

Writing Sample - Biotechnology - User Guide

Part 1

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Background

The Applied Biosystems 3500/3500xL Genetic Analyzers is an automated 8 and/or 24 capillary instrument designed for a wide range of sequencing and fragment analysis applications.

I developed the guide by myself, as a lead technical writer, while managing other writers tasks, schedules, and performances.

Scope

The Applied Biosystems 3500/3500xL Genetic Analyzer User Guide provides step-by-step instructions for preparing and analyzing a sample. It is designed to help you learn how to use the instrument.

The guide is one of the many documents that I developed for the AB 3500/3500xL system.

The authoring tool for drafting this guide was Oxygen XML Author, and I used single-sourcing and content reuse techniques.

Audience

This user guide is written for principal investigators and laboratory staff who are planning to operate and maintain the Applied Biosystems 3500/3500xL Genetic Analyzers.

About writing sample - Biotechnology - User Guide

The following writing sample contains parts of the actual user guide.

The user guide, in its entirety, is available in case it is needed.

I gathered the information required for this user guide by interviewing scientists, product managers, bioinformatics analysts, and lab technicians.



Applied Biosystems 3500/3500xL Genetic Analyzer User Guide

User Guide

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Preface

Safety information

Note: For general safety information, see this Preface and [Appendix F, “Safety” on page 315](#). When a hazard symbol and hazard type appear by a chemical name or instrument hazard, see [Appendix F, “Safety” on page 315](#) for the complete alert on the chemical or instrument.

Safety alert words

Four safety alert words appear in Applied Biosystems user documentation at points in the document where you need to be aware of relevant hazards. Each alert word—**IMPORTANT**, **CAUTION**, **WARNING**, **DANGER**—implies a particular level of observation or action, as defined below:

IMPORTANT! – Indicates information that is necessary for proper instrument operation, accurate chemistry kit use, or safe use of a chemical.

 **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. This signal word is to be limited to the most extreme situations.

Except for **IMPORTANTs**, each safety alert word in an Applied Biosystems document appears with an open triangle figure that contains a hazard symbol. *These hazard symbols are identical to the hazard symbols that are affixed to Applied Biosystems instruments (see “Safety symbols” on page 315).*

MSDSs

The MSDSs (Material Safety Data Sheets) for any chemicals supplied by Applied Biosystems or Ambion are available to you free 24 hours a day. For instructions on obtaining MSDSs, see [“MSDSs” on page 329](#).

IMPORTANT! For the MSDSs of chemicals not distributed by Applied Biosystems or Ambion contact the chemical manufacturer.

Safety labels on instruments

The following CAUTION, WARNING, and DANGER statements may be displayed on Applied Biosystems instruments in combination with the safety symbols described in the preceding section.

Hazard symbol	English	Français
	CAUTION! Hazardous chemicals. Read the Material Safety Data Sheets (MSDSs) before handling.	ATTENTION! Produits chimiques dangereux. Lire les fiches techniques de sûreté de matériaux avant toute manipulation de produits.
	CAUTION! Hazardous waste. Refer to MSDS(s) and local regulations for handling and disposal.	ATTENTION! Déchets dangereux. Lire les fiches techniques de sûreté de matériaux et la régulation locale associées à la manipulation et l'élimination des déchets.
	CAUTION! Potential slipping hazard.	ATTENTION! Risque potentiel d'avoir un sol glissant.
	CAUTION! Hot surface.	ATTENTION! Surface brûlante.
	DANGER! High voltage. WARNING! To reduce the chance of electrical shock, do not remove covers that require tool access. No user-serviceable parts are inside. Refer servicing to Applied Biosystems qualified service personnel.	DANGER! Haute tension. Avertissement! Pour éviter les risques d'électrocution, ne pas retirer les capots dont l'ouverture nécessite l'utilisation d'outils. L'instrument ne contient aucune pièce réparable par l'utilisateur. Toute intervention doit être effectuée par le personnel de service qualifié venant de chez Applied Biosystems.
	CAUTION! Class 2(II) visible and/or invisible radiation present. Do not stare directly into the beam or view directly with optical instruments.	ATTENTION! Rayonnement visible ou invisible d'un faisceau. Ne pas regarder le faisceau directement ou au travers d'un instrument optique.
	DANGER! Class 3B (III) visible and/or invisible radiation present. Avoid exposure to beam.	DANGER! Rayonnement visible ou invisible d'un faisceau de Classe 3B (III) en cas d'ouverture. Evitez toute exposition au faisceau.
	CAUTION! Sharp object.	Avertissement! Objet Sharp.

About the product

The Applied Biosystems 3500/3500xL Genetic Analyzers is an automated 8 and/or 24 capillary instrument designed for a wide range of sequencing and fragment analysis applications.

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

Purpose of this guide

The *Applied Biosystems 3500/3500xL Genetic Analyzer User Guide* provides step-by-step instructions for preparing and analyzing a sample. It is designed to help you learn how to use the instrument.



CAUTION! The protection provided by the equipment may be impaired if the instrument is operated outside the environment and use specifications, the user provides inadequate maintenance, or the equipment is used in a manner not specified by the manufacturer (Applied Biosystems).

Audience

This user guide is written for principle investigators and laboratory staff who are planning to operate and maintain the Applied Biosystems 3500/3500xL Genetic Analyzers.

Assumptions

The *Applied Biosystems 3500/3500xL Genetic Analyzer User Guide* assumes that your 3500 or 3500xL analyzer has been installed by an Applied Biosystems service representative.

This guide also assumes you have the following background:

- Familiarity with Microsoft® Windows Vista® operating system.
- Knowledge of general techniques for handling DNA samples and preparing them for electrophoresis.
- A general understanding of hard drives, data storage, file transfers, and copying and pasting.

How to use this guide

Text conventions	This guide uses the following conventions: <ul style="list-style-type: none">• Bold text indicates user action. For example: Type 0, then press Enter for each of the remaining fields.• <i>Italic</i> text indicates new or important words and is also used for emphasis. For example: Before changing reagents, <i>always</i> determine what chemicals have been used in the instrument.• A right arrow symbol (►) separates successive commands you select from a drop-down or shortcut menu. For example: Select File ► Open ► Spot Set. Right-click the sample row, then select View Filter ► View All Runs.
User attention words	Two user attention words appear in Applied Biosystems user documentation. Each word implies a particular level of observation or action as described below: Note: Provides information that may be of interest or help but is not critical to the use of the product. IMPORTANT! Provides information that is necessary for proper instrument operation, accurate chemistry kit use, or safe use of a chemical.
Table of Acronyms	The following table explains the acronyms used in the <i>Applied Biosystems 3500/3500xL Genetic Analyzer User Guide</i> .

