PERKIN ELMER

Performance,

Engineering

and

Environmental

Specifications

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PHI Model 5600
Multitechnique Systems

Specifications are subject to change without prior notice

PHI Model 5600 MultiTechnique Systems

These specifications apply to a 5600 system equipped with the Omni Focus™ III Small Area Lens, a MultiChannel Detector and the Model 10−360 Spherical Capacitor Analyzer.

XPS Sensitivity

Magnesium anode specified performance is obtained with a single Mg anode operating at 400W (26.7 mA and 15 kV) on a sample of clean silver. The performance curve for a selected aperture size will meet or exceed the following values. The sensitivity is defined as the counts per second (peak above background) in the data channel for the Ag 3d5/2 peak; the FWHM of the Ag 3d5/2 peak is measured following a subtraction of background intensity linearly interpolated between the background intensity at binding energies approximately 3 eV above and below the Ag 3d5/2 peak.

Analysis Area

The analysis area is selected by an externally adjustable five−position aperture and by computer−controlled analyzer lens voltages. For the minimum area mode, the analysis area diameter is defined as the distance between the points at which the Ag 3d5/2 signal amplitude is 16% and 84% of the maximum value as a silver−coated knife edge is analyzed. The area specification applies to all analyzer pass energies below 90 eV.

†Peak Sensitivity (counts per second)
Minimum Area Mode, Large Solid Angle, Dual Anode X−ray Source

Analysis Area	≤0.79 eV	≤0.80 eV	≤1.00 eV	≤1.40eV
Slit (800 µmx2000 µm)		≥450,000	≥3,500,000	≥7,000,000
800 µm diameter		≥275,000	≥1,375,000	≥2,750,000
400 µm diameter		≥100,000	≥500,000	≥1,000,000
150 µm diameter	≥3,000	≥6,000	≥30,000	≥60,000
75 µm diameter	≥500	≥1,000	≥5,000	≥10,000

†Peak Sensitivity (counts per second)
Minimum Area Mode with Optional Model 10−420 Toroidal Monochromator and Model 10−610 X−ray Source (350W)

	Ultimate		Resolution, FWHM		
Analysis Area	Resolution	Sensitivity	≤0.50 eV	≤0.60 eV	≤1.00eV
Slit (800 µm x 2000 µm)	≤0.52	≥150,000		≥450,000	≥1,750,000
800 µm diameter	≤0.51	≥125,000		≥300,000	≥1,000,000
400 µm diameter			≥75,000	≥200,000	≥575,000
150 µm diameter	≤0.48	≥3,000	≥7,500	≥20,000	≥50,000
75 µm diameter	≤0.48	≥250	≥1,000	≥4,000	≥10,000

ISS Performance

These specifications apply to a 5600 system equipped with the Model 80−366A Analyzer Control and the Model 04−303A Ion Gun. The ionizing gas is 3 helium at 1 kV for Ag and 2 kV for PET. Ag specifications are obtained without rastering the ion beam, and PET specifications are obtained with a 1.5 mm x 1.5 mm raster of the ion beam. The beam current is measured with a 90−volt bias on the sample mount. Sensitivity is peak above background.

†Sensitivity for Ag	50,000 cps/nA
†Sensitivity for O in PET (polyethyleneterephthalate)	500 cps at 5 nA.

Specifications indicate minimum guaranteed performance. System will meet or exceed stated specifications. Items marked with a dagger (†) will be demonstrated at customer site. Specifications are subject to change without notice.

SIMS Performance

See Performance, Engineering and Environmental Specification for the PHI Model 3600 and 3700 SIMS.

AES Performance

These specifications apply to a 5600 System equipped with the optional Model 10–210 Electron Gun and scanning electronics.

†Minimum Electron Beam Diameter	≤100 nm at 10 kV accelerating voltage; determined using the 20% and 80% SED signal levels across a 1500 line–per–inch grid.

Cu LMM Auger Peak at 914 eV

†Sensitivity	Peak intensity ≥500,000 cps above background at 10 kV, 10 nA, 0.4% analyzer resolution (fixed retarding ratio mode).
Tilt	Sample normal to analyzer (60° to electron gun).
Signal–to–noise (rms noise)	≥800:1.
*Beam current	10 nA (measured into a Faraday cup).
Detection mode	Pulse count.
Beam voltage	10 kV.
Resolution	0.4% ± 0.05%(fixed retarding ratio mode).
Acquisition time	1 sec/step (20 msec/step: 50 sweeps).
Definitions:	
Signal	Cu LMM Auger peak height at maximum near 914 eV above the background at 950 eV, measured at 1 eV/step.
Noise	The square root of the mean square deviation of the background from 961 to 975 eV from a second order polynomial fit. The background is measured at 0.2 eV/step. (Refer to PHI Technical Bulletin 8404R3, "Auger Electron Spectroscopy N(E) Signal–to–Noise Ratio.")

