QXDx Automated Droplet Generator
REF **12008019**

QXDx Droplet Reader
REF **12008020**

BIO-RAD

QXDx AutoDG Droplet Digital PCR System

Operation Manual

IVD

April 2019
12012076revB

UNITED STATES, *Bio-Rad Laboratories, Inc., 5731 W. Las Positas Blvd. Pleasanton, CA USA 94588, 510-724-7000*

Translations

Product documents may be provided in additional languages on electronic media.

Symbols Lexicon

 Manufacturer	 Lot Number
 Use by	 For In Vitro Diagnostic Use
 Temperature Limit	 Catalog Number
 Consult Instructions for Use	 Number of Tests
 For use with	 Serial Number
Rx Only Prescription Use Only	 Contains Latex

Bio-Rad Technical Assistance

For help and technical advice, please contact the Bio-Rad Technical Support department. In the United States, the Technical Support department is open Monday–Friday, 5:00 AM–5:00 PM, Pacific time.

Phone: 1-800-424-6723

Fax: 1-510-741-5802

Online technical support and worldwide contact information are available at www.consult.bio-rad.com.

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Safety and Regulatory Compliance

This instrument has been tested and found to be in compliance with all applicable requirements of the following safety and electromagnetic standards:

- IEC 61010-1:2010 (3rd ed.), EN61010-1:2010 (3rd ed). Electrical Equipment for Measurement, Control, and Laboratory Use — Part 1: General requirements
- EN 61326-1:2006 (Class A). Electrical equipment for measurement, control, and laboratory use. EMC requirements, Part 1: General requirements
- UL 61010-1:2004, Laboratory equipment, Test & Measurement Equipment and Industrial Process Controls
- CAN/CSA 22.2 No 61010-1-04, Safety Requirements for Electrical. Equipment for Measurement, Control, and Laboratory Use, Part I: General. Requirements

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment

in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

The CE mark indicates that the manufacturer ensures the product conforms with the essential requirements of the European Directive for in vitro diagnostic medical devices 98/79/EC

The CSA mark indicates that a product has been tested to Canadian and U.S. standards and it meets the requirements of those applicable standards.

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

The Waste Electrical and Electronic Equipment Directive symbol indicates that when the end-user wishes to discard this product, it must be sent to separate collection facilities for recovery and recycling

This instrument is for use only by trained personnel.

Do not position the equipment so that it is difficult to operate the plug of the power supply. The plug of the power supply is the disconnect device.

No serviceable parts inside.

Instrument Safety Warnings

Alteration of this instrument voids the warranty and safety certification and creates a potential safety hazard.

This instrument is intended for laboratory use only. Bio-Rad Laboratories is not responsible for any injury or damage caused by use of this instrument for purposes other than those for which it is intended, or by modifications of the instrument not performed by Bio-Rad Laboratories or an authorized agent. Follow the safety specifications listed here and throughout this manual. Use only the power cord supplied with the instrument, using only the plug adaptor that corresponds to the electrical outlets in your region.

NOTE: *Use of unapproved supermixes may harm the instrument and voids the warranty.*

PPE (Personal Protective Equipment) Training

Proper use of gloves is recommended with use of oils and sample plates. OSHA requirements for PPE are set forth in the Code of Federal Regulations (CFR) at 29 CFR 1910.132 (General requirements); 29 CFR 1910.138 (Hand protection); 29 CFR 1926.95 (Criteria for standard personal protective equipment). Any gloves with impaired protective ability should be discarded and replaced. Consider the toxicity of the chemicals and factors such as duration of exposure, storage, and temperature when deciding to reuse chemically exposed gloves. Features to aid glove selection for handling of machines, assays, oils, and cleaning solvents:

- Butyl gloves are made of a synthetic rubber and protect against peroxide, hydrofluoric acid, strong bases, alcohols, aldehydes, and ketones
- Natural (latex) rubber gloves are comfortable to wear and feature outstanding tensile strength, elasticity, and temperature resistance
- Neoprene gloves are made of synthetic rubber and offer good pliability, finger dexterity, high density, and tear resistance; they protect against alcohols, organic acids, and alkalis
- Nitrile gloves are made of copolymer and provide protection from chlorinated solvents such as trichloroethylene and tetrachloroethene; they offer protection when working with oils, greases, acids, and caustic substances

Transporting the Instrument

- Avoid dropping or subjecting the instrument to shock when transporting.
- This product weighs in excess of 50 lb. When lifting, two people are required. Grip from the underside with the people on opposite sides.
- After unpacking for placement of equipment, transport per lifting instructions above; place near grounded outlet with plug of power supply accessible.

Electrostatic Discharge

- Based on EMC testing, caution should be used if the intended use environment has low relative humidity, if the user wears synthetic clothing, or if there is synthetic carpeting. Under these conditions, the environment is more likely to make users susceptible to generating higher levels of electrostatic discharge.
- It is recommended to touch a metal door frame or other grounded metal surface to discharge static electricity before touching the equipment.

Radiated Emissions

QXDx Droplet Reader:

4.1.6 Final Tabulated Data – 30 - 1000 MHz

120V 60 Hz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB
96.00706	56.04	1.97	-19.66	38.35	Quasi Peak	V	269	340	40	-1.65
199.9922	50.97	2.51	-15.82	37.65	Quasi Max	H	363	298	40	-2.35
175.9981	50.36	2.38	-17.43	35.31	Quasi Max	H	328	330	40	-4.69
108.0103	46.96	2.04	-16.45	32.55	Quasi Max	V	329	227	40	-7.45
84.00813	50.3	1.9	-21.46	30.74	Quasi Max	V	298	188	40	-9.26
71.97813	44.53	1.83	-20.77	25.59	Quasi Max	V	160	360	40	-14.42

230V 50 Hz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB
180.0074	43.45	2.4	-17.63	28.22	Quasi Max	V	121	180	40	-11.78
86.21094	58.8	1.92	-21.46	39.26	Quasi Max	H	364	180	40	-0.74
344.7166	39.31	3.04	-14.63	27.73	Quasi Max	H	215	189	47	-19.27
199.9894	49.47	2.51	-15.82	36.15	Quasi Max	H	336	296	40	-3.85
175.9866	47.18	2.38	-17.43	32.13	Quasi Max	H	391	4	40	-7.87
219.9872	50	2.58	-18.02	34.56	Quasi Max	H	354	13	40	-5.44

4.1.7 Final Tabulated Data – 1 - 6 GHz

CISPR 32 Limits

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB
4783.058	57.51	4.28	-15.41	46.39	Peak Max	V	262	10	80	-33.61
2145	57.96	2.88	-22.53	38.32	Peak Max	V	292	38	76	-37.68
2088.612	59.24	2.85	-22.63	39.47	Peak Max	V	210	38	76	-36.53
2993.2	71.79	3.41	-19.67	55.53	Peak Max	V	157	115	76	-20.47
1593.296	55.54	2.48	-24.66	33.36	Peak Max	V	166	162	76	-42.64
5582.893	48.27	4.64	-15.26	37.65	Peak Max	V	234	346	80	-42.35
4783.058	35.78	4.28	-15.41	24.66	Average Max	V	262	10	60	-35.34
2145	39.75	2.88	-22.53	20.1	Average Max	V	292	38	56	-35.9
2088.612	39.27	2.85	-22.63	19.49	Average Max	V	210	38	56	-36.51
2993.2	43.18	3.41	-19.67	26.92	Average Max	V	157	115	56	-29.08
1593.296	38.08	2.48	-24.66	15.91	Average Max	V	166	162	56	-40.09
5582.893	36.57	4.64	-15.26	25.96	Average Max	V	234	346	60	-34.04

FCC Limits

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV	Margin dB
4783.058	35.78	4.28	-15.41	24.66	Average Max	V	262	10	60	-35.34
2145	39.75	2.88	-22.53	20.1	Average Max	V	292	38	60	-39.9
2088.612	39.27	2.85	-22.63	19.49	Average Max	V	210	38	60	-40.51
2993.2	43.18	3.41	-19.67	26.92	Average Max	V	157	115	60	-33.08
1593.296	38.08	2.48	-24.66	15.91	Average Max	V	166	162	60	-44.09
5582.893	36.57	4.64	-15.26	25.96	Average Max	V	234	346	60	-34.04

QXDx Automated Droplet Generator:

4.1.6 Final Tabulated Data – 30 - 1000 MHz,

220V 60 Hz

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
206.5134	51.67	2.35	-21.3	32.71	Quasi Max	H	384	103	40	-7.29
35.34219	41.06	1.51	-14.93	27.64	Quasi Max	V	125	117	40	-12.36
88.50094	56.01	1.85	-25.01	32.86	Quasi Peak	V	148	146	40	-7.15
68.56656	52.77	1.74	-24.27	30.24	Quasi Max	V	328	197	40	-9.76
82.38469	47.06	1.82	-24.8	24.08	Quasi Max	V	123	213	40	-15.92
65.04688	55.49	1.72	-24.58	32.63	Quasi Peak	V	308	275	40	-7.37

Final Tabulated Data – 30 - 1000 MHz

110V 60 Hz

Freq	Raw Reading	Cable Loss	AF	Corrected	Detector Type	Pol H/V	Ant Height	Azi	Limit	Margin
MHz	dBuV/m	dB	dB	dBuV/m			Cm	Deg	dBuV/m	dB
65.51969	49.21	1.72	-24.53	26.4	Quasi Max	V	248	40	40	-13.6
159.9825	46.51	2.16	-20.21	28.46	Quasi Max	V	98	50	40	-11.54
139.7003	44.9	2.08	-19.42	27.55	Quasi Max	V	163	91	40	-12.45
206.5038	52.58	2.35	-21.3	33.62	Quasi Max	V	128	144	40	-6.38
35.32813	40.89	1.51	-14.92	27.48	Quasi Max	V	111	177	40	-12.52
88.44781	51.88	1.85	-25.02	28.71	Quasi Max	V	195	274	40	-11.29

Sensitivity to Electromagnetic Fields

Both the QXDx Droplet Reader and QXDx Automated Droplet Generator were tested for conducted immunity with no performance degradation. However as an added precaution, do not stack RF emitting devices (cell phones, other laboratory equipment, computers, microwave ovens) on top of, or very close to, the device to ensure proper performance.

Cybersecurity

The purpose of this Section is to provide a basic summary of Bio-Rad's Cybersecurity policies as they pertain to the QXDx Software.

Accounts & Passwords

The QXDx Software is configured as a domain environment and uses network accounts to access the computers and servers that make up the system. Using the Microsoft Windows Active Directory the software can be configured to set up and authenticate user roles, privileges, and set login timeouts. The passwords used for both the domain and local accounts meet typical minimum complexity requirements.

Customer/Site Responsibilities (Laptop Computer with QXDx Software):

It is recommended that the customer use anti-virus software and a network firewall to help prevent unauthorized internet users from accessing their private network.

In the event a user encounters any issues with the laptop that are potentially related to a virus or malware, it is recommended users contact Bio-Rad Laboratories Technical Service Department.

Only qualified personnel with privileged device access (in accordance with the Accounts & Passwords section above) are allowed to perform software or firmware updates on the laptop (including those affecting the operating system, applications, and anti-malware).

Hospital/Clinic Site's IT Administration is responsible for password rules. This includes determining the necessary strength of password and time between changing of passwords.

Files:

Data backup, restore, and archive are all integrated into the software. For data recovery users should contact Bio-Rad Laboratories Technical Service Department.

Analysis protocol files that are generated with the QXDx Software are encrypted when exported/imported to prevent unauthorized personnel to alter critical protocol data used in results determination.

Network:

The Bio-Rad QXDx Software can be used on a stand-alone computer, or on the customer's network. The Bio-Rad system shall be connected to the customer's network only where required. Only authorized users (in accordance with the Accounts & Passwords section above) are able to access the QXDx Software applications.

Operating System Updates:

The system is updated at the time of deployment with all the relevant operating system patches.

Contents

1 QXDx AutoDG Droplet Digital PCR System

1.1 Introduction

The QXDx AutoDG ddPCR System, performs accurate and precise digital PCR.

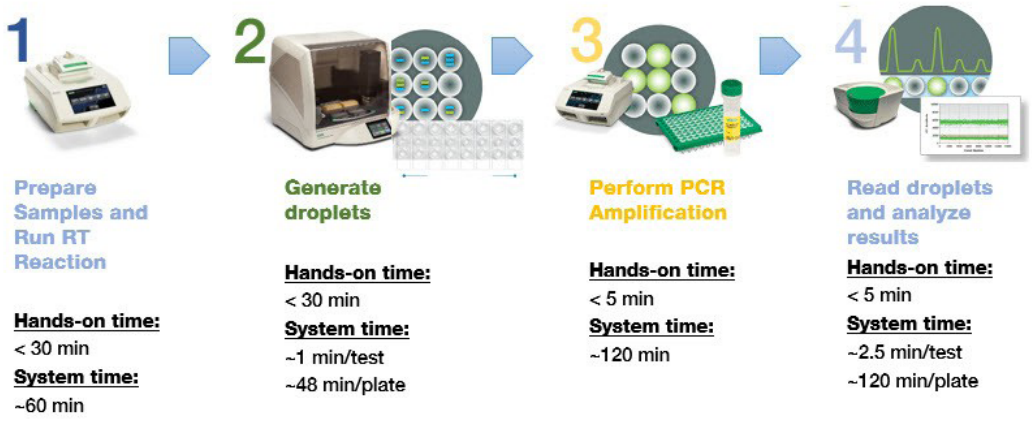
The system consists of two instruments, the QXDx Automated Droplet Generator and the QXDx Droplet Reader, and their associated consumables. The QXDx Automated Droplet Generator partitions samples into ~20,000 nanoliter-sized droplets and, after PCR on a thermal cycler, droplets from each sample are analyzed individually on the QXDx Droplet Reader.

1.2 Intended Use and Indication for Use

The QXDx AutoDG Droplet Digital PCR System with QXDx software is an in vitro diagnostic droplet digital PCR amplification and detection test system. It is intended for the amplification, detection (qualitative and quantitative), and analysis of nucleic acid samples, which have been partitioned into nanoliter droplets using fluorescence detection methods. The QXDx AutoDG Droplet Digital PCR System is indicated for use in clinical laboratories with legally-marketed assays which specify its use.

1.3 Droplet Digital PCR Workflow

Droplet Digital PCR involves the following steps. The entire workflow takes about 5-6 hours to complete.



1.3.1 Procedure

1. Prepare PCR-ready samples. For RNA based assay - Extract RNA from sample medium, and run the RT reaction for cDNA.
   Refer to the Instruction Manual from your RT kit and Thermal Cycler for more information on performing RT reaction.
2. Use the QXDx Automated Droplet Generator(AutoDG) to generate droplets by partitioning the sample using microfluidics into nanoliter-sized droplets required for ddPCR analysis.
3. Perform PCR amplification — Remove the plate from AutoDG and seal the plate with foil using

a PX1 Plate Sealer. Perform PCR to end point (~40 cycles) using a thermal cycler. Refer to the Instruction Manual of your thermal cycler for more information performing pcr. The thermal cycler must meet the following specifications:

Thermal Cycler (meeting the following specifications):	
• Temperature accuracy:	±0.2°C
• Well-to-well temperature uniformity:	± 0.4°C within 10 seconds
• Adjustable ramp rate:	at or adjustable to 2°C per second
• Temperature range:	0 - 100°C

4. Read droplets and analyze results:
   Load the plate into the QXDx Droplet Reader, IVD and start your run. The droplet reader sips each sample, singulates the droplets, and streams them in single file past a two-color detector. The detector reads the droplets to determine which contain a target (+) and which do not (–).1

   NOTE: *If reading or quantifying droplets and recovering material from droplets in parallel, prepare two sets of reactions, one for each application. For example, a set of eight wells in a single DG32 cartridge can be generated: four of these will be read after thermal cycling, and four will not be read.*

The droplet reader connects to a laptop computer running QXDx Software. The software provides a complete set of tools for setting up and naming samples, running and controlling the instrument, and analyzing results. It also reads the positive and negative droplets in each sample and plots the fluorescence droplet by droplet. The fraction of positive droplets in a sample determines the concentration of target in copies/µl

1.4 Setting Up and Operating the System

Set up and power-up the system before using it for acquisition and analysis.

1.4.1 About this task

The system consists of two instruments and associated software:

- QXDx Automated Droplet Generator (AutoDG) — utilizes proprietary reagents and microfluidics to partition samples into ~20,000 nanoliter-sized droplets
- QXDx Droplet Reader — following PCR amplification of the nucleic acid target in the droplets, this instrument analyzes each droplet individually using a two-color detection system (set to detect FAM and VIC, HEX); PCR- positive and PCR-negative droplets are counted to provide absolute quantification of target DNA in digital form using QXDx Software

1.4.2 Procedure

1. Connect the QXDx Automated Droplet Generator and QXDx Droplet Reader to a power source using the power cords and power adapter provided.
   Leave 10” (25 cm) clear space behind and 5” (12 cm) clear to the right and left of each instrument for proper ventilation. Position the instrument such that it can be easily disconnected from the power source should that become necessary for servicing the equipment.
2. Connect the QXDx Droplet Reader to the Bio-Rad provided system laptop using the USB 2.0

cord provided. QXDx Software comes pre-installed on the laptop.