Acronym	Definition
ABC	Anode Buffer Container
BDT	BigDye® Terminator Kit
BDX	BigDye® Xterminator™
Cap	Capillaries
CBC	Cathode Buffer Container
CV/Fitting	Check Valve pouch attachment fitting
EPT	ElectroPhoresis Telemetry
FR	Factory Repeating
MicroSeq® kit (or other product name)	Microbial Sequencing
NIC	Network Interface Card
NT	Nucleoid Type Nucleotide Base Color (A, G, C, T)
Pe	Probability of error
QV	Quality Value

Acronym	Definition
GM	GeneMapper® Software
GMIDx	GeneMapper® IDx
POP™	Polymer (Brand name of the polymer)
PPS	Power Protection System
SAE	Security, Administration, Electronic signature

How to obtain support

For the latest services and support information for all locations, go to:

www.appliedbiosystems.com

At the Applied Biosystems web site, you can:

- Access worldwide telephone and fax numbers to contact Applied Biosystems Technical Support and Sales facilities.
- Search through frequently asked questions (FAQs).
- Submit a question directly to Technical Support.
- Order Applied Biosystems user documents, MSDSs, certificates of analysis, and other related documents.
- Download PDF documents.
- Obtain information about customer training.
- Download software updates and patches.

How to obtain more information

For detailed information on preparing for installation, refer to the *Applied Biosystems 3500 Series Genetic Analyzer Site Preparation Guide* (4401689).

Note: The purpose of the Site Prep Guide is to help you prepare your site for installation of the 3500 or 3500xL analyzer. For specific details about your system, please refer to this user guide.

Instrument and Software Description

System description

The 3500 or 3500xL analyzer is shipped with the following system components:

- Capillary Electrophoresis instrument.
- 3500 (8-capillary) or 3500xL (24-capillary) array and POP™ polymer
- DNA sequencing, or fragment analysis, reagents, and other consumables for system qualification.
- Dell® computer workstation with flat-screen monitor.
- Integrated software for instrument control, data collection, quality control, and basecalling or sizing of samples.

Instrument description

The Applied Biosystems 3500/3500xL Genetic Analyzers are fluorescence based DNA analysis instrument using capillary electrophoresis technology with 8- or 24-capillaries.

For detailed dimensions of the instrument, refer to the *Applied Biosystems 3500 Series Genetic Analyzer Site Preparation Guide* (4401689).

Note: The purpose of the Site Prep Guide is to help you prepare your site for installation of the 3500 or 3500xL analyzer. For specific details about your system, please refer to this user guide.



Instrument interior components

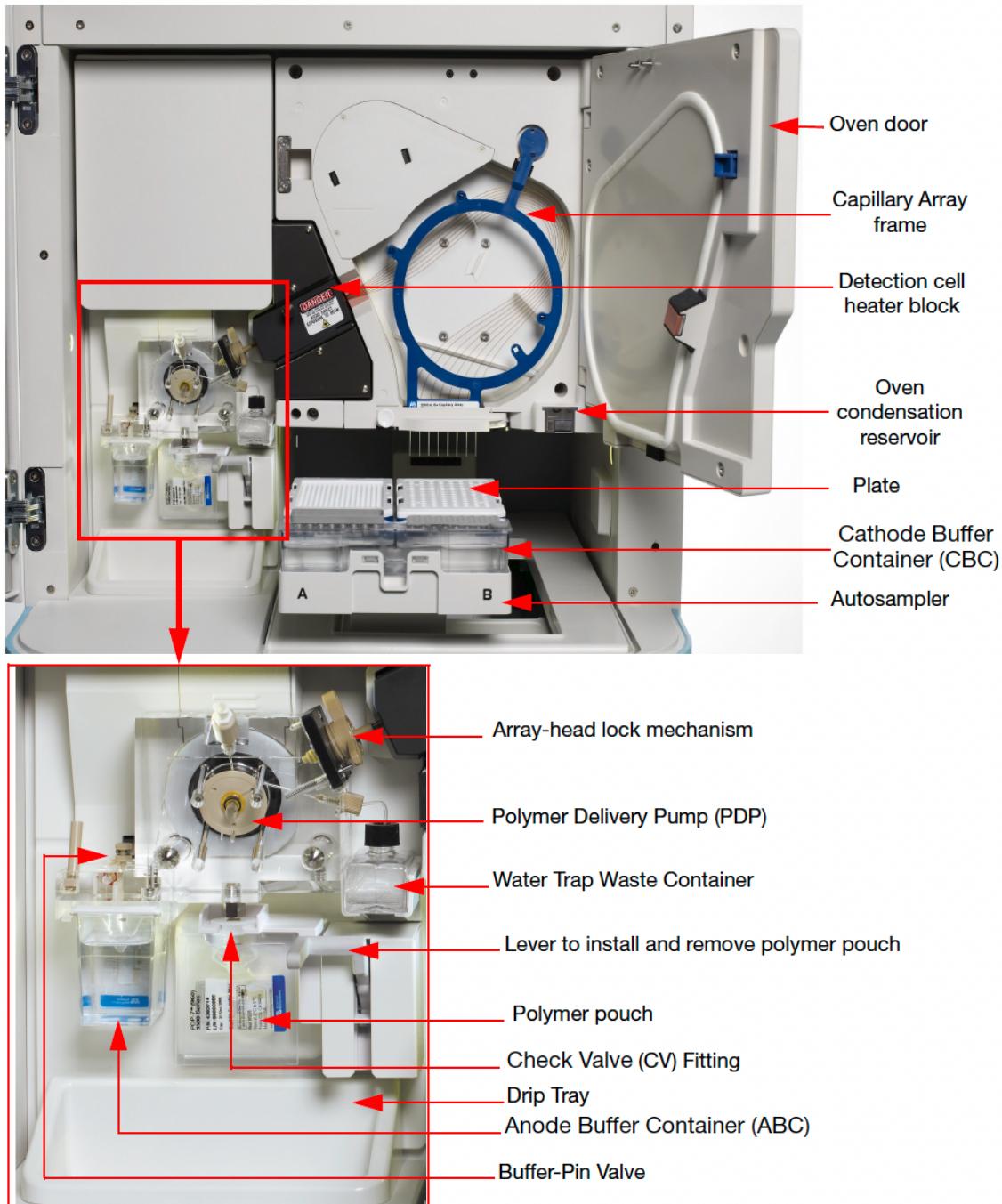


Figure 1 Instrument interior components

Instrument parts and functions

Table 1 Instrument parts and functions

Part	Function
Autosampler	Holds the sample plates and Cathode Buffer Container (CBC) and moves to align the plates and CBC with the capillaries.
Oven	Maintains uniform capillary array temperature.
Oven condensation reservoir	Collects condensation from the oven.
Pump block	Includes the displacement pump chamber, polymer chambers, piston water seal, syringe fitting array attachment point (array port), the lower polymer block, and the CV/Fitting (Check Valve pouch attachment fitting).
Detection cell heater block	Holds the detection cell in place for laser detection and maintains the detection cell temperature of 50 °C.
Polymer Delivery Pump (PDP)	Pumps polymer into the array and allows for automated maintenance procedures.
Lower polymer block	Contains the buffer valve, anode electrode, buffer gasket, and holds the anode buffer container.
Radio Frequency Identification (RFID)	RFID tags to read the following information for primary instrument consumables: <ul style="list-style-type: none">• Lot numbers• Serial numbers• Dates (expiration)• Capacity (usage) The primary consumables are: <ul style="list-style-type: none">• Capillary Array• Cathode Buffer Container (CBC)• POP™ Polymer• Anode Buffer Container (ABC)
Capillary Array	Enables the separation of the fluorescent-labeled DNA fragments by electrophoresis. It is a replaceable unit composed of 8 or 24 capillaries (50 cm and 36 cm length). Note: The 36 cm capillary is for HID applications, only.
Anode Buffer Container (ABC)	The Anode Buffer Container (ABC) contains 1X running buffer to support all electrophoresis applications on the instrument. It has a built-in overflow chamber to maintain constant fluid height.
Cathode Buffer Container (CBC)	The Cathode Buffer Container (CBC) contains 1X running buffer to support all electrophoresis applications on the instrument.
Polymer pouch	Supplies polymer to the Polymer Delivery Pump.
Conditioning reagent	The pouch is used for priming the polymer pump, washing the polymer pump between polymer type changes, and during instrument shut down. It has adequate volume for a one-time use.

