Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

M160068

January 12, 2016

Uwe Scherf, Ph.D.
Director, Division of Microbiology Devices
Office of In Vitro Diagnostics and Radiological Health
Center for Device and Radiological Health
Food and Drug Administration

FDA/CDRH/DCC
JAN 13 2016
RECEIVED

Document Mail Center – WO66-0609
10903 New Hampshire Avenue
Silver Spring, MD 20993-0002

Re: FilmArray Respiratory Panel (RP) for use with FilmArray Torch

Dear Dr. Scherf,

BioFire Diagnostics, LLC is submitting the enclosed special 510(k), demonstrating substantial equivalence of the FilmArray RP used with the FilmArray Torch (modified FilmArray 2.0) to the previously cleared FilmArray RP for use with the Multi-instrument FilmArray system (FilmArray 2.0) (K143080).

The FilmArray Torch is an automated *in vitro* diagnostic (IVD) device designed to work with specific highly-multiplexed reagent pouches to detect multiple nucleic acid targets contained in clinical specimens. It is a modification to the FilmArray 2.0, placing multiple instrument modules into a tower configuration on a System Base with a streamlined user interface. Each FilmArray Torch Module interacts with a reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nested multiplex PCR in a closed system. The resulting PCR products are evaluated using DNA melting analysis. The FilmArray Software automatically interprets the results and provides an easy-to-understand test report.

The FilmArray Torch (configurable from two to 12 modules) progresses the current FilmArray 2.0 system to address customer need for even higher throughput, by allowing a larger number of samples to be tested per linear foot of bench space.

The intended use and the test principle of FilmArray RP are unchanged by performing the test with FilmArray Torch. Data included in this submission demonstrates that the performance of FilmArray RP is also unchanged by the use of FilmArray Torch.

An eCopy is included for this submission. **The eCopy is an exact duplicate of the paper copy.**

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Kristen Kanack

Kristen J. Kanack, Ph.D.
Vice President, Regulated Products and Clinical Affairs
BioFire Diagnostics, LLC
Phone: 801-736-6354 ext 330
Fax: 801-588-0507
E-mail: kristen.kanack@biofiredx.com

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

January 12, 2016

Uwe Scherf, Ph.D.
Director, Division of Microbiology Devices
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Sincerely,

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Vice President, Regulated Products and Clinical Affairs
BioFire Diagnostics, LLC
Phone: 801-736-6354 ext 330
Fax: 801-588-0507
E-mail: kristen.kanack@biofiredx.com

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Form Approved: OMB No. 0910-0511 Expiration Date: April 30, 2016. See Instructions for OMB Statement.

DEPARTMENT OF HEALTH AND HUMAN SERVICES FOOD AND DRUG ADMINISTRATION **MEDICAL DEVICE USER FEE COVER SHEET**	PAYMENT IDENTIFICATION NUMBER: (b)(4) [redacted] Write the Payment Identification number on your check.

A completed cover sheet must accompany each original application or supplement subject to fees. If payment is sent by U.S. mail or courier, please include a copy of this completed form with payment. Payment and mailing instructions can be found at: http://www.fda.gov/oc/mdufma/coversheet.html

1. COMPANY NAME AND ADDRESS (include name, street address, city state, country, and post office code)	2. CONTACT NAME
IDAHO TECHNOLOGY, INC. 390 Wakara Way Salt Lake City Salt Lake UT 84108 US	Gina Bergman 2.1 E-MAIL ADDRESS gina.bergman@biofiredx.com 2.2 TELEPHONE NUMBER (include Area code) 801-7366354 486 2.3 FACSIMILE (FAX) NUMBER (Include Area code) 801-5880507
1.1 EMPLOYER IDENTIFICATION NUMBER (EIN) (b)(4) [redacted]	

3. TYPE OF PREMARKET APPLICATION (Select one of the following in each column; if you are unsure, please refer to the application descriptions at the following web site: http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm345263.htm

Select an application type:	3.1 Select a center
[X] Premarket notification(510(k)); except for third party	[X] CDRH
[ ] 513(g) Request for Information	[ ] CBER
[ ] Biologics License Application (BLA)	3.2 Select one of the types below
[ ] Premarket Approval Application (PMA)	[X] Original Application
[ ] Modular PMA	Supplement Types:
[ ] Product Development Protocol (PDP)	[ ] Efficacy (BLA)
[ ] Premarket Report (PMR)	[ ] Panel Track (PMA, PMR, PDP)
[ ] 30-Day Notice	[ ] Real-Time (PMA, PMR, PDP)
	[ ] 180-day (PMA, PMR, PDP)

4. ARE YOU A SMALL BUSINESS? (See the instructions for more information on determining this status)

[ ] YES, I meet the small business criteria and have submitted the required qualifying documents to FDA	[X] NO, I am not a small business

4.1 If Yes, please enter your Small Business Decision Number:

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

5. FDA WILL NOT ACCEPT YOUR SUBMISSION IF YOUR COMPANY HAS NOT PAID AN ESTABLISHMENT REGISTRATION FEE THAT IS DUE TO FDA. HAS YOUR COMPANY PAID ALL ESTABLISHMENT REGISTRATION FEES THAT ARE DUE TO FDA?

[X] YES (All of our establishments have registered and paid the fee, or this is our first device, and we will register and pay the fee within 30 days of FDA's approval/clearance of this device.)

[ ] NO (If "NO," FDA will not accept your submission until you have paid all fees due to FDA. This submission will not be processed; see http://www.fda.gov/cdrh/mdufma for additional information)

6. IS THIS PREMARKET APPLICATION COVERED BY ANY OF THE FOLLOWING USER FEE EXCEPTIONS? IF SO, CHECK THE APPLICABLE EXCEPTION.

[ ] This application is the first PMA submitted by a qualified small business, including any affiliates

[ ] The sole purpose of the application is to support conditions of use for a pediatric population

[ ] This biologics application is submitted under section 351 of the Public Health Service Act for a product licensed for further manufacturing use only

[ ] The application is submitted by a state or federal government entity for a device that is not to be distributed commercially

7. IS THIS A SUPPLEMENT TO A PREMARKET APPLICATION FOR WHICH FEES WERE WAIVED DUE TO SOLE USE IN A PEDIATRIC POPULATION THAT NOW PROPOSES CONDITION OF USE FOR ANY ADULT POPULATION? (If so, the application is subject to the fee that applies for an original premarket approval application (PMA).

[ ] YES [X] NO

PAPERWORK REDUCTION ACT STATEMENT

Public reporting burden for this collection of information is estimated to average 18 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the address below.

Department of Health and Human Services, Food and Drug Administration, Office of Chief Information Officer, 8455 Colesville Road, COLE-14-14253 Silver Spring, MD 20993-0002 [Please do NOT return this form to the above address, except as it pertains to comments on the burden estimate.]

8. USER FEE PAYMENT AMOUNT SUBMITTED FOR THIS PREMARKET APPLICATION

(b)(4) [redacted] 30-Nov-2015

Form FDA 3601 (05/13)

"Close Window" Print Cover sheet

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016
Form Approved: OMB No. 0910-0616. Expiration Date: 2/28/2018. See PRA Statement on page 2.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Certification of Compliance

Under 42 U.S.C. § 282(j)(5)(B), with Requirements of ClinicalTrials.gov Data Bank (42 U.S.C. § 282(j))

(For submission with an application/submission, including amendments, supplements, and resubmissions, under §§ 505, 515, 520(m), or 510(k) of the Federal Food, Drug, and Cosmetic Act or § 351 of the Public Health Service Act.)

SPONSOR / APPLICANT / SUBMITTER INFORMATION

1. Name of Sponsor/Applicant/Submitter
BioFire Diagnostics, LLC

2. Date of the Application/Submission Which This Certification Accompanies
01/12/2016

3. Address

Address 1 *(Street address, P.O. box, company name c/o)*
390 Wakara Way

Address 2 *(Apartment, suite, unit, building, floor, etc.)*

City: Salt Lake City
State/Province/Region: UT
Country: USA
ZIP or Postal Code: 84108

4. Telephone and Fax Numbers *(Include country code if applicable and area code)*
(Tel): 801-736-6354
(Fax): 801-588-0507

PRODUCT INFORMATION

5. **For Drugs/Biologics:** Include Any/All Available Established, Proprietary and/or Chemical/Biochemical/Blood/Cellular/Gene Therapy Product Name(s).
For Devices: Include Any/All Common or Usual Name(s), Classification, Trade or Proprietary or Model Name(s) and/or Model Number(s)

FilmArray Respiratory Panel (RP) for use with FilmArray Torch

Continuation Page for #5

APPLICATION / SUBMISSION INFORMATION

6. Type of Application/Submission Which This Certification Accompanies

☐ IND ☐ NDA ☐ ANDA ☐ BLA ☐ PMA ☐ HDE ☒ 510(k) ☐ PDP ☐ Other

7. Include IND/NDA/ANDA/BLA/PMA/HDE/510(k)/PDP/ Other Number *(If number previously assigned)*

If BLA was selected in item 6, provide Supplement Number

8. Serial Number Assigned to Application/Submission Which This Certification Accompanies

CERTIFICATION STATEMENT / INFORMATION

9. Check only one of the following boxes *(See instructions for additional information and explanation)*

☒ A. I certify that the requirements of 42 U.S.C. § 282(j), Section 402(j) of the Public Health Service Act do not apply because the application/submission which this certification accompanies does not reference any clinical trial.

☐ B. I certify that the requirements of 42 U.S.C. § 282(j), Section 402(j) of the Public Health Service Act do not apply to any clinical trial referenced in the application/submission which this certification accompanies.

☐ C. I certify that the requirements of 42 U.S.C. § 282(j), Section 402(j) of the Public Health Service Act apply to one or more of the clinical trials referenced in the application/submission which this certification accompanies and that those requirements have been met.

Certification Statement / Information section continued on page 2

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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CERTIFICATION STATEMENT / INFORMATION *(Continued)*

10. If you checked box C, in number 9, provide the National Clinical Trial (NCT) Number(s) for any "applicable clinical trial(s)," under 42 U.S.C. § 282(J)(1)(a)(i), section 402(j)(1)(a)(i) of the Public Health Service Act, referenced in the application/ submission which this Certification accompanies. *(Add continuation page as necessary.)*

NCT Number(s): _____ _____ _____ _____ _____

Continuation Page for #10

The undersigned declares, to the best of her/his knowledge, that this is an accurate, true, and complete submission of information. I understand that the failure to submit the certification required by 42 U.S.C. § 282(j)(5)(B), section 402(j)(5)(B) of the Public Health Service Act, and the knowing submission of a false certification under such section are prohibited acts under 21 U.S.C. § 331, section 301 of the Federal Food, Drug, and Cosmetic Act.

Warning: A willfully and knowingly false statement is a criminal offense, U.S. Code, title 18, section 1001.

11. Name and Title of the Person who Signs Number 15

Name	Title
Kristen Kanack	Vice President, Regulated Products and Clinical Affairs

12. Address

Address 1 *(Street address, P.O. box, company name c/o)* 390 Wakara Way	
Address 2 *(Apartment, suite, unit, building, floor, etc.)*	
City: Salt Lake City	State/Province/Region: UT
Country: USA	ZIP or Postal Code: 84108

13. Telephone and Fax Numbers *(Include country code if applicable and area code)*

(Tel): 801-736-6354 x330

(Fax): 801-588-0507

14. Date of Certification

1·12·2014

15. Signature of Sponsor/Applicant/Submitter or an Authorized Representative *(Sign)*

Sign

Kristen Kanack

This section applies only to requirements of the Paperwork Reduction Act of 1995.

*****DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.*****

The burden time for this collection of information is estimated to average 15 minutes and 45 minutes (depending on the type of application/ submission) per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

DEPARTMENT OF HEALTH AND HUMAN SERVICES
FOOD AND DRUG ADMINISTRATION

CDRH PREMARKET REVIEW SUBMISSION COVER SHEET

Form Approval
OMB No. 0910-0120
Expiration Date: December 31, 2013
See PRA Statement on page 5.

Date of Submission	User Fee Payment ID Number	FDA Submission Document Number *(if known)*
01/12/2016	(b)(4) [redacted]	

SECTION A — TYPE OF SUBMISSION

PMA	PMA & HDE Supplement	PDP	510(k)	Request for Feedback
☐ Original Submission	☐ Regular (180 day)	☐ Original PDP	☒ Original Submission:	☐ Pre-Submission
☐ Premarket Report	☐ Special	☐ Notice of Completion	☐ Traditional	☐ Informational Meeting
☐ Modular Submission	☐ Panel Track (PMA Only)	☐ Amendment to PDP	☒ Special	☐ Submision Issue Meeting
☐ Amendment	☐ 30-day Supplement		☐ Abbreviated (Complete section I, Page 5)	☐ Day 100 Meeting
☐ Report	☐ 30-day Notice		☐ Additional Information	☐ Agreement Meeting
☐ Report Amendment	☐ 135-day Supplement		☐ Third Party	☐ Determination Meeting
☐ Licensing Agreement	☐ Real-time Review			☐ Study Risk Determination
	☐ Amendment to PMA & HDE Supplement			☐ Other *(specify)*:
	☐ Other			

IDE	Humanitarian Device Exemption (HDE)	Class II Exemption Petition	Evaluation of Automatic Class III Designation (De Novo)	Other Submission
☐ Original Submission	☐ Original Submission	☐ Original Submission	☐ Original Submission	☐ 513(g)
☐ Amendment	☐ Amendment	☐ Additional Information	☐ Additional Information	☐ Other *(describe submission)*:
☐ Supplement	☐ Supplement			
	☐ Report			
	☐ Report Amendment			

Have you used or cited Standards in your submission? ☒ Yes ☐ No *(If Yes, please complete Section I, Page 5)*

SECTION B — SUBMITTER, APPLICANT OR SPONSOR

Company / Institution Name: BioFire Diagnostics, LLC	Establishment Registration Number *(if known)*: 3002773840
Division Name *(if applicable)*: Regulated Products	Phone Number *(including area code)*: 801-736-6354 ext 330
Street Address: 390 Wakara Way	FAX Number *(including area code)*: 801-588-0507
City: Salt Lake City	State / Province: UT; ZIP/Postal Code: 84108; Country: USA
Contact Name: Kristen J. Kanack, Ph.D.	
Contact Title: Vice President, Regulated Products & Clinical Affairs	Contact E-mail Address: kristen.kanack@biofiredx.com

SECTION C — APPLICATION CORRESPONDENT (e.g., consultant, if different from above)

Company / Institution Name	
Division Name *(if applicable)*	Phone Number *(including area code)*
Street Address	FAX Number *(including area code)*
City	State / Province; ZIP Code; Country
Contact Name	
Contact Title	Contact E-mail Address

PSC Publishing Services (301) 443-6740 EF

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

SECTION D1 — REASON FOR APPLICATION - PMA, PDP, OR HDE

- ☐ New Device
- ☐ Withdrawal
- ☐ Additional or Expanded Indications
- ☐ Request for Extension
- ☐ Post-approval Study Protocol
- ☐ Request for Applicant Hold
- ☐ Request for Removal of Applicant Hold
- ☐ Request to Remove or Add Manufacturing Site

- ☐ Change in design, component, or specification:
  - ☐ Software / Hardware
  - ☐ Color Additive
  - ☐ Material
  - ☐ Specifications
  - ☐ Other *(specify below)*

- ☐ Location change:
  - ☐ Manufacturer
  - ☐ Sterilizer
  - ☐ Packager

- ☐ Report Submission:
  - ☐ Annual or Periodic
  - ☐ Post-approval Study
  - ☐ Adverse Reaction
  - ☐ Device Defect
  - ☐ Amendment

- ☐ Process change:
  - ☐ Manufacturing ☐ Packaging
  - ☐ Sterilization
  - ☐ Other *(specify below)*

- ☐ Labeling change:
  - ☐ Indications
  - ☐ Instructions
  - ☐ Performance Characteristics
  - ☐ Shelf Life
  - ☐ Trade Name
  - ☐ Other *(specify below)*

- ☐ Change in Ownership
- ☐ Change in Correspondent
- ☐ Change of Applicant Address

- ☐ Response to FDA correspondence:

- ☐ Other Reason *(specify)*:

SECTION D2 — REASON FOR APPLICATION - IDE

- ☐ New Device
- ☐ New Indication
- ☐ Addition of Institution
- ☐ Expansion / Extension of Study
- ☐ IRB Certification
- ☐ Termination of Study
- ☐ Withdrawal of Application
- ☐ Unanticipated Adverse Effect
- ☐ Notification of Emergency Use
- ☐ Compassionate Use Request
- ☐ Treatment IDE
- ☐ Continued Access

- ☐ Change in:
  - ☐ Correspondent / Applicant
  - ☐ Design / Device
  - ☐ Informed Consent
  - ☐ Manufacturer
  - ☐ Manufacturing Process
  - ☐ Protocol - Feasibility
  - ☐ Protocol - Other
  - ☐ Sponsor

- ☐ Report submission:
  - ☐ Current Investigator
  - ☐ Annual Progress Report
  - ☐ Site Waiver Report
  - ☐ Final

- ☐ Response to FDA Letter Concerning:
  - ☐ Conditional Approval
  - ☐ Deemed Approved
  - ☐ Deficient Final Report
  - ☐ Deficient Progress Report
  - ☐ Deficient Investigator Report
  - ☐ Disapproval
  - ☐ Request Extension of Time to Respond to FDA
  - ☐ Request Meeting
  - ☐ Request Hearing

- ☐ Other Reason *(specify)*:

SECTION D3 — REASON FOR SUBMISSION - 510(k)

- ☐ New Device
- ☐ Additional or Expanded Indications
- ☐ Change in Technology

- ☒ Other Reason *(specify)*:

The purpose of this submission is to add FilmArray Torch as an additional instrument system for use with the FilmArray Respiratory Panel (RP). FilmArray RP used with the FilmArray Torch (modified FilmArray 2.0) demonstrates substantial equivalence to the previously cleared FilmArray RP for use with the Multi-instrument FilmArray system (FilmArray 2.0) (K143080). There have been no changes to the previously cleared FilmArray Respiratory Panel reagent kit itself.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

SECTION E — ADDITIONAL INFORMATION ON 510(K) SUBMISSIONS

Product codes of devices to which substantial equivalence is claimed

1	OCC	2	OEM	3	OOU	4	OEP
5	OTG	6	OZZ	7	OOI	8	OZX

Summary of, or statement concerning, safety and effectiveness information

- [x] 510 (k) summary attached
- [ ] 510 (k) statement

Information on devices to which substantial equivalence is claimed *(if known)*

	510(k) Number		*Trade or Proprietary or Model Name*		*Manufacturer*
1	K143080	1	FilmArray Respiratory Panel (RP) for use with Multi-Instrument System (FilmArray 2.0)	1	BioFire Diagnostics, LLC
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	

SECTION F — PRODUCT INFORMATION - APPLICATION TO ALL APPLICATIONS

Common or usual name or classification name

FilmArray Respiratory Panel (RP)

	Trade or Proprietary or Model Name for This Device		Model Number
1	FilmArray Respiratory Panel (RP) for use with FilmArray Torch	1	
2		2	
3		3	
4		4	
5		5	

FDA document numbers of all prior related submissions *(regardless of outcome)*

1 K143080	2 K123620	3 K120267	4 K110764	5 K103175	6
7	8	9	10	11	12

Data Included in Submission

- [ ] Laboratory Testing
- [ ] Animal Trials
- [ ] Human Trials

SECTION G — PRODUCT CLASSIFICATION - APPLICATION TO ALL APPLICATIONS

Product Code	C.F.R. Section *(if applicable)*	Device Class
OCC, OEM, OOU	21 CFR 866.3980	[ ] Class I [x] Class II [ ] Class III [ ] Unclassified

Classification Panel

Microbiology

Indications *(from labeling)*

The FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Note: Submission of the information entered in Section H does not affect the need to submit device establishment registration.	FDA Document Number *(if known)*

SECTION H — MANUFACTURING / PACKAGING / STERILIZATION SITES RELATING TO A SUBMISSION

☒ Original ☐ Add ☐ Delete	Facility Establishment Identifier (FEI) Number	☒ Manufacturer ☐ Contract Sterilizer ☐ Contract Manufacturer ☐ Repackager / Relabeler	
Company / Institution Name: BioFire Diagnostics, LLC		Establishment Registration Number: 3002773840	
Division Name *(if applicable)*: Regulated Products		Phone Number *(including area code)*: 801-736-6354 x330	
Street Address: 390 Wakara Way		FAX Number *(including area code)*: 801-588-0507	
City: Salt Lake City		State / Province: UT	ZIP Code: 84108 / Country: USA
Contact Name: Kristen J. Kanack, Ph.D.	Contact Title: Vice President, Regulated Products & Clinical Affairs	Contact E-mail Address: kristen.kanack@biofiredx.com	

☐ Original ☐ Add ☐ Delete	Facility Establishment Identifier (FEI) Number	☐ Manufacturer ☐ Contract Sterilizer ☐ Contract Manufacturer ☐ Repackager / Relabeler	
Company / Institution Name		Establishment Registration Number	
Division Name *(if applicable)*		Phone Number *(including area code)*	
Street Address		FAX Number *(including area code)*	
City		State / Province	ZIP Code / Country
Contact Name	Contact Title	Contact E-mail Address	

☐ Original ☐ Add ☐ Delete	Facility Establishment Identifier (FEI) Number	☐ Manufacturer ☐ Contract Sterilizer ☐ Contract Manufacturer ☐ Repackager / Relabeler	
Company / Institution Name		Establishment Registration Number	
Division Name *(if applicable)*		Phone Number *(including area code)*	
Street Address		FAX Number *(including area code)*	
City		State / Province	ZIP Code / Country
Contact Name	Contact Title	Contact E-mail Address	

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

SECTION I UTILIZATION OF STANDARDS

Note: Complete this section if your application or submission cites standards or includes a *"Declaration of Conformity to a Recognized Standard"* statement.

	Standards No.	Standards Organization	Standards Title	Version	Date
1			Please see attached list.		
2					
3					
4					
5					
6					
7					

Please include any additional standards to be cited on a separate page.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF ADDRESS BELOW.

The burden time for this collection of information is estimated to average 0.5 hour per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
1350 Piccard Drive, Room 400
Rockville, MD 20850

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Performance Standards

This Special 510(k) Premarket Notification was prepared with reference to the following guidance documents. The referenced documents were used as guidance; however, modifications to recommended study designs were made, where appropriate, to fit the specifics of the product:

- Guidance for Industry and Food and Drug Administration Staff – Highly Multiplexed Microbiological/Medical Countermeasure In Vitro Nucleic Acid Based Diagnostic Devices, (August 27, 2014)
- Statistical Guidance on Reporting Results from Studies Evaluating Diagnostic Tests, FDA Guidance Document (March 13, 2007)
- User Protocol for Evaluation of Qualitative Test Performance, Clinical and Laboratory Standards Institute (CLSI) Approved Guideline – Second Edition, EP12-A2 (January 2008)
- Molecular Diagnostic Methods for Infectious Diseases, Clinical and Laboratory Standards Institute (CLSI) Approved Guideline, MM3-A2 (February 2006)
- EN ISO 14971:2012, 'Medical devices – Application of risk management to medical devices'.
- ISO 13485:2003/EN ISO 13485:2012, 'Medical devices – Quality Management System – Requirements for regulatory purposes'.
- EN 13641:2002, 'Elimination or reduction of risk of infection related to in vitro diagnostic reagents'.
- EN 62366:2008, 'Medical devices-Application of usability engineering to medical devices'.
- EN 13612:2002, 'Performance evaluation of in vitro diagnostic devices'.
- EN ISO 23640:2013, '*In vitro* diagnostic medical devices – Evaluation of stability of *in vitro* diagnostic reagents'.
- Guidance for Sponsors, Institutional Review Boards, Clinical Investigators and FDA Staff – Guidance on Informed Consent for *In Vitro* Diagnostic Device Studies Using Leftover Human Specimens that are Not Individually Identifiable, (April 25, 2005)
- Guidance for Industry and Food and Drug Administration Staff – Assay Migration Studies for In Vitro Diagnostic Devices. (April 25, 2013).

Instrument Specific

- EN 61010-2-101:2002, 'Safety requirements for electrical equipment for measurement, control, and laboratory use –Part 2-101: Particular requirements for in vitro diagnostic (IVD) medicinal equipment', IEC 61010-2-101:2002 (modified) December 17, 2002.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

- EN 61326-2-6:2006 'Electrical equipment for measurement, control and laboratory use—EMC requirements—Part 2-6: Particular requirements –in vitro diagnostic (IVD) medical equipment', IEC 61326-2-6:2006, November 27, 2008.

Software Specific

- Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices, FDA Guidance Document (May 11, 2005)
- Guidance for Industry, FDA Reviewers and Compliance on Off-The-Shelf Software Use in Medical Devices (September 9, 1999)
- General Principle of Software Validation; Final Guidance for Industry and FDA Staff (January 11, 2002)
- ISO 62304:2006, 'Medical device software – Software life-cycle processes' – IEC 62304:2006, November 27, 2008.

Labeling

- Use of Symbols on Labels and in Labeling of In Vitro Diagnostic Devices Intended for Professional Use, FDA Guidance Document (November 30, 2004)
- Guidance for Industry and FDA on Alternative to Certain Prescription Device Labeling Requirements (January 1, 2000)
- 21 CFR 809.10, Labeling for in vitro diagnostic products
- EN 980:2008, 'Symbols for use in the labelling of medical devices'
- ISO 15223-1:2012, 'Medical Devices – Symbols to be used with medical device labels, labeling and information to be supplied – Part 1: General requirements'.
- EN ISO 18113-1:2011, '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 1: Terms, definition and general requirements'.
- EN ISO 18113-2:2011, '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 2: In vitro diagnostic reagents for professional use'.
- EN ISO 18113-3:2011 – '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 3: In vitro diagnostic instruments for professional use'.

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Appendix C

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Acceptance Checklist for Special 510(k)s

(Should be completed within 15 days of DCC receipt)

The following information is not intended to serve as a comprehensive review.
FDA recommends that the submitter include this completed checklist as part of the submission.

510(k)#: K **Date Received by DCC:**

Lead Reviewer:

Branch: **Division:** **Center/Office:**

Note: If an element is left blank on the checklist, it does not mean the checklist is incomplete; it means the reviewer did not assess the element during the RTA review and that the element will be assessed during substantive review.

Special 510(k) Criteria The submission should not be reviewed as a Special 510(k) if "No" is selected for any of the 4 criteria below. Complete the Refuse to Accept Checklist for a Traditional 510(k) if submission is converted.			
		Yes	**No**
1.	**510(k) is submitted to modify a legally marketed device (predicate) AND the Special 510(k) submission is submitted by the holder of the 510(k) for the predicate device.**	☑	☐
	Comments: N/A		
2.	**Indications for Use of the proposed device are unchanged from the legally marketed device (predicate).**	☑	☐
	Comments: N/A		
3.	**Fundamental scientific technology of the proposed device is unchanged from the legally marketed device (predicate).**	☑	☐
	Comments: N/A		
4.	**The submission includes only summary-level information (i.e., NO test reports with performance data).** *Note that if performance data are provided and are conducted under design validation (21 CFR 820.30(g)), for example, to demonstrate continued conformance with a special control or recognized standard, then a Special 510(k) may be appropriate.*	☑	☐
	Comments: N/A		

Does the submission meet all 4 criteria above?

☑ Yes, submission meets criteria for a Special 510(k). Continue checklist below.

☐ No, submission does not meet criteria for a Special 510(k). Discontinue this RTA checklist, convert to a Traditional and apply the Traditional checklist.

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Contains Nonbinding Recommendations

Organizational Elements

Failure to include these items should not result in an RTA designation.

***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**		**Yes**	**No**	***Page #**
1.	Submission contains a Table of Contents.	☑	☐	510(k) i-iii
2.	Each section is labeled (e.g., headings or tabs designating Device Description section, Labeling section, etc.).	☑	☐	510(k) multiple
3.	All pages of the submission are numbered. *All pages should be numbered in such a manner that information can be referenced by page number. This may be done either by consecutively numbering the entire submission, or numbering the pages within a section (e.g., 12-1, 12-2…).*	☑	☐	510(k) multiple
4.	Type of 510(k) is identified (i.e., Traditional, Abbreviated, or Special) *If type of 510(k) is not designated, review as a Traditional 510(k).*	☑	☐	510(k) 2, 4, 5, and footer of each page
Comments: N/A				

Elements of a Complete Submission (RTA Items)
(21 CFR 807.87 unless otherwise indicated)

Submission should be designated RTA if not addressed

- Any "No" answer will result in a "Refuse to Accept" decision; however, FDA staff has discretion to determine whether missing items are needed to ensure that the submission is administratively complete to allow the submission to be accepted or to request missing checklist items interactively from submitters during the RTA review.
- Each element on the checklist should be addressed within the submission. The submitter may provide a rationale for omission for any criteria that are deemed not applicable. If a rationale is provided, the criterion is considered present (Yes). An assessment of the rationale will be considered during the review of the submission.

Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**			**Yes**	**No**	**N/A**	***Page #**
A.	**Administrative**					
	1.	All content used to support the submission is written in English (including translations of test reports, literature articles, etc.).	☑	☐		510(k) multiple

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
		Comments:					
	2.	Submission identifies the following (FDA recommends use of the CDRH Premarket Review Submission Cover Sheet form [Form 3514]):					
		a.	Device trade/proprietary name	☑	☐		510(k) 1
		b.	Device class and panel or Classification regulation or Statement that device has not been classified with rationale for that conclusion	☑	☐		510(k) 1
		Comments: N\A					
	3.	Submission contains an Indication for Use Statement with Rx and/or OTC designated (see also 21 CFR 801.109, and FDA's guidance "Alternative to Certain Prescription Devices Labeling Requirements.") *See recommended format (http://www.fda.gov/downloads/AboutFDA/ReportsManualsForms/Forms/UCM360431.pdf).*		☑	☐		510(k) ix, x
		Comments: N\A					
	4.	Submission contains a 510(k) Summary or 510(k) Statement. *Refer to 21 CFR 807.92 and 21 CFR 807.93 for contents of 510(k) Summary and Statement, respectively. Adequacy of the content will be assessed during substantive review.*		☑	☐		510(k) Summary 1-5
		Comments: N\A					
	5.	Submission contains a Truthful and Accuracy Statement per 21 CFR 807.87(k). *See recommended format (http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketNotification510k/ucm142707.htm).*		☑	☐		510(k) xii
		Comments: N\A					
	6.	Submission is a Class III 510(k) Device. *Select "N/A" only if submission is not a Class III 510(k).*		☐		☑	
		a.	Contains Class III Summary and Certification	☐	☐	☑	

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
			See recommended content (http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketNotification510k/ucm142662.htm). Select "N/A" only if submission is not a Class III 510(k).				
		Comments N/A					
	7.	The submission identifies prior submissions for the same device included in the current submission (e.g., submission numbers for a prior not substantially equivalent [NSE] determination, prior deleted or withdrawn 510(k), Pre-Submission, IDE, PMA, etc.). **OR** States that there were no prior submissions for the subject device. *Prior submissions (or no prior submissions) for this device should be included in Section F (prior related submissions) of the CDRH Premarket Review Submission Cover Sheet form (Form 3514). This information may also be included in the Cover Letter (i.e., as a statement that there were no prior submissions for the device or a listing of the number(s) of the prior submissions).*		☑	☐		CDRH Premarket Review Cover Sheet form 3514 page 3, and 510(K) 5
		a.	If there were prior submissions, the submitter has identified where in the current submission any issues related to a determination of substantial equivalence from prior submissions for this device are addressed. *To address this criterion, it is recommended that the submission include a separate section with the prior submission number(s), a copy of the FDA feedback (e.g., letter, meeting minutes), and a statement of how or where in the submission this prior feedback was addressed. Note that adequacy of how the feedback was addressed will be assessed during the substantive review.* *Select "N/A" if the submitter states there were no prior submissions.*	☑	☐	☐	510(K) 2
		Comments: N/A					
B.	**Device Description**						
	8.	The device has a device-specific guidance document, special controls document, and/or requirements in a device-specific regulation regarding device description that is applicable to the		☑		☐	See B8 Comments

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
		subject device. *If "N/A" is selected, parts a and b below are omitted from the checklist.*					
		a.	The submission addresses device description recommendations outlined in the device-specific guidance. **OR** The submission provides an alternative approach intended to address the applicable statutory and/or regulatory criteria. *Select "N/A" if there is no applicable device-specific guidance. Select "No" if the submission does not include a rationale for any omitted information or any alternative approach as outlined above. Note that the adequacy of how recommendations in a device-specific guidance, etc., have been addressed should be assessed during the substantive review.*	☑	☐	☐	See B8 Comments
		b.	The submission includes device description information that addresses relevant mitigation measures set forth in a special controls document or device-specific regulation applicable to the device. **OR** The submission uses alternative mitigation measures and provides rationale why the alternative measures provide an equivalent assurance of safety and effectiveness. *Select "N/A" if there is no applicable special controls document or device-specific regulation. Select "No" if the submission does not include a rationale for any omitted information or any alternative approach as outlined above. Note that the adequacy of how such mitigation measures have been addressed should be assessed during the substantive review.*	☑	☐	☐	See B8 Comments
		Comments: Included in previous submissions listed in CDRH Premarket Review Cover sheet form 3514 page 3.					
	9.	Descriptive information is present and consistent within the submission (e.g., the device description section is consistent with the device description in the labeling).		☑	☐		510(k) 5
		Comments: N/A					
	10.	The submission includes descriptive information for the device,					

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
		including the following:					
		a.	A description of the principle of operation or mechanism of action for achieving the intended effect.	☑	☐		510(k) 6
		b.	A description of proposed conditions of use, such as surgical technique for implants; anatomical location of use; user interface; how the device interacts with other devices; and/or how the device interacts with the patient.	☑	☐		510(k) 7
		c.	A list and description of each device for which clearance is requested. *Select "N/A" if there is only one device or model. "Device" may refer to models, part numbers, various sizes, etc.*	☐	☐	☑	
		d.	Submission contains representative engineering drawing(s), schematics, illustrations, photos and/or figures of the device. **OR** Submission includes a statement that engineering drawings, schematics, etc. are not applicable to the device (e.g., device is a reagent and figures are not pertinent to describe the device). *In lieu of engineering drawings, schematics, etc. of each device to be marketed, "representative" drawings, etc. may be provided, where "representative" is intended to mean that the drawings, etc. provided capture the differences in design, size, and other important characteristics of the various models, sizes, or versions of the device(s) to be marketed.*	☑	☐		510(k) 8 and 14 and Appendix A documents
		Comments: N/A					
	11.	A description of all device modification(s) including rationale for each modification.		☑	☐		510(k) 6-17
		Comments: N/A					
	12.	Device is intended to be marketed with multiple components, accessories, and/or as part of a system. *Select "N/A" if the device is not intended to be marketed with multiple components, accessories, and/or as part of a system. If "N/A"is selected, parts a-c below are omitted from the checklist.*		☐		☑	
		a.	Submission includes a list of all components and accessories to be marketed with the subject device.	☐	☐		

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
		b.	Submission includes a description (as detailed in item 10a., 10b., and 10d. above) of each component or accessory. *Select "N/A" if the component(s)/accessory(ies) has been previously cleared, or is exempt, and the proposed indications for use are consistent with the cleared indications.*	☐	☐	☑	
		c.	A 510(k) number is provided for each component or accessory that received a prior 510(k) clearance **AND** A statement is provided that identifies components or accessories that have not received prior 510(k) clearance.	☐	☐		
		Comments: N/A					
C.	**Substantial Equivalence Discussion**						
	13.	Submitter has identified a predicate device(s), including the following information:					
		a.	Predicate device identifier provided (e.g., 510(k) number, de novo number, reclassified PMA number, regulation number if exempt or statement that the predicate is a preamendment device). For predicates that are preamendments devices, information is provided to document preamendments status. *Information regarding documenting preamendment status is available online (http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/MedicalDeviceQualityandCompliance/ucm379552.htm)* .	☑	☐		510(K) 5
		b.	The identified predicate(s) is consistent throughout the submission (e.g., the predicate(s) identified in the Substantial Equivalence section is the same as that listed in the 510(k) Summary (if applicable) and that used in comparative performance testing.	☑	☐		510(K) 2, 55, and 56
		Comments: N/A					
	14.	Submission includes a comparison of the following for the predicate(s) and subject device and a discussion why any differences between the subject and predicate(s) do not impact safety and effectiveness [see section 513(i)(1)(A) of the FD&C Act					

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
		and 21 CFR 807.87(f)] *See "The 510(k) Program: Evaluating Substantial Equivalence in Premarket Notifications [510(k)]" guidance document for more information on comparing intended use and technological characteristics.*					
		a.	Indications for use *If there are no differences between the subject device and the predicate(s) with respect to indications and intended use, this should be explicitly stated.*	☑	☐		510(k) 3
		b.	Technology, including features, materials, and principles of operation *Examples of technological characteristics include, but are not limited to design, features, materials, energy source, and principle of operation.* *FDA recommends a tabular format for comparing technological characteristics. Any characteristic that is the same as the predicate(s) should be explicitly stated. Differences in technological characteristics should be identified and a rationale provided why they do not raise different questions of safety and effectiveness.*	☑	☐		510(k) 55, and 56
D.	**Design Control Activities**						
	15.	Design Control Activities Summary includes all of the following:					
		a.	Identification of Risk Analysis method(s) used to assess the impact of the modification on the device and its components **AND** the results of the analysis	☑	☐		510(k) 44
		b.	Based on the Risk Analysis, an identification of the verification and/or validation activities required, including methods or tests used and acceptance criteria	☑	☐		510(k) 46
		c.	Declaration of conformity with design controls. All 3 below must be present to answer "Yes." i. Statement that all verification and validation activities were performed by designated individuals and results demonstrate that predetermined acceptance criteria were met.	☑	☐		510(k) xiii

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Check "Yes" if item is present, "N/A" if it is not needed and "No" if it is not included but needed. ***Submitters including the checklist with their submission should identify the page numbers where requested information located. Use the comments section for an element if additional space is needed to identify the location of supporting information.**				**Yes**	**No**	**N/A**	***Page #**
			ii. Statement that manufacturing facility is in conformance with design control procedure requirements as specified in 21 CFR 820.30. iii. Statement is signed by the individual responsible for these activities.				
		Comments: N/A					
E.	**Proposed Labeling (see also 21 CFR parts 801 and 809 as applicable)**						
	16.	Submission includes proposed package labels and labeling (e.g., instructions for use, package insert, operator's manual).		☑	☐		510(k) 4 and Appendix A
		a.	All changes in proposed labeling resulting from device modification(s) are highlighted or prominently identified.	☑	☐		510(k) Appendix A
		Comments: N/A					
	17.	Statement that the intended use of the modified device, as described in the labeling, has not changed as a result of the modification(s).		☑	☐		510(k) 3
		Comments: N/A					

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Decision: Accept_____ Refuse to Accept_____

If Accept, notify the applicant

If Refuse to Accept, notify applicant electronically and include a copy of this checklist.

Digital Signature Concurrence Table	
Reviewer Sign-Off	
Branch Chief Sign-Off (digital signature optional)*	
Division Sign-Off (digital signature optional)*	

*Branch and Division review of checklist and concurrence with decision required. Branch and Division digital signature optional.

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Special 510(k) Premarket Notification

FilmArray® Respiratory Panel for use with FilmArray Torch

January 12, 2016
BioFire Diagnostics, LLC
Salt Lake City, UT
DC-33777

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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B.13.2 FilmArray Torch Software Release Candidate Tests
B.13.3 System Reliability FilmArray Torch Software Validation

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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510(k) Screening Checklist

[Hard copy of CDRH coversheet to be inserted here]

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[screening checklist 2]

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[screening checklist 3]

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[screening checklist 4]

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[screening checklist 5]

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Performance Standards

This Special 510(k) Premarket Notification was prepared with reference to the following guidance documents. The referenced documents were used as guidance; however, modifications to recommended study designs were made, where appropriate, to fit the specifics of the product:

- Guidance for Industry and Food and Drug Administration Staff – Highly Multiplexed Microbiological/Medical Countermeasure In Vitro Nucleic Acid Based Diagnostic Devices, (August 27, 2014)
- Statistical Guidance on Reporting Results from Studies Evaluating Diagnostic Tests, FDA Guidance Document (March 13, 2007)
- User Protocol for Evaluation of Qualitative Test Performance, Clinical and Laboratory Standards Institute (CLSI) Approved Guideline – Second Edition, EP12-A2 (January 2008)
- Molecular Diagnostic Methods for Infectious Diseases, Clinical and Laboratory Standards Institute (CLSI) Approved Guideline, MM3-A2 (February 2006)
- EN ISO 14971:2012, 'Medical devices – Application of risk management to medical devices'.
- ISO 13485:2003/EN ISO 13485:2012, 'Medical devices – Quality Management System – Requirements for regulatory purposes'.
- EN 13641:2002, 'Elimination or reduction of risk of infection related to in vitro diagnostic reagents'.
- EN 62366:2008, 'Medical devices-Application of usability engineering to medical devices'.
- EN 13612:2002, 'Performance evaluation of in vitro diagnostic devices'.
- EN ISO 23640:2013, '*In vitro* diagnostic medical devices – Evaluation of stability of *in vitro* diagnostic reagents'.
- Guidance for Sponsors, Institutional Review Boards, Clinical Investigators and FDA Staff – Guidance on Informed Consent for *In Vitro* Diagnostic Device Studies Using Leftover Human Specimens that are Not Individually Identifiable, (April 25, 2005)
- Guidance for Industry and Food and Drug Administration Staff – Assay Migration Studies for In Vitro Diagnostic Devices. (April 25, 2013).

Instrument Specific

- EN 61010-2-101:2002, 'Safety requirements for electrical equipment for measurement, control, and laboratory use –Part 2-101: Particular requirements for in vitro diagnostic (IVD) medicinal equipment', IEC 61010-2-101:2002 (modified) December 17, 2002.
- EN 61326-2-6:2006 'Electrical equipment for measurement, control and laboratory use—EMC requirements—Part 2-6: Particular requirements –in vitro diagnostic (IVD) medical equipment', IEC 61326-2-6:2006, November 27, 2008.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Software Specific

- Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices, FDA Guidance Document (May 11, 2005)
- Guidance for Industry, FDA Reviewers and Compliance on Off-The-Shelf Software Use in Medical Devices (September 9, 1999)
- General Principle of Software Validation; Final Guidance for Industry and FDA Staff (January 11, 2002)
- ISO 62304:2006, 'Medical device software – Software life-cycle processes' – IEC 62304:2006, November 27, 2008.

Labeling

- Use of Symbols on Labels and in Labeling of In Vitro Diagnostic Devices Intended for Professional Use, FDA Guidance Document (November 30, 2004)
- Guidance for Industry and FDA on Alternative to Certain Prescription Device Labeling Requirements (January 1, 2000)
- 21 CFR 809.10, Labeling for in vitro diagnostic products
- EN 980:2008, 'Symbols for use in the labelling of medical devices'
- ISO 15223-1:2012, 'Medical Devices – Symbols to be used with medical device labels, labeling and information to be supplied – Part 1: General requirements'.
- EN ISO 18113-1:2011, '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 1: Terms, definition and general requirements'.
- EN ISO 18113-2:2011, '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 2: In vitro diagnostic reagents for professional use'.
- EN ISO 18113-3:2011 – '*In vitro* diagnostic medical devices – Information supplied by the manufacturer (labeling) – Part 3: In vitro diagnostic instruments for professional use'.

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Indications for Use

510(k) Number (if known): _____
Device Name: FilmArray Respiratory Panel (RP)

The FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the Film Array RP may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis*, Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4 were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens.

Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., cell culture or sequence analysis).

The FilmArray RP assay for Coronavirus OC43 may cross-react with some isolates of Coronavirus HKU1. A dual positive result may be due to cross-reactivity or may indicate a co-infection.

Performance characteristics for Influenza A were established when Influenza A 2009 H1N1, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel

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Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent Influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

Prescription Use ___x____ (Part 21 CFR 801 Subpart D) AND/OR Over-the-Counter Use _____ (21 CFR 801 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE—CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of Center for Devices and Radiological Health (CDRH)

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Declaration of Conformity with Design Controls

Verification Activities

To the best of my knowledge, the verification activities, as required by the risk analysis, for the modification were performed by the designated individual(s) and the results demonstrated that the predetermined acceptance criteria were met.

_____ _____

Kristen Kanack, PhD
Vice President, Regulated Products
and Clinical Affairs
BioFire Diagnostics, LLC

Date

Manufacturing Facility

The manufacturing facility, BioFire Diagnostics, LLC, is in conformance with the design control requirements as specified in 21 CFR 820. 30 and the records are available for review.

_____ _____

Gina Bergman
Director of Quality Assurance
BioFire Diagnostics, LLC

Date

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Truthful and Accurate Statement for the Modification to the FilmArray Respiratory Panel (FilmArray Torch)

Pursuant to 21 CFR 807.87(k), I, Kristen Kanack, in my capacity as Vice President of Regulated Products and Clinical Affairs at BioFire Diagnostics, LLC, certify that to the best of my knowledge all data and information submitted in this premarket notification are truthful and accurate and that no material fact has been omitted.

_____ _____

Kristen Kanack, PhD
Vice President, Regulated Products
and Clinical Affairs

Date

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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1 Company Name and Address

BioFire Diagnostics, LLC

390 Wakara Way

Salt Lake City, UT 84108

Telephone: 801-736-6354

Facsimile: 801-588-0507

Primary contact: Kristen Kanack, ext. 330

Secondary contact: Ajay Bhatia, ext. 246 or Beth Amiott, ext. 761

2 Device Name

Trade Name: FilmArray Respiratory Panel (RP) for use with FilmArray Torch

Common Name: Same

Classification Name:

Respiratory Viral Panel Multiplex Nucleic Acid Assay (21 CFR 866.3980)

Instrumentation for Clinical Multiplex Test Systems (21 CFR 862.2570)

Product Codes:

OCC, OEM, OOU, OEP, OTG, OOI, OZX, OZY, OQW and OZZ

NSU

3 Establishment Registration Number

Company: BioFire Diagnostics, LLC

Establishment Registration Number: 3002773840

4 Device Classification

The FilmArray Respiratory Panel has been previously categorized as a Class II device under 21 CFR 866.3980. Since performing the test on FilmArray Torch does not alter the intended use of the product or its test principle, we believe that the FilmArray Respiratory Panel when used with FilmArray Torch is a Class II device.

The FilmArray Torch is categorized as a Class II device under 21 CFR 862.2570 (Product Code: NSU - instrumentation for clinical multiplex test systems).

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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5 Predicate Device Information

Trade Name: FilmArray Respiratory Panel (RP) for Use with Multi-instrument FilmArray System (FilmArray 2.0)

Common Name: Same

510(k) number(s): K143080

6 Regulatory History

The following pre-submission documents were provided to FDA by BioFire Diagnostics:

1. Q151638 (August 25, 2015)- Provided a description of the modifications and the proposed validation studies that were to be used to support a proposed Special 510(k) for the use of the FilmArray RP on the FilmArray Torch (modified FilmArray 2.0).
2. Q151638/S001 (October 2, 2015) - Provided responses to the previous submission as well as clarifications of modifications for the FilmArray Torch configuration.

The following FDA pre-submission interactions took place:

3. Q151638 Acknowledgement Letter (August 27, 2015)
4. October 1, 2015 – E-mail from FDA to BioFire asking for a complete description of all changes (response provided via E-mail).
5. Q151638/Review Memo (November, 4th, 2015) – FDA provided responses to the initial questions BioFire posed in Q151638.

Provided below is the list of questions posed by BioFire specifically about the FilmArray RP for use with the FilmArray Torch and the responses by the FDA.

- Does the FDA concur with the special 510(k) regulatory pathway for the use of FilmArray RP with the FilmArray Torch?
  - Response: Yes, the FDA agrees that the special 510(k) regulatory pathway is appropriate for this device modification. Please note that only summary level data and no line data should be submitted in a special 510(k).
- Does FDA concur with the testing plans to validate the use of FilmArray RP with the FilmArray Torch system?
  - Response: Yes, the testing plans proposed to validate the FilmArray RP on the FilmArray Torch system are appropriate. We offer the following comments:
    - Samples evaluated in the Representative Organism and Reproducibility studies should be prepared with whole organism preparations in NP swab matrix.

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- You indicate that samples for the Representative Organism study will be spiked "near the LoD". We recommend that samples are prepared with concentrations of each organism at no higher than 3X LoD.

- BioFire intends to modify the FilmArray RP package insert by adding FilmArray Torch to the list of systems with which FilmArray RP can be used, and by including a paragraph describing the results of the Full Panel Reproducibility at LoD study. Is this acceptable?
  - Response: Yes, it is acceptable to add the FilmArray Torch to the FilmArray RP PI, including the panel reproducibility study. The procedure for using the FilmArray RP pouch in the FilmArray Torch should also be included in the PI. Additionally, any appropriate pictures or diagrams showing the new user interface and pouch loading procedure should also be added to the PI. Please submit a red-lined revised and clean version of the PI with your special 510(k) submission.

7 Indications for Use Statement

The indications for use statement is provided below and is the same statement used for the FilmArray Respiratory Panel (RP) (K143080) cleared for use with the FilmArray 2.0 (K143178). There is no intention to change the indications for use or the performance claims for the modified product.

The FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the FilmArray RP may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

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Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis*, Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4 were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens.

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8 Proposed Labeling

Appendix A contains the proposed labeling to support the use of the FilmArray RP with the modified FilmArray Torch that is described in this Special 510(k). The Torch labels included in this submission will show UDI compliant barcodes; however, this element may not be included on labels before September 2016.

All proposed labeling is included in Appendix A, as follows:

- *FilmArray Torch Labels (Appendix A.1)*
- *FilmArray Torch Operator's Manual IVD (Appendix A.2)*
- *FilmArray Torch Operator's Manual RUO (Appendix A.3)*
- *FilmArray Torch Information Quick Guide (Appendix A.4)*
- *FilmArray Respiratory Panel Labels (Appendix A.5)*

  Note: The Filmarray RP outer package and component labels have not been changed for this submission.
- *FilmArray Respiratory Panel Instruction Booklet (Appendix A.6)*

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- *FilmArray Respiratory Panel Quick Guide (Appendix A.7)*

9 Description of Device Modifications

9.1 Background

Upper respiratory tract infections cause acute local and systemic disease of varying severity, with the most severe cases occurring in children, older adults, and immunocompromised individuals. Due to the similarity in clinical presentation, an exact diagnosis cannot be made based solely on clinical symptoms; however, identification of the causative agent provides physicians with important information to aid in determining appropriate patient treatment and public health response for disease containment. The FilmArray Respiratory Panel (RP) aids in the diagnosis of upper respiratory tract infections by testing nasopharyngeal swab (NPS) specimens for 20 different respiratory pathogens in a time frame (~one hour) that allows the test results to be used in determining appropriate patient treatment and management.

BioFire Diagnostics, LLC (BioFire) manufactures the FilmArray Respiratory Panel (RP), along with a family of PCR-based *in vitro* diagnostic instrument systems and other specific highly-multiplexed reagent panels for use on FilmArray systems for infectious disease testing. The FilmArray family currently consists of FilmArray and FilmArray 2.0, both of which have been FDA-cleared (K103175 and K143178 respectively) and CE-marked. FilmArray systems include a computer, an instrument (or multiple instruments), accessories, and FilmArray Software. The FilmArray Software functions to control the FilmArray instrument and also to collect, analyze, view and store test data transferred from the instrument. Reagent panel-specific information (i.e. protocol, assay information, analysis parameters and final report configuration) is programmed into separate pouch modules that are unique to each panel and can be loaded onto the main FilmArray Software as new panels are developed.

The FilmArray RP for use with the FilmArray and FilmArray 2.0, was fully described and received FDA clearance in previous 510(k)s (K103175, K110764, K120267, and K123620, K143080). The content of this Special 510(k) submission is limited to obtaining FDA clearance for the use of the FilmArray RP with the FilmArray Torch, a modification of the FilmArray 2.0.

Several significant changes were implemented when progressing from FilmArray to FilmArray 2.0. These changes were fully described in K143178 and are briefly described here. FilmArray is a low-throughput system consisting of a computer and single instrument. In order to meet the space and throughput demands of multi-instrument (and multi-panel) users, FilmArray 2.0 was developed to allow up to eight FilmArray instruments to be connected to a single computer with one set of accessories (barcode scanner, mouse and printer). FilmArray 2.0 included modifications to instrument/software functions (capacity for on-board image data processing and short term data storage), instrument-software communication (communication via Ethernet

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port/switch instead of Firewire and USB cables), and instrument optics (new camera, excitation LED, and filters).

While FilmArray 2.0 helped to address throughput challenges for laboratories by reducing the footprint required to run multiple instruments and allowing control of up to eight instruments from a single computer, the FilmArray 2.0 still requires a substantial amount of bench space. In order to further address this issue, BioFire modified FilmArray 2.0 to place the computer and instruments (now called FilmArray Torch Modules) into a single tower housing. This modular configuration of the FilmArray 2.0 is called the FilmArray Torch. In contrast to the step between FilmArray and FilmArray 2.0, modifications needed to create FilmArray Torch required no significant changes to instrument function, communication, optics, etc.

9.2 FilmArray Respiratory Panel

There were no modifications to the FilmArray RP cleared in K143080. Additionally, the FilmArray RP pouch module software used with the FilmArray Torch is identical to the pouch module used with FilmArray 2.0.

9.3 FilmArray Torch: A Modification of FilmArray 2.0

The FilmArray Torch is an automated *in vitro* diagnostic (IVD) device designed to work with specific highly-multiplexed reagent pouches to detect multiple nucleic acid targets contained in clinical specimens. The FilmArray Torch interacts with the reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nested multiplex PCR in a closed system. The resulting PCR products are evaluated using DNA melting analysis. The FilmArray Torch Software automatically interprets the results and provides an easy-to-understand test report.

Given the increased use of FilmArray, customers requested a system with a smaller footprint and higher through-put. In order to meet these needs, the FilmArray 2.0 was modified to develop the FilmArray Torch by connecting densely packaged instruments (now called FilmArray Torch Modules) in a “tower” configuration to one computer (housed in the FilmArray Torch System Base). Pouches are now inserted via an edge-load mechanism from the front of the FilmArray Torch Module. This configuration allows the instruments to be stacked directly on top of each other and minimize the footprint.

9.3.1 *Summary of Modifications*

The FilmArray Torch, depicted in Figure 9-1, progresses the current FilmArray 2.0 to address customer need for even higher throughput, by allowing a larger number of samples to be tested per linear foot of bench space. This FilmArray Torch is intended to have ten times the throughput of the original FilmArray.

The following modifications were made to the FilmArray 2.0 in order to achieve a more densely-packaged configuration:

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1. The computer, barcode scanner, and a touch screen user interface are integrated into the FilmArray Torch System Base instead of being a separate stand-alone computer with monitor, barcode scanner, keyboard, and mouse.
2. The modified FilmArray 2.0 instruments are now called FilmArray Torch Modules. Two FilmArray Torch Modules are included as part of the FilmArray Torch System Base and up to five additional Duplexes, each containing two FilmArray Torch Modules, can be stacked onto the FilmArray Torch System Base to create a system with a 12-pouch testing capability.
3. In order for the FilmArray Torch Modules to be stacked, a new edge-load mechanism for introducing the pouches into the FilmArray Torch Modules was created to replace the previous top-load mechanism. The edge load mechanism automatically pulls the pouch into the FilmArray Torch Module; the pouch is automatically ejected at the end of the run.
4. The workflow for inserting a pouch and starting a run is slightly modified by requiring the user to scan the pouch before loading into the FilmArray Torch Module instead of scanning the pouch after top-loading. This is required due to the barcode being inaccessible once pulled into the FilmArray Torch Module by the edge-load mechanism. The procedure for loading a sample into a pouch is unchanged.
5. Non-significant changes were made to the FilmArray 2.0 Software in order to control testing of 12 FilmArray Torch Modules from the single computer base.

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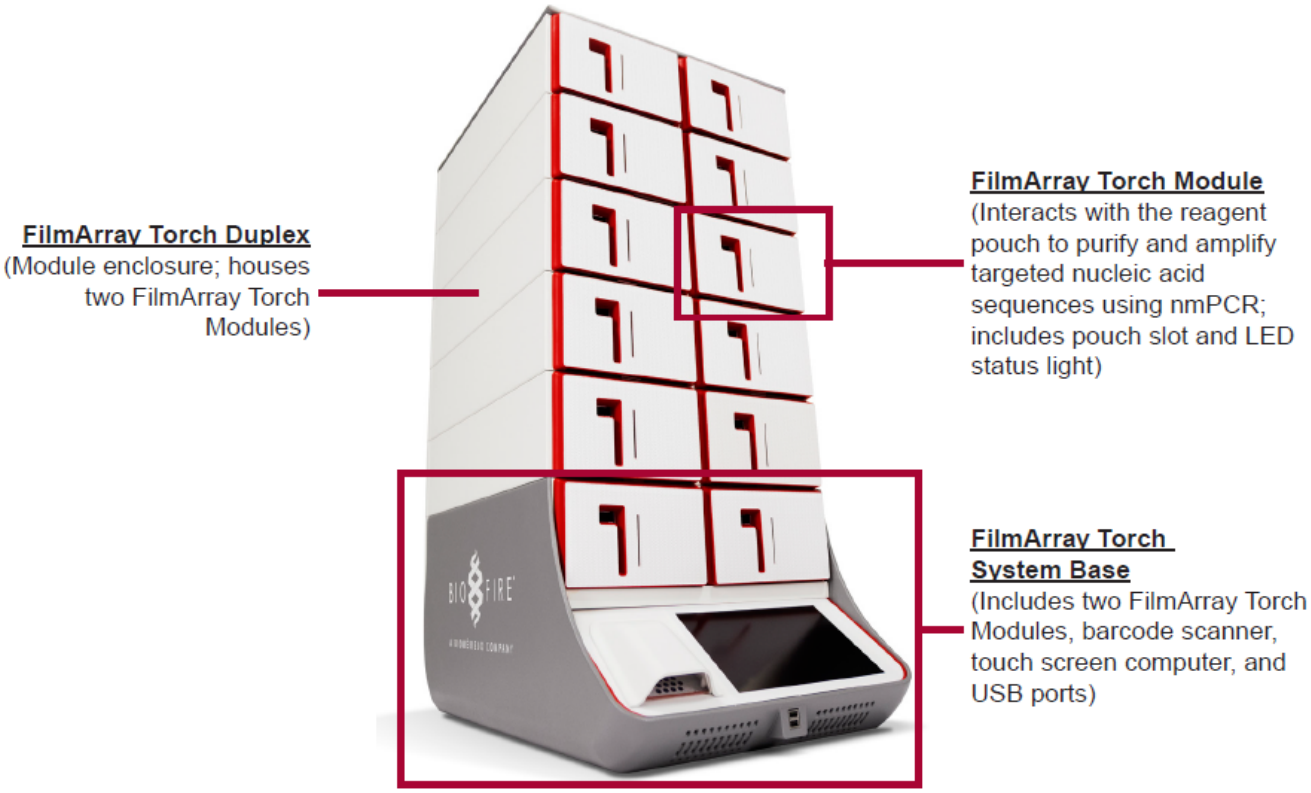

Figure 9-1. The FilmArray Torch

While the configuration has changed from the FilmArray 2.0, the design and operation of the individual FilmArray instruments (now called FilmArray Torch Modules), including the steps in the testing process and the data interpretation, are unchanged. In fact, during this project, changes were strictly limited only to those that were required to meet the objectives of reduced footprint and higher through-put. Changes that would affect the performance of the reagent pouches were not allowed. Table 9-1 highlights that the essential processes, functions, and technological principles for the FilmArray Torch are unchanged from the FilmArray 2.0.

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Table 9-1. Comparison of the FilmArray Torch to the FilmArray 2.0

Element	 FilmArray 2.0	 FilmArray Torch
Intended Use	The FilmArray System is a qualitative *in vitro* diagnostic test system for the rapid detection of pathogens. The test is intended for use in a clinical setting, as an aid in the diagnosis of individuals who are suspected of having a disease caused by a pathogen.	Same
Assays	For use with FDA cleared FilmArray panels: Respiratory Panel (RP) Blood Culture Identification (BCID) Panel Gastrointestinal (GI) Panel Meningitis/Encephalitis (ME) Panel	Same: Submission for Respiratory Panel (other panels to follow)
Protocol Processing Steps	Cell disruption, nucleic acid extraction, PCR1 thermocycling, PCR2 thermocycling, DNA melt and signal detection.	Same
Time to result	Approximately 1 hour per sample	Same
Technological Principles	Nested multiplex nucleic acid amplification (including reverse transcription as appropriate) followed by high-resolution melting analysis to confirm the identity of the amplified product.	Same
Required Accessory	FilmArray Reagent kit	Same
Sample Preparation Method	Minimal sample processing and hands-on time.	Same
Test Interpretation and Results Reporting	Automated test interpretation and report generation. User cannot access raw data. Report can be printed.	Same

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Element	 **FilmArray 2.0**	 **FilmArray Torch**
User Complexity	Moderate	Same
Instrument Optics	Complimentary metal-oxide semiconductor (CMOS) camera Hard-coated filters.	Same
Instrument Classification	Class II Device: Instrumentation for clinical multiplex test systems; 21 CFR 862.2570, product code NSU	Same
Instrument – Software Communication	Communication for multiple instruments travels via Ethernet cable/port.	Same (multiple FilmArray Torch Modules)

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Element	 **FilmArray 2.0**	 **FilmArray Torch**
System configuration	Multiple FilmArray instruments (up to 8) to one computer with mouse, barcode scanner and pouch loading station.	Multiple FilmArray Torch Modules (up to 12) to one FilmArray Torch System Base incorporating computer, barcode scanner, and touch-screen user interface, with pouch loading station.
	Single-sample test capacity per instrument with random-access multi-sample test capacity per System.	Same (single sample per FilmArray Torch Module)
	Printer included.	Printer optional.
	Interlocking two-instrument racks available to stack instruments and reduce footprint. (Optional)	FilmArray Torch System Base (containing 2 Torch Modules) with optional Duplex additions (2 Torch Modules per Duplex) up to 12 FilmArray Torch Modules per System Base.
	Instrument held at 0° angle when no rack is used. Instrument held at 15° angle on rack.	FilmArray Torch Modules held at 0° angle only (same as FilmArray, K103175).
	Pouches are manually inserted and removed from the top of the instrument, under the instrument lid.	Pouches are drawn into the front of the FilmArray Torch Module via an edge-loading mechanism. Pouches are auto-ejected at the end of a run.

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Element	 **FilmArray 2.0**	 **FilmArray Torch**
Core Software Functions/Features	Interfaces with operator to collect information about sample and user.	Same (with touch-screen user interface)
	Provides on-screen instructions as well as status and error messaging.	Same
	Provides instrument instructions at the beginning of a test run and collects run data at the end of a test run.	Same
	Maintains run data in a queryable database.	Same
	Monitors test performance and provides error messaging when out of specification conditions occur.	Same
	Instrument dashboard to run multiple instruments from a single computer.	Same (to run multiple FilmArray Torch Modules per Torch System Base)
Pouch Module Software Functions	Defines panel-specific parameters, instrument protocols and report requirements.	Same
	Analyzes processed image data (fluorescence and temperature data) and provides test results.	Same

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9.3.2 *Hardware/Configuration Modifications*

Some modifications to the FilmArray 2.0 (Figure 9-3) instrument manifold were required to accommodate the stacked multi-unit configuration of instruments (FilmArray Torch Modules) and the new edge-load mechanism of FilmArray Torch (Figure 9-2). The modifications are as follows:

1. The FilmArray Torch Module height was reduced to accommodate the stacking of FilmArray Torch Modules (leading to the need for several of the next modifications).
2. The LED position was rotated to fit within the FilmArray Torch Module. The angle of the LED with respect to the pouch array is unchanged; the LED itself is unchanged; the optical path is unchanged; the camera is unchanged.
3. All features that interact with the pouch during testing (e.g. bladders, hard seals, peltier plates) are unchanged. Material was added on the outside of these features to interface with the edge-load mechanism. Clear-block studies (in which the actuation can be visually inspected during the testing process through a clear material) demonstrated no change in any pouch actuation processes. See Figure 9-2 and Figure 9-3 for comparison between manifold assemblies.
4. To fit within the FilmArray Torch Module, the manifold is now mounted directly to the chassis instead of being mounted to supports.
5. The highest concern of the new edge-load mechanism was ensuring that the pouch was brought into the same location in the manifold as when the pouch is top loaded. In the FilmArray 2.0 (and FilmArray), the peltier plate has a datum that matches up to a datum on the pouch when seated correctly into the manifold. In the FilmArray Torch, a spring-loaded mechanism holds the pouch in the same location, with the same matching, after the edge-loading mechanism has pulled it into the FilmArray Torch Module manifold. A sensor in each of the FilmArray Torch Modules confirms that the pouch is in the correct location; the user is prevented from moving forward with the test until the pouch is in the correct position. Additionally, there is a self-check step in all FilmArray systems in which an image of the array is captured at the start of the run to create a mask for the result analysis and ensure the array is in the correct position.

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Figure 9-2. FilmArray Torch Manifold Assembly

(b)(4)

[redacted]

Figure 9-3. FilmArray 2.0 Manifold Assembly

9.3.3 *Software Modifications*

As described below (see Section 9.3.4 and 9.3.5), modifications (touch screen monitor with a redesigned Dashboard, updated User Interface, and updated Workflow) have been added to support the higher-throughput, stacked configuration of the FilmArray Torch. Any modifications to the FilmArray 2.0 Software were strictly limited to those that were required to support and meet the objectives of the reduced footprint and higher throughput FilmArray Torch. Changes that would affect the performance of the reagent pouches were not allowed. The FilmArray Torch Software and modifications are described more in depth below in *Section 10, Software.*

The FilmArray RP requires the installation of a separate software pouch module before a test can be executed. The pouch module provides panel-specific instrument protocols as

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well as panel specific data analysis and results reporting rules. As stated above (see Section 9.2), the FilmArray RP pouch module used with the FilmArray Torch is the same as the pouch module used with FilmArray 2.0.

9.3.4 *User Interface Modifications*

Allowing up to 12 FilmArray Torch Modules to be operated from a single FilmArray Torch System Base, along with a modified pouch insertion workflow (see *9.3.5 Workflow Modifications*) and touchscreen interface, required the development of new user interface components in the FilmArray Torch Software. The modifications are as follows:

1. A touch screen monitor with a redesigned Dashboard (see Figure 9-4 and Figure 9-5 for a comparison of the FilmArray 2.0 and FilmArray Torch Dashboards), a Kiosk-style interaction, and reduced Windows 7 OS access was added to the User Interface in order to better handle the modified workflow.
2. Some functions were streamlined on the new User Interface in order to maintain optimal functionality with the new touchscreen monitor. The following features were streamlined:
    a. Advanced run details: Run Notes and Tags were removed
    b. Optional advanced user features: the PCR Evaluator and the option to "View Control Results" separately from the report was removed.
3. The Instrument Configuration application, which allows operators to add, remove or otherwise configure FilmArray Torch Modules on each FilmArray Torch System Base, was moved from the main User Interface of the FilmArray 2.0 Software to an Admin Mode in the FilmArray Torch User Interface.
4. The previously cleared FilmArray 2.0 Software (K143080) will be available to FilmArray Torch users who desire to use the optional advanced user features (e.g. PCR Evaluator). This software can be installed on a stand-alone computer of their choosing, allowing them to view runs exported from FilmArray Torch and access any features that were otherwise reduced or removed during modifications to create the FilmArray Torch.

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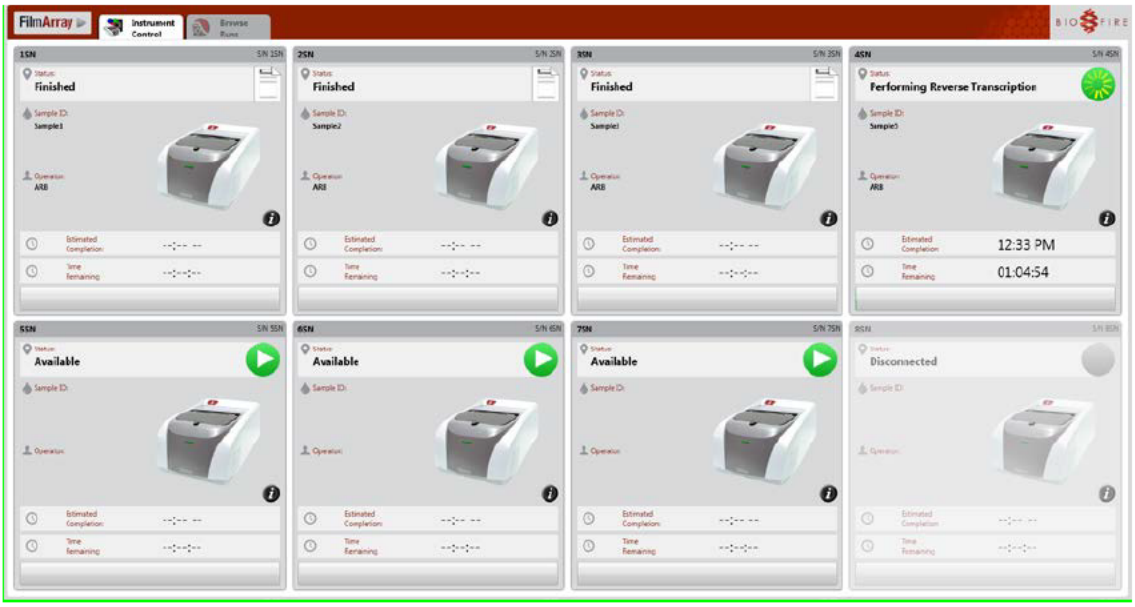

Figure 9-4. FilmArray 2.0 Instrument Dashboard

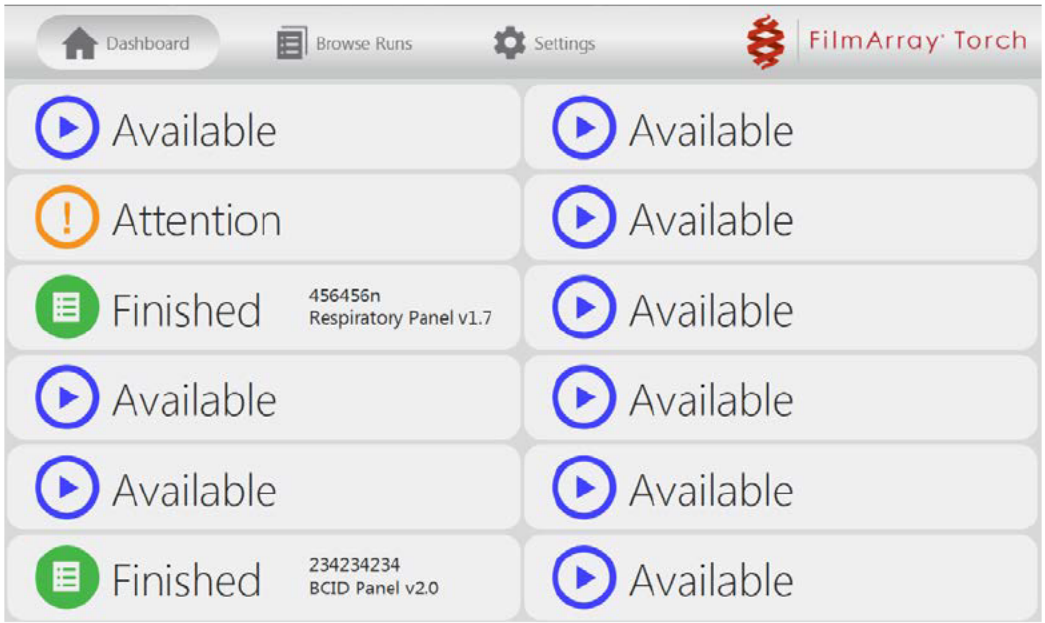

Figure 9-5. FilmArray Torch Dashboard

9.3.5 *Workflow Modifications*

Modifications from the FilmArray 2.0 workflow were required to handle the new edge-load mechanism and integrated barcode scanner of FilmArray Torch. The modifications are as follows:

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1. Pouches will be side-loaded (see Figure 9-7) and pulled into the machine by the edge-load mechanism instead of being manually top-loaded (see Figure 9-6). This was done so that the FilmArray Torch Modules could be stacked on top of each other, resulting in a reduced footprint and higher through-put.
2. The user is now required to scan the pouch before loading into the FilmArray Torch Module instead of scanning the pouch after top-loading. This is required due to the barcode being inaccessible once pulled into the FilmArray Torch Module by the edge-load mechanism.

Figure 9-6. Manual Top-Loading of the FilmArray 2.0 Instrument

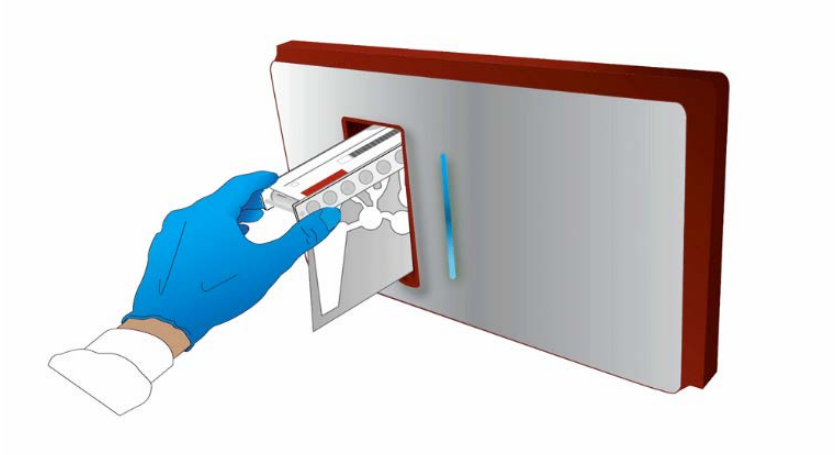

Figure 9-7. Side-Loading of the FilmArray Torch via the Edge-Load Mechanism

9.4 Combined Functions

Similar to FilmArray and FilmArray 2.0, the FilmArray Torch will be sold by both BioFire Diagnostics and its sister company, BioFire Defense.

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At BioFire Diagnostics, marketing is limited only to IVD FilmArray panels. The FilmArray Torch will come preloaded with the FilmArray Torch Software, including the FilmArray Software pouch modules for FDA cleared reagent panels (when cleared for use with FilmArray Torch). The system is provided with an IVD specific FilmArray Torch Operators Manual which specifies that the instrument is for use with IVD FilmArray reagent panels (see Appendix A.2).

BioFire Defense primarily markets reagent panels for testing of environmental samples (e.g., FilmArray Biothreat Panel); however, military customers require a system that can be used for both environmental and clinical testing. During the recent Ebola outbreaks, the military requested systems capable of testing human samples for Ebola using an EUA panel as well as the ability to perform environmental screening using reagent panels developed specifically for this purpose. In addition, the Next Generation Diagnostics System (NGDS) program includes development of reagent panels for testing of clinical and environmental samples. This capability is critical to the protection of the warfighter and for providing the military with the best tools for biosurveillance. A FilmArray Torch sold by BioFire Defense will come with both an IVD and an RUO FilmArray Torch Operators Manual (Appendix A.3).

To meet this need, the FilmArray Torch has been designed similarly to FilmArray 2.0 in order to meet the requirements outlined in the guidance document '*Molecular Diagnostic Instruments with Combined Functions – Draft Guidance for Industry and Food and Drug Adminstration Staff*' (April 9, 2013). This process was described previously in the 510(k) submission for FilmArray 2.0 (K143178)

10 Software

The FilmArray Torch Software is responsible for (1) providing on-screen instructions to the user, (2) allowing user interactions with the FilmArray Torch System Base, (e.g., entering pouch and sample information), (3) providing commands to control the operation of the FilmArray Torch Modules (coded in the panel-specific pouch modules), (4) receiving status and error messages from the FilmArray Torch Modules, (5) acquiring and processing image data from the FilmArray Torch Modules, and (6) storing and managing data in a database.

FilmArray Torch Software is pre-installed on the FilmArray Torch System Base at the time of manufacture and is the primary application that the operator interacts with. Once this core software has been installed, individual panel-specific pouch modules, like the FilmArray RP pouch module, can be installed or removed depending on the needs of the FilmArray Torch user.

While most of the core software and firmware functions (including the analysis function) of the FilmArray Torch are unchanged from FilmArray 2.0, a new software and firmware release was required to support the new user interface and the pouch edge-load mechanism. This section provides a complete description of the new version of the software and the changes to the firmware, including the required elements described in

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FDA Guidance Documents, *Guidance for the Content of Premarket Submissions for Software Contained in Medical Device* (May 11, 2005).

The FilmArray RP pouch module is unchanged from the version described in K143080; therefore, information about the pouch module will not be provided in this submission.

10.1 Level of Concern

As described in the intended use statement, the FilmArray Torch is an automated *in vitro* diagnostic (IVD) device designed to work with specific reagent pouches to detect multiple nucleic acid targets contained in clinical specimens. The FilmArray RP is used to identify microorganisms from NPS samples in viral transport medium obtained from individuals with signs and/or symptoms of respiratory infection. The test results are used in conjunction with other clinical, laboratory, and epidemiological information as an aid in the diagnosis of infectious diseases. The test results are not used as the sole basis for treatment.

The FilmArray Torch has the same intended use and risks as the FilmArray and FilmArray 2.0 and should therefore also be a Class II device. Based on the current FDA-cleared version of the RP, the FilmArray RP for use with the FilmArray Torch will be classified as a Class II device, indicating that it is a moderate risk device. A risk analysis performed at BioFire also determined that the risk of both false positive and false negative results is of moderate severity, supporting the claim that the FilmArray Torch and the FilmArray RP are Class II devices with moderate risk of causing harm to the patient or operator.

According to the guidance document, *Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices*, the FilmArray Torch and FilmArray Torch Software do not have a major level of concern because; (1) the software does not qualify as a blood establishment computer software, (2) it is not intended to be used in combination with a drug or biologic, (3) it is not an accessory to a medical device that has a major level of concern, and (4) a software failure could not result in death or serious injury to a patient or to an operator. The FilmArray Torch Software qualifies as having a moderate level of concern because it is an accessory to a medical device that has a moderate level of concern and because a software defect leading to an erroneous diagnosis or a delay in the delivery of appropriate medical care would likely lead to non-serious injury.

In accordance with this analysis and with the requirements described in EN 62304:2006 '*Medical device software – Software life-cycle processes*', the FilmArray Torch Software and all of its components (or software items) have been assigned a software safety classification of Class B, indicating that failure of the software can result in non-serious injury.

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10.2 Software and Firmware Description

10.2.1 *Overview*

The FilmArray Torch is controlled by Windows®-based software running on a computer configured with a Microsoft® Windows Operating System (Windows 7). The FilmArray Torch Software is used to control the FilmArray Torch Modules, save runs to the FilmArray database, and view the results of the runs utilizing an integrated computer with a touch screen. It has the following main features:

- Dashboard—(or "Home" screen) displays the status of each FilmArray Torch Module within the FilmArray Torch and guides operators through the process of operating the FilmArray Torch Modules and performing runs
- Browse Runs—allows operators to search for runs and perform certain operations on individual runs or on groups of runs
- Settings—allows users to perform administrative type tasks, such as managing operators (adding and updating), managing pouch modules, view system logs, archiving of runs, etc.

In addition to the FilmArray Torch Software, each reagent pouch requires a specific pouch module. The pouch module interacts with the FilmArray Torch Software and provides pouch-specific instructions, including the definition of a pouch (assay names and locations), the information required to run a pouch on a FilmArray Torch Module (the instrument protocol), analysis instructions used to interpret the data from a run and to display the results, and instructions for generating the test report. Pouch modules are developed and deployed independently of the core software. This approach allows the test menu for any FilmArray Torch to be modified without the need to change the core software. The pouch modules are installed onto the FilmArray Torch System Base via an import tool within the FilmArray Torch Software. Each FilmArray pouch module contains information necessary to perform a test with the corresponding FilmArray panel.

The architecture of the FilmArray Torch Software, including the interaction between the core software and the pouch modules, is outlined in Figure 10-1. FilmArray Torch Software Architecture is described in more detail in DCT-020046, *FilmArray Torch Software Architecture Summary* (Appendix B.1). The remainder of Section 10 focuses on the FilmArray Torch Software and Firmware.

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Figure 10-1. FilmArray Torch Software Architecture – with Overlay Indicating Modifications to FilmArray 2.0 Software (Note: new user interface includes most features/functions available in the FilmArray 2.0 user interface.)

10.2.2 *FilmArray Torch Software and Firmware*

The FilmArray Torch Software and Firmware versions were created from the current version of the FilmArray 2.0 Software and Firmware and retain the same functions and use much of the same code as the current versions (including data management). However, a new User Interface, new Workflow, and new/modified features were required to support the higher-throughput, stacked configuration of the FilmArray Torch. This section includes a complete description of the software/firmware and points out new/modified features. Figure 10-1 gives an overview of the modifications that were made to the FilmArray 2.0 Software in order to create the FilmArray Torch Software.

10.2.2.1 Admin Mode

Due to the kiosk style interaction of the FilmArray Torch, access to the native Windows functions is hidden from operators during standard FilmArray Torch use. The Admin Mode feature provides an operator with the ability to access the native Windows interface by logging on to a pre-configured administrator user account. In this mode the administrator can perform maintenance tasks such as:

- Adding or removing printers

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- Updating FilmArray Torch Software
- Utilize the Instrument Configuration Application to maintain the system

While in this mode the FilmArray Torch Software is not active.

10.2.2.2 Instrument Configuration Application

Similar to Instrument Configuration for FilmArray 2.0, the FilmArray Torch Instrument Configuration Application (Figure 10-2 and Figure 10-3) enables operators to add or remove FilmArray Torch Modules from a FilmArray Torch using a newly re-designed, intuitive user interface. However, the FilmArray Torch Instrument Configuration Application can now only be accessed through the software's Admin Mode, where the operator can then configure up to twelve FilmArray Torch Modules to the FilmArray Torch Software after they have been physically connected to the FilmArray Torch System Base. This was done to maintain an easy to use User Interface when performing tests and viewing reports. The operator can also remove FilmArray Torch Modules from the system in order to swap out FilmArray Torch Modules or alter the configuration using this application. When the configuration is completed and saved, the instruments configuration file ("instruments.config") is generated to be consumed by the FilmArray Torch Software upon startup.

Figure 10-2. Instrument Configuration for FilmArray Torch Screen 1 – Add Button (Circled in Red)

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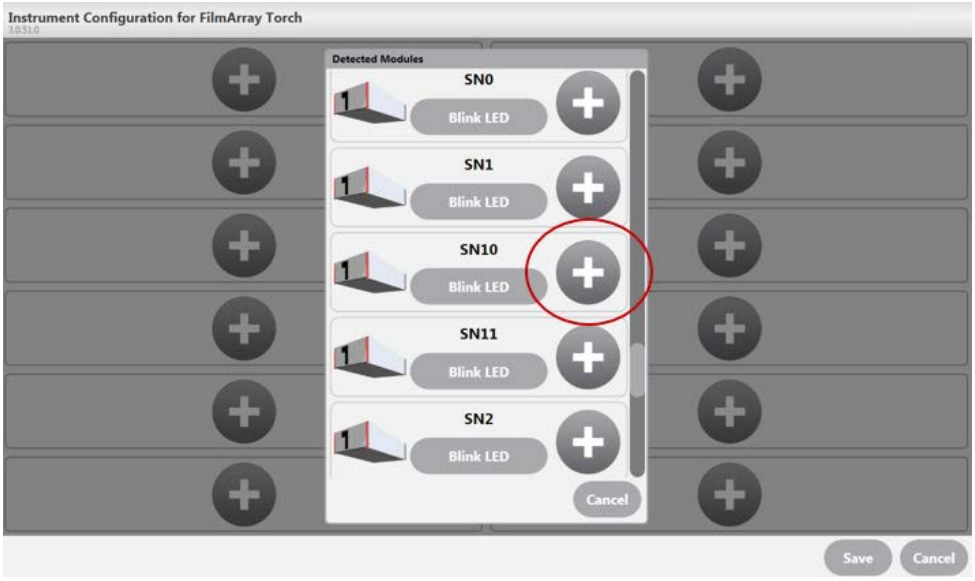

Figure 10-3. Instrument Configuration for FilmArray Torch Screen 2 – Add Button (Circled in Red)

10.2.2.3 Dashboard

The Dashboard (Figure 10-4) allows the operator to interact with several FilmArray Torch Modules from one System Base. Each FilmArray Torch Module (up to twelve) is represented by a box displayed on the computer screen. The number of boxes on the Dashboard mirrors the number of FilmArray Torch Modules that were configured using the Instrument Configuration Application. The boxes display FilmArray Torch Module status (‘Available’, ‘Finished’, ‘Attention’, or time remaining for runs in progress) and run detail information (Sample ID, Panel Type) for runs in progress or finished runs. The layout of the status information is different depending on the number of FilmArray Torch Modules configured. If the number of FilmArray Torch Modules configured is less than or equal to 6 (bottom 3 duplexes), the run information appears below the status as shown in Figure 10-4. If more than 6 instruments are configured (above the first 3 duplexes), the run information appears to the right of the status as shown in Figure 10-5.

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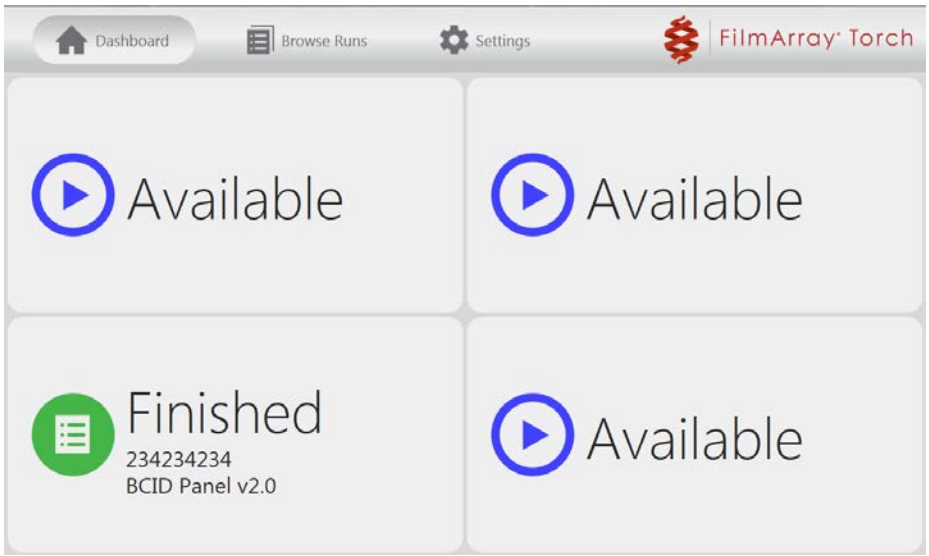

Figure 10-4. FilmArray Torch Dashboard Screenshot - 4 FilmArray Torch Modules

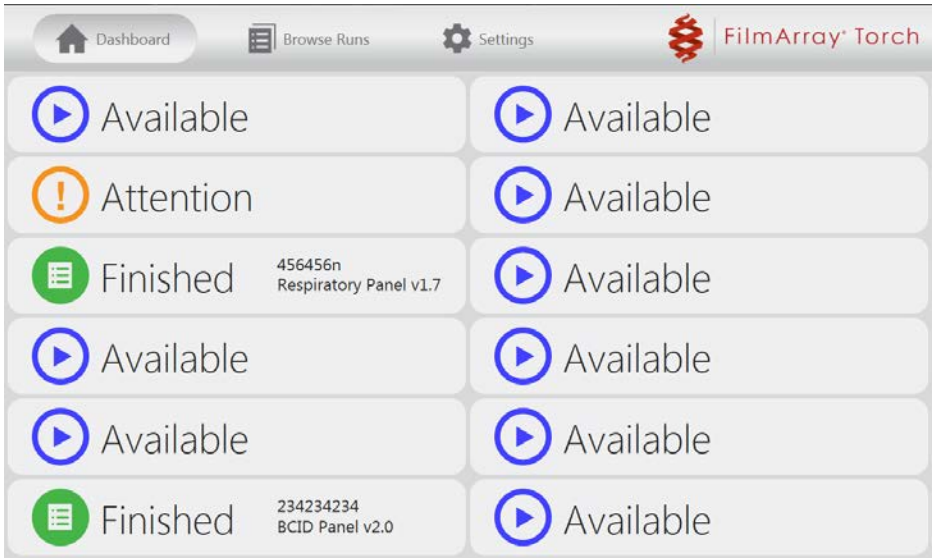

Figure 10-5. FilmArray Torch Dashboard Screenshot - 12 FilmArray Torch Modules

Any FilmArray Torch Module box can be selected to display additional details about the FilmArray Torch Module depending on its current status. To select a FilmArray Torch Module, the user simply selects the appropriate Dashboard box, which launches either the Start Run Workflow (for Available FilmArray Torch Modules), the Run in Progress screen (for FilmArray Torch Modules with in progress run time displayed), the Error Screen (for Attention FilmArray Torch Modules), or the Report screen (for Finished FilmArray Torch Modules).

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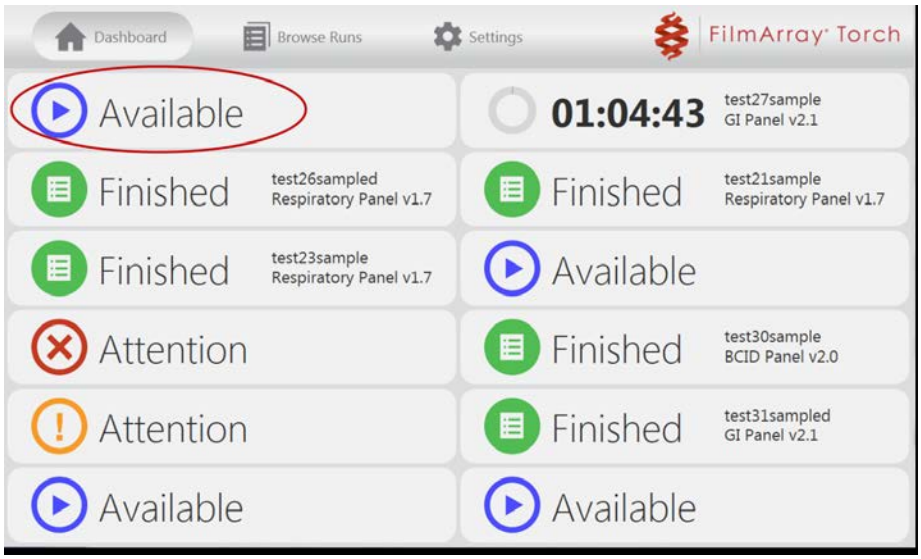

Figure 10-6. FilmArray Torch Dashboard (Instrument Control Screen) – Available FilmArray Torch Module (Circled in Red)

10.2.2.4 Run Workflow

The Run Workflow is the main user interface for setting up and performing tests on a specific FilmArray Torch Module. This replaces the Instrument Control function in the previously cleared FilmArray 2.0 Software. The Run Workflow is accessed through the Dashboard by either selecting an Available box for a FilmArray Torch Module in the Dashboard or scanning and then inserting a pouch into an available FilmArray Torch Module (indicated by flashing blue LED on the face of the FilmArray Torch Module). It then uses a combination of on-screen text, GIFs, and graphics to guide the operator though the steps of entering data (sample ID, lot, serial number, pouch type, protocol, and operator information) and starting a run (see Figure 10-5). During the test, the Run Workflow displays the steps of the testing process and the elapsed time of the run in progress (see Figure 10-6). This screen can also be accessed from the Dashboard at any time by selecting a box that shows a run in progress.

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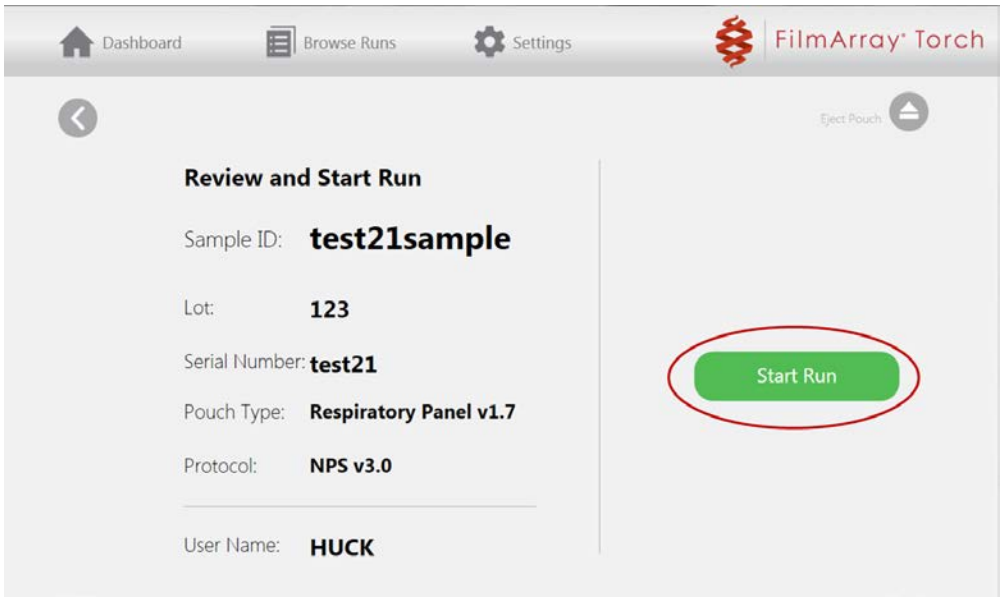

Figure 10-7. The FilmArray Torch Review and Start Run Screen – Start Run Button (Circled in Red)

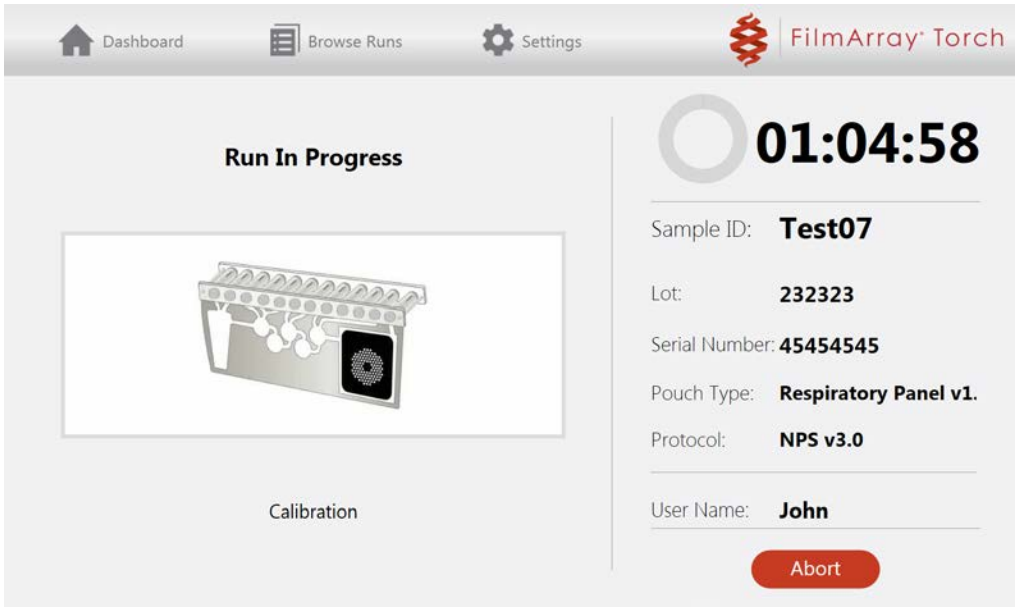

Figure 10-8. FilmArray Torch Run In Progress Screen

10.2.2.5 Starting and Monitoring a Run

Once the user initiates a test, the user input and instrument protocol are sent to the FilmArray Torch Module to start the run. For example, if 'Respiratory Panel' is entered as the pouch type at the beginning of the Run Workflow, then the instrument protocol contained in the Respiratory Panel pouch module is transferred to the FilmArray Torch

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Module at the start of the test. If the Respiratory Panel pouch module is not installed in the FilmArray Torch Software (see section *10.2.2.9 Pouch Module Management* below), then the test will not be able to execute, and an error message will be displayed to the operator.

The instrument protocol contains a specific sequence of events (including specific pressures, times, and temperatures) that are necessary for the FilmArray Torch Module to perform that test. Once the instrument protocol is downloaded, no further communication between the FilmArray Torch Module and computer in the System Base is required until the completion of the test. The FilmArray Torch Module follows the instructions and then collects paired temperature and fluorescence data for each well of the array, which is processed on-board by the FilmArray Torch Firmware. At the end of the test, the collected temperature and fluorescence data is transferred back to the computer for analysis. Data analysis is performed by the analysis service, which is unchanged in the new version of software.

The specific steps of the instrument protocol and the data analysis for all reagent pouches are unchanged from FilmArray 2.0.

10.2.2.6 Test Report Generation

When a run is completed, the software automatically generates a report with the test results. The report can be accessed three ways: (1) It is automatically displayed on the Run in Progress screen for the selected FilmArray Torch Module once the run is completed (Figure 10-9). (2) If the pouch is still in the FilmArray Torch Module, a report icon will appear once the Dashboard status has changed to ‘Finished’. The report can be accessed by selecting anywhere in that ‘Finished’ FilmArray Torch Module box on the Dashboard screen (Figure 10-10). (3) The report will be displayed when the test run is selected from the Browse Runs screen (Figure 10-9). Once displayed, the report can be printed or saved to a removable drive as a PDF, or exported (Figure 10-13) onto a removable drive and imported onto a computer running the FilmArray 2.0 Software.

As mentioned in *Section 9.3.4*, some reduced functionality was given to the FilmArray Torch Software in order to maintain optimal functionality with the new touchscreen monitor. Unlike the FilmArray 2.0 Software, operators will not have access to a PCR Evaluator and the option to view the control results (separately from the report) from the FilmArray Torch. However, by utilizing the option to export FilmArray Torch run data onto a removable drive, operators will be able to upload data onto a computer running the FilmArray 2.0 Software and utilize these optional advanced features. The FilmArray 2.0 Software will be available to every customer that purchases the FilmArray Torch.

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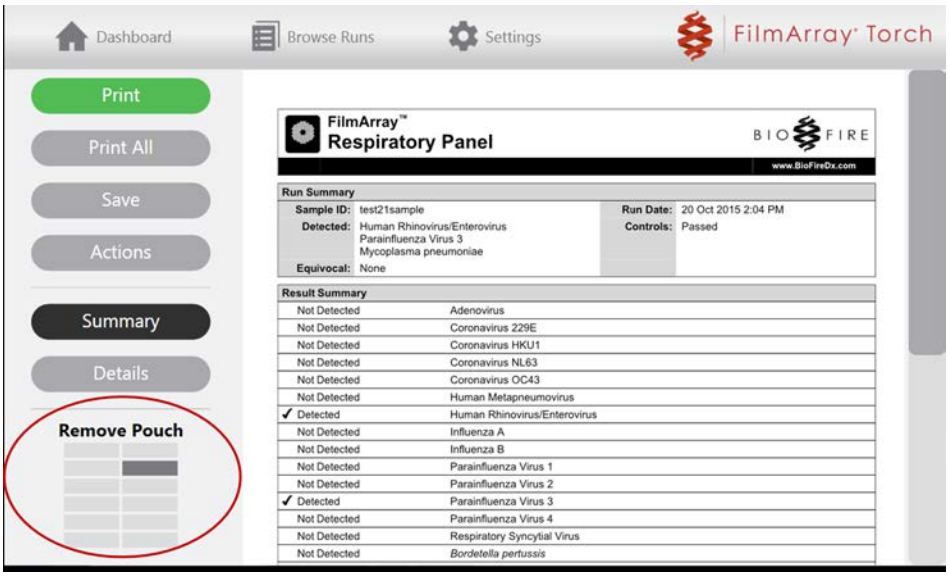

Figure 10-9. Viewing a Report from the Run in Progress Screen. A "Remove Pouch" area (circled in red) will also show on this this screen to remind users to remove the pouch.

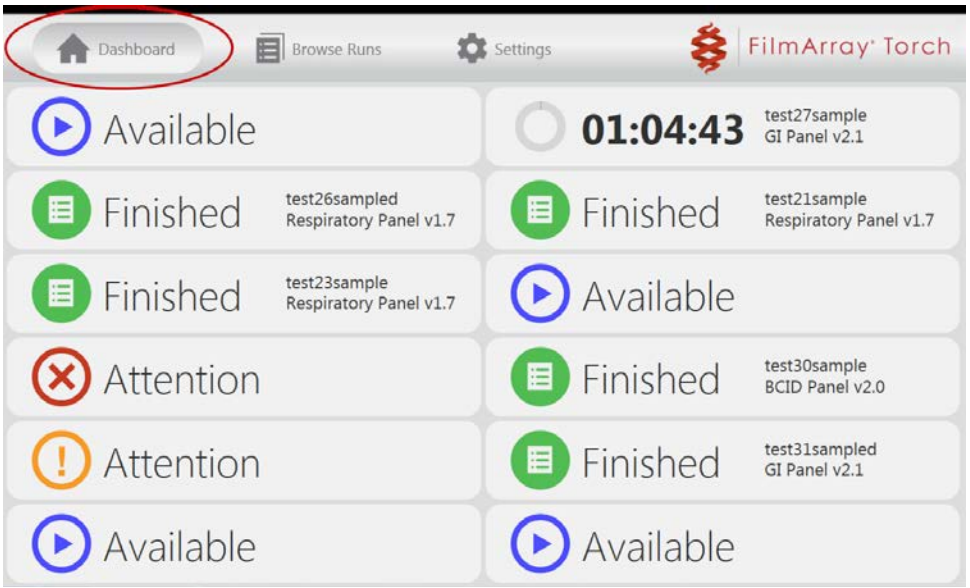

Figure 10-10. Viewing a Report from the Dashboard (Circled in Red) by Selecting a 'Finished' FilmArray Torch Module

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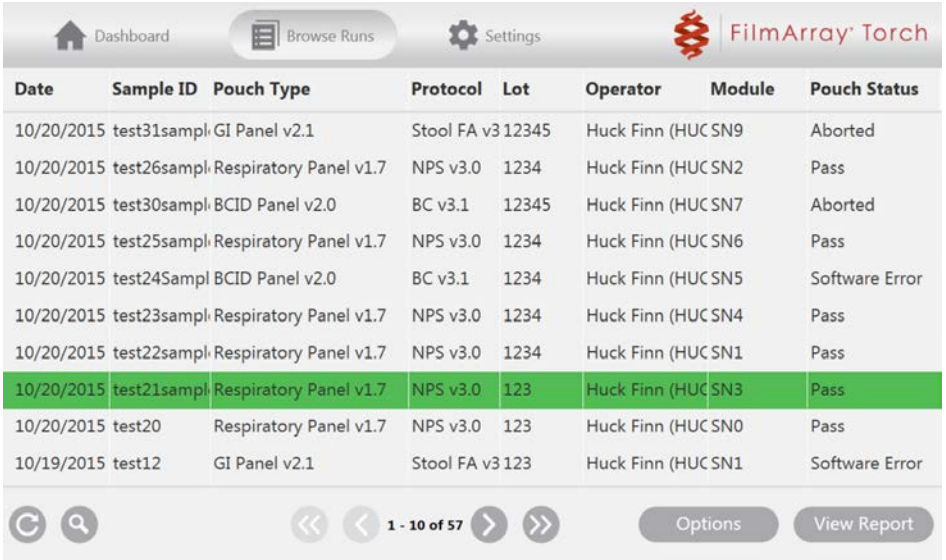

Figure 10-11. Viewing a Report from the Browse Runs Screen

10.2.2.7 Data Management

Once a test is completed, it is stored in a database, which can be searched and used to view past test data using the Browse Runs feature described in Section 10.2.2.8. The database is not changed from FilmArray 2.0. Once the database is near a pre-configured size limit, the FilmArray Torch Software prompts the user to archive run data.

10.2.2.8 Error Handling

As with the current FilmArray 2.0, the firmware monitors the FilmArray Torch Module to ensure that it is operating within specifications (including monitoring temperature and pressure control and the functionality of the optics system). If a specification is not met or an error occurs, the firmware produces an error message that the software displays on the computer screen. The error message provides the operator with a description of the error and a recommended course of action (such as resetting the FilmArray Torch Module or calling technical support). This feature is unchanged from FilmArray 2.0.

In the event that communication between the FilmArray Torch Module and the System Base is lost, the test results or error messages are saved by the firmware on-board the FilmArray Torch Module until communication is re-established. There is also a System Log in the FilmArray Torch Software that logs and displays important information, including errors, which can help with troubleshooting the system. These features are also unchanged from FilmArray 2.0.

10.2.2.9 Browse Runs

The Browse Runs page (Figure 10-11) displays information for all runs stored in the database and can be searched according to multiple criteria. Test runs can be selected to view the test report. Once the report is displayed (Figure 10-12), the user has the option

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to print the report, save the report, or create an error bundle through the Actions option. The Options button on the Browse Runs page (Figure 10-11) enables the operator to import and export runs (Figure 10-13). While the user interface for the Browse Runs page has changed considerably from that of FilmArray 2.0 in order to fit within the limited screen space, the functionality is the same.

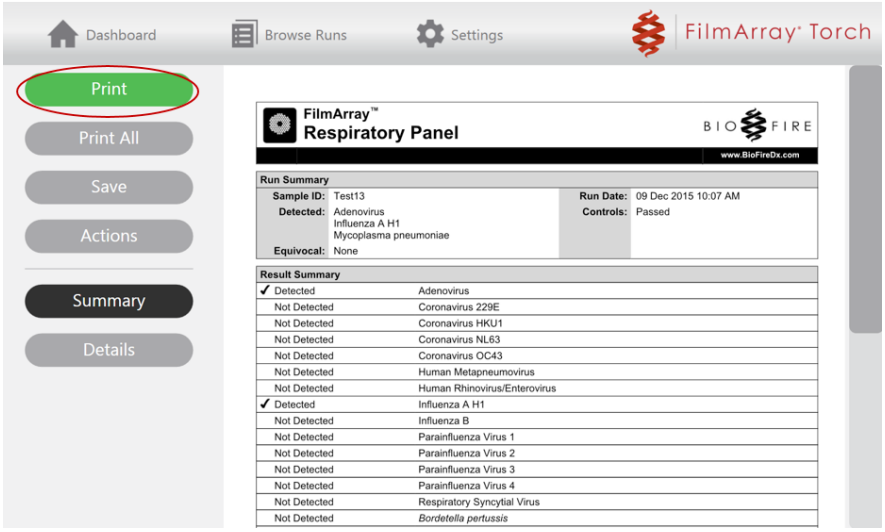

Figure 10-12. FilmArray Torch Report Displayed Through the Browse Runs Screen - Print Option (Circled in Red)

Figure 10-13. Options Menu Accessed Through the Browse Runs Page

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10.2.2.10 Pouch Module Management

The Pouch Module Management feature (Figure 10-14) enables the operator to see which FilmArray pouch modules are currently installed and available for use. The Pouch Module Manager also allows new pouch modules to be installed as they become available or uninstalled as needed. This functionality remains unchanged from FilmArray 2.0.

