ACTON RESEARCH CORPORATION

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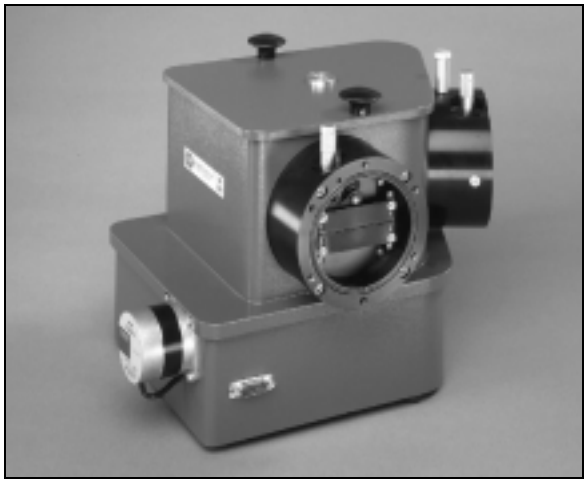
Operating Instructions
ARC Model VM-502
0.2 Meter Vacuum Monochromator



Rev. 997.V2

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SECTION I
GENERAL DESCRIPTION

1.1 Description:

The ARC Model VM-502 is a nominal 0.2 meter evacuable scanning monochromator, with an optimum wavelength range in the vacuum ultraviolet region. However, with other gratings and coatings, the instrument is useful from the extreme UV to the infrared.

The Model VM-502 is designed to use an aberration-corrected concave holographic grating, which provides and aperture ratio of f/4.5.

The Model VM-502 is set up as specified in the conventional "V" configuration (Model VM-502-V) in a straight through configuration (Model VM-502-S) or a combination of both (Model VM-502).

1.2 Specifications:

(specifications are with standard 1200 G/mm gratings unless otherwise noted)

Focal Length: nominal 0.2 meters

Optical System: aberration-corrected concave holographic grating

Aperture Ratio: nominal f/4.5

Reciprocal Linear Dispersion: nominally 4.0 nm/mm, with 1200 G/mm grating in the first order

Wavelength Range: mechanical scanning range is zero order to 546.1 nm, with a 1200 G/mm grating. Low wavelength limit is dependent upon light source and detector; typically less than 30 nm

Grating Coating: Standard coating is ARC #1200 VUV Aluminum and MgF2, with reflectance of 80% typical at 121.6 nm. Iridium coatings are optional for the extreme UV, and are supplied if specified

Grating Holder: The grating holder is kinematically mounted in the instrument, allowing gratings to be interchanged without requiring realignment. Each grating holder contains the classical grating adjustments for initial alignment of the grating to the instrument

Scanning Mechanism: A sine drive mechanism provides a linear wavelength change with the rotation of a precision lead screw. A Model SD2 controller is provided for scanning drive control using a computer (customer provided). The SD2 can also be controlled by an optional hand held scan controller.

Slits: Standard fixed width slits 1cm high are supplied to customer's specified width. If specified, bilateral slits are supplied and are adjustable from 5 micrometers to 3 millimeters. A precision micrometer provides for slit adjustment under vacuum conditions, and is graduated in 10 micrometer increments. The slit height is adjustable from 0 to 20 mm

Movable Diverter Mirror (optional): A movable diverter mirror is provided to divert the beam from the V slit position to the straight through position. A knob in the instrument cover allows the mirror to be moved under vacuum conditions

Slit Chamber Isolation Valve (optional): Vacuum valves are provided to isolate the slit chambers form the main instrument chamber. Ports (1/8 NPT) are provided in the slit chambers for gauge and roughing accessories

Air Inlet Valve (optional): An air inlet valve is located in the instrument housing to vent the instrument to atmospheric pressure

SECTION II
INSTALLATION

2.1 General Description:

The instrument is shipped completely assembled, tested and ready for immediate installation. If the instrument is to be stored before use, contact ARC for storage instructions.