Software Specifications

Computer System

The system electronics architecture uses distributed microprocessors controlled by a central host computer, linked with the IEEE–488 General Purpose Instrument Bus through the Interface Controller. The host computer is an HP–Apollo Personal Workstation™ computer. The combination of the data acquisition hardware and software, microprocessors and specialized bus provides high–speed data acquisition, storage and manipulation.

*Note: Orienting the sample so the electron beam angle of incidence is a shallow, grazing angle can increase the signal counting rate (as defined above) by a factor greater than 1.6, increase the peak–to–background ratio to 1:1, and influence the electron beam current measurement. Grazing angles are not useful for high spatial resolution scanning Auger work due to the large area irradiated by the primary electron beam. This specification is defined at a more practical working geometry. For further discussion of the influence of sample geometry and instrument geometry on AES signal, refer to PHI Technical Bulletin 8604R1, "Geometrical Considerations in Scanning Auger Microscopy."

System Description – HP–Apollo® host computer

The PHI ACCESS software runs on the 32–bit HP–Apollo® Series Personal Workstation ™ computer under a combination of the AT&T System V UNIX® and HP–Apollo's AEGIS ™ operating systems, using the C programming language.

Command input is via 10 softkeys, which may be picked directly or by using the mouse or trackball. In addition to the standard PHI settings, up to four sets of user–defined settings can be saved and recalled to allow the user interface to be customized for four individual users. The user can assign names to the HOME BANKS (a grouping of commands) and assign which commands appear at each location within each HOME BANK. Within the HOME BANKS and COMMAND BANKS, keyboard type–ahead has been included to allow very fast user input. The mouse can also be used to select parameters within the menus.

An Ethernet® interface is included with each HP–Apollo computer provided by PHI. Also included are utilities which allow access to data files by other PHI–Apollo systems on the network, and which provide sharing of the plotter and printer peripherals on the network. File translation compatible with PHI–MATLAB ™ and other formats is also included.

Version 5.0 MultiTechnique Software

I. System Startup

Status Line Display
- Technique (XPS, AES, SIMS, ISS)
- Date, time of day
- X–ray source (anode, On, Off) for XPS
- Electron gun (On, Off) for AES or SIMS
- Ion gun (On, Off)
- Neutralizer (On, Off) for XPS, SIMS or ISS
- Electron Emission for AES or SIMS
- Electron beam (last reading) for AES
- Ion beam (last reading) for SIMS or ISS
- Counts display (log or linear) for SIMS
- Time remaining for sputter
- Acquisition message

Hardware Configuration
- Stage select
- Stage tilt (auto, manual)
- Stage index (auto, manual)
- Neutralizer control select
- X–ray source select (dual anode, monochromator)
- Plotter (HP7475A, HP7550B)
- Electron gun (10–110, 10–210)
- RF generator
- DIG reading
- Floppy disk (Yes, No)

Analyzer Parameters
- Input Lens
- Analysis mode (large, small, minimum)
- Aperture sensitivity selection
- Lens–to–sample distance

X–ray Control
- Photon energy
- X–ray power
- Manual or computer control of On/Off
- Standard or monochromatic X–ray source

Ion Gun Menu
- Ion energy
- Grid energy
- Sputter time
- Beam voltage (On, Off)

Alignment (XPS, ISS)

Align (Elastic Peak) *for systems with either SAM or TFA options*:
- N(E) display
- dN(E) display

SEM Menu (Electron Gun and Scan Control) *for systems with a SAM option:*
- SED images on Digital Storage Monitor
- Image shift
- Image rotation
- Reduced area scan with variable size and location
- Stigmation correction
- Lens control
- Pseudocolor display (with user assignable colors from palette of 32)
- Gamma transfer function
- Automated video signal gain, offset, contrast, and brightness
- Electron beam current measurement

SEM Menu (Electron Gun and Scan Control) *for systems with a TFA option:*
- SED images on video monitor
- Image shift
- Lens control
- Electron beam current measurement

Energy Resolution Menu (XPS)
- Selection mode (survey, utility, high resolution)
- Pass energy
- eV/step
- Time/step
- Fixed Analyzer Transmission (FAT) also available

for Auger acquisitions
Fixed Retarding Ratio (FRR) only available for Auger acquisitions

Electron Multiplier Supply
XPS – counts vs. voltage display
MCD start–up conditioning

Acquisition Default Menu
Sputter Mode (Alternating, Continuous)
X–ray on during Sputtering (for XPS acquisitions only)
Baseline Endpoint Calculation
Type (Smooth, Average), Number of Points

User Savable Settings
For survey, multiplex, profile, angle dependent profile, line, map, SEM and sputter modes

SEM Photos
At any magnification, (only available with SAM option)

SAM Imaging
Acquire, store, recall, display, photo exposing full rectangular area of picture element (only available with SAM option)

Color Selection Menu
Data display and axis colors (20 selectable)

II. Data Acquisition

User may begin to acquire immediately assuming previous settings, or may go into the setup routine.