Theory of operation

The 3500 or 3500xL analyzer is a fluorescence-based DNA analysis system that uses proven capillary electrophoresis technology with 8- or 24-capillaries.

The 3500 or 3500xL analyzer is fully automated, from sample loading to primary data analysis, for sequencing, fragment analysis, and HID (human identification) analysis.

Note: In this document, primary analysis for sequencing is referred to as basecalling. Primary analysis for fragment or HID procedures is referred to as sizing.

Preparing samples

When DNA samples are prepared for sequencing, fragment analysis, or HID analysis on the 3500 or 3500xL analyzer, fluorescent dyes are attached to the DNA. For most applications, the sample is denatured so that only single-strand DNA is present.

Preparing the instrument

Two calibrations are required to prepare the instrument for sample runs:

- **Spatial calibration** – Determines the position of the image from each capillary on the CCD array. For more information, refer to “[Spatial calibration](#)” on page 99.
- **Spectral calibration** – Generates a matrix for each capillary that compensates for dye overlap and is used to convert the 20-color data into 4-, 5-, or 6-dye data. For more information, refer to “[Spectral calibration](#)” on page 103.

During a run

During a run, the system:

- Prepares the capillary by pumping fresh polymer solution under high pressure from the polymer delivery pump to the waste position in the Cathode Buffer Container (CBC).
- Electrokinetically injects the sample into the capillary using a low-voltage for a few seconds.
- Washes the capillary tips in the rinse position of the CBC, then returns the capillary to the buffer position of the CBC.

- Ramps the voltage up to a constant voltage.
A high electric field is created between the ground end of the Anode Buffer Container (ABC) and the negative voltage applied to the load header of the capillary array. This field pulls the negatively charged DNA through the separation polymer. The smaller fragments migrate faster than the larger fragments and reach the detector first.
- To insure optimal separation and maintain denaturation of the DNA, the capillaries are thermally controlled in the oven and in the detection cell. The oven has a Peltier heat unit and fan-circulated air. The Peltier can heat and cool the oven to maintain sub-ambient temperatures, which are useful for non-denaturing applications such as SSCP (Single-strand conformation polymorphism).
- In the detection cell, the dyes attached to DNA are excited by a narrow beam of laser light. The laser light is directed into the plane of the capillaries from both the bottom and top. A small amount of laser light is absorbed by the dyes and emitted as longer wavelength light in all directions.
- Captures the fluorescent light on the instrument optics while blocking the laser light. The light passes through a transmission grating, which spreads the light out. The light is imaged onto a cooled, scientific-grade CCD array. For each capillary, 20 zones on the CCD are collected to provide 20-color data for each capillary.
- Converts the 20-color data into multi-dye data for the entire run. For sequencing applications, 4 different dyes are used to determine the 4 bases A, G, C and T. For fragment and HID analysis applications, up to 6 dyes can be used in a single run for higher throughput.

Results

The software generates an electropherogram (intensity plot) for each dye based on the migration of DNA fragments over the run and generates primary analysis results:

- For sequencing applications, the electropherogram is adjusted to compensate for slight mobility differences due to the dyes, then basecalling is performed and quality values are assigned.
- For fragment and HID analysis, the software uses the internal size standard to assign a fragment size and a sizing quality value to each peak.

If the autoanalysis functionality has been set up, the system transfers the sample data to a secondary analysis software application for further processing. Alternatively, you can manually transfer the sample data to a secondary analysis software application for further processing.

Normalization

Overview of the normalization feature

For fragment analysis and HID applications, the 3500 Series Data Collection Software includes a normalization feature for use with the GeneScan™ 600 LIZ® Size Standard v2.0 (GS600 LIZ v2). This feature attenuates signal variations associated with instrument, capillary array, sample salt load, and injection variability between capillaries and instruments. Normalization can be applied during primary analysis of the data.

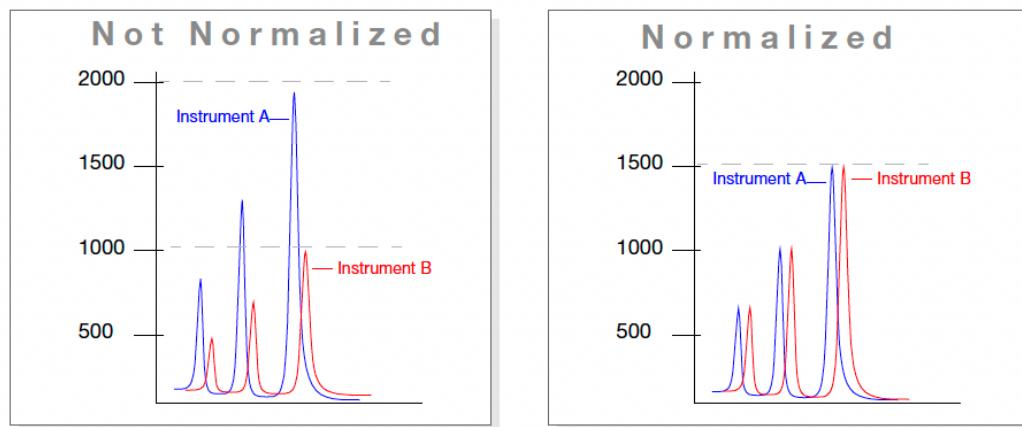


Figure 2 Comparison of fragment analysis results with and without the normalization feature

To use the normalization feature, prepare each sample with the GS600 LIZ v2 size standard, then specify the appropriate normalization size standard for file primary analysis. The GS600 LIZ v2 reagent can function as an internal standard for signal-height normalization as well as a size standard for peak sizing.

When to use the normalization feature

The 3500 Series Data Collection Software provides three normalization size-standard definition files that you can specify for primary analysis of samples prepared with the GS600 LIZ v2 size standard:

- **Fragment:**
 - GS600LIZ+Normalization
 - GS600(60-600)LIZ+Normalization – For applications that have primer peaks that obscure the 20 and 40-mer peaks of the GS600 LIZ v2 size standard.
- **HID:**
 - GS600(80-400)LIZ+Normalization

Materials for routine operation

Contact your local Applied Biosystems service representative (or go to www.appliedbiosystems.com, then click **Products**) to order the materials for 3500 or 3500xL analyzer.

External barcode scanner

An external barcode scanner can be used with the 3500 or 3500xL analyzer to scan the plate template.

Applied Biosystems recommends the Symbol LS 1203 handheld barcode scanner (shown), which connects to the instrument computer.



The scanner allows you to scan barcodes into any text box in the 3500 Series Data Collection Software.

For details on installation, use, decoding capabilities, and product specifications see the product documentation.

Uninterruptible Power Supply (UPS)

Loss of power during a run can result in lost data. To address concerns with loss of power in the laboratories, Applied Biosystems recommends the use of an Instrumentation Power Protection System (IPPS) with the 3500 or 3500xL analyzer.

