

BD FACSVerse™



Helping all people
live healthy lives

Simply brilliant

BD FACSV^{er}se: Simply Brilliant

The BD FACSV^{er}se™ flow cytometer was engineered from the ground up to offer remarkable performance, flexibility, and ease of operation for research applications using up to 10 parameters. Innovation in hardware design, and in the new BD FACSuite™ software, delivers users a seamless workflow from system setup through data acquisition, analysis, and shutdown.

The BD FACSV^{er}se optical system features a compact optical bench, miniaturized detection optics, and memory chips integrated in the filter/mirror units to automate configuration detection. This enables the system to alert users if the instrument configuration does not match the defined experimental parameters, ensuring the reliability of results.

The combination of vacuum-driven fluidics, a unique Sample Injection Tube (SIT), and a new cuvette design improves system reliability and signal resolution. In addition to the standard high, medium, and low sample flow rates, the BD FACSV^{er}se system includes a special high-sensitivity fluidics mode for detection of dimly stained particles.

The new fluidics design also enables the widest selection of sample input devices. Choose from microcentrifuge tubes (~500 µL) to large (up to 50 mL) conical tubes for continuous sample acquisition. The optional BD FACS™ Universal Loader provides walkaway operation with samples loaded in either microtiter plates or tube racks.

BD FACSuite software intelligently manages the cytometer to streamline processes, and takes a novel approach to system setup. The software guides the researcher through key steps such as configuration management, performance qualification, fluorescence characterization, and spillover correction to ensure reliable, reproducible data.

To support a wide range of applications, pre-defined research assays are available. They can be run as-is and can serve as the starting point for creating user-defined experiments. Users can convert their new experiments into assays that include relevant settings, acquisition and analysis worksheets, gating strategies, and customized experiment reports. These assays can be shared with other users and laboratories, making it possible to reproduce results on different BD FACSV^{er}se systems in a laboratory or across sites.

As with all BD instruments and reagents, highly qualified BD technical and application support personnel are available for help in streamlining research and maintaining optimal instrument performance.

Optimal sensitivity, compact design

Reliable Performance for All Users

The compact optical system uses free-space lasers to concentrate intensity at the flow cell. It is designed to minimize light loss and maximize resolution for multicolor applications. A number of innovations built into the optical system—including patented automated laser alignment, smart filter/mirror units for the detector arrays, and a stainless steel flow cell—are designed to maximize reliability and improve system performance.



Smart Heptagon Detector Arrays Ensure Reliability

Compact heptagon detector arrays specially designed for the BD FACSVerser system use pre-assembled filter/mirror units, each with built-in memory chips that precisely identify the spectral information of both the mirror and filter. When the filter/mirror unit is inserted into the heptagon assembly, spectral information is passed from the microprocessor to the cytometer to verify that the unit matches the expected optical configuration. This is another way that the new BD FACSVerser system helps to ensure improved data integrity and ultimately, the reliability of results.

Automated Alignment Adds Consistency

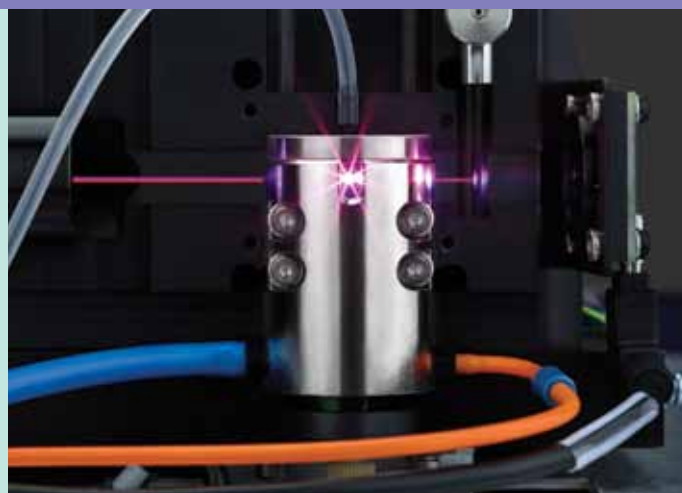
Patented automated alignment and fine alignment features in the BD FACSVerser system also contribute to more consistent performance. Each laser can be independently aligned using a patented 30:1 optical reduction feature to make very small adjustments for achieving optimal alignment.

Better Thermal Stability

Advances in the design of the BD FACSVerser excitation optics include superior thermal regulation of the lasers. Thermal stability ensures more consistent beam pointing, and as a result, more predictable optical performance.

