



# Alpha Analyst™

## Integrated Alpha Spectrometer



Table Top

Cabinet

### KEY FEATURES

- Completely integrated alpha spectroscopy instrument
- 100% computer controlled electronics and vacuum
- Automatic recoil suppression control
- Modular for ease of expansion
- Straightforward sample oriented graphical user interface
- Clean vent port to reduce moisture and contamination buildup in chambers
- Extensive QA record keeping built in
- Connects directly to Ethernet network
- Optional calibration services and startup

### DESCRIPTION

The Mirion Alpha Analyst along with Apex-Alpha™ software is the complete solution for both routine and non-routine alpha spectroscopy applications. This flexible Alpha Spectroscopy System is designed to operate the way you do – whether that’s counting samples in a production “batch mode” environment or one sample at a time in a research type environment.

### TURNKEY PERFORMANCE

The Alpha Analyst system is a turnkey instrument solution from Mirion. It is available with a full suite of integration, installation, calibration, training, and consulting services that let you begin productive sample counting soon after set up.

Traditionally, the user of an alpha spectroscopy system might spend large amounts of time integrating components, setting up hardware and software, building analysis procedures, calibrating, training operators and writing standard operating procedures. With the Alpha Analyst unit and the full suite of calibration services performed by a trained expert, the instrument will be ready to begin processing samples in only a couple of days.

### COMPLETE COMPUTER CONTROL

The Alpha Analyst system uses Apex-Alpha lab productivity software. Apex-Alpha software is the ultimate alpha spectroscopy software package for automating Alpha Analyst detector set-up and calibration, quality assurance, sample analysis and reporting activities in large or small alpha spectroscopy laboratories. This software package brings the productivity gains to alpha spectroscopy that the Apex® Lab Productivity Suite has brought to gamma spectroscopy for a number of years.

With Apex-Alpha software, the complete status of your Alpha Analyst is available at a glance. Click – and find all the batches waiting to be counted. Log samples into the system from any location where the information is known, such as from the radiochemistry laboratory or other sample log-in area. Let Apex-Alpha software enforce your calibration/QA schedules and monitor QA results – and automatically take the appropriate action if something goes wrong.

# Alpha Analyst Integrated Alpha Spectrometer

The integral instrument controller unit coordinates all operations on an Alpha Analyst unit including: instrument setup, automatic pumping and venting of spectrometers, data acquisition, control and the monitoring of the status of each spectrometer. Computer control of the front end electronics eliminates any knobs to turn or buttons to push so the possibility of tampering or accidental settings modification is eliminated. Precise adjustment of all front end electronics is accomplished via Apex-Alpha software.

Data acquisition is continuously and automatically monitored during all aspects of instrument operation preventing any corruption of data due to vacuum loss. No longer will samples need to be recounted because the vacuum was lost 8 hours into a 16 hour count. The pressure of each individual chamber is independently and continuously monitored to verify correct operating conditions are established and maintained for data acquisition. Should the pressure in any chamber at any time during counting exceed the user defined limit, acquisition will be automatically suspended until the proper operating pressure is again attained, at which time the controller will continue the count.