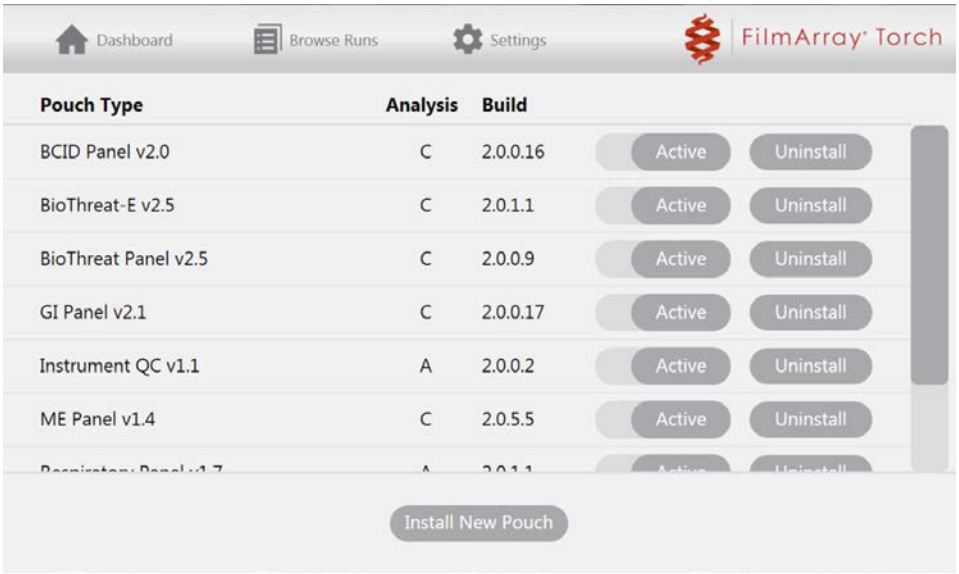

Figure 10-14. FilmArray Torch Pouch Management

10.2.2.11 Operational Environment

The FilmArray Torch Software operates on the computer that is integrated into the FilmArray Torch System Base. BioFire Diagnostics pre-configures the computer's operating system prior to shipping it to the customer. The specification for the operating system configuration, including Windows updates configuration, can be found in DCT-019643, *FilmArray Computer Image Requirements* (Appendix B.2). This computer has the following minimum specifications:

- Microsoft® Windows® 7 Embedded OS
- 12+1 Ethernet, 4 USB interfaces,
- At least Core i7 / 3.1 GHz processors,
- A dedicated graphics card,
- At least 16 gigabytes of memory, and
- At least 512 gigabytes of hard disk space.

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10.2.3 *Off-the-Shelf Software*

BioFire installs all FilmArray Torch Software applications and the necessary Off-the-Shelf (OTS) software on the FilmArray Torch System Base. The key OTS software components in the FilmArray Torch Software are the following:

(b)(4) [redacted]

Detailed documentation concerning off-the-shelf software is provided in DX-DCT-024115, *FilmArray Torch Off-the-Shelf Software Specification* (Appendix B.3) and DX-DCT-024121, *FilmArray Off-the-Shelf Software Risk Analysis* (Appendix B.4).

10.3 Device Hazard Analysis

Part of the software and firmware development process includes performing a risk analysis to identify risks, their possible causes, and appropriate control mechanisms. Risk Management of the FilmArray Torch Software and Firmware followed the processes outlined in SOP-205, *Risk Management*, which is compliant with ISO 14971:2012, *Medical devices – application of risk management to medical devices*. In brief, risk management started by identifying the hazards (the potential causes of harm) associated with the use of the FilmArray Torch. The hazards fell into four categories: false positive results, false negative results, assay reporting errors, and delayed test results. A medical expert was then consulted to determine the severity of these hazards and the likelihood that the hazard would lead to patient harm (the hazardous situation). The development team then identified potential causes of initiating events that could lead to these hazards and determined the probability of occurrence. Whenever possible, the probability of initiating events was based on actual data, such as the observed incidence of the failure mode in the clinical evaluation or in real-world use. When data was not available, the probability of the failure mode was estimated by product experts. Risk scores were then calculated as a function of severity and the likelihood of occurrence. Three score regions were defined: No Risk, Low Risk, and High Risk. After mitigation, all hazards associated with the FilmArray Torch Software have a Risk score of No Risk.

The FilmArray Torch Software Risk Analysis is provided in DX-DCT-020043, *FilmArray Torch Software Risk Analysis* (Appendix B.5).

10.4 Software and Firmware Requirements Specifications

Requirements for the FilmArray Torch Software were derived from the FilmArray Torch design inputs document that describes the system and software. As described in SOP-304, *Software Design Control*, the design inputs were converted into high-level requirements that describe the overall function of the FilmArray Torch Software.

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After the high-level requirements were determined, detailed specifications, called subsystem requirements, were developed that describe the function of the software. Appropriate teams reviewed and approved the specification documents, and they were used to concurrently drive both the software development process and the software testing process. A complete set of the Software Requirement Specifications is listed in Table 10-1 and provided in Appendix B.6.

Table 10-1. Software Requirements Documents

DOC #	DOCUMENT	REV	Location
(b)(4)	*FilmArray Torch Software Computer Image Requirements*	01	Appendix B.2
	FilmArray Torch Software High Level Requirements	02	Appendix B.6.1
	FilmArray Torch Software Workflow Requirements	02	Appendix B.6.2
	FilmArray Torch Dashboard Requirements	03	Appendix B.6.3
	FilmArray Torch Software Settings Requirements	02	Appendix B.6.4
	FilmArray Torch Instrument Configuration Requirements	01	Appendix B.6.5
	FilmArray Torch Software Browse Runs Requirements	02	Appendix B.6.6
	FilmArray Torch Database Requirements	01	Appendix B.6.7
	FilmArray Torch Software Installer Requirements	02	Appendix B.6.8
	FilmArray Torch Off-the-Shelf Software Specification	01	Appendix B.3

Requirements for the FilmArray Torch Firmware were also derived from the FilmArray Torch design inputs document. As described in SOP-301, *Design Control*, and EN-WID-116, *Engineering Development Process*, the design inputs were converted into high-level instrument requirements that describe the overall function of the instrument. The instrument requirements then drove the detailed firmware specifications.

The firmware was developed to meet these specifications. The firmware team reviewed and approved the specification documents, and they were used to define the firmware development process and the firmware verification testing. The Firmware specifications are provided in DX-DCT-018403, *HTFA Embedded Software Specification* (Appendix B.7).

10.5 Architecture Design Chart

A high-level architecture design chart for the FilmArray Torch Software is provided in Section 10.2, *Software Description* (see Figure 10-1). Additional information about the architecture of the FilmArray Torch Software, including state diagrams and flow charts is

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provided in DX-DCT-020046, *FilmArray Torch Software Architecture Summary* (see Appendix B.1).

10.6 Software Design Specification

The FilmArray Torch Software development is conducted according to procedures defined in SOP-304, *Software Design Control*. The FilmArray Firmware development is conducted according to the procedures defined in SOP-317, *Embedded Software Development*. During software and firmware development, detailed development documents are written, formally reviewed, and approved by the project manager and technical leads. These development documents take the form of detailed design specifications which drive the software and firmware development, dictate the behavior of the pouch modules, and form the basis of design verification. A complete list of Software Design Specifications for the FilmArray Torch Software is provided in DX-DCT-020044, *FilmArray Torch Software Release Summary* (see Appendix B.8). Design specifications for the FilmArray Torch Firmware are provided in DX-DCT-018403, *HTFA Embedded Software Specification* (Appendix B.7).

10.7 Traceability Analysis

BioFire Diagnostics' software traceability analysis is conducted according to procedures defined in SOP-205, *Risk Analysis* and SOP-304, *Software Design Control.* FilmArray Torch Software risk analysis (see Appendix B.5, DX-DCT-020043, *FilmArray Torch Software Risk Analysis*) links potential hazards to the software requirements that are designed to mitigate each of the identified hazards.

In addition, a traceability matrix is included in each test case. BioFire's traceability analysis is used to ensure that each requirement is appropriately tested, and to identify the test cases that must be modified when a specific requirement is modified. These individual trace matrices are compiled into a master trace matrix linking each of the FilmArray Torch Software requirements to the verification test cases (DX-DCT-024192, *FilmArray Torch Software Verification Trace Matrix)* or the validation test cases (DX-DCT-024331, *FilmArray Torch Software Validation Trace Matrix*, see Appendix B.9).

Firmware traceability is conducted according to procedures defined in SOP-205, *Risk Management*, and SOP-317, *Embedded Software Development*. Each firmware requirement traces to associated verification test cases. See DX-DCT-024171, *DCN Summary Report Beta Firmware Release 3* (Appendix B.10) for a list of firmware verification test cases.

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10.8 Software and Firmware Development Environment Description

10.8.1 *Software Development Process*

(b)(4)

[redacted]

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(b)(4) [redacted]

10.8.2 *FilmArray Torch Software Development*

(b)(4) [redacted]

10.8.3 *Firmware Development Process*

(b)(4) [redacted]

10.8.4 *Firmware Program Language*

(b)(4) [redacted]

10.8.5 *Related Software and Firmware Process Activities*

(b)(4) [redacted]

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(b)(4)

[redacted]

10.9 Verification and Validation Documentation

10.9.1 *Software Verification Testing*

(b)(4)

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The executed verification test cases for the FilmArray Torch Software are listed below and provided in Appendix B.11.

Table 10-2. Software Verification Test Documentation

VER #	DOC #	DOCUMENT TITLE	REV	LOCATION
DX-VER-021815-01	DX-DCT-023913	*FilmArray Torch Software Automated Tests Report*	01	Appendix B.11.1
	DX-DCT-021814	*FilmArray Torch Software Installer Tests*	01	Appendix B.11.2
	DX-DCT-021816	*FilmArray Torch Software Manual Tests*	01	Appendix B.11.3
	DX-DCT-023836	*FilmArray Torch Software Instrument Configuration App Tests*	01	Appendix B.11.4
	DX_DCT-021819	*FilmArray Torch Software Unit Tests*	01	Appendix B.11.5
DX-VER-021819-01	DX-DCT-023820	*FilmArray Torch Computer Image Tests*	01	Appendix B11.6

All test cases for the modified FilmArray Torch Software passed with the exception of the following:

(b)(4)

[redacted]

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10.9.2 *Firmware Verification Testing*

(b)(4)

[redacted]

10.9.3 *Validation Testing*

(b)(4)

[redacted]

Table 10-3. Software and System Validation Test Documentation

VAL #	DOC #	DOCUMENT	REV	Location
DX-VAL-021812-01	DX-DCT-021813	*FilmArray Torch Software Workflow Tests*	01	Appendix B.13.1
	DX-DCT-021817	*FilmArray Torch Software Release Candidate Tests*	01	Appendix B.13.2
DX-VAL-023368-01	N/A	*System Reliability FilmArray Torch Software Validation*	01	Appendix B.13.3

During validation, the following defect was observed and assigned a defect identification for investigation and monitoring:

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- ID 6122—The System Base operating system is not tracked in the FilmArray Torch Software. This does not affect usability and not data is lost. The operating system can be found on the System Base in Admin Mode.

After testing, the FilmArray Torch Software v3.0.837 was found to be functionally equivalent to the current version.

10.9.4 *Software Releases*

(b)(4)

[redacted]

10.9.5 *Firmware Releases*

At the end of the firmware verification cycle a design change notice (DCN) summary document (DX-DCT-024171, *DCN Summary Report Beta Firmware Release3*, Appendix B.10) was produced summarizing the results of the verification testing and the recommendation regarding releasing the firmware based on the verification results. The DCN summary was reviewed and approved by appropriate team members and team leadership prior to the firmware being released on change order.

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10.9.6 *Revision History*

The revision history for the FilmArray Torch Software is provided in the table below. This information is also provided inDX-DCT-020044, *FilmArray Torch Software Release Summary* (see Appendix B.8).

VERSION	BUILD DATE	RELEASE	DESCRIPTION
3.0.837	27 Oct 2015	DX-CO-024317	Initial release of the software used for research and development, system validation, analytical and clinical studies, and the 510(k) submission.

10.10 Unresolved Anomalies or Defects

All software defects are evaluated during software design reviews and tracked using unique identifies as per SOP-311: *Software Defect Tracking*.

The following rationale is used to classify defects and to assign severity scores for the purpose of this risk analysis:

Classification of *normal*

Software defects are classified as *normal* if they have the potential to cause any of the hazards considered in DX-DCT-020043: *FilmArray Torch Software Risk Analysis* (Appendix B.5).

HAZARD	RATIONALE
False Positive	The patient is treated unnecessarily and there is delayed treatment for the true cause. Unnecessary precautions and expenses are incurred.
False Negative	Risk scenarios are misjudged. The patient may not receive necessary treatment.
Delayed/No Result	The test must be re-run, resulting in delayed treatment.
Reporting Error	Results for validated assays may not be reported, or results for un-validated assays may be reported.

Classification of *minor*

Software defects are classified as *minor* if they do NOT have the potential to cause any of the hazards considered in DX-DCT-020043, *FilmArray Torch Software Risk Analysis*.

Classification of *enhancement*

Software defects are classified as an *enhancement* if they do not have a corresponding software requirement. Defects with this classification are not listed here.

All unresolved defects with a classification of *normal* or *minor*, i.e. all defects that are not categorized as *enhancements*, are evaluated in the table below. A probability is also assigned to each defect based on how often the defect was observed during software

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verification and validation and system validation. The probability assigned is consistent with the Probability of Hazard ranking in DX-DCT-020043, *FilmArray Torch Software Risk Analysis*.

Probability of Hazard	Rationale
ZERO (Immeasurable)	The hazard occurs in less than 1 in 10,000 runs.
Low	The hazard occurs in less than 1 in 1,000 runs.
Medium	The hazard occurs in less than 1 in 100 runs.
High	The hazard occurs in 1 in 10 runs or more.

These defects listed below were evaluated in the Output Review meeting and the software was found acceptable for release. These defects will be tracked and evaluated for possible correction in future software versions.

Table 10-4. Observed Defects

(b)(4)

[redacted]

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UNRESOLVED DEFECTS

(b)(4)

[redacted]

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UNRESOLVED DEFECTS

(b)(4)

11 Summary of Design Control Activities

11.1 Risk Analysis

BioFire Diagnostics performed a risk analysis of the modifications made to reconfigure the FilmArray 2.0 into the FilmArray Torch. The purpose of the modifications was only to place the system into an integrated tower configuration, having a much smaller footprint with minimal adjustments to any components. None of the modifications were intended to alter performance or capabilities of the device. All risks were evaluated in the context of 21 CFR 807.81(a)(3) and FDA's guidance document '510(k) Device Modifications: Deciding When to Submit a 510(k) for a Change to an Existing Device'. The following potential risks were identified.

False Negative Results caused by:

1. Combination of minor changes in FilmArray Torch Module design results in a decrease in sensitivity.

False Positive Results caused by:

1. Edge-load ejection mechanism results in an increase in pouch ruptures and contamination of work area.

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Delayed or No Results caused by:

1. User Error or confusion due to new User Interface
2. Pouches stuck in FilmArray Torch Module due to new edge-load mechanism.

User Injuries caused by:

1. No new user risks were identified. However, safety testing was performed to ensure that modifications during FilmArray Torch development did not pose any unforeseen risks to the user or the environment (see *Section 11.2* below for more information).

Validation and Verification studies were performed to assess the risks related to false negative, false positive and delayed results (see *Section 11.3* below). Warnings were also included in the FilmArray Torch Operator's Manual to address noted issues.

11.2 Instrument Testing

11.2.1 *Electrical Safety Testing*

The FilmArray Torch has been certified by UL San Jose, San Jose, CA to meet the following requirements:

- EN 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use*.

  EN 61010-1 specifies general safety requirements for electrical test and measurement equipment intended for professional use. The standard contains requirements and test methods to ensure that the design and methods of construction used provide adequate protection for the operator and the operating environment against:
  - Electric shock or burn
  - Mechanical hazards
  - Excessive temperature
  - Spread of fire from the equipment
  - Effects of fluids and fluid pressure
  - Effects of radiation, including lasers sources, and sonic and ultrasonic
  - Liberated gases, explosion and implosion.

- EN 61010-2-101:2015, *Safety requirements for electrical equipment for measurement, control and laboratory use – Particular requirements for in vitro diagnostic (IVD) medical equipment*

11.2.2 *Electromagnetic Capability*

The FilmArray Torch was tested by Nemko-CCL (Communications Certification Laboratories, Salt Lake City, UT) and found to comply with international electromagnetic emissions and susceptibility standards.

In order to verify compliance to the emissions and immunity portions of the EMC directive, Nemko-CCL applied the following standards to the FilmArray instrument:

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- EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements
- EN 61326-2-6:2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-6: Particular requirements - In vitro diagnostic (IVD) medical equipment

The results of these tests demonstrate that the FilmArray Torch does not generate electromagnetic interference (emissions) beyond the acceptable limits specified by the standard and that the instrument is capable of operating correctly in the specified level of electromagnetic disturbance (immunity). The safety and EMC test reports are part of the instrument's Design History File and are also filed in the Device Master Record.

11.3 Verification/Validation Studies

Based on the results of the risk analysis and the recommendations in *Guidance for Industry and Food and Drug Administration Staff – Assay Migration Studies for In Vitro Diagnostic Devices* (April 25, 2013), a series of validation studies were performed for the FilmArray RP on FilmArray Torch.

In all comparison studies, testing was performed on a minimum of three FilmArray Torch systems (three System Bases, each configured with up to 12 FilmArray Torch Modules) and three comparison FilmArray instruments. Detection results for each assay and/or analyte were compared, with a requirement for at least 95% agreement between FilmArray and FilmArray Torch. In addition, the melting temperature (Tm) values generated by each system were required to be equivalent between systems (within the known system variation (σ=0.5˚C) of the FilmArray). Though not utilized in the FilmArray RP results determination, crossing point (Cp) values for amplification curves give a relative indication of the efficacy of amplification and were required to be within ± 2.5 cycles when comparing between FilmArray and FilmArray Torch.

11.3.1 *System Reliability*

The reliability of the FilmArray Torch was evaluated by comparing the error rate observed during the system validation to the system specifications. All observed rates were within the system specifications.

Table 11-1. Errors Observed during System Validation.

(b)(4)

[redacted]

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11.3.2 *Detection at Low Analyte Levels and Precision*

(b)(4)

[redacted]

Table 11-2. Results of Low Analyte Reproducibility Testing on FilmArray Torch

(b)(4)

[redacted]

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(b)(4)

[redacted]

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(b)(4)

[redacted]

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(b)(4)

[redacted]

Table 11-3. Reproducibility of melting temperature (Tm) values (standard deviation or St Dev) for all FilmArray RP assays on FilmArray Torch

(b)(4)

[redacted]

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(b)(4)

[redacted]

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Table 11-4. Comparison of reproducibility results for select analytes tested at 1×LoD on the FilmArray Torch and FilmArray systems

(b)(4)

[redacted]

11.3.3 *Synthetic Template Method Comparison*

(b)(4)

[redacted]

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(b)(4)

[redacted]

11.3.4 *Negative Sample Method Comparison*

FilmArray RP reagent pouches were tested using only Sample Buffer as the test sample. Testing was performed on both FilmArray Torch (46 pouches) and FilmArray (45 pouches) systems. In all cases all expected negative results were observed (100% system agreement).

11.3.5 *Representative Organism Method Comparison*

(b)(4)

[redacted]

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Therefore, the performance of the FilmArray RP when testing a representative set of analytes is equivalent between FilmArray Torch and FilmArray.

Table 11-6. Representative RP Organism Detection Comparison between FilmArray Torch and FilmArray

Organism	# Detected/Tested %Detected	
	Torch	FilmArray
Adenovirus [DNA Virus]	25/25 100%	24/24 100%
Human Rhinovirus [RNA Virus]	25/25 100%	24/24 100%
Influenza A H1-2009 [RNA Virus]	25/25 100%	24/24 100%
Parainfluenza Virus 3 [RNA Virus]	25/25 100%	23/24 95.8%
Mycoplasma pneumoniae [Bacterium]	25/25 100%	24/24 100%

Table 11-7. Representative RP Organism Cp and Tm Comparison between FilmArray Torch and FilmArray

(b)(4)

[redacted]

11.3.6 *User Evaluation*

A summative usability evaluation for the FilmArray Torch Software and its touchscreen user interface was conducted by an independent human factors engineer. A total of 15 representative user participants were tested on usage scenarios that included setting up and starting a new test run, reviewing and printing test reports, finding previously completed tests in Browse Runs, using the Browse Runs search feature, responding to error messages and using the Settings menu. Test participants represented lab technicians who are the primary user group for the FilmArray Torch.

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In general, participants were able to navigate around in the software very easily. They found the touchscreen interface responsive, intuitive and easy to use. Participants were able to complete most of the task scenarios correctly and on their own. Some minor enhancements were identified as a result of this testing, which have been documented in section 10.10.

12 Substantial Equivalence

The FilmArray Respiratory Panel for use with the FilmArray Torch is substantially equivalent to the FilmArray Respiratory Panel (K143080), which was cleared on February 17, 2015 and determined to be a Class II device.

The following table compares the FilmArray Respiratory Panel for use with the FilmArray Torch to the previously cleared FilmArray Respiratory Panel (K143080). The table outlines the similarities and differences between the two systems.

Table 12-1. Comparison of the FilmArray Torch Respiratory Panel to the current FilmArray Respiratory Panel.

Element	Modified Device: FilmArray Respiratory Panel for use with the FilmArray Torch	Predicate: FilmArray Respiratory Panel for use with the Multi-instrument FilmArray System (K143080)
Organisms Detected	Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Respiratory Syncytial Virus, Human Metapneumovirus, Adenovirus, Parainfluenza 1, Parainfluenza 2, Parainfluenza virus 3, Parainfluenza 4, Human Rhinovirus/Enterovirus, Coronavirus HKU1, Coronavirus NL63, Coronavirus 229E, Coronavirus OC43, *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae*, and *Bordetella pertussis*.	Same
Analyte	RNA/DNA	Same
Specimen Types	Nasopharyngeal swabs	Same
Technological Principles	Nested multiplex RT-PCR followed by high resolution melting analysis to confirm identity of amplified product.	Same
Instrumentation	Single instrument FilmArray System, FilmArray 2.0 System, or FilmArray Torch System	Single instrument FilmArray System or FilmArray 2.0 System
Instrument-Software Communication	Communication for multiple FilmArray Torch Modules travels via Ethernet cable/port.	Same (multiple instruments)
Time to result	About 1 hour	Same

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Element	Modified Device: FilmArray Respiratory Panel for use with the FilmArray Torch	Predicate: FilmArray Respiratory Panel for use with the Multi-instrument FilmArray System (K143080)
Test Interpretation	Automated test interpretation and report generation. User cannot access raw data.	Same
Reagent Hydration and Sample Loading	Syringe-based loading procedure or FilmArray Injection Vial-based loading procedure	Same
Sample Preparation Method	Sample Processing is automated in the FilmArray RP pouch.	Same
Reagent Storage	Reagents are stored at room temperature.	Same
Controls	Two controls are included in each reagent pouch to control for sample processing and both stages of PCR and melt analysis.	Same
User Complexity	Moderate/Low	Same

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Special 510(k) Summary
BioFire Diagnostics, LLC

FilmArray Respiratory Panel (RP) for use with FilmArray Torch

Introduction: According to the requirements of 21 CFR 807.92, the following information provides sufficient detail to understand the basis for a determination of substantial equivalence.

Submitted by:
BioFire Diagnostics, LLC
390 Wakara Way
Salt Lake City, UT 84108

Contact:
Kristen Kanack,
Telephone: 801-736-6354, ext. 330
Fax: 801-588-0507
Email: Kristen.kanack@biofiredx.com

Date Submitted:
January 12, 2016

Trade Name:
FilmArray Respiratory Panel (RP) for use with FilmArray Torch

Classification Name:
21 CFR 866.3980 – Respiratory Viral Panel Multiplex Nucleic Acid Assay
21 CFR 862.2570 – Instrumentation for Clinical Multiplex Test Systems

Predicate Device:
K143080 – FilmArray Respiratory Panel for Use with Multi-Instrument FilmArray System (FilmArray 2.0)

Intended Use:
The FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and

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epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the Film Array RP may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis*, Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4 were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens.

Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., cell culture or sequence analysis).

The FilmArray RP assay for Coronavirus OC43 may cross-react with some isolates of Coronavirus HKU1. A dual positive result may be due to cross-reactivity or may indicate a co-infection.

Performance characteristics for Influenza A were established when Influenza A 2009 H1N1, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent Influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

Device Description:
The FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The FilmArray Respiratory Panel is designed to be used with FilmArray systems (currently FilmArray and FilmArray 2.0). This 510(k) modifies the Device by adding the FilmArray Torch as an additional instrument system for use with the FilmArray Respiratory Panel.
The FilmArray RP pouch contains freeze-dried reagents to perform nucleic acid purification, reverse transcription, and nested, multiplex PCR with DNA melt analysis. FilmArray RP simultaneously conducts 20 tests for the identification of respiratory pathogens from nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections (Table 1). Results from the FilmArray RP test are available within about one hour.

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Table 1. Bacteria and Viruses Detected by the FilmArray Respiratory Panel

Viral Respiratory Pathogens
Adenovirus
Coronavirus 229E
Coronavirus HKU1
Coronavirus NL63
Coronavirus OC43
Human Metapneumovirus
Human Rhinovirus/Enterovirus
Influenza A
H1 subtype
H3 subtype
H1-2009 subtype
Influenza B
Parainfluenza Virus 1
Parainfluenza Virus 2
Parainfluenza Virus 3
Parainfluenza Virus 4
Respiratory Syncytial Virus
Bacterial Respiratory Pathogens
Bordetella pertussis
Chlamydophila pneumoniae
Mycoplasma pneumoniae

A test is initiated by loading Hydration Solution and an unprocessed patient nasopharyngeal swab (NPS) specimen (i.e. specimen mixed with Sample Buffer) into the FilmArray RP pouch. The pouch contains all of the reagents required for specimen testing and analysis in a freeze-dried format; the addition of Hydration Solution and specimen/Sample Buffer Mix rehydrates the reagents. After the pouch is prepared, the FilmArray software guides the user though the steps of placing the pouch into the instrument, scanning the pouch barcode, entering the sample identification, and initiating the run.

FilmArray systems contain a coordinated system of inflatable bladders and seal points, which act on the pouch to control the movement of liquid between the pouch blisters. When a bladder is inflated over a reagent blister, it forces liquid from the blister into connecting channels. Alternatively, when a seal is placed over a connecting channel it acts as a valve to open or close a channel. In addition, electronically controlled pneumatic pistons are positioned over multiple plungers in order to deliver the rehydrated reagents into the blisters at the appropriate times. Two Peltier devices control heating and cooling of the pouch to drive the PCR reactions and the melt curve analysis.

Nucleic acid extraction occurs within the FilmArray pouch using mechanical and chemical lysis followed by purification using standard magnetic bead technology. After extracting and purifying nucleic acids from the unprocessed sample, the FilmArray performs a nested multiplex PCR that is executed in two stages. During the first stage, the FilmArray performs a single, large volume, highly multiplexed reverse transcription PCR (RT-PCR) reaction. The products from first stage PCR are then diluted and combined with a fresh, primer-free master mix and a fluorescent double stranded DNA binding dye (LC Green™ Plus, BioFire Defense, LLC). The

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solution is then distributed to each well of the array. Array wells contain sets of primers designed specifically to amplify sequences internal to the PCR products generated during the first stage PCR reaction. The 2nd stage PCR, or nested PCR, is performed in singleplex fashion in each well of the array. At the conclusion of the 2nd stage PCR, the array is interrogated by melt curve analysis for the detection of signature amplicons denoting the presence of specific targets. A digital camera placed in front of the array captures fluorescent images of the PCR reactions and software interprets the data.

The FilmArray Software automatically interprets the results of each DNA melt curve analysis and combines the data with the results of the internal pouch controls to provide a test result for each organism on the panel.

Device Comparison:

The purpose of this submission is to add FilmArray Torch as an additional instrument system for use with the FilmArray Respiratory Panel. There have been no changes to the previously cleared FilmArray Respiratory Panel reagent kit itself. In order to increase throughput capacity, the FilmArray 2.0 was modified to develop the FilmArray Torch by organizing densely packaged instruments (now called FilmArray Torch Modules) into a "tower" configuration having the computer with touchscreen interface incorporated into the system base. Pouches are now inserted horizontally rather than from the top. This configuration allows the FilmArray Torch Modules to be stacked directly on top of each other to minimize system footprint.

The following table compares the FilmArray Respiratory Panel for use with the FilmArray Torch to the previously cleared FilmArray Respiratory Panel for Use with the Multi-instrument FilmArray System (FilmArray 2.0) (K143080). The table outlines the similarities and differences between the two systems.

Table 2. Comparison of the Respiratory Panel for use with FilmArray Torch to the current FilmArray Respiratory Panel for use with FilmArray 2.0.

Element	Modified Device: FilmArray Respiratory Panel for use with FilmArray Torch	Predicate: FilmArray Respiratory Panel for use with the Multi-instrument FilmArray System (FilmArray 2.0) (K143080)
Organisms Detected	Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Respiratory Syncytial Virus, Human Metapneumovirus, Adenovirus, Parainfluenza 1, Parainfluenza 2, Parainfluenza virus 3, Parainfluenza 4, Human Rhinovirus/Enterovirus, Coronavirus HKU1, Coronavirus NL63, Coronavirus 229E, Coronavirus OC43, *Mycoplasma pneumoniae*, *Chlamydophila pneumoniae*, and *Bordetella pertussis*.	Same
Analyte	RNA/DNA	Same
Specimen Types	Nasopharyngeal swabs	Same

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Element	Modified Device: FilmArray Respiratory Panel for use with FilmArray Torch	Predicate: FilmArray Respiratory Panel for use with the Multi-instrument FilmArray System (FilmArray 2.0) (K143080)
Technological Principles	Nested multiplex RT-PCR followed by high resolution melting analysis to confirm identity of amplified product.	Same
Instrumentation	Single instrument FilmArray system, FilmArray 2.0 system, or FilmArray Torch system	Single instrument FilmArray system or FilmArray 2.0 system
Instrument-Software Communication	Communication for multiple FilmArray Torch Modules travels via Ethernet cable/port.	Same (multiple instruments)
Time to result	About 1 hour	Same
Test Interpretation	Automated test interpretation and report generation. User cannot access raw data.	Same
Reagent Hydration and Sample Loading	Syringe-based loading procedure or FilmArray Injection Vial-based loading procedure	Same
Sample Preparation Method	Sample Processing is automated in the FilmArray RP pouch.	Same
Reagent Storage	Reagents are stored at room temperature.	Same
Controls	Two controls are included in each reagent pouch to control for sample processing and both stages of PCR and melt analysis.	Same
User Complexity	Moderate/Low	Same

Performance Characteristics of FilmArray RP on FilmArray Torch

Validation studies have established that the performance characteristics of FilmArray RP, including LoD and reproducibility, are equivalent on FilmArray, FilmArray 2.0, and FilmArray Torch.

Contrived samples containing each FilmArray RP analyte at low positive levels (1x LoD) were tested on three complete FilmArray Torch systems (12 FilmArray Torch Modules per system) over five days (30 replicates per analyte per system for 90 total replicates per analyte). Agreement with the expected Detected results on FilmArray Torch systems was ≥95.6% for each FilmArray RP analyte and agreement with the expected negative results (Not Detected) was 100% for each analyte.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Truthful and Accurate Statement for the Modification to the FilmArray Respiratory Panel (FilmArray Torch)

Pursuant to 21 CFR 807.87(k), I, Kristen Kanack, in my capacity as Vice President of Regulated Products and Clinical Affairs at BioFire Diagnostics, LLC, certify that to the best of my knowledge all data and information submitted in this premarket notification are truthful and accurate and that no material fact has been omitted.

Kristen Kanack

Kristen Kanack, PhD
Vice President, Regulated Products
and Clinical Affairs

12 January 2016
Date

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Declaration of Conformity with Design Controls

Verification Activities

To the best of my knowledge, the verification activities, as required by the risk analysis, for the modification were performed by the designated individual(s) and the results demonstrated that the predetermined acceptance criteria were met.

Kristen Kanack

Kristen Kanack, PhD
Vice President, Regulated Products
and Clinical Affairs
BioFire Diagnostics, LLC

12 January 2016
Date

Manufacturing Facility

The manufacturing facility, **BioFire Diagnostics, LLC**, is in conformance with the design control requirements as specified in 21 CFR 820. 30 and the records are available for review.

Gina Bergman

Gina Bergman
Director of Quality Assurance
BioFire Diagnostics, LLC

01-12-2016
Date

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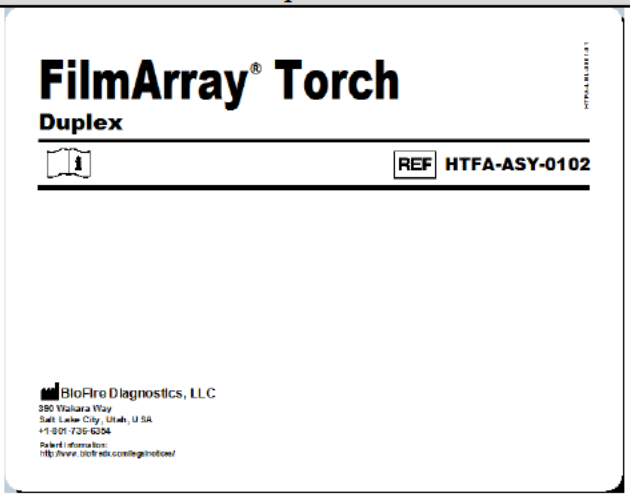
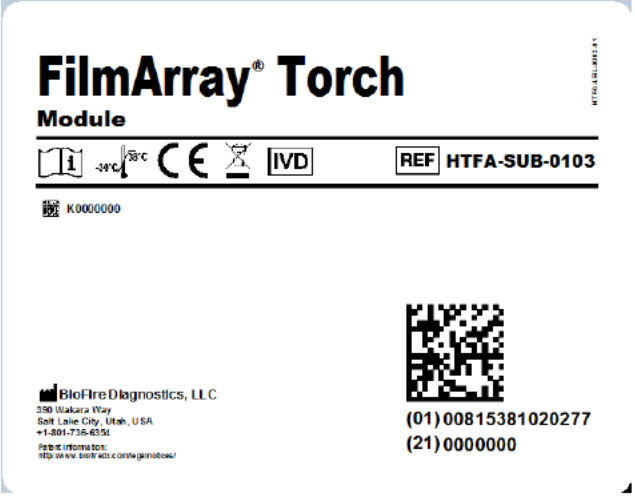
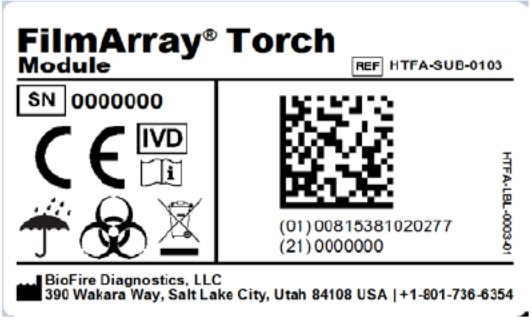
BFDX PN	Sample Label
FilmArray Torch Duplex Outer Box Label (HTFA-LBL-0001)	
FilmArray Torch Module Outer Box Label (HTFA-LBL-0002)	
FilmArray Torch Module Serial Number Label (HTFA-LBL-0003)	

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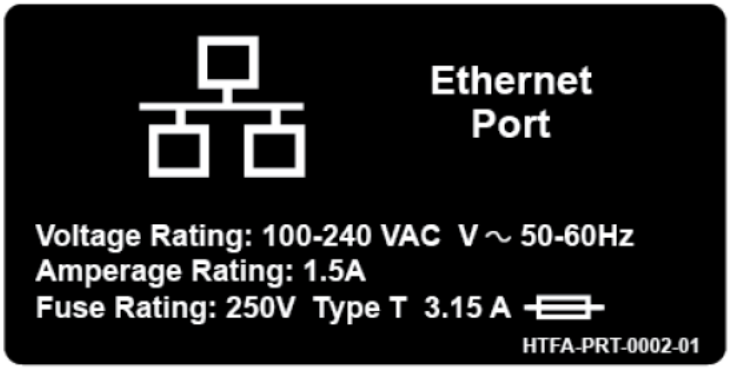
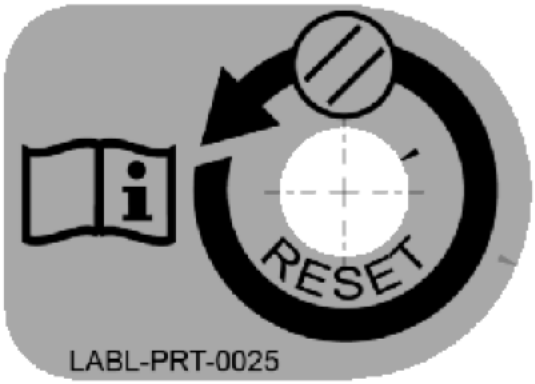
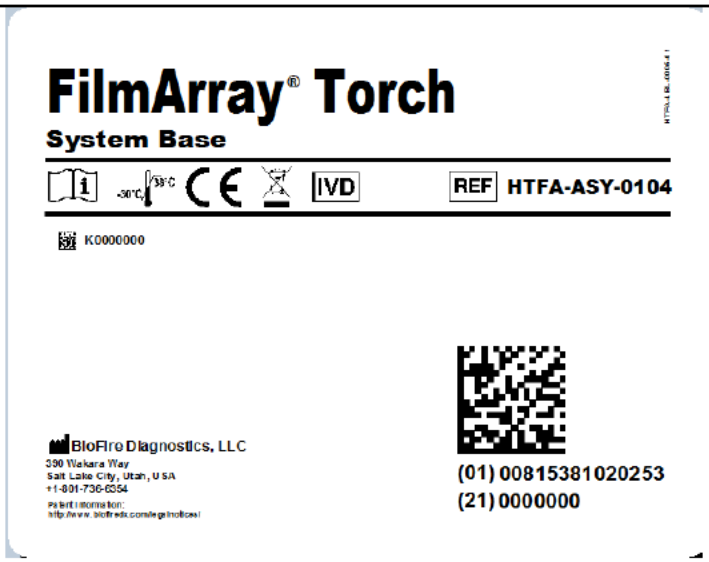
BFDX PN	Sample Label
FilmArray Torch Module Electrical Label (HTFA-LBL-0002)	
FilmArray Torch Module Reset Label (LABL-PRT-0025)	
FilmArray Torch System Base Outer Box Label (HTFA-LBL-0005)	

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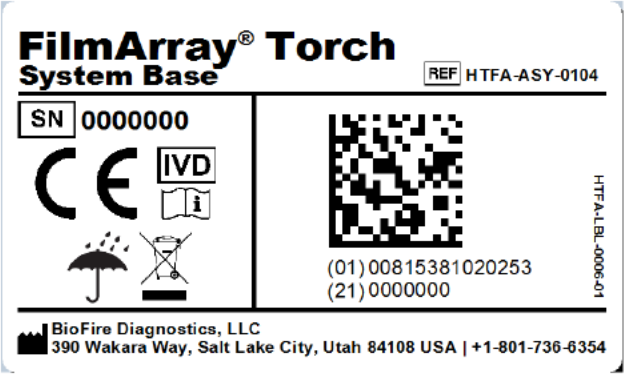
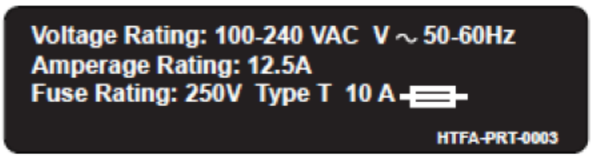
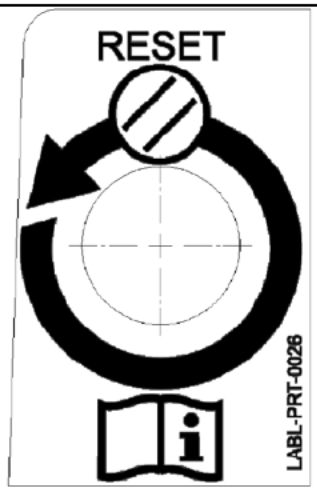
BFDX PN	Sample Label
FilmArray Torch System Base Serial Number Label (HTFA-LBL-0006)	
FilmArray Torch System Base Electrical Label (HTFA-LBL-0003)	
FilmArray Torch System Base Reset Label (LABL-PRT-0026)	

BFDX PN	Sample Label
UL Listed DNA Label (RFIT-LBL-0297)	
Rebuilt UL Listed DNA Label (RFIT-LBL-0298)	
HTFA Port ID Label (LABL-PRT-0027)	

BFDX PN	Sample Label
HTFA USB Port Label (LABL-PRT-0028)	
FilmArray Torch E-Labeling Information Label (RFIT-LBL-0299)	
FilmArray Torch Operator's Manual (HTFA-PRT-0001-Draft January 2016)X	

BFDX PN	Sample Label
FilmArray Torch Information Quick Guide (HTFA-PRT-0007-Draft)	
BioFire Logo Label (RFIT-LBL-0310)	

BFDX PN	Sample Label
FilmArray Torch Information CD Label (HTFA-PRT-0008)	

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Operator's Manual

For *In Vitro* Diagnostic Use

IVD

CE

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A BIOMÉRIEUX COMPANY

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This document is used solely for the purpose of FilmArray Torch operation.

Always maintain the FilmArray Torch in good working order. If used in a manner not specified by BioFire Diagnostics, LLC, then protection provided by the equipment may be impaired.

A printed version of this manual is available upon request.

BioFire Diagnostics, LLC
390 Wakara Way
Salt Lake City, UT 84108
USA

EC REP Qarad b.v.b.a.
Cipalstraat 3
B-2440 Geel, Belgium

FilmArray® Torch Operator s Manual IVD HTFA-PRT-0001-DRAFT January 2016

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E-Labeling

The manual for this product can be accessed online at www.online-ifu.com/KEY-CODE. The product KEY-CODE is provided on the outer box label at the end of the URL. The KEY-CODE for this operator's manual is also listed below. Additionally, a paper copy is available upon request by contacting customer service via phone, fax, e-mail, or regular mail.

FilmArray Torch Operator's Manual	ITI0066	http://www.online-ifu.com/ITI0066
FilmArray Torch Information Quick Guide	ITI0077	http://www.online-ifu.com/ITI0077

Customer and Technical Support

Customer and Technical Support for U.S. Customers	
Reach Us on the Web www.biofiredx.com **Reach Us by E-mail** support@biofiredx.com **Reach Us by Mail** 390 Wakara Way Salt Lake City, UT 84108 USA	**Reach Us by Phone** 1-800-735-6544 –Toll Free (801) 736-6354 - Utah **Reach Us by Fax** (801) 588-0507
Customer and Technical Support Outside of the U.S.	
Contact the local bioMérieux sales representative or an authorized distributor for technical support.	

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Table of Symbols

The following symbols can be found on the FilmArray Torch Modules, the System Base, the Duplex(es), the FilmArray pouches, or throughout this manual. Use the definitions below as a guideline to interpreting the symbols.

	Manufacturer		Biological risks		Caution
	Consult instructions for use	www	Instructions for use available online	Tel.	Instructions for use available by telephone
IVD	*In vitro* diagnostic medical device	REF	Catalog number	SN	Serial number
LOT	Batch code (Lot number)	CE	European Union Conformity	EC REP	Authorized representative in the European Community
c UL us LISTED	Underwriter's Laboratory Listing Mark		Electrical Power		Protective Ground
	Off		On		Reset
	Alternating current		WEEE - Do not throw in trash		USB Cable
	Keep dry		Ethernet Cable		Use-by date (YYYY-MM-DD)
	Temperature limit		The NOTE symbol explains how to operate the FilmArray Torch more efficiently.		

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Abbreviation of Terms

A.....amp (ampere)
cm .....centimeters
DNA .....deoxyribonucleic acid
dNTP.....deoxyribonucleotide triphosphate
kg.....kilograms
Hz .....hertz
in .....inches
IVD.....*in vitro* diagnostic
lbs .....pounds
m.....meters
nmPCR .....nested multiplex PCR
PCR .....polymerase chain reaction
PPE.....personal protective equipment
RNA .....ribonucleic acid
RT .....reverse transcription
Taq .....enzyme from Thermus aquaticus
Tm.....melting temperature
VAC.....volt, alternating current

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CHAPTER 1: FILMARRAY TORCH

FilmArray Torch Intended Use

The FilmArray Torch is an automated *in vitro* diagnostic (IVD) device intended for use with FDA cleared or approved IVD FilmArray panels. The FilmArray Torch is intended for use in combination with assay specific reagent pouches to detect multiple nucleic acid targets contained in clinical specimens. The FilmArray Torch interacts with the reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nested multiplex PCR (nmPCR) in a closed system. The resulting PCR products are evaluated using DNA melting analysis. The FilmArray Torch Software automatically determines the results and provides a test report.

FilmArray Torch is a modification of FilmArray 2.0 and is composed of two to twelve FilmArray Torch Modules connected to a FilmArray Torch System Base running FilmArray Torch Software. The FilmArray Torch System Base houses two FilmArray Torch Modules. Up to five Duplex Module enclosures, each capable of housing two additional Torch Modules, may be added on top of the FilmArray Torch System Base. Each FilmArray Torch Module can be randomly and independently accessed to run a reagent pouch. The FilmArray Torch Software controls the function of each FilmArray Torch Module and collects, analyzes, and stores data generated by each FilmArray Torch Module.

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Limitations of Use

- This product can be used only with FilmArray pouches.
- For prescription use only.
- The FilmArray Torch is intended to be used in combination with FilmArray panels that have been FDA cleared or approved for use on the FilmArray Torch.
- Do not remove the FilmArray Torch Module(s) face plate during a run.
- Use only the supplied cables when connecting any FilmArray Torch Module to the FilmArray Torch System Base.
- Do not use cable extenders to increase cable length.
- Do not install any software other than the BioFire Diagnostics FilmArray Torch Software on the computer unless required by peripheral devices (printers, flash drives, other USB devices).
- Do not install any antivirus software on the computer.
- Do not enable Windows Automatic Updates on the computer.
- Do not change screensaver settings on the computer.
- Do not run other software programs when running the FilmArray Torch Software.
- Do not enable wireless network connections.
- Do not modify the FilmArray Torch Software or configuration settings.
- Do not adjust system settings (such as date/time) while FilmArray Torch Modules are running.
- Do not re-run a pouch associated with an error, incomplete run, or invalid result.
- Only authorized service personnel should install and perform service or repairs on the FilmArray Torch.

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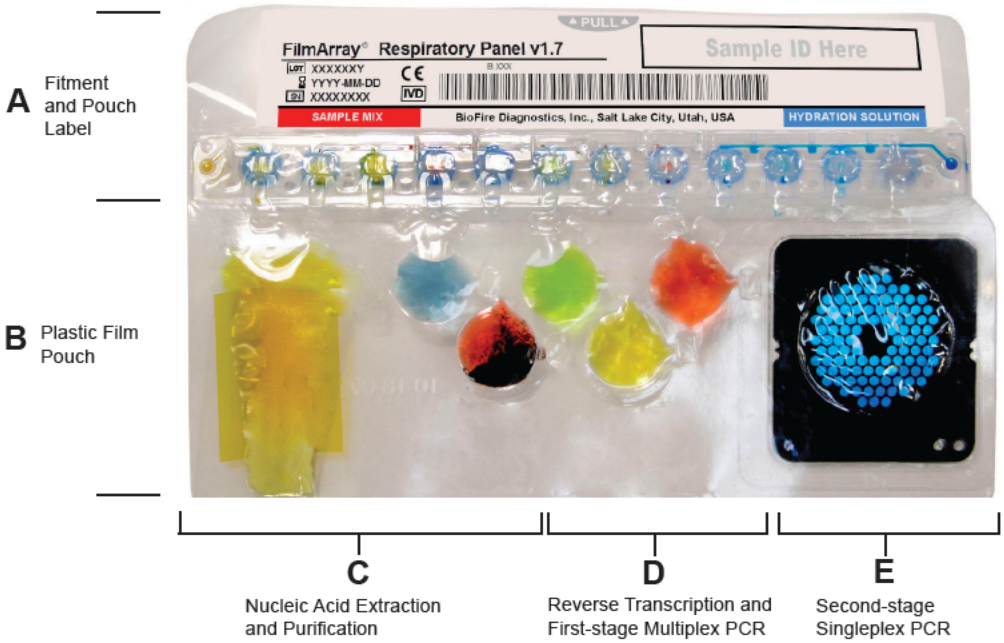
FilmArray Pouch

Each FilmArray pouch is a self-contained, closed-system disposable that houses all the chemistry required to isolate, amplify, and detect nucleic acid from a sample. The reservoirs in the rigid plastic component, or fitment, of the pouch (A) contain freeze-dried reagents. The flexible plastic film portion of the pouch (B) is divided into discrete segments (blisters) which, via interactions with actuators and sensors in the FilmArray Torch Module, are where the following chemical processes are performed:

(C) Extraction and purification of nucleic acids from a clinical sample using mechanical lysis (bead beating) and magnetic bead technology

(D) First-stage multiplex PCR (including reverse transcription of target RNAs when appropriate)

(E) Second-stage singleplex PCR and melting analysis within a multi-well array



NOTE: The colored liquid in this image of a FilmArray pouch is for visualization only. FilmArray pouches do not contain any colored fluid.

Each pouch contains at least one internal process control. Control material is lysed and the nucleic acids of the control material are extracted along with that of the organisms contained in the sample. When the internal control is positive, proper operation of the FilmArray Torch Module and chemical processes have been demonstrated.

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FilmArray Torch

Major components and operations of the FilmArray Torch are described below. A full list of components can be found in *Chapter 2* and specific step-by-step operating instructions can be found in *Chapter 5*.

FilmArray Pouch Modules

Each FilmArray reagent pouch requires a pouch specific software called a pouch module to be installed on the FilmArray Torch in order to perform a test. These pouch modules contain definitions, instrument protocols, analysis and reporting for specific FilmArray reagent kits. See the *Pouch Modules* section in *Chapter 6* for more information.

FilmArray Pouch Preparation

Refer to the *Procedure* section of the appropriate FilmArray reagent kit instruction booklet for step-by-step instructions for sample and pouch preparation.

FilmArray Torch Runs

The FilmArray Torch is used in combination with FilmArray reagent pouches to perform tests, also known as runs, that detect multiple nucleic acid targets contained in clinical specimens. The FilmArray Torch interacts with the reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nmPCR in a closed system.

The FilmArray Torch Software includes a detailed workflow that guides the operator on how to perform a run. Once a pouch has been prepared for testing, on-screen instructions prompt the operator to enter pouch and sample information, insert the pouch into an available Torch Module and start the run. For more information on starting a FilmArray Torch run, see *Chapter 5.*

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FilmArray Torch Module and Pouch Interaction

After the run is started, a series of plungers, pneumatic actuators, and hard seals work together to move and mix liquid reagents between the blisters of the pouch. The FilmArray Torch Module controls these functions automatically based on the pouch module run protocol selected for a specific pouch and sample type in the FilmArray Torch Software.

Mechanical Lysis

The first step in processing a sample is to break the outer membrane of the target cells or organisms contained in the sample using a device called a bead-beater. A sensor detects the speed and operation of the bead-beater motor and aborts the run if the bead-beater is not working properly.

Nucleic Acid Extraction

Following bead-beating, the nucleic acids contained in the sample are purified by magnetic bead technology. A retractable magnet is used to capture or release the magnetic beads during washes.

Thermal Control

The purified nucleic acids are mixed with PCR reagents, which amplify all of the targets identified by the pouch as well as the control material. A Peltier device drives the thermocycling (heating and cooling of the solution) of the reverse transcription and/or first-stage PCR reactions. A second Peltier device controls thermocycling for second-stage PCR and DNA melting. These reactions take place in the array located in the final pouch blister. The thermocycling conditions are controlled by the run protocol associated with each specific reagent pouch and sample type.

Optics and Imaging

To identify targets from positive PCR reactions, DNA melting curve analysis is performed. The fluorescence emitted by the LCGreen® Plus dye is imaged by a camera. DNA melting curves are captured by slowly increasing the temperature of the PCR array and capturing the fluorescent signal. These images are processed automatically by the computer, and the data is analyzed to determine if the control reactions passed and which targets were detected in the sample.

The optics system contained in the FilmArray Torch Module is aligned, focused, and calibrated at the factory. Proper operation and calibration of FilmArray Torch Module optics is monitored by the FilmArray Torch Module self-tests and internal pouch controls.

FilmArray Torch Software

The FilmArray Torch Software manages and controls the operation of each FilmArray Torch Module. The software also collects, stores, and analyzes data generated by the FilmArray Torch Module. Results of analyses are presented in a test report. A brief overview of major software components are described below. For more detailed information about the features and operation of the FilmArray Torch Software, see *Chapter 6, FilmArray Torch Software*.

Toolbar

The toolbar always displays at the top of the screen and consists of three options:

- Dashboard
- Browse Runs
- Settings

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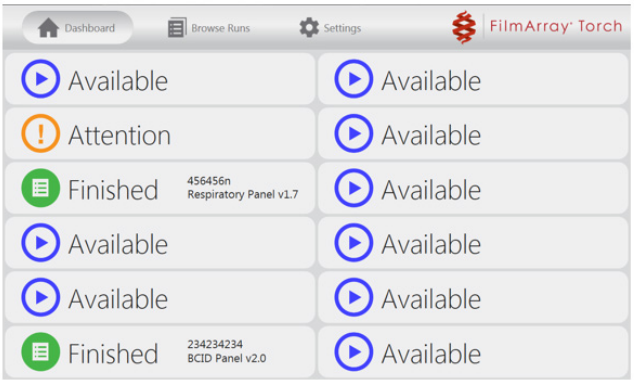
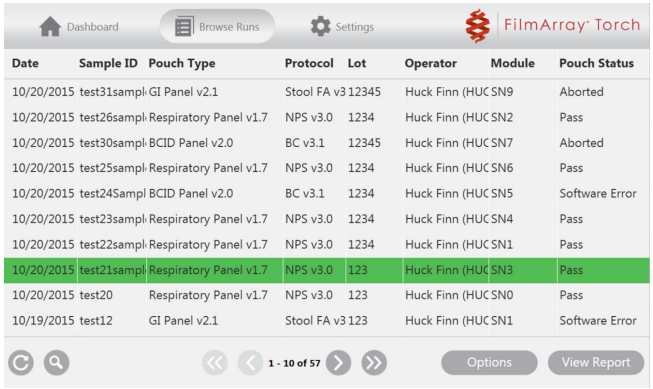
Dashboard

Displays the status of each FilmArray Torch Module within the FilmArray Torch and guides operators through the process of operating the Modules.



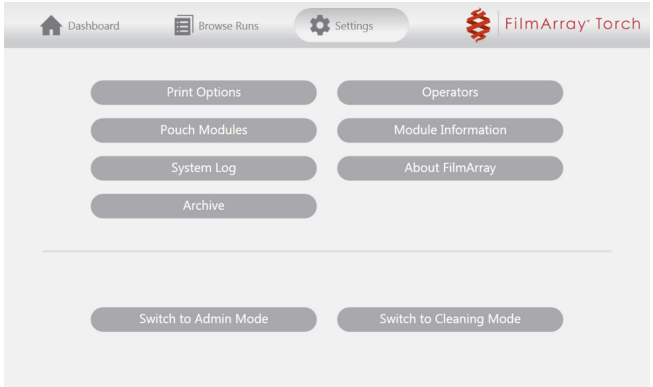
Browse Runs

Allows operators to search for runs and perform operations on individual runs or on groups of runs.



Settings

Allows users to perform administrative type tasks, such as managing operators (adding and updating), view system logs, etc.



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CHAPTER 2: FILMARRAY TORCH SETUP

CAUTION: FilmArray Torch installation should only be performed by a BioFire Diagnostics appointed specialist. A brief description of the installation process is provided below.

Setup Requirements

Select a clean, well-ventilated area that is large enough to fit the FilmArray Torch.

- There must be at least 1 inch (2.6 cm) between the rear panels and any other surface (such as the wall) to allow for proper air flow.
- The depth of the bench-top space should be at least 30 in (77 cm).
- The width of the bench-top space should be at least 19 in (49 cm).
- The height of the space required depends on the number of FilmArray Torch Modules installed:
  - System Base (1 computer, 1 Duplex) – 11.5 in (30 cm)
  - System Base + 1 Duplex – 16 in (41 cm)
  - System Base + 2 Duplexes – 20.5 in (53 cm)
  - System Base + 3 Duplexes – 25 in (64 cm)
  - System Base + 4 Duplexes – 29.5 in (75 cm)
  - System Base + 5 Duplexes – 34 in (87 cm)

NOTE: One Duplex holds two FilmArray Torch Modules.

- Power Specifications:

Qty. of Modules	Voltage	Frequency	AC Current at 120V*	AC Current at 240V*
2	100-240VAC	50-60Hz	3.2 A	1.7 A
4			5.0 A	2.8 A
6			6.9 A	3.8 A
8			8.8 A	4.8 A
10			10.6 A	5.8 A
12			12.5 A	6.9 A

*Grounded outlet required

NOTE: FilmArray Torch requires one power outlet. A single data outlet is sufficient for optional LIS connectivity.

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The FilmArray Torch complies with the emission and immunity requirements in IEC 61326. It is advisable to evaluate the electromagnetic environment prior to operating the device.

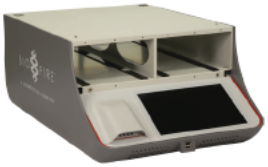
CAUTION: Do not use this device in close proximity to sources of strong electromagnetic radiation (unshielded intentional radio frequency sources, for example) because these may interfere with the operation of the FilmArray Torch.

FilmArray Torch Components

Each FilmArray Torch comes with a FilmArray Torch System Base, at least two FilmArray Torch Modules, accessories, and optional Duplexes to house additional Modules. The FilmArray Torch ships in a minimum of three boxes and a maximum of 18 boxes: one FilmArray Torch System Base box, two to twelve FilmArray Torch Module box(es) (one box per Module), and up to five FilmArray Torch Duplex boxes (one for every two Torch Modules past the first two Torch Modules). Materials provided in these boxes include:

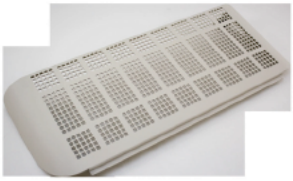
FilmArray Torch System Base Box Contents

NOTE: The FilmArray Torch System Base comes pre-loaded with the FilmArray Torch Software



System Base

Top Cover



System Base Cable Shroud

FilmArray Pouch Loading Station

EU Power Cable

US Power Cable

Ethernet Cable

FilmArray Torch Information CD

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FilmArray Torch Module Box Contents

FilmArray Torch Module

Face Plate

Filter

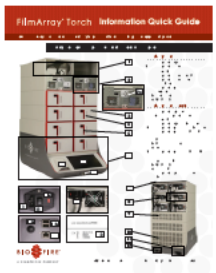
Long Ethernet Cable

Long Power Cable

Spare Filters (2x)

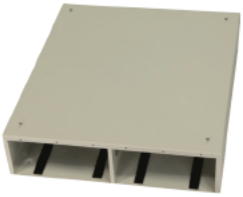
Short Ethernet Cable

Short Power Cable



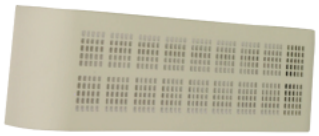
Information Quick Guide

FilmArray Duplex Box Contents



Duplex

FilmArray Pouch Loading Station



Duplex Cable Shroud

NOTE: The Duplexes are shipped separately in their own boxes (each Duplex can house two FilmArray Torch Modules).

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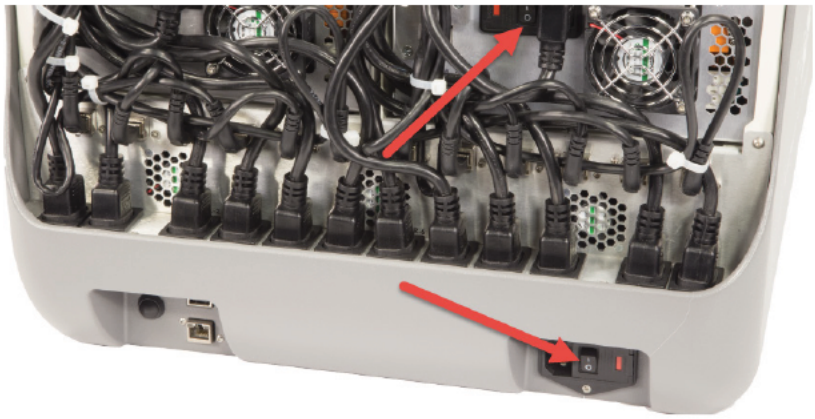
FilmArray Torch System Base Setup

CAUTION: Use only the supplied cables when connecting the FilmArray Torch Modules to the Film Array Torch System Base. Do not use cable extenders to increase cable length.

1. Remove all components in the System Base and Module boxes.
2. Place the System Base in desired location.
3. Install the two Modules onto the System Base.
4. Connect Modules to the Torch System Base using the numbered power and ethernet ports on the System Base for best connections.

5. Plug in power and ethernet cord from the System Base to the wall.
6. Turn on power to the System Base and each Module.



NOTE: The System Base is equipped with additional USB ports on the front that can be used to connect removable drives. The required drivers for these devices can be installed on the System Base computer.

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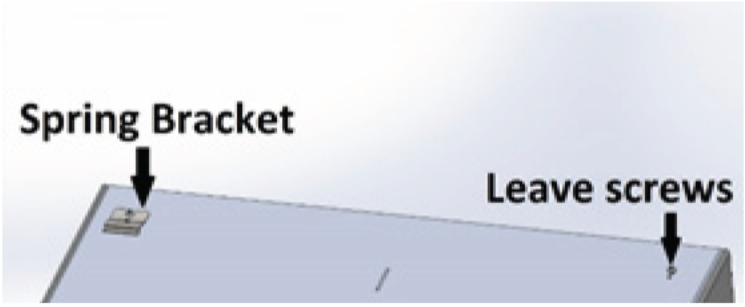
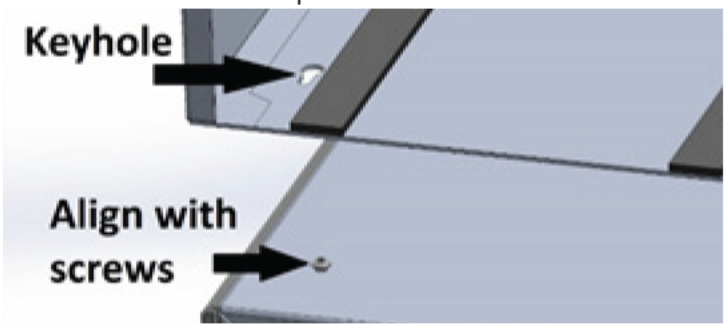
FilmArray Torch Duplex Setup

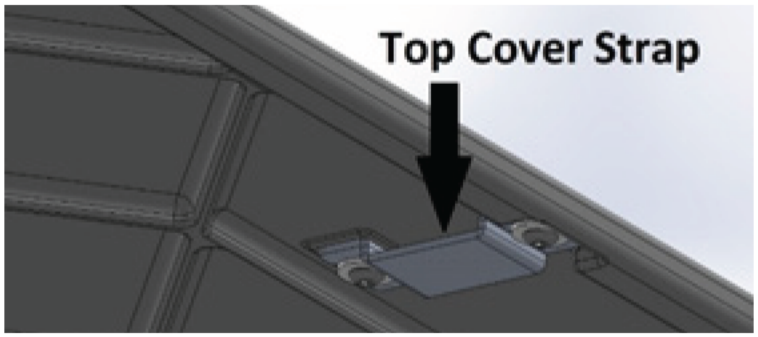
1. Remove all components from the Duplex box(es).
2. Remove the spring brackets at the rear of the top cover (leave the screw threaded in below).



3. Stack a Duplex module enclosure on top of the System Base/lower Duplex and align the key-holes with the screws in the base/Duplex below.



4. Slide the new Duplex back until the front edge is aligned with the Duplex below it; then tighten the fasteners.
5. Repeat steps 4 – 5 until all Duplexes are installed (up to a max of 5 Duplexes; the FilmArray Torch should only ever have 12 Modules connected).
6. Reinstall the top cover spring brackets on the top Duplex (at the rear holes) and tighten the screws.
7. Align the Top Cover straps on the underside of the Top Cover assembly with the spring brack-ets; then slide the Top Cover back until the Top Cover tabs align with the front of the top Duplex.



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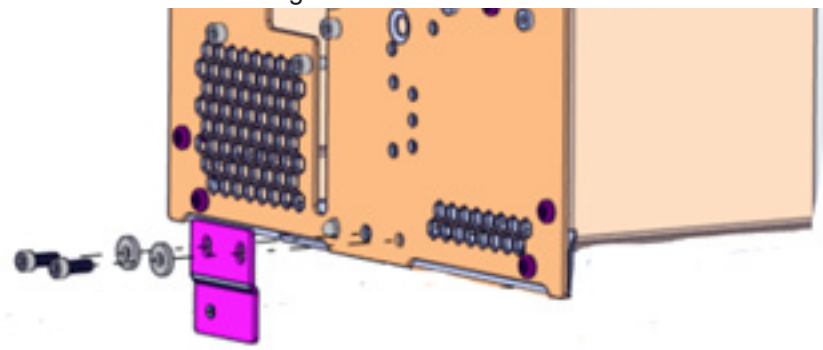
8. Fasten with star lock washers and #6 tamper-resistant screws.

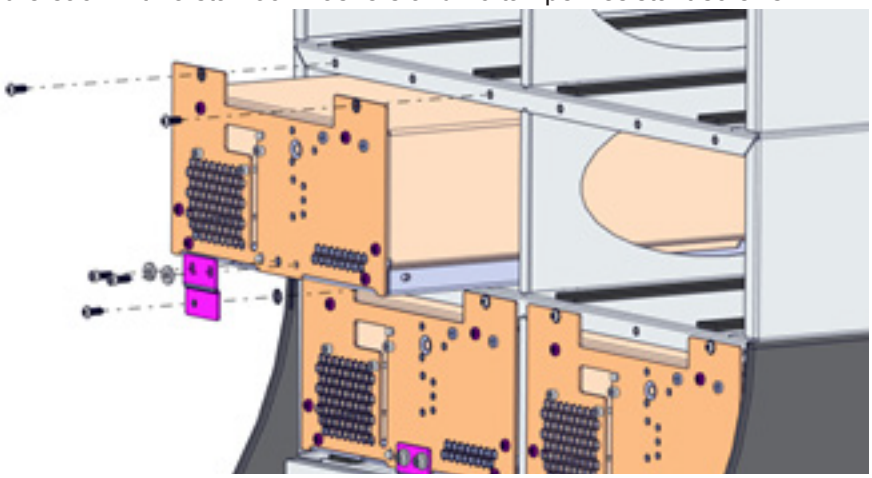
FilmArray Torch Module Installation

Unplug the FilmArray Torch from power and Ethernet before beginning. See next section for removing modules.

1. Remove all contents from the Module box(es).
2. If necessary, install all Duplexes (see previous section for instructions).
3. Install a tab on each Module using two #6 screws and washers.



4. Starting at the bottom and working up, install Modules into the front of each Duplex opening and secure each with 3 star lock washers and #6 tamper-resistant screws.



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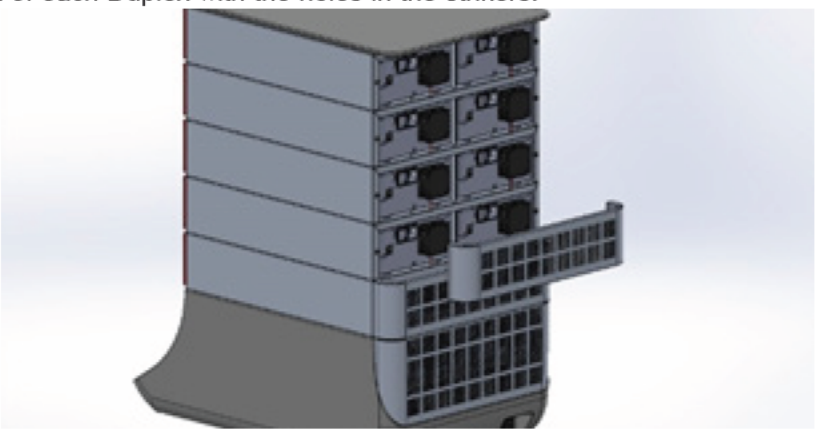
5. Using the power and electrical cables, connect each Module to the back of the System Base. The labels next to the AC power connectors on the System Base will indicate the optimal cable routing order.

6. Install cable shrouds over the electrical cables. The shrouds attach by aligning the magnets on the back of each Duplex with the holes in the strikers.



7. Ensure the filters are in place on the back of each Module Face Plate; then attach a Face Plate to each Module by aligning the mounting posts with the alignment holes in the plastic.
8. Plug the System Base power cord into a power source; then plug the System Base Ethernet cable into desired Ethernet port.
9. Turn the FilmArray Torch on using the power switch on the back of the System Base near the power cord.

NOTE: FilmArray Torch does not require routine shutdown, but can be turned off by first holding down the reset button on the back of the System Base until the screen goes black; then using the power switch near the power cord.

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FilmArray Torch Module Swapping

1. Turn off the Module to be replaced and remove the Front Cover.
2. Remove the cable shroud from the back of the Module and disconnect the cables.
3. Unscrew the 3 star lock washers and tamper-resistant screws on the front of the Module; then carefully slide the Module out of its Duplex.
4. Ensure that the new Module being installed is turned off; then re-install using the directions in the previous section.

Instrument Configuration Application for FilmArray Torch

The FilmArray Torch System Base computer is preinstalled with the Instrument Configuration applicatio. The Instrument Configuration application allows an operator to add one to twelve Modules to the FilmArray Torch Software after they have been physically connected to the System Base.

NOTE: A Module must be added to the FilmArray Torch before the software can be used to initiate and perform runs.

Starting the Instrument Configuration Application for FilmArray Torch

To access to the application from the FilmArray Torch Software:

1. Navigate to the Settings toolbar and select **Switch to Admin Mode**.

   The software verifies that the operator wants to exit the software; then displays the standard windows login screen for the admin user.

2. Log into Admin Mode.
3. When the windows desktop displays, select the Instrument Configuration application.

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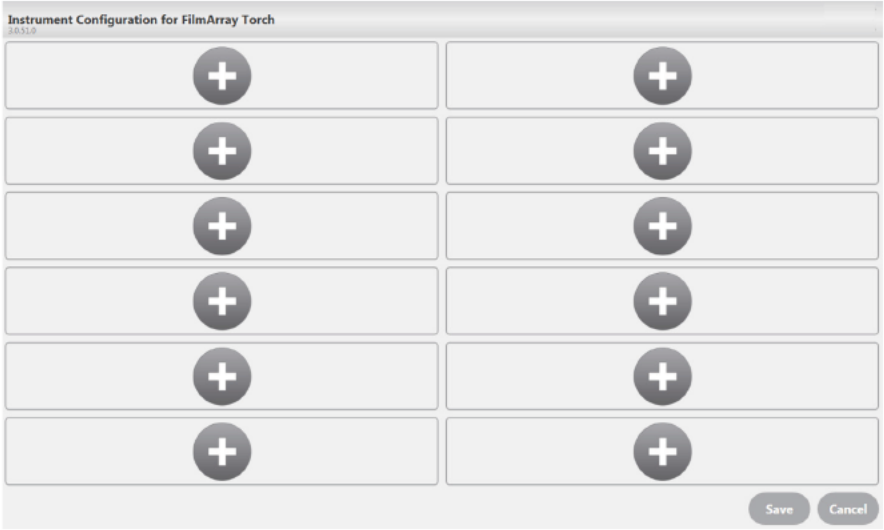
Instrument Configuration Grid

The Instrument Configuration grid is broken into 12 boxes that represent the physical locations for all 12 potential Modules.



NOTE: Start initial configuration from the bottom and work up.

Each FilmArray Torch Module that is currently configured to the FilmArray Torch displays within a box. Any boxes that have not had a Module configured to them contain a icon.

Save and Cancel

Upon initial startup of the application, the Save and Cancel options contain labels of Saved and Close, and the Saved option is disabled.

After at least one operation has been performed:

1. The **Saved** option changes to **Save** and becomes enabled.
2. The **Close** option changes to **Cancel**.

Select the **Save** option in order to preserve any changes to configuration of the FilmArray Torch.

After a Save operation has been performed:

1. The **Save** option changes to **Saved** and becomes disabled.
2. The **Cancel** option changes back to **Close**.

When the **Cancel** option is selected a warning message is displayed to confirm that any changes will be lost.

Select the **Close** option to shut the application down.

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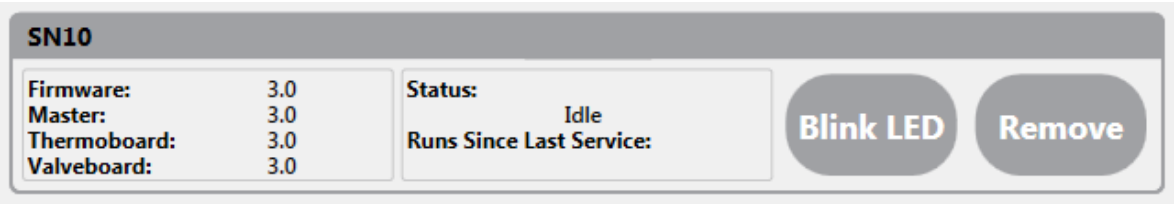
Grid Box

The grid box represents a single bay within the FilmArray Torch.

Each Module that is configured to the FilmArray Torch has the following details displayed within its grid box:

1. **Serial Number** displayed as a title.
2. **Instrument Details**:
   a. **Firmware:** contains the Firmware Version installed on the FilmArray Torch Module.
   b. **Master:** contains the Master Version installed on the FilmArray Torch Module.
   c. **Thermoboard:** contains the Thermoboard Version installed on the FilmArray Torch Module.
   d. **Valveboard:** contains the Valveboard Version installed on the FilmArray Torch Module.
   e. **Status:** contains the FilmArray Torch Module's current status.
   f. **Runs Since Last Service:** contains the Number Of Runs field from the FilmArray Torch Module.
3. A **Blink LED** option.
4. A **Remove** option.



Blink LED

The Blink LED option in the grid box and on the Detected Instruments dialog can be used to identify which physical Module is linked to that bay, and to verify that the operator is working with the correct Module before starting any configuration operations.

Selecting the **Blink LED** option for the selected Module will make the LED blink white.

The Blink LED option cannot be enabled if the Module:

1. Is not powered on.
2. Is disconnected from the FilmArray Torch.
3. Is currently initializing.
4. Is currently performing a run.

Remove

The Remove option in the grid box removes a Module from the FilmArray Torch configuration (see the *Remove a FilmArray Torch Module* section below).

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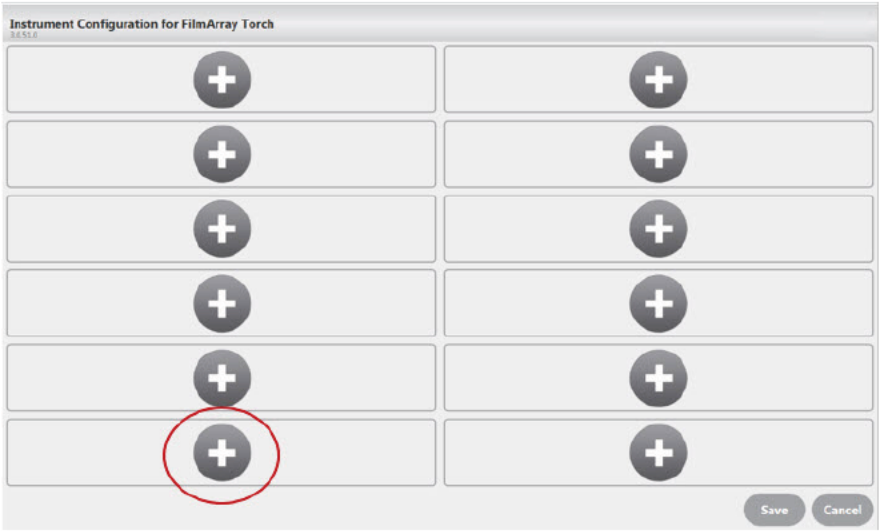
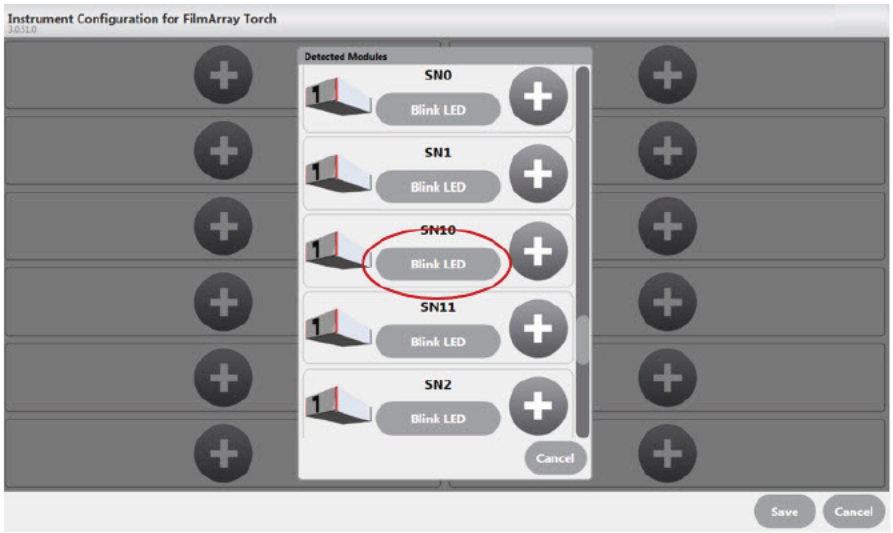
Add a FilmArray Torch Module

To add a Module to the FilmArray Torch Software:

1. Select the icon for the appropriate bay.



2. The application presents the Detected Instruments dialog, which displays a list of all Modules detected.
3. Scroll to the applicable Module Serial Number and select the **Blink LED**.



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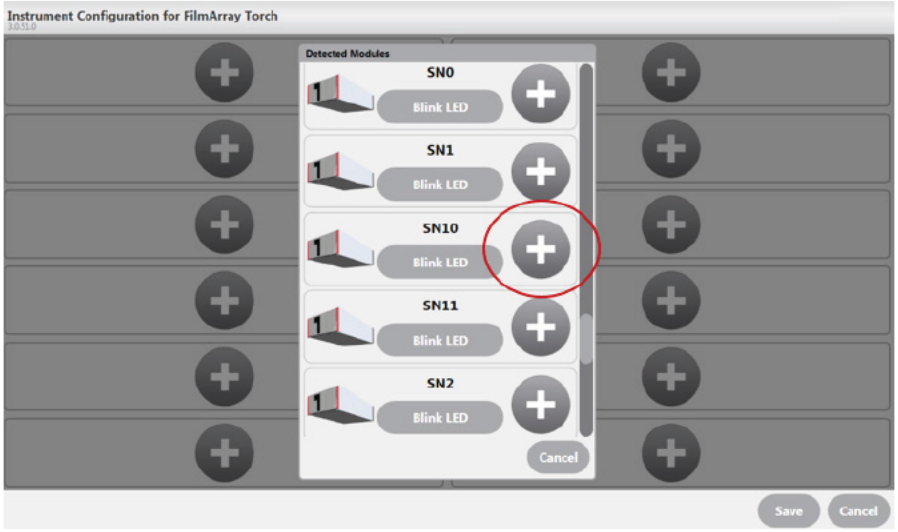
4. Add the Module by selecting the for that Module in the Detected Instruments dialog.



5. The Detected Instruments dialog closes and the application displays the details of the added Module.

6. Select **Save** to save all changes made during this operation.

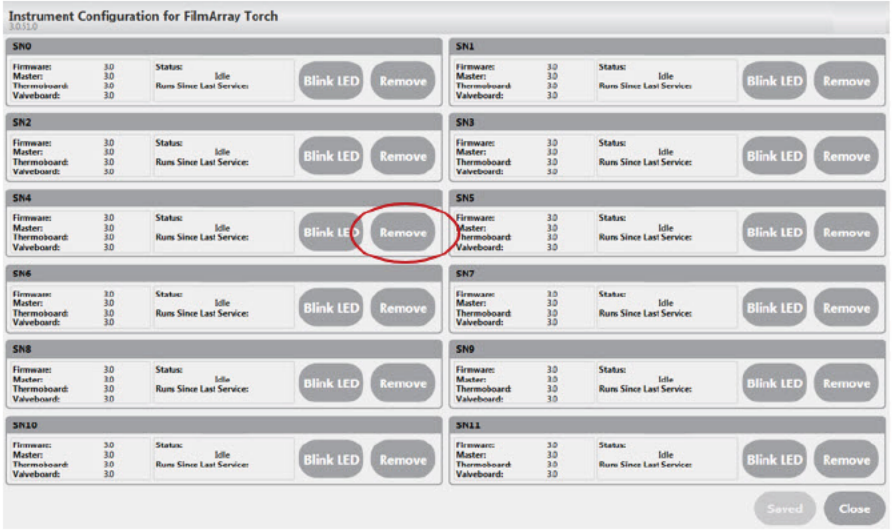
Remove a FilmArray Torch Module

To remove a Module from the FilmArray Torch Software:

1. Identify the bay configured to Module and check that its status is **Idle**.

NOTE: There is no warning presented for removal of a FilmArray Torch Module that is currently in a running status.

2. Select **Remove** on the applicable bay.



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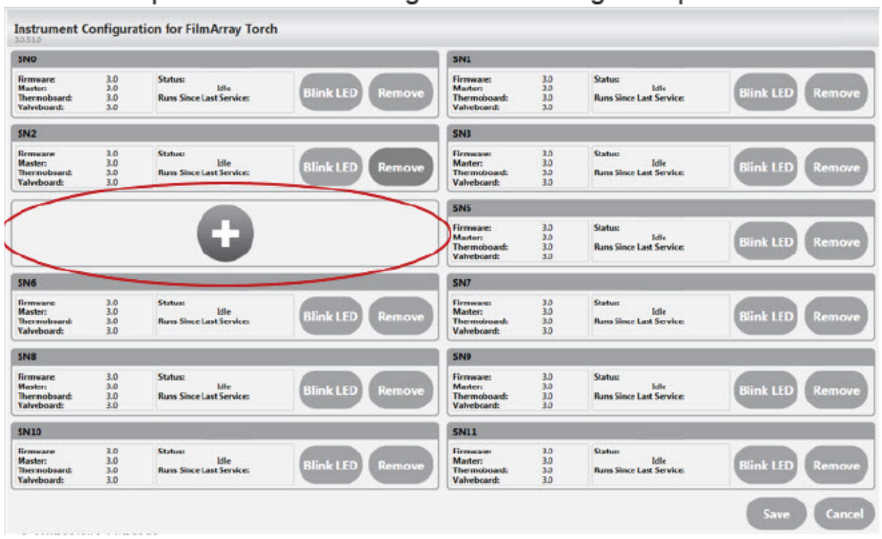
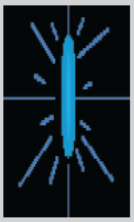
3. Select the **Save** option to save all changes made during this operation.



FilmArray Torch Module Status

The front of each FilmArray Torch Module is equipped with an LED light that shows the specific status of that Module.

LED	Color	Status	Meaning
	White	Solid	Module initializing.
	Yellow	Solid	Warning - e.g., Module not connected.
	Blue	Solid	Module idle and available to run a pouch.
	Blue	Blink	Module waiting for operator to insert a pouch.

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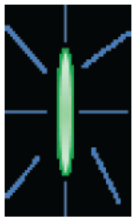
LED	Color	Status	Meaning
	Green	Fast Blink	pouch inserted and seated, but pouch run not started.
	Green	Solid	pouch run in progress.
	Green	Slow Blink	Run complete - remove pouch
	Yellow	Blink	Warning – Operator action required - e.g., unexpected insertion, double insertion, pouch jam Follow on-screen instructions.
	Purple	Blink	Error. Operator intervention or maintenance required. Module must be reset. Remove the face plate of the affected Module and reset the Module, or power off then power on the Module.
	Red	Solid	Error. Operator intervention or maintenance required. Module must be reset. Remove the face plate of the affected Module and reset the Module, or power off then power on the Module.

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Connecting a Printer to FilmArray Torch

The FilmArray Torch does not come with its own printer. It can be configured to print to any printer using the native Windows Operating System. The following workflow details how printers will be added on the System Base through an Administrator User Account. Contact Customer Support for account log in and more information (*see page i*).

Add or Update Printer for FilmArray Torch

1. Navigate to the **Settings** toolbar.
2. Select **Switch to Admin Mode**.

   The software displays a warning message that the operator is entering the base Windows operating system to perform administrative tasks and will be logged out of the FilmArray Torch Software as a result, with a directive to confirm the switch.
3. Select **Yes** to confirm the switch.

   The software logs the operator out of the FilmArray Torch Software and the operator is presented with the standard Windows login screen.
4. Log into an Administrator User Account by entering the appropriate user name and password.

   The computer validates the access and presents the standard Windows desktop layout.
5. Navigate to the Control Panel to manipulate printer details for the FilmArray Torch.
6. When printer maintenance is complete, restart the computer. The FilmArray Torch Software will automatically load.

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CHAPTER 3: PRINCIPLES OF OPERATION

FilmArray is an automated *in vitro* diagnostic (IVD) system that utilizes nmPCR and high-resolution melting analysis to detect and identify multiple nucleic acid targets from clinical specimens. The user of the FilmArray Torch loads the sample into a reagent pouch, places the pouch into the FilmArray Torch Module, and starts the run. The FilmArray Torch Module interacts with the reagent pouch to extract nucleic acids from the sample and to amplify pathogen specific DNA sequences that are targeted by the assays. The resulting PCR products are evaluated using DNA melting analysis and the results are automatically determined and presented by the FilmArray software in a test report.

PCR Basics

Polymerase chain reaction (PCR) is the process of making billions of copies of DNA. Copies are made by melting the DNA into separate strands and using each strand as a template for generation of a new strand. To identify specific pathogens using PCR, primers (short pieces of a specific DNA sequence) are included in the PCR reaction to target unique segments of the pathogen genome. If the organism of interest has an RNA genome, a process called reverse transcription (RT) is performed prior to PCR in order to convert the RNA template into a DNA template (RT-PCR).

There are 3 steps to a PCR cycle:

Step 1: Denaturation - The sample is heated to about 94°C to denature or 'melt' the double-stranded target DNA into single strands.

Step 2: Primer annealing - The sample is cooled to about 60°C, allowing the primers to bind or "anneal" to the target DNA strands at a specific site.

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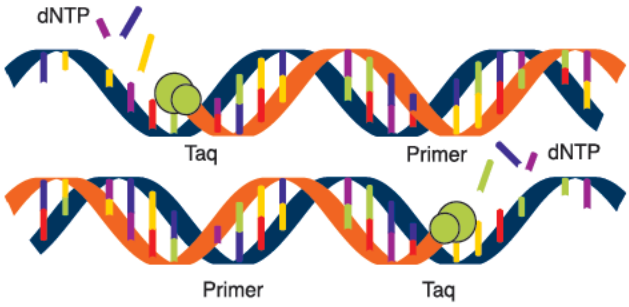
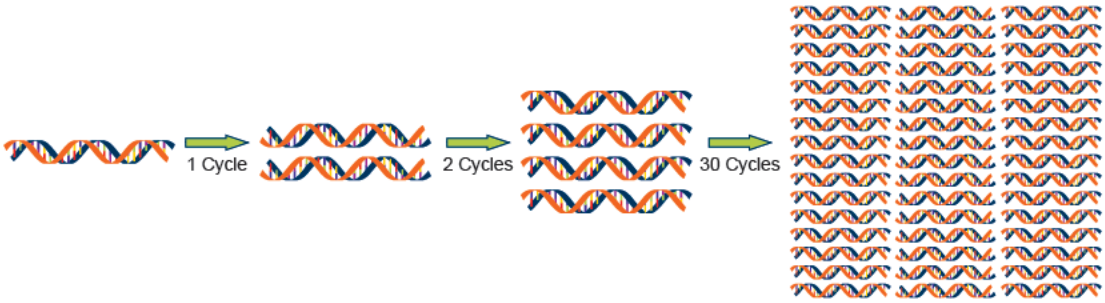
Step 3: Primer extension - an enzyme (Taq DNA polymerase) binds to the DNA/primer complex and makes a copy of the original double stranded DNA by adding nucleotides (dNTPs A, G, T or C) that are complementary to the nucleotide sequence of the target DNA.



At the end of a cycle, each piece of double-stranded target DNA has been duplicated. The new DNA copies act as templates in the next cycles, so after 30 cycles, as many as 1 billion copies of a single piece of DNA can be produced. With this duplication process, it becomes possible to detect DNA or RNA from even a low concentration of pathogens in the original sample.



Nested Multiplex PCR

nmPCR uses two stages of PCR. During the first-stage PCR, multiple “outer primers” are used to perform multiplex PCR on the target templates present in the sample.

Second-stage PCR is performed in a singleplex format to further amplify the DNA copies generated during the first-stage PCR. The “inner primers” used in second-stage PCR are made up of sequences “nested” within the first-stage PCR product(s).

High Resolution Melting Analysis

FilmArray PCR reactions contain the DNA binding dye LCGreen® Plus. LCGreen Plus is incorporated into the copies of DNA as they are made during each PCR cycle. When bound to double-stranded DNA, the dye fluoresces and the fluorescence is detected by the FilmArray Torch Module. As the temperature is increased and the copies of double-stranded DNA melt, the LCGreen Plus dye is released and a reduction in fluorescence is detected.

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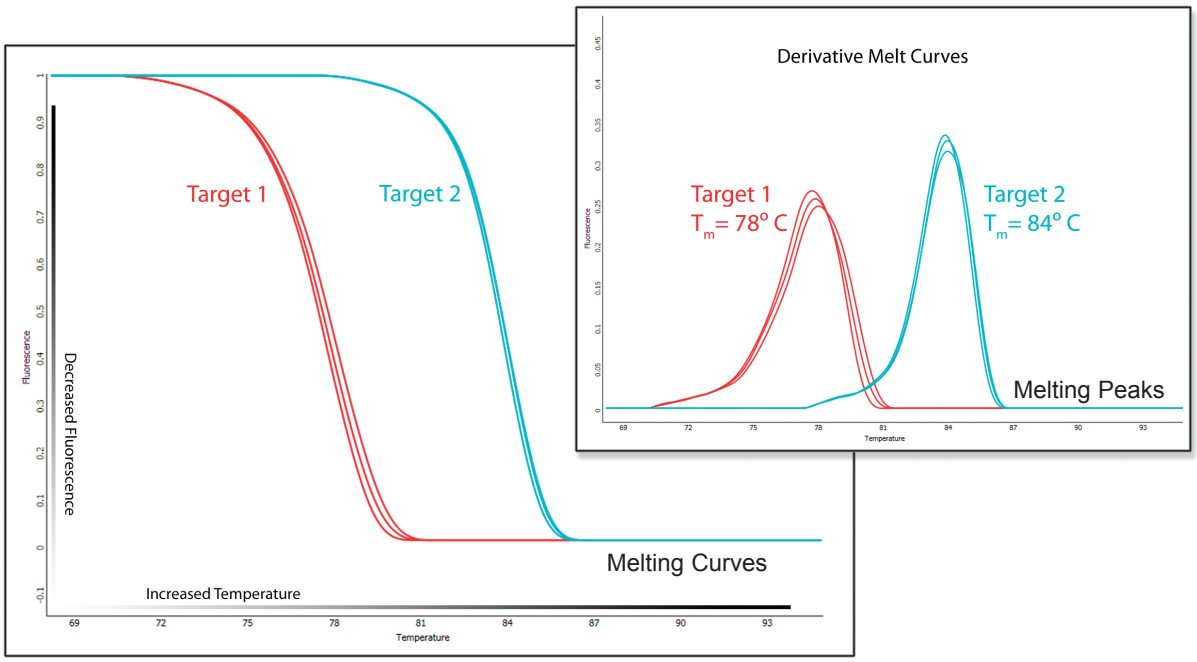
Copies of double-stranded DNA generated during PCR (called PCR products or amplicon) will have unique sequences based on the template that was amplified. Amplicon length and sequence determines the temperature at which the double-stranded DNA will melt apart, which is known as the melting temperature (Tm) of the amplicon. PCR products made from different targets will have different sequences and, therefore, different Tms.

After the last cycle of PCR, the FilmArray Torch Module gradually raises the temperature of the reaction from approximately 60°C to 94°C. As the temperature reaches the Tm of an amplicon, the amplicon denatures and fluorescence drops, releasing LCGreen Plus. This produces a melting curve, seen in the graph below, which shows the rapid decline in fluorescence. A melting peak with a specific Tm is generated for each amplicon by plotting the negative derivative of the melting curve.

Melting Curves for two Different Targets with Unique Amplicon Sequences



The FilmArray uses melting curve analysis to identify pathogen specific PCR product. Since the sequence and Tm of an amplicon from a specific target is known and consistent, pathogen specific PCR product can be identified as being copied from that target. Non-specific PCR products with different Tms are excluded.

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CHAPTER 4: PERFORMANCE SPECIFICATIONS

FilmArray Torch System Specifications

<table>
<tr><td>Sample Description</td><td>• One sample capacity per FilmArray Torch Module (with up to 12 samples per FilmArray Torch)</td></tr>
<tr><td>Run Time</td><td>• Sample run time about one hour</td></tr>
<tr><td>User Interface</td><td>• System Base with touch screen and barcode scanner</td></tr>
<tr><td>Data Output</td><td>• Automatic analysis with end-of-run interpretive reports</td></tr>
<tr><td>Fluorescence Acquisition</td><td>• Single color optics module: 475nm excitation, 545nm emission, and sensor imaging</td></tr>
<tr><td>Temperature Control</td><td>• Operating temperature 15°C to 30°C
• Peltier devices:
  • Ambient to 100°C
  • Ramp rate from 0.1–0.5°C /sec on melt</td></tr>
<tr><td>Operations Specification</td><td>• 15°C to 30°C @ 20 to 80% relative humidity (non-condensing)
• -16m to 3048m
• Indoor use only</td></tr>
<tr><td>Shipping Specifications</td><td>• -30°C to 38°C @ 5 to 85% relative humidity (non-condensing)
• -16m to 10,600m</td></tr>
<tr><td>Power Requirements</td><td>
<table>
<tr><th>Qty. of Modules</th><th>Voltage</th><th>Frequency</th><th>AC Current at 120V</th><th>AC Current at 240V</th></tr>
<tr><td>2</td><td rowspan="6">100-240VAC</td><td rowspan="6">50-60Hz</td><td>3.2 A</td><td>1.7 A</td></tr>
<tr><td>4</td><td>5.0 A</td><td>2.8 A</td></tr>
<tr><td>6</td><td>6.9 A</td><td>3.8 A</td></tr>
<tr><td>8</td><td>8.8 A</td><td>4.8 A</td></tr>
<tr><td>10</td><td>10.6 A</td><td>5.8 A</td></tr>
<tr><td>12</td><td>12.5 A</td><td>6.9 A</td></tr>
</table>
</td></tr>
<tr><td>Fuse</td><td>• 250V 3.15A Type T (Modules)
• 250V 10A Type T (System Base)</td></tr>
</table>

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Dimensions and Weight	• 18 x 29 x 11.5 in (45.8 x 73.66 x 29.21 cm) (W x D x H; System Base only)
	  • 4.5 in (11.43 cm) (H; Modules only)
	  • 34 in (86.36 cm) max height (12 Modules)
	• Weight: Approximately 250 lbs (113.4 kg) maximum:
	  • System Base – 50 lbs (22.68 kg)
	  • Modules – 14 lbs (6.35 kg) each
	  • Duplex (Module enclosure) – 5 lbs (2.27 kg) each

EMC Requirements	• The FilmArray Torch complies with the emission and immunity requirements in IEC 61326: Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements.
Safety Requirements	• The FilmArray Torch complies with IEC 61010-2-101: Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-101: Particular requirements for in vitro diagnostic (IVD) medical equipment.
CPU	• Intel® Core™ i7 4770S 3.1 GHz or faster
Storage and Memory	• 512 GB Hard Drive or greater • 16 GB RAM or greater
Interfaces and Peripherals	System Base • 12+1 Ethernet network interfaces • 4 USB connections or more
	Instrument • One Ethernet network interface
Display	• LCD • 10.6” diagonal (26.9 cm) • 1280 x 768 resolution • Capacitive touch screen interface
Operating System	• Microsoft® Windows® 7 Embedded OS

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CHAPTER 5: FILMARRAY TORCH OPERATING INSTRUCTIONS

NOTE: Additional instruction on how to operate the FilmArray Torch is provided in the FilmArray Torch Info CD provided in the FilmArray Torch System Base box.

NOTE: Pouch preparation may vary depending on the pouch type used. Please consult the instruction booklet for each FilmArray reagent kit for specific preparation steps.

Using the FilmArray Torch involves three main steps:

1. Adding patient sample to the FilmArray pouch.
2. Performing a run within a FilmArray Torch Module.
3. Viewing and/or printing a report.

FilmArray Reagent Kits

FilmArray reagent kits include FilmArray pouches and all components required to run tests on the FilmArray Torch. Components will vary based on the type of FilmArray reagent kit. Refer to the instruction booklet or Quick Guide for specific preparation and testing procedures.

CAUTION: Do not attempt to use components from one reagent kit to prepare a different pouch type. Components are pouch specific.

Each FilmArray pouch is labeled with:

LOT Batch Code

SN Serial Number

This information is both human-readable and contained in the barcode. The pouch also includes a space to write the Sample ID or affix a Sample ID barcode.

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FilmArray Test Procedure

General Precautions

BIOLOGICAL RISKS: When working with the FilmArray Torch and clinical specimens, personnel may come in contact with contaminants or potentially infectious material. Appropriate biohazard guidelines for working with potentially infectious samples should be followed. Refer to the *Safety Precautions* section of the appropriate FilmArray reagent kit instruction booklet for additional safety information.

It is recommended that the handling of potentially infectious samples be performed in a biological safety cabinet or hood, or behind a protective shield. Once a sample has been added to the FilmArray pouch, move the pouch to a separate area to perform the test.

One of the most important guidelines for a test using PCR is to avoid contamination. Some important rules to follow are:

1. Sample collection, pouch loading, and FilmArray Torch operation should each be performed in separate locations or work areas.
2. Do not leave a work area or return to a previous work area without first completing decontamination procedures (i.e., washing the area and changing protective clothing and gloves).
3. Prepare and load only one pouch at a time.
4. Always dispose of used pouches, or pouches that have come in contact with a sample, in a biohazard waste container. Change gloves after handling a used pouch.

FilmArray pouches are stored under vacuum in individually-wrapped canisters. To preserve the integrity of the pouch vacuum for proper operation, be sure that a FilmArray Torch Module will be available and operational before unwrapping any pouches for loading.

Initiate Run

Refer to the *Procedure* section of the appropriate FilmArray reagent kit instruction booklet for step-by-step instructions for sample and pouch preparation.

The FilmArray Torch Software includes a detailed workflow that guides the operator on how to perform a run.

Once a pouch has been prepared for testing, follow the on-screen instructions to enter pouch and sample information. Insert the pouch into an available FilmArray Torch Module and start the run.

The operator cannot start a run until one FilmArray Torch Module has been added to the FilmArray Torch Software. Please see the *Instrument Configuration* section in *Chapter 2* for more information about adding a FilmArray Torch Module. In addition, one pouch module must be installed on the FilmArray Torch in order to start a run (see the *Pouch Module Management* section in this Chapter).

Initiate a FilmArray Torch run by Manual Initiation or Scan Initiation.

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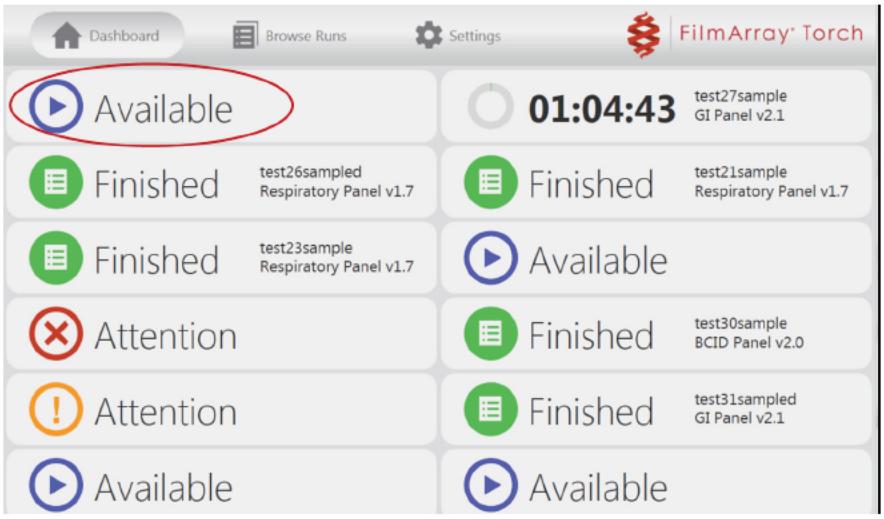
Manual Initiation

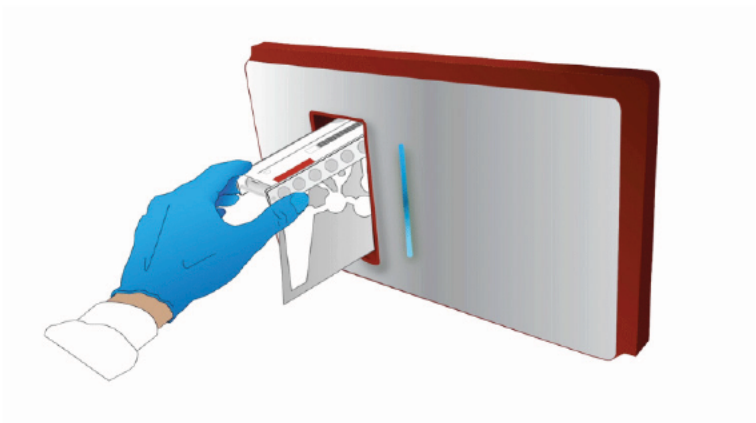
The operator selects a specific FilmArray Torch Module from the Dashboard using the touch screen. To initiate a run manually:

1. Select an **Available** Module on the Dashboard and scan the pouch barcode on the fitment label. Then scan or manually enter the Sample ID.

NOTE: If the barcode scanner is not available or the barcode is unreadable, manually enter the lot number and serial number printed on the pouch label.



2. Insert the pouch into the selected FilmArray Torch Module. The Module's LED will blink blue. Ensure that the pouch fitment label is lying flat on top of the pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.



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Scan Initiation

The operator scans the fitment label on the pouch while the Dashboard is displayed on the touch screen. To initiate a run by scanning:

1. Scan the pouch barcode on the fitment label. Then scan or manually enter the Sample ID.
2. Insert the pouch into any Available FilmArray Torch Module. All available Module's LED will blink blue. Ensure that the pouch fitment label is lying flat on top of pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.

Start Run

After the pouch is correctly inserted into the FilmArray Torch Module, the LED will blink green to indicate that the pouch has been seated but the run has not yet started. To continue the run after Manual or Scan Initiation:

CAUTION: Do not insert sharp objects to remove a jammed pouch. In the event of a jammed pouch, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor for technical support.

1. Select the correct pouch protocol for the pouch and sample type.

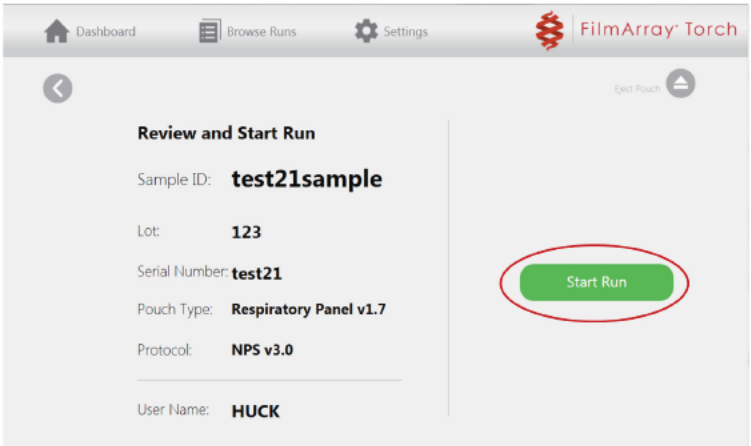
NOTE: If only one protocol is available, it will be automatically selected.

2. Enter operator username and password, then select **Next**.

   The Next key will only become available when a correct username and password is entered. See the *Create New Operator(s)* section in *Chapter 6* for more information on how to create a new operator's username and password.

NOTE: The font color of the username and password is red until the user name is recognized by the FilmArray Torch Software.

3. Review entered run information on the screen; if correct, select **Start Run.**



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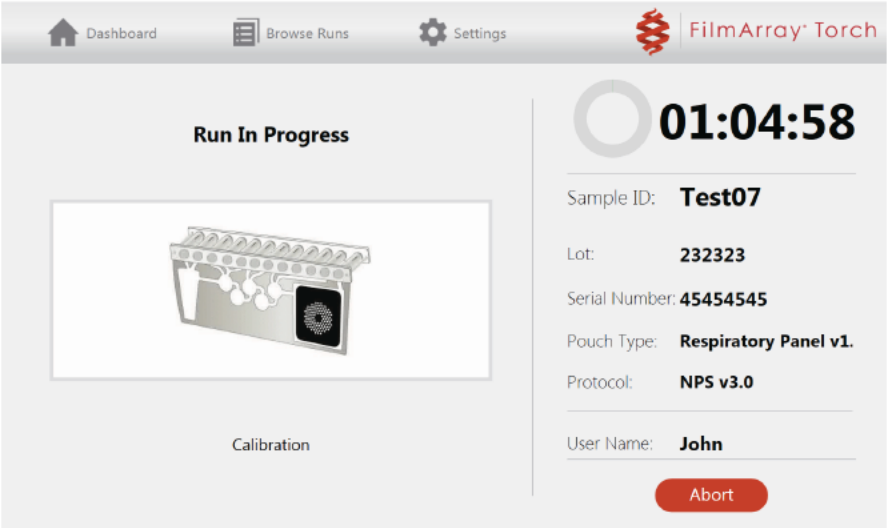
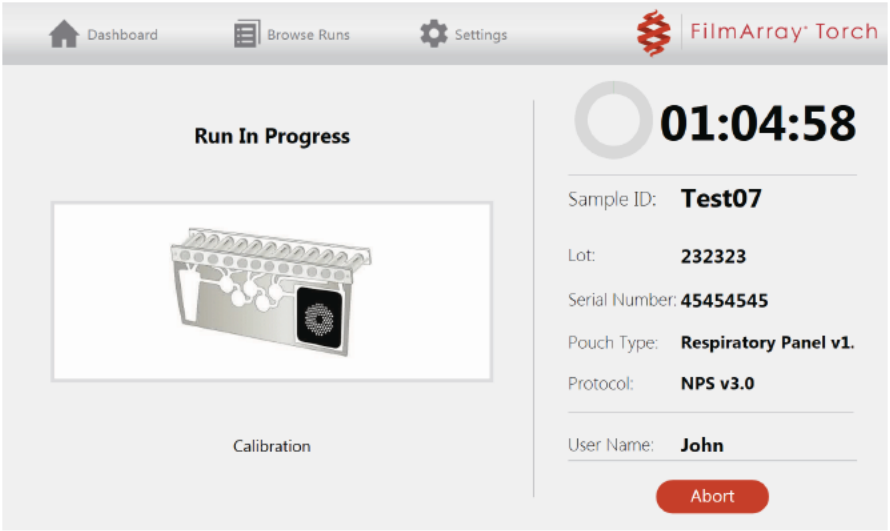
Once the run has been started, the selected Module's LED will turn solid green, indicating the run is in progress. The display also changes to the Run In Progress screen and shows the steps that the Module is currently performing and the approximate remaining run time. The operator may navigate to the Dashboard to perform other tasks.



