MultiMode Facilities Requirements

Facility site requirements, safety requirements, and configuration options are detailed for the MultiMode™ Scanning Probe Microscope (SPM). Compliance with the following specifications is essential to successful and safe installation. This support note includes:

Document Revision History: Support Note 311

Rev.	Date	Sections	Ref. DCR	Approval
D	01/19/2011	Re-branded		R.Wishengrad
C	10/16/08	Overall Update	N/A	D. Paszkeicz
B	7/18/03	Overall Update	N/A	L. Burrows
A	3/20/01	Preliminary Release	0396	A. Rice

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311.1 MultiMode SPM Configuration Options

The essential components of a MultiMode SPM system are: the SPM, its controller, and a computer with dual monitors. A MultiMode SPM system has no third-party essential components. Optionally, a MultiMode SPM can be housed inside an acoustic hood or placed on an isolation tripod.

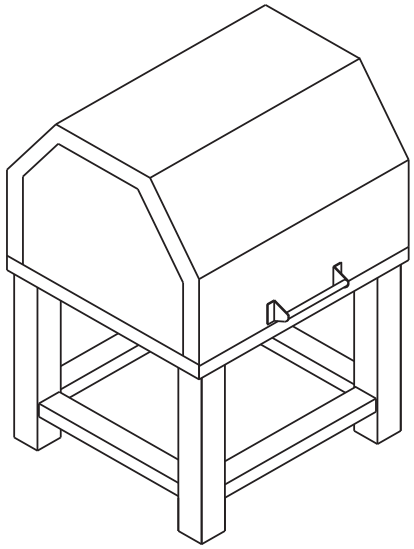
The following are typical configurations for the MultiMode SPM system. This Support Note details options for acoustic and mechanical vibration isolation, as well as various options for positioning the control station (computer, control electronics and accessories). Facilities requirements depend on what type of configuration is used.

311.1.1 VT-103-MM-3 Air Table and Acoustic Hood

The VT-103-MM-3 is only used with the MultiMode. The VT-103-MM-3 is an integrated air table and acoustic hood for vibration isolation. The VT-103-MM-3 is comprised of an air table on which the MultiMode microscope rests (not shown) and an acoustic hood which can be raised to access the instrument, and lowered to seal the instrument during operation.

Note: The OMV optical microscope accessory for the MultiMode cannot be placed inside the VT-103-MM-3 hood. It must be placed on an adjacent table.

Figure 311.1a VT-103-MM-3VT-103-MM-3



VT-103-MM-3 Dimensions

Note: Dimensions and weights are summarized in Section 311.2.

Figure 311.1b VT-103-MM-3 (Front View, Hood Closed)

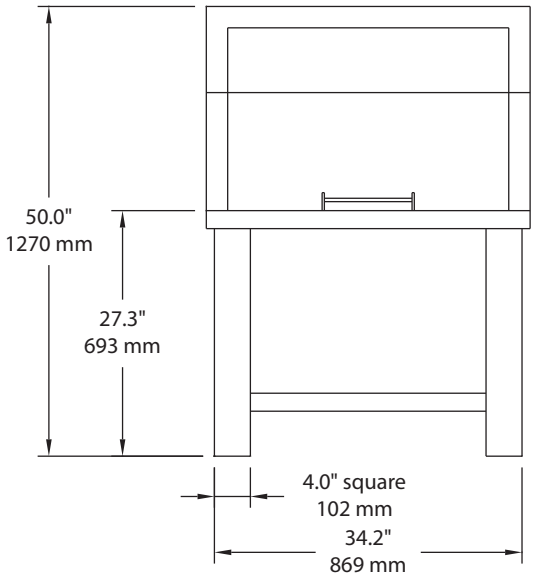


Figure 311.1c VT-103-MM-3 (Hood Open)

