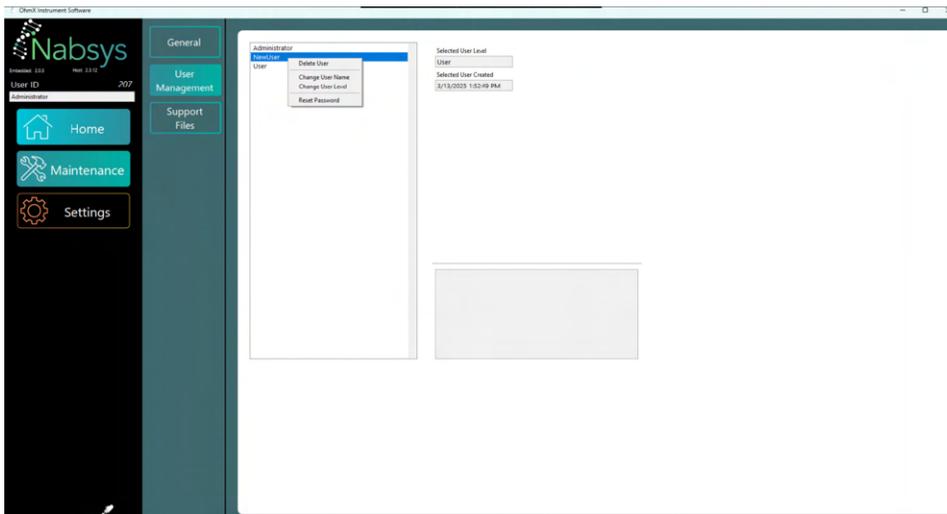
3. Enter a new username, select the appropriate user level and assign a password.



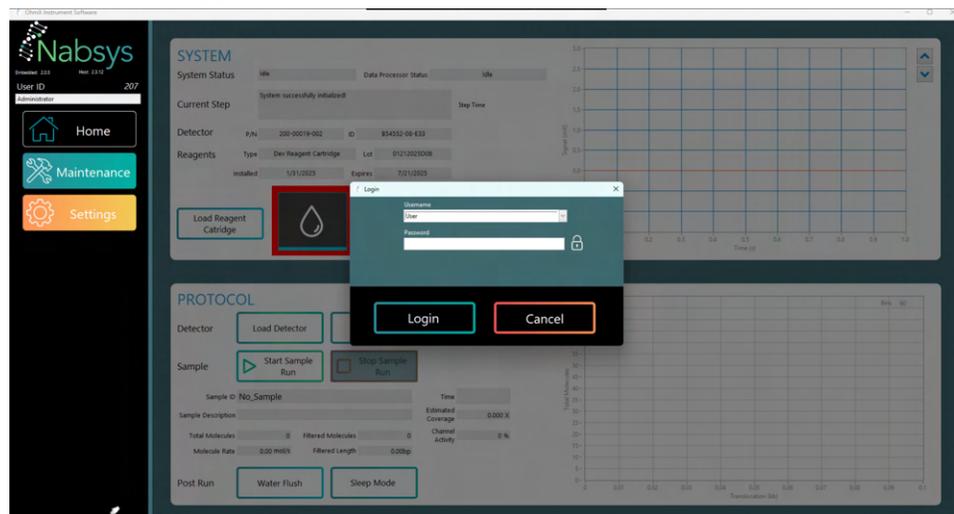
4. Select Create User.

Change User Name, Change User Level and Reset Password

1. Right click on the user and select the action.



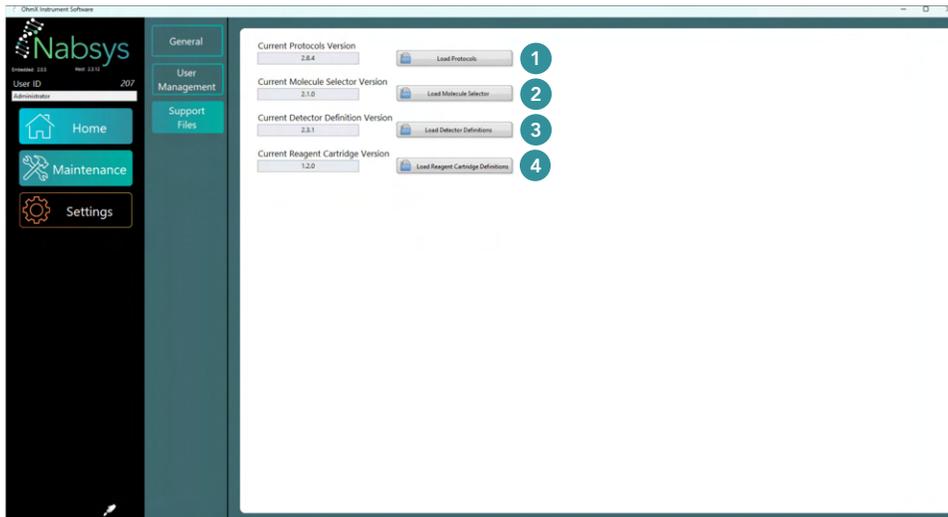
Changing User Logged In



1. Click the **Login** button.
2. Enter the desired **Username**.
3. Enter the **Password**.
4. Select **Login**.

Note: The logged in user is recorded in the data files. It is good practice to create a user account for each analyzer user.

Settings - Support Files



Periodically, Nabsys will provide updates to the support files that determine the operating parameters of the analyzer. This screen allows the user to run the processes to update these files.

1. **Load Protocols**—Protocols define the processes that allow automated operation of the analyzer.
2. **Load Molecule Selector**—Molecule Selector Parameters define how the analyzer initially extracts molecule data from the raw data.
3. **Load Detector Definitions**—Detector Definitions provide running conditions for the different versions of detectors.
4. **Load Reagent Cartridge Definitions**—Reagent Cartridge Definitions provide running conditions for the different reagent cartridges.

Chapter 3: Hardware and Consumables

Consumables are sold separately and include OhmX Detectors, OhmX Reagent Cartridges, OhmX Flush Cartridges, and the OhmX VOLT™ Whole Genome Kit. All OhmX consumables are specific to the OhmX Analyzer Platform and are available exclusively through Nabsys.

OhmX™ Analyzer and Controller

Instrument	Description	Part Number
OhmX Analyzer	The Nabsys OhmX Analyzer is a benchtop electronic genome mapping (EGM) analyzer featuring precision fluidics and integrated electronics for real-time DNA analysis.	900-00002-256
OhmX Controller	Desktop computer with OhmX Software and HDM-Analysis data processing software configured and pre-installed. Includes keyboard and mouse.	900-00010-002
OhmX Monitor	A 24-inch color monitor with an LCD display.	900-00038-001

Accessory Kit

All components listed in the following **Additional Parts and Tools** table are included in the accessory kit supplied with every analyzer.

