



## ALPHA/BETA COUNTING

# Apex-Alpha/Beta™

Counting Productivity Software



Figure 1 - Main View

## FEATURES

- Control and Analysis software for most Mirion gas-flow alpha/beta counters
- Compatible with Series 6LB™, LB4200™, LB4100™, Mini20™, IN20™, Series 5 XLB™ and Series 5 LB5500™ systems
- Feature by feature replacement for Eclipse™ software
- Express Count for immediate counting with no sample data pre-entry
- Automated Plateau and Region of Interest setup
- Unattended Calibration on Changer Systems
- Calibration and QC Sequences
- Selectable count modes:
  - Alpha only
  - Alpha/beta simultaneous
  - Alpha then beta
- Enhanced efficiency calibration including multiple curve-fitting models
- Integrated QA capabilities
- Custom procedure creation for sample type-specific acquisition and analysis
- English, French, and German language support
- Sample database tracks samples through log-in, counting and data review processes
- Integrated support for ISO11929 MDA and Bayesian Best Estimates
- Simplified report customization with integrated report editor
- Comprehensive event logging records every event on the system – with flexible search capabilities
- Multi-level security system limits user access to only the prescribed functions allowed by the system manager
- Common look and feel with the rest of the Mirion family of Apex® Productivity Software
- Includes SQL Server Express database
- Compatible with Windows 10

## DESCRIPTION

Apex-Alpha/Beta™ software is a Windows 10 (64-bit) software application for automating detector setup and calibration, quality assurance, sample analysis and reporting activities with the Mirion low background alpha/beta counting systems. It is designed for the way samples are counted in production laboratories, thereby making gross alpha/beta sample analysis and associated quality assurance and data management tasks fast and efficient.

Mirion has been building low background alpha/beta counters for over 30 years. In that time, many software packages have come and gone, but power and ease of use are still dominant on the wish lists of users. The Mirion Apex-Alpha/Beta software is a fresh approach to the application using current tools with no dependencies on outdated spreadsheets, yesterday's database formats, or expensive third party reporting tools.

The software is the culmination of everything Mirion has learned over the years about alpha/beta counting needs from the earliest DOS applications, all the way through the Mirion Eclipse software. Apex-Alpha/Beta software draws heavily on paradigms established in Mirion's highly successful Apex-Gamma™ and Apex-Alpha™ software.

With Apex-Alpha/Beta software, batches of samples are created easily. Sample information can be entered individually, or the **sample helper** (Figure 2) can create the entire batch, including “special samples” such as blanks, spikes, and duplicates. Once created, sample batches can be easily copied and reused for future similar batches. Samples are assigned to manual drawer detectors or sample changer groups using the “drag and drop” feature, or the **sample assigner** can automatically assign the samples to available manual drawer detectors. Sample detectors are part of custom display groups that allow users to divide detectors by analysis type, or any other way that is desired.

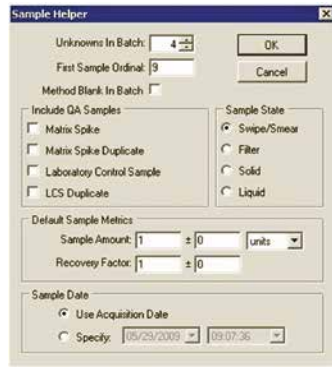


Figure 2 - Sample Helper

Apex-Alpha/Beta Express Count allows samples to be counted without any data pre-entry. The streamlined approach allows for user sample information to be entered during the count, after the count or not at all. Express Count is configurable based on the needs of the user. It can be setup so that an analysis can be started by selecting the detectors to be counted and pressing a single button. Express Count can be configured so that the Load Samples button and/or the Sample Assignment report are still utilized in instances where the operator wants feedback from the software as to where each sample is to be counted.

As the samples count, up to the minute results are displayed on the **main view** (Figure 1) for each detector in the selected display group of up to eight detectors. As with other Apex family products, an established background color code is used to quickly show the status of all detectors. A blue “halo” on the detector signifies a detector is available for counting. Green indicates counting, and aqua indicates the detector is assigned but not counting yet.