Previous, New, File or up to 4 User Defined Settings

Selected points and areas for acquisition (*XPS and SAM option only*)

Define Areas Menu *(XPS and SAM option only)*
Up to 20 acquisition areas and points
Rectangular areas (*SAM option only*)
Lower magnification image shows area or point positions used for survey, multiplex, profile or map acquisition, with area number displayed on digital storage monitor.

Survey (XPS, AES, SIMS, ISS)

Multiplex (XPS, AES, SIMS)
Up to 20 energy regions selectable

Profile (XPS, AES, SIMS, ISS)
Up to 20 energy regions selectable
Continuous or alternating sputtering
Save every nth cycle
Two–point/Three–point *(AES option only)*
N(E) or dN(E) display (*AES options only*)
Zalar rotation
Flexible Profiles
Add and delete regions
Change number of sweeps
Change sputter intervals or sputter rates and record all changes

Angle Resolved Depth Profile (*XPS only*)
Up to 12 take–off angles
Up to 20 energy regions
N(E)/E, Profile or ACP display

Line Scans (*XPS, SAM and SIMS only*)
Variable sweeps and cycles (*SAM option only*)
Up to 20 horizontal and vertical lines
Up to 20 energy regions

Maps (*XPS, SAM and SIMS only*)
Up to 20 elements (2 point/3 point)
Up to six defined analysis areas *(SAM only)*
Variable sweeps and cycles

Ion Depth Profiles *(SIMS only)*

Save SEM Image *(AES options only)*

Cycle Stop Acquisition

Sweep Stop Acquisition

Abort Acquisition

More (Allows user to take more data, and add to a completed survey, multiplex or profile data file)

Suspend/Resume ability for survey, multiplex, profile or line data file.

Test Acquisition for Auger map, line or profile setup menu

III. Graphics Data Massage and Display

User defined massage soft key banks allow the operator to customize the location of massage soft keys to place the functions used most often in the most convenient keyboard location.

Smooth (3–25 point Savitzky–Golay convolution; cubic–quadratic)

Differentiation (3–25 point Savitzky–Golay convolution method)

Expand With Either Numeric or Graphic Input

Cursor (Readout of Energy and Intensity or M/E ratio)

Edit Data

Annotation
- User labeling
- Label axis with massage operator used

Display Add to Superimpose Curves

Add/Subtract Spectra

Montage Display

Baseline Subtraction (Linear or Integral)

Shift of Energy Axis

Curve Fit
- Gaussian
- Lorentzian
- Gaussian/Lorentzian mixed
- Asymmetric line shapes
- Doublet fitting
- Multiplet fitting

Deconvolution

X–ray Satellite Peak Subtraction

Integrate (right to left or left to right)

Normalize

Topographical Correction on Lines and Maps during acquisition (SAM option only)

Peak Measurement Redefine (changes to AC profile, linescans and maps after acquisition)

Save Massaged Data

Area

List Data and Data Parameters

Hard Copy Data Output
- HP LaserJet IIP
- HP LaserJet Plus™ Printer Output
- HP 7550B 8 Pen Plotter (user–defined plot sizes)

IV. Image Processing and Display

Image Registration (*with SAM option only*)

Image Processing
- Edge enhance (3 x 3 pixels)
- Smooth (3 x 3 pixels)
- User defined kernel (3 x 3 pixels, user defined kernels are savable)
- Median filter
- Histogram display
- Histogram equalization
- Threshold slide (black/white and color)

Display
- Annotate – variable font size, user selects location within image
- Overlay color images (color composite images) with 16 level intensity modulation of each primary color
- Gray scale
- Pseudocolor scale, 2 to 16 levels, user assignable color sequence and portion of signal intensity range
- 4 quadrant display

Photography
- Recorder Camera with Polaroid film back (35 mm film back optional)
- Color or black and white photos
- Superimpose line scan data and location on photo
- Label fields and annotation background can be individually turned On or Off
- Auto shutter control

V. System Level Functions

Directory Utilities
- Listing
- Delete
- Copy
- Search
- More
- Create
- Rename

Auto File Naming

Foreground/Background Operation

Display of Valid Parameter Entry Range

Data Transmit
- RS 232 Terminal Emulator (optional)
- Kermit Protocol
- IBM Formatted Floppy Disks (optional)

Network Interface

VI. AutoChem

Atomic Concentration
- User settings
- User–modifiable sensitivity tables
- AC's from surveys
- AC profile conversion
- Pre–selected acquisition limits
- Profile redefine
- Baseline redefine
- Area under a curve

Automatic Peak Identification
- User–modifiable S/N selection
- Turn elements On/Off
- Automatic peak labeling

Chemical State Identification Table
- User–selectable energy range
- Element selection
- Transition selection
- Chemical assignment with binding energy
- Literature reference

Element Table (XPS, AES)
- Element Name, Transition Type
- Acquisition Window
- Analysis Window
- Peak Energy
- Sensitivity Factors

AutoCom
- Automated Command Sequence
- Sequencing ability
- Looping ability
- User–defined sequences
- Up to 40 sequences in user–named files

Sensitivity Factor Selection
- Input lens, magnification
- X–ray source position (standard, monochromator)

Hardware Specifications

Precision Energy Analyzer, Model 10–360

Type	Spherical Capacitor Analyzer (SCA).
Mean Diameter	279.4 mm (11.0 in.).
Lens	Omni Focus III.
Lens Solid Angle	Computer software selectable: ±2°, ±5°, ±7°,
Input Slit	4 x 10 mm.
Detector	MultiChannel Detector.