Additional Parts and Tools	Quantity	Part Number
INTEGRA® VIAFLO® Pipette 10-300 µL (Single-Channel)	1	900-00070-001
INTEGRA® Charging/Communication Stand	1	900-00071-001
INTEGRA® GRIPTIPS®, 300 µL, wide bore, sterile	1	900-00077-001
INTEGRA® GRIPTIPS®, 300 µL, standard bore, low retention, sterile, filter	1	900-00073-001
Waste Tube Replacements	4	900-00013-001
Spill Tray	1	900-00034-001
OhmX Storage Detector	1	900-00064-001
Sample Injection Port Replacements	2	900-00014-002
Sample Injection Port and Pierce Tube Tool	1	900-00019-002
OhmX Detector Simulator	1	900-00033-001
Absorbent Pad Replacements	2	900-00023-002
Analyzer Power Module Assembly	1	900-00023-001
North American Power Cord	1	900-00015-001
Network Cable	1	900-00016-001
Mouse Pad	1	900-00049-001

System Consumables

Consumables	Quantity	Description	Shelf-life*	Part Number
OhmX System Reagent Cartridge	1	Prefilled cartridge with the necessary reagents to flush, clean, and run detectors for OhmX experiments	4 months	900-00056-001
OhmX System Flush Cartridge	1	Prefilled cartridge containing only DI water for flushing and maintaining analyzer fluidics	12 months	900-00057-001
OhmX Detector	1	Detection chip with integrated gasket featuring an array of nanodetectors for high-sensitivity electronic detection of tagged HMW DNA on the OhmX Analyzer	6 months	900-00058-001
OhmX Detector	5	OhmX Detector bundle–5 count	6 months	900-00058-005
OhmX Detector	10	OhmX Detector bundle–10 count	6 months	900-00058-010
OhmX VOLT™ Whole Genome Kit	1	All sample preparation consumables required to prepare sequence-specific tagged HMW DNA samples for electronic detection in the OhmX Analyzer, 10 samples	12 months	900-00076-001
OhmX Sample Injection Diluent	1	Sample running buffer for diluting prepared tagged HMW DNA samples prior to injection into the OhmX Analyzer, 6.8 mL	4 months	900-00048-001

* Shelf-life measured from date of manufacture.

Training Kit

A training kit (OhmX Training and Installation Kit (part # 900-00051-001) is supplied with the purchase of each analyzer to facilitate installation and initial customer training.

Component	Quantity	Part Number	Description
OhmX Detectors (10 Pack)	1	900-00058-010	Ten detectors with integrated gasket
OhmX VOLT™ Whole Genome Kit	1	900-00076-001	Sample preparation consumables required to prepare sequence specific tagged HMW DNA samples for electronic detection in the OhmX Analyzer featuring simultaneous nicking and labeling, 10 samples
OhmX System Reagent Cartridge	10	900-00056-001	Preloaded cassette with all reagents required for cleaning detectors, running assays, and maintaining the fluidics
OhmX System Flush Cartridge	2	900-00057-001	Preloaded cassette engineered to provide reagents necessary for instrument maintenance
OhmX Sample Injection Diluent	1	900-00048-001	Sample running buffer used for diluting human DNA prior to injection into the OhmX Analyzer
DNA, Lambda Control	2	900-00067-001	10 µg of isolated HMW lambda DNA
DNA, Nabsys Human Control	2	900-00060-001	10 µg of isolated HMW human control DNA
Cell Pellet, Nabsys Human Control	6	900-00066-001	1x10 ⁶ control human cell line cells for the OhmX Genome Preparation Workflow

OhmX VOLT™ Whole Genome Kit (Part #900-00076-001) Shipping and Storage Conditions

Box	Part	Components	 RT	 4°C	 -20°C
Box 1 Received at Room Temperature	Part 1	1X TE Buffer Nanosep Filters	●		
		Tagging Buffer DNA Tag Molecular Biology-Grade Water		●	
Box 2 Received on Dry Ice	Part 2	Labeled Nucleotide Mix Calibrant DNA		●	
	Part 3	Coating Buffer DNA Coating Protein OhmX Polymerase			●

Note: Isolated HMW DNA, Nicked/Labeled DNA, and Tagged Coated DNA are stored at 4°C.

OhmX Detector

The OhmX Detector consists of a high-performance silicon chip mounted onto a printed circuit board (PCB), designed for seamless integration with the OhmX Analyzer. The chip features an array of nanodetectors for high-sensitivity electronic detection of tagged HMW DNA samples. The detector is paired with a black gasket that 1) forms a fluidic seal between the chip and the fluidic manifold nose-piece on the OhmX Analyzer and 2) covers and protects the sensitive wire bond connections between the chip and the PCB.



For handling, the detector should only be touched on the edges of the PCB or the white pull tab on the top. The gold pad array on the back of the detector should be kept clean and can be wiped with a laboratory wipe if necessary.

OhmX System Reagent Cartridge (orange label)

Contains Sample Running Buffer, Detector Preparation Reagent, and DI water. The lot number and expiration date are found on the cartridge label and a series of 12 septa on the bottom of the cartridge allow for fluidic connections with the analyzer. When the reagent door is closed, tubing in the reagent compartment pierces the septa and supplies reagents to the analyzer. After removal from the analyzer, placing a reagent cartridge septa side up prevents leaks. Used reagent cartridges contain corrosive liquid and should be disposed of appropriately.



IMPORTANT!

OhmX System Reagent Cartridges and Sample Injection Diluent must be stored at room temperature

OhmX Sample Injection Diluent

Small amber bottle containing 6.8 mL of OhmX Sample Injection Diluent used to dilute tagged/coated samples prior to injecting into the OhmX Analyzer for sample run.



IMPORTANT!

After receiving OhmX System Reagents Cartridges and the OhmX Sample Injection Diluent, upload and share the temperature logging information following the instructions below to confirm proper conditions during shipment, if your shipment contained a temperature logger.

1. Upload and share the temperature logger data with support@nabsys.com using the instructions in the **Reagent Cartridge and Injection Diluent Room Temperature Incubation** bulletin provided with your shipment.
2. Discard any previous amber OhmX Sample Injection Diluent bottle. Make sure to use only the latest OhmX Sample Injection Diluent received. Previously shipped reagent cartridges do not need to be discarded.
3. Incubate the reagent cartridges and the OhmX Sample Injection Diluent at room temperature for at least 24 hours before loading onto your OhmX Analyzer or diluting your prepared sample.
4. Invert the Sample Injection Diluent gently 15 times before each use.

OhmX System Flush Cartridge (blue label)

Contains only DI water to flush the analyzer for long-term storage. Like the reagent cartridge, this cartridge has a label with a lot number on the top and a series of 12 septa on the bottom to allow for fluidic connections with the analyzer. After removal from the analyzer, place the flush cartridge septa side up to prevent leaks.



User-Supplied Materials

Consumables	Supplier and Catalog Number
1.5 mL DNase/RNase-free tubes	General lab supplier
INTEGRA® GRIPTIPS®, 300 µL, wide bore, sterile	INTEGRA®, 3935
INTEGRA® GRIPTIPS®, 300 µL, standard bore, low retention, sterile, filter	INTEGRA®, 3835
Low-lint laboratory wipes	General lab supplier

Automated Pipetting of HMW DNA

HMW DNA shears easily with mechanical force. It is key that all handling and pipetting of DNA be done gently and slowly in order to maintain your sample at the appropriate length for the OhmX Analyzer. This is most easily achieved using the INTEGRA VIAFLO® single-channel electronic pipette fitted with INTEGRA wide-bore pipette tips. This pipettor is supplied with the OhmX Analyzer and should be used to transfer HMW DNA between tubes, manage reaction mixing steps, and control sample injection into the OhmX Analyzer. The pipette comes pre-loaded with custom programs for reaction handling and mixing steps that have a defined volume (see table below).