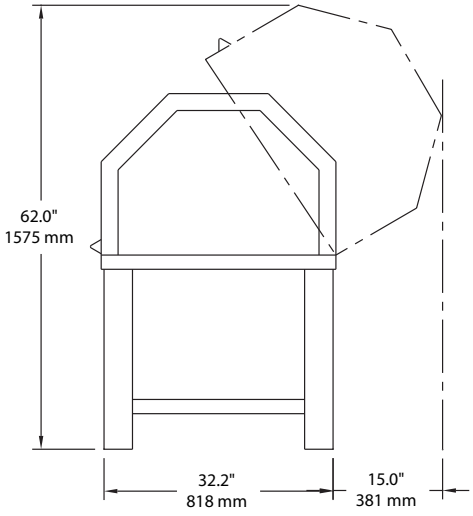
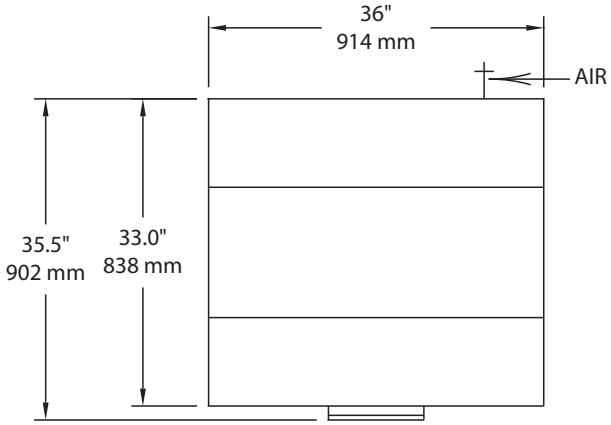


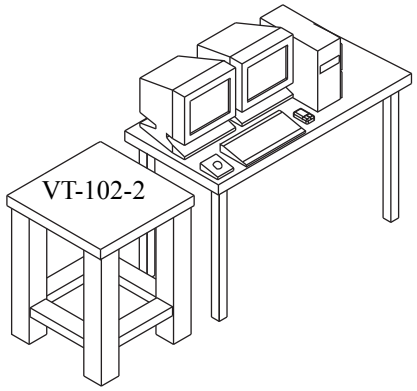
Figure 311.1d VT-103-MM-3 (Top View)



311.1.2 VT-102-2 Air Table

The VT-102-2 can be used with the MultiMode. This configuration consists of two basic elements: the VT-102-2 which is an air table for vibration isolation, and a typical “table top” version of the control station (computer, control electronics and accessories). The VT-102-2 is a compact air table on which the MultiMode microscope rests and does not include an acoustic hood. The OMV optical microscope accessory can be placed on the VT-102-2 table. Figure 311.1e illustrates the “table top” version of the control station in one of many possible configurations used to position the control station elements. This configuration includes the controller on the far right of the table; the tower computer placed next to it on the table top; and the monitors (2), keyboard, and mouse located on the far left. Alternatively, the controller and/or computer may be located on the floor or underneath the monitors to minimize footprint.

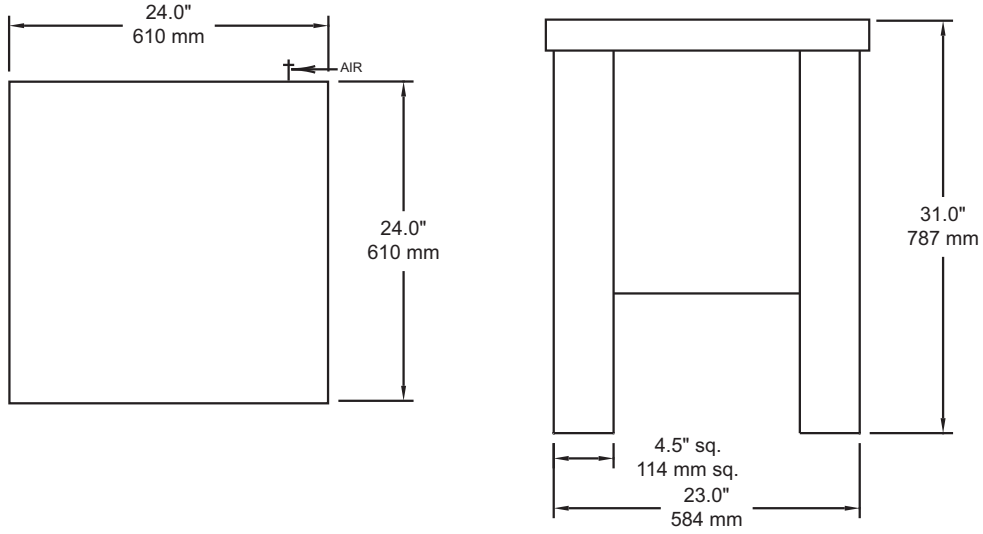
Figure 311.1e VT-102-2



VT-102-2 Dimensions and Utilities

The VT-102-2 vibration isolation table may be used with the MultiMode for selected applications that do not require acoustic isolation for the desired performance level. The table must be moved to its final location before Bruker personnel can install, and train on the SPM.

