



NEOS TECHNOLOGIES

A Gooch & Housego Company

OPERATING MANUAL

ACOUSTO OPTIC MODULATOR

MODEL NUMBER:

23110-.5

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SECTION I

INSPECTION PROCEDURE

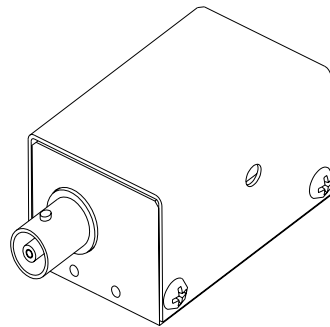
Examine the shipping carton for damage. If the shipping carton or packing material is damaged it should be kept for the carrier's inspection. Notify the carrier and NEOS Technologies. Check the contents of the shipment for completeness, mechanical damage, and then test the equipment electronically. Operating procedures are contained in Section VII. If the contents are incomplete, or the equipment does not pass the electrical testing please notify NEOS Technologies.

If there is any problem with the use of this equipment, or if the equipment fails to function as expected contact NEOS Technologies, do not try to trouble shoot or repair this equipment. Consult with a NEOS service engineer. If the equipment needs repair or replacement, contact NEOS Technologies, Inc for a Return Authorization Number.

SECTION II
DESCRIPTION
AO MODULATOR
23110-.5

The 23110-.5 modulator consist of a Tellurium Dioxide crystal with a Lithium Niobate transducer. The modulator assembly should be mounted on a fixture to provide sufficient adjustment to peak the modulator efficiency (Bragg angle, horizontal, and vertical position) and the lenses must be supplied to achieve the rise time. The 23110-.5 modulator can be purchased with a Bragg angle mount Model 72000.

The modulator can be driven with any good driver with a nominal 50 ohm output of 80 MHz, however, it is recommended that a NEOS driver be used to drive this modulator to achieve optimum performance. RF input should not exceed 1 watts CW. Be extremely careful not to focus the laser beam on the gold bond wires on the acoustic transducer, which may vaporize the bond wires. NEOS will not warranty any such damage. The modulator has been designed and verified to satisfy the specifications.