NOTE: The pipette should routinely be stored on the charging stand when not in use to ensure that it is sufficiently charged to allow the full sample preparation and injection workflow to be completed without interruption.

Custom Program Name	Sample Preparation Step
DNA STOCK MIX	Mix/homogenize HMW DNA stocks prior to sample preparation
SNL	Mix the simultaneous nicking and labeling reaction
TRANS TO NANO	Transfer the nicked and labeled DNA to the Nanosep Filter
NANO ELUTE	Mix and remove the eluted DNA from the Nanosep membrane
NANO HOMOGEN	Mix/homogenize the purified DNA after removal from the Nanosep membrane
CALIBRANT MIX	Mix/homogenize the Calibrant DNA prior to use
TAGGING	Mix the tagging reaction
COATING	Mix the coating reaction
SAMPLE DILUTION	Deliver the tagged and coated DNA to the sample dilution tube and mix with OhmX Sample Running Buffer (see OhmX Analyzer Guide, 755-00003- 001)
INJECT	Inject the diluted sample into the OhmX Analyzer (see OhmX Analyzer Guide, 755-00003-001)



Chapter 4: OhmX Analyzer Installation

Site Preparation

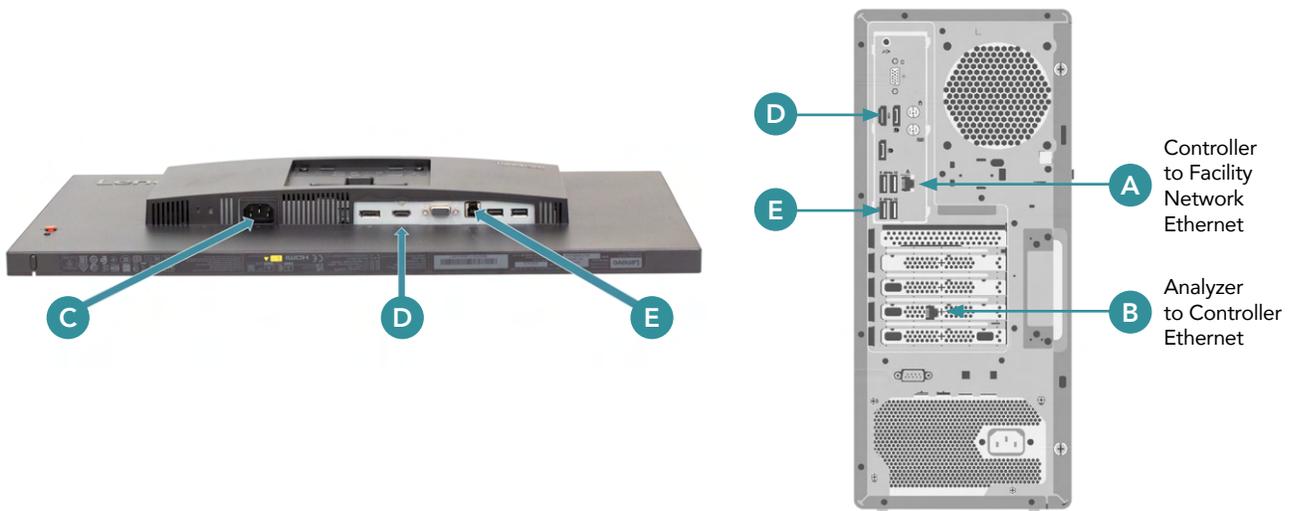
The following sections detail system setup and installation instructions for the OhmX Analyzer and Controller. For complete site preparation information, refer to the [OhmX Analyzer Site Preparation Guide \(755-00020-001\)](#).

System Setup

Unpack the System

The system weighs approximately 16 kg and requires 3 AC power outlets.

1. Set up the computer and monitor per the following figures and the manufacturer instructions included in the box.
 - A. Connect the facility network to the primary ethernet port as shown below.
 - B. Connect the analyzer to the secondary ethernet port as shown below.
 - C. Connect the monitor power cord to an AC power outlet.
 - D. Connect the HDMI port on the monitor to the HDMI port on the controller.
 - E. Connect the USB port on the monitor to a USB port on the controller.



2. Carefully lift the OhmX Analyzer from the box and set it upright on the lab bench. Remove all blue packing tape.



WARNING!

Do not lift the analyzer by the reagent door, sample injection door, or waste manifold drawer. Lifting the doors can damage the analyzer.

3. Place the computer and monitor adjacent to the OhmX Analyzer, along with the mouse and keyboard, on the lab bench. Ensure the controller ventilation holes (if any) are on the top.
4. Allow at least 6 in (15 cm) of space behind the OhmX Analyzer for ample air circulation.
5. Save the packing materials for future use.

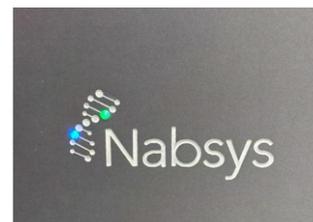
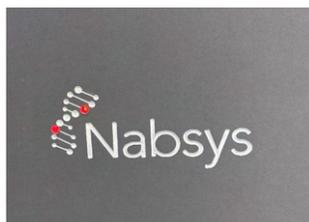


Install the OhmX Analyzer

1. Slide open the waste drawer and verify the four waste tubes are installed and secure. The tubes pivot out to facilitate removal and installation. **These waste tubes are unique and sold exclusively by Nabsys (#900-00013-001).** Users should not try and install off-the-shelf 50 mL conical tubes.
2. If the tubes are not in place, install the four waste tubes included with the system.
3. Manually tighten the waste tubes. Do not over-tighten.
4. Pivot the tubes back to their original position.
5. Connect the network cable (1) to the port on the back panel of the analyzer and to the communication port on the controller.
6. Plug the analyzer power cord (2) into the power inlet on the back panel of the analyzer.



7. Plug the DC power cord into a power outlet. The analyzer power cord has a locking-style connector. To unplug the power cord, you must pull the outer ring away from the power inlet before removing the cord from the power inlet.
8. Turn on the computer and log in.
9. Turn on the analyzer using the power switch at the top of the back panel.
10. Launch the OhmX software.
11. Confirm both LED indicator lights on the front of the analyzer are on, which indicates that configuration is complete. The following table describes a typical startup routine.



