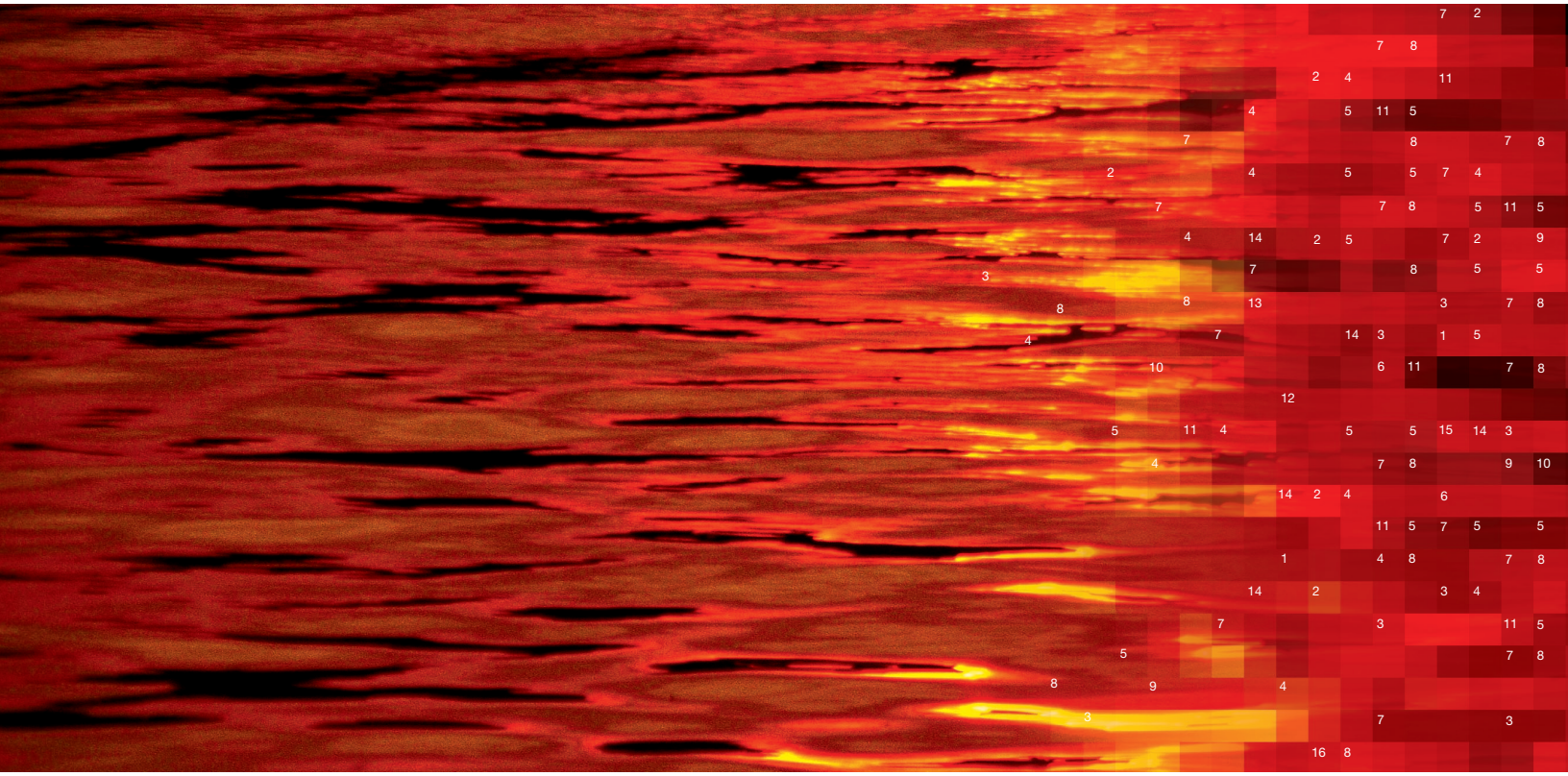
Imaging



Molecular Imager® **PharosFX**™ Systems

Your Vision Ahead

BIO-RAD

Molecular Imager Systems

While drawing on diverse technologies and performing in a variety of applications, Bio-Rad's Molecular Imager systems share a distinctive set of features: a common software interface, seamless integration with data analysis tools, intuitive instrument controls, compact ergonomic design, and superior data quality.

