

BD FACSCelesta™

FLOW CYTOMETER



Working Together in Perfect Harmony



BD FACSCelesta: Working together in perfect harmony

The BD FACSCelesta™ flow cytometer is designed to make multicolor flow cytometry more accessible and allow researchers to benefit from new innovations in instrument and reagent technology. Parallel advances in optical and reagent technology are pairing multi-laser, multi-detector instruments with bright new dyes, enabling increasingly deep and powerful insights in cell analysis.

The BD FACSCelesta platform offers four configurations, each optimized to enable use of traditional as well as innovative BD Horizon Brilliant™ dyes that can help you detect low-density antigens and rare populations. These advanced dyes minimize spectral overlap and simplify experimental design and analysis for experienced researchers as well as those new to flow cytometry. The system has been designed to fit on the benchtop and leverages the proven BD FACSDiva™ software to streamline workflow from system setup to data acquisition to data analysis.

The BD FACSCelesta is the first flow cytometer optimized by design to work with BD Horizon Brilliant dyes. Developed from patented technology and based on Nobel Prize-winning chemistry, the BD Horizon Brilliant dyes are bright, photo stable, and emit in a narrow spectrum. For reagents, *bright is better*, because bright fluorochromes enable researchers to identify cell populations that emit dim signals. These innovative products allow researchers to examine complex cellular processes and trace changes at the single-cell level in normal and disease states.

The BD FACSCelesta platform, while enabling higher levels of multicolor applications, remains easy to adopt in the laboratory. The BD FACSDiva software, already used by many researchers worldwide, simplifies setup, operation, panel design, and compensation. It requires minimal training while providing researchers confidence in the consistency and reliability of their data.

The BD FACSCelesta system harmonizes all of the above advances in a device that fits neatly on your benchtop, yet its optical subsystem allows detection of up to 14 parameters using three lasers.

Welcome to a more colorful world.SM

Convergence of key technologies

Optimized for Brilliance in a Compact Footprint

BD multi-laser flow cytometers are known for delivering high sensitivity and performance. In the BD FACSCelesta, the optical and electronics systems—lasers, filters, detectors, optical paths, and signal processing technologies—have been engineered to get the most out of BD Horizon Brilliant dyes.

More Parameters Mean More Impact

BD FACSCelesta users can choose from four instrument configurations. All configurations have blue (488-nm) and violet (405-nm) lasers, which can be paired with a red (640-nm), ultraviolet (355-nm), or yellow-green (561-nm) laser, depending on your application needs. The ability to detect and analyze up to 14 parameters in a single sample maximizes your power of discovery and the impact of your research.

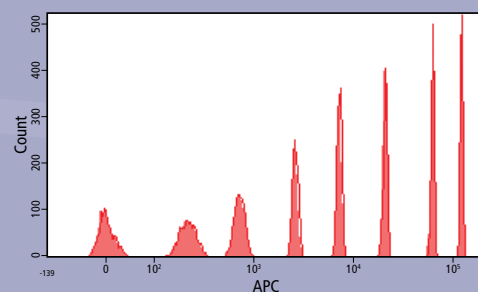
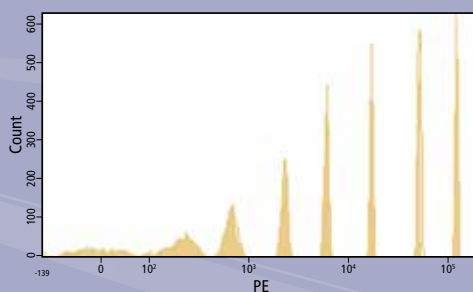
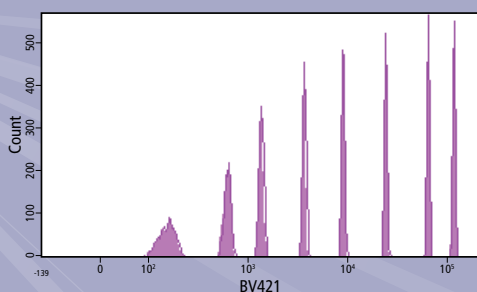
The laser combinations mix new and established technology to achieve optical stability and reliable performance within a compact footprint. A system of dichroic mirrors and bandpass filters, packed into a compact polygon, splits off light from each laser and directs it to the correct detectors. The detectors (photomultiplier tubes or PMTs) themselves fit compactly behind the filter assemblies.