3. Power on both systems using the switch on the back.
   The status indicator turns solid green to indicate that the power is on.
4. Replace the droplet reader oil per the prescribed maintenance task. The droplet reader requires the QXDx Droplet Reader Oil Pack.

1.4.3 Results

Your system is connected and ready for use.

1.5 System Components

Table 1: *QXDx AutoDG Droplet Digital PCR System components. Items shipped with the QXDx AutoDG Droplet Digital PCR System Catalog # refers to replacement items (quantities may be different).*

Component	Description	Catalog#
QXDx Automated Droplet Generator	Instrument used for droplet Generation	12008019
Cooling block accessory	Prevents evaporation during droplet generation.	Call technical support
Oil waste reservoir	Collects oil waste from priming and flushing	Call technical support
Power Cord	Positions and holds the droplet generator cartridge in the instrument for droplet generation	Call technical support
QXDx Droplet Reader	Instrument used for droplet reading, data collection	12008020
Droplet reader plate holders (2)	Position96-well PCR plate in the droplet reader droplet reader	Call technical support
USB 2.0 cable	Connects QXDx Droplet Reader to PC	Call technical support
Powercord	Connects QXDx Droplet Reader to power source	Call technical support
Laptop PC	Connects to the QXDX Droplet Reader for data acquisition and analysis	Call technical support
QXDx USB QXDx Software(2 Modules)	Contains Software images and manual	Call technical support
QXDx Acquisition	Acquisition controls instrument and data acquisition	Call technical support
QXDx Analysis	Analysis performs assay specific analysis	Call technical support

Table 2: *Universal Kit*

Component	Catalog #	Description
QXDx Universal Kit for AutoDG ddPCR System	17001378	
QXDx AutoDG Consumable Pack	12001922	Includes ddPCR 96-Well Plates, ddPCR Pierceable Foil Heat Seals, Automated Droplet Generation Oil for Probes, DG32 Cartridges, Pipet Tips, and instructions for use required for automated droplet generation
QXDx AutoDG Supermix Pack	12003031	Includes supermix required for Droplet Digital PCR
QXDx Droplet Reader Oil Pack	12002526	Includes Droplet Reader Oil required for Droplet Digital PCR

Table 3: *Additional materials needed but not provided with the system*

Component	Recommended	Catalog# and Supplier
Plate Sealer	PX1 PCR Plate Sealer	181-4000
Thermal Cycler	Thermal Cyclers with specifications equivalent to the following: Accuracy: +/- 0.2°C Uniformity: +/- 0.4°C well-to-well within 10 sec Adjustable ramp rate capability with required ramp rate: 2°C/sec Temperature range: 0-100°C	N/A
Droplet reader waste bottle	Empty waste bottle	N/A

Technical Assistance

Bio-Rad Technical Support

The Bio-Rad Technical Support department is open Monday through Friday, 5:00 AM to 5:00 PM, Pacific Time. Phone: 1-800-424-6723

Email: **Support@Bio-Rad.com** (U.S./Canada only)

For technical assistance outside the U.S. and Canada, contact your local technical support office or click the Contact us link at **www.bio-rad.com**.

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Czech Republic 420 241 430 532 **Denmark** 45 44 52 10 00 **Finland** 358 09 804 22 00 **France** 33 01 47 95 69 65
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Spain 34 91 590 5200 **Sweden** 46 08 555 12700 **Switzerland** 41 026 674 55 05 **Taiwan** 886 2 2578 7189
Thailand 66 2 651 831 **United Arab Emirates** 971 4 8187300 **United Kingdom** 44 020 8328 2000

2 About QXDx Automated Droplet Generator

Bio-Rad's QXDx AutoDG ddPCR System combines water-oil emulsion droplet technology with microfluidics to perform accurate and precise digital PCR. The system consists of two instruments — an QXDx Automated Droplet Generator and a QXDx Droplet Reader — and associated consumables. The QXDx Automated Droplet Generator, partitions each sample into ~20,000 uniform nanoliter-sized droplets in which nucleic acid molecules are distributed in a random fashion. Each droplet serves to partition the reactions.

The 96-well PCR plate of droplets are removed from the AutoDG Instrument, sealed, and PCR is performed to end point in a thermal cycler. Droplets from each sample are analyzed individually on the Droplet Reader; the droplets stream single file through the reader for fluorescence analysis.

2.1 Sample Plate Layout

Use the sample layout provided here to prepare and fill the wells as per the kit IFU.

Make sure that the wells are filled as per the following example layout. The assay requires preset position for calibrators and controls positioned on the plate as indicated in the layout. Additionally, the plate must hold minimum of 8 wells worth of materials at a minimum in a column. The run cannot be initiated unless all 8 wells contain reagents. For blank wells, that contain no sample, control, or calibrator, use 2x control buffer diluted with a 1:1 ratio of water and buffer.

NOTE: *If the total number of samples and controls are not in multiples of 8 (such as 8,16, 24 and so forth then fill the remaining wells with 25 µL ddPCR control buffer or excess reagents. Droplets will not form if the wells are left empty.*

Table 4: *Sample Plate Layout Template.*

	1	2	3	4	5	6		7	8	9	10	11	12
A	NTC	NTC	S1	S1									
B	Hi	Hi	S2	S2									
C	N	N	S3	S3									
D	Lo	Lo	S4	S4									
E	0.1%IS	0.1%IS	S5	S5									
F	10%IS	10%IS	S6	S6									
G	Buf	Buf	S7	S7									
H	Buf	Buf	S8	S8									

NOTE: *This is just a sample layout. The layout for QXDx Assays may vary depending on the assay specifications.*

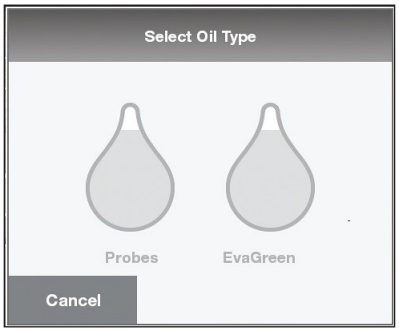
2.2 Loading a Bottle of Oil before Configuring a Plate

2.2.1 About this task

To save time at the beginning of a run, a bottle of Automated Droplet Generation Oil can be loaded into the instrument, and the oil delivery system primed, at any point. When there is no bottle of oil loaded into the instrument, the Oil Level display on the screen will appear gray to indicate it is empty. The Oil Type display on the screen will not display an oil type.

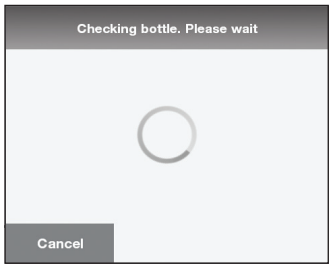
2.2.2 Procedure

1. Open the door of the AutoDG Instrument by lifting up on the handle until it clicks into a locked position.
2. Remove the cap from the bottle of AutoDG Oil and insert the bottle into the tower of the oil delivery system at the front left corner of the instrument.
3. Touch the Oil Type button on the home screen to bring up the Select Oil Type display.
4. Touch the droplet to indicate which type of oil has been loaded. To help differentiate, the AutoDG Oil for Probes bottle has a yellow label and contains a yellow straw, while the AutoDG Oil for EvaGreen bottle has a green label and contains a green straw.

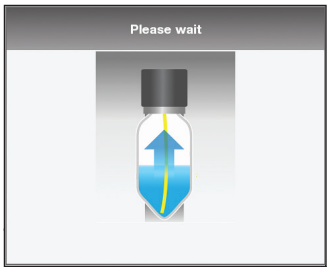


5. The instrument will check that there is oil in the bottle. If you did not load a bottle (or insert the bottle completely) as described in step 2, you will be prompted to load a bottle of the oil type that you selected in the previous screen. Once correctly loaded, the AutoDG Instrument will begin the flush and prime routine.
   A, display while checking for the bottle; B, display while priming the oil delivery system with AutoDG Oil for Probes. Once complete, the instrument will display a screen confirming successful priming of the selected and loaded oil.

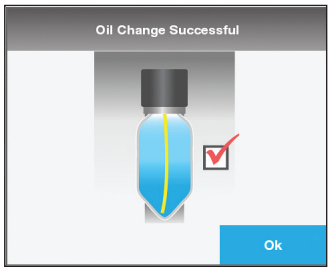
A



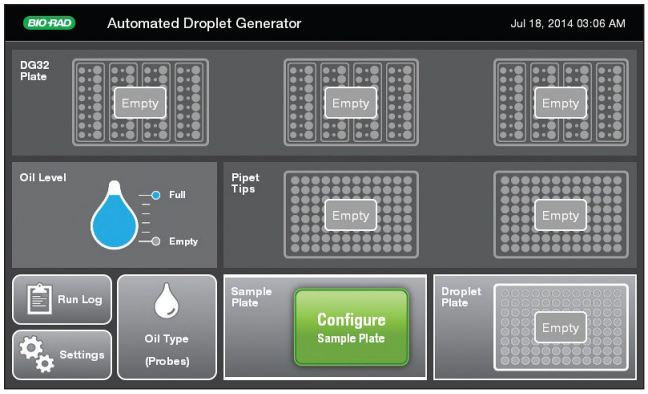
B



C



6. Touch OK to return to the home screen. The Oil Level icon will now reflect the amount of oil in the bottle, and the Oil Type icon will reflect the type of oil loaded and primed.
   The example below shows the home screen displaying a full bottle of AutoDG Oil for Probes loaded.



2.3 Starting a Run on AutoDG

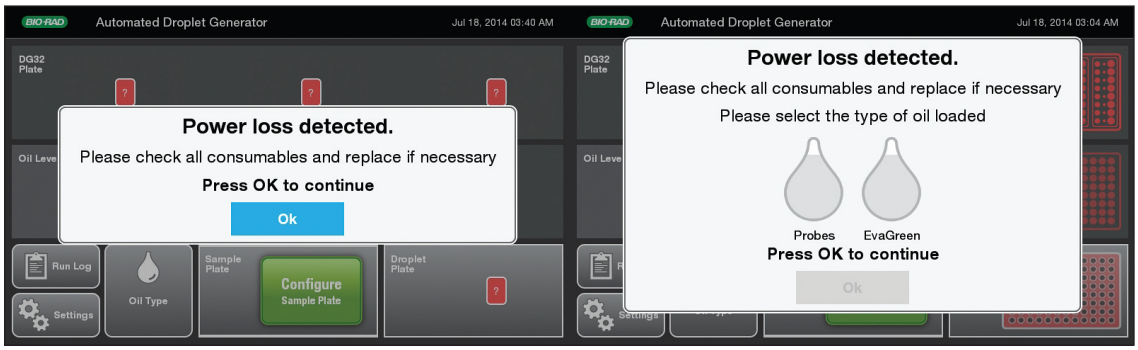
2.3.1 About this task

The Automated Droplet Generator (AutoDG) is designed to remain powered on in order to preserve positive airflow inside of the instrument and track consumable use. The instrument stays in an idle state when not being used.

If the instrument deck is empty, the indicator lights on the deck of the AutoDG should be off, indicating that no consumables are present. The corresponding areas of the touch screen will be gray.

When a new or different bottle of oil is loaded, or when power is lost, the AutoDG will perform a small volume flush and prime of the oil delivery system. If the AutoDG Instrument has not been used for an extended time period (a week or more) but left powered on, it is recommended to perform a flush and prime routine before running a plate

If consumables were present in the instrument when power was lost or disconnected, an error message will appear prompting you to check and reset the consumables if necessary. The cartridges, gaskets, tips, and plates are all single- use consumables and should be discarded after use. If the consumables in the instrument are of questionable use after power loss, please remove and discard.



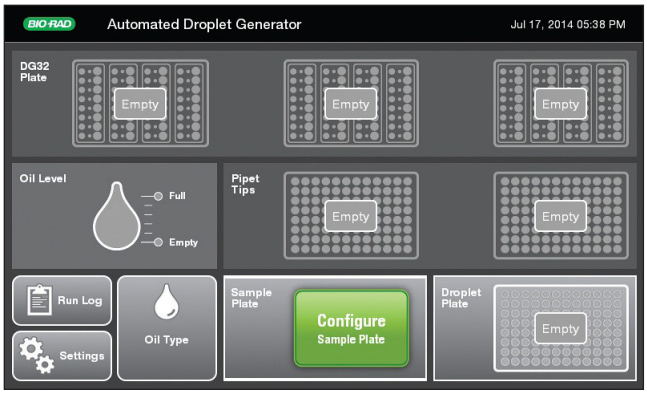
ATTENTION: *The AutoDG accepts either a sealed or open 96-well PCR plate containing 25 µl prepared ddPCR reactions. Detailed sample preparation and reaction setup information can be found in the QXDx Supermix product inserts.*

2.3.2 Procedure

1. Touch the screen to bring the AutoDG out of idle mode.

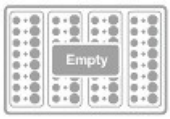
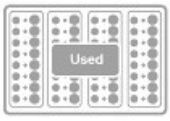
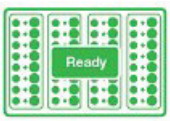
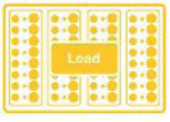
   NOTE: *When powering on the AutoDG, you will see a startup screen while the instrument powers on and performs a self-check. The door will automatically close.*

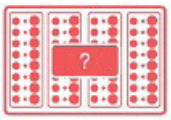
   Figure 1: *Home screen, no consumables loaded*



2. Check the indicator lights on the deck of the AutoDG Instrument nd the consumable icons on the touch screen. Refer to the table below to familiarize with the deck lighting statuses, touch screen icons statuses, and their descriptions.

   Table 5: *AutoDG Instrument deck lighting and touch screen status indicators*

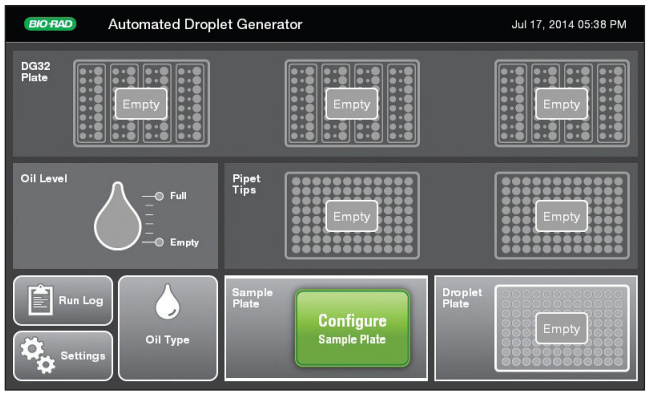
Deck Lighting Status	Touch Screen	Icon Status	Indication
Off	Gray, Empty		Ready to configure a new run
Off	Gray, Used		Ready to configure a new run; instrument will prompt for consumable replacement in used positions when the next run is configured
Green	Green, Ready		Ready to configure a new run; consumables in the green positions are ready to be used
Yellow	Yellow, Load		Run configured, load consumables as prompted (this status occurs only during run setup).

Deck Lighting Status	Touch Screen	Icon Status	Indication
Blue	Blue, Complete		Run complete and droplets ready; occurs only at droplet plate position
Red	Red, ?		Consumables status unknown after power loss, please confirm manually

3. To create a plate of droplets with the QXDx Automated Droplet Generator:

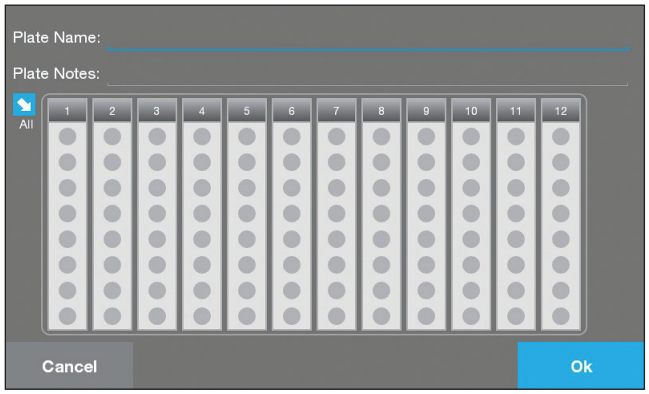
   a. Touch the Configure Sample Plate button at the bottom center of the screen.