Figure 311.1f VT-102-2 Vibration Isolation Table



311.1.3 VT-50 Benchtop Vibration Isolation Platform

The VT-50, shown in Figure 311.1g, is a compact vibration isolation platform that offers high performance while not requiring air lines or electricity for operation. As a table-top platform, it offers the additional benefit of placing MultiMode at a convenient height on an existing table. Use of the VT-50 is recommended when a table is available that is highly rigid, adjacent to the workstation, and mechanically separated from the workstation desk. It is not recommended to place the VT-50 on the same desk that is also used for the workstation.

Note: The VT-50 is fully compatible with the OMV optical viewing system given the large dimensions of the isolation platform.

Figure 311.1g VT-50 Benchtop Vibration Isolation Platform

311.1.4 TRVI Vibration Isolation Platform

The TRVI, shown in Figure 311.1h, is a low cost, highly effective vibration isolation platform with fundamental frequency of oscillation of less than 1Hz in vertical, horizontal and rotational modes. It does not require air lines or electricity for operation.

Note: The TRVI is not compatible with the OMV optical viewing system due to inadequate space on the isolation platform.

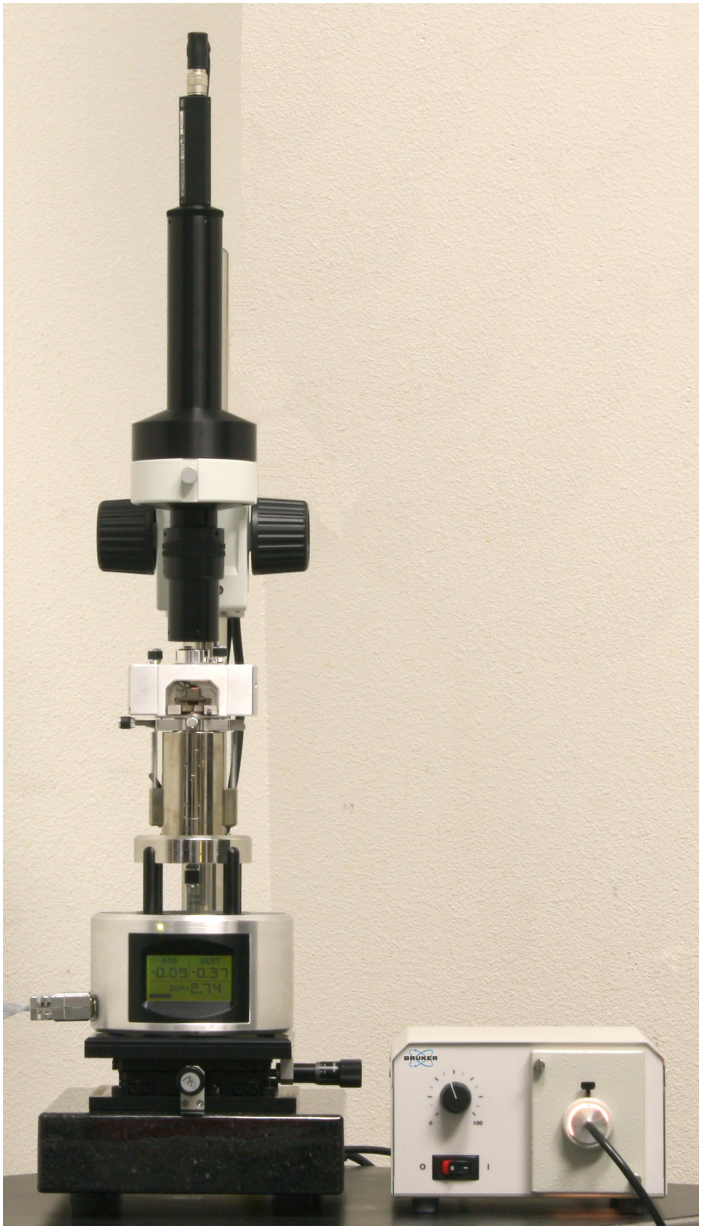
Figure 311.1h TRVI Vibration Isolation Platform

311.1.5 OMV Optical Viewing System

The OMV optical viewing system, shown in Figure 311.1i, is an aid for aligning MultiMode SPMs. The optical viewing system consists of a camera, which is mounted vertically over the head of the SPM to view both the sample surface and tip.