Optical deck of the BD FACSCelesta Blue-Violet-Red (BVR) laser configuration.

Rainbow beads demonstrate sensitivity and resolution

SPHERO™ 8-Peak Rainbow Calibration Particles (RCP-30-5A) are calibration particles designed to measure the performance of fluorescence channels from 365 to 650 nm. The narrow bands and clear peaks demonstrate the sensitivity and resolution of the BD FACSCelesta for three compatible fluorochromes.



Easy to monitor and adapt to your workflow

Reliable Fluidics, High-Throughput Capability

The fluidics system of the BD FACSCelesta—the sample lines, fluid containers, and pumps that carry sample, sheath fluid, and waste through the unit—is designed for reliability and convenience. A newly designed digital control panel makes it easy to monitor the operational status of the cytometer and make adjustments. The simple display indicates the operational mode of the system.



The BD High Throughput Sampler (HTS) option provides rapid, fully automated sample acquisition from microtiter plates.

High-Throughput Option

For multi-sample applications requiring a high-throughput, workflow, the BD™ High Throughput Sampler (HTS) option for the BD FACSCelesta provides rapid, fully automated sample acquisition from microtiter plates. The HTS option supports a wide range of research applications and is compatible with 96-well U, V, and flat-bottom plates as well as 384-well microtiter plates. In high-throughput mode, the HTS can process a 96-well plate in fewer than 15 minutes with less than 1% carryover. Standard throughput mode can be selected to acquire larger sample volumes or where longer acquisition times are required.

BD FACSFlow Supply System Option

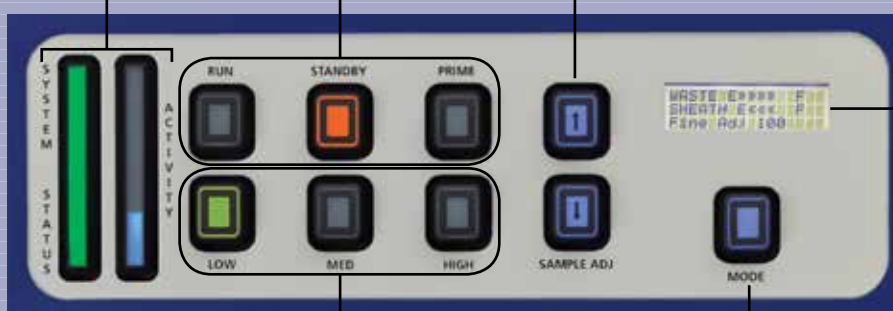
The optional BD FACSFlow™ Supply System (FFSS) fluidics cart increases capacity and ease of use while maintaining a stable fluidics pressure. It includes an automated sheath and waste fluid control system that reduces daily maintenance by incorporating two 20-L containers (Cubitainers®). Fluidic sensors maintain constant pressure, and a fluidics monitoring system warns when sheath fluid is low or empty, or when the waste container is full.