Stainless Steel Flow Cell Adds Stability

The flow cell in the BD FACSVerser analyzer is made of stainless steel, which boosts stability in two ways. First, since stainless steel is hydrophilic, its affinity for water helps reduce bubbles for better overall fluidic performance. Second, the lower coefficient of thermal expansion of the stainless steel makes the flow cell less sensitive to temperature fluctuations for more predictable, stable performance.





Smart Components Track Performance

Finally, the optical system in the BD FACSVerse flow cytometer is continuously monitored to help keep it operating at top performance by alerting users to potential maintenance issues before failures occur. The laser and operational status are tracked to help manage configuration with minimal user interaction.



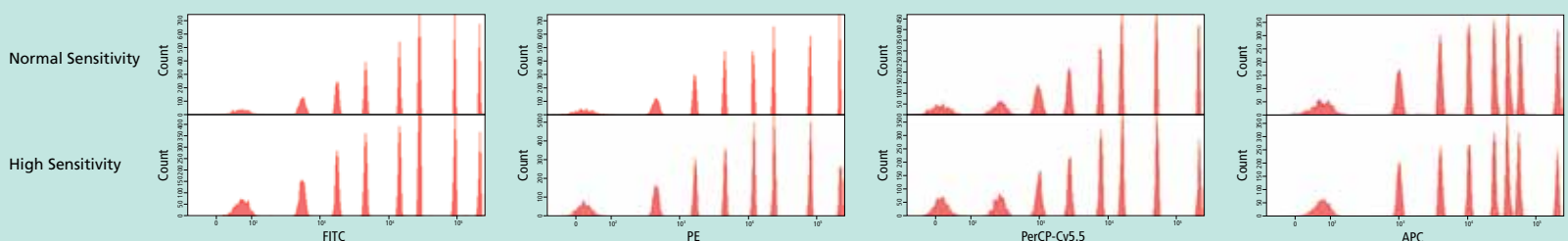
Filter/Mirror Units



Compact Optical Deck with Three Lasers

Eight-Peak Bead Data

Fluorescence patterns of 8-peak beads are shown for FITC, PE, PerCP-CyTM5.5, and APC detected on a BD FACSVerse system in normal and high-sensitivity modes.



Consistency, high performance

Best-in-Class Design with Exceptional Flexibility

Through the precise coordination of the optical and fluidics subsystems, the BD FACSVerser analyzer offers best-in-class optical detection, sensitivity, and flexibility for multicolor research applications.



Vacuum-Based System Enables Flexibility

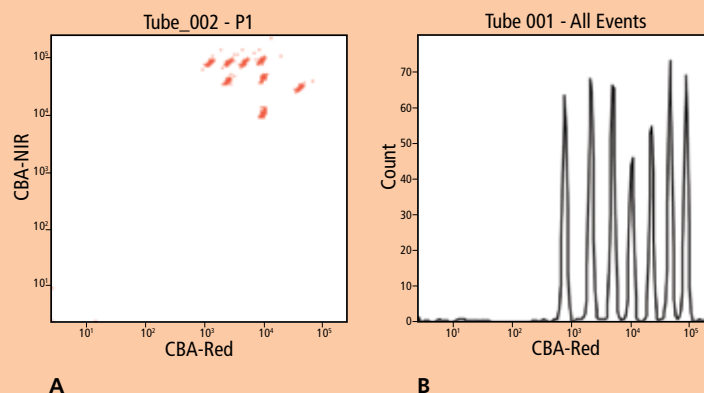
The BD FACSVerser fluidics system is vacuum-based for exceptional flexibility. This allows users complete freedom to acquire samples manually from virtually any tube format and streamlines workflow. Users simply click the sample tube in place to begin acquisition. The tube holder is built into the cytometer's chassis to make it more robust and to protect the Sample Injection Tube (SIT) from daily wear.

Sample Input Options to Accommodate Many Needs

The system can accommodate a wide range of input devices in the manual loading position, including 12 x 75-mm tubes made of polystyrene, polypropylene, or K-resin; 15-mL and 50-mL conical tubes; and 1,500- μ L or 500- μ L microcentrifuge tubes. The optional BD FACS Universal Loader further extends this list to include 30- or 40-tube racks with a microplate SBS footprint, deep and standard well 96-well plates, and 384-well plates for maximum flexibility in sample input.

BD™ Cytometric Bead Array (CBA) for Protein Quantitation

The BD FACSVerser system is capable of detecting beads from BD CBA Flex Sets (A) and CBA kits (B). Keywords entered into BD FACSuite software are recognized in FICAP Array™ v3.0 software during analysis, resulting in a simple, robust workflow for protein quantitation.