Molecular Imager PharosFX Systems

These powerful systems are carefully optimized for complex fluorescence imaging applications and can be used for the sensitive detection and analysis of DNA, RNA, or protein samples in gels, blots, or microplates.

Molecular Imager PharosFX and PharosFX Plus Systems

The Molecular Imager PharosFX and PharosFX Plus systems are specially designed for imaging the most complex multifluorescence applications.

Both systems:

- Image single- and multicolor fluorescence via direct laser excitation, with high sensitivity, high resolution, and precise spectral assignment
- Detect a wide range of fluorophores with optional 488 nm and 635 nm external lasers
- Utilize novel fluorophores when configured with custom emission filters
- Are equipped with a transillumination screen for gel documentation with colorimetric stains
- Integrate seamlessly with PDQuest™ 2-D analysis software and the EXQuest™ spot cutter

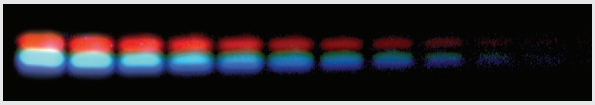
The Molecular Imager PharosFX Plus system combines the sophisticated fluorescence imaging capabilities of the PharosFX with the ability to image radiolabeled samples using storage phosphor screens, all in a convenient, ergonomically designed unit.

The PharosFX Plus system:

- Accurately quantitates ^{32}P, ^{33}P, ^{35}S, ^{14}C, and ^{3}H over a wide dynamic range (5 orders of magnitude vs. 3 for X-ray film)
- Accommodates most commercially available storage phosphor screens (20 x 25 cm and 35 x 43 cm)

Fluorescence Detection and Gel Documentation With the Molecular Imager PharosFX and PharosFX Plus Systems

The included Quantity One® 1-D analysis software offers turnkey application templates for most common fluorophores and colorimetric dyes. The option of adding 488 nm and 635 nm external lasers to the built-in 532 nm laser ensures excellent application flexibility.



100 fmol 200 amol

Limits of detection and separation of fluorescent signals into three color channels. End-labeled oligonucleotides separated on a Criterion™ 15% TBE gel. Sizes are 20, 25, and 30 bases. Red is Cy5, blue is FAM, and green is Cy3. The FAM and Cy3 dyes comigrate in this gel, resulting in the cyan bands, visible down to 200 amol.

Traditional and Novel Fluorophore Detection

In both these models, optimized excitation/emission filter combinations deliver optimal signal-to-noise and thus exceptional sensitivity. Flexibility in the choice of filters, together with software control, allows extensive user customization. The PharosFX and PharosFX Plus imagers detect photons with a variable-gain photomultiplier tube (PMT) assembly. The variable PMT gain is software controlled, and can be used to boost imaging sensitivity for enhanced detection of low-abundance proteins or small quantities of fluorescently labeled nucleotides.

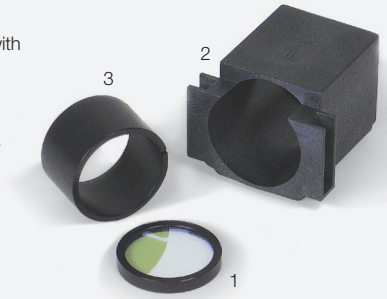
While the PharosFX systems include several installed emission filters to cover a range of applications, they also offer the flexibility to install any filter type that is required for special applications. A filter holder is provided, and the bundled software can store information about custom applications, including the appropriate emission wavelength. PharosFX systems incorporate two fully automated emission filter wheels, with up to five positions that can be used for custom filters.