Figure 2: *AutoDG Home Screen*



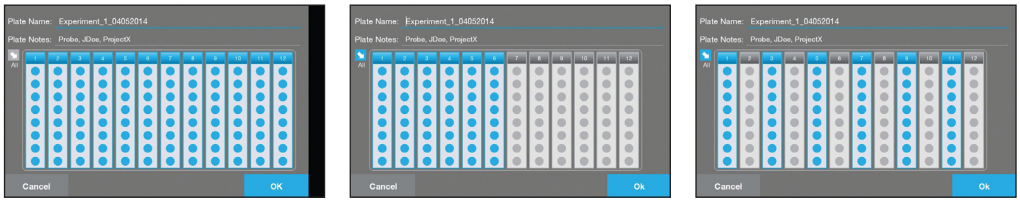
   b. Optional: Enter the plate name and plates notes. Touch the fields to bring up a keyboard on the screen.

Figure 3: *Plate Layout Screen*



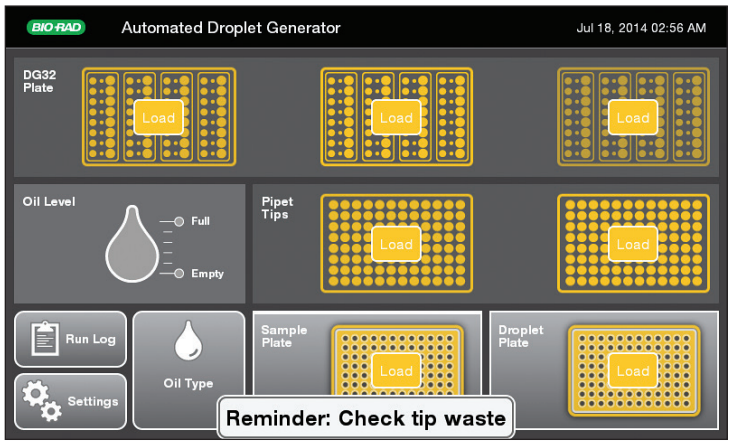
c. Touch or swipe across the screen to select the columns in which your samples are located on the sample plate. Touching a selected column deselects it. You can touch any orientation of columns.

d. Configure Sample Plate screen with A, full plate of samples selected; B, half plate of samples selected; C, alternating columns of samples selected.



A B C

e. Click **OK** when done.
In the example below, a full plate has been selected



Based on the number of columns selected the consumable icons on the screen will begin to blink yellow to indicate where new consumables need to be loaded into the instrument.

4. Depending on the indication on the screen do one of the following:
   - If the blinking yellow icon displays Load on the screen, remove the previously used consumable (if applicable) and load a new consumable into the designated area of the instrument.
   - If the icon remains gray on the screen, that consumable is not needed to complete the currently configured run.
5. Open the door on the AutoDG Instrument by lifting up on the handle at the front of the instrument. The electronic braking system will assist you in this task and prevent the lid from closing accidentally.

   ATTENTION: *The QXDx Automated Droplet Generator door will close to preserve HEPA-filtered enclosure if left open for longer than 20 minutes while in idle mode (not generating droplets). There is an audible click when the door brake releases, and the door closes slowly. Observe caution around the pinch points of the instrument and keep your hands clear. To avoid*

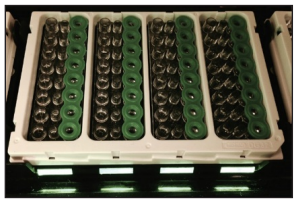
contamination, load the consumables from the back to the front of the instrument. Do not plate anything on the instrument deck outside of the dedicated consumable holders.

6. To load the DG32 AutoDG Cartridges along the back row of the instrument, remove the plastic wrapping from the DG32 cartridges and place with the green gaskets to the right, into the three plate holders. The holders are keyed for proper orientation of each DG32 cartridge to prevent incorrect loading.

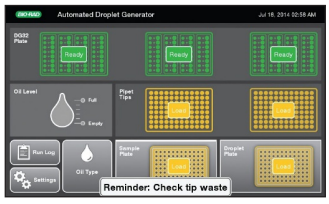
   A, DG32 Cartridge holders on the AutoDG deck in the “Load” state, indicated by yellow lights; B, green lights indicate the DG32 Cartridge has been correctly loaded and is ready; C, DG32 consumables have been correctly loaded. The Ready status appears on the DG32 icons on the screen.

   Table 6: *Example indicators*

A



B



C

   The lights on the DG32 plate holders will change from yellow to green when the DG32 cartridges are inserted correctly. If a light remains yellow, try repositioning the plate in a different orientation. As the lights turn green on the deck, the corresponding icons on the touch screen will go from blinking yellow to solid green, and Ready will be displayed.

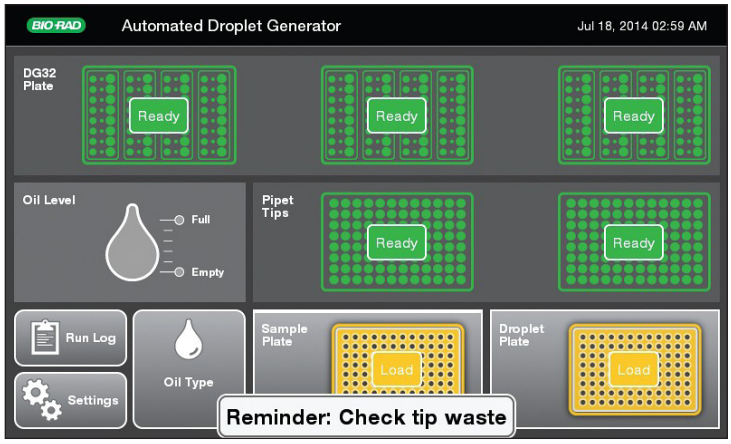
7. To load the AutoDG Pipet Tips along the center row of the instrument:

   ATTENTION: *Only AutoDG Pipet Tips should be used; other tips can damage the instrument.*

   a. Remove the plastic wrapping and box lids from the tip boxes and place into the plate holders in the middle of the deck. Only full tip boxes should be loaded.

      Remove the tip waste bin containing any tips from a previous run and replace with a clean waste bin.

      The example shows that the pipet tip boxes have been correctly loaded. The Ready status appears on the Pipet Tip icons on the screen.

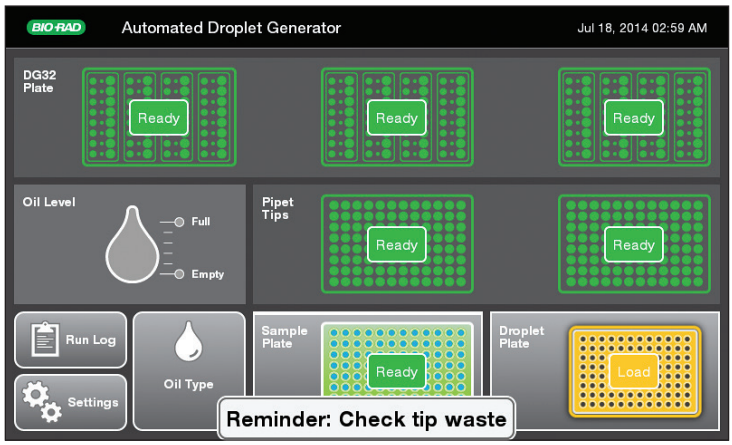


The lights on the tip box holders will change from yellow to green when the tip boxes are inserted correctly. As the lights turn green on the deck, the corresponding areas of the touch screen will go from blinking yellow to solid green, and Ready will be displayed.

8. To load the 96-well PCR plate containing your prepared ddPCR reactions into the front row of the instrument: Please note that a sample plate is required for every run, regardless of the number of columns selected.

   a. The sample plate can be sealed with a PX1 Plate Sealer and heat-sealing foil in advance of loading into the AutoDG Instrument. Each well should contain 25 µl of your prepared ddPCR reaction.
   See the supermix product insert for more detailed information on ddPCR reaction setup.

   b. Place the plate into the front left plate holder, labeled on the screen as Sample Plate. The holder is keyed for proper orientation and contains plate clips to support sealed plates.
   In the example, the sample plate has been correctly loaded. The Ready status appears on the Sample Plate icon on the screen.



The light on the Sample Plate holder will change from yellow to green when the plate is inserted correctly. If the light remains yellow, try repositioning the plate in a different orientation. As the light turns green on the deck, the corresponding icon on the touch screen will go from blinking yellow to solid green, and **Ready** will be displayed.

9. To load the Droplet Plate assembly:

   ATTENTION: *The cooling block should be placed in a –20°C freezer for at least 2 hours before configuring a run on the AutoDG Instrument and inserting the Droplet Plate assembly into the instrument. The block goes from a pink color at room temperature to a dark purple color when properly cooled.*

   NOTE: *The AutoDG Instrument uses a cooling method to prevent droplet evaporation, much like the Droplet Generator requires you to cover the wells once droplets are transferred.*

   a. Remove the cooling block from the freezer and place into the front right plate holder, labeled on the screen as Droplet Plate. The holder is keyed for proper orientation of the cooling block. The block should be a dark purple color, indicating it is at the proper temperature. If the block is pink, it has warmed up and should not be used.

   A, purple - ready for use; B, pink - freeze before use.

   As the light turns green on the deck, the corresponding area of the screen will go from blinking yellow to solid green, and Ready will be displayed.

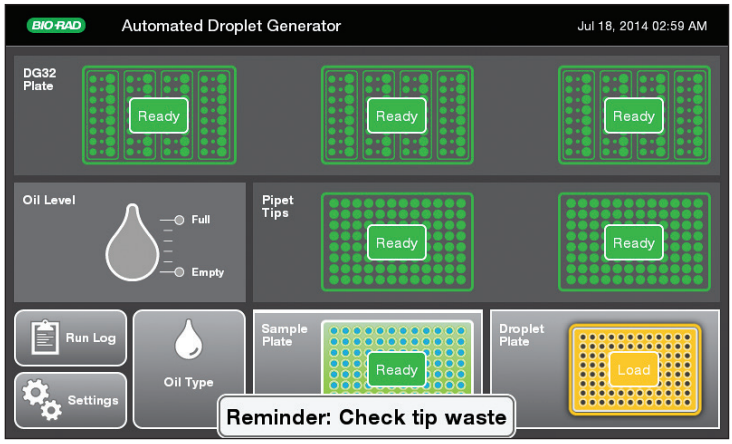
   b. Place a clean 96-well PCR plate for droplet collection into the cooling block accessory. The cooling block is also keyed for proper orientation of the plate.
   In the example, the droplet plate and cooling block assembly have been correctly loaded. The Ready status appears on the Droplet Plate icon on the screen.
   A clean droplet plate is required for every run, regardless of the number of columns selected. Once generated, the droplets will be dispensed into the same plate orientation as the ddPCR reactions were taken from the sample plate.

10. To load Automated Droplet Generation Oil into the instrument:
    If a bottle of Automated Droplet Generation Oil was previously loaded, you may be prompted to confirm the type of oil currently loaded into the instrument.
    If the last plate was run on the AutoDG Instrument with a different oil type than the one being currently loaded and selected, the instrument will perform a small volume purge of the oil through the delivery system and into the oil waste reservoir. The total run time will be a few minutes longer when this occurs, but droplet generation will not be impacted. To prevent this operation in the future, see advanced oil loading and switching.

    a. Remove the cap from the bottle of Automated Droplet Generation Oil and twist the bottle into the tower of the oil delivery system at the front left corner of the instrument. Turn the bottle until it does not move; the label on the bottle should face out.

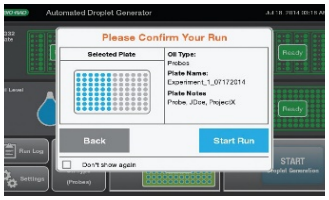
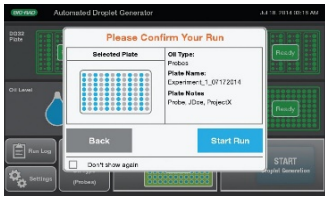
    b. Touch Probes oil, to select the type of Automated Droplet Generation Oil that was loaded into the instrument.

Figure 4: *Select Oil Type Dialog*

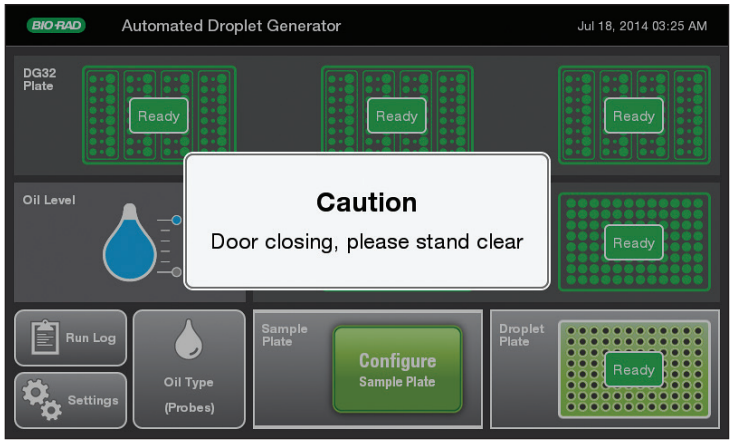


c. After the droplet you select will turn blue; touch OK to set the oil type.
The Oil Level icon on the screen will turn blue and display the current oil level of the bottle.
The system will display the oil type at the bottom left of the screen as well.

11. After all of the consumables are loaded and the corresponding lights are green on the deck and touch screen, a blue Start button appears at the bottom right of the screen. Touch Start to bring up a confirmation window indicating the type of Droplet Generation Oil loaded, the number and orientation of columns selected for droplet generation, and any plate name and details entered during configuration of the sample plate.
Home screen; all consumables are correctly loaded and the system is ready to start droplet generation.
12. Run confirmation screen with A, full plate of samples selected; B, half plate of samples selected; C, alternating columns of samples selected.

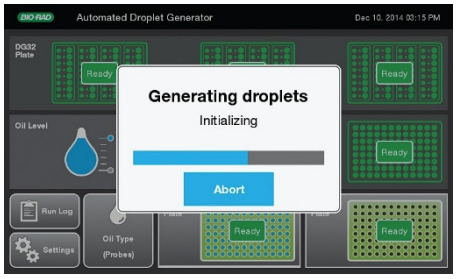
A	B	C
		

- Once you have confirmed the plate setup, touch the Start Run button to begin droplet generation. The door will automatically close at the beginning of the run and must remain closed during the run. Opening the door before the Droplets Ready message appears may cause the instrument to terminate the run and samples to be lost.
- If the selected columns on the confirmation screen do not match the location of samples in your sample plate, touch Back to make any changes. Touch the sample plate to bring up the Configure Sample Plate window and change your selections as needed.
- The AutoDG door automatically closes at the start of each run and must remain closed until droplet generation is complete.

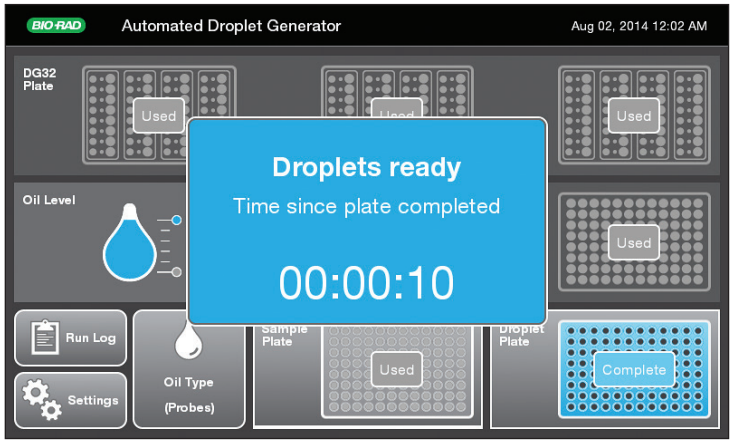


- After a brief initialization, the AutoDG displays a countdown timer on the screen with time remaining until the plate of droplets is ready. No additional action is needed until the plate is ready. The initialization can take 1–5 min, depending on whether the oil type has been changed or not. If you want to abort, skip to the next step.

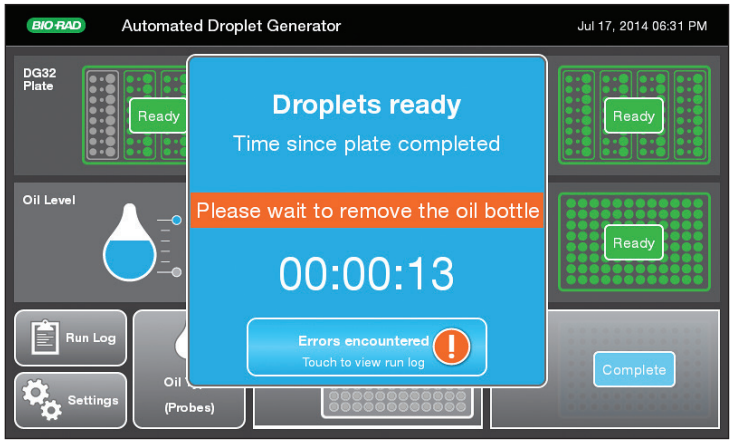
Table 7: *A, initializing display with progress bar at the beginning of a run; B, countdown timer display indicates the time remaining until droplet generation is complete and the Droplet Plate can be removed.*

A	B
	

- Once the plate of droplets is ready, the screen displays a finalizing window followed by a blue Droplets ready message with the time taken for the run to complete.