Unique Sample Injection Tube Design for Reliable Results

The unique Sample Injection Tube (SIT) design is key to the fluidics system in the BD FACSVerser analyzer. It consists of a stainless steel outer probe and an inner probe made of a high-performing polymer that descends into the vessel and draws in the sample during acquisition. This allows access to smaller diameter formats without affecting usability. When sample acquisition is complete, the sample injection tubing area is flushed, minimizing carryover. This simplifies workflow and reduces the potential aerosol formation.

Feedback Mechanisms Ensure Stability

An ingenious dual-feedback system in the fluidics design controls sheath flow rate to ensure core stream stability. In addition, a thermal feedback loop maintains core stream speed with respect to temperature, giving the BD FACSVerser system unmatched stability over its entire operating temperature range.



The BD FACSVerser fluidics system offers two fluidics modes. The standard mode uses three sample flow rates (high, medium, and low) at normal sheath velocity which users can select as required for their application protocols. The high-sensitivity mode uses a lower sheath velocity setting at the medium sample flow rate to support the detection of dimly stained particles. In the high-sensitivity mode, stained cells have a slower transit through the laser interrogation point, which results in higher fluorescence signal resolution.

Optional Volumetric Flow Sensor

The BD™ Flow Sensor option for volumetric measurement measures the volume over the entire acquisition time. It allows the user to reproducibly obtain a precise measure of cells or particles in a volume of sample acquired by the system. It directly determines the volume of the samples as it passes through the sample injection tubing for accurate counts.

Flexible Fluid Supply and Waste Management

For routine use, the 5-L capacity fluidic and waste tanks can be positioned next to the cytometer or within easy access.

Field-upgradable extended use tanks with 10-L or 20-L capacity are also available to support up to 8 hours of continuous operation.

Level detection in the fluid tanks tracks the volume of both sheath and waste. Users are alerted when capacity is low, and a shutdown of the system is triggered.



Exceptional choice and easy operation

Truly Universal Walkaway Processing

The optional BD FACS Universal Loader automates sample handling, enabling rapid processing of multitube racks and microtiter plates in this single unit. Designed to be easy to use and flexible, this option supports walkaway operation for busy research laboratories.



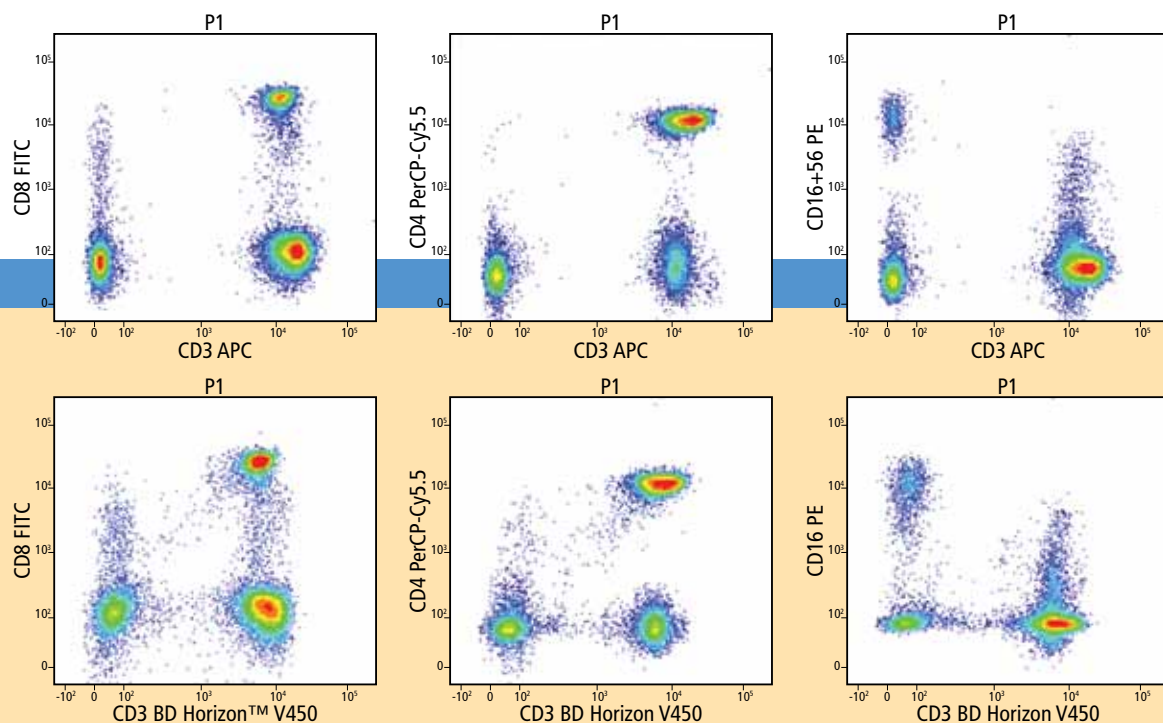
Tube Racks and Plates in the Same Footprint