Abort Run

If a run needs to be stopped before it is finished, select the applicable FilmArray Torch Module from the Dashboard. The Run In Progress screen will display the current run information; select **Abort**. Any data that has been generated for the aborted run will not be available for analysis. An aborted run cannot be restarted and the pouch must not be re-run.

NOTE: Aborting a run may take up to five minutes to complete.



Finish Run

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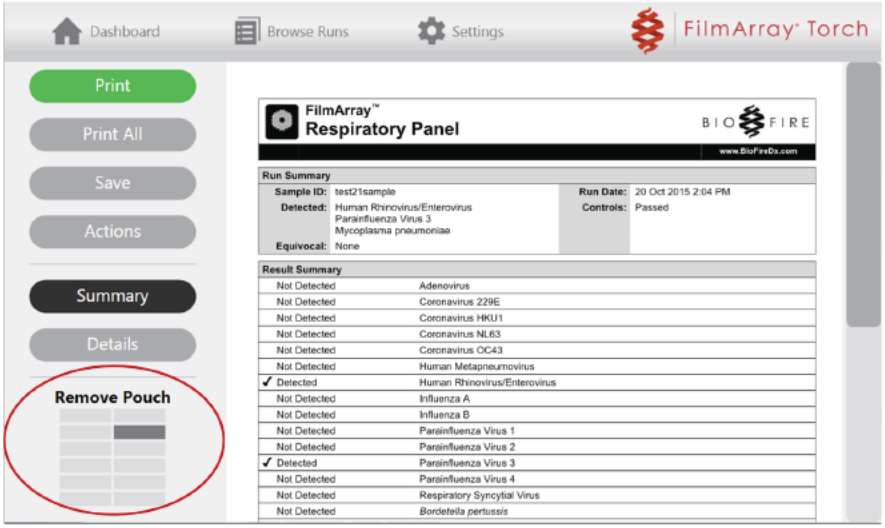
At the end of the run, the Dashboard changes the status of the Module to Finished and the pouch is partially ejected. To finish a run:

1. Select the **Finished** Module on the Dashboard to view the report.



2. Remove the pouch from the Module as indicated above. The Module LED is solid blue indicating that the Module is ready for a new run

NOTE: Once the pouch has been removed, the report can only be viewed through the Browse Runs feature.

View Report

When a run is finished the report can be viewed on the:

- Run In Progress screen—the run report displays once the run is complete.
- Dashboard screen—a report icon appears and the status changes to **Finished**. Selecting the Module box displays the run report. Once the pouch is removed from the FilmArray Torch Module, the status changes to **Available**.
- Browse Runs screen—the run reports are accessible from the table.

Refer to the instruction booklet for the appropriate FilmArray reagent kit for more details about the information provided in the report.

Print Report

Reports will always be printed to the default printer. The FilmArray Torch Software can be configured to automatically print the report at the end of the run (see the *Print Options* section within *Settings* in *Chapter 6, FilmArray Torch Software*).

To print a report from a previous FilmArray pouch run:

1. Select **Browse Runs** in the top menu on the touch screen.

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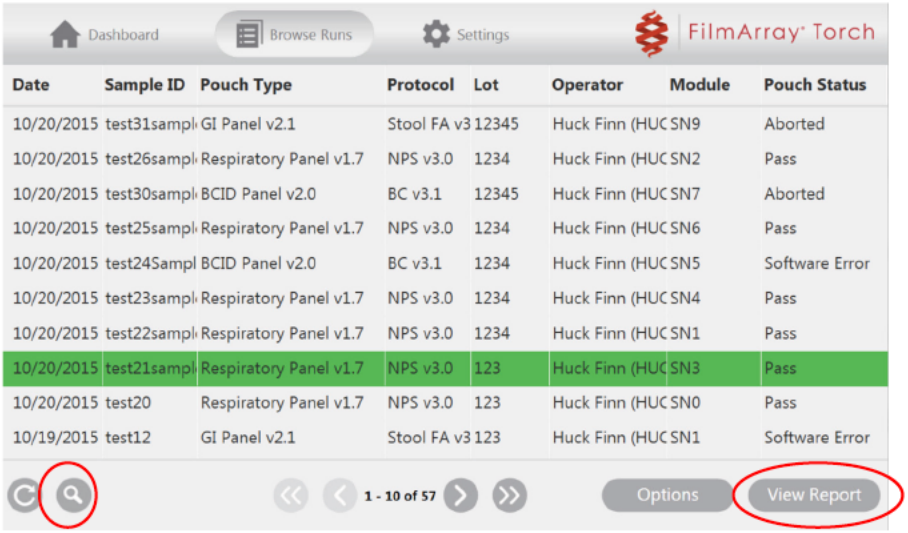
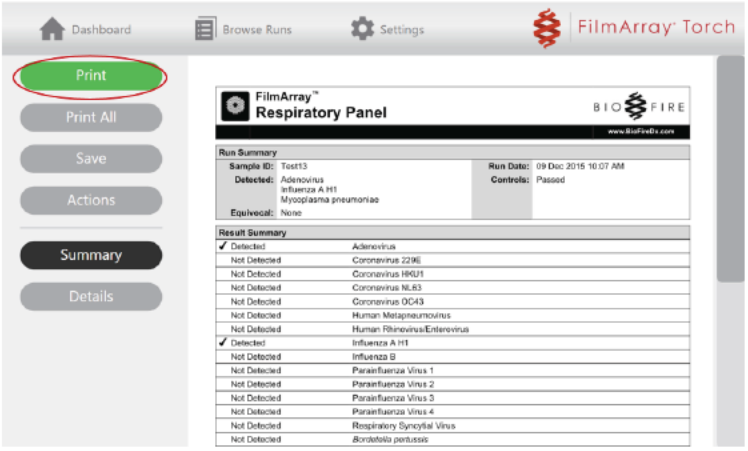
2. Use the icon to search for runs.
3. Select a single desired run from the table.
4. Select **View Report** to open the report page.

NOTE: If no runs or multiple runs are selected, the View Report option is disabled.



5. Select **Print.**



Error Messages

If errors occur, see *Chapter 8, Preventative Maintenance and Troubleshooting*, for more information on viewing and handling error messages.

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CHAPTER 6: FILMARRAY TORCH SOFTWARE

This chapter explains how to use the FilmArray Torch Software and manage the database. The FilmArray Torch Software automatically starts when the FilmArray Torch is powered on – there is no login required.

FilmArray Torch Toolbar

The table below lists the features available in the FilmArray Torch toolbar:

FilmArray Torch Toolbar	Description
Dashboard	The Dashboard allows the operator to do the following: • View the status of each FilmArray Torch Module in the system with a graphical indicator that can be seen from a distance. • View the status of all runs that are in progress, along with the Sample ID, Pouch Type, and time remaining until completion. • Start a run using the Start Run Workflow.
Browse Runs	Browse Runs allows the operator to review Run Results for runs performed on all FilmArray Torch Modules within the FilmArray Torch. The Browse Runs feature displays all the runs, ordered so that the most recent run is at the top of the list, and also allows access to the following actions: • View Report – this option is inactive until a specific report is selected. • Options – Allows access to additional features. • Run Table – Allows the operator to perform the following actions: a. View and sort runs in the database. b. Filter the database by run criteria. c. Page through the runs using the paging navigation at the bottom of the screen.
Settings	Settings allows the operator to perform basic configuration and management of the FilmArray Torch. See the Settings section for details.

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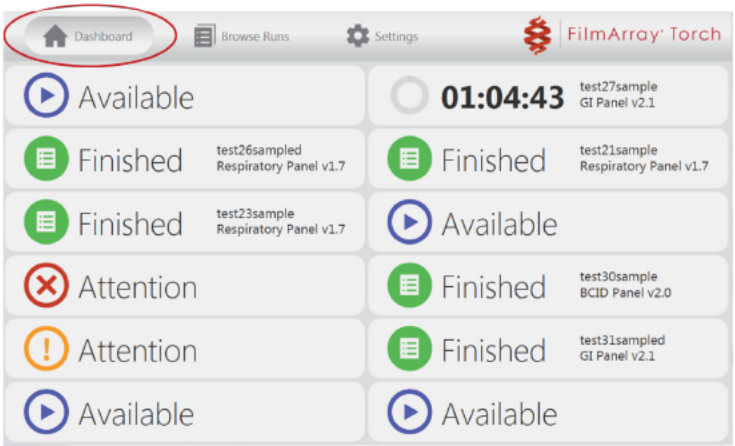
Dashboard

The Dashboard option is always accessible from the toolbar. To access the Dashboard from any screen, select the **Dashboard** option on the toolbar. The FilmArray Torch Dashboard allows the operator to interact with several FilmArray Torch Modules from one System Base. Each FilmArray Torch Module is represented by a box displayed on the touch screen. Until at least one Module has been added to the FilmArray Torch Software, the Dashboard will be blank. The number of boxes on the Dashboard mirrors the number of Modules that are configured.

Any FilmArray Torch Module box on the Dashboard can be selected to display additional details about the FilmArray Torch Module status.



The details for each FilmArray Torch Module include the following:

Status Icon	Status	Description
Available	Available	The module is available for a new run – can initiate a new run (Manual Initiation of workflow)
01:04:43 test27sample GI Panel v2.1	Run In Progress	Instrument is performing a run and displays the Time Remaining.
Overtime test27sample GI Panel v2.1	Overtime	Instrument is performing a run and has gone over the expected run time for the pouch and displays Overtime.
Finished test21sample Respiratory Panel v1.7	Finished	Run has finished, pouch is ejected, run report is ready for viewing.
Attention	Attention	Module has lost connection with the software as a result of one of the following: • Instrument is initializing or is not connected. • There is an unknown pouch in the module.
Attention	Attention	The Module needs to be reset. Module has an error on it as a result of one of the following: • Pouch jam. • In error.

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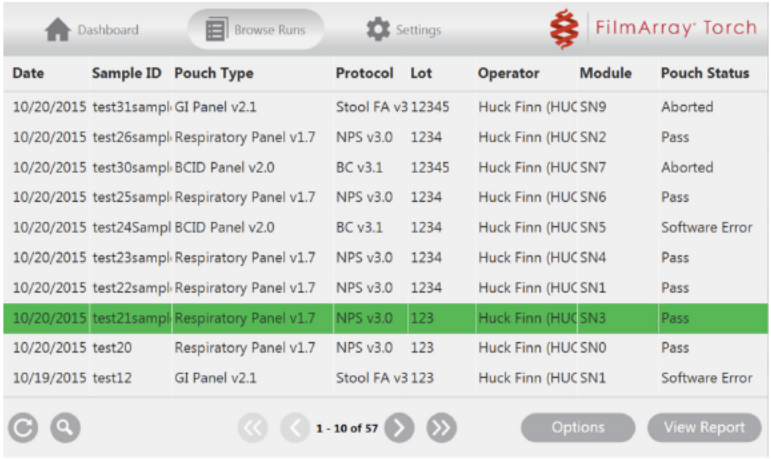
Browse Runs

The Browse Runs option is always accessible from the toolbar. To access Browse Runs from any screen, select the **Browse Runs** option on the toolbar. When a run is completed on a Module, the software generates a report with the results of the run. Upon initial entry into the Browse Runs screen, all the runs within the database are displayed.

The runs are presented as a table that lists the date of the run, the Sample ID, and other information about the run. Selecting an individual run enables the View Report option, which can be selected to display the run report. For more information on viewing a report, see *Chapter 5, FilmArray Torch Operating Instructions*.



Date	Sample ID	Pouch Type	Protocol	Lot	Operator	Module	Pouch Status
10/20/2015	test31sampl	GI Panel v2.1	Stool FA v3	12345	Huck Finn (HUC	SN9	Aborted
10/20/2015	test26sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN2	Pass
10/20/2015	test30sampl	BCID Panel v2.0	BC v3.1	12345	Huck Finn (HUC	SN7	Aborted
10/20/2015	test25sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN6	Pass
10/20/2015	test24Sampl	BCID Panel v2.0	BC v3.1	1234	Huck Finn (HUC	SN5	Software Error
10/20/2015	test23sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN4	Pass
10/20/2015	test22sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN1	Pass
10/20/2015	test21sampl	Respiratory Panel v1.7	NPS v3.0	123	Huck Finn (HUC	SN3	Pass
10/20/2015	test20	Respiratory Panel v1.7	NPS v3.0	123	Huck Finn (HUC	SN0	Pass
10/19/2015	test12	GI Panel v2.1	Stool FA v3	123	Huck Finn (HUC	SN1	Software Error

View Report Menu

The table below lists the features available on the View Report menu:

Menu Item	Description
Print	Prints the run report. See *Chapter 5, FilmArray Torch Operating Instructions* for more information on printing a report.
Save	Opens a dialog that enables the operator to save the run report to a chosen location.
Actions	Allows for the following actions to be performed for that report: 1. **Edit Sample ID**: If a mistake was made during run setup when entering the Sample ID, the operator can make the necessary corrections. A history is recorded of all changes and will be added to the run report. 2. **Show Run Details**: Allows the operator to view system details, messages and errors associated with a run. 3. **Create Error Bundle**: If an error occurs that is associated with a FilmArray run, a technical support representative may request that the operator create an error bundle for that run and send it to BioFire Diagnostics. For more information on creating an error bundle, see the *Error Bundle* section in *Chapter 8*.

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Save Report

Run reports can be saved as a PDF file for future use. To save reports as PDF file:

1. Insert a removable drive into an available USB port on the front of the System Base.

NOTE: Reports can only be saved to a removable drive.

2. Select **Save** on the View Report page.
3. Choose location and filename; then select **Save**.

Edit Sample ID

To change the Sample ID if a mistake was made during run set up:

1. Select **Actions** in the View Report page; then select **Edit Sample ID**.

   The operator is presented with a table that lists any previous change history.

2. Update the current Sample ID; then enter Username and Password.

   The save option is not enabled until the operator has entered their Username and Password. This tracks the changes to a specific user and meets the electronic signature and records requirements required in laboratories.

3. Select **Save**.

   After saving the changes, the report reflects the new Sample ID and displays the Change History.

Show Run Details

To see details of the run:

1. Select **Actions** on the View Report page; then select **Show Run Details** from the menu.

   The operator is presented with a list of the system details, messages, and errors associated with that run.

Create Error Bundle

For more information on creating an Error Bundle, see the *Error Bundle* section in *Chapter 8.*

Search Run Data

Search

The icon on the Browse Runs page contains multiple search criteria the operator can use to locate desired runs. The following table describes the search criteria options:

Criteria	Description
Date	Search by selecting the date or date range of interest.
Sample ID	Search by entering the Sample ID of interest.
Pouch Type	Search by selecting the panel of interest.

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Criteria	Description
Operator	Search by selecting the operator of interest.
Module	Search by selecting the Module serial number of interest.
Pouch Status	Search by selecting the pouch outcome of interest: Pass, Fail or Invalid, Completed, Incomplete, Aborted, Instrument Error, or Software Error.

To clear Search Criteria and view all of the runs saved in the database, click **Clear All** on the search screen or the **X** on the search results page.

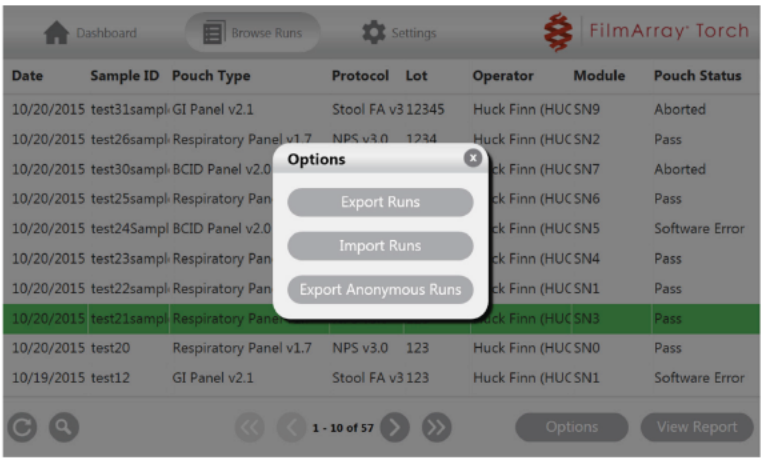
To retain the search criteria and update the search results to include recent runs, select **Refresh**.

Browse Runs Options Menu

The Browse Runs options menu presents a list of actions the operator can use on FilmArray Torch runs. The following table describes the available Browse Runs options:

Menu Item	Description
Export Runs	Enables the operator to write runs to a file while leaving the original runs in the FilmArray database.
Import Runs	Enables the operator to import FilmArray runs from a separate FilmArray database into the database on the FilmArray System Base being used.
Export Anonymous Runs	Works like the Export Runs option, but replaces the Sample ID in the run files with Anonymous.

To access the Browse Runs options menu, select **Options** to bring up the Options menu.



Export Runs

When exporting runs, database files are saved with the extension .db. To export runs to a file:

1. Highlight one or more desired runs on the Browse Runs page. Use the icon to search for runs to export. For more information, see the *Search Run Data* section in this chapter.
2. Select **Options** to view the Options menu; then select **Export Runs**.

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The Specify Filename dialog will appear and allow the user to select a location and filename for the .db file.

3. Select **Save** to start the export process.

   The operator can cancel the export process before it completes by selecting **Cancel** on the export process dialog. Any runs that were exported before selecting Cancel will be saved to the chosen location.

4. After export completion, select **OK** to close the export process dialog.

Import Runs

When importing runs, database files with the extension .db are added.

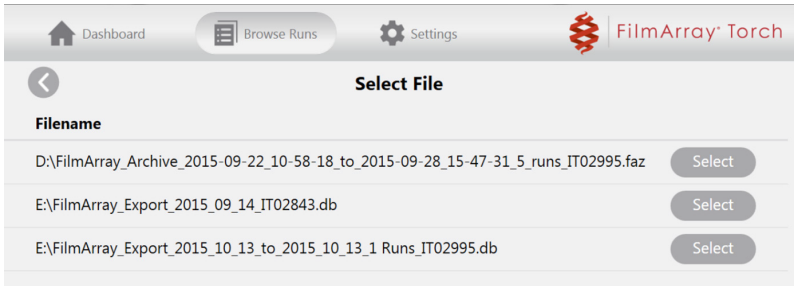
This process can also be used to restore any archived files with the extension .faz. Prior to restoring archived runs, verify that there is sufficient room in the database. If the database is approaching 5,000 runs, see the *Archive Runs* section in this chapter for more information.

To import runs from a file:

1. Insert the removable drive(s) containing the files into an available USB port of the front of the System Base.

2. On the Browse Runs page, select **Options** to display the Options menu; then select **Import Runs**.

   The software searches all removable drives for any files that contain run data (both .db and .faz) and displays these files on the Select File page.



3. Select the runs needing to be imported (or restored) to start the import process.

   The operator can stop the import process before it completes by selecting **Stop**. Any runs that were imported before selecting Stop will be saved in the database.

4. After import completion, select **OK** to close the dialog.

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Export Anonymous Runs

Anonymous run files are saved with extension .adb. If a copy of run files must be sent to an external site, this option protects patient confidentiality. To prevent operators from overwriting a run file with an anonymous run file, these files cannot be imported back into the database

To export anonymous runs to a file:

1. Highlight one or more desired runs on the Browse Runs page. Use the icon to search for runs to export. For more information, see the *Search Run Data* section in this chapter.
2. Select **Options** to view the Options menu; then select **Export Anonymous Runs**.

   The Specify Filename dialog will appear and allow the user to select a location and filename for the .db file.
3. Select **Save** to start the export process.

   The operator can cancel the export process before it completes by selecting **Cancel**. Any runs that were exported before selecting Cancel will be saved to the chosen location.
4. After export completion, select **OK** to close the dialog.

Settings

The Settings option is always accessible from the toolbar. To access Settings from any screen, select the **Settings** option on the toolbar. The Settings option allows users to perform the following administrative type tasks:

- **Print Options**—Allows the operator to set or change a default printer as well as the option to have reports automatically printed.
- **Operators**—Displays all operators currently recognized in the software and allows for addition and modification of operators within the system.
- **Pouch Modules**—Displays all currently installed pouch modules within the software and allows for installation of new pouch modules, modification of their status (active/inactive), and removal.
- **Module Information**—Displays high level information for all Modules connected to FilmArray Torch.
- **Archive**—Allows operators to archive old runs off FilmArray Torch to a removable drive.
- **System Log**—Allows access to system logs for all Modules.
- **About FilmArray**—Displays details about FilmArray Torch installation.
- **Switch to Admin Mode**—Allows an administrator to log out of the FilmArray Torch Software and access the Windows OS to perform administrative tasks (such as software/firmware updates, printer maintenance, and Instrument Configuration).
- **Switch to Cleaning Mode**—Allows an operator to temporarily freeze the touch screen so the surface can be cleaned without activating any actions (see *Chapter 8, Preventative Maintenance and Troubleshooting*).

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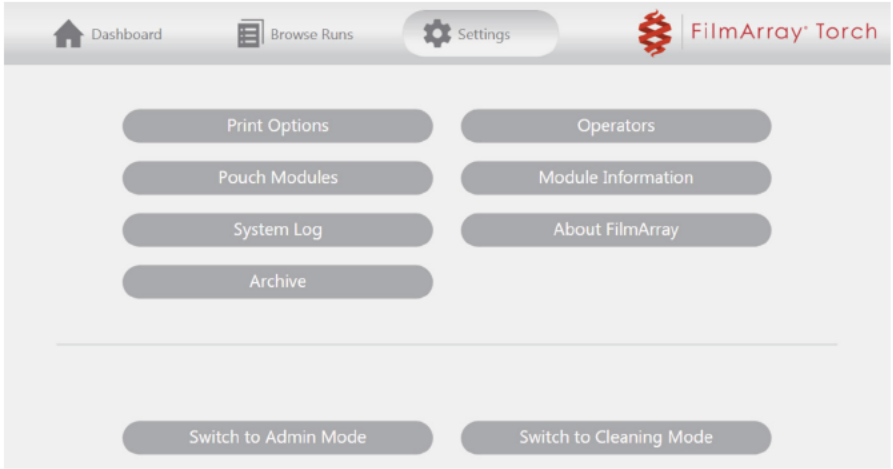


Print Options

Any printer that has been configured to FilmArray Torch can be selected as the default.

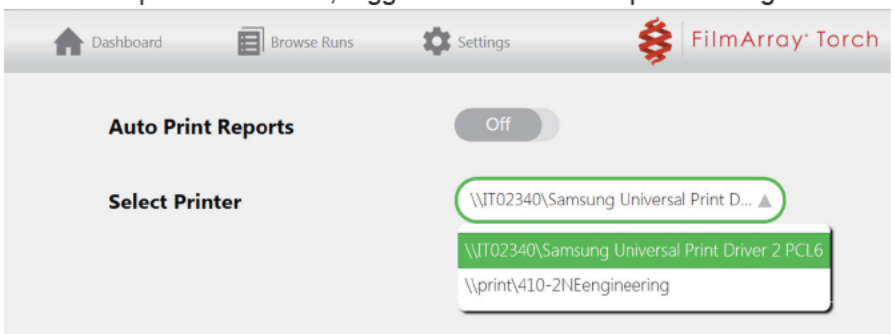
To set a default printer:

1. Select the **Select Printer** drop down box to display all printers configured to the computer. The current default printer is highlighted green.

Select the applicable printer to set it as the default.

The software updates the default printer and displays the new default within the Select Printer display box.

To Auto Print Reports after a run, toggle the Auto Print Reports setting to On or Off.



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Operators

An operator username and password are required to run a pouch on FilmArray Torch.

The FilmArray Torch Software prompts the operator to enter these credentials after a pouch has been inserted into an available Module and pouch information has been captured.

The Operators feature displays all current operators on FilmArray Torch. This feature allows for the addition, modification, and/or deletion of operators.

Create New Operator(s)

New operators are created in two ways:

- Within the Settings toolbar Operators menu option within the Settings toolbar.
- Before starting a run during the Enter Operator Information step.

Operators menu option:

1. Select the **Settings** options from the toolbar; then select **Operators**.
2. Select **Add Operator** at the bottom of the screen when the list of current operators display.
3. Enter the new operator's information in the following fields:
   - **First Name**
   - **Last Name**
   - **Username**
   - **Password**
   - **Confirm**.

     The Confirm field will always display the password dots in red until the Password and Confirm fields match.
4. Select **Save** when complete.

Enter Operator Information step:

1. Select **Add/Edit Operator**.
2. Follow steps 3 and 4 above.

Pouch Modules

This feature enables the operator to install, and inactivate/uninstall pouch modules. These pouch modules contain definitions, instrument protocols, analysis and reporting for specific FilmArray reagent kits.

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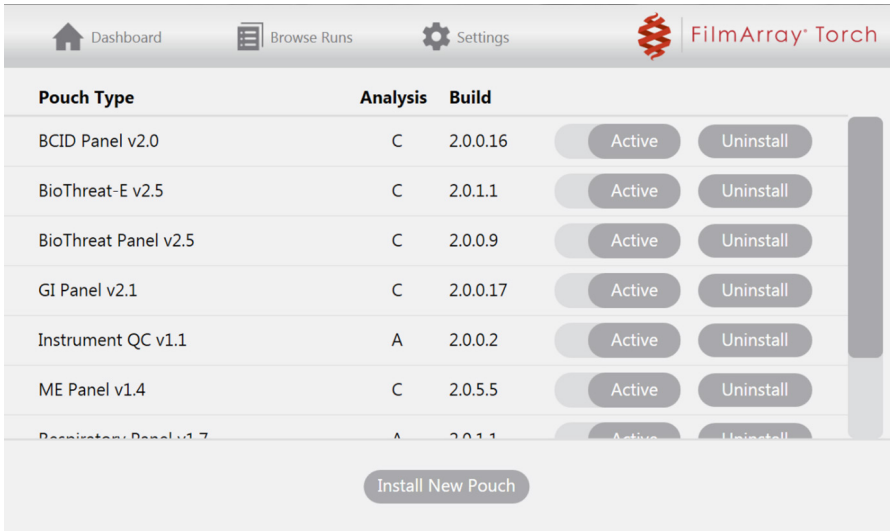
Install Pouch Modules

When new pouch modules are received from BioFire Diagnostics, the Pouch Modules option must be used on the FilmArray Torch. For information on receiving new pouch modules, contact customer support (see *page i*).

To install a new pouch module:

1. Insert removable drive containing the pouch module software.
2. Navigate to the Settings menu from the toolbar.
3. Select **Pouch Modules**.

   All pouch modules currently installed display as Active.



4. Select **Install New Pouch**.

   The new pouch module is displayed and will be set to Active status, to indicate that it is ready for use.

Inactivate/Uninstall Pouch Module

To inactivate a pouch module:

1. Toggle the **Active** slider next to the pouch name to **Inactive**.

To uninstall a pouch module:

1. Select **Uninstall** next to the pouch module name.

   When a pouch module in uninstalled, it is no longer available for selection when starting a run. To re-activate an uninstalled pouch module, it must be installed again.

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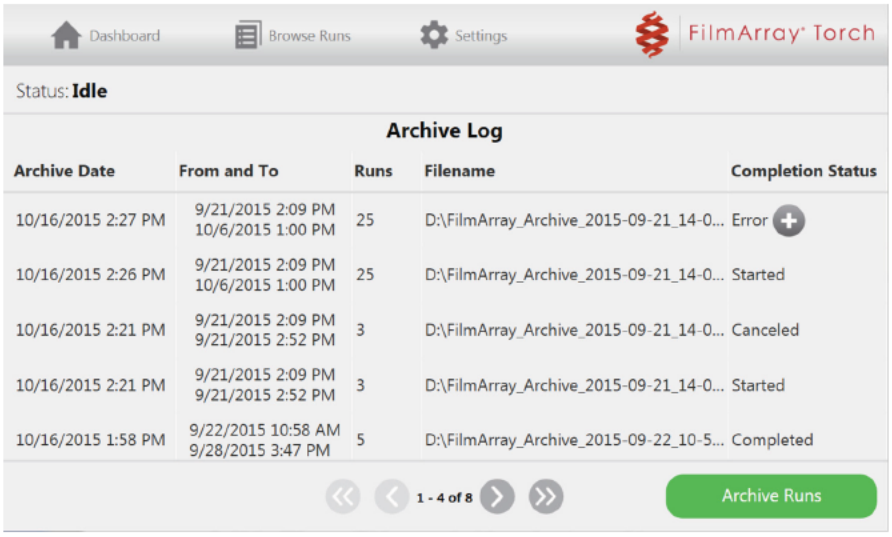
Archive Runs

To archive runs stored in the FilmArray database:

1. Navigate to the Settings menu from the toolbar.
2. Select **Archive**.

   The Archive Log will display the current status of archives and a log of all previous archiving tasks.



3. Select **Archive Runs** to display a calendar.
4. Select a date parameter on the calendar. This parameter means that all runs on or before that date will be archived.

   If more than 100 runs is selected, archived runs are sorted into files containing 100 runs each.
5. Select **Next** to choose the location and filename for the archived runs.

   By default, runs are saved to a file with the extension .faz. Filenames default to a name containing the date parameter and the name of the computer being used.

   After selecting the file name, a message displays indicating that the selected runs will be deleted from the database.
6. Select **Yes** to launch the archiving process. The date and time of the start will be recorded in the Archive Log.

   The archive process executes in the background and the status of the archive is seen in the status message on the Archive Log page. The operator may navigate to the Dashboard to perform other tasks.

   NOTE: The software verifies that all runs have been saved to the file, and then deletes each run from the database one at a time.

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When the archiving is complete, the date and time of the completion is logged and the archiving Status is set to Idle.

7. Remove the removable drive on which the .faz file was saved from the System Base and store according to institutional data retention policies.

Abort Archive Process

It is safe to abort the archive process while runs are being saved. To abort:

1. Select the **Cancel** status message; then select **Confirm**.

   The status message changes to Canceling Archive. The archive stalls and all runs remain in the database.

   When archive cancellation is complete, the date and time of the completion is recorded in the Archive Log and the archiving Status is set to Idle.

NOTE: It is not safe to abort the archiving process while runs are being removed from the database. During this time, the software will not allow the operator to cancel the process.

CAUTION: Do not attempt to shut down the computer or switch to Admin Mode during the archiving process. Wait until the process is complete before shutting down the computer or performing other tasks.

Restore Runs

If a run file must be accessed after it has been removed from the database, the runs stored in the .faz file can be restored to the database by using Import Runs (see the *Import Runs* section in this chapter for more information).

Switch to Admin Mode

Admin Mode tasks are specific to the Windows application; these include:

- Installing printers
- Adding and removing Modules
- Updating software and applying security patches.

Please see Microsoft help for instructions on adding and deleting printers and changing the date and time. For further assistance, please contact technical support (see *page i*).

NOTE: Do not perform administrative tasks on the computer—including setting the computer's date/time—while a run is in progress on any Module.

To access the main Windows application:

1. Select **Settings** from the toolbar; then select **Switch to Admin Mode**.

   This logs the user out of the FilmArray Torch Software and allows for the admin user to log in to Windows. Once logged in as the admin user, the normal Windows desktop is displayed with limited access to Windows tools and the Instrument Configuration application.

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NOTE: Logging into Admin Mode requires a BioFire Diagnostics provided password. To obtain this password, please contact customer support (*see page i*).

Instrument Configuration

Details of instrument configuration, including how to add and remove individual FilmArray Torch Modules, is done through Admin Mode using a separate application. Please see the *Instrument Configuration* section in *Chapter 2* for more information about adding a Module.

Printer Configuration

Adding and configuring printers to the FilmArray Torch is done through Admin Mode using the standard Windows features. For more information, please contact technical support (see *page i*).

Database Management

A local database on the computer stores all run data generated by the FilmArray Torch. The runs saved in the database are listed in a table within Browse Runs toolbar. For more information on the function and use of the Browse Runs toolbar, see the *Browse Runs* section in this chapter.

The database stores up to 12,000 runs reliably. A warning appears when 5,000 runs is reached to encourage frequent archiving of data. For more information on archiving runs, see the *Archive Runs* section in this chapter.

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CHAPTER 7: PRECAUTIONS WHEN WORKING WITH THE FILMARRAY SYSTEM

Laboratory Safety and Biohazards

General Safety Precautions

Please note that while the FilmArray pouches and the FilmArray Torch Modules are not themselves biohazardous, it is good laboratory procedure to handle all waste materials as potentially biohazardous material.

a. Follow all safety instructions printed on, or attached to, the FilmArray Torch.

b. Observe all general safety precautions that apply to electrical instruments.

c. Never touch switches or power cords with wet hands.

d. Do not open the housing of the FilmArray Torch.

CAUTION: Do not attempt to lift or carry the FilmArray Torch while Modules are installed. Remove all Modules prior to lifting or carrying the FilmArray Torch System Base and always lift from the bottom.

NOTE: Only authorized service personnel should perform service or repairs required for this unit.

Laboratory Precautions

Handle all samples and waste materials as if they were capable of transmitting infectious agents. Refer to Biosafety in Microbiological and Biomedical Laboratories (Centers for Disease Control and Prevention and National Institutes of Health; available online at http://www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.htm) or other appropriate Biosafety procedures.

Observe safety guidelines found in the Clinical and Laboratory Standards Institute (CLSI) Protection of Laboratory Workers from Occupationally Acquired Infections, Approved Guideline M29 or other appropriate safety guidelines.

Wear personal protective equipment (PPE) and disposable powder-free gloves while handling reagents or samples and change gloves often. Wash hands thoroughly after performing a run.

Refer to the FilmArray reagent kit instruction booklets for assay-specific safety precautions.

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CAUTION: Use caution when removing pouches from the FilmArray Torch Module; a tear in the pouch could contaminate the FilmArray Torch Module and the surrounding area. Carefully dispose of pouches in a biohazard waste container.

General PCR Precautions

One of the most important guidelines when performing PCR is to avoid contamination. Some important rules to follow are:

a. Perform sample collection, pouch preparation, and running the FilmArray Torch in separate locations.

b. Load the pouch with sample behind a protective shield (or in a biological safety cabinet or hood whenever possible).

c. Do not leave a laboratory area without first completing decontamination procedures (i.e., washing and changing protective clothing and gloves).

Decontamination and Cleaning Procedures

The decontamination and cleaning procedures listed are intended to limit spread of contaminants as a result of a broken or leaked pouch. decontamination is necessary to prevent false-positive results in subsequent runs.

If a pouch leak or breakage occurs, change gloves and other potentially contaminated personal protective equipment (PPE). Change gloves often during the decontamination process, especially during the first steps of decontamination and before touching any clean surface. All PPE should be disposed of after decontamination.

CAUTION: It is important that contamination from leaking and/or punctured pouches be contained and cleaned immediately. pouches that break after PCR can contain large quantities of contaminants and target DNA template that can contaminate future pouch runs. This material, although noninfectious, is easily spread by normal human activity. Consequently, very small (molecular) quantities can be amplified by PCR in future runs, which can then be identified as a false positive by the FilmArray Torch. Treat all broken pouches as capable of contaminating the work area.

BIOLOGICAL RISKS: If the pouch contains potentially infectious material, the risk of biohazard contamination exists in addition to sample contamination.

Cleaning Materials

This list provides items that are necessary in a laboratory to keep contamination to a minimum:

- 10% bleach solution in a squeeze or spray bottle (1 part bleach to 9 parts water)
- Distilled water in a squeeze or spray bottle
- DNAZap™ or equivalent DNA degrading system
- Paper towels
- Bleach wipes

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Pouch Loading Station Decontamination

Routine cleaning of the Pouch Loading Station includes a 10% bleach wipe followed by two water wipes before each new pouch is loaded.

In the event of a sample spill or pouch leak, perform the following decontamination procedures.

1. Put on clean PPE, such as lab coat and gloves.
2. Fill a sink or bin with water and add bleach to create a 10% bleach solution.
3. Submerge the Pouch Loading Station until completely covered with bleach solution. Soak for 15 minutes.
4. Remove Pouch Loading Station from sink or bin. Replace bleach solution with distilled water.
5. Rinse the Pouch Loading Station by completely submerging in distilled water two additional times.

Contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor to obtain a replacement Pouch Loading Station, if necessary.

Decontamination Related to Pouch Leakage

If a pouch leaks, take the following precautions to avoid contamination:

1. Put on clean PPE, such as a lab coat and gloves.
2. Ensure no one uses the FilmArray Torch Module or potentially contaminated areas until the decontamination is complete.
3. Decontaminate the FilmArray Torch Module and work area and dispose of the pouch using the following steps:
   a. Discard leaking pouch in a biohazard container.
   b. Dispose of potentially contaminated gloves and put on clean gloves.
   c. Dispose of the potentially contaminated lab coat.
   d. Put on clean PPE, such as a lab coat and gloves.
   e. Clean the FilmArray Torch Module and affected work areas following the guidelines below in FilmArray Torch Module Decontamination.

CAUTION: Use only 10% bleach solution, distilled water, and/or DNAZap to decontaminate the FilmArray Torch Module and Pouch Loading Station.

FilmArray Torch Module Decontamination

1. Put on clean PPE, such as a lab coat and gloves.
2. Remove pouch from FilmArray Torch Module and discard in biohazard waste container.
3. Dispose of potentially contaminated gloves and lab coat and put on clean gloves and lab coat.

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NOTE: When cleaning the touch screen, put the FilmArray Software into Cleaning Mode. The Cleaning Mode allows 30 seconds for the touch screen to be cleaned. Access this features from the Settings toolbar (see *Chapter 8, Preventative Maintenance and Troubleshooting* for more information).

4. Wet a paper towel with the 10% bleach solution and wipe all exterior surfaces of the FilmArray Torch, including the bottom and the bench top where the FilmArray Torch Module had contact. Let it stand for at least 3 minutes to allow the bleach solution to react with any contaminants. Discard paper towel in biohazard waste. Change gloves.

CAUTION: The interior of the pouch slot and Module(s) should not be cleaned.

5. Repeat Step 4 twice with fresh paper towels for a total of three bleach wipes.
6. Change gloves, then wet a new paper towel with distilled water and wipe the all exterior surfaces of the FilmArray Torch. Discard paper towel in biohazard waste. Change gloves.
7. Repeat Step 6 with a new paper towel.
8. Remove FilmArray Torch Module face plate. Repeat Steps 3 through 7 for inner face plate surfaces and pouch slots.

Decontamination of Bench Tops and Other Areas

1. Put on clean PPE, such as a lab coat and gloves.
2. Spray the 10% bleach solution on the area that may have been contaminated. Let it stand for at least three minutes to allow the bleach solution to react with any contaminants on the surface.
3. Wipe the area with a clean paper towel. Change gloves.
4. Repeat Steps 2 and 3 twice, for a total of three wipes.
5. Change gloves. Spray the area with distilled water.
6. Wipe the area dry with a new paper towel. Change gloves.
7. Spray the area with DNAZap or an equivalent product. Follow the product's instructions for correct use. Change gloves.
8. Rinse the area by spraying it with distilled water and wiping it dry.

Check Function of Decontaminated FilmArray Torch Module

1. Test a negative sample by preparing a pouch according to instructions in *Chapter 5*, using water as the sample. Use distilled, sterile or molecular grade water for this test.
2. If the run is successful and all results are negative, continue using the FilmArray Torch Module as normal.
3. If unexpected positive results are obtained, or the run fails, please contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor for further instructions.

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CHAPTER 8: PREVENTATIVE MAINTENANCE AND TROUBLESHOOTING

Introduction

This chapter provides step-by-step instructions for operators performing basic maintenance and troubleshooting for the FilmArray Torch.

The tasks performed in this chapter are the only tasks that should be performed by the operator. Do not attempt to perform any additional maintenance without the guidance and direction of a specialist from BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.

In the event that an individual Module or the entire FilmArray Torch is taken out of service, it should be returned following the *FilmArray Torch Return Procedure* in *Appendix A*.

CAUTION: Before performing maintenance on the FilmArray Torch, put on appropriate PPE, turn off the power to the system, and unplug the Ethernet and power cables.

General Maintenance

There is no general maintenance needed for the FilmArray Torch other than the periodic cleaning steps listed below:

1. Wipe down all outside surfaces of the FilmArray Torch with a cloth or paper towel and a freshly prepared 10% bleach solution (one part bleach to nine parts water), followed by a water wipe.

NOTE: Do not remove the FilmArray Torch Module face plate and clean underneath it, except in the case of a contamination event.

2. Periodically check and clean the FilmArray Torch Module's air filters for any build up and debris. Air filters can also be swapped out with the spare filters included with the FilmArray Torch Module box (see *Chapter 2, FilmArray Torch Setup*).

3. When cleaning the touch screen of the FilmArray Torch, it is recommended that the FilmArray Torch Software be put into **Cleaning Mode** in order to avoid any accidental selections.

   This can be done by navigating to the Settings toolbar and selecting the **Switch to Cleaning Mode** option. After selecting a confirmation for this action, the screen will display a timer for 30 seconds that will temporarily freeze the screen and allow for cleaning of the surface.

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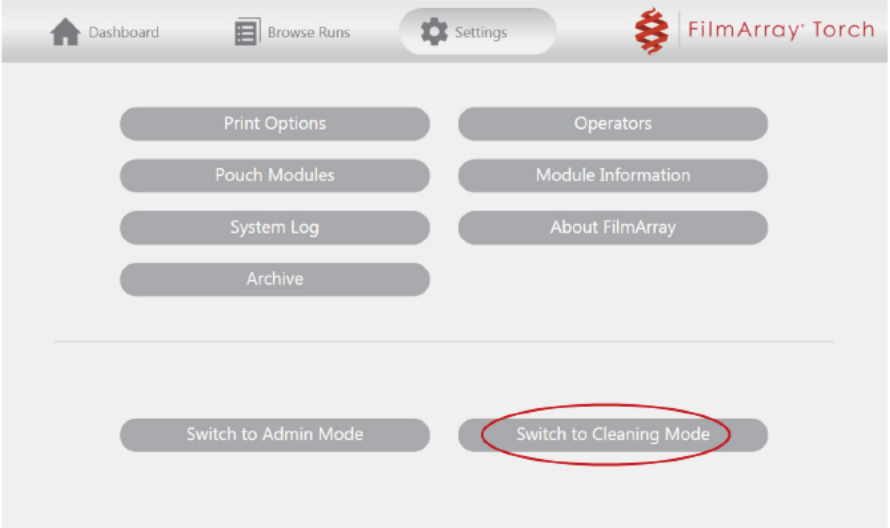

4. Use a lens cloth and lens cleaner to clean the lens of the barcode scanner.

Error Reporting Tools

The FilmArray Torch performs self-diagnostics with every run. Malfunctions are reported as errors to the operator with instructions on how to correct them. Record any error messages to assist in troubleshooting. Questions should be directed to BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.

Troubleshooting

Hardware Troubleshooting

The table below lists potential symptoms and possible solutions for troubleshooting hardware issues with the FilmArray Torch. If the issue(s) persists after applying the recommended solutions, contact technical support for further assistance (see page i).

Note all error messages, as well as the serial numbers of the System Base and affected Module(s), along with any necessary pouch lot numbers before contacting technical support. Technical support personnel will use this information to identify and resolve the issue(s).

Symptom	Possible Solution
FilmArray Torch Module status lights are not on	• Turn Module on • Check power cord • Try different outlet • If problem persists, contact technical support
FilmArray Torch Module status light is red	• Reset system using the reset button located on the rear of the System Base • Check and reconnect cables • If problem persists, contact technical support

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Symptom	Possible Solution
FilmArray Torch Module status light is blinking purple	• Remove and discard the pouch • Remove the faceplate of the affected Module and reset the Module • If problem persists, contact technical support
Software will not connect to FilmArray Torch Module	• Check cable connections • Turn off system and disconnect all cables • Reconnect all cables and turn system on • If problem persists, contact technical support
Pouch not recognized when inserted into or removed from FilmArray Torch Module	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Pouch not recognized when inserted into FilmArray Torch Module, due to jam	• Follow the software's on-screen instructions for recovery • If problem persists, contact technical support
Pouch is ejected immediately after insertion	• Remove the face plate of the affected Module and reset the Module • Check and reconnect cables • If problem persists, contact technical support
Pouch is difficult to insert into FilmArray Torch Module	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Pouch does not eject from Module after run	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Software on the System Base computer crashes	• Reset the computer using the reset button on the back of the System Base. • If problem persists, contact technical support

Barcode Scanner

The barcode scanner is included with the FilmArray Torch. It is preprogrammed to read the pouch barcodes. Pouch information may be entered manually in the event the barcode scanner is not working.

If the issue persists after applying the recommended solution shown in the table below, contact technical support for further assistance (see page i).

Symptom	Possible Solution
Barcode will not scan	• Clean the barcode scanner screen • Manually input the pouch serial number and lot number

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Diagnostic Errors

Diagnostic errors are used mainly by technical support representatives to troubleshoot FilmArray Torch problems. Diagnostic errors can be found in the System Log. See the *System Log* section in this chapter for details on accessing this information.

The table below lists potential error messages and possible solutions. If the error(s) persists after applying the recommended solutions, contact technical support for further assistance (see *page i*).

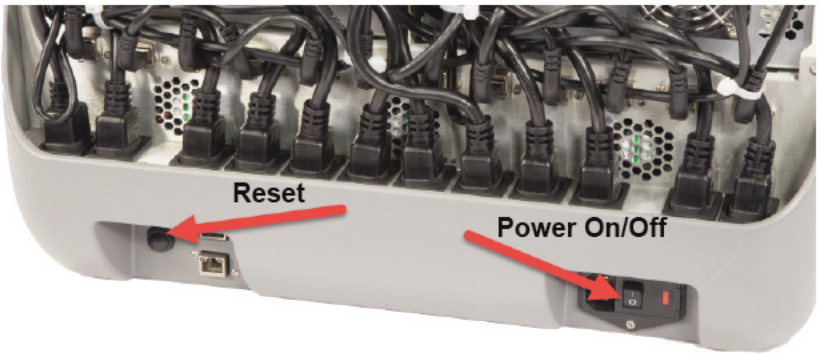
Note all error messages, as well as the serial numbers of the System Base and affected Module(s), along with any necessary pouch lot numbers before contacting technical support. Technical support personnel will use this information to identify and resolve the error(s).

Error Message	Possible Solution
1012 Pouch Not Present	• Remove the face plate of the affected Module and reset the Module by holding down the reset button on the front of the Module until the light turns off. • If problem persists, contact technical support
1014 Failed to Find Run Data	
1015 Failed to Read Run Data	
2003 Thermoboard is not present	
2004 Valve board is not present	
3001 Valve Board Response Timeout	
3002 Valve Board Malformed Response	
3003 Valve Board Command Error Response	• Remove the face plate of the affected Module and reset the Module by holding down the reset button on the front of the Module until the light turns off. • If problem persists, contact technical support
3004 Thermocycler Board Response Timeout	
3005 Thermocycler Board Malformed Response	
3006 Thermocycler Board Command Error Response	
4001 Pressurization failed	
7001 Camera Initialization Error	
7003 Failed Excitation Check	

Software Troubleshooting

Weekly Maintenance

It is not necessary to shut down and restart the computer. However, if it is facility policy to do so, this can be done by selecting the reset button on the back of the System Base, waiting for the screen to go black, then switching off the power. Switching the power back on will then restart the computer and start the software automatically.



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Attention Status

If communication is lost between the FilmArray Torch Module and FilmArray Torch System Base during a run, the run will continue and data will be uploaded when communication is re-established.

Error Messages

Errors in the FilmArray Torch may originate in a FilmArray Torch Module, in the software, or in communication between the two. In each case, the FilmArray Torch Software reports a clear message with instructions that the operator can follow to resolve the issue. These messages and the suggested actions are reported in the table that follows.

Error Message	Possible Solution
The pouch has already been run - a pouch can only be used once.	Verify the correct pouch has been loaded into the FilmArray Torch Module. Discard any pouch that has already been run in a FilmArray Torch Module.
The software for the scanned pouch is not installed or is inactive. Please install or activate the required pouch module.	Verify the correct pouch module is installed and the correct barcode has been scanned for the pouch.
An attempt to Leave the Workflow has been made. If a pouch has been inserted the pouch will be ejected and Run Setup will have to be restarted. Do you wish to continue?. NOTE: All entered data will be lost.	Confirm if Run Setup Workflow will be ended. If a pouch has been inserted, that pouch needs to be removed from the Module.
FilmArray Torch database has more than 5,000 runs on it. Please use the Archive feature within Settings to remove runs from the database and store them according to your data retention policy. Please contact FilmArray Customer Support if you require assistance.	The FilmArray Torch database stores up to 12,000 runs reliably. Should this number be approached, use the Archive Runs feature in the Settings area to remove run files from the database and store the data in a separate location. Contact technical support if the problem persists.
The Module is in an Attention state. Remove the magnetic faceplate from the Module and press the Reset button. A white light on the Module indicates initialization which may take up to 2 minutes. If the problem persists, contact FilmArray Customer Support for assistance.	Follow the error message as directed. Contact technical support if the problem persists.
The FilmArray Torch encountered an error during the run. The test results are invalid. Please see the System Log for details. If the problem persists, contact FilmArray Customer Support for assistance.	Discard the pouch and follow the error message as directed. This message should be accompanied by a fast blinking green light on the Module. This light indicates that the test is complete and the pouch can be removed. Removing the pouch sets the FilmArray Torch Module into an Available state and prepares the Module for another test. Contact technical support if the problem persists.

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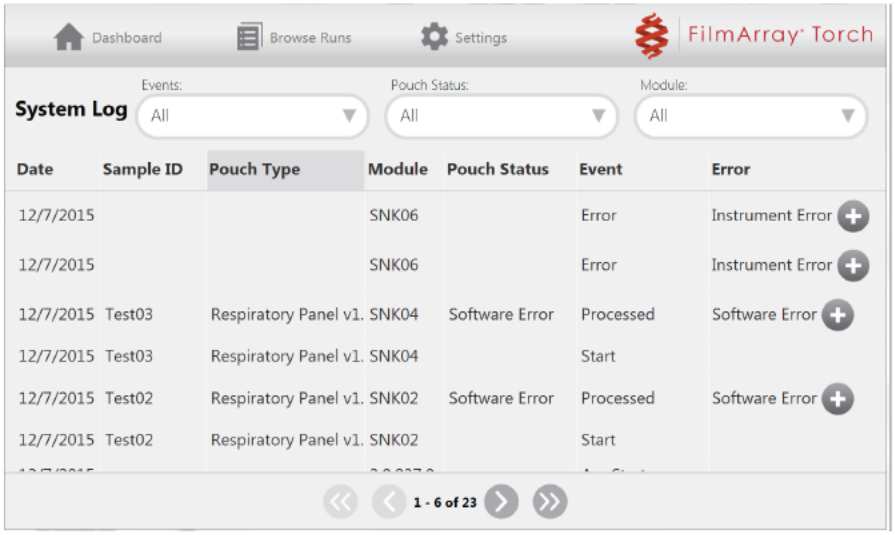
Error Message	Possible Solution
The FilmArray Torch software encountered an unexpected error. Please see the System Log for details. If the problem persists, contact FilmArray Torch Customer Support for assistance.	Follow the error message as directed. Contact technical support if the problem persists.
Run data was retrieved but cannot be analyzed because the <pouch type> pouch module was not installed in the software. For assistance, please contact FilmArray Customer Support.	

System Log

Depending on the error, the FilmArray Torch Software may refer to the System Log for details about the error. The System Log is accessed via the Settings toolbar.

When the System Log is opened, a table is presented that displays the following information as shown in the figure below.

1. Date the log was created
2. Sample ID
3. Pouch Type
4. Module serial number
5. Pouch Status
6. Type of Log Event (Start, Processed, Error)
7. Error encountered



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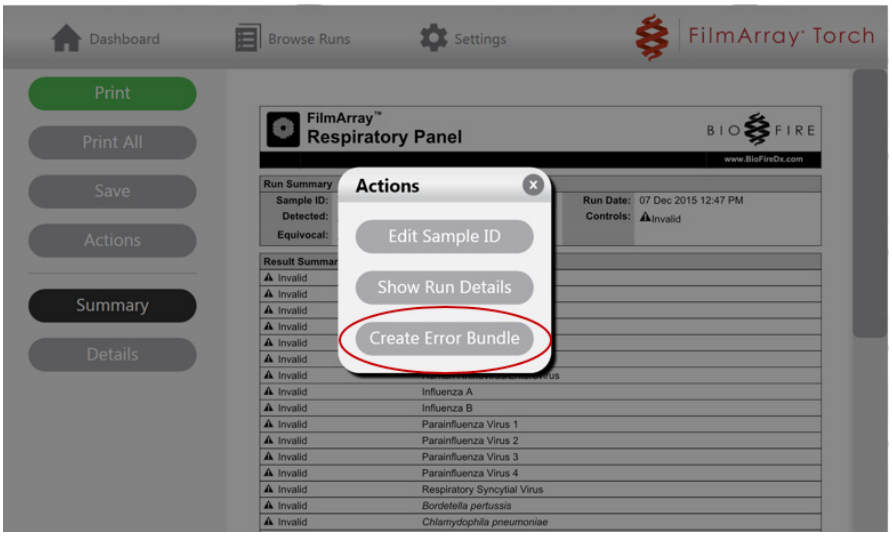
Error Bundle

If an error occurs that is associated with a FilmArray Torch run, a technical support representative may request the operator to create and provide an error bundle for that run. The error bundle is designed to assist in troubleshooting errors associated with a run. It packages files related to the status of the system, FilmArray Torch Module, and software, including System Log data.

To create an error bundle:

1. Navigate to the Browse Runs page from the toolbar.
2. Highlight the desired run in the Browse Runs toolbar.
3. Select **View Report** to open the report page; then select **Actions**.
4. Select the menu item **Create Error Bundle**. A dialog to specify the drive and file name is displayed.



5. Select an existing folder to store the zipped file in, or create a new one. The FilmArray Torch software saves the file to the desired folder.
6. When the error bundle is complete a message to indicate that the error bundle has been created will appear.

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Pouch Troubleshooting

For problems encountered while using a FilmArray pouch, see the possible solutions below. If pouch leakage occurs, refer to Chapter 7 for proper decontamination procedures.

Problem	Possible Error Cause	Solution
Pouch packaging is not sealed tightly around pouch canister	Loss of vacuum in pouch packaging	Attempt to hydrate. If pouch hydration is successful, continue the run. Otherwise, discard the pouch and use a new pouch to test the sample.
Pouch does not automatically draw Hydration Solution or sample mix into pouch when loading	Loss of vacuum in pouch	Discard the pouch and use a new pouch to test the sample.
Failed controls	Hydration Solution not added or drawn into pouch	Retest sample in a new pouch.
	Sample mix not added or drawn into pouch	Retest sample in a new pouch.
	pouch and/or FilmArray Torch Module are not functioning properly	Retest sample in a new pouch.
		If controls continue to fail contact technical support.
Inadequate volume in Hydration Solution or Sample Buffer vials/ampoules	Evaporation or leakage	Discard vials/ampoules and obtain new ones.

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APPENDIX A: FILMARRAY SUPPORT INFORMATION

FilmArray Torch Module problems may be reported by contacting BioFire Diagnostics technical support, the local bioMérieux sales representative, or an authorized distributor.

FilmArray Torch Module Return Procedure

If returning a FilmArray Torch Module from within the United States, visit the Return Forms and Decontamination Procedures webpage:

- http://www.biofiredx.com/support/return-forms/

If returning a FilmArray Torch Module from outside the United States, contact the local bioMérieux sales representative or an authorized distributor for detailed instructions.

Disposal Recommendation

Components of the FilmArray Torch such as the FilmArray Torch Module, the computer, monitor, keyboard, etc., which are marked with the crossed-out wheeled bin symbol are covered by the European Directive 2012/19/EU.

These items must be disposed of via designated collection facilities appointed by government or local authorities.

For more information about disposal of your old product, please contact your city office or waste disposal service; or BioFire Diagnostics Customer Support Department, a local bioMérieux sales representative, or an authorized distributor.

FilmArray Ordering Instructions

Customers inside the United States should contact BioFire Diagnostics to order any FilmArray equipment, accessories, and/or supplies.

BioFire Diagnostics accepts purchase orders and credit cards (Visa®, MasterCard®, and American Express®) as methods of payment.

Orders can be made via:

- E-mail: salesorders@biofiredx.com
- Fax: 801-588-0507
- Phone: 800-735-6544 or 801-736-6354
  - Payment is by credit card only for phone orders.

If ordering from outside the United States, contact the local bioMérieux sales representative or an authorized distributor for detailed instructions.

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Warranty Information

Product warranty information is available online at:

- http://www.biofiredx.com/support/

For warranty information for customers outside the United States, contact the local bioMérieux sales representative or an authorized distributor.

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APPENDIX B: BARCODE CALIBRATION

If the barcode reader is not functioning, calibrate it by scanning the barcode shown below to program the barcode reader. The reader should sound as the code is scanned.

FilmArrayCR8000Config

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For additional information regarding our products and applications, please contact BioFire Diagnostics Customer Support Department, local bioMérieux sales representative or an authorized distributor.

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Operator's Manual

For Research Use Only

RUO

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This document is used solely for the purpose of FilmArray Torch operation.

Always maintain the FilmArray Torch in good working order. If used in a manner not specified by BioFire Diagnostics, LLC, then protection provided by the equipment may be impaired.

A printed version of this manual is available upon request.

BioFire Diagnostics, LLC
390 Wakara Way
Salt Lake City, UT 84108
USA

FilmArray® Torch Operator s Manual RUO HTFA-PRT-0009-DRAFT January 2016

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Customer and Technical Support

Customer and Technical Support for U.S. Customers	
Reach Us on the Web www.biofiredx.com **Reach Us by E-mail** support@biofiredx.com **Reach Us by Mail** 390 Wakara Way Salt Lake City, UT 84108 USA	**Reach Us by Phone** 1-800-735-6544 –Toll Free (801) 736-6354 - Utah **Reach Us by Fax** (801) 588-0507
Customer and Technical Support Outside of the U.S.	
Contact the local bioMérieux sales representative or an authorized distributor for technical support.	

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Table of Symbols

The following symbols can be found on the FilmArray Torch Modules, the System Base, the Duplex(es), the FilmArray pouches, or throughout this manual. Use the definitions below as a guideline to interpreting the symbols.

	Manufacturer		Biological risks		Caution
	Consult instructions for use	www	Instructions for use available online	Tel.	Instructions for use available by telephone
RUO	RUO Research Use Only	REF	Catalog number	SN	Serial number
LOT	Batch code (Lot number)	CE	European Union Conformity	EC REP	Authorized representative in the European Community
c UL us LISTED	Underwriter's Laboratory Listing Mark		Electrical Power		Protective Ground
	Off		On		Reset
	Alternating current		WEEE - Do not throw in trash		USB Cable
	Keep dry		Ethernet Cable		Use-by date (YYYY-MM-DD)
	Temperature limit		The NOTE symbol explains how to operate the FilmArray Torch more efficiently.		

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Abbreviation of Terms

A.....amp (ampere)
cm .....centimeters
DNA .....deoxyribonucleic acid
dNTP.....deoxyribonucleotide triphosphate
kg.....kilograms
Hz .....hertz
in .....inches
RUO.....Research Use Only
lbs .....pounds
m.....meters
nmPCR .....nested multiplex PCR
PCR .....polymerase chain reaction
PPE.....personal protective equipment
RNA .....ribonucleic acid
RT .....reverse transcription
Taq .....enzyme from Thermus aquaticus
Tm.....melting temperature
VAC.....volt, alternating current

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CHAPTER 1: FILMARRAY TORCH

FilmArray Torch Intended Use

The FilmArray Torch is an automated device designed to work with specific reagent pouches to detect multiple nucleic acid targets contained in samples. The FilmArray Torch interacts with the reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nested multiplex PCR (nmPCR) in a closed system. The resulting PCR products are evaluated using DNA melting analysis. The FilmArray Torch Software automatically determines the results and provides a test report.

FilmArray Torch is a modification of FilmArray 2.0 and is composed of two to twelve FilmArray Torch Modules connected to a FilmArray Torch System Base running FilmArray Torch Software. The FilmArray Torch System Base houses two FilmArray Torch Modules. Up to five Duplex Module enclosures, each capable of housing two additional Torch Modules, may be added on top of the FilmArray Torch System Base. Each FilmArray Torch Module can be randomly and independently accessed to run a reagent pouch. The FilmArray Torch Software controls the function of each FilmArray Torch Module and collects, analyzes, and stores data generated by each FilmArray Torch Module.

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Limitations of Use

- This product can be used only with FilmArray pouches.
- Do not remove the FilmArray Torch Module(s) face plate during a run.
- Use only the supplied cables when connecting any FilmArray Torch Module to the FilmArray Torch System Base.
- Do not use cable extenders to increase cable length.
- Do not install any software other than the BioFire Diagnostics FilmArray Torch Software on the computer unless required by peripheral devices (printers, flash drives, other USB devices).
- Do not install any antivirus software on the computer.
- Do not enable Windows Automatic Updates on the computer.
- Do not change screensaver settings on the computer.
- Do not run other software programs when running the FilmArray Torch Software.
- Do not enable wireless network connections.
- Do not modify the FilmArray Torch Software or configuration settings.
- Do not adjust system settings (such as date/time) while FilmArray Torch Modules are running.
- Do not re-run a pouch associated with an error, incomplete run, or invalid result.
- Only authorized service personnel should install and perform service or repairs on the FilmArray Torch.

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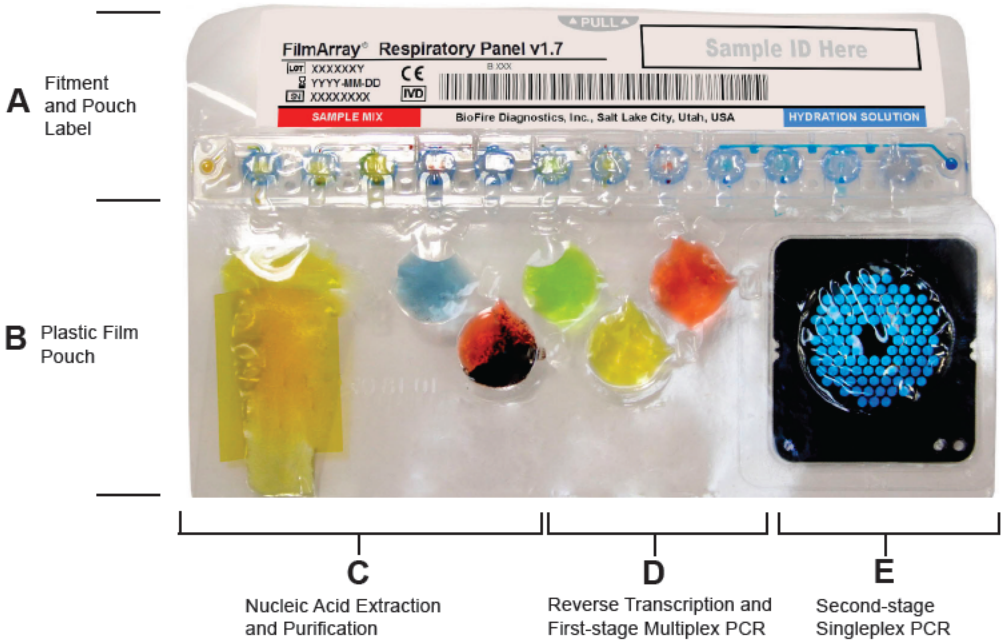
FilmArray Pouch

Each FilmArray pouch is a self-contained, closed-system disposable that houses all the chemistry required to isolate, amplify, and detect nucleic acid from a sample. The reservoirs in the rigid plastic component, or fitment, of the pouch (A) contain freeze-dried reagents. The flexible plastic film portion of the pouch (B) is divided into discrete segments (blisters) which, via interactions with actuators and sensors in the FilmArray Torch Module, are where the following chemical processes are performed:

(C) Extraction and purification of nucleic acids from a sample using mechanical lysis (bead beating) and magnetic bead technology

(D) First-stage multiplex PCR (including reverse transcription of target RNAs when appropriate)

(E) Second-stage singleplex PCR and melting analysis within a multi-well array



NOTE: The colored liquid in this image of a FilmArray pouch is for visualization only. FilmArray pouches do not contain any colored fluid.

Each pouch contains at least one internal process control. Control material is lysed and the nucleic acids of the control material are extracted along with that of the organisms contained in the sample. When the internal control is positive, proper operation of the FilmArray Torch Module and chemical processes have been demonstrated.

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FilmArray Torch

Major components and operations of the FilmArray Torch are described below. A full list of components can be found in *Chapter 2* and specific step-by-step operating instructions can be found in *Chapter 5*.

FilmArray Pouch Modules

Each FilmArray reagent pouch requires a pouch specific software called a pouch module to be installed on the FilmArray Torch in order to perform a test. These pouch modules contain definitions, instrument protocols, analysis and reporting for specific FilmArray reagent kits. See the *Pouch Modules* section in *Chapter 6* for more information.

FilmArray Pouch Preparation

Refer to the *Procedure* section of the appropriate FilmArray reagent kit instruction booklet for step-by-step instructions for sample and pouch preparation.

FilmArray Torch Runs

The FilmArray Torch is used in combination with FilmArray reagent pouches to perform tests, also known as runs, that detect multiple nucleic acid targets contained in samples. The FilmArray Torch interacts with the reagent pouch to both purify nucleic acids and amplify targeted nucleic acid sequences using nmPCR in a closed system.

The FilmArray Torch Software includes a detailed workflow that guides the operator on how to perform a run. Once a pouch has been prepared for testing, on-screen instructions prompt the operator to enter pouch and sample information, insert the pouch into an available Torch Module and start the run. For more information on starting a FilmArray Torch run, see *Chapter 5.*

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FilmArray Torch Module and Pouch Interaction

After the run is started, a series of plungers, pneumatic actuators, and hard seals work together to move and mix liquid reagents between the blisters of the pouch. The FilmArray Torch Module controls these functions automatically based on the pouch module run protocol selected for a specific pouch and sample type in the FilmArray Torch Software.

Mechanical Lysis

The first step in processing a sample is to break the outer membrane of the target cells or organisms contained in the sample using a device called a bead-beater. A sensor detects the speed and operation of the bead-beater motor and aborts the run if the bead-beater is not working properly.

Nucleic Acid Extraction

Following bead-beating, the nucleic acids contained in the sample are purified by magnetic bead technology. A retractable magnet is used to capture or release the magnetic beads during washes.

Thermal Control

The purified nucleic acids are mixed with PCR reagents, which amplify all of the targets identified by the pouch as well as the control material. A Peltier device drives the thermocycling (heating and cooling of the solution) of the reverse transcription and/or first-stage PCR reactions. A second Peltier device controls thermocycling for second-stage PCR and DNA melting. These reactions take place in the array located in the final pouch blister. The thermocycling conditions are controlled by the run protocol associated with each specific reagent pouch and sample type.

Optics and Imaging

To identify targets from positive PCR reactions, DNA melting curve analysis is performed. The fluorescence emitted by the LCGreen® Plus dye is imaged by a camera. DNA melting curves are captured by slowly increasing the temperature of the PCR array and capturing the fluorescent signal. These images are processed automatically by the computer, and the data is analyzed to determine if the control reactions passed and which targets were detected in the sample.

The optics system contained in the FilmArray Torch Module is aligned, focused, and calibrated at the factory. Proper operation and calibration of FilmArray Torch Module optics is monitored by the FilmArray Torch Module self-tests and internal pouch controls.

FilmArray Torch Software

The FilmArray Torch Software manages and controls the operation of each FilmArray Torch Module. The software also collects, stores, and analyzes data generated by the FilmArray Torch Module. Results of analyses are presented in a test report. A brief overview of major software components are described below. For more detailed information about the features and operation of the FilmArray Torch Software, see *Chapter 6, FilmArray Torch Software*.

Toolbar

The toolbar always displays at the top of the screen and consists of three options:

- Dashboard
- Browse Runs
- Settings

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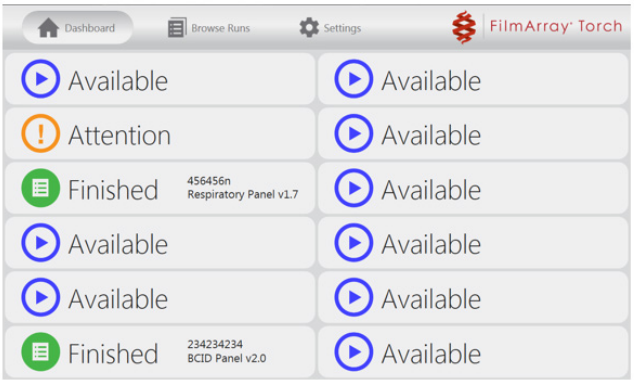
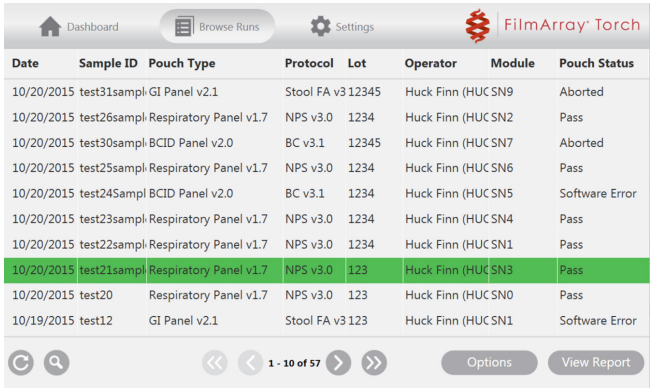
Dashboard

Displays the status of each FilmArray Torch Module within the FilmArray Torch and guides operators through the process of operating the Modules.



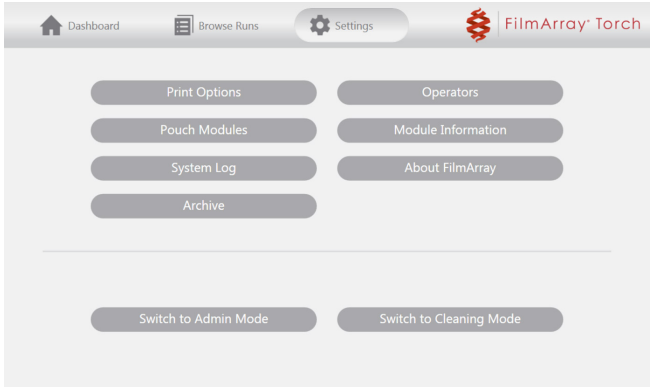
Browse Runs

Allows operators to search for runs and perform operations on individual runs or on groups of runs.



Settings

Allows users to perform administrative type tasks, such as managing operators (adding and updating), view system logs, etc.



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CHAPTER 2: FILMARRAY TORCH SETUP

CAUTION: FilmArray Torch installation should only be performed by a BioFire Diagnostics appointed specialist. A brief description of the installation process is provided below.

Setup Requirements

Select a clean, well-ventilated area that is large enough to fit the FilmArray Torch.

- There must be at least 1 inch (2.6 cm) between the rear panels and any other surface (such as the wall) to allow for proper air flow.
- The depth of the bench-top space should be at least 30 in (77 cm).
- The width of the bench-top space should be at least 19 in (49 cm).
- The height of the space required depends on the number of FilmArray Torch Modules installed:
  - System Base (1 computer, 1 Duplex) – 11.5 in (30 cm)
  - System Base + 1 Duplex – 16 in (41 cm)
  - System Base + 2 Duplexes – 20.5 in (53 cm)
  - System Base + 3 Duplexes – 25 in (64 cm)
  - System Base + 4 Duplexes – 29.5 in (75 cm)
  - System Base + 5 Duplexes – 34 in (87 cm)

NOTE: One Duplex holds two FilmArray Torch Modules.

- Power Specifications:

Qty. of Modules	Voltage	Frequency	AC Current at 120V*	AC Current at 240V*
2	100-240VAC	50-60Hz	3.2 A	1.7 A
4			5.0 A	2.8 A
6			6.9 A	3.8 A
8			8.8 A	4.8 A
10			10.6 A	5.8 A
12			12.5 A	6.9 A

*Grounded outlet required

NOTE: FilmArray Torch requires one power outlet. A single data outlet is sufficient for optional LIS connectivity.

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The FilmArray Torch complies with the emission and immunity requirements in IEC 61326. It is advisable to evaluate the electromagnetic environment prior to operating the device.

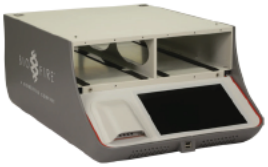
CAUTION: Do not use this device in close proximity to sources of strong electromagnetic radiation (unshielded intentional radio frequency sources, for example) because these may interfere with the operation of the FilmArray Torch.

FilmArray Torch Components

Each FilmArray Torch comes with a FilmArray Torch System Base, at least two FilmArray Torch Modules, accessories, and optional Duplexes to house additional Modules. The FilmArray Torch ships in a minimum of three boxes and a maximum of 18 boxes: one FilmArray Torch System Base box, two to twelve FilmArray Torch Module box(es) (one box per Module), and up to five FilmArray Torch Duplex boxes (one for every two Torch Modules past the first two Torch Modules). Materials provided in these boxes include:

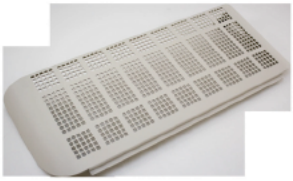
FilmArray Torch System Base Box Contents

NOTE: The FilmArray Torch System Base comes pre-loaded with the FilmArray Torch Software



System Base

Top Cover



System Base Cable Shroud

FilmArray Pouch Loading Station

EU Power Cable

US Power Cable

Ethernet Cable

FilmArray Torch Information CD

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FilmArray Torch Module Box Contents

FilmArray Torch Module

Face Plate

Filter

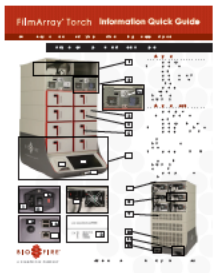
Long Ethernet Cable

Long Power Cable

Spare Filters (2x)

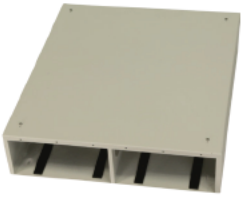
Short Ethernet Cable

Short Power Cable



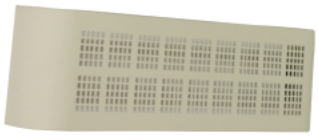
Information Quick Guide

FilmArray Duplex Box Contents



Duplex

FilmArray Pouch Loading Station



Duplex Cable Shroud

NOTE: The Duplexes are shipped separately in their own boxes (each Duplex can house two FilmArray Torch Modules).

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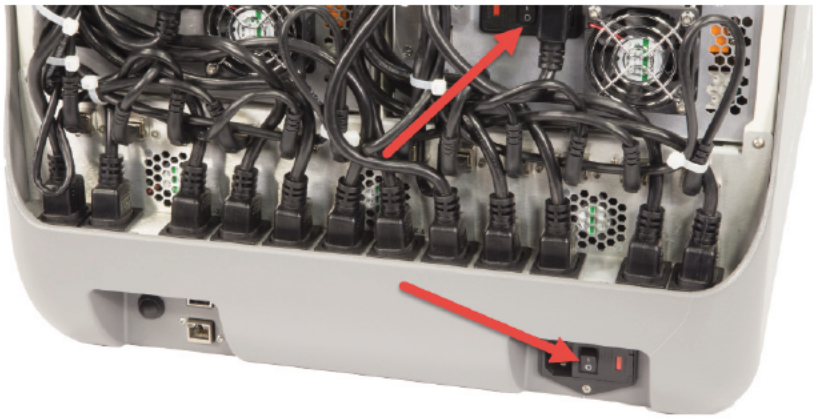
FilmArray Torch System Base Setup

CAUTION: Use only the supplied cables when connecting the FilmArray Torch Modules to the Film Array Torch System Base. Do not use cable extenders to increase cable length.

1. Remove all components in the System Base and Module boxes.
2. Place the System Base in desired location.
3. Install the two Modules onto the System Base.
4. Connect Modules to the Torch System Base using the numbered power and ethernet ports on the System Base for best connections.

5. Plug in power and ethernet cord from the System Base to the wall.
6. Turn on power to the System Base and each Module.



NOTE: The System Base is equipped with additional USB ports on the front that can be used to connect removable drives. The required drivers for these devices can be installed on the System Base computer.

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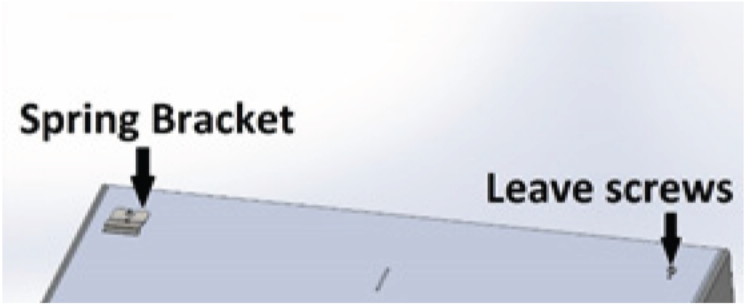
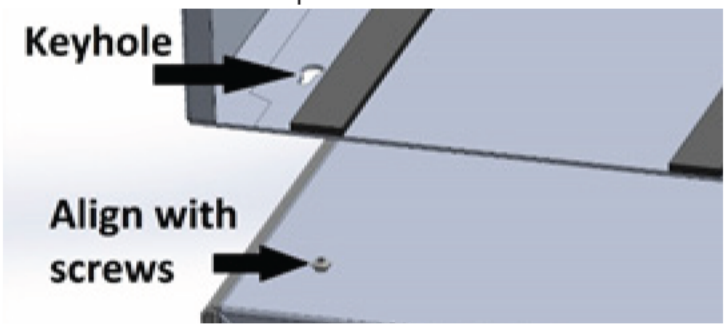
FilmArray Torch Duplex Setup

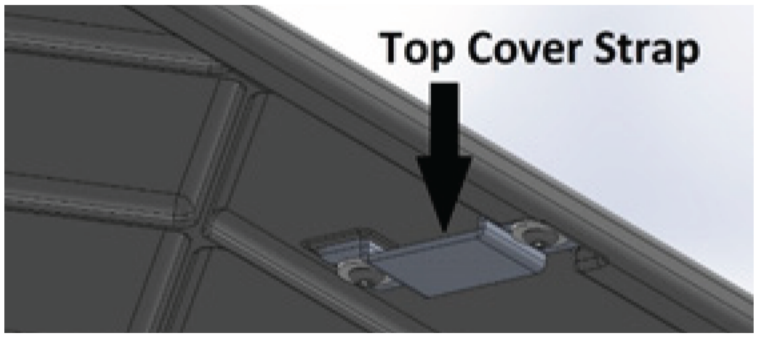
1. Remove all components from the Duplex box(es).
2. Remove the spring brackets at the rear of the top cover (leave the screw threaded in below).



3. Stack a Duplex module enclosure on top of the System Base/lower Duplex and align the key-holes with the screws in the base/Duplex below.



4. Slide the new Duplex back until the front edge is aligned with the Duplex below it; then tighten the fasteners.
5. Repeat steps 4 – 5 until all Duplexes are installed (up to a max of 5 Duplexes; the FilmArray Torch should only ever have 12 Modules connected).
6. Reinstall the top cover spring brackets on the top Duplex (at the rear holes) and tighten the screws.
7. Align the Top Cover straps on the underside of the Top Cover assembly with the spring brack-ets; then slide the Top Cover back until the Top Cover tabs align with the front of the top Duplex.



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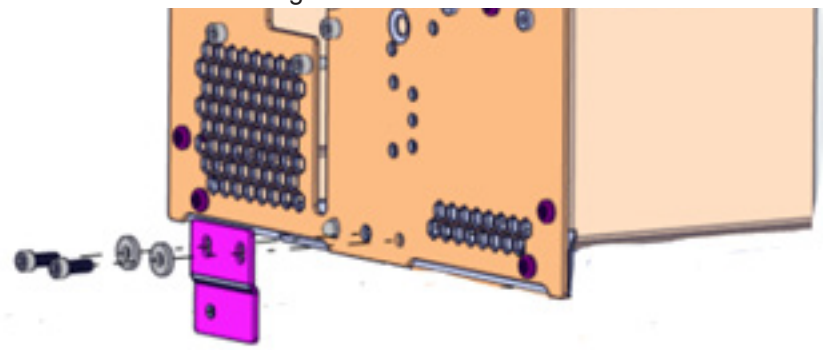
8. Fasten with star lock washers and #6 tamper-resistant screws.

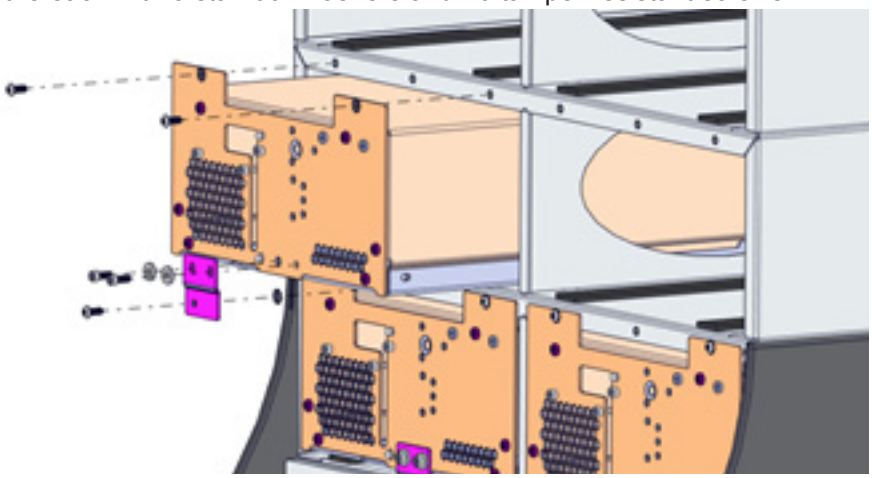
FilmArray Torch Module Installation

Unplug the FilmArray Torch from power and Ethernet before beginning. See next section for removing modules.

1. Remove all contents from the Module box(es).
2. If necessary, install all Duplexes (see previous section for instructions).
3. Install a tab on each Module using two #6 screws and washers.



4. Starting at the bottom and working up, install Modules into the front of each Duplex opening and secure each with 3 star lock washers and #6 tamper-resistant screws.



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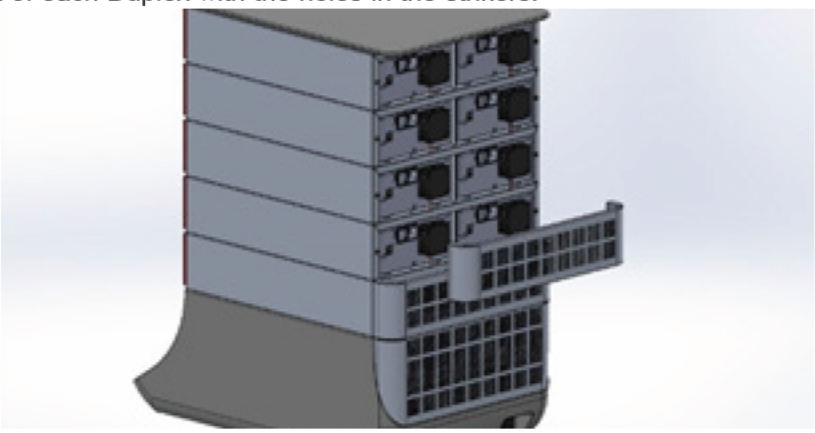
5. Using the power and electrical cables, connect each Module to the back of the System Base. The labels next to the AC power connectors on the System Base will indicate the optimal cable routing order.

6. Install cable shrouds over the electrical cables. The shrouds attach by aligning the magnets on the back of each Duplex with the holes in the strikers.



7. Ensure the filters are in place on the back of each Module Face Plate; then attach a Face Plate to each Module by aligning the mounting posts with the alignment holes in the plastic.
8. Plug the System Base power cord into a power source; then plug the System Base Ethernet cable into desired Ethernet port.
9. Turn the FilmArray Torch on using the power switch on the back of the System Base near the power cord.

NOTE: FilmArray Torch does not require routine shutdown, but can be turned off by first holding down the reset button on the back of the System Base until the screen goes black; then using the power switch near the power cord.

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FilmArray Torch Module Swapping

1. Turn off the Module to be replaced and remove the Front Cover.
2. Remove the cable shroud from the back of the Module and disconnect the cables.
3. Unscrew the 3 star lock washers and tamper-resistant screws on the front of the Module; then carefully slide the Module out of its Duplex.
4. Ensure that the new Module being installed is turned off; then re-install using the directions in the previous section.

Instrument Configuration Application for FilmArray Torch

The FilmArray Torch System Base computer is preinstalled with the Instrument Configuration applicatio. The Instrument Configuration application allows an operator to add one to twelve Modules to the FilmArray Torch Software after they have been physically connected to the System Base.

NOTE: A Module must be added to the FilmArray Torch before the software can be used to initiate and perform runs.

Starting the Instrument Configuration Application for FilmArray Torch

To access to the application from the FilmArray Torch Software:

1. Navigate to the Settings toolbar and select **Switch to Admin Mode**.

   The software verifies that the operator wants to exit the software; then displays the standard windows login screen for the admin user.

2. Log into Admin Mode.
3. When the windows desktop displays, select the Instrument Configuration application.

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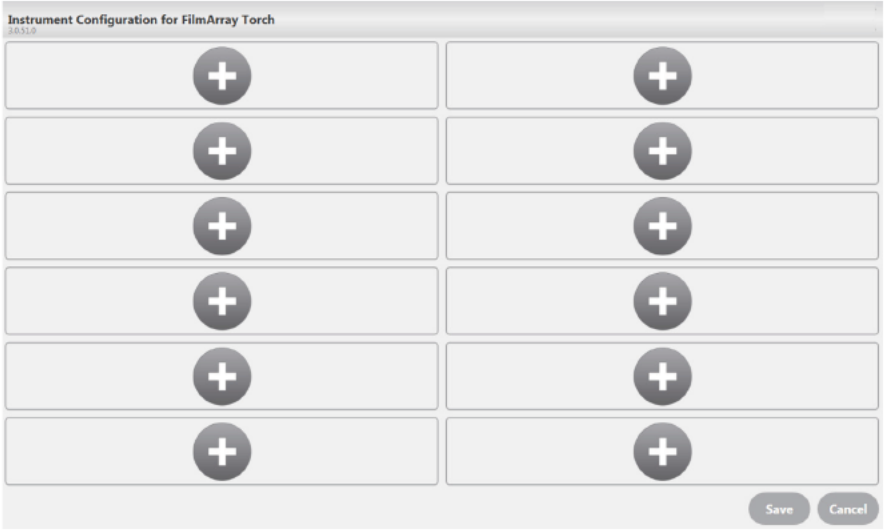
Instrument Configuration Grid

The Instrument Configuration grid is broken into 12 boxes that represent the physical locations for all 12 potential Modules.



NOTE: Start initial configuration from the bottom and work up.

Each FilmArray Torch Module that is currently configured to the FilmArray Torch displays within a box. Any boxes that have not had a Module configured to them contain a icon.

Save and Cancel

Upon initial startup of the application, the Save and Cancel options contain labels of Saved and Close, and the Saved option is disabled.

After at least one operation has been performed:

1. The **Saved** option changes to **Save** and becomes enabled.
2. The **Close** option changes to **Cancel**.

Select the **Save** option in order to preserve any changes to configuration of the FilmArray Torch.

After a Save operation has been performed:

1. The **Save** option changes to **Saved** and becomes disabled.
2. The **Cancel** option changes back to **Close**.

When the **Cancel** option is selected a warning message is displayed to confirm that any changes will be lost.

Select the **Close** option to shut the application down.

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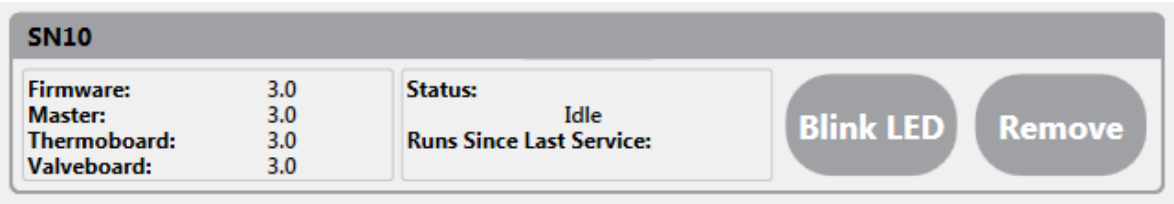
Grid Box

The grid box represents a single bay within the FilmArray Torch.

Each Module that is configured to the FilmArray Torch has the following details displayed within its grid box:

1. **Serial Number** displayed as a title.
2. **Instrument Details**:
   a. **Firmware:** contains the Firmware Version installed on the FilmArray Torch Module.
   b. **Master:** contains the Master Version installed on the FilmArray Torch Module.
   c. **Thermoboard:** contains the Thermoboard Version installed on the FilmArray Torch Module.
   d. **Valveboard:** contains the Valveboard Version installed on the FilmArray Torch Module.
   e. **Status:** contains the FilmArray Torch Module's current status.
   f. **Runs Since Last Service:** contains the Number Of Runs field from the FilmArray Torch Module.
3. A **Blink LED** option.
4. A **Remove** option.



Blink LED

The Blink LED option in the grid box and on the Detected Instruments dialog can be used to identify which physical Module is linked to that bay, and to verify that the operator is working with the correct Module before starting any configuration operations.

Selecting the **Blink LED** option for the selected Module will make the LED blink white.

The Blink LED option cannot be enabled if the Module:

1. Is not powered on.
2. Is disconnected from the FilmArray Torch.
3. Is currently initializing.
4. Is currently performing a run.

Remove

The Remove option in the grid box removes a Module from the FilmArray Torch configuration (see the *Remove a FilmArray Torch Module* section below).

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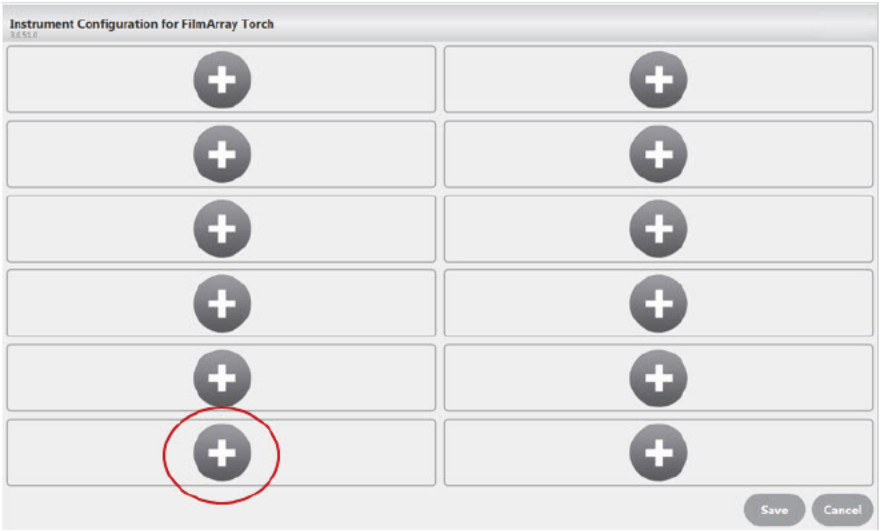
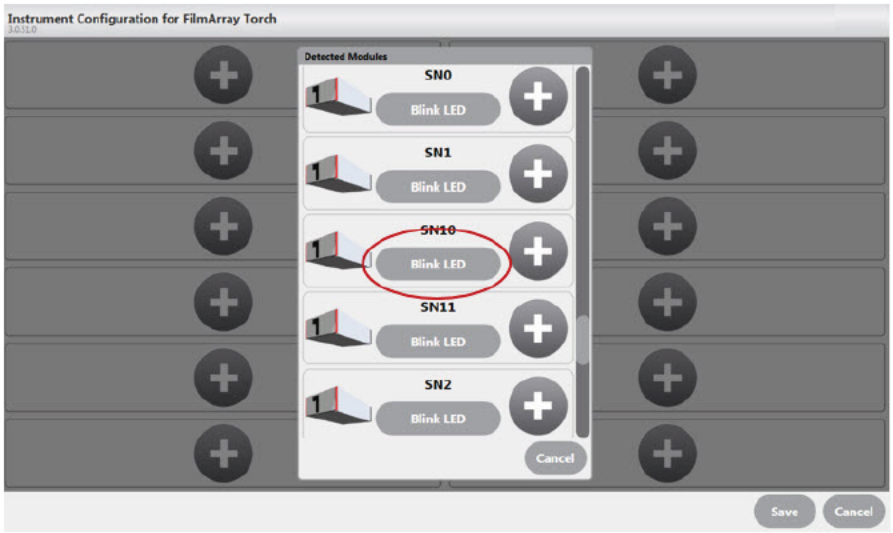
Add a FilmArray Torch Module

To add a Module to the FilmArray Torch Software:

1. Select the icon for the appropriate bay.



2. The application presents the Detected Instruments dialog, which displays a list of all Modules detected.
3. Scroll to the applicable Module Serial Number and select the **Blink LED**.



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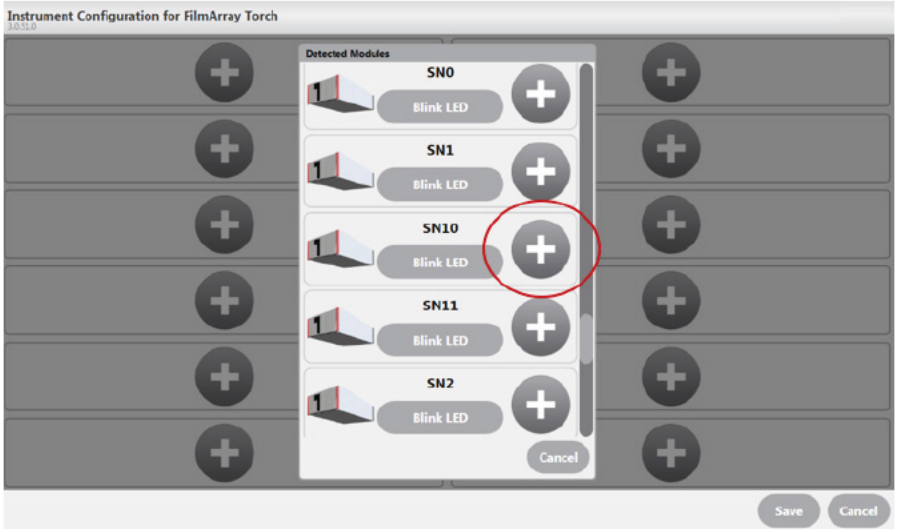
4. Add the Module by selecting the for that Module in the Detected Instruments dialog.



5. The Detected Instruments dialog closes and the application displays the details of the added Module.

6. Select **Save** to save all changes made during this operation.

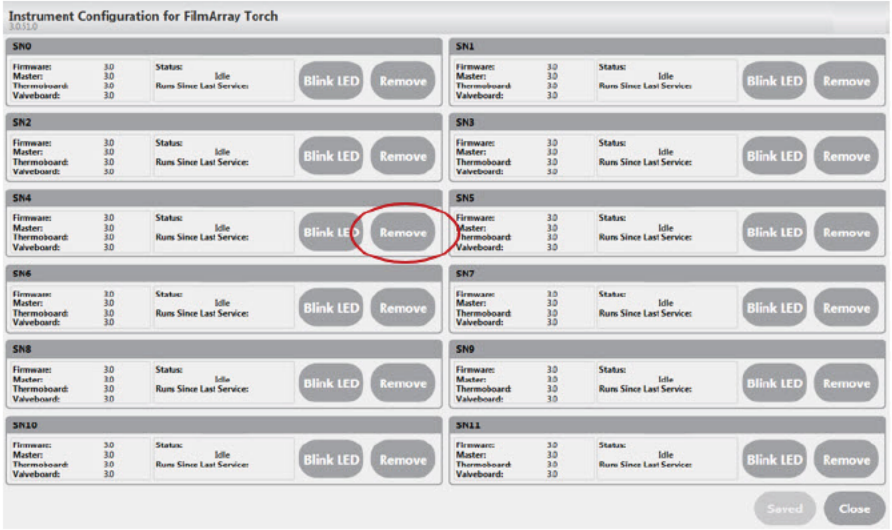
Remove a FilmArray Torch Module

To remove a Module from the FilmArray Torch Software:

1. Identify the bay configured to Module and check that its status is **Idle**.

NOTE: There is no warning presented for removal of a FilmArray Torch Module that is currently in a running status.

2. Select **Remove** on the applicable bay.



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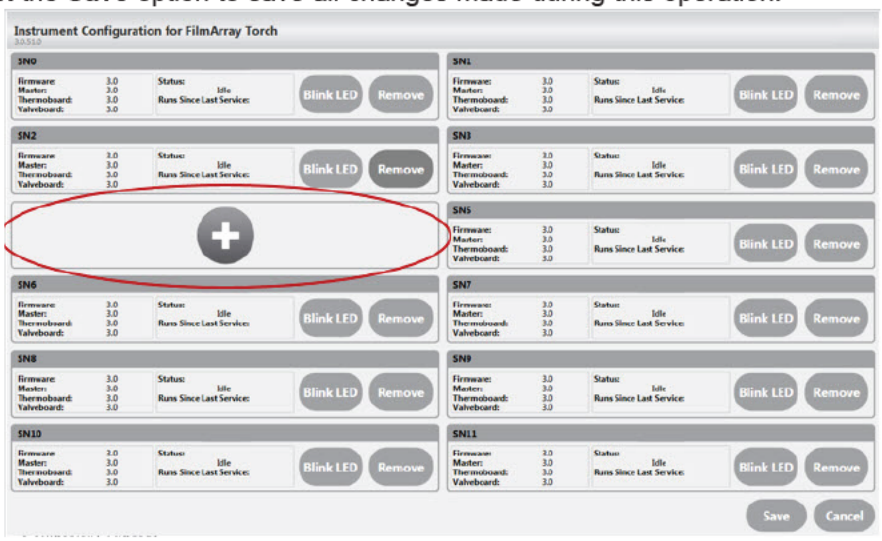
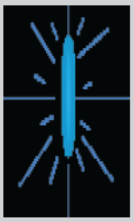
3. Select the **Save** option to save all changes made during this operation.



FilmArray Torch Module Status

The front of each FilmArray Torch Module is equipped with an LED light that shows the specific status of that Module.

LED	Color	Status	Meaning
	White	Solid	Module initializing.
	Yellow	Solid	Warning - e.g., Module not connected.
	Blue	Solid	Module idle and available to run a pouch.
	Blue	Blink	Module waiting for operator to insert a pouch.

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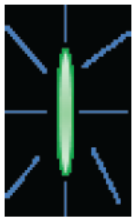
LED	Color	Status	Meaning
	Green	Fast Blink	pouch inserted and seated, but pouch run not started.
	Green	Solid	pouch run in progress.
	Green	Slow Blink	Run complete - remove pouch
	Yellow	Blink	Warning – Operator action required - e.g., unexpected insertion, double insertion, pouch jam Follow on-screen instructions.
	Purple	Blink	Error. Operator intervention or maintenance required. Module must be reset. Remove the face plate of the affected Module and reset the Module, or power off then power on the Module.
	Red	Solid	Error. Operator intervention or maintenance required. Module must be reset. Remove the face plate of the affected Module and reset the Module, or power off then power on the Module.

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Connecting a Printer to FilmArray Torch

The FilmArray Torch does not come with its own printer. It can be configured to print to any printer using the native Windows Operating System. The following workflow details how printers will be added on the System Base through an Administrator User Account. Contact Customer Support for account log in and more information (*see page i*).

Add or Update Printer for FilmArray Torch

1. Navigate to the **Settings** toolbar.
2. Select **Switch to Admin Mode**.

   The software displays a warning message that the operator is entering the base Windows operating system to perform administrative tasks and will be logged out of the FilmArray Torch Software as a result, with a directive to confirm the switch.
3. Select **Yes** to confirm the switch.

   The software logs the operator out of the FilmArray Torch Software and the operator is presented with the standard Windows login screen.
4. Log into an Administrator User Account by entering the appropriate user name and password.

   The computer validates the access and presents the standard Windows desktop layout.
5. Navigate to the Control Panel to manipulate printer details for the FilmArray Torch.
6. When printer maintenance is complete, restart the computer. The FilmArray Torch Software will automatically load.

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CHAPTER 3: PRINCIPLES OF OPERATION

FilmArray is an automated system that utilizes nmPCR and high-resolution melting analysis to detect and identify multiple nucleic acid targets from samples. The user of the FilmArray Torch loads the sample into a reagent pouch, places the pouch into the FilmArray Torch Module, and starts the run. The FilmArray Torch Module interacts with the reagent pouch to extract nucleic acids from the sample and to amplify pathogen specific DNA sequences that are targeted by the assays. The resulting PCR products are evaluated using DNA melting analysis and the results are automatically determined and presented by the FilmArray software in a test report.

PCR Basics

Polymerase chain reaction (PCR) is the process of making billions of copies of DNA. Copies are made by melting the DNA into separate strands and using each strand as a template for generation of a new strand. To identify specific pathogens using PCR, primers (short pieces of a specific DNA sequence) are included in the PCR reaction to target unique segments of the pathogen genome. If the organism of interest has an RNA genome, a process called reverse transcription (RT) is performed prior to PCR in order to convert the RNA template into a DNA template (RT-PCR).

There are 3 steps to a PCR cycle:

Step 1: Denaturation - The sample is heated to about 94°C to denature or 'melt' the double-stranded target DNA into single strands.

Step 2: Primer annealing - The sample is cooled to about 60°C, allowing the primers to bind or "anneal" to the target DNA strands at a specific site.

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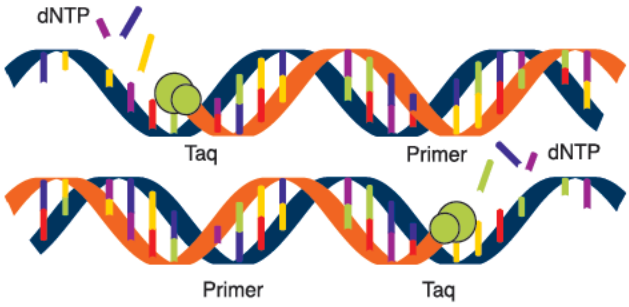
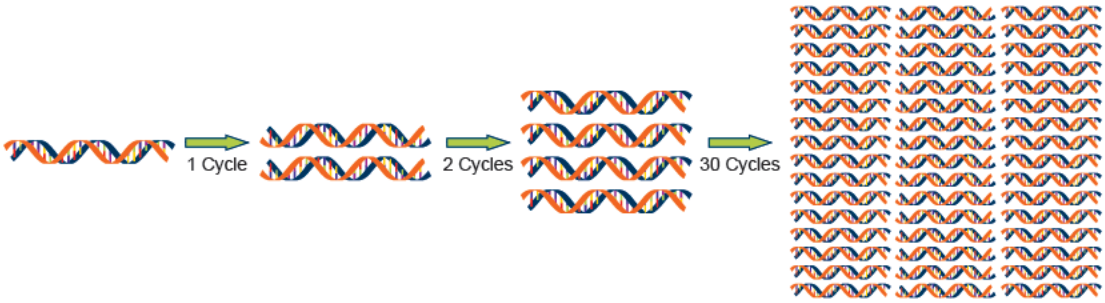
Step 3: Primer extension - an enzyme (Taq DNA polymerase) binds to the DNA/primer complex and makes a copy of the original double stranded DNA by adding nucleotides (dNTPs A, G, T or C) that are complementary to the nucleotide sequence of the target DNA.



At the end of a cycle, each piece of double-stranded target DNA has been duplicated. The new DNA copies act as templates in the next cycles, so after 30 cycles, as many as 1 billion copies of a single piece of DNA can be produced. With this duplication process, it becomes possible to detect DNA or RNA from even a low concentration of pathogens in the original sample.



Nested Multiplex PCR

nmPCR uses two stages of PCR. During the first-stage PCR, multiple “outer primers” are used to perform multiplex PCR on the target templates present in the sample.

Second-stage PCR is performed in a singleplex format to further amplify the DNA copies generated during the first-stage PCR. The “inner primers” used in second-stage PCR are made up of sequences “nested” within the first-stage PCR product(s).

High Resolution Melting Analysis

FilmArray PCR reactions contain the DNA binding dye LCGreen® Plus. LCGreen Plus is incorporated into the copies of DNA as they are made during each PCR cycle. When bound to double-stranded DNA, the dye fluoresces and the fluorescence is detected by the FilmArray Torch Module. As the temperature is increased and the copies of double-stranded DNA melt, the LCGreen Plus dye is released and a reduction in fluorescence is detected.

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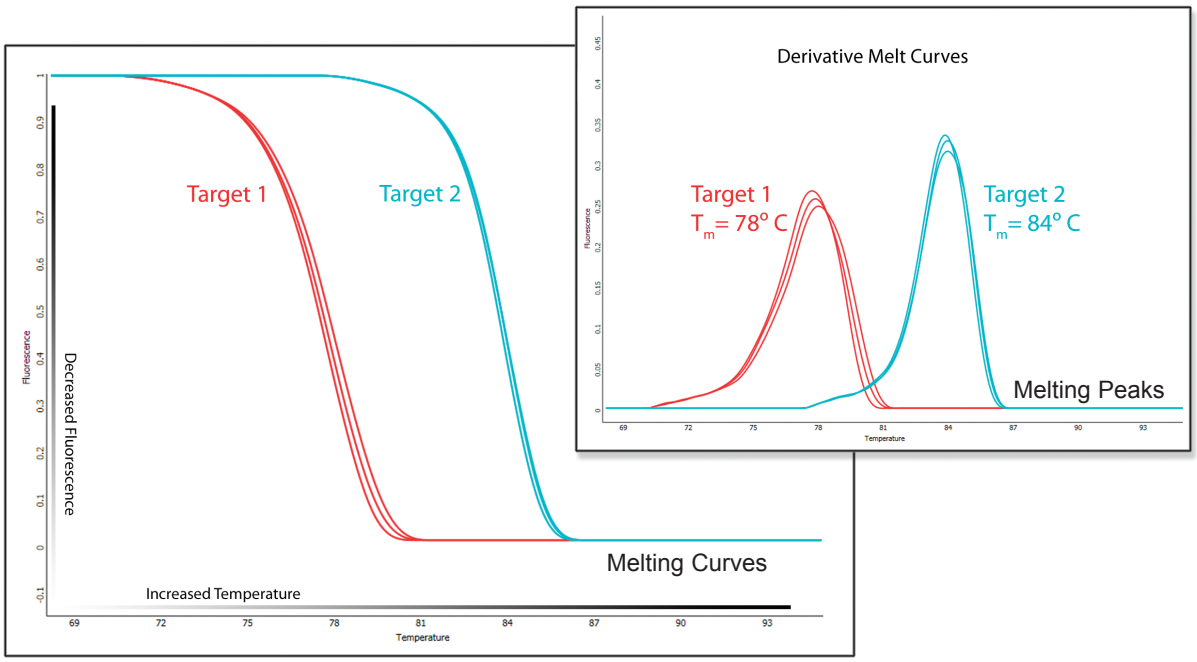
Copies of double-stranded DNA generated during PCR (called PCR products or amplicon) will have unique sequences based on the template that was amplified. Amplicon length and sequence determines the temperature at which the double-stranded DNA will melt apart, which is known as the melting temperature (Tm) of the amplicon. PCR products made from different targets will have different sequences and, therefore, different Tms.