Standard Filter Wheel Configurations

	Wavelength of Excitation Laser					
	532 nm only		532 and 488 nm		532, 488, and 635 nm	
Position	Filter Wheel A	Filter Wheel B	Filter Wheel A	Filter Wheel B	Filter Wheel A	Filter Wheel B
PharosFX System						
1	Blank	605 nm BP*	Blank	605 nm BP	Blank	605 nm BP
2	Blank	Blank	Blank	Blank	Blank	695 nm BP
3	640 nm BP	Blank	640 nm BP	530 nm BP	640 nm BP	530 nm BP
4	Blank	Blank	Blank	Blank	Blank	Blank
PharosFX Plus System						
1	Blank	605 nm BP	Blank	605 nm BP	Blank	605 nm BP
2	390 nm BP	Blank	390 nm BP	Blank	390 nm BP	695 nm BP
3	640 nm BP	Blank	640 nm BP	530 nm BP	640 nm BP	530 nm BP
4	Blank	Blank	Blank	Blank	Blank	Blank

* Bandpass filter = Locked filter position.

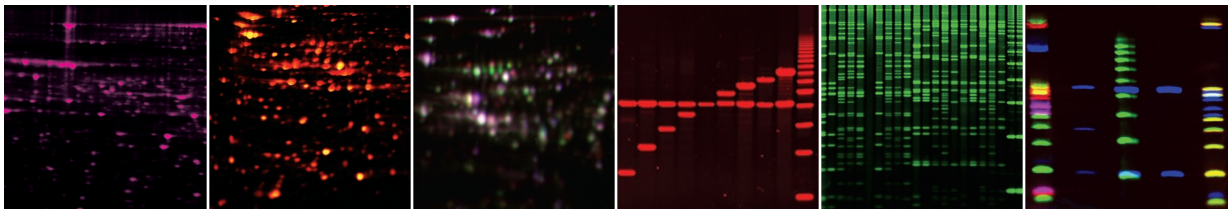
Filter holders with emission filters can be easily accessed from the front panel.



For a unique application, order required emission filter from an optical filter vendor. The PharosFX system uses emission filters with standard microscopy filter parameters (diameter, thickness, optical coating).

1. Microscopy-type emission filter.
2. Filter holder.
3. Locking plastic cylinder.

Exceptional versatility is what makes the PharosFX and PharosFX Plus systems the most desirable fluorescence imagers. Their resolution, sensitivity, and scan speed have been specially designed for imaging the most complex 1-D or 2-D gels and blots, or even macroarrays.



Flamingo™ stain | SYPRO Ruby | DIGE | Ethidium bromide | SYBR® Green I | FITC/Cy3/Cy5

Molecular Imager PharosFX Systems: The Best Choice for Proteomic Applications

The PharosFX and PharosFX Plus systems enable protein detection and expression analysis involving small quantities of low-abundance proteins or subtle changes in expression.

Stain gels with Flamingo fluorescent gel stain and then scan them with a PharosFX system for the most sensitive quantitative detection of total protein in gels.

The PharosFX and PharosFX Plus systems support a broad range of multiplex fluorescence imaging applications in gels and blots, such as Qdot multiplex blotting, DIGE, and gel staining with Pro-Q dyes.

Quickly and easily scan 2-D gels as part of any expression proteomics workflow. In combination with the EXQuest spot cutter, the PharosFX systems support a compact, convenient, and user-friendly proteomic workflow.