Flexibility is built into Apex-Alpha/Beta software. You can count samples, then easily export the data to another program for final analysis, or use the matrix efficiency corrections to calculate final results within the software. The software can easily be setup to automatically export the data at the end of the analysis.

### UNIFIED LAB OPERATION

Many laboratories already depend on the other members of the Mirion Apex family to help manage their counting rooms.

Apex-Alpha/Beta software is designed so that those users immediately understand the common themes and processes. Even for users unfamiliar with the Apex paradigm, the software is easy to learn. Previous generations of counting systems from manufacturers now under the Mirion flag can also operate under Apex-Alpha/Beta software. Multiple systems, even of different types, can be controlled by one Apex-Alpha/Beta workstation making facility training and operation as easy as possible.

### PLATEAU AND REGION OF INTEREST SETUP

System setup for the operating voltage and ROI counting windows is easier than ever. The count data and the voltage plot can be viewed live during the count. For maximum flexibility, the operator can accept the system-calculated value or choose to override with a manual entry. The software also allows multi-detector systems to use multiple sources for a plateau, or to use only one source and later combine the results from separate detector counts into a single plateau measurement. This flexibility allows the voltage plateau for all detectors sharing a common high voltage supply to be calculated correctly taking each detector into account for the final setting. The user can choose to manually adjust the alpha and beta discriminators, or the software will automatically adjust the levels for the optimum counting compromise between spillover and efficiency.

### BUILT-IN MASS ATTENUATION CORRECTION

Not all samples are alike. The physical interaction of different energetic alpha and beta particles can produce different mass attenuation relationships. Apex-Alpha/Beta software offers the flexibility to choose from several different methods to approximate the count loss as a function of residual mass on a planchet. As shown in Figure 3, the software allows the operator to view the results before selecting the best fit attenuation curve. The curve-fitting models include:

- Inverse Linear
- Inverse Quadratic
- Exponential
- Linear

If a fitted efficiency is not necessary, a constant efficiency can be selected instead.

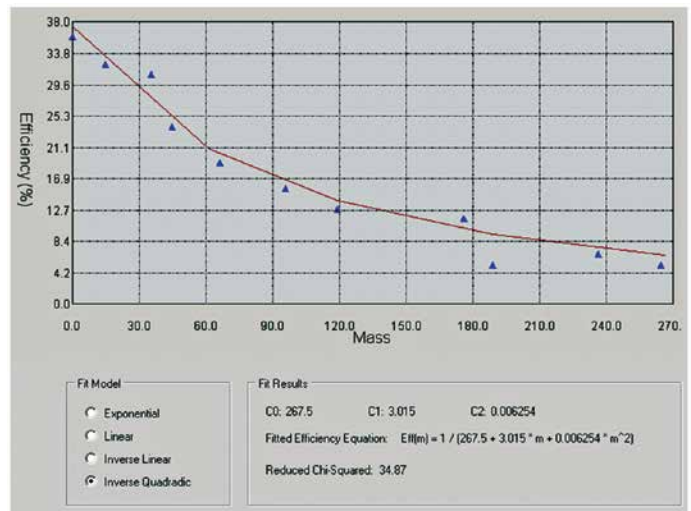


Figure 3 - Fitted Efficiency Setup

**CALIBRATION MADE EASY**

Apex-Alpha/Beta software is designed to be calibration-centric. The calibration includes information about HOW to COUNT samples; in particular, what COUNT MODE (alpha, alpha then beta, or alpha/beta simultaneous), what background, and which efficiencies (fitted or constant) should be used for corrections to the final results. Users can then create an unlimited number of counting procedures based on that calibration to cover the range of their counting requirements. Need a different kind of analysis? Simply create a new calibration.

Calibration sequences tie multiple procedures together to automate and simplify the calibration process on sample changer based systems. Simply load the calibration standards on the changer, start the sequence, and later return to a fully calibrated system!