- The Droplet Plate at the front right corner of the instrument illuminates in blue. The corresponding icon on the touch screen will also pulses blue. The instrument door unlocks for the droplet plate to be removed. Wait to remove the oil bottle as noted on the screen; the unused oil is being returned to the bottle.

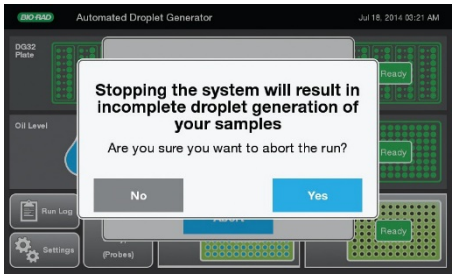


If any errors were encountered during the run, an error notification appears below the count-up timer. Touch the Errors encountered button to bring up the run logs and identify the error.

13. Optional: If for any reason you need to stop the run, touch the Abort button on the countdown timer screen. In the confirmation window that appears, touch Yes to abort the run or No to return to the countdown timer.

IMPORTANT: *Stopping the AutoDG during a run can result in loss of the current column of samples being processed.*

The example shows, A, abort confirmation screen; B, terminated message

A	B
	

After confirmation, the system confirms with time when run was terminated.

2.3.3 What to do next

- Seal the plate before performing PCR amplification.
- Remove any consumables from the AutoDG Instrument that have been completely used and discard. You must not reuse DG32 cartridges, tips, and plates, as they are single-use consumables only. The AutoDG will remember the status of the consumables as long as it remains powered on; if a consumable has been only partially used, leave it in the AutoDG for the next run.

2.4 Sealing the Plate after a Run on AutoDG

2.4.1 Before you begin

You must remove the droplet plate containing ddPCR droplets.

2.4.2 About this task

You must seal the plate within 30 min of droplet generation using the PX1 PCR Plate Sealer and foil seals listed under system components. For more details, see also instructions in the PX1 PCR Plate Sealer Instruction Manual.

2.4.3 Procedure

1. Set the plate sealer temperature to 180°C and time to 5 sec.
2. Touch the arrow to open the PX1 tray door. Position the support block on the tray with the 96-well side facing up. Place the 96-well plate onto the support block and ensure that all plate wells are aligned with the support block.
3. Cover the 96-well plate with one sheet of pierceable foil seal. (The red stripe on the foil seal should face up towards the user.) Do not attempt to place the frame over the foil-covered plate. The frame is only for use with other seals.
4. Once the 96-well plate is secured on the support block and covered with the pierceable foil seal, touch the Seal button. The tray will close and heat sealing will initiate.
5. When heat sealing is complete, the PX1 door will open automatically. Remove the plate from the block for thermal cycling. Remove the block from the PX1 Sealer.

6. Check that all the wells in the plate are sealed; the depressions of the wells should be visible on the foil.

2.4.4 Results

Once sealed, the plate is ready for thermal cycling.

2.4.5 What to do next

After the 96-well plate containing the droplets is sealed, place it into the thermal cycler for PCR amplification within 30 min of sealing the plate, or store the plate at 4°C for up to 24hrs prior to thermal cycling.

Refer to the assay/supermix product inserts for cycling conditions.

After the PCR amplification is complete, remove the 96-well plate from the thermal cycler and read the droplets using the QXDx Droplet Reader. If the goal is to read or quantify droplets and recover material from droplets in parallel, prepare two sets of reactions, one for each application.

For example, a set of eight wells in a single DG32 cartridge can be generated: four of these will be read after thermal cycling, and four will not be read.

2.5 Accessing Run Logs

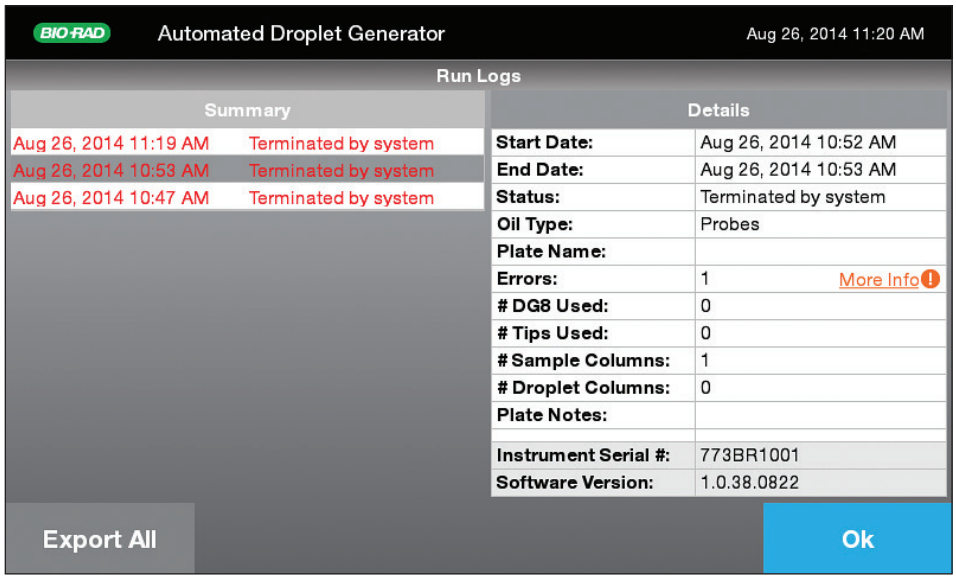
2.5.1 About this task

The AutoDG stores information about each run, including consumables used, rows of reactions processed, and any errors that may have occurred.

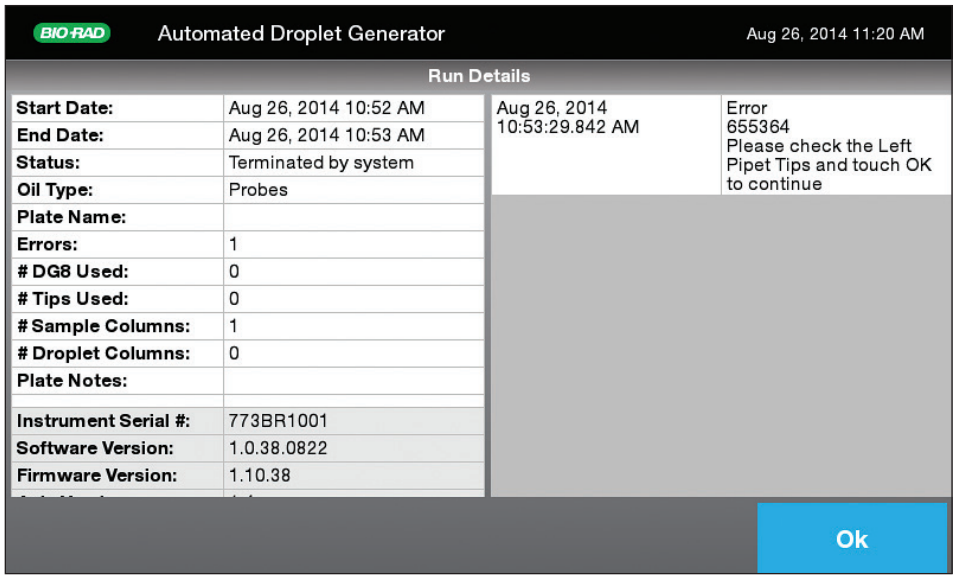
To access the run log:

2.5.2 Procedure

1. Touch the Run Log button on the home screen.
2. To display detailed information about a run, touch the run.
   - Example showing AutoDG Instrument run log with system summary of runs (completed or terminated).



   - Example of Run Details for a run terminated by the system due to a pipet tip box lid being left on when placed in the instrument. The run details are displayed on the left of the screen and the error details on the right.



3. Touch OK to return to the run log (and to export run log or exit).

2.6 Exporting an AutoDG Run Log

2.6.1 Before you begin

Open the run log before you can export it. Have a USB key connected and ready for receiving the exported file.

2.6.2 About this task

Use this procedure to export the AutoDG run logs to a USB drive.

2.6.3 Procedure

1. Touch the Run Log button on the home screen.
2. Remove the AutoDG Instrument's side panel to the right of the touch screen. Slide the magnetic panel down to release, then pull straight out to remove the panel.
3. Insert a USB key into the USB port on the side of the instrument.
4. Touch the Export All button at the bottom left of the screen. Wait while the system exports the run logs to the USB key.
   When finished, Run logs successfully exported will be displayed on the screen. It is now safe to remove the USB key.
5. If the USB key is not connected, the AutoDG Instrument will display the message USB key not found. Please insert it and try again. Insert the USB key and touch Retry to proceed.
6. Replace the side panel.

3 Using the QXDx Droplet Reader

3.1.1 Before you begin

NOTE: *You must have performed PCR amplification and must be ready to load the plate for reading.*

3.1.2 Procedure

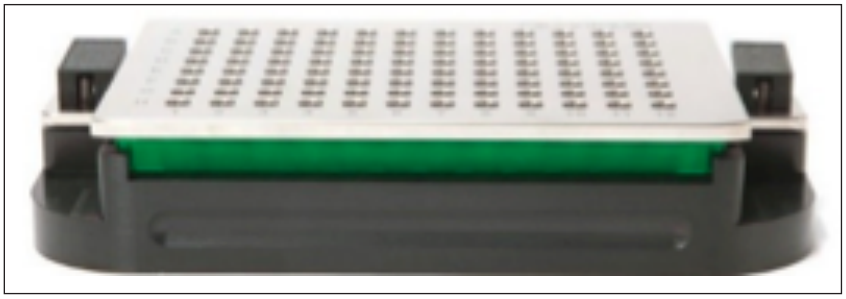
1. Power on the QXDx Droplet Reader using the switch at the back. Allow it to warm up.
2. Check the indicator lights on the front of the droplet reader.
3. The first two lights at left should be solid green. This indicates that the power is turned on, there is sufficient oil in the designated oil reservoir, and there is less than 700 ml in the waste bottle. If the lights are flashing amber, the run cannot be started; clean out the waste bottle or replace the oil.
4. After the instrument has warmed up, switch on the PC.
5. Open and login to the QXDx Acquisition Software.
6. Place the prepared 96-well PCR plate into the plate holder.

Figure 3-1: *Placing the 96-well plate into the plate holder*

a. Place the 96-well PCR plate containing the amplified droplets into the base of the plate holder. Well A1 of the PCR plate must be in the top left position.

b. Move the release tabs of the top of the plate holder into the “up” position and place the top on the PCR plate. Firmly press both release tabs down to secure the PCR plate in the holder.

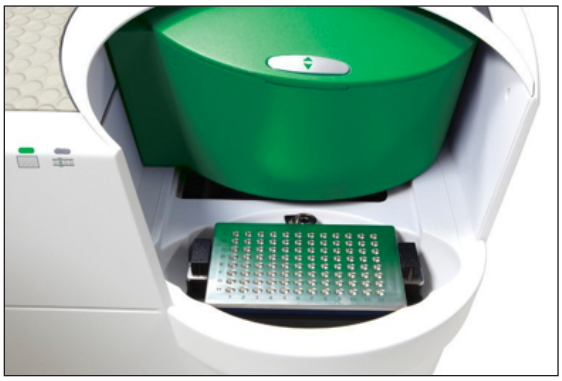
Figure 3-2: *Tabs down to lock the plate in place*



7. Press the button on the green lid to open the droplet reader. Load the plate holder into the droplet reader, and press the button on the lid again to close the cover. Confirm the first three indicator lights are green

Figure 3-3: *Push button to open/close*

Figure 3-4: *Placing the plate holder into the droplet reader*



After loading the plate, you are ready to start the run on the QXDx Acquisition software.

3.2 Light Indicators

Table 8: *Status indicator lights on the QXDx™ Droplet Reader, IVD and its meaning.*

				
Solid green	Power on	Bottle levels OK*	Plate in place	Run complete
Flashing green	—	Oil <30% or waste >70%**	—	Run in progress
Flashing amber	—	Oil <10% or waste >90%***	—	Error during run
Off	Power off	—	No plate	Idle

* There is sufficient oil and room in the waste bottle to run 96 wells.

** The run can be started if <96 wells are run (for example, only 19% oil is required for 24 wells); if there is not enough oil for the run, the software will not allow you to start the run.

*** The software will not allow you to start the run.

4 About QXDx Software

QXDx Software has two application interfaces, QXDx Acquisition and QXDx Analysis. The dual application design enables simplistic approach for end user to perform a run and analyze the data generated from the run separately.

This also allows enables Bio-Rad to update the applications without impacting instrument controls.

The QXDx Acquisition software is designed with instrument control and run setup as the primary function of this application.

The QXDx Analysis Software is designed with the flexibility to analyze, annotate run data and generate reports.

The software workflow can be described as follows:

In the QXDx Acquisition software you perform

- Instrument controls – perform instrument functions outside of starting a run.
- Manage Assays – Add/Remove application programmable file specifics to assays
- Plate Setup — enter information about the samples, assays, and experiments.
- Run — start the run with pre-defined plate setup and apf.
- Maintenance – Perform maintenance tasks

In the QXDx Analysis software you perform

- Load Raw data – load data generated in QXDx Acquisition with (.ddpcrx) file.
- Analyze the automated data analysis from raw .ddpcrx file to nucleic acid concentration.
- Review Results — view results based on Assay specific rules (defined in the apf).
- PDF reports – sample, patient, summary and trend reports.
- Comma-separated values (*.csv) — analyzed data in a format that can be assessed using other programs, such as Microsoft Excel

4.1 Adding or Editing Lot Information

As a lab assistant, before you can start a new acquisition on the QXDx Acquisition software, you must add or edit the universal and test-specific kit lot information.

4.1.1 About this task

Use the **Edit/Add Kit Lot Information** dialog to add a new kit lot information for both universal and test-specific kits for running QXDx data acquisition. You can also edit existing kit lot information that you had previously entered.

4.1.2 Procedure

1. Open the **Edit/Add Kit Lot Information** dialog one of the following ways:
   - Select **Configure System > Kit Lot Manager**
   - Click the **Add/Edit Lot** button on the **Run Setup/Status** dialog.
2. Click the **Universal Kits** tab to open it.

   You can simply click on a row to start adding new lot information or click on any column of an existing kit lot row to starting editing it.

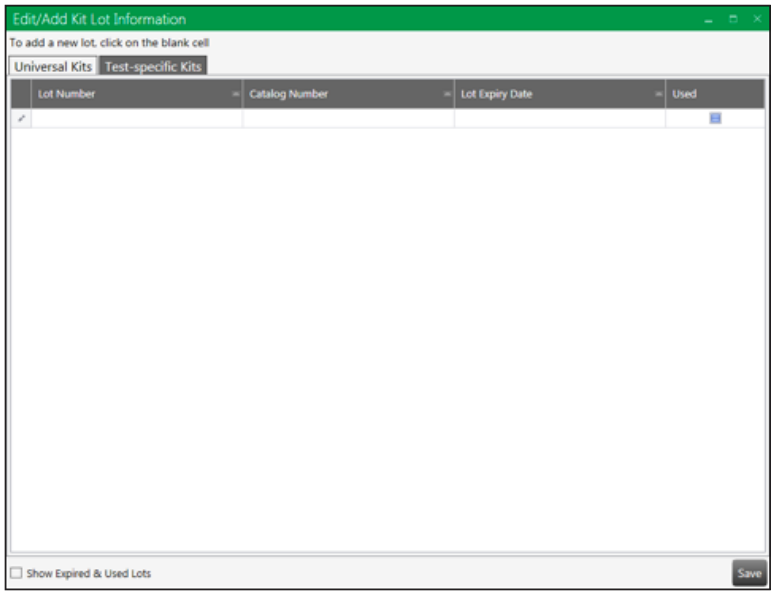
   NOTE: *A pencil icon appears in the first column to indicate the edit mode for that row.*

   a. Enter the Lot Number for the kit.

   b. Enter the Part Number.

   c. Enter a valid Lot Expiry Date. The date cannot be current date or in the past.

   d. Select the Used check box to indicate if the kit is a previously used lot.



3. Click the **Test-specific Kits** tab to open it.

You can simply click on a row to start adding new lot information or click on any column of an existing kit lot row to starting editing it.

NOTE: *A pencil icon appears in the first column to indicate the edit mode for that row.*

a. Simply click on a row to start adding lot information.

b. Select the **Test Name** from the drop-down.

c. Enter the **Lot Number** for the kit.

d. Enter the **Part Number**.

e. Enter a valid **Lot Expiry Date**. The date cannot be current date or in the past.