For shipping purposes, some optical components are covered, and mechanical components are tied or placed in specific positions. The following procedure is recommended to prepare the instrument for use.

2.2 SD2 Connections:

Locate the SD2 controller, two interconnecting cables, a power supply and power cable. Connect the cable with the 15 pin connectors to the VM-502 and SD2. Assure the switch on the power supply is OFF and connect it to the SD2. Connect the power supply to a proper power source.

If the SD2 is to be controlled from a customer supplied computer, use the remaining cable to connect the SD2 to the computer. If the SD2 is to be controlled by a hand held controller, connect the cable supplied with the hand held controller to the SD2.

Refer to the section labeled SD2 for operation.

2.3 Removal of Protective Cover and Shipping Ties:

To remove the protective cover on the optical component and the shipping tie, the instrument must be vented and the cover removed. This should be done only by personnel familiar with optical surfaces and instrumentation.

1. Locate the air inlet valve in the instrument housing. Remove the protective cap. Connect the air inlet valve to a dry nitrogen tank if possible. Open air inlet valve slowly by rotating the handle until it is in line with the valve body.

2. Remove the instrument cover by rotating the two cover knobs until they are loose, and lift off the cover.

3. If the instrument is equipped with a movable diverter mirror, it is held in position with rubber bands for shipment. Locate the rubber bands holding the movable diverter mirror in position; cut and remove these rubber bands.

A protective cover is attached to the grating mask with rubber bands. Assure that all rubber bands are removed from the chamber. Remove the shipping cover.
NOTE: Save this cover to protect the grating if interchanging gratings.

CAUTION: THE OPTICAL SURFACE IS NOW EXPOSED--DO NOT TOUCH, TALK, OR BREATHE OVER THE OPTICAL SURFACES!

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4. Replace the instrument cover after checking the o-ring and mating surface for cleanliness.

NOTE: If the instrument is provided with a movable diverter mirror, assure the diverter mirror knob on the cover aligns with the diverter mirror; refer to Section 3.8

5. Close the air inlet valve by rotating the handle 90° to valve body.

2.4 Pumping System Mounting:

The instrument is now ready for mounting to a pumping system. A pictorial drawing at the end of the instruction manual specifies the location and dimensions of a pumping port located in the instrument base. The instrument may be supported by the pumping port or the three pads provided.

CAUTION: DO NOT APPLY EXCESS PRESSURE BETWEEN THE PUMPING PORT AND THE THREE PADS PROVIDED ON THE BASE OF THE INSTRUMENT!

SECTION III
OPERATION

3.1 Fixed Width Slit Assemblies:

Slit apertures 1cm high and with a fixed width are provided. The width of each slit is marked on each fixed slit assembly. The fixed slit assemblies are removable from the slit housing and are precisely aligned to a master slit for each interchange and precise alignment.

3.2 Bilateral Slit Assemblies: (optional)

1. Slit Width: The slit width of each bilateral slit assembly is adjustable from 0.005 millimeters to 3 millimeters (5 to 3,000 micrometers) by a micrometer knob located on the slit housing. The micrometer knob is graduated in 0.01 millimeter (10 micrometer) increments.

One counterclockwise revolution of the micrometer knob increases the slit width 0.25 millimeters (250 micrometers). For maximum reproducibility, the slit width should be set in a counterclockwise direction (increasing slit widths) each time it is changed.

The micrometer knob should not be rotated below a reading 0.00 or above a reading of 3.00. A micrometer setting of less than 0.005 millimeters (5 micrometers) cannot be used, because a stop is provided to prevent the slit jaws from touching each other.

2. Slit Height: The slit height is controlled by a pair of horizontal baffles located in the slit housing, and must be set up prior to mounting a pair of graduated blocks, located in the slit housing. The graduations on the blocks are 1mm apart, with the center graduation being the widest. To adjust the baffles, loosen the screws at each end of the

horizontal baffles, loosen the screws at each end of the horizontal baffle and set the baffles to 1/2 the total desired slit height above and below the center graduation.

