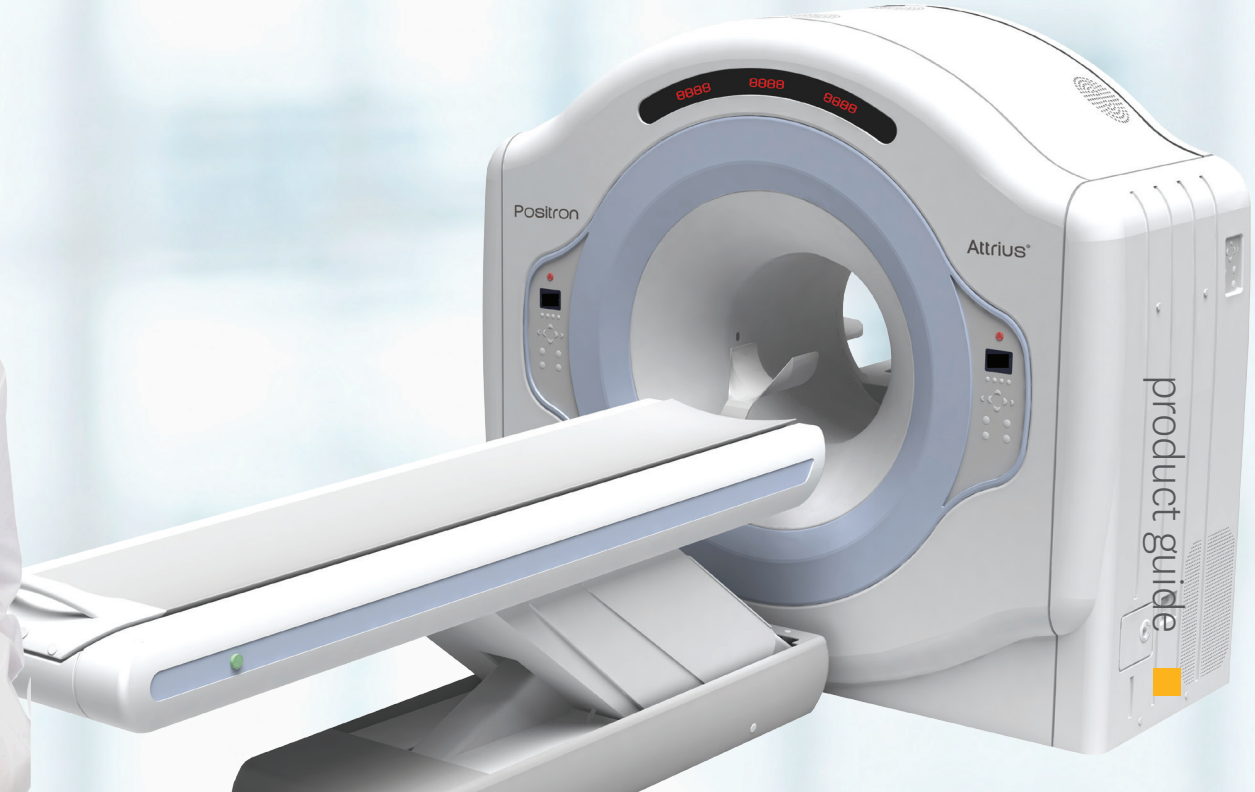
Positron

Attrius

at the heart of cardiac PET imaging



product guide

Attrius: cardiac PET scanner

Positron's Attrius scanner offers a new perspective for cardiac imaging. The Attrius, a dedicated PET system, is optimized for myocardial perfusion imaging. It provides excellent system uptime, minimal radiation exposure and a proprietary cardiac-specific software package. The advancements in Attrius' technology provide physicians with superior, proven technology that enables accurate diagnosing for today's most challenging clinical cases.

the evolution

from SPECT to PET

Today's nuclear cardiology community faces various challenges with SPECT imaging due to its dated technology, molybdenum isotope shortages, and cuts in reimbursement. Cardiac PET utilizes the latest technological advancements, allowing cardiologists to provide their patients a more accurate diagnosis.

PET's ease of use, for physicians as well as technologists, maximizes the capabilities of their cardiovascular practices. Favorable cardiac reimbursement further positions the Attrius system as the premier technology for the future of nuclear cardiology.