If your laboratory has a backup-power generator, a battery-powered backup Power Protection System (PPS) is required to provide power for the amount of time that it takes for your laboratory's backup power to begin generating power and stabilize.

Note: The instrument, computer, and monitor must all be connected to the PPS.

If your laboratory does not have a backup-power generator, a PPS can provide protection from power disruptions of a limited duration. For longer durations, optional battery cabinets can be added to the base PPS unit. A base unit PPS rated for 800W can provide over 20 minutes of backup protection, and over 2 hours when a single battery cabinet was added.

Note: Battery output can be affected by temperature and the age of battery so these backup times are not guaranteed.

Instrument reagents and consumables

For application-specific reagents, consumables, and run modules, see [Appendix A, Application Reagents and Run Modules](#).

Anode buffer container (ABC)

The ABC (PN 4393927) contains 1X running buffer to support all electrophoresis applications on the 3500 or 3500xL analyzer.

The ABC is made in a ready to use, disposable, container with a radio frequency identification (RFID) tag incorporated into the label. It has a built-in overflow chamber to maintain constant fluid height.

For the following hazard(s), see the complete safety alert descriptions in “[Specific chemical alerts](#)” on page 333.



WARNING! CHEMICAL HAZARD. Anode Buffer Container (ABC).

Store the ABC at 2 °C to 8 °C until ready to use. The sealed ABC is stable at this temperature until the expiration date shown on the label. Once the seal is peeled, the running buffer is stable at ambient temperature for up to 7 days. Ensure that the seal remains in place until just prior to use on the instrument.

To ensure optimal performance, the use of the ABC is limited to either 7 days after the first installation or 120 injections on a 3500 (8-capillary)/50 injections on a 3500xL (24-capillary), whichever comes first. When notified of the limit by the instrument software, you have to replace the ABC with a new one before you can proceed further.

For more details see the product insert included in the product package.

See “[Change the anode buffer container \(ABC\)](#)” on page 237 for instructions on how to change the ABC.

Cathode buffer container (CBC)

The CBC (PN 4408256) contains 1X running buffer to support all electrophoresis applications on the 3500 or 3500xL analyzer.

The CBC is made in a ready to use, disposable, container with a radio frequency identification (RFID) tag incorporated into the label. It has two separate sides:

- The side containing 24 holes provides the cathode buffer for electrophoresis.
- The side that contains 48 smaller holes provides the liquid for wash and waste functionality for rinsing the capillary tips and collecting wash waste between injections.

For the following hazard(s), see the complete safety alert descriptions in “[Specific chemical alerts](#)” on page 333.



WARNING! CHEMICAL HAZARD. Cathode Buffer Container (CBC).

Store the CBC at 2 °C to 8 °C until ready to use. The sealed CBC is stable at this temperature until the expiration date shown on the label. Once the seal is peeled, the running buffer is stable at ambient temperature for up to 7 days. Ensure that the seal remains in place until just prior to use on the instrument.

To ensure optimal performance, the use of the CBC is limited to either 7 days after the first installation or 120 injections on a 3500 (8-capillary)/50 injections on a 3500XL (24-capillary), whichever comes first. When notified of the limit by the instrument software, you have to replace the ABC with a new one before you can proceed further.

For more details see the product insert included in the product package.

See “[Change the cathode buffer container \(CBC\)](#)” on page 238 for instructions on how to change the CBC.

Polymers

The polymer for 3500 or 3500xL analyzer is available as a ready to use pouch with either POP-4™, POP-6™ or POP-7™ polymer as the separation matrix.

IMPORTANT! Do not use a polymer pouch that has been installed on one type of instrument on another type of instrument. For example, if you install a new polymer pouch on a 3500 (8-capillary) instrument, do not use that polymer on a 3500xL (24-capillary) instrument.

The pouch has adequate polymer to support the stated number of samples (384 or 960) or injections and additional volume to handle a limited number of installations and setup related wizard operations. Incorporated into the label is a radio frequency identification (RFID) tag.

Note: The top part of the pouch fitment is sealed with a plastic film, which should be removed prior to direct installation on to the instrument.

For the following hazard(s), see the complete safety alert descriptions in “[Specific chemical alerts](#)” on page 333.



WARNING! CHEMICAL HAZARD. POP-4™, POP-6™, and POP-7™ polymers.

Store the polymer at 2 °C to 8 °C until ready to use. The sealed polymer is stable at this temperature until the expiration date shown on the label.

For more details see the product insert included in the product package.

See “[Change polymer type](#)” on page 247 for instructions on how to change polymers.

IMPORTANT! If you remove a polymer pouch for storage, place a Pouch Cap (PN 4412619) onto the pouch, then place an empty pouch (or conditioning reagent) on the connector to prevent desiccation of any residual polymer on the connector. Follow the instructions in the wizard to ensure the proper operation of the pouch and the instrument.

Applications

- POP-6™ and POP-7™ polymers are recommended for sequencing and fragment analysis applications.
- POP-4™ polymer is recommended for HID/Forensic applications.

Table 2 Polymers used for all applications

Polymer type	Part number	Instrument used	On-instrument life or whichever comes first [‡]	Pouch limits	
				Cannot exceed [§]	User option to continue [#]
POP-4™ (960)	4393710	3500 (8-capillary)	Lower of 7 days or 960 samples or 120 Injections	Expiry date, Sample limit and/or Injections limit	7-day limit
POP-6™ ^{##} (960)		3500xL (24-capillary)	Lower of 7 days or 960 samples or 50 Injections		
POP-7™ (960)	4393714	3500 (8-capillary)	Lower of 7 days or 384 samples or 60 Injections	Expiry date, Sample limit and/or Injections limit	7-day limit
POP-4™ (384)		3500xL (24-capillary)	Lower of 7 days or 384 samples or 20 Injections		
POP-6™ ^{##} (384)	4393715	3500 (8-capillary)	Lower of 7 days or 384 samples or 60 Injections		
POP-7™ (384)		3500xL (24-capillary)	Lower of 7 days or 384 samples or 20 Injections		

[‡] The polymer pouch includes additional volume to accommodate a limited number of installation and wizard operations. However, if the number of wizard operations exceeds a certain limit, the number of remaining samples or injections will be reduced. For example, if you run the total bubble remove option in the bubble remove wizard more than four times, or run other wizards operations excessively, the number of remaining samples or injections will be reduced. Refer to the polymer gage on the dashboard for the up-to-date number of remaining samples or injections at any given point.

[§] Replace the pouch before proceeding further.

[#] Applied Biosystems has verified the polymer for a maximum of 7 days on the instrument.

^{##}Ambient temperature must be in the range of 15 °C to 25 °C. Sustained use at higher temperatures may result in shorter read lengths than specified.

Conditioning reagent

The conditioning reagent (PN 4393718) for 3500 or 3500xL analyzer is available as a ready to use pouch. It is used for priming the polymer pump, washing the polymer pump between polymer type changes, and during instrument shut down. It has adequate volume for a one-time use.

Note: Use of the conditioning reagent is dictated by the instrument wizards. Install the pouch when requested to do so by the wizard.



CAUTION! Expired pouches cannot be used on the instrument. Once installed on the instrument, the pouch is good for a one-time use, only.