**SIMPLIFIED COUNTING PROCEDURES**

The key to sample entry simplicity in Apex-Alpha/Beta software is the Procedure. The Procedure Editor allows the user to define all sample-specific parameters for each type of analysis. These parameters include: count time, sample information needed, any required background and efficiency corrections, reports and required data review(s) for a given type of sample.

Apex-Alpha/Beta software offers multiple count modes that provide the optimum results for a particular type of sample. In addition to the traditional Alpha Only and Alpha/Beta Simultaneous modes, there is an Alpha then Beta mode to positively qualify alpha activity. When using the Alpha-then-Beta mode, there is no beta crosstalk, so the alpha activity has inherently better counting statistics. The application of this count mode can be important for nuclear power operations, where high levels of beta activity can result in higher than expected beta-to-alpha crosstalk. This crosstalk can lead to false positive alpha activity. The Alpha-then-Beta count mode confirms or disqualifies the presence of alpha activity in the sample. With this mode, samples can be automatically counted using the alpha calibration voltage then the beta calibration voltage. Alpha activity is a direct measurement, and the beta activity is calculated as the difference between each count mode.

**QUICK AND SIMPLE SAMPLE ENTRY**

The Batch Manager (Figure 4) allows data to be entered as a template for routine samples and used later for similar groups of samples. Previously analyzed batch information can be renewed and applied to a new batch of samples. For a new batch where all the samples are similar, the sample helper allows for creation of multiple samples with the same (but editable) information making it easy to start counting quickly. Standard sample-oriented QA parameters can be monitored on a sample type basis and include:

- Method Blank
- Laboratory Control Sample (LCS) recovery and duplicate
- Matrix Spike
- Matrix Duplicate

The QA samples counted with sample batches can be easily identified through the data review process so that users can perform QA analysis of chemistry methods.

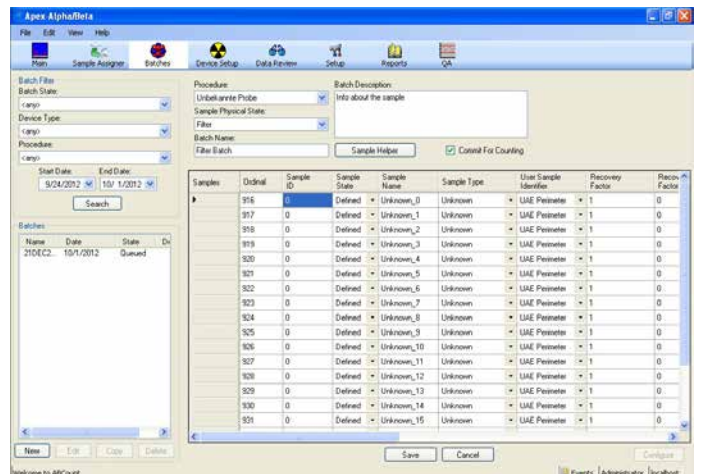


Figure 4 - Batch Manager

**COMPATIBLE WITH MIRION'S NEWEST COUNTER- THE SERIES 6LB COUNTER**

Apex-Alpha/Beta software can operate a Series 6LB counter exactly like it does a Series 5 XLB system. This allows for new Series 6LB units to be integrated into an existing Series 5 XLB laboratory without requiring changes in the laboratory's operating procedures. Features in the Series 6LB system allow it to be even more efficient to operate than any of our previous counters. Express batches and QA sequences can be started from the instrument's tablet-like front panel without having to directly interface with the computer or Apex-Alpha/Beta software. Apex-Alpha/Beta platform registers and records the results the same as if the counts had been initiated in the software.

**THE QUALITY ASSURANCE PROGRAM**

System quality assurance is an integral feature of Apex-Alpha/Beta software. Increasing demands on instrument and laboratory method quality control add to the requirements of the radio-analytical laboratory. Statistical quality control charts provide the lab manager with information related to system operation and status. The database charting engine of Apex-Alpha/Beta software develops QA charts quickly for background and efficiency. Control limits can be calculated based on calibration data, from daily runs covering an adjustable time period, or they can be manually entered.