Light bars allow monitoring of system status and activity level

Buttons to select desired Fluidics Operation

Up and down arrows allow fine adjustment of flow rates within each flow rate setting

Front fluidics panel on BD FACSCelesta



Digital display of fluid levels in tanks

Easily switch between Low, Medium, and High flow rates

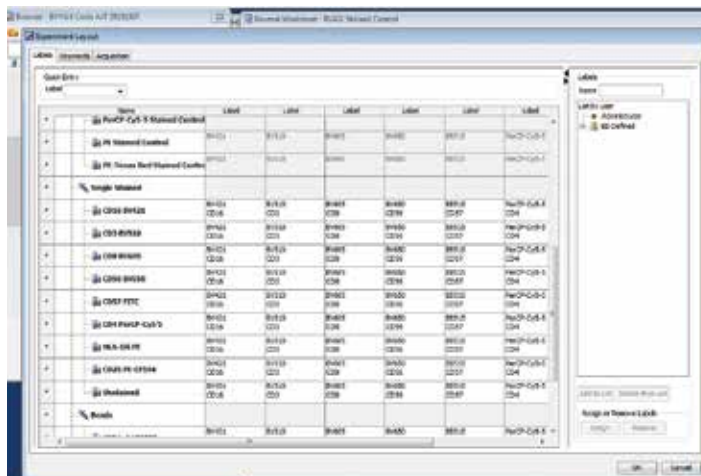
Select Manual or HTS mode

Complete, familiar software toolset

Streamlined Workflows from Setup through Analysis

The BD FACSCelesta operates with BD FACSDiva™ software, a collection of convenient and easy tools for flow cytometer and application setup, data acquisition, and data analysis. BD FACSDiva helps streamline flow cytometry workflows, expanding flexibility, and improving efficiency in today's busy laboratory.

The software package simplifies the creation and management of samples and experiments, and provides a wide array of analysis features for laboratories through use of a single software platform. Efficient data management tools simplify data storage and improve data organization, while allowing the flexibility to export data for use with downstream analysis and presentation applications.



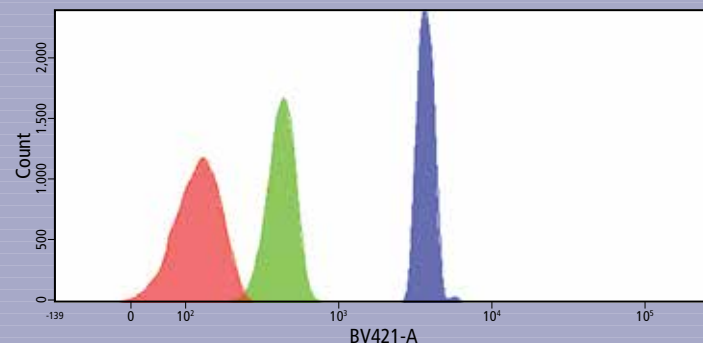
Intuitive Workflows Help You Focus on Science

With a large worldwide installed base spanning multiple platforms, BD FACSDiva is already familiar to many users, reducing the need for training. Maintaining consistency and accuracy of data acquisition requires only a single daily setup and QC run using BD FACSDiva software and BD FACSDiva™ CS&T (Cytometer Setup & Tracking) research beads. The CS&T software module enables BD FACSDiva to automatically calculate and adjust key cytometer setup values for PMT voltages, laser delay, and area scaling factors, thereby sustaining optimal performance over time and across instruments. This automation reduces startup time to approximately five minutes and eliminates multiple error-prone and expensive manual data acquisitions and calculations.

The Experiment Layout feature in BD FACSDiva software simplifies and accelerates creating a new experiment.

CS&T beads ensure data consistency

Analysis of BD FACSDiva CS&T research beads (gated on forward vs side scatter signals) shows the separation between dim, medium, and bright beads for each fluorescence channel on the BD FACSCelesta. After each daily setup and QC run, BD FACSDiva automatically adjusts PMT voltages to ensure consistent results from day to day and across instruments. BD FACSDiva CS&T research beads are excited by all supported lasers and emit in the range of virtually any filter combination.