NOTE: In most optical systems, resolution deteriorates with increasing slit height; therefore if maximum resolution is required, slits of one to four millimeters should be used.

3.3 Grating and Holder Assembly:

The grating holder assembly is kinematically mounted onto a rotary table in the instrument vacuum chamber. Therefore after initial alignment, the assembly can be removed and replaced without alignment.

To remove the grating holder assembly from the instrument, the following procedure is recommended:

1. Assure that the instrument is at atmospheric pressure.
2. Remove the instrument cover by rotating the two cover knobs counterclockwise until the screws are loose. Remove the cover.

CAUTION: THE GRATING IS NOW EXPOSED--DO NOT TOUCH, TALK, OR BREATHE ON THE GRATING!

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3. Place the shipping grating cover supplied over the face of the grating. Loosen the one 8-32 clamp screw in the base of the grating assembly and remove the complete grating holder assembly.

Reverse the procedure when reinstalling the grating assembly.

NOTE: To assure proper positioning, assure that the grating assembly is properly seated before tightening the 8-32 clamp screw. The clamp screw should be tightened the same torque to assure proper positioning.

CAUTION: If instrument is equipped with a flip diverter mirror, assure mirror and control knob in cover are in proper position before replacing the instrument cover. Refer to Section 3.8.

3.4 Air Inlet Valve: (optional)

An air inlet valve is supplied to bring the main instrument chamber to atmospheric pressure, and is located in the instrument housing. The valve is open when the handle is in line with the valve body, and closed when the handle is at 90° to the valve body.

CAUTION: Assure vacuum system is in proper mode before opening air inlet valve!

3.5 Movable Diverter Mirror: (optional)

A movable diverter mirror diverts the beam from the “V” slit position to the straight through slit position. A knob on the instrument cover indexes the mirror to either the “S” or “V” position. The “V” position, positions the mirror out of the beam, and the “S” position diverts the beam to the straight through slit position. To change the mirror position, gently rotate the knob to the desired “S” or “V” position; a click will be heard and felt when the mirror indexes into position.

NOTE: When the instrument cover is replaced, assure that the diverter mirror and control knob are set to the same “S” or “V” position for proper engagement of mirror and knob control arm.

3.6 Slit Chamber Isolation Valves: (optional)

Vacuum valves are located in the slit housing to isolate the slit chamber from the main instrument chamber. A valve control knob is located on the top of each slit housing. The valve is open when the knob is in line with the optical beam and closed when the knob is in line with the silver dot on the slit housing. (approximately 80° to the beam).

CAUTION: Never vent the main instrument chamber with the slit chamber isolation valves closed. Never open the slit chamber isolation valve with the main instrument chamber under vacuum and the slit chambers at atmospheric pressure. When the main instrument chamber is under vacuum, the slit chambers must be evacuated to 200 Torr or less before the slit chamber isolation valves can be opened.

3.7 Slit Chamber Air Inlet Valves: (optional)

An air inlet valve is supplied to bring the slit chamber to atmospheric pressure and is located on the side of the slit housing. The valve is open when the handle is in line with the valve body, and closed when the handle is 90° to the valve body.

CAUTION: Assure isolation valve is closed before opening slit chamber air inlet valve!

3.8 Slit Chamber Roughing Valves: (optional)

A slit chamber roughing valve is supplied for connection to an auxiliary mechanical pump for rough pumping of the slit chamber. The valve is open when the handle is in line with the valve body, and closed when the handle is 90° to the valve body.

CAUTION: Assure isolation valve and air inlet valve are closed before opening roughing valve!

SECTION IV
CARE OF THE INSTRUMENT

4.1 Main Chamber: (Instrument)

The main chamber should be kept sealed at all times, and under vacuum if possible. Only vacuum compatible material should be exposed to the vacuum of the instrument. When operating the instrument in the vacuum ultraviolet region, the vacuum should be better than 5×10^{-4} Torr.