Using the advanced QA capabilities of Apex-Alpha/Beta software, the lab operator can ensure that all counts are being performed on instruments with up-to-date, successful QA checks. Paperwork burdens and off-line activities are drastically reduced. QA program compliance can be demonstrated to an outside auditor or regulator with ease. Figure 5 shows an example Quality Control Chart. QC sequences tie multiple “daily check” procedures together to simplify routine source and background checks.

**DATA REVIEW, APPROVAL AND EXPORT**

With the Apex-Alpha/Beta software, the data review and approval process is built in. Data reviews can be either optional or mandatory as determined by the system manager. If mandatory, a counted sample is held with a status of “pending review” until a user with the requisite security authorization reviews and approves it – at which time the sample status updates to “done”. Samples can be automatically approved by the system when counted, or can require first or second level approval.

Retrieval of samples for review couldn’t be easier – database filters are applied to locate a single sample or group of samples that are to be reviewed. This flexibility is particularly important where the Data Review Utility is needed to respond to follow-up queries. For example, an environmental lab may receive an inquiry about a specific type of sample from a specific project. By utilizing date and time filters in conjunction with procedure, sample type and other information, the user can easily isolate the specific samples in question.

The Data Review Utility allows for custom exporting of data to CSV or TSV formats independent of the built-in Custom Reporting engine. This is very helpful for users who want to manually import data into a LIMS system or even a simple spreadsheet.

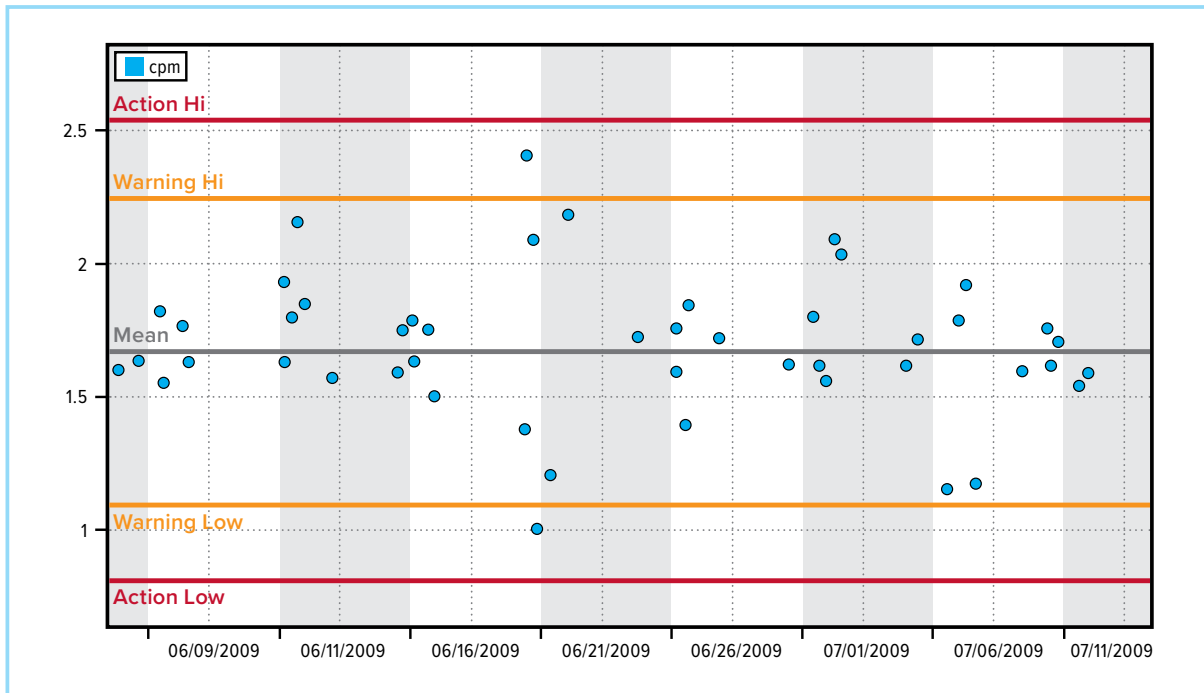


Figure 5 - Beta Background Quality Control Chart

**CUSTOM REPORTING AND DATABASE FUNCTIONALITY**

Apex-Alpha/Beta software uses an integrated report writing tool so that custom reports can be created and modified as necessary. There is no third party software required with yearly updates or compatibility issues. The standard reporting system of Apex-Alpha/Beta software provides all of the necessary report formats for typical user requirements. System setup and calibration information including plateau, background and counting efficiency as a graphical plot, and raw count data formats are standard. Many report formats carry continuing calibration and review signature information (both manual and electronic) to satisfy site data validation requirements.