Note: The OMV is compatible with the VT-102-2 and VT-50 isolation platforms. It is incompatible with the VT-103-MM-3 and the TRVI isolation platforms due to space restrictions.

Figure 311.1i OMV Optical Viewing System



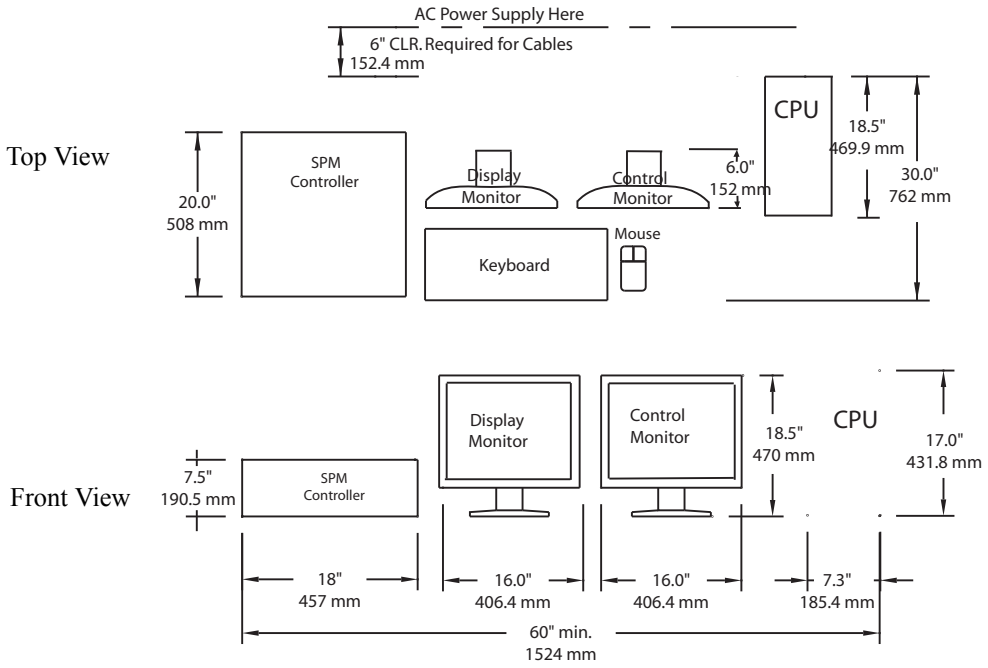
OMV Optical Viewing System Specifications

- Compatible with all TopView AFM, TipView STM and MultiMode configurations
- Allows optical imaging simultaneous with AFM, STM or MultiMode operation
- 10X Nikon objective (working distance = 49.5mm; numerical aperture 0.2; and resolution of 1.6-micron)
- 450X magnification on a 14-inch color display monitor
- Erect image (the optical image is not inverted horizontally or vertically)
- 12.7mm travel two-axis stage
- Total vertical range of over 400mm
- Stable, vibration-isolated granite base (additional isolation pad required beneath AFM, STM or MultiMode microscopes for atomic resolution)
- Sony high-resolution CCD color camera

311.1.6 Computer/Controller Facilities Requirements

Customer must supply a table or workstation on which to place the control system.

Figure 311.1j Table Top Setup



Weight: 170 lbs. nominal total; 140 typically on table top.

Note: Dimensions shown for computer and controller equipment are approximate and subject to change without notice.

311.2 Facilities Requirements Summary

Note: The following summary does not include computer/controller requirements.