4.2 Bilateral Slits:

The knife edges that form the slit aperture are mounted on Ball Slides and therefore require no lubrication. Nothing should contact the slit jaws directly; the slides are spring-loaded to prevent damage, thus their positions can be changed if they are contacted directly.

4.3 Scanning Mechanism:

The precision drive screw is located in the instrument base and should be lubricated every 6 months with the oil supplied.

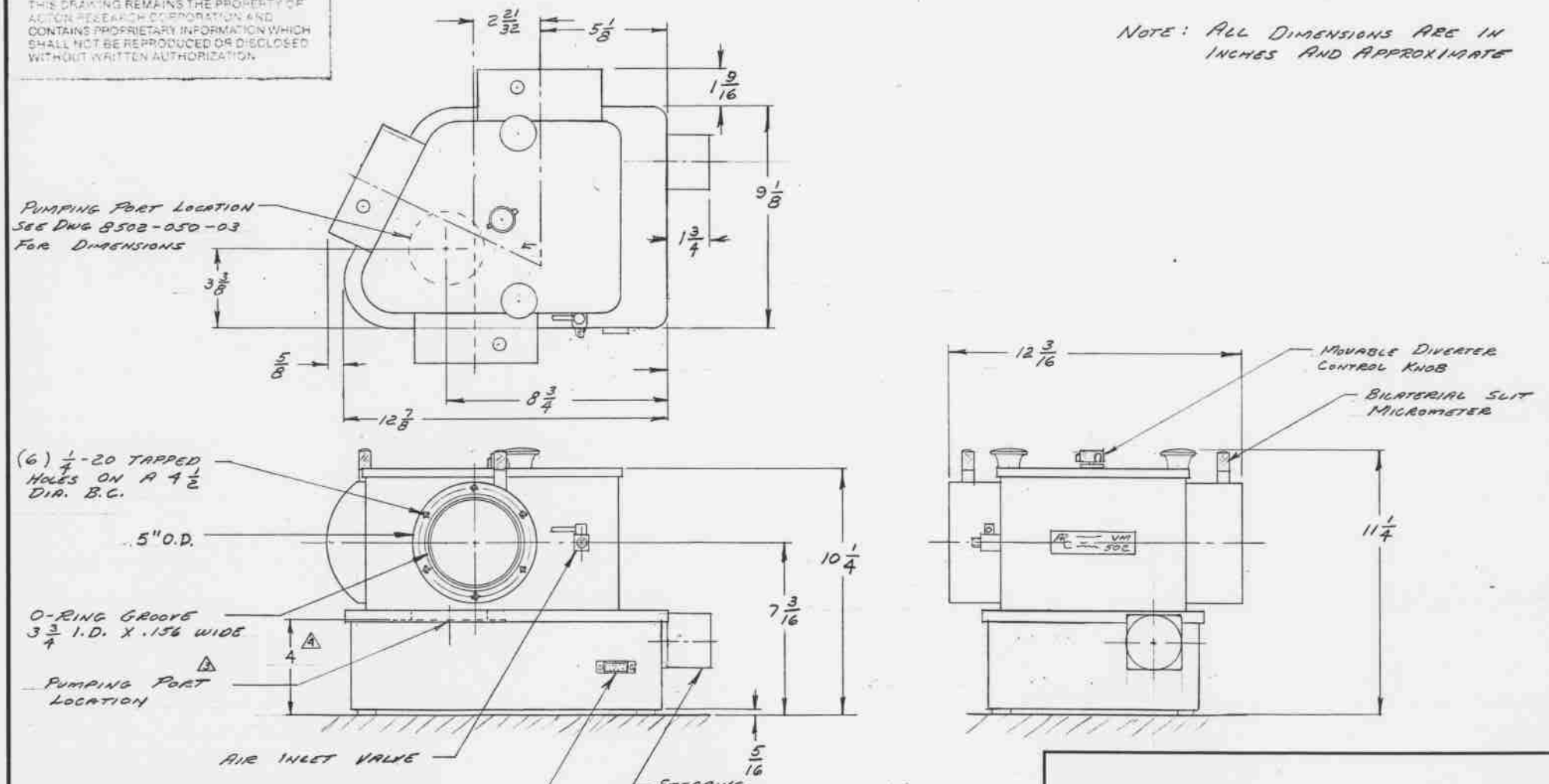
4.4 Optical Surfaces:

The optical surfaces are extremely delicate and can be permanently damaged by mechanical contact with anything. Do not touch, talk or breathe over the optical surfaces. After long periods of use the optical surfaces become contaminated and therefore have a drastically reduced efficiency. ARC can generally re-coat the optical components and obtain their original efficiency, depending of course on the condition of the surfaces. Please contact ARC directly if you believe the optical surfaces are contaminated or damaged.

SECTION V
DRAWINGS AND SCHEMATICS

THIS DRAWING REMAINS THE PROPERTY OF ACTON RESEARCH CORPORATION AND CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR DISCLOSED WITHOUT WRITTEN AUTHORIZATION.

NOTE: ALL DIMENSIONS ARE IN INCHES AND APPROXIMATE



REV	DESCRIPTION	DATE
5	DELETED SIN DRIVE; NOW 748 RF	5-20-97
4	ADDED DIMENSION 1" #16388 KRA	4-1-93
3	ADDED NOTE	5/27/81
2	CHANGE SWITCH & LIGHT LOCATION	9/28/79
1	ADDED PUMPING PORT LOCATION	12/28/78

SCALE: ~	APPROVED BY	DRAWN BY BKF
DATE: 11/1/78		

ACTON RESEARCH CORPORATION — BOX 215 ACTON MA 01720

VM 502 PICTORIAL — DRAWING NUMBER 8502-050-02

REV. 5

CHARRETTE PRO-FORM 930PF PRINTED ON 920H CHARPRINT VELLUM

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REV.	DESCRIPTION	DATE
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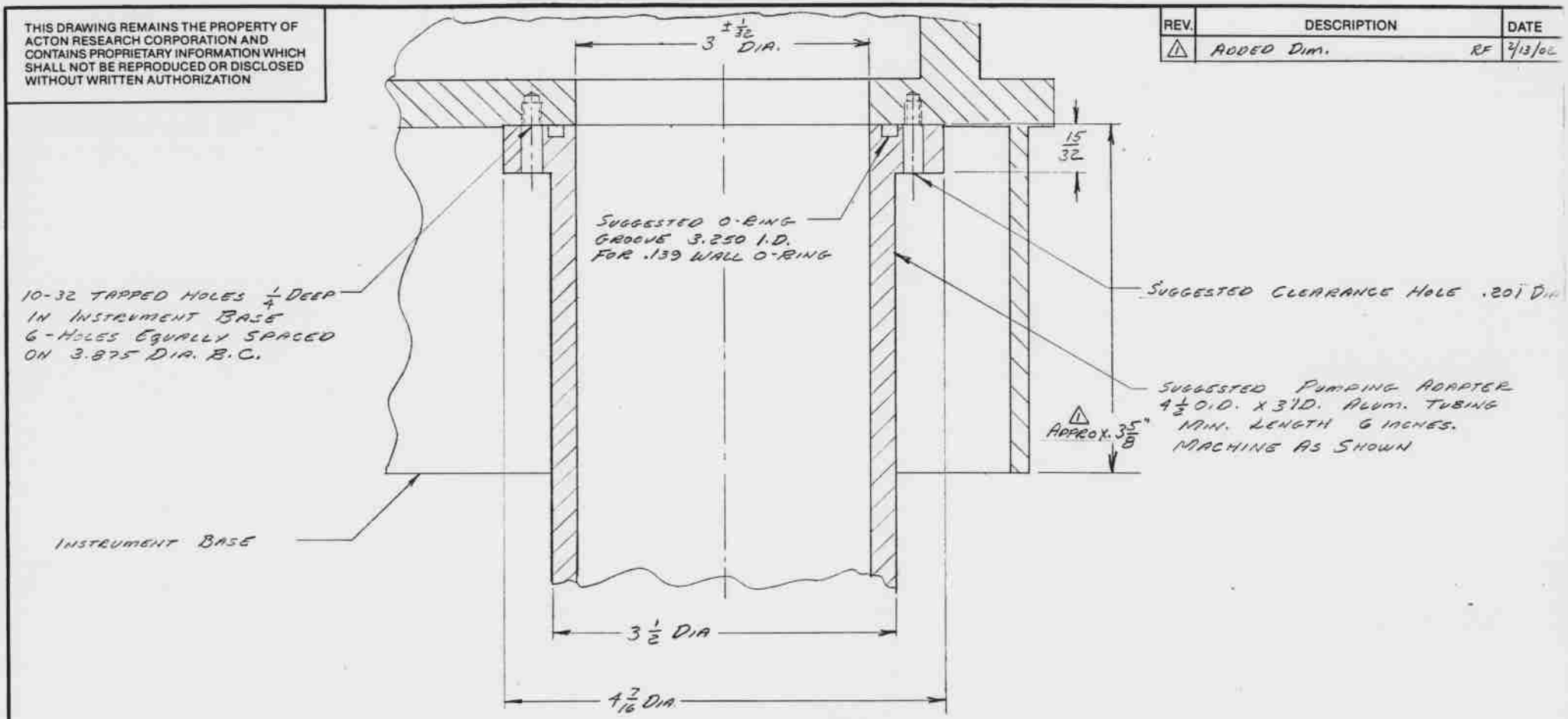
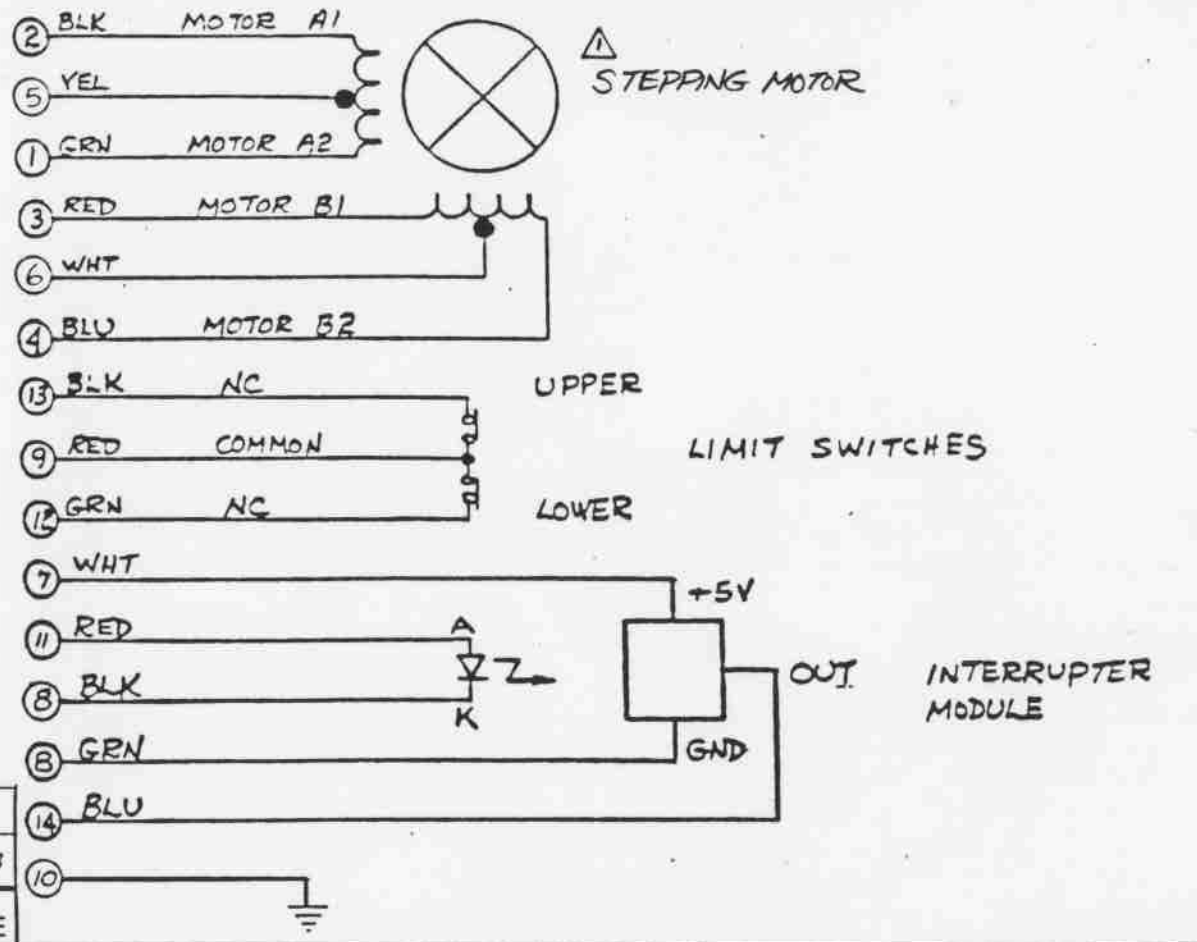