Status	Instrument Control LED (bottom)	Data Communication LED (top)
Analyzer powering on, internal application booting	Solid blue	Solid blue
Analyzer powered on, PC application not running	Solid red	Solid red
Analyzer configuration complete and ready for use	Solid blue	Solid green

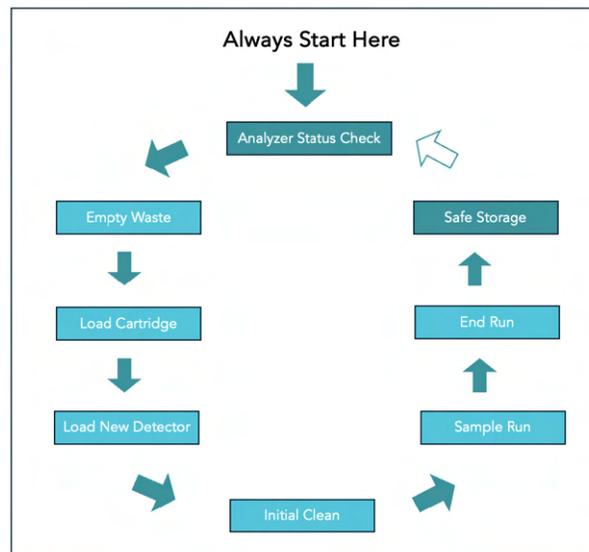
12. Follow the instructions in Chapter 5 to Load a Detector. Confirm that a detector with a gasket is in place prior to proceeding to the next step.
13. Select **Maintenance**, and then select **Init Flush** to wet the analyzer and completely flush with DI water using a Flush Cartridge before use. The Init Flush protocol only needs to be completed once after initially receiving the analyzer or if the analyzer was previously dried for storage. Init Flush ensures all air has been removed from the microfluidic lines.
14. Follow the software prompts to complete the initial air purge and fluidics priming. The radio button "System Wet" turns blue after the process successfully completes.
15. On the **Maintenance** screen, select **Wet Inject** to prepare the Sample Injection Port.
16. Follow the software prompts to inject 200 μ L Sample Injection Diluent from the OhmX Sample Injection Diluent bottle. The radio button turns blue after the process successfully completes.
17. Return to the Home screen and select **Water Flush**. This clears the OhmX Sample Injection Diluent from the system.
18. The OhmX Analyzer is now ready for use. If the OhmX Analyzer is not going to be used immediately, select **Sleep Mode** to store the system safely for up to 4 weeks. After 4 weeks, contact Nabsys Technical Support (support@nabsys.com) for further guidance.

Chapter 5: Operate the OhmX Analyzer

The OhmX Analyzer is designed for streamlined operation, ensuring efficiency and reproducibility in **electronic genome mapping (EGM)**. This chapter provides a step-by-step guide to running the analyzer, from system preparation to sample injection and data collection. The workflow is optimized for minimal hands-on time, integrating automated protocols for reagent management, detector handling, and real-time performance monitoring. Following the outlined protocol will ensure optimal analyzer function, high-quality data output, and proper system maintenance for reliable long-term use.

For a concise version of this protocol, see the **OhmX Analyzer Quick Start Guide**.

OhmX Analyzer Operation Overview



Step 1: Check OhmX Analyzer Status

1. Select **Abort** to end any protocol currently running on the analyzer, including **Sleep Mode**. The status of the system should indicate **Idle** prior to starting any new protocols.
2. Inspect the injection port for precipitated salt. If precipitants are present, flush the injection port with water using a pipette. For instructions, refer to **Chapter 6: Maintenance**.
3. Check the **System** panel on the **Home** screen to confirm that either a storage detector or previously used detector is present. If a detector is not present, go directly to **Step 4: Load a Detector**.
4. After confirming a detector is installed and the system is idle, proceed to **Step 2: Empty Waste**.

Step 2: Empty Waste

1. Select **Empty Waste** in the **System** panel next to the **Waste** icon.
2. Following the software prompts, open the waste drawer by gripping the sides of the drawer and sliding the drawer out to expose the waste manifold and waste tubes.
3. While wearing gloves, tilt a full waste tube to the side and unscrew to remove, being careful not to spill the waste.
4. Remove the waste tube and empty the contents into an appropriate hazardous waste container.

 **IMPORTANT!**

If waste tubes need to be replaced, only use tubes supplied by Nabsys. While other tubes may seem to fit, they will not seal properly with the system and will cause pressure leaks.

- Using a clean laboratory wipe, wipe the tube rim to remove any residual liquid. Precipitated salt can interfere with forming a good seal, so care should be taken to remove all residual liquid.
- Manually tighten the waste tube without over-tightening.
- Repeat steps 4–6 for all waste tubes.
- Return the empty waste tubes to an upright position and close the waste drawer.
- Select **Complete** to initiate the pressurization protocol and ensure proper installation of the waste tubes.
- A pressure test is performed after installation of the waste tubes to ensure a proper seal. If an error occurs during the test, refer to **Chapter 7: Troubleshooting** for resolution.

Step 3: Load a Reagent Cartridge

- Prior to loading a new cartridge, check that either a storage detector or previously used detector is installed by reviewing the **System** panel on the **Home** screen.

 **IMPORTANT!**

The absence of a detector when loading a new reagent or flush cartridge will result in damage to the analyzer.

- On the **Home** screen, select **Load Reagent Cartridge**.
- Following the software prompt, open the reagent door at the top of the analyzer.
- Remove the used reagent cartridge and discard or save:
 - If discarding a used reagent cartridge, follow all federal, state, and local regulations for disposal.
 - If saving a used reagent cartridge, place the cartridge septa side (bottom) up to prevent leaks.

 **IMPORTANT!**

Partially used reagent and flush cartridges can be saved for later use. The software automatically recognizes the used cartridge and updates the remaining volume.

- With the label facing up and forward, gently place a new reagent cartridge into the reagent compartment. The cartridge can only fit into the reagent compartment in one direction.
- Slowly close the reagent door, allowing the door motion to lower the reagent cartridge into the analyzer.
- In the dialog box, select **Start** to initiate the purge protocol.
- During the purge protocol, slide the waste drawer open to observe liquid accumulating into all four waste tubes. If an uneven volume of waste is observed after the purge, contact Nabsys Support. If **Wet Inject** was not already used from the maintenance page, the system will prompt for injection of Sample Injection Diluent into the sample port.
- After the purge protocol completes, the reagent cartridge is ready for use.
- Leave the reagent cartridge in the analyzer for up to 1 week. If you exceed 1 week, replace the reagent cartridge with a flush cartridge and enter into **Sleep Mode** as outlined in **Step 10: Storing the Analyzer**.

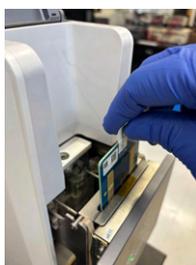
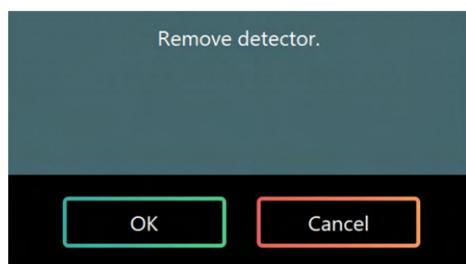
Step 4: Load a Detector



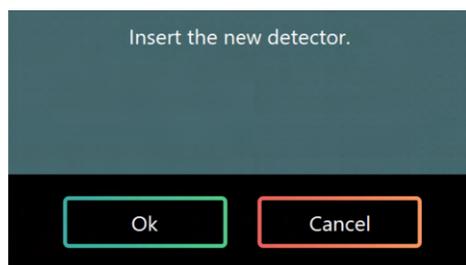
IMPORTANT!