Apex-Alpha/Beta software includes a Microsoft SQL Server Express database. The SQL Server format allows for infinite compatibility with other databases and LIMS installations. The security of SQL Server, along with its flexibility, mean that advanced tasks can be performed, or the database can be quietly forgotten as it operates in the background of Apex-Alpha/Beta software.

The Custom Reports can be exported into a variety of reporting formats including PDF, Microsoft Word, Microsoft Excel, as well as image formats (bmp, gif, jpeg), and many others. Data is exported manually or can be setup to exported automatically.

**EVENT LOGGING**

The ability to retrieve information, retrace steps, review history – at any time – is very important to lab operations.

Rapid and complete information retrieval can save huge amounts of time and money, whether for the purposes of performance review or determining how many samples might have been impacted if a problem is found in the lab. Apex-Alpha/Beta software automatically logs events into a database table. Every log-on/off, sample count, calibration, QA check, data review, etc. is recorded and can be recalled whenever needed. Figure 7 shows the Event Log Report Selector screen which allows the user to tailor an event log search as needed.



Figure 7 - Event Log Report Selector

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**Background Report**

Batch Name: Batch\_4014      Count Date: 7/29/2009 8:18:47 AM  
 Procedure: Background AB Basic      Preset Count Time: 600  
 Calibration: AB Basic      Count Mode: Simultaneous

Calculated background (cpm)			
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)	
LB41AB_D1P4	2.0000E+001 +/- 1.4142E-001	2.4000E+000 +/- 4.8990E-001	
Calculated background (cpm)			
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)	
LB41AB_D1P3	0.0000E+000 +/- 0.0000E+000	3.2000E+000 +/- 5.6569E-001	
Calculated background (cpm)			
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)	
LB41AB_D1P2	3.0000E+001 +/- 1.7321E-001	1.2000E+000 +/- 3.4641E-001	
Calculated background (cpm)			
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)	
LB41AB_D1P1	1.0000E+001 +/- 1.0000E-001	1.8000E+000 +/- 4.2426E-001	

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**Efficiency Report**

Batch Name: Batch\_8003      Count Date: 7/29/2009 9:36:14 AM  
 Procedure: Efficiency AB Basic      Preset Count Time: 60  
 Calibration: AB Basic      Count Mode: Simultaneous  
 Decay Mode: Alpha

Calculated Efficiency (%)					
Detector Name	Avg. Efficiency (%)	Count Rate (cpm)		Avg. Spillover (%)	
LB41AB_D1P4	42.00 +/- 4.40E-001	9.142E+003 +/- 9.561E-001	7.110E+001 +/- 8.850E-002	0.500E+001 +/- 8.002E-000	
Assay Date	Iteration	Efficiency (%)	Alpha Count Rate (cpm)	Spillover	Beta Count Rate (cpm)
7/29/2009 9:36:09 AM	1	42.05 +/- 4.40E-001	9.332E+003 +/- 9.606E-001	8.894E-001 +/- 9.800E-002	8.300E+001 +/- 9.110E-000
7/29/2009 9:37:51 AM	2	42.51 +/- 4.42E-001	9.240E+003 +/- 9.612E-001	6.494E-001 +/- 8.410E-002	6.000E+001 +/- 7.746E-000
7/29/2009 9:39:25 AM	3	42.51 +/- 4.42E-001	9.271E+003 +/- 9.629E-001	7.011E-001 +/- 8.727E-002	6.500E+001 +/- 8.002E-000
7/29/2009 9:41:21 AM	4	42.05 +/- 4.43E-001	9.103E+003 +/- 9.541E-001	8.019E-001 +/- 9.423E-002	7.300E+001 +/- 8.544E-000
7/29/2009 9:43:49 AM	5	41.88 +/- 4.39E-001	9.103E+003 +/- 9.541E-001	8.019E-001 +/- 9.423E-002	7.300E+001 +/- 8.544E-000