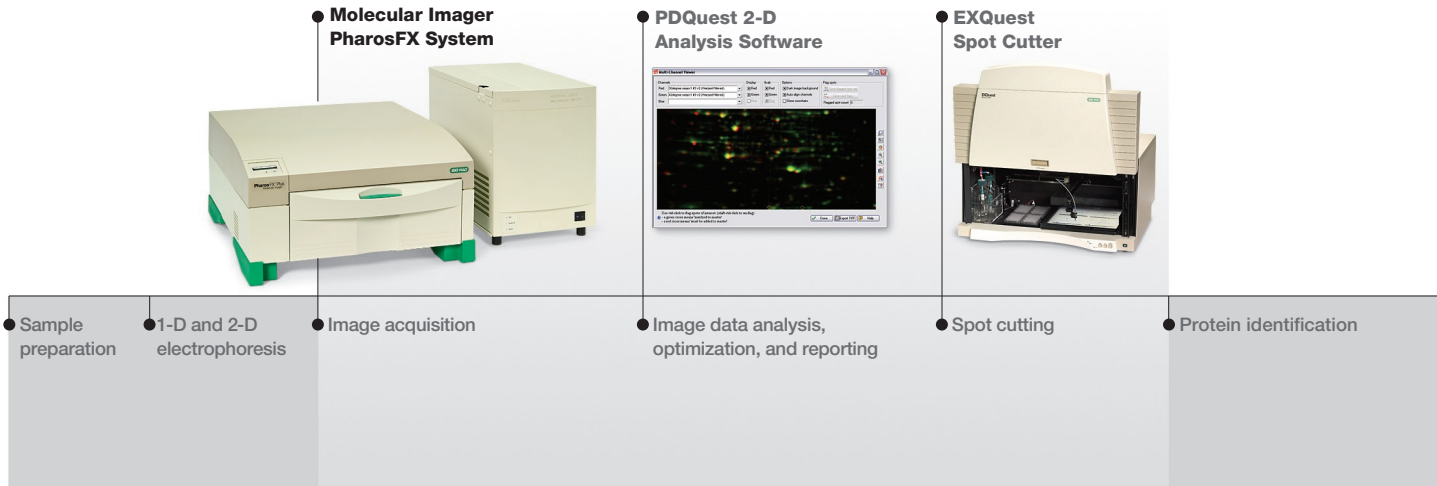
To learn more about the full range of expression proteomics products and applications offered by Bio-Rad, request bulletin 5331, or visit us on the Web at **www.expressionproteomics.com/**.

Molecular Imager PharosFX Systems: The Best Choice for Genomic Applications

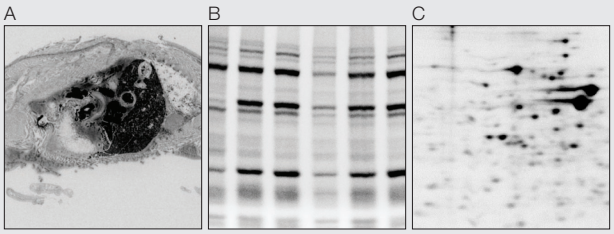
The PharosFX and PharosFX Plus systems are compatible with standard nucleic acid stains such as ethidium bromide, SYBR® Green, and Radiant® Red stain. Their exceptional resolution and multiplexing capabilities enable accurate high-throughput quantitative scanning of fluorescent macroarrays for gene expression analysis. The PharosFX Plus also handles radiolabeled samples for the broadest range of genomic applications.

Accurate detection and efficient analysis for RNAi applications can be achieved with the wide range of Bio-Rad–supported protein or gene expression techniques (for more information, go to **www.bio-rad.com/RNAi/**). The PharosFX and PharosFX Plus systems are the imagers of choice to take advantage of the various technologies for qualitative and quantitative assessment of gene silencing.

Expression Proteomics Workflow



The PharosFX Plus system is also designed to handle a variety of storage phosphor applications. Storage phosphor screens — which are sensitive to β-particles, γ-rays, and X-rays — are reusable and with proper treatment are unharmed by repeated exposure to radioisotopes.



Radiolabeled samples. A, rat (^{14}C); B, DNA (^{32}P); and C, protein (^{35}S).

Sample exposure cassette

Screen eraser

Imaging Screen-K

These are general-purpose screens designed for use with commonly used radioisotopes such as ^{32}P, ^{33}P, ^{35}S, and ^{14}C. These screens are covered by a one year limited warranty.

Imaging Screen-K/Tritium

These are specialty screens, available for imaging ^{3}H. The screens require special handling and are reusable only with proper care. They are covered by a six month limited warranty.

Sample Exposure Cassette

The sample exposure cassette is designed to ensure that close contact is made between the sample and imaging screen. The cassette features a grid-marked surface where the sample is mounted, which allows it to be firmly pressed against the imaging screen to generate a high-quality image.