Prior to loading a new detector, it is important to load a new reagent cartridge to ensure there is enough reagent to perform an overnight sample run.

1. Tear the top of the ESD shielding bag and remove the detector by gripping the attached pull tab. Handle the detector only by the PCB edges. Do not touch the front surface of the PCB or the bare gold contacts on the back side of the PCB. Inspect the detector and confirm that a black gasket is attached on the electric board.
2. In the **Protocol** section of the **Home** screen, select **Load Detector**.
3. Following the software prompt, remove the detector by grabbing the pull tab and pulling up to release it from the detector drawer.
4. Select **OK**.



5. Next, insert the new detector into the detector drawer, ensuring that the black gasket is facing the fluidic manifold. When inserting the detector into the detector drawer, use two fingers and push the detector down until the top of the detector is flush with the top of the detector drawer. See pictures below. **Note:** the detector can only be inserted one direction.
6. After inserting the detector, select **OK**.



7. Confirm that the detector **P/N** and **ID** have been populated in the **System** panel.
8. Select **Initial Clean** to start the automated initial clean protocol. The automated protocol performs a pressure test and conductivity test to ensure the proper fluidic connections have been made and reagents are being delivered to the detector appropriately.
9. Check back after 10 minutes to ensure the protocol is proceeding without error. If an error is encountered, proceed to **Chapter 7: Troubleshooting**, for resolution.
10. The **Initial Clean** protocol takes a total of 45 minutes to complete.
11. Once complete, the current step in the **System** panel will indicate **Initial Clean Complete**. The detector is stored in water and can safely be stored at this stage until the user is ready to begin a sample run. It is best practice to use the detector the same day.

Step 5: Start the Sample Run

1. From the **Home** screen, select **Start Sample Run**.
2. If there is not enough reagent remaining in the cartridge to complete an overnight sample run, the software will alert the user. It is best practice to use an old detector to load a new reagent cartridge to avoid introducing air into the newly cleaned detector. Follow the procedure below if a new reagent cartridge is needed at this step.
 - a. Select **Load Detector** to remove the current detector and set aside. Move quickly through this process to ensure the detector does not begin to dry and affect downstream performance.
 - b. Insert a previously used detector or storage detector with an integrated gasket.
 - c. Select **Load Reagent Cartridge** and follow the software prompts to remove the old cartridge and insert a new reagent cartridge.
 - d. Select **Start** to initiate the purge protocol .
 - e. After the purge protocol completes, select **Load Detector** and follow the software prompts to re-insert the recently cleaned detector.
 - f. Select **Start Sample Run**.
3. The sample run protocol exchanges the detector into the running buffer reagent and performs routine detector performance checks prior to prompting the user to inject the sample. If a detector does not pass set performance specifications an error message will appear. Refer to **Chapter 7: Troubleshooting** for next steps.
4. Once the exchange and performance checks are complete, the protocol will pause and ask the user if they want to inject a sample. While paused at this dialogue box, proceed below to **Step 6: Dilute the Sample**.

Step 6: Dilute the Sample

Samples prepared using the **OhmX VOLT™ Whole Genome Kit Guide** must be diluted in OhmX Sample Injection Diluent prior to injection into the OhmX Analyzer. Follow the table and protocol below to prepare a sample for injection.

Component	Volume (µL)
OhmX Sample Injection Diluent	150
Tagged & Coated DNA Sample	33
Total Volume	183

1. Add 150 µL of the Sample Injection Diluent to a 1.5 mL tube.
2. The tagged and coated DNA sample is transferred to the tube containing the Sample Injection Diluent using the INTEGRA electronic pipette custom program **SAMPLE DILUTION** with a **wide-bore tip**. This is a 3-step program that
 - 1) Aspirates 33 µL of tagged & coated sample
 - 2) Dispenses the sample into the tube containing the Sample Injection Diluent
 - 3) Mixes the diluted sample 20x at the appropriate speed; total mix time is ~4 min



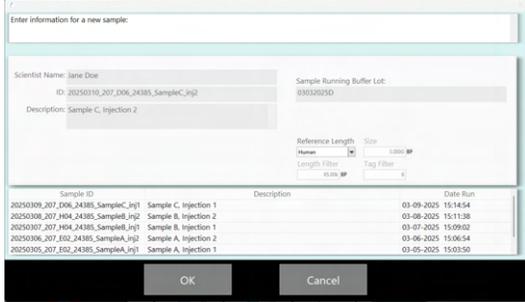
Each step is initiated by pressing the RUN button on the pipette. Ensure that the pipette is fitted with a wide-bore tip and avoid pressing the pipette tip against the bottom of the tube. Follow the meniscus down while mixing to avoid generating bubbles. Set aside the diluted sample at room temperature. Do not store it on ice.

3. After dilution in OhmX Sample Injection Diluent, the sample must be used the same day. Proceed to **Step 7: Inject the Sample**.

Step 7: Inject the Sample

1. The dialogue box prompting the user to inject a sample indicates the detector has passed all routine performance tests.
2. Select **Yes** to inject a sample. Select **No** to end the protocol and flush the detector with water.
3. In the **Sample Information** dialog box, enter the following information:

- **Scientist name:** User operating the analyzer.
- **ID:** The sample ID is the base file name for all data files associated with the run and should be unique to the sample injection. Sample IDs cannot contain special characters [\ : / * ? " < > | or space] or end with a period [.].
- **Reference Length:** Input sample type (human, lambda, custom) and genome size.
- **Sample Injection Diluent Lot:** Record the lot number of the Sample Injection Diluent used to dilute the sample.
- **Description:** This field is for the user to describe any details of the experiment.

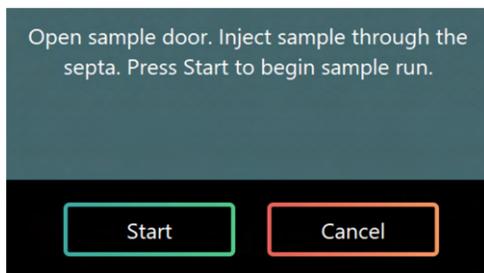


Sample ID	Description	Date Run
20250309_207_D06_24385_SampleC_Inj1	Sample C, Injection 1	03-09-2025 15:14:54
20250308_207_H04_24385_SampleB_Inj2	Sample B, Injection 2	03-09-2025 15:11:38
20250307_207_H04_24385_SampleB_Inj1	Sample B, Injection 1	03-07-2025 15:09:02
20250306_207_E02_24385_SampleA_Inj2	Sample A, Injection 2	03-06-2025 15:06:54
20250305_207_E02_24385_SampleA_Inj1	Sample A, Injection 1	03-05-2025 15:03:50

★ IMPORTANT!

The system is not ready for sample injection until the user enters the necessary information and proceeds to the next step. Attempting to inject the sample too early will result in a failure to deliver the sample to the detector.

4. Select **OK** after entering all information to proceed to the next step.
5. With the dialogue box shown to the right, the system is now ready for sample injection.