For more details see the product insert included in the product package.

See “[Use the conditioning reagent](#)” on page 250 for instructions on how to use the conditioning reagent.

Hi-Di™ Formamide

Hi-Di™ Formamide (pack of four) 5-ml tube (PN 4440753) is a highly deionized formamide, formulated with a stabilizer, ready for use as an injection solvent for all applications on the 3500 or 3500xL analyzer.

For the following hazard(s), see the complete safety alert descriptions in “[Specific chemical alerts](#)” on page 333.



WARNING! CHEMICAL HAZARD. Hi-Di™ Formamide.

For more details see the product insert included in the product package.



CAUTION! Expired Hi-Di™ Formamide cannot be used on the instrument.

Applications

The Hi-Di™ Formamide is used for sequencing analysis, fragment analysis, and HID/Forensic applications. To determine the exact, and necessary, volume of formamide for each specific application, follow the provided protocols and product inserts.

Table 3 Hi-Di™ Formamide used for all applications

Hi-Di™ Formamide name	Instrument	Part number	On-instrument life and usage
Hi-Di™ Formamide - 5-ml bottle (pack of four)	3500 (8-capillary) 3500xL (24-capillary)	4440753	24 hours

Capillary arrays

The capillary array for 3500 or 3500xL analyzer is installed on the instrument and ready to use.



CAUTION! SHARP The load-end of the capillary array has small but blunt ends and it could lead to piercing injury.

See “[To change the capillary array](#)” on page 252 for instructions on how to change the capillary array.

Applications

- The 36 cm capillary array is used for HID/Forensic applications.
- The 50 cm capillary array is used for sequencing and fragment analysis applications.

Table 4 Capillary arrays used for all applications

Capillary array name	Part number	Instrument used	On-instrument life	RFID-controlled limits
				User option to continue‡
8-Capillary, 36 cm	4404683	3500	160 injections	Under user option to continue (160 injections and expiry date)
8-Capillary, 50 cm	4404685			Under user option to continue (160 injections and expiry date)
24-Capillary, 36 cm	4404687	3500xL		Under user option to continue (160 injections and expiry date)
24-Capillary, 50 cm	4404689			Under user option to continue (160 injections and expiry date)

‡ Applied Biosystems has verified the array for 160 injections.

Overview of the 3500 Series Data Collection Software

About the software

Table 5 3500 Series Data Collection Software applications supported

Application	Supports
Sequencing	<ul style="list-style-type: none">• Direct sequencing for mutation detection• Comparative sequencing with and without references• Microbial sequence identification
Fragment analysis	<ul style="list-style-type: none">• Microsatellite• AFLP® (amplified fragment length polymorphism)• SNaPshot® kit• LOH (loss of heterozygosity)• MLPA® (Multiplex ligation-dependent probe amplification)
HID	<ul style="list-style-type: none">• Forensic DNA casework• Databasing• Paternity testing

During a run, the software:

- Controls the instrument and generates sample data files:
 - Sequencing (.ab1)
 - Fragment analysis (.fsa)
 - HID (.hid)
- Performs primary analysis and reporting that evaluate the quality of the data:
 - Sequencing – Bascalling and trimming
 - Fragment analysis and HID – Peak detection and sizing
- (Optional) Performs secondary analysis (auto-analysis) with the following Applied Biosystems software applications:
 - Sequencing – SeqScape® Software v2.7 (or later) or MicroSeq® ID Analysis Software v2.2 (or later)
 - Fragment analysis – GeneMapper® Software v4.1 (or later)
 - HID – GeneMapper® ID-X Software v1.2 (or later)

Note: You can also manually import sample data files in to the secondary analysis software applications above. Sample data files generated by the 3500 Series Data Collection Software are also compatible with Applied Biosystems Variant Reporter™ Software (v1.1 or later) and Sequence Analysis (SeqA) Software (v5.4 or later).

Parts of the software

Dashboard The first screen that is displayed when you start the 3500 Series Data Collection Software is the Dashboard ([Figure 3](#)).

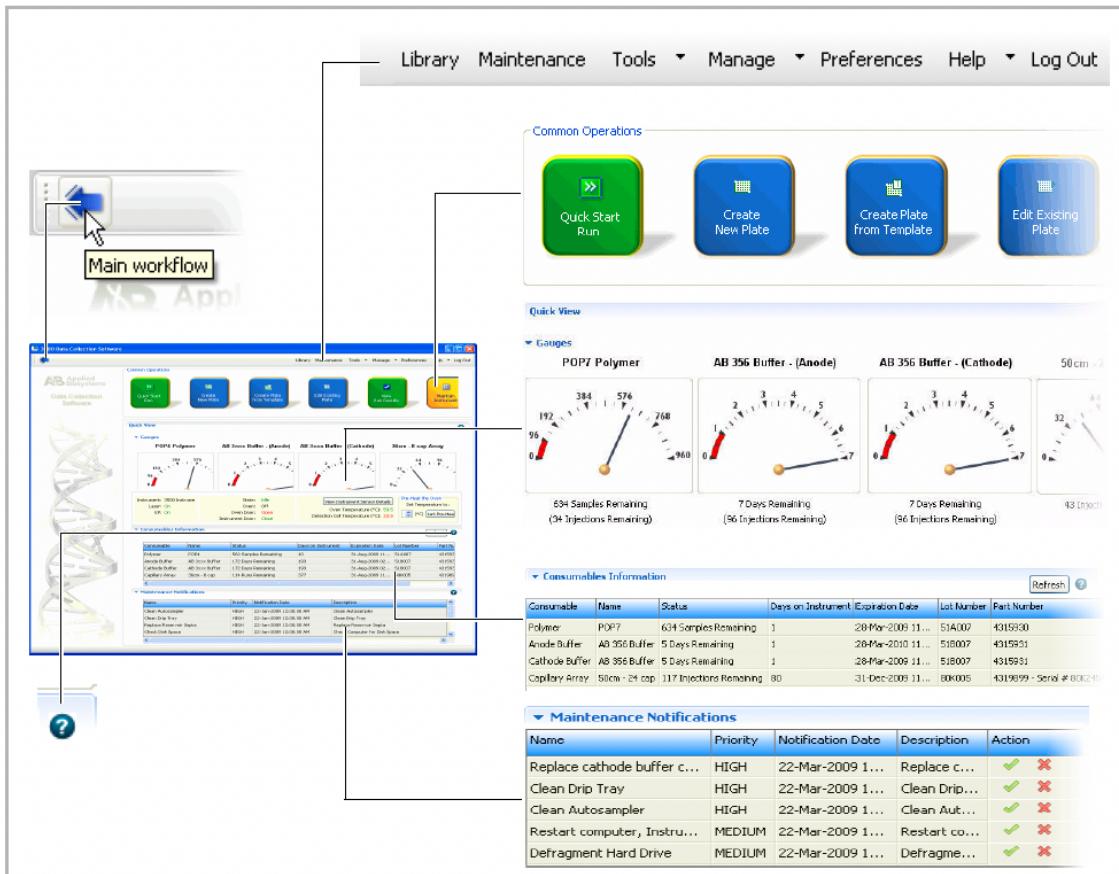


Figure 3 3500 Series Data Collection Software Dashboard

The Dashboard gives you quick access to the information and tasks you need to set up and run:

- **Main workflow arrow** → – Advances to the screens where you set up, load, and run plates, and view results.
- **Menu bar** – Accesses all other parts of the software. The menu bar is displayed on all screens.
- **Common operations** – Allows you to quick-start (load a plate that is set up), create or edit plates, view results, and access the Maintenance workflow.