"RECIPIENT OF THE 2010 NORTH AMERICAN MOLECULAR IMAGING NEW PRODUCT INNOVATION AWARD BY INDUSTRY LEADING RESEARCH FIRM, FROST & SULLIVAN"

reliability and performance

higher performance

The Attrius is one of the highest 2D sensitivity systems in the industry. Several factors impacting scanner sensitivity include size of detector, distance from patient, detector encoding scheme, parallelism of the electronics, and crystal packing fraction. The Attrius achieves such high sensitivity by placing more crystal mass closer to the object being imaged. This practice results in fewer gaps for housing or reflective material.

Positron's patented, staggered crystal design deliver a unique, shorter septa. Short septa permit the use of a smaller diameter detector ring, allowing the detectors to be closer to the subject. Closer detectors allow for a higher sensitivity without decreasing the size of the aperture. Being closer to the patient requires the Attrius detector to be capable of accepting and processing higher fluxes of events, as compared to other PET scanners, for the same amount of activity in the patient.

The dynamic quantitative measurement of blood flow is dependent upon two factors within a scanner; its sensitivity and its count-rate capability. Combined with its extraordinary sensitivity, the Attrius scanner is capable of imaging ALL available PET isotopes. With more counts obtained, physicians can more accurately define the locale of a lesion or perfusion defect.

> "THE ATTRIUS, CARDIAC PET SCANNER, IS ONE OF THE HIGHEST 2D SENSITIVITY SYSTEMS IN THE INDUSTRY."

better economics

The Attrius has a small design footprint and a significantly lower overall operating cost when compared to the purchase, installation and on-going maintenance of a combined PET/CT system.

The Attrius PET scanner system holds to the same high quality standards that Positron has consistently delivered for over 25 years. Many customers say that their Positron PET scanner is still producing high quality images with excellent reliability and uptime after 15 years of operation. This level of reliability speaks to the positive, long term investment opportunity in a Positron scanning system.

for the patient

The Attrius features a comfortable patient table with a weight capacity of 440 pounds, which includes a vertical adjustment feature to allow for safe and easy loading of patients. Patient comfort leads to less unnecessary movement during the full spectrum of acquisition modes, allowing for fast and dependable studies, even with larger patients. The Attrius' advanced technology also facilitates early detection of heart disease, leading to potentially life-saving outcomes for patients.

> "ATTRIUS FILLS A CRITICAL VACUUM IN THE CARE OF CORONARY DISEASED PATIENTS."

Attrius advantages over PET/CT

similar scanning times at reduced cost and exposure

Positron's rapid segmented attenuation correction, or SAC, allows for scan times competitive to that of PET/CT. Positron's segmented attenuation scan times are approximately 3-5 minutes depending on patient BMI. Optimal cardiac CT transmission attenuation calls for multiple scans that produce images similar to those of the Ge-68 rod attenuation system used in the Attrius. CT attenuation can, however, result in higher radiation exposure levels to the patient.

elimination of inaccuracies from CT based transmission scanning

Misregistration of CT attenuation correction and PET emission data with associated artifactual PET defects are due to momentary helical CT "snapshots" imaged during the respiratory cycle. The artifacts occur due to the changing attenuation of the thoracic–diaphragmatic structures during breathing. The brief CT snapshots commonly do not match the actual average attenuation of the constantly changing thoracic–diaphragmatic structures over longer emission scans during normal breathing.[1]

no need for specialized CT trained technologists

Some states require specialized CT training for the nuclear medicine technologist operating the PET/CT camera. Some states also require that a CT certified technologist work along with the nuclear medicine technologist even if the CT portion is only for transmission scanning. An Attrius PET scanning system eliminates the need for additional CT training or personnel.

uptime issues

PET/CT devices have two imaging modalities. Consequently, when one modality is not functioning, the other modality is affected and the camera is inoperable. Specifically, the X-ray tubes in the CT modality are highly susceptible to fault. X-ray tube downtime renders the PET modality unusable, thus creating longer periods of downtime and leading to costly repairs that adversely affect the imaging center's ability to generate revenue.