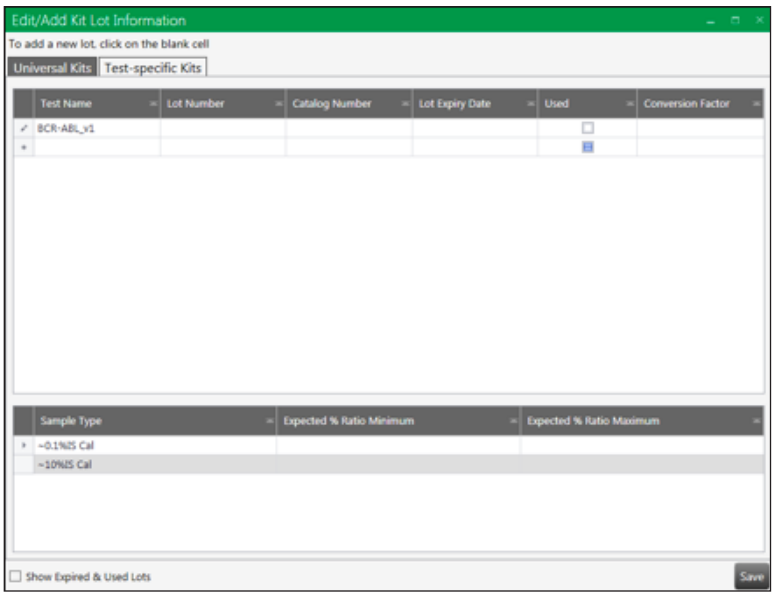
f. Select the **Used** check box to indicate if the kit is a previously used lot.

g. Enter the **Conversion Factor** for the kit lot.

h. For each Test-specific kit added, also add the following information about the kit.

In this column	Enter
Expected % Ratio Minimum	The minimum expected % ratio for both ~0.1%IS and~10%IS calibrators. The value must be in the valid range.
Expected % Ratio Maximum	The maximum expected % ratio for both ~0.1%IS and~10%IS calibrators. The value must be in the valid range.

4. Select the **Show Expired & Used Lots** check box to show expired and used lots during the run for selection. This option is not selected by default.
5. Click **Save** to save changes and exit the dialog.



4.2 Starting a New Run

As a lab assistant, start a new acquisition on the QXDx Acquisition software.

4.2.1 Before you begin

You have loaded the sealed 96-well plate into the QXDx Droplet Reader. You have opened and logged into the QXDx Acquisition software. You have added the **universal kit and test-specific kit lot information**.

4.2.2 Procedure

1. In the QXDx Acquisition software, click on **New Run**.
2. Select the test name from the list of tests.
3. Click **New Plate** to load a fresh plate, or click on **Open Plate** to open an existing plate. The plate screen opens.
4. Configure the plates using the well editor. See section, **"Using the Well Editor**" in Chapter 4.
5. After the plate is setup, click **Run**.
   On the screen, a visual indicator with a list of mechanical checks are listed with green check marks indicating successful instrument status. Failures are also indicated in which case you must fix issues before proceeding with the run. For a list of instrument and mechanical errors, see Chapter 6, Troubleshooting.
6. On the **Run Start Dialog**, select the lot information for both **Universal Kit** and **Test-Specific Kit**.

   NOTE: *See Section 4.1, Adding or Editing Lot Information for more information.*
7. Optional: Enter comments specific to the run in the **Run Notes** text field.
8. When ready, click **Start Run** to initiate the data acquisition.

4.2.3 Results

The run status indicator appears showing the progress and estimated time for completion. Depending on the number of samples in the plate, data acquisition typically takes about a 2.5 minutes per test and approximately 120 minutes per plate (fully filled). After a successful run completion, the QXDx Analysis software opens automatically.

4.3 Using the Well Editor

4.3.1 About this task

Use the well editor to define the settings (samples, experiment type, and detection type) for the plate. Sample and experiment types are color-coded and can be customized for easy reference in the plate map. The plate map in the software must be configured exactly the way the wells were filled.

Settings appear in the Applied Well Settings box as you enter them. When you are done, click Apply to save the information. The settings appear in the well in the plate map.

4.3.2 Procedure

1. To open the well editor, double-click on the well(s) you wish to edit. Selected wells are highlighted, and the well editor opens in the edit mode.
   a. To select multiple wells, hold Ctrl and select the wells.
   b. To select wells in a continuous series (horizontal or vertical), hold Shift and select the first and last wells.
   c. To select all wells, double-click in the top left corner of the plate.
   d. To select a row or column, double-click the letter or number for that row or column.
2. For samples, enter the sample name and select the experiment from the drop-down menu.
   For each sample, two neighboring wells are filled. Thus two contiguous wells with the same sample must be configured on the plate layout matching the filled well location on the plate.
   NOTE: *To ensure traceable, and accurate results for each sample, scan or enter the ID in the correct well location as filled in the wells on the plate.*
   a. All saved experiments appear in the drop-down menu.
   b. The sample name is case-sensitive; only wells with identical sample names can be treated as merged wells during data analysis.
   c. To create or edit an experiment, use the experiment editor.
3. Select the Supermix from the drop-down menu (required; selection cannot be changed after data collection).
4. Assign each assay a Name and sample Type.

4.4 Viewing and Printing of Results

4.4.1 About this task

The results are generated automatically by the QXDx Analysis Software including measured droplet counts, fluorescent signals, and embedded calculation algorithms and displayed in the **View Results**.

4.4.2 Procedure

1. Upon completion, the Run Complete Dialog will appear and ask the user to go directly to **QXDx Analysis** Software for data review, or ask the user to logout and login to QXDx Analysis with the active user.
2. In the QXDx Analysis Software select the **Review Results** button run to review, There will be 2 status buttons “In Review Runs” and “Reviewed Runs.”
   a. In Review Runs – allows users to review the data, add notes, view sample reports, view summary reports and release the results.

NOTE: *Reports are draft reports and water will not be removed until the run is Reviewed and Released.*

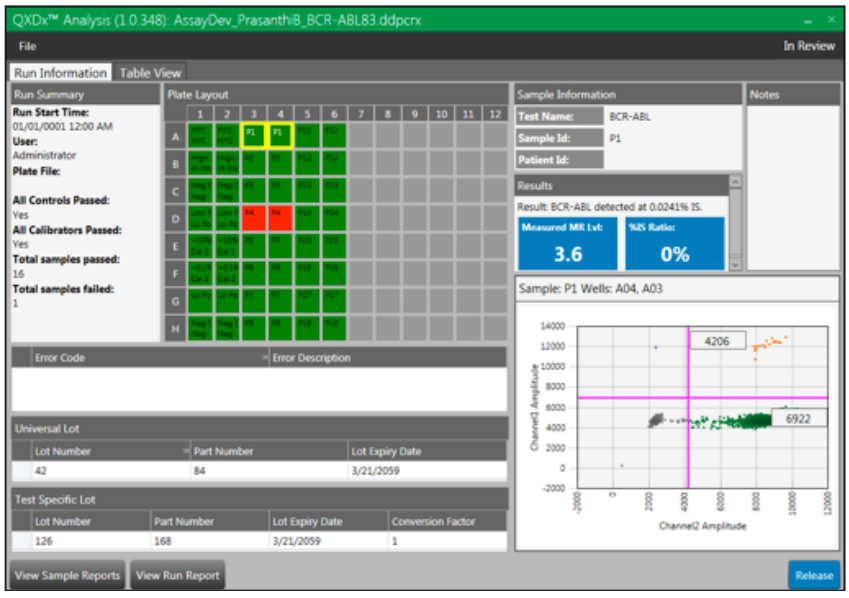
b. Reviewed Runs – is the status that follows once a user reviews and releases the results for distribution.

3. Once the run file is open, you will find 2 tabs – **Run Information** and **Table View**

   a. Run Information – allows the user to view runs 1 sample at time w/ 2D plot and sample specific results. It also user to edit the sample/patient id in the event of transcription error.

   b. Table View – allows the user to view the results in a tabular format and raw data supporting the analysis.

4. Click on a link for a run from **In Review Runs** to open the data for analysis. You can perform one or more of the following functions to review results.
   - Click on the sample on the plate layout to view the plot by Sample.
   - Select a sample to review data and add notes to samples. Samples are two contiguous wells with the same information.
   - Review each sample for analysis errors listed in the **Errors** section.
   - You can also use the table view to review the data analysis summary.
   - Refer to the IFU for interpretation of results
   - The following is a sample screenshot of a well selected in the review screen.



5. Enter relevant comments in the **Release Notes** text field.

   NOTE: *You must be an authorized user to perform this function.*

6. To view reports, click one or more of the following options:
   - Preview Sample Reports
   - Preview Run Report

PDF reports are saved in the configured folder.

7. After completing your analysis, click **Review** button at the bottom right of the screen to release the final report. The analysis data is moved to the **Released Runs** list.

4.5 Reports

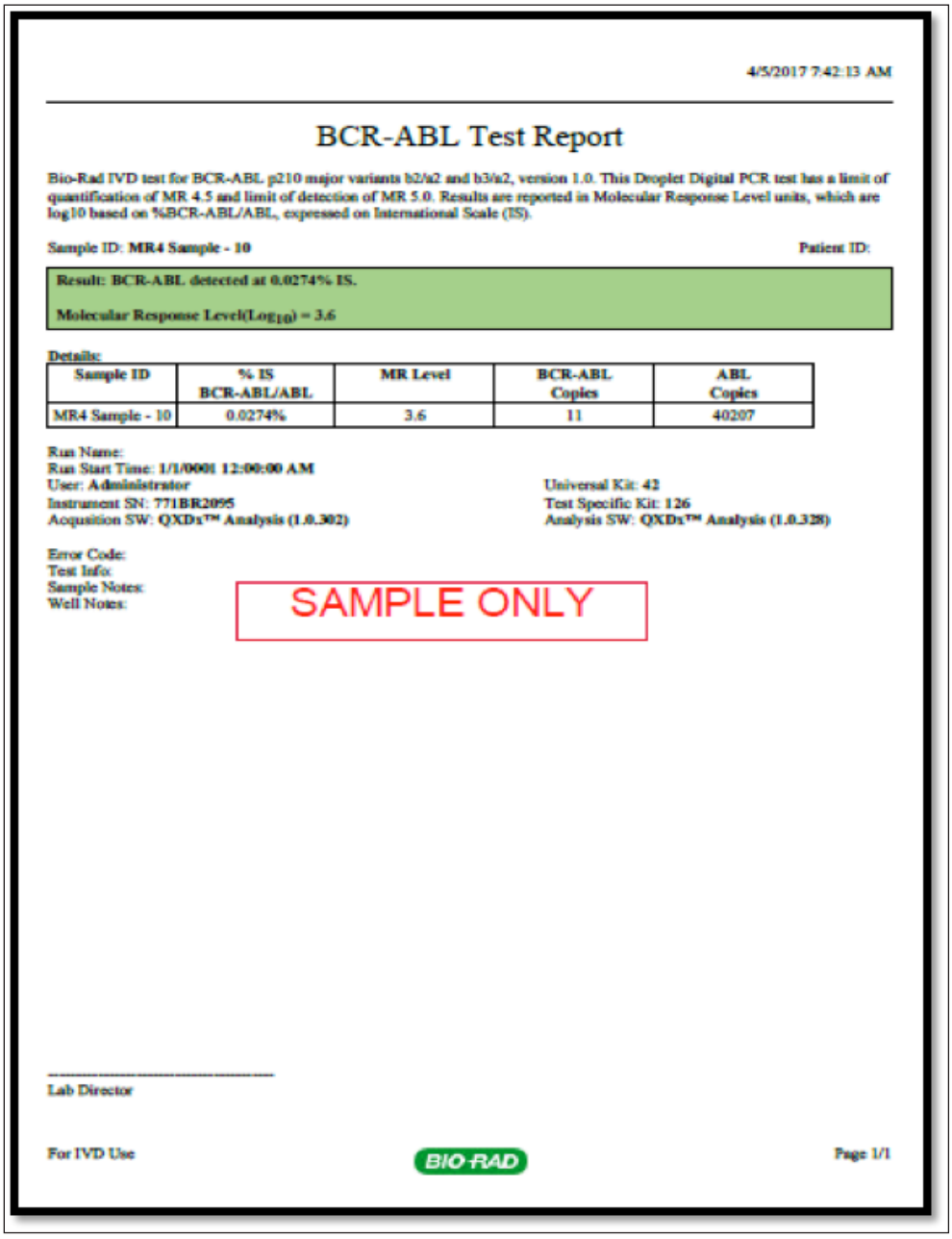
Reports are generated by both user groups (admin, and standard user). The following reports are available to the user under the reports section of QXDx Analysis software.

4.5.1 Procedure

1. In the QXDx Analysis software, click on **Reports**.
2. Select desired report **Sample**, **Patient**, **Control Trend**, **Event Log**.
3. **Select and Input required pararmeters to generate the reports.**

See below for example reports.

Example Sample Report - Passed



4/5/2017 7:42:13 AM

BCR-ABL Test Report

Bio-Rad IVD test for BCR-ABL p210 major variants b2/a2 and b3/a2, version 1.0. This Droplet Digital PCR test has a limit of quantification of MR 4.5 and limit of detection of MR 5.0. Results are reported in Molecular Response Level units, which are log10 based on %BCR-ABL/ABL, expressed on International Scale (IS).

Sample ID: **MR4 Sample - 10** Patient ID:

Result: BCR-ABL detected at 0.0274% IS.

Molecular Response Level(Log_{10}) = 3.6

Details:

Sample ID	% IS BCR-ABL/ABL	MR Level	BCR-ABL Copies	ABL Copies
MR4 Sample - 10	0.0274%	3.6	11	40207

Run Name:
Run Start Time: **1/1/0001 12:00:00 AM**
User: **Administrator**
Instrument SN: **771BR2095**
Acquisition SW: **QXDx™ Analysis (1.0.302)**

Universal Kit: **42**
Test Specific Kit: **126**
Analysis SW: **QXDx™ Analysis (1.0.328)**

Error Code:
Test Info:
Sample Notes:
Well Notes:

SAMPLE ONLY

_____
Lab Director

For IVD Use

BIO-RAD

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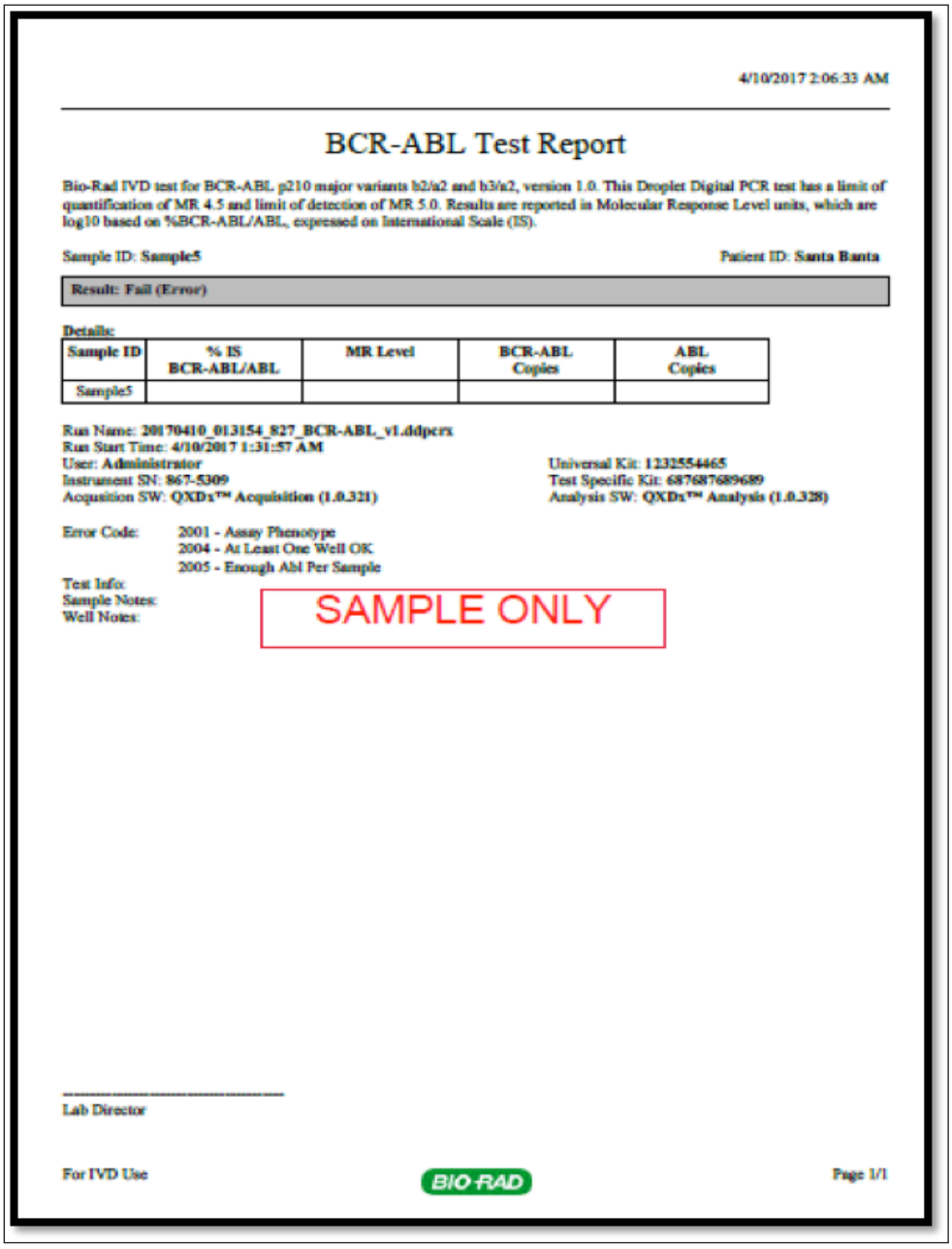
Example Sample Report – Failed



4/10/2017 2:06:33 AM

BCR-ABL Test Report

Bio-Rad IVD test for BCR-ABL p210 major variants b2/a2 and b3/a2, version 1.0. This Droplet Digital PCR test has a limit of quantification of MR 4.5 and limit of detection of MR 5.0. Results are reported in Molecular Response Level units, which are log10 based on %BCR-ABL/ABL, expressed on International Scale (IS).