After the last cycle of PCR, the FilmArray Torch Module gradually raises the temperature of the reaction from approximately 60°C to 94°C. As the temperature reaches the Tm of an amplicon, the amplicon denatures and fluorescence drops, releasing LCGreen Plus. This produces a melting curve, seen in the graph below, which shows the rapid decline in fluorescence. A melting peak with a specific Tm is generated for each amplicon by plotting the negative derivative of the melting curve.

Melting Curves for two Different Targets with Unique Amplicon Sequences



The FilmArray uses melting curve analysis to identify pathogen specific PCR product. Since the sequence and Tm of an amplicon from a specific target is known and consistent, pathogen specific PCR product can be identified as being copied from that target. Non-specific PCR products with different Tms are excluded.

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CHAPTER 4: PERFORMANCE SPECIFICATIONS

FilmArray Torch System Specifications

<table>
<tr><td>Sample Description</td><td>• One sample capacity per FilmArray Torch Module (with up to 12 samples per FilmArray Torch)</td></tr>
<tr><td>Run Time</td><td>• Sample run time about one hour</td></tr>
<tr><td>User Interface</td><td>• System Base with touch screen and barcode scanner</td></tr>
<tr><td>Data Output</td><td>• Automatic analysis with end-of-run interpretive reports</td></tr>
<tr><td>Fluorescence Acquisition</td><td>• Single color optics module: 475nm excitation, 545nm emission, and sensor imaging</td></tr>
<tr><td>Temperature Control</td><td>• Operating temperature 15°C to 30°C
• Peltier devices:
  • Ambient to 100°C
  • Ramp rate from 0.1–0.5°C /sec on melt</td></tr>
<tr><td>Operations Specification</td><td>• 15°C to 30°C @ 20 to 80% relative humidity (non-condensing)
• -16m to 3048m
• Indoor use only</td></tr>
<tr><td>Shipping Specifications</td><td>• -30°C to 38°C @ 5 to 85% relative humidity (non-condensing)
• -16m to 10,600m</td></tr>
<tr><td>Power Requirements</td><td>
<table>
<tr><th>Qty. of Modules</th><th>Voltage</th><th>Frequency</th><th>AC Current at 120V</th><th>AC Current at 240V</th></tr>
<tr><td>2</td><td rowspan="6">100-240VAC</td><td rowspan="6">50-60Hz</td><td>3.2 A</td><td>1.7 A</td></tr>
<tr><td>4</td><td>5.0 A</td><td>2.8 A</td></tr>
<tr><td>6</td><td>6.9 A</td><td>3.8 A</td></tr>
<tr><td>8</td><td>8.8 A</td><td>4.8 A</td></tr>
<tr><td>10</td><td>10.6 A</td><td>5.8 A</td></tr>
<tr><td>12</td><td>12.5 A</td><td>6.9 A</td></tr>
</table>
</td></tr>
<tr><td>Fuse</td><td>• 250V 3.15A Type T (Modules)
• 250V 10A Type T (System Base)</td></tr>
</table>

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Dimensions and Weight	• 18 x 29 x 11.5 in (45.8 x 73.66 x 29.21 cm) (W x D x H; System Base only)
	  • 4.5 in (11.43 cm) (H; Modules only)
	  • 34 in (86.36 cm) max height (12 Modules)
	• Weight: Approximately 250 lbs (113.4 kg) maximum:
	  • System Base – 50 lbs (22.68 kg)
	  • Modules – 14 lbs (6.35 kg) each
	  • Duplex (Module enclosure) – 5 lbs (2.27 kg) each

EMC Requirements	• The FilmArray Torch complies with the emission and immunity requirements in IEC 61326: Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements.
Safety Requirements	• The FilmArray Torch complies with IEC 61010-1: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements
CPU	• Intel® Core™ i7 4770S 3.1 GHz or faster
Storage and Memory	• 512 GB Hard Drive or greater • 16 GB RAM or greater
Interfaces and Peripherals	System Base • 12+1 Ethernet network interfaces • 4 USB connections or more
	Instrument • One Ethernet network interface
Display	• LCD • 10.6” diagonal (26.9 cm) • 1280 x 768 resolution • Capacitive touch screen interface
Operating System	• Microsoft® Windows® 7 Embedded OS

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CHAPTER 5: FILMARRAY TORCH OPERATING INSTRUCTIONS

NOTE: Additional instruction on how to operate the FilmArray Torch is provided in the FilmArray Torch Info CD provided in the FilmArray Torch System Base box.

NOTE: Pouch preparation may vary depending on the pouch type used. Please consult the instruction booklet for each FilmArray reagent kit for specific preparation steps.

Using the FilmArray Torch involves three main steps:

1. Adding sample to the FilmArray pouch.
2. Performing a run within a FilmArray Torch Module.
3. Viewing and/or printing a report.

FilmArray Reagent Kits

FilmArray reagent kits include FilmArray pouches and all components required to run tests on the FilmArray Torch. Components will vary based on the type of FilmArray reagent kit. Refer to the instruction booklet or Quick Guide for specific preparation and testing procedures.

CAUTION: Do not attempt to use components from one reagent kit to prepare a different pouch type. Components are pouch specific.

Each FilmArray pouch is labeled with:

LOT Batch Code

SN Serial Number

This information is both human-readable and contained in the barcode. The pouch also includes a space to write the Sample ID or affix a Sample ID barcode.

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FilmArray Test Procedure

General Precautions

BIOLOGICAL RISKS: When working with the FilmArray Torch and samples, personnel may come in contact with contaminants or potentially infectious material. Appropriate biohazard guidelines for working with potentially infectious samples should be followed. Refer to the *Safety Precautions* section of the appropriate FilmArray reagent kit instruction booklet for additional safety information.

It is recommended that the handling of potentially infectious samples be performed in a biological safety cabinet or hood, or behind a protective shield. Once a sample has been added to the FilmArray pouch, move the pouch to a separate area to perform the test.

One of the most important guidelines for a test using PCR is to avoid contamination. Some important rules to follow are:

1. Sample collection, pouch loading, and FilmArray Torch operation should each be performed in separate locations or work areas.
2. Do not leave a work area or return to a previous work area without first completing decontamination procedures (i.e., washing the area and changing protective clothing and gloves).
3. Prepare and load only one pouch at a time.
4. Always dispose of used pouches, or pouches that have come in contact with a sample, in a biohazard waste container. Change gloves after handling a used pouch.

FilmArray pouches are stored under vacuum in individually-wrapped canisters. To preserve the integrity of the pouch vacuum for proper operation, be sure that a FilmArray Torch Module will be available and operational before unwrapping any pouches for loading.

Initiate Run

Refer to the *Procedure* section of the appropriate FilmArray reagent kit instruction booklet for step-by-step instructions for sample and pouch preparation.

The FilmArray Torch Software includes a detailed workflow that guides the operator on how to perform a run.

Once a pouch has been prepared for testing, follow the on-screen instructions to enter pouch and sample information. Insert the pouch into an available FilmArray Torch Module and start the run.

The operator cannot start a run until one FilmArray Torch Module has been added to the FilmArray Torch Software. Please see the *Instrument Configuration* section in *Chapter 2* for more information about adding a FilmArray Torch Module. In addition, one pouch module must be installed on the FilmArray Torch in order to start a run (see the *Pouch Module Management* section in this Chapter).

Initiate a FilmArray Torch run by Manual Initiation or Scan Initiation.

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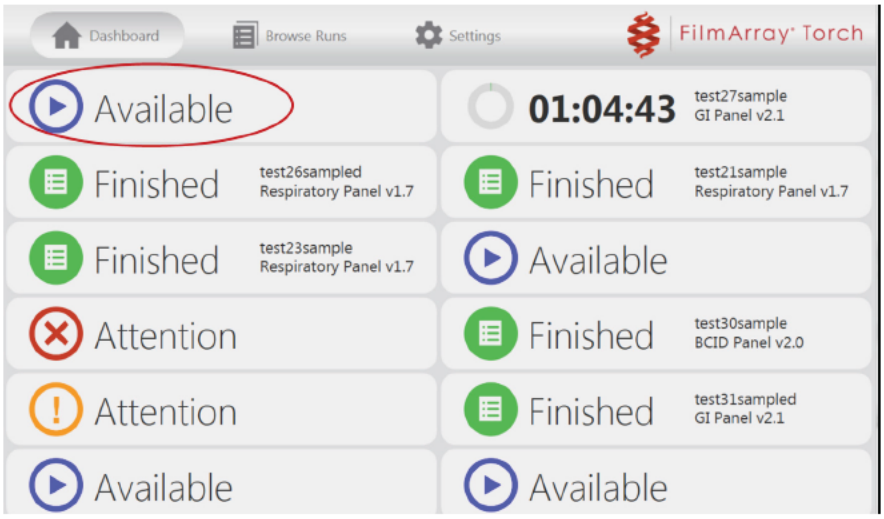
Manual Initiation

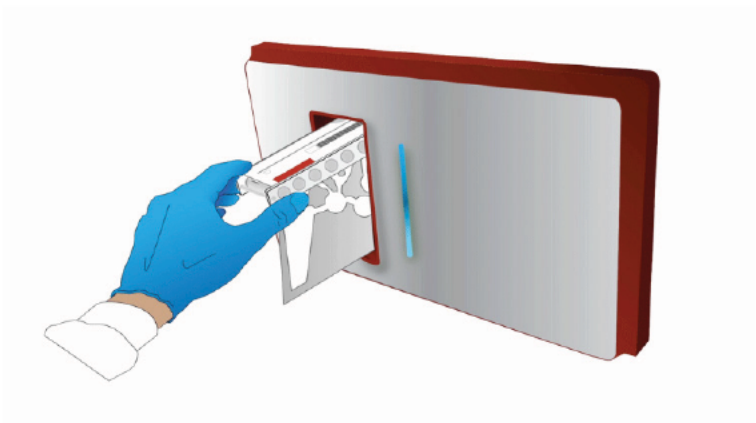
The operator selects a specific FilmArray Torch Module from the Dashboard using the touch screen. To initiate a run manually:

1. Select an **Available** Module on the Dashboard and scan the pouch barcode on the fitment label. Then scan or manually enter the Sample ID.

NOTE: If the barcode scanner is not available or the barcode is unreadable, manually enter the lot number and serial number printed on the pouch label.



2. Insert the pouch into the selected FilmArray Torch Module. The Module's LED will blink blue. Ensure that the pouch fitment label is lying flat on top of the pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.



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Scan Initiation

The operator scans the fitment label on the pouch while the Dashboard is displayed on the touch screen. To initiate a run by scanning:

1. Scan the pouch barcode on the fitment label. Then scan or manually enter the Sample ID.
2. Insert the pouch into any Available FilmArray Torch Module. All available Module's LED will blink blue. Ensure that the pouch fitment label is lying flat on top of pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.

Start Run

After the pouch is correctly inserted into the FilmArray Torch Module, the LED will blink green to indicate that the pouch has been seated but the run has not yet started. To continue the run after Manual or Scan Initiation:

CAUTION: Do not insert sharp objects to remove a jammed pouch. In the event of a jammed pouch, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor for technical support.

1. Select the correct pouch protocol for the pouch and sample type.

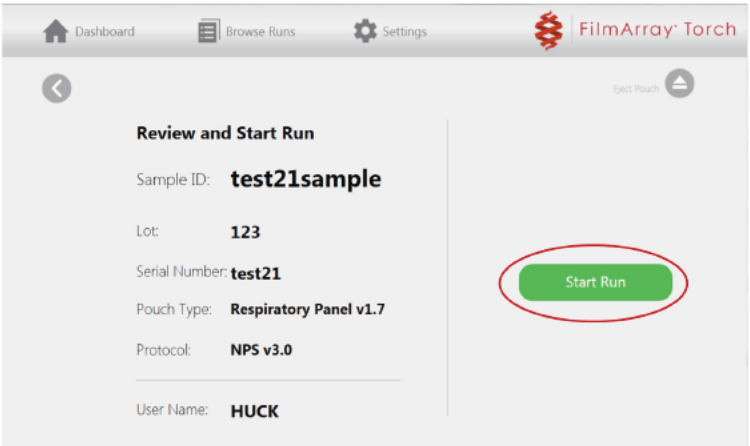
NOTE: If only one protocol is available, it will be automatically selected.

2. Enter operator username and password, then select **Next**.

   The Next key will only become available when a correct username and password is entered. See the *Create New Operator(s)* section in *Chapter 6* for more information on how to create a new operator's username and password.

NOTE: The font color of the username and password is red until the user name is recognized by the FilmArray Torch Software.

3. Review entered run information on the screen; if correct, select **Start Run.**



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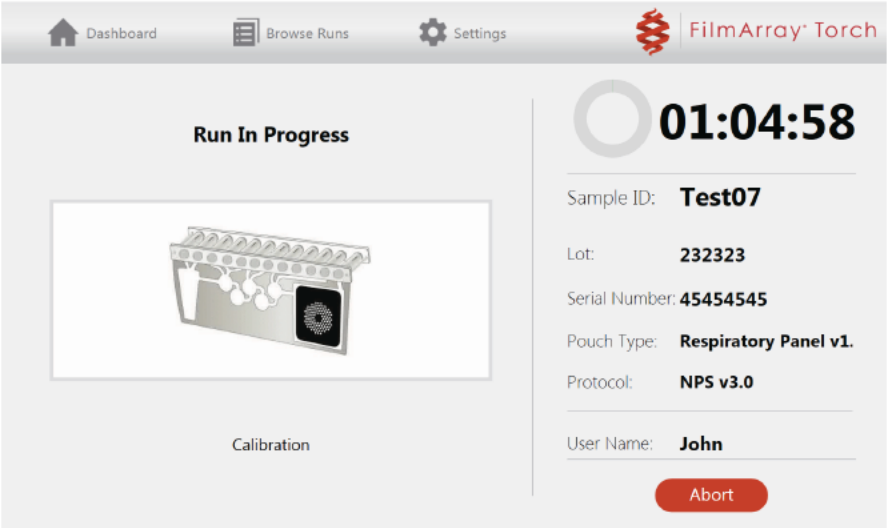
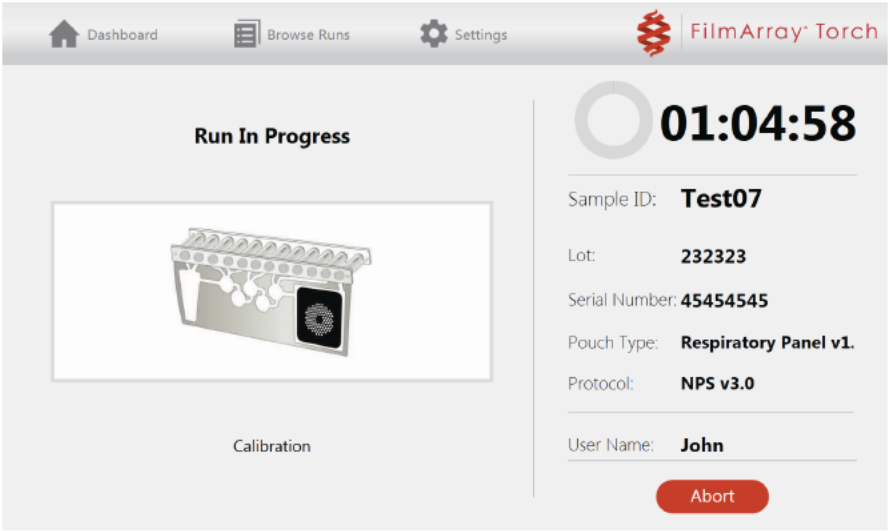
Once the run has been started, the selected Module's LED will turn solid green, indicating the run is in progress. The display also changes to the Run In Progress screen and shows the steps that the Module is currently performing and the approximate remaining run time. The operator may navigate to the Dashboard to perform other tasks.



Abort Run

If a run needs to be stopped before it is finished, select the applicable FilmArray Torch Module from the Dashboard. The Run In Progress screen will display the current run information; select **Abort**. Any data that has been generated for the aborted run will not be available for analysis. An aborted run cannot be restarted and the pouch must not be re-run.

NOTE: Aborting a run may take up to five minutes to complete.



Finish Run

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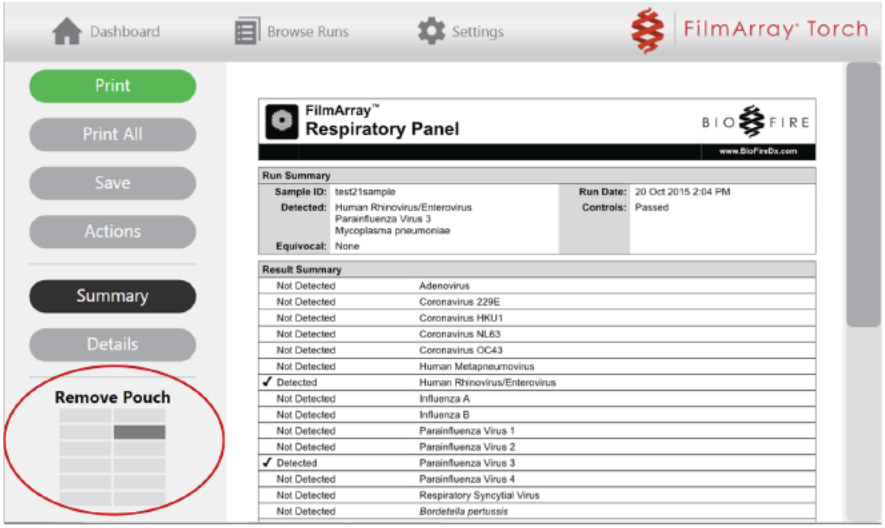
At the end of the run, the Dashboard changes the status of the Module to Finished and the pouch is partially ejected. To finish a run:

1. Select the **Finished** Module on the Dashboard to view the report.



2. Remove the pouch from the Module as indicated above. The Module LED is solid blue indicating that the Module is ready for a new run

NOTE: Once the pouch has been removed, the report can only be viewed through the Browse Runs feature.

View Report

When a run is finished the report can be viewed on the:

- Run In Progress screen—the run report displays once the run is complete.
- Dashboard screen—a report icon appears and the status changes to **Finished**. Selecting the Module box displays the run report. Once the pouch is removed from the FilmArray Torch Module, the status changes to **Available**.
- Browse Runs screen—the run reports are accessible from the table.

Refer to the instruction booklet for the appropriate FilmArray reagent kit for more details about the information provided in the report.

Print Report

Reports will always be printed to the default printer. The FilmArray Torch Software can be configured to automatically print the report at the end of the run (see the *Print Options* section within *Settings* in *Chapter 6, FilmArray Torch Software*).

To print a report from a previous FilmArray pouch run:

1. Select **Browse Runs** in the top menu on the touch screen.

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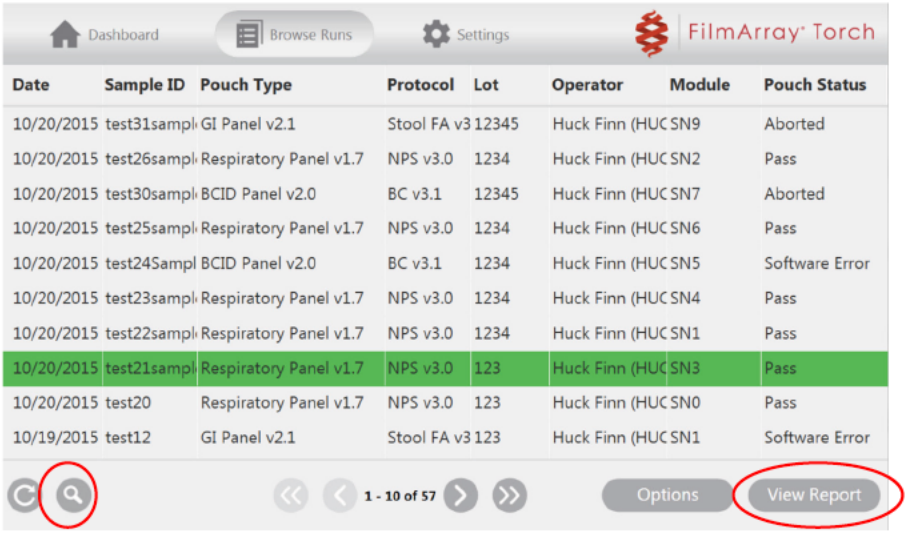
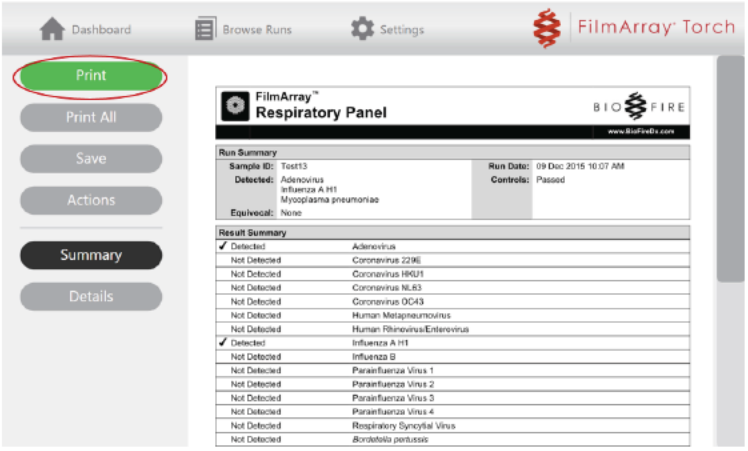
2. Use the icon to search for runs.
3. Select a single desired run from the table.
4. Select **View Report** to open the report page.

NOTE: If no runs or multiple runs are selected, the View Report option is disabled.



5. Select **Print.**



Error Messages

If errors occur, see *Chapter 8, Preventative Maintenance and Troubleshooting*, for more information on viewing and handling error messages.

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CHAPTER 6: FILMARRAY TORCH SOFTWARE

This chapter explains how to use the FilmArray Torch Software and manage the database. The FilmArray Torch Software automatically starts when the FilmArray Torch is powered on – there is no login required.

FilmArray Torch Toolbar

The table below lists the features available in the FilmArray Torch toolbar:

FilmArray Torch Toolbar	Description
Dashboard	The Dashboard allows the operator to do the following: • View the status of each FilmArray Torch Module in the system with a graphical indicator that can be seen from a distance. • View the status of all runs that are in progress, along with the Sample ID, Pouch Type, and time remaining until completion. • Start a run using the Start Run Workflow.
Browse Runs	Browse Runs allows the operator to review Run Results for runs performed on all FilmArray Torch Modules within the FilmArray Torch. The Browse Runs feature displays all the runs, ordered so that the most recent run is at the top of the list, and also allows access to the following actions: • View Report – this option is inactive until a specific report is selected. • Options – Allows access to additional features. • Run Table – Allows the operator to perform the following actions: a. View and sort runs in the database. b. Filter the database by run criteria. c. Page through the runs using the paging navigation at the bottom of the screen.
Settings	Settings allows the operator to perform basic configuration and management of the FilmArray Torch. See the Settings section for details.

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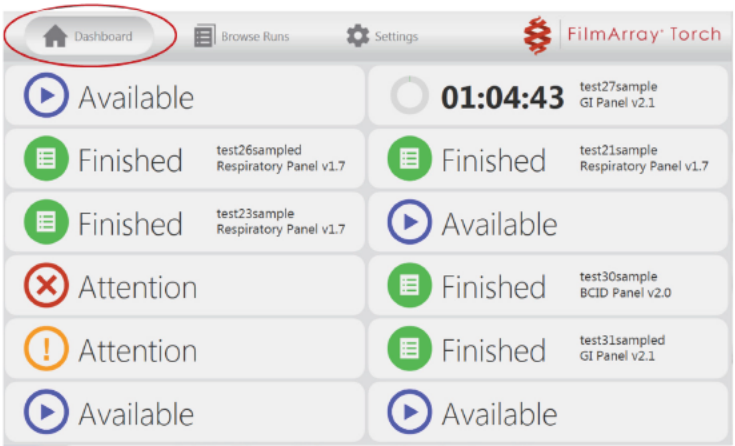
Dashboard

The Dashboard option is always accessible from the toolbar. To access the Dashboard from any screen, select the **Dashboard** option on the toolbar. The FilmArray Torch Dashboard allows the operator to interact with several FilmArray Torch Modules from one System Base. Each FilmArray Torch Module is represented by a box displayed on the touch screen. Until at least one Module has been added to the FilmArray Torch Software, the Dashboard will be blank. The number of boxes on the Dashboard mirrors the number of Modules that are configured.

Any FilmArray Torch Module box on the Dashboard can be selected to display additional details about the FilmArray Torch Module status.



The details for each FilmArray Torch Module include the following:

Status Icon	Status	Description
Available	Available	The module is available for a new run – can initiate a new run (Manual Initiation of workflow)
01:04:43 test27sample GI Panel v2.1	Run In Progress	Instrument is performing a run and displays the Time Remaining.
Overtime test27sample GI Panel v2.1	Overtime	Instrument is performing a run and has gone over the expected run time for the pouch and displays Overtime.
Finished test21sample Respiratory Panel v1.7	Finished	Run has finished, pouch is ejected, run report is ready for viewing.
Attention	Attention	Module has lost connection with the software as a result of one of the following: • Instrument is initializing or is not connected. • There is an unknown pouch in the module.
Attention	Attention	The Module needs to be reset. Module has an error on it as a result of one of the following: • Pouch jam. • In error.

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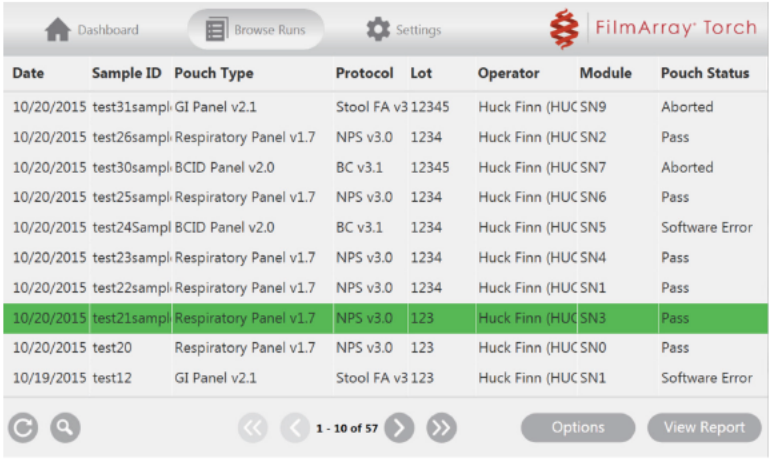
Browse Runs

The Browse Runs option is always accessible from the toolbar. To access Browse Runs from any screen, select the **Browse Runs** option on the toolbar. When a run is completed on a Module, the software generates a report with the results of the run. Upon initial entry into the Browse Runs screen, all the runs within the database are displayed.

The runs are presented as a table that lists the date of the run, the Sample ID, and other information about the run. Selecting an individual run enables the View Report option, which can be selected to display the run report. For more information on viewing a report, see *Chapter 5, FilmArray Torch Operating Instructions*.



Date	Sample ID	Pouch Type	Protocol	Lot	Operator	Module	Pouch Status
10/20/2015	test31sampl	GI Panel v2.1	Stool FA v3	12345	Huck Finn (HUC	SN9	Aborted
10/20/2015	test26sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN2	Pass
10/20/2015	test30sampl	BCID Panel v2.0	BC v3.1	12345	Huck Finn (HUC	SN7	Aborted
10/20/2015	test25sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN6	Pass
10/20/2015	test24Sampl	BCID Panel v2.0	BC v3.1	1234	Huck Finn (HUC	SN5	Software Error
10/20/2015	test23sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN4	Pass
10/20/2015	test22sampl	Respiratory Panel v1.7	NPS v3.0	1234	Huck Finn (HUC	SN1	Pass
10/20/2015	test21sampl	Respiratory Panel v1.7	NPS v3.0	123	Huck Finn (HUC	SN3	Pass
10/20/2015	test20	Respiratory Panel v1.7	NPS v3.0	123	Huck Finn (HUC	SN0	Pass
10/19/2015	test12	GI Panel v2.1	Stool FA v3	123	Huck Finn (HUC	SN1	Software Error

View Report Menu

The table below lists the features available on the View Report menu:

Menu Item	Description
Print	Prints the run report. See *Chapter 5, FilmArray Torch Operating Instructions* for more information on printing a report.
Save	Opens a dialog that enables the operator to save the run report to a chosen location.
Actions	Allows for the following actions to be performed for that report: 1. **Edit Sample ID**: If a mistake was made during run setup when entering the Sample ID, the operator can make the necessary corrections. A history is recorded of all changes and will be added to the run report. 2. **Show Run Details**: Allows the operator to view system details, messages and errors associated with a run. 3. **Create Error Bundle**: If an error occurs that is associated with a FilmArray run, a technical support representative may request that the operator create an error bundle for that run and send it to BioFire Diagnostics. For more information on creating an error bundle, see the *Error Bundle* section in *Chapter 8*.

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Save Report

Run reports can be saved as a PDF file for future use. To save reports as PDF file:

1. Insert a removable drive into an available USB port on the front of the System Base.

NOTE: Reports can only be saved to a removable drive.

2. Select **Save** on the View Report page.
3. Choose location and filename; then select **Save**.

Edit Sample ID

To change the Sample ID if a mistake was made during run set up:

1. Select **Actions** in the View Report page; then select **Edit Sample ID**.

   The operator is presented with a table that lists any previous change history.

2. Update the current Sample ID; then enter Username and Password.

   The save option is not enabled until the operator has entered their Username and Password. This tracks the changes to a specific user and meets the electronic signature and records requirements required in laboratories.

3. Select **Save**.

   After saving the changes, the report reflects the new Sample ID and displays the Change History.

Show Run Details

To see details of the run:

1. Select **Actions** on the View Report page; then select **Show Run Details** from the menu.

   The operator is presented with a list of the system details, messages, and errors associated with that run.

Create Error Bundle

For more information on creating an Error Bundle, see the *Error Bundle* section in *Chapter 8.*

Search Run Data

Search

The icon on the Browse Runs page contains multiple search criteria the operator can use to locate desired runs. The following table describes the search criteria options:

Criteria	Description
Date	Search by selecting the date or date range of interest.
Sample ID	Search by entering the Sample ID of interest.
Pouch Type	Search by selecting the panel of interest.

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Criteria	Description
Operator	Search by selecting the operator of interest.
Module	Search by selecting the Module serial number of interest.
Pouch Status	Search by selecting the pouch outcome of interest: Pass, Fail or Invalid, Completed, Incomplete, Aborted, Instrument Error, or Software Error.

To clear Search Criteria and view all of the runs saved in the database, click **Clear All** on the search screen or the **X** on the search results page.

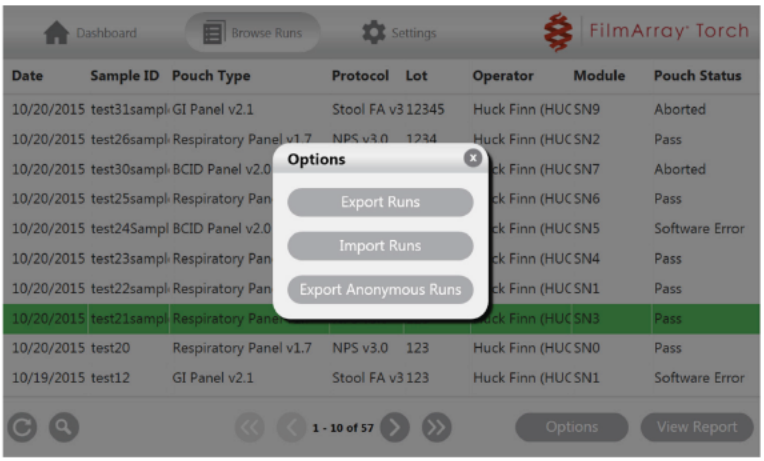
To retain the search criteria and update the search results to include recent runs, select **Refresh**.

Browse Runs Options Menu

The Browse Runs options menu presents a list of actions the operator can use on FilmArray Torch runs. The following table describes the available Browse Runs options:

Menu Item	Description
Export Runs	Enables the operator to write runs to a file while leaving the original runs in the FilmArray database.
Import Runs	Enables the operator to import FilmArray runs from a separate FilmArray database into the database on the FilmArray System Base being used.
Export Anonymous Runs	Works like the Export Runs option, but replaces the Sample ID in the run files with Anonymous.

To access the Browse Runs options menu, select **Options** to bring up the Options menu.



Export Runs

When exporting runs, database files are saved with the extension .db. To export runs to a file:

1. Highlight one or more desired runs on the Browse Runs page. Use the icon to search for runs to export. For more information, see the *Search Run Data* section in this chapter.
2. Select **Options** to view the Options menu; then select **Export Runs**.

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The Specify Filename dialog will appear and allow the user to select a location and filename for the .db file.

3. Select **Save** to start the export process.

   The operator can cancel the export process before it completes by selecting **Cancel** on the export process dialog. Any runs that were exported before selecting Cancel will be saved to the chosen location.

4. After export completion, select **OK** to close the export process dialog.

Import Runs

When importing runs, database files with the extension .db are added.

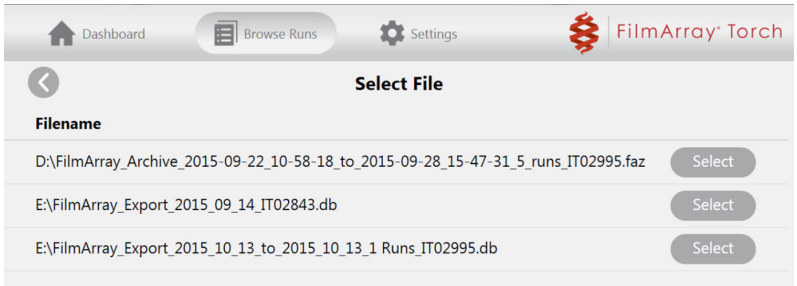
This process can also be used to restore any archived files with the extension .faz. Prior to restoring archived runs, verify that there is sufficient room in the database. If the database is approaching 5,000 runs, see the *Archive Runs* section in this chapter for more information.

To import runs from a file:

1. Insert the removable drive(s) containing the files into an available USB port of the front of the System Base.

2. On the Browse Runs page, select **Options** to display the Options menu; then select **Import Runs**.

   The software searches all removable drives for any files that contain run data (both .db and .faz) and displays these files on the Select File page.



3. Select the runs needing to be imported (or restored) to start the import process.

   The operator can stop the import process before it completes by selecting **Stop**. Any runs that were imported before selecting Stop will be saved in the database.

4. After import completion, select **OK** to close the dialog.

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Export Anonymous Runs

Anonymous run files are saved with extension .adb. If a copy of run files must be sent to an external site, this option protects confidentiality. To prevent operators from overwriting a run file with an anonymous run file, these files cannot be imported back into the database

To export anonymous runs to a file:

1. Highlight one or more desired runs on the Browse Runs page. Use the icon to search for runs to export. For more information, see the *Search Run Data* section in this chapter.
2. Select **Options** to view the Options menu; then select **Export Anonymous Runs**.

   The Specify Filename dialog will appear and allow the user to select a location and filename for the .db file.
3. Select **Save** to start the export process.

   The operator can cancel the export process before it completes by selecting **Cancel**. Any runs that were exported before selecting Cancel will be saved to the chosen location.
4. After export completion, select **OK** to close the dialog.

Settings

The Settings option is always accessible from the toolbar. To access Settings from any screen, select the **Settings** option on the toolbar. The Settings option allows users to perform the following administrative type tasks:

- **Print Options**—Allows the operator to set or change a default printer as well as the option to have reports automatically printed.
- **Operators**—Displays all operators currently recognized in the software and allows for addition and modification of operators within the system.
- **Pouch Modules**—Displays all currently installed pouch modules within the software and allows for installation of new pouch modules, modification of their status (active/inactive), and removal.
- **Module Information**—Displays high level information for all Modules connected to FilmArray Torch.
- **Archive**—Allows operators to archive old runs off FilmArray Torch to a removable drive.
- **System Log**—Allows access to system logs for all Modules.
- **About FilmArray**—Displays details about FilmArray Torch installation.
- **Switch to Admin Mode**—Allows an administrator to log out of the FilmArray Torch Software and access the Windows OS to perform administrative tasks (such as software/firmware updates, printer maintenance, and Instrument Configuration).
- **Switch to Cleaning Mode**—Allows an operator to temporarily freeze the touch screen so the surface can be cleaned without activating any actions (see *Chapter 8, Preventative Maintenance and Troubleshooting*).

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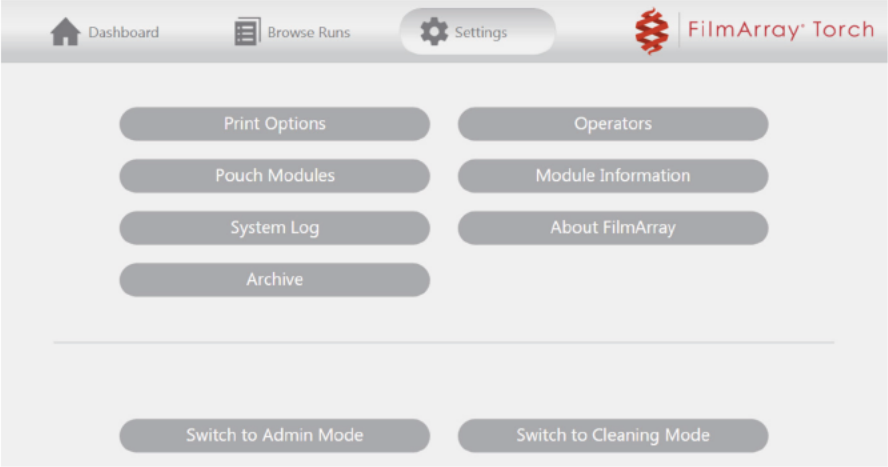


Print Options

Any printer that has been configured to FilmArray Torch can be selected as the default.

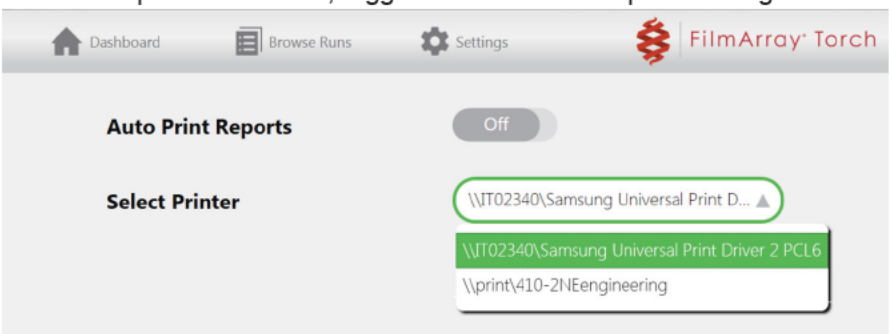
To set a default printer:

1. Select the **Select Printer** drop down box to display all printers configured to the computer. The current default printer is highlighted green.

Select the applicable printer to set it as the default.

The software updates the default printer and displays the new default within the Select Printer display box.

To Auto Print Reports after a run, toggle the Auto Print Reports setting to On or Off.



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Operators

An operator username and password are required to run a pouch on FilmArray Torch.

The FilmArray Torch Software prompts the operator to enter these credentials after a pouch has been inserted into an available Module and pouch information has been captured.

The Operators feature displays all current operators on FilmArray Torch. This feature allows for the addition, modification, and/or deletion of operators.

Create New Operator(s)

New operators are created in two ways:

- Within the Settings toolbar Operators menu option within the Settings toolbar.
- Before starting a run during the Enter Operator Information step.

Operators menu option:

1. Select the **Settings** options from the toolbar; then select **Operators**.
2. Select **Add Operator** at the bottom of the screen when the list of current operators display.
3. Enter the new operator's information in the following fields:
   - **First Name**
   - **Last Name**
   - **Username**
   - **Password**
   - **Confirm**.

     The Confirm field will always display the password dots in red until the Password and Confirm fields match.
4. Select **Save** when complete.

Enter Operator Information step:

1. Select **Add/Edit Operator**.
2. Follow steps 3 and 4 above.

Pouch Modules

This feature enables the operator to install, and inactivate/uninstall pouch modules. These pouch modules contain definitions, instrument protocols, analysis and reporting for specific FilmArray reagent kits.

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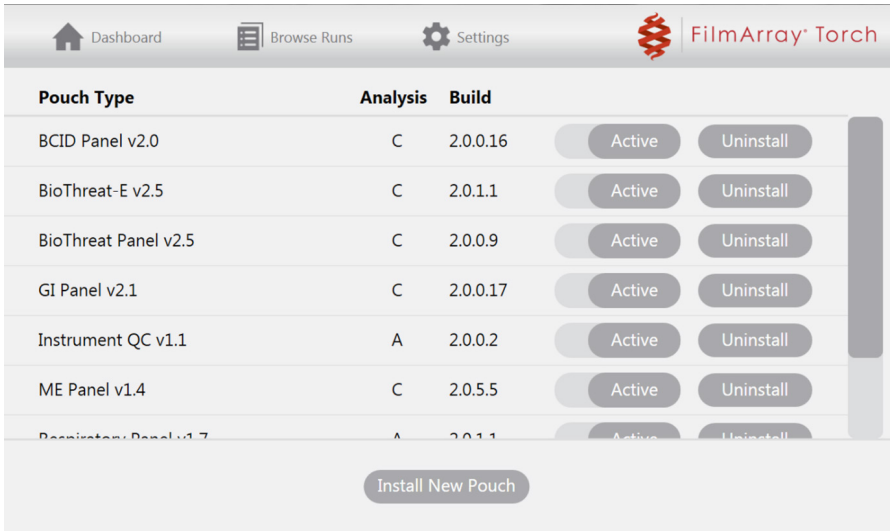
Install Pouch Modules

When new pouch modules are received from BioFire Diagnostics, the Pouch Modules option must be used on the FilmArray Torch. For information on receiving new pouch modules, contact customer support (see *page i*).

To install a new pouch module:

1. Insert removable drive containing the pouch module software.
2. Navigate to the Settings menu from the toolbar.
3. Select **Pouch Modules**.

   All pouch modules currently installed display as Active.



4. Select **Install New Pouch**.

   The new pouch module is displayed and will be set to Active status, to indicate that it is ready for use.

Inactivate/Uninstall Pouch Module

To inactivate a pouch module:

1. Toggle the **Active** slider next to the pouch name to **Inactive**.

To uninstall a pouch module:

1. Select **Uninstall** next to the pouch module name.

   When a pouch module in uninstalled, it is no longer available for selection when starting a run. To re-activate an uninstalled pouch module, it must be installed again.

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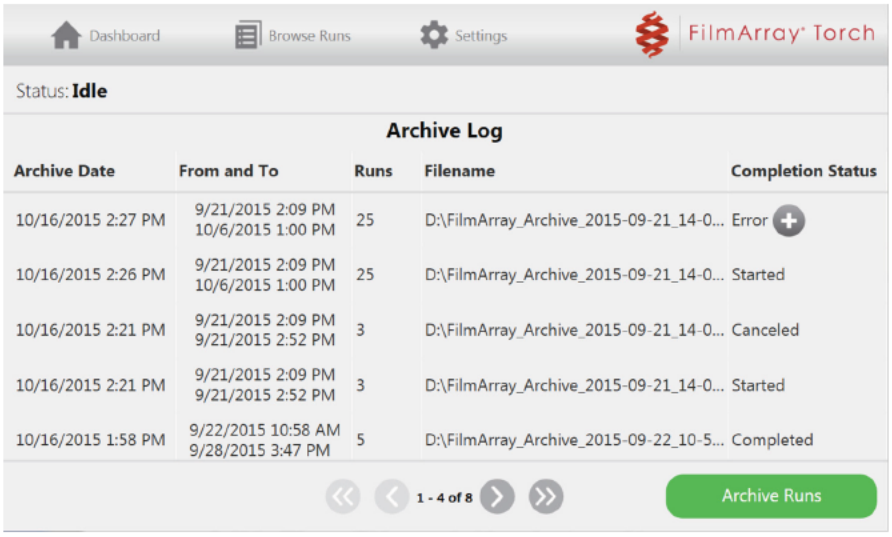
Archive Runs

To archive runs stored in the FilmArray database:

1. Navigate to the Settings menu from the toolbar.
2. Select **Archive**.

   The Archive Log will display the current status of archives and a log of all previous archiving tasks.



3. Select **Archive Runs** to display a calendar.
4. Select a date parameter on the calendar. This parameter means that all runs on or before that date will be archived.

   If more than 100 runs is selected, archived runs are sorted into files containing 100 runs each.
5. Select **Next** to choose the location and filename for the archived runs.

   By default, runs are saved to a file with the extension .faz. Filenames default to a name containing the date parameter and the name of the computer being used.

   After selecting the file name, a message displays indicating that the selected runs will be deleted from the database.
6. Select **Yes** to launch the archiving process. The date and time of the start will be recorded in the Archive Log.

   The archive process executes in the background and the status of the archive is seen in the status message on the Archive Log page. The operator may navigate to the Dashboard to perform other tasks.

   NOTE: The software verifies that all runs have been saved to the file, and then deletes each run from the database one at a time.

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When the archiving is complete, the date and time of the completion is logged and the archiving Status is set to Idle.

7. Remove the removable drive on which the .faz file was saved from the System Base and store according to institutional data retention policies.

Abort Archive Process

It is safe to abort the archive process while runs are being saved. To abort:

1. Select the **Cancel** status message; then select **Confirm**.

   The status message changes to Canceling Archive. The archive stalls and all runs remain in the database.

   When archive cancellation is complete, the date and time of the completion is recorded in the Archive Log and the archiving Status is set to Idle.

NOTE: It is not safe to abort the archiving process while runs are being removed from the database. During this time, the software will not allow the operator to cancel the process.

CAUTION: Do not attempt to shut down the computer or switch to Admin Mode during the archiving process. Wait until the process is complete before shutting down the computer or performing other tasks.

Restore Runs

If a run file must be accessed after it has been removed from the database, the runs stored in the .faz file can be restored to the database by using Import Runs (see the *Import Runs* section in this chapter for more information).

Switch to Admin Mode

Admin Mode tasks are specific to the Windows application; these include:

- Installing printers
- Adding and removing Modules
- Updating software and applying security patches.

Please see Microsoft help for instructions on adding and deleting printers and changing the date and time. For further assistance, please contact technical support (see *page i*).

NOTE: Do not perform administrative tasks on the computer—including setting the computer's date/time—while a run is in progress on any Module.

To access the main Windows application:

1. Select **Settings** from the toolbar; then select **Switch to Admin Mode**.

   This logs the user out of the FilmArray Torch Software and allows for the admin user to log in to Windows. Once logged in as the admin user, the normal Windows desktop is displayed with limited access to Windows tools and the Instrument Configuration application.

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NOTE: Logging into Admin Mode requires a BioFire Diagnostics provided password. To obtain this password, please contact customer support (*see page i*).

Instrument Configuration

Details of instrument configuration, including how to add and remove individual FilmArray Torch Modules, is done through Admin Mode using a separate application. Please see the *Instrument Configuration* section in *Chapter 2* for more information about adding a Module.

Printer Configuration

Adding and configuring printers to the FilmArray Torch is done through Admin Mode using the standard Windows features. For more information, please contact technical support (see *page i*).

Database Management

A local database on the computer stores all run data generated by the FilmArray Torch. The runs saved in the database are listed in a table within Browse Runs toolbar. For more information on the function and use of the Browse Runs toolbar, see the *Browse Runs* section in this chapter.

The database stores up to 12,000 runs reliably. A warning appears when 5,000 runs is reached to encourage frequent archiving of data. For more information on archiving runs, see the *Archive Runs* section in this chapter.

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CHAPTER 7: PRECAUTIONS WHEN WORKING WITH THE FILMARRAY SYSTEM

Laboratory Safety and Biohazards

General Safety Precautions

Please note that while the FilmArray pouches and the FilmArray Torch Modules are not themselves biohazardous, it is good laboratory procedure to handle all waste materials as potentially biohazardous material.

a. Follow all safety instructions printed on, or attached to, the FilmArray Torch.

b. Observe all general safety precautions that apply to electrical instruments.

c. Never touch switches or power cords with wet hands.

d. Do not open the housing of the FilmArray Torch.

CAUTION: Do not attempt to lift or carry the FilmArray Torch while Modules are installed. Remove all Modules prior to lifting or carrying the FilmArray Torch System Base and always lift from the bottom.

NOTE: Only authorized service personnel should perform service or repairs required for this unit.

Laboratory Precautions

Handle all samples and waste materials as if they were capable of transmitting infectious agents. Refer to Biosafety in Microbiological and Biomedical Laboratories (Centers for Disease Control and Prevention and National Institutes of Health; available online at http://www.cdc.gov/od/ohs/biosfty/bmbl5/bmbl5toc.htm) or other appropriate Biosafety procedures.

Observe safety guidelines found in the Clinical and Laboratory Standards Institute (CLSI) Protection of Laboratory Workers from Occupationally Acquired Infections, Approved Guideline M29 or other appropriate safety guidelines.

Wear personal protective equipment (PPE) and disposable powder-free gloves while handling reagents or samples and change gloves often. Wash hands thoroughly after performing a run.

Refer to the FilmArray reagent kit instruction booklets for assay-specific safety precautions.

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CAUTION: Use caution when removing pouches from the FilmArray Torch Module; a tear in the pouch could contaminate the FilmArray Torch Module and the surrounding area. Carefully dispose of pouches in a biohazard waste container.

General PCR Precautions

One of the most important guidelines when performing PCR is to avoid contamination. Some important rules to follow are:

a. Perform sample collection, pouch preparation, and running the FilmArray Torch in separate locations.

b. Load the pouch with sample behind a protective shield (or in a biological safety cabinet or hood whenever possible).

c. Do not leave a laboratory area without first completing decontamination procedures (i.e., washing and changing protective clothing and gloves).

Decontamination and Cleaning Procedures

The decontamination and cleaning procedures listed are intended to limit spread of contaminants as a result of a broken or leaked pouch. decontamination is necessary to prevent false-positive results in subsequent runs.

If a pouch leak or breakage occurs, change gloves and other potentially contaminated personal protective equipment (PPE). Change gloves often during the decontamination process, especially during the first steps of decontamination and before touching any clean surface. All PPE should be disposed of after decontamination.

CAUTION: It is important that contamination from leaking and/or punctured pouches be contained and cleaned immediately. pouches that break after PCR can contain large quantities of contaminants and target DNA template that can contaminate future pouch runs. This material, although noninfectious, is easily spread by normal human activity. Consequently, very small (molecular) quantities can be amplified by PCR in future runs, which can then be identified as a false positive by the FilmArray Torch. Treat all broken pouches as capable of contaminating the work area.

BIOLOGICAL RISKS: If the pouch contains potentially infectious material, the risk of biohazard contamination exists in addition to sample contamination.

Cleaning Materials

This list provides items that are necessary in a laboratory to keep contamination to a minimum:

- 10% bleach solution in a squeeze or spray bottle (1 part bleach to 9 parts water)
- Distilled water in a squeeze or spray bottle
- DNAZap™ or equivalent DNA degrading system
- Paper towels
- Bleach wipes

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Pouch Loading Station Decontamination

Routine cleaning of the Pouch Loading Station includes a 10% bleach wipe followed by two water wipes before each new pouch is loaded.

In the event of a sample spill or pouch leak, perform the following decontamination procedures.

1. Put on clean PPE, such as lab coat and gloves.
2. Fill a sink or bin with water and add bleach to create a 10% bleach solution.
3. Submerge the Pouch Loading Station until completely covered with bleach solution. Soak for 15 minutes.
4. Remove Pouch Loading Station from sink or bin. Replace bleach solution with distilled water.
5. Rinse the Pouch Loading Station by completely submerging in distilled water two additional times.

Contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor to obtain a replacement Pouch Loading Station, if necessary.

Decontamination Related to Pouch Leakage

If a pouch leaks, take the following precautions to avoid contamination:

1. Put on clean PPE, such as a lab coat and gloves.
2. Ensure no one uses the FilmArray Torch Module or potentially contaminated areas until the decontamination is complete.
3. Decontaminate the FilmArray Torch Module and work area and dispose of the pouch using the following steps:
   a. Discard leaking pouch in a biohazard container.
   b. Dispose of potentially contaminated gloves and put on clean gloves.
   c. Dispose of the potentially contaminated lab coat.
   d. Put on clean PPE, such as a lab coat and gloves.
   e. Clean the FilmArray Torch Module and affected work areas following the guidelines below in FilmArray Torch Module Decontamination.

CAUTION: Use only 10% bleach solution, distilled water, and/or DNAZap to decontaminate the FilmArray Torch Module and Pouch Loading Station.

FilmArray Torch Module Decontamination

1. Put on clean PPE, such as a lab coat and gloves.
2. Remove pouch from FilmArray Torch Module and discard in biohazard waste container.
3. Dispose of potentially contaminated gloves and lab coat and put on clean gloves and lab coat.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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NOTE: When cleaning the touch screen, put the FilmArray Software into Cleaning Mode. The Cleaning Mode allows 30 seconds for the touch screen to be cleaned. Access this features from the Settings toolbar (see *Chapter 8, Preventative Maintenance and Troubleshooting* for more information).

4. Wet a paper towel with the 10% bleach solution and wipe all exterior surfaces of the FilmArray Torch, including the bottom and the bench top where the FilmArray Torch Module had contact. Let it stand for at least 3 minutes to allow the bleach solution to react with any contaminants. Discard paper towel in biohazard waste. Change gloves.

CAUTION: The interior of the pouch slot and Module(s) should not be cleaned.

5. Repeat Step 4 twice with fresh paper towels for a total of three bleach wipes.
6. Change gloves, then wet a new paper towel with distilled water and wipe the all exterior surfaces of the FilmArray Torch. Discard paper towel in biohazard waste. Change gloves.
7. Repeat Step 6 with a new paper towel.
8. Remove FilmArray Torch Module face plate. Repeat Steps 3 through 7 for inner face plate surfaces and pouch slots.

Decontamination of Bench Tops and Other Areas

1. Put on clean PPE, such as a lab coat and gloves.
2. Spray the 10% bleach solution on the area that may have been contaminated. Let it stand for at least three minutes to allow the bleach solution to react with any contaminants on the surface.
3. Wipe the area with a clean paper towel. Change gloves.
4. Repeat Steps 2 and 3 twice, for a total of three wipes.
5. Change gloves. Spray the area with distilled water.
6. Wipe the area dry with a new paper towel. Change gloves.
7. Spray the area with DNAZap or an equivalent product. Follow the product's instructions for correct use. Change gloves.
8. Rinse the area by spraying it with distilled water and wiping it dry.

Check Function of Decontaminated FilmArray Torch Module

1. Test a negative sample by preparing a pouch according to instructions in *Chapter 5*, using water as the sample. Use distilled, sterile or molecular grade water for this test.
2. If the run is successful and all results are negative, continue using the FilmArray Torch Module as normal.
3. If unexpected positive results are obtained, or the run fails, please contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor for further instructions.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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CHAPTER 8: PREVENTATIVE MAINTENANCE AND TROUBLESHOOTING

Introduction

This chapter provides step-by-step instructions for operators performing basic maintenance and troubleshooting for the FilmArray Torch.

The tasks performed in this chapter are the only tasks that should be performed by the operator. Do not attempt to perform any additional maintenance without the guidance and direction of a specialist from BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.

In the event that an individual Module or the entire FilmArray Torch is taken out of service, it should be returned following the *FilmArray Torch Return Procedure* in *Appendix A*.

CAUTION: Before performing maintenance on the FilmArray Torch, put on appropriate PPE, turn off the power to the system, and unplug the Ethernet and power cables.

General Maintenance

There is no general maintenance needed for the FilmArray Torch other than the periodic cleaning steps listed below:

1. Wipe down all outside surfaces of the FilmArray Torch with a cloth or paper towel and a freshly prepared 10% bleach solution (one part bleach to nine parts water), followed by a water wipe.

NOTE: Do not remove the FilmArray Torch Module face plate and clean underneath it, except in the case of a contamination event.

2. Periodically check and clean the FilmArray Torch Module's air filters for any build up and debris. Air filters can also be swapped out with the spare filters included with the FilmArray Torch Module box (see *Chapter 2, FilmArray Torch Setup*).
3. When cleaning the touch screen of the FilmArray Torch, it is recommended that the FilmArray Torch Software be put into **Cleaning Mode** in order to avoid any accidental selections.

   This can be done by navigating to the Settings toolbar and selecting the **Switch to Cleaning Mode** option. After selecting a confirmation for this action, the screen will display a timer for 30 seconds that will temporarily freeze the screen and allow for cleaning of the surface.

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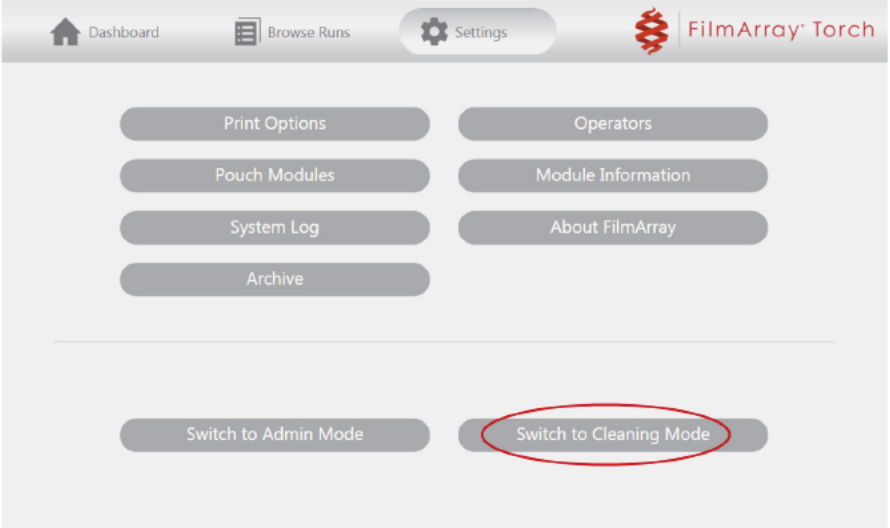

4. Use a lens cloth and lens cleaner to clean the lens of the barcode scanner.

Error Reporting Tools

The FilmArray Torch performs self-diagnostics with every run. Malfunctions are reported as errors to the operator with instructions on how to correct them. Record any error messages to assist in troubleshooting. Questions should be directed to BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.

Troubleshooting

Hardware Troubleshooting

The table below lists potential symptoms and possible solutions for troubleshooting hardware issues with the FilmArray Torch. If the issue(s) persists after applying the recommended solutions, contact technical support for further assistance (see page i).

Note all error messages, as well as the serial numbers of the System Base and affected Module(s), along with any necessary pouch lot numbers before contacting technical support. Technical support personnel will use this information to identify and resolve the issue(s).

Symptom	Possible Solution
FilmArray Torch Module status lights are not on	• Turn Module on • Check power cord • Try different outlet • If problem persists, contact technical support
FilmArray Torch Module status light is red	• Reset system using the reset button located on the rear of the System Base • Check and reconnect cables • If problem persists, contact technical support

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Symptom	Possible Solution
FilmArray Torch Module status light is blinking purple	• Remove and discard the pouch • Remove the faceplate of the affected Module and reset the Module • If problem persists, contact technical support
Software will not connect to FilmArray Torch Module	• Check cable connections • Turn off system and disconnect all cables • Reconnect all cables and turn system on • If problem persists, contact technical support
Pouch not recognized when inserted into or removed from FilmArray Torch Module	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Pouch not recognized when inserted into FilmArray Torch Module, due to jam	• Follow the software's on-screen instructions for recovery • If problem persists, contact technical support
Pouch is ejected immediately after insertion	• Remove the face plate of the affected Module and reset the Module • Check and reconnect cables • If problem persists, contact technical support
Pouch is difficult to insert into FilmArray Torch Module	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Pouch does not eject from Module after run	• Remove the face plate of the affected Module and reset the Module • If problem persists, contact technical support
Software on the System Base computer crashes	• Reset the computer using the reset button on the back of the System Base. • If problem persists, contact technical support

Barcode Scanner

The barcode scanner is included with the FilmArray Torch. It is preprogrammed to read the pouch barcodes. Pouch information may be entered manually in the event the barcode scanner is not working.

If the issue persists after applying the recommended solution shown in the table below, contact technical support for further assistance (see page i).

Symptom	Possible Solution
Barcode will not scan	• Clean the barcode scanner screen • Manually input the pouch serial numbe

Diagnostic Errors

Diagnostic errors are used mainly by technical support representatives to troubleshoot FilmArray Torch problems. Diagnostic errors can be found in the System Log. See the *System Log* section in this chapter for details on accessing this information.

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The table below lists potential error messages and possible solutions. If the error(s) persists after applying the recommended solutions, contact technical support for further assistance (see *page i*).

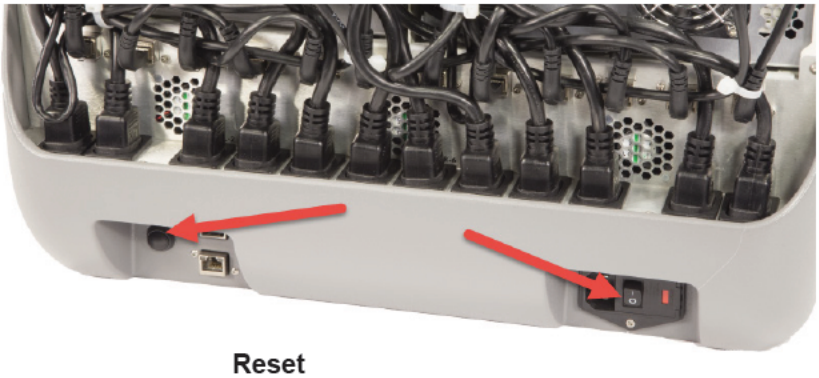
Note all error messages, as well as the serial numbers of the System Base and affected Module(s), along with any necessary pouch lot numbers before contacting technical support. Technical support personnel will use this information to identify and resolve the error(s).

Error Message	Possible Solution
1012 Pouch Not Present	• Remove the face plate of the affected Module and reset the Module by holding down the reset button on the front of the Module until the light turns off. • If problem persists, contact technical support
1014 Failed to Find Run Data	
1015 Failed to Read Run Data	
2003 Thermoboard is not present	
2004 Valve board is not present	
3001 Valve Board Response Timeout	
3002 Valve Board Malformed Response	
3003 Valve Board Command Error Response	• Remove the face plate of the affected Module and reset the Module by holding down the reset button on the front of the Module until the light turns off. • If problem persists, contact technical support
3004 Thermocycler Board Response Timeout	
3005 Thermocycler Board Malformed Response	
3006 Thermocycler Board Command Error Response	
4001 Pressurization failed	
7001 Camera Initialization Error	
7003 Failed Excitation Check	

Software Troubleshooting

Weekly Maintenance

It is not necessary to shut down and restart the computer. However, if it is facility policy to do so, this can be done by selecting the reset button on the back of the System Base, waiting for the screen to go black, then switching off the power. Switching the power back on will then restart the computer and start the software automatically.



Reset

Power On/Off

Attention Status

If communication is lost between the FilmArray Torch Module and FilmArray Torch System Base during a run, the run will continue and data will be uploaded when communication is re-established.

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Error Messages

Errors in the FilmArray Torch may originate in a FilmArray Torch Module, in the software, or in communication between the two. In each case, the FilmArray Torch Software reports a clear message with instructions that the operator can follow to resolve the issue. These messages and the suggested actions are reported in the table that follows.

Error Message	Possible Solution
The pouch has already been run - a pouch can only be used once.	Verify the correct pouch has been loaded into the FilmArray Torch Module. Discard any pouch that has already been run in a FilmArray Torch Module.
The software for the scanned pouch is not installed or is inactive. Please install or activate the required pouch module.	Verify the correct pouch module is installed and the correct barcode has been scanned for the pouch.
An attempt to Leave the Workflow has been made. If a pouch has been inserted the pouch will be ejected and Run Setup will have to be restarted. Do you wish to continue?. NOTE: All entered data will be lost.	Confirm if Run Setup Workflow will be ended. If a pouch has been inserted, that pouch needs to be removed from the Module.
FilmArray Torch database has more than 5,000 runs on it. Please use the Archive feature within Settings to remove runs from the database and store them according to your data retention policy. Please contact FilmArray Customer Support if you require assistance.	The FilmArray Torch database stores up to 12,000 runs reliably. Should this number be approached, use the Archive Runs feature in the Settings area to remove run files from the database and store the data in a separate location. Contact technical support if the problem persists.
The Module is in an Attention state. Remove the magnetic faceplate from the Module and press the Reset button. A white light on the Module indicates initialization which may take up to 2 minutes. If the problem persists, contact FilmArray Customer Support for assistance.	Follow the error message as directed. Contact technical support if the problem persists.
The FilmArray Torch encountered an error during the run. The test results are invalid. Please see the System Log for details. If the problem persists, contact FilmArray Customer Support for assistance.	Discard the pouch and follow the error message as directed. This message should be accompanied by a fast blinking green light on the Module. This light indicates that the test is complete and the pouch can be removed. Removing the pouch sets the FilmArray Torch Module into an Available state and prepares the Module for another test. Contact technical support if the problem persists.

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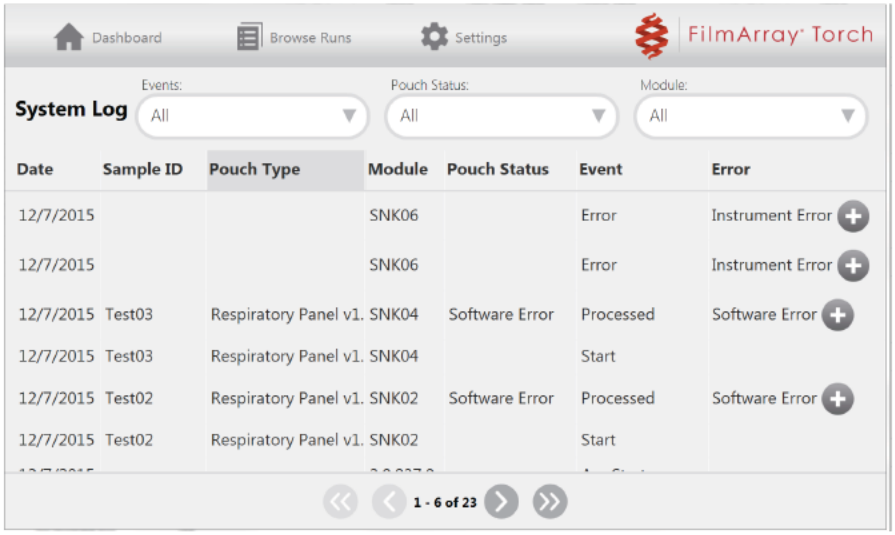
Error Message	Possible Solution
The FilmArray Torch software encountered an unexpected error. Please see the System Log for details. If the problem persists, contact FilmArray Torch Customer Support for assistance.	Follow the error message as directed. Contact technical support if the problem persists.
Run data was retrieved but cannot be analyzed because the <pouch type> pouch module was not installed in the software. For assistance, please contact FilmArray Customer Support.	

System Log

Depending on the error, the FilmArray Torch Software may refer to the System Log for details about the error. The System Log is accessed via the Settings toolbar.

When the System Log is opened, a table is presented that displays the following information as shown in the figure below.

1. Date the log was created
2. Sample ID
3. Pouch Type
4. Module serial number
5. Pouch Status
6. Type of Log Event (Start, Processed, Error)
7. Error encountered



Error Bundle

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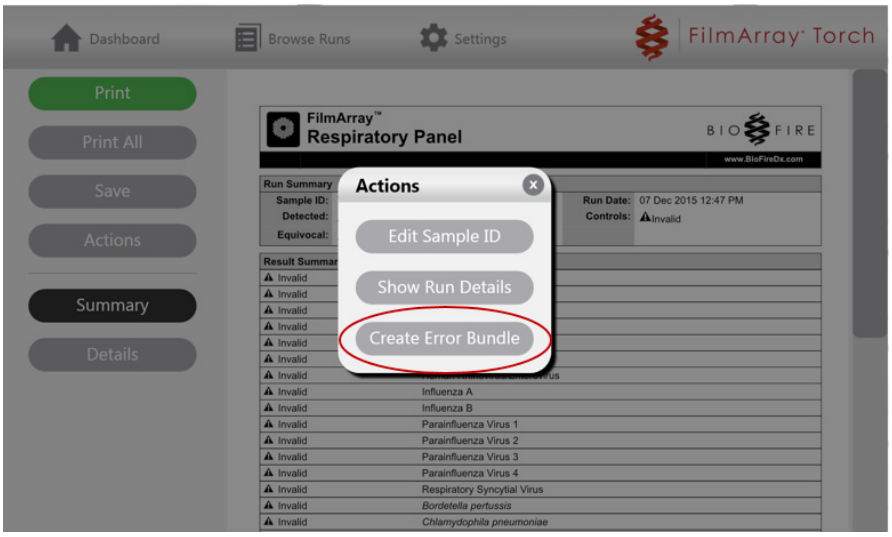
If an error occurs that is associated with a FilmArray Torch run, a technical support representative may request the operator to create and provide an error bundle for that run. The error bundle is designed to assist in troubleshooting errors associated with a run. It packages files related to the status of the system, FilmArray Torch Module, and software, including System Log data.

To create an error bundle:

1. Navigate to the Browse Runs page from the toolbar.
2. Highlight the desired run in the Browse Runs toolbar.
3. Select **View Report** to open the report page; then select **Actions**.
4. Select the menu item **Create Error Bundle**. A dialog to specify the drive and file name is displayed.



5. Select an existing folder to store the zipped file in, or create a new one. The FilmArray Torch software saves the file to the desired folder.
6. When the error bundle is complete a message to indicate that the error bundle has been created will appear.

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Pouch Troubleshooting

For problems encountered while using a FilmArray pouch, see the possible solutions below. If pouch leakage occurs, refer to Chapter 7 for proper decontamination procedures.

Problem	Possible Error Cause	Solution
Pouch packaging is not sealed tightly around pouch canister	Loss of vacuum in pouch packaging	Attempt to hydrate. If pouch hydration is successful, continue the run. Otherwise, discard the pouch and use a new pouch to test the sample.
Pouch does not automatically draw Hydration Solution or sample mix into pouch when loading	Loss of vacuum in pouch	Discard the pouch and use a new pouch to test the sample.
Failed controls	Hydration Solution not added or drawn into pouch	Retest sample in a new pouch.
	Sample mix not added or drawn into pouch	Retest sample in a new pouch.
	pouch and/or FilmArray Torch Module are not functioning properly	Retest sample in a new pouch.
		If controls continue to fail contact technical support.
Inadequate volume in Hydration Solution or Sample Buffer vials/ampoules	Evaporation or leakage	Discard vials/ampoules and obtain new ones.

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APPENDIX A: FILMARRAY SUPPORT INFORMATION

FilmArray Torch Module problems may be reported by contacting BioFire Diagnostics technical support, the local bioMérieux sales representative, or an authorized distributor.

FilmArray Torch Module Return Procedure

If returning a FilmArray Torch Module from within the United States, visit the Return Forms and Decontamination Procedures webpage:

- http://www.biofiredx.com/support/return-forms/

If returning a FilmArray Torch Module from outside the United States, contact the local bioMérieux sales representative or an authorized distributor for detailed instructions.

Disposal Recommendation

Components of the FilmArray Torch such as the FilmArray Torch Module, the computer, monitor, keyboard, etc., which are marked with the crossed-out wheeled bin symbol are covered by the European Directive 2012/19/EU.

These items must be disposed of via designated collection facilities appointed by government or local authorities.

For more information about disposal of your old product, please contact your city office or waste disposal service; or BioFire Diagnostics Customer Support Department, a local bioMérieux sales representative, or an authorized distributor.

FilmArray Ordering Instructions

Customers inside the United States should contact BioFire Diagnostics to order any FilmArray equipment, accessories, and/or supplies.

BioFire Diagnostics accepts purchase orders and credit cards (Visa®, MasterCard®, and American Express®) as methods of payment.

Orders can be made via:

- E-mail: salesorders@biofiredx.com
- Fax: 801-588-0507
- Phone: 800-735-6544 or 801-736-6354
  - Payment is by credit card only for phone orders.

If ordering from outside the United States, contact the local bioMérieux sales representative or an authorized distributor for detailed instructions.

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Warranty Information

Product warranty information is available online at:

- http://www.biofiredx.com/support/

For warranty information for customers outside the United States, contact the local bioMérieux sales representative or an authorized distributor.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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APPENDIX B: BARCODE CALIBRATION

If the barcode reader is not functioning, calibrate it by scanning the barcode shown below to program the barcode reader. The reader should sound as the code is scanned.

FilmArrayCR8000Config

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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For additional information regarding our products and applications, please contact BioFire Diagnostics Customer Support Department, local bioMérieux sales representative or an authorized distributor.

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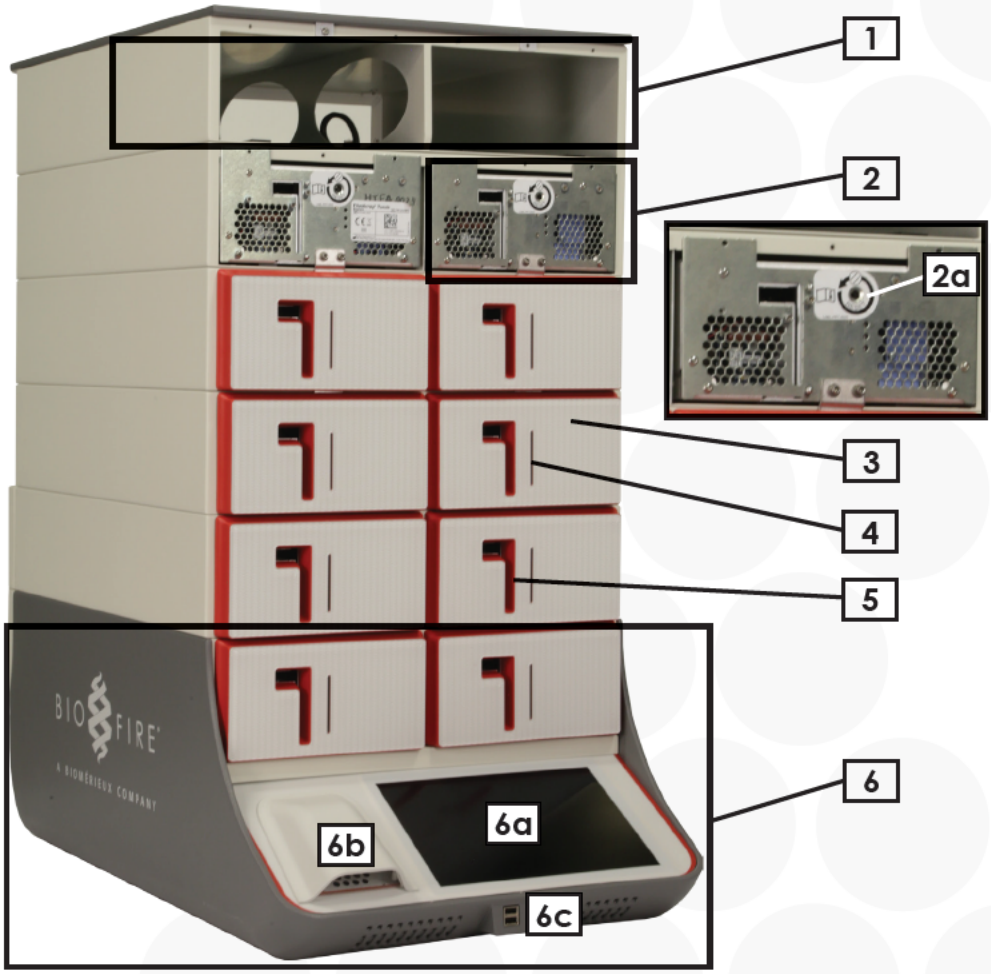
FilmArray® Torch Information Quick Guide

Caution: FilmArray Torch installation should only be performed by a BioFire Diagnostics appointed specialist.

FilmArray Torch requires one power outlet. A single data outlet is sufficient for optional LIS connectivity.

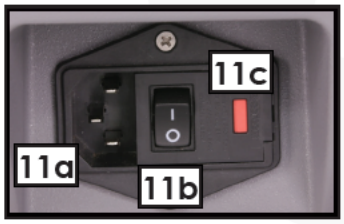


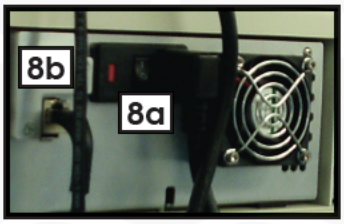
FilmArray Torch (Front)

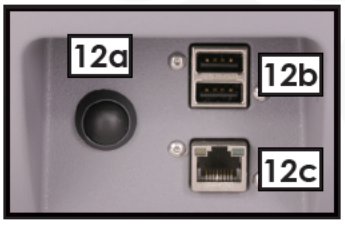
1. FilmArray Torch Duplex
2. FilmArray Torch Module
   a. Module Reset
3. Module Face Plate
4. Module Status LED Light
5. FilmArray Pouch Insert Slot
6. FilmArray Torch System Base
   a. Touch Screen
   b. Barcode Scanner
   c. USB Ports (2x)

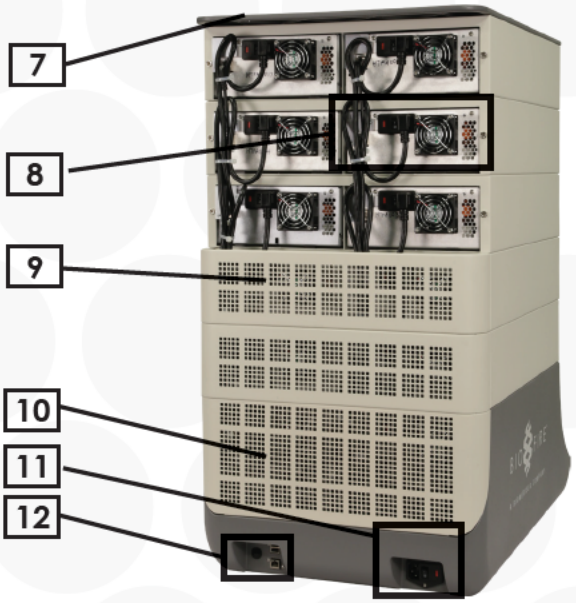
FilmArray Torch (Back)

7. FilmArray Torch Top Cover
8. Back of Module
   a. Power On/Off Switch + Fuse Holder
   b. Ethernet Port
9. Duplex Cable Shroud
10. System Base Cable Shroud
11. System Base Power Port + On/Off
    a. Power Inlet
    b. Power On/Off Switch
    c. Fuse Holder
12. System Base Reset + USB + Ethernet
    a. System Base Reset
    b. USB Ports (2x)
    c. Ethernet Port









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Note: *For additional information, please refer to the FilmArray Torch Operator's Manual.*

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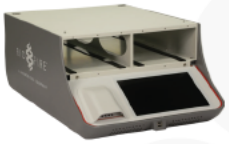
FilmArray® Torch Components List

Caution: FilmArray Torch installation should only be performed by a BioFire Diagnostics appointed specialist.

FilmArray Torch E-Labeling Information

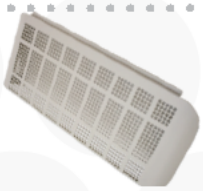
FilmArray Torch Operator's Manual	http://www.online-ifu.com/ITI0066
FilmArray Torch Information Quick Guide	http://www.online-ifu.com/ITI0077

FilmArray Torch System Base Box Components



❑ FilmArray Torch System Base

❑ Top Cover



❑ Cable Shroud

❑ FilmArray Pouch Loading Station

❑ Ethernet Cable

❑ US Power Cable

❑ EU Power Cable

FilmArray Torch Module Box Components

❑ FilmArray Torch Module

❑ Face Plate

❑ Filter

❑ Long Ethernet Cable

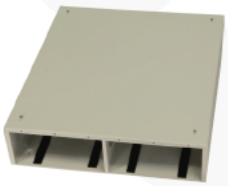
❑ Short Ethernet Cable

❑ FilmArray Torch Information CD

❑ Long Power Cable

❑ Short Power Cable

FilmArray Torch Duplex Box Components



❑ FilmArray Torch Duplex

❑ Cable Shroud

❑ FilmArray Pouch Loading Station

Note: *For additional information, please refer to the FilmArray Torch Operator's Manual.*

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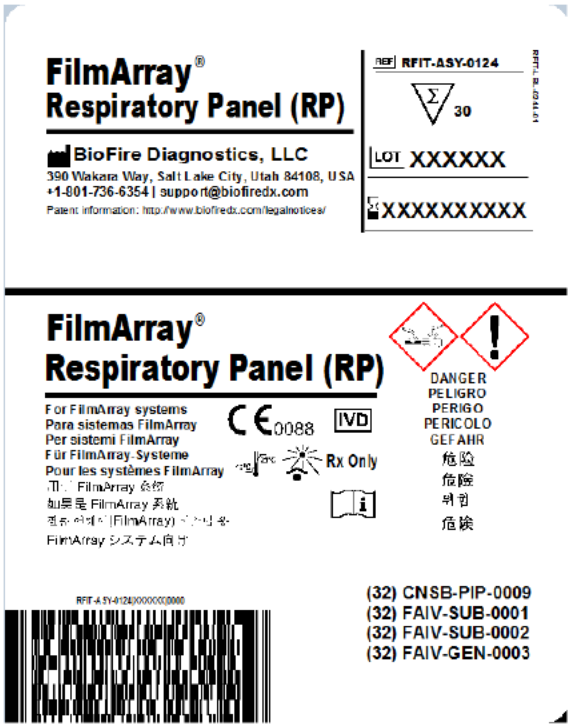
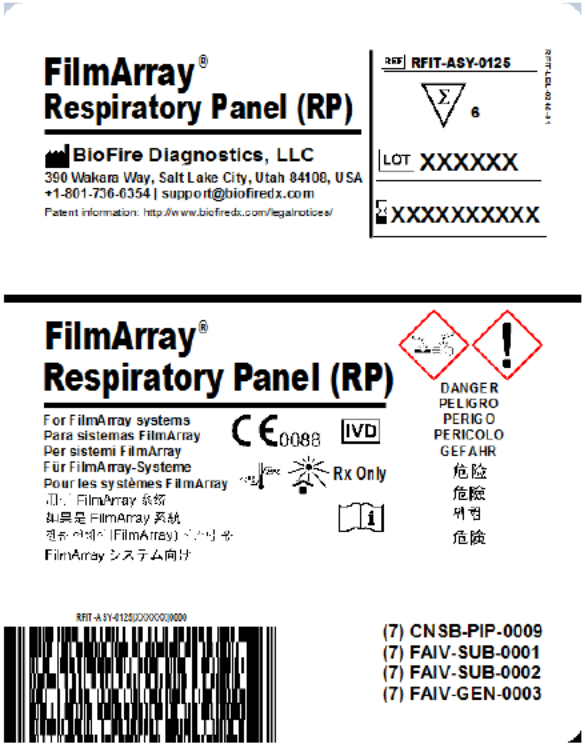
BFDX PN	Sample Label
Outer Kit Box Label, 30 Pack (RFIT-LBL-0244)	
Outer Kit Box Label, 6 Pack (RFIT-LBL-0245)	

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BFDX PN	Sample Label
FilmArray OSHA Information Label (RFIT-LBL-0257)	BioFire Diagnostics, LLC 390 Wakara Way, Salt Lake City, Utah 84108, USA | +1-801-736-6354 Avoid release to the environment. Wear protective gloves, clothing, eye and face protection. IF IN EYES: Rinse cautiously with water for several mintues. Remove contact lenses, if present and easy to do. Continue rinsing. IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. DANGER Harmful if swallowed, causes skin irritation and serious eye damage. Harmful to aquatic life with long lasting effects. RFIT-LBL-0257-02
Mylar Pouch Label (RFIT-LBL-0081)	FilmArray® Respiratory Panel v 1.7 CE 0088 IVD B: XXX Σ 1 15°C 25°C LOT XXXXXX YYYY-MM-DD RFIT-SUB-0202 RFIT-LBL-0081-06 BioFire Diagnostics, LLC, 390 Wakara Way, Salt Lake City, Utah 84108, USA
Fitment Label (RFIT-LBL-0080)	PULL FilmArray® Respiratory Panel v1.7 LOT XXXXXXY YYYY-MM-DD SN XXXXXXXZ CE 0088 IVD B: XXX SAMPLE ID HERE SAMPLE MIX BioFire Diagnostics, LLC, 390 Wakara Way, Salt Lake City, Utah 84108, USA HYDRATION SOLUTION RFIT-PRT-0004-09

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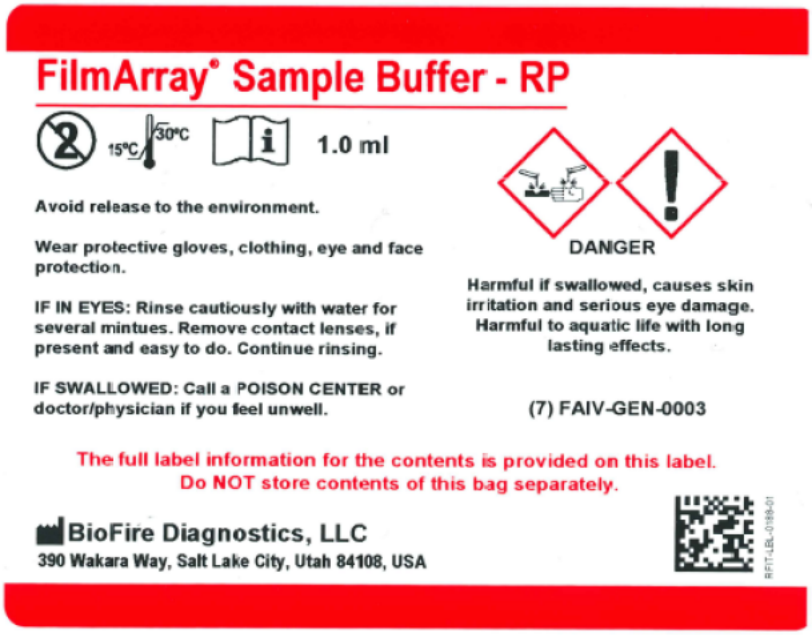
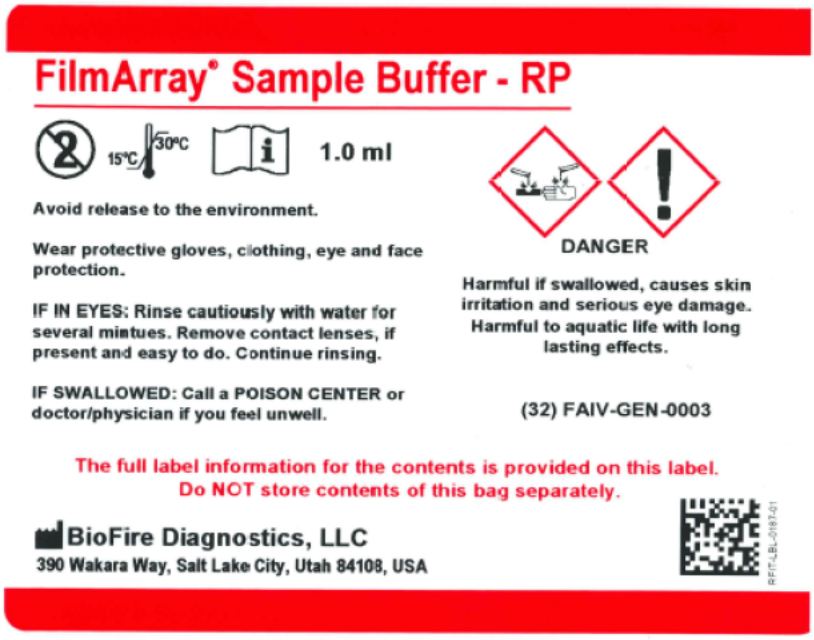
BFDX PN	Sample Label
FilmArray Sample Buffer Ampoule Bag Label – 6 Pack (RFIT-LBL-0188)	
FilmArray Sample Buffer Ampoule Bag Label – 30 Pack (RFIT-LBL-0187)	

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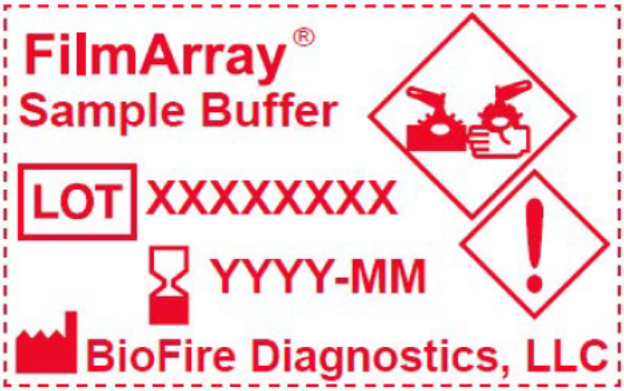
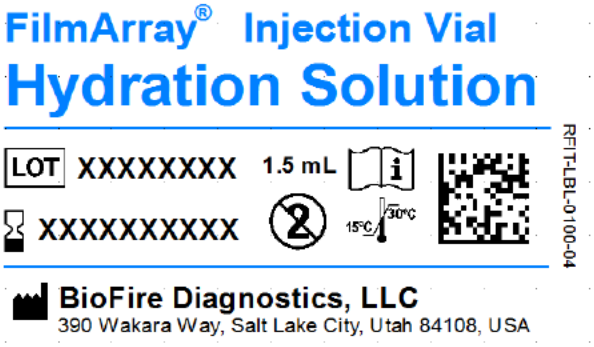
BFDX PN	Sample Label
Sample Buffer Ampoule Label (RFIT-LBL-0101)	
Hydration Solution Injection Vial Label (RFIT-LBL-0100)	
Hydration Solution Injection Vial Bag Label – 6 Pack (RFIT-LBL-0190)	

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BFDX PN	Sample Label
Hydration Solution Injection Vial Bag Label – 30 Pack (RFIT-LBL-0189)	FilmArray® Injection Vial - RP **Hydration Solution** (32) FAIV-SUB-0002 BioFire Diagnostics, LLC 390 Wakara Way Salt Lake City, Utah 84108, USA RFIT-LBL-0189-01
Sample Buffer Injection Vial Bag Label – 6 Pack (RFIT-LBL-0186)	FilmArray® Injection Vial - RP **Sample** (7) FAIV-SUB-0001 BioFire Diagnostics, LLC 390 Wakara Way Salt Lake City, Utah 84108, USA RFIT-LBL-0186-01
Sample Buffer Injection Vial Bag Label – 30 Pack (RFIT-LBL-0185)	FilmArray® Injection Vial - RP **Sample** (32) FAIV-SUB-0001 BioFire Diagnostics, LLC 390 Wakara Way Salt Lake City, Utah 84108, USA RFIT-LBL-0185-01

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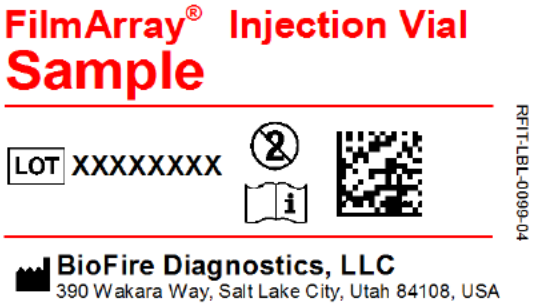
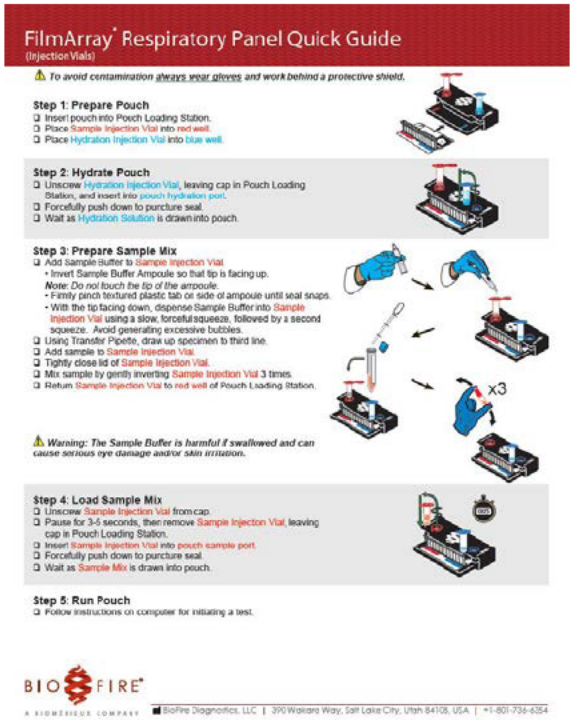
BFDX PN	Sample Label
Sample Buffer Injection Vial Label (RFIT-LBL-0099)	
Transfer Pipette Bag Label – 6 Pack (RFIT-LBL-0050)	
Transfer Pipette Bag Label – 30 Pack (RFIT-LBL-0020)	

BFDX PN	Sample Label
FilmArray Respiratory Panel Kit CE-IVD E-Labeling Information Label (RFIT-LBL-0234)	www.online-ifu.com/ITI0040 EU: +800 135 79 135 RO: 0800 895 084 SK: 0800 606 287 US: +1 855 236 0910 Kit RFIT-LBL-0234-02
FilmArray Respiratory Panel (RP) Instruction Booklet (RFIT-PRT-0435) Changes have been introduced to include testing on the FilmArray Torch	REF RFIT-ASY-0124 RFIT-ASY-0125 *FilmArray® Respiratory Panel (RP)* *Instruction Booklet* For use with the FilmArray Injection Vial-based loading system IVD CE 0088 BIOFIRE® A BIOMÉRIEUX COMPANY

BFDX PN	Sample Label
FilmArray Respiratory Panel Quick Guide (RFIT-PRT-0436) The instructions in Step 5 have been modified to be inclusive of all FilmArray Systems	

FilmArray® Respiratory Panel Quick Guide
(Injection Vials)

⚠ *To avoid contamination always wear gloves and work behind a protective shield.*

Step 1: Prepare Pouch
- ❑ Insert pouch into Pouch Loading Station.
- ❑ Place Sample Injection Vial into red well.
- ❑ Place Hydration Injection Vial into blue well.

Step 2: Hydrate Pouch
- ❑ Unscrew Hydration Injection Vial, leaving cap in Pouch Loading Station, and insert into pouch hydration port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Hydration Solution is drawn into pouch.

Step 3: Prepare Sample Mix
- ❑ Add Sample Buffer to Sample Injection Vial.
  - Invert Sample Buffer Ampoule so that tip is facing up.
  - *Note: Do not touch the tip of the ampoule.*
  - Firmly pinch textured plastic tab on side of ampoule until seal snaps.
  - With the tip facing down, dispense Sample Buffer into Sample Injection Vial using a slow, forceful squeeze, followed by a second squeeze. Avoid generating excessive bubbles.
- ❑ Using Transfer Pipette, draw up specimen to third line.
- ❑ Add sample to Sample Injection Vial.
- ❑ Tightly close lid of Sample Injection Vial.
- ❑ Mix sample by gently inverting Sample Injection Vial 3 times.
- ❑ Return Sample Injection Vial to red well of Pouch Loading Station.

⚠ ***Warning: The Sample Buffer is harmful if swallowed and can cause serious eye damage and/or skin irritation.***

Step 4: Load Sample Mix
- ❑ Unscrew Sample Injection Vial from cap.
- ❑ Pause for 3-5 seconds, then remove Sample Injecton Vial, leaving cap in Pouch Loading Station.
- ❑ Insert Sample Injection Vial into pouch sample port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Sample Mix is drawn into pouch.

Step 5: Run Pouch
- ❑ Follow instructions on computer for initiating a test.

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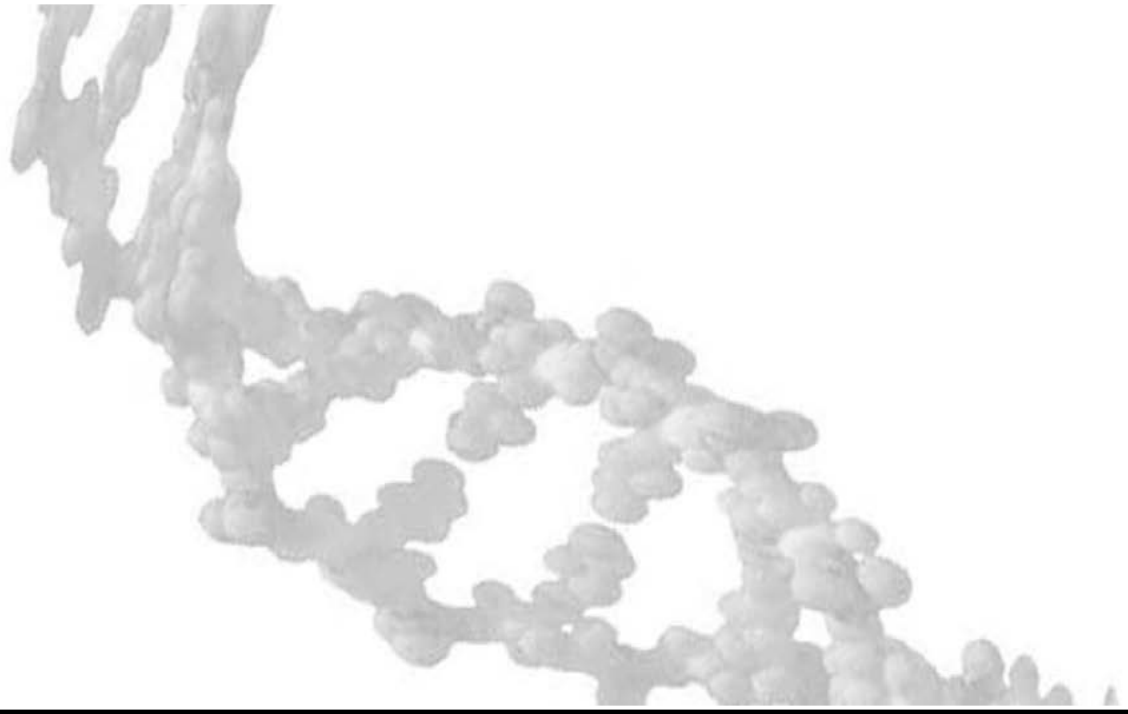
REF RFIT-ASY-0124
RFIT-ASY-0125



FilmArray® Respiratory Panel (RP)

Instruction Booklet

For use with the FilmArray Injection Vial-based loading system

IVD

CE 0088

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Customer and Technical Support for U.S. Customers

Reach Us on the Web
http://www.BioFireDX.com

Reach Us by E-mail
support@BioFireDX.com

Reach Us by Mail
390 Wakara Way
Salt Lake City, UT 84108
USA

Reach Us by Phone
1-800-735-6544 - Toll Free
(801) 736-6354 - Utah

Reach Us by Fax
(801) 588-0507

Customer and Technical Support outside of the U.S.

Contact your local sales representative or distributor for technical support

BioFire Diagnostics, LLC
390 Wakara Way
Salt Lake City, UT 84108
USA

EC REP

Qarad b.v.b.a
Cipalstraat 3
B-2440 Geel, Belgium

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TABLE OF SYMBOLS

The following symbols can be found on FilmArray Respiratory Panel Kit components or throughout this Instruction Booklet. Use the definitions below as a guideline to interpreting the symbols.

Table of Symbols					
	Manufacturer	REF	Catalog Number		Use-By date (YYYY-MM-DD)
	Consult Instructions for Use	LOT	Batch Code (Lot Number)		Temperature limit
CE	European Union Conformity	SN	Serial Number	Σ n	Contains Sufficient For <n> Tests
IVD	*In vitro* Diagnostic Medical Device		Keep Away from Sunlight		Do Not Reuse
	Serious eye damage, cat. 1		Acute toxicity, cat. 4 & Skin irritation, cat. 2		Do Not Use if Package is Damaged
EC REP	Authorized representative in the European Community				

E-LABELING

The manual for this product can be accessed online at www.online-ifu.com/KEY-CODE. The product KEY-CODE is provided on the outer box label at the end of the URL. The KEY-CODE for this instruction booklet is also listed below. Additionally, a paper copy is available upon request by contacting customer service via phone, fax, email, or regular mail.

FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit - IFU	https://www.online-ifu.com/ITI0040
FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit – Quick Guide	https://www.online-ifu.com/ITI0050
FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit - SDS	https://www.online-ifu.com/ITI0054

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NAME AND INTENDED USE

FilmArray Respiratory Panel

FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the FilmArray RP may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis,* Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4 were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens.

Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., cell culture or sequence analysis).

The FilmArray RP assay for Coronavirus OC43 may cross-react with some isolates of Coronavirus HKU1. A dual positive result may be due to cross-reactivity or may indicate a co-infection.

Performance characteristics for Influenza A were established when Influenza A H1-2009, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent Influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

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SUMMARY AND EXPLANATION OF THE TEST

Respiratory pathogens cause acute local and systemic disease of varying severity, with the most severe cases occurring in children, the elderly and immunocompromised individuals. Respiratory symptoms can include coughing, nasal discharge, congestion, fever, wheezing, headache and myalgia. Due to the similarity of diseases caused by many viruses and bacteria, diagnosis based on clinical symptoms alone is difficult. Identification of potential causative agents provides data to aid the physician in determining appropriate patient treatment and public health response for disease containment. The FilmArray RP pouch is designed for simultaneous detection and identification of the following upper respiratory viruses and bacteria: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Influenza A (with subtyping for hemagglutinin genes H1, H1-2009 and H3), Influenza B, Human Metapneumovirus, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Respiratory Syncytial Virus, Rhinovirus/Enterovirus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. A summary of characteristics for these organisms is provided in Table 1.

Table 1. Respiratory Pathogens Detected in the FilmArray Respiratory Panel

Organism (abbreviation)	Classification (Genome type)	Season of Highest Incidence[a]	Most Commonly Infected Demographic
Adenovirus (AdV)	Adenovirus (DNA)	Late winter to early summer[1]	All ages, immunocompromised[1]
Coronavirus (CoV) 229E, HKU1, NL63, OC43	Coronavirus (RNA)	Winter, spring[2-3]	Children, adults[2-3]
Enterovirus (EV)	Picornavirus(RNA)	Summer, early fall [4]	All ages[5]
Human Rhinovirus (HRV)	Picornavirus (RNA)	Fall, spring[6]	All ages[6]
Human Metapneumovirus (hMPV)	Paramyxovirus (RNA)	Winter, early spring[7]	Children[7]
Influenza A (Flu A) (subtypes H1, H1-2009, and H3)	Orthomyxovirus (RNA)	Winter [8]	All ages [8], 5-20 % of US population[9]
Influenza B (Flu B)	Orthomyxovirus (RNA)	Winter [8]	All ages [8], 5-20 % of US population[9]
Parainfluenza Virus 1 (PIV1)	Paramyxovirus (RNA)	Fall, periodicity of 1-2 years[10]	Infants, young children, immunocompromised[10]
Parainfluenza Virus 2 (PIV2)	Paramyxovirus (RNA)	Fall, periodicity of 1-2 years[10]	Infants, young children, immunocompromised[10]
Parainfluenza Virus 3 (PIV3)	Paramyxovirus (RNA)	Spring, summer[10]	Infants, young children, immunocompromised [10]
Parainfluenza Virus 4 (PIV4)	Paramyxovirus (RNA)	Unknown	All ages[11]
Respiratory Syncytial Virus (RSV)	Paramyxovirus (RNA)	Winter, varies by location[12-13]	Children, older adults[12-13]
Bordetella pertussis	Bacterium (DNA)	No peak season	All ages[14]
Chlamydophila pneumoniae	Bacterium (DNA)	No peak season	Older children, young adults, immunocompromised[15]
Mycoplasma pneumoniae	Bacterium (DNA)	Outbreaks most common in summer, outbreak periodicity 4 – 7 years	Older children, young adults[16-17]

[a] based on North American seasons

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Summary of Detected Organisms

Adenoviruses are a diverse group of non-enveloped DNA viruses with seven species (A to G) categorized by hemagglutination and approximately 55 serotypes. All serotypes have been associated with human disease. Adenovirus species B, C, and E cause acute respiratory disease. Outbreaks occur in institutional settings such as military training, long-term care facilities, and pediatric tertiary-care hospitals, due to high rates of transmission in closed populations [18-20]. Adenoviruses (species A, D, F and G) can cause a variety of illnesses, including cystitis, gastroenteritis, and conjunctivitis [1]. Adenoviruses are shed for long periods of time and persist on surfaces in an infective state [20].

Coronaviruses 229E, HKU1, NL63, and OC43. Human Coronaviruses were established as respiratory pathogens in the 1960's. Initially, two serologic variants were characterized (229E and OC43) and recently, two additional human coronaviruses (HKU1 and NL63) have been identified [2, 21-23]. These viruses are most commonly associated with upper respiratory tract infections; however, they have also been detected in individuals with lower respiratory tract infections [2-3, 24]. Coronaviruses have been associated with croup and exacerbation of asthma [2, 22]. Coronavirus infection occurs more often in the winter and there appears to be a periodicity of epidemics for strains 229E and OC43 of every two to three years [3].

Human Metapneumovirus was discovered in 2001 as a respiratory pathogen in children [25]. Further studies confirmed hMPV infections in persons of all ages [26]. Human Metapneumoviruses are in the family *Paramyxoviridae* [7]. Infection in infants and young children is commonly associated with bronchiolitis [7]. The two genotypes, A and B, can circulate at the same time and do not appear to differ in the severity of illness [7].

Influenza A and B are RNA viruses in the *Orthomyxoviridae* family. During annual Influenza epidemics, 5-20% of the population is affected with upper respiratory tract infections with rapid onset of fever [8]. The dominant type of Influenza virus varies often due to antigenic drift and shift [27]. During the 2009-10 Influenza season, Influenza A H1-2009 was the dominant circulating Influenza virus, accounting for approximately 99% of reported Influenza infections [28] (Table 2). Influenza A can be subtyped by the hemagglutinin (H) and neuraminidase (N) genes; subtypes H1N1 and H3N2 are the strains that most commonly infect humans. More severe disease and increased mortality are associated with H3N2 subtype [27]. Currently, at least four antiviral medications are available for Influenza treatment – amantadine, rimantadine, zanamivir and oseltamivir – with type-specific efficacy and drug resistance arising with the spread of new strains of the virus [27, 29]. Complications with viral or bacterial pneumonia increase mortality from Influenza infections [30].

Table 2. Proportions of Influenza Subtype Infections in the United States (as reported by the US Centers for Disease Control)

Flu Season	Influenza A	% of Influenza A			Influenza B
		H1	H1-2009	H3	
2009-2010[1,2]	99.6%	0.1	99.8	0.1	0.4%
2008-2009	89.4%	13.2	79.9	6.9	10.6%
2007-2008	71%	26.2	0.0	73.8	29%
2006-2007	79.2%	62.3	0.0	37.7	20.8%
2005-2006	79.7%	8.1	0.0	91.9	20.3%

[1] Season during which prospective clinical data described in this package insert were accumulated
[2] Cumulative results from August 30, 2009 to May 22, 2010

Parainfluenza Viruses. Parainfluenza viruses are RNA viruses in the *Paramyxoviridae* family. In the 1950's, Parainfluenza viruses were determined to be respiratory pathogens different from influenza viruses [10]. Parainfluenza viruses are divided into four types antigenically and genetically, with type 4 further subtyped as A and B

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[10]. Parainfluenza Virus 1 causes biennial epidemics in the fall, with 50% of croup cases attributed to this virus [10]. Parainfluenza Virus 2 has a periodicity of epidemics of one to two years that may alternate with Parainfluenza 1 outbreaks [10]. Children less than six months old are particularly susceptible to Parainfluenza Virus 3 infection, with outbreaks occurring in neonatal intensive care units and epidemics are most common in the spring and summer [10]. Parainfluenza Virus 4 infection affects all age groups and a periodicity of infection has not been established [11].