## INTEGRATING YOUR LABORATORY

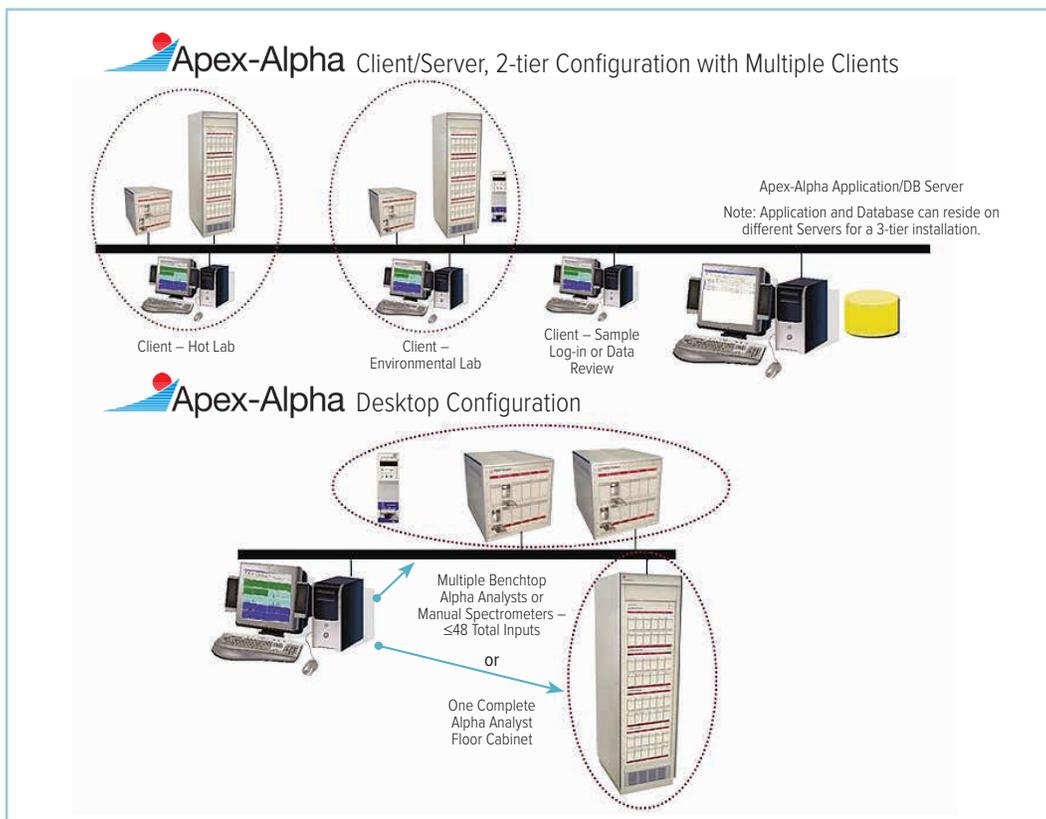
The Alpha Analyst system offers the same consistency of operation and flexibility offered with all Genie™ applications. The Alpha Analyst instrument makes use of an Ethernet based computer controlled MCA located in the Alpha Analyst Controller Unit.

Because it is Ethernet based, the Alpha Analyst system can be located and controlled from where it is convenient for your operation – including client/server distributed architecture.

Redundancy of operation is paramount in high volume applications – instrument down time due to computer failure cannot be tolerated. The Alpha Analyst unit is totally integrated containing the detector signal processing and control electronics – allowing instrument control from multiple clients.

Instrument settings are maintained in Apex-Alpha software ensuring the system integrity is maintained at all times. A complete copy of all instrument settings is maintained with each and every sample measurement, providing traceability for each measurement directly to the appropriate instrument setup and calibration.

Vacuum management is accomplished entirely by the controller unit. There are no mechanical valves to manipulate simplifying the task of loading and unloading samples. The operator can concentrate on getting the samples counted and let the computer automatically manipulate the vacuum system to control venting, protecting acquiring chambers from inadvertent venting.



Network Diagram



## INTELLIGENT SOFTWARE

Apex-Alpha software provides full computer control of the Alpha Analyst unit and can also support manual spectrometers through Genie software compatible MCA's. Apex-Alpha software is also the replacement for Genie-ESP/AMS (Alpha Management Software) systems used for alpha spectroscopy. Apex-Alpha software is available as both a Desktop version and a Client/Server version.

Apex-Alpha software uses a relational database (SQL Server® 2008) for storage and retrieval of sample information/analysis results, log files, etc. and provides a comprehensive, but intuitive, user interface. Apex-Alpha software provides simplified batch creation, simplified sample loading/assigning, automatic energy calibration, automatic efficiency calibration, and extensive QA capabilities. For more detailed information see the separate Apex-Alpha spec sheet.

## STANDARD OPERATING PROCEDURES

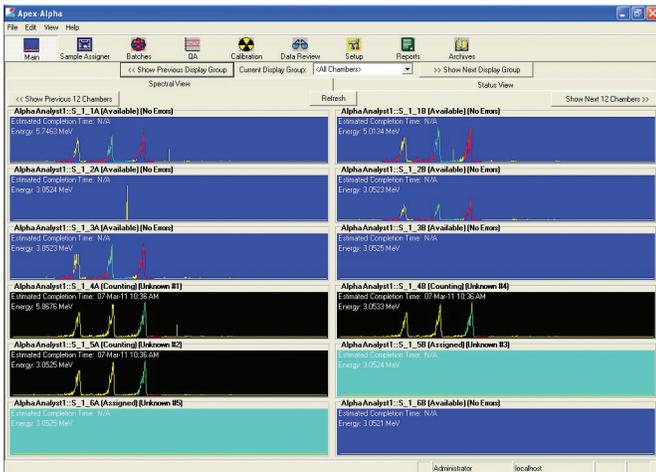
The standardized instrument design of the Alpha Analyst system eliminates the hours normally needed to write custom operating procedures specific to each user's application. Each instrument includes a complete set of operating procedures governing routine sample analysis QA checks, background collection and system calibration. Should the end user desire to customize these procedures, they are supplied in both printed and electronic formats.