Analyzer Electronics, Model 80–365A or Optional 80–366A

Energy	
Scan Range	0 to 3200 eV for XPS and AES.
Resolution	25 meV minimum step size.
Polarity	Dual polarity with Model 80–366A for optional ISS.
Pass Energy (Fixed Analyzer Transmission Mode)	
Range	0 to 400 eV.
Resolution	25 meV.
Resolution (Fixed Retarding Ratio Mode)	
Range	0.1 to 0.8%, DE/E.
Multiplier	
Input Bias	0 to 200 V.
Multiplier Voltage	500 to 2400 V.

Dual Anode X–Ray Source, Model 04–548

Energy Range	Variable; 4 to 15 kV; 15 kV for optimum performance.
Anode	Dual anode design.
Anode Material	Side 1–Mg; Side 2–Al; Mg, Cu, Si, Zr, Au, Ag or Ti optional.
Power	750 W total power (15 kV, 50 mA); maximum 400 W during single–anode operation. Single or simultaneous dual–anode operation with independent computer control of individual anode power
Anode Selection	Switch selectable; computer controlled or manual.
Source Cooling	Recirculating heat exchanger with deionizer cools anode and housing; position up to 7.6 m (25 ft) from system.
Coolant	Deionized water.
Safety Interlocks	High voltage, coolant flow rate and vacuum sensors.

10–210 Electron Gun (SAM Option)

Source	LaB6 cathode; field replaceable.
Vacuum Compatibility	UHV, bakeable to 200°C.
Lenses	Electrostatic lenses with four externally adjustable apertures.
Magnification	To 500,000X; continuously variable. (The system will not produce a sharp image at this magnification, but the scanning system can raster the electron beam over this small an area.)
Minimum Magnification (Nominal)	54X at 2 kV; 136X at 5 kV; 273X at 10 kV.
Accelerating Voltage	0.5 to 10 kV, variable in 0.1 kV steps.
Beam Alignment/Stigmation	Via electrostatic deflection and mechanical adjustment.
†Maximum Beam Current	$\geq$10 μA at 10 kV accelerating voltage.
Working Distance	2.85 cm sample to objective lens.
Gun Control	Computer control of all gun parameters via menus; automatic tracking of deflection voltages, stigmator voltages and lens voltages.
Image Registration	Automatic image tracking for correction of thermal and electronic drift. Accurate to within two beam diameters.

10–110 Electron Gun (TFA Option)

Source	W cathode.
Vacuum Compatibility	UHV, bakeable 200°C.
Lenses	Electrostatic condenser lens and electrostatic objective lens.
Accelerating Voltage	0.5 to 8 kV, variable in 0.1 kV steps.
Beam Alignment	Via electrostatic deflection.
†Maximum Beam Current	$\geq$10 μA at 8 kV accelerating voltage.
Working Distance	2.85 cm sample to objective lens.
Gun Control	Computer control of all gun parameters via menus.

Electron Beam Scanning System (SAM Option)

Control	Dedicated microprocessor for scanning and video signal control, operating under central host computer control.
Image Shift	±150 μm in all modes.
Scanning Rate	From 0.2 sec./frame at 512 x 512 pixels to 50 sec./frame at 2048 x 2048 pixels within the SEM menus.
Video Signals	Auger electron, secondary electron detection (SED), and backscattered secondary electron (BSE).
Signal Processing	Video signals are digitized and stored in the monitor display memory. Automatic video offset and contrast with manual override, brightness, gamma and inverse image. See Software Specification on Image Processing.
Photo	High–resolution black–and–white output with automatic shutter and Polaroid_4 x 5 in. film back. Optional color photography. Optional 35 mm film back.
Photo Annotation	Photo number, beam voltage, micron size bar, original magnification, comments and date. Option for black background behind the annotation.
Display	Color video monitor with 512 x 512 pixel resolution. Black–and–white, pseudocolor or color composite imaging (where the intensity of each of the three primary colors is modulated up to 16 intensity levels).
Display Time	Display of 256 x 256 pixel Auger image from hard disk memory in $\leq$4 sec.

Electron Beam Scanning System (TFA Option)

Control	Microprocessor under central computer control.
Image Shift	±150 μm in all modes.
Scanning Rate	TV rate.
Video Signals	Secondary electron detection (SED) and backscattered secondary electron (BSE).
Signal Processing	Brightness and inverse image.
Display	Nine−inch video monitor with long−persistence phosphor.