Injection into the OhmX Analyzer is accomplished by using the INTEGRA electronic pipette custom protocol INJECTION with a **standard-bore tip**. This is a 2-step protocol that (1) aspirates 165 μL of diluted sample and (2) slowly dispenses 150 μL of the sample into the analyzer. Each step is initiated by pressing the **RUN** button on the pipette. Residual sample left in the pipette tip is expected and should be discarded following injection.



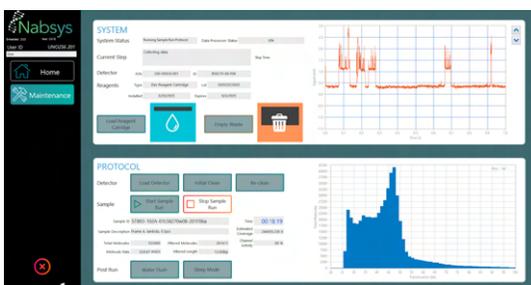
6. Using the INTEGRA pipette **INJECTION** custom program, press **RUN** to aspirate the diluted sample.
7. Open the sample door.
8. Keeping the pipette vertical, insert the standard-bore tip into the sample injection port as far as possible, feeling the pipette tip bottom out.
9. Press the **RUN** button a second time to inject the sample into the analyzer. Injection takes ~ 30 s and the pipette will beep once it is complete. Remove the pipette tip from the sample injection port and dispose of the tip containing the residual sample.
10. Press the **RUN** button to reset the pipette.
11. Close the sample door, and select **Start**.

Step 8: Monitor Data Collection

After a sample run starts, the sample is pressurized into the detector, the electric field turns on, and the signal from DNA molecules translocating through the detector can be observed in the **DNA Signal** panel. The spikes above DNA backbone signals correspond to sequence-specific tags added during sample preparation. Multiple molecules may pass through the detector simultaneously, generating more complex signals that are deconvolved during signal processing. The software continuously monitors the signal from individual channels and disables data collection on those channels that fall outside specified ranges. The percentage of active channels updates throughout the run. To maintain optimal detector performance and channel activity, data collection periodically pauses and initiates a channel maintenance protocol. Once complete, data collection automatically resumes.

The software images below provide examples of 1) a control lambda sample run and 2) a standard human sample run.

1) Control Lambda Sample Run During Data Collection



2) Standard Human Sample Run During Data Collection



Initial evaluation of data collection

Lambda DNA Sample:

A lambda control sample has a relatively uniform molecule length and tagging pattern that may be used to evaluate the OhmX Analyzer and associated consumables. As shown above (1), the monodisperse nature of lambda should result in a single translocation peak observed in the **Data Histogram** panel. In the **DNA Signal** panel, the user should observe relatively uniform molecule translocation times with associated signal spikes corresponding to attached tags. Expected **Molecule Rates** for a lambda sample run are > 500 mol/s with an initial **Channel Activity** of $> 80\%$. Channel activity fluctuates during the course of a run. Collection of ~ 10 minutes of lambda data is sufficient to evaluate the run characteristics and remapping performance. In the event that lambda molecule length or tagging characteristics are not as shown above, consult **Sample-Related Troubleshooting** in Chapter 7.

Human DNA Sample:

In contrast to lambda, a human sample has a non-uniform length distribution as shown above (2). This results in variable-length signals in the **DNA Signal** panel and a **Data Histogram** with a tail reaching to 200 kb or beyond. A shoulder in the histogram should be observed at 40–50 kb corresponding to the Calibrant DNA added during sample preparation. Expected starting **Molecule Rates** for a human sample run are > 200 mol/s with an initial **Channel Activity** of > 80%. As with lambda, a properly prepared human sample will display molecule backbone signals with associated (attached) tags and few dips in signal between the rise and fall. If the length distribution is significantly shorter than shown above, molecules appear to have no/few attached tags, or frequent dips in the backbone coating are observed, consult **Sample-Related Troubleshooting** in Chapter 7.

Monitoring Waste

As the run progresses the waste containers will fill. It is expected that waste tubes in the front of the waste drawer will fill more quickly than the waste tubes in the back. Once the volume in a waste tube reaches ~45 mL the run will stop and the user has one hour to empty the waste before the system automatically flushes with water to safely store the system. If the user chooses to empty the waste when prompted, the run will continue.

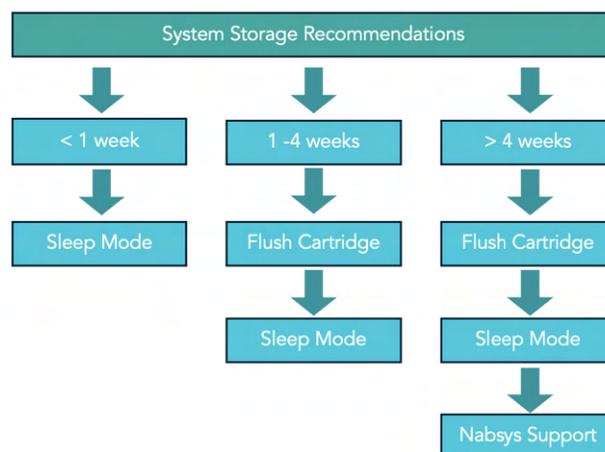
Step 9: End the Sample Run

Over the course of an overnight sample run, **Molecule Rate** and channel activity will gradually decline. A typical overnight sample run lasts ~16 hr, after which the **Molecule Rate** is below 60 molecules/s and further data collection becomes inefficient.

1. If the user is satisfied with the data collected or the molecule rate drops below an efficient level, select **Stop Sample Run**. Follow the software prompts to run the **Water Flush** protocol and store the system in water. Proceed to **Step 10: Storing the Analyzer**.
2. The system may automatically stop data collection if either of the following occur:
 - a. **Waste tubes are full**—error code 500014, the analyzer will automatically end the run after 1 hour and flush the system with water if the user does not intervene to empty waste.
 - b. **Reagents in the reagent cartridge are insufficient**—error code 500015, the analyzer will automatically end the run and flush the system with water.

Step 10: Storing the Analyzer

When the system is not in use, it must be stored in a safe state to prevent clogging of the microfluidic lines. Follow the recommendations below to ensure optimal system performance and longevity.



1. Determine how long the analyzer is likely to be idle and install the appropriate cartridge. Reference the flow chart below.
 - a. Up to 1 week—OhmX System Reagent Cartridge.

- b. Up to 4 weeks—OhmX System Flush Cartridge.
2. Select **Empty Waste** and follow the software prompts to empty the waste.
3. Select **Sleep Mode** from the **Protocol** panel on the **Home** screen.
4. Ensure the system has fully entered **Sleep Mode** prior to walking away from the system (a countdown timer of 24 hours will appear indicating when the system will next flush the fluidic system in **Sleep Mode**).
5. If the system will be idle for more than 4 weeks, contact Nabsys Technical Support for further guidance.

**IMPORTANT!**

Storing the system in **Sleep Mode** is crucial for maintaining optimal operational conditions.

Step 11: Data Analysis

1. Confirm that signal processing has completed and that the **Data Processor Status** box says **Idle** before transferring data.
2. Open the **Nabsys Data Selector** software to compress the sample output folder into a ZIP file to prepare the data for downstream analysis. Refer to the **Nabsys Data Selector Installation and Usage Guide** for more information.