Respiratory Syncytial Virus is a member of the RNA viruses in the *Paramyxoviridae* family, related to human metapneumoviruses and parainfluenza viruses [12]. RSV is the most common cause of severe respiratory disease in infants, with acute bronchiolitis as the major cause of hospitalization [12]. An association of asthma with RSV infection is being investigated [12]. Treatment or prophylaxis with a humanized monoclonal antibody against the fusion protein of RSV has shown a reduction in disease for high risk infants [12].

Rhinoviruses and **Enteroviruses** are related RNA viruses in the *Picornavirus* family [6]. There are more than 100 serotypes of Human Rhinovirus based on the serology of the capsid protein [6]. Rhinovirus is noted as causing the "common cold", but may also be involved in precipitating asthma attacks and severe complications [6]. Enteroviruses are divided into four species that include a total of 89 serotypes. Individual serotypes can be associated with different clinical manifestations, including nonspecific respiratory illnesses in infants or adults [5].

Bordetella pertussis is the causative agent of whooping cough or pertussis, a vaccine-preventable disease that is reportable to public health organizations [31-32]. *B. pertussis* is a gram-negative bacterium with a high infectivity rate that is treatable with several antibiotics [14]. Vaccine-induced immunity has been shown to decrease after 5-10 years. Pertussis occurs most commonly in children but also occurs in adolescents and adults and outbreaks have been documented in fully vaccinated populations due to waning immunity [14, 33]. The highest mortality from pertussis occurs with infants and elderly [14]. Early (catarrhal) pertussis disease is non-specific, and classic signs of pertussis (paroxysmal coughing, inspiratory 'whoop', post-tussive emesis, as well as apnea or cyanosis in infants) do not arise until approximately 2 weeks after the initial onset of symptoms. Symptoms of *B. pertussis* infection are known to vary due to a number of factors including: age, previous immunization or infection, passively acquired antibody, and antibiotic treatment [14]. No peak season has been defined for *B. pertussis* infection.

Chlamydophila pneumoniae is an obligate intracellular bacterium that causes acute respiratory infections and is a common cause of community-acquired pneumonia [34-35]. Outbreaks occur in schools, military barracks, and nursing homes [36]. No peak season has been identified for *C. pneumoniae* infections.

Mycoplasma pneumoniae is a causative agent of community-acquired atypical pneumonia, frequently in outbreak situations [17, 37]. Incubation time for *M. pneumoniae* infection is approximately 1 to 4 weeks [16]. *M. pneumoniae* respiratory disease does not have a defined season of highest incidence but epidemics have a periodicity of 3-7 years [37].

Principle of the Procedure

The FilmArray RP pouch is a closed system disposable that houses all the chemistry required to isolate, amplify and detect nucleic acid from multiple respiratory pathogens within a single NPS specimen. The rigid plastic component (fitment) of the FilmArray RP pouch contains reagents in freeze-dried form. The flexible plastic portion of the pouch is divided into discrete segments (blisters) which, through interactions with actuators and sensors in the FilmArray instrument, are where the required chemical processes are carried out. The user of the FilmArray RP loads the sample into the FilmArray RP pouch, places the pouch into the FilmArray instrument/Module, and starts the run. All other operations are automated.

The following is an overview of the testing procedure:

1. Remove the FilmArray pouch from its vacuum-sealed package. Since solutions are drawn into the FilmArray RP pouch by vacuum, it is important to keep pouches in their protective packaging until the time of use.

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2. Place the FilmArray RP pouch into the FilmArray Pouch Loading Station. The FilmArray Pouch Loading Station has been designed to prevent error by providing instructions and visual cues in the form of color-coded arrows to ensure that the pouch is properly loaded.

3. Load Hydration Solution into the FilmArray RP pouch. Loading the pouch with Hydration Solution rehydrates the freeze-dried reagents contained in the pouch fitment.

4. Mix NPS specimen with Sample Buffer. The Sample Buffer contains reagents that inactivate RNases in the sample and promote binding of nucleic acids to magnetic beads for isolation.

5. Load the sample/buffer mixture into the FilmArray RP pouch. A process control contained in the fitment of the pouch is introduced into the sample. The process control monitors all of the critical processes that occur in the pouch.

6. Transfer the pouch to the instrument/Module and initiate a run. To aid in proper insertion of the pouch in the instrument, the FilmArray software provides on-screen animations illustrating the steps needed to start the run.

7. View results on the test report at the completion of the run.

The following is an overview of the operations and processes that occur during a FilmArray run:

1. **Nucleic Acid Purification** - Nucleic acid purification occurs in the first three blisters of the pouch. The sample is lysed by agitation (bead beating) and the liberated nucleic acid is captured, washed and eluted using magnetic bead technology. These steps require about ten minutes and the bead-beater apparatus can be heard as a high-pitched whine during the first minute of operation.

2. **Reverse Transcription and 1st Stage Multiplex PCR** - Since many pathogens identified by the FilmArray RP pouch are RNA viruses, a reverse transcription (RT) step is performed to convert the viral RNA into cDNA prior to amplification. The purified nucleic acid solution is combined with a preheated master mix to initiate the RT step and subsequent thermocycling for multiplex PCR. The effect of 1st stage PCR is to enrich for the target nucleic acids present in the sample.

3. **2nd Stage PCR** - The products of 1st stage PCR are diluted and mixed with fresh PCR reagents containing an intercalating fluorescent DNA dye (LCGreen® Plus, BioFire Diagnostics, LLC). This solution is distributed over the 2nd stage PCR array. The individual wells of the array contain primers for different assays (each present in triplicate) that target specific nucleic acid sequences from each of the pathogens detected, as well as control template material. These primers are 'nested' or internal to the specific products of the 1st stage multiplex reaction, which enhances both the sensitivity and specificity of the reactions.

4. **DNA Melting Analysis** – After 2nd stage PCR, the temperature is slowly increased and fluorescence in each well of the array is monitored and analyzed to generate a melting curve. The temperature at which a specific PCR product melts (melting temperature or Tm) is consistent and predictable and the FilmArray software automatically evaluates the data from replicate wells for each assay to report results. For a description of data interpretation and reporting see the Interpretation of Results section of this booklet.

The FilmArray software controls the operation of the instrument/Module, collects and analyzes data, and automatically generates a test report at the end of the run. The entire process takes about an hour. Additional detail for each FilmArray system can be found in the appropriate FilmArray Operator's Manual.

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MATERIALS PROVIDED

Each kit contains sufficient reagents to test 30 or 6 specimens:

- Individually packaged FilmArray RP pouches
- Single-use (1.0 mL) Sample Buffer ampoules
- Single-use pre-filled (1.5 mL) Hydration Injection Vials (blue)
- Single-use Sample Injection Vials (red)
- Individually packaged Transfer Pipettes

MATERIALS REQUIRED BUT NOT PROVIDED

FilmArray system including:

- FilmArray, FilmArray 2.0, or FilmArray Torch and software
- FilmArray Pouch Loading Station

WARNINGS AND PRECAUTIONS

General Precautions

1. For *in vitro* diagnostic use only.
2. This device is restricted to sale by or on the order of a physician, or to a clinical laboratory; its use is restricted to, by, or on the order of a physician.
3. A trained healthcare professional should carefully interpret the results from the FilmArray RP in conjunction with a patient's signs and symptoms and results from other diagnostic tests.
4. FilmArray RP pouches are only for use with FilmArray systems.
5. Performance characteristics of the FilmArray RP have only been determined with nasopharyngeal swab (NPS) specimens.
6. Always check the expiration date on the pouch and do not use a pouch after its expiration date.
7. Pertussis is a nationally notifiable infectious condition in the U.S. If *Bordetella pertussis* is detected, notify the state and/or local health departments.

Safety Precautions

1. Wear appropriate Personal Protective Equipment (PPE), including (but not limited to) disposable powder-free gloves and lab coats. Protect skin, eyes and mucus membranes. Change gloves often when handling reagents or specimens.
2. Handle all specimens and waste materials as if they were capable of transmitting infectious agents. Observe safety guidelines such as those outlined in CDC/NIH *Biosafety in Microbiological and Biomedical Laboratories* [38], the CLSI Document M29 *Protection of Laboratory Workers from Occupationally Acquired Infections* [39], or other appropriate guidelines.
3. Follow your institution's safety procedures for handling biological samples.
4. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection

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control precautions for novel virulent Influenza viruses and sent to state or local health department for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

5. Dispose of materials used in this assay, including reagents, specimens, and used buffer vials, according to federal, state, and local regulations.
6. Sample Buffer is assigned the following classifications: Acute toxicity (Category 4), Serious Eye damage (Category 1), and Skin irritation (Category 2). Accordingly, the Sample Buffer is harmful if swallowed, causes serious eye damage, and causes skin irritation. The following precautions should be observed:

   Wear protective gloves/eye protection/face protection.

   IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

   IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

   Please refer to the FilmArray Respiratory Panel Safety Data Sheet (SDS) for more information.

7. Sample Buffer will form hazardous compounds and fumes when mixed with bleach or other disinfectants.

WARNING: Bleach should never be added to Sample Buffer or sample waste.

8. Bleach, a recommended disinfectant, is corrosive and may cause severe irritation or damage to eyes and skin. Vapor or mist may irritate the respiratory tract. Bleach is harmful if swallowed or inhaled. The following first aid measures are recommended.

   Eye contact: Hold eye open and rinse with water for 15-20 minutes. Remove contact lenses after the first 5 minutes and continue rinsing eye. Seek medical attention.

   Skin contact: Immediately flush skin with plenty of water for at least 15 minutes. If irritation develops, seek medical attention.

   Ingestion: Do not induce vomiting. Drink a glassful of water. If irritation develops, seek medical attention.

   Please refer to the appropriate Safety Data Sheet (SDS) for more information.

Laboratory Precautions

1. **Preventing organism contamination**

   Due to the sensitive nature of the FilmArray RP, it is important to guard against contamination of the work area by following these guidelines:

   - Laboratory workers can be infected with common respiratory pathogens and can inadvertently contaminate the sample while it is being processed. To avoid this, specimens should be processed and pouches should be loaded in a biosafety cabinet. If a biosafety cabinet is not used, a dead air box (e.g., AirClean PCR workstation), a splash shield (e.g., Bel-Art Scienceware Splash Shields), or a face shield should be used when preparing specimens.
   - A biosafety cabinet that is used for performing viral or bacterial culture should not be used for specimen preparation or pouch loading.
   - Prior to processing a specimen, thoroughly clean both the work area and the FilmArray Pouch Loading Station using a suitable cleaner such as freshly prepared 10% bleach or a similar disinfectant. To avoid residue build-up and potential PCR inhibition, wipe disinfected surfaces with water.

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- Some *Bordetella pertussis* acellular vaccines (i.e. Pentacel®, Daptacel®, and Adacel®) contain PCR-detectable DNA. Contamination of specimens or testing materials with vaccine can cause false-positive *B. pertussis* results. Specimens should not be collected or processed in areas that are exposed to *B. pertussis* vaccine material and particular care should be taken during specimen collection and handling to avoid contamination (http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-pcr-bestpractices.html).
- Specimens and pouches should be handled one-at-a-time.
- Use clean gloves to remove materials from bulk packaging bags, and reseal bulk packaging bags when not in use.
- Change gloves and clean the work area between preparation of each patient specimen.
- Laboratory workers with active respiratory symptoms (runny nose, cough) should wear a standard surgical mask (or equivalent) and should avoid touching the mask while preparing specimens.

2. **Preventing amplicon contamination**

   A common concern with PCR-based assays is false positive results caused by contamination of the work area with PCR amplicon. Because the FilmArray RP pouch is a closed system, the risk of amplicon contamination is low provided that pouches remain intact after the test is completed. Adhere to the following guidelines to prevent amplicon contamination:

   - Discard used pouches in an appropriate biohazard container immediately after the run has completed.
   - Avoid excessive handling of pouches after test runs.
   - Avoid exposing pouches to sharp edges or anything that might cause a puncture.

WARNING: If liquid is observed on the exterior of a pouch, the liquid and pouch should be immediately contained and discarded in a biohazard container. The instrument and work space must be decontaminated as described in the FilmArray Operator's Manual.

DO NOT PERFORM ADDITIONAL TESTING UNTIL THE AREA HAS BEEN DECONTAMINATED.

Precaution Related to Public Health Reporting in the United States

Local, state, and federal regulations for notification of reportable disease are continually updated and include a number of organisms for surveillance and outbreak investigations [40-41]. Additionally, the Centers for Disease Control (CDC) recommends that when pathogens from reportable diseases are detected by a culture independent diagnostic test (CIDT), the laboratory should facilitate obtaining the isolate or clinical materials for submission to the appropriate public health laboratory to aid in outbreak detection and epidemiological investigations. Laboratories are responsible for following their state and/or local regulations and should consult their local and/or state public health laboratories for isolate and/or clinical sample submission guidelines.

REAGENT STORAGE, HANDLING AND STABILITY

1. Store the test kit, including reagent pouches and buffers, at room temperature (15–25 ºC). **DO NOT REFRIGERATE.**
2. Avoid storage of any materials near heating or cooling vents or in direct sunlight.

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3. Always check the expiration date and do not use reagents beyond the expiration date printed on the pouch or kit.
4. All kit components should be stored and used together. Do not use components from one kit with those of another kit.
5. Do not remove pouches from their packaging until a sample is ready to be tested. Once the pouch packaging has been opened, the pouch should be loaded as soon as possible (within approximately 30 minutes).
6. Once a pouch has been loaded, the test run should be started as soon as possible (within 60 minutes).

SPECIMEN COLLECTION AND PREPARATION

This section describes the requirements for specimen collection, preparation, and handling that will help ensure accurate test results.

Nasopharyngeal Swab Collection - NPS specimens should be collected according to standard technique and immediately placed in viral transport media (VTM).

Minimum Sample Volume - 300 µL of sample is required for testing.

Transport and Storage - Specimens in VTM should be processed and tested as soon as possible. If storage is required, specimens in VTM can be held at room temperature (18–30 °C) for up to 4 hours, at refrigerator temperature (2-8 °C) for up to 3 days, or at freezer temperature (<-15 °C) for up to 30 days.

PROCEDURE

Refer to the FilmArray Respiratory Panel Quick Guide, the FilmArray Training Video or the appropriate FilmArray Operator's Manual for more detail and pictorial representations of these instructions.

Gloves and other Personal Protective Equipment (PPE) should be used when handling pouches and specimens. Only one FilmArray RP pouch should be loaded at a time. Once the pouch is loaded, it should be promptly transferred to the instrument/Module to start the run. After the run is complete, the pouch should be discarded in a biohazard container.

Prepare Pouch

1. Thoroughly clean the work area and the FilmArray Pouch Loading Station with freshly prepared 10% bleach (or suitable disinfectant) followed by a water rinse.
2. Remove the FilmArray RP pouch from its vacuum-sealed package by tearing or cutting the notched outer packaging and opening the protective aluminum canister.

   NOTE: If the vacuum seal of the pouch packaging is not intact, the pouch may still be used. Attempt to hydrate the pouch using the steps below. If hydration is successful, continue with the run. If hydration fails, discard the pouch and use a new pouch to test the sample.

3. Place the FilmArray Pouch into the FilmArray Pouch Loading Station. To do so, hold the pouch so that the barcoded label is upright and readable, and then slide the flexible film portion of the pouch into the loading

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station. In the correct configuration, the inlet ports on both ends of the rigid plastic part of the pouch will point up, and the red and blue labels on the pouch will align with the red and blue arrows on the FilmArray Pouch Loading Station.

4. Place a blue-capped Hydration Injection Vial in the blue well of the FilmArray Pouch Loading Station.
5. Place a red-capped Sample Injection Vial in the red well of the FilmArray Pouch Loading Station.

Hydrate Pouch

1. Twist and lift the Hydration Injection Vial, leaving blue cap in the well of the FilmArray Pouch Loading Station.
2. Insert the cannula tip into the port in the pouch located directly below the blue arrow of the FilmArray Pouch Loading Station. Push down forcefully in a firm and quick motion until you hear a faint "pop" and feel an ease in resistance. The correct volume of liquid will be pulled into the pouch by vacuum.
3. Verify that the pouch has been hydrated.
4. Flip the barcode label down and check to see that fluid has entered the reagent wells (located at the base of the rigid plastic part of the pouch). Small air bubbles may be seen. If the pouch fails to hydrate (dry reagents appear as white pellets), repeat Step 2 to verify that the seal of the port was broken or retrieve a new pouch and repeat from Step 2 of the Prepare Pouch section.

Prepare Sample Mix

1. Hold the Sample Buffer ampoule so that the tip is facing up.

   NOTE: Use care to avoid touching the tip during handling, as this may introduce contamination.

2. Gently pinch the textured plastic tab on the side of the ampoule until the seal snaps.
3. Invert the ampoule over the red-capped Sample Injection Vial and re-position thumb and forefinger to grip the bottom of the ampoule. Dispense Sample Buffer using a slow, forceful squeeze, followed by a second squeeze. Squeezing the ampoule additional times will generate excessive bubbles, which should be avoided.
4. Using the Transfer Pipette provided in the test kit, draw sample (NPS in VTM) to the third line (approximately 0.3 mL). Add sample to the red Sample Injection Vial. Tightly close the lid of the Sample Injection Vial.

   NOTE: DO NOT use the Transfer Pipette to mix the sample once it is added to the Sample Injection Vial.

5. Remove the Sample Injection Vial from the FilmArray Pouch Loading Station and gently invert the vial at least three times to mix.
6. Return the Sample Injection Vial to the FilmArray Pouch Loading Station.

Load Sample Mix

1. Slowly twist the Sample Injection Vial so it loosens from its red cap and pause for 3-5 seconds. Lift the Sample Injection Vial, leaving the red cap in the well of the FilmArray Pouch Loading Station.
2. Insert the cannula tip into the port in the pouch located directly below the red arrow of the FilmArray Pouch Loading Station. Push down forcefully in a firm and quick motion until you hear a faint "pop" and feel an ease in resistance. The correct volume of liquid will be pulled into the pouch by vacuum.

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3. Verify that the sample has been loaded. Flip the barcode label down and check to see that fluid has entered the reagent well next to the sample loading port. If the pouch fails to pull sample from the Sample Injection Vial, the pouch should be discarded. Retrieve a new pouch and repeat from Step 2 of the Pouch Preparation section.
4. Discard the Sample Injection Vial and the Hydration Injection Vial in an appropriate biohazard sharps container.
5. Record the Sample ID in the provided area on the pouch label (or affix a barcoded Sample ID) and remove the pouch from the FilmArray Pouch Loading Station.

Run Pouch

The FilmArray Software includes step-by-step on-screen instructions that guide the operator through performing a run. Brief instructions for FilmArray, FilmArray 2.0, and FilmArray Torch Systems are given below. Refer to the appropriate FilmArray operator's manual for more detailed instructions.

FilmArray and FilmArray 2.0

1. Ensure that the FilmArray system is on and the software is launched.
2. Open the lid of an available instrument (if not already open).

   NOTE: An available instrument is indicated by a constant green light on the front of the instrument.

3. Insert the pouch into the instrument.

   Position the pouch so that the array is on the right with the film directed downward into the FilmArray instrument. The red and blue labels on the pouch should align with the red and blue arrows on the FilmArray instrument. The pouch will click into place. If inserted correctly, the barcode is visible and the label is readable on the top of the pouch. The instrument and software must detect that the pouch has been inserted correctly before continuing to the next step.

   NOTE: If the pouch does not slide into the instrument easily, gently push the lid of the instrument back to be sure that it is completely open.

4. Scan the barcode on the FilmArray pouch using the barcode scanner.

   Pouch identification (Lot Number and Serial Number), Pouch Type and Protocol are preprogrammed in the rectangular barcode located on the FilmArray pouch. The information will be automatically entered when the barcode is scanned. If it is not possible to scan the barcode, the pouch Lot Number, Serial Number, Pouch Type and Protocol can be manually entered from the information provided on the pouch label into the appropriate fields. To reduce data entry errors, it is strongly recommended that the pouch information be entered by scanning the barcode.

   NOTE: The barcode cannot be scanned prior to placing the pouch in the instrument.

5. Enter the Sample ID. The Sample ID can be entered manually or scanned in by using the barcode scanner when a barcoded Sample ID is used.
6. If necessary, select and/or confirm a protocol from the Protocol drop down list.

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7. Enter a user name and password in the Name and Password fields.
8. Close the FilmArray instrument lid.
9. Click the Start Run button on the screen.

   Once the run has started, the screen displays a list of the steps being performed by the instrument and the number of minutes remaining in the run.

   NOTE: The bead-beater apparatus can be heard as a high-pitched noise (whine) during the first minute of operation.

10. When the run is finished, follow the on-screen instructions to open the instrument and remove the pouch.
11. Immediately discard the pouch in a biohazard container.
12. Results are automatically displayed in the report section of the screen.

    Select Print to print the report, or Save to save the report as a file.

FilmArray Torch

1. Ensure that the FilmArray Torch system is on.
2. Select an available Module on the touch screen.
3. Scan the barcode on the FilmArray pouch using the barcode scanner.

   Pouch identification (Lot Number and Serial Number), Pouch Type and Protocol are preprogrammed in the rectangular barcode located on the FilmArray pouch. The information will be automatically entered when the barcode is scanned. If it is not possible to scan the barcode, the pouch Lot Number, Serial Number, Pouch Type and Protocol can be manually entered from the information provided on the pouch label into the appropriate fields. To reduce data entry errors, it is strongly recommended that the pouch information be entered by scanning the barcode.
4. Enter the Sample ID. The Sample ID can be entered manually or scanned in by using the barcode scanner when a barcoded Sample ID is used.
5. Insert the pouch into the Module.

   Ensure that the pouch fitment label is lying flat on top of pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.
6. If necessary, select and/or confirm a protocol from the protocol drop down list.
7. Enter operator user name and password, then select Next.

   NOTE: The font color of the username is red until the user name is recognized by the software.

8. Review the entered run information on the screen. If correct, select Start Run.

   Once the run has started, the screen displays a list of the steps being performed by the instrument and the number of minutes remaining in the run.

   NOTE: The bead-beater apparatus can be heard as a high-pitched noise (whine) during the first minute of operation.

9. At the end of the run, the status of the Module changes to Finished and the pouch is partially ejected.

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10. Select the Finished Module on the Dashboard to view the report.

    Select Print to print the report, or Save to save the report as a file

11. Removed the pouch from the Module and immediately discard the pouch in a biohazard container.

> **NOTE: Once the pouch has been removed, the report can only be viewed through the Browse Runs feature.**

QUALITY CONTROL

Process Controls

Two process controls are included in each pouch:

1. **RNA Process Control**
   The RNA Process Control assay targets an RNA transcript from the yeast *Schizosaccharomyces pombe*. The yeast is present in the pouch in a freeze-dried form and becomes rehydrated when sample is loaded. The control material is carried through all stages of the test process, including lysis, nucleic acid purification, reverse transcription, 1st stage PCR, dilution, 2nd stage PCR and DNA melting. A positive control result indicates that all steps carried out in the FilmArray RP pouch were successful.

2. **PCR2 Control**
   The PCR2 Control assay detects a DNA target that is dried into wells of the array along with the corresponding primers. A positive result indicates that 2nd stage PCR was successful.

Both control assays must be positive for the test run to pass. When either control fails, the Controls field of the test report (upper right hand corner) will display Failed and all results will be listed as Invalid. If the controls fail, the sample should be retested using a new pouch.

Monitoring Test System Performance

It is possible to trend Tm values for the RNA Process Control and/or PCR2 Control assays and maintain records according to standard laboratory quality control practices [42-43]. The FilmArray software will automatically fail the run if the Tm for either the RNA Process Control or the PCR2 Control is outside of the acceptable range (80.6-84.6 for the RNA Process Control and 74.5-78.5 for the PCR2 Control). Any trend variations should be investigated. Contact Technical Support for help with out-of-range controls.

> **NOTE: Trending for the two control assays (RNA Process Control and PCR2 Control) should be tracked on separate control charts as the expected Tm values for these two controls are different.**

Good laboratory practice recommends running external positive and negative controls regularly. Use viral transport medium as the external negative control, and previously characterized positive samples or negative samples spiked with well characterized organisms as external positive controls. External controls should be used in accordance with the appropriate accrediting organizations, as applicable.

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INTERPRETATION OF RESULTS

The FilmArray software automatically analyzes and interprets the assay results and displays the final results in a test report (see the FilmArray Respiratory Panel Quick Guide to view an example of a test report). The analyses performed by the FilmArray software and details of the test report are described below.

Assay Interpretation

When 2nd stage PCR is complete, the FilmArray instrument performs a high resolution DNA melting analysis on the PCR products and measures the fluorescence signal generated in each well (for more information see FilmArray Operator's Manual). The FilmArray software then performs several analyses and assigns a final assay result.

Analysis of melting curves. The FilmArray software evaluates the DNA melting curve for each well of the 2nd stage PCR array to determine if a PCR product was present in that well. If the melt profile indicates the presence of a PCR product, then the analysis software calculates the melting temperature (Tm) of the curve. The Tm value is then compared against the expected Tm range for the assay. If the software determines that the melt is positive and the melt peak falls inside the assay-specific Tm range, the curve is called positive. If the software determines that the melt is negative or is not in the appropriate Tm range, the curve is called negative.

Analysis of replicates. Once melt curves have been identified, the software evaluates the three replicates for each assay to determine the assay result. For an assay to be called positive, at least two of the three associated melt curves must be called positive, and the Tm for at least two of the three positive curves must be similar (within 1°C). Assays that do not meet these criteria are called negative.

Organism Interpretation. For most organisms detected by the FilmArray RP, the organism is considered to be Detected if a single corresponding assay is positive. For example, Human Metapneumovirus will have a test report result of Human Metapneumovirus Detected if at least two of the three replicates of the one Human Metapneumovirus assay have similar positive melt peaks with Tm values that are within the assay-specific Tm range. The test results for Adenovirus, the Human Rhinovirus/Enterovirus group, and Influenza A depend on the interpretation of results from several assays. Interpretation and follow-up testing for these three results are provided below.

Rhinovirus/Enterovirus Group

The FilmArray RP pouch contains six different assays (HRV1, HRV2, HRV3, HRV4, Entero 1, Entero 2) for the detection of Rhinoviruses and Enteroviruses. Though these viruses are both very diverse, they are also closely related. Therefore, the six assays are not able to reliably differentiate Rhinovirus and Enterovirus. The FilmArray software interprets each of the six assays independently (as described above) and the results are combined as a final test result for the virus(es). If any of the six assays are positive, the test report result will be Human Rhinovirus/Enterovirus Detected. If all six assays are negative, the test report result will be Human Rhinovirus/Enterovirus Not Detected. A positive FilmArray RP Human Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., viral culture or sequence analysis).

NOTE: Despite the names, the HRV (1-4) and Entero (1-2) assays are not specific for detection of Human Rhinovirus or Enterovirus, respectively. Individual assay results cannot be used to differentiate these two viruses.

Adenovirus

The FilmArray RP pouch contains two different assays (Adeno, Adeno2) for the detection of Adenovirus. The FilmArray software interprets each of these assays independently (as described above) and the results are combined as a final test result for the virus. If either or both assays are positive, the test report result will be Adenovirus Detected. If both the Adeno and Adeno2 assays are negative, the test report result will be Adenovirus Not Detected.

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Influenza A

The assays in the FilmArray RP are designed to both detect Influenza A and to differentiate commonly occurring hemagglutinin subtypes. To accomplish this, the FilmArray RP uses two Influenza A assays, (FluA-pan-1 and FluA-pan-2) and three subtyping assays directed at the hemagglutinin gene (FluA-H1-pan, FluA-H1-2009 and FluA-H3). The FluA-H1-pan assay is designed to detect both Influenza A H1 and the Influenza A H1-2009 variant. Each of the individual assays is interpreted independently (as described above) and the test result reported for Influenza A is based on the combined results of the five assays as outlined in Table 3.

In general, Influenza A is determined to be Detected if at least one of the two FluA-pan assays is positive and a subtyping assay is also positive. If neither of the FluA-pan assays is positive, but a subtyping assay is positive, then the result is considered Equivocal for that specific subtype and the sample should be retested. If one of the FluA-pan assays is positive and none of the subtyping assays are positive, the result is Equivocal for Influenza A and the specimen should be retested. All Equivocal results should be retested.

Table 3. Possible Assay Results for Influenza A and the Corresponding Interpretation

Final Result \ Assay	FluA-pan Assays (n=2)	FluA-H1-pan	FluA-H1-2009	FluA-H3	Required Follow-up
Influenza A Not Detected	Negative	Negative	Negative	Negative	None
Influenza A H1	**≥1 positive**	**Positive**	Negative	Negative	
Influenza A H3	**≥1 positive**	Negative	Negative	**Positive**	
Influenza A H1-2009	**≥1 positive**	Any result	**Positive**	Negative	
Influenza A H1 and Influenza A H3	**≥1 positive**	**Positive**	Negative	**Positive**	Multiple infections are possible but rare [a], retest to confirm result [b]
Influenza A H1-2009 and Influenza A H3	**≥1 positive**	Any result	**Positive**	**Positive**	
Influenza A (no subtype detected)	**2 positive**	Negative	Negative	Negative	See below
Influenza A Equivocal	**1 positive**	Negative	Negative	Negative	Retest
Influenza A H1 Equivocal	Negative	**Positive**	Negative	Negative	
Influenza A H3 Equivocal	Negative	Negative	Negative	**Positive**	
Influenza A H1-2009 Equivocal	Negative	Any result	**Positive**	Negative	

[a] The FilmArray RP can simultaneously detect multiple Influenza viruses contained in the FluMist® nasal Influenza vaccine (see "Interference" section below).

[b] Repeated multiple positives should be further confirmed by other FDA cleared Influenza subtyping tests.

Influenza A (no subtype detected)

If both of the FluA-pan assays are positive, but none of the hemagglutinin subtyping assays are positive, then the interpretation is Influenza A (no subtype detected). This result could occur when the titer of the virus in the specimen is low and not detected by the subtyping assays. This result could also indicate the presence of a novel Influenza A strain. In both cases, the sample in question should be retested. If the retest provides a different result, test the sample a third time to ensure the accuracy of the result. If the retest provides the same result, then the function of the RP pouches should be verified by testing with appropriate external control materials (known positive samples for Influenza A H1, Influenza A H3 and Influenza A H1-2009), and a negative control should also be run to test for PCR-product contamination. If the FilmArray RP accurately

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identifies the external and negative controls, contact the appropriate public health authorities for confirmatory testing.

FilmArray RP Test Report

The FilmArray RP test report is automatically displayed upon completion of a run and contains three sections, the Run Summary, the Results Summary, and the Run Details (see the FilmArray Respiratory Panel Quick Guide to view an example of a test report). The test report can be saved as a file or printed.

The **Run Summary** section of the test report provides the Sample ID, time and date of the run, control results and an overall summary of the test results. Any target with a Detected or Equivocal result will be listed in the corresponding field of the summary. If all of the tests were negative then None will be displayed in the Detected field. Controls are listed as Passed, Failed or Invalid. See Control Field section below for detailed information about the interpretation of controls and appropriate follow-up in the case of control failures.

The **Results Summary** section of the test report lists the result for each target tested by the panel. Possible results are Detected, Not Detected, Equivocal or Invalid. See Results Summary section below for detailed information about interpretation of test results and appropriate follow-up for Invalid and Equivocal results. The assay-by-assay results for each target are available in an optional 2nd page of the report. To access the 2nd page of the report, select the Details button at the bottom of the report screen or Print All for a printed report. The 2nd page of the report provides the results of each assay regardless of the pouch control results.

The **Run Details** section provides additional information about the run including: pouch information (type, lot number, and serial number), run status (Completed, Incomplete, Aborted, Instrument Error, Instrument Communication Error, or Software Error), the protocols that were used to perform the test, the identity of the operator that performed the test, and the instrument used to perform the test.

Once a run has completed, it is possible to edit the Sample ID. If this information has been changed, an additional section called **Change History** will be added to the test report. This Change History section lists the field that was changed, the original entry, the revised entry, the operator that made the change and the date that the change was made. Sample ID is the only field of the report that can be changed.

Control Field

The Control field on the test report will display Passed, Failed, or Invalid. The Control field will display Passed only if the run completed successfully (no instrument or software errors) and both of the pouch control assays (RNA Process Control and PCR2 Control) were successful. The Control field will display Failed if the run was completed successfully (no instrument or software errors) but one or both of the pouch control assays failed (0 or 1 positive replicates for either of the controls, each of which is tested in triplicate). If the control result is Failed, then the result for all of the tests on the panel are displayed as Invalid and the specimen will need to be retested with a new pouch.

Table 4 provides a summary and explanation of the possible control results and follow-up actions.

The FilmArray monitors each run to ensure that the instrument is working within specification and to detect hardware or software errors that might compromise the accuracy of the test result. If the instrument detects an out-of-specification condition, or a significant error, it will automatically abort the run. If this happens, or if a run is aborted by the user, then the Control field on the report will display Invalid and all test results in the Result Summary of the report will also be displayed as Invalid. To determine why a run failed to complete, note any specific error codes that are displayed on the screen and refer to the Run Status in the Run Details section of the report. The Run Status will display Incomplete, Aborted, Software Error, Instrument Error, or Instrument Communication Error. Refer to the FilmArray Operator's Manual or call Technical Support for further instruction. The specimen should be retested after the error is corrected or by using an alternate FilmArray instrument/Module.

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Table 4. Interpretation of Control Field on the FilmArray RP Test Report

Control Result	Explanation	Action Required	Outcome
Passed	The run was successfully completed AND Both pouch controls were successful.	None	Report the results provided on the test report.
Failed	The run was successfully completed BUT At least one of the pouch controls failed.	Repeat the test using a new pouch.	Accept the results of the repeat testing. If the error persists, contact Technical Support for further instruction.
Invalid	The controls are invalid because the run failed. (typically a software or hardware error)	Note any error codes displayed during the run and the Run Status field in the Run Details section of the report. Refer to the appropriate FilmArray Operator's Manual or contact Technical Support for further instruction. Once the error is resolved, repeat the test or repeat the test using another instrument. If the error occurred in the first 30 seconds of the run, the same pouch may be used for the repeat test (within 60 minutes of pouch loading) using the same instrument or another instrument/Module, as available. If the error occurred later in the run or you are unsure when the error occurred, return to the original sample to load a new pouch. Repeat the test with the new pouch on the same or another instrument/Module, as available.	Accept the valid results of the repeat testing. If the error persists, contact Technical Support for further instruction.

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Result Summary

Test results for the organisms included in the FilmArray RP are provided in two locations on the report. The Result Summary section provides a complete list of the test results. Possible results include Detected, Not Detected, Equivocal, and Invalid. Positive (Detected) and Equivocal results are also displayed in the Run Summary section. Table 5 provides an explanation for each interpretation and any follow-up necessary to obtain a final result.

Table 5. Interpretation of Results on the FilmArray RP Test Report

Organism Result	Explanation	Action
Detected	The run was successfully completed AND The pouch controls were successful (Passed) AND The assay(s) for the organism were POSITIVE (i.e., met the requirements for a positive result described in the Assay Interpretation section above)	Report results.
Not Detected	The run was successfully completed AND The pouch controls were successful (Passed) AND The assay(s) for the organism were NEGATIVE (i.e., did not meet the requirements for a positive result described in the Assay Interpretation section above)	Report results.
Equivocal (Influenza A only)	The run was successfully completed AND The pouch controls were successful (Passed) AND The combination of positive and negative assay results for Influenza A was inconclusive (see Table 3)	Retest the original specimen using a new pouch and report the results of the retest.
Invalid	The pouch controls were not successful (Failed) OR The run was not successful (Run Status displayed as: Aborted, Incomplete, Instrument Error, Software Error, or Instrument Communication Error)	See Table 4 , Interpretation of Control Field on the FilmArray Test Report for instruction.

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LIMITATIONS OF THE PROCEDURE

- For prescription use only
- FilmArray Respiratory Panel performance has only been established on the FilmArray, FilmArray 2.0 and FilmArray Torch systems.
- This test is a qualitative test and does not provide a quantitative value for the virus(es) and/or bacteria detected in the specimen.
- The performance of the test has been evaluated for use with human specimen material only.
- This test has not been validated for testing specimens other than nasopharyngeal swab (NPS) specimens.
- The performance of this test has not been established for immunocompromised individuals.
- The performance of this test has not been established for patients without signs and symptoms of respiratory infection.
- Results from this test must be correlated with the clinical history, epidemiological data, and other data available to the clinician evaluating the patient.
- Viral and bacterial nucleic acids may persist *in vivo* independent of organism viability. Detection of organism target(s) does not imply that the corresponding organisms are infectious or are the causative agents for clinical symptoms.
- The detection of viral and bacterial nucleic acid is dependent upon proper specimen collection, handling, transportation, storage and preparation. Failure to observe proper procedures in any one of these steps can lead to incorrect results. There is a risk of false positive or false negative values resulting from improperly collected, transported or handled specimens.
- A negative FilmArray RP result does not exclude the possibility of viral or bacterial infection. Negative test results may occur from the presence of sequence variants in the region targeted by the assay, the presence of inhibitors, technical error, sample mix-up or an infection caused by an organism not detected by the panel. Test results may also be affected by concurrent antiviral/antibacterial therapy or levels of organism in the specimen that are below the limit of detection for the test. Negative results should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen.
- Positive and negative predictive values are highly dependent on prevalence. False negative test results are more likely during peak activity when prevalence of disease is high. False positive test results are more likely during periods when prevalence is moderate to low.
- Organism and amplicon contamination may produce erroneous results for this test. Particular attention should be given to the Laboratory Precautions noted under the Warnings and Precautions section.
- There is a risk of false positive values resulting from cross-contamination by target organisms, their nucleic acids or amplified product, or from non-specific signals in the assay.
- Cross-reactivity with respiratory tract organisms other than those listed in the Analytical Specificity section below may lead to erroneous results.
- The FilmArray RP Adenovirus assay may show variable detection with non-respiratory serotypes within species A, D, F and G.
- The FilmArray RP Influenza A subtyping assays target the Influenza A hemagglutinin gene only. The FilmArray RP does not detect or differentiate the Influenza A neuraminidase gene.
- Clinical specificity was established when Influenza A H1-2009 was the predominant Influenza A virus in circulation. When other Influenza A viruses are emerging, clinical specificity may vary.

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- Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis,* Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4, were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens. The performance of this test has not been established for monitoring treatment of seasonal Influenza A H1, A H3, A H1-2009 or RSV infections.
- The performance of this test has not been established for screening of blood or blood product for the presence of seasonal Influenza A H1, A H3 or A H1-2009.
- The performance of this test has not been established with potentially interfering medications for the treatment of influenza or cold viruses. The effect of interfering substances has only been evaluated for those listed in the labeling. Interference by substances other than those described in the "Interference" section below could lead to erroneous results.
- The performance of the FilmArray RP has not been established in individuals who received influenza vaccine. Recent administration of a nasal influenza vaccine may cause false positive results for Influenza A and/or Influenza B.
- Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g. cell culture or sequence analysis).
- The Coronavirus OC43 assay may cross-react with Coronavirus HKU1. As a result, when both HKU1 and OC43 are detected in the same patient specimen, the result may be due to assay cross-reactivity. A co-infection with these two viruses is also possible.
- The FilmArray RP may not be able to distinguish between existing viral strains and new variants as they emerge. For example, the FilmArray RP can detect Influenza A H3N2v (first recognized in August, 2011), but will not be able to distinguish this variant from Influenza A H3N2 seasonal.
- Results of the FilmArray RP *B. pertussis* assay may not be concordant with the results of commonly used *Bordetella* PCR assays that target the multi-copy insertion sequence (IS481) due to differences in sensitivity and specificity. IS481 is a multi-copy target and is present in several *Bordetella* species (*B. pertussis, B. holmesii and B. bronchiseptica*). The FilmArray RP *B. pertussis* assay targets the single-copy promoter region of the pertussis toxin gene and is designed to be highly specific for detection of *B. pertussis*. Although cross-reactivity with closely-related *Bordetella* species was not observed in the clinical study or Analytical Specificity testing of a variety of strains at 1 x 10^6 CFU/mL, instances of cross-reactivity can occur with high levels (above 1 x 10^6 CFU/mL) or with rare sequence variants of other *Bordetella* species, such as *B. bronchiseptica* and *B. parapertussis*.

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EXPECTED VALUES

NOTE: The expected values presented in this section were obtained prior to the addition of a second Adenovirus assay to FilmArray RP.

In the first phase of the prospective FilmArray RP clinical study, 853 eligible prospective nasopharyngeal (NPS) swab specimens were collected and tested at three sites across the U.S. from December 2009 thru May 2010. A second phase of the prospective FilmArray RP clinical study was conducted to obtain additional positive specimens for Parainfluenza Viruses 1, 2, and 4. During the anticipated peak season for Parainfluenza Viruses 1 and 2 (September 2010 thru January 2011), another 264 eligible specimens were collected and tested at two of the three sites. The number and percentage of positive cases as determined by the FilmArray RP calculated by testing site or by age group are presented in the following tables:

Table 6. Expected Value (as Determined by the FilmArray RP) Summary by Site for the First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Organism	Overall (n=853)		Site 1 (n=275)		Site 2 (n=333)		Site 3 (n=245)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value	Number	Expected Value
Adenovirus	38	4.5%	5	1.8%	11	3.3%	22	9.0%
Influenza A	11	1.3%	10	3.6%	1	0.3%	0	0%
Influenza A H1	0	0%	0	0%	0	0%	0	0%
Influenza A H3	0	0%	0	0%	0	0%	0	0%
Influenza A H1-2009	11	1.3%	10	3.6%	1	0.3%	0	0%
Influenza B	0	0%	0	0%	0	0%	0	0%
Parainfluenza Virus 1	1	0.1%	0	0%	0	0%	1	0.4%
Parainfluenza Virus 2	0	0%	0	0%	0	0%	0	0%
Parainfluenza Virus 3	33	3.9%	1	0.4%	1	0.3%	31	12.7%
Parainfluenza Virus 4	8	0.9%	0	0%	4	1.2%	4	1.6%
Respiratory Syncytial Virus	139	16.3%	4	1.5%	86	25.8%	49	20.0%
Coronavirus 229E	14	1.6%	5	1.8%	3	0.9%	6	2.4%
Coronavirus HKU1	25	2.9%	9	3.3%	13	3.9%	3	1.2%
Coronavirus NL63	23	2.7%	4	1.5%	9	2.7%	10	4.1%
Coronavirus OC43	8	0.9%	2	0.7%	6	1.8%	0	0%
Human Metapneumovirus	94	11.0%	12	4.4%	41	12.3%	41	16.7%
Human Rhinovirus/Entero	225	26.4%	36	13.1%	92	27.6%	97	39.6%
Bordetella pertussis	4	0.4%	2	0.7%	1	0.3%	1	0.4%
Chlamydophila pneumoniae	1	0.1%	0	0%	0	0%	1	0.4%
Mycoplasma pneumoniae	2	0.2%	2	0.2%	0	0%	0	0%

Table 7. Expected Value (as Determined by the FilmArray RP) Summary by Site for the Second Phase Prospective Clinical Evaluation (September 2010 – January 2011)

Organism	Overall (n=264)		Site 2 (n=180)		Site 3 (n=84)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value
Adenovirus	15	5.7%	11	6.1%	4	4.6%
Influenza A	5	1.9%	0	0%	5	6.0%
Influenza A H1	0	0%	0	0%	0	0%

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Organism	Overall (n=264)		Site 2 (n=180)		Site 3 (n=84)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value
Influenza A H3	5	1.9%	0	0%	5	6.0%
Influenza A H1-2009	0	0%	0	0%	0	0%
Influenza B	1	0.4%	1	0.6%	0	0%
Parainfluenza Virus 1	1	0.4%	0	0%	1	1.1%
Parainfluenza Virus 2	9	3.4%	4	2.2%	5	5.7%
Parainfluenza Virus 3	5	1.9%	0	0%	5	5.7%
Parainfluenza Virus 4	2	0.7%	1	0.6%	1	1.1%
Respiratory Syncytial Virus	31	11.7%	11	6.1%	20	23.8%
Coronavirus 229E	0	0%	0	0%	0	0%
Coronavirus HKU1	0	0%	0	0%	0	0%
Coronavirus NL63	1	0.4%	1	0.6%	0	0%
Coronavirus OC43	11	4.2%	1	0.5%	10	11.9%
Human Metapneumovirus	4	1.5%	0	0%	4	4.6%
Human Rhinovirus/Entero	125	47.3%	91	50.6%	34	39.1%
Bordetella pertussis	3	1.1%	3	1.6%	0	0%
Chlamydophila pneumoniae	0	0%	0	0%	0	0%
Mycoplasma pneumoniae	2	0.8%	1	0.5%	1	1.2%

Table 8. Expected Value (as Determined by FilmArray RP) Summary by Age Group for First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Organism	Total (Expected Value)	≤ 5 years	6-21 years	22-49 years	≥ 50 years
Adenovirus	38 (4.5%)	32	2	3	1
Influenza A	11 (1.3%)	1	1	7	2
Influenza A H1	0 (0%)	0	0	0	0
Influenza A H3	0 (0%)	0	0	0	0
Influenza A H1-2009	11 (1.3%)	1	1	7	2
Influenza B	0 (0%)	0	0	0	0
Parainfluenza Virus 1	1 (0.1%)	0	1	0	0
Parainfluenza Virus 2	0 (0%)	0	0	0	0
Parainfluenza Virus 3	33 (3.9%)	31	1	0	1
Parainfluenza Virus 4	8 (0.9%)	7	1	0	0
Respiratory Syncytial Virus	139 (16.3%)	127	3	4	5
Coronavirus 229E	14 (1.6%)	6	2	5	1
Coronavirus HKU1	25 (2.9%)	12	1	8	4
Coronavirus NL63	23 (2.7%)	17	2	2	2
Coronavirus OC43	8 (0.9%)	4	0	2	2
Human Metapneumovirus	94 (11.0%)	76	4	10	4
Human Rhinovirus/Entero	225 (26.4%)	161	24	29	11
Bordetella pertussis	4 (0.4%)	2	1	0	1
Chlamydophila pneumoniae	1 (0.1%)	1	0	0	0
Mycoplasma pneumoniae	2 (0.2%)	0	0	2	0

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Table 9. Expected Value (as Determined by FilmArray RP) Summary by Age Group for Second Phase Prospective Clinical Evaluation (September 2010-January 2011)

Organism	Total (Expected Value)	≤ 5 years	6-21 years	22-49 years	≥ 50 years
Adenovirus	15 (5.7%)	15	0	n/a	n/a
Influenza A	5 (1.9%)	4	1	n/a	n/a
Influenza A H1	0 (0%)	0	0	n/a	n/a
Influenza A H3	5 (1.9%)	4	1	n/a	n/a
Influenza A H1-2009	0 (0%)	0	0	n/a	n/a
Influenza B	1 (0.4%)	1	0	n/a	n/a
Parainfluenza Virus 1	1 (0.4%)	1	0	n/a	n/a
Parainfluenza Virus 2	9 (3.4%)	9	0	n/a	n/a
Parainfluenza Virus 3	5 (1.9%)	5	0	n/a	n/a
Parainfluenza Virus 4	2 (0.7%)	2	0	n/a	n/a
Respiratory Syncytial Virus	31 (11.7%)	30	1	n/a	n/a
Coronavirus 229E	0 (0%)	0	0	n/a	n/a
Coronavirus HKU1	0 (0%)	0	0	n/a	n/a
Coronavirus NL63	1 (0.4%)	1	0	n/a	n/a
Coronavirus OC43	11 (4.2%)	9	2	n/a	n/a
Human Metapneumovirus	4 (1.5%)	4	0	n/a	n/a
Human Rhinovirus/Entero	125 (47.3%)	118	7	n/a	n/a
Bordetella pertussis	3 (1.1%)	3	0	n/a	n/a
Chlamydophila pneumoniae	0 (0%)	0	0	n/a	n/a
Mycoplasma pneumoniae	2 (0.8%)	2	0	n/a	n/a

The number and percentage of co-infection cases as determined by the FilmArray RP calculated by age group are presented in the following tables:

Table 10. Expected Value (Co-infections as Determined by FilmArray RP) Summary by Age Group for First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
HRV/EV + RSV	21 (2.46%)	20	0	1	0
HRV/EV + AdV	8 (0.94%)	8	0	0	0
HRV/EV + PIV3	8 (0.94%)	7	1	0	0
HRV/EV + hMPV	7 (0.82%)	7	0	0	0
hMPV + RSV	4 (0.47%)	4	0	0	0
HRV/EV + CoV NL63	4 (0.47%)	3	0	1	0
CoV HKU1 + hMPV	3 (0.35%)	3	0	0	0
CoV HKU1 + HRV/EV	3 (0.35%)	1	0	2	0
CoV HKU1 + RSV	3 (0.35%)	3	0	0	0
CoV NL63 + hMPV	3 (0.35%)	3	0	0	0
CoV NL63 + RSV	3 (0.35%)	3	0	0	0
hMPV + PIV3	3 (0.35%)	3	0	0	0

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Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
AdV + HRV/EV + PIV3	2 (0.23%)	2	0	0	0
CoV OC43 + RSV	2 (0.23%)	2	0	0	0
CoV HKU1 + CoV OC43	2 (0.23%)	0	0	1	1
HRV/EV + PIV4	2 (0.23%)	2	0	0	0
AdV + hMPV	1 (0.12%)	1	0	0	0
AdV + PIV3	1 (0.12%)	1	0	0	0
AdV + RSV	1 (0.12%)	1	0	0	0
AdV + CoV NL63	1 (0.12%)	1	0	0	0
AdV + RSV + CoV 229E	1 (0.12%)	1	0	0	0
AdV + HRV/EV + *B. pertussis*	1 (0.12%)	1	0	0	0
AdV + *C. pneumoniae*	1 (0.12%)	1	0	0	0
CoV 229E + RSV	1 (0.12%)	1	0	0	0
CoV 229E + CoV NL63 + HRV/EV+RSV	1 (0.12%)	1	0	0	0
CoV 229E + HRV/EV	1 (0.12%)	1	0	0	0
CoV HKU1 + HRV/EV + RSV	1 (0.12%)	1	0	0	0
CoV NL63 + hMPV + RSV	1 (0.12%)	1	0	0	0
HRV/EV + *B. pertussis*	1 (0.12%)	1	0	0	0
HRV/EV + PIV1	1 (0.12%)	0	1	0	0
hMPV + PIV4	1 (0.12%)	1	0	0	0
PIV4 + RSV	1 (0.12%)	1	0	0	0

Table 11. Expected Value (Co-infections as Determined by FilmArray RP) Summary by Age Group for Second Phase Prospective Clinical Evaluation (September 2010 – January 2011)

Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
HRV/EV + RSV	6 (2.2%)	6	0	n/a	n/a
HRV/EV + AdV	6 (2.2%)	6	0	n/a	n/a
CoV OC43 + HRV/EV	5 (1.9%)	5	0	n/a	n/a
HRV/EV + PIV2	1 (0.4%)	1	0	n/a	n/a
HRV/EV + PIV3	1 (0.4%)	1	0	n/a	n/a
HRV/EV + PIV4	1 (0.4%)	1	0	n/a	n/a
hMPV + RSV	1 (0.4%)	1	0	n/a	n/a
Flu B + RSV	1 (0.4%)	1	0	n/a	n/a
AdV + CoV OC43	1 (0.4%)	1	0	n/a	n/a
CoV OC43 + hMPV	1 (0.4%)	1	0	n/a	n/a
CoV OC43 + RSV	1 (0.4%)	1	0	n/a	n/a
HRV/EV + *B. pertussis*	1 (0.4%)	1	0	n/a	n/a
PIV2 + *M. pneumoniae*	1 (0.4%)	1	0	n/a	n/a

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PERFORMANCE CHARACTERISTICS

Clinical Performance

NOTE: The clinical performance data presented in the first part of this section were obtained prior to the addition of a second Adenovirus assay to FilmArray RP. Data from a clinical comparison study demonstrating performance of a modified FilmArray RP (containing a second Adenovirus assay) as compared to the original FilmArray RP are presented starting on page 34.

The clinical performance of the FilmArray RP was established during two phases of a prospective clinical study. The first phase of the prospective clinical study was conducted at 3 U.S. clinical sites over a 6 month time period (December 2009 thru May 2010). The second phase of the prospective clinical study was carried out at 2 of the 3 sites for an additional 5 month time period (September 2010 thru January 2011) in an attempt to achieve increased detection of several low prevalence organisms (i.e. PIV1, PIV2, and PIV4) during the anticipated peak season for PIV1 and PIV2. Subjects with signs and symptoms of respiratory infection were invited to participate. Upon obtaining informed consent, NPS samples were collected for FilmArray and comparator testing. A total of 857 subjects were initially enrolled in the 2009/2010 respiratory season (Phase 1) and 4 were withdrawn. Table 12A provides a summary of demographic information for the 853 subjects that participated in the first phase of the prospective study. Another 287 subjects were enrolled in the 2010/2011 respiratory season (Phase 2) and 20 specimens were omitted from analysis due to improper specimen storage prior to testing. Another 3 specimens were also excluded from analysis due to the lack of clinical protocol-required associated valid external control mix results. Table 12B provides a summary of the remaining 264 subjects.

Table 12. Demographic Summary for FilmArray RP Prospective Clinical Study

A. December 2009 thru May 2010

Sex	Number of Subjects
Male	449 (53%)
Female	404 (47%)
Age	**Number of Subjects**
≤5	484 (57%)
6-21	95 (11%)
22-49	190 (22%)
≥50	84 (10%)

B. September 2010 thru January 2011

Sex	Number of Subjects
Male	151 (57%)
Female	113 (43%)
Age	**Number of Subjects**
≤5	240 (91%)
6-21	24 (9%)
22-49	0 (0%)
≥50	0 (0%)

A NPS specimen from each subject was tested with the FilmArray RP. The performance of the FilmArray RP was evaluated by comparing the FilmArray RP test result for each member of the panel with the appropriate comparator/reference methods shown in Table 13.

Table 13. Reference/Comparator Methods Used to Assess FilmArray RP Performance

Virus	Reference/Comparator Method(s)
Adenovirus	Viral culture followed by DFA identification[a]
Influenza A	
Influenza B	

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Virus	Reference/Comparator Method(s)
Parainfluenza Virus 1	
Parainfluenza Virus 2	
Parainfluenza Virus 3	
Respiratory Syncytial Virus	
Influenza A H1 subtyping	Viral Culture followed by 1 PCR test of viral culture with bi-directional sequence confirmation[b]
Influenza A H3 subtyping	
Influenza A H1-2009 subtyping	
Parainfluenza Virus 4	
Human Rhinovirus	2 PCR tests of patient specimens with bi-directional sequence confirmation[c]
Human Enterovirus	
Coronavirus 229E	
Coronavirus HKU1	
Coronavirus NL63	
Coronavirus OC43	
Human Metapneumovirus	
Bordetella pertussis	
Chlamydophila pneumoniae	
Mycoplasma pneumoniae	

[a] Performance of the FilmArray RP detecting AdV, Flu A, Flu B, PIV1, PIV2, PIV3, or RSV, respectively, was compared to viral culture followed by fluorescent antibody identification. "True" positives were considered as any sample that tested positive by viral culture followed by DFA testing. "True" negatives were considered as any sample that tested negative by viral culture followed by DFA testing.

[b] Performance of the FilmArray RP detecting Flu A H1, A H3, A H1-2009, or PIV4, respectively, was compared to viral culture followed by one analytically validated PCR assay with bi-directional sequence confirmation. The comparator assays were designed to amplify a different sequence from that amplified by the FilmArray assay(s). None of the comparator PCR assays overlapped any FilmArray amplicon sequence even if the same gene was targeted. "True" Flu A H1, A H3, or A H1-2009 positives, respectively, were considered as any sample that tested positive for Flu A by viral culture, and had bi-directional sequencing data meeting pre-defined quality acceptance criteria that matched the respective subtype sequences deposited in the National Center for Biotechnology Information (NCBI) GenBank database (www.ncbi.nlm.nih.gov) with acceptable E-values. "True" Flu A H1, A H3, or A H1-2009 negatives, respectively, were considered as any sample that tested negative for Flu A by viral culture, or any sample that tested positive for Flu A virus by viral culture, but tested negative by the respective subtype specific PCR assay. "True" PIV4 positives were considered as any sample for which bi-directional sequencing data matching PIV4 sequences deposited in the NCBI GenBank database was obtained from testing of viral culture material. "True" PIV4 negatives were considered as any sample where testing of viral culture material with the analytically validated PIV4 specific PCR assay was negative.

[c] Performance of the FilmArray RP detecting HRV, EV, CoV 229E, CoV HKU1, CoV NL63, CoV OC43, hMPV, *B. pertussis, C. pneumoniae,* or *M. pneumoniae* respectively, was compared to a predetermined algorithm that used composite comparator methods. The methods consist of two analytically validated PCR assays followed by bi-directional sequencing. The comparator assays were designed to amplify a different sequence from that amplified by the FilmArray assay(s). None of the comparator PCR assays overlapped any FilmArray amplicon sequence even if the same gene was targeted. "True positives were considered as any sample that had bi-directional sequencing data meeting pre-defined quality acceptance criteria that matched organism-specific sequences deposited in the NCBI GenBank database (www.ncbi.nlm.nih.gov) with acceptable E-values. "True" negatives were considered as any sample that tested negative by both of the comparator PCR assays.

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A total of 853 specimens were evaluated for Adenovirus, Influenza A, Influenza B, Parainfluenza Virus 3, Respiratory Syncytial Virus, Coronavirus HKU1, Coronavirus NL63, Human Metapneumovirus, and Human Rhinovirus/Enterovirus in the first phase of the study. A total of 1117 specimens were evaluated for Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 4, Coronavirus 229E, Coronavirus OC43, *B. pertussis, C. pneumoniae,* and *M. pneumoniae* in the first and second phases of the study. (During the second phase of the prospective clinical study, only the reference/comparator methods for Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 4, Coronavirus 229E, Coronavirus OC43, *B. pertussis, C. pneumoniae,* and *M. pneumoniae* were performed on all specimens and used to calculate the performance.) Clinical sensitivity or positive percent agreement (PPA) was calculated as 100% x (TP / TP + FN). True positive (TP) indicates that both the FilmArray RP and comparator method had a positive result for this specific organism, and false negative (FN) indicates that the FilmArray result was negative while the comparator result was positive. Specificity or negative percent agreement (NPA) was calculated as 100% x (TN / TN + FP). True negative (TN) indicates that both the FilmArray RP and the comparator method had negative results, and a false positive (FP) indicates that the FilmArray RP result was positive but the comparator result was negative. The exact binomial two-sided 95% confidence interval was calculated. The results are summarized in Table 14.

Table 14. Clinical Sensitivity and Specificity or Positive Percent Agreement (PPA) and Negative Percent Agreement (NPA) for the FilmArray RP Prospective Clinical Study

Organism	Sensitivity		95% CI	Specificity		95% CI
Adenovirus	24/27[a]	88.9%	70.8 - 97.7%	812/826[b]	98.3%	97.2 - 99.1%
Influenza A	9/10	90.0%	55.5 – 99.8%	841/843[c]	99.8%	99.2 -100%
Influenza A H1	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Influenza A H3	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Influenza A H1-2009	8/9	88.9%	51.8 - 99.7%	841/844[c]	99.6%	99.0 - 99.9%
Influenza B	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Parainfluenza Virus 1	1/1	100%	n/a	1115/1116[d]	99.9%	99.5 – 100%
Parainfluenza Virus 2	7/8[e,g]	87.4%	47.4 – 99.7%	1107/1109[f,g]	99.8%	99.4 – 100%
Parainfluenza Virus 3	23/24[h]	95.8%	78.9 – 99.9%	819/829[i]	98.8%	97.8 - 99.4%
Parainfluenza Virus 4	9/9	100%	66.4 – 100%	1107/1108[j]	99.9%	99.5 – 100%
Respiratory Syncytial Virus	52/52	100%	93.2 - 100%	714/801[k]	89.1%	86.8 - 91.2%
Organism	**PPA**		**95% CI**	**NPA**		**95% CI**
Coronavirus 229E	12/12	100%	73.5 - 100%	1103/1105[l]	99.8%	99.4 - 100%
Coronavirus HKU1	23/24	95.8%	78.9 - 99.9%	827/829[m]	99.8%	99.1 - 100%
Coronavirus NL63	23/24	95.8%	78.9 - 99.9%	829/829	100%	99.6 - 100%
Coronavirus OC43	14/14	100%	76.8 - 100%	1098/1103[n,o]	99.6%	99.0 - 99.9%
Human Metapneumovirus	88/93	94.6%	87.9 - 98.2%	754/760	99.2%	98.3 - 99.7%
Human Rhinovirus/Enterovirus	190/205	92.7%	88.2 - 95.8%	613/648	94.6%	92.6 - 96.2%
Bordetella pertussis	6/6	100%	54.1 - 100%	1110/1111	99.9%	99.5 - 100%
Chlamydophila pneumoniae	1/1	100%	n/a	1116/1116	100%	99.7 - 100%
Mycoplasma pneumoniae	4/4	100%	39.8 - 100%	1113/1113	100%	99.7 - 100%

[a] The FilmArray RP detected Adenovirus in 1/3 false negative specimens when retested. The Adenovirus in the retested specimen was identified as species C by bi-directional sequence analysis. The Adenoviruses in the remaining two false negative specimens were identified as species C and species B.

[b] Adenoviruses were identified in 13/14 false positive specimens using bi-directional sequence analysis. Ten were identified as species C, two as species B, and one as species E.

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[c] Influenza A viruses (H1-2009 subtype) were identified in 3/3 false positive specimens (2/2 false positive compared to influenza A culture alone) using sequence analysis with an alternate assay.
[d] PIV1 was identified in this specimen using bi-directional sequence analysis.
[e] PIV2 virus was not detected in the single false negative specimen using PCR analysis.
[f] PIV2 virus was detected in both false positive specimens using bi-directional sequencing analysis.
[g] Two adjacent specimens (one false positive and one false negative) may have been switched during the viral culture reference method testing as is evidenced by bi-directional sequence analysis of these specimens.
[h] The FilmArray RP detected PIV3 in the single false negative specimen when retested.
[i]. PIV3 viruses were identified in 10/10 false positive specimens using bi-directional sequence analysis.
[j] A PIV4 virus was detected in this false positive NPS specimen by bi-directional sequence analysis although it was not detected from viral culture.
[k] RSV viruses were identified in 83/87 false positive specimens using bi-directional sequence analysis.
[l] CoV 229E was identified by bi-directional sequence analysis in 1/2 false positive specimens using an alternate assay.
[m] CoV HKU1 viruses were identified in 2/2 false positive specimens using bi-directional sequence analysis with an alternate assay.
[n] CoV OC43 was detected in 2/5 false positive specimens using an alternate assay with bi-directional sequence analysis.
[o] 2/5 false positives were determined to be cross-reactive products derived from amplification of CoV HKU1 virus with the CoV OC43 assay primers.

The FilmArray RP detected a total of 94 mixed infections in the first phase of the prospective clinical evaluation performed from December 2009 thru May 2010 (853 tested and analyzed specimens). This represents 18% of the total positive specimens (94/524). Eighty-seven (87/94; 92.6%) were double infections, 6 (6/94; 6.3%) were triple infections, and one was a quadruple infection (1/94; 1.1%). The total number of test results comprising these co-infections was 189. The single most common co-infection was Human Rhinovirus/Enterovirus with Respiratory Syncytial Virus (20/94; 21.1%). These viruses were the most prevalent in the tested population. Out of the 94 co-infections, 54 contained one or more organisms that had not been detected with the reference/comparator methods, i.e. discrepant co-infection.

Table 15. Distinct Co-infection Combinations Detected by the FilmArray RP in the First Phase of the Prospective Clinical Trial (December 2009 to May 2010)

Distinct Co-infection Combinations Detected by FilmArray RP				Total Co-infections	Number of Discrepant Co-infections[a]	Discrepant Organism(s)[a]
Organism 1	Organism 2	Organism 3	Organism 4			
AdV	*B. pertussis*	HRV/EV		1	1	AdV/*B. pertussis*
AdV	HRV/EV	PIV3		2	2	AdV (2)
AdV	CoV 229E	RSV		1	1	AdV; RSV
AdV	*C. pneumoniae*			1	0	
AdV	CoV NL63			1	1	AdV
AdV	hMPV			1	1	AdV; hMPV
AdV	HRV/EV			8	2	AdV; HRV/EV
AdV	PIV3			1	1	PIV3
AdV	RSV			1	1	RSV
CoV 229E	RSV			1	0	
B. pertussis	HRV/EV			1	1	HRV/EV
CoV 229E	CoV NL63	HRV/EV	RSV	1	1	RSV; CoV 229E
CoV 229E	HRV/EV			1	0	

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Distinct Co-infection Combinations Detected by FilmArray RP				Total Co-infections	Number of Discrepant Co-infections[a]	Discrepant Organism(s)[a]
Organism 1	Organism 2	Organism 3	Organism 4			
CoV HKU1	HRV/EV	RSV		1	1	RSV
CoV HKU1	CoV OC43			2	2	CoV OC43 (2)[b]
CoV HKU1	hMPV			3	0	
CoV HKU1	HRV/EV			3	0	
CoV HKU1	RSV			3	1	RSV
CoV NL63	hMPV	RSV		1	1	RSV
CoV NL63	hMPV			3	0	
CoV NL63	HRV/EV			4	1	HRV/EV
CoV NL63	RSV			3	2	RSV (2)
CoV OC43	RSV			2	2	RSV (2); CoV OC43 (2)
hMPV	HRV/EV			7	3	hMPV (2); HRV/EV (1)
hMPV	PIV3			3	1	PIV3
hMPV	PIV4			1	1	hMPV
hMPV	RSV			4	4	hMPV (1); RSV (3)
HRV/EV	PIV1			1	1	PIV1
HRV/EV	PIV3			8	6	HRV/EV (3); PIV3 (3)
HRV/EV	PIV4			2	0	
HRV/EV	RSV			21	16	HRV/EV (8); RSV (13)
PIV4	RSV			1	0	
Total Co-infections				**94**	**54**	**65/200(32.5%)**
Total Double Infections				**87**	**47**	**55/178 (30.9%)**
Total Triple Infections				**6**	**6**	**8/18 (44.4%)**
Total Quadruple Infections				**1**	**1**	**2/4 (50%)**

[a] A discrepant co-infection or discrepant organism was defined as one that was detected by FilmArray RP but not detected by the reference/comparator methods or by discrepancy investigation using bi-directional sequence analysis. Sixty-five (65) organisms from 54 of the 94 co-infections were not detected by the reference/comparator methods. Forty-four (44) were investigated using bi-directional sequence analysis with an alternate assay; in 37 cases the investigative assay successfully identified the organism in the specimen.

[b] Both discrepant CoV O43 results were false-positive due to cross-reactivity of the CoV OC43 assay with CoV HKU1 viruses in the specimens.

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Table 16. Additional Distinct Co-infection Combinations Detected by Reference/Comparator Methods, but not by the FilmArray RP in the First Phase of the Prospective Clinical Trial (December 2009 to May 2010)

Distinct Co-infection Combinations[a]		Total Co-infections	Number of Discrepant Co-infections	Discrepant Organism(s)
Organism 1	**Organism 2**			
CoV 229E	HRV/EV	1	1	HRV/EV (1)
hMPV	HRV/EV	3	3	hMPV (2); HRV/EV (1)
HRV/EV	RSV	1	1	HRV/EV (1)
Total Co-infections		**5**	**5**	
Total Double Infections		**5**	**5**	

[a]This table includes only distinct co-infections that were detected by the reference/comparator method but not by FilmArray RP; the remaining co-infections detected by the reference/comparator methods are already represented in the table above.

Table 17. Mixed Infections Detected by FilmArray RP in the First Phase (December 2009 to May 2010) and the Second Phase (September 2010 to January 2011) of the Prospective Clinical Trial and Prevalence of Individual Organisms in Mixed Infections

Organism Combinations	Number of Positive Samples	Percentage of Total Samples Tested (n/1117)	Organism	Number of Mixed Infections	Prevalence in Mixed Infections (n/121)
HRV/EV + RSV	27	2.40%	HRV/EV	82	68%
AdV + HRV/EV	14	1.30%	RSV	59	49%
HRV/EV + PIV3	9	0.80%	AdV	24	20%
hMPV + HRV/EV	7	0.60%	hMPV	25	21%
CoV OC43 + HRV/EV	5	0.50%	PIV3	15	15%
hMPV + RSV	5	0.40%	CoV NL63	13	11%
CoV NL63 + HRV/EV	4	0.40%	CoV OC43	12	10%
CoV HKU1 + hMPV	3	0.30%	CoV HKU1	12	10%
CoV HKU1 + HRV/EV	3	0.30%	PIV4	5	4%
CoV HKU1 + RSV	3	0.30%	CoV 229E	4	3%
CoV NL63 + hMPV	3	0.30%	*B. pertussis*	3	2%
CoV NL63 + RSV	3	0.40%	PIV2	2	2%
CoV OC43 + RSV	3	0.30%	*C. pneumoniae*	1	1%
hMPV + PIV3	3	0.30%	Flu B	1	1%
HRV/EV + PIV4	3	0.30%	*M. pneumoniae*	1	1%
AdV + HRV/EV + PIV3	2	0.20%	PIV1	1	1%
AdV + RSV	1	0.20%			
CoV HKU1 + CoV OC43	2	0.20%			
HRV/EV + *B. pertussis*	2	0.10%			
AdV + *B. pertussis* + HRV/Entero	1	0.10%			
AdV + *C. pneumoniae*	1	0.10%			
AdV + CoV 229E + RSV	1	0.10%			

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Organism Combinations	Number of Positive Samples	Percentage of Total Samples Tested (n/1117)	Organism	Number of Mixed Infections	Prevalence in Mixed Infections (n/121)
Adenovirus + CoV NL63	1	0.10%			
Adenovirus + CoV OC43	1	0.10%			
Adenovirus + hMPV	1	0.10%			
Adenovirus + PIV3	1	0.10%			
CoV 229E + CoV NL63 + HRV/EV + RSV	1	0.10%			
CoV 229E + HRV/EV	1	0.10%			
CoV 229E + RSV	1	0.10%			
CoV HKU1 + HRV/EV + RSV	1	0.10%			
CoV NL63 + hMPV + RSV	1	0.10%			
CoV OC43 + hMPV	1	0.10%			
hMPV + PIV4	1	0.10%			
HRV/EV + PIV1	1	0.10%			
HRV/EV + PIV2	1	0.10%			
Flu B + RSV	1	0.10%			
PIV4 + RSV	1	0.10%			
PIV2 + *M. pneumoniae*	1	0.10%			

A total of 1117 prospective clinical specimens were tested and analyzed during the first phase and the second phase of the prospective clinical evaluation (2009/2010 respiratory season and 2010/2011 respiratory season). Of the 1117 analyzed prospective clinical specimens, 94.6% (1057/1117) of these specimens yielded valid results on the first attempt (i.e. first loaded pouch). Invalid results or no results were obtained for the remaining 60 (5.4%) specimens (no results for 24 specimens due to incomplete runs; 36 specimens were Invalid due to pouch control failures). Of the 24 incomplete runs, 3 were aborted by users (0.3%); 6 were due to software-related errors (0.6%) and 15 were due to instrument errors (1.3%). Fifty-seven (57) of the 60 initially failed (no results or invalid) specimens yielded valid results after a single retest using a new pouch/sample. The remaining three (3) specimens failed on the second attempt (2 due to failed pouch controls, 1 due to an instrument error), but yielded valid results following a second retest using another pouch/sample.

A single pouch leak (1/1244 loaded pouches; 0.08%) was observed during the first phase of the prospective clinical evaluation. Following discovery of the leak, the operator followed recommended decontamination procedures and performed contamination surveillance swab testing of the area surrounding the instrument. No contamination was detected. No pouch leaks were observed in the second phase of the prospective clinical study.

Testing of Preselected Archived Specimens

Several organisms, such as Influenza, were either not encountered in the prospective clinical study or had a low prevalence. To supplement the results of the prospective clinical study, an evaluation of preselected archived specimens was performed. The specimens were archived clinical NPS that were selected because they had previously tested positive for one of the following organisms: Adenovirus, *Bordetella pertussis*, Coronaviruses 229E and OC43, Enterovirus, Influenzas A H1, H1-2009, and H3, Influenza B, *Mycoplasma pneumoniae*, and Parainfluenza Viruses 1-4. Prior to testing with the FilmArray RP, the presence (or absence for negative specimens) of the expected organisms was confirmed in each specimen using validated organism-specific PCR assays followed by bi-directional sequencing. The specimens were organized into “test panels” and randomized such that the users performing the

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FilmArray RP testing were blinded as to the expected test result. Each panel contained specimens known to be positive and specimens known to be negative for the specific organism being evaluated, which allows for the calculation of a positive percent agreement (PPA) and a negative percent agreement (NPA). A summary of the available demographic information of the tested samples is provided in Table 18 and the results of the FilmArray testing are presented in Table 19.

Table 18. Demographic Summary of FilmArray RP Archived Specimen Study

Total Specimens		668
Sex	Female (%)	217 (32.5%)
	Male (%)	217 (32.5%)
	Unknown[a]	234 (35%)
Age	Avg	13
	Median	7
	Min	0.5
	Max	91
Age Range	≤5	239 (35.8%)
	6-21	112 (16.8%)
	22-49	42 (6.3%)
	≥50	47 (7%)
	≥5[b]	3 (0.4%)
	Unknown[a]	225 (33.7%)

[a] Demographic information was not provided for specimens from one source. Because the specimens were provided by a pediatric hospital, it is understood that the age range of specimens was from <1 yrs to 21 yrs.
[b] One source provided age category "less than 5 years of age or equal to/greater than 5 years of age"

Table 19. Summary of FilmArray RP Archived Specimen Performance Data

Organism	Positive Percent Agreement (PPA)			Negative Percent Agreement (NPA)		
	TP/TP +FN	Percent	95% CI	TN/TN+FP	Percent	95% CI
Adenovirus	27/27[a]	100%	87.2 - 100%	28/28	100%	87.7 - 100%
B. pertussis	53/56[b]	94.6%	85.1 - 98.9%	56/58[c]	96.5%	88.1 - 99.6%
Coronavirus 229E	13/13	100%	75.3 - 100%	45/47[d]	95.7%	85.5 - 99.5%
Coronavirus OC43	24/24	100%	85.8 - 100%	33/36[e]	91.7%	77.5 - 98.2%
Enterovirus	22/23[f]	95.7%	78.0 - 99.9%	90/90	100%	96.0 - 100%
Influenza A H1	32/32[g]	100%	89.1 - 100%	127/127	100%	97.1 - 100%
Influenza A H1-2009	34/34[h]	100%	89.7 - 100%	125/125	100%	97.1 - 100%
Influenza A H3	54/54[i]	100%	93.4 - 100%	105/105	100%	96.5 - 100%
Influenza B	30/30[j]	100%	88.4 - 100%	129/129	100%	97.2 - 100%
M. pneumoniae	54/64[k]	84.4%	73.1 - 92.2%	58/65[l]	89.2%	79.1 - 95.6%
Parainfluenza Virus 1	34/35[m]	97.1%	85.1 - 99.9%	94/94	100%	96.2 - 100%
Parainfluenza Virus 2	28/28[n]	100%	87.6 - 100%	101/101	100%	96.4 - 100%
Parainfluenza Virus 3	36/36	100%	90.3 - 100%	93/93	100%	96.1 - 100%
Parainfluenza Virus 4	11/11[o]	100%	71.5 - 100%	6/6	100%	54.1 - 100%

[a] Out of 28 AdV specimens received for testing, the organism status of one (1) specimen could not be confirmed by organism specific PCR followed by bidirectional sequencing and was excluded from further analysis.

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[b] Two (2) *B. pertussis*-positive specimens were originally identified by the source lab as negative for *B. pertussis* but were unexpectedly found to be positive by organism specific PCR followed by bidirectional sequencing. Both of these specimens were negative when tested with the FilmArray, and both were found to be negative for *B. pertussis* during discrepancy investigation of confirmation testing.
[c] Ten (10) *B. pertussis*-negative specimens were originally identified by the source lab as positive for *B. pertussis* but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Two (2) of these specimens were positive when tested with the FilmArray and both of these specimens were found to be positive for *B. pertussis* during discrepancy investigation of confirmation testing. Two (2) source laboratory positive samples were found to contain *B. holmesii;* both of these samples gave the expected negative result when tested with the FilmArray RP.
[d] One (1) CoV 229E-negative specimen was originally identified by the source lab as positive for CoV 229E but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. This specimen was positive when tested with the FilmArray RP.
[e] Four (4) CoV OC43-negative specimens were originally identified by the source lab as positive for CoV OC43 but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Two (2) of these specimens were positive when tested with the FilmArray RP.
[f] Out of 30 Enterovirus specimens received for testing, the organism status of 7 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[g] Out of 37 Flu A H1 specimens received for testing, the organism status of 5 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[h] Out of 37 Flu A H1-2009 specimens received for testing, the organism status of 2 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis. One additional sample was excluded due to an invalid FilmArray result.
[i] Out of 58 FluA A H3 specimens received for testing, the organism status of 4 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[j] Out of 36 Flu B specimens received for testing, the organism status of 5 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis. One additional sample was excluded due to an invalid FilmArray result.
[k] The Ct results obtained during confirmation PCR testing for the 10 samples that were not detected by FilmArray indicated low organism levels in the sample (Ct range 34.3-38.7) possible resulting from sample degradation during storage of these archived specimens.
[l] Twenty-two (22) *M. pneumoniae*-negative specimens were originally identified by the source lab as positive for *M. pneumoniae* but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Seven (7) of these specimens were positive when tested with the FilmArray RP.
[m] Out of 38 PIV1 specimens received for testing, the organism status of 3 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[n] Out of 29 PIV2 specimens received for testing, the organism status of 1 specimen could not be confirmed with organism-specific PCR and bi-directional sequencing and was excluded from further analysis.
[o] Out of 13 PIV4 specimens received for testing, the organism status of 2 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.

Testing of Contrived *C. pneumoniae* Specimens

Archived NPS specimens that had previously tested positive for *C. pneumoniae* were unavailable for testing. Therefore, contrived *C. pneumoniae* specimens were used as surrogate clinical specimens to test the sensitivity and specificity of the FilmArray RP *C. pneumoniae* assay. Residual specimens that had been collected during the prospective clinical evaluation were spiked with *C. pneumoniae* at clinically relevant levels (or unspiked; 50 of each). The organism status of each contrived specimen was blinded to the users testing the specimens.

Table 20. FilmArray RP Contrived *C. pneumoniae* Specimen Performance Data

Organism	Positive Percent Agreement (PPA)			Negative Percent Agreement (NPA)		
	TP/TP +FN	Percent	95% CI	TN/TN+FP	Percent	95% CI
C. pneumoniae	50/50	100%	92.9 – 100%	50/50	100%	92.9 – 100%

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Clinical Comparison Study (Modified FilmArray RP as Compared to Original FilmArray RP)

The original FilmArray RP was modified by the addition of a second Adenovirus assay to improve Adenovirus detection by the device. To demonstrate performance of the modified FilmArray RP, a comparison study was performed by testing 222 de-identified archived nasopharyngeal swab specimens collected between 2008 and 2011 throughout the U.S. (at least 8 geographically distinct locations) and Scotland (at least 1 location) with both the original FilmArray RP and modified FilmArray RP. A total of 26 Adenovirus specimens were detected by the modified FilmArray RP, of these only 15 were detected by the original FilmArray RP, demonstrating a 73% greater detection rate by the modified FilmArray RP in this clinical comparison study. For the other 19 organisms on the panel, performance appeared to be equivalent between the original and modified FilmArray RP versions.

Table 21. Performance Comparison of the Modified FilmArray RP to the Original FilmArray RP using Archived Specimens

Analyte	Positive Agreement				Negative Agreement			
	orig + mod +	orig + mod -	PPA	95% CI	orig - mod -	orig - mod +	NPA	95% CI
Adenovirus	15	0	100% (15/15)	78.2 – 100%	196	11 [a]	94.7% (196/207)	90.7 – 97.3%
CoV 229E	6	0	100% (6/6)	54.1 – 100%	216	0	100% (216/216)	98.3 – 100%
CoV HKU1	8	0	100% (8/8)	63.1 – 100%	214	0	100% (214/214)	98.3 – 100%
CoV NL63	15	1 [b]	93.8% (15/16)	69.8 – 99.8%	206	0	100% (206/206)	98.2 – 100%
CoV OC43	13	0	100% (13/13)	75.3 – 100%	208	1 [c]	99.5% (208/209)	97.4– 100%
hMPV	10	0	100% (10/10)	69.2 – 100%	209	3 [d]	98.6% (209/212)	95.9 – 99.7%
HRV/EV	57	4 [e]	93.4% (57/61)	84.0 – 98.2%	158	3 [e]	98.1% (158/161)	94.6 – 99.6%
Flu A	36	0	100% (36/36)	90.3 – 100%	184	1 [f]	99.5% (184/185)	97.0 – 100%
Flu A H1	9	0	100% (9/9)	66.4 – 100%	213	0	100% (213/213)	98.3 – 100%
Flu A H1-2009	15	0	100% (15/15)	78.2 – 100%	205	1 [f]	99.5% (205/206)	97.3 – 100%
Flu A H3	13	0	100% (13/13)	75.3 – 100%	209	0	100% (209/209)	98.3 – 100%
Flu B	10	0	100% (10/10)	69.2 – 100%	212	0	100% (212/212)	98.3 – 100%
RSV	21	0	100% (21/21)	83.9 – 100%	201	0	100% (201/201)	98.2 – 100%
PIV1	11	0	100% (11/11)	71.5 – 100%	211	0	100% (211/211)	98.3 – 100%
PIV2	8	0	100% (8/8)	63.1 – 100%	214	0	100% (214/214)	98.3 – 100%
PIV3	18	0	100% (18/18)	81.5 – 100%	204	0	100% (204/204)	98.2 – 100%
PIV4	6	0	100% (6/6)	54.1 – 100%	214	2 [g]	99.1% (214/216)	96.7 – 99.9%
B. pertussis	25	1 [h]	96.2% (25/26)	80.4 – 99.9%	196	0	100% (196/196)	98.1 – 100%
C. pneumoniae	1	0	100% (1/1)	n/a	221	0	100% (221/221)	98.3 – 100%
M. pneumoniae	0	0	n/a	n/a	222	0	100% (222/222)	98.4 – 100%

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

orig = original FilmArray RP, mod = modified FilmArray RP, PPA = positive percent agreement, NPA = negative percent agreement, CI = confidence interval
[a] 10/11 of the additional AdV detections by the modified FilmArray RP were confirmed to contain AdV by bi-directional sequence analysis; these AdV were identified by sequencing as AdVC2, AdVC5, AdVC6, AdVE4, and one undetermined serotype. One specimen could not be sequenced due to low analyte levels.
[b] A single specimen was found to be positive for CoV NL63 when tested with the original RP pouch but not the modified RP pouch. The specimen had previously been identified as positive for *B. pertussis* and had not been tested for CoV NL63 by the source laboratory. This specimen previously tested using the original pouch was negative for CoV NL63 . There was insufficient specimen for discrepancy investigation. Low viral load is suspected to have caused this spurious result.
[c] The Coronavirus OC43 discrepancy was due to cross-reactivity between the OC43 assay and HKU1 virus that was detected in the RP modified pouch and not in the original RP pouch.
[d] 2/3 human Metapneumovirus discrepant specimens were confirmed by bi-directional sequence analysis. Low viral load is suspected to have prevented detection by sequencing for the other specimen.
[e] 0/7 Human Rhinovirus/Enterovirus discrepant specimens were confirmed by bi-directional sequence analysis. Low viral load is suspected to have prevented detection by sequencing.
[f] A single specimen containing Influenza A H1-2009 provided repeated equivocal results on the original RP pouch, but was detected by the modified pouch.
[g] Parainfluenza Virus 4 was confirmed in both discrepant specimens by bi-directional sequence analysis.
[h] *B. pertussis* was confirmed in the discrepant specimen by bi-directional sequence analysis.

To supplement the archived specimen data for low prevalence organisms and to provide additional Adenovirus performance data specifically for AdVC2 and AdVC6, a set of 44 contrived (spiked NPS) specimens (10 AdVC2, 10 AdVC6, 10 *C. pneumoniae*, and 14 *M. pneumoniae*) was tested with both the modified FilmArray RP and the original FilmArray RP. The organism status of each contrived specimen was blinded to the users analyzing the specimens. Modified FilmArray RP detected all 20 Adenovirus-spiked specimens, while original FilmArray RP detected none of the Adenovirus-spiked specimens. Modified FilmArray RP also detected another Adenovirus in the background of a specimen spiked with *C. pneumoniae*. Performance appeared to be equivalent between modified FilmArray RP and original FilmArray RP for *C. pneumoniae* and *M. pneumoniae*.

Table 22. Clinical Comparison Data of the Modified FilmArray RP to the Original FilmArray RP for 44 Contrived Specimens

Organism	Positive Agreement				Negative Agreement			
	orig + mod +	orig + mod -	PPA	95% CI	orig - mod -	orig - mod +	NPA	95% CI
Adenovirus (AdVC2 and AdVC6)	0	0	n/a	n/a	23	21[a]	52.3% (23/44)	36.7 – 67.5%
C. pneumoniae	8	1	88.9% (8/9)	51.8 – 99.7%	35	0	100% (35/35)	90.0 – 100%
M. pneumoniae	14	0	100% (14/14)	76.8 – 100%	30	0	100% (30/30)	88.4 – 100%

orig = original FilmArray RP, mod = modified FilmArray RP, PPA = positive percent agreement, NPA = negative percent agreement, CI = confidence interval
[a] In addition to ten specimens spiked with AdVC6 and ten specimens spiked with AdVC2, modified FilmArray RP also detected an Adenovirus in the background of one specimen that had been spiked with *C. pneumoniae*. This detection was confirmed by bi-directional sequence analysis to be AdVC2.

The Adenoviruses detected in archived specimens were categorized into serotype groups using bi-directional sequence analysis. Combined, the archived and contrived specimen comparison data demonstrates improved detection of AdVC2, AdVC5, AdVC6, AdVE4 by modified FilmArray RP as compared to original FilmArray RP.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Table 23. Adenovirus Serotype Detections by the Modified FilmArray RP and the Original FilmArray RP in Archived and Contrived Specimens

Adenovirus (Serotyped by PCR)	Number of Adenovirus-positive Specimens (as Detected by Modified FilmArray RP)	Detections by Original FilmArray RP
AdVC1	8	8/8 (100%)
AdVC2	15 [a]	2/15 (13%)
AdVC5	2	1/2 (50%)
AdVC6	16 [a]	1/16 (6%)
AdVB3	1	1/1 (100%)
AdVE4	3	2/3 (67%)
AdV serotype unknown	2	0/2 (0%)

[a] Ten AdVC2 specimens and ten AdVC6 specimens were contrived by spiking these viruses into NPS specimens. One AdVC2 was also detected and sequence confirmed in the background of a specimen spiked with *C. pneumoniae*.

Limit of Detection

The analytical sensitivity or Limit of Detection (LoD) for FilmArray RP organisms was determined by testing limiting dilutions of quantified cultures or clinical specimens. LoD is defined as the lowest concentration at which the organism is consistently detected (detection in ≥95% of samples tested). Simulated NPS sample matrix (cultured human cells in VTM) was spiked with one or more organisms and at least 20 replicates were tested at the estimated LoD concentration. The LoD concentration for each FilmArray RP analyte listed in Table 24 has been confirmed with detection in at least 19/20 replicates (≥95%) on the FilmArray, FilmArray 2.0 and FilmArray Torch systems.

Table 24. LoD for Organisms Detected by FilmArray RP

Organism	Strain	LoD Concentration
Adenovirus[a]	AdVC1	100 $TCID_{50}$/mL[a]
	AdVC2	
	AdVE4	
	AdVC6	
Coronavirus 229E	ATCC VR-740	4 $TCID_{50}$/mL
Coronavirus HKU1[b]	Clinical Specimen [a]	1.9 x 10^6 RNA copies/mL
Coronavirus NL63	NR-470	5 $TCID_{50}$/mL
Coronavirus OC43	ATCC VR-759	600 $TCID_{50}$/mL
Enterovirus	Echovirus 6	30,000 $TCID_{50}$/mL[c]
Human Metapneumovirus	hMPV-16, IA10-2003 (Type A1)	2 $TCID_{50}$/mL
Human Rhinovirus	Type 1A	1 $TCID_{50}$/mL
Influenza A H1N1	A/Brisbane/59/07	200 $TCID_{50}$/mL
	A/New Caledonia/20/99	2,000 $TCID_{50}$/mL
Influenza A H1-2009	A/SwineNY/03/2009	100 $TCID_{50}$/mL
Influenza A H3N2	A/Wisconsin/67/2005	5 $TCID_{50}$/mL
	A/Port Chalmers/1/73	50 $TCID_{50}$/mL
Influenza B	B/FL/04/06	60 $TCID_{50}$/mL
	B/Taiwan/2/62	
Parainfluenza Virus 1	Type 1	500 $TCID_{50}$/mL
Parainfluenza Virus 2	Type 2	10 $TCID_{50}$/mL
Parainfluenza Virus 3	Type 3	10 $TCID_{50}$/mL

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Organism	Strain	LoD Concentration
Parainfluenza Virus 4	Type 4 (subtype A)	5,000 $TCID_{50}$/mL
Respiratory Syncytial Virus	Type A	2 $TCID_{50}$/mL
Bordetella pertussis	A639	4,000 CFU/mL
Chlamydophila pneumoniae	TW183	3,000 DNA copies/mL
Mycoplasma pneumoniae	M129 (Type 1)	30 $TCID_{50}$/mL

[a] LoD for Adenovirus of 100$TCID_{50}$/mL was confirmed using the modified FilmArray RP (v1.7). The original FilmArray RP Adenovirus LoD was 300 $TCID_{50}$/mL.
[b] Coronavirus HKU1 was evaluated using a clinical specimen containing a high load of Coronavirus HKU1. The specimen was quantified by real-time PCR against a standard curve of synthetic Coronavirus HKU1 RNA transcript to obtain quantification of the viral nucleic acid in specimen (RNA copies/mL).
[c] The Enterovirus LoD (30,000 $TCID_{50}$/mL) represents the sensitivity of the Entero1 and Entero2 assays. A positive Human Rhinovirus/Enterovirus result can be obtained at 100-fold lower concentrations (300 $TCID_{50}$/mL) based on detection of the virus with a combination of 6 relevant assays (HRV1-4, Entero1, and Entero2).

NOTE: Most viruses were re-grown and quantified in $TCID_{50}$ (50% Tissue Culture Infectious Dose) for LoD determination. The unit $TCID_{50}$ is a measure of infectivity or cytotoxicity rather than number of organisms or copies of nucleic acid. Variability in $TCID_{50}$/mL may not accurately reflect differences in the relative sensitivity of detection between different organisms or different strains of the same organism.

Analytical Reactivity (Inclusivity)

The analytical reactivity of the FilmArray RP assays was evaluated with an inclusivity panel consisting of strains/isolates that represent the genetic, temporal, and geographic diversity of the FilmArray RP: 33 Adenovirus, 6 Coronavirus (1 229E, 3 HKU1, 1 OC43, and 1 NL63), 10 human Metapneumovirus, 12 Enterovirus, 14 Rhinovirus, 22 Influenza A (including 10 Influenza A H1, 3 Influenza A H1-2009, and 9 Influenza A H3), 11 Influenza B, 12 Parainfluenza Virus (3 PIV1, 2 PIV2, 3 PIV3, and 4 PIV4), 6 Respiratory Syncytial Virus, 9 *Bordetella pertussis*, 4 *Chlamydophila pneumoniae*, and 9 *Mycoplasma pneumoniae*. Each strain was initially tested in a simulated NPS sample matrix at or near the LoD (using the original FilmArray RP unless otherwise noted). Higher concentrations were tested if the organism was not detected at LoD. Each of the 148 strains tested in this study were detected by the FilmArray RP.

For some organisms, additional analysis of clinical data and *in silico* analysis of NCBI database sequences was carried out to supplement the testing of the inclusivity panel.

Adenovirus

Adenovirus inclusivity testing was performed on 33 Adenovirus isolates representing 22 different serotypes within species A-F. Each isolate was tested at LoD concentration (100 $TCID_{50}$/mL) using the modified FilmArray RP. If an Adenovirus isolate was not detected at LoD, testing was repeated at 10x LoD. Isolates not detected at 10x LoD (1,000 $TCID_{50}$/mL) are listed as Not Detected, however, some reactivity may be observed with these serotypes if present in a sample at high levels.

Table 25 provides inclusivity results for respiratory serotypes belonging to species B, C, and E. The FilmArray RP was designed to detect all respiratory species/serotypes of Adenovirus.

AdVB55 and AdVC57 are the only respiratory serotypes that were not evaluated for inclusivity. Available sequence information for these serotypes indicates a perfect match to FilmArray RP Adenovirus assay primers and efficient detection at 1x LoD is predicted.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 25. Results of Inclusivity Testing for Adenovirus - Respiratory Serotypes

Species	Serotype	Isolate	Concentration Detected	Multiple of LoD Detected
B	3	Zeptometrix #0810062CF	100 $TCID_{50}$/mL	1x
	7a	Zeptometrix #0810021CF	100 $TCID_{50}$/mL	1x
	7d2	Iowa/2001	100 $TCID_{50}$/mL	1x
	7h	Iowa/1999	100 $TCID_{50}$/mL	1x
	11	Wisconsin/2005	100 $TCID_{50}$/mL	1x
	14	Missouri/2005	100 $TCID_{50}$/mL	1x
	16	ATCC VR-17	100 $TCID_{50}$/mL	1x
	21	Missouri/2005	100 $TCID_{50}$/mL	1x
	34	Texas/2005	100 $TCID_{50}$/mL	1x
	35	ATCC VR-718	100 $TCID_{50}$/mL	1x
	50	ATCC VR-1602	100 $TCID_{50}$/mL	1x
C	1	Zeptometrix #0810050CF	100 $TCID_{50}$/mL	1x
	2	New York/2004	100 $TCID_{50}$/mL	1x
		ATCC VR-846	100 $TCID_{50}$/mL	1x
		Clinical isolate #266153	100 $TCID_{50}$/mL	1x
		Clinical isolate #266161	100 $TCID_{50}$/mL	1x
		Clinical isolate #266213	100 $TCID_{50}$/mL	1x
	5	Zeptometrix #0810020CF	100 $TCID_{50}$/mL	1x
	6	Colorado/2005	100 $TCID_{50}$/mL	1x
		ATCC VR-6	100 $TCID_{50}$/mL	1x
		Clinical isolate #274924	100 $TCID_{50}$/mL	1x
		Clinical isolate #274948	100 $TCID_{50}$/mL	1x
		Clinical isolate #275032	100 $TCID_{50}$/mL	1x
E	4a	South Carolina/2004	100 $TCID_{50}$/mL	1x
	4p3	New Jersey/2005	100 $TCID_{50}$/mL	1x

Table 26 provides inclusivity results for non-respiratory serotypes belonging to species A, D, and F. The sensitivity of detection for non-respiratory adenoviruses will vary.

Table 26. Results of Inclusivity Testing for Adenovirus - Non-Respiratory Serotypes

Species	Serotype	Isolate	Concentration Detected	Multiple of LoD Detected
A	12	ATCC VR-863	Not Detected[a]	
	18	ATCC VR-19	Not Detected[a]	
	31	Zeptometrix #0810073CF	1000 $TCID_{50}$/mL	10x
D[b]	8	Zeptometrix #0810069CF	100 $TCID_{50}$/mL	1x
	20	Zeptometrix #0810115CF	100 $TCID_{50}$/mL	1x
	37	Zeptometrix #0810119CF	100 $TCID_{50}$/mL	1x
F	40	Zeptometrix #0810084CF	Not Detected[a]	
	41	Indiana/2004	100 $TCID_{50}$/mL	1x

[a] Adenovirus serotypes AdVA12, AdVA18 and AdVF40 were not detected when tested at 10x LoD ($TCID_{50}$/mL).
[b] Adenovirus species D is comprised of over 30 different serotypes.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Supplemental Adenovirus Reactivity Information (clinical data from original and modified FilmArray RP):

A subset of prospective and retrospective archived clinical specimens that were FilmArray RP positive for Adenovirus was subjected to PCR and bi-directional sequence analysis. BLAST analysis of the sequence data obtained for a region of the Adenovirus hexon gene identified species B (serotypes 3, 3+11p, 7, 16 and 21), species C (serotypes 1, 2, 5, and 6), and species E (serotype 4) in these clinical specimens. Species A, D, F, and G (often associated with conjunctivitis and gastroenteritis) were not identified in clinical specimens.

Coronaviruses 229E, HKU1, OC43 and NL63

Table 27. Results of Inclusivity Testing for Coronaviruses

Coronavirus	Strain / Isolate	Concentration Detected	Multiple of LoD Detected
229E	ATCC VR-740	4 $TCID_{50}$/mL	1x
HKU1	Clinical Specimen #1120	2.08×10^6 RNA copies/mL[b]	1.1x
	Clinical Specimen #6123	1.41×10^4 $TCID_{50}$/mL[a] ~1.9×10^6 RNA copies/mL[b]	1x
	Clinical Specimen #6213 (Type B)[c]	1.9×10^6 RNA copies/mL[b]	1x
NL63	BEI Resources NR-470	50 $TCID_{50}$/mL	1x
OC43	ATCC VR-759	600 $TCID_{50}$/mL	1x

[a] Virus contained in Clinical Specimen #6123 was grown in culture and quantified ($TCID_{50}$/mL) by infectivity assay.
[b] Quantification of the viral RNA contained in clinical specimens containing Coronavirus HKU1 was performed using real-time RT-PCR against a standard curve generated from a synthetic RNA template.
[c] Classification of Coronavirus HKU1 Clinical Specimen #6213 (Type B) was determined by bi-directional sequence analysis of the nucleocapsid (N) gene.

Human Metapneumovirus

Table 28. Results of Inclusivity Testing for Human Metapneumovirus

Subtype	Strain ID		Concentration Detected	Multiple of LoD Detected
A1	9	IA3-2002	2 $TCID_{50}$/mL	1x
	16	IA10-2003	2 $TCID_{50}$/mL	1x
A2	20	IA14-2003	2 $TCID_{50}$/mL	1x
	27	IA27-2004	2 $TCID_{50}$/mL	1x
B1	3	Peru2-2002	2 $TCID_{50}$/mL	1x
	5	Peru3-2003	2 $TCID_{50}$/mL	1x
	13	IA7-2003	2 $TCID_{50}$/mL	1x
	18	IA18-2003	2 $TCID_{50}$/mL	1x
B2	8	Peru6-2003	2 $TCID_{50}$/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Subtype	Strain ID		Concentration Detected	Multiple of LoD Detected
	22	IA16-2003	2 $TCID_{50}$/mL	1x

Human Rhinovirus and Enterovirus

Analytical inclusivity testing evaluated the reactivity of the FilmArray RP HRV and Entero assays with 25 individual serotypes representing various species, including Enterovirus species A-D and Human Rhinovirus species A and B.

Table 29. Results of inclusivity Testing for Human Rhinovirus / Enterovirus

Species	Strain / Serotype	Concentration Detected	Multiple of LoD[a] Detected
Enterovirus A	Coxsackievirus A10 ATCC VR-168	30,000 $TCID_{50}$/mL	1x
	Enterovirus 71 ATCC VR-1432	1:30,000 dilution of stock	n/a
	Enterovirus 71	9,400 $TCID_{50}$/mL [b]	<1x
Enterovirus B	Coxsackievirus A9	9,400 $TCID_{50}$/mL [b]	<1x
	Coxsackievirus B3	30,000 $TCID_{50}$/mL	1x
	Coxsackievirus B4	30,000 $TCID_{50}$/mL	1x
	Echovirus 6	30,000 $TCID_{50}$/mL	1x
	Echovirus 9	9,400 $TCID_{50}$/mL [b]	<1x
	Echovirus 11	300,000 $TCID_{50}$/mL	10x
Enterovirus C	Coxsackievirus A21 /Kuykendall ATCC VR-850	30,000 $TCID_{50}$/mL	1x
	Coxsackievirus A24 DN-19 ATCC VR-583	30,000 $TCID_{50}$/mL	1x
Enterovirus D	Enterovirus 68 (F02-3607 corn) ATCC VR-1197	30,000 $TCID_{50}$/mL	1x
Rhinovirus A	**A1**	1 $TCID_{50}$/mL	1x
	A2 (HGP) ATCC VR-482	10 $TCID_{50}$/mL	10x
	A7 (68-CV11) ATCC VR-1601	1 $TCID_{50}$/mL	1x
	A16 (11757) ATCC VR-283	10 $TCID_{50}$/mL	10x
	A34 (137-3) ATCC VR-507	1 $TCID_{50}$/mL	1x
	A57 (Ch47) ATCC VR-1600	100 $TCID_{50}$/mL	100x
	A77 (130-63) ATCC VR-1187	1 $TCID_{50}$/mL	1x
	A85 (50-525-CV54) ATCC VR-1195	10 $TCID_{50}$/mL	10x
Rhinovirus B	**B3** (FEB) ATCC VR-483	1 $TCID_{50}$/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Species	Strain / Serotype	Concentration Detected	Multiple of LoD[a] Detected
	B14 (1059) ATCC VR-284	1 $TCID_{50}$/mL	1x
	B17 (33342) ATCC-282	100 $TCID_{50}$/mL	100x
	B27 (5870) ATCC VR-1137	1 $TCID_{50}$/mL	1x
	B42 (56822) ATCC VR-338	10 $TCID_{50}$/mL	10x
	B83 (Baylor 7) ATCC VR-1193	1 $TCID_{50}$/mL	1x

[a] The LoD for Enterovirus used for this study was 30,000 $TCID_{50}$/mL. The LoD for Rhinovirus was 1 $TCID_{50}$/mL.
[b] Strains were tested below the Enterovirus LoD concentration due to a lesser concentration of virus in the culture fluid.

Supplemental Human Rhinovirus/Enterovirus Reactivity Information (clinical data and *in silico* analyses):

In addition to the analytical inclusivity testing, BLAST analysis was performed on sequence data obtained from prospective and retrospective archived clinical specimens that were FilmArray positive for Human Rhinovirus/Enterovirus. The following species and subtypes were identified in clinical specimens:

Enterovirus Species A:	Enterovirus serotype 71
	Coxsackievirus A2 and A6
Enterovirus Species B:	Echovirus serotypes 3, 6, 7, 11, 15, 21 and 30
	Coxsackievirus B1, B3 and A9
	Enterovirus serotypes 81 and 88
Rhinovirus Species A:	Human Rhinovirus serotypes 1B, 8, 9,10, 13, 19, 21, 22, 23, 28, 30, 32, 34, 38, 39, 40, 46, 47, 49, 51, 54, 56, 58, 59, 61, 62, 66, 68, 75, 77, 78, 80, 82, 98 and 100
Rhinovirus Species B:	Human Rhinovirus serotypes 27, 69, 83 and 91
Rhinovirus Species C:	at least 3 individual strains and 12 distinct isolates[a]

[a]Human Rhinovirus species C (also known as Enterovirus species D) has not been classified into serotypes.

Enterovirus species C includes Poliovirus types 1-3. Simulated reactivity of the FilmArray RP Human Rhinovirus/Enterovirus assays with Enterovirus Species C Poliovirus sequences was generated using a bioinformatics approach. Alignment of assay primer sequences with the listed GenBank sequences indicates the FilmArray RP assay can react with Poliovirus types 1, 2 and 3, giving a Human Rhinovirus/Enterovirus result.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 30. Simulated Reactivity of the FilmArray RP HRV and Entero Assays with Poliovirus Sequences

Strain	GenBank ID	Simulated FilmArray RP Result
Human poliovirus 1 strain CHN8264c/GZ/CHN/2004	FJ769385	Human Rhinovirus/Enterovirus
Human poliovirus 2, complete genome	AY177685	Human Rhinovirus/Enterovirus
Human poliovirus 3 strain IRA10853, complete genome	EU684056	Human Rhinovirus/Enterovirus

Influenza A

Table 31. Results of Inclusivity Testing for Human Isolates of Influenza A

Type	Strain	Concentration Detected	Multiple of LoD Detected
Influenza A H1	A/Brisbane/59/07	200 $TCID_{50}$/mL	1x
	A/Solomon Islands/3/2006	200 $TCID_{50}$/mL	1x
	A/Hawaii/15/01 CDC#2001701117	1:300[a]	n/a
	A/New Caledonia/20/99	200 $TCID_{50}$/mL	1x
	A1/Denver/1/57	200 $TCID_{50}$/mL	1x
	A/Mal/302/54	200 $TCID_{50}$/mL	1x
	A1/FM/1/47	200 $TCID_{50}$/mL	1x
	A/Weiss/43	200 $TCID_{50}$/mL	1x
	A/PR/8/34	2000 $TCID_{50}$/mL	10x
	A/NWS/33	200 $TCID_{50}$/mL	1x
Influenza A H1-2009	A/SwineNY/01/2009	100 $TCID_{50}$/mL	1x
	A/SwineNY/02/2009	100 $TCID_{50}$/mL	1x
	A/SwineNY/03/2009	100 $TCID_{50}$/mL	1x
Influenza A H3	A/Brisbane/10/07	5 $TCID_{50}$/mL	1x
	A/Wisconsin/67/2005	5 $TCID_{50}$/mL	1x
	A/NewYork/55/2005 CDC#2005705561	1:300,000 [a]	n/a
	A/Victoria/3/75	5 $TCID_{50}$/mL	1x
	A/Port Chalmers/1/73	5 $TCID_{50}$/mL	1x
	A/Aichi/2/68	50 $TCID_{50}$/mL	10x
	A/Hong Kong/8/68	5 $TCID_{50}$/mL	1x
	Alice (vaccine) A/England/42/72 ATCC VR-776	5 $TCID_{50}$/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Type	Strain	Concentration Detected	Multiple of LoD Detected
	MRC-2 Recombinant strain ATCC VR-777	5 $TCID_{50}$/mL	1x

[a] Strain was not re-cultured and titered. Dilutions of the original culture/titer from the CDC were used.
The HA titer for A/Hawaii/15/01 is unknown and the HA titer for A/NewYork/55/2005 was 256.

Supplemental Reactivity Information for Influenza Strains of Human, Swine and Avian Origin (analytical testing data and *in silico* analyses):

Influenza A viruses are classified by host and subtype, a combination of H (hemagglutinin) and N (neuraminidase) types. Occasionally, non-human Influenza strains are transferred to human hosts. Several strains of swine and avian influenzas were tested or analyzed using bioinformatics for reactivity with the Influenza A and subtyping assays contained in the FilmArray RP. The Influenza A assays (FluA-pan1 and FluA-pan2) were designed to react with all strains of Influenza A. FilmArray RP Influenza A subtyping assays (FluA-H1-pan, FluA-H1-2009 and FluA-H3) were designed to react with specific HA subtypes, with a focus on human host strains. The FluA-H1-2009 assay was designed to be specific for the human pandemic variant of swine origin H1N1 that emerged in 2009.