Sample ID: **Sample5** Patient ID: **Santa Banta**

Result: Fail (Error)

Details:

Sample ID	% IS BCR-ABL/ABL	MR Level	BCR-ABL Copies	ABL Copies
Sample5				

Run Name: **20170410_013154_827_BCR-ABL_v1.ddpcrx**
Run Start Time: **4/10/2017 1:31:57 AM**
User: **Administrator**
Instrument SN: **867-5309**
Acquisition SW: **QXDx™ Acquisition (1.0.321)**

Universal Kit: **1232554465**
Test Specific Kit: **687687689689**
Analysis SW: **QXDx™ Analysis (1.0.328)**

Error Code: 2001 - Assay Phenotype
2004 - At Least One Well OK
2005 - Enough Abl Per Sample

Test Info:
Sample Notes:
Well Notes:

SAMPLE ONLY

Lab Director

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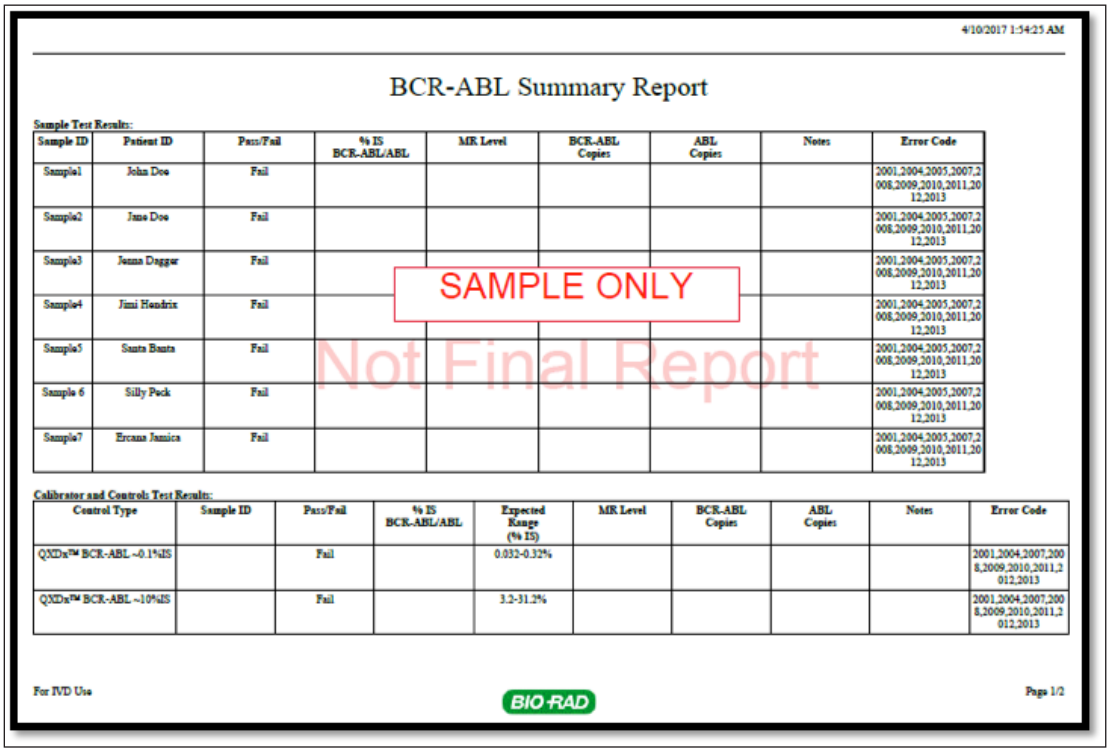
Sample Summary Report



4/10/2017 1:54:25 AM

BCR-ABL Summary Report

Sample Test Results:

Sample ID	Patient ID	Pass/Fail	% IS BCR-ABL/ABL	MR Level	BCR-ABL Copies	ABL Copies	Notes	Error Code
Sample1	John Doe	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample2	Jane Doe	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample3	Jenna Dagger	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample4	Jimi Hendrix	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample5	Santa Banta	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample 6	Silly Puck	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
Sample7	Ercana Jamica	Fail						2001,2004,2005,2007,2008,2009,2010,2011,2012,2013

SAMPLE ONLY

Not Final Report

Calibrator and Controls Test Results:

Control Type	Sample ID	Pass/Fail	% IS BCR-ABL/ABL	Expected Range (% IS)	MR Level	BCR-ABL Copies	ABL Copies	Notes	Error Code
QXDx™ BCR-ABL ~0.1%IS		Fail		0.032-0.32%					2001,2004,2007,2008,2009,2010,2011,2012,2013
QXDx™ BCR-ABL ~10%IS		Fail		3.2-31.2%					2001,2004,2007,2008,2009,2010,2011,2012,2013

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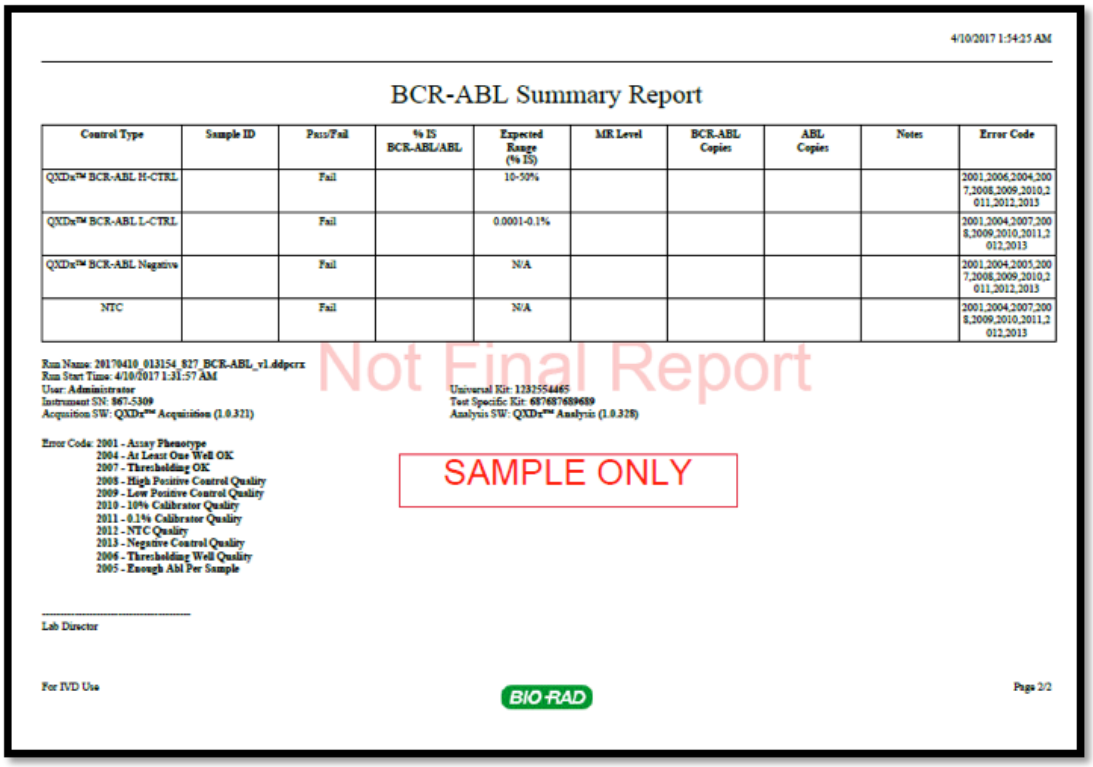

4/10/2017 1:54:25 AM

BCR-ABL Summary Report

Control Type	Sample ID	Pass/Fail	% IS BCR-ABL/ABL	Expected Range (% IS)	MR Level	BCR-ABL Copies	ABL Copies	Notes	Error Code
QXDx™ BCR-ABL H-CTRL		Fail		10-50%					2001,2006,2004,2007,2008,2009,2010,2011,2012,2013
QXDx™ BCR-ABL L-CTRL		Fail		0.0001-0.1%					2001,2004,2007,2008,2009,2010,2011,2012,2013
QXDx™ BCR-ABL Negative		Fail		N/A					2001,2004,2005,2007,2008,2009,2010,2011,2012,2013
NTC		Fail		N/A					2001,2004,2007,2008,2009,2010,2011,2012,2013

Not Final Report

Run Name: 20170410_013154_827_BCR-ABL_v1.4dpcrx
Run Start Time: 4/10/2017 1:31:57 AM
User: Administrator
Instrument SN: 867-5309
Acquisition SW: QXDx™ Acquisition (1.0.321)

Universal Kit: 1232554465
Test Specific Kit: 687687689689
Analysis SW: QXDx™ Analysis (1.0.328)

Error Code: 2001 - Assay Phenotype
2004 - At Least One Well OK
2007 - Thresholding OK
2008 - High Positive Control Quality
2009 - Low Positive Control Quality
2010 - 10% Calibrator Quality
2011 - 0.1% Calibrator Quality
2012 - NTC Quality
2013 - Negative Control Quality
2006 - Thresholding Well Quality
2005 - Enough Abl Per Sample

SAMPLE ONLY

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Sample Control Trend Report

Lab 1:
123 Expressway, Bio-Rad

6/1/2018 11:29:14 AM

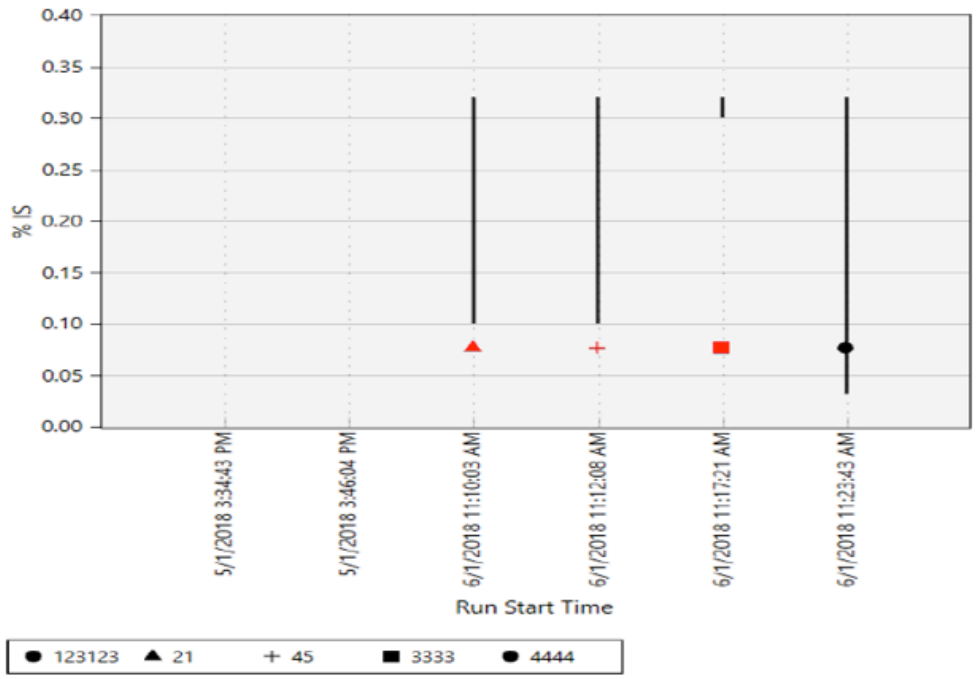
Control Trend Report

Selection Criteria:
Assay: **BCR-ABL_v1**
Date Range: **6/1/2015 to 6/1/2018**
Control Type: **~0.1%IS Cal**
Reagent Lot(s): **123123, 32, 3333, 45, 21, 4444, 5555**

Number Of Runs Found: **6**

Number Of Passed Runs: **1**
Number Of Runs Not Plotted Due To Insufficient Data: **2**

Trend Graph



5 Maintenance

Recommended maintenance tasks for QXDx system and components.

Both QXDx Automated Droplet Generator and QXDx Droplet Reader are verified by Bio-Rad to be functioning to manufacturer specifications upon installation. Annual preventative maintenance offered by Bio-Rad is recommended to whichever comes first, 365 runs on the system or 1 year from last PM to ensure that both instruments continue to function according to manufacturing specifications.

Maintenance Log is provided below for user to follow and track their daily, weekly, monthly and annual activities.

In the event of malfunction and/or changes in the analytical performance of the device, please contact Bio-Rad Technical Support (1-800-424-6723).

It is recommended to clean instrument surfaces regularly. Use deionized/ distilled water with a slightly dampened cloth to wipe down surfaces. For decontamination, use 10% bleach followed by 70% ethanol and/or deionized/ distilled water. Do not use acetone or tap water.

Inspect equipment regularly for damaged external components or wiring. Do not use if damaged.

Apply standard MSDS (Material Safety Data Sheet) and OSHA practices when handling and disposing of generated waste.

Bio-Rad droplet generation and reader fluids are based on fluorinated hydrocarbon chemistry and should be disposed of in accordance with institutional, state, and local regulations. These nonflammable fluids are inert and have low environmental impact and low toxicity. Collect waste in a polyethylene container and discard within one month.

Droplets made with Bio-Rad master mix have antimicrobial properties, but microbial growth is possible. The waste profile should contain the following: fluorinated hydrocarbons, water, fluorescent dye (from probes), intercalating dye, protein, and nucleic acids. The droplet generator is not intended to be used with bio hazardous material.

Do not replace detachable power cord with an uncertified or an inadequately rated cord.

Maintenance Log

QXDx™ AutoDG™ ddPCR™ System Maintenance Log

Registered Name: QX200™ AutoDG™ ddPCR™ Dx System

AutoDG S/N _____ Droplet Reader S/N: _____

Last Annual Maintainence Date: _____

Month: _____ Year: _____

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
As Necessary																															
Oil Replacement																															
Waste Removal																															
Daily																															
Clean Work Area (prior & post use)																															
Discard used consumables																															
Weekly																															
Reboot the AutoDG																															
Reboot the Droplet Reader																															
Restart the PC & QXDx Software																															
Monthly																															
Prime Instrument																															
Quarterly																															
AutoDG Oil Purge																															
Backup Database																															
Annual Maintenance																															

Refer to QXDx™ AutoDG™ ddPCR™ System Instrument Manual maintanence section for detailed Insturection instructions

5.1 Updating the Software and Firmware

5.1.1 About this task

Perform the software and firmware upgrade using the upgrade USB key, if Bio-Rad informs you of a newer version of the AutoDG software and firmware.

5.1.2 Procedure

1. Remove AutoDG Instrument's side panel to the right of the touch screen. Slide the magnetic panel down to release, then pull straight out to remove the panel.
2. Insert a USB key into the USB port on the side of the instrument.
3. Touch the Settings button on the home screen.
4. Scroll down to the Update section of the menu and touch Update Software and Firmware.
5. Touch the Update button and wait while the system completes the upgrade.
   When finished, a message will appear indicating it is safe to remove the USB key.
6. Replace the side panel and power cycle the instrument.