Screen Eraser

The screen eraser removes any residual signal or excessive background from an exposed storage phosphor screen. The erasure process blanks the screen to a minimal "zero" level, for maximum sensitivity, broad linear response, superior image quality, and quantitative accuracy. Complete erasure of the screen after each exposure extends its useful life.

Imaging Screen Specifications and Recommended Applications

Screen Name	Application	Key Features	Sizes (W x H)	Catalog #
Imaging screen-K	^{32}P, ^{33}P, ^{14}C, ^{35}S	BaFBr:Eu formulation Protective coating Easy-to-use format Compatible with standard X-ray cassettes	35 x 43 cm 20 x 25 cm	170-7841 170-7843
Imaging screen-K/tritium	^{3}H	BaFBr:Eu formulation Sensitive to weak ^{3}H signal Easy-to-use format Compatible with standard X-ray cassettes	20 x 25 cm	170-7845

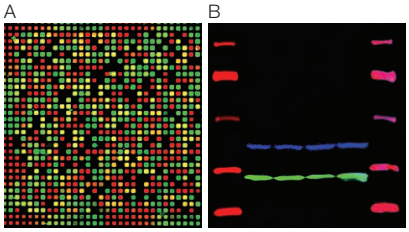
The Personal Molecular Imager™ (PMI™) System

This imager is another member of the Molecular Imager family that is designed specifically for detection of radiolabeled samples using storage phosphor screens. The PMI system has all the storage phosphor detection capabilities and functionality of the top-of-the-line PharosFX Plus imager. For more information, visit us on the Web at **www.bio-rad.com/imaging/**.

Scanning of a Wide Variety of Samples

The PharosFX, PharosFX Plus, and PMI systems are equipped with accessories that allow the scanning of a wide range of gels, blots, and microplates with high sensitivity and precision.

A B



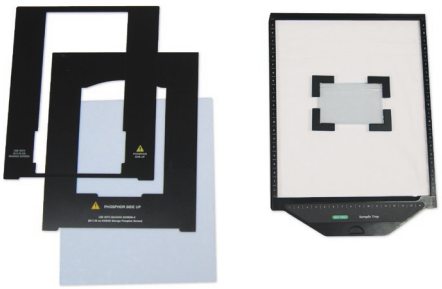
A, 1,536-well microplate labeled with FITC and rhodamine;
B, western blot with Qdot particles of 605, 655, and 705 nm.

Accommodates Various Blots and Gels

The glass sample tray that is included with each scanner is moisture-sealed and is ideal for scanning wet blots and gels.

The black aluminum multi-sample trays are designed to accommodate different types of phosphor screens, polyacrylamide gels (within the glass plates), and thick agarose gels. For microplates, a convenient adaptor is provided to position the plates securely during scanning.

A B



Sample tray (170-7811) comes with: A, a transillumination screen for gel documentation of colorimetric stains; B, four gel holders and two frames for positioning smaller storage phosphor screens. All of these components are included with each Molecular Imager PharosFX, PharosFX Plus, or PMI system.

Multi-sample tray I and multi-sample tray II.

Selection of Appropriate Accessories for Specific Applications

Accessory	Uses	Preparation Notes	Catalog #
Sample tray	Agarose gels; polyacrylamide gels; blots and membranes; colorimetric stains; unmounted storage; phosphor screens	▪ No gels thicker than 8 mm ▪ Gels should be wet ▪ Blots or membranes should be moist ▪ Use sample holders (170-7813) to keep sample from moving during scan ▪ For imaging colorimetric stains, use the transillumination screen supplied ▪ Will accept unmounted screens from many manufacturers, including Kodak, MD, and Fuji ▪ For working with 20 x 25 cm small-format screens (170-7843), use the alignment template supplied with the sample tray	170-7811
Multi-sample tray I	Mounted screens (MD format); microplates	▪ Face MD screens upward inside the tray ▪ For scanning microplates, use the microplate adaptor (170-7814) ▪ Microplate adaptor assembly accepts up to 8 microplates ▪ Plates that can be scanned include 96-, 384-, and 1,536-well formats	170-7812
Multi-sample tray II	Polyacrylamide gels sandwiched between glass plates; polyacrylamide gels sitting on glass with no upper glass plate; TLC plates	▪ Make certain that the thickness of the sample and the glass plates fits within the scanner prior to scanning ▪ The multi-sample tray II ships with three sets of nonslip spacing strips; use these to determine the optimal focus for differential display work	170-7819