To ensure simplicity of operation and improve experimental input flexibility, the Loader is designed such that both tube racks and microtiter plates fit into the same compact SBS footprint.

Sample Identification and Imaging Improve Control

The BD FACS Universal Loader software reads barcode labels on tubes and plates when used with a 30-tube rack, matrix-storage tube rack, and all supported microtiter plates. In laboratories that handle high volumes of diverse samples, this helps minimize errors due to mismatches of samples with the assays to be run.

A powerful imaging system in the Loader matches the live image of the sample carrier type loaded into the system with image data stored in the system. This reduces potential errors by verifying that the sample carrier matches what was specified for the user in the worklist, ensuring that tube racks or plates are loaded correctly, and that lids of microtiter plates have been removed. Functional status indicators present on the Loader notify users about loading and unloading status of devices to further support walkaway operation.



UNIVERSAL LOADER



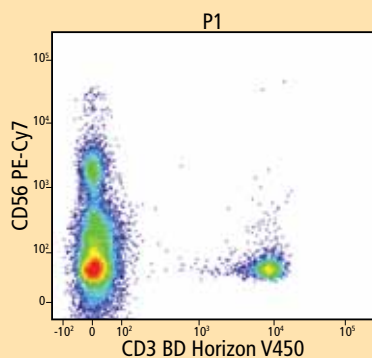
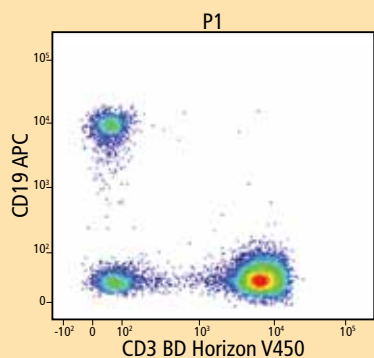
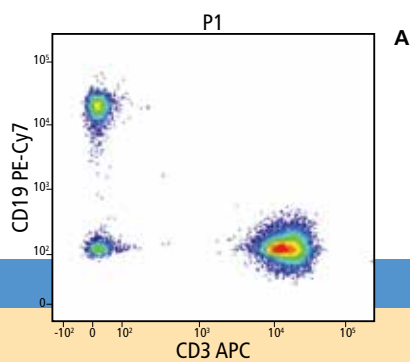
Mixing Design for Reliable Sample Resuspension

An orbital shaker built into the Loader vortexes samples in tubes or microtiter plates. This design maximizes flexibility so that users can load prepared samples onto the Loader without needing to manually resuspend them. A selection of mixing frequencies, optimized for multiple types of sample carriers, ensures adequate mixing while preserving the cellular viability of the sample.



Universal Experience, Ergonomic Design

The BD FACSVerse system was designed to ensure that the customer experience was equivalent with or without the BD FACS Universal Loader option. To maintain the system flexibility, the manual station is always accessible, even when the Loader is present. The Loader is designed to keep the footprint as compact as possible and is ergonomically situated so that the system workstation is to the right. The Loader's indicator lights and warning systems have been designed to ensure that a user seated at the workstation can easily see the Loader status.



Immunophenotyping Analysis

A Normal human blood was labeled with CD8 FITC/CD16+56 PE/CD4 PerCP-Cy5.5/CD3 APC/CD19 PE-Cy7, and plots were gated on lymphocytes.

B Normal human blood was labeled with CD8 FITC/CD16 PE/CD4 PerCP-Cy5.5/CD56 PE-Cy7/CD19 APC/CD3 V450, and plots were gated on lymphocytes.

Robust and reliable data

Taking Productivity to the Next Level

A true evolution in flow cytometry is empowered by BD FACSuite software. It enables the BD FACSVerse analyzer to provide the ultimate in ease of use and flexibility while generating the highest quality reproducible data possible with the technology available today.