Table 311.2a Isolation Table/Hood Facilities Requirements Summary

	MultiMode with VT-103-MM-3 Hood / Table	MultiMode with VT-102-2 Table	MultiMode with VT-50
Disconnect or Shutoff	None required	None required	None required
Clean Dry Air for Air Table	Requires user supplied air 60-80 PSI, 1 CFM2	Requires user supplied air 60-80 PSI, 1 CFM2	None required
Approximate Footprints	36" x 33"	23" x 23"	17” x 17”
Min. Door Width	36" minimum	26" minimum	Not applicable
Hood and Table Including SPM	1,000 pounds evenly distributed	650 pounds evenly distributed	85 pounds evenly distributed
Crated Dimensions/Weights of Hoods/ Tables	39" x 39" x 53" 960 pounds	28" x 42" x 37" 650 pounds	23" x 23" x 15" 110 pounds

Table 311.2b MultiMode Facilities Requirements Summary

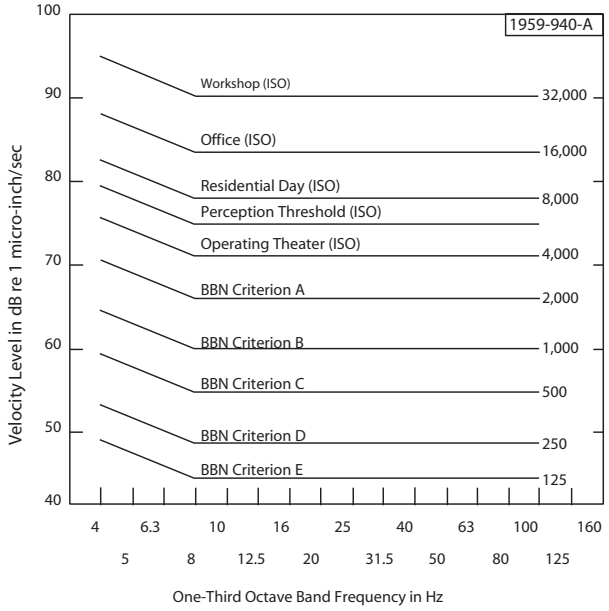
	MultiMode
Vacuum for Sample Holddown	None required
LAN Connection	None required but network support card included
Electrical	1,800W; single phase; 100V, 120V or 240V duplex outlet; dedicated circuit
Exhaust	None required
Environment / Noise	See Page 12
Crated MMAFM System Dimensions/ Weight	54" x 46" x 33" 250 pounds

311.3 Environmental Acoustic / Vibration Specifications

The following conditions must be met in order to guarantee published system specifications:

- Acoustic: Acoustic noise should not exceed 75dBC (Note “C” weighting).
- Vibration: Vibration of the SPM mounting surface should not exceed VC-D in any direction, vertical or horizontal.

Figure 311.3a Vibration Criteria Plot



BBN Criterion A - Probe Test Equipment. 100X Microscopes
BBN Criterion B - 500X Microscopes. Aligners, Steppers to 5µm Geometries
BBN Criterion C - 1000X Microscopes. Aligners, Steppers to 1.5µm Geometries
BBN Criterion D - Steppers, E-Beams to 0.3µm Geometries, CD Inspection Equipment. Most SEMs to 50,000X
BBN Criterion E - Anticipated Adequate for Future Fabrication and Test Equipment for Low Submicron Geometries

311.4 General Facilities Guidelines

The following list contains general facilities recommendations for the MultiMode system:

- Do not mount PA/Paging speakers near the AFM. If a speaker is required, use a local volume control instead.
- Keep the telephone ringer on low and install the telephone away from the AFM. Or, turn the telephone ringer off and install a flashing light as a substitute ringer.
- Do not install fluorescent lighting with switching ballasts (also referred to as electronic ballasts). Standard high efficiency ballasts are fine.
- Install baffling in the air ducts to reduce the hissing from the HVAC system or use non-powered HEPA filters. This type of filtering is called Class M7 or 245,000. An in-line fan is installed upstream to provide pressure for the HEPA filter. If installing locally powered HEPA fans, a local on/off switch is needed to turn the fans off while images are captured.
- Add insulation to all walls. If possible, all walls should be hard walls as opposed to temporary walls. Installing insulation in the ceiling helps to damper the acoustic noise from the roof.
- Temperature is standard laboratory setting +/- 2.5 F°.
- Humidity is standard laboratory setting +/- 10% RH.