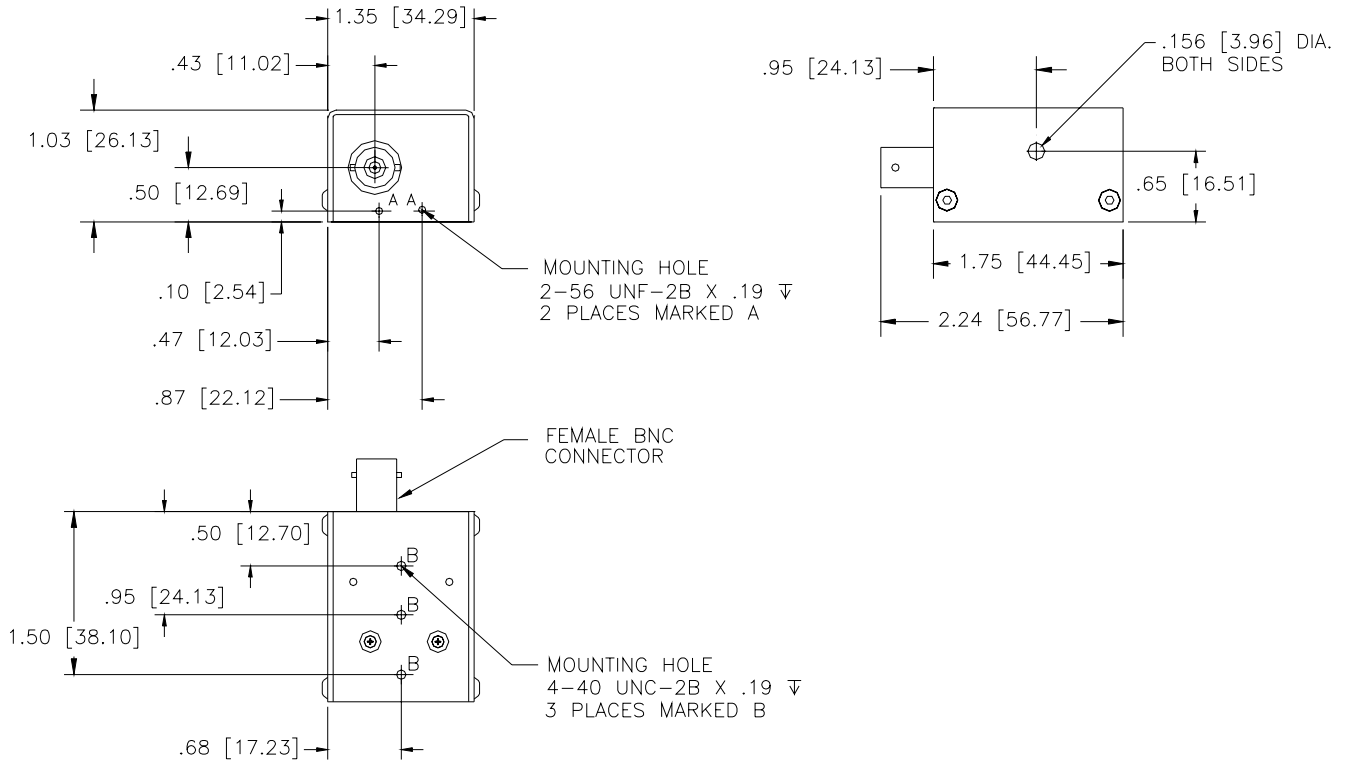


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SECTION III
SPECIFICATIONS
23110-.5

<u>PARAMETER</u>	<u>SPECIFICATION</u>
Interactive Material	TeO ₂
Acoustic Mode	Longitudinal
Operating Wavelength	440 –850 nm
Window Configuration	AR Coated
Static Transmission	> 95 %
Operating Frequency	110 MHz
Diffraction Efficiency	> 90 % @ 633 nm With Linear Polarization Perpendicular to Acoustic Propagation. or With Random Polarization.
Acoustic Aperture Size	0.5 mm
Rise Time	150 ns / mm beam diameter.
Deflection Angle	16.3 mrad @ 633 nm
RF Power Level	< 1 watt
Impedance	50 ohms
VSWR	< 1.2:1 @ 110 MHz
Package:	53B00504
Operating Manual: Use Latest Revision.	51A01512
Acceptance Test Procedure:	42A12059
Acceptance Test Results form:	52A01513
Recommended Drivers:	
Analog Driver System: 21110-1AS	Digital Driver System: 21110-1DS
Analog Driver Module: 21110-1AM	Digital Driver Module: 21110-1DM

SECTION IV
OUTLINE DRAWINGS
23110-5



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Dimensions are in inches
Dimensions in [] are in mm.

Tolerances: Decimal: .xx = .01 .xxx = .005
 Millimeter: .xx = .25mm .xxx = .127mm
Angle: = ± 30'

SECTION V CALCULATIONS

- The equations to determine the AOM rise time "t_r" are as follows:

First determine the waist size by the equation,
$$d_0 = \frac{4f\lambda}{\pi d_1}$$

Where: f = lens focal length in mm

λ = the optical wavelength in 10⁻⁶m

d₁ = the input optical beam diameter in mm

d₀ = the waist diameter inside the modulator in 10⁻⁶m

Knowing the waist size inside the modulator, then the modulator rise time can be calculated from the relationship:

$$t_r = \frac{1.3d_0}{2V}$$

Where: V = the acoustic velocity of the modulator material which is 4260 m/s

- The focal length of the lens is the F# of the lens times the input spot diameter:

$$F\# d_1 = f_{\text{lens}}$$

- The deflection angle " \varnothing_d " is defined as the acoustic drive frequency in megahertz times the wavelength, divided by the acoustic velocity of the material:

$$\varnothing_d = 2\theta_{\text{Bragg}} = \frac{f_a \lambda}{V} = \frac{110 \times 10^6 \lambda}{4260 \text{ m/s}}$$

Where: θ_{Bragg} = Bragg angle of the modulator.

SECTION VI.

OPERATING INSTRUCTIONS

Mount the modulator in the optical path with the laser beam passing through the device window centered on the window vertically and close to the transducer (connector end). The modulator is polarization sensitive and performs best with light linear polarized, oriented perpendicular to the acoustic propagation axis. Random polarization can be used but the diffraction efficiency will be reduced by 10 %. The modulator mount assembly must have sufficient adjustments to peak the modulator efficiency (Bragg angle, horizontal, and vertical position) and the lenses must be supplied to achieve the rise time. Be extremely careful not to focus the laser beam on the gold bond wires on the acoustic transducer, which may vaporize the bond wires. NEOS will not warranty any such damage.

Using a 50 ohm coaxial cable, connect the "RF out" of the driver to the modulator. Turn on the RF power. If using the NEOS driver system, be sure the mode switch is in the CW position. Make sure that the RF power does not exceed 1 watt CW. NEOS will not warranty any failure resulting from the application of too much RF power.