## RECOIL CONTAMINATION PROTECTION

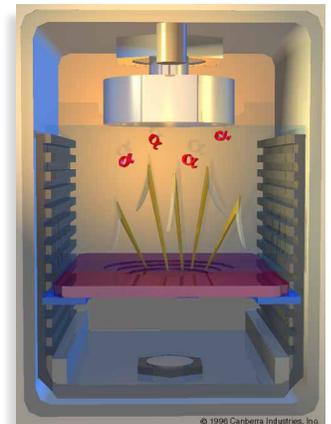
Even with the most carefully prepared samples system operators cannot eliminate the possibility of contamination of the detector with recoil nuclei. This unwanted contamination leads to decreased measurement sensitivity and ultimately longer counting times until some detectors are eventually rendered useless. The Alpha Analyst unit includes recoil suppression as a standard feature on each instrument so that you can maintain consistently low backgrounds maintain sample throughput and extend the life of your alpha detectors.

During instrument setup the user defines a desired air thickness ( $\mu\text{g}/\text{cm}^2$ ) to maintain in the counting chamber during the measurement of samples. When samples are counted in the vacuum regulation mode the computer controlled vacuum system automatically regulates the operating pressure in each dual alpha spectrometer to within  $\pm 10\%$  of the desired operating vacuum.

This protective layer of air coupled with a +5 volt bias applied to the detector shell provides the ultimate defense from recoil contamination.



Apex-Alpha Software



## CLEAN VENT FEATURE

In environmental applications requiring low sensitivity it is desirable to reduce or eliminate the introduction of radon and/or moisture into the counting chambers during loading and unloading operations. The Alpha Analyst makes available the clean vent port, which allows for the chambers to be vented using (customer supplied) dry bottled air or nitrogen which is free of radon and its progeny. All chambers are connected to a common vent manifold, which is supplied with low pressure compressed air or nitrogen.

When the counting chambers are vented for sample loading/unloading the chambers are backfilled with this supplied gas and continuously purged while the chambers are open to atmosphere.

## PIPS® DETECTORS

The Mirion PIPS Passivated Implanted Planar Silicon detectors are a product of modern semiconductor technology whose performance surpasses that of traditional silicon surface barrier (SSB) type detectors and diffused junction (DJ) type devices. The PIPS detector has a number of advantages over the older technologies for room temperature detection of alpha particles.

The electrical contacts on a PIPS detector are ion-implanted to form precise thin and abrupt junctions for good alpha resolution.

The entrance window of a PIPS detector is stable and rugged – and standard detectors are bakeable to 100 °C. The leakage current a major contributor to detector noise is typically 0.1 to 0.001 that of SSB and DJ type detectors.

The Model A450-18 AM is by far the most popular model detector for standard alpha spectroscopy but other sizes are also available.



## THE ALPHA ANALYST SYSTEM ON LEGACY VMS

For users requiring capability with an existing OpenVMS®-based operating system, the Alpha Analyst unit is also compatible with legacy Canberra™ VMS Alpha Management Software (AMS). This allows existing AMS users to expand or upgrade and take advantage of the features available with the Alpha Analyst hardware particularly the 100% complete control recoil suppression mode and space saving design.

## ALPHA ANALYST MODULAR UPGRADES

For users who have open space in an existing Alpha Analyst system, Mirion offers the Model 7200 dual spectrometer as a cost-effective way to increase capacity two chambers at a time.

## INSTALLATION AND STARTUP

Traditionally, the purchase of a new instrument meant days or even weeks of set up and calibrations before you could count your first sample. The Alpha Analyst unit is provided with factory integration and testing. When the Alpha Analyst system is purchased with the exclusive installation and calibration services you'll be counting samples in record time. The installation services include setup of the instrument at the customer's site, software installation, tailoring of the setup to site specific requirements and basic training on the overall operation of the instrument. A trained professional will assist with creation of nuclide libraries, calibration certificates, counting protocols, analysis sequence files and QA files. When the setup is completed your operators will know the basics of calibrations and sample counting.

In addition to the installation services, the calibration and consulting options can be purchased for users who need to go beyond the basics of the installation services. Complete energy shape and efficiency calibrations will be performed on each detector. Instrument checks will be performed including detector backgrounds and pulser checks. When finished the instrument will be completely configured and calibrated and your trained operators will be ready to begin counting samples.