Simplified Workflow

BD FACSuite software minimizes the number of user interactions with the instrument so that the user can spend more time working with samples. BD FACSuite software users can complete tasks at the click of a button for key workflows, from startup through instrument setup, sample acquisition, data analysis, and system shutdown.

Streamlined Setup

BD FACSuite software streamlines instrument setup to achieve a new level of ease of use and reproducibility in cytometer setup and subsequent analysis.

BD FACSuite™ CS&T Research Beads are used to check the cytometer performance and automatically make adjustments, ensuring consistent values from day to day and experiment to experiment. Comprehensive checks during system initialization and setup, including performance QC, verify system performance, ensure that detector settings are optimal, and trigger the automated laser alignment process if required. The entire setup process can be performed without manual intervention.

A New Approach Enabling Easy, Flexible Compensation

Accurate compensation is absolutely necessary for proper analysis of multicolor flow cytometric experiments, but it has always been a challenging and time-consuming process for users.

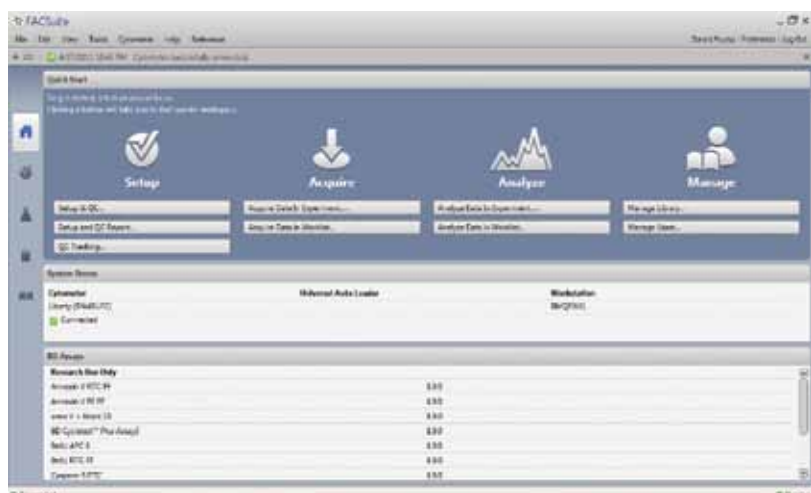
Automatic Startup, System Idle, and Shutdown

To increase laboratory efficiency and ensure that the system is ready by a specified time each day, a timer in the software can be set to turn on the instrument and complete initialization and warmup routines. BD FACSuite software can also be programmed to shut down the BD FACSVerse system at the end of a worklist run or when the system is idle for a specified period of time. In the case of idle time shutdown, a dialog communicates that the system will be shutting down, so that users can cancel the shutdown if desired.

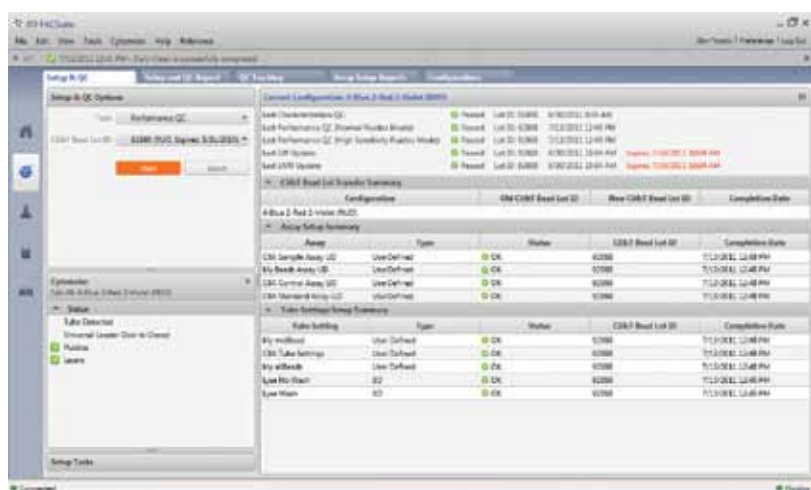
In the past, generating accurate compensation matrices typically required running individual compensation controls for every fluorochrome used at least once a day. Thus, for a five-color experiment, all five fluorochromes would be run initially to determine their spillover values (SOVs) for a compensation matrix. To subsequently add a sixth fluorochrome to the experiment, users would have to re-run all six at the same time.