Brilliant dyes, reduced compensation

Multiplex Across the Color Spectrum

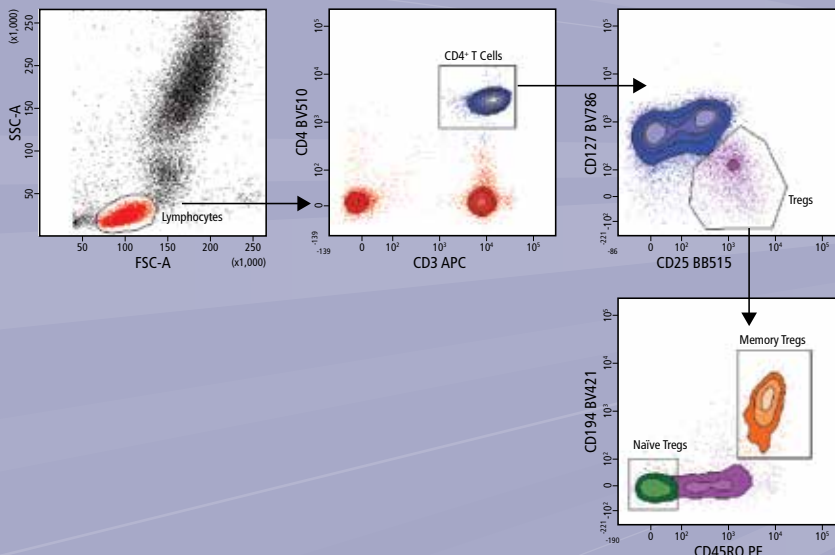
Matched Optics and Reagents Maximize Experimental Results

Each BD FACSCelesta configuration optimizes different BD Horizon Brilliant conjugates and therefore different applications. With all configurations, the combination of bright, narrow-spectrum fluorochromes and sensitive optics results in panels that can readily resolve even dim

populations, yet are easy to use and compensate. As a result, you can develop multicolor panels that actually use all of the fluorescence channels that your BD FACSCelesta system offers.

Blue/Violet		Blue/Violet/UV		Blue/Violet/Yellow-Green		Blue/Violet/Red	
Laser	Fluorochromes	Laser	Fluorochromes	Laser	Fluorochromes	Laser	Fluorochromes
405 nm	BD Horizon™ BV421, V450, Pacific Blue	405 nm	BD Horizon BV421, V450, Pacific Blue	405 nm	BD Horizon BV421, V450, Pacific Blue	405 nm	BD Horizon BV421, V450, Pacific Blue
	BD Horizon™ BV510, V500		BD Horizon BV510, V500		BD Horizon BV510, V500		BD Horizon BV510, V500
	BD Horizon™ BV605		BD Horizon BV605		BD Horizon BV605		BD Horizon BV605
	BD Horizon™ BV650		BD Horizon BV650		BD Horizon BV650		BD Horizon BV650
	BD Horizon™ BV711		BD Horizon BV711		BD Horizon BV711		BD Horizon BV786
	BD Horizon™ BV786		BD Horizon BV786		BD Horizon BV786		BD Horizon BV786
488 nm	BD Horizon™ BB515, FITC, Alexa Fluor® 488	488 nm	BD Horizon BB515, FITC, Alexa Fluor® 488	488 nm	BD Horizon BB515, FITC, Alexa Fluor® 488	488 nm	BD Horizon BB515, FITC, Alexa Fluor® 488
	PE		PE		PerCP, PerCP-Cy5.5, 7-AAD		PE
	BD Horizon™ PE-CF594, PI		BD Horizon PE-CF594, PI	561 nm	PE		BD Horizon PE-CF594, PI
	PerCP, PerCP-Cy™5.5, 7-AAD		PerCP, PerCP-Cy5.5, 7-AAD		BD Horizon PE-CF594, PI		PerCP, PerCP-Cy5.5, 7-AAD
		355 nm	BD Horizon BUV395		PE-Cy™5, 7-AAD	640 nm	APC, Alexa Fluor® 647
			BD Horizon BUV737		PE-Cy™7		BD Horizon™ APC-R700, Alexa Fluor® 700
							APC-H7