1 Loghin C, Sdringola S, Gould KL, Common Artifacts in PET Myocardial Perfusion Images Due to Attenuation-Emission Misregistration: Clinical Significance, Causes and Solutions, J Nuc Med 2004; 45: 1029-1039

cardiac specific software

Positron's technology, spanning from hardware to software, was designed in partnership with an industry leading cardiologist. Our software was developed specifically to permit easy interpretation of even the most complex clinical cases. The Attrius has robust, cardiac specific imaging software designed to execute on multiple processors in order to optimize simultaneous acquisitions and processing capabilities. The system is designed to provide concurrent acquisition, reconstruction, image processing and display, as well as data archiving, without interference.

multiple acquisition modes

The acquisition window provides a user friendly interface to control all aspects of data acquisition. When the data acquisition process box of any automated protocol is activated, the acquisition window is displayed.

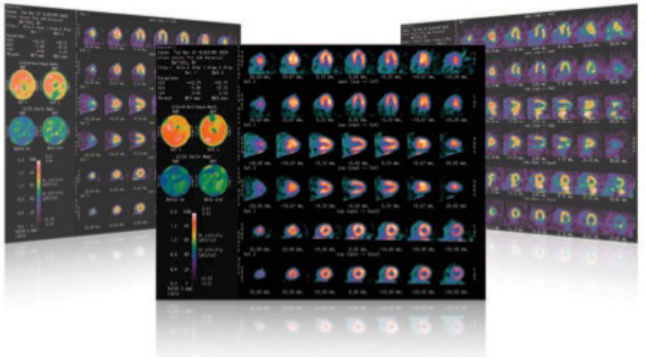
simultaneous gating and flow acquisitions

The Attrius acquisition buffering system was designed to accommodate simultaneous function and data acquisition. The users can choose between time or phase mode gating. Retrospective analysis and formatting makes flow measurements quick and easy.

> "POSITRON'S TECHNOLOGY WAS DEVELOPED BY CARDIOLOGISTS, FOR CARDIOLOGISTS."

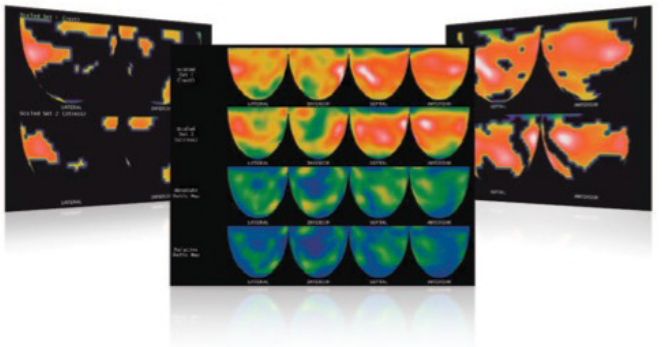
traditional cardiac display

Positron's traditional cardiac display color format can be customized to the interpreter's preferences. This selection displays seven images from each viewing angle (HLA, VLA, and CSA) for each set, as well as the scaled bulls-eye images for each study and the relative and absolute ratio maps.



topographic projections with comparison to normal database

Positron's proprietary cardiac software is based on topographic cardiac maps; reflecting coronary artery distribution down to secondary or tertiary branches. The visual comparison of rest/stress cardiac positron emission tomography indicates coronary flow reserve for diagnosing and assessing the severity of coronary artery disease. An accurate, rapid, and automated method for comparison and quantitation of paired cardiac PET studies has been developed to analyze size, intensity, statistical significance of and changes in perfusion or metabolism.

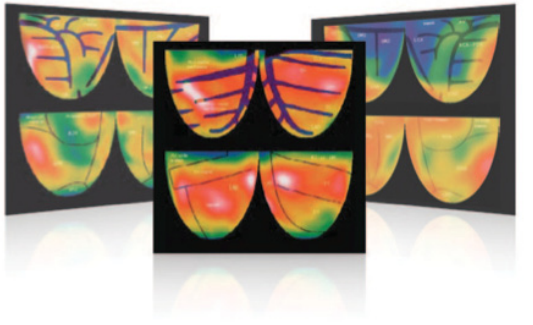


coronary artery overlay/coronary territory

To map precise myocardial perfusion anatomy, the software details coronary arteriographic anatomy for every coronary artery and all secondary branches in the heart that had flow-limiting stenosis with corresponding specific, circumscribed, myocardial perfusion defects by positron emission tomography.