Chapter 6: Maintenance

The OhmX Analyzer is a precision electronic and microfluidic instrument, so optimal operating conditions require some maintenance. Always wear appropriate personal protective equipment (PPE), including gloves, lab coat, and eye protection when performing maintenance and cleaning procedures.

Clean the Sample Injection Port

The Sample Injection Port has a septum installed that allows you to insert a pipette tip for sample injection. After routine use, the sample port can accumulate precipitated run reagents.

To clean the Sample Injection Port:

1. Use a 200 μ L pipette tip to flush the injection port with 100 μ L of DI water.
2. Avoid piercing the septum and simply flush the injection port above the septum to remove precipitated material.
3. Repeat flushing as necessary.
4. Before sample injection, ensure that all water is removed.

Replace the Sample Injection Port

Replace the sample injection port if pooled liquid is observed at the bottom of the Sample Injection Port.

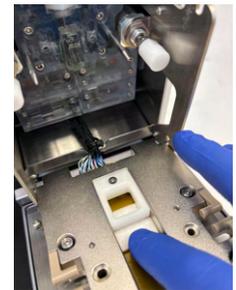
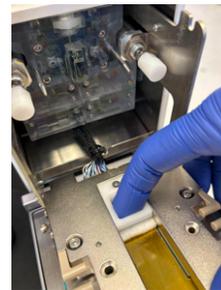
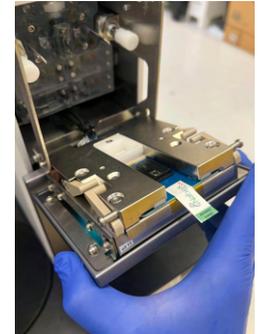
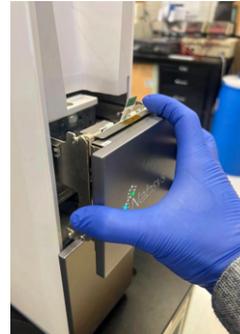
To replace the Sample Injection Port:

1. Close the analyzer software.
2. Turn off the analyzer using the power switch at the top of the back pane.
3. Open the sample door and use a pipette to remove any liquid above the septum.
4. Unscrew the Sample Injection Port Assembly (part # 900-00014-001) using the sample Injection Port and Pierce Tube Tool (part # 900-00019-001).
5. Install the new Sample Injection Port and manually tighten using the Sample Injection Port Tool. The Sample Injection Port is pre-pierced and ready to use.
6. Turn the analyzer on and restart the software.
7. Wet the injection port using the **Wet Inject** protocol on the **Maintenance Screen**.

Clean the Detector Manifold

In the unlikely event a leak occurs and you observe liquid or precipitated salt when removing a detector, clean the fluidic manifold and replace the absorbent pad:

1. Start the **Clean Manifold** process from the **Maintenance** screen.
2. Follow the software prompts to fold down the detector drawer and expose the fluidic manifold.
3. Lift the detector drawer:
 - a. Grip the outer sides of the door.
 - b. Lift to release locator guides (side slots) at the top of the door.
4. Open the door forward to the horizontal position to reveal the fluidic manifold.
5. Using a clean lab wipe, wipe the surface of the nose piece on the fluidic manifold.
6. If the absorbent pad in the detector drawer is wet or stained yellow, replace it following the procedure below:
 - a. Using your finger, slide the absorbent pad out from under its holder.
 - b. Insert a new absorbent pad (part # 900-00023-001) as shown in the picture to the right.
7. Grip the outer sides of the detector drawer and close the drawer. Ensure the locator guides rest evenly into the slide slots as shown in the arrow on the picture below.
8. Select **Continue** to allow the detector drawer to close.



Clean the Reagent Cartridge Manifold

If a reagent cartridge leaks, dried or pooled reagent might be visible in the manifold. Cleaning the manifold after a water flush, when the status is **Idle**, is ideal. Depending on the source of the leak, follow the instructions for a small reagent cartridge leak or insecure reagent tube fitting.



Reagent leak in column of ports



Using syringe to clean manifold

Insecure Reagent Tube Fitting

If the reagent tube fitting is not secure, liquid reagent might be visible in the column of ports associated with the leak.

1. Using a plastic syringe, remove any pooled liquid. Flush the area several times with deionized (DI) water and remove waste with the syringe.
2. Using a cotton swab, clean and dry the area.
3. Using the Sample Injection Port and Pierce Tube Tool, check the tightness of all the fittings.
4. Insert a flush cartridge and allow it to sit overnight.
5. Remove the flush cartridge and visually check the fluidic manifold to confirm that the leak was corrected.



Sample Injection Port and Pierce Tube Tool



Checking the tightness of fittings

6. Select **Load Reagent Cartridge** and install a reagent cartridge to properly purge the system before loading a new detector or performing a sample run.
7. Insert a flush cartridge and allow it to sit overnight.
8. Remove the flush cartridge and visually check the fluidic manifold to confirm that the leak was corrected.
9. Select **Load Reagent Cartridge** and install a reagent cartridge to properly purge the system before loading a new detector or performing a sample run.

Chapter 7: Troubleshooting

System Issues

Observation	Cause	Recommended Action
Connectivity issue	The software fails to sync with the analyzer.	Check the communication cable between the analyzer and controller. Restart the controller and power cycle the analyzer, powering it off for at least 10 seconds.
Sample port leak	OhmX Sample Running Buffer is pooled on top of the septum during a sample run.	Remove the pooled liquid with a pipette and follow Replace the Sample Injection Port in Chapter 6: Maintenance .
Detector manifold leak	When removing a detector, liquid or precipitated salts are observed on the detector gasket, manifold, or detector drawer.	See Clean the Detector Manifold in Chapter 6: Maintenance . If the problem persists, contact Nabsys Technical Support.
Reagent cartridge leak	When removing a reagent cartridge, pooled liquid is observed on the manifold.	See Clean the Reagent Cartridge Manifold in Chapter 6: Maintenance .
Protocols unavailable	Buttons in the Protocol panel are unavailable and detector ID information is missing from the System panel.	Confirm a detector is loaded. Select the Load Detector protocol to remove the detector and reinsert it. If the problem persists, contact Nabsys Technical Support.

System Error Codes

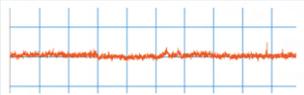
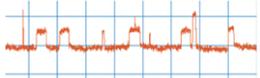
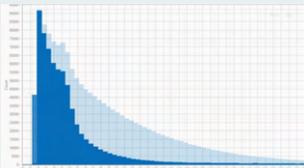
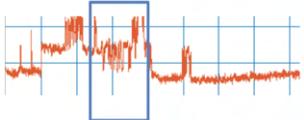
Error Code	Description	Recommended Action
500000	Failed current leakage	Run the Load Detector protocol to eject the detector. Check for leaks and, if necessary, clean the manifold per Clean the Detector Manifold in Chapter 6: Maintenance . If the problem persists, contact Nabsys Technical Support.
500003	Failed autoset bias voltage	Confirm that the detector completed the Initial Clean protocol. Abort and re-try the sample run protocol. If the problem persists contact Nabsys Technical Support.
500005	Failed pressurization	If the problem persists, contact Nabsys Technical Support.
500006	Failed conductivity check	First, confirm that a reagent cartridge and not a flush cartridge is loaded. If the error occurs during the Initial Clean , remove the detector, and check for leaks inside the analyzer. If leaks are not observed, reinsert the detector and restart the Initial Clean protocol. If leaks are observed, clean the manifold per Clean the Detector Manifold in Chapter 6: Maintenance . If the problem persists, replace the detector. If the problem occurs over multiple detectors, contact Nabsys Technical Support.
500007	Pressure leak	An issue at the Gasket/Detector/System interface is likely. Clean the manifold per Clean the Detector Manifold in Chapter 6: Maintenance . Clean the manifold surface using a lab wipe. If the problem repeats, replace the detector. If the problem persists on more than one detector, contact Nabsys Technical Support.
500013	Detector is not viable	During routine detector performance checks, the minimum number of channels are not operational. Reclean the detector and reinject the sample as needed. If the problem persists contact Nabsys Technical Support.