Fluorochrome reference for BD FACSCelesta configurations



Six-color Treg analysis on the BD FACSCelesta BVR configuration

Normal human whole blood was stained, lysed, and washed to analyze regulatory T cells (Tregs). Cells were gated and lymphocytes were identified using light scatter. Lymphocytes were further gated on CD3⁺CD4⁺ helper T cells and finally on CD25⁺CD127⁻ Tregs to identify naive (CD45RO⁻CD194⁻) and memory (CD45RO⁺CD194⁺) Tregs. (The absence of CD127 is a proxy for the presence of the classic intracellular Treg marker FoxP3.) BD Horizon Brilliant dyes were used to stain four of the six markers, allowing easy resolution of rare Treg subpopulations.

Immunology applications

See What You've Been Missing

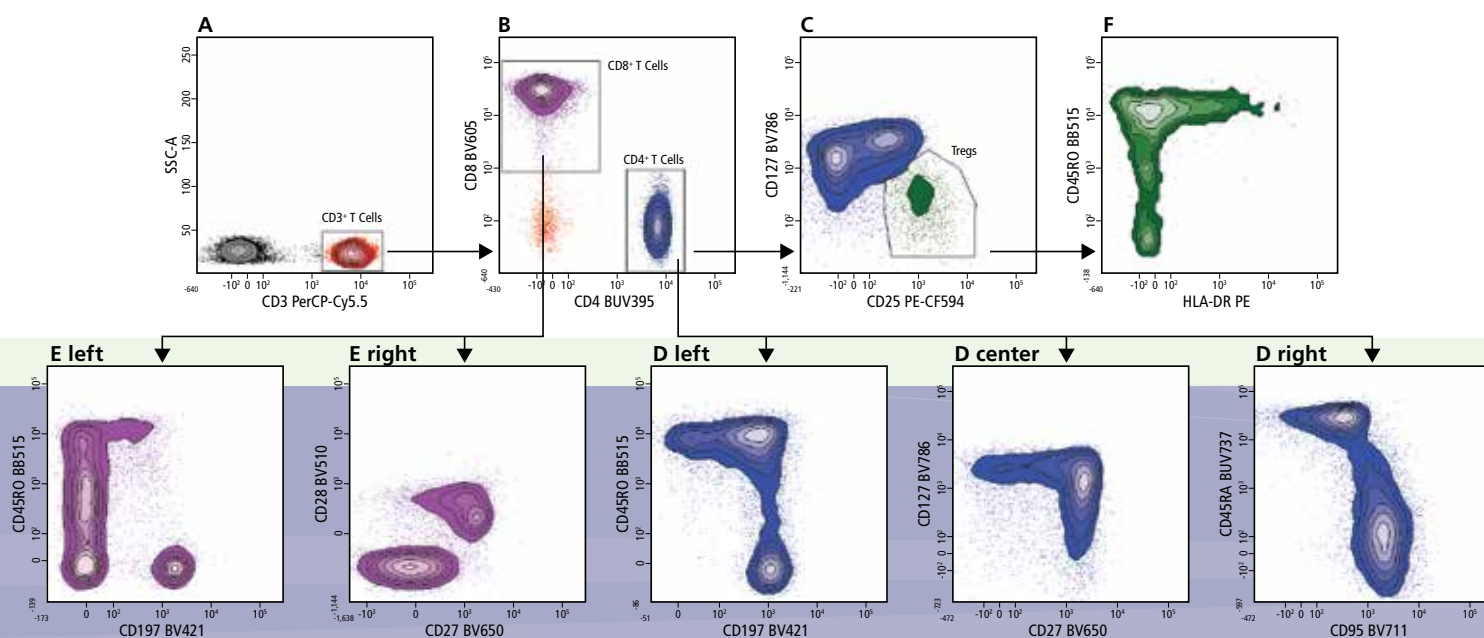
The BD FACSCelesta can rapidly and accurately analyze many kinds of cells, including lymphoid tissue (thymus, spleen, and lymph nodes), digested solid tissues, and blood.