XPS Scanning Control, Model 71−080

X−Y Field of View	≥2 mm
Minimum pixel step size	1 μm
Minimum images display time per frame	20 sec at 64 x 64 pixels

X−Ray Monochromator, Model 10−420 (Optional)

The X−ray monochromator is a 500−mm Rowland Circle quartz crystal monochromator, compatible with the test chamber and uses the Model 10−600 X−ray Source with an aluminum anode.

Crystals	Quartz (100) crystals on a toroidal substrate.
Alignment	Six degrees of freedom: X tilt, Y tilt, focus, X−ray source X and Y motions and tilt.
Electronics	X−ray controller is capable of continuous operation at 600 W on a single aluminum anode in Area Mode.
Energy Range	Variable, 4 to 15 kV; 14 kV for optimum performance.
Power	400 W (14 kV, 28.6 mA) recommended cont. power in spot mode. 600 W (15 kV, 40 mA) recommended cont. power in spot mode.
Source Cooling	Recirculating heat exchanger with deionizer cools anode and housing. Position up to 7.6 m (25 ft) from system.
Coolant	Deionized water.
Safety Interlocks	High voltage, coolant flow rate and vacuum sensors.
Anode and Filament Lifetime	Every 1000 hours at 400W.

04−303A Ion Beam Sputter Etching Gun/11−065 Control

Beam Voltage	Variable, up to 5 kV.
†Maximum Beam Current	>5 μA at 4 kV.
Beam Current Density	>600 μA/cm^2 at 4 kV; 1 nm/sec. sputter rate in SiO_2.
Minimum Beam Diameter	250 μm at 70 mm from gun.
Beam Deflection	
Mechanical	±4 mm in X, Y directions via integral port aligner.
Electrical	
Static	±0.5 mm in X and Y via two 10−turn potentiometers.
Raster	Independent X, Y rastering; maximum 10 mm x 10 mm centered on static beam position.
Source Type	Electron impact.
Gas	Argon (other noble gases available).
Gas Inlet	Leak valve (feedback−regulated thermal leak valve optional).
Typical Filament Lifetime	450 hours
Pressure Differential	≤5 x 10^{-8} Torr in test chamber while sputtering, with optional turbo pump and differential pumping; ≤5 x 10^{-7} Torr in test chamber while sputtering without differential pumping.
Faraday Cup	250 μm diameter aperture; measures ion current density.
Working Distance	70 mm.

Specimen–Handling System

The specimen–handling system consists of the specimen manipulator, specimen introduction attachment, and various stage modules and specimen holders.

Specimen Manipulator, Model 10–325

Sample Holder	Accepts models 260, 261 and 262, and models 190 and 190M, 191 and 191M, and Model 193 Faraday cup.
Y– and Z–axis Sample Translation	
Range	±1.25 cm.
Resolution	±25 μm.
X–axis Sample Translation	
Range	+1.0 to –2.5 cm.
Resolution	±15 μm.
Sample Tilt	
Range	±50°.
Resolution	±1°.
Manual Tilt Control (standard)	Model 176 Tilt Module.
Automatic Tilt Control (optional)	Model 170 Motorized Rotary Feedthrough with Model 71–205–7 Digital Motor Control operated by the computer system.
Manual Rotation (standard)	Model 198 Rotation Module allows access to any position on a 60 mm diameter specimen holder.
Zalar Rotation™ (optional)	Model 199 Module.
X–, Y– and Z–axis Motorization (optional)	Model 171E Scanning Module and Model 71–205–7 Digital Motor Control operated by the computer system.

Specimen Introduction Attachment, Model 07–763 or 07–863

Specimen Holder	Holds one model 260, 261, 262, 190, 190M, 191, or 191M Specimen Holder with attached specimen or one Model 193 Faraday cup.
Entry Mechanism	
Model 07–763	Sliding elastimer introduction rod.
Model 07–863	Magnetically coupled introduction rod.
Specimen Transfer	Holders are manually transferred to Model 10–325 Specimen Manipulator.
Introduction Time	Less than three minutes from air to analysis position for non–outgassing samples.
Valve Control	Manual or optional Automatic Valve Control.
Pumping	Air–cooled turbomolecular pump, 60 l/sec.; Backing pump, 1.5 m^3/hour.

Specimen Holders

Base Pressure	$<10^{-4}$ Pa (10^{-6}) Torr with turbomolecular pump.
Model 260	A 6 cm (2.36 in.) diameter platen which mounts a 5 cm (2 in.) diameter sample (or multiple samples). Stainless steel construction.
Model 261	A 6 cm (2.36 in.) diameter platen which has six recessed slots for powdered or bulk samples. Slot size is 1 x 2 x 0.5 cm (0.4 x 0.8 x 0.2 in.).
Model 262	A 6 cm (2.36 in). x 3.4 cm (1.34 in.) platen which mounts a 5 x 3 cm (2 x 1.2 in.) sample (or multiple smaller samples) for angular–dependent analysis. Stainless steel construction.
Model 190	A 2.5 cm (1.0 in.) diameter platen which mounts a 2.5 cm sample. Stainless steel construction.
Model 190M	A Model 190 Specimen Holder made of molybdenum. Used with the heating or cooling module.