Error Code	Description	Recommended Action
500014	Waste level too high	Empty the waste because the waste levels are too high. Ignoring this error risks damaging the analyzer.
500015	Reagent levels too low	The reagent volume is insufficient to complete the current protocol. Abort the protocol and replace the reagent cartridge to continue following the steps outlined in Step 5: Start the Sample Run of Chapter 5: Operate the OhmX Analyzer . Ignoring this error risks reduced run time.
500016	Waste tank leak	A leak is detected in at least 1 of the waste collection tubes. Abort the protocol and reseal the waste tubes. Retry the desired protocol. If the problem persists, contact Nabsys Technical Support.
500017	Failed system restart	Ensure the analyzer cables are properly connected. Power cycle both the analyzer (power switch on the back) and the controller. Restart the software. If the problem persists, contact Nabsys Technical Support.
500020	Unknown error	Select OK and, if possible, water flush the detector to safely store the system. Contact Nabsys Technical Support.
500021	Protocol step timeout	Select Abort and water flush the detector to safely store the system. Contact Nabsys Technical Support.
500022	Protocol already running	The system is attempting to run a protocol while a protocol is already in progress. Power cycle the analyzer and controller, retry running a protocol.
500023	Settings file not found	The system is attempting to run with a settings group it cannot find. Contact Nabsys Technical Support for a software update.
500024	Compressor duty cycle warning	The system is attempting to run a protocol while a protocol is already in progress or the hard drive is full. Power cycle the instrument and computer and retry.
500025	Compressor on-time warning	The compressor stayed on for too long and has been disabled to prevent overheating. Turn off the system and contact Nabsys Technical Support.
500027	Reagent cartridge memory error	The system cannot read the reagent cartridge. Try removing and reinstalling the reagent cartridge. If the problem persists, contact Nabsys Technical Support.
500028	Detector not ready	The detector is not performing adequately. You can ignore this error but run efficiency might be inadequate. You can also try aborting, recleaning the detector, and restarting the sample run.
500029 and 500030	Gasket configuration errors	The detector configuration and system configuration do not match. Contact Nabsys Technical Support for assistance.
500031	Detector definition not found	The system does not recognize the loaded detector. Contact Nabsys Technical Support for a software update.
500033	Detector molecule selector parameter set not found	The system requires a software update to utilize the loaded detector. Contact Nabsys Technical Support for a software update.
500034	Detector protocol set not found	The system requires a software update to utilize the loaded detector. Contact Nabsys Technical Support for a software update.
500035	Detector part number not found	The system does not recognize the loaded detector. Contact Nabsys Technical Support for a software update.
500036	Insufficient drive space to start sample run	The system controller lacks adequate space to collect a full sample run (D drive). Please clear some space to continue.

Error Code	Description	Recommended Action
500037	Insufficient drive space to continue sample run	The system controller no longer has adequate space to collect more sample data. Please clear space on the data drive (D drive) to continue, or select Water Flush to end the run.
500038	Failed bias voltage	Upon setting the bias voltage, the system detected an error. Please contact Nabsys Technical Support.
500039	Unsupported reagent cartridge	The reagent cartridge loaded is not currently supported. Please contact Nabsys Technical Support.
500040	Unsupported detector	The detector loaded is not currently supported. Please contact Nabsys Technical Support.
500041	Expired reagent cartridge	The installed reagent cartridge has expired. Please replace the reagent cartridge.
500042	Wrong detector type	The detector loaded is not currently supported on the system as configured. Please contact Nabsys Technical Support.
500043	Insufficient reagent levels - start of sample run	There are not sufficient reagents to conduct a full overnight sample run. Replace the reagent cartridge if you require a full overnight run.

Sample-Related Troubleshooting

Useful observations related to the quality of a sample can be made during data collection through examination of the live DNA Signal and Data Histogram on the user interface Home screen. Consult **Step 8: Monitor Data Collection of Chapter 5: Operate the OhmX Analyzer** for examples of DNA Signals and Data histograms associated with properly prepared samples. Visual deviation from this expectation can be a sign of a sample preparation problem with likely root causes and remedies listed in the table below.

Observation	Signal	Likely Causes	Recommended Action
No DNA observed at sample injection		<ul style="list-style-type: none"> DNA was not added to the tagging reaction Coating reaction was improperly assembled Unsuccessful sample injection 	<ul style="list-style-type: none"> Look for evidence of pooled sample in the Sample Injection Port. If found, Abort the run, clean the Sample Injection Port, and repeat the sample injection process from the beginning. Confirm the concentration of the nicked/labeled DNA sample and repeat the tagging and coating reaction.
No or few tags observed on the DNA backbone		<ul style="list-style-type: none"> Unsuccessful nicking or labeling reaction Improper assembly of tagging reaction 	<ul style="list-style-type: none"> Confirm the concentration of the nicked/labeled DNA sample and repeat the tagging and coating reaction. Verify the purity of input DNA (260/280, 260/230) and repeat sample preparation from the beginning.
Short length histogram (dark blue) relative to expectation (light blue) indicated by distribution that tapers <150 kb		<ul style="list-style-type: none"> Input DNA length was insufficient Use of non-wide-bore pipette tips or overly aggressive mixing Dropping a tube of tagged / coated sample prior to injection 	<ul style="list-style-type: none"> If the coated sample was dropped, repeat the tagging and coating reaction. Review procedure for careful dilution of sample prior to injection and repeat. Verify the input DNA length via PFGE and review proper HMW DNA handling procedures. If necessary, re-isolate HMW DNA and prepare a fresh nicked/labeled sample.
Dips observed in the DNA signal		<ul style="list-style-type: none"> Unsuccessful coating reaction Use of non-wide-bore pipette tips Overly aggressive sample mixing/injection Expired sample (> 2 weeks old) 	<ul style="list-style-type: none"> Coated HMW DNA is particularly sensitive to mechanical shearing. Review proper HMW DNA handling procedures and dilute a fresh sample for injection. Repeating the tagging and coating reactions might be required. If the tagged/coated sample is > 2 weeks old, prepare a freshly tagged/coated sample

Technical Support

Nabsys
60 Clifford Street
Providence, Rhode Island
02903 USA

support@nabsys.com

For more information, visit nabsys.com