Using panels of directly conjugated fluorescent antibodies to recognize specific cell surface and intracellular epitopes, multicolor flow cytometric analysis allows researchers to interrogate specific target protein levels expressed by individual cells in various phases of development and differentiation. The multiparametric, single-cell focus of multicolor flow cytometry is perfectly suited to further immunological discovery of protein and gene expression and cell signaling. BD's solutions for cell identification, transcription factor expression, and cytokine secretion and measurement reflect a commitment to high quality and consistency, which are needed for advanced research.

Illuminate Rare Cells and Low-Density Antigens

Rare cells, or cells that have few surface receptors of a marker of interest, can be difficult to detect using conventional reagents. Bright reagents are essential in resolving these dim cells from others in a sample.

BD Horizon Brilliant polymer conjugates can endow previously dim cells with much brighter fluorescence signals than traditional organic fluorescent dyes or even phycobiliproteins such as PE or APC. Optimization for these bright dyes enables the BD FACSCelesta to identify cell populations with a broader range of receptor density than was previously possible.



12-color T-cell analysis on the BD FACSCelesta BVUV configuration

This T-cell panel demonstrates the sensitivity and resolution of the BD FACSCelesta, even in detecting rare subpopulations. After normal human whole blood was stained, lysed, and washed, BD Horizon Brilliant dyes were used to stain nine of the 12 markers, allowing easy resolution of rare T-cell and Treg subpopulations. **A.** Cells were gated to select the CD3⁺ T cells. **B.** CD3⁺ lymphocytes were gated to show the CD4⁺ helper T cells and CD8⁺ cytotoxic T cells. **C.** Gated on the CD4⁺ T cells, surface markers were used to identify CD25⁺CD127⁻ Tregs. (The absence of CD127 is a proxy for the presence of the classic intracellular Treg marker FoxP3.) **D.** CD4⁺ helper T cells were analyzed for memory T-cell subsets using CD45RO, CD197, and CD27. Additional surface markers were used to distinguish CD127, CD45RA, and CD95 expression levels. **E.** CD8⁺ cytotoxic T cells were analyzed for memory T-cell subsets using CD45RO, CD197, CD27, and CD28. **F.** HLA-DR and CD45RO expression levels were plotted for the Treg population.

Cell biology applications

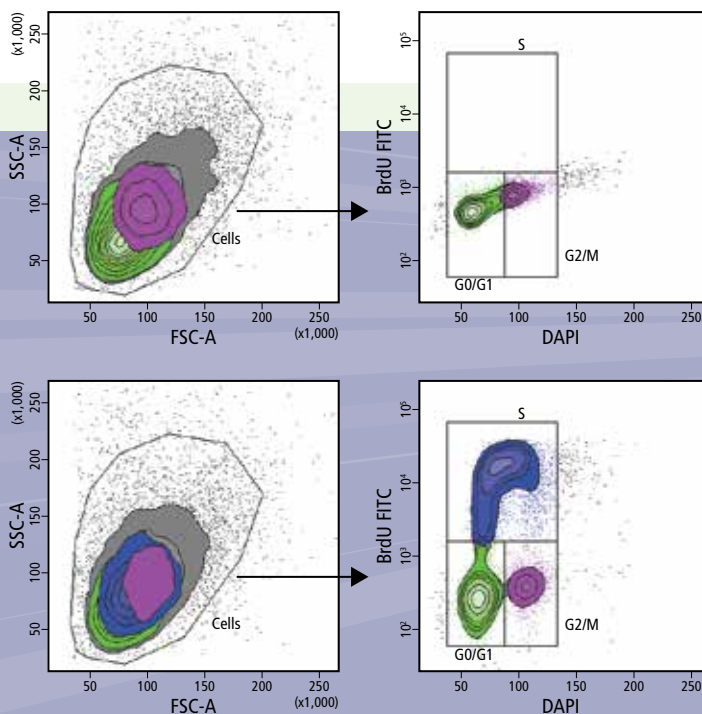
Cell Analysis in a New Light

Flow cytometry can provide rich data to cell biologists working in a wide range of fields, from molecular interaction to systems biology, from pharmacokinetics to cancer biology, from cell signaling to marine biology to biophysics. Use of flow cytometry has blossomed with intensified interest in proteomics, increased use of biomarkers in drug development research, and the spread of high-throughput, cell-based drug screening research.