Testing of viral isolates or nucleic acid from viral culture indicate that the FilmArray RP Influenza A and subtyping assays react with some strains of swine and avian origin as expected (Table 32)

Table 32. Results of Inclusivity Testing with Swine and Avian Isolates of Influenza A

Host	Subtype	Isolate / Strain	Test Concentration	FilmArray Result
Swine	H1N1	Influenza A/Swine/1976/31	~1 x 10^6 EID_{50}/mL	Influenza A H1[a]
	H1N1	Influenza A/Swine/Iowa/15/30	~1 x 10^7 EID_{50}/mL	
Avian	H1N2	Kilbourne F63 A/NWS/34 (HA) x A/Rockefeller Institute/5/57 (NA)[b]	14.8 ng RNA	Influenza A H1

[a] No reactivity was observed with the H1-2009 subtyping assay or other FilmArray RP assays.
[b] Purified and quantified RNA from avian influenza culture was obtained from BEI Resources.

Laboratory testing of Influenza A strains was supplemented with *in silico* predictions of reactivity using bioinformatics and sequence alignments between FilmArray RP assay primers and sequences for Influenza A strains of human, swine, and avian origin. For each strain, multiple (3) GenBank IDs were evaluated, corresponding to the gene segments targeted by the FilmArray RP assays (matrix (MA), non-structural (NS) and hemagglutinin (HA)). Simulated reactivity was determined based on the number and location of mismatches in the targeted region.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Based on this analysis, the strains listed in Table 33 are predicted to react with the FilmArray RP Influenza A and H1 or H3 subtyping assays as indicated.

Table 33. Simulated Reactivity of FilmArray Influenza A assays with Human, Swine, and Avian Influenza Strains

Host	Subtype	Isolate / Strain	GenBank ID	Simulated FilmArray Result
Human	H1N1	A/California/UR06-0393/2007(H1N1)	CY026540	Influenza A H1
			CY026543	
			CY026539	
	H1N2	A/New York/297/2003(H1N2)	CY002668	
			CY002665	
			CY002664	
	H1-2009	A/Aalborg/INS133/2009(H1N1)	CY063606	Influenza A H1-2009
			CY063610	
			CY063607	
	H3N2	A/Boston/38/2008(H3N2)	CY044581	Influenza A H3
			CY044584	
			CY044580	
	A/(H3N2)v[a]	A/Pennsylvania/09/2011(H3N2)	JN655537	
			JN655534	
			JN655538	
Swine	H1N1	A/swine/Wisconsin/1/1971(H1N1)	CY022414	Influenza A H1
			CY022417	
			CY022413	
	H1N2	A/swine/Hong Kong/NS857/2001(H1N2)	GQ229348	
			GQ229350	
			GQ229347	
Avian	H3N1	A/blue-winged teal/ALB/452/1983(H3N1)	CY004635	Influenza A H3
			CY004638	
			CY005940	
	H3N5	A/mallard/Netherlands/2/1999(H3N5)	CY060261	
			CY060264	
			CY060265	
	H3N7	A/northernshoveler/California/HKWF1367/2007(H3N7)	CY033372	
			CY033375	
			CY033376	
	H3N8	A/American black duck/Washington/699/1978(H3N8)	GU052299	
			GU052302	
			GU052300	

[a]Swine-origin variant H3N2 virus identified in human clinical specimens in 2011. All available GenBank sequences (as of Dec. 12, 2011) were evaluated and a single representative sequence is provided in this table. All isolates for which sequences are available are predicted to generate an Influenza A H3 result when tested with the FilmArray RP.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

The strains of human, swine or avian origin listed in Table 34 are predicted to react only with the FilmArray RP Influenza A (FluA-pan1 and FluA-pan2) assays, giving an Influenza A (no subtype detected) result.

Table 34. Simulated Reactivity of FilmArray Influenza A assays with Human, Swine, and Avian Influenza Strains

Host	Subtype	Strain	GenBank ID	Simulated FilmArray RP Reactivity
Human	H2N2	A/Albany/20/1957(H2N2)	CY022013	Influenza A (no subtype detected)
			CY022014	
			CY022017	
	H5N1	A/Cambodia/R0405050/2007(H5N1)	HQ200572	
			HQ200573	
			FJ225472	
		A/Hong Kong/486/97(H5N1)	AF084281	
			AF255368	
			AF115289	
	H7N2	A/New York/107/2003(H7N2)	EU587368	
			EU587373	
			EU587374	
	H7N3	A/Canada/rv504/2004(H7N3)	CY015006	
			CY015007	
			CY015010	
	H7N7	A/Netherlands/219/03(H7N7)	AY340089	
			AY342422	
			AY338459	
	H9N2	A/Hong Kong/1073/99(H9N2)	AJ404626	
			AJ278647	
			AJ278649	
Swine	H1N2	A/swine/Sweden/1021/2009(H1N2)	GQ495135	
			GQ495136	
			GQ495132	
	H5N1	A/swine/East Java/UT6010/2007(H5N1)	HM440124	
			HM440111	
			HM440123	
Avian	H2N2	A/chicken/New York/13828-3/1995(H2N2)	CY014822	
			CY014825	
			CY014821	
		A/Japan/305/1957(H2N2)	CY045804	
			CY014977	
			CY014980	
		A/Korea/426/1968(H2N2)	CY031595	
			CY031596	
			CY031599	
	H3N2	A/American black duck/North Carolina/675-075/2004(H3N2)	GU051135	
			GU051136	
			GU051137	
	H3N6	A/American black duck/New Brunswick/25182/2007(H3N6)	CY047696	
			CY047697	
			CY047700	
	H4N6	A/blue-winged teal/Minnesota/Sg-00043/2007(H4N6)	CY063977	
			CY063978	
			CY063981	
	H5N1	A/rook/Rostov-on-Don/26/2007(H5N1)	EU814503	
			EU814504	
			EU814507	
		A/turkey/VA/505477-18/2007(H5N1)	GU186509	
			GU186510	

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Host	Subtype	Strain	GenBank ID	Simulated FilmArray RP Reactivity
			GU186513	
		A/chicken/Bangladesh/1151-10/2010(H5N1)	HQ156765	
			HQ156766	
			HQ156764	
	H5N2	A/duck/Pennsylvania/10218/1984(H5N2)	AB295603	
			AB286120	
			AB286652	
	H5N3	A/duck/Singapore/F119/3/1997(H5N3)	GU052802	
			GU052803	
			GU052805	
	H6N1	A/duck/PA/486/1969(H6N1)	EU743286	
			EU743287	
			EU743289	
	H6N2	A/mallard/Czech Republic/15902-17K/2009(H6N2)	HQ244430	
			HQ244433	
			HQ244434	
	H7N7	A/mallard/Korea/GH171/2007(H7N7)	FJ750872	
			FJ959087	
			FJ959090	
	H9N2	A/turkey/Wisconsin/1/1966(H9N2)	CY014663	
			CY014664	
			CY014667	
	H10N7	A/chicken/Germany/N/1949(H10N7)	GQ176136	
			GQ176135	
			GQ176132	
	H11N9	A/duck/Memphis/546/1974(H11N9)	CY014691	
			GQ257441	
			CY014687	

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Influenza B

Table 35. Results of Inclusivity Testing for Influenza B

Strain	Concentration Detected	Multiple of LoD Detected
B/FL/04/06	60 $TCID_{50}$/mL	1x
B/Ohio/01/2005 CDC#2005743348	1:3,000,000[a]	n/a
B/Florida/07/04	60 $TCID_{50}$/mL	1x
B/Malaysia/2506/04	600 $TCID_{50}$/mL	10x
B/Hong Kong/5/72 ATCC VR-823	60 $TCID_{50}$/mL	1x
B/Taiwan/2/62 ATCC VR-295	60 $TCID_{50}$/mL	1x
B/Maryland/1/59 ATCC VR-296	600 $TCID_{50}$/mL	10x
B/GL/1739/54 ATCC VR-103	60 $TCID_{50}$/mL	1x
B/Allen/45 ATCC VR-102	6,000 EID_{50}/mL	n/a
B/Lee/40ATCC VR-101	60 $TCID_{50}$/mL	1x
B/Brigit Recombinant ATCC VR-786	60 $TCID_{50}$/mL	1x

[a] Strain was not re-cultured and titered. Dilutions of the original culture/titer from the CDC were used. The HA titer for B/Ohio/01/2005 was 128.

Parainfluenza Viruses

Table 36. Results of Inclusivity Testing for Parainfluenza Viruses

Type		Strain or Source	Concentration	Multiple of LoD Detected
PIV1		Zeptometrix #0810014CF	500 $TCID_{50}$/mL	1x
		C-35 ATCC VR-94	500 $TCID_{50}$/mL	1x
		C39 BEI NR-3226	500 $TCID_{50}$/mL	1x
PIV2		Zeptometrix #0810015CF	10 $TCID_{50}$/mL	1x
		Greer ATCC VR-92	10 $TCID_{50}$/mL	1x
PIV3		Zeptometrix #0810016CF	10 $TCID_{50}$/mL	1x
		C-243 ATCC VR-93	500 $TCID_{50}$/mL	50x
		NIH 47885 BEI NR-3233	100 $TCID_{50}$/mL	10x
PIV4	A	M25 ATCC VR-1378	5000 $TCID_{50}$/mL	1x
		Zeptometrix #0810060CF	5000 $TCID_{50}$/mL	1x
	B	CH-19503 ATCC VR-1377	5000 $TCID_{50}$/mL	1x
		Zeptometrix #08010060BCF	5000 $TCID_{50}$/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Respiratory Syncytial Virus

Table 37. Results of Inclusivity Testing for Respiratory Syncytial Virus

Type	Strain or Source	Concentration Detected	Multiple of LoD Detected
A	Zeptometrix #0810040ACF	2 $TCID_{50}$/mL	1x
	A/A2 ATCC VR-1540	2 $TCID_{50}$/mL	1x
	A/Long ATCC VR-26	2 $TCID_{50}$/mL	1x
B	B/9320 ATCC VR-955	2 $TCID_{50}$/mL	1x
	B/Wash18537/62 ATCC VR-1580	2 $TCID_{50}$/mL	1x
	B/WV/14617/85 ATCC VR-1400	2 $TCID_{50}$/mL	1x

Bordetella pertussis

Table 38. Results of Inclusivity Testing for *Bordetella pertussis*

Strain	Concentration Detected	Multiple of LoD Detected
A639	4000 CFU/mL	1x
E431	4000 CFU/mL	1x
F ATCC 8467	4000 CFU/mL	1x
5 [17921] ATCC 9340	4000 CFU/mL	1x
18323 [NCTC 10739] ATCC 9797	4000 CFU/mL	1x
10-536 ATCC 10380	4000 CFU/mL	1x
CNCTC Hp 12/63 [623] ATCC 51445	4000 CFU/mL	1x
Tohama I ATCC BAA-589 (vaccine strain)	4000 CFU/mL	1x
MN2531 ATCC BAA-1335	4000 CFU/mL	1x

Chlamydophila pneumoniae

Table 39. Results of Inclusivity Testing for *Chlamydophila pneumoniae*

Strain	Concentration Detected	Multiple of LoD Detected
AR-39 ATCC 53592	3000 copies/mL	1x
CDC/CWL-029 VR-1310	3000 copies/mL	1x
CM-1 ATCC VR-1360	3000 copies/mL	1x
TW183 ATCC VR-2282	3000 copies/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Mycoplasma pneumoniae

Table 40. Results of Inclusivity Testing for *Mycoplasma pneumoniae*

Type	Strain	Concentration Detected	Multiple of LoD Detected[b]
Type 1	M129	30 $TCID_{50}$/mL	1x
	M129-B7 ATCC 29342	300 CCU/mL[a]	10x
	PI 1428 ATCC 29085	3,000 CCU/mL	100x
Type 2	FH strain [NCTC 10119] ATCC 15531	300 CFU/mL[c]	n/a
	[Mac] ATCC 15492	300 CCU/mL	10x
Not Determined	[M52] ATCC 15293	300 CCU/mL	10x
	[Bru] ATCC 15377	30,000 CCU/mL	1,000x
	Mutant 22 ATCC 39505	30 CCU/mL	1x
	UMTB-10G ATCC 49894	300 CCU/mL	10x

[a] CCU = Color Changing Unit. Both $TCID_{50}$ and CCU were determined according to the Reed-Muench method. Quantification in CCU/mL was considered equivalent to quantification in $TCID_{50}$/mL.
[b] Following inclusivity testing, all *M. pneumoniae* isolates previously quantified in CCU/mL were re-evaluated by real-time PCR against a standard curve of the LoD strain (M129, $TCID_{50}$/mL). Based on relative molecular quantification, all isolates were detected at levels <1x – 10x LoD, rather than 1-1,000x LoD determined by CCU/mL. ATCC 49894, ATCC 15293, ATCC 29342, and ATCC 39505 were detected at or below 1x LoD, while ATCC 15492, ATCC 29085, and ATCC 15377 were detected between 1-10x LoD.
[c] This was the only *M. pneumoniae* isolate in the panel able to form colonies on plates and was quantified in CFU/mL.

Analytical Specificity (Cross-Reactivity and Exclusivity)

The potential for cross-reactivity between assays contained in the FilmArray RP was evaluated by testing simulated NPS samples containing high concentrations of respiratory panel organisms (tens to thousands-fold higher than LoD). Exclusivity testing was performed with the modified FilmArray RP, except where indicated. No cross-reactivity was observed with the strains and concentrations listed in Table 41.

NOTE: The Coronavirus OC43 assay may cross-react with certain strains of Coronavirus HKU1 when present in the sample at high concentrations.

Table 41. Results of Testing for Cross-Reactivity with FilmArray RP Organisms

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
Adenovirus	AdVC1	1.00×10^5 $TCID_{50}$/mL	1,000x
Coronavirus	229E ATCC VR-740	5.67×10^3 $TCID_{50}$/mL	1,418x
	HKU1[a] Clinical specimen 42/08	1.34×10^8 copies/mL	70x
	NL63 NR-470	5.67×10^3 $TCID_{50}$/mL	1,134x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
	OC43 ATCC VR-759	7.30×10^4 $TCID_{50}$/mL	122x
Human Metapneumovirus	Type A1 hMPV-16 IA10-2003 A1	8.17×10^3 $TCID_{50}$/mL	4,085x
Human Rhinovirus / Enterovirus	Echovirus 6	3.40×10^6 $TCID_{50}$/mL	113x
	Rhinovirus A1	5.67×10^3 $TCID_{50}$/mL	5,670x
Influenza A H1N1	A/Brisbane/59/07	1.00×10^5 $TCID_{50}$/mL	500x
	A/New Caledonia/20/99[b]	1.00×10^5 $TCID_{50}$/mL	500x
	A/PR/8/34[b]	1.00×10^6 $TCID_{50}$/mL	5,000x
	A1/FM/1/47[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/NWS/33[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A1/Denver/1/57[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/Solomon Islands/3/2006 [b]	1.39×10^4 $TCID_{50}$/mL	70x
	A/Weiss/43[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/Mal/302/54[b]	1.39×10^4 $TCID_{50}$/mL	70x
Influenza A H1-2009	A/SwineNY/03/2009	8.40×10^4 $TCID_{50}$/mL	840x
Influenza A H3N2	A/Wisconsin/67/2005	8.17×10^3 $TCID_{50}$/mL	1634x
	A/Victoria/3/75[b]	4.70×10^3 $TCID_{50}$/mL	940x
	A/Port Chalmers/1/73[b]	5.67×10^3 $TCID_{50}$/mL	1,134x
	A/Aichi/2/68[b]	1.00×10^5 $TCID_{50}$/mL	20,000x
	A/Hong Kong/8/68[b]	1.00×10^5 $TCID_{50}$/mL	20,000x
	A/Alice[b]	4.70×10^3 $TCID_{50}$/mL	940x
	A/MRC 2[b]	8.17×10^3 $TCID_{50}$/mL	1,634x
	A/Brisbane/10/07[b]	8.17×10^3 $TCID_{50}$/mL	1,634x
Influenza B	B/FL/04/06	1.67×10^4 $TCID_{50}$/mL	278x
	B/Lee/40[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Taiwan/2/62[b]	5.03×10^4 $TCID_{50}$/mL	838x
	B/GL/1739/54[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Maryland/1/59[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Florida/07/04[b]	1.00×10^5 $TCID_{50}$/mL	1,667x
	B/Malaysia/2506/04[b]	5.67×10^3 $TCID_{50}$/mL	95x
	B/Allen/45[b]	1.00×10^5 $TCID_{50}$/mL	1,667x
	B/HongKong/5/72[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Brigit[b]	3.50×10^4 $TCID_{50}$/mL	583x
Parainfluenza Virus	Type 1	1.39×10^4 $TCID_{50}$/mL	28x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
	Type 2	1.6×10^4 $TCID_{50}$/mL	1,670x
	Type 3	1.00×10^5 $TCID_{50}$/mL	10,000x
	Type 4A	5.67×10^3 $TCID_{50}$/mL[c]	1.13x[c]
Respiratory Syncytial Virus	A	1.39×10^4 $TCID_{50}$/mL	6,950x
	B	2.14×10^4 $TCID_{50}$/mL	10,700x
Bordetella pertussis	E431[b]	1.00×10^6 CFU/mL	250x
	A639		
	ATCC 8467[b]		
	ATCC 9797[b]		
	ATCC 51445[b]		
	ATCC BAA-589[b]		
	ATCC 9340[b]		
	ATCC 10380[b]		
	ATCC BAA-1335[b]		
Chlamydophila pneumoniae	TW183	2.42×10^5 copies/mL	81x
Mycoplasma pneumoniae	M129	1.88×10^5 $TCID_{50}$/mL	6,267x
	ATCC 15531[b]	4.27×10^5 CFU/mL	n/a
	ATCC 15293[b]	1.00×10^6 CCU/mL	33,333x
	ATCC 15377[b]		
	ATCC 15492[b]		
	ATCC 29085[b]		
	ATCC 29342[b]		
	ATCC 39505[b]		
	ATCC 49894[b]		

[a] Cross-reactivity was not observed between this isolate of Coronavirus HKU1 and the Coronavirus OC43 assay at the concentration tested. However, in the clinical data set, 2 specimens showed cross-reactivity between the OC43 assay and the HKU1 virus contained in the specimen.
[b] Exclusivity testing was performed with the original FilmArray RP.
[c] Parainfluenza Virus 4A could not be tested at higher concentrations due to the relatively low titer of the stock viral culture.

The potential for the FilmArray RP to cross-react with non-FilmArray RP organisms was evaluated by testing an exclusivity panel consisting of 26 bacteria, 6 viruses, and 1 yeast. These organisms were selected based on their relatedness to FilmArray RP organisms, clinical relevance (cause respiratory symptoms or represent nasopharyngeal flora), or high prevalence within the population (e.g. Herpes Simplex Virus). Negative sample matrix was spiked with bacteria or fungi at a concentration of 10^6 CFU/mL and viruses at a concentration between 10^4 - 10^5 $TCID_{50}$/mL, or the highest concentration possible. The FilmArray RP did not cross-react with the exclusivity panel organisms listed in Table 42.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 42. Non-FilmArray RP Exclusivity Panel – No cross-reactivity was observed with the organisms listed

Virus	Strain / Isolate
Bocavirus	Clinical Specimen
Cytomegalovirus (CMV)	AD-169 (VR-538)
Epstein-Barr Virus (EBV)	B95-8
Herpes Simplex Virus	Type 1
Measles Virus	Edmonston
Mumps	Zeptometrix # 0810079CF
Yeast	**Strain / Isolate**
Candida albicans	Zeptometrix #0801504
Bacterium	**Strain / Isolate**
Bordetella bronchiseptica[a]	clinical isolate
Bordetella holmesii	F061
Bordetella parapertussis[a]	A747
Chlamydia trachomatis	D-UW3
Corynebacterium diptheriae	ATCC14779
Escherichia coli	O157:H7
Haemophilus influenzae	MinnA
Lactobacillus acidophilus	Type strain
Lactobacillus plantarum	17-5
Legionella longbeacheae	Long Beach 4
Legionella micdadei	Tatlock
Legionella pneumophilia	Philadelphia
Moraxella catarrhalis	Ne 11 (type strain)
Mycobacterium tuberculosis	H37Ra-1
Mycoplasma hominis	ATCC 23114
Mycoplasma genitalium	ATCC 33530
Neisseria elongate	type strain
Neisseria gonorrhoeae	ATCC 700825
Neisseria meningitidis	M1027 (type strain)
Pseudomonas aeruginosa	Zeptometrix #0801519
Staphylococcus aureus	COL
Staphylococcus epidermidis	RP62A
Streptococcus pneumoniae	type 59
Streptococcus pyogenes	Zeptometrix #0801512
Streptococcus salivarius	ATCC 13419
Ureaplasma urealyticum	ATCC 27618

[a] Though not observed in this study, the FilmArray RP *Bordetella pertussis* assay can cross-react with strains of *B. bronchiseptica* and *B. parapertussis* that carry a pertussis toxin pseudogene (see Limitations section).

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Supplemental Analytical Exclusivity Testing for Influenza Strains of Avian Origin:

Additional analytical exclusivity testing was carried out (using the original FilmArray RP) with either live isolates or purified genomic RNA of avian host influenza A strains with the following results:

Table 43. Results of Exclusivity Testing of Virus or Nucleic Acid from Cultures of Avian Isolates of Influenza A

Host	Subtype	Isolate / Strain	Test Concentration[a]	FilmArray Result
Avian	H2N2	A/Japan/305/57	3.3 ng RNA	Influenza A (no subtype detected)
		Kilbourne F38 A/Korea/426/68 (HA, NA) x A/Puerto Rico/8/34	6.3 ng RNA	
	H5N1	A/Vietnam/1203/2004 R-H5	N/A[b]	
	H5N2	A/duck/Pennsylvania/10218/84	2.5 ng RNA	
	H5N3	Kilbourne F181 A/duck/Singapore/645/97	247 ng RNA	
	H7N2	A/NewYork/107/2003	N/A[b]	
	H7N3	A/Mallard/Netherlands/12/2000	N/A[b]	
	H10N7	A/chicken/Germany/N/49	68 ng RNA	

[a] Purified and quantified RNA from Avian Influenza cultures was obtained from BEI Resources
[b] Stock virus HA titer from CDC = 128. Twenty microliters of virus stock tested.

Supplemental SARS Coronavirus Exclusivity Information:

In silico analysis of SARS virus sequence (GenBank ID NC_004718.3) against primers for each of the 4 FilmArray RP Coronavirus assays was conducted. When the non-SARS Coronavirus assay primers were aligned with the corresponding target sequence from SARS virus, each primer contained at least 6 mismatches. Based on alignments, no reactivity was predicted between SARS virus and the 4 FilmArray RP Coronavirus assays.

Cross-Contamination and Carryover

To evaluate cross-contamination or carryover, high positive samples (Table 41) were loaded and tested back-to-back with other high positive samples containing different organisms. No false positive results were observed, indicating that the system design and recommended sample handling practices are effective in preventing carryover.

Reproducibility

A multicenter reproducibility study was performed to determine between-site and overall reproducibility of the FilmArray RP. Reproducibility testing occurred at three test sites utilizing the original FilmArray RP and a panel of twelve simulated NPS specimens spiked with various combinations of organisms at three different test levels: Medium Positive (3X LoD), Low Positive (1X LoD), and High Negative (LoD/10). The High Negative test level was predicted to generate positive results in approximately 20-80% of the samples tested. On each testing day, two operators at each site tested two aliquots of specimens on two different FilmArray instruments (six specimens per operator per instrument per day). Every specimen was tested four times a day on five days at the three testing sites, for a total of at least 60 tests per organism per concentration. A total of 26 lots of reagents and 20 FilmArray instruments were utilized in the reproducibility study.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Positive, Equivocal, Negative results and Tm data for each organism are summarized in the tables below:

Table 44. Summary of Positive Agreement, Negative Agreement, and Tm Results from Reproducibility Testing of Single Assay Organisms

Adenovirus AdVC1		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD)[c] 900 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.74	0.24	83.33 - 84.26
	Site B	20/20	0/20	100%	83.2% – 100%	84.23	0.21	83.95 - 84.60
	Site C	20/20	0/20	100%	83.2% – 100%	83.76	0.28	83.03 - 84.13
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.93**	**0.36**	**83.03 - 84.60**
Low Positive (1X LoD)[c] 300 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.42	0.28	83.01 - 83.98
	Site B	20/20	0/20	100%	83.2% – 100%	83.90	0.26	83.54 - 84.30
	Site C	20/20	0/20	100%	83.2% – 100%	83.62	0.38	83.05 - 84.64
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.64**	**0.39**	**83.01 - 84.64**
High Negative[b] (LoD/10)[c] 30 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% – 98.8%	83.33	0.26	83.02 - 83.76
	Site B	16/20	4/20	80.0%	56.3% – 94.3%	83.71	0.30	82.93 - 84.29
	Site C	10/20	10/20	50.0%	27.2% – 72.8%	83.26	0.31	82.61 - 83.86
	All Sites	**44/60**	**16/60**	**73.3%**	**60.3% – 83.9%**	**83.43**	**0.38**	**82.61 - 84.29**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.
[c] Reproducibility testing was performed prior to the modification of the panel to include a second Adenovirus assay. Test concentrations and multiples of LoD reflect the Adenovirus LoD prior to panel modification (300 $TCID_{50}$/mL).

Coronavirus 229E ATCC VR-740		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 12 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.20	0.20	80.81 - 81.47
	Site B	20/20	0/20	100%	83.2% – 100%	81.80	0.32	81.35 - 82.18
	Site C	20/20	0/20	100%	83.2% – 100%	81.35	0.34	81.03 - 82.13
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.37**	**0.40**	**80.81 - 82.18**
Low Positive (1X LoD) 4 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.19	0.21	80.83 - 81.66
	Site B	20/20	0/20	100%	83.2% – 100%	81.62	0.25	81.12 - 82.08
	Site C	20/20	0/20	100%	83.2% – 100%	81.09	0.32	80.30 - 81.56
	All	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.31**	**0.38**	**80.30 - 82.08**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus 229E ATCC VR-740		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	Sites							
High Negative[b] (LoD/10) 0.4 $TCID_{50}$/mL	Site A	14/20	6/20	70%	45.7% - 88.1%	81.06	0.22	80.72 - 81.43
	Site B	7/20	13/20	35%	15.4% - 59.2%	81.54	0.24	81.15 - 82.08
	Site C	11/20	9/20	55%	31.5% - 76.9%	81.17	0.24	80.70 - 81.68
	All Sites	**32/60**	**28/60**	**53.3%**	**40.0% - 66.3%**	**81.25**	**0.34**	**80.70 - 82.08**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Coronavirus HKU1 Type B Clinical Specimen 6123		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 5.7×10^6 RNA copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	75.61	0.23	75.37 - 76.02
	Site B	20/20	0/20	100%	83.2% – 100%	76.02	0.26	75.58 - 76.33
	Site C	20/20	0/20	100%	83.2% – 100%	75.49	0.32	74.96 - 75.90
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**75.69**	**0.41**	**74.96 - 76.33**
Low Positive (1X LoD) 1.9×10^6 RNA copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	75.47	0.22	74.96 - 75.79
	Site B	20/20	0/20	100%	83.2% – 100%	75.89	0.20	75.59 - 76.12
	Site C	20/20	0/20	100%	83.2% – 100%	75.35	0.30	74.83 - 75.81
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**75.55**	**0.40**	**74.83 - 76.12**
High Negative[b] (LoD/10) 1.9×10^5 RNA copies/mL	Site A	15/20	5/20	75.0%	50.9% - 91.3%	75.51	0.28	75.06 - 75.90
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	75.85	0.22	75.26 - 76.23
	Site C	19/20	1/20	95.0%	75.1% – 99.9%	75.33	0.22	74.98 - 75.59
	All Sites	**51/60**	**9/60**	**85.0%**	**73.4% – 92.9%**	**75.55**	**0.38**	**74.98 - 76.23**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus NL63 BEI Resources NR-470		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 15 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.21	0.31	79.64 - 80.90
	Site B	20/20	0/20	100%	83.2% – 100%	80.55	0.33	79.99 - 81.03
	Site C	20/20	0/20	100%	83.2% – 100%	80.04	0.25	79.67 - 80.62
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.29**	**0.40**	**79.64 - 81.03**
Low Positive (1X LoD) 5 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.08	0.25	79.57 - 80.42
	Site B	20/20	0/20	100%	83.2% – 100%	80.40	0.24	79.98 - 80.89
	Site C	20/20	0/20	100%	83.2% – 100%	79.88	0.27	79.36 - 80.40
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.12**	**0.38**	**79.14 - 80.89**
High Negative[b] (LoD/10) 0.5 $TCID_{50}$/mL	Site A	13/20	7/20	65.0%	40.8% - 84.6%	80.08	0.34	79.21 - 80.82
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	80.36	0.30	79.98 - 80.91
	Site C	10/20	10/20	50.0%	27.2% - 72.8%	79.91	0.26	79.24 - 80.30
	All Sites	**37/60**	**23/60**	**61.7%**	**48.2% - 73.9%**	**80.11**	**0.39**	**79.21 - 80.91**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Coronavirus OC43 ATCC VR-759		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 1,800 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.98	0.23	80.53 - 81.36
	Site B	20/20	0/20	100%	83.2% – 100%	81.39	0.25	81.04 - 81.82
	Site C	20/20	0/20	100%	83.2% – 100%	81.20	0.26	80.60 - 81.55
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.17**	**0.32**	**80.53 - 81.82**
Low Positive (1X LoD) 600 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.82	0.26	80.29 - 81.25
	Site B	20/20	0/20	100%	83.2% – 100%	81.31	0.24	80.95 - 81.85
	Site C	20/20	0/20	100%	83.2% – 100%	81.07	0.37	80.40 - 81.58
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.07**	**0.38**	**80.29 - 81.85**
High Negative[b] (LoD/10) 60 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% - 98.8%	80.86	0.24	80.49 - 81.25
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	81.29	0.28	80.92 - 81.81
	Site C	16/20	4/20	80.0%	56.3% - 94.3%	81.04	0.32	80.11 - 81.45

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus OC43 ATCC VR-759		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	All Sites	**48/60**	**12/60**	**80.0%**	**67.7% - 89.2%**	**81.07**	**0.36**	**80.11 - 81.81**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	1/180	179/180	99.4%	96.9% - 100%			
	All Sites	**1/540**	**539/540**	**99.8%**	**99.0% - 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Human Metapneumovirus hMPV-16 (Type A1)		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 6 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.61	0.23	77.06 - 77.90
	Site B	20/20	0/20	100%	83.2% – 100%	78.07	0.28	77.67 - 78.61
	Site C	19/20	1/20	95.0%	75.1% - 99.9%	77.73	0.21	77.45 - 78.11
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**77.82**	**0.36**	**77.06 - 78.61**
Low Positive (1X LoD) 2 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.39	0.21	77.04 - 77.79
	Site B	20/20	0/20	100%	83.2% – 100%	77.88	0.22	77.37 - 78.11
	Site C	20/20	0/20	100%	83.2% – 100%	77.60	0.24	77.16 - 77.99
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**77.62**	**0.35**	**77.04 - 78.11**
High Negative[b] (LoD/10) 0.2 $TCID_{50}$/mL	Site A	17/20	2/20	85.0%	62.1% - 96.8%	77.34	0.20	77.05 - 77.59
	Site B	19/20	6/20	95.0%	75.1% - 99.9%	77.76	0.22	77.06 - 78.11
	Site C	12/20	4/20	60.0%	36.1% - 80.9%	77.37	0.29	76.74 - 77.79
	All Sites	**48/60**	**12/60**	**80.0%**	**67.7% - 89.2%**	**77.50**	**0.35**	**76.74 - 78.11**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Influenza B B/FL/04/06		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 180 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.47	0.26	79.88 - 80.93
	Site B	20/20	0/20	100%	83.2% – 100%	80.88	0.31	80.30 - 81.30
	Site C	20/20	0/20	100%	83.2% – 100%	80.36	0.32	79.78 - 80.80
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.56**	**0.40**	**79.78 - 81.30**
Low Positive (1X LoD) 60 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.44	0.27	80.00 - 80.92
	Site B	20/20	0/20	100%	83.2% – 100%	80.79	0.29	80.40 - 81.33
	Site C	20/20	0/20	100%	83.2% – 100%	80.34	0.22	79.77 - 80.81
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.51**	**0.37**	**79.77 - 81.33**
High Negative[b] (LoD/10) 6 $TCID_{50}$/mL	Site A	12/20	8/20	60.0%	36.1% - 80.9%	80.42	0.32	79.84 - 80.90
	Site B	10/20	10/20	50.0%	27.2% - 72.8%	80.78	0.25	80.40 - 81.17
	Site C	8/20	12/20	40.0%	19.1% - 64.0%	80.30	0.21	79.79 - 80.69
	All Sites	**30/60**	**30/60**	**50.0%**	**36.8% - 63.2%**	**80.50**	**0.36**	**79.79 - 81.17**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 1 Zeptometrix # 0810014CFN		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 1,500 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	78.86	0.26	78.42 - 79.25
	Site B	20/20	0/20	100%	83.2% – 100%	79.32	0.28	78.83 - 79.78
	Site C	19/20	1/20	95.0%	75.1% - 99.9%	78.50	0.28	78.02 - 78.87
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**78.91**	**0.50**	**78.02 - 79.78**
Low Positive (1X LoD) 500 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	78.60	0.31	77.99 - 79.05
	Site B	20/20	0/20	100%	83.2% – 100%	78.93	0.26	78.31 - 79.36
	Site C	20/20	0/20	100%	83.2% – 100%	78.50	0.38	77.90 - 79.16
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**78.67**	**0.40**	**77.90 - 79.36**
High Negative[b] (LoD/10) 50 $TCID_{50}$/mL	Site A	15/20	5/20	75.0%	50.1% - 91.3%	78.54	0.25	78.10 - 78.94
	Site B	15/20	5/20	75.0%	50.1% - 91.3%	78.94	0.25	78.52 - 79.36
	Site C	13/20	7/20	65.0%	41.0% - 84.6%	78.41	0.35	77.87 - 79.02

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 1 Zeptometrix # 0810014CFN		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
	All Sites	**43/60**	**17/60**	**71.7%**	**58.6% - 82.6%**	**78.61**	**0.42**	**77.79 - 79.36**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 2 Zeptometrix #0810015CF		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 30 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.63	0.36	83.01 - 84.39
	Site B	20/20	0/20	100%	83.2% – 100%	84.06	0.40	83.44 - 84.79
	Site C	20/20	0/20	100%	83.2% – 100%	83.88	0.32	83.13 - 84.28
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.85**	**0.42**	**83.01 - 84.79**
Low Positive (1X LoD) 10 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.56	0.28	82.94 - 84.08
	Site B	20/20	0/20	100%	83.2% – 100%	84.00	0.31	83.52 - 84.63
	Site C	20/20	0/20	100%	83.2% – 100%	83.79	0.32	82.92 - 84.25
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.78**	**0.37**	**82.92 - 84.63**
High Negative[b] (LoD/10) 1 $TCID_{50}$/mL	Site A	12/20	8/20	60.0%	36.1% - 80.9%	83.43	0.34	82.71 - 83.96
	Site B	12/20	8/20	60.0%	36.1% - 80.9%	83.91	0.31	83.43 - 84.56
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	83.71	0.36	82.91 - 84.30
	All Sites	**35/60**	**25/60**	**58.3%**	**44.9% - 70.9%**	**83.69**	**0.41**	**82.71 - 84.56**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 3 Zeptometrix #0810016CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 30 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.17	0.36	80.71 - 81.86
	Site B	20/20	0/20	100%	83.2% – 100%	81.48	0.35	81.03 - 81.89
	Site C	20/20	0/20	100%	83.2% – 100%	80.94	0.28	80.63 - 81.37
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.22**	**0.41**	**80.63 - 81.89**
Low Positive (1X LoD) 10 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.97	0.36	80.36 - 81.52
	Site B	20/20	0/20	100%	83.2% – 100%	81.35	0.26	80.93 - 81.79
	Site C	17/20	3/20	85.0%	62.1% - 96.8%	80.86	0.28	80.10 - 81.21
	All Sites	**57/60**	**3/60**	**95.0%**	**86.1% - 99.0%**	**81.08**	**0.40**	**80.10 - 81.79**
High Negative[b] (LoD/10) 1 $TCID_{50}$/mL	Site A	10/20	10/20	50.0%	27.2% - 72.8%	80.99	0.26	80.30 - 81.34
	Site B	7/20	13/20	35.0%	15.4% - 59.2%	81.29	0.28	80.61 - 81.77
	Site C	5/20	15/20	25.0%	8.7% - 49.1%	80.84	0.24	80.41 - 81.24
	All Sites	**22/60**	**38/60**	**36.7%**	**24.6% - 50.1%**	**81.05**	**0.34**	**80.30 - 81.77**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 4a Zeptometrix #0810060CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 15,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.70	0.30	77.36 - 78.10
	Site B	20/20	0/20	100%	83.2% – 100%	78.09	0.56	77.48 - 78.74
	Site C	20/20	0/20	100%	83.2% – 100%	77.73	0.40	77.05 - 78.21
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	77.82	0.47	77.05 - 78.74
Low Positive (1X LoD) 5,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.11	0.28	76.64 - 77.68
	Site B	20/20	0/20	100%	83.2% – 100%	77.65	0.41	76.73 - 78.71
	Site C	20/20	0/20	100%	83.2% – 100%	77.23	0.38	76.81 - 78.20
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	77.33	0.46	76.64 - 78.71
High Negative[b] (LoD/10)	Site A	4/20	16/20	20.0%	5.7% - 43.7%	77.07	0.26	76.63 - 77.58
	Site B	5/20	15/20	25.0%	8.7% - 49.1%	77.59	0.27	77.05 - 78.00

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 4a Zeptometrix #0810060CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
500 $TCID_{50}$/mL	Site C	11/20	9/20	55.0%	31.5% - 76.9%	77.24	0.30	76.62 - 77.84
	All Sites	**20/60**	**40/60**	**33.3%**	**21.7% - 46.7%**	77.29	0.40	76.62 - 78.00
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Respiratory Syncytial Virus Type A		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 6 $TCID_{50}$/mL	Site A	60/60	0/60	100%	94.0% - 100%	80.44	0.35	79.46 - 80.83
	Site B	60/60	0/60	100%	94.0% - 100%	80.86	0.25	80.41 - 81.56
	Site C	60/60	0/60	100%	94.0% - 100%	80.39	0.33	80.08 - 80.91
	All Sites	**180/180**	**0/180**	**100%**	**97.8% - 100%**	**80.58**	**0.40**	**79.46 - 81.56**
Low Positive (1X LoD) 2 $TCID_{50}$/mL	Site A	40/40	0/40	100%	91.2% - 100%	79.82	0.50	78.93 - 80.62
	Site B	40/40	0/40	100%	91.2% - 100%	80.40	0.46	79.47 - 81.03
	Site C	40/40	0/40	100%	91.2% - 100%	80.13	0.47	79.13 - 80.79
	All Sites	**120/120**	**0/120**	**100%**	**97.0% - 100%**	**80.10**	**0.57**	**78.93 - 81.03**
High Negative[b] (LoD/10) 0.2 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% - 98.8%	79.63	0.50	78.72 - 80.72
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	80.12	0.50	79.26 - 80.89
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	79.97	0.57	78.83 - 80.84
	All Sites	**46/60**	**14/60**	**76.7%**	**64.0% - 86.6%**	**79.90**	**0.58**	**78.72 - 80.89**
Negative	Site A	0/120	120/120	100%	97.0% - 100%			
	Site B	0/120	120/120	100%	97.0% - 100%			
	Site C	0/120	120/120	100%	97.0% - 100%			
	All Sites	**0/360**	**360/360**	**100%**	**99.0% - 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Bordetella pertussis A639		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 12,000 CFU/mL	Site A	20/20	0/20	100%	83.2% – 100%	88.36	0.36	87.46 - 89.05
	Site B	20/20	0/20	100%	83.2% – 100%	88.81	0.29	88.26 - 89.20
	Site C	20/20	0/20	100%	83.2% – 100%	88.34	0.18	87.97 - 88.58
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**88.50**	**0.38**	**87.46 - 89.20**
Low Positive (1X LoD) 4,000 CFU/mL	Site A	20/20	0/20	100%	83.2% – 100%	88.39	0.28	87.73 - 88.96
	Site B	20/20	0/20	100%	83.2% – 100%	88.64	0.31	88.07 - 89.20
	Site C	20/20	0/20	100%	83.2% – 100%	88.22	0.28	87.74 - 88.67
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**88.42**	**0.34**	**87.73 - 89.20**
High Negative[b] (LoD/10) 400 CFU/mL	Site A	16/20	4/20	80.0%	56.3% - 94.3%	88.41	0.34	87.86 - 89.36
	Site B	12/20	8/20	60.0%	36.1% - 80.9%	88.70	0.32	88.33 - 89.29
	Site C	12/20	8/20	60.0%	36.1% - 80.9%	88.26	0.28	87.52 - 88.71
	All Sites	**40/60**	**20/60**	**66.7%**	**53.3% - 78.3%**	**88.46**	**0.37**	**87.52 - 89.36**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Chlamydophila pneumoniae TW183		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 9,000 copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	79.65	0.29	78.94 - 79.99
	Site B	20/20	0/20	100%	83.2% – 100%	80.27	0.30	79.88 - 80.82
	Site C	20/20	0/20	100%	83.2% – 100%	79.73	0.23	79.42 - 80.09
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**79.92**	**0.45**	**78.94 - 80.82**
Low Positive (1X LoD) 3,000 copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	79.63	0.27	79.03 - 80.09
	Site B	19/20	1/20	95.0%	75.1% - 99.9%	80.15	0.28	79.68 - 80.62
	Site C	20/20	0/20	100%	83.2% – 100%	79.61	0.30	78.84 - 80.09
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**79.79**	**0.42**	**78.84 - 80.62**
High Negative[b] (LoD/10) 300 copies/mL	Site A	11/20	9/20	55.0%	31.5% - 76.9%	79.55	0.25	79.25 - 80.08
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	80.02	0.29	79.66 - 80.72
	Site C	10/20	10/20	50.0%	27.2% - 72.8%	79.61	0.29	79.16 - 80.21

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Chlamydophila pneumoniae TW183		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	All Sites	**35/60**	**25/60**	**58.3%**	**44.9% - 70.9%**	**79.72**	**0.38**	**79.16 - 80.72**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Mycoplasma pneumoniae Type 1 - M129		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 90 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.42	0.29	77.04 - 77.71
	Site B	20/20	0/20	100%	83.2% – 100%	77.94	0.33	77.59 - 78.30
	Site C	20/20	0/20	100%	83.2% – 100%	77.83	0.28	77.44 - 78.12
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**77.75**	**0.38**	**77.04 - 78.30**
Low Positive (1X LoD) 30 $TCID_{50}$/mL	Site A	19/20	1/20	95.0%	75.1% - 99.9%	77.55	0.30	77.05 - 78.00
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	77.96	0.33	77.36 - 78.37
	Site C	20/20	0/20	100%	83.2% – 100%	77.68	0.39	76.65 - 78.10
	All Sites	**56/60**	**4/60**	**93.3%**	**83.8% - 98.2%**	**77.73**	**0.40**	**76.65 - 78.37**
High Negative[b] (LoD/10) 3 $TCID_{50}$/mL	Site A	5/20	15/20	25.0%	8.7% - 49.1%	77.58	0.31	76.72 - 78.01
	Site B	4/20	16/20	20.0%	5.7% - 43.7%	78.01	0.27	77.67 - 78.45
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	77.76	0.34	77.04 - 78.09
	All Sites	**20/60**	**40/60**	**33.3%**	**21.7% - 46.7%**	**77.78**	**0.38**	**76.72 - 78.45**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 45. Summary of Positive Agreement, Negative Agreement, and Tm Results from Reproducibility Testing of Multi-Assay Organisms

Reproducibility Agreement Summary for Enterovirus (Human Rhinovirus/Enterovirus)

Enterovirus Echovirus 6 (Species B)		**# Positive**	**# Negative**	**% Agreement with Expected Result** [a]	**95% CI**
Medium Positive (3X LoD) 90,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 30,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**60/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 3,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
Negative	Site A	0/60	60/60	100%	94.0% - 100%
	Site B	0/60	60/60	100%	94.0% - 100%
	Site C	0/60	60/60	100%	94.0% - 100%
	All Sites	**0/180**	**180/180**	**100%**	**97.8% - 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Enterovirus

Assay	**Enterovirus** Echovirus 6 (Species B)		**Mean Tm**	**% CV Tm**	**Observed Tm Range**
Entero 1	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	87.12	0.24	86.79 - 87.73
		Site B	87.51	0.30	86.99 - 88.05
		Site C	86.98	0.33	86.37 - 87.64
		All Sites	**87.18**	**0.39**	**86.37 - 88.05**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	87.00	0.33	86.17 - 87.64
		Site B	87.36	0.29	86.80 - 87.85
		Site C	86.81	0.35	86.15 - 87.41
		All Sites	**87.05**	**0.42**	**86.15 - 87.85**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	86.89	0.29	86.06 - 87.40
		Site B	87.34	0.31	86.67 - 87.86
		Site C	86.67	0.29	85.97 - 87.30
		All Sites	**86.96**	**0.44**	**85.97 - 87.86**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Enterovirus Echovirus 6 (Species B)		Mean Tm	% CV Tm	Observed Tm Range
Entero 2	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	87.09	0.28	86.68 - 87.73
		Site B	87.47	0.30	86.82 - 88.00
		Site C	86.93	0.36	86.16 - 87.64
		All Sites	**87.14**	**0.41**	**86.16 - 88.00**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	86.98	0.30	86.28 - 87.53
		Site B	87.34	0.28	86.89 - 87.82
		Site C	86.77	0.35	86.05 - 87.52
		All Sites	**87.02**	**0.41**	**86.05 - 87.82**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	86.86	0.29	86.17 - 87.54
		Site B	87.26	0.35	86.59 - 87.94
		Site C	86.65	0.27	86.27 - 87.20
		All Sites	**86.92**	**0.42**	**86.17 - 87.94**
HRV4	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	85.70	0.31	85.21 - 86.18
		Site B	86.19	0.30	85.35 - 86.77
		Site C	85.59	0.34	84.91 - 86.19
		All Sites	**85.81**	**0.44**	**84.91 - 86.77**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	85.45	0.26	84.81 - 86.06
		Site B	85.87	0.24	85.44 - 86.36
		Site C	85.32	0.40	84.69 - 86.26
		All Sites	**85.54**	**0.40**	**84.69 - 86.36**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	85.37	0.26	84.80 - 86.04
		Site B	85.82	0.23	85.43 - 86.23
		Site C	85.22	0.22	84.82 - 85.58
		All Sites	**85.46**	**0.39**	**84.80 - 86.23**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Agreement Summary for Rhinovirus (Human Rhinovirus/Enterovirus)

Human Rhinovirus A1		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 3 $TCID_{50}$/mL	Site A	60/60	0/60	100%	94.0% - 100%
	Site B	60/60	0/60	100%	94.0% - 100%
	Site C	60/60	0/60	100%	94.0% - 100%
	All Sites	**180/180**	**0/180**	**100%**	**97.8% - 100%**
Low Positive (1X LoD) 1 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 0.1 $TCID_{50}$/mL	Site A	40/40	0/40	100%	91.2% - 100%
	Site B	40/40	0/40	100%	91.2% - 100%
	Site C	32/40	8/40	80.0%	64.4% - 91.0%
	All Sites	**112/120**	**8/120**	**93.3%**	**87.3% - 97.1%**
Negative	Site A	0/60	60/60	100%	94.0% - 100%
	Site B	0/60	60/60	100%	94.0% - 100%
	Site C	0/60	60/60	100%	94.0% - 100%
	All Sites	**0/180**	**180/180**	**100%**	**97.8% - 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Rhinovirus

Assay	Human Rhinovirus A1		Mean Tm	% CV Tm	Observed Tm Range
HRV1	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	83.79	0.44	83.25 - 85.09
		Site B	84.06	0.31	83.43 - 84.56
		Site C	83.68	0.23	83.22 - 84.09
		All Sites	**83.84**	**0.38**	**83.22 - 85.09**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.71	0.29	83.07 - 84.35
		Site B	84.07	0.34	83.44 - 84.66
		Site C	83.93	0.34	83.24 - 84.71
		All Sites	**83.90**	**0.37**	**83.07 - 84.71**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.56	0.28	83.02 - 84.26
		Site B	83.91	0.34	83.22 - 84.52
		Site C	83.76	0.31	83.04 - 84.48
		All Sites	**83.74**	**0.36**	**83.02 - 84.52**
HRV2	Medium Positive 3x LoD	Site A	83.33	0.48	82.55 - 84.67
		Site B	83.65	0.29	83.11 - 84.17
		Site C	83.30	0.28	82.70 - 83.77

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Human Rhinovirus A1		Mean Tm	% CV Tm	Observed Tm Range
	3 $TCID_{50}$/mL	**All Sites**	**83.42**	**0.41**	**82.55 - 84.67**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.28	0.31	82.57 - 83.86
		Site B	83.66	0.36	83.02 - 84.37
		Site C	83.52	0.39	82.82 - 84.29
		All Sites	**83.48**	**0.40**	**82.57 - 84.37**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.17	0.34	82.42 - 83.88
		Site B	83.58	0.36	82.80 - 84.31
		Site C	83.37	0.33	82.51 - 83.92
		All Sites	**83.37**	**0.40**	**82.42 - 84.31**
HRV3	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	82.73	0.53	81.99 - 83.94
		Site B	83.25	0.36	82.49 - 83.88
		Site C	82.89	0.43	82.10 - 83.88
		All Sites	**82.96**	**0.51**	**81.99 - 83.94**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	82.67	0.49	81.76 - 83.65
		Site B	83.24	0.44	82.40 - 84.08
		Site C	83.07	0.41	82.13 - 83.76
		All Sites	**82.98**	**0.54**	**81.76 - 84.08**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	82.68	0.50	81.78 - 83.67
		Site B	83.21	0.46	82.18 - 84.37
		Site C	82.97	0.42	81.85 - 83.64
		All Sites	**82.96**	**0.52**	**81.78 - 84.37**
HRV4	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	83.81	0.38	83.28 - 84.98
		Site B	84.14	0.34	83.43 - 84.83
		Site C	83.80	0.25	83.44 - 84.20
		All Sites	**83.90**	**0.37**	**83.28 - 84.98**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.79	0.31	83.18 - 84.45
		Site B	84.08	0.31	83.55 - 84.61
		Site C	84.04	0.38	83.35 - 84.93
		All Sites	**83.94**	**0.37**	**83.18 - 84.93**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.58	0.26	83.11 - 84.05
		Site B	83.88	0.31	83.34 - 84.49
		Site C	83.86	0.27	83.24 - 84.58
		All Sites	**83.76**	**0.33**	**83.11 - 84.58**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Agreement Summary for Influenza A H1

Influenza A H1N1 A/Brisbane/59/07		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 600 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 200 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	19/20	1/20	0/20	95.0%	75.1% - 99.9%
	Site C	17/20	2/20	1/20	85.0%	62.1% – 96.8%
	All Sites	**56/60**	**3/60**	**1/60**	**93%**	**83.8% – 98.2%**
High Negative (LoD/10)[b] 20 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	17/20	2/20	1/20	85.0%	62.1% – 96.8%
	Site C	14/20	5/20	1/20	70.0%	45.7% - 88.1%
	All Sites	**51/60**	**7/60**	**2/60**	**85.0%**	**73.4% - 92.9%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%
	All Sites	**0/540**	**0/540**	**540/540**	**100%**	**99.3% – 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Influenza A H1

Assay	Influenza A H1N1 A/Brisbane/59/07		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	84.67	0.24	84.27 - 85.12
		Site B	85.10	0.24	84.78 - 85.56
		Site C	84.64	0.34	83.76 - 85.23
		All Sites	**84.80**	**0.37**	**83.76 - 85.56**
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	84.57	0.27	84.17 - 85.31
		Site B	85.01	0.28	84.59 - 85.75
		Site C	84.68	0.26	84.16 - 85.18
		All Sites	**84.75**	**0.34**	**84.16 - 85.75**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	84.27	0.26	83.85 - 84.81
		Site B	84.75	0.23	84.29 - 85.32
		Site C	84.46	0.35	83.89 - 85.48
		All Sites	**84.48**	**0.37**	**83.85 - 85.48**
FluA-pan2	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	80.42	0.25	79.78 - 80.63
		Site B	80.85	0.27	80.39 - 81.26
		Site C	80.31	0.28	79.89 - 80.72
		All Sites	**80.52**	**0.39**	**79.78 - 81.26**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Influenza A H1N1 A/Brisbane/59/07		Mean Tm	% CV Tm	Observed Tm Range
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	80.36	0.23	79.99 - 80.73
		Site B	80.80	0.21	80.42 - 81.15
		Site C	80.52	0.22	80.19 - 80.89
		All Sites	**80.57**	**0.32**	**79.99 - 81.15**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	79.91	0.37	79.15 - 80.41
		Site B	80.49	0.30	79.67 - 80.83
		Site C	80.10	0.35	79.56 - 80.73
		All Sites	**80.17**	**0.45**	**79.15 - 80.83**
FluA-H1-pan	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	78.79	0.25	78.31 - 79.25
		Site B	79.20	0.31	78.30 - 79.57
		Site C	78.76	0.39	77.79 - 79.25
		All Sites	**78.91**	**0.42**	**77.67 - 79.57**
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	78.77	0.25	78.42 - 79.34
		Site B	79.20	0.27	78.72 - 79.67
		Site C	78.80	0.25	78.30 - 79.26
		All Sites	**78.93**	**0.36**	**78.30 - 79.67**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	77.65	0.33	77.15 - 78.21
		Site B	78.18	0.45	77.47 - 79.26
		Site C	77.93	0.49	77.43 - 79.04
		All Sites	**77.92**	**0.51**	**77.15 - 79.26**

Reproducibility Agreement Summary for Influenza A H1-2009

Influenza A H1-2009 A/Swine NY/03/2009		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 300 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 100 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 10 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	19/20	1/20	0/20	95.0%	75.1% - 99.9%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**59/60**	**1/60**	**0/60**	**98.3%**	**91.1% – 100%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Influenza A H1-2009 A/Swine NY/03/2009		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
	All Sites	0/540	0/540	540/540	100%	99.3% – 100%

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Influenza A H1-2009

Assay	Influenza A H1-2009 A/Swine NY/03/2009		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	84.67	0.24	84.27 - 85.12
		Site B	85.10	0.24	84.78 - 85.56
		Site C	84.64	0.34	83.76 - 85.23
		All Sites	**84.80**	**0.37**	**83.76 - 85.56**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	84.57	0.27	84.17 - 85.31
		Site B	85.01	0.28	84.59 - 85.75
		Site C	84.68	0.26	84.16 - 85.18
		All Sites	**84.75**	**0.34**	**84.16 - 85.75**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	84.27	0.26	83.85 - 84.81
		Site B	84.75	0.23	84.29 - 85.32
		Site C	84.46	0.35	83.89 - 85.48
		All Sites	**84.48**	**0.37**	**83.85 - 85.48**
FluA-pan2	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	80.62	0.20	80.31 - 80.83
		Site B	81.01	0.17	80.70 - 81.36
		Site C	80.69	0.23	80.19 - 81.02
		All Sites	**80.81**	**0.32**	**80.19 - 81.36**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	80.39	0.29	79.87 - 80.73
		Site B	80.91	0.27	80.20 - 81.24
		Site C	80.30	0.17	80.05 - 80.61
		All Sites	**80.62**	**0.44**	**79.87 - 81.24**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	80.43	0.27	80.08 - 81.03
		Site B	80.72	0.27	80.11 - 81.14
		Site C	80.41	0.34	79.86 - 80.82
		All Sites	**80.54**	**0.34**	**79.86 - 81.14**
FluA-H1-pan	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	78.87	0.40	78.20 - 79.56
		Site B	79.44	0.35	78.94 - 79.99
		Site C	78.62	0.43	77.92 - 79.44
		All Sites	**78.97**	**0.58**	**77.92 - 79.99**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	78.37	0.30	77.89 - 79.24
		Site B	78.90	0.37	78.21 - 79.76
		Site C	78.16	0.25	77.83 - 78.69
		All Sites	**78.47**	**0.51**	**77.78 - 79.76**
	High Negative 0.1x LoD	Site A	78.34	0.37	77.90 - 79.37
		Site B	78.83	0.37	77.99 - 79.68

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Influenza A H1-2009 A/Swine NY/03/2009		Mean Tm	% CV Tm	Observed Tm Range
	10 $TCID_{50}$/mL	Site C	78.08	0.27	77.68 - 78.51
		All Sites	**78.40**	**0.53**	**77.68 - 79.68**
FluA-H1-2009	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	78.73	0.24	78.31 - 79.14
		Site B	79.20	0.24	78.84 - 79.67
		Site C	78.54	0.30	77.89 - 78.92
		All Sites	**78.81**	**0.44**	**77.89 - 79.67**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	78.64	0.26	78.10 - 79.14
		Site B	79.03	0.25	78.53 - 79.48
		Site C	78.49	0.24	78.12 - 78.82
		All Sites	**78.71**	**0.39**	**78.10 - 79.48**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	78.60	0.28	77.90 - 79.04
		Site B	79.00	0.23	78.52 - 79.36
		Site C	78.52	0.28	78.10 - 78.93
		All Sites	**78.70**	**0.38**	**77.90 - 79.36**

Reproducibility Agreement Summary for Influenza A H3

Influenza A H3N2 A/Wisconsin/67/2005		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 15 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 5 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 0.5 $TCID_{50}$/mL	Site A	3/20	11/20	6/20	15.0%	3.2% - 37.9%
	Site B	4/20	12/20	4/20	20.0%	5.7% - 43.7%
	Site C	3/20	8/20	9/20	15.0%	3.2% - 37.9%
	All Sites	**10/60**	**31/60**	**19/60**	**16.7%**	**8.3% - 28.5%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%
	All Sites	**0/540**	**0/540**	**540/540**	**100%**	**99.3% – 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Tm Summary (by assay) for Influenza A H3

Assay	Influenza A H3N2 A/Wisconsin/67/2005		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	85.33	0.26	84.79 - 85.73
		Site B	85.48	0.42	84.91 - 86.27
		Site C	85.06	0.38	84.50 - 85.40
		All Sites	**85.36**	**0.38**	**84.50 - 86.27**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	84.95	0.41	84.19 - 86.03
		Site B	85.31	0.31	84.79 - 86.02
		Site C	84.83	0.26	84.37 - 85.25
		All Sites	**85.03**	**0.41**	**84.19 - 86.03**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	84.91	0.39	84.22 - 85.60
		Site B	85.24	0.30	84.78 - 85.77
		Site C	84.86	0.27	84.48 - 85.33
		All Sites	**85.01**	**0.37**	**84.22 - 85.77**
FluA-pan2	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	79.75	0.25	79.51 - 79.99
		Site B	79.94	0.30	79.40 - 80.37
		Site C	79.60	0.24	79.14 - 79.86
		All Sites	**79.81**	**0.33**	**79.14 - 80.37**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	79.42	0.31	79.00 - 80.30
		Site B	79.69	0.35	79.14 - 80.29
		Site C	79.25	0.20	78.82 - 79.59
		All Sites	**79.45**	**0.37**	**78.82 - 80.30**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	79.22	0.35	78.64 - 79.75
		Site B	79.59	0.29	79.05 - 79.99
		Site C	79.24	0.20	78.84 - 79.54
		All Sites	**79.35**	**0.36**	**78.64 - 79.99**
FluA-H3	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	82.58	0.35	81.87 - 83.01
		Site B	82.89	0.19	82.60 - 83.11
		Site C	82.44	0.33	81.98 - 82.81
		All Sites	**82.62**	**0.39**	**81.87 - 83.11**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	82.32	0.29	81.88 - 82.69
		Site B	82.69	0.34	82.16 - 83.32
		Site C	82.21	0.25	81.76 - 82.73
		All Sites	**82.39**	**0.41**	**81.67 - 83.32**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	82.28	0.36	81.71 - 82.91
		Site B	82.61	0.29	82.17 - 83.05
		Site C	82.20	0.23	81.87 - 82.57
		All Sites	**82.37**	**0.36**	**81.71 - 83.05**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Repeatability

The repeatability of the FilmArray RP results was evaluated with the original FilmArray RP by repeated testing the same 12 specimens tested in the Reproducibility study while minimizing as many sources of variability as possible. The in-house Repeatability testing was performed at Site C over the course of 12 testing days. On each day, all 12 specimens were tested 4 times by 2 operators on 2 FilmArray instruments.

Table 46. Summary of Positive Agreement Results for Repeatability Testing

Organism Result	Moderate Positive (3x LoD)		Low Positive (1x LoD)		High Negative (0.1x LoD)	
	# Positive / Total	% Positive Results	# Positive / Total	% Positive Results	# Positive / Total	% Positive Results
Adenovirus[a]	48/48	100%	48/48	100%	34/48	70.8%
Coronavirus 229E	48/48	100%	48/48	100%	19/48	39.6%
Coronavirus HKU1	48/48	100%	48/48	100%	44/48	91.7%
Coronavirus NL63	48/48	100%	48/48	100%	27/48	56.3%
Coronavirus OC43	48/48	100%	47/48	97.9%	33/48	68.8%
Human Metapneumovirus	47/48	97.9%	48/48	100%	32/48	66.7%
Enterovirus	48/48	100%	48/48	100%	48/48	100%
Human Rhinovirus	144/144	100%	47/48	97.9%	83/96	86.5%
Influenza A H1	48/48	100%	43/48[b]	89.6%[b]	39/48[c]	81.3%[c]
Influenza A H1-2009	48/48	100%	48/48	100%	47/48[d]	97.9%[d]
Influenza A H3	48/48	100%	48/48	100%	7/48[e]	14.6%[e]
Influenza B	48/48	100%	48/48	100%	25/48	52.1%
Parainfluenza Virus 1	47/48	97.9%	48/48	100%	32/48	66.7%
Parainfluenza Virus 2	48/48	100%	47/48	97.9%	27/48	56.3%
Parainfluenza Virus 3	48/48	100%	41/48	85.4%	14/48	29.2%
Parainfluenza Virus 4	48/48	100%	48/48	100%	26/48	54.2%
Respiratory Syncytial Virus	144/144	100%	96/96	100%	32/48	66.7%
Bordetella pertussis	48/48	100%	48/48	100%	27/48	56.3%
Chlamydophila pneumoniae	48/48	100%	46/48	95.8%	18/48	37.5%
Mycoplasma pneumoniae	48/48	100%	47/48	97.9%	19/48	39.6%
% positive (all organisms) per test level	**1102/1104 99.8%**		**942/960 98.1%**		**599/960 62.4%**	

[a] Repeatability testing was performed prior to the modification of the panel to include a second Adenovirus assay. Test concentrations and multiples of LoD reflect the Adenovirus LoD prior to panel modification (300 $TCID_{50}$/mL).
[b] The five (5) non-positive results for Influenza A H1 at LoD include: (1) Negative, (1) Influenza A H1 Equivocal and (3) Influenza A Equivocal results.
[c] The nine (9) non-positive results for Influenza A H1 at 0.1 x LoD include: (1) Negative, (3) Influenza A (no subtype detected), (1) Influenza A H1 Equivocal, and (4) Influenza A Equivocal results.
[d] One (1) Influenza A H1-2009 Equivocal result at the 0.1 x LoD test level.
[e] The 42 non-positive results for Influenza A H3 at 0.1 x LoD include: (18) Negative, (2) Influenza A (no subtype detected) (15) Influenza A H3 Equivocal, and (7) Influenza A Equivocal results.

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Interference

Substances that could be present in NPS samples or introduced during sample handling were evaluated for their potential to interfere with assay performance. Four different mixes containing FilmArray RP organisms were spiked into a simulated NPS (sNPS) sample matrix (human epithelial cells in VTM) at 5x their respective LoDs. The 5x LoD organism concentration was chosen to be near the LoD but also to provide consistent results for sample-to-sample comparison. Each sample was tested with the original FilmArray RP in the presence of each potentially interfering substance listed in Table 47. None of the substances tested were found to compete or interfere with the control or organism assays in the FilmArray RP.

Table 47. List of Potentially Interfering Substances Evaluated (No Interference or Inhibition Observed)

Endogenous Substances		**Competing / Interfering Microorganisms**	
Human Blood (with Na Citrate) (1% v/v)		Respiratory Syncytial Virus A	2.8×10^4 $TCID_{50}$/mL
Mucin (bovine submaxillary gland) (1% v/v)		Human Rhinovirus	1.1×10^4 $TCID_{50}$/mL
Human Genomic DNA: 0.2 ng/µL		Influenza A H1-2009	1.0×10^5 $TCID_{50}$/mL
2 ng/µL		*Staphylococcus aureus*	1.0×10^6 CFU/mL
20 ng/µL		*Neisseria meningitidis*	1.0×10^6 CFU/mL
		Corynebacterium diptheriae	1.0×10^6 CFU/mL
Exogenous Substances			
Saline Nasal Spray with Preservatives (1% v/v)		Analgesic ointment (1% w/v)	
Nasal Decongestant Spray (Oxymetazoline HCl) (1%v/v)		Petroleum Jelly (1% w/v)	
Tobramycin (0.6 mg/mL)		Smokeless Tobacco (1% w/v)	
Mupirocin (2% w/v)		FluMist® Nasal Influenza Vaccine (2009-2010)	
Technique Specific Substances			
Laboratory Reagents:	**Viral Transport Media:**	**Swabs:**	
Bleach (1%, 2%, 5% v/v)	Remel M4	Copan 168C (rayon / twisted aluminum shaft)	
Disinfecting wipes	Remel M4-RT	Copan FloQ (flocked nylon / plastic shaft)	
Ethanol (7% v/v)	Remel M5	Copan 175KS01 (polyester / aluminum shaft)	
DNAzap (1% v/v)	Remel M6	Millipore 519CS01M (flocked nylon / plastic shaft)	
RNaseOut (1% v/v)	Copan UTM		

Evaluation of the FilmArray RP was not performed using clinical NPS specimens obtained from individuals who had recently received the FluMist® nasal influenza vaccine (MedImmune, Gaithersburg, MD). However, analytical testing was performed (using the original FilmArray RP) with simulated samples containing various concentrations of the 2009-2010 formulation of the vaccine material. The FilmArray RP assays react with the Influenza A H1, Influenza A H3 and Influenza B viral material contained in the vaccine (Table 48). No cross-reactivity was observed with other, non-influenza FilmArray RP assays.

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Table 48. Evaluation of FluMist® Nasal Vaccine as a Potentially Interfering Substance

FluMist 2009-2010 (% v/v)	Adenovirus	Coronavirus 229E	Coronavirus HKU	Coronavirus NL63	Coronavirus OC43	Human Metapneumovirus	Human Rhinovirus / Enterovirus	Influenza A			Influenza B	Parainfluenza Virus 1	Parainfluenza Virus 2	Parainfluenza Virus 3	Parainfluenza Virus 4	Respiratory Syncytial Virus	*Bordetella pertussis*	*Chlamydophila pneumoniae*	*Mycoplasma pneumoniae*
								H1	H1-2009	H3									
10%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
1%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.1%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.01%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.001%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.0001%	-	-	-	-	-	-	-	-	-	Equiv [a]	+	-	-	-	-	-	-	-	-
0.00001%	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
0.000001%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Influenza A H3 Equivocal result

Analysis of Potential Interference from Medications

The clinical dataset from the original FilmArray RP was analyzed for evidence of the effects of potentially interfering medications (prescription and over-the-counter; OTC) administered to or taken by the study population. If clinically significant interference from medications had occurred, it would be expected that the organism detection rate in the medicated population would be lower than that in the non-medicated population. This effect was not observed in the clinical dataset. One or more organisms was detected by the reference/comparator methods in 118 of 257 (45.9%) non-medicated individuals. The FilmArray RP correctly identified all organisms in 112 (94.9%) of these individuals. One or more organisms were detected by the reference/comparator methods in 342 of 596 (57.4%) medicated individuals. The FilmArray RP correctly identified all organisms in 331 (96.8%) of these individuals. Table 49 lists the medications administered to or taken by the enrolled study population (self-reported and/or recorded from patient charts).

Table 49. List of Medications Administered/Taken During the FilmArray RP Clinical Evaluation

Acetaminophen	Clindamycin	Lansoprazole	Phenobarbital
Albuterol	Co-trimoxazole	Levalbuterol	Phenylephrine
Alendronate	Cough drops/syrups (various OTC)	Levothyroxine	Pilocarpine
Alprazolam	Cyproheptadine	Lisinopril	Pravachol (Pravastatin)
Amoxicillin	Deferasirox	Loperamide	Prednisolone
Amoxicillin Clavulanate	Dextromethorphan	Loratadine	Prednisone
Azithromycin	Dextromethorphan hydrobromide	Lorazepam	Propranolol
Baclofen	Diphenhydramine	Metoclopramide	Pseudoephedrine
Benzonatate	Doxylamine succinate	Metolazone	Ranitidine
Betamethasone	Electrolyte solutions (rehydration salts)	Metoprolol	Saline Nasal Drops/Sprays (various OTC)
Brimonidine	Enoxaparin	Midazolam	Salmeterol
Budesonide	Eszopiclone	Montelukast	Simethicone
Budesonide/Formoterol	Fentanyl	Naproxen	Sirolimus

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Fumarate Dihydrate			
Bupropion hydrochloride	Fluticasone	Nizatidine	Spironolactone
Carvedilol	Furosemide	Omeprazole	Temazepam
Cefdinir	Gabapentin	Oseltamivir	Tiotropium
Cefepime	Gemfibrozil	Oxybutynin	Ursodiol
Ceftriaxone	Guaifenesin	Pancrelipase	Valacyclovir
Cephrazole	Hydrocodone	Pantoprazole	Vancomycin
Cetirizine	Ibuprofen	Penicillin	Vitamins/Multivitamins/ Minerals (various OTC)
Chlorpheniramine maleate	Inderal (Propranolol)	Pentamidine	Voriconazole
Ciprofloxacin	Isosorbide		

PERFORMANCE CHARACTERISTICS OF FILMARRAY RP ON FILMARRAY 2.0 AND FILMARRAY TORCH

Clinical and non-clinical studies have established that the performance characteristics of the FilmArray RP, including LoD (see Limit of Detection section above), clinical sensitivity and specificity, and reproducibility are equivalent on FilmArray, FilmArray 2.0 and FilmArray Torch systems.

NOTE: FilmArray Torch Modules are FilmArray 2.0 instruments that have been re-configured into a stacked system for higher-throughput in a smaller workspace.

Clinical Comparison

A clinical comparison study was performed using specimens previously obtained during the FilmArray RP prospective clinical evaluation and supplemented with other archived specimens collected from external medical facilities and reference laboratories to increase the number of specimens being tested for low prevalence analytes. A total of 102 specimens were selected such that each analyte was represented 3-5 times. Each specimen was thawed and tested using the FilmArray and FilmArray 2.0 systems. Overall positive percent agreement (PPA) between systems was 96.8% with the lower bound of the two-sided 95% confidence interval (95% CI) at 92.0%. Overall negative percent agreement (NPA) was 99.8% with the lower bound of the two-sided 95% CI at 99.5%.

Table 50. Analyte Results from FilmArray System Clinical Comparison Study

Analyte	FilmArray 2.0 / FilmArray					
	PPA	%	95% CI	NPA	%	95% CI
Viruses						
Adenovirus	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Coronavirus 229E	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Coronavirus HKU1	6/6	100%	54.1-100%	95/96	99%	94.3-100%
Coronavirus NL63	6/6	100%	54.1-100%	96/96	100%	96.2-100%
Coronavirus OC43	4/5	80%	28.4-99.5%	97/97	100%	96.3-100%
Human Metapneumovirus	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Human Rhinovirus/Enterovirus	9/10	90%	55.5-99.7%	91/92	98.9%	94.1-100%
Influenza A	16/16	100%	79.4-100%	86/86	100%	95.8-100%
Influenza A H1	3/3	100%	29.2-100%	99/99	100%	96.3-100%
Influenza A H1-2009	6/6	100%	54.1-100%	96/96	100%	96.2-100%

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Analyte	FilmArray 2.0 / FilmArray					
	PPA	%	95% CI	NPA	%	95% CI
Influenza A H3	7/7	100%	59-100%	95/95	100%	96.2-100%
Influenza B	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Parainfluenza Virus 1	7/7	100%	59-100%	95/95	100%	96.2-100%
Parainfluenza Virus 2	6/6	100%	54.1-100%	95/96	99%	94.3-100%
Parainfluenza Virus 3	6/6	100%	54.1-100%	96/96	100%	96.2-100%
Parainfluenza Virus 4	5/6	83.3%	35.9-99.6%	96/96	100%	96.2-100%
Respiratory Syncytial Virus	8/8	100%	63.1-100%	94/94	100%	96.2-100%
Bacteria						
Bordetella pertussis	4/4	100%	39.8-100%	97/98	99%	94.4-100%
Chlamydophila pneumoniae	3/3	100%	29.2-100%	99/99	100%	96.3-100%
Mycoplasma pneumoniae	5/6	83.3%	35.9-99.6%	96/96	100%	96.2-100%
Overall agreement	***121/125***	***96.8%***	***92.0-99.1%***	***1911/1915***	***99.8%***	***99.5-99.9%***

System performance for testing of 102 specimens on each platform was calculated. For the FilmArray, a total of 108 runs were attempted, 104 of which were completed (96.3%; 104/108). There were two run failures each for software (1.9%) and instrument (1.9%) errors. No control failures were observed. Two specimens were retested due to Influenza A 'equivocal' results. For the FilmArray 2.0, a total of 103 runs were attempted, all of which completed (100%; 103/103). No control failures were observed. One specimen was retested due to an Influenza A 'equivocal' result.

Reproducibility

A multicenter reproducibility study was performed to determine between-site and overall reproducibility of the FilmArray RP on FilmArray 2.0 systems. Reproducibility testing occurred at three test sites using contrived NPS samples, each spiked with various combinations of four different RP analytes representing the types of organisms detected by the panel (bacteria, DNA viruses and RNA viruses). Each analyte was evaluated at three different concentrations (Negative, Low Positive and Moderate Positive). Negative results for each assay were obtained from samples that were not spiked with a corresponding organism (analyte not in the sample).

The data include 90 replicates per analyte and incorporate a range of potential variation introduced by 8 different operators, 3 different pouch lots, and 11 different FilmArray 2.0 instruments configured on 3 different multi-instrument systems. Similar to the reproducibility of the FilmArray RP on the FilmArray (Tables 44-45 above), percent (%) agreement with the expected Detected, Not Detected or N/A result was 95.6% or better and the standard deviation in Tm was 0.5˚C or less for all assays.

Table 51. Summary of Reproducibility Results on the FilmArray 2.0

Analyte Tested	Concentration Tested	Expected Test Result	% Agreement with Expected Result			
			Site/System			Total (95% Confidence Interval)
			A	B	C	
Bordetella pertussis **Strain A639** Zeptometrix 0801459	**Moderate Positive** 3× LoD $1.2x10^4$ CFU/mL	Detected	30/30 100%	29/30 96.7%	30/30 100%	89/90 98.9% (94.0-100%)

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Analyte Tested	Concentration Tested	Expected Test Result	% Agreement with Expected Result			
			Site/System			Total (95% Confidence Interval)
			A	B	C	
	Low Positive 1× LoD 4x10^3 CFU/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Adenovirus Species C Serotype 1 Zeptometrix 0810050CF	**Moderate Positive** 3× LoD 3.0x10^2 TCID$_{50}$/mL	Detected	29/30 96.7%	30/30 100%	28/30 93.3%	89/90 98.9% (94.0%-100%)
	Low Positive 1× LoD 1.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	29/30 96.7%	89/90 98.9% (94.0%-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Influenza A H1N1-2009 A/SwineNY/03/2009 Zeptometrix 0810109CFN	**Moderate Positive** 3× LoD 3.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Low Positive 1× LoD 1.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Respiratory Syncytial Virus Type A Zeptometrix 0810040ACF	**Moderate Positive** 3× LoD 6.0 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Low Positive 1× LoD 2.0 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)

A similar FilmArray RP reproducibility evaluation was performed on FilmArray Torch systems. Contrived samples containing each FilmArray RP analyte at low positive levels (1x LoD) were tested on three complete FilmArray Torch systems (12 FilmArray Torch Modules per system) over five days (30 replicates per analyte per system for 90 total replicates per analyte). Agreement with the expected Detected results on FilmArray Torch systems was ≥95.6% for each FilmArray RP analyte and agreement with the expected negative results (Not Detected) was 100% for each analyte.

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REFERENCES

1. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases (DVD) Web site. http://www.cdc.gov/ncidod/dvrd/revb/respiratory/eadfeat.htm. Accessed January 7, 2011.
2. Kahn, J.S. and K. McIntosh, *History and recent advances in coronavirus discovery.* Pediatr Infect Dis J, 2005. **24**(11 Suppl): p. S223-7, discussion S226.
3. Kuypers, J., et al., *Clinical disease in children associated with newly described coronavirus subtypes.* Pediatrics, 2007. **119**(1): p. e70-6.
4. Romero, J., *Enteroviruses and Parechoviruses*, in *Manual of Clinical Microbiology, 9th Edition*, P. Murray, Baron, E., Pfaller, M., Jorgensen, J., Landry, M., Editor. 2007, American Society for Microbiology.
5. Jacques, J., et al., *Epidemiological, molecular, and clinical features of enterovirus respiratory infections in French children between 1999 and 2005.* J Clin Microbiol, 2008. **46**(1): p. 206-13.
6. Anzueto, A. and M.S. Niederman, *Diagnosis and treatment of rhinovirus respiratory infections.* Chest, 2003. **123**(5): p. 1664-72.
7. Kahn, J.S., *Epidemiology of human metapneumovirus.* Clin Microbiol Rev, 2006. **19**(3): p. 546-57.
8. World Health Organization.WHO Fact Sheet No. 221, April 2009. Influenza (Seasonal). http://www.who.int/mediacentre/factsheets/fs211/en/index.html. Accessed January 7, 2011.
9. Flu.gov. Flu.gov web site. About the Flu. http://flu.gov/individualfamily/about/index.html. Accessed January 8, 2011.
10. Henrickson, K.J., *Parainfluenza viruses.* Clin Microbiol Rev, 2003. **16**(2): p. 242-64.
11. Lau, S.K., et al., *Human parainfluenza virus 4 outbreak and the role of diagnostic tests.* J Clin Microbiol, 2005. **43**(9): p. 4515-21.
12. Mohapatra, S.S. and S. Boyapalle, *Epidemiologic, experimental, and clinical links between respiratory syncytial virus infection and asthma.* Clin Microbiol Rev, 2008. **21**(3): p. 495-504.
13. Panozzo, C.e.a., *Brief report: respiratory syncytial virus activity- United States, July 2007-December 2008.* MMWR, 2008. **57**: p. 1355-1358.
14. Mattoo, S. and J.D. Cherry, *Molecular pathogenesis, epidemiology, and clinical manifestations of respiratory infections due to Bordetella pertussis and other Bordetella subspecies.* Clin Microbiol Rev, 2005. **18**(2): p. 326-82.
15. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Disease Listing: Chlamydophila pneumoniae Web Site . http://www.cdc.gov/ncidod/dbmd/diseaseinfo/chlamydiapneumonia_t.htm. Accessed October 6, 2011.
16. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Disease Listing: Mycoplasma pneumoniae Web Site . http://www.cdc.gov/ncidod/dbmd/diseaseinfo/mycoplasmapneum_t.htm. Accessed October 12, 2011
17. Mezarina, K., Huffmire A , Downing, J, Core, N , Gershman,K , Hoffman, R *Outbreak of Community-Acquired Pneumonia Caused by Mycoplasma pneumoniae --- Colorado, 2000.* MMWR, 2001. **50**(12): p. 227-230.
18. Calder, J.A., et al., *Adenovirus type 7 genomic-type variant, New York City, 1999.* Emerg Infect Dis, 2004. **10**(1): p. 149-52.
19. Metzgar, D., et al., *Abrupt emergence of diverse species B adenoviruses at US military recruit training centers.* J Infect Dis, 2007. **196**(10): p. 1465-73.
20. Russell, K.L., et al., *Transmission dynamics and prospective environmental sampling of adenovirus in a military recruit setting.* J Infect Dis, 2006. **194**(7): p. 877-85.
21. Kahn, J.S., *The widening scope of coronaviruses.* Curr Opin Pediatr, 2006. **18**(1): p. 42-7.
22. van der Hoek, L., et al., *Croup is associated with the novel coronavirus NL63.* PLoS Med, 2005. **2**(8): p. e240.
23. Lau, S.K., et al., *Coronavirus HKU1 and other coronavirus infections in Hong Kong.* J Clin Microbiol, 2006. **44**(6): p. 2063-71.
24. Dominguez, S.R., C.C. Robinson, and K.V. Holmes, *Detection of four human coronaviruses in respiratory infections in children: a one-year study in Colorado.* J Med Virol, 2009. **81**(9): p. 1597-604.
25. van den Hoogen, B.G., et al., *A newly discovered human pneumovirus isolated from young children with respiratory tract disease.* Nat Med, 2001. **7**(6): p. 719-24.
26. Falsey, A.R., et al., *Human metapneumovirus infections in young and elderly adults.* J Infect Dis, 2003. **187**(5): p. 785-90.
27. Brammer, L., K. Fukuda, A. Klimov, and N. Cox. 2002, *Influenza*, in *VPD Surveillence Manual, 3rd Edition*. 2002.

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28. Jhung M, e.a., *Update: influenza activity -- United States, August 30, 2009-March 27, 2010, and composition of the 2010-11 influenza vaccine.* MMWR, 2010. **59**: p. 423-30.
29. WHO. *Influenza: About antiviral drugs*. Available from: http://www.euro.who.int/en/what-we-do/health-topics/communicable-diseases/influenza/facts-and-figures/seasonal-influenza/about-antiviral-drugs.
30. Morens, D.M., J.K. Taubenberger, and A.S. Fauci, *Predominant role of bacterial pneumonia as a cause of death in pandemic influenza: implications for pandemic influenza preparedness.* J Infect Dis, 2008. **198**(7): p. 962-70.
31. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Pertussis (Whooping Cough) Web Site . http://www.cdc.gov/pertussis/. Accessed May 3, 2012
32. World Health Organization (WHO). WHO Immunization, Vaccines and Biologicals; Pertussis Web Site. http://www.who.int/immunization/topics/pertussis/en/index.html. Accessed May 3, 2012.
33. Srugo, I., et al., *Pertussis infection in fully vaccinated children in day-care centers, Israel.* Emerg Infect Dis, 2000. **6**(5): p. 526-9.
34. Hahn, D.L., et al., *Chlamydia pneumoniae as a respiratory pathogen.* Front Biosci, 2002. **7**: p. e66-76.
35. Grayston, J.T., *Chlamydia pneumoniae, strain TWAR pneumonia.* Annu Rev Med, 1992. **43**: p. 317-23.
36. Peeling, R.W. and R.C. Brunham, *Chlamydiae as pathogens: new species and new issues.* Emerg Infect Dis, 1996. **2**(4): p. 307-19.
37. Klement, E., et al., *Identification of risk factors for infection in an outbreak of Mycoplasma pneumoniae respiratory tract disease.* Clin Infect Dis, 2006. **43**(10): p. 1239-45.
38. Trakhna, F., et al., *Rapid Aeromonas hydrophila identification by TaqMan PCR assay: comparison with a phenotypic method.* Lett Appl Microbiol, 2009. **49**(2): p. 186-90.
39. *Protection of Laboratory Workers From Occupationally Acquired Infections; Approved Guideline M29*, Clinical Laboratory Standards Institute.
40. Summary of Notifiable Diseases. MMWR available at http://www.cdc.gov
41. CIFOR Analysis of State Legal Authorities available at http://www.cifor.us
42. NCCLS, *Statistical Quality Control for Quantitative Measurement Procedures: Principles and Definitions; Approved Guideline. NCCLS Document C24-A3.* 2006, National Committee for Clinical Laboratory Standards: Wayne Pennsylvania.
43. NCCLS, *User Protocol for Evaluation of Qualitative Test Performance; Approved Guideline. NCCLS Document E12-A2*. 2008, National Committee for Clinical Laboratory Standards Wayne Pennsylvania.

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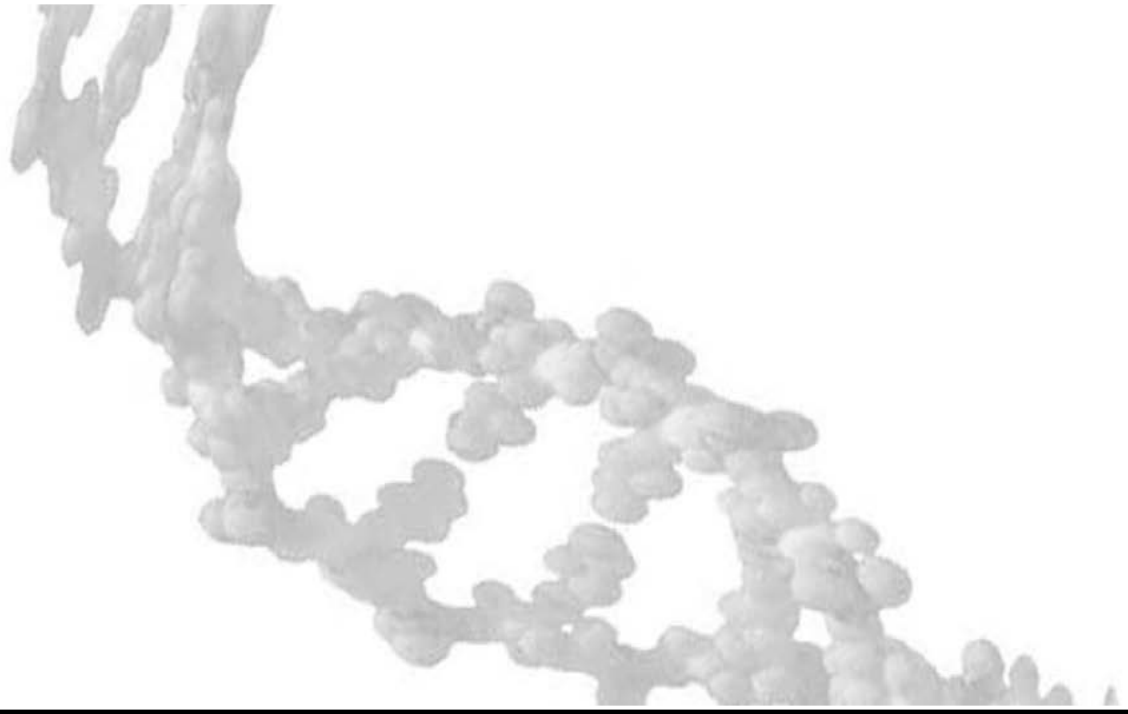

FilmArray® Respiratory Panel (RP)

Instruction Booklet

For use with the FilmArray Injection Vial-based loading system

IVD

CE 0088

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TABLE OF SYMBOLS

The following symbols can be found on FilmArray Respiratory Panel Kit components or throughout this Instruction Booklet. Use the definitions below as a guideline to interpreting the symbols.

Table of Symbols					
	Manufacturer	REF	Catalog Number		~~Expiry Date~~ Use-By date (YYYY-MM-DD)
	Consult Instructions for Use	LOT	~~Lot Number~~ Batch Code (Lot Number)		~~Storage~~ Temperature ~~Limitations~~limit
CE	European Union Conformity	SN	Serial Number	Σ n	Contains Sufficient For <n> Tests
IVD	*In vitro* Diagnostic Medical Device		Keep Away from Sunlight		Do Not Reuse
	Serious eye damage, cat. 1		Acute toxicity, cat. 4 & Skin irritation, cat. 2		Do Not Use if Package is Damaged
EC REP	Authorized representative in the European Community				

E-LABELING

The manual for this product can be accessed online at www.online-ifu.com/KEY-CODE. The product KEY-CODE is provided on the outer box label at the end of the URL. The KEY-CODE for this instruction booklet is also listed below. Additionally, a paper copy is available upon request by contacting customer service via phone, fax, email, or regular mail.

FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit - IFU	https://www.online-ifu.com/ITI0040
FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit – Quick Guide	https://www.online-ifu.com/ITI0050
FilmArray Respiratory Panel (RP) CE IVD 6 and 30 Pack Kit - SDS	https://www.online-ifu.com/ITI0054

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NAME AND INTENDED USE

FilmArray Respiratory Panel

FilmArray Respiratory Panel (RP) is a multiplexed nucleic acid test intended for use with FilmArray systems for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the FilmArray RP may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis,* Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4 were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens.

Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., cell culture or sequence analysis).

The FilmArray RP assay for Coronavirus OC43 may cross-react with some isolates of Coronavirus HKU1. A dual positive result may be due to cross-reactivity or may indicate a co-infection.

Performance characteristics for Influenza A were established when Influenza A H1-2009, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent Influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

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SUMMARY AND EXPLANATION OF THE TEST

Respiratory pathogens cause acute local and systemic disease of varying severity, with the most severe cases occurring in children, the elderly and immunocompromised individuals. Respiratory symptoms can include coughing, nasal discharge, congestion, fever, wheezing, headache and myalgia. Due to the similarity of diseases caused by many viruses and bacteria, diagnosis based on clinical symptoms alone is difficult. Identification of potential causative agents provides data to aid the physician in determining appropriate patient treatment and public health response for disease containment. The FilmArray RP pouch is designed for simultaneous detection and identification of the following upper respiratory viruses and bacteria: Adenovirus, Coronavirus 229E, Coronavirus HKU1, Coronavirus NL63, Coronavirus OC43, Influenza A (with subtyping for hemagglutinin genes H1, H1-2009 and H3), Influenza B, Human Metapneumovirus, Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3, Parainfluenza Virus 4, Respiratory Syncytial Virus, Rhinovirus/Enterovirus, *Bordetella pertussis*, *Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*. A summary of characteristics for these organisms is provided in Table 1.

Table 1. Respiratory Pathogens Detected in the FilmArray Respiratory Panel

Organism (abbreviation)	Classification (Genome type)	Season of Highest Incidence[a]	Most Commonly Infected Demographic
Adenovirus (AdV)	Adenovirus (DNA)	Late winter to early summer[1]	All ages, immunocompromised[1]
Coronavirus (CoV) 229E, HKU1, NL63, OC43	Coronavirus (RNA)	Winter, spring[2-3]	Children, adults[2-3]
Enterovirus (EV)	Picornavirus(RNA)	Summer, early fall [4]	All ages[5]
Human Rhinovirus (HRV)	Picornavirus (RNA)	Fall, spring[6]	All ages[6]
Human Metapneumovirus (hMPV)	Paramyxovirus (RNA)	Winter, early spring[7]	Children[7]
Influenza A (Flu A) (subtypes H1, H1-2009, and H3)	Orthomyxovirus (RNA)	Winter [8]	All ages [8], 5-20 % of US population[9]
Influenza B (Flu B)	Orthomyxovirus (RNA)	Winter [8]	All ages [8], 5-20 % of US population[9]
Parainfluenza Virus 1 (PIV1)	Paramyxovirus (RNA)	Fall, periodicity of 1-2 years[10]	Infants, young children, immunocompromised[10]
Parainfluenza Virus 2 (PIV2)	Paramyxovirus (RNA)	Fall, periodicity of 1-2 years[10]	Infants, young children, immunocompromised[10]
Parainfluenza Virus 3 (PIV3)	Paramyxovirus (RNA)	Spring, summer[10]	Infants, young children, immunocompromised [10]
Parainfluenza Virus 4 (PIV4)	Paramyxovirus (RNA)	Unknown	All ages[11]
Respiratory Syncytial Virus (RSV)	Paramyxovirus (RNA)	Winter, varies by location[12-13]	Children, older adults[12-13]
Bordetella pertussis	Bacterium (DNA)	No peak season	All ages[14]
Chlamydophila pneumoniae	Bacterium (DNA)	No peak season	Older children, young adults, immunocompromised[15]
Mycoplasma pneumoniae	Bacterium (DNA)	Outbreaks most common in summer, outbreak periodicity 4 – 7 years	Older children, young adults[16-17]

[a] based on North American seasons

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Summary of Detected Organisms

Adenoviruses are a diverse group of non-enveloped DNA viruses with seven species (A to G) categorized by hemagglutination and approximately 55 serotypes. All serotypes have been associated with human disease. Adenovirus species B, C, and E cause acute respiratory disease. Outbreaks occur in institutional settings such as military training, long-term care facilities, and pediatric tertiary-care hospitals, due to high rates of transmission in closed populations [18-20]. Adenoviruses (species A, D, F and G) can cause a variety of illnesses, including cystitis, gastroenteritis, and conjunctivitis [1]. Adenoviruses are shed for long periods of time and persist on surfaces in an infective state [20].

Coronaviruses 229E, HKU1, NL63, and OC43. Human Coronaviruses were established as respiratory pathogens in the 1960's. Initially, two serologic variants were characterized (229E and OC43) and recently, two additional human coronaviruses (HKU1 and NL63) have been identified [2, 21-23]. These viruses are most commonly associated with upper respiratory tract infections; however, they have also been detected in individuals with lower respiratory tract infections [2-3, 24]. Coronaviruses have been associated with croup and exacerbation of asthma [2, 22]. Coronavirus infection occurs more often in the winter and there appears to be a periodicity of epidemics for strains 229E and OC43 of every two to three years [3].

Human Metapneumovirus was discovered in 2001 as a respiratory pathogen in children [25]. Further studies confirmed hMPV infections in persons of all ages [26]. Human Metapneumoviruses are in the family *Paramyxoviridae* [7]. Infection in infants and young children is commonly associated with bronchiolitis [7]. The two genotypes, A and B, can circulate at the same time and do not appear to differ in the severity of illness [7].

Influenza A and B are RNA viruses in the *Orthomyxoviridae* family. During annual Influenza epidemics, 5-20% of the population is affected with upper respiratory tract infections with rapid onset of fever [8]. The dominant type of Influenza virus varies often due to antigenic drift and shift [27]. During the 2009-10 Influenza season, Influenza A H1-2009 was the dominant circulating Influenza virus, accounting for approximately 99% of reported Influenza infections [28] (Table 2). Influenza A can be subtyped by the hemagglutinin (H) and neuraminidase (N) genes; subtypes H1N1 and H3N2 are the strains that most commonly infect humans. More severe disease and increased mortality are associated with H3N2 subtype [27]. Currently, at least four antiviral medications are available for Influenza treatment – amantadine, rimantadine, zanamivir and oseltamivir – with type-specific efficacy and drug resistance arising with the spread of new strains of the virus [27, 29]. Complications with viral or bacterial pneumonia increase mortality from Influenza infections [30].

Table 2. Proportions of Influenza Subtype Infections in the United States (as reported by the US Centers for Disease Control)

Flu Season	Influenza A	% of Influenza A			Influenza B
		H1	H1-2009	H3	
2009-2010[1,2]	99.6%	0.1	99.8	0.1	0.4%
2008-2009	89.4%	13.2	79.9	6.9	10.6%
2007-2008	71%	26.2	0.0	73.8	29%
2006-2007	79.2%	62.3	0.0	37.7	20.8%
2005-2006	79.7%	8.1	0.0	91.9	20.3%

[1] Season during which prospective clinical data described in this package insert were accumulated
[2] Cumulative results from August 30, 2009 to May 22, 2010

Parainfluenza Viruses. Parainfluenza viruses are RNA viruses in the *Paramyxoviridae* family. In the 1950's, Parainfluenza viruses were determined to be respiratory pathogens different from influenza viruses [10]. Parainfluenza viruses are divided into four types antigenically and genetically, with type 4 further subtyped as A and B

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[10]. Parainfluenza Virus 1 causes biennial epidemics in the fall, with 50% of croup cases attributed to this virus [10]. Parainfluenza Virus 2 has a periodicity of epidemics of one to two years that may alternate with Parainfluenza 1 outbreaks [10]. Children less than six months old are particularly susceptible to Parainfluenza Virus 3 infection, with outbreaks occurring in neonatal intensive care units and epidemics are most common in the spring and summer [10]. Parainfluenza Virus 4 infection affects all age groups and a periodicity of infection has not been established [11].

Respiratory Syncytial Virus is a member of the RNA viruses in the *Paramyxoviridae* family, related to human metapneumoviruses and parainfluenza viruses [12]. RSV is the most common cause of severe respiratory disease in infants, with acute bronchiolitis as the major cause of hospitalization [12]. An association of asthma with RSV infection is being investigated [12]. Treatment or prophylaxis with a humanized monoclonal antibody against the fusion protein of RSV has shown a reduction in disease for high risk infants [12].

Rhinoviruses and **Enteroviruses** are related RNA viruses in the *Picornavirus* family [6]. There are more than 100 serotypes of Human Rhinovirus based on the serology of the capsid protein [6]. Rhinovirus is noted as causing the "common cold", but may also be involved in precipitating asthma attacks and severe complications [6]. Enteroviruses are divided into four species that include a total of 89 serotypes. Individual serotypes can be associated with different clinical manifestations, including nonspecific respiratory illnesses in infants or adults [5].

Bordetella pertussis is the causative agent of whooping cough or pertussis, a vaccine-preventable disease that is reportable to public health organizations [31-32]. *B. pertussis* is a gram-negative bacterium with a high infectivity rate that is treatable with several antibiotics [14]. Vaccine-induced immunity has been shown to decrease after 5-10 years. Pertussis occurs most commonly in children but also occurs in adolescents and adults and outbreaks have been documented in fully vaccinated populations due to waning immunity [14, 33]. The highest mortality from pertussis occurs with infants and elderly [14]. Early (catarrhal) pertussis disease is non-specific, and classic signs of pertussis (paroxysmal coughing, inspiratory 'whoop', post-tussive emesis, as well as apnea or cyanosis in infants) do not arise until approximately 2 weeks after the initial onset of symptoms. Symptoms of *B. pertussis* infection are known to vary due to a number of factors including: age, previous immunization or infection, passively acquired antibody, and antibiotic treatment [14]. No peak season has been defined for *B. pertussis* infection.

Chlamydophila pneumoniae is an obligate intracellular bacterium that causes acute respiratory infections and is a common cause of community-acquired pneumonia [34-35]. Outbreaks occur in schools, military barracks, and nursing homes [36]. No peak season has been identified for *C. pneumoniae* infections.

Mycoplasma pneumoniae is a causative agent of community-acquired atypical pneumonia, frequently in outbreak situations [17, 37]. Incubation time for *M. pneumoniae* infection is approximately 1 to 4 weeks [16]. *M. pneumoniae* respiratory disease does not have a defined season of highest incidence but epidemics have a periodicity of 3-7 years [37].

Principle of the Procedure

The FilmArray RP pouch is a closed system disposable that houses all the chemistry required to isolate, amplify and detect nucleic acid from multiple respiratory pathogens within a single NPS specimen. The rigid plastic component (fitment) of the FilmArray RP pouch contains reagents in freeze-dried form. The flexible plastic portion of the pouch is divided into discrete segments (blisters) which, through interactions with actuators and sensors in the FilmArray instrument, are where the required chemical processes are carried out. The user of the FilmArray RP loads the sample into the FilmArray RP pouch, places the pouch into the FilmArray instrument/M~~m~~odule, and starts the run. All other operations are automated.

The following is an overview of the testing procedure:

1. Remove the FilmArray pouch from its vacuum-sealed package. Since solutions are drawn into the FilmArray RP pouch by vacuum, it is important to keep pouches in their protective packaging until the time of use.

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2. Place the FilmArray RP pouch into the FilmArray Pouch Loading Station. The FilmArray Pouch Loading Station has been designed to prevent error by providing instructions and visual cues in the form of color-coded arrows to ensure that the pouch is properly loaded.

3. Load Hydration Solution into the FilmArray RP pouch. Loading the pouch with Hydration Solution rehydrates the freeze-dried reagents contained in the pouch fitment.

4. Mix NPS specimen with Sample Buffer. The Sample Buffer contains reagents that inactivate RNases in the sample and promote binding of nucleic acids to magnetic beads for isolation.

5. Load the sample/buffer mixture into the FilmArray RP pouch. A process control contained in the fitment of the pouch is introduced into the sample. The process control monitors all of the critical processes that occur in the pouch.

6. Transfer the pouch to the instrument/Module and initiate a run. To aid in proper insertion of the pouch in the instrument, the FilmArray software provides on-screen animations illustrating the steps needed to start the run.

7. View results on the test report at the completion of the run.

The following is an overview of the operations and processes that occur during a FilmArray run:

1. **Nucleic Acid Purification** - Nucleic acid purification occurs in the first three blisters of the pouch. The sample is lysed by agitation (bead beating) and the liberated nucleic acid is captured, washed and eluted using magnetic bead technology. These steps require about ten minutes and the bead-beater apparatus can be heard as a high-pitched whine during the first minute of operation.

2. **Reverse Transcription and 1st Stage Multiplex PCR** - Since many pathogens identified by the FilmArray RP pouch are RNA viruses, a reverse transcription (RT) step is performed to convert the viral RNA into cDNA prior to amplification. The purified nucleic acid solution is combined with a preheated master mix to initiate the RT step and subsequent thermocycling for multiplex PCR. The effect of 1st stage PCR is to enrich for the target nucleic acids present in the sample.

3. **2nd Stage PCR** - The products of 1st stage PCR are diluted and mixed with fresh PCR reagents containing an intercalating fluorescent DNA dye (LCGreen® Plus, BioFire Diagnostics, LLC). This solution is distributed over the 2nd stage PCR array. The individual wells of the array contain primers for different assays (each present in triplicate) that target specific nucleic acid sequences from each of the pathogens detected, as well as control template material. These primers are 'nested' or internal to the specific products of the 1st stage multiplex reaction, which enhances both the sensitivity and specificity of the reactions.

4. **DNA Melting Analysis** – After 2nd stage PCR, the temperature is slowly increased and fluorescence in each well of the array is monitored and analyzed to generate a melting curve. The temperature at which a specific PCR product melts (melting temperature or Tm) is consistent and predictable and the FilmArray software automatically evaluates the data from replicate wells for each assay to report results. For a description of data interpretation and reporting see the Interpretation of Results section of this booklet.

The FilmArray software controls the operation of the instrument/Module, collects and analyzes data, and automatically generates a test report at the end of the run. The entire process takes about an hour. Additional detail for each FilmArray system can be found in the appropriate FilmArray Operator's Manual.

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MATERIALS PROVIDED

Each kit contains sufficient reagents to test 30 or 6 specimens:

- Individually packaged FilmArray RP pouches
- Single-use (1.0 mL) Sample Buffer ampoules
- Single-use pre-filled (1.5 mL) Hydration Injection Vials (blue)
- Single-use Sample Injection Vials (red)
- Individually packaged Transfer Pipettes

MATERIALS REQUIRED BUT NOT PROVIDED

FilmArray system including:

- FilmArray ~~or~~, FilmArray 2.0, or FilmArray Torch ~~instrument~~ and software
- FilmArray Pouch Loading Station

WARNINGS AND PRECAUTIONS

General Precautions

1. For *in vitro* diagnostic use only.
2. This device is restricted to sale by or on the order of a physician, or to a clinical laboratory; its use is restricted to, by, or on the order of a physician.
3. A trained healthcare professional should carefully interpret the results from the FilmArray RP in conjunction with a patient's signs and symptoms and results from other diagnostic tests.
4. FilmArray RP pouches are only for use with FilmArray systems.
5. Performance characteristics of the FilmArray RP have only been determined with nasopharyngeal swab (NPS) specimens.
6. Always check the expiration date on the pouch and do not use a pouch after its expiration date.
7. Pertussis is a nationally notifiable infectious condition in the U.S. If *Bordetella pertussis* is detected, notify the state and/or local health departments.

Safety Precautions

1. Wear appropriate Personal Protective Equipment (PPE), including (but not limited to) disposable powder-free gloves and lab coats. Protect skin, eyes and mucus membranes. Change gloves often when handling reagents or specimens.
2. Handle all specimens and waste materials as if they were capable of transmitting infectious agents. Observe safety guidelines such as those outlined in CDC/NIH *Biosafety in Microbiological and Biomedical Laboratories* [38], the CLSI Document M29 *Protection of Laboratory Workers from Occupationally Acquired Infections* [39], or other appropriate guidelines.
3. Follow your institution's safety procedures for handling biological samples.
4. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection

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control precautions for novel virulent Influenza viruses and sent to state or local health department for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

5. Dispose of materials used in this assay, including reagents, specimens, and used buffer vials, according to federal, state, and local regulations.
6. Sample Buffer is assigned the following classifications: Acute toxicity (Category 4), Serious Eye damage (Category 1), and Skin irritation (Category 2). Accordingly, the Sample Buffer is harmful if swallowed, causes serious eye damage, and causes skin irritation. The following precautions should be observed:

   Wear protective gloves/eye protection/face protection.

   IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.

   IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

   Please refer to the FilmArray Respiratory Panel Safety Data Sheet (SDS) for more information.

7. Sample Buffer will form hazardous compounds and fumes when mixed with bleach or other disinfectants.

WARNING: Bleach should never be added to Sample Buffer or sample waste.

8. Bleach, a recommended disinfectant, is corrosive and may cause severe irritation or damage to eyes and skin. Vapor or mist may irritate the respiratory tract. Bleach is harmful if swallowed or inhaled. The following first aid measures are recommended.

   Eye contact: Hold eye open and rinse with water for 15-20 minutes. Remove contact lenses after the first 5 minutes and continue rinsing eye. Seek medical attention.

   Skin contact: Immediately flush skin with plenty of water for at least 15 minutes. If irritation develops, seek medical attention.

   Ingestion: Do not induce vomiting. Drink a glassful of water. If irritation develops, seek medical attention.

   Please refer to the appropriate Safety Data Sheet (SDS) for more information.

Laboratory Precautions

1. **Preventing organism contamination**

   Due to the sensitive nature of the FilmArray RP, it is important to guard against contamination of the work area by following these guidelines:

   - Laboratory workers can be infected with common respiratory pathogens and can inadvertently contaminate the sample while it is being processed. To avoid this, specimens should be processed and pouches should be loaded in a biosafety cabinet. If a biosafety cabinet is not used, a dead air box (e.g., AirClean PCR workstation), a splash shield (e.g., Bel-Art Scienceware Splash Shields), or a face shield should be used when preparing specimens.
   - A biosafety cabinet that is used for performing viral or bacterial culture should not be used for specimen preparation or pouch loading.
   - Prior to processing a specimen, thoroughly clean both the work area and the FilmArray Pouch Loading Station using a suitable cleaner such as freshly prepared 10% bleach or a similar disinfectant. To avoid residue build-up and potential PCR inhibition, wipe disinfected surfaces with water.

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- Some *Bordetella pertussis* acellular vaccines (i.e. Pentacel®, Daptacel®, and Adacel®) contain PCR-detectable DNA. Contamination of specimens or testing materials with vaccine can cause false-positive *B. pertussis* results. Specimens should not be collected or processed in areas that are exposed to *B. pertussis* vaccine material and particular care should be taken during specimen collection and handling to avoid contamination (http://www.cdc.gov/pertussis/clinical/diagnostic-testing/diagnosis-pcr-bestpractices.html).
- Specimens and pouches should be handled one-at-a-time.
- Use clean gloves to remove materials from bulk packaging bags, and reseal bulk packaging bags when not in use.
- Change gloves and clean the work area between preparation of each patient specimen.
- Laboratory workers with active respiratory symptoms (runny nose, cough) should wear a standard surgical mask (or equivalent) and should avoid touching the mask while preparing specimens.