PharosFX and PharosFX Plus Emission Filter Configurations

Standard Emission Filters

Application	Dye or Stain	Laser	Emission Filter Wheel A	Emission Filter Wheel B
Fluorophores	Alexa Fluor 488	488 nm	Blank (1)	530 nm BP (3)
	Alexa Fluor 532	532 nm	Blank (1)	605 nm BP (1)
	Alexa Fluor 546	532 nm	Blank (1)	605 nm BP (1)
	Alexa Fluor 635	635 nm	Blank (1)	695 nm BP (2)
	Cy2	488 nm	Blank (1)	530 nm BP (3)
	Cy3	532 nm	Blank (1)	605 nm BP (1)
	Cy5	635 nm	Blank (1)	695 nm BP (2)
	FAM	488 nm	Blank (1)	530 nm BP (3)
	FITC	488 nm	Blank (1)	530 nm BP (3)
	HEX	532 nm	Blank (1)	605 nm BP (1)
	R6G	532 nm	Blank (1)	605 nm BP (1)
	TAMRA	532 nm	Blank (1)	605 nm BP (1)
	Texas Red	532 nm	640 nm BP (3)	Blank (4)
Multiplexing	DIGE Cy2	488 nm	Blank (1)	530 nm BP (3)
	DIGE Cy3	532 nm	Blank (1)	605 nm BP (1)
	DIGE Cy5	635 nm	Blank (1)	695 nm BP (2)
	DyLight 488	488 nm	Blank (1)	530 nm BP (3)
	DyLight 549	532 nm	Blank (1)	605 nm BP (1)
	DyLight 649	635 nm	Blank (1)	695 nm BP (2)
	Pro-Q Diamond	532 nm	Blank (1)	605 nm BP (1)
	Pro-Q Emerald	488 nm	Blank (1)	530 nm BP (3)
	SYPRO Ruby	532 nm	Blank (1)	605 nm BP (1)
Protein stains	Deep Purple	532 nm	Blank (1)	605 nm BP (1)
	Flamingo	532 nm	Blank (1)	605 nm BP (1)
	Nile Red	532 nm	640 nm BP (3)	Blank (4)
	SYPRO Orange	488 nm	Blank (1)	530 nm BP (3)
	SYPRO Red	532 nm	640 nm BP (3)	Blank (4)
	SYPRO Ruby	532 nm	Blank (1)	605 nm BP (1)
DNA stains	Ethidium bromide	532 nm	Blank (1)	605 nm BP (1)
	SYBR® Gold	488 nm	Blank (1)	530 nm BP (3)
	SYBR® Green I and II	488 nm	Blank (1)	530 nm BP (3)
Chemifluorescence	AttoPhos	488 nm	Blank (1)	530 nm BP (3)
	ECL Plus	488 nm	Blank (1)	530 nm BP (3)
Radioisotopes (PharosFX Plus)	K screen (Kodak)	532 nm	390 nm BP (2)	Blank (1)
Colorimetric samples (requires transillumination screen)	Coomassie Blue–stained gel or blot	532 nm	Blank (1)	605 nm BP (1)
	Copper-stained gel or blot	532 nm	Blank (1)	605 nm BP (1)
	Silver-stained gel or blot	532 nm	Blank (1)	605 nm BP (1)
	X-ray film (gray type)	532 nm	Blank (1)	605 nm BP (1)
Microplate format	DNA (PicoGreen)	488 nm	Blank (1)	530 nm BP (3)
	β-Gal (fluorescein di-β-D-galactopyranoside)	488 nm	Blank (1)	530 nm BP (3)
	GUS (fluorescein di-β-D-glucuronide)	488 nm	Blank (1)	530 nm BP (3)
	DNA (SYBR® Green I)	488 nm	Blank (1)	530 nm BP (3)
	Protein (NanoOrange)	488 nm	Blank (1)	530 nm BP (3)
	ssDNA (OliGreen)	488 nm	Blank (1)	530 nm BP (3)

Laser excitation for fluorescence: ■ = 488 nm; ■ = 532 nm; ■ = 635 nm
Numbers in parentheses define filter positions on the filter wheels.