- **Quick view** – Displays gauges that show the remaining usage of consumables and gives the status of instrument conditions. Consumable usage is automatically tracked by the instrument by radio-frequencing identification (RFID) tags.
- **Consumables information** – Gives details for the installed consumables and indicates in red if any consumable is about to expire based on RFID tags.
- **Maintenance notifications** – Lists the scheduled maintenance tasks.
- **Help icon ?** – Displays a help topic specific to a screen or an area of the screen.

For more information, see “[Check system status in the Dashboard](#)” on page 26.

Main workflow Click the main workflow arrow at the top left of the Dashboard to access the Main workflow.

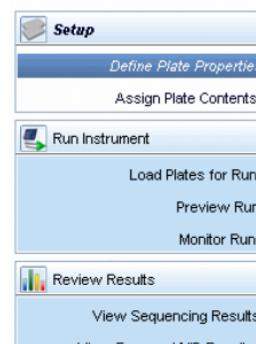


The Main workflow contains the screens where you set up, load, and run plates, and view results.

The Main workflow navigation pane is designed as a task workflow. Each screen contains a button that you can click to advance to the next screen in the workflow.

Select a task in the navigation pane to access each screen.

You can select **Dashboard** or any other menu item at any time to advance from the Main workflow.



The Main workflow is described in [Chapter 3, “Set Up and Run” on page 41](#), and [“Review Results” on page 79](#).

Library workflow

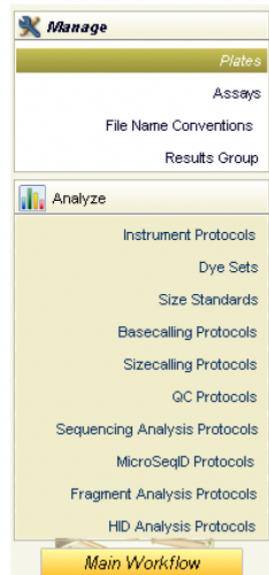
Select **Library** in the menu bar to access the Library workflow.



The Library workflow contains the screens where you manage assays, protocols, and other items that you use to acquire and process data.

The Library workflow contains:

- Items that you select when you set up for a run: plates, assays, filename conventions, and results groups
- Items that you select when you create an assay:
 - Instrument protocols
 - Primary analysis protocols – Basecalling (sequencing), sizecalling (fragment analysis), QC (HID analysis)
 - Optional secondary analysis protocols – Sequencing analysis, fragment analysis, and HID analysis
- Items that you select when you create instrument, sizecalling, and QC protocols: Dye sets and size standards



You can click **Main Workflow**, or select **Dashboard** or any other menu item at any time to advance from the Library workflow.

The Library workflow is described in “[Manage Library Resources](#)” on page 139.

Maintenance workflow

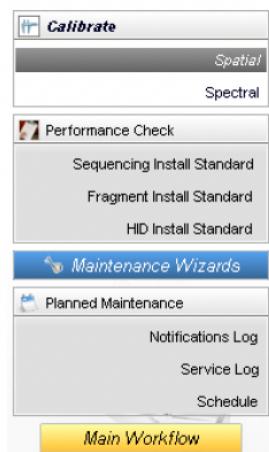
Select **Maintenance** in the menu bar to access the Maintenance workflow.



The Maintenance workflow contains the screens where you calibrate, check instrument performance, run maintenance procedures, and access records about instrument maintenance and service.

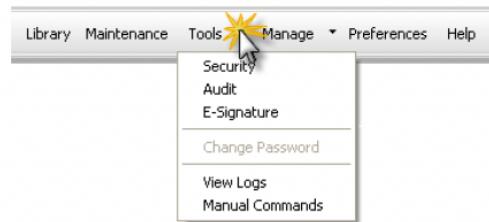
You can click **Main Workflow** or select **Dashboard** or any other menu item at any time to advance from the Maintenance workflow.

The Maintenance workflow is described in [Chapter 8, “Maintain the Instrument”](#) on page 229.



Tools menu

Select **Tools** in the menu bar to access 3500 Series Data Collection Software tools.



Tools provided are:

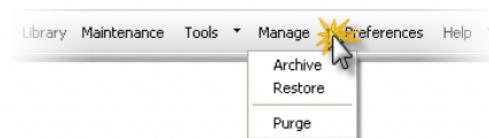
- Security, Audit, and E-signature (if your system includes the SAE module)
- Change Password that allows you to change passwords.
- View Logs that provides reports of instrument runs.
- Manual Commands that you can use to troubleshoot instrument performance.

The SAE module is described in [Chapter 7, “Use Security, Audit, and E-Sig Functions \(SAE Module\)”](#) on page 197.

Manage menu

Select **Manage** in the menu bar to access archive, restore, and purge functions

Archive, restore, and purge are described in [Chapter 8, Maintain the Instrument](#).



Preferences menu

Select **Preferences** in the menu bar to access the parameters for which you can set defaults.

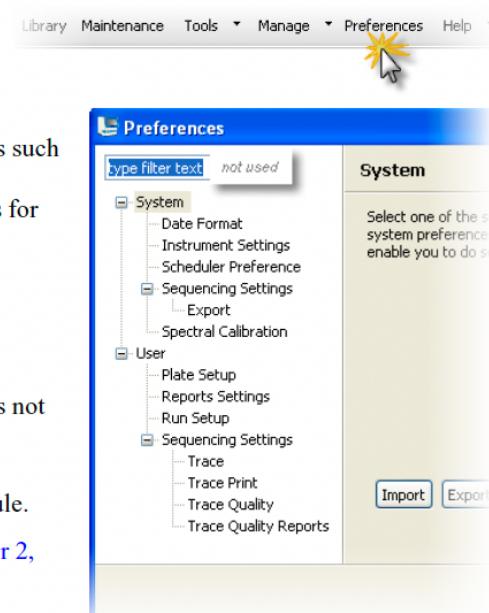
Preferences allow you to set system and user defaults for settings such as the date format, sample data file storage location, export file formats for sequencing data, and a variety of sequencing-specific settings.

System defaults apply to all users.

User defaults apply to:

- **All users** – If your system does not include the SAE module.
- **Each logged-in user** – If your system includes the SAE module.

Preferences are described in [Chapter 2, “Start the System”](#) on page 21.



Help menu

Select **Help** in the menu bar to access 3500 Series Data Collection Software Help.



The Help provides quick access to brief information about how to perform tasks on a screen. For details about tasks and other information, refer to the chapters in this user guide.

Navigate the Software

From the Dashboard

To advance from the Dashboard to:

- **Main workflow** – Click .
- **Other screens in the software** – Select items from the menu bar.



From the Main workflow

To advance from the Main workflow to:

- **Dashboard** – Click **Dashboard**.
- **Other screens in the Main workflow** – Select items in the navigation pane.
- **Other screens in the software** – Select items from the menu bar.



From the Library or Maintenance workflows

To advance from the Maintenance or Library workflow to:

- **Dashboard** – Click **Dashboard**.
- **Other screens in the workflow** – Select items in the navigation pane.
- **Main workflow** – Click **Main Workflow** in the navigation pane.
- **Other screens in the software** – Select items from the menu bar.