2. **Preventing amplicon contamination**

   A common concern with PCR-based assays is false positive results caused by contamination of the work area with PCR amplicon. Because the FilmArray RP pouch is a closed system, the risk of amplicon contamination is low provided that pouches remain intact after the test is completed. Adhere to the following guidelines to prevent amplicon contamination:

   - Discard used pouches in an appropriate biohazard container immediately after the run has completed.
   - Avoid excessive handling of pouches after test runs.
   - Avoid exposing pouches to sharp edges or anything that might cause a puncture.

WARNING: If liquid is observed on the exterior of a pouch, the liquid and pouch should be immediately contained and discarded in a biohazard container. The instrument and work space must be decontaminated as described in the FilmArray Operator's Manual.

DO NOT PERFORM ADDITIONAL TESTING UNTIL THE AREA HAS BEEN DECONTAMINATED.

Precaution Related to Public Health Reporting in the United States

Local, state, and federal regulations for notification of reportable disease are continually updated and include a number of organisms for surveillance and outbreak investigations [40-41]. Additionally, the Centers for Disease Control (CDC) recommends that when pathogens from reportable diseases are detected by a culture independent diagnostic test (CIDT), the laboratory should facilitate obtaining the isolate or clinical materials for submission to the appropriate public health laboratory to aid in outbreak detection and epidemiological investigations. Laboratories are responsible for following their state and/or local regulations and should consult their local and/or state public health laboratories for isolate and/or clinical sample submission guidelines.

REAGENT STORAGE, HANDLING AND STABILITY

1. Store the test kit, including reagent pouches and buffers, at room temperature (15–25 ºC). **DO NOT REFRIGERATE.**
2. Avoid storage of any materials near heating or cooling vents or in direct sunlight.

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3. Always check the expiration date and do not use reagents beyond the expiration date printed on the pouch or kit.
4. All kit components should be stored and used together. Do not use components from one kit with those of another kit.
5. Do not remove pouches from their packaging until a sample is ready to be tested. Once the pouch packaging has been opened, the pouch should be loaded as soon as possible (within approximately 30 minutes).
6. Once a pouch has been loaded, the test run should be started as soon as possible (within 60 minutes).

SPECIMEN COLLECTION AND PREPARATION

This section describes the requirements for specimen collection, preparation, and handling that will help ensure accurate test results.

Nasopharyngeal Swab Collection - NPS specimens should be collected according to standard technique and immediately placed in viral transport media (VTM).

Minimum Sample Volume - 300 µL of sample is required for testing.

Transport and Storage - Specimens in VTM should be processed and tested as soon as possible. If storage is required, specimens in VTM can be held at room temperature (18–30 °C) for up to 4 hours, at refrigerator temperature (2-8 °C) for up to 3 days, or at freezer temperature (<-15 °C) for up to 30 days.

PROCEDURE

Refer to the FilmArray Respiratory Panel Quick Guide, the FilmArray Training Video or the appropriate FilmArray Operator's Manual for more detail and pictorial representations of these instructions.

Gloves and other Personal Protective Equipment (PPE) should be used when handling pouches and specimens. Only one FilmArray RP pouch should be loaded at a time. Once the pouch is loaded, it should be promptly transferred to the instrument/Module to start the run. After the run is complete, the pouch should be discarded in a biohazard container.

Prepare Pouch

1. Thoroughly clean the work area and the FilmArray Pouch Loading Station with freshly prepared 10% bleach (or suitable disinfectant) followed by a water rinse.
2. Remove the FilmArray RP pouch from its vacuum-sealed package by tearing or cutting the notched outer packaging and opening the protective aluminum canister.

> **NOTE: If the vacuum seal of the pouch packaging is not intact, the pouch may still be used. Attempt to hydrate the pouch using the steps below. If hydration is successful, continue with the run. If hydration fails, discard the pouch and use a new pouch to test the sample.**

3. Place the FilmArray Pouch into the FilmArray Pouch Loading Station. To do so, hold the pouch so that the barcoded label is upright and readable, and then slide the flexible film portion of the pouch into the loading

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station. In the correct configuration, the inlet ports on both ends of the rigid plastic part of the pouch will point up, and the red and blue labels on the pouch will align with the red and blue arrows on the FilmArray Pouch Loading Station.

4. Place a blue-capped Hydration Injection Vial in the blue well of the FilmArray Pouch Loading Station.
5. Place a red-capped Sample Injection Vial in the red well of the FilmArray Pouch Loading Station.

Hydrate Pouch

1. Twist and lift the Hydration Injection Vial, leaving blue cap in the well of the FilmArray Pouch Loading Station.
2. Insert the cannula tip into the port in the pouch located directly below the blue arrow of the FilmArray Pouch Loading Station. Push down forcefully in a firm and quick motion until you hear a faint "pop" and feel an ease in resistance. The correct volume of liquid will be pulled into the pouch by vacuum.
3. Verify that the pouch has been hydrated.
4. Flip the barcode label down and check to see that fluid has entered the reagent wells (located at the base of the rigid plastic part of the pouch). Small air bubbles may be seen. If the pouch fails to hydrate (dry reagents appear as white pellets), repeat Step 2 to verify that the seal of the port was broken or retrieve a new pouch and repeat from Step 2 of the Prepare Pouch section.

Prepare Sample Mix

1. Hold the Sample Buffer ampoule so that the tip is facing up.

   NOTE: Use care to avoid touching the tip during handling, as this may introduce contamination.

2. Gently pinch the textured plastic tab on the side of the ampoule until the seal snaps.
3. Invert the ampoule over the red-capped Sample Injection Vial and re-position thumb and forefinger to grip the bottom of the ampoule. Dispense Sample Buffer using a slow, forceful squeeze, followed by a second squeeze. Squeezing the ampoule additional times will generate excessive bubbles, which should be avoided.
4. Using the Transfer Pipette provided in the test kit, draw sample (NPS in VTM) to the third line (approximately 0.3 mL). Add sample to the red Sample Injection Vial. Tightly close the lid of the Sample Injection Vial.

   NOTE: DO NOT use the Transfer Pipette to mix the sample once it is added to the Sample Injection Vial.

5. Remove the Sample Injection Vial from the FilmArray Pouch Loading Station and gently invert the vial at least three times to mix.
6. Return the Sample Injection Vial to the FilmArray Pouch Loading Station.

Load Sample Mix

1. Slowly twist the Sample Injection Vial so it loosens from its red cap and pause for 3-5 seconds. Lift the Sample Injection Vial, leaving the red cap in the well of the FilmArray Pouch Loading Station.
2. Insert the cannula tip into the port in the pouch located directly below the red arrow of the FilmArray Pouch Loading Station. Push down forcefully in a firm and quick motion until you hear a faint "pop" and feel an ease in resistance. The correct volume of liquid will be pulled into the pouch by vacuum.

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3. Verify that the sample has been loaded. Flip the barcode label down and check to see that fluid has entered the reagent well next to the sample loading port. If the pouch fails to pull sample from the Sample Injection Vial, the pouch should be discarded. Retrieve a new pouch and repeat from Step 2 of the Pouch Preparation section.
4. Discard the Sample Injection Vial and the Hydration Injection Vial in an appropriate biohazard sharps container.
5. Record the Sample ID in the provided area on the pouch label (or affix a barcoded Sample ID) and remove the pouch from the FilmArray Pouch Loading Station.

Run Pouch

The FilmArray Software includes step-by-step on-screen instructions that guide the operator through performing a run. Brief instructions for FilmArray, FilmArray 2.0, and FilmArray Torch Systems are given below. Refer to the appropriate FilmArray operator's manual for more detailed instructions.

FilmArray and FilmArray 2.0

~~The FilmArray software includes a step-by-step on-screen tutor that shows each step of the test.~~

1. Ensure that the ~~computer and~~ FilmArray system is on and the software is launched.~~instrument(s) are on and the FilmArray software is launched.~~
2. Open the lid of an available instrument (if not already open).

   NOTE: An available instrument is indicated by a constant green light on the front of the instrument.

3. Insert the pouch into the instrument.

   Position the pouch so that the array is on the right with the film directed downward into the FilmArray instrument. The red and blue labels on the pouch should align with the red and blue arrows on the FilmArray instrument. The pouch will click into place. If inserted correctly, the barcode is visible and the label is readable on the top of the pouch. The instrument and software must detect that the pouch has been inserted correctly before continuing to the next step.

   NOTE: If the pouch does not slide into the instrument easily, gently push the lid of the instrument back to be sure that it is completely open.

4. Scan the barcode on the FilmArray pouch using the barcode scanner.

   Pouch identification (Lot Number and Serial Number), Pouch Type and Protocol are preprogrammed in the rectangular barcode located on the FilmArray pouch. The information will be automatically entered when the barcode is scanned. If it is not possible to scan the barcode, the pouch Lot Number, Serial Number, Pouch Type and Protocol can be manually entered from the information provided on the pouch label into the appropriate fields. To reduce data entry errors, it is strongly recommended that the pouch information be entered by scanning the barcode.

   NOTE: The barcode cannot be scanned prior to placing the pouch in the instrument.

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5. Enter the Sample ID. The Sample ID can be entered manually or scanned in by using the barcode scanner when a barcoded Sample ID is used.
6. If necessary, select and/or confirm a protocol from the Protocol drop down list.
7. Enter a user name and password in the Name and Password fields.
8. Close the FilmArray instrument lid.
9. Click the Start Run button on the screen.

   Once the run has started, the screen displays a list of the steps being performed by the instrument and the number of minutes remaining in the run.

   NOTE: The bead-beater apparatus can be heard as a high-pitched noise (whine) during the first minute of operation.

10. When the run is finished, follow the on-screen instructions to open the instrument and remove the pouch.
11. Immediately discard the pouch in a biohazard container.
12. Results are automatically displayed in the report section of the screen.

    Select Print to print the report, or Save to save the report as a file.

FilmArray Torch

1. Ensure that the FilmArray Torch system is on.
2. Select an available Module on the touch screen.
3. Scan the barcode on the FilmArray pouch using the barcode scanner.

   Pouch identification (Lot Number and Serial Number), Pouch Type and Protocol are preprogrammed in the rectangular barcode located on the FilmArray pouch. The information will be automatically entered when the barcode is scanned. If it is not possible to scan the barcode, the pouch Lot Number, Serial Number, Pouch Type and Protocol can be manually entered from the information provided on the pouch label into the appropriate fields. To reduce data entry errors, it is strongly recommended that the pouch information be entered by scanning the barcode.
4. Enter the Sample ID. The Sample ID can be entered manually or scanned in by using the barcode scanner when a barcoded Sample ID is used.
5. Insert the pouch into the Module.

   Ensure that the pouch fitment label is lying flat on top of pouch and not folded over. As the pouch is inserted, the Module will grab onto the pouch and pull it into the chamber.
6. If necessary, select and/or confirm a protocol from the protocol drop down list.
7. Enter operator user name and password, then select Next.

   NOTE: The font color of the username is red until the user name is recognized by the software.

8. Review the entered run information on the screen. If correct, select Start Run.

   Once the run has started, the screen displays a list of the steps being performed by the instrument and the number of minutes remaining in the run.

   NOTE: The bead-beater apparatus can be heard as a high-pitched noise (whine) during the first minute of operation.

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9. At the end of the run, the status of the Module changes to Finished and the pouch is partially ejected.
10. Select the Finished Module on the Dashboard to view the report.

    Select Print to print the report, or Save to save the report as a file
11. Removed the pouch from the Module and immediately discard the pouch in a biohazard container.

> **NOTE: Once the pouch has been removed, the report can only be viewed through the Browse Runs feature.**

QUALITY CONTROL

Process Controls

Two process controls are included in each pouch:

1. **RNA Process Control**
   The RNA Process Control assay targets an RNA transcript from the yeast *Schizosaccharomyces pombe*. The yeast is present in the pouch in a freeze-dried form and becomes rehydrated when sample is loaded. The control material is carried through all stages of the test process, including lysis, nucleic acid purification, reverse transcription, 1st stage PCR, dilution, 2nd stage PCR and DNA melting. A positive control result indicates that all steps carried out in the FilmArray RP pouch were successful.
2. **PCR2 Control**
   The PCR2 Control assay detects a DNA target that is dried into wells of the array along with the corresponding primers. A positive result indicates that 2nd stage PCR was successful.

Both control assays must be positive for the test run to pass. When either control fails, the Controls field of the test report (upper right hand corner) will display Failed and all results will be listed as Invalid. If the controls fail, the sample should be retested using a new pouch.

Monitoring Test System Performance

It is possible to trend Tm values for the RNA Process Control and/or PCR2 Control assays and maintain records according to standard laboratory quality control practices [42-43]. The FilmArray software will automatically fail the run if the Tm for either the RNA Process Control or the PCR2 Control is outside of the acceptable range (80.6-84.6 for the RNA Process Control and 74.5-78.5 for the PCR2 Control). Any trend variations should be investigated. Contact Technical Support for help with out-of-range controls.

> **NOTE: Trending for the two control assays (RNA Process Control and PCR2 Control) should be tracked on separate control charts as the expected Tm values for these two controls are different.**

Good laboratory practice recommends running external positive and negative controls regularly. Use viral transport medium as the external negative control, and previously characterized positive samples or negative samples spiked with well characterized organisms as external positive controls. External controls should be used in accordance with the appropriate accrediting organizations, as applicable.

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INTERPRETATION OF RESULTS

The FilmArray software automatically analyzes and interprets the assay results and displays the final results in a test report (see the FilmArray Respiratory Panel Quick Guide to view an example of a test report). The analyses performed by the FilmArray software and details of the test report are described below.

Assay Interpretation

When 2nd stage PCR is complete, the FilmArray instrument performs a high resolution DNA melting analysis on the PCR products and measures the fluorescence signal generated in each well (for more information see FilmArray Operator's Manual). The FilmArray software then performs several analyses and assigns a final assay result.

Analysis of melting curves. The FilmArray software evaluates the DNA melting curve for each well of the 2nd stage PCR array to determine if a PCR product was present in that well. If the melt profile indicates the presence of a PCR product, then the analysis software calculates the melting temperature (Tm) of the curve. The Tm value is then compared against the expected Tm range for the assay. If the software determines that the melt is positive and the melt peak falls inside the assay-specific Tm range, the curve is called positive. If the software determines that the melt is negative or is not in the appropriate Tm range, the curve is called negative.

Analysis of replicates. Once melt curves have been identified, the software evaluates the three replicates for each assay to determine the assay result. For an assay to be called positive, at least two of the three associated melt curves must be called positive, and the Tm for at least two of the three positive curves must be similar (within 1°C). Assays that do not meet these criteria are called negative.

Organism Interpretation. For most organisms detected by the FilmArray RP, the organism is considered to be Detected if a single corresponding assay is positive. For example, Human Metapneumovirus will have a test report result of Human Metapneumovirus Detected if at least two of the three replicates of the one Human Metapneumovirus assay have similar positive melt peaks with Tm values that are within the assay-specific Tm range. The test results for Adenovirus, the Human Rhinovirus/Enterovirus group, and Influenza A depend on the interpretation of results from several assays. Interpretation and follow-up testing for these three results are provided below.

Rhinovirus/Enterovirus Group

The FilmArray RP pouch contains six different assays (HRV1, HRV2, HRV3, HRV4, Entero 1, Entero 2) for the detection of Rhinoviruses and Enteroviruses. Though these viruses are both very diverse, they are also closely related. Therefore, the six assays are not able to reliably differentiate Rhinovirus and Enterovirus. The FilmArray software interprets each of the six assays independently (as described above) and the results are combined as a final test result for the virus(es). If any of the six assays are positive, the test report result will be Human Rhinovirus/Enterovirus Detected. If all six assays are negative, the test report result will be Human Rhinovirus/Enterovirus Not Detected. A positive FilmArray RP Human Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., viral culture or sequence analysis).

NOTE: Despite the names, the HRV (1-4) and Entero (1-2) assays are not specific for detection of Human Rhinovirus or Enterovirus, respectively. Individual assay results cannot be used to differentiate these two viruses.

Adenovirus

The FilmArray RP pouch contains two different assays (Adeno, Adeno2) for the detection of Adenovirus. The FilmArray software interprets each of these assays independently (as described above) and the results are combined as a final test result for the virus. If either or both assays are positive, the test report result will be Adenovirus Detected. If both the Adeno and Adeno2 assays are negative, the test report result will be Adenovirus Not Detected.

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Influenza A

The assays in the FilmArray RP are designed to both detect Influenza A and to differentiate commonly occurring hemagglutinin subtypes. To accomplish this, the FilmArray RP uses two Influenza A assays, (FluA-pan-1 and FluA-pan-2) and three subtyping assays directed at the hemagglutinin gene (FluA-H1-pan, FluA-H1-2009 and FluA-H3). The FluA-H1-pan assay is designed to detect both Influenza A H1 and the Influenza A H1-2009 variant. Each of the individual assays is interpreted independently (as described above) and the test result reported for Influenza A is based on the combined results of the five assays as outlined in Table 3.

In general, Influenza A is determined to be Detected if at least one of the two FluA-pan assays is positive and a subtyping assay is also positive. If neither of the FluA-pan assays is positive, but a subtyping assay is positive, then the result is considered Equivocal for that specific subtype and the sample should be retested. If one of the FluA-pan assays is positive and none of the subtyping assays are positive, the result is Equivocal for Influenza A and the specimen should be retested. All Equivocal results should be retested.

Table 3. Possible Assay Results for Influenza A and the Corresponding Interpretation

Final Result \ Assay	FluA-pan Assays (n=2)	FluA-H1-pan	FluA-H1-2009	FluA-H3	Required Follow-up
Influenza A Not Detected	Negative	Negative	Negative	Negative	None
Influenza A H1	**≥1 positive**	**Positive**	Negative	Negative	
Influenza A H3	**≥1 positive**	Negative	Negative	**Positive**	
Influenza A H1-2009	**≥1 positive**	Any result	**Positive**	Negative	
Influenza A H1 and Influenza A H3	**≥1 positive**	**Positive**	Negative	**Positive**	Multiple infections are possible but rare [a], retest to confirm result [b]
Influenza A H1-2009 and Influenza A H3	**≥1 positive**	Any result	**Positive**	**Positive**	
Influenza A (no subtype detected)	**2 positive**	Negative	Negative	Negative	See below
Influenza A Equivocal	**1 positive**	Negative	Negative	Negative	Retest
Influenza A H1 Equivocal	Negative	**Positive**	Negative	Negative	
Influenza A H3 Equivocal	Negative	Negative	Negative	**Positive**	
Influenza A H1-2009 Equivocal	Negative	Any result	**Positive**	Negative	

[a] The FilmArray RP can simultaneously detect multiple Influenza viruses contained in the FluMist® nasal Influenza vaccine (see "Interference" section below).

[b] Repeated multiple positives should be further confirmed by other FDA cleared Influenza subtyping tests.

Influenza A (no subtype detected)

If both of the FluA-pan assays are positive, but none of the hemagglutinin subtyping assays are positive, then the interpretation is Influenza A (no subtype detected). This result could occur when the titer of the virus in the specimen is low and not detected by the subtyping assays. This result could also indicate the presence of a novel Influenza A strain. In both cases, the sample in question should be retested. If the retest provides a different result, test the sample a third time to ensure the accuracy of the result. If the retest provides the same result, then the function of the RP pouches should be verified by testing with appropriate external control materials (known positive samples for Influenza A H1, Influenza A H3 and Influenza A H1-2009), and a negative control should also be run to test for PCR-product contamination. If the FilmArray RP accurately

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identifies the external and negative controls, contact the appropriate public health authorities for confirmatory testing.

FilmArray RP Test Report

The FilmArray RP test report is automatically displayed upon completion of a run and contains three sections, the Run Summary, the Results Summary, and the Run Details (see the FilmArray Respiratory Panel Quick Guide to view an example of a test report). The test report can be saved as a file or printed.

The **Run Summary** section of the test report provides the Sample ID, time and date of the run, control results and an overall summary of the test results. Any target with a Detected or Equivocal result will be listed in the corresponding field of the summary. If all of the tests were negative then None will be displayed in the Detected field. Controls are listed as Passed, Failed or Invalid. See Control Field section below for detailed information about the interpretation of controls and appropriate follow-up in the case of control failures.

The **Results Summary** section of the test report lists the result for each target tested by the panel. Possible results are Detected, Not Detected, Equivocal or Invalid. See Results Summary section below for detailed information about interpretation of test results and appropriate follow-up for Invalid and Equivocal results. The assay-by-assay results for each target are available in an optional 2nd page of the report. To access the 2nd page of the report, select the Details button at the bottom of the report screen or Print All for a printed report. The 2nd page of the report provides the results of each assay regardless of the pouch control results.

The **Run Details** section provides additional information about the run including: pouch information (type, lot number, and serial number), run status (Completed, Incomplete, Aborted, Instrument Error, Instrument Communication Error, or Software Error), the protocols that were used to perform the test, the identity of the operator that performed the test, and the instrument used to perform the test.

Once a run has completed, it is possible to edit the Sample ID. If this information has been changed, an additional section called **Change History** will be added to the test report. This Change History section lists the field that was changed, the original entry, the revised entry, the operator that made the change and the date that the change was made. Sample ID is the only field of the report that can be changed.

Control Field

The Control field on the test report will display Passed, Failed, or Invalid. The Control field will display Passed only if the run completed successfully (no instrument or software errors) and both of the pouch control assays (RNA Process Control and PCR2 Control) were successful. The Control field will display Failed if the run was completed successfully (no instrument or software errors) but one or both of the pouch control assays failed (0 or 1 positive replicates for either of the controls, each of which is tested in triplicate). If the control result is Failed, then the result for all of the tests on the panel are displayed as Invalid and the specimen will need to be retested with a new pouch.

Table 4 provides a summary and explanation of the possible control results and follow-up actions.

The FilmArray ~~instrument~~ monitors each run to ensure that the instrument is working within specification and to detect hardware or software errors that might compromise the accuracy of the test result. If the instrument detects an out-of-specification condition, or a significant error, it will automatically abort the run. If this happens, or if a run is aborted by the user, then the Control field on the report will display Invalid and all test results in the Result Summary of the report will also be displayed as Invalid. To determine why a run failed to complete, note any specific error codes that are displayed on the screen and refer to the Run Status in the Run Details section of the report. The Run Status will display Incomplete, Aborted, Software Error, Instrument Error, or Instrument Communication Error. Refer to the FilmArray Operator's Manual or call Technical Support for further instruction. The specimen should be retested after the error is corrected or by using an alternate FilmArray instrument/Module.

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Table 4. Interpretation of Control Field on the FilmArray RP Test Report

Control Result	Explanation	Action Required	Outcome
Passed	The run was successfully completed AND Both pouch controls were successful.	None	Report the results provided on the test report.
Failed	The run was successfully completed BUT At least one of the pouch controls failed.	Repeat the test using a new pouch.	Accept the results of the repeat testing. If the error persists, contact Technical Support for further instruction.
Invalid	The controls are invalid because the run failed. (typically a software or hardware error)	Note any error codes displayed during the run and the Run Status field in the Run Details section of the report. Refer to the appropriate- FilmArray Operator's Manual or contact Technical Support for further instruction. Once the error is resolved, repeat the test or repeat the test using another instrument. If the error occurred in the first 30 seconds of the run, the same pouch may be used for the repeat test (within 60 minutes of pouch loading) using the same instrument or another instrument/Module, as available. If the error occurred later in the run or you are unsure when the error occurred, return to the original sample to load a new pouch. Repeat the test with the new pouch on the same ~~instrument~~ or another instrument/Module, as available.	Accept the valid results of the repeat testing. If the error persists, contact Technical Support for further instruction.

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Result Summary

Test results for the organisms included in the FilmArray RP are provided in two locations on the report. The Result Summary section provides a complete list of the test results. Possible results include Detected, Not Detected, Equivocal, and Invalid. Positive (Detected) and Equivocal results are also displayed in the Run Summary section. Table 5 provides an explanation for each interpretation and any follow-up necessary to obtain a final result.

Table 5. Interpretation of Results on the FilmArray RP Test Report

Organism Result	Explanation	Action
Detected	The run was successfully completed AND The pouch controls were successful (Passed) AND The assay(s) for the organism were POSITIVE (i.e., met the requirements for a positive result described in the Assay Interpretation section above)	Report results.
Not Detected	The run was successfully completed AND The pouch controls were successful (Passed) AND The assay(s) for the organism were NEGATIVE (i.e., did not meet the requirements for a positive result described in the Assay Interpretation section above)	Report results.
Equivocal (Influenza A only)	The run was successfully completed AND The pouch controls were successful (Passed) AND The combination of positive and negative assay results for Influenza A was inconclusive (see Table 3)	Retest the original specimen using a new pouch and report the results of the retest.
Invalid	The pouch controls were not successful (Failed) OR The run was not successful (Run Status displayed as: Aborted, Incomplete, Instrument Error, Software Error, or Instrument Communication Error)	See Table 4 , Interpretation of Control Field on the FilmArray Test Report for instruction.

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LIMITATIONS OF THE PROCEDURE

- For prescription use only
- FilmArray Respiratory Panel performance has only been established on the FilmArray, ~~and~~ FilmArray 2.0 and FilmArray Torch systems.
- This test is a qualitative test and does not provide a quantitative value for the virus(es) and/or bacteria detected in the specimen.
- The performance of the test has been evaluated for use with human specimen material only.
- This test has not been validated for testing specimens other than nasopharyngeal swab (NPS) specimens.
- The performance of this test has not been established for immunocompromised individuals.
- The performance of this test has not been established for patients without signs and symptoms of respiratory infection.
- Results from this test must be correlated with the clinical history, epidemiological data, and other data available to the clinician evaluating the patient.
- Viral and bacterial nucleic acids may persist *in vivo* independent of organism viability. Detection of organism target(s) does not imply that the corresponding organisms are infectious or are the causative agents for clinical symptoms.
- The detection of viral and bacterial nucleic acid is dependent upon proper specimen collection, handling, transportation, storage and preparation. Failure to observe proper procedures in any one of these steps can lead to incorrect results. There is a risk of false positive or false negative values resulting from improperly collected, transported or handled specimens.
- A negative FilmArray RP result does not exclude the possibility of viral or bacterial infection. Negative test results may occur from the presence of sequence variants in the region targeted by the assay, the presence of inhibitors, technical error, sample mix-up or an infection caused by an organism not detected by the panel. Test results may also be affected by concurrent antiviral/antibacterial therapy or levels of organism in the specimen that are below the limit of detection for the test. Negative results should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen.
- Positive and negative predictive values are highly dependent on prevalence. False negative test results are more likely during peak activity when prevalence of disease is high. False positive test results are more likely during periods when prevalence is moderate to low.
- Organism and amplicon contamination may produce erroneous results for this test. Particular attention should be given to the Laboratory Precautions noted under the Warnings and Precautions section.
- There is a risk of false positive values resulting from cross-contamination by target organisms, their nucleic acids or amplified product, or from non-specific signals in the assay.
- Cross-reactivity with respiratory tract organisms other than those listed in the Analytical Specificity section below may lead to erroneous results.
- The FilmArray RP Adenovirus assay may show variable detection with non-respiratory serotypes within species A, D, F and G.
- The FilmArray RP Influenza A subtyping assays target the Influenza A hemagglutinin gene only. The FilmArray RP does not detect or differentiate the Influenza A neuraminidase gene.
- Clinical specificity was established when Influenza A H1-2009 was the predominant Influenza A virus in circulation. When other Influenza A viruses are emerging, clinical specificity may vary.

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- Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis,* Coronavirus 229E, Coronavirus OC43, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, Parainfluenza Virus 1, Parainfluenza Virus 2, and Parainfluenza Virus 4, were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydophila pneumoniae* were established primarily using contrived clinical specimens. The performance of this test has not been established for monitoring treatment of seasonal Influenza A H1, A H3, A H1-2009 or RSV infections.
- The performance of this test has not been established for screening of blood or blood product for the presence of seasonal Influenza A H1, A H3 or A H1-2009.
- The performance of this test has not been established with potentially interfering medications for the treatment of influenza or cold viruses. The effect of interfering substances has only been evaluated for those listed in the labeling. Interference by substances other than those described in the "Interference" section below could lead to erroneous results.
- The performance of the FilmArray RP has not been established in individuals who received influenza vaccine. Recent administration of a nasal influenza vaccine may cause false positive results for Influenza A and/or Influenza B.
- Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP cannot reliably differentiate them. A positive FilmArray RP Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g. cell culture or sequence analysis).
- The Coronavirus OC43 assay may cross-react with Coronavirus HKU1. As a result, when both HKU1 and OC43 are detected in the same patient specimen, the result may be due to assay cross-reactivity. A co-infection with these two viruses is also possible.
- The FilmArray RP may not be able to distinguish between existing viral strains and new variants as they emerge. For example, the FilmArray RP can detect Influenza A H3N2v (first recognized in August, 2011), but will not be able to distinguish this variant from Influenza A H3N2 seasonal.
- Results of the FilmArray RP *B. pertussis* assay may not be concordant with the results of commonly used *Bordetella* PCR assays that target the multi-copy insertion sequence (IS481) due to differences in sensitivity and specificity. IS481 is a multi-copy target and is present in several *Bordetella* species (*B. pertussis, B. holmesii and B. bronchiseptica*). The FilmArray RP *B. pertussis* assay targets the single-copy promoter region of the pertussis toxin gene and is designed to be highly specific for detection of *B. pertussis*. Although cross-reactivity with closely-related *Bordetella* species was not observed in the clinical study or Analytical Specificity testing of a variety of strains at 1 x 10^6 CFU/mL, instances of cross-reactivity can occur with high levels (above 1 x 10^6 CFU/mL) or with rare sequence variants of other *Bordetella* species, such as *B. bronchiseptica* and *B. parapertussis*.

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EXPECTED VALUES

NOTE: The expected values presented in this section were obtained prior to the addition of a second Adenovirus assay to FilmArray RP.

In the first phase of the prospective FilmArray RP clinical study, 853 eligible prospective nasopharyngeal (NPS) swab specimens were collected and tested at three sites across the U.S. from December 2009 thru May 2010. A second phase of the prospective FilmArray RP clinical study was conducted to obtain additional positive specimens for Parainfluenza Viruses 1, 2, and 4. During the anticipated peak season for Parainfluenza Viruses 1 and 2 (September 2010 thru January 2011), another 264 eligible specimens were collected and tested at two of the three sites. The number and percentage of positive cases as determined by the FilmArray RP calculated by testing site or by age group are presented in the following tables:

Table 6. Expected Value (as Determined by the FilmArray RP) Summary by Site for the First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Organism	Overall (n=853)		Site 1 (n=275)		Site 2 (n=333)		Site 3 (n=245)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value	Number	Expected Value
Adenovirus	38	4.5%	5	1.8%	11	3.3%	22	9.0%
Influenza A	11	1.3%	10	3.6%	1	0.3%	0	0%
Influenza A H1	0	0%	0	0%	0	0%	0	0%
Influenza A H3	0	0%	0	0%	0	0%	0	0%
Influenza A H1-2009	11	1.3%	10	3.6%	1	0.3%	0	0%
Influenza B	0	0%	0	0%	0	0%	0	0%
Parainfluenza Virus 1	1	0.1%	0	0%	0	0%	1	0.4%
Parainfluenza Virus 2	0	0%	0	0%	0	0%	0	0%
Parainfluenza Virus 3	33	3.9%	1	0.4%	1	0.3%	31	12.7%
Parainfluenza Virus 4	8	0.9%	0	0%	4	1.2%	4	1.6%
Respiratory Syncytial Virus	139	16.3%	4	1.5%	86	25.8%	49	20.0%
Coronavirus 229E	14	1.6%	5	1.8%	3	0.9%	6	2.4%
Coronavirus HKU1	25	2.9%	9	3.3%	13	3.9%	3	1.2%
Coronavirus NL63	23	2.7%	4	1.5%	9	2.7%	10	4.1%
Coronavirus OC43	8	0.9%	2	0.7%	6	1.8%	0	0%
Human Metapneumovirus	94	11.0%	12	4.4%	41	12.3%	41	16.7%
Human Rhinovirus/Entero	225	26.4%	36	13.1%	92	27.6%	97	39.6%
Bordetella pertussis	4	0.4%	2	0.7%	1	0.3%	1	0.4%
Chlamydophila pneumoniae	1	0.1%	0	0%	0	0%	1	0.4%
Mycoplasma pneumoniae	2	0.2%	2	0.2%	0	0%	0	0%

Table 7. Expected Value (as Determined by the FilmArray RP) Summary by Site for the Second Phase Prospective Clinical Evaluation (September 2010 – January 2011)

Organism	Overall (n=264)		Site 2 (n=180)		Site 3 (n=84)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value
Adenovirus	15	5.7%	11	6.1%	4	4.6%
Influenza A	5	1.9%	0	0%	5	6.0%
Influenza A H1	0	0%	0	0%	0	0%

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Organism	Overall (n=264)		Site 2 (n=180)		Site 3 (n=84)	
	Number	Expected Value	Number	Expected Value	Number	Expected Value
Influenza A H3	5	1.9%	0	0%	5	6.0%
Influenza A H1-2009	0	0%	0	0%	0	0%
Influenza B	1	0.4%	1	0.6%	0	0%
Parainfluenza Virus 1	1	0.4%	0	0%	1	1.1%
Parainfluenza Virus 2	9	3.4%	4	2.2%	5	5.7%
Parainfluenza Virus 3	5	1.9%	0	0%	5	5.7%
Parainfluenza Virus 4	2	0.7%	1	0.6%	1	1.1%
Respiratory Syncytial Virus	31	11.7%	11	6.1%	20	23.8%
Coronavirus 229E	0	0%	0	0%	0	0%
Coronavirus HKU1	0	0%	0	0%	0	0%
Coronavirus NL63	1	0.4%	1	0.6%	0	0%
Coronavirus OC43	11	4.2%	1	0.5%	10	11.9%
Human Metapneumovirus	4	1.5%	0	0%	4	4.6%
Human Rhinovirus/Entero	125	47.3%	91	50.6%	34	39.1%
Bordetella pertussis	3	1.1%	3	1.6%	0	0%
Chlamydophila pneumoniae	0	0%	0	0%	0	0%
Mycoplasma pneumoniae	2	0.8%	1	0.5%	1	1.2%

Table 8. Expected Value (as Determined by FilmArray RP) Summary by Age Group for First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Organism	Total (Expected Value)	≤ 5 years	6-21 years	22-49 years	≥ 50 years
Adenovirus	38 (4.5%)	32	2	3	1
Influenza A	11 (1.3%)	1	1	7	2
Influenza A H1	0 (0%)	0	0	0	0
Influenza A H3	0 (0%)	0	0	0	0
Influenza A H1-2009	11 (1.3%)	1	1	7	2
Influenza B	0 (0%)	0	0	0	0
Parainfluenza Virus 1	1 (0.1%)	0	1	0	0
Parainfluenza Virus 2	0 (0%)	0	0	0	0
Parainfluenza Virus 3	33 (3.9%)	31	1	0	1
Parainfluenza Virus 4	8 (0.9%)	7	1	0	0
Respiratory Syncytial Virus	139 (16.3%)	127	3	4	5
Coronavirus 229E	14 (1.6%)	6	2	5	1
Coronavirus HKU1	25 (2.9%)	12	1	8	4
Coronavirus NL63	23 (2.7%)	17	2	2	2
Coronavirus OC43	8 (0.9%)	4	0	2	2
Human Metapneumovirus	94 (11.0%)	76	4	10	4
Human Rhinovirus/Entero	225 (26.4%)	161	24	29	11
Bordetella pertussis	4 (0.4%)	2	1	0	1
Chlamydophila pneumoniae	1 (0.1%)	1	0	0	0
Mycoplasma pneumoniae	2 (0.2%)	0	0	2	0

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Table 9. Expected Value (as Determined by FilmArray RP) Summary by Age Group for Second Phase Prospective Clinical Evaluation (September 2010-January 2011)

Organism	Total (Expected Value)	≤ 5 years	6-21 years	22-49 years	≥ 50 years
Adenovirus	15 (5.7%)	15	0	n/a	n/a
Influenza A	5 (1.9%)	4	1	n/a	n/a
Influenza A H1	0 (0%)	0	0	n/a	n/a
Influenza A H3	5 (1.9%)	4	1	n/a	n/a
Influenza A H1-2009	0 (0%)	0	0	n/a	n/a
Influenza B	1 (0.4%)	1	0	n/a	n/a
Parainfluenza Virus 1	1 (0.4%)	1	0	n/a	n/a
Parainfluenza Virus 2	9 (3.4%)	9	0	n/a	n/a
Parainfluenza Virus 3	5 (1.9%)	5	0	n/a	n/a
Parainfluenza Virus 4	2 (0.7%)	2	0	n/a	n/a
Respiratory Syncytial Virus	31 (11.7%)	30	1	n/a	n/a
Coronavirus 229E	0 (0%)	0	0	n/a	n/a
Coronavirus HKU1	0 (0%)	0	0	n/a	n/a
Coronavirus NL63	1 (0.4%)	1	0	n/a	n/a
Coronavirus OC43	11 (4.2%)	9	2	n/a	n/a
Human Metapneumovirus	4 (1.5%)	4	0	n/a	n/a
Human Rhinovirus/Entero	125 (47.3%)	118	7	n/a	n/a
Bordetella pertussis	3 (1.1%)	3	0	n/a	n/a
Chlamydophila pneumoniae	0 (0%)	0	0	n/a	n/a
Mycoplasma pneumoniae	2 (0.8%)	2	0	n/a	n/a

The number and percentage of co-infection cases as determined by the FilmArray RP calculated by age group are presented in the following tables:

Table 10. Expected Value (Co-infections as Determined by FilmArray RP) Summary by Age Group for First Phase Prospective Clinical Evaluation (December 2009 – May 2010)

Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
HRV/EV + RSV	21 (2.46%)	20	0	1	0
HRV/EV + AdV	8 (0.94%)	8	0	0	0
HRV/EV + PIV3	8 (0.94%)	7	1	0	0
HRV/EV + hMPV	7 (0.82%)	7	0	0	0
hMPV + RSV	4 (0.47%)	4	0	0	0
HRV/EV + CoV NL63	4 (0.47%)	3	0	1	0
CoV HKU1 + hMPV	3 (0.35%)	3	0	0	0
CoV HKU1 + HRV/EV	3 (0.35%)	1	0	2	0
CoV HKU1 + RSV	3 (0.35%)	3	0	0	0
CoV NL63 + hMPV	3 (0.35%)	3	0	0	0
CoV NL63 + RSV	3 (0.35%)	3	0	0	0
hMPV + PIV3	3 (0.35%)	3	0	0	0

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Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
AdV + HRV/EV + PIV3	2 (0.23%)	2	0	0	0
CoV OC43 + RSV	2 (0.23%)	2	0	0	0
CoV HKU1 + CoV OC43	2 (0.23%)	0	0	1	1
HRV/EV + PIV4	2 (0.23%)	2	0	0	0
AdV + hMPV	1 (0.12%)	1	0	0	0
AdV + PIV3	1 (0.12%)	1	0	0	0
AdV + RSV	1 (0.12%)	1	0	0	0
AdV + CoV NL63	1 (0.12%)	1	0	0	0
AdV + RSV + CoV 229E	1 (0.12%)	1	0	0	0
AdV + HRV/EV + *B. pertussis*	1 (0.12%)	1	0	0	0
AdV + *C. pneumoniae*	1 (0.12%)	1	0	0	0
CoV 229E + RSV	1 (0.12%)	1	0	0	0
CoV 229E + CoV NL63 + HRV/EV+RSV	1 (0.12%)	1	0	0	0
CoV 229E + HRV/EV	1 (0.12%)	1	0	0	0
CoV HKU1 + HRV/EV + RSV	1 (0.12%)	1	0	0	0
CoV NL63 + hMPV + RSV	1 (0.12%)	1	0	0	0
HRV/EV + *B. pertussis*	1 (0.12%)	1	0	0	0
HRV/EV + PIV1	1 (0.12%)	0	1	0	0
hMPV + PIV4	1 (0.12%)	1	0	0	0
PIV4 + RSV	1 (0.12%)	1	0	0	0

Table 11. Expected Value (Co-infections as Determined by FilmArray RP) Summary by Age Group for Second Phase Prospective Clinical Evaluation (September 2010 – January 2011)

Co-Infection	Total (Expected Value)	≤ 5 Years	6-21 Years	22-49 Years	≥ 50 Years
HRV/EV + RSV	6 (2.2%)	6	0	n/a	n/a
HRV/EV + AdV	6 (2.2%)	6	0	n/a	n/a
CoV OC43 + HRV/EV	5 (1.9%)	5	0	n/a	n/a
HRV/EV + PIV2	1 (0.4%)	1	0	n/a	n/a
HRV/EV + PIV3	1 (0.4%)	1	0	n/a	n/a
HRV/EV + PIV4	1 (0.4%)	1	0	n/a	n/a
hMPV + RSV	1 (0.4%)	1	0	n/a	n/a
Flu B + RSV	1 (0.4%)	1	0	n/a	n/a
AdV + CoV OC43	1 (0.4%)	1	0	n/a	n/a
CoV OC43 + hMPV	1 (0.4%)	1	0	n/a	n/a
CoV OC43 + RSV	1 (0.4%)	1	0	n/a	n/a
HRV/EV + *B. pertussis*	1 (0.4%)	1	0	n/a	n/a
PIV2 + *M. pneumoniae*	1 (0.4%)	1	0	n/a	n/a

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PERFORMANCE CHARACTERISTICS

Clinical Performance

NOTE: The clinical performance data presented in the first part of this section were obtained prior to the addition of a second Adenovirus assay to FilmArray RP. Data from a clinical comparison study demonstrating performance of a modified FilmArray RP (containing a second Adenovirus assay) as compared to the original FilmArray RP are presented starting on page 34.

The clinical performance of the FilmArray RP was established during two phases of a prospective clinical study. The first phase of the prospective clinical study was conducted at 3 U.S. clinical sites over a 6 month time period (December 2009 thru May 2010). The second phase of the prospective clinical study was carried out at 2 of the 3 sites for an additional 5 month time period (September 2010 thru January 2011) in an attempt to achieve increased detection of several low prevalence organisms (i.e. PIV1, PIV2, and PIV4) during the anticipated peak season for PIV1 and PIV2. Subjects with signs and symptoms of respiratory infection were invited to participate. Upon obtaining informed consent, NPS samples were collected for FilmArray and comparator testing. A total of 857 subjects were initially enrolled in the 2009/2010 respiratory season (Phase 1) and 4 were withdrawn. Table 12A provides a summary of demographic information for the 853 subjects that participated in the first phase of the prospective study. Another 287 subjects were enrolled in the 2010/2011 respiratory season (Phase 2) and 20 specimens were omitted from analysis due to improper specimen storage prior to testing. Another 3 specimens were also excluded from analysis due to the lack of clinical protocol-required associated valid external control mix results. Table 12B provides a summary of the remaining 264 subjects.

Table 12. Demographic Summary for FilmArray RP Prospective Clinical Study

A. December 2009 thru May 2010

Sex	Number of Subjects
Male	449 (53%)
Female	404 (47%)
Age	**Number of Subjects**
≤5	484 (57%)
6-21	95 (11%)
22-49	190 (22%)
≥50	84 (10%)

B. September 2010 thru January 2011

Sex	Number of Subjects
Male	151 (57%)
Female	113 (43%)
Age	**Number of Subjects**
≤5	240 (91%)
6-21	24 (9%)
22-49	0 (0%)
≥50	0 (0%)

A NPS specimen from each subject was tested with the FilmArray RP. The performance of the FilmArray RP was evaluated by comparing the FilmArray RP test result for each member of the panel with the appropriate comparator/reference methods shown in Table 13.

Table 13. Reference/Comparator Methods Used to Assess FilmArray RP Performance

Virus	Reference/Comparator Method(s)
Adenovirus	Viral culture followed by DFA identification[a]
Influenza A	
Influenza B	

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Virus	Reference/Comparator Method(s)
Parainfluenza Virus 1	
Parainfluenza Virus 2	
Parainfluenza Virus 3	
Respiratory Syncytial Virus	
Influenza A H1 subtyping	Viral Culture followed by 1 PCR test of viral culture with bi-directional sequence confirmation[b]
Influenza A H3 subtyping	
Influenza A H1-2009 subtyping	
Parainfluenza Virus 4	
Human Rhinovirus	2 PCR tests of patient specimens with bi-directional sequence confirmation[c]
Human Enterovirus	
Coronavirus 229E	
Coronavirus HKU1	
Coronavirus NL63	
Coronavirus OC43	
Human Metapneumovirus	
Bordetella pertussis	
Chlamydophila pneumoniae	
Mycoplasma pneumoniae	

[a] Performance of the FilmArray RP detecting AdV, Flu A, Flu B, PIV1, PIV2, PIV3, or RSV, respectively, was compared to viral culture followed by fluorescent antibody identification. "True" positives were considered as any sample that tested positive by viral culture followed by DFA testing. "True" negatives were considered as any sample that tested negative by viral culture followed by DFA testing.

[b] Performance of the FilmArray RP detecting Flu A H1, A H3, A H1-2009, or PIV4, respectively, was compared to viral culture followed by one analytically validated PCR assay with bi-directional sequence confirmation. The comparator assays were designed to amplify a different sequence from that amplified by the FilmArray assay(s). None of the comparator PCR assays overlapped any FilmArray amplicon sequence even if the same gene was targeted. "True" Flu A H1, A H3, or A H1-2009 positives, respectively, were considered as any sample that tested positive for Flu A by viral culture, and had bi-directional sequencing data meeting pre-defined quality acceptance criteria that matched the respective subtype sequences deposited in the National Center for Biotechnology Information (NCBI) GenBank database (www.ncbi.nlm.nih.gov) with acceptable E-values. "True" Flu A H1, A H3, or A H1-2009 negatives, respectively, were considered as any sample that tested negative for Flu A by viral culture, or any sample that tested positive for Flu A virus by viral culture, but tested negative by the respective subtype specific PCR assay. "True" PIV4 positives were considered as any sample for which bi-directional sequencing data matching PIV4 sequences deposited in the NCBI GenBank database was obtained from testing of viral culture material. "True" PIV4 negatives were considered as any sample where testing of viral culture material with the analytically validated PIV4 specific PCR assay was negative.

[c] Performance of the FilmArray RP detecting HRV, EV, CoV 229E, CoV HKU1, CoV NL63, CoV OC43, hMPV, *B. pertussis, C. pneumoniae,* or *M. pneumoniae* respectively, was compared to a predetermined algorithm that used composite comparator methods. The methods consist of two analytically validated PCR assays followed by bi-directional sequencing. The comparator assays were designed to amplify a different sequence from that amplified by the FilmArray assay(s). None of the comparator PCR assays overlapped any FilmArray amplicon sequence even if the same gene was targeted. "True positives were considered as any sample that had bi-directional sequencing data meeting pre-defined quality acceptance criteria that matched organism-specific sequences deposited in the NCBI GenBank database (www.ncbi.nlm.nih.gov) with acceptable E-values. "True" negatives were considered as any sample that tested negative by both of the comparator PCR assays.

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A total of 853 specimens were evaluated for Adenovirus, Influenza A, Influenza B, Parainfluenza Virus 3, Respiratory Syncytial Virus, Coronavirus HKU1, Coronavirus NL63, Human Metapneumovirus, and Human Rhinovirus/Enterovirus in the first phase of the study. A total of 1117 specimens were evaluated for Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 4, Coronavirus 229E, Coronavirus OC43, *B. pertussis, C. pneumoniae,* and *M. pneumoniae* in the first and second phases of the study. (During the second phase of the prospective clinical study, only the reference/comparator methods for Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 4, Coronavirus 229E, Coronavirus OC43, *B. pertussis, C. pneumoniae,* and *M. pneumoniae* were performed on all specimens and used to calculate the performance.) Clinical sensitivity or positive percent agreement (PPA) was calculated as 100% x (TP / TP + FN). True positive (TP) indicates that both the FilmArray RP and comparator method had a positive result for this specific organism, and false negative (FN) indicates that the FilmArray result was negative while the comparator result was positive. Specificity or negative percent agreement (NPA) was calculated as 100% x (TN / TN + FP). True negative (TN) indicates that both the FilmArray RP and the comparator method had negative results, and a false positive (FP) indicates that the FilmArray RP result was positive but the comparator result was negative. The exact binomial two-sided 95% confidence interval was calculated. The results are summarized in Table 14.

Table 14. Clinical Sensitivity and Specificity or Positive Percent Agreement (PPA) and Negative Percent Agreement (NPA) for the FilmArray RP Prospective Clinical Study

Organism	Sensitivity		95% CI	Specificity		95% CI
Adenovirus	24/27[a]	88.9%	70.8 - 97.7%	812/826[b]	98.3%	97.2 - 99.1%
Influenza A	9/10	90.0%	55.5 – 99.8%	841/843[c]	99.8%	99.2 -100%
Influenza A H1	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Influenza A H3	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Influenza A H1-2009	8/9	88.9%	51.8 - 99.7%	841/844[c]	99.6%	99.0 - 99.9%
Influenza B	0/0	n/a	n/a	853/853	100%	99.6 - 100%
Parainfluenza Virus 1	1/1	100%	n/a	1115/1116[d]	99.9%	99.5 – 100%
Parainfluenza Virus 2	7/8[e,g]	87.4%	47.4 – 99.7%	1107/1109[f,g]	99.8%	99.4 – 100%
Parainfluenza Virus 3	23/24[h]	95.8%	78.9 – 99.9%	819/829[i]	98.8%	97.8 - 99.4%
Parainfluenza Virus 4	9/9	100%	66.4 – 100%	1107/1108[j]	99.9%	99.5 – 100%
Respiratory Syncytial Virus	52/52	100%	93.2 - 100%	714/801[k]	89.1%	86.8 - 91.2%
Organism	**PPA**		**95% CI**	**NPA**		**95% CI**
Coronavirus 229E	12/12	100%	73.5 - 100%	1103/1105[l]	99.8%	99.4 - 100%
Coronavirus HKU1	23/24	95.8%	78.9 - 99.9%	827/829[m]	99.8%	99.1 - 100%
Coronavirus NL63	23/24	95.8%	78.9 - 99.9%	829/829	100%	99.6 - 100%
Coronavirus OC43	14/14	100%	76.8 - 100%	1098/1103[n,o]	99.6%	99.0 - 99.9%
Human Metapneumovirus	88/93	94.6%	87.9 - 98.2%	754/760	99.2%	98.3 - 99.7%
Human Rhinovirus/Enterovirus	190/205	92.7%	88.2 - 95.8%	613/648	94.6%	92.6 - 96.2%
Bordetella pertussis	6/6	100%	54.1 - 100%	1110/1111	99.9%	99.5 - 100%
Chlamydophila pneumoniae	1/1	100%	n/a	1116/1116	100%	99.7 - 100%
Mycoplasma pneumoniae	4/4	100%	39.8 - 100%	1113/1113	100%	99.7 - 100%

[a] The FilmArray RP detected Adenovirus in 1/3 false negative specimens when retested. The Adenovirus in the retested specimen was identified as species C by bi-directional sequence analysis. The Adenoviruses in the remaining two false negative specimens were identified as species C and species B.

[b] Adenoviruses were identified in 13/14 false positive specimens using bi-directional sequence analysis. Ten were identified as species C, two as species B, and one as species E.

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[c] Influenza A viruses (H1-2009 subtype) were identified in 3/3 false positive specimens (2/2 false positive compared to influenza A culture alone) using sequence analysis with an alternate assay.
[d] PIV1 was identified in this specimen using bi-directional sequence analysis.
[e] PIV2 virus was not detected in the single false negative specimen using PCR analysis.
[f] PIV2 virus was detected in both false positive specimens using bi-directional sequencing analysis.
[g] Two adjacent specimens (one false positive and one false negative) may have been switched during the viral culture reference method testing as is evidenced by bi-directional sequence analysis of these specimens.
[h] The FilmArray RP detected PIV3 in the single false negative specimen when retested.
[i]. PIV3 viruses were identified in 10/10 false positive specimens using bi-directional sequence analysis.
[j] A PIV4 virus was detected in this false positive NPS specimen by bi-directional sequence analysis although it was not detected from viral culture.
[k] RSV viruses were identified in 83/87 false positive specimens using bi-directional sequence analysis.
[l] CoV 229E was identified by bi-directional sequence analysis in 1/2 false positive specimens using an alternate assay.
[m] CoV HKU1 viruses were identified in 2/2 false positive specimens using bi-directional sequence analysis with an alternate assay.
[n] CoV OC43 was detected in 2/5 false positive specimens using an alternate assay with bi-directional sequence analysis.
[o] 2/5 false positives were determined to be cross-reactive products derived from amplification of CoV HKU1 virus with the CoV OC43 assay primers.

The FilmArray RP detected a total of 94 mixed infections in the first phase of the prospective clinical evaluation performed from December 2009 thru May 2010 (853 tested and analyzed specimens). This represents 18% of the total positive specimens (94/524). Eighty-seven (87/94; 92.6%) were double infections, 6 (6/94; 6.3%) were triple infections, and one was a quadruple infection (1/94; 1.1%). The total number of test results comprising these co-infections was 189. The single most common co-infection was Human Rhinovirus/Enterovirus with Respiratory Syncytial Virus (20/94; 21.1%). These viruses were the most prevalent in the tested population. Out of the 94 co-infections, 54 contained one or more organisms that had not been detected with the reference/comparator methods, i.e. discrepant co-infection.

Table 15. Distinct Co-infection Combinations Detected by the FilmArray RP in the First Phase of the Prospective Clinical Trial (December 2009 to May 2010)

Distinct Co-infection Combinations Detected by FilmArray RP				Total Co-infections	Number of Discrepant Co-infections[a]	Discrepant Organism(s)[a]
Organism 1	Organism 2	Organism 3	Organism 4			
AdV	*B. pertussis*	HRV/EV		1	1	AdV/*B. pertussis*
AdV	HRV/EV	PIV3		2	2	AdV (2)
AdV	CoV 229E	RSV		1	1	AdV; RSV
AdV	*C. pneumoniae*			1	0	
AdV	CoV NL63			1	1	AdV
AdV	hMPV			1	1	AdV; hMPV
AdV	HRV/EV			8	2	AdV; HRV/EV
AdV	PIV3			1	1	PIV3
AdV	RSV			1	1	RSV
CoV 229E	RSV			1	0	
B. pertussis	HRV/EV			1	1	HRV/EV
CoV 229E	CoV NL63	HRV/EV	RSV	1	1	RSV; CoV 229E
CoV 229E	HRV/EV			1	0	

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Distinct Co-infection Combinations Detected by FilmArray RP				Total Co-infections	Number of Discrepant Co-infections[a]	Discrepant Organism(s)[a]
Organism 1	Organism 2	Organism 3	Organism 4			
CoV HKU1	HRV/EV	RSV		1	1	RSV
CoV HKU1	CoV OC43			2	2	CoV OC43 (2)[b]
CoV HKU1	hMPV			3	0	
CoV HKU1	HRV/EV			3	0	
CoV HKU1	RSV			3	1	RSV
CoV NL63	hMPV	RSV		1	1	RSV
CoV NL63	hMPV			3	0	
CoV NL63	HRV/EV			4	1	HRV/EV
CoV NL63	RSV			3	2	RSV (2)
CoV OC43	RSV			2	2	RSV (2); CoV OC43 (2)
hMPV	HRV/EV			7	3	hMPV (2); HRV/EV (1)
hMPV	PIV3			3	1	PIV3
hMPV	PIV4			1	1	hMPV
hMPV	RSV			4	4	hMPV (1); RSV (3)
HRV/EV	PIV1			1	1	PIV1
HRV/EV	PIV3			8	6	HRV/EV (3); PIV3 (3)
HRV/EV	PIV4			2	0	
HRV/EV	RSV			21	16	HRV/EV (8); RSV (13)
PIV4	RSV			1	0	
Total Co-infections				**94**	**54**	**65/200(32.5%)**
Total Double Infections				**87**	**47**	**55/178 (30.9%)**
Total Triple Infections				**6**	**6**	**8/18 (44.4%)**
Total Quadruple Infections				**1**	**1**	**2/4 (50%)**

[a] A discrepant co-infection or discrepant organism was defined as one that was detected by FilmArray RP but not detected by the reference/comparator methods or by discrepancy investigation using bi-directional sequence analysis. Sixty-five (65) organisms from 54 of the 94 co-infections were not detected by the reference/comparator methods. Forty-four (44) were investigated using bi-directional sequence analysis with an alternate assay; in 37 cases the investigative assay successfully identified the organism in the specimen.

[b] Both discrepant CoV O43 results were false-positive due to cross-reactivity of the CoV OC43 assay with CoV HKU1 viruses in the specimens.

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Table 16. Additional Distinct Co-infection Combinations Detected by Reference/Comparator Methods, but not by the FilmArray RP in the First Phase of the Prospective Clinical Trial (December 2009 to May 2010)

Distinct Co-infection Combinations[a]		Total Co-infections	Number of Discrepant Co-infections	Discrepant Organism(s)
Organism 1	**Organism 2**			
CoV 229E	HRV/EV	1	1	HRV/EV (1)
hMPV	HRV/EV	3	3	hMPV (2); HRV/EV (1)
HRV/EV	RSV	1	1	HRV/EV (1)
Total Co-infections		**5**	**5**	
Total Double Infections		**5**	**5**	

[a]This table includes only distinct co-infections that were detected by the reference/comparator method but not by FilmArray RP; the remaining co-infections detected by the reference/comparator methods are already represented in the table above.

Table 17. Mixed Infections Detected by FilmArray RP in the First Phase (December 2009 to May 2010) and the Second Phase (September 2010 to January 2011) of the Prospective Clinical Trial and Prevalence of Individual Organisms in Mixed Infections

Organism Combinations	Number of Positive Samples	Percentage of Total Samples Tested (n/1117)	Organism	Number of Mixed Infections	Prevalence in Mixed Infections (n/121)
HRV/EV + RSV	27	2.40%	HRV/EV	82	68%
AdV + HRV/EV	14	1.30%	RSV	59	49%
HRV/EV + PIV3	9	0.80%	AdV	24	20%
hMPV + HRV/EV	7	0.60%	hMPV	25	21%
CoV OC43 + HRV/EV	5	0.50%	PIV3	15	15%
hMPV + RSV	5	0.40%	CoV NL63	13	11%
CoV NL63 + HRV/EV	4	0.40%	CoV OC43	12	10%
CoV HKU1 + hMPV	3	0.30%	CoV HKU1	12	10%
CoV HKU1 + HRV/EV	3	0.30%	PIV4	5	4%
CoV HKU1 + RSV	3	0.30%	CoV 229E	4	3%
CoV NL63 + hMPV	3	0.30%	*B. pertussis*	3	2%
CoV NL63 + RSV	3	0.40%	PIV2	2	2%
CoV OC43 + RSV	3	0.30%	*C. pneumoniae*	1	1%
hMPV + PIV3	3	0.30%	Flu B	1	1%
HRV/EV + PIV4	3	0.30%	*M. pneumoniae*	1	1%
AdV + HRV/EV + PIV3	2	0.20%	PIV1	1	1%
AdV + RSV	1	0.20%			
CoV HKU1 + CoV OC43	2	0.20%			
HRV/EV + *B. pertussis*	2	0.10%			
AdV + *B. pertussis* + HRV/Entero	1	0.10%			
AdV + *C. pneumoniae*	1	0.10%			
AdV + CoV 229E + RSV	1	0.10%			

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Organism Combinations	Number of Positive Samples	Percentage of Total Samples Tested (n/1117)	Organism	Number of Mixed Infections	Prevalence in Mixed Infections (n/121)
Adenovirus + CoV NL63	1	0.10%			
Adenovirus + CoV OC43	1	0.10%			
Adenovirus + hMPV	1	0.10%			
Adenovirus + PIV3	1	0.10%			
CoV 229E + CoV NL63 + HRV/EV + RSV	1	0.10%			
CoV 229E + HRV/EV	1	0.10%			
CoV 229E + RSV	1	0.10%			
CoV HKU1 + HRV/EV + RSV	1	0.10%			
CoV NL63 + hMPV + RSV	1	0.10%			
CoV OC43 + hMPV	1	0.10%			
hMPV + PIV4	1	0.10%			
HRV/EV + PIV1	1	0.10%			
HRV/EV + PIV2	1	0.10%			
Flu B + RSV	1	0.10%			
PIV4 + RSV	1	0.10%			
PIV2 + *M. pneumoniae*	1	0.10%			

A total of 1117 prospective clinical specimens were tested and analyzed during the first phase and the second phase of the prospective clinical evaluation (2009/2010 respiratory season and 2010/2011 respiratory season). Of the 1117 analyzed prospective clinical specimens, 94.6% (1057/1117) of these specimens yielded valid results on the first attempt (i.e. first loaded pouch). Invalid results or no results were obtained for the remaining 60 (5.4%) specimens (no results for 24 specimens due to incomplete runs; 36 specimens were Invalid due to pouch control failures). Of the 24 incomplete runs, 3 were aborted by users (0.3%); 6 were due to software-related errors (0.6%) and 15 were due to instrument errors (1.3%). Fifty-seven (57) of the 60 initially failed (no results or invalid) specimens yielded valid results after a single retest using a new pouch/sample. The remaining three (3) specimens failed on the second attempt (2 due to failed pouch controls, 1 due to an instrument error), but yielded valid results following a second retest using another pouch/sample.

A single pouch leak (1/1244 loaded pouches; 0.08%) was observed during the first phase of the prospective clinical evaluation. Following discovery of the leak, the operator followed recommended decontamination procedures and performed contamination surveillance swab testing of the area surrounding the instrument. No contamination was detected. No pouch leaks were observed in the second phase of the prospective clinical study.

Testing of Preselected Archived Specimens

Several organisms, such as Influenza, were either not encountered in the prospective clinical study or had a low prevalence. To supplement the results of the prospective clinical study, an evaluation of preselected archived specimens was performed. The specimens were archived clinical NPS that were selected because they had previously tested positive for one of the following organisms: Adenovirus, *Bordetella pertussis*, Coronaviruses 229E and OC43, Enterovirus, Influenzas A H1, H1-2009, and H3, Influenza B, *Mycoplasma pneumoniae*, and Parainfluenza Viruses 1-4. Prior to testing with the FilmArray RP, the presence (or absence for negative specimens) of the expected organisms was confirmed in each specimen using validated organism-specific PCR assays followed by bi-directional sequencing. The specimens were organized into “test panels” and randomized such that the users performing the

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FilmArray RP testing were blinded as to the expected test result. Each panel contained specimens known to be positive and specimens known to be negative for the specific organism being evaluated, which allows for the calculation of a positive percent agreement (PPA) and a negative percent agreement (NPA). A summary of the available demographic information of the tested samples is provided in Table 18 and the results of the FilmArray testing are presented in Table 19.

Table 18. Demographic Summary of FilmArray RP Archived Specimen Study

Total Specimens		668
Sex	Female (%)	217 (32.5%)
	Male (%)	217 (32.5%)
	Unknown[a]	234 (35%)
Age	Avg	13
	Median	7
	Min	0.5
	Max	91
Age Range	≤5	239 (35.8%)
	6-21	112 (16.8%)
	22-49	42 (6.3%)
	≥50	47 (7%)
	≥5[b]	3 (0.4%)
	Unknown[a]	225 (33.7%)

[a] Demographic information was not provided for specimens from one source. Because the specimens were provided by a pediatric hospital, it is understood that the age range of specimens was from <1 yrs to 21 yrs.
[b] One source provided age category "less than 5 years of age or equal to/greater than 5 years of age"

Table 19. Summary of FilmArray RP Archived Specimen Performance Data

Organism	Positive Percent Agreement (PPA)			Negative Percent Agreement (NPA)		
	TP/TP +FN	Percent	95% CI	TN/TN+FP	Percent	95% CI
Adenovirus	27/27[a]	100%	87.2 - 100%	28/28	100%	87.7 - 100%
B. pertussis	53/56[b]	94.6%	85.1 - 98.9%	56/58[c]	96.5%	88.1 - 99.6%
Coronavirus 229E	13/13	100%	75.3 - 100%	45/47[d]	95.7%	85.5 - 99.5%
Coronavirus OC43	24/24	100%	85.8 - 100%	33/36[e]	91.7%	77.5 - 98.2%
Enterovirus	22/23[f]	95.7%	78.0 - 99.9%	90/90	100%	96.0 - 100%
Influenza A H1	32/32[g]	100%	89.1 - 100%	127/127	100%	97.1 - 100%
Influenza A H1-2009	34/34[h]	100%	89.7 - 100%	125/125	100%	97.1 - 100%
Influenza A H3	54/54[i]	100%	93.4 - 100%	105/105	100%	96.5 - 100%
Influenza B	30/30[j]	100%	88.4 - 100%	129/129	100%	97.2 - 100%
M. pneumoniae	54/64[k]	84.4%	73.1 - 92.2%	58/65[l]	89.2%	79.1 - 95.6%
Parainfluenza Virus 1	34/35[m]	97.1%	85.1 - 99.9%	94/94	100%	96.2 - 100%
Parainfluenza Virus 2	28/28[n]	100%	87.6 - 100%	101/101	100%	96.4 - 100%
Parainfluenza Virus 3	36/36	100%	90.3 - 100%	93/93	100%	96.1 - 100%
Parainfluenza Virus 4	11/11[o]	100%	71.5 - 100%	6/6	100%	54.1 - 100%

[a] Out of 28 AdV specimens received for testing, the organism status of one (1) specimen could not be confirmed by organism specific PCR followed by bidirectional sequencing and was excluded from further analysis.

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[b] Two (2) *B. pertussis*-positive specimens were originally identified by the source lab as negative for *B. pertussis* but were unexpectedly found to be positive by organism specific PCR followed by bidirectional sequencing. Both of these specimens were negative when tested with the FilmArray, and both were found to be negative for *B. pertussis* during discrepancy investigation of confirmation testing.
[c] Ten (10) *B. pertussis*-negative specimens were originally identified by the source lab as positive for *B. pertussis* but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Two (2) of these specimens were positive when tested with the FilmArray and both of these specimens were found to be positive for *B. pertussis* during discrepancy investigation of confirmation testing. Two (2) source laboratory positive samples were found to contain *B. holmesii;* both of these samples gave the expected negative result when tested with the FilmArray RP.
[d] One (1) CoV 229E-negative specimen was originally identified by the source lab as positive for CoV 229E but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. This specimen was positive when tested with the FilmArray RP.
[e] Four (4) CoV OC43-negative specimens were originally identified by the source lab as positive for CoV OC43 but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Two (2) of these specimens were positive when tested with the FilmArray RP.
[f] Out of 30 Enterovirus specimens received for testing, the organism status of 7 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[g] Out of 37 Flu A H1 specimens received for testing, the organism status of 5 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[h] Out of 37 Flu A H1-2009 specimens received for testing, the organism status of 2 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis. One additional sample was excluded due to an invalid FilmArray result.
[i] Out of 58 FluA A H3 specimens received for testing, the organism status of 4 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[j] Out of 36 Flu B specimens received for testing, the organism status of 5 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis. One additional sample was excluded due to an invalid FilmArray result.
[k] The Ct results obtained during confirmation PCR testing for the 10 samples that were not detected by FilmArray indicated low organism levels in the sample (Ct range 34.3-38.7) possible resulting from sample degradation during storage of these archived specimens.
[l] Twenty-two (22) *M. pneumoniae*-negative specimens were originally identified by the source lab as positive for *M. pneumoniae* but this could not be confirmed by organism specific PCR followed by bidirectional sequencing. Seven (7) of these specimens were positive when tested with the FilmArray RP.
[m] Out of 38 PIV1 specimens received for testing, the organism status of 3 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.
[n] Out of 29 PIV2 specimens received for testing, the organism status of 1 specimen could not be confirmed with organism-specific PCR and bi-directional sequencing and was excluded from further analysis.
[o] Out of 13 PIV4 specimens received for testing, the organism status of 2 specimens could not be confirmed with organism-specific PCR and bi-directional sequencing and were excluded from further analysis.

Testing of Contrived *C. pneumoniae* Specimens

Archived NPS specimens that had previously tested positive for *C. pneumoniae* were unavailable for testing. Therefore, contrived *C. pneumoniae* specimens were used as surrogate clinical specimens to test the sensitivity and specificity of the FilmArray RP *C. pneumoniae* assay. Residual specimens that had been collected during the prospective clinical evaluation were spiked with *C. pneumoniae* at clinically relevant levels (or unspiked; 50 of each). The organism status of each contrived specimen was blinded to the users testing the specimens.

Table 20. FilmArray RP Contrived *C. pneumoniae* Specimen Performance Data

Organism	Positive Percent Agreement (PPA)			Negative Percent Agreement (NPA)		
	TP/TP +FN	Percent	95% CI	TN/TN+FP	Percent	95% CI
C. pneumoniae	50/50	100%	92.9 – 100%	50/50	100%	92.9 – 100%

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Clinical Comparison Study (Modified FilmArray RP as Compared to Original FilmArray RP)

The original FilmArray RP was modified by the addition of a second Adenovirus assay to improve Adenovirus detection by the device. To demonstrate performance of the modified FilmArray RP, a comparison study was performed by testing 222 de-identified archived nasopharyngeal swab specimens collected between 2008 and 2011 throughout the U.S. (at least 8 geographically distinct locations) and Scotland (at least 1 location) with both the original FilmArray RP and modified FilmArray RP. A total of 26 Adenovirus specimens were detected by the modified FilmArray RP, of these only 15 were detected by the original FilmArray RP, demonstrating a 73% greater detection rate by the modified FilmArray RP in this clinical comparison study. For the other 19 organisms on the panel, performance appeared to be equivalent between the original and modified FilmArray RP versions.

Table 21. Performance Comparison of the Modified FilmArray RP to the Original FilmArray RP using Archived Specimens

Analyte	Positive Agreement				Negative Agreement			
	orig + mod +	orig + mod -	PPA	95% CI	orig - mod -	orig - mod +	NPA	95% CI
Adenovirus	15	0	100% (15/15)	78.2 – 100%	196	11 [a]	94.7% (196/207)	90.7 – 97.3%
CoV 229E	6	0	100% (6/6)	54.1 – 100%	216	0	100% (216/216)	98.3 – 100%
CoV HKU1	8	0	100% (8/8)	63.1 – 100%	214	0	100% (214/214)	98.3 – 100%
CoV NL63	15	1 [b]	93.8% (15/16)	69.8 – 99.8%	206	0	100% (206/206)	98.2 – 100%
CoV OC43	13	0	100% (13/13)	75.3 – 100%	208	1 [c]	99.5% (208/209)	97.4– 100%
hMPV	10	0	100% (10/10)	69.2 – 100%	209	3 [d]	98.6% (209/212)	95.9 – 99.7%
HRV/EV	57	4 [e]	93.4% (57/61)	84.0 – 98.2%	158	3 [e]	98.1% (158/161)	94.6 – 99.6%
Flu A	36	0	100% (36/36)	90.3 – 100%	184	1 [f]	99.5% (184/185)	97.0 – 100%
Flu A H1	9	0	100% (9/9)	66.4 – 100%	213	0	100% (213/213)	98.3 – 100%
Flu A H1-2009	15	0	100% (15/15)	78.2 – 100%	205	1 [f]	99.5% (205/206)	97.3 – 100%
Flu A H3	13	0	100% (13/13)	75.3 – 100%	209	0	100% (209/209)	98.3 – 100%
Flu B	10	0	100% (10/10)	69.2 – 100%	212	0	100% (212/212)	98.3 – 100%
RSV	21	0	100% (21/21)	83.9 – 100%	201	0	100% (201/201)	98.2 – 100%
PIV1	11	0	100% (11/11)	71.5 – 100%	211	0	100% (211/211)	98.3 – 100%
PIV2	8	0	100% (8/8)	63.1 – 100%	214	0	100% (214/214)	98.3 – 100%
PIV3	18	0	100% (18/18)	81.5 – 100%	204	0	100% (204/204)	98.2 – 100%
PIV4	6	0	100% (6/6)	54.1 – 100%	214	2 [g]	99.1% (214/216)	96.7 – 99.9%
B. pertussis	25	1 [h]	96.2% (25/26)	80.4 – 99.9%	196	0	100% (196/196)	98.1 – 100%
C. pneumoniae	1	0	100% (1/1)	n/a	221	0	100% (221/221)	98.3 – 100%
M. pneumoniae	0	0	n/a	n/a	222	0	100% (222/222)	98.4 – 100%

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orig = original FilmArray RP, mod = modified FilmArray RP, PPA = positive percent agreement, NPA = negative percent agreement, CI = confidence interval
[a] 10/11 of the additional AdV detections by the modified FilmArray RP were confirmed to contain AdV by bi-directional sequence analysis; these AdV were identified by sequencing as AdVC2, AdVC5, AdVC6, AdVE4, and one undetermined serotype. One specimen could not be sequenced due to low analyte levels.
[b] A single specimen was found to be positive for CoV NL63 when tested with the original RP pouch but not the modified RP pouch. The specimen had previously been identified as positive for *B. pertussis* and had not been tested for CoV NL63 by the source laboratory. This specimen previously tested using the original pouch was negative for CoV NL63 . There was insufficient specimen for discrepancy investigation. Low viral load is suspected to have caused this spurious result.
[c] The Coronavirus OC43 discrepancy was due to cross-reactivity between the OC43 assay and HKU1 virus that was detected in the RP modified pouch and not in the original RP pouch.
[d] 2/3 human Metapneumovirus discrepant specimens were confirmed by bi-directional sequence analysis. Low viral load is suspected to have prevented detection by sequencing for the other specimen.
[e] 0/7 Human Rhinovirus/Enterovirus discrepant specimens were confirmed by bi-directional sequence analysis. Low viral load is suspected to have prevented detection by sequencing.
[f] A single specimen containing Influenza A H1-2009 provided repeated equivocal results on the original RP pouch, but was detected by the modified pouch.
[g] Parainfluenza Virus 4 was confirmed in both discrepant specimens by bi-directional sequence analysis.
[h] *B. pertussis* was confirmed in the discrepant specimen by bi-directional sequence analysis.

To supplement the archived specimen data for low prevalence organisms and to provide additional Adenovirus performance data specifically for AdVC2 and AdVC6, a set of 44 contrived (spiked NPS) specimens (10 AdVC2, 10 AdVC6, 10 *C. pneumoniae*, and 14 *M. pneumoniae*) was tested with both the modified FilmArray RP and the original FilmArray RP. The organism status of each contrived specimen was blinded to the users analyzing the specimens. Modified FilmArray RP detected all 20 Adenovirus-spiked specimens, while original FilmArray RP detected none of the Adenovirus-spiked specimens. Modified FilmArray RP also detected another Adenovirus in the background of a specimen spiked with *C. pneumoniae*. Performance appeared to be equivalent between modified FilmArray RP and original FilmArray RP for *C. pneumoniae* and *M. pneumoniae*.

Table 22. Clinical Comparison Data of the Modified FilmArray RP to the Original FilmArray RP for 44 Contrived Specimens

Organism	Positive Agreement				Negative Agreement			
	orig + mod +	orig + mod -	PPA	95% CI	orig - mod -	orig - mod +	NPA	95% CI
Adenovirus (AdVC2 and AdVC6)	0	0	n/a	n/a	23	21[a]	52.3% (23/44)	36.7 – 67.5%
C. pneumoniae	8	1	88.9% (8/9)	51.8 – 99.7%	35	0	100% (35/35)	90.0 – 100%
M. pneumoniae	14	0	100% (14/14)	76.8 – 100%	30	0	100% (30/30)	88.4 – 100%

orig = original FilmArray RP, mod = modified FilmArray RP, PPA = positive percent agreement, NPA = negative percent agreement, CI = confidence interval
[a] In addition to ten specimens spiked with AdVC6 and ten specimens spiked with AdVC2, modified FilmArray RP also detected an Adenovirus in the background of one specimen that had been spiked with *C. pneumoniae*. This detection was confirmed by bi-directional sequence analysis to be AdVC2.

The Adenoviruses detected in archived specimens were categorized into serotype groups using bi-directional sequence analysis. Combined, the archived and contrived specimen comparison data demonstrates improved detection of AdVC2, AdVC5, AdVC6, AdVE4 by modified FilmArray RP as compared to original FilmArray RP.

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Table 23. Adenovirus Serotype Detections by the Modified FilmArray RP and the Original FilmArray RP in Archived and Contrived Specimens

Adenovirus (Serotyped by PCR)	Number of Adenovirus-positive Specimens (as Detected by Modified FilmArray RP)	Detections by Original FilmArray RP
AdVC1	8	8/8 (100%)
AdVC2	15 [a]	2/15 (13%)
AdVC5	2	1/2 (50%)
AdVC6	16 [a]	1/16 (6%)
AdVB3	1	1/1 (100%)
AdVE4	3	2/3 (67%)
AdV serotype unknown	2	0/2 (0%)

[a] Ten AdVC2 specimens and ten AdVC6 specimens were contrived by spiking these viruses into NPS specimens. One AdVC2 was also detected and sequence confirmed in the background of a specimen spiked with *C. pneumoniae*.

Limit of Detection

The analytical sensitivity or Limit of Detection (LoD) for FilmArray RP organisms was determined by testing limiting dilutions of quantified cultures or clinical specimens. LoD is defined as the lowest concentration at which the organism is consistently detected (detection in ≥95% of samples tested). Simulated NPS sample matrix (cultured human cells in VTM) was spiked with one or more organisms and at least 20 replicates were tested at the estimated LoD concentration. The ~~confirmed~~ LoD concentration for each FilmArray RP ~~organism~~ analyte listed in Table 24 has been ~~(determined with the original FilmArray RP unless otherwise noted~~confirmed with detection in at least 19/20 replicates (≥95%) on the FilmArray, FilmArray 2.0 and FilmArray Torch systems.

Table 24. LoD for Organisms Detected by FilmArray RP

Organism	Strain	LoD Concentration
Adenovirus[a]	AdVC1	100 $TCID_{50}$/mL[a]
	AdVC2	
	AdVE4	
	AdVC6	
Coronavirus 229E	ATCC VR-740	4 $TCID_{50}$/mL
Coronavirus HKU1[b]	Clinical Specimen [ba]	1.9 x 10^6 RNA copies/mL
Coronavirus NL63	NR-470	5 $TCID_{50}$/mL
Coronavirus OC43	ATCC VR-759	600 $TCID_{50}$/mL
Enterovirus	Echovirus 6	30,000 $TCID_{50}$/mL[c]
Human Metapneumovirus	hMPV-16, IA10-2003 (Type A1)	2 $TCID_{50}$/mL
Human Rhinovirus	Type 1A	1 $TCID_{50}$/mL
Influenza A H1N1	A/Brisbane/59/07	200 $TCID_{50}$/mL
	A/New Caledonia/20/99	2,000 $TCID_{50}$/mL
Influenza A H1-2009	A/SwineNY/03/2009	100 $TCID_{50}$/mL
Influenza A H3N2	A/Wisconsin/67/2005	5 $TCID_{50}$/mL
	A/Port Chalmers/1/73	50 $TCID_{50}$/mL
Influenza B	B/FL/04/06	60 $TCID_{50}$/mL
	B/Taiwan/2/62	
Parainfluenza Virus 1	Type 1	500 $TCID_{50}$/mL
Parainfluenza Virus 2	Type 2	10 $TCID_{50}$/mL

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Organism	Strain	LoD Concentration
Parainfluenza Virus 3	Type 3	10 $TCID_{50}$/mL
Parainfluenza Virus 4	Type 4 (subtype A)	5,000 $TCID_{50}$/mL
Respiratory Syncytial Virus	Type A	2 $TCID_{50}$/mL
Bordetella pertussis	A639	4,000 CFU/mL
Chlamydophila pneumoniae	TW183	3,000 DNA copies/mL
Mycoplasma pneumoniae	M129 (Type 1)	30 $TCID_{50}$/mL

[a] LoD for Adenovirus ~~serotypes~~ of 100$TCID_{50}$/mL was confirmed using the modified FilmArray RP (v1.7). The original FilmArray RP Adenovirus LoD was ~~with 20 replicates using the modified FilmArray RP. LoD was decreased from~~ 300 $TCID_{50}$/mL. ~~with the original panel to 100 $TCID_{50}$/mL with the modified panel. Analytical sensitivity for all other organisms was determined to be equivalent between the original and modified FilmArray RP.~~

[b] Coronavirus HKU1 was evaluated using a clinical specimen containing a high load of Coronavirus HKU1. The specimen was quantified by real-time PCR against a standard curve of synthetic Coronavirus HKU1 RNA transcript to obtain quantification of the viral nucleic acid in specimen (RNA copies/mL).

[c] The Enterovirus LoD (30,000 $TCID_{50}$/mL) represents the sensitivity of the Entero1 and Entero2 assays. A positive Human Rhinovirus/Enterovirus result can be obtained at 100-fold lower concentrations (300 $TCID_{50}$/mL) based on detection of the virus with a combination of 6 relevant assays (HRV1-4, Entero1, and Entero2).

NOTE: Most viruses were re-grown and quantified in $TCID_{50}$ (50% Tissue Culture Infectious Dose) for LoD determination. The unit $TCID_{50}$ is a measure of infectivity or cytotoxicity rather than number of organisms or copies of nucleic acid. Variability in $TCID_{50}$/mL may not accurately reflect differences in the relative sensitivity of detection between different organisms or different strains of the same organism.

Analytical Reactivity (Inclusivity)

The analytical reactivity of the FilmArray RP assays was evaluated with an inclusivity panel consisting of strains/isolates that represent the genetic, temporal, and geographic diversity of the FilmArray RP: 33 Adenovirus, 6 Coronavirus (1 229E, 3 HKU1, 1 OC43, and 1 NL63), 10 human Metapneumovirus, 12 Enterovirus, 14 Rhinovirus, 22 Influenza A (including 10 Influenza A H1, 3 Influenza A H1-2009, and 9 Influenza A H3), 11 Influenza B, 12 Parainfluenza Virus (3 PIV1, 2 PIV2, 3 PIV3, and 4 PIV4), 6 Respiratory Syncytial Virus, 9 *Bordetella pertussis*, 4 *Chlamydophila pneumoniae*, and 9 *Mycoplasma pneumoniae*. Each strain was initially tested in a simulated NPS sample matrix at or near the LoD (using the original FilmArray RP unless otherwise noted). Higher concentrations were tested if the organism was not detected at LoD. Each of the 148 strains tested in this study were detected by the FilmArray RP.

For some organisms, additional analysis of clinical data and *in silico* analysis of NCBI database sequences was carried out to supplement the testing of the inclusivity panel.

Adenovirus

Adenovirus inclusivity testing was performed on 33 Adenovirus isolates representing 22 different serotypes within species A-F. Each isolate was tested at LoD concentration (100 $TCID_{50}$/mL) using the modified FilmArray RP. If an Adenovirus isolate was not detected at LoD, testing was repeated at 10x LoD. Isolates not detected at 10x LoD (1,000 $TCID_{50}$/mL) are listed as Not Detected, however, some reactivity may be observed with these serotypes if present in a sample at high levels.

Table 25 provides inclusivity results for respiratory serotypes belonging to species B, C, and E. The FilmArray RP was designed to detect all respiratory species/serotypes of Adenovirus.

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AdVB55 and AdVC57 are the only respiratory serotypes that were not evaluated for inclusivity. Available sequence information for these serotypes indicates a perfect match to FilmArray RP Adenovirus assay primers and efficient detection at 1x LoD is predicted.

Table 25. Results of Inclusivity Testing for Adenovirus - Respiratory Serotypes

Species	Serotype	Isolate	Concentration Detected	Multiple of LoD Detected
B	3	Zeptometrix #0810062CF	100 $TCID_{50}$/mL	1x
	7a	Zeptometrix #0810021CF	100 $TCID_{50}$/mL	1x
	7d2	Iowa/2001	100 $TCID_{50}$/mL	1x
	7h	Iowa/1999	100 $TCID_{50}$/mL	1x
	11	Wisconsin/2005	100 $TCID_{50}$/mL	1x
	14	Missouri/2005	100 $TCID_{50}$/mL	1x
	16	ATCC VR-17	100 $TCID_{50}$/mL	1x
	21	Missouri/2005	100 $TCID_{50}$/mL	1x
	34	Texas/2005	100 $TCID_{50}$/mL	1x
	35	ATCC VR-718	100 $TCID_{50}$/mL	1x
	50	ATCC VR-1602	100 $TCID_{50}$/mL	1x
C	1	Zeptometrix #0810050CF	100 $TCID_{50}$/mL	1x
	2	New York/2004	100 $TCID_{50}$/mL	1x
		ATCC VR-846	100 $TCID_{50}$/mL	1x
		Clinical isolate #266153	100 $TCID_{50}$/mL	1x
		Clinical isolate #266161	100 $TCID_{50}$/mL	1x
		Clinical isolate #266213	100 $TCID_{50}$/mL	1x
	5	Zeptometrix #0810020CF	100 $TCID_{50}$/mL	1x
	6	Colorado/2005	100 $TCID_{50}$/mL	1x
		ATCC VR-6	100 $TCID_{50}$/mL	1x
		Clinical isolate #274924	100 $TCID_{50}$/mL	1x
		Clinical isolate #274948	100 $TCID_{50}$/mL	1x
		Clinical isolate #275032	100 $TCID_{50}$/mL	1x
E	4a	South Carolina/2004	100 $TCID_{50}$/mL	1x
	4p3	New Jersey/2005	100 $TCID_{50}$/mL	1x

Table 26 provides inclusivity results for non-respiratory serotypes belonging to species A, D, and F. The sensitivity of detection for non-respiratory adenoviruses will vary.

Table 26. Results of Inclusivity Testing for Adenovirus - Non-Respiratory Serotypes

Species	Serotype	Isolate	Concentration Detected	Multiple of LoD Detected
A	12	ATCC VR-863	Not Detected[a]	
	18	ATCC VR-19	Not Detected[a]	
	31	Zeptometrix #0810073CF	1000 $TCID_{50}$/mL	10x
D[b]	8	Zeptometrix #0810069CF	100 $TCID_{50}$/mL	1x
	20	Zeptometrix #0810115CF	100 $TCID_{50}$/mL	1x
	37	Zeptometrix #0810119CF	100 $TCID_{50}$/mL	1x
F	40	Zeptometrix #0810084CF	Not Detected[a]	

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	41	Indiana/2004	100 $TCID_{50}$/mL	1x

[a] Adenovirus serotypes AdVA12, AdVA18 and AdVF40 were not detected when tested at 10x LoD ($TCID_{50}$/mL).
[b] Adenovirus species D is comprised of over 30 different serotypes.

Supplemental Adenovirus Reactivity Information (clinical data from original and modified FilmArray RP):

A subset of prospective and retrospective archived clinical specimens that were FilmArray RP positive for Adenovirus was subjected to PCR and bi-directional sequence analysis. BLAST analysis of the sequence data obtained for a region of the Adenovirus hexon gene identified species B (serotypes 3, 3+11p, 7, 16 and 21), species C (serotypes 1, 2, 5, and 6), and species E (serotype 4) in these clinical specimens. Species A, D, F, and G (often associated with conjunctivitis and gastroenteritis) were not identified in clinical specimens.

Coronaviruses 229E, HKU1, OC43 and NL63

Table 27. Results of Inclusivity Testing for Coronaviruses

Coronavirus	Strain / Isolate	Concentration Detected	Multiple of LoD Detected
229E	ATCC VR-740	4 $TCID_{50}$/mL	1x
HKU1	Clinical Specimen #1120	2.08×10^6 RNA copies/mL[b]	1.1x
	Clinical Specimen #6123	1.41×10^4 $TCID_{50}$/mL[a] ~1.9×10^6 RNA copies/mL[b]	1x
	Clinical Specimen #6213 (Type B)[c]	1.9×10^6 RNA copies/mL[b]	1x
NL63	BEI Resources NR-470	50 $TCID_{50}$/mL	1x
OC43	ATCC VR-759	600 $TCID_{50}$/mL	1x

[a] Virus contained in Clinical Specimen #6123 was grown in culture and quantified ($TCID_{50}$/mL) by infectivity assay.
[b] Quantification of the viral RNA contained in clinical specimens containing Coronavirus HKU1 was performed using real-time RT-PCR against a standard curve generated from a synthetic RNA template.
[c] Classification of Coronavirus HKU1 Clinical Specimen #6213 (Type B) was determined by bi-directional sequence analysis of the nucleocapsid (N) gene.

Human Metapneumovirus

Table 28. Results of Inclusivity Testing for Human Metapneumovirus

Subtype	Strain ID		Concentration Detected	Multiple of LoD Detected
A1	9	IA3-2002	2 $TCID_{50}$/mL	1x
	16	IA10-2003	2 $TCID_{50}$/mL	1x
A2	20	IA14-2003	2 $TCID_{50}$/mL	1x
	27	IA27-2004	2 $TCID_{50}$/mL	1x
B1	3	Peru2-2002	2 $TCID_{50}$/mL	1x

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Subtype	Strain ID		Concentration Detected	Multiple of LoD Detected
	5	Peru3-2003	2 $TCID_{50}$/mL	1x
	13	IA7-2003	2 $TCID_{50}$/mL	1x
	18	IA18-2003	2 $TCID_{50}$/mL	1x
B2	8	Peru6-2003	2 $TCID_{50}$/mL	1x
	22	IA16-2003	2 $TCID_{50}$/mL	1x

Human Rhinovirus and Enterovirus

Analytical inclusivity testing evaluated the reactivity of the FilmArray RP HRV and Entero assays with 25 individual serotypes representing various species, including Enterovirus species A-D and Human Rhinovirus species A and B.

Table 29. Results of inclusivity Testing for Human Rhinovirus / Enterovirus

Species	Strain / Serotype	Concentration Detected	Multiple of LoD[a] Detected
Enterovirus A	Coxsackievirus A10 ATCC VR-168	30,000 $TCID_{50}$/mL	1x
	Enterovirus 71 ATCC VR-1432	1:30,000 dilution of stock	n/a
	Enterovirus 71	9,400 $TCID_{50}$/mL [b]	<1x
Enterovirus B	Coxsackievirus A9	9,400 $TCID_{50}$/mL [b]	<1x
	Coxsackievirus B3	30,000 $TCID_{50}$/mL	1x
	Coxsackievirus B4	30,000 $TCID_{50}$/mL	1x
	Echovirus 6	30,000 $TCID_{50}$/mL	1x
	Echovirus 9	9,400 $TCID_{50}$/mL [b]	<1x
	Echovirus 11	300,000 $TCID_{50}$/mL	10x
Enterovirus C	Coxsackievirus A21 /Kuykendall ATCC VR-850	30,000 $TCID_{50}$/mL	1x
	Coxsackievirus A24 DN-19 ATCC VR-583	30,000 $TCID_{50}$/mL	1x
Enterovirus D	Enterovirus 68 (F02-3607 corn) ATCC VR-1197	30,000 $TCID_{50}$/mL	1x
Rhinovirus A	**A1**	1 $TCID_{50}$/mL	1x
	A2 (HGP) ATCC VR-482	10 $TCID_{50}$/mL	10x
	A7 (68-CV11) ATCC VR-1601	1 $TCID_{50}$/mL	1x
	A16 (11757) ATCC VR-283	10 $TCID_{50}$/mL	10x
	A34 (137-3) ATCC VR-507	1 $TCID_{50}$/mL	1x
	A57 (Ch47) ATCC VR-1600	100 $TCID_{50}$/mL	100x

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Species	Strain / Serotype	Concentration Detected	Multiple of LoD[a] Detected
	A77 (130-63) ATCC VR-1187	1 $TCID_{50}$/mL	1x
	A85 (50-525-CV54) ATCC VR-1195	10 $TCID_{50}$/mL	10x
Rhinovirus B	**B3** (FEB) ATCC VR-483	1 $TCID_{50}$/mL	1x
	B14 (1059) ATCC VR-284	1 $TCID_{50}$/mL	1x
	B17 (33342) ATCC-282	100 $TCID_{50}$/mL	100x
	B27 (5870) ATCC VR-1137	1 $TCID_{50}$/mL	1x
	B42 (56822) ATCC VR-338	10 $TCID_{50}$/mL	10x
	B83 (Baylor 7) ATCC VR-1193	1 $TCID_{50}$/mL	1x

[a] The LoD for Enterovirus used for this study was 30,000 $TCID_{50}$/mL. The LoD for Rhinovirus was 1 $TCID_{50}$/mL.
[b] Strains were tested below the Enterovirus LoD concentration due to a lesser concentration of virus in the culture fluid.

Supplemental Human Rhinovirus/Enterovirus Reactivity Information (clinical data and *in silico* analyses):

In addition to the analytical inclusivity testing, BLAST analysis was performed on sequence data obtained from prospective and retrospective archived clinical specimens that were FilmArray positive for Human Rhinovirus/Enterovirus. The following species and subtypes were identified in clinical specimens:

Enterovirus Species A:	Enterovirus serotype 71
	Coxsackievirus A2 and A6
Enterovirus Species B:	Echovirus serotypes 3, 6, 7, 11, 15, 21 and 30
	Coxsackievirus B1, B3 and A9
	Enterovirus serotypes 81 and 88
Rhinovirus Species A:	Human Rhinovirus serotypes 1B, 8, 9,10, 13, 19, 21, 22, 23, 28, 30, 32, 34, 38, 39, 40, 46, 47, 49, 51, 54, 56, 58, 59, 61, 62, 66, 68, 75, 77, 78, 80, 82, 98 and 100
Rhinovirus Species B:	Human Rhinovirus serotypes 27, 69, 83 and 91
Rhinovirus Species C:	at least 3 individual strains and 12 distinct isolates[a]

[a]Human Rhinovirus species C (also known as Enterovirus species D) has not been classified into serotypes.

Enterovirus species C includes Poliovirus types 1-3. Simulated reactivity of the FilmArray RP Human Rhinovirus/Enterovirus assays with Enterovirus Species C Poliovirus sequences was generated using a bioinformatics approach. Alignment of assay primer sequences with the listed GenBank sequences indicates the FilmArray RP assay can react with Poliovirus types 1, 2 and 3, giving a Human Rhinovirus/Enterovirus result.

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Table 30. Simulated Reactivity of the FilmArray RP HRV and Entero Assays with Poliovirus Sequences

Strain	GenBank ID	Simulated FilmArray RP Result
Human poliovirus 1 strain CHN8264c/GZ/CHN/2004	FJ769385	Human Rhinovirus/Enterovirus
Human poliovirus 2, complete genome	AY177685	Human Rhinovirus/Enterovirus
Human poliovirus 3 strain IRA10853, complete genome	EU684056	Human Rhinovirus/Enterovirus

Influenza A

Table 31. Results of Inclusivity Testing for Human Isolates of Influenza A

Type	Strain	Concentration Detected	Multiple of LoD Detected
Influenza A H1	A/Brisbane/59/07	200 $TCID_{50}$/mL	1x
	A/Solomon Islands/3/2006	200 $TCID_{50}$/mL	1x
	A/Hawaii/15/01 CDC#2001701117	1:300[a]	n/a
	A/New Caledonia/20/99	200 $TCID_{50}$/mL	1x
	A1/Denver/1/57	200 $TCID_{50}$/mL	1x
	A/Mal/302/54	200 $TCID_{50}$/mL	1x
	A1/FM/1/47	200 $TCID_{50}$/mL	1x
	A/Weiss/43	200 $TCID_{50}$/mL	1x
	A/PR/8/34	2000 $TCID_{50}$/mL	10x
	A/NWS/33	200 $TCID_{50}$/mL	1x
Influenza A H1-2009	A/SwineNY/01/2009	100 $TCID_{50}$/mL	1x
	A/SwineNY/02/2009	100 $TCID_{50}$/mL	1x
	A/SwineNY/03/2009	100 $TCID_{50}$/mL	1x
Influenza A H3	A/Brisbane/10/07	5 $TCID_{50}$/mL	1x
	A/Wisconsin/67/2005	5 $TCID_{50}$/mL	1x
	A/NewYork/55/2005 CDC#2005705561	1:300,000 [a]	n/a
	A/Victoria/3/75	5 $TCID_{50}$/mL	1x
	A/Port Chalmers/1/73	5 $TCID_{50}$/mL	1x
	A/Aichi/2/68	50 $TCID_{50}$/mL	10x
	A/Hong Kong/8/68	5 $TCID_{50}$/mL	1x
	Alice (vaccine) A/England/42/72 ATCC VR-776	5 $TCID_{50}$/mL	1x

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Type	Strain	Concentration Detected	Multiple of LoD Detected
	MRC-2 Recombinant strain ATCC VR-777	5 $TCID_{50}$/mL	1x

[a] Strain was not re-cultured and titered. Dilutions of the original culture/titer from the CDC were used.
The HA titer for A/Hawaii/15/01 is unknown and the HA titer for A/NewYork/55/2005 was 256.

Supplemental Reactivity Information for Influenza Strains of Human, Swine and Avian Origin (analytical testing data and *in silico* analyses):

Influenza A viruses are classified by host and subtype, a combination of H (hemagglutinin) and N (neuraminidase) types. Occasionally, non-human Influenza strains are transferred to human hosts. Several strains of swine and avian influenzas were tested or analyzed using bioinformatics for reactivity with the Influenza A and subtyping assays contained in the FilmArray RP. The Influenza A assays (FluA-pan1 and FluA-pan2) were designed to react with all strains of Influenza A. FilmArray RP Influenza A subtyping assays (FluA-H1-pan, FluA-H1-2009 and FluA-H3) were designed to react with specific HA subtypes, with a focus on human host strains. The FluA-H1-2009 assay was designed to be specific for the human pandemic variant of swine origin H1N1 that emerged in 2009.

Testing of viral isolates or nucleic acid from viral culture indicate that the FilmArray RP Influenza A and subtyping assays react with some strains of swine and avian origin as expected (Table 32)

Table 32. Results of Inclusivity Testing with Swine and Avian Isolates of Influenza A

Host	Subtype	Isolate / Strain	Test Concentration	FilmArray Result
Swine	H1N1	Influenza A/Swine/1976/31	~1 x 10^6 EID_{50}/mL	Influenza A H1[a]
	H1N1	Influenza A/Swine/Iowa/15/30	~1 x 10^7 EID_{50}/mL	
Avian	H1N2	Kilbourne F63 A/NWS/34 (HA) x A/Rockefeller Institute/5/57 (NA)[b]	14.8 ng RNA	Influenza A H1

[a] No reactivity was observed with the H1-2009 subtyping assay or other FilmArray RP assays.
[b] Purified and quantified RNA from avian influenza culture was obtained from BEI Resources.

Laboratory testing of Influenza A strains was supplemented with *in silico* predictions of reactivity using bioinformatics and sequence alignments between FilmArray RP assay primers and sequences for Influenza A strains of human, swine, and avian origin. For each strain, multiple (3) GenBank IDs were evaluated, corresponding to the gene segments targeted by the FilmArray RP assays (matrix (MA), non-structural (NS) and hemagglutinin (HA)). Simulated reactivity was determined based on the number and location of mismatches in the targeted region.

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Based on this analysis, the strains listed in Table 33 are predicted to react with the FilmArray RP Influenza A and H1 or H3 subtyping assays as indicated.

Table 33. Simulated Reactivity of FilmArray Influenza A assays with Human, Swine, and Avian Influenza Strains

Host	Subtype	Isolate / Strain	GenBank ID	Simulated FilmArray Result
Human	H1N1	A/California/UR06-0393/2007(H1N1)	CY026540	Influenza A H1
			CY026543	
			CY026539	
	H1N2	A/New York/297/2003(H1N2)	CY002668	
			CY002665	
			CY002664	
	H1-2009	A/Aalborg/INS133/2009(H1N1)	CY063606	Influenza A H1-2009
			CY063610	
			CY063607	
	H3N2	A/Boston/38/2008(H3N2)	CY044581	Influenza A H3
			CY044584	
			CY044580	
	A/(H3N2)v[a]	A/Pennsylvania/09/2011(H3N2)	JN655537	
			JN655534	
			JN655538	
Swine	H1N1	A/swine/Wisconsin/1/1971(H1N1)	CY022414	Influenza A H1
			CY022417	
			CY022413	
	H1N2	A/swine/Hong Kong/NS857/2001(H1N2)	GQ229348	
			GQ229350	
			GQ229347	
Avian	H3N1	A/blue-winged teal/ALB/452/1983(H3N1)	CY004635	Influenza A H3
			CY004638	
			CY005940	
	H3N5	A/mallard/Netherlands/2/1999(H3N5)	CY060261	
			CY060264	
			CY060265	
	H3N7	A/northernshoveler/California/HKWF1367/2007(H3N7)	CY033372	
			CY033375	
			CY033376	
	H3N8	A/American black duck/Washington/699/1978(H3N8)	GU052299	
			GU052302	
			GU052300	

[a]Swine-origin variant H3N2 virus identified in human clinical specimens in 2011. All available GenBank sequences (as of Dec. 12, 2011) were evaluated and a single representative sequence is provided in this table. All isolates for which sequences are available are predicted to generate an Influenza A H3 result when tested with the FilmArray RP.

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The strains of human, swine or avian origin listed in Table 34 are predicted to react only with the FilmArray RP Influenza A (FluA-pan1 and FluA-pan2) assays, giving an Influenza A (no subtype detected) result.

Table 34. Simulated Reactivity of FilmArray Influenza A assays with Human, Swine, and Avian Influenza Strains

Host	Subtype	Strain	GenBank ID	Simulated FilmArray RP Reactivity
Human	H2N2	A/Albany/20/1957(H2N2)	CY022013	Influenza A (no subtype detected)
			CY022014	
			CY022017	
	H5N1	A/Cambodia/R0405050/2007(H5N1)	HQ200572	
			HQ200573	
			FJ225472	
		A/Hong Kong/486/97(H5N1)	AF084281	
			AF255368	
			AF115289	
	H7N2	A/New York/107/2003(H7N2)	EU587368	
			EU587373	
			EU587374	
	H7N3	A/Canada/rv504/2004(H7N3)	CY015006	
			CY015007	
			CY015010	
	H7N7	A/Netherlands/219/03(H7N7)	AY340089	
			AY342422	
			AY338459	
	H9N2	A/Hong Kong/1073/99(H9N2)	AJ404626	
			AJ278647	
			AJ278649	
Swine	H1N2	A/swine/Sweden/1021/2009(H1N2)	GQ495135	
			GQ495136	
			GQ495132	
	H5N1	A/swine/East Java/UT6010/2007(H5N1)	HM440124	
			HM440111	
			HM440123	
Avian	H2N2	A/chicken/New York/13828-3/1995(H2N2)	CY014822	
			CY014825	
			CY014821	
		A/Japan/305/1957(H2N2)	CY045804	
			CY014977	
			CY014980	
		A/Korea/426/1968(H2N2)	CY031595	
			CY031596	
			CY031599	
	H3N2	A/American black duck/North Carolina/675-075/2004(H3N2)	GU051135	
			GU051136	
			GU051137	
	H3N6	A/American black duck/New Brunswick/25182/2007(H3N6)	CY047696	
			CY047697	
			CY047700	
	H4N6	A/blue-winged teal/Minnesota/Sg-00043/2007(H4N6)	CY063977	
			CY063978	
			CY063981	
	H5N1	A/rook/Rostov-on-Don/26/2007(H5N1)	EU814503	
			EU814504	
			EU814507	
		A/turkey/VA/505477-18/2007(H5N1)	GU186509	
			GU186510	

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Host	Subtype	Strain	GenBank ID	Simulated FilmArray RP Reactivity
			GU186513	
		A/chicken/Bangladesh/1151-10/2010(H5N1)	HQ156765	
			HQ156766	
			HQ156764	
	H5N2	A/duck/Pennsylvania/10218/1984(H5N2)	AB295603	
			AB286120	
			AB286652	
	H5N3	A/duck/Singapore/F119/3/1997(H5N3)	GU052802	
			GU052803	
			GU052805	
	H6N1	A/duck/PA/486/1969(H6N1)	EU743286	
			EU743287	
			EU743289	
	H6N2	A/mallard/Czech Republic/15902-17K/2009(H6N2)	HQ244430	
			HQ244433	
			HQ244434	
	H7N7	A/mallard/Korea/GH171/2007(H7N7)	FJ750872	
			FJ959087	
			FJ959090	
	H9N2	A/turkey/Wisconsin/1/1966(H9N2)	CY014663	
			CY014664	
			CY014667	
	H10N7	A/chicken/Germany/N/1949(H10N7)	GQ176136	
			GQ176135	
			GQ176132	
	H11N9	A/duck/Memphis/546/1974(H11N9)	CY014691	
			GQ257441	
			CY014687	

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Influenza B

Table 35. Results of Inclusivity Testing for Influenza B

Strain	Concentration Detected	Multiple of LoD Detected
B/FL/04/06	60 $TCID_{50}$/mL	1x
B/Ohio/01/2005 CDC#2005743348	1:3,000,000[a]	n/a
B/Florida/07/04	60 $TCID_{50}$/mL	1x
B/Malaysia/2506/04	600 $TCID_{50}$/mL	10x
B/Hong Kong/5/72 ATCC VR-823	60 $TCID_{50}$/mL	1x
B/Taiwan/2/62 ATCC VR-295	60 $TCID_{50}$/mL	1x
B/Maryland/1/59 ATCC VR-296	600 $TCID_{50}$/mL	10x
B/GL/1739/54 ATCC VR-103	60 $TCID_{50}$/mL	1x
B/Allen/45 ATCC VR-102	6,000 EID_{50}/mL	n/a
B/Lee/40ATCC VR-101	60 $TCID_{50}$/mL	1x
B/Brigit Recombinant ATCC VR-786	60 $TCID_{50}$/mL	1x

[a] Strain was not re-cultured and titered. Dilutions of the original culture/titer from the CDC were used. The HA titer for B/Ohio/01/2005 was 128.