Model 191	A 2.5 cm (1.0 in.) diameter platen which has a recessed slot for powdered or bulk samples. Slot size is 1 x 2 x 0.5 cm (0.4 x 0.8 x 0.2 in.). Stainless steel construction.
Model 191M	A Model 191 Specimen Holder made of molybdenum. Used with the heating or cooling module.
Model 193	A 2.5 cm (1.0 in.) diameter platen containing a Faraday cup which connects to the ion feedthrough on the Model 10–325 Specimen Manipulator. Aperture size is 0.254 mm (0.010 in.) diameter.

Note: Specimen holders are supplied with every system. The number and type depend upon the options selected.

Eight–Sample Module (Optional)

Specimen Capacity	Holds up to eight single–sample specimen mounts in a carousel. Accepts models 190, 190M, 191, 191M and 193 Faraday Cup.
Range	Two rotations per sample advance; 360° continuous.
Manual Control (standard)	Rotary feedthrough module.
Automatic Control (optional)	Model 172 Motorized Rotary Feedthrough with Model 71–205–7 Digital Motor Control run from computer system.
Electrical Connections	Two BNC connectors provided for target and ion current. A 10–pin feedthrough is provided with six pins wired for the sample heater.

Cooling Module (Optional):

(Model 196 Single–Specimen Holder and Model 198 Eight–Specimen Holder Modules)

Cooling	Internal thermal conductor connected to Model 6, External Cryogenic Dewar.
Compatibility	Attaches to Model 10–325 Specimen Manipulator. Cools specimen holder at analysis position.
Temperatures	Ambient to < –100°C with Model 190M or Model 191M Specimen Holder.

Single–Mount Heating Module and Control, Model 175 (Optional)

Temperature Range	Ambient to 600°C.
Temperature Stability	±1°C.
Electrical Connections	Heater (2), Thermocouple (2).

Vacuum Transfer Vessel, Model 04–110 (Optional)

Specimen Holder	Holds one model 190, 190M, 191 or 191M Specimen Holder with attached specimens.
Vacuum Vessel Seal	O–ring sealed platform.
Open/Close Control	Top knob; 16 turns CCW lowers platform.
Introduction	Vacuum vessel seals onto Model 07–763 or 07–863 Specimen Introduction Attachment hatch opening.
Entry Mechanism/Specimen Transfer	Vacuum vessel platform opens inside specimen introduction chamber, and specimen transfers to fork.
Vessel Pumping (optional)	Miniature CF flange 1.91 cm (0.75 in.) OD with port for mounting 2 l/sec. ion pump.

Sample Fracture Attachment, Model 04–535 (Optional)

Must be used with Model 04–745 Linear Transport.

Sample Mounts	Special fracture mount accepts notched, cylindrical sample.
Fracture Mode	Plunger–actuated lever for shear fracture.

Analysis Chamber (Refer to chamber drawing)

Type	Stainless steel; copper gaskets; magnetic shielding (optional).
Type	60 l/sec., air–cooled turbomolecular pump.
Range	Ambient to 10^{-3} Pa (10^{-5} Torr).
Gauging	Thermocouple gauge in introduction chamber.
UHV Pumping	
Type	220 l/sec. differential ion pump with Ti sublimator.
Range	10^{-3} to 10^{-8} Pa (10^{-5} to 10^{-10} Torr).
Gauging	Nude thermionic ionization gauge in analysis chamber.
†Guaranteed Base Pressure	6.7×10^{-8} Pa (5×10^{-10} Torr) following bakeout and using Ti sublimator.
Vacuum Interlock	Electrical power to analysis electronics disabled when preset vacuum level is reached (set point is adjustable).
System Bakeout	Analysis chamber and installed optics bakeable.
Ovens	Heating elements integral to vacuum console and ion pump; fabric shroud for analysis chamber.
Temperature	Greater than 100°C but less than 200°C (les. than 150°C with optional monochromator).
Control	Automatic bakeout timer.

Console Configurations

The standard integrated console has the vacuum chamber, system electronics and computer on one platform. The optional vibration–isolation console has separate vacuum and electronics consoles.

Environmental Requirements

Magnetic Fields	Less than 0.3 μT (3 mG) peak–to–peak, alternating field. Less than 1 G static field.
Relative Humidity	Less than 70%.
Temperature	20 ± 5°C
Heat Dissipation	3000 W under typical operating conditions. 8800 W additional heat during system bakeout.
Vibration	Not to exceed 10 μm at 0.1 – 60 Hz.