Figure 6 - Example Reports

**SYSTEM SECURITY**

Security requirements are necessary in most sample counting facilities. It is imperative that personnel only perform operations that they are qualified to perform – to allow otherwise risks the integrity of the data generated. Data and system security is a hallmark of all Mirion application software. Apex-Alpha/Beta software is certainly no exception, and its security capability is both extensive and flexible. The system administrator plans the security setup by determining the different classes of operators and the functions that should be assigned to each class. Each class can consist of any number of individual users from a single sample approver to a number of count room technicians. A group profile is created for each class using the Security Setup Editor (Figure 8).

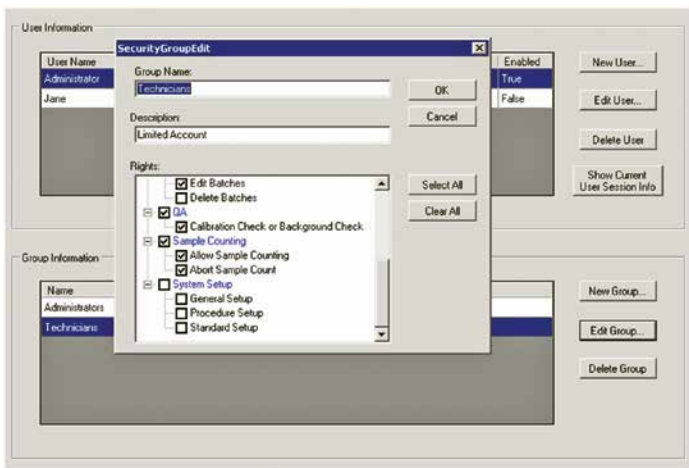


Figure 8 - Security Setup Editor

Once the groups have been established and privileges assigned to each one, individual users can then be assigned to the appropriate groups. Each user has a log-in password, and all activities performed while a user is logged on are associated with that user in the database. There are no pre-defined, hard-coded “levels” in the profiles, only access or non-access to specific functions thus providing the ultimate in flexibility for setting up security profiles.

**UPGRADES TO EXISTING SYSTEMS**

Apex-Alpha/Beta software is compatible with all LB4100-W systems with no need to update system firmware. Most IN20 and Mini20 systems will not need a firmware upgrade. Series 5 XLB and Series 5 LB5500 systems that were running under Version 3.3 or newer will not require a firmware update. The software supports multiple counters on a single PC-compatible workstation. The computer requires an IEEE 488.2 Compliant Interface for LB4100 and Series 5 systems, and an RS-232 Serial Interface for IN20 and Mini20 systems. Each IEEE 488.2 compliant interface connects to an LB4100 or Series 5 Controller and can support up to thirty (30) sample drawers or sample changers. LB4200 systems require an available USB port for up to four drawers.

**SPECIFICATIONS**

**RECOMMENDED REQUIREMENTS**

- Intel Core i7 Processor
- Microsoft Windows 10 Professional x64.
- 8 GB RAM.
- Hard disk with 500 GB.
- A DVD +RW drive.
- IEEE-488.2-compliant interface for LB4100 or Series 5 systems.
- Available Serial Interface Com Port for IN20/MINI20 systems.
- Available USB port for Series 6LB and LB4200 systems.

**ORDERING INFORMATION**

- S556C Apex-Alpha/Beta Counting Productivity Software.  
Note: Genie™ 2000 software is NOT required for Apex-Alpha/Beta software.
- S556U Apex-Alpha/Beta Upgrade from older version of Apex-Alpha/Beta software.  
Note: Requires previous purchase of S556C.
- S5E2S5XU Upgrade Kit for Series 5-E to Series 5-XLB system.