System Capabilities Guide

Applications and Features	PharosFX	PharosFX Plus	PMI
Fluorescent			
Blue-excited (488 nm external laser)	○	○	—
Green-excited (532 nm internal laser)	●	●	—
Red-excited (635 nm external laser)	○	○	—
Multiplex applications	●	●	—
Radioisotopic detection (Kodak/Fuji screens) using internal laser of specified wavelength	—	● (532 nm)	● (635 nm)
Choice of emission filters (including custom filters)	●	●	—
USB2 interface	●	●	●

● = Standard; ○ = Optional; — = Not available.

Specifications

		PharosFX Plus	PharosFX	PMI
Detection limit				
Storage phosphor	<0.95 dpm/mm^2 for 1 hr exposure to ^{14}C using imaging screen-K	●		●
	<0.15 dpm/mm^2 for 1 hr exposure to ^{32}P using imaging screen-K	●		●
Fluorescence (depends on experimental conditions)	0.2 fmol of FITC end-labeled DNA using 488 nm laser	●	●	
	6 pg of SYBR® Green I–stained DNA using 488 nm laser	●	●	
	0.4 fmol of FITC end-labeled DNA using 532 nm laser	●	●	
	25 pg of SYBR® Green I–stained DNA using 532 nm laser	●	●	
	0.2 fmol of Cy3 end-labeled DNA using 532 nm laser	●	●	
	0.2 fmol of Cy5 end-labeled DNA using 635 nm laser	●	●	
Dynamic range	5 orders of magnitude	●	●	●
Linearity	$r^2 > 0.99$	●	●	●
Uniformity	±5% over entire scan area	●	●	●
Scan resolution	800, 200, 100, and 50 µm (user selectable)	●	●	●
Scan time	20 x 25 cm area: 8.5 min at 100 µm, 15 min at 50 µm	●	●	●
	35 x 43 cm area: 8.5 min at 200 µm, 17 min at 100 µm	●	●	●
Spatial resolution of storage phosphor*	^{14}C: 200 µm (2.5 line pairs/mm) using imaging screen-K	●		●
	^{32}P: 300 µm (1.5 line pairs/mm) using imaging screen-K	●		●
Digital resolution	16-bit (65,536 gray scale)	●	●	●
Excitation source	25 mW 532 nm (green) diode-pumped solid-state laser	●	●	
	10 mW 635 nm diode laser			●
Optional external lasers	15 mW 488 nm (blue) external argon ion laser	●	●	
	10 mW 635 nm (red) external diode laser	●	●	
Maximum power	65 W	●	●	
Input voltage range	100–240 VAC, 50–60 Hz	●	●	●
Operating environmental requirements	10–32°C, 30–80% humidity	●	●	●
Computer interface	USB2	●	●	●
Operating system	Windows 2000 or XP, or Mac OS X	●	●	●
Dimensions (W x D x H)	57 x 68 x 30 cm	●	●	●
Weight (scanner)	32 kg	●	●	●

* Dependent on radioisotope characteristics and storage phosphor crystal size coated on the screen.