## SPECIFICATIONS

### DUAL ALPHA SPECTROMETER MODULE

- **MODULES** – Two vacuum chambers per Dual Spectrometer Module.
- **VACUUM CHAMBERS** – Low background stainless steel; 8.26 x 6.03 x 6.35 cm (3.25 x 2.375 x 2.5 in.), H x W x D.
- **SAMPLE SIZE** – Up to 51 mm (2.0 in.) in diameter.
- **SAMPLE-TO-DETECTOR SPACING** – 1 to 45 mm in 4 mm increments.
- **MAXIMUM DETECTOR SIZE** – 1200 mm<sup>2</sup>.
- **VACUUM GAUGE** – Vacuum monitoring of each Dual Alpha Spectrometer Module is performed by the respective module's processor; read out by the host computer.
- **VACUUM RANGE** – 0 to >26.7 kPa (0 to >200 Torr).
- **VACUUM/BIAS INTERLOCK** – The Dual Alpha Spectrometer Module will turn on the bias when a vacuum level of <10 kPa (<75 Torr) is reached.
- **EMERGENCY VENTING** – Manual vent screw to vent both chambers of a Dual Alpha Spectrometer module, in the event of a communications, computer or power failure. Located on the valve block on the rear panel of the module.
- **BIAS SUPPLY** – Bias control for each Spectrometer Module; the bias for both Detectors/Chambers on a Spectrometer Module is set identically; controlled through the host computer; adjustable in 1 V increments from 0 to 100 V.
- **DETECTOR LEAKAGE CURRENT MONITOR** – 4 nA to +2500 nA range; read by the host computer.
- **REFERENCE PULSER** – Each chamber in a Spectrometer Module has its own independent pulser. The pulsers associated with all Spectrometer Modules are synchronized, allowing up to 48 chambers to be QA checked simultaneously.
  - FREQUENCY – 40.69 Hz.
  - FREQUENCY STABILITY – ±50 ppm.
  - RANGE – 0 to 10 MeV; limited by system threshold to 70% of full range; computer controlled.
  - ADJUSTMENT RESOLUTION – 12 bits (2.5 keV granularity).
  - AMPLITUDE DRIFT – <±100 ppm/°C.
  - LONG TERM DRIFT – <±0.005% of full scale/ 24 hours at constant temperature.

### SPECTROMETER PERFORMANCE

- Based on use of a 450-18AM PIPS detector with a good quality <sup>241</sup>Am point source.
- **ENERGY RESOLUTION** – <18 keV (FWHM) with a detector-source spacing equal to the detector diameter.
- **DETECTOR EFFICIENCY** – >25% for detector-source spacing of less than 1 mm.
- **BACKGROUND** – <1 count/hr above 3 MeV.

### RECOIL SUPPRESSION

- **SUPPRESSION BIAS** – +5 V continuously applied to detector shell to repel recoil contamination. Detector bias is applied with respect to +5 V detector “return”.
- **REGULATION** – Nominal programmed pressure ±10%.
- **PRESSURE RANGE** – 0.13-2.67 kPa (1-20 Torr), corresponding to air thickness of approximately 12 to 16 g/cm<sup>2</sup> and detector-sample spacing of 5 mm to 45 mm.

### SPECTROMETER OPERATIONS

- Performed through the host computer and Alpha Analyst software.
- **SYSTEM LLD** – Fixed at 0.5 volt.
- **MCA SPECTRUM SIZE** – 4096, 2048, 1024, 512, or 256.
- **MCA MEMORY CAPACITY** – For all ADC ranges, the capacity is 32 bits/channel (>4 x 10<sup>9</sup> counts/channel).
- **DATA RETENTION** – 20 years of power loss.
- **PRESET MODE** – Individual presets for each Spectrometer; True or Live Time, multiples of 1 second: max preset >4x10<sup>7</sup> seconds; composite DT for all Spectrometers within a single chassis (live time correction factor is the same for all Spectrometers within a single chassis).
- **CONTROL INTERFACE** – Ethernet AIM protocol, 802.2/802.3 compliant; Ethernet (RJ-45) built in.
- **RS-232 INTERFACE** – Provided as a diagnostic port.