BD FACSuite software minimizes the frequency and number of compensation controls required by taking advantage of the accurate, reproducible instrument setup provided by a combination of BD FACSuite CS&T Research Beads and BD FACSuite™ FC Beads. A single 20-minute procedure using BD FACSuite FC Beads determines SOVs that are gain-independent. These values are valid for 30 days. The system also provides the user the ability to use user-defined compensation controls with beads, cells, or other particles. To add a new fluorochrome to the system, users run just one control for the new fluorochrome. Finally, the calculation of gain-independent SOVs lets users modify PMT voltages if required without re-running compensation controls. All SOVs are automatically recalculated.

Together, these features mean time savings every day, since the BD FACSuite system significantly reduces the frequency and complexity of the compensation process. It does this while increasing the accuracy and reproducibility of SOVs, and therefore the final experimental results.



BD FACSuite Home Page



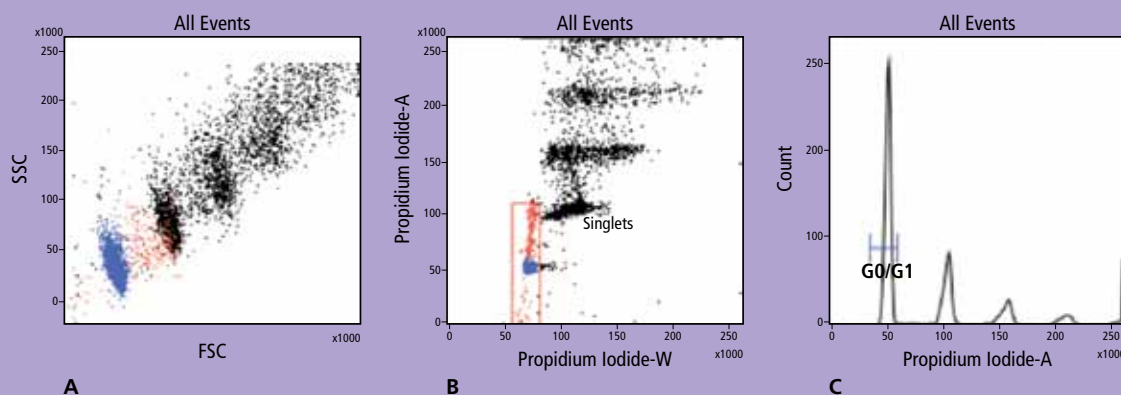
BD FACSuite Setup and QC workspace

Representative CTN (Chicken Thymocyte Nuclei) Data Acquired on a BD FACSuite System

A Forward scatter vs side scatter of CTN using BD FACSuite software.

B Plot showing aggregates on the basis of Propidium Iodide width (W) vs Propidium Iodide Area (A).

C Resolution and linearity shown by a Propidium Iodide - Area histogram of propidium iodide-stained CTN.



Pre-defined and user-defined assays

Streamlined Approach to Application Support

BD FACSuite software provides optional BD pre-defined research assays for apoptosis, cell cycle, cell proliferation, and cytokine detection that are matched with BD reagent kits for reproducible results.

User-defined experiments created in BD FACSuite software can be converted to reusable assays that include relevant settings, acquisition and analysis worksheets, gating strategies, and report parameters to reduce variability of data between users for the same application.

In addition, before samples are acquired, the software verifies that the system's current configuration matches the configuration needed to run the experiment. If it identifies a mismatch, such as a different optical filter/mirror unit, the system alerts the user. This check can help streamline workflow and ensure reliability of results.

Intuitive Workspaces for Ease of Adoption

The user interface is designed around three common workflows: setup, acquisition, and analysis. Workspaces provide users the functionality they need to perform the tasks relevant to a given workflow. For example, in the Setup workspace, users find the QC tools and tools for instrument configuration. In the Experiment workspace, users can adjust tube settings, plots, and gates. These workflow-based workspaces reduce clutter to help users complete their tasks more quickly. Administrative functions such as user management, diagnostics, and periodic maintenance procedures are accessible only to authorized personnel.

Multitasking Support for Added Productivity

The functions in BD FACSuite software workspaces operate both together and independently. The software supports multitasking, enabling users to work on several tasks simultaneously, such as performing data analysis while the system is acquiring data. A user is able to prioritize a single sample for immediate analysis. Multitasking is yet another way that the software promotes a more flexible, productive workflow.



Greater Speed and Freedom for Data Analysis

BD FACSuite software offers a variety of ways to visualize data and tools to easily look more closely at data for analysis.