Part of the Expression Proteomics Program from Bio-Rad

www.expressionproteomics.com

Ordering Information

Catalog #	Description
Molecular Imager PharosFX and PharosFX Plus Systems	
170-9450	**Molecular Imager PharosFX System**, PC or Mac, 100/240 V, includes Quantity One software, sample tray set, fluorescence filters (170-7866, 170-7896), USB2 cable, instructions
170-9460	**Molecular Imager PharosFX Plus System**, PC or Mac, 110/240 V, includes Quantity One software, sample tray set, fluorescence (170-7866, 170-7896) and phosphor imaging filters, USB2 cable, instructions
Personal Molecular Imager (PMI) System	
170-9400	**Personal Molecular Imager (PMI) System**, PC or Mac, 110/240 V, includes Quantity One software, sample tray set, USB2 cable, instructions
Accessories	
170-7890	**External Laser**, 488 nm, includes 170-9459 filter
170-7893	**635 nm External Laser Upgrade**, for 170-7890, includes 170-7865 filter
170-7892	**External Lasers**, 488 nm and 635 nm, includes 170-7865 filter
170-9459	**Filter 530 nm BP**, for ECL Plus, AttoPhos, SYBR® Green I, Alexa Fluor 488, FITC, Cy2, and Pro-Q Emerald dyes
170-7863	**Filter 555 nm LP**, for Texas Red dye
170-7866	**Filter 605 nm BP**, for ethidium bromide, SYPRO Red, SYPRO Ruby, Alexa Fluor 532 and 546, and Cy3 dyes
170-7896	**Filter 640 nm BP**, for Texas Red dye
170-7865	**Filter 695 nm BP**, for Cy5 and Alexa Fluor 635 dyes
170-7867	**Blank Filter Holder**
170-7811	**Sample Tray**
170-7813	**Sample Holders**, for gels
170-7812	**Multi-Sample Tray I**, for small aluminum-mounted screens and microplates
170-7814	**Microplate Adaptor**, for multi-sample tray I
170-7819	**Multi-Sample Tray II**, for scanning gels mounted to glass plates
170-7845	**Imaging Screen-K (Kodak)/Tritium**, 20 x 25 cm
170-7843	**Imaging Screen-K (Kodak)**, 20 x 25 cm
170-7841	**Imaging Screen-K (Kodak)**, 35 x 43 cm
170-7861	**Exposure Cassette-K**, for 20 x 25 cm screens
170-7862	**Exposure Cassette-K**, for 35 x 43 cm screens
170-7809	**Screen-K Eraser**, 110/120 V
170-7806	**Screen-K Eraser**, 220/240 V
931-0071	**3 m USB Cable**
161-0722	**Bio-Rad Cleaning Concentrate**
170-7869	**Replacement Bulb for Screen-K Eraser**

Catalog #	Description
Related Products	
161-0490	**Flamingo Fluorescent Gel Stain**, 10x solution, 20 ml
161-0491	**Flamingo Fluorescent Gel Stain**, 10x solution, 100 ml
161-0492	**Flamingo Fluorescent Gel Stain**, 10x solution, 500 ml
165-7200	**EXQuest Spot Cutter**
165-7201	**EXQuest Spot Cutter With PC**
170-9631	**PDQuest Advanced 1-User Network License**
170-9632	**PDQuest Advanced 2-User Network License**
170-9633	**PDQuest Advanced 3-User Network License**
170-9634	**PDQuest Advanced 4-User Network License**
170-9635	**PDQuest Advanced 5-User Network License**
170-9636	**PDQuest Advanced 10-User Network License**
170-9638	**PDQuest Advanced Add 1 User to Network License**
170-9640	**PDQuest Basic to Advanced Software Version Upgrade**
170-9642	**PDQuest User Guide**
170-9645	**PDQuest Advanced CFR Module**
170-9620	**PDQuest Basic 2-D Analysis Software**
170-9660	**PDQuest Basic Software Version Upgrade**, 7.x to 8.0
170-9670	**PDQuest Advanced Software Version Upgrade**, 7.x to 8.0
165-3414	**Gel Clip**, holds any gel size

The Molecular Imager PharosFX systems are covered by the following patents: US patents 4,812,660, 4,822,520, and 4,830,875 (licensed exclusively to Bio-Rad Laboratories); US patent 5,266,803 (issued to Bio-Rad); and patents pending, and are a Class I laser product.

BIO-RAD

Bio-Rad Laboratories, Inc.

Life Science Group

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