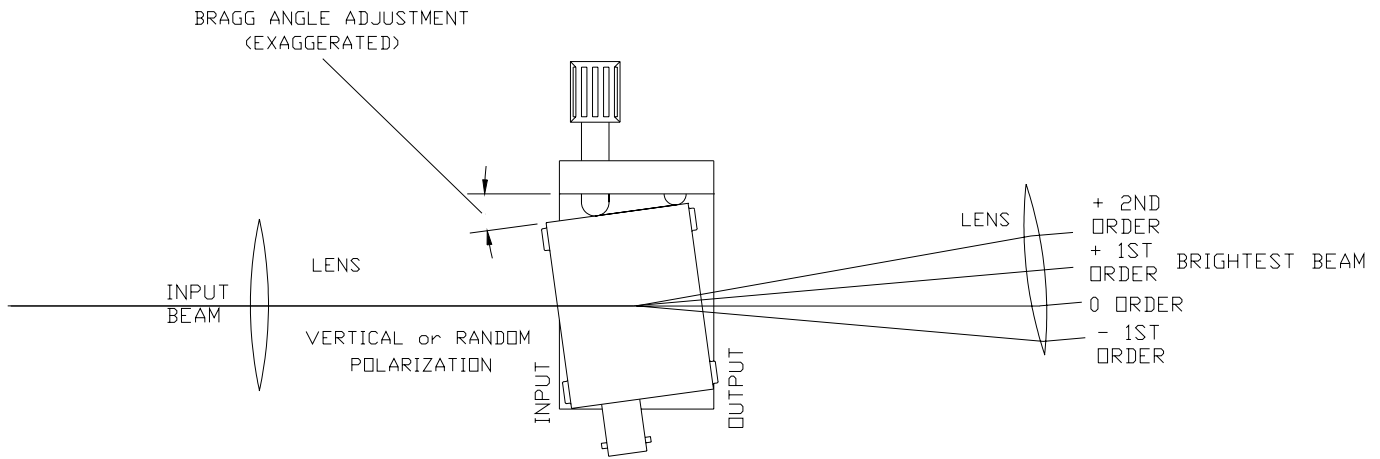
With the laser beam going through the optical crystal, and close to the transducer, adjust the Bragg angle, by rotating the modulator, to allow the diffracted first order beam away from the transducer (connector end), to be the most intense. See figure 3.

Install the input lens, one "f" away, and adjust the height of the modulator to achieve diffraction. Make changes in the Bragg adjustment screw to obtain optimum efficiency. Adjust, if necessary, the RF driver for power level to obtain maximum diffraction efficiency. If the driver and modulator are purchased together, the driver will be adjusted for optimum performance before shipment. Install the output lens, one "f" away, to re-collimate the output beam.

The modulator has been designed and verified to satisfy the specifications.

To operate the modulator use the first order diffracted beam with the driver mode switch set to normal. See the driver manual for other information.

Figure 3



AOM Bragg adjustment

SECTION VII.

OPTICAL CLEANING

Periodic cleaning of the AO device is a normal part of maintaining an optical system. When the device is installed in an optical system, make sure that there is access to allow removal of the protective cover and room to clean the device. If removal from the system is necessary, then follow the alignment procedure in this manual to reinstall, realign and, adjust the AO device.

To clean the AO device, remove the screws that hold the cover to the mount. Caution must be used when placing a screw driver near the window opening in the cover, as it is best to protect the opening with tape or cover the opening with your finger (without touching the crystal) to protect it. NEOS will not warrant any damage or scratches caused by inserting the screwdriver into the window opening.

- Remove the protective cover.
- Blow off any visible dust with canned air. Do not use an air gun unless it is filtered and water and oil free!
- Fold (4 times) a new lens tissue into a triangle to make a cleaning tool.
- Dip the tip of the lens tissue into fresh acetone or spray fresh acetone from a squeeze bottle onto it. Then shake excess fluid out of the lens tissue. Do not handle the wet area of the tissue, as your finger oil will be absorbed and contaminate the optical surface of the crystal.
- Wipe (only once) across the crystal in an even motion, starting near the transducer and drawing the tissue across the optical surface toward the other end. Do not damage the bond wires! Do not reuse the tissue as the mounting silver epoxy may be spread onto the window of the crystal.
- Repeat with a new tissue each time and for each surface that needs cleaning.
- Replace the protective cover and screws.
- Realign the device in your system and adjust the Bragg angle for maximum diffraction efficiency.

Notes:

- The lens tissue must be lint free and the best grade available.
- Only use each tissue once, for only one surface. Do not reuse the tissue, as it will redistribute the removed dust or mounting silver epoxy.
- The acetone must be electronic grade. The acetone must be fresh from a new bottle, as the acetone will absorb water from the air and cause streaks. Discard any acetone, which has been exposed to the air for more than 4 hours. If the bottle is half- empty, do not use.