### INDICATORS

- **INITIALIZATION** – At power on, all LEDs will blink at a high rate during the first part of the initialization sequence, then go off momentarily during the self check, after this, the Fault LED will blink slowly until communication is established with the Host.
- **DUAL ALPHA SPECTROMETER INDICATORS** – Four LED indicators report the operational status of each Dual Spectrometer Module.
- **ACQUISITION A and ACQUISITION B** – Green LEDs. On: chamber acquiring; Off: chamber not acquiring; Blinking: chamber available for loading or unloading.
- **VACUUM** – Yellow LED. On: chamber is in operating vacuum range; Off: chamber is vented; Blinking: adjusting chamber pressure.
- **FAULT** – Yellow LED. Vacuum Pressure has been below the alarm threshold for 1.5 seconds or Vacuum Gauge Fault, indicating a possible valve problem.
- **CONTROLLER INDICATORS** – Two LEDs indicate the status of the Controller.
- **FAULT** – Yellow LED signals that a command error or vacuum control error has occurred. After power on initialization completes the LED will blink until the HOST has established communication with the Controller.
- **POWER** – Green LED indicates controller has power.
- **COMMUNICATION STATUS INDICATORS** – Three LEDs indicate status of the communication link between the Host and the Controller.

## INDICATORS (continued)

- **IN USE** – Yellow LED indicates that the Host has established communication with the Controller.
- **COMM TX** – Yellow LED indicates the interface is sending data to the Host via the Ethernet port or to the diagnostic RS-232 port.
- **COMM RX** – Yellow LED indicates the interface is receiving data from the Host; during Power-On Self Test, it can indicate an Ethernet network error.

## CONNECTORS

- **DETECTOR** – Axial microdot.
- **DIAGNOSTIC** – RS-232; rear panel 9-pin male D-connector.
- **ETHERNET** – RJ-45 jack provides connection to network through 10 Base-T and 100 Base-TX transceivers.
- **CHASSIS POWER CONNECTOR** – Provides +5 V dc, ±15 V dc, and 115 V ac; flying cable, terminated in a 15-pin D-connector.
- **CONTROLLER POWER CONNECTOR** – Provides +5 V dc and ±15 V dc; rear panel 15-pin D-connector.
- **AC LINE CONNECTOR** – Line entry module with integral IEC connector to accept compatible line cord.

## INPUT POWER

- **SELECTIONS** – 100-240 V ac Selectable, via fusing in the Power Entry Module, as follows: Nominal 100 V; Nominal 120 V; Nominal 230 V; Nominal 240 V; 50/60Hz; 121 W for a Model 7200-12 Alpha Analyst populated with six Dual Alpha Spectrometer Modules.

## PHYSICAL

- **DIMENSIONS** – Benchtop instruments: 52.1 x 43.8 x 65.4 cm (20.5 x 17.25 x 25.75 in.) W x H x D.
- **WEIGHT** – 63.5 kg (140 lb) for a 7200-12 Alpha Analyst populated with six Dual Alpha Spectrometer Modules.

## ENVIRONMENTAL

- **OPERATING TEMPERATURE** – 0 to 50 °C.
- **OPERATING HUMIDITY** – Up to 95%, non-condensing. Tested to the environmental conditions specified by EN 61010, Installation Category I, Pollution Degree 2.

## ORDERING INFORMATION

To fully configure a benchtop Alpha Analyst Workstation, select the appropriate Alpha Analyst instrument, PIPS detectors, software, vacuum pump and, if applicable, a PC. Also highly recommended is the optional suite of startup services.

- **Models: 7200-XX** (available from 2 to 12 input, in multiples of 2)
- **Detector: A450-18 Alpha PIPS**, or other appropriate size
- **Vacuum Pump: 7400-01 115 V, 60 Hz**, or equivalent
- **S770C Apex-Alpha Desktop License**
  - Requires Genie 2000 packages
- **S771C Apex-Alpha Server License**
  - Requires Genie 2000 packages and SQL Server 2005
- **S772C Apex-Alpha Client License**
  - Requires Genie 2000 packages (or S520)
- **S775C Apex-Alpha Desktop/Genie 2000 Package**
  - Includes Genie 2000 packages
- **S775M Apex-Alpha/G2K Desktop Migration Package**
  - Requires existing Genie 2000 licenses listed above plus the S570C Alpha Analyst Control Software which is also included in Model AASW-G2
  - Includes updates to Genie 2000 media

## MINIMUM COMPUTER REQUIREMENTS – PC

- Consult Factory

## ACCESSORIES

- 7400-10 – Replacement Vacuum Filter Cartridges
- 7400-17 – Exhaust Filter Kit
- 7400-SRC – Mixed Alpha Standard Source
- 7400-19 – ISO (16) Flange Adapter
- 7200 – Dual Alpha Spectrometer Upgrade Module

## OPTIONS

- AA-INST – Installations Services
- AA-OSCAL – Calibration Services
- 556B-CONV – 10BASE-2 to 10BASE-T Converter



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