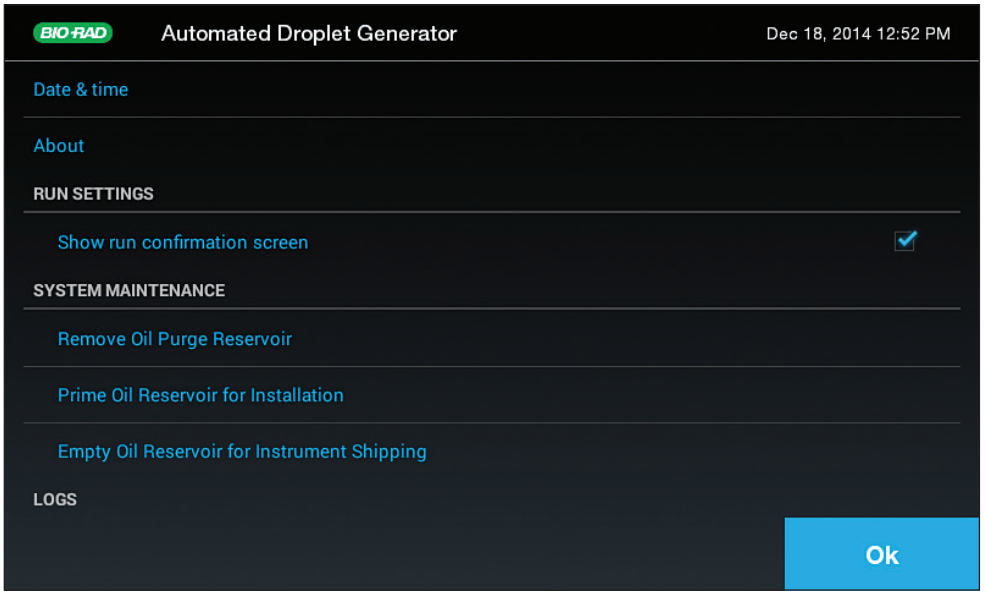
5.2 Cleaning the Oil Purge Reservoir

5.2.1 About this task

It is recommended that you clean the oil purge reservoir on a quarterly basis. The oil purge reservoir collects Droplet Generation Oil during the flush and prime routine; it is unused oil that has not come into contact with the ddPCR™ reaction. To access the oil purge reservoir:

5.2.2 Procedure

1. Touch the **Settings** button on the home screen.
2. Under the System Maintenance section of the menu, touch Remove Oil Purge Reservoir.



3. If the door is open it will close automatically and a message will appear. Touch **OK** to continue.
4. The droplet generation head of the AutoDG Instrument will slide out of the way, exposing the small oil purge reservoir. The screen will display a Moving droplet generation head message while this occurs.
5. Once complete, the onscreen instructions will prompt you to remove the oil purge reservoir, clean, and replace it. Open the door and remove the reservoir from the back left corner of the instrument deck. The reservoir is magnetic and can be lifted easily.
6. Wash the oil purge reservoir with distilled water, dry completely, and replace.
7. Touch the **OK** button to close the door and move the droplet generation head back into place. The Moving droplet generation head message will once again be displayed while this occurs.

5.2.3 Results

When finished, a complete message will appear, and you can touch OK to return to the Settings menu.

5.3 Replacing Droplet Reader Oil and Removing Waste

5.3.1 Before you begin

If the instrument has been unused for longer than a week, prime the system before running a plate.

5.3.2 Procedure

1. Replace the droplet reader oil and empty the waste receptacle as needed.
2. Use the handle built into the side compartment to slide the carriage out.
3. Use empty oil supply bottles as new waste bottles.
4. Add 50 ml 10% bleach to the waste bottle to prevent microbial growth
5. Place a label on the waste bottle at this time.
6. Place the new bottle of oil in the oil position and screw the cap into place.
7. In QXDx Software, click **Maintenance** > **Prime Instrument**.

5.4 Performing Maintenance Routines

Simple system maintenance routines to keep the system in check.

5.4.1 About this task

When the droplet reader is powered on and connected to QXDx Acquisition Software. The software provides some maintenance options. Use the following options for routine maintenance and calibration:

5.4.2 Procedure

- Click **Maintenance** > **Prime Instrument** to prime the syringes, fluid lines, etc. with droplet reader oil and remove air from the system, for example, perform this after replacing droplet reader oil.

- Click **Maintenance** > **Flush Instrument** — to clear the syringes and fluid lines if a clog is suspected
- The other options are used mainly by field service technicians when setting up or troubleshooting the system:
    a. Click **Maintenance** > **Color Calibration** to calibrate the system or new set of probes using a color calibration plate setup. The Droplet Reader calibration is performed using a droplet standard plate with known size droplets containing FAM and VIC standard dyes. These premade droplets are used in photomultiplier adjustments, color calibration, and verification of proper fluidics performance.

5.5 Quality Control

5.5.1 Well Aggregation

- Each plate contains Calibrators, Controls along with Samples and are measured in two replicate wells
- Each well must individually produce sufficient number of detected droplets in order to be used for further processing
- The measurement for replicate wells are compared for consistency, if the results fall outside of acceptable imprecision, no valid result is reported. See the exceptions below.

5.5.2 Calibrators

- Both calibrators (0.1%IS and 10%IS) must produce results within the specs.
- If a Calibrator fails, then the entire plate will fail, rendering the results invalid and no. In which case, the sample results are not reported.
- In the event of failed calibration, repeat the run starting with the RT reaction step.

5.5.3 Controls

- All control samples must produce data values within specs
    - □ H-CTRL and L-CTRL must be within specified range
    - □ Negative Control must produce a negative result

If any of the control samples fail – the entire plate will fail, rendering the results invalid and no.

- No sample results are reported.
- In the event a control fails, repeat the run starting with the RT reaction step

6 Troubleshooting

Understand and troubleshoot possible system and analysis errors.

The system may indicate possible instrument, and mechanical errors in the software interface through pop-up messages and analysis errors in the Errors section of the well and table review in the QXDx Analysis software.

The AutoDG also provides onscreen troubleshooting should an error occur. Steps to resolve such errors displays on the instrument screen, or message to contact Bio-Rad Technical Support displays in case of errors that do not have a clear workaround.

Consult each subsections below to understand the different types of errors and how to remedy them.

6.1 Restarting a Run on AutoDG after an Error

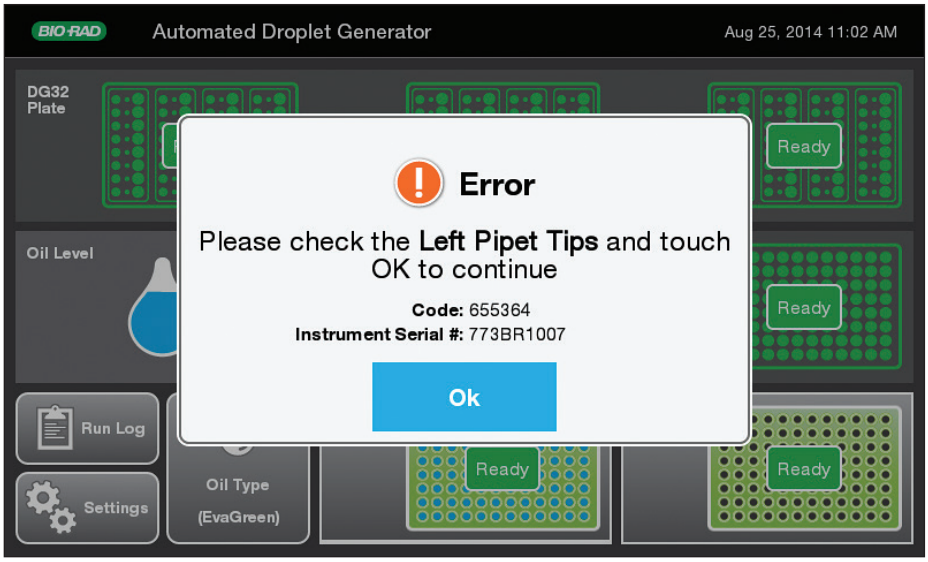
6.1.1 About this task

If the AutoDG encounters an obstruction during the run, it will stop the run and display an error message indicating the area of the deck that needs your immediate attention.

6.1.2 Procedure

1. Open the door and remove the obstruction and/or replace the consumable indicated in the onscreen error message.
2. Close the door and touch **OK** on the error display.
3. Touch the Configure Sample Plate icon on the home screen; the AutoDG Instrument remembers the status of all consumables so long as it remains connected to a power supply.
4. On the screen, select the columns of samples remaining to be processed and touch **OK**. Example of error message displayed when the lid is left on the box of tips placed in the left tip box holder. The run stops and an error message indicating the position of the error displays on the touch screen.

Figure 9: *AutoDG Example Error Message*



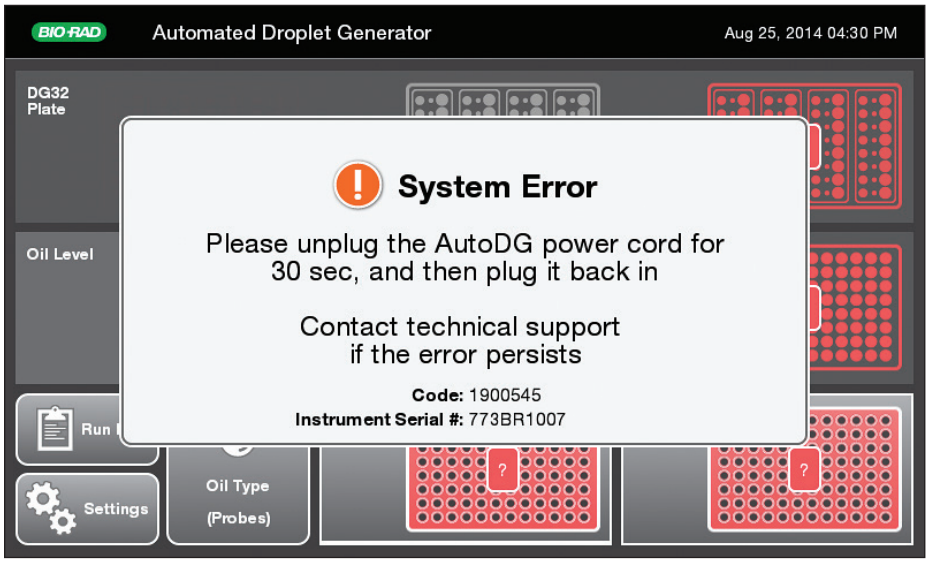
5. Touch the **Start Droplet Generation** icon to resume the run.

6.2 Restarting a Run on AutoDG After a System Error

6.2.1 About this task

If the AutoDG encounters a system error during the run, it will stop the run and display an error message indicating that the instrument requires power cycling. If this error occurs do the following.

Figure 10: *System Error Message Example*



6.2.2 Procedure

1. Unplug the AutoDG Instrument from the power supply.
2. Wait 30 sec and plug it back in.
3. The AutoDG Instrument will not be able to recall the status of all consumables and will require manual confirmation.
4. Reset the unused consumables and touch the **Configure Sample Plate** icon on the home screen.
5. Select the columns of samples remaining to be processed on the screen and touch **OK**.
6. Touch the **Start Droplet Generation** icon to restart the run.

6.3 Instrument and Mechanical Errors

Possible instrument and mechanical errors that can occur during a run.

6.3.1 QXDx Automated Droplet Generator System Errors

Consult the following table for information on instrument or mechanical errors and suggested actions to remedy them. These errors show in the code series 1xx-9xx.

Issue	Description/Possible cause	Suggested Action
No screen display No response when you power on the instrument	The instrument is disconnected from the power source.	Check the power cord. Make sure that it is securely plugged in and the system is switched on.
Screen display is missing characters, illegible, or not responsive to touch	There was an LCD screen failure.	Request service
Door won't open or is hard to open	The instrument is running. The instrument is disconnected from the power source.	Wait for droplet generation to complete or touch the Abort button on the screen to terminate the run early. Once movement has stopped inside the instrument, the door will unlock and can be opened easily. Connect the instrument to a power supply and wait for initialization to complete; the door will unlock and can be opened easily.
Light under a consumable	Consumable is not inserted all of the way or is in the incorrect orientation.	Try positioning the consumable in a different orientation.
Red Oil Level icon	AutoDG Oil bottle contains less than a full plate's worth of oil and will require additional oil to complete the next run.	Be prepared to insert a new bottle of oil during the setup process for the next plate.

6.3.2 QXDx Droplet Reader System Errors

Consult the following table for information on instrument or mechanical errors and suggested actions to remedy them. These errors show in the code series 1xx-9xx.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
101	CommReinitFailed	This error occurs after a low level SPTI command fails and reinitializing the SPTI interface fails as well.	Before performing a new run, you should • Disconnect and reconnect the USB cable. Power cycle the instrument.
102	CommSPTIFailure	Occurs when a low level instrument command fails. This indicates a possible communication failure between the software and instrument.	Before performing a new run, you should • Disconnect and reconnect the USB cable. • Power cycle the instrument.
103	CommInvalidDetResponse	The instrument detector board echoes the command it receives from the software. If the echoed command, sequence, parameter number, or value does not match the sent values, this error occurs.	Before performing a new run, you should • Disconnect and reconnect the USB cable. • Power cycle the instrument.
104	CommDetError	The instrument detector board reported that an error has occurred while running the command it received from the software.	Before performing a new run, you should • Disconnect and reconnect the USB cable. • Power cycle the instrument.
105	CommInvalidFluResponse	The response was received after the fluidics board command was issued with invalid value. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
106	CommInvalidMotRespons	The response was received after the motor board command was issued with invalid value. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
110	NotConnected	A connection to the instrument could not be established or was lost.	Before performing a new run, you should • Disconnect and reconnect the USB cable. • Power cycle the instrument.
111	InvalidState	A command was issued from an instrument state that did not support it. This could be due to a communication loss between the instrument and software.	Before performing a new run, you should • Disconnect and reconnect the USB cable. • Power cycle the instrument.
201	MotNotEnabled	Due to some mechanical errors the motors were disabled. The motor failed to reach the home position correctly, thus prohibiting it from being enabled.	Before performing a new run, you should • reseat the plate/plate lid. • check for incorrect or multiple plate heat seal foil layers. • check for strain on all motor axes. • power cycle the instrument.
202, 203, 204	MotAtLimit (X, Y, Z)	The X, Y, Z motor has been at one of its limit switches for 5 consecutive polls of the motor position	Before performing a new run, you should • Check X, Y, Z motor for obstructions. • Power cycle the instrument.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
205	XMotMoveTimeout	A mechanical error has occurred as the X-axis was unable to reach the target position within the alloted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
206	YMotMoveTimeout	A mechanical error has occurred as the Y-axis was unable to reach the target position within the alloted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
207	ZMotMoveTimeout	A mechanical error has occurred as the Z-axis was unable to reach the target position within the allotted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
210	XHomeTimeout	A mechanical error has occurred as the X-axis was unable to reach the home position within the allotted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
211	YHomeTimeout	A mechanical error has occurred as the Y-axis was unable to reach the home position within the allotted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
212	ZHomeTimeout	A mechanical error has occurred as the Z-axis was unable to reach the home position within the allotted time of 10 seconds. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
213	MotAtLimit	This indicates that one of the motors is at its limit.	Before performing a new run • Check for motor obstructions. • Power cycle the instrument.
214	MissingMotor	This indicates a motor component of the instrument is not function correctly or missing.	Before performing a run, Power cycle the instrument. Call Tech Support if the problem persists.
218	FailedToSetMotorState	A communication error has occurred as the motor failed to transition to the next state. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
219	MotorWhileDoorOpen	A motor command was executed when door was still left open or is moving but not fully closed.	Before performing a new run, power cycle the instrument. • Check the door position

Code (Decimal)	Name	Description/Possible cause	Suggested Action
301	PumpInvalidResponse	A mechanical error has occurred as the pump was not properly. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
302	PumpInvalidValue	A communication error has occurred as the pump received an invalid value that was sent as part of a command. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
303	PumpNotInitialized	A mechanical error has occurred as the pump has been unable to initialize. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
304	PumpStalled	A mechanical error has occurred as the pump has stalled. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
305	PumpValveStalled	A mechanical error has occurred as the pump showed that its valve has stalled. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
306	PumpError	A mechanical error has occurred as the pump showed an irrecoverable error. You may be able to use some data that was acquired during the run, before the failure occurred.	Before performing a new run, power cycle the instrument.
307	PumpTimeout	A mechanical error has occurred as the pump was unable to become ready within 8 seconds, which is the default allotted time for the pump to be ready. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
308	PumpResponseGarbled	Upon connecting to the instrument, the command to retrieve the pump revision received an incorrectly formatted response. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
312	PumpHomeTimeout	A mechanical error has occurred as the pump was unable to become ready within 8 seconds, which is the default allotted time for the pump to be ready. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
316	PumpInvalidVelocity	A mechanical error has occurred when trying to issue the move command to a pump that contained an invalid flow rate. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
317	PumpInvalidVolume	A mechanical error has occurred when trying to issue the move command to a pump that contained an invalid volume. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
330	UnhandledFluidStatus	An unknown fluid status has occurred causing a fluid error. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run - • Check all bottle levels. • Close the bottle door.
331	OilLevelCritical	The oil indicator is at a critical level causing a fluid error and must be cleared before the data from the well is acquired. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run - • Remove and replace the oil bottle • Close the bottle door.
332	WasteLevelCritical	The waste indicator is at a critical level causing a fluid error and must be cleared before the data from the well is acquired. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run • Remove and replace the waste bottle. • Close the bottle door.