Parainfluenza Viruses

Table 36. Results of Inclusivity Testing for Parainfluenza Viruses

Type		Strain or Source	Concentration	Multiple of LoD Detected
PIV1		Zeptometrix #0810014CF	500 $TCID_{50}$/mL	1x
		C-35 ATCC VR-94	500 $TCID_{50}$/mL	1x
		C39 BEI NR-3226	500 $TCID_{50}$/mL	1x
PIV2		Zeptometrix #0810015CF	10 $TCID_{50}$/mL	1x
		Greer ATCC VR-92	10 $TCID_{50}$/mL	1x
PIV3		Zeptometrix #0810016CF	10 $TCID_{50}$/mL	1x
		C-243 ATCC VR-93	500 $TCID_{50}$/mL	50x
		NIH 47885 BEI NR-3233	100 $TCID_{50}$/mL	10x
PIV4	A	M25 ATCC VR-1378	5000 $TCID_{50}$/mL	1x
		Zeptometrix #0810060CF	5000 $TCID_{50}$/mL	1x
	B	CH-19503 ATCC VR-1377	5000 $TCID_{50}$/mL	1x
		Zeptometrix #08010060BCF	5000 $TCID_{50}$/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Respiratory Syncytial Virus

Table 37. Results of Inclusivity Testing for Respiratory Syncytial Virus

Type	Strain or Source	Concentration Detected	Multiple of LoD Detected
A	Zeptometrix #0810040ACF	2 $TCID_{50}$/mL	1x
	A/A2 ATCC VR-1540	2 $TCID_{50}$/mL	1x
	A/Long ATCC VR-26	2 $TCID_{50}$/mL	1x
B	B/9320 ATCC VR-955	2 $TCID_{50}$/mL	1x
	B/Wash18537/62 ATCC VR-1580	2 $TCID_{50}$/mL	1x
	B/WV/14617/85 ATCC VR-1400	2 $TCID_{50}$/mL	1x

Bordetella pertussis

Table 38. Results of Inclusivity Testing for *Bordetella pertussis*

Strain	Concentration Detected	Multiple of LoD Detected
A639	4000 CFU/mL	1x
E431	4000 CFU/mL	1x
F ATCC 8467	4000 CFU/mL	1x
5 [17921] ATCC 9340	4000 CFU/mL	1x
18323 [NCTC 10739] ATCC 9797	4000 CFU/mL	1x
10-536 ATCC 10380	4000 CFU/mL	1x
CNCTC Hp 12/63 [623] ATCC 51445	4000 CFU/mL	1x
Tohama I ATCC BAA-589 (vaccine strain)	4000 CFU/mL	1x
MN2531 ATCC BAA-1335	4000 CFU/mL	1x

Chlamydophila pneumoniae

Table 39. Results of Inclusivity Testing for *Chlamydophila pneumoniae*

Strain	Concentration Detected	Multiple of LoD Detected
AR-39 ATCC 53592	3000 copies/mL	1x
CDC/CWL-029 VR-1310	3000 copies/mL	1x
CM-1 ATCC VR-1360	3000 copies/mL	1x
TW183 ATCC VR-2282	3000 copies/mL	1x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Mycoplasma pneumoniae

Table 40. Results of Inclusivity Testing for *Mycoplasma pneumoniae*

Type	Strain	Concentration Detected	Multiple of LoD Detected[b]
Type 1	M129	30 $TCID_{50}$/mL	1x
	M129-B7 ATCC 29342	300 CCU/mL[a]	10x
	PI 1428 ATCC 29085	3,000 CCU/mL	100x
Type 2	FH strain [NCTC 10119] ATCC 15531	300 CFU/mL[c]	n/a
	[Mac] ATCC 15492	300 CCU/mL	10x
Not Determined	[M52] ATCC 15293	300 CCU/mL	10x
	[Bru] ATCC 15377	30,000 CCU/mL	1,000x
	Mutant 22 ATCC 39505	30 CCU/mL	1x
	UMTB-10G ATCC 49894	300 CCU/mL	10x

[a] CCU = Color Changing Unit. Both $TCID_{50}$ and CCU were determined according to the Reed-Muench method. Quantification in CCU/mL was considered equivalent to quantification in $TCID_{50}$/mL.
[b] Following inclusivity testing, all *M. pneumoniae* isolates previously quantified in CCU/mL were re-evaluated by real-time PCR against a standard curve of the LoD strain (M129, $TCID_{50}$/mL). Based on relative molecular quantification, all isolates were detected at levels <1x – 10x LoD, rather than 1-1,000x LoD determined by CCU/mL. ATCC 49894, ATCC 15293, ATCC 29342, and ATCC 39505 were detected at or below 1x LoD, while ATCC 15492, ATCC 29085, and ATCC 15377 were detected between 1-10x LoD.
[c] This was the only *M. pneumoniae* isolate in the panel able to form colonies on plates and was quantified in CFU/mL.

Analytical Specificity (Cross-Reactivity and Exclusivity)

The potential for cross-reactivity between assays contained in the FilmArray RP was evaluated by testing simulated NPS samples containing high concentrations of respiratory panel organisms (tens to thousands-fold higher than LoD). Exclusivity testing was performed with the modified FilmArray RP, except where indicated. No cross-reactivity was observed with the strains and concentrations listed in Table 41.

NOTE: The Coronavirus OC43 assay may cross-react with certain strains of Coronavirus HKU1 when present in the sample at high concentrations.

Table 41. Results of Testing for Cross-Reactivity with FilmArray RP Organisms

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
Adenovirus	AdVC1	1.00×10^5 $TCID_{50}$/mL	1,000x
Coronavirus	229E ATCC VR-740	5.67×10^3 $TCID_{50}$/mL	1,418x
	HKU1[a] Clinical specimen 42/08	1.34×10^8 copies/mL	70x
	NL63 NR-470	5.67×10^3 $TCID_{50}$/mL	1,134x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
	OC43 ATCC VR-759	7.30×10^4 $TCID_{50}$/mL	122x
Human Metapneumovirus	Type A1 hMPV-16 IA10-2003 A1	8.17×10^3 $TCID_{50}$/mL	4,085x
Human Rhinovirus / Enterovirus	Echovirus 6	3.40×10^6 $TCID_{50}$/mL	113x
	Rhinovirus A1	5.67×10^3 $TCID_{50}$/mL	5,670x
Influenza A H1N1	A/Brisbane/59/07	1.00×10^5 $TCID_{50}$/mL	500x
	A/New Caledonia/20/99[b]	1.00×10^5 $TCID_{50}$/mL	500x
	A/PR/8/34[b]	1.00×10^6 $TCID_{50}$/mL	5,000x
	A1/FM/1/47[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/NWS/33[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A1/Denver/1/57[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/Solomon Islands/3/2006 [b]	1.39×10^4 $TCID_{50}$/mL	70x
	A/Weiss/43[b]	4.70×10^3 $TCID_{50}$/mL	24x
	A/Mal/302/54[b]	1.39×10^4 $TCID_{50}$/mL	70x
Influenza A H1-2009	A/SwineNY/03/2009	8.40×10^4 $TCID_{50}$/mL	840x
Influenza A H3N2	A/Wisconsin/67/2005	8.17×10^3 $TCID_{50}$/mL	1634x
	A/Victoria/3/75[b]	4.70×10^3 $TCID_{50}$/mL	940x
	A/Port Chalmers/1/73[b]	5.67×10^3 $TCID_{50}$/mL	1,134x
	A/Aichi/2/68[b]	1.00×10^5 $TCID_{50}$/mL	20,000x
	A/Hong Kong/8/68[b]	1.00×10^5 $TCID_{50}$/mL	20,000x
	A/Alice[b]	4.70×10^3 $TCID_{50}$/mL	940x
	A/MRC 2[b]	8.17×10^3 $TCID_{50}$/mL	1,634x
	A/Brisbane/10/07[b]	8.17×10^3 $TCID_{50}$/mL	1,634x
Influenza B	B/FL/04/06	1.67×10^4 $TCID_{50}$/mL	278x
	B/Lee/40[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Taiwan/2/62[b]	5.03×10^4 $TCID_{50}$/mL	838x
	B/GL/1739/54[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Maryland/1/59[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Florida/07/04[b]	1.00×10^5 $TCID_{50}$/mL	1,667x
	B/Malaysia/2506/04[b]	5.67×10^3 $TCID_{50}$/mL	95x
	B/Allen/45[b]	1.00×10^5 $TCID_{50}$/mL	1,667x
	B/HongKong/5/72[b]	8.17×10^3 $TCID_{50}$/mL	136x
	B/Brigit[b]	3.50×10^4 $TCID_{50}$/mL	583x
Parainfluenza Virus	Type 1	1.39×10^4 $TCID_{50}$/mL	28x

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Virus or Bacterium	Type / Strain	Test Concentration	Multiple of LoD Tested
	Type 2	1.6×10^4 $TCID_{50}$/mL	1,670x
	Type 3	1.00×10^5 $TCID_{50}$/mL	10,000x
	Type 4A	5.67×10^3 $TCID_{50}$/mL[c]	1.13x[c]
Respiratory Syncytial Virus	A	1.39×10^4 $TCID_{50}$/mL	6,950x
	B	2.14×10^4 $TCID_{50}$/mL	10,700x
Bordetella pertussis	E431[b]	1.00×10^6 CFU/mL	250x
	A639		
	ATCC 8467[b]		
	ATCC 9797[b]		
	ATCC 51445[b]		
	ATCC BAA-589[b]		
	ATCC 9340[b]		
	ATCC 10380[b]		
	ATCC BAA-1335[b]		
Chlamydophila pneumoniae	TW183	2.42×10^5 copies/mL	81x
Mycoplasma pneumoniae	M129	1.88×10^5 $TCID_{50}$/mL	6,267x
	ATCC 15531[b]	4.27×10^5 CFU/mL	n/a
	ATCC 15293[b]	1.00×10^6 CCU/mL	33,333x
	ATCC 15377[b]		
	ATCC 15492[b]		
	ATCC 29085[b]		
	ATCC 29342[b]		
	ATCC 39505[b]		
	ATCC 49894[b]		

[a] Cross-reactivity was not observed between this isolate of Coronavirus HKU1 and the Coronavirus OC43 assay at the concentration tested. However, in the clinical data set, 2 specimens showed cross-reactivity between the OC43 assay and the HKU1 virus contained in the specimen.
[b] Exclusivity testing was performed with the original FilmArray RP.
[c] Parainfluenza Virus 4A could not be tested at higher concentrations due to the relatively low titer of the stock viral culture.

The potential for the FilmArray RP to cross-react with non-FilmArray RP organisms was evaluated by testing an exclusivity panel consisting of 26 bacteria, 6 viruses, and 1 yeast. These organisms were selected based on their relatedness to FilmArray RP organisms, clinical relevance (cause respiratory symptoms or represent nasopharyngeal flora), or high prevalence within the population (e.g. Herpes Simplex Virus). Negative sample matrix was spiked with bacteria or fungi at a concentration of 10^6 CFU/mL and viruses at a concentration between 10^4 - 10^5 $TCID_{50}$/mL, or the highest concentration possible. The FilmArray RP did not cross-react with the exclusivity panel organisms listed in Table 42.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Table 42. Non-FilmArray RP Exclusivity Panel – No cross-reactivity was observed with the organisms listed

Virus	Strain / Isolate
Bocavirus	Clinical Specimen
Cytomegalovirus (CMV)	AD-169 (VR-538)
Epstein-Barr Virus (EBV)	B95-8
Herpes Simplex Virus	Type 1
Measles Virus	Edmonston
Mumps	Zeptometrix # 0810079CF
Yeast	**Strain / Isolate**
Candida albicans	Zeptometrix #0801504
Bacterium	**Strain / Isolate**
Bordetella bronchiseptica[a]	clinical isolate
Bordetella holmesii	F061
Bordetella parapertussis[a]	A747
Chlamydia trachomatis	D-UW3
Corynebacterium diptheriae	ATCC14779
Escherichia coli	O157:H7
Haemophilus influenzae	MinnA
Lactobacillus acidophilus	Type strain
Lactobacillus plantarum	17-5
Legionella longbeacheae	Long Beach 4
Legionella micdadei	Tatlock
Legionella pneumophilia	Philadelphia
Moraxella catarrhalis	Ne 11 (type strain)
Mycobacterium tuberculosis	H37Ra-1
Mycoplasma hominis	ATCC 23114
Mycoplasma genitalium	ATCC 33530
Neisseria elongate	type strain
Neisseria gonorrhoeae	ATCC 700825
Neisseria meningitidis	M1027 (type strain)
Pseudomonas aeruginosa	Zeptometrix #0801519
Staphylococcus aureus	COL
Staphylococcus epidermidis	RP62A
Streptococcus pneumoniae	type 59
Streptococcus pyogenes	Zeptometrix #0801512
Streptococcus salivarius	ATCC 13419
Ureaplasma urealyticum	ATCC 27618

[a] Though not observed in this study, the FilmArray RP *Bordetella pertussis* assay can cross-react with strains of *B. bronchiseptica* and *B. parapertussis* that carry a pertussis toxin pseudogene (see Limitations section).

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Supplemental Analytical Exclusivity Testing for Influenza Strains of Avian Origin:

Additional analytical exclusivity testing was carried out (using the original FilmArray RP) with either live isolates or purified genomic RNA of avian host influenza A strains with the following results:

Table 43. Results of Exclusivity Testing of Virus or Nucleic Acid from Cultures of Avian Isolates of Influenza A

Host	Subtype	Isolate / Strain	Test Concentration[a]	FilmArray Result
Avian	H2N2	A/Japan/305/57	3.3 ng RNA	Influenza A (no subtype detected)
		Kilbourne F38 A/Korea/426/68 (HA, NA) x A/Puerto Rico/8/34	6.3 ng RNA	
	H5N1	A/Vietnam/1203/2004 R-H5	N/A[b]	
	H5N2	A/duck/Pennsylvania/10218/84	2.5 ng RNA	
	H5N3	Kilbourne F181 A/duck/Singapore/645/97	247 ng RNA	
	H7N2	A/NewYork/107/2003	N/A[b]	
	H7N3	A/Mallard/Netherlands/12/2000	N/A[b]	
	H10N7	A/chicken/Germany/N/49	68 ng RNA	

[a] Purified and quantified RNA from Avian Influenza cultures was obtained from BEI Resources
[b] Stock virus HA titer from CDC = 128. Twenty microliters of virus stock tested.

Supplemental SARS Coronavirus Exclusivity Information:

In silico analysis of SARS virus sequence (GenBank ID NC_004718.3) against primers for each of the 4 FilmArray RP Coronavirus assays was conducted. When the non-SARS Coronavirus assay primers were aligned with the corresponding target sequence from SARS virus, each primer contained at least 6 mismatches. Based on alignments, no reactivity was predicted between SARS virus and the 4 FilmArray RP Coronavirus assays.

Cross-Contamination and Carryover

To evaluate cross-contamination or carryover, high positive samples (Table 41) were loaded and tested back-to-back with other high positive samples containing different organisms. No false positive results were observed, indicating that the system design and recommended sample handling practices are effective in preventing carryover.

Reproducibility

A multicenter reproducibility study was performed to determine between-site and overall reproducibility of the FilmArray RP. Reproducibility testing occurred at three test sites utilizing the original FilmArray RP and a panel of twelve simulated NPS specimens spiked with various combinations of organisms at three different test levels: Medium Positive (3X LoD), Low Positive (1X LoD), and High Negative (LoD/10). The High Negative test level was predicted to generate positive results in approximately 20-80% of the samples tested. On each testing day, two operators at each site tested two aliquots of specimens on two different FilmArray instruments (six specimens per operator per instrument per day). Every specimen was tested four times a day on five days at the three testing sites, for a total of at least 60 tests per organism per concentration. A total of 26 lots of reagents and 20 FilmArray instruments were utilized in the reproducibility study.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Positive, Equivocal, Negative results and Tm data for each organism are summarized in the tables below:

Table 44. Summary of Positive Agreement, Negative Agreement, and Tm Results from Reproducibility Testing of Single Assay Organisms

Adenovirus AdVC1		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD)[c] 900 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.74	0.24	83.33 - 84.26
	Site B	20/20	0/20	100%	83.2% – 100%	84.23	0.21	83.95 - 84.60
	Site C	20/20	0/20	100%	83.2% – 100%	83.76	0.28	83.03 - 84.13
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.93**	**0.36**	**83.03 - 84.60**
Low Positive (1X LoD)[c] 300 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.42	0.28	83.01 - 83.98
	Site B	20/20	0/20	100%	83.2% – 100%	83.90	0.26	83.54 - 84.30
	Site C	20/20	0/20	100%	83.2% – 100%	83.62	0.38	83.05 - 84.64
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.64**	**0.39**	**83.01 - 84.64**
High Negative[b] (LoD/10)[c] 30 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% – 98.8%	83.33	0.26	83.02 - 83.76
	Site B	16/20	4/20	80.0%	56.3% – 94.3%	83.71	0.30	82.93 - 84.29
	Site C	10/20	10/20	50.0%	27.2% – 72.8%	83.26	0.31	82.61 - 83.86
	All Sites	**44/60**	**16/60**	**73.3%**	**60.3% – 83.9%**	**83.43**	**0.38**	**82.61 - 84.29**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.
[c] Reproducibility testing was performed prior to the modification of the panel to include a second Adenovirus assay. Test concentrations and multiples of LoD reflect the Adenovirus LoD prior to panel modification (300 $TCID_{50}$/mL).

Coronavirus 229E ATCC VR-740		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 12 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.20	0.20	80.81 - 81.47
	Site B	20/20	0/20	100%	83.2% – 100%	81.80	0.32	81.35 - 82.18
	Site C	20/20	0/20	100%	83.2% – 100%	81.35	0.34	81.03 - 82.13
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.37**	**0.40**	**80.81 - 82.18**
Low Positive (1X LoD) 4 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.19	0.21	80.83 - 81.66
	Site B	20/20	0/20	100%	83.2% – 100%	81.62	0.25	81.12 - 82.08
	Site C	20/20	0/20	100%	83.2% – 100%	81.09	0.32	80.30 - 81.56
	All	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.31**	**0.38**	**80.30 - 82.08**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus 229E ATCC VR-740		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	Sites							
High Negative[b] (LoD/10) 0.4 $TCID_{50}$/mL	Site A	14/20	6/20	70%	45.7% - 88.1%	81.06	0.22	80.72 - 81.43
	Site B	7/20	13/20	35%	15.4% - 59.2%	81.54	0.24	81.15 - 82.08
	Site C	11/20	9/20	55%	31.5% - 76.9%	81.17	0.24	80.70 - 81.68
	All Sites	**32/60**	**28/60**	**53.3%**	**40.0% - 66.3%**	**81.25**	**0.34**	**80.70 - 82.08**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Coronavirus HKU1 Type B Clinical Specimen 6123		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 5.7×10^6 RNA copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	75.61	0.23	75.37 - 76.02
	Site B	20/20	0/20	100%	83.2% – 100%	76.02	0.26	75.58 - 76.33
	Site C	20/20	0/20	100%	83.2% – 100%	75.49	0.32	74.96 - 75.90
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**75.69**	**0.41**	**74.96 - 76.33**
Low Positive (1X LoD) 1.9×10^6 RNA copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	75.47	0.22	74.96 - 75.79
	Site B	20/20	0/20	100%	83.2% – 100%	75.89	0.20	75.59 - 76.12
	Site C	20/20	0/20	100%	83.2% – 100%	75.35	0.30	74.83 - 75.81
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**75.55**	**0.40**	**74.83 - 76.12**
High Negative[b] (LoD/10) 1.9×10^5 RNA copies/mL	Site A	15/20	5/20	75.0%	50.9% - 91.3%	75.51	0.28	75.06 - 75.90
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	75.85	0.22	75.26 - 76.23
	Site C	19/20	1/20	95.0%	75.1% – 99.9%	75.33	0.22	74.98 - 75.59
	All Sites	**51/60**	**9/60**	**85.0%**	**73.4% – 92.9%**	**75.55**	**0.38**	**74.98 - 76.23**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus NL63 BEI Resources NR-470		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 15 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.21	0.31	79.64 - 80.90
	Site B	20/20	0/20	100%	83.2% – 100%	80.55	0.33	79.99 - 81.03
	Site C	20/20	0/20	100%	83.2% – 100%	80.04	0.25	79.67 - 80.62
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.29**	**0.40**	**79.64 - 81.03**
Low Positive (1X LoD) 5 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.08	0.25	79.57 - 80.42
	Site B	20/20	0/20	100%	83.2% – 100%	80.40	0.24	79.98 - 80.89
	Site C	20/20	0/20	100%	83.2% – 100%	79.88	0.27	79.36 - 80.40
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.12**	**0.38**	**79.14 - 80.89**
High Negative[b] (LoD/10) 0.5 $TCID_{50}$/mL	Site A	13/20	7/20	65.0%	40.8% - 84.6%	80.08	0.34	79.21 - 80.82
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	80.36	0.30	79.98 - 80.91
	Site C	10/20	10/20	50.0%	27.2% - 72.8%	79.91	0.26	79.24 - 80.30
	All Sites	**37/60**	**23/60**	**61.7%**	**48.2% - 73.9%**	**80.11**	**0.39**	**79.21 - 80.91**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Coronavirus OC43 ATCC VR-759		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 1,800 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.98	0.23	80.53 - 81.36
	Site B	20/20	0/20	100%	83.2% – 100%	81.39	0.25	81.04 - 81.82
	Site C	20/20	0/20	100%	83.2% – 100%	81.20	0.26	80.60 - 81.55
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.17**	**0.32**	**80.53 - 81.82**
Low Positive (1X LoD) 600 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.82	0.26	80.29 - 81.25
	Site B	20/20	0/20	100%	83.2% – 100%	81.31	0.24	80.95 - 81.85
	Site C	20/20	0/20	100%	83.2% – 100%	81.07	0.37	80.40 - 81.58
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.07**	**0.38**	**80.29 - 81.85**
High Negative[b] (LoD/10) 60 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% - 98.8%	80.86	0.24	80.49 - 81.25
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	81.29	0.28	80.92 - 81.81
	Site C	16/20	4/20	80.0%	56.3% - 94.3%	81.04	0.32	80.11 - 81.45

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Coronavirus OC43 ATCC VR-759		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	All Sites	**48/60**	**12/60**	**80.0%**	**67.7% - 89.2%**	**81.07**	**0.36**	**80.11 - 81.81**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	1/180	179/180	99.4%	96.9% - 100%			
	All Sites	**1/540**	**539/540**	**99.8%**	**99.0% - 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Human Metapneumovirus hMPV-16 (Type A1)		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 6 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.61	0.23	77.06 - 77.90
	Site B	20/20	0/20	100%	83.2% – 100%	78.07	0.28	77.67 - 78.61
	Site C	19/20	1/20	95.0%	75.1% - 99.9%	77.73	0.21	77.45 - 78.11
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**77.82**	**0.36**	**77.06 - 78.61**
Low Positive (1X LoD) 2 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.39	0.21	77.04 - 77.79
	Site B	20/20	0/20	100%	83.2% – 100%	77.88	0.22	77.37 - 78.11
	Site C	20/20	0/20	100%	83.2% – 100%	77.60	0.24	77.16 - 77.99
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**77.62**	**0.35**	**77.04 - 78.11**
High Negative[b] (LoD/10) 0.2 $TCID_{50}$/mL	Site A	17/20	2/20	85.0%	62.1% - 96.8%	77.34	0.20	77.05 - 77.59
	Site B	19/20	6/20	95.0%	75.1% - 99.9%	77.76	0.22	77.06 - 78.11
	Site C	12/20	4/20	60.0%	36.1% - 80.9%	77.37	0.29	76.74 - 77.79
	All Sites	**48/60**	**12/60**	**80.0%**	**67.7% - 89.2%**	**77.50**	**0.35**	**76.74 - 78.11**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Influenza B B/FL/04/06		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 180 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.47	0.26	79.88 - 80.93
	Site B	20/20	0/20	100%	83.2% – 100%	80.88	0.31	80.30 - 81.30
	Site C	20/20	0/20	100%	83.2% – 100%	80.36	0.32	79.78 - 80.80
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.56**	**0.40**	**79.78 - 81.30**
Low Positive (1X LoD) 60 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.44	0.27	80.00 - 80.92
	Site B	20/20	0/20	100%	83.2% – 100%	80.79	0.29	80.40 - 81.33
	Site C	20/20	0/20	100%	83.2% – 100%	80.34	0.22	79.77 - 80.81
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**80.51**	**0.37**	**79.77 - 81.33**
High Negative[b] (LoD/10) 6 $TCID_{50}$/mL	Site A	12/20	8/20	60.0%	36.1% - 80.9%	80.42	0.32	79.84 - 80.90
	Site B	10/20	10/20	50.0%	27.2% - 72.8%	80.78	0.25	80.40 - 81.17
	Site C	8/20	12/20	40.0%	19.1% - 64.0%	80.30	0.21	79.79 - 80.69
	All Sites	**30/60**	**30/60**	**50.0%**	**36.8% - 63.2%**	**80.50**	**0.36**	**79.79 - 81.17**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 1 Zeptometrix # 0810014CFN		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 1,500 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	78.86	0.26	78.42 - 79.25
	Site B	20/20	0/20	100%	83.2% – 100%	79.32	0.28	78.83 - 79.78
	Site C	19/20	1/20	95.0%	75.1% - 99.9%	78.50	0.28	78.02 - 78.87
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**78.91**	**0.50**	**78.02 - 79.78**
Low Positive (1X LoD) 500 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	78.60	0.31	77.99 - 79.05
	Site B	20/20	0/20	100%	83.2% – 100%	78.93	0.26	78.31 - 79.36
	Site C	20/20	0/20	100%	83.2% – 100%	78.50	0.38	77.90 - 79.16
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**78.67**	**0.40**	**77.90 - 79.36**
High Negative[b] (LoD/10) 50 $TCID_{50}$/mL	Site A	15/20	5/20	75.0%	50.1% - 91.3%	78.54	0.25	78.10 - 78.94
	Site B	15/20	5/20	75.0%	50.1% - 91.3%	78.94	0.25	78.52 - 79.36
	Site C	13/20	7/20	65.0%	41.0% - 84.6%	78.41	0.35	77.87 - 79.02

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 1 Zeptometrix # 0810014CFN		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
	All Sites	**43/60**	**17/60**	**71.7%**	**58.6% - 82.6%**	**78.61**	**0.42**	**77.79 - 79.36**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 2 Zeptometrix #0810015CF		**# Positive**	**# Negative**	**% Agreement with Expected Result [a]**	**95% CI**	**Mean Tm**	**%CV Tm**	**Observed Tm Range**
Medium Positive (3X LoD) 30 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.63	0.36	83.01 - 84.39
	Site B	20/20	0/20	100%	83.2% – 100%	84.06	0.40	83.44 - 84.79
	Site C	20/20	0/20	100%	83.2% – 100%	83.88	0.32	83.13 - 84.28
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.85**	**0.42**	**83.01 - 84.79**
Low Positive (1X LoD) 10 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	83.56	0.28	82.94 - 84.08
	Site B	20/20	0/20	100%	83.2% – 100%	84.00	0.31	83.52 - 84.63
	Site C	20/20	0/20	100%	83.2% – 100%	83.79	0.32	82.92 - 84.25
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**83.78**	**0.37**	**82.92 - 84.63**
High Negative[b] (LoD/10) 1 $TCID_{50}$/mL	Site A	12/20	8/20	60.0%	36.1% - 80.9%	83.43	0.34	82.71 - 83.96
	Site B	12/20	8/20	60.0%	36.1% - 80.9%	83.91	0.31	83.43 - 84.56
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	83.71	0.36	82.91 - 84.30
	All Sites	**35/60**	**25/60**	**58.3%**	**44.9% - 70.9%**	**83.69**	**0.41**	**82.71 - 84.56**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 3 Zeptometrix #0810016CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 30 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	81.17	0.36	80.71 - 81.86
	Site B	20/20	0/20	100%	83.2% – 100%	81.48	0.35	81.03 - 81.89
	Site C	20/20	0/20	100%	83.2% – 100%	80.94	0.28	80.63 - 81.37
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**81.22**	**0.41**	**80.63 - 81.89**
Low Positive (1X LoD) 10 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	80.97	0.36	80.36 - 81.52
	Site B	20/20	0/20	100%	83.2% – 100%	81.35	0.26	80.93 - 81.79
	Site C	17/20	3/20	85.0%	62.1% - 96.8%	80.86	0.28	80.10 - 81.21
	All Sites	**57/60**	**3/60**	**95.0%**	**86.1% - 99.0%**	**81.08**	**0.40**	**80.10 - 81.79**
High Negative[b] (LoD/10) 1 $TCID_{50}$/mL	Site A	10/20	10/20	50.0%	27.2% - 72.8%	80.99	0.26	80.30 - 81.34
	Site B	7/20	13/20	35.0%	15.4% - 59.2%	81.29	0.28	80.61 - 81.77
	Site C	5/20	15/20	25.0%	8.7% - 49.1%	80.84	0.24	80.41 - 81.24
	All Sites	**22/60**	**38/60**	**36.7%**	**24.6% - 50.1%**	**81.05**	**0.34**	**80.30 - 81.77**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Parainfluenza Virus 4a Zeptometrix #0810060CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 15,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.70	0.30	77.36 - 78.10
	Site B	20/20	0/20	100%	83.2% – 100%	78.09	0.56	77.48 - 78.74
	Site C	20/20	0/20	100%	83.2% – 100%	77.73	0.40	77.05 - 78.21
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	77.82	0.47	77.05 - 78.74
Low Positive (1X LoD) 5,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.11	0.28	76.64 - 77.68
	Site B	20/20	0/20	100%	83.2% – 100%	77.65	0.41	76.73 - 78.71
	Site C	20/20	0/20	100%	83.2% – 100%	77.23	0.38	76.81 - 78.20
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	77.33	0.46	76.64 - 78.71
High Negative[b] (LoD/10)	Site A	4/20	16/20	20.0%	5.7% - 43.7%	77.07	0.26	76.63 - 77.58
	Site B	5/20	15/20	25.0%	8.7% - 49.1%	77.59	0.27	77.05 - 78.00

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Parainfluenza Virus 4a Zeptometrix #0810060CF		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
500 $TCID_{50}$/mL	Site C	11/20	9/20	55.0%	31.5% - 76.9%	77.24	0.30	76.62 - 77.84
	All Sites	**20/60**	**40/60**	**33.3%**	**21.7% - 46.7%**	77.29	0.40	76.62 - 78.00
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Respiratory Syncytial Virus Type A		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 6 $TCID_{50}$/mL	Site A	60/60	0/60	100%	94.0% - 100%	80.44	0.35	79.46 - 80.83
	Site B	60/60	0/60	100%	94.0% - 100%	80.86	0.25	80.41 - 81.56
	Site C	60/60	0/60	100%	94.0% - 100%	80.39	0.33	80.08 - 80.91
	All Sites	**180/180**	**0/180**	**100%**	**97.8% - 100%**	**80.58**	**0.40**	**79.46 - 81.56**
Low Positive (1X LoD) 2 $TCID_{50}$/mL	Site A	40/40	0/40	100%	91.2% - 100%	79.82	0.50	78.93 - 80.62
	Site B	40/40	0/40	100%	91.2% - 100%	80.40	0.46	79.47 - 81.03
	Site C	40/40	0/40	100%	91.2% - 100%	80.13	0.47	79.13 - 80.79
	All Sites	**120/120**	**0/120**	**100%**	**97.0% - 100%**	**80.10**	**0.57**	**78.93 - 81.03**
High Negative[b] (LoD/10) 0.2 $TCID_{50}$/mL	Site A	18/20	2/20	90.0%	68.3% - 98.8%	79.63	0.50	78.72 - 80.72
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	80.12	0.50	79.26 - 80.89
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	79.97	0.57	78.83 - 80.84
	All Sites	**46/60**	**14/60**	**76.7%**	**64.0% - 86.6%**	**79.90**	**0.58**	**78.72 - 80.89**
Negative	Site A	0/120	120/120	100%	97.0% - 100%			
	Site B	0/120	120/120	100%	97.0% - 100%			
	Site C	0/120	120/120	100%	97.0% - 100%			
	All Sites	**0/360**	**360/360**	**100%**	**99.0% - 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Bordetella pertussis A639		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 12,000 CFU/mL	Site A	20/20	0/20	100%	83.2% – 100%	88.36	0.36	87.46 - 89.05
	Site B	20/20	0/20	100%	83.2% – 100%	88.81	0.29	88.26 - 89.20
	Site C	20/20	0/20	100%	83.2% – 100%	88.34	0.18	87.97 - 88.58
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**88.50**	**0.38**	**87.46 - 89.20**
Low Positive (1X LoD) 4,000 CFU/mL	Site A	20/20	0/20	100%	83.2% – 100%	88.39	0.28	87.73 - 88.96
	Site B	20/20	0/20	100%	83.2% – 100%	88.64	0.31	88.07 - 89.20
	Site C	20/20	0/20	100%	83.2% – 100%	88.22	0.28	87.74 - 88.67
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**88.42**	**0.34**	**87.73 - 89.20**
High Negative[b] (LoD/10) 400 CFU/mL	Site A	16/20	4/20	80.0%	56.3% - 94.3%	88.41	0.34	87.86 - 89.36
	Site B	12/20	8/20	60.0%	36.1% - 80.9%	88.70	0.32	88.33 - 89.29
	Site C	12/20	8/20	60.0%	36.1% - 80.9%	88.26	0.28	87.52 - 88.71
	All Sites	**40/60**	**20/60**	**66.7%**	**53.3% - 78.3%**	**88.46**	**0.37**	**87.52 - 89.36**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Chlamydophila pneumoniae TW183		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 9,000 copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	79.65	0.29	78.94 - 79.99
	Site B	20/20	0/20	100%	83.2% – 100%	80.27	0.30	79.88 - 80.82
	Site C	20/20	0/20	100%	83.2% – 100%	79.73	0.23	79.42 - 80.09
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**79.92**	**0.45**	**78.94 - 80.82**
Low Positive (1X LoD) 3,000 copies/mL	Site A	20/20	0/20	100%	83.2% – 100%	79.63	0.27	79.03 - 80.09
	Site B	19/20	1/20	95.0%	75.1% - 99.9%	80.15	0.28	79.68 - 80.62
	Site C	20/20	0/20	100%	83.2% – 100%	79.61	0.30	78.84 - 80.09
	All Sites	**59/60**	**1/60**	**98.3%**	**91.1% - 100%**	**79.79**	**0.42**	**78.84 - 80.62**
High Negative[b] (LoD/10) 300 copies/mL	Site A	11/20	9/20	55.0%	31.5% - 76.9%	79.55	0.25	79.25 - 80.08
	Site B	14/20	6/20	70.0%	45.7% - 88.1%	80.02	0.29	79.66 - 80.72
	Site C	10/20	10/20	50.0%	27.2% - 72.8%	79.61	0.29	79.16 - 80.21

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Chlamydophila pneumoniae TW183		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
	All Sites	**35/60**	**25/60**	**58.3%**	**44.9% - 70.9%**	**79.72**	**0.38**	**79.16 - 80.72**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Mycoplasma pneumoniae Type 1 - M129		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI	Mean Tm	%CV Tm	Observed Tm Range
Medium Positive (3X LoD) 90 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%	77.42	0.29	77.04 - 77.71
	Site B	20/20	0/20	100%	83.2% – 100%	77.94	0.33	77.59 - 78.30
	Site C	20/20	0/20	100%	83.2% – 100%	77.83	0.28	77.44 - 78.12
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**	**77.75**	**0.38**	**77.04 - 78.30**
Low Positive (1X LoD) 30 $TCID_{50}$/mL	Site A	19/20	1/20	95.0%	75.1% - 99.9%	77.55	0.30	77.05 - 78.00
	Site B	17/20	3/20	85.0%	62.1% - 96.8%	77.96	0.33	77.36 - 78.37
	Site C	20/20	0/20	100%	83.2% – 100%	77.68	0.39	76.65 - 78.10
	All Sites	**56/60**	**4/60**	**93.3%**	**83.8% - 98.2%**	**77.73**	**0.40**	**76.65 - 78.37**
High Negative[b] (LoD/10) 3 $TCID_{50}$/mL	Site A	5/20	15/20	25.0%	8.7% - 49.1%	77.58	0.31	76.72 - 78.01
	Site B	4/20	16/20	20.0%	5.7% - 43.7%	78.01	0.27	77.67 - 78.45
	Site C	11/20	9/20	55.0%	31.5% - 76.9%	77.76	0.34	77.04 - 78.09
	All Sites	**20/60**	**40/60**	**33.3%**	**21.7% - 46.7%**	**77.78**	**0.38**	**76.72 - 78.45**
Negative	Site A	0/180	180/180	100%	98.0% - 100%			
	Site B	0/180	180/180	100%	98.0% - 100%			
	Site C	0/180	180/180	100%	98.0% - 100%			
	All Sites	**0/540**	**540/540**	**100%**	**99.3% – 100%**			

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 45. Summary of Positive Agreement, Negative Agreement, and Tm Results from Reproducibility Testing of Multi-Assay Organisms

Reproducibility Agreement Summary for Enterovirus (Human Rhinovirus/Enterovirus)

Enterovirus Echovirus 6 (Species B)		**# Positive**	**# Negative**	**% Agreement with Expected Result** [a]	**95% CI**
Medium Positive (3X LoD) 90,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 30,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**60/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 3,000 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
Negative	Site A	0/60	60/60	100%	94.0% - 100%
	Site B	0/60	60/60	100%	94.0% - 100%
	Site C	0/60	60/60	100%	94.0% - 100%
	All Sites	**0/180**	**180/180**	**100%**	**97.8% - 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Enterovirus

Assay	**Enterovirus** Echovirus 6 (Species B)		**Mean Tm**	**% CV Tm**	**Observed Tm Range**
Entero 1	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	87.12	0.24	86.79 - 87.73
		Site B	87.51	0.30	86.99 - 88.05
		Site C	86.98	0.33	86.37 - 87.64
		All Sites	**87.18**	**0.39**	**86.37 - 88.05**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	87.00	0.33	86.17 - 87.64
		Site B	87.36	0.29	86.80 - 87.85
		Site C	86.81	0.35	86.15 - 87.41
		All Sites	**87.05**	**0.42**	**86.15 - 87.85**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	86.89	0.29	86.06 - 87.40
		Site B	87.34	0.31	86.67 - 87.86
		Site C	86.67	0.29	85.97 - 87.30
		All Sites	**86.96**	**0.44**	**85.97 - 87.86**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Enterovirus Echovirus 6 (Species B)		Mean Tm	% CV Tm	Observed Tm Range
Entero 2	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	87.09	0.28	86.68 - 87.73
		Site B	87.47	0.30	86.82 - 88.00
		Site C	86.93	0.36	86.16 - 87.64
		All Sites	**87.14**	**0.41**	**86.16 - 88.00**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	86.98	0.30	86.28 - 87.53
		Site B	87.34	0.28	86.89 - 87.82
		Site C	86.77	0.35	86.05 - 87.52
		All Sites	**87.02**	**0.41**	**86.05 - 87.82**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	86.86	0.29	86.17 - 87.54
		Site B	87.26	0.35	86.59 - 87.94
		Site C	86.65	0.27	86.27 - 87.20
		All Sites	**86.92**	**0.42**	**86.17 - 87.94**
HRV4	Medium Positive 3x LoD 90,000 $TCID_{50}$/mL	Site A	85.70	0.31	85.21 - 86.18
		Site B	86.19	0.30	85.35 - 86.77
		Site C	85.59	0.34	84.91 - 86.19
		All Sites	**85.81**	**0.44**	**84.91 - 86.77**
	Low Positive 1x LoD 30,000 $TCID_{50}$/mL	Site A	85.45	0.26	84.81 - 86.06
		Site B	85.87	0.24	85.44 - 86.36
		Site C	85.32	0.40	84.69 - 86.26
		All Sites	**85.54**	**0.40**	**84.69 - 86.36**
	High Negative 0.1x LoD 3,000 $TCID_{50}$/mL	Site A	85.37	0.26	84.80 - 86.04
		Site B	85.82	0.23	85.43 - 86.23
		Site C	85.22	0.22	84.82 - 85.58
		All Sites	**85.46**	**0.39**	**84.80 - 86.23**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Agreement Summary for Rhinovirus (Human Rhinovirus/Enterovirus)

Human Rhinovirus A1		# Positive	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 3 $TCID_{50}$/mL	Site A	60/60	0/60	100%	94.0% - 100%
	Site B	60/60	0/60	100%	94.0% - 100%
	Site C	60/60	0/60	100%	94.0% - 100%
	All Sites	**180/180**	**0/180**	**100%**	**97.8% - 100%**
Low Positive (1X LoD) 1 $TCID_{50}$/mL	Site A	20/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 0.1 $TCID_{50}$/mL	Site A	40/40	0/40	100%	91.2% - 100%
	Site B	40/40	0/40	100%	91.2% - 100%
	Site C	32/40	8/40	80.0%	64.4% - 91.0%
	All Sites	**112/120**	**8/120**	**93.3%**	**87.3% - 97.1%**
Negative	Site A	0/60	60/60	100%	94.0% - 100%
	Site B	0/60	60/60	100%	94.0% - 100%
	Site C	0/60	60/60	100%	94.0% - 100%
	All Sites	**0/180**	**180/180**	**100%**	**97.8% - 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Rhinovirus

Assay	Human Rhinovirus A1		Mean Tm	% CV Tm	Observed Tm Range
HRV1	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	83.79	0.44	83.25 - 85.09
		Site B	84.06	0.31	83.43 - 84.56
		Site C	83.68	0.23	83.22 - 84.09
		All Sites	**83.84**	**0.38**	**83.22 - 85.09**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.71	0.29	83.07 - 84.35
		Site B	84.07	0.34	83.44 - 84.66
		Site C	83.93	0.34	83.24 - 84.71
		All Sites	**83.90**	**0.37**	**83.07 - 84.71**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.56	0.28	83.02 - 84.26
		Site B	83.91	0.34	83.22 - 84.52
		Site C	83.76	0.31	83.04 - 84.48
		All Sites	**83.74**	**0.36**	**83.02 - 84.52**
HRV2	Medium Positive 3x LoD	Site A	83.33	0.48	82.55 - 84.67
		Site B	83.65	0.29	83.11 - 84.17
		Site C	83.30	0.28	82.70 - 83.77

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Human Rhinovirus A1		Mean Tm	% CV Tm	Observed Tm Range
	3 $TCID_{50}$/mL	**All Sites**	**83.42**	**0.41**	**82.55 - 84.67**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.28	0.31	82.57 - 83.86
		Site B	83.66	0.36	83.02 - 84.37
		Site C	83.52	0.39	82.82 - 84.29
		All Sites	**83.48**	**0.40**	**82.57 - 84.37**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.17	0.34	82.42 - 83.88
		Site B	83.58	0.36	82.80 - 84.31
		Site C	83.37	0.33	82.51 - 83.92
		All Sites	**83.37**	**0.40**	**82.42 - 84.31**
HRV3	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	82.73	0.53	81.99 - 83.94
		Site B	83.25	0.36	82.49 - 83.88
		Site C	82.89	0.43	82.10 - 83.88
		All Sites	**82.96**	**0.51**	**81.99 - 83.94**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	82.67	0.49	81.76 - 83.65
		Site B	83.24	0.44	82.40 - 84.08
		Site C	83.07	0.41	82.13 - 83.76
		All Sites	**82.98**	**0.54**	**81.76 - 84.08**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	82.68	0.50	81.78 - 83.67
		Site B	83.21	0.46	82.18 - 84.37
		Site C	82.97	0.42	81.85 - 83.64
		All Sites	**82.96**	**0.52**	**81.78 - 84.37**
HRV4	Medium Positive 3x LoD 3 $TCID_{50}$/mL	Site A	83.81	0.38	83.28 - 84.98
		Site B	84.14	0.34	83.43 - 84.83
		Site C	83.80	0.25	83.44 - 84.20
		All Sites	**83.90**	**0.37**	**83.28 - 84.98**
	Low Positive 1x LoD 1 $TCID_{50}$/mL	Site A	83.79	0.31	83.18 - 84.45
		Site B	84.08	0.31	83.55 - 84.61
		Site C	84.04	0.38	83.35 - 84.93
		All Sites	**83.94**	**0.37**	**83.18 - 84.93**
	High Negative 0.1x LoD 0.1 $TCID_{50}$/mL	Site A	83.58	0.26	83.11 - 84.05
		Site B	83.88	0.31	83.34 - 84.49
		Site C	83.86	0.27	83.24 - 84.58
		All Sites	**83.76**	**0.33**	**83.11 - 84.58**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Agreement Summary for Influenza A H1

Influenza A H1N1 A/Brisbane/59/07		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 600 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 200 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	19/20	1/20	0/20	95.0%	75.1% - 99.9%
	Site C	17/20	2/20	1/20	85.0%	62.1% – 96.8%
	All Sites	**56/60**	**3/60**	**1/60**	**93%**	**83.8% – 98.2%**
High Negative (LoD/10)[b] 20 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	17/20	2/20	1/20	85.0%	62.1% – 96.8%
	Site C	14/20	5/20	1/20	70.0%	45.7% - 88.1%
	All Sites	**51/60**	**7/60**	**2/60**	**85.0%**	**73.4% - 92.9%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%
	All Sites	**0/540**	**0/540**	**540/540**	**100%**	**99.3% – 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Influenza A H1

Assay	Influenza A H1N1 A/Brisbane/59/07		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	84.67	0.24	84.27 - 85.12
		Site B	85.10	0.24	84.78 - 85.56
		Site C	84.64	0.34	83.76 - 85.23
		All Sites	**84.80**	**0.37**	**83.76 - 85.56**
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	84.57	0.27	84.17 - 85.31
		Site B	85.01	0.28	84.59 - 85.75
		Site C	84.68	0.26	84.16 - 85.18
		All Sites	**84.75**	**0.34**	**84.16 - 85.75**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	84.27	0.26	83.85 - 84.81
		Site B	84.75	0.23	84.29 - 85.32
		Site C	84.46	0.35	83.89 - 85.48
		All Sites	**84.48**	**0.37**	**83.85 - 85.48**
FluA-pan2	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	80.42	0.25	79.78 - 80.63
		Site B	80.85	0.27	80.39 - 81.26
		Site C	80.31	0.28	79.89 - 80.72
		All Sites	**80.52**	**0.39**	**79.78 - 81.26**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Influenza A H1N1 A/Brisbane/59/07		Mean Tm	% CV Tm	Observed Tm Range
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	80.36	0.23	79.99 - 80.73
		Site B	80.80	0.21	80.42 - 81.15
		Site C	80.52	0.22	80.19 - 80.89
		All Sites	**80.57**	**0.32**	**79.99 - 81.15**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	79.91	0.37	79.15 - 80.41
		Site B	80.49	0.30	79.67 - 80.83
		Site C	80.10	0.35	79.56 - 80.73
		All Sites	**80.17**	**0.45**	**79.15 - 80.83**
FluA-H1-pan	Moderate Positive 3x LoD 600 $TCID_{50}$/mL	Site A	78.79	0.25	78.31 - 79.25
		Site B	79.20	0.31	78.30 - 79.57
		Site C	78.76	0.39	77.79 - 79.25
		All Sites	**78.91**	**0.42**	**77.67 - 79.57**
	Low Positive 1x LoD 200 $TCID_{50}$/mL	Site A	78.77	0.25	78.42 - 79.34
		Site B	79.20	0.27	78.72 - 79.67
		Site C	78.80	0.25	78.30 - 79.26
		All Sites	**78.93**	**0.36**	**78.30 - 79.67**
	High Negative 0.1x LoD 20 $TCID_{50}$/mL	Site A	77.65	0.33	77.15 - 78.21
		Site B	78.18	0.45	77.47 - 79.26
		Site C	77.93	0.49	77.43 - 79.04
		All Sites	**77.92**	**0.51**	**77.15 - 79.26**

Reproducibility Agreement Summary for Influenza A H1-2009

Influenza A H1-2009 A/Swine NY/03/2009		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 300 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 100 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 10 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	19/20	1/20	0/20	95.0%	75.1% - 99.9%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**59/60**	**1/60**	**0/60**	**98.3%**	**91.1% – 100%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Influenza A H1-2009 A/Swine NY/03/2009		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
	All Sites	0/540	0/540	540/540	100%	99.3% – 100%

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Reproducibility Tm Summary (by assay) for Influenza A H1-2009

Assay	Influenza A H1-2009 A/Swine NY/03/2009		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	84.67	0.24	84.27 - 85.12
		Site B	85.10	0.24	84.78 - 85.56
		Site C	84.64	0.34	83.76 - 85.23
		All Sites	**84.80**	**0.37**	**83.76 - 85.56**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	84.57	0.27	84.17 - 85.31
		Site B	85.01	0.28	84.59 - 85.75
		Site C	84.68	0.26	84.16 - 85.18
		All Sites	**84.75**	**0.34**	**84.16 - 85.75**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	84.27	0.26	83.85 - 84.81
		Site B	84.75	0.23	84.29 - 85.32
		Site C	84.46	0.35	83.89 - 85.48
		All Sites	**84.48**	**0.37**	**83.85 - 85.48**
FluA-pan2	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	80.62	0.20	80.31 - 80.83
		Site B	81.01	0.17	80.70 - 81.36
		Site C	80.69	0.23	80.19 - 81.02
		All Sites	**80.81**	**0.32**	**80.19 - 81.36**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	80.39	0.29	79.87 - 80.73
		Site B	80.91	0.27	80.20 - 81.24
		Site C	80.30	0.17	80.05 - 80.61
		All Sites	**80.62**	**0.44**	**79.87 - 81.24**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	80.43	0.27	80.08 - 81.03
		Site B	80.72	0.27	80.11 - 81.14
		Site C	80.41	0.34	79.86 - 80.82
		All Sites	**80.54**	**0.34**	**79.86 - 81.14**
FluA-H1-pan	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	78.87	0.40	78.20 - 79.56
		Site B	79.44	0.35	78.94 - 79.99
		Site C	78.62	0.43	77.92 - 79.44
		All Sites	**78.97**	**0.58**	**77.92 - 79.99**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	78.37	0.30	77.89 - 79.24
		Site B	78.90	0.37	78.21 - 79.76
		Site C	78.16	0.25	77.83 - 78.69
		All Sites	**78.47**	**0.51**	**77.78 - 79.76**
	High Negative 0.1x LoD	Site A	78.34	0.37	77.90 - 79.37
		Site B	78.83	0.37	77.99 - 79.68

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Assay	Influenza A H1-2009 A/Swine NY/03/2009		Mean Tm	% CV Tm	Observed Tm Range
	10 $TCID_{50}$/mL	Site C	78.08	0.27	77.68 - 78.51
		All Sites	**78.40**	**0.53**	**77.68 - 79.68**
FluA-H1-2009	Moderate Positive 3x LoD 300 $TCID_{50}$/mL	Site A	78.73	0.24	78.31 - 79.14
		Site B	79.20	0.24	78.84 - 79.67
		Site C	78.54	0.30	77.89 - 78.92
		All Sites	**78.81**	**0.44**	**77.89 - 79.67**
	Low Positive 1x LoD 100 $TCID_{50}$/mL	Site A	78.64	0.26	78.10 - 79.14
		Site B	79.03	0.25	78.53 - 79.48
		Site C	78.49	0.24	78.12 - 78.82
		All Sites	**78.71**	**0.39**	**78.10 - 79.48**
	High Negative 0.1x LoD 10 $TCID_{50}$/mL	Site A	78.60	0.28	77.90 - 79.04
		Site B	79.00	0.23	78.52 - 79.36
		Site C	78.52	0.28	78.10 - 78.93
		All Sites	**78.70**	**0.38**	**77.90 - 79.36**

Reproducibility Agreement Summary for Influenza A H3

Influenza A H3N2 A/Wisconsin/67/2005		# Positive	# Equivocal	# Negative	% Agreement with Expected Result [a]	95% CI
Medium Positive (3X LoD) 15 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
Low Positive (1X LoD) 5 $TCID_{50}$/mL	Site A	20/20	0/20	0/20	100%	83.2% – 100%
	Site B	20/20	0/20	0/20	100%	83.2% – 100%
	Site C	20/20	0/20	0/20	100%	83.2% – 100%
	All Sites	**60/60**	**0/60**	**0/60**	**100%**	**94.0% - 100%**
High Negative[b] (LoD/10) 0.5 $TCID_{50}$/mL	Site A	3/20	11/20	6/20	15.0%	3.2% - 37.9%
	Site B	4/20	12/20	4/20	20.0%	5.7% - 43.7%
	Site C	3/20	8/20	9/20	15.0%	3.2% - 37.9%
	All Sites	**10/60**	**31/60**	**19/60**	**16.7%**	**8.3% - 28.5%**
Negative	Site A	0/180	0/180	180/180	100%	98.0% - 100%
	Site B	0/180	0/180	180/180	100%	98.0% - 100%
	Site C	0/180	0/180	180/180	100%	98.0% - 100%
	All Sites	**0/540**	**0/540**	**540/540**	**100%**	**99.3% – 100%**

[a] Expected results for the "Medium Positive", the "Low Positive", and the "High Negative" panel members are positive. Expected result for the "Negative" panel member is negative.
[b] High negative samples are targeted to be positive 20-80% of the time.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Reproducibility Tm Summary (by assay) for Influenza A H3

Assay	Influenza A H3N2 A/Wisconsin/67/2005		Mean Tm	% CV Tm	Observed Tm Range
FluA-pan1	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	85.33	0.26	84.79 - 85.73
		Site B	85.48	0.42	84.91 - 86.27
		Site C	85.06	0.38	84.50 - 85.40
		All Sites	**85.36**	**0.38**	**84.50 - 86.27**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	84.95	0.41	84.19 - 86.03
		Site B	85.31	0.31	84.79 - 86.02
		Site C	84.83	0.26	84.37 - 85.25
		All Sites	**85.03**	**0.41**	**84.19 - 86.03**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	84.91	0.39	84.22 - 85.60
		Site B	85.24	0.30	84.78 - 85.77
		Site C	84.86	0.27	84.48 - 85.33
		All Sites	**85.01**	**0.37**	**84.22 - 85.77**
FluA-pan2	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	79.75	0.25	79.51 - 79.99
		Site B	79.94	0.30	79.40 - 80.37
		Site C	79.60	0.24	79.14 - 79.86
		All Sites	**79.81**	**0.33**	**79.14 - 80.37**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	79.42	0.31	79.00 - 80.30
		Site B	79.69	0.35	79.14 - 80.29
		Site C	79.25	0.20	78.82 - 79.59
		All Sites	**79.45**	**0.37**	**78.82 - 80.30**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	79.22	0.35	78.64 - 79.75
		Site B	79.59	0.29	79.05 - 79.99
		Site C	79.24	0.20	78.84 - 79.54
		All Sites	**79.35**	**0.36**	**78.64 - 79.99**
FluA-H3	Moderate Positive 3x LoD 15 $TCID_{50}$/mL	Site A	82.58	0.35	81.87 - 83.01
		Site B	82.89	0.19	82.60 - 83.11
		Site C	82.44	0.33	81.98 - 82.81
		All Sites	**82.62**	**0.39**	**81.87 - 83.11**
	Low Positive 1x LoD 5 $TCID_{50}$/mL	Site A	82.32	0.29	81.88 - 82.69
		Site B	82.69	0.34	82.16 - 83.32
		Site C	82.21	0.25	81.76 - 82.73
		All Sites	**82.39**	**0.41**	**81.67 - 83.32**
	High Negative 0.1x LoD 0.5 $TCID_{50}$/mL	Site A	82.28	0.36	81.71 - 82.91
		Site B	82.61	0.29	82.17 - 83.05
		Site C	82.20	0.23	81.87 - 82.57
		All Sites	**82.37**	**0.36**	**81.71 - 83.05**

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Repeatability

The repeatability of the FilmArray RP results was evaluated with the original FilmArray RP by repeated testing the same 12 specimens tested in the Reproducibility study while minimizing as many sources of variability as possible. The in-house Repeatability testing was performed at Site C over the course of 12 testing days. On each day, all 12 specimens were tested 4 times by 2 operators on 2 FilmArray instruments.

Table 46. Summary of Positive Agreement Results for Repeatability Testing

Organism Result	Moderate Positive (3x LoD)		Low Positive (1x LoD)		High Negative (0.1x LoD)	
	# Positive / Total	% Positive Results	# Positive / Total	% Positive Results	# Positive / Total	% Positive Results
Adenovirus[a]	48/48	100%	48/48	100%	34/48	70.8%
Coronavirus 229E	48/48	100%	48/48	100%	19/48	39.6%
Coronavirus HKU1	48/48	100%	48/48	100%	44/48	91.7%
Coronavirus NL63	48/48	100%	48/48	100%	27/48	56.3%
Coronavirus OC43	48/48	100%	47/48	97.9%	33/48	68.8%
Human Metapneumovirus	47/48	97.9%	48/48	100%	32/48	66.7%
Enterovirus	48/48	100%	48/48	100%	48/48	100%
Human Rhinovirus	144/144	100%	47/48	97.9%	83/96	86.5%
Influenza A H1	48/48	100%	43/48[b]	89.6%[b]	39/48[c]	81.3%[c]
Influenza A H1-2009	48/48	100%	48/48	100%	47/48[d]	97.9%[d]
Influenza A H3	48/48	100%	48/48	100%	7/48[e]	14.6%[e]
Influenza B	48/48	100%	48/48	100%	25/48	52.1%
Parainfluenza Virus 1	47/48	97.9%	48/48	100%	32/48	66.7%
Parainfluenza Virus 2	48/48	100%	47/48	97.9%	27/48	56.3%
Parainfluenza Virus 3	48/48	100%	41/48	85.4%	14/48	29.2%
Parainfluenza Virus 4	48/48	100%	48/48	100%	26/48	54.2%
Respiratory Syncytial Virus	144/144	100%	96/96	100%	32/48	66.7%
Bordetella pertussis	48/48	100%	48/48	100%	27/48	56.3%
Chlamydophila pneumoniae	48/48	100%	46/48	95.8%	18/48	37.5%
Mycoplasma pneumoniae	48/48	100%	47/48	97.9%	19/48	39.6%
% positive (all organisms) per test level	**1102/1104 99.8%**		**942/960 98.1%**		**599/960 62.4%**	

[a] Repeatability testing was performed prior to the modification of the panel to include a second Adenovirus assay. Test concentrations and multiples of LoD reflect the Adenovirus LoD prior to panel modification (300 $TCID_{50}$/mL).
[b] The five (5) non-positive results for Influenza A H1 at LoD include: (1) Negative, (1) Influenza A H1 Equivocal and (3) Influenza A Equivocal results.
[c] The nine (9) non-positive results for Influenza A H1 at 0.1 x LoD include: (1) Negative, (3) Influenza A (no subtype detected), (1) Influenza A H1 Equivocal, and (4) Influenza A Equivocal results.
[d] One (1) Influenza A H1-2009 Equivocal result at the 0.1 x LoD test level.
[e] The 42 non-positive results for Influenza A H3 at 0.1 x LoD include: (18) Negative, (2) Influenza A (no subtype detected) (15) Influenza A H3 Equivocal, and (7) Influenza A Equivocal results.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Interference

Substances that could be present in NPS samples or introduced during sample handling were evaluated for their potential to interfere with assay performance. Four different mixes containing FilmArray RP organisms were spiked into a simulated NPS (sNPS) sample matrix (human epithelial cells in VTM) at 5x their respective LoDs. The 5x LoD organism concentration was chosen to be near the LoD but also to provide consistent results for sample-to-sample comparison. Each ~~FilmArray RP~~ sample was tested with the original FilmArray RP in the presence of each potentially interfering substance listed in Table 47. None of the substances tested were found to compete or interfere with the control or organism assays in the FilmArray RP.

Table 47. List of Potentially Interfering Substances Evaluated (No Interference or Inhibition Observed)

Endogenous Substances		**Competing / Interfering Microorganisms**	
Human Blood (with Na Citrate) (1% v/v)		Respiratory Syncytial Virus A	2.8×10^4 $TCID_{50}$/mL
Mucin (bovine submaxillary gland) (1% v/v)		Human Rhinovirus	1.1×10^4 $TCID_{50}$/mL
Human Genomic DNA: 0.2 ng/µL		Influenza A H1-2009	1.0×10^5 $TCID_{50}$/mL
2 ng/µL		*Staphylococcus aureus*	1.0×10^6 CFU/mL
20 ng/µL		*Neisseria meningitidis*	1.0×10^6 CFU/mL
		Corynebacterium diptheriae	1.0×10^6 CFU/mL
Exogenous Substances			
Saline Nasal Spray with Preservatives (1% v/v)		Analgesic ointment (1% w/v)	
Nasal Decongestant Spray (Oxymetazoline HCl) (1%v/v)		Petroleum Jelly (1% w/v)	
Tobramycin (0.6 mg/mL)		Smokeless Tobacco (1% w/v)	
Mupirocin (2% w/v)		FluMist® Nasal Influenza Vaccine (2009-2010)	
Technique Specific Substances			
Laboratory Reagents:	**Viral Transport Media:**	**Swabs:**	
Bleach (1%, 2%, 5% v/v)	Remel M4	Copan 168C (rayon / twisted aluminum shaft)	
Disinfecting wipes	Remel M4-RT	Copan FloQ (flocked nylon / plastic shaft)	
Ethanol (7% v/v)	Remel M5	Copan 175KS01 (polyester / aluminum shaft)	
DNAzap (1% v/v)	Remel M6	Millipore 519CS01M (flocked nylon / plastic shaft)	
RNaseOut (1% v/v)	Copan UTM		

Evaluation of the FilmArray RP was not performed using clinical NPS specimens obtained from individuals who had recently received the FluMist® nasal influenza vaccine (MedImmune, Gaithersburg, MD). However, analytical testing was performed (using the original FilmArray RP) with simulated samples containing various concentrations of the 2009-2010 formulation of the vaccine material. The FilmArray RP assays react with the Influenza A H1, Influenza A H3 and Influenza B viral material contained in the vaccine (Table 48). No cross-reactivity was observed with other, non-influenza FilmArray RP assays.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Table 48. Evaluation of FluMist® Nasal Vaccine as a Potentially Interfering Substance

FluMist 2009-2010 (% v/v)	Adenovirus	Coronavirus 229E	Coronavirus HKU	Coronavirus NL63	Coronavirus OC43	Human Metapneumovirus	Human Rhinovirus / Enterovirus	Influenza A			Influenza B	Parainfluenza Virus 1	Parainfluenza Virus 2	Parainfluenza Virus 3	Parainfluenza Virus 4	Respiratory Syncytial Virus	*Bordetella pertussis*	*Chlamydophila pneumoniae*	*Mycoplasma pneumoniae*
								H1	H1-2009	H3									
10%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
1%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.1%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.01%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.001%	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-
0.0001%	-	-	-	-	-	-	-	-	-	Equiv [a]	+	-	-	-	-	-	-	-	-
0.00001%	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
0.000001%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] Influenza A H3 Equivocal result

Analysis of Potential Interference from Medications

The clinical dataset from the original FilmArray RP was analyzed for evidence of the effects of potentially interfering medications (prescription and over-the-counter; OTC) administered to or taken by the study population. If clinically significant interference from medications had occurred, it would be expected that the organism detection rate in the medicated population would be lower than that in the non-medicated population. This effect was not observed in the clinical dataset. One or more organisms was detected by the reference/comparator methods in 118 of 257 (45.9%) non-medicated individuals. The FilmArray RP correctly identified all organisms in 112 (94.9%) of these individuals. One or more organisms were detected by the reference/comparator methods in 342 of 596 (57.4%) medicated individuals. The FilmArray RP correctly identified all organisms in 331 (96.8%) of these individuals. Table 49 lists the medications administered to or taken by the enrolled study population (self-reported and/or recorded from patient charts).

Table 49. List of Medications Administered/Taken During the FilmArray RP Clinical Evaluation

Acetaminophen	Clindamycin	Lansoprazole	Phenobarbital
Albuterol	Co-trimoxazole	Levalbuterol	Phenylephrine
Alendronate	Cough drops/syrups (various OTC)	Levothyroxine	Pilocarpine
Alprazolam	Cyproheptadine	Lisinopril	Pravachol (Pravastatin)
Amoxicillin	Deferasirox	Loperamide	Prednisolone
Amoxicillin Clavulanate	Dextromethorphan	Loratadine	Prednisone
Azithromycin	Dextromethorphan hydrobromide	Lorazepam	Propranolol
Baclofen	Diphenhydramine	Metoclopramide	Pseudoephedrine
Benzonatate	Doxylamine succinate	Metolazone	Ranitidine
Betamethasone	Electrolyte solutions (rehydration salts)	Metoprolol	Saline Nasal Drops/Sprays (various OTC)
Brimonidine	Enoxaparin	Midazolam	Salmeterol
Budesonide	Eszopiclone	Montelukast	Simethicone
Budesonide/Formoterol	Fentanyl	Naproxen	Sirolimus

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Fumarate Dihydrate			
Bupropion hydrochloride	Fluticasone	Nizatidine	Spironolactone
Carvedilol	Furosemide	Omeprazole	Temazepam
Cefdinir	Gabapentin	Oseltamivir	Tiotropium
Cefepime	Gemfibrozil	Oxybutynin	Ursodiol
Ceftriaxone	Guaifenesin	Pancrelipase	Valacyclovir
Cephrazole	Hydrocodone	Pantoprazole	Vancomycin
Cetirizine	Ibuprofen	Penicillin	Vitamins/Multivitamins/ Minerals (various OTC)
Chlorpheniramine maleate	Inderal (Propranolol)	Pentamidine	Voriconazole
Ciprofloxacin	Isosorbide		

PERFORMANCE CHARACTERISTICS OF FILMARRAY RP ON ~~THE~~ FILMARRAY 2.0 AND FILMARRAY TORCH

Clinical and non-clinical studies ~~were carried out to~~have established that the performance characteristics of the FilmArray RP, including LoD (see Limit of Detection section above), clinical sensitivity and specificity, and reproducibility are equivalent on ~~the~~ FilmArray, ~~and~~ FilmArray 2.0 and FilmArray Torch systems.

NOTE: FilmArray Torch Modules are FilmArray 2.0 instruments that have been re-configured into a stacked system for higher-throughput in a smaller workspace. ~~systems.~~

Clinical Comparison

~~The~~ A clinical comparison study was performed using specimens previously obtained during the FilmArray RP prospective clinical evaluation and supplemented with other archived specimens collected from external medical facilities and reference laboratories to increase the number of specimens being tested for low prevalence analytes. A total of 102 specimens were selected such that each analyte was represented 3-5 times. Each specimen was thawed and tested using the FilmArray and FilmArray 2.0 systems. Overall positive percent agreement (PPA) between systems was 96.8% with the lower bound of the two-sided 95% confidence interval (95% CI) at 92.0%. Overall negative percent agreement (NPA) was 99.8% with the lower bound of the two-sided 95% CI at 99.5%.

Table 50. Analyte Results from FilmArray System Clinical Comparison Study

Analyte	FilmArray 2.0 / FilmArray					
	PPA	%	95% CI	NPA	%	95% CI
Viruses						
Adenovirus	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Coronavirus 229E	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Coronavirus HKU1	6/6	100%	54.1-100%	95/96	99%	94.3-100%
Coronavirus NL63	6/6	100%	54.1-100%	96/96	100%	96.2-100%
Coronavirus OC43	4/5	80%	28.4-99.5%	97/97	100%	96.3-100%
Human Metapneumovirus	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Human Rhinovirus/Enterovirus	9/10	90%	55.5-99.7%	91/92	98.9%	94.1-100%
Influenza A	16/16	100%	79.4-100%	86/86	100%	95.8-100%
Influenza A H1	3/3	100%	29.2-100%	99/99	100%	96.3-100%
Influenza A H1-2009	6/6	100%	54.1-100%	96/96	100%	96.2-100%

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Analyte	FilmArray 2.0 / FilmArray					
	PPA	%	95% CI	NPA	%	95% CI
Influenza A H3	7/7	100%	59-100%	95/95	100%	96.2-100%
Influenza B	5/5	100%	47.8-100%	97/97	100%	96.3-100%
Parainfluenza Virus 1	7/7	100%	59-100%	95/95	100%	96.2-100%
Parainfluenza Virus 2	6/6	100%	54.1-100%	95/96	99%	94.3-100%
Parainfluenza Virus 3	6/6	100%	54.1-100%	96/96	100%	96.2-100%
Parainfluenza Virus 4	5/6	83.3%	35.9-99.6%	96/96	100%	96.2-100%
Respiratory Syncytial Virus	8/8	100%	63.1-100%	94/94	100%	96.2-100%
Bacteria						
Bordetella pertussis	4/4	100%	39.8-100%	97/98	99%	94.4-100%
Chlamydophila pneumoniae	3/3	100%	29.2-100%	99/99	100%	96.3-100%
Mycoplasma pneumoniae	5/6	83.3%	35.9-99.6%	96/96	100%	96.2-100%
Overall agreement	***121/125***	***96.8%***	***92.0-99.1%***	***1911/1915***	***99.8%***	***99.5-99.9%***

System performance for testing of 102 specimens on each platform was calculated. For the FilmArray, a total of 108 runs were attempted, 104 of which were completed (96.3%; 104/108). There were two run failures each for software (1.9%) and instrument (1.9%) errors. No control failures were observed. Two specimens were retested due to Influenza A 'equivocal' results. For the FilmArray 2.0, a total of 103 runs were attempted, all of which completed (100%; 103/103). No control failures were observed. One specimen was retested due to an Influenza A 'equivocal' result.

Reproducibility

A multicenter reproducibility study was performed to determine between-site and overall reproducibility of the FilmArray RP on ~~multi-instrument~~ FilmArray 2.0 systems. Reproducibility testing occurred at three test sites using contrived NPS samples, each spiked with various combinations of four different RP analytes representing the types of organisms detected by the panel (bacteria, DNA viruses and RNA viruses). Each analyte was evaluated at three different concentrations (Negative, Low Positive and Moderate Positive). Negative results for each assay were obtained from samples that were not spiked with a corresponding organism (analyte not in the sample).

The data include 90 replicates per analyte and incorporate a range of potential variation introduced by 8 different operators, 3 different pouch lots, and 11 different FilmArray 2.0 instruments configured on 3 different multi-instrument systems. Similar to the reproducibility of the FilmArray RP on the FilmArray (Tables 44-45 above), percent (%) agreement with the expected Detected, Not Detected or N/A result was 95.6% or better and the standard deviation in Tm was 0.5˚C or less for all assays.

Table 51. Summary of Reproducibility Results on the FilmArray 2.0

Analyte Tested	Concentration Tested	Expected Test Result	% Agreement with Expected Result			
			Site/System			Total (95% Confidence Interval)
			A	B	C	
Bordetella pertussis **Strain A639** Zeptometrix 0801459	**Moderate Positive** 3× LoD $1.2x10^4$ CFU/mL	Detected	30/30 100%	29/30 96.7%	30/30 100%	89/90 98.9% (94.0-100%)

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Analyte Tested	Concentration Tested	Expected Test Result	% Agreement with Expected Result			
			Site/System			Total (95% Confidence Interval)
			A	B	C	
	Low Positive 1× LoD 4x10^3 CFU/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Adenovirus Species C Serotype 1 Zeptometrix 0810050CF	**Moderate Positive** 3× LoD 3.0x10^2 TCID$_{50}$/mL	Detected	29/30 96.7%	30/30 100%	28/30 93.3%	89/90 98.9% (94.0%-100%)
	Low Positive 1× LoD 1.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	29/30 96.7%	89/90 98.9% (94.0%-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Influenza A H1N1-2009 A/SwineNY/03/2009 Zeptometrix 0810109CFN	**Moderate Positive** 3× LoD 3.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Low Positive 1× LoD 1.0x10^2 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
Respiratory Syncytial Virus Type A Zeptometrix 0810040ACF	**Moderate Positive** 3× LoD 6.0 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Low Positive 1× LoD 2.0 TCID$_{50}$/mL	Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)
	Negative	Not Detected	30/30 100%	30/30 100%	30/30 100%	90/90 100% (96.0-100%)

A similar FilmArray RP reproducibility evaluation was performed on FilmArray Torch systems. Contrived samples containing each FilmArray RP analyte at low positive levels (1x LoD) were tested on three complete FilmArray Torch systems (12 FilmArray Torch Modules per system) over five days (30 replicates per analyte per system for 90 total replicates per analyte). Agreement with the expected Detected results on FilmArray Torch systems was ≥95.6% for each FilmArray RP analyte and agreement with the expected negative results (Not Detected) was 100% for each analyte.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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REFERENCES

1. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases (DVD) Web site. http://www.cdc.gov/ncidod/dvrd/revb/respiratory/eadfeat.htm. Accessed January 7, 2011.
2. Kahn, J.S. and K. McIntosh, *History and recent advances in coronavirus discovery.* Pediatr Infect Dis J, 2005. **24**(11 Suppl): p. S223-7, discussion S226.
3. Kuypers, J., et al., *Clinical disease in children associated with newly described coronavirus subtypes.* Pediatrics, 2007. **119**(1): p. e70-6.
4. Romero, J., *Enteroviruses and Parechoviruses*, in *Manual of Clinical Microbiology, 9th Edition*, P. Murray, Baron, E., Pfaller, M., Jorgensen, J., Landry, M., Editor. 2007, American Society for Microbiology.
5. Jacques, J., et al., *Epidemiological, molecular, and clinical features of enterovirus respiratory infections in French children between 1999 and 2005.* J Clin Microbiol, 2008. **46**(1): p. 206-13.
6. Anzueto, A. and M.S. Niederman, *Diagnosis and treatment of rhinovirus respiratory infections.* Chest, 2003. **123**(5): p. 1664-72.
7. Kahn, J.S., *Epidemiology of human metapneumovirus.* Clin Microbiol Rev, 2006. **19**(3): p. 546-57.
8. World Health Organization.WHO Fact Sheet No. 221, April 2009. Influenza (Seasonal). http://www.who.int/mediacentre/factsheets/fs211/en/index.html. Accessed January 7, 2011.
9. Flu.gov. Flu.gov web site. About the Flu. http://flu.gov/individualfamily/about/index.html. Accessed January 8, 2011.
10. Henrickson, K.J., *Parainfluenza viruses.* Clin Microbiol Rev, 2003. **16**(2): p. 242-64.
11. Lau, S.K., et al., *Human parainfluenza virus 4 outbreak and the role of diagnostic tests.* J Clin Microbiol, 2005. **43**(9): p. 4515-21.
12. Mohapatra, S.S. and S. Boyapalle, *Epidemiologic, experimental, and clinical links between respiratory syncytial virus infection and asthma.* Clin Microbiol Rev, 2008. **21**(3): p. 495-504.
13. Panozzo, C.e.a., *Brief report: respiratory syncytial virus activity- United States, July 2007-December 2008.* MMWR, 2008. **57**: p. 1355-1358.
14. Mattoo, S. and J.D. Cherry, *Molecular pathogenesis, epidemiology, and clinical manifestations of respiratory infections due to Bordetella pertussis and other Bordetella subspecies.* Clin Microbiol Rev, 2005. **18**(2): p. 326-82.
15. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Disease Listing: Chlamydophila pneumoniae Web Site . http://www.cdc.gov/ncidod/dbmd/diseaseinfo/chlamydiapneumonia_t.htm. Accessed October 6, 2011.
16. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Disease Listing: Mycoplasma pneumoniae Web Site . http://www.cdc.gov/ncidod/dbmd/diseaseinfo/mycoplasmapneum_t.htm. Accessed October 12, 2011
17. Mezarina, K., Huffmire A , Downing, J, Core, N , Gershman,K , Hoffman, R *Outbreak of Community-Acquired Pneumonia Caused by Mycoplasma pneumoniae --- Colorado, 2000.* MMWR, 2001. **50**(12): p. 227-230.
18. Calder, J.A., et al., *Adenovirus type 7 genomic-type variant, New York City, 1999.* Emerg Infect Dis, 2004. **10**(1): p. 149-52.
19. Metzgar, D., et al., *Abrupt emergence of diverse species B adenoviruses at US military recruit training centers.* J Infect Dis, 2007. **196**(10): p. 1465-73.
20. Russell, K.L., et al., *Transmission dynamics and prospective environmental sampling of adenovirus in a military recruit setting.* J Infect Dis, 2006. **194**(7): p. 877-85.
21. Kahn, J.S., *The widening scope of coronaviruses.* Curr Opin Pediatr, 2006. **18**(1): p. 42-7.
22. van der Hoek, L., et al., *Croup is associated with the novel coronavirus NL63.* PLoS Med, 2005. **2**(8): p. e240.
23. Lau, S.K., et al., *Coronavirus HKU1 and other coronavirus infections in Hong Kong.* J Clin Microbiol, 2006. **44**(6): p. 2063-71.
24. Dominguez, S.R., C.C. Robinson, and K.V. Holmes, *Detection of four human coronaviruses in respiratory infections in children: a one-year study in Colorado.* J Med Virol, 2009. **81**(9): p. 1597-604.
25. van den Hoogen, B.G., et al., *A newly discovered human pneumovirus isolated from young children with respiratory tract disease.* Nat Med, 2001. **7**(6): p. 719-24.
26. Falsey, A.R., et al., *Human metapneumovirus infections in young and elderly adults.* J Infect Dis, 2003. **187**(5): p. 785-90.
27. Brammer, L., K. Fukuda, A. Klimov, and N. Cox. 2002, *Influenza*, in *VPD Surveillence Manual, 3rd Edition*. 2002.

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28. Jhung M, e.a., *Update: influenza activity -- United States, August 30, 2009-March 27, 2010, and composition of the 2010-11 influenza vaccine.* MMWR, 2010. **59**: p. 423-30.
29. WHO. *Influenza: About antiviral drugs*. Available from: http://www.euro.who.int/en/what-we-do/health-topics/communicable-diseases/influenza/facts-and-figures/seasonal-influenza/about-antiviral-drugs.
30. Morens, D.M., J.K. Taubenberger, and A.S. Fauci, *Predominant role of bacterial pneumonia as a cause of death in pandemic influenza: implications for pandemic influenza preparedness.* J Infect Dis, 2008. **198**(7): p. 962-70.
31. Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, Pertussis (Whooping Cough) Web Site . http://www.cdc.gov/pertussis/. Accessed May 3, 2012
32. World Health Organization (WHO). WHO Immunization, Vaccines and Biologicals; Pertussis Web Site. http://www.who.int/immunization/topics/pertussis/en/index.html. Accessed May 3, 2012.
33. Srugo, I., et al., *Pertussis infection in fully vaccinated children in day-care centers, Israel.* Emerg Infect Dis, 2000. **6**(5): p. 526-9.
34. Hahn, D.L., et al., *Chlamydia pneumoniae as a respiratory pathogen.* Front Biosci, 2002. **7**: p. e66-76.
35. Grayston, J.T., *Chlamydia pneumoniae, strain TWAR pneumonia.* Annu Rev Med, 1992. **43**: p. 317-23.
36. Peeling, R.W. and R.C. Brunham, *Chlamydiae as pathogens: new species and new issues.* Emerg Infect Dis, 1996. **2**(4): p. 307-19.
37. Klement, E., et al., *Identification of risk factors for infection in an outbreak of Mycoplasma pneumoniae respiratory tract disease.* Clin Infect Dis, 2006. **43**(10): p. 1239-45.
38. Trakhna, F., et al., *Rapid Aeromonas hydrophila identification by TaqMan PCR assay: comparison with a phenotypic method.* Lett Appl Microbiol, 2009. **49**(2): p. 186-90.
39. *Protection of Laboratory Workers From Occupationally Acquired Infections; Approved Guideline M29*, Clinical Laboratory Standards Institute.
40. Summary of Notifiable Diseases. MMWR available at http://www.cdc.gov
41. CIFOR Analysis of State Legal Authorities available at http://www.cifor.us
42. NCCLS, *Statistical Quality Control for Quantitative Measurement Procedures: Principles and Definitions; Approved Guideline. NCCLS Document C24-A3.* 2006, National Committee for Clinical Laboratory Standards: Wayne Pennsylvania.
43. NCCLS, *User Protocol for Evaluation of Qualitative Test Performance; Approved Guideline. NCCLS Document E12-A2*. 2008, National Committee for Clinical Laboratory Standards Wayne Pennsylvania.

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http://www.biofiredx.com/support/

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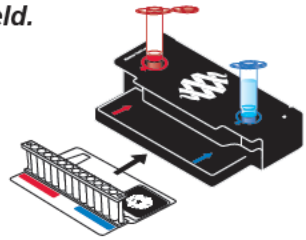
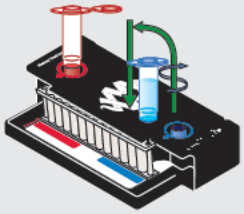
FilmArray® Respiratory Panel Quick Guide
(Injection Vials)

⚠ ***To avoid contamination <u>always wear gloves</u> and work behind a protective shield.***

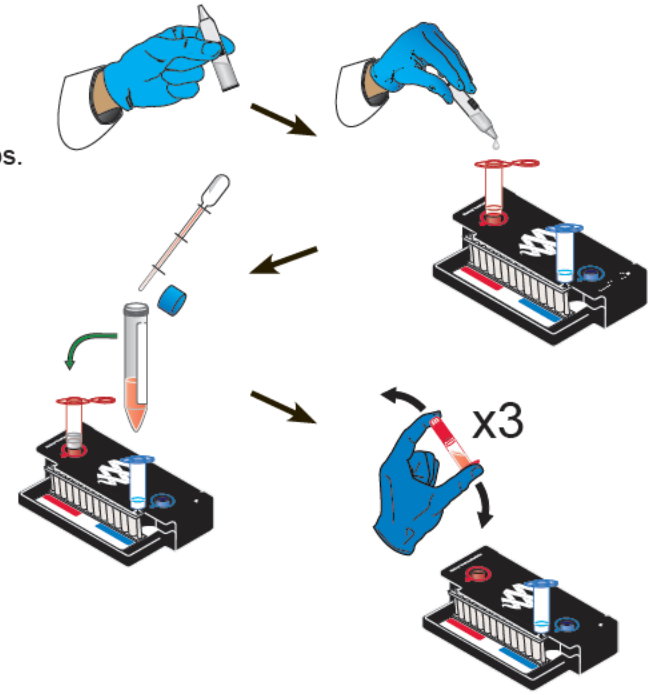


Step 1: Prepare Pouch
- ❑ Insert pouch into Pouch Loading Station.
- ❑ Place Sample Injection Vial into red well.
- ❑ Place Hydration Injection Vial into blue well.

Step 2: Hydrate Pouch
- ❑ Unscrew Hydration Injection Vial, leaving cap in Pouch Loading Station, and insert into pouch hydration port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Hydration Solution is drawn into pouch.

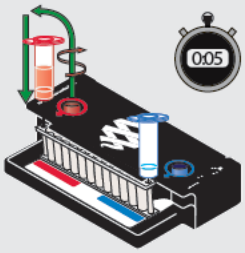


Step 3: Prepare Sample Mix
- ❑ Add Sample Buffer to Sample Injection Vial.
  - Invert Sample Buffer Ampoule so that tip is facing up.
  - ***Note:*** *Do not touch the tip of the ampoule.*
  - Firmly pinch textured plastic tab on side of ampoule until seal snaps.
  - With the tip facing down, dispense Sample Buffer into Sample Injection Vial using a slow, forceful squeeze, followed by a second squeeze. Avoid generating excessive bubbles.
- ❑ Using Transfer Pipette, draw up specimen to third line.
- ❑ Add sample to Sample Injection Vial.
- ❑ Tightly close lid of Sample Injection Vial.
- ❑ Mix sample by gently inverting Sample Injection Vial 3 times.
- ❑ Return Sample Injection Vial to red well of Pouch Loading Station.



⚠ ***Warning: The Sample Buffer is harmful if swallowed and can cause serious eye damage and/or skin irritation.***

Step 4: Load Sample Mix
- ❑ Unscrew Sample Injection Vial from cap.
- ❑ Pause for 3-5 seconds, then remove Sample Injection Vial, leaving cap in Pouch Loading Station.
- ❑ Insert Sample Injection Vial into pouch sample port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Sample Mix is drawn into pouch.



Step 5: Run Pouch
- ❑ Follow instructions on computer for initiating a test.

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(Injection Vials)

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*The **Run Summary Section** displays information about the sample and a summary of the control and test results.*

1. Detected:
   - Names of any detected pathogens
   - If 'None', no pathogens were detected
   - If '⚠Invalid', RETEST SAMPLE
2. Equivocal (↔):
   - If 'None', no pathogens were equivocal
   - If a pathogen is listed, RETEST SAMPLE
   - If '⚠Invalid', RETEST SAMPLE
3. Controls:
   - If 'Passed', results are valid
   - If '⚠Failed', RETEST SAMPLE
   - If '⚠Invalid', RETEST SAMPLE

Run Summary

Sample ID:	1-214	Run Date:	23 Jan 2013 11:30 AM
1. Detected:	Human Rhinovirus/Enterovirus	3. Controls:	Passed
2. Equivocal:	↔ Influenza A H1-2009		

*The **Results Summary Section** lists the test results for each pathogen targeted by the Respiratory Panel.*

4. If 'Not Detected', pathogen was not detected
5. If '✓Detected', pathogen was detected
6. If '↔ Equivocal', result could not be determined, RETEST SAMPLE

If '⚠Invalid', RETEST SAMPLE

***Note**: If repeated 'Invalid' results are obtained, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.*

Result Summary

	Not Detected	Adenovirus
4.	Not Detected	Coronavirus 229E
	Not Detected	Coronavirus HKU1
	Not Detected	Coronavirus NL63
	Not Detected	Coronavirus OC43
	Not Detected	Human Metapneumovirus
5. ✓	Detected	Human Rhinovirius /Enterovirus
↔	Equivocal	Influenza A H1 2009
6.	Not Detected	Influenza B
	Not Detected	Parainfluenza Virus 1
	Not Detected	Parainfluenza Virus 2
	Not Detected	Parainfluenza Virus 3
	Not Detected	Parainfluenza Virus 4
	Not Detected	Respiratory Syncytial Virus
	Not Detected	*Bordetella pertussis*
	Not Detected	*Chlamydophila pneumoniae*
	Not Detected	*Mycoplasma pneumoniae*

*The **Run Details Section** displays information about the pouch, instrument, run status, and operator.*

7. Run Status:
   - If 'Completed', run is complete
   - If 'Incomplete', 'Aborted', or any other error message, RETEST SAMPLE

***Note**: If repeated 'Error' messages are obtained, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.*

Run Details

Pouch	Respiratory Panel	Protocol:	NPS v.2 0
7. Run Status:	Completed	Operator:	JDoe
Serial No.:	00026577	Instrument:	*ITI FA "FA1115"*
Lot No.:	100302A		

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RFIT-PRT-0436-02

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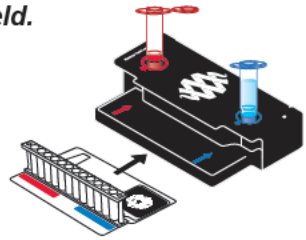

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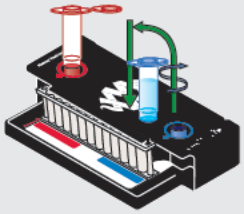
Step 2: Hydrate Pouch
- ❑ Unscrew Hydration Injection Vial, leaving cap in Pouch Loading Station, and insert into pouch hydration port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Hydration Solution is drawn into pouch.



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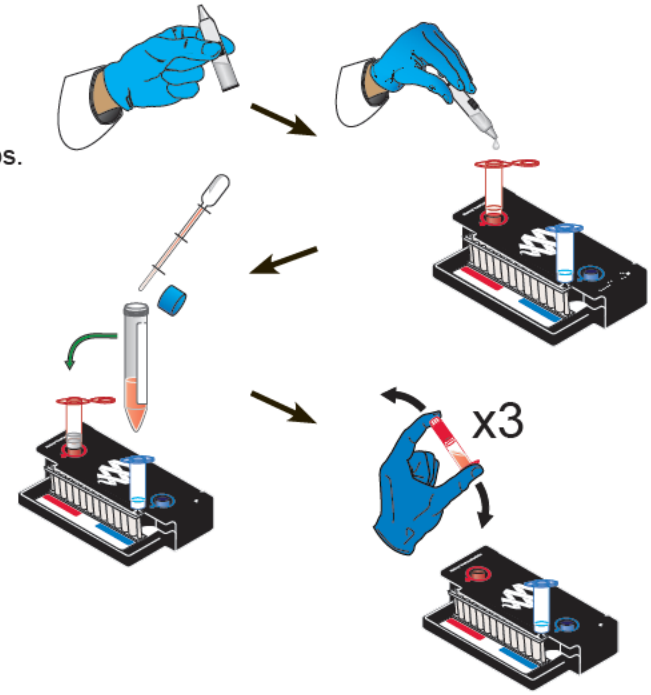
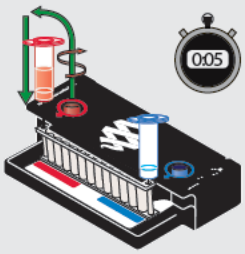
  - With the tip facing down, dispense Sample Buffer into Sample Injection Vial using a slow, forceful squeeze, followed by a second squeeze. Avoid generating excessive bubbles.
- ❑ Using Transfer Pipette, draw up specimen to third line.
- ❑ Add sample to Sample Injection Vial.
- ❑ Tightly close lid of Sample Injection Vial.
- ❑ Mix sample by gently inverting Sample Injection Vial 3 times.
- ❑ Return Sample Injection Vial to red well of Pouch Loading Station.



⚠ ***Warning: The Sample Buffer is harmful if swallowed and can cause serious eye damage and/or skin irritation.***

Step 4: Load Sample Mix
- ❑ Unscrew Sample Injection Vial from cap.
- ❑ Pause for 3-5 seconds, then remove Sample Injection Vial, leaving cap in Pouch Loading Station.
- ❑ Insert Sample Injection Vial into pouch sample port.
- ❑ Forcefully push down to puncture seal.
- ❑ Wait as Sample Mix is drawn into pouch.



Step 5: Run Pouch
- ❑ Follow instructions on computer for initiating a test.
- ~~❑ The pouch will click into place when properly seated.~~

~~***Note:*** *If the pouch does not insert easily, <u>ensure that the lid is opened completely</u>.*~~

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   - If 'Passed', results are valid
   - If '⚠Failed', RETEST SAMPLE
   - If '⚠Invalid', RETEST SAMPLE

Run Summary

Sample ID:	1-214	Run Date:	23 Jan 2013 11:30 AM
1. Detected:	Human Rhinovirus/Enterovirus	3. Controls:	Passed
2. Equivocal:	↔ Influenza A H1-2009		

*The **Results Summary Section** lists the test results for each pathogen targeted by the Respiratory Panel.*

4. If 'Not Detected', pathogen was not detected
5. If '✓Detected', pathogen was detected
6. If '↔ Equivocal', result could not be determined, RETEST SAMPLE

If '⚠Invalid', RETEST SAMPLE

***Note**: If repeated 'Invalid' results are obtained, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.*

Result Summary

	Not Detected	Adenovirus
4.	Not Detected	Coronavirus 229E
	Not Detected	Coronavirus HKU1
	Not Detected	Coronavirus NL63
	Not Detected	Coronavirus OC43
	Not Detected	Human Metapneumovirus
5. ✓	Detected	Human Rhinovirius /Enterovirus
↔	Equivocal	Influenza A H1 2009
6.	Not Detected	Influenza B
	Not Detected	Parainfluenza Virus 1
	Not Detected	Parainfluenza Virus 2
	Not Detected	Parainfluenza Virus 3
	Not Detected	Parainfluenza Virus 4
	Not Detected	Respiratory Syncytial Virus
	Not Detected	*Bordetella pertussis*
	Not Detected	*Chlamydophila pneumoniae*
	Not Detected	*Mycoplasma pneumoniae*

*The **Run Details Section** displays information about the pouch, instrument, run status, and operator.*

7. Run Status:
   - If 'Completed', run is complete
   - If 'Incomplete', 'Aborted', or any other error message, RETEST SAMPLE

***Note**: If repeated 'Error' messages are obtained, contact BioFire Diagnostics, the local bioMérieux sales representative, or an authorized distributor.*

Run Details

Pouch	Respiratory Panel	Protocol:	NPS v.2 0
7. Run Status:	Completed	Operator:	JDoe
Serial No.:	00026577	Instrument:	*ITI FA "FA1115"*
Lot No.:	100302A		

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RFIT-PRT-0436-01

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

FilmArray Systems Software

FilmArray Torch Software Architecture Summary

(b)(4) [redacted]

2015-December-17
Revision 01

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Director of Software Development	12/15/15
	Associate Director of Software Development	12/15/15
	Senior Software Project Manager	12/15/15
	Software Architect	12/17/15
	Software Engineer V	12/15/15
	Software Bio-Mathematician II	12/17/15

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In contrast to the changes made to move from FilmArray to FilmArray 2.0, no significant changes have been made to instrument functions, optics, communications, or software functions to progress from FilmArray 2.0 to FilmArray Torch.

1.3 FilmArray Torch Software Overview

The FilmArray Torch is controlled by Windows®-based software running on an integrated computer. The *FilmArray Torch Software* is delivered pre-installed on the *FilmArray Torch System Base* computer as a single application, with the applicable Pouch Modules.

The *FilmArray Torch Software* is used to run the *FilmArray Torch Modules*, save runs to the FilmArray database, and view the results of the runs utilizing an integrated computer with a touch screen. It has the following main features:

- *Dashboard*—(or "Home" screen) displays the status of each *FilmArray Torch Module* within the FilmArray Torch and guides operators through the process of operating the *FilmArray Torch Modules* and performing runs
- *Browse Runs*—allows operators to search for runs and perform certain operations on individual runs or on groups of runs
- *Settings*—allows users to perform administrative type tasks, such as managing operators (adding and updating), managing pouch modules, view system logs, archiving of runs, etc.

1.4 Related Documents

This software project is a component of the FilmArray Torch project, described in the following project documents.

Document Number	Title
DX-DCT-017849	*FilmArray Torch Project Proposal*
DX-DCT-017908	*FilmArray Torch Project Plan*
DCT-005459	*FilmArray Torch Risk Management Plan*
DX-DCT-018262	*FilmArray Torch Risk Analysis*
DX-DCT-018081	*FilmArray Torch Design Input*
DX-DCT-019825	*FilmArray Torch Software Project Plan*

The *FilmArray Torch Software* utilizes the FilmArray Pouch Module software (which contains definitions, instrument programs, analysis and reporting for a specific reagent pouch type) that can be installed separately from the *FilmArray Torch Software*. The architecture of the FilmArray Pouch Module software is detailed in:

Document Number	Title
DCT-016392	*FilmArray v2.0 System Pouch Module Architecture Summary*
DCT-009558	*FilmArray Pouch Module Analysis Software Design*

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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1.5 Regulatory References

The following external standard for software development was considered during the development of the *FilmArray Torch Software*:

- EN 62304:2006, *Medical device software — Software life-cycle processes*

The FilmArray Torch Software items and software units documented herein were defined in accordance with this regulation.

1.6 Terminology

Within this document the following terminology is used to represent the specific items within a FilmArray Torch:

Software – The *FilmArray Torch Software*.

Instrument – A single *FilmArray Torch Module* (or unit) or up to 12 *FilmArray Torch Modules*.

Duplex – The housing for 2 *FilmArray Torch Modules* that builds up from the initial 2.

System – This is composed of the software, multiple instruments, the enclosure, computer and peripherals – FilmArray Torch.

2 Software Deliverables

The *FilmArray Torch Software Installer* is delivered as an executable (.exe) file that installs the files required by the *FilmArray Torch Software*. The executable file is used to install the *FilmArray Torch Software* onto the *FilmArray Torch Image*.

The *FilmArray Torch Image* includes the Windows® 7 OS, the *FilmArray Torch Software*, the *FilmArray Pouch Modules*, and the *FilmArray Torch Instrument Configuration Application*. The *FilmArray Torch Image* is pre-installed on the FilmArray Torch System Base computer and is NOT deployed independently to the customer.

This document describes the architecture of the *FilmArray Torch Software* and the *FilmArray Torch Instrument Configuration Application*. The *FilmArray Pouch Modules* are described in separate documents as listed above.

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FilmArray Systems Software

FilmArray Torch Software Computer Image Requirements

(b)(4) [redacted]

2015-October-21
Revision 01

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	10/7/15
	Associate Director of Software Development	10/8/15
	Instrument Engineering Manager	10/8/15
	Software Test Engineer III	10/7/15
	Software Support Engineer	10/7/15
	Software Architect	10/15/15
	Director of Customer Support	10/20/15
	Program Director	10/21/15

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FilmArray Systems Software

FilmArray Torch Software Off-the-Shelf Software Specification

(b)(4) [redacted]

2015-December-16
Revision 01

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	12/16/15
	Software Engineer V	12/16/15
	Software Test Engineer III	12/16/15
	Associate Director of Software Development	12/16/15

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FilmArray Torch Software
Off-the-Shelf Software Risk Analysis

(b)(4)

2016-January-04
Revision 01

Reviewers

Name	Title / Role	Approval Date
(b) (6)	Senior Software Project Manager	12/15/15
	Associate Director of Software Development	12/16/15
	Director of Software Development	12/17/15
	VP of Regulated Products & Clinical Affairs	1/4/16
	Program Director	1/4/16
	Associate Director of Quality Assurance	12/21/15

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FilmArray Systems Software

FilmArray Torch Software High Level Requirements

(b)(4) [redacted]

2015-December-01
Revision 02

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Software Project Manager	11/10/15
	Associate Director of Software Development	11/18/15
	Director of Engineering	11/11/15
	Director of Systems Integration	11/16/15
	Director of Customer Service	11/12/15
	Product Marketing Manager	11/11/15
	VP of Regulated Products & Clinical Affairs	11/29/15
	Associate Director of Quality Assurance	11/16/15
	Program Director	12/1/15

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FilmArray Systems Software

FilmArray Torch Software Workflow Requirements

(b)(4) [redacted]

2015-November-12
Revision 02

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Software Project Manager	11/4/15
	Software Test Engineer III	11/4/15
	Director of Engineering	11/4/15
	Program Director	11/12/15
	Associate Director of Software Development	11/5/15
	Senior Software Engineer	11/4/15

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FilmArray Systems Software

FilmArray Torch Software Dashboard Requirements

(b)(4) [redacted]

2015-November-23
Revision 03

Reviewers

Name	Title	Approval Date
[redacted] (b) (6)	Senior Software Project Manager	11/19/15
	Software Engineer V	11/19/15
	Software Architect	11/19/15
	Software Engineer II	11/23/15
	Software Test Engineer I	11/19/15
	Software Test Engineer III	11/19/15
	Associate Director of Software Development	11/23/15

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FilmArray Systems Software

FilmArray Torch Software Settings Requirements

(b)(4) [redacted]

2015-November-23
Revision 02

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	11/19/15
	Software Engineer V	11/19/15
	Software Architect	11/19/15
	Software Engineer II	11/23/15
	Software Test Engineer I	11/19/15
	Software Test Engineer III	11/19/15
	Associate Director of Software Development	11/23/15

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FilmArray Systems Software

FilmArray Torch Software Instrument Configuration Application

(b)(4) [redacted]

2015-September-01
Revision 01

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	9/1/15
	Software Engineer V	9/3/15
	Software Architect	9/14/15
	Software Engineer II	9/15/15
	Software Engineer III	9/1/15
	Software Test Engineer I	9/1/15
	Software Test Engineer III	9/14/15
	Associate Director of Software Development	9/16/15

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FilmArray Systems Software

FilmArray Torch Software Browse Runs Requirements

(b)(4) [redacted]

2015-November-23
Revision 02

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	11/19/15
	Software Engineer V	11/19/15
	Software Architect	11/19/15
	Software Engineer II	11/23/15
	Software Test Engineer I	11/19/15
	Software Test Engineer III	11/19/15
	Associate Director of Software Development	11/23/15

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FilmArray Systems Software

FilmArray Torch Software Database Requirements

(b)(4) [redacted]

2015-October-28
Revision 01

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Associate Director of Software Development	10/15/15
	Senior Software Project Manager	10/15/15
	Senior Software Engineer V	10/27/15
	Software Architect	10/28/15
	Software Test Engineer III	10/15/15
	Software Test Engineer I	10/15/15

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FilmArray Systems Software

FilmArray Torch Software Installer Requirements

(b)(4) [redacted]

2015-November18
Revision 02

Reviewers

Name	Title	Approval Date
(b) (6) [redacted]	Senior Software Project Manager	11/12/15
	Software Architect	11/12/15
	Software Engineer II	11/18/15
	Software Engineer II	11/13/15
	Software Test Engineer III	11/12/15
	Associate Director of Software Development	11/18/15

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HTFA Embedded Software Specification

(ESRS)

2016-Jan-08
REV 03

(b)(4)

Reviewers

Names of reviewers	
Name	Role
(b)(4)	HTFA Lead Embedded Software Engineer
	HTFA Lead Systems Engineer
	HTFA Lead Mechanical Engineer
	HTFA Lead Software Engineer
	Engineering Project Manager
	QRT Manager

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FilmArray Systems Software

FilmArray Torch Software Release Summary

(b)(4) [redacted]

2016-January-12
Revision 01

Part Number: (b)(4) [redacted]

Version (b)(4) [redacted]

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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FilmArray Systems Software

FilmArray Torch Software Validation Trace Matrix

(b)(4) [redacted]

06 January 2016
Revision 01

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DCN Summary Report

(b)(4)

(b)(4)

(b)(4)

Date: 01/07/2016

Release Signatures

Reviewers	DCID#	(b)(4)
Title / Role	**Name**	
Firmware Engineer	(b) (6)	
Lead Firmware Engineer		
Project Manager		
Instrument Engineering Manager		
Director of Engineering		

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FilmArray Torch Automated Tests Report (b)(4)

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(b)(4)

Revision 01

18 November 2015

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Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4)
(b)(4)
(b)(4)
DCID (b)(4)

Test Description			
Test Name	(b)(4)	**V&V Number and Revision**	(b)(4)
Part Number	(b)(4)	**Design Control Number**	(b)(4)
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

The objective of the installer tests is to verify the FilmArray Torch Installer successfully installs the software as specified in (b)(4) *FA Torch Software Installer Requirements.*

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6)	Senior Software Project Manager	11/16/15
	Associate Director of Software Development	11/16/15
	Software Test Engineer III	11/16/15
	Software Test Engineer III	11/16/15

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Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4)
CO# (b)(4)
DCID (b)(4)

Test Description			
Test Name	FilmArray Torch Manual Tests	**V&V Number and Revision**	(b)(4)
Part Number	(b)(4)	**Design Control Number**	(b)(4)
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

Manual test cases to verify requirements of the FilmArray Torch Software that cannot, or have not, been covered by automated tests.

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6)	Senior Software Project Manager	11/19/15
	Associate Director of Software Development	11/19/15
	Software Test Engineer III	11/19/15
	Software Test Engineer III	11/19/15

Proprietary and Confidential.
Authorization required for use outside of BFDx.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4)
CO# (b)(4)
DCID (b)(4)

Test Description			
Test Name	FilmArray Torch Instrument Config App Tests	**V&V Number and Revision**	(b)(4)
Part Number	(b)(4)	**Design Control Number**	(b)(4)
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

The objective of the *FilmArray Torch Instrument Config App Tests* is to verify the *FilmArray Torch Instrument Config App* successfully installs the software as specified in (b)(4) *Torch Software Instrument Config App Requirements*, and can successfully configure the Modules for the FilmArray Torch.

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6)	Senior Software Project Manager	11/16/15
	Associate Director of Software Development	11/16/15
	Software Test Engineer III	11/16/15
	Software Test Engineer III	11/16/15

Proprietary and Confidential.
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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4)
CO# (b)(4) (b)(4)

Test Description			
Test Name	FilmArray Torch Software Unit Tests	**V&V Number and Revision**	(b)(4)
Part Number	(b)(4)	**Design Control Number**	(b)(4)
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

This report summarizes the code level unit tests for the FilmArray Torch Software.

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6)	Senior Software Project Manager	N/A
	Associate Director of Software Development	N/A
	Associate Director of Software Development	N/A
	Software Test Engineer III	N/A
	Software Architect	N/A

Proprietary and Confidential.
Authorization required for use outside of BFDx.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4) [redacted]

Test Description			
Test Name	FilmArray Torch Computer Image Tests	**V&V Number and Revision**	(b)(4) [redacted]
Part Number	(b)(4) [redacted]	**Design Control Number**	(b)(4) [redacted]
Project Name	FilmArray Torch Computer Image	**System Name**	FilmArray Torch

Test Objective

The objective is to verify that the image (b)(4) [redacted]) can be installed on the Torch Computer Base (b)(4) [redacted]) per the instructions and tools in the production (b)(4) [redacted] and Batch Record (b)(4) [redacted], and that the imaged computer meets the requirements in (b)(4) [redacted].

Test Case Preapproval Review

Name	Title	Preapproval Date
[redacted]	Senior Software Project Manager	12/3/15
	Associate Director of Software Development	12/8/15
	Associate Director of Software Development	12/10/15
	Software Test Engineer III	12/3/15
	Software Support Engineer	12/8/15

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Authorization required for use outside of BioFire Diagnostics, LLC.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4) [redacted]

Test Description			
Test Name	HTFA Side Load Verification	**V&V number and revision**	(b)(4) [redacted]

Test Objective

This verification tests the functionality of the new side-load mechanism in the HTFA product. This verification ensures that a pouch can be inserted correctly, ejected correctly, and that the firmware reports the correct errors in the event an insert/eject fails.

Test Case Preapproval Review

Approved by	Title	Preapproval Date
[redacted] (b) (6)	Lead Firmware Engineer	10/16/15
	Firmware Engineer	10/28/15
	Lead Mechanical Engineer	10/22/15
	Mechanical Engineer	10/20/15
	QRT Manager	10/19/15
	Engineering Manager	10/16/15
	Project Manager	10/15/15

Proprietary and Confidential.
Authorization required for use outside of Ortho

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Records Processed under FOIA request 2016-2022; Released by CDRH on 09/06/2016

Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4) [redacted]

Test Description			
Test Name	HTFA Front Panel LED Verifications	**V&V number and revision**	(b)(4) [redacted]
Test Objective			
This verification tests the functionality of the LEDS in the HTFA instrument.			

Test Case Preapproval Review

Approved by	Title	Preapproval Date
[redacted] (b) (6)	Firmware Engineer	10/14/15
	Lead Firmware Engineer	10/6/15
	QRT Manager	10/13/15
	Engineering Manager	10/16/15
	Project Manager	10/6/15

Revision History of Approved Test Cases

[redacted] (b)(4)

Proprietary and Confidential.
Authorization required for use outside of BFDX.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4) [redacted]

Test Description			
Test Name	FilmArray Torch Workflow Tests	**V&V Number and Revision**	(b)(4) [redacted]
Part Number	(b)(4) [redacted]	**Design Control Number**	(b)(4) [redacted]
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

The software workflows outlined in (b)(4) [redacted]: *FilmArray Torch Workflow Requirements* will be manually executed to validate the software with the FilmArray Torch.

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6) [redacted]	Senior Software Project Manager	11/10/15
	Associate Director of Software Development	11/11/15
	Associate Director of Software Development	11/10/15
	Program Coordinator	11/12/15
	Director of Engineering	11/10/15
	Software Test Engineer III	11/10/15
	Software Engineer V	11/10/15
	Software Test Engineer III	11/10/15

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document # (b)(4) (b)(4) [redacted]

Test Description			
Test Name	FilmArray Torch Release Candidate Tests	**V&V Number and Revision**	(b)(4) [redacted]
Part Number	(b)(4) [redacted]	**Design Control Number**	(b)(4) [redacted]
Project Name	FilmArray Torch Software	**System Name**	FilmArray Torch

Test Objective

The purpose of these test cases is to validate that the release candidate installation disk contains the correct revision of the FilmArray Torch Software, and that it correctly installs on a supported computer system as per SOP (b)(4) [redacted]: *Software Design Control*.

Test Case Preapproval Review

Name	Title	Preapproval Date
(b) (6) [redacted]	Senior Software Project Manager	11/16/15
	Associate Director of Software Development	11/16/15
	Software Test Engineer III	11/16/15
	Software Test Engineer III	11/16/15

Proprietary and Confidential.
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Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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Verification & Validation Test Case

BioFire Diagnostics, LLC

Document #(b)(4) (b)(4)

Test Description			
Test Name	System Reliability FilmArray Torch Software Validation	**V&V number and revision**	(b)(4)

Test Objective

To validate the FilmArray Torch system software is comparable to the current v1.4 FilmArray software.

Documents referenced in this validation:

- FilmArray Torch Software High Level Requirements (b)(4))
- FilmArray Torch Design Inputs (b)(4))
- FilmArray Torch Operator's Manual (b)(4))
- FilmArray RP FAIV Quick Guide (b)(4)
- FilmArray BCID FAIV Quick Guide (b)(4))
- GI Panel Quick Guide (b)(4)
- FilmArray Meningitis/Encephalitis Quick Guide (b)(4)
- Design Control (b)(4)

Test Case Preapproval Review

Approved by	Title	Preapproval Date
(b) (6)	Director of Systems Integration	10/30/15
	Scientist for Regulated Products	11/2/15
	System Validation Manager	10/29/15
	Senior Software Project Manager	10/29/15

Proprietary and Confidential.
Authorization required for use outside of BFDx.

Questions? Contact FDA/CDRH/OCE/DID at CDRH-FOISTATUS@fda.hhs.gov or 301-796-8118

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