UNLESS OTHERWISE SPECIFIED	MATERIAL ~	FINISH ~
DIMENSIONS ARE IN INCHES TOLERANCE ON FRACTIONS ± 1/64 DECIMALS .xx ± .010 .xxx ± .005 ANGLES ± 15 MIN MACH. SURFACE 32 MAX. REMOVE ALL BURRS & BREAK SHARP EDGES .010R. MAX.	SCALE: ~	DRAWN BY ROF
	DATE: 12/19/78 NEXT ASS'Y	QTY ~
	ACTON RESEARCH CORPORATION	BOX 215/525 MAIN ST. ACTON, MA 01720
DWG. TITLE: PUMPING PORT SIZE	SIZE: B	DWG NO.: 8502-050-03 REV.: 1

THIS DRAW REMAINS THE PROPERTY OF ACTON RESEARCH CORPORATION AND CONTAINS PROPRIETARY INFORMATION WHICH SHALL NOT BE REPRODUCED OR DISCLOSED WITHOUT WRITTEN AUTHORIZATION

REV.	DESCRIPTION		DATE
1	WAS VEXTA # PH265M-31B	KRA	12-27-90
2	ADDED 507 1ST #14370 S/N 507124	KRA	12.20-91

NOTES:
1. COLORS ARE TYPICAL & FOR REFERENCE ONLY
2. NUMBERS REFER TO PIN #'S IN 15 PIN "D" TYPE CONNECTOR



REV.	DESCRIPTION		DATE
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UNLESS OTHERWISE SPECIFIED
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FRACTIONS ± 1/64 DECIMALS .xx ± .010 .xxx ± .005 ANGLES ± 15 MIN
MACH. SURFACE 32 MAX.
REMOVE ALL BURRS & BREAK SHARP EDGES .010R. MAX.

MATERIAL ~

FINISH ~

SCALE: ~ | 1ST #12714 | DRAWN BY KRA

DATE: 12-17-90 | NEXT ASS'Y | QTY 1

2 3

505

502

USED ON:

ACTON RESEARCH CORPORATION

BOX 215/525 MAIN ST.
ACTON, MA 01720

DWG. TITLE: SCHEMATIC

SIZE: A

DWG NO.: 8748-112-02

REV.: 3

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