Code (Decimal)	Name	Description/Possible cause	Suggested Action
403	DAQStopFailed	The data acquisition mode could not be completed successfully due to a possible communication loss. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
406	InvalidLEDPower	Setting the LED power to an invalid value caused an electrical error. Some data that was acquired during the run, before the failure occurred, may be usable.	Before performing a new run, power cycle the instrument.
502	SettingsChecksumError	The checksum of the persistent storage was incorrect. This could be due a communication loss or an invalid checksum value.	
900	CommandNotImplemented	The instrument does not support the command. This could be due a communication loss or an invalid command.	

6.4 User Actions During Run

List of user actions and system actions during a system run.

Table 9: *QXDx Droplet Reader actions*

User Action	Is this action possible during a run?	System Action
Open the plate lid	NO. The lid cannot be opened	N/A
Open the bottle door	YES	Waits till the second well acquisition begins, then opens the door. Processes the second well. Pauses the run and warns user with the message Door is open. Fix the problem or abort the run. User can retry after closing the door or can abort the run.
Open the bottle door and replace the oil bottle with an empty bottle	YES	Pauses the run and warns user with the message Door is open. Fix the problem or abort the run. User can retry after replenishing the oil bottle and closing the door or can abort the run.
Disconnect the USB cable	YES	Waits for 10 mins to reconnect to the instrument. If the cable is reconnected before timeout then the run resumes automatically. If the cable remains disconnected after the retry time limit, then the system pauses the run and warns user with the message 102 CommSPTIFailure error. The user can retry after reconnecting the USB cable and click Continue to restart the run.
Disconnect the power to the instrument	YES	
Bump the plate door	YES	

6.5 Analysis Errors

The possible analysis error that can occur during a run and suggested user actions to fix these analysis errors. The analysis errors show 2xxx code series.

Code	Message Text	Description/Possible Cause	Suggested Action
2000	Droplet Quality	• Poor mixing - you may not have pipetted thoroughly during sample preparation. • Poor sample quality.	Rerun the sample after thoroughly mixing. If the error persists, call technical support.
2001	Assay Phenotype	• Poor mixing - you may not have pipetted thoroughly during sample preparation. • Poor sample quality.	Rerun the sample after thoroughly mixing. If the error persists, call technical support.
2002	Not Enough Reference	The range did not fall within the set threshold due to the sample concentration being too high or due to poor mixing.	Dilute and rerun the sample after thoroughly mixing. If the error persists, call technical support.
2003	Replicate Similarity	The replicates did not meet the set concentration and limits for variability due to one or more of the following: • Equal volume were not pipetted into replicate wells. • Poor mixing - you may not have pipetted thoroughly during sample preparation. • Microfluidics issue occurred on the AutoDG	Rerun the sample after thoroughly mixing. If the error persists, call technical support.

Code	Message Text	Description/Possible Cause	Suggested Action
2004	Sample Validity (At least one well ok)	Both sample wells did not meet the validation parameters due to one or more of the following: • Poor mixing - you may not have pipetted thoroughly during sample preparation. • An instrument error occurred.	Rerun the sample after thoroughly mixing. If the error persists, call technical support.
2005	ABL Count per sample	Sample did not meet the minimum ABL copies count due to one or more of the following: • Poor sample quality. • Possibly degraded reagents.	• Rerun the sample after thoroughly mixing. • Request for a new patient sample and rerun tests with the new sample. • Check the expiration date and storage conditions of the kit lots used for the sample run. • If the error persists, call technical support.
2006	Thresholding Well Quality	Sample well did not meet the quantitative threshold in ddPCR due to one or more of the following: • Poor sample quality. • Possibly degraded reagents. • Poor mixing - you may not have pipetted thoroughly during sample preparation. • An instrument error occurred.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • Check the expiration date and storage conditions of the kit lots used for the sample run. • If the error persists, call technical support.

Code	Message Text	Description/Possible Cause	Suggested Action
2007	Plate Thresholding	Sample well did not meet the thresholding quality due to one or more of the following: • Poor sample quality. • Poor mixing - you may not have pipetted thoroughly during sample preparation.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • If the error persists, call technical support.
2008	High Positive Control Quality	The High Positive Control did not meet concentration limits due to one or more of the following: • Incorrect sample placement. • Possibly degraded high positive control. • Poor mixing - you may not have pipetted thoroughly during sample preparation.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • Check the expiration date and storage conditions of the control sample. • If the error persists, call technical support.
2009	Low Positive Control Quality	The Low Positive Control did not meet concentration limits due to one or more of the following: • Incorrect sample placement. • Possibly degraded low positive control. • Poor mixing - you may not have pipetted thoroughly during sample preparation.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • Check the expiration date and storage conditions of the control sample. • If the error persists, call technical support.

Code	Message Text	Description/Possible Cause	Suggested Action
2010	~10%IS Calibrator Quality	The ~10% IS Calibrator did not meet required ratio within range due to one or more of the following: • Incorrect sample placement. • Possibly degraded calibrator. • Poor mixing - you may not have pipetted thoroughly during sample preparation.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • Check the expiration date and storage conditions of the calibrator. • If the error persists, call technical support.
2011	~0.1% IS Calibrator Quality	The ~0.1% IS Calibrator did not meet required ratio within range due to one or more of the following: • Incorrect sample placement. • Possibly degraded calibrator. • Poor mixing - you may not have pipetted thoroughly during sample preparation.	• Rerun the sample after thoroughly mixing. • Check for the sample quality. • Check the expiration date and storage conditions of the calibrator. • If the error persists, call technical support.
2012	NTC Quality	The sample copy count is greater than maximum copies (1) allowed due to possible contamination.	If the plate failed, decontaminate working area, instruments, and pipettes with bleach and ethanol. Then rerun the plate. If the error persists, call technical support
2013	Negative Control Quality	The sample copy count is greater than maximum copies (1) allowed due to possible contamination.	If the plate failed, decontaminate working area, instruments, and pipettes with bleach and ethanol. Then rerun the plate. If the error persists, call technical support

7 Specifications

7.1 QXDx AutoDG Specifications

Consult the table below for the optimal system specifications of AutoDG.

Figure 11: *Instrument Dimensions*

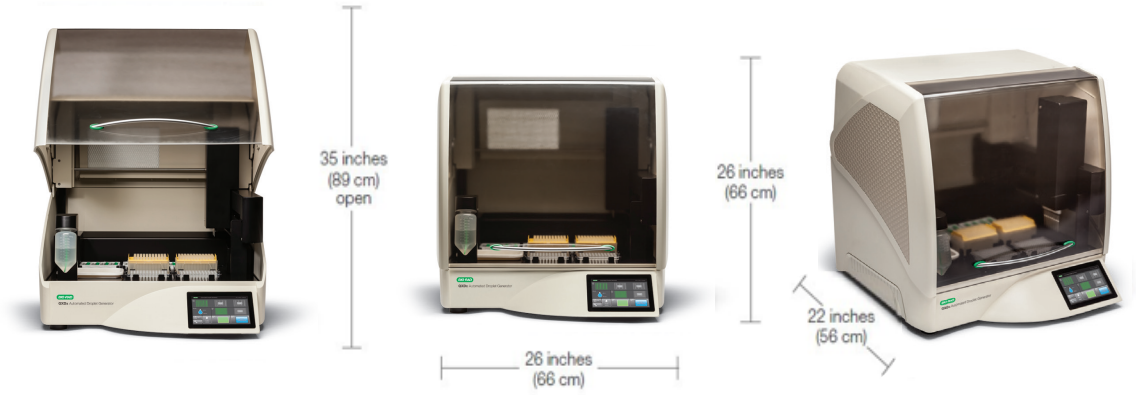


Table 10: *System Specifications*

Weight	100 lb (45.4 kg)
Size (W x D x H)	26 x 22 x 26” (66 x 56 x 66 cm)
Electrical requirements	100–240 V, 50/60 Hz, 90 W; voltage fluctuations not to exceed +10% of ratings (for external power supply provided)
Fuse	4 A, 24 V internal (not user serviceable)
Temperature	18–30ºC
Altitude	0–6,560 ft (0–2,000 m)
Humidity	50% max (noncondensing)
Pollution degree	2 (indoor use)
Installation category	II (external power supply plugs into standard AC receptacle)
Ventilation requirements	5” (13 cm) left and right of machine and 2” (5 cm) behind should be unobstructed for proper ventilation

7.2 QXDx Droplet Reader Specifications

Consult the table below for the optimal system specifications for QXDx Droplet Reader.

Figure 12: *Instrument Dimensions*

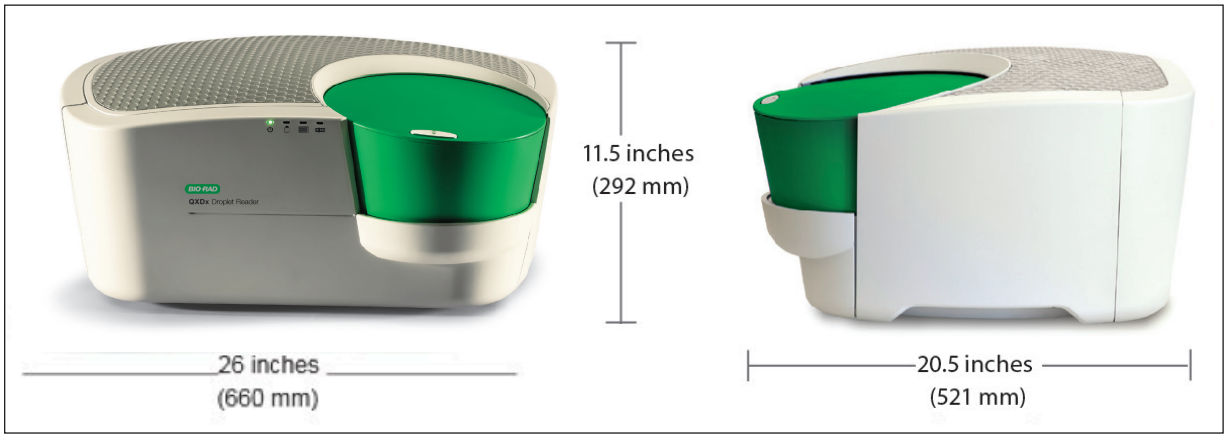


Table 11: *System Specifications*

Weight	56.6lb. (26 kg)
Size (W x D x H)	26 x 20.5 x 11.5” (660 x 521 x 292 cm)
Electrical requirements	100–240 V, 50/60 Hz, 1 A; voltage fluctuations not to exceed +10% of ratings (for external power supply provided); fuse: T5AV, 250 V
Temperature	18–30ºC
Altitude	0–6,560 ft (0–2,000 m)
Humidity	85% max(noncondensing)
Pollution degree	2(indoor use)
Installation category	II(external power supply plugs into standard AC receptacle)
Ventilation requirements	5” (12 cm) left and right of machine and 10” (25 cm) behind should be unobstructed for proper ventilation

Table 12: *Performance Specifications*

Starting sample size	25 µl
QXDx Automated Droplet Generator, IVD capacity	1–8 samples/cartridge 20,000 Droplets per 20µl sample
QXDx Droplet Reader, IVD capacity	1–96 samples
Sample illumination	Light-emitting diodes
Sample detection	Multi-pixel photon counter
Detection channels	FAM (EvaGreen), HEX (VIC)
Linear dynamic range	5 orders of magnitude
Precision	±10%
Droplets per 96-well plate, million	~1.5

8 Advanced Administration

The **Manage Users** and **Configure System** modules are only available to the system administrator. These modules enable the system administrator to manage users and configure system settings.

8.1 Changing the Password

Change an existing password for the current user.

8.1.1 Procedure

1. Open and login to the QXDx software using the administrator credentials.
2. Click User > Change Password
3. Enter the Old Password.
4. Enter the **New Password** and reenter to confirm.
5. Click **OK** to save the new password or click Cancel to quit without saving.

8.2 Adding, Editing and Deleting Users

As an administrator, you can manage users of the system.

8.2.1 Procedure

1. Open and login to the QXDx software using the administrator credentials.
2. Click User > Manage Users
3. Do one of more of the following:
   - Click on a new row to add a new user. Enter **User Name**, **Full Name**, **Password**, and **Role**.
   - For an existing user, click a cell to edit and replace with new value.
   - To delete a user, in that user row, click the Remove checkbox to select it.
4. Click **OK** to exit the screen and save changes made.
5. Enter User Name, Full Name, Password, and Role.

8.3 Managing Assays

As an administrator, you can manage assays on the system. Managing assays allows user to upload new '.APF' – assay protocol file.

8.3.1 Procedure

1. Open and login to the QXDx software using the administrator credentials.
2. Click Configure System > Manage Assays.
3. Click Add Assay to import a new APF into the software
   a. Find the APF file in your file system on the computer.
   b. Click open to import the file
4. Click Remove Assay by clicking on the list of Assays in the software

8.4 Configuring Database Connection

8.4.1 Procedure

1. Open and login to the QXDx software using the administrator credentials.
2. Click Configure System > Database Configuration
3. Enter the hostname or IP address in the Acquisition Machine Name field.
4. Enter the Port Number.
5. Click Test Connection to check if the configuration works correctly.
6. Click Save to save changes and close the window. Otherwise click Restore to cancel changes.

8.5 Backing Up and Restoring Data

As a system administrator, you may back-up and restore from back-up.

8.5.1 About this task

Always make sure to backup before restoring from another backup. Restoring will replace the current database with the restored backup.

8.5.2 Procedure

1. Open and login to the QXDx software using the administrator credentials.
2. Click Configure System > Backup Now
3. Browse to the location you wish to save the backup and click **OK**. The backup file is saved to the selected location.
4. To restore from a saved backup, Click **Configure System** > **Restore Backup**.
5. Click **Yes** on the dialog that opens to confirm that you wish to replace the current database with the restored copy.

8.6 Lab Configuration

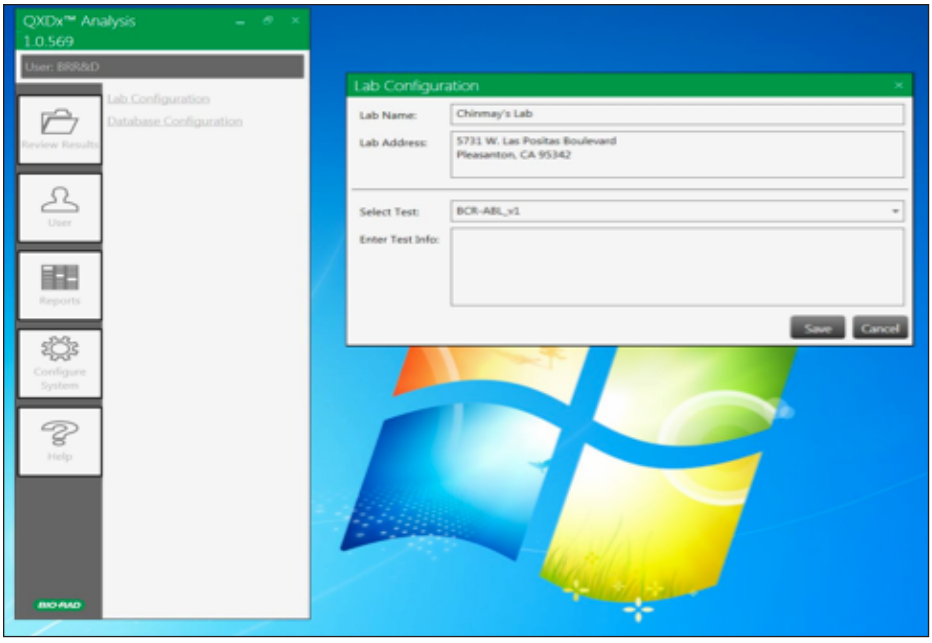
As a system administrator, you may setup and customize your laboratory information, which will appear readily in reports.

8.6.1 About this task

Upon installation of instrument and software, remember to setup your laboratory details. They are editable by an administrator following initial setup.

8.6.2 Procedure

1. Open and login to the QXDx Analysis software using the administrator credentials.
2. Click Configure System > Lab Configuration
3. Input following details: Lab Name, Lab Address
4. Select Test/Assay (i.e. BCR-ABL), Enter generic testing comments made visible in the report.



8.7 Event Log

As a system administrator, you may generate an event log report for your audit.

8.7.1 About this task

Event Log report maybe valuable information while troubleshooting or audit of changes actions/ comments added to any run by any user.

8.7.2 Procedure

1. Open and login to the QXDx Analysis software using the administrator credentials.
2. Click Reports > Event Log
3. Selects and Time for audit of activities/actions performed.

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