Detecting and analyzing light scatter allows researchers to measure physical characteristics of cells in suspension, such as cell shape, size, and internal complexity. Adding fluorescent markers allows researchers to interrogate expressed or secreted proteins that reveal cell phenotype, function, and status. Using a broad landscape of cell function assays, flow cytometry can shed light on a variety of sample types, such as whole blood, cell lines, and yeast. With three lasers and up to 14 optical channels, the BD FACSCelesta can multiplex many of these assays at once on the same sample.

Study Complex Populations at the Single-Cell Level

A major strength of flow cytometry is its ability to study complex populations. Western blots, immunoprecipitation, and PCR-based techniques rely on lysing the entire sample. Their results provide useful data for the population as a whole, but it can be difficult to compare subsets of cells that might behave differently. Other techniques that examine individual cells, such as microscopy, are hard to scale up for quantitative analysis. Flow cytometry can characterize large numbers of individual cells, allowing it to identify, quantify, and characterize different subsets of cells in a heterogeneous population.



Cell cycle analysis on the BD FACSCelesta BVR configuration

Bromodeoxyuridine (BrdU) is an analog of the DNA precursor thymidine. When cells are incubated in the presence of BrdU, the molecule is incorporated into newly synthesized DNA by cells entering and progressing through the S phase of the cell cycle. It can then be detected with antibodies against BrdU. To determine the amount of total DNA, samples can also be stained with a DNA dye such as DAPI. With this combination, two-color flow cytometry can determine the cell cycle phase (G₀/G₁, S, or G₂/M) of cells that are actively synthesizing DNA. In this analysis, cells were gated based on light scatter. Cells pulsed with BrdU (lower plots) show a characteristic horseshoe pattern.

Services and Support

BD Biosciences is fully committed to the success and satisfaction of its customers. The BD FACSCelesta system is backed by BD's world-class service and support organization with unmatched flow cytometry experience.

Training

Hands-on training is included with each BD FACSCelesta flow cytometer. In addition, training courses are held at BD training centers worldwide.

Technical Support

Combining years of collective knowledge with diverse research laboratory experience, BD Biosciences technical application support specialists provide timely, professional telephone, email, and onsite scientific support. They can address issues related to instruments, software, and reagents across a broad range of applications, from instrument troubleshooting to multicolor panel selection to experimental design.

With access to BD's extensive support and knowledge network—much of it available to customers in our online Technical Resource Library—BD support specialists will help you get the most from your new BD FACSCelesta flow cytometer.

Telephone, Email, and Online Support

The instrument support team is the first point of contact for instrument-related issues and questions by telephone and email.