The coronary artery overlay portion of our software was developed in partnership with K. Lance Gould, M.D., who imaged eight hundred ninety-five patients with abnormal coronary arteriograms showing any visible coronary artery narrowing of greater than 10% diameter stenosis. These patients underwent positron emission tomography perfusion imaging at rest and after dipyridamole stress; the data obtained was processed automatically into 3-dimensional topographic displays of relative radionuclide uptake in anterior, septal, left lateral, and inferior quadrant views, without attenuation artifacts, depth-dependent resolution, or spatial distortion of polar displays.

The selection criterion for detailed anatomic analysis was the presence of a discrete, localized, moderate to severe, dipyridamole induced perfusion defect, defined by automated algorithms as one quadrant view outside two standard deviations of healthy control subjects with which a specific stenotic coronary artery and/or its secondary branches could be correlated unequivocally on the coronary arteriogram for mapping precise perfusion anatomy, not for determining sensitivity or specificity.



proprietary statistics reporting

This display image panel is used to display statistics (computed from the profile data, not the mapped images) and the visual analysis for scaled bulls-eye/Mercator Topo Projection maps and the ratio maps. It includes averages, minima, blackout functions, visual analysis and area estimate for each of the six regions for each of the four maps. It also includes pixel histograms for each of the four maps.

proprietary x-y shift correction algorithm

The integration of a motion algorithm program is essential to ensure the highest level of technical quality of any given scan. Positron recognizes that if the patient moved between the attenuation and emission acquisitions, then significant artifacts can occur in the image and bulls-eye data. Positron's motion correction shift procedure resolves X-Y patient movement and is used to view the alignment of the attenuation and emission images and determine if there is a position error between these images. If a significant error exists the data can be reprocessed to correct for these shifts in position.

software features

image viewing and analysis

All interactions with image data are conducted via a control panel on the same screen as the displayed images, eliminating the need to switch back and forth between screens. All control is via mouse, simplifying operator interaction. A general-purpose display utility, VIEW, is available to display images and sinograms.

key features:

// Display of single and multiple images from one or more studies
// Display magnification of a selected region of the image
// Interactive threshold and window/level adjustments
// Scaling functions include linear, exponential, logarithmic and gamma
// User selectable color table
// Display of scale bar and quantitative information
// Flexible image annotation
// Rotation of images in three axes, in real time
// Display of coronal, sagittal, and projection images from volume data sets
// Cine display of multiple static, dynamic frames or static gated
// Statistical 2D ROI package for time activity curve generation

3D image rotation

In addition to the general image view, the software includes 3D Maximum Intensity Projection (MIP) rotation of whole body images.

security

All USER accounts are provided with PASSWORDS. Only one account (CONTROL) is allowed access to the scanner hardware controls. All USER accounts have a “SCREEN LOCK” button in the main windows. This is to allow the screen to be locked during off hours or low use time. The SCREEN LOCK requires a PASSWORD to unlock the screen.

Note that any system security measures are not necessarily HIPAA-compliant unless strong site defined policies and procedures are also in place to govern their use.

image acquisition/viewing console

The standard acquisition, processing, and remote display workstation provides advanced computational power with a wide spectrum of graphic capabilities to meet the demanding requirements of PET medical imaging applications. The workstation is compatible with all Sun workstation image processing/viewing console configurations. The workstation includes Ethernet network connection for up to 80 feet from the gantry system. Software applications include: the Director™ file selection utility, image view and analysis tools, neurology image processing and display functions, oncology image processing and display functions, and cardiac image processing and display functions.

additional options:

cardiac gate trigger

Includes an ECG freeze to capture ectopic ECG waveforms, fully automatic operation, easy to read display of Heart Rate, universal voltage and frequency (50 or 60HZ).

postscript printer

Black and white print speeds of up to 40 pages per minute, color print speeds of up to 35 pages per minute, maximum resolution of 600 x 600 dpi, maximum monthly duty cycle of up to 95,000 pages per month, duplex printing unit (two-sided printing) comes standard.

All security features on the main console are available on the remote display workstation.