Utility Requirements

Electrical	200–240 V AC single–phase, 50–60 Hz, 50 A (to be hard–wired to separate 60 A branch circuit by customer).
Dry Nitrogen	0.279 kg/cm^2 (4 PSI) maximum.
Compressed Air	5.6 to 7.0 kg/cm^2 at 0.17 m^3/hr (80 to 100 PSIG at 0.1 CFM), pressure–regulated for vibration–isolated console and Automatic Valve Control options only.
Liquid Nitrogen	2 l/hour for cryopanel (optional).

Code Compliance

The 5600 system is packaged in consideration of:

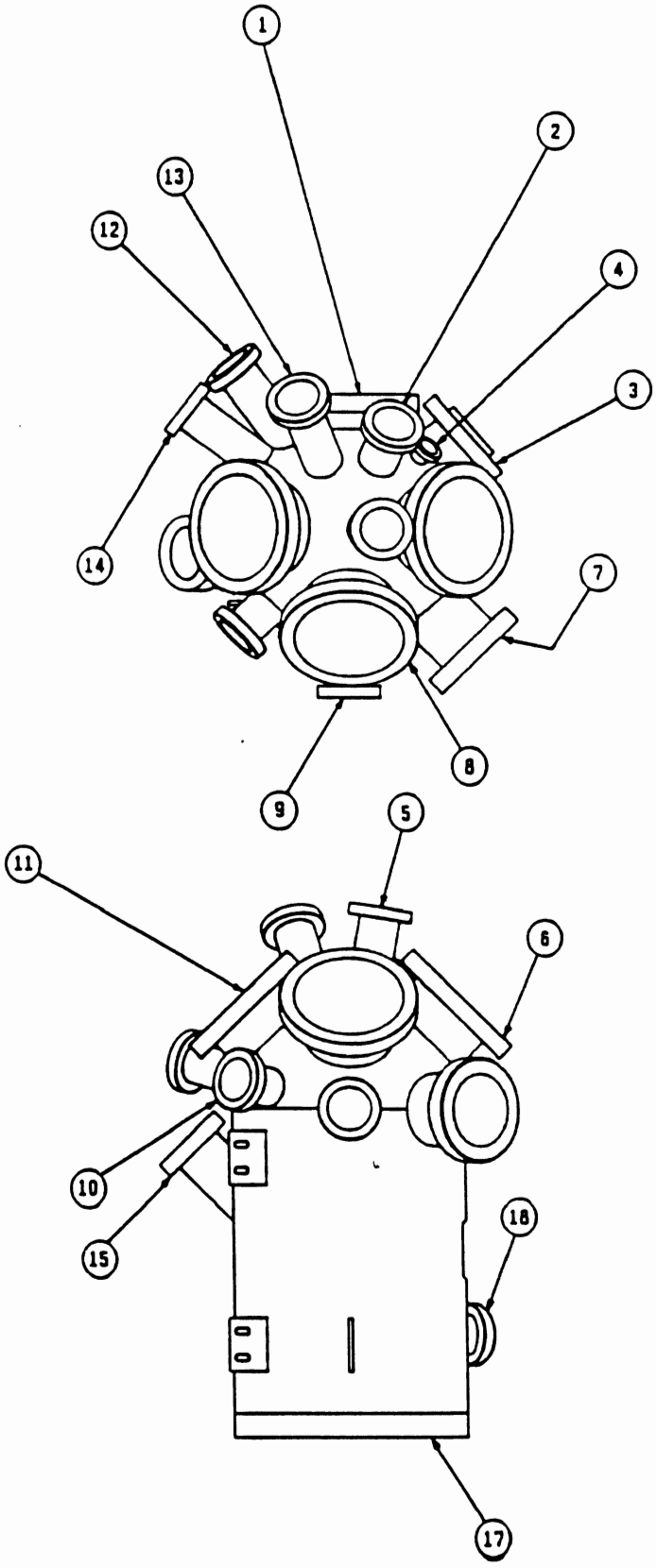
UL 1262 Standard for Laboratory Equipment
IBM Location Manufacturing Standard L M S 0–7001–000 1981–08
IBM Nonproduct Equipment Design Standard C–B3–0502–202–198305
VDE, CSA, FCC

Shipping and Installation

Shipping Weight	Approximately 2000 kg (4400lbs) varies with options.
Shipping Volume	Approximately 14.2 m^3 (500 ft^3).
Laboratory Entrance	System will pass through a 91.4 cm (36 in.) door.