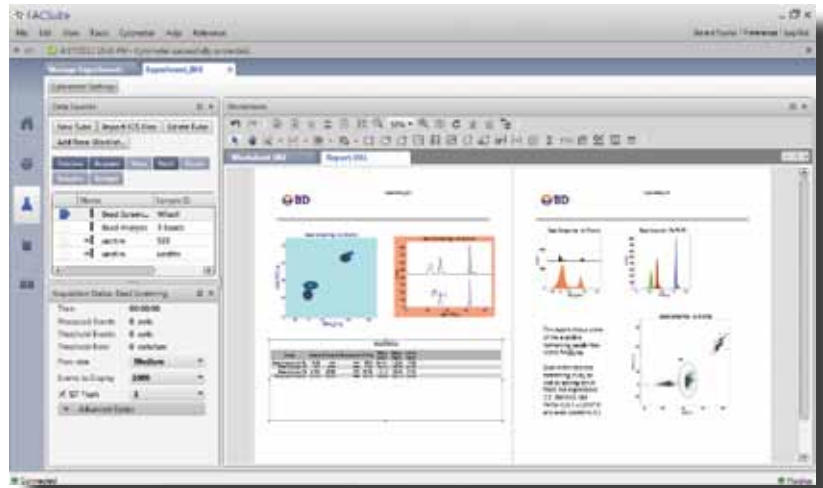
The data analysis tools let users examine data as dot plots, histograms, contours, and density plots. For a better look at data, new hybrid contour plots combine standard dot plots with the coloring of contour plots. The information about contour statistics is available by hovering over the plot. A new capability lets users overlay dot plots within the same or different files. Gating tools include ellipses, polygons, and free-hand polygons, as well as the traditional rectangle. Gates can be rotated as needed, and with a zoom feature, users can zoom in or out of areas of interest.

Several types of new quadrant markers provide additional flexibility, including a hinged marker to more precisely identify quadrants of interest.

An expression editor is also built into BD FACSuite software to speed analysis. The expression editor lets users develop mathematical expressions and assign them to keywords. Users can hover over a result for a display of the formula that was used to calculate it.

To assist with presentation, vector graphics provide superior quality images that can be easily cut and pasted into third-party software such as Microsoft® PowerPoint®. A new report generator produces high-quality reports that include color graphics and can be easily customized by dragging and dropping report elements.

BD FACSuite Experiment workspace



Reliable Data Across Sites

For the first time, researchers have control to ensure consistent instrument setup and consistent experiment results (acquisition, analysis, gating strategies, and report parameters) in a single application—BD FACSuite software. Free from concerns about instrument and human variables, scientists can move forward in their research, reliably reproducing an experiment from one instrument to another and across sites.

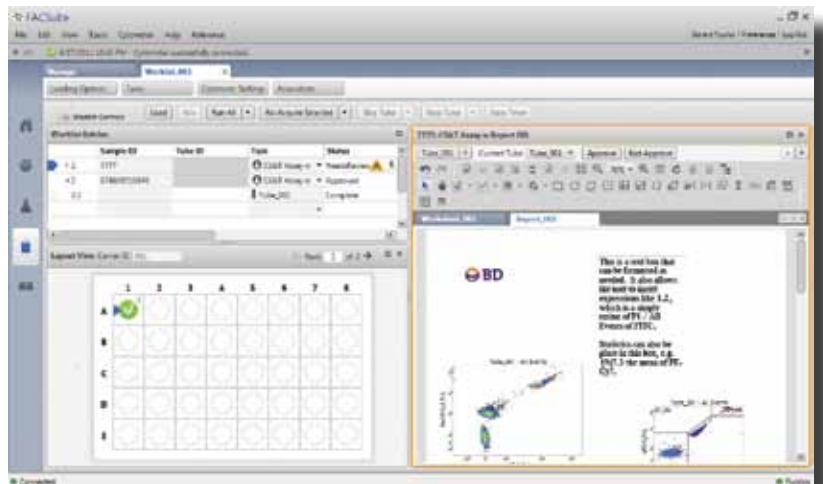
Support for Security Standards and More

BD FACSuite software supports 21 CFR Part 11 guidelines for Electronic Records and Signatures to protect data integrity. This includes unique user identification and passwords, electronic signatures, and audit trails. In addition to meeting the requirements specified in the 21 CFR Part 11 guidelines, BD FACSuite software encrypts files and uses specially designed algorithms to ensure that data is not manipulated by unauthorized entities.