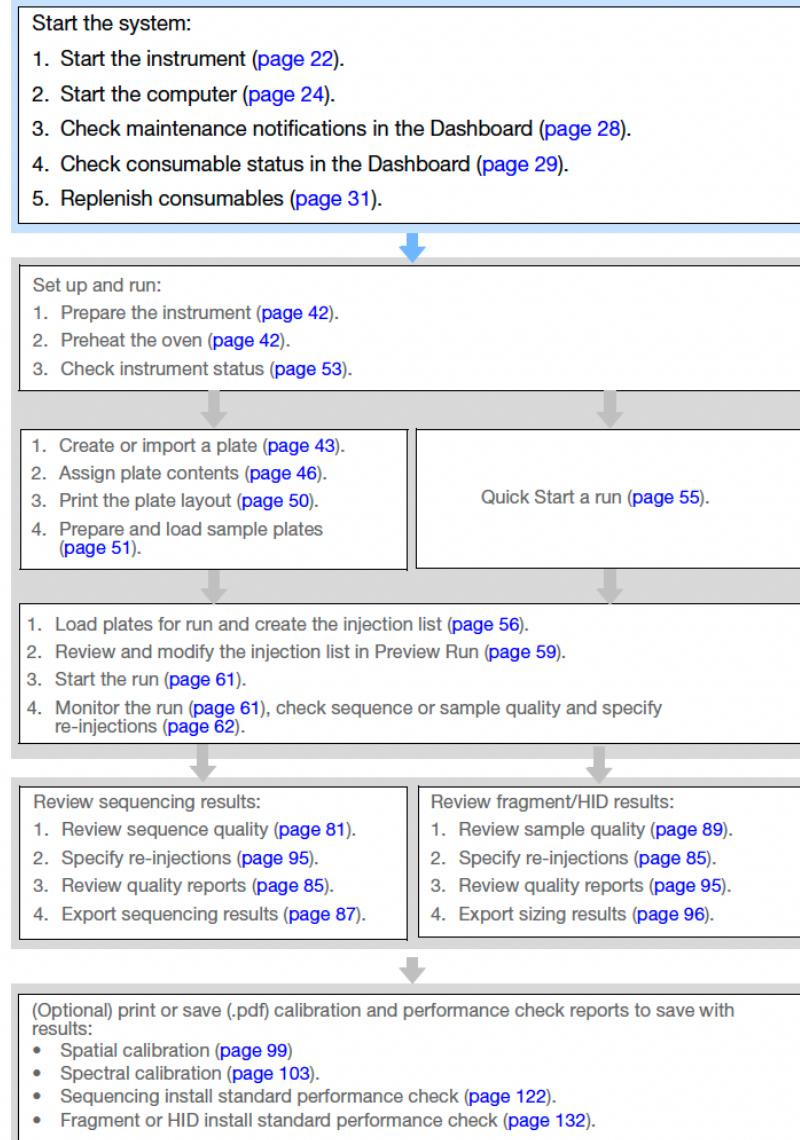
Use the software without an instrument

You can install the 3500 Series Data Collection Software on a computer that is not connected to an instrument. You can use this stand-alone version of the software to create plates, protocols, and other library items, and to review completed results.

IMPORTANT! Do not select instrument-related functions in the stand-alone version of the software.

Start the System

Workflow



Start the instrument

1. Verify that the instrument is connected to the appropriate power supply.



CAUTION! Do not unpack or plug in any components until the Applied Biosystems service representative has configured the system for the proper operating voltage.

See the *Applied Biosystems 3500 Series Genetic Analyzer Site Preparation Guide* (4401689) for details.

Note: The purpose of the Site Prep Guide is to help you prepare your site for installation of the 3500 or 3500xL analyzer. For specific details about your system, please refer to this user guide.

IMPORTANT! Do not rename the computer after the 3500 Series Data Collection Software has been installed. The instrument computer has been assigned a unique name. Changing the name may cause the 3500 Series Data Collection Software to malfunction.

2. Inspect instrument interior. Ensure that:

- a. The oven door is closed.
- b. No objects are left inside the instrument.

IMPORTANT! Misplaced objects left inside the instrument can cause damage.

3. Close instrument door.

4. Turn on the instrument. Press the power on/off button on the front of the instrument and wait for the green status light to turn on.



- a. Press the Tray button on the outside of the instrument to bring the autosampler to forward position. Wait until the autosampler stops at the forward position.

Note: When the door is open, the yellow status light blinks while the instrument performs self-check and the autosampler adjusts.

- b. Check the instrument status. Ensure the green status light is on and not flashing before proceeding. The table below explains the status indicator lights for the instrument.

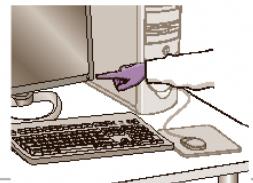
Indicator	Status
All lights off	Instrument off
Green light	<p>Operational (awaiting run)</p> <p>Pause run, terminate run, stop injection button (in SW) pressed by user.</p> <p>Note: You can only abort an injection when the green light is flashing, not when it is solid green.</p>
Green light (blinking)	Operational (Run in progress)
Amber light (blinking)	<p>Power-up self-test in progress</p> <p>Run paused</p> <p>Door open</p> <p>Run failure that doesn't require restart of instrument</p>
Amber light	Standby
Red light	<p>Self-test failed</p> <p>Instrument failure</p> <p>Requires a restart of the instrument and computer</p>

Start the computer

1. Power on the computer.



2. Power on the monitor.
3. In the Log On to Windows dialog box:
 - a. Enter the user name.
 - b. If applicable, enter a password.



Note: If the computer is connected to a network, you do not need to log on to the network before starting the instrument.

- c. Click OK. Wait until the computer finishes booting.

IMPORTANT! The status icon, on the right lower-corner of your screen, shows when the 3500 Server Monitor is active by displaying the icon shown here.



IMPORTANT! Do not close this icon. Doing so will prevent proper functioning of the software.

Log on to Windows

Follow the prompts to log on to the Windows operating system.

Launch the application

Step one: Launch the Daemon

If the Daemon does not start automatically, launch the Daemon:
Start ▶ Programs ▶ Applied Biosystems ▶ 3500 ▶ Daemon



Note: It will take approximately 15 seconds for Daemon to populate.

Step two: Launch the Server Monitor

If the Server Monitor does not start automatically, launch the Server Monitor:
Start ▶ Programs ▶ Applied Biosystems ▶ 3500 ▶ Server Monitor



Note: It will take approximately 2 minutes for the Server Monitor to set up. During this time, you will see the status icon transition from a red circle, with an X in the middle (indicating that not all 3500 services are loaded) to the shape of an hour-glass on your desktop, next to the clock.



When Server Monitor set up is complete, the icon in the shape of an hour-glass will disappear and a checkmark icon appears indicating that the 3500 Server Monitor has started and all 3500 services loaded.