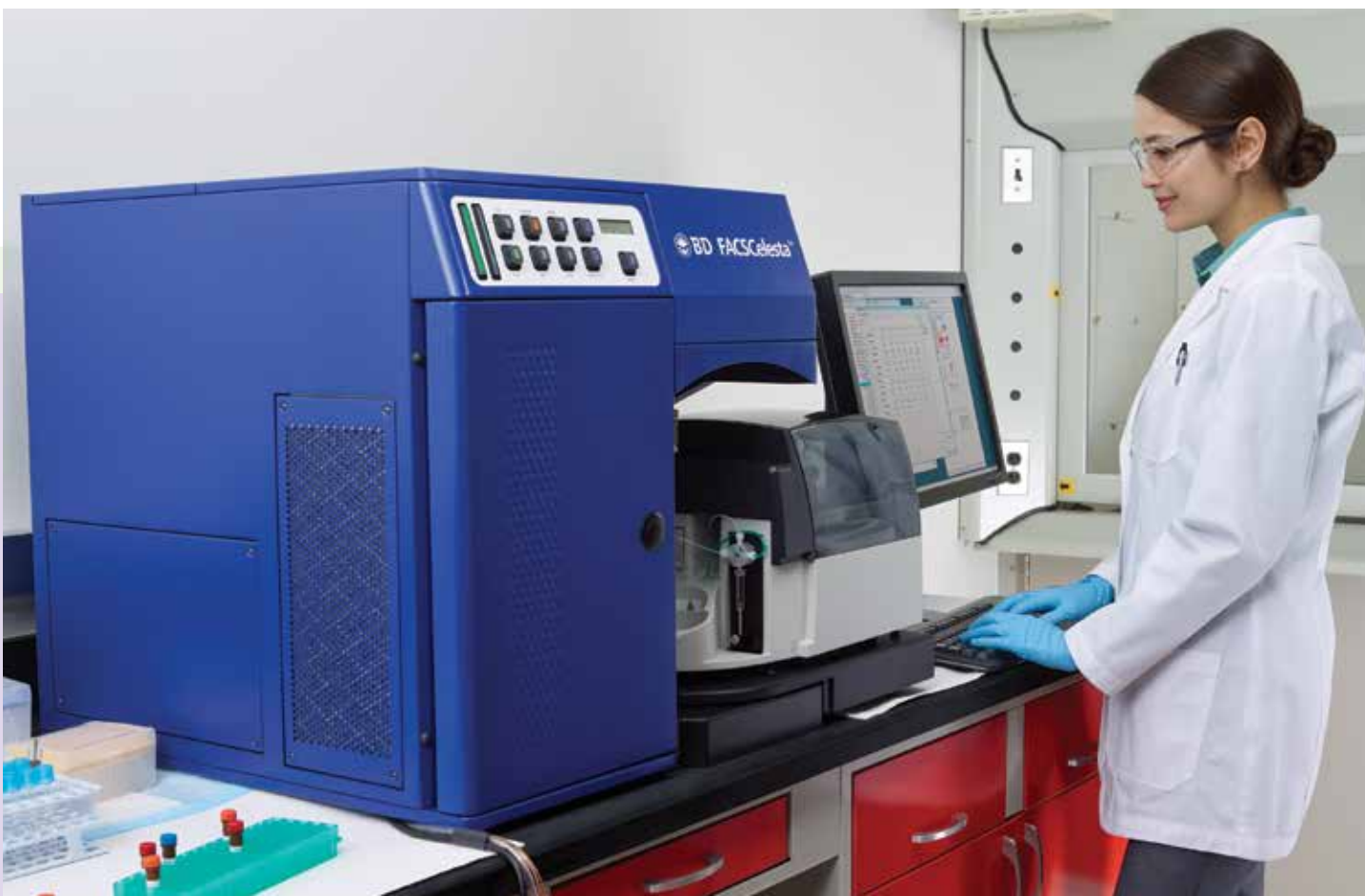
In addition, to ensure that customers have the information they need when they need it, BD Biosciences maintains a comprehensive online Technical Resource Center. Available at any time, this extensive online library includes technical documentation, quick references and guides, protocols, application notes, technical bulletins, product specifications and information sheets, tools and templates, and other information about BD Biosciences products and applications.

You can find the Technical Resource Center at bdbiosciences.com under **Instruments > Research > Cell Analyzers > BD FACSCelesta™**.

Installation and Field Service

Installation coordinators and field service engineers carefully orchestrate delivery, unpacking, maneuvering the instrument into your lab, installation, and verification. Field service engineers are located across the world.

A full-year warranty ensures that new instruments are effectively installed in your lab environment and that optimal performance is maintained for 12 months. Onsite service and maintenance agreements are available to provide long-term support for the BD FACSCelesta system.



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Class 1 Laser Product.

APC-Cy7: US patent 5,714,386

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