Computer	Sun Microsystems Workstation with Solaris 10 OS
Memory	≥ 12 GB RAM
Hard Disk	≥ 500 GB × 2 Raid
Keyboard	107 key, UNIX style key layout
Pointing Device	Mouse, 3 button and Sun compatible

color display	
monitor	19", standard display (upgradable to 21" or 24" display)
resolution	1280(h) × 1024(v) pixels
DICOM 3.0 support	
DICOM PET IOD	support for storage SCU
DICOM SC IOD	(secondary capture) gray scale and color support
DICOM	Part 10 Export
optical back-up device	
	DVD- RW Storage 4.7 GB typical
color display	
fast ethernet switch (TCP/IP)	16 ports (10/100BaseT)
DICOM support	DICOM v3.0 compliant

service

quality

Positron has been providing world class customer service and preventative maintenance to our customers for over 20 years. Positron has implemented a total remote access strategy in their Attrius design. Service engineers, applications specialists and our experienced physicians can seemlessly log into the system from anywhere in the world. The total remote access system will improve system uptime and ensure that our customers are provided the highest level of service. Whether service is conducted directly by Positron, or by a local service partner, all technologists receive extensive service training and are authorized, by Positron to service your scanner. In many locations, replacement parts are inventoried locally to insure they are available immediately, so if you experience an issue we can get your scanner back up to peak performance in the shortest amount of time possible.

reliability

Positron's scanners have stood the test of time by remaining reliable even after 15 years of continued service. The redesigned Attrius PET scanner product line offers an even higher level of uptime and improved reliability.

customer support and satisfaction

Positron will diligently guide you through the entire purchasing process from the early site-planning stages through installation and training. Positron provides on-going clinical support and our service technicians are available around the clock to ensure your Attrius PET system is running at peak performance. With the addition of all new onboard remote diagnostic hardware, Positron has the ability to diagnose and correct most issues over our secure VPN tunnel. If on site service is needed, we react promptly to insure you are up and running as soon as possible. We are committed to providing the highest level of customer service and satisfaction.

"THE POSITRON TEAM HAS BEEN EFFICIENT AND EFFECTIVE IN THE SERVICE THEY PROVIDE AND THEY ARE ALWAYS A PLEASURE TO DEAL WITH."

general information

warranty and training

An extensive training program is provided for Attrius customers along with a 12 month standard warranty.

course curriculum includes:

// Attrius system operations and security features
// custom parameter input
// Director™ software and automated protocols
// Custom protocol design
// Acquisition and reconstruction options
// Clinical (patient) protocols
// Quality control and calibration procedures
// Data archival and retrieval
// Image display processing and analysis
// File system

clinical training

Optional additional training will take place at our technical and clinical training institute in Niagara Falls, NY, under the guidance of Michael Merhige, M.D., Positron's Medical Director, in partnership with the Heart Center of Niagara.

start-up training

A phantom or volunteer study will be performed by the site technologist prior to the first patient being scanned.

rods

The Attrius requires two (2) Ge-68 solid sources for the Rotating Fan Beam (included). The initial source activities are 5.0 mCi (calibration and attenuation) and 1.0 mCi (emission normalization (calibration only).

rod type	nominal activity in mCi	active length	catalog number
Attrius L (8PMT)			
Attenuation Study	5 mCi*	172 cm	PET-172/5 series
Calibration Study	1 mCi*	172 cm	PET-172/1 series
Attrius (6PMT)			
Attenuation Study	5 mCi*	127 cm	PET-127/5 series
Calibration Study	1 mCi*	127 cm	PET-127/1 series

* Activity range is +10%, -10% 172 indicates the source length in mm, and 5/1 indicates the activity in mCi. *The source rods are available from Sanders Medical Products (PET- 172/5/1 Series).

patient gantry/table specifications

// Patient Aperture: diameter ~53 cm
// Patient Positioning Laser Alignment System: 3 (top and side) cross hairs, two field-of-view lasers
// Digital Display: patient longitudinal position
// Patient Table: longitudinal travel 187 cm (min.); table limit 440 lbs./200 kg.

design footprint

height..... 5'9" / 1,808 mm

width..... 6'7" / 2,050 mm

length..... bed & gantry total 13'2" / 4,019 mm

gantry weight..... 5,511 lbs. / 2,500 kg

table weight limit..... 440 lbs. / 200 kg

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