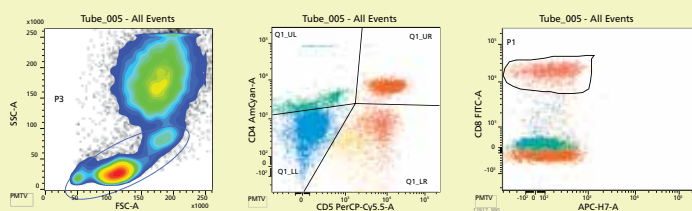
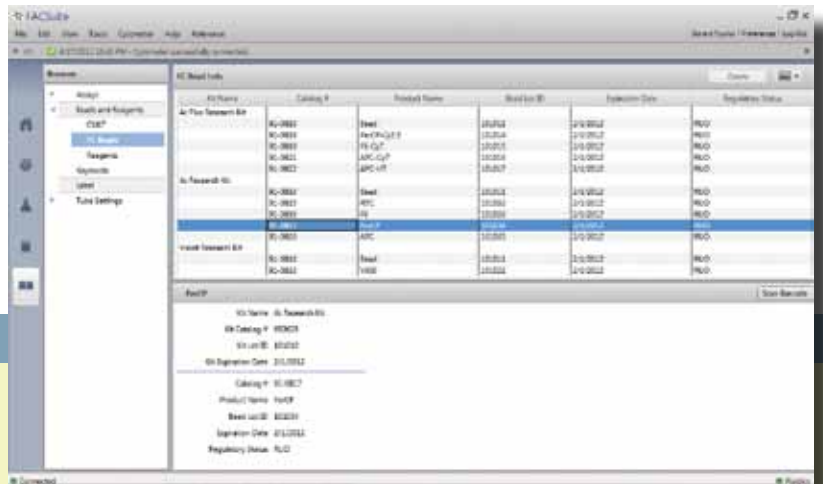
Optional Remote Systems Management

Optional remote systems management software enables BD field service personnel to access a networked BD FACSuite system and review system performance and status using the System Health Report. This allows the BD service team to determine the nature and extent of the issue, and if possible repair the issue remotely to ensure minimal downtime. It also helps the BD service team to be better prepared if on-site support is required.

BD FACSuite Assay Worklist workspace



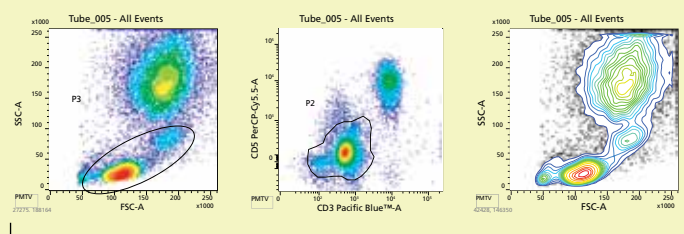
BD FACSuite Library workspace



Ellipse Gate

Hinged Quadrant Marker

Freehand Gate



Sample of Contour Plot Styles

Services and Support

BD Biosciences is fully committed to the success and satisfaction of its customers.

The BD FACSVerser system is backed by a world-class service and support organization with unmatched flow cytometry experience.

Since commercializing the first cell sorter in 1973, BD has delivered flow cytometry systems that are ever more powerful, dependable, and easy to use. This expertise is made available to BD FACSVerser customers through comprehensive training, application and technical support, and expert field service.

Training

Hands-on training is included with each BD FACSVerser analyzer. In addition, training courses are held at BD training centers worldwide. BD flow cytometry courses combine theory and practice to provide participants with the skills and experience they need to take full advantage of the capabilities of the BD FACSVerser system.

Technical Application Support

BD Biosciences technical application support specialists are available to provide field- or phone-based assistance and advice. Expert in a diverse array of topics, BD technical application specialists are well equipped to address customer needs in both instrument and application support.

Field Service

When instrument installation or service is required, a BD Biosciences Technical Field Service Engineer can be dispatched to the customer site. BD Biosciences field service engineers are located across the world. On-site service and maintenance agreements are available to provide long-term support for the BD FACSVerser system.

Custom Services

Mobilizing technology for research applications requires close collaboration. The Custom Technology Team (CTT) at BD Biosciences works with customers to provide solutions through custom reagents, panels, and assay protocols.

Staffed by leading scientists with breadth and depth of technical expertise in cytometry, the CTT will coordinate with researchers to study the problem at hand, make recommendations, and help implement the solutions. In this way, BD Biosciences technical know-how is translated into practical solutions that allow customers to focus on research.



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Class 1 Laser Product.

The BD FACSVerser flow cytometer is covered by one or more of the following US patents: 7,787,197; 7,129,505; 6,897,954; 6,809,804; 6,683,314; and 6,510,007.

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