Port Assignment Chart
Model 41 Series Belljars

Port No.	Flange OD	Flange to Centerline Length	Options
1	6.0"	7.4"	10–325 Manipulator
2	2.75"	7.68"	Microscope
3	4.5"	7.0"	Viewing Port
4	1.33"	5.8"	Light Source
5	2.75"	9.0"	04–548 X–ray Source
6	6.0"	6.95"	Monochromator or SIMS
7	4.5"	8.0"	07–763 or 08–763 Intro
8	6.0"	6.95"	e–Gun, SIMS
9	2.75"	7.5"	Neutralizer, Reaction Chamber
			or Fracture
10	2.75"	7.0"	UPS or Neutralizer
11	6.0"	6.75"	10–360 SCA
12	2.75"	9.0"	Neutralizer or SED
13	2.75"	9.8"	Ion Gun
14	2.75"	9.0"	Neutralizer or SED
15	3.38"	9.9"	SCA Pumping
16	2.75"	5.5"	Blank
17	10.00"	N/A	Pumping Port
18	2.75"	7.0"	LN_2 Dewar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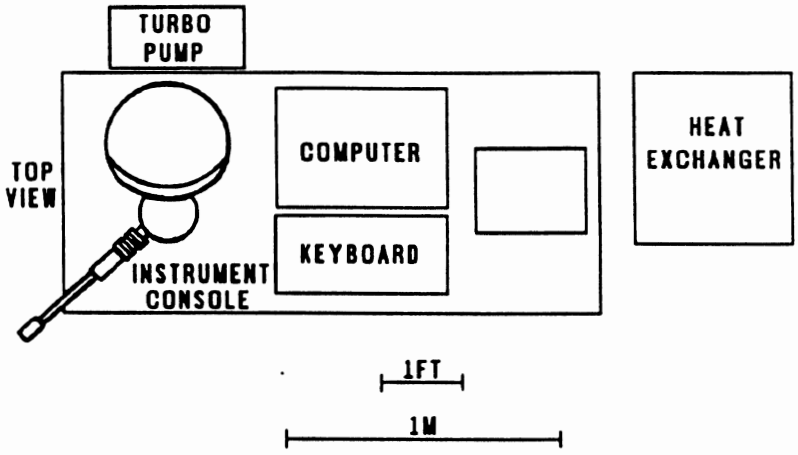
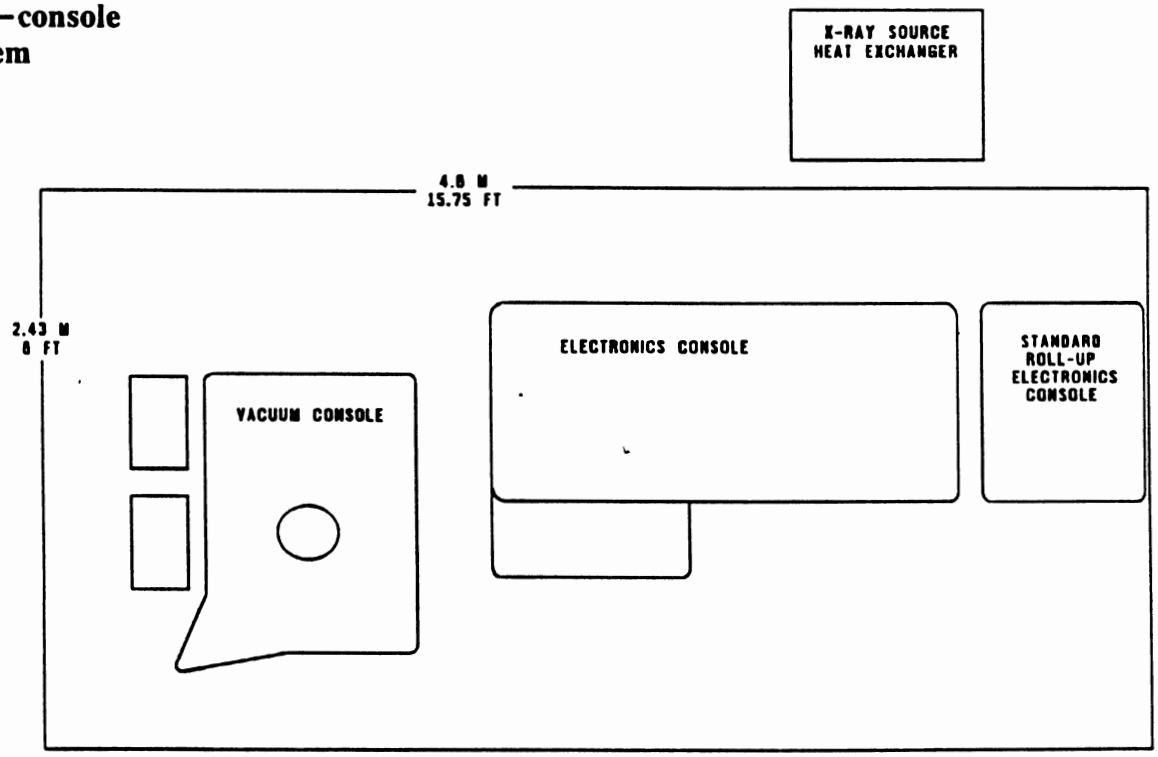
Floor space requirements:

One–console system



Two–console system



Model 41 Series Test Chambers

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Specification Sheet Part No. 615163 Rev. B