Step three: Launch the 3500 application

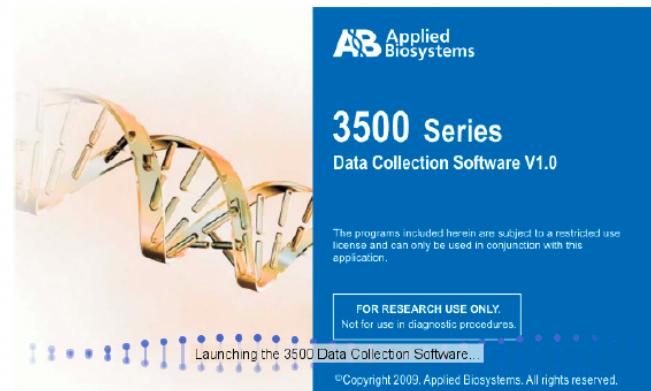
Launch the application:

Start ▶ Programs ▶ Applied Biosystems ▶ 3500



Splash screen

After you launched the 3500 application, the 3500 Series Data Collection Software splash screen appears. This screen will remain active for a few seconds until the 3500 Log In dialog box opens.



After the 3500 Series Data Collection Software splash screen disappears, one of the following occurs:

- The Dashboard is displayed (go to “[Check system status in the Dashboard](#)” on page 26)
- The Login dialog box is displayed (go to “[Log In](#)” on page 26)

Log In

Security, Audit, and E-Signature

The Security, Audit, E-Signature (SAE) module is an optional component of the 3500 Series Data Collection Software. Researchers have the option to purchase this feature and enable/disable the functionality for SAE. If the SAE feature is enabled, see [Chapter 7, Use Security, Audit, and E-Sig Functions \(SAE Module\)](#) for user configurations.

After the 3500 Series Data Collection Software splash screen disappears, log in from the Dashboard:

1. Enter the User Name and Password in the 3500 Log In dialog box.



2. Click OK.

The 3500 Series Data Collection Software splash screen reappears. This screen will remain active for a few seconds and the 3500 Series Data Collection Software opens.

The 3500 Series Data Collection Software launches and the Dashboard appears.

IMPORTANT! If you accidentally close any of the services (via 3500 Server Monitor), the system will not work. To open a closed service, place the cursor on the status icon, click the right-mouse button, go to Services, and click the service that is closed.

Check system status in the Dashboard

Dashboard, a quick glance

The first screen that is displayed when you start the 3500 Series Data Collection Software is the Dashboard ([Figure 4](#)).

The Dashboard displays gauges, instrument information, consumable information, and maintenance notifications that provide a quick overview of the usage of each consumable and the status of the instrument.

Consumable containers include radio frequency identification (RFID) tags that identify the consumable and allow the software to monitor the number of runs or days remaining, the number of days on the instrument, the expiration date, lot number and part numbers.

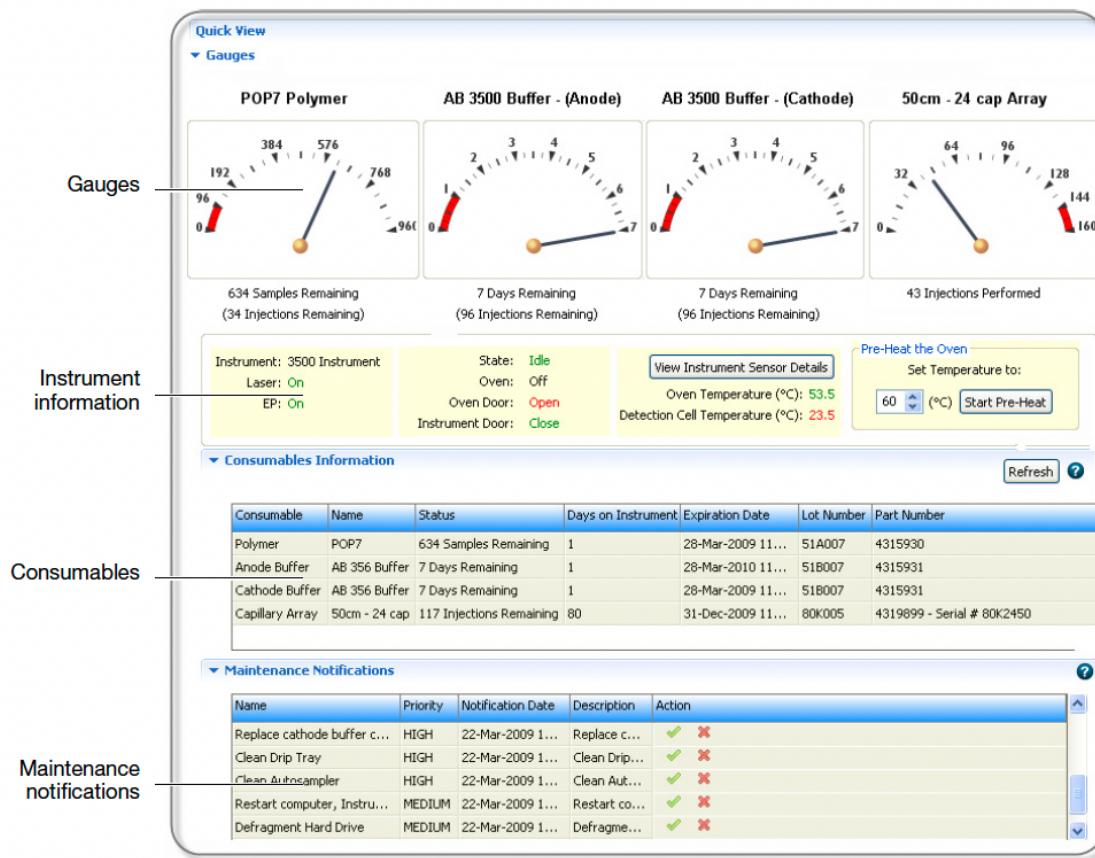


Figure 4 Dashboard

Check maintenance notifications

The Maintenance Notification section displays reminders for the tasks scheduled in the maintenance calendar (see “[Use the maintenance calendar](#)” on page 232). You can set the time to trigger maintenance notifications in Preferences (see “[Set general preferences](#)” on page 33).

1. Review the Maintenance Notifications pane.

Maintenance Notifications				
Name	Priority	Notification Date	Description	Action
Perform Performance Check	HIGH	28-Jan-2009 12:00:00 AM	Performance Check	✓ ✘
Clean Drip Tray	HIGH	28-Jan-2009 12:00:00 AM	Clean Drip Tray	✓ ✘
Clean Autosampler	HIGH	28-Jan-2009 12:00:00 AM	Clean Autosampler	✓ ✘
Replace Reservoir Septa	HIGH	28-Jan-2009 12:00:00 AM	Replace Reservoir Septa	✓ ✘
Wash Pump Trap	HIGH	28-Jan-2009 12:00:00 AM	Wash Pump Trap	✓ ✘

2. Perform any scheduled maintenance tasks, then click to mark it as complete, (or click to mark it as dismissed if you do not perform the task). Actions are recorded in the Notifications log (for more information, see “[Review the Maintenance Notifications Log](#)” on page 257).
3. Perform any daily, monthly, or quarterly maintenance tasks that are not listed in the Maintenance Notifications pane (see [Chapter 8, Maintain the Instrument](#)).
4. Inspect the instrument interior. See “[Start the instrument](#)” on page 22.
 - a. If you see any spills, clean immediately.
 - b. If you see any leaks and dried residue around the Buffer-Pin Valve, check valve, and array locking lever. If leaks persist, contact Applied Biosystems.

