**MODEL ASM SERIES**

**UV ACOUSTO-OPTIC MODULATOR**

- INTENSITY MODULATION
- PHOTOLITHOGRAPHY
- OPTICAL FREQUENCY SHIFTING
- LASER BEAM DEFLECTION
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMPERATURE STABILITY

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>ASM-851B8</th>
<th>ASM-702B8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical Wavelength Range</td>
<td>300 to 400 nm</td>
<td></td>
</tr>
<tr>
<td>Acousto-optic Material</td>
<td>UV Grade Fused Silica</td>
<td></td>
</tr>
<tr>
<td>Optical Insertion Loss</td>
<td>&lt;4 percent</td>
<td></td>
</tr>
<tr>
<td>Optical Polarization</td>
<td>Linear vertical</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>175 grams</td>
<td></td>
</tr>
<tr>
<td>RF Connector</td>
<td>SMA</td>
<td></td>
</tr>
<tr>
<td>Size (less connector)</td>
<td>2.80 L x 2.40 W x 0.70 H inches</td>
<td>71.2 L x 61.0 W x 17.8 H mm</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>50 ohms</td>
<td></td>
</tr>
<tr>
<td><strong>MODEL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center Frequency¹</td>
<td>85 MHz</td>
<td>70 MHz</td>
</tr>
<tr>
<td>Beam Separation² (360 nm)</td>
<td>5.14 mrad</td>
<td>4.24 mrad</td>
</tr>
<tr>
<td>Frequency Shift Range</td>
<td>&quot;(70 to 100) MHz&quot;</td>
<td>&quot;(55 to 85) MHz&quot;</td>
</tr>
<tr>
<td>Active Aperture Height</td>
<td>1 mm</td>
<td>2 mm</td>
</tr>
<tr>
<td>Diffraction Efficiency</td>
<td>80 percent</td>
<td>80 percent</td>
</tr>
<tr>
<td>RF Drive Power³ (360 nm)</td>
<td>2 watts (360 nm)</td>
<td>2 watts (360 nm)</td>
</tr>
<tr>
<td>Modulation Bandwidth(-3db)</td>
<td>20 MHz (0.22mm dia.)</td>
<td>8.8 MHz (0.5mm dia.)</td>
</tr>
<tr>
<td>Optical Rise Time</td>
<td>24 nsec (0.22mm dia.)</td>
<td>55 nsec (0.5 mm dia.)</td>
</tr>
</tbody>
</table>

¹ Other frequencies available upon request
² Beam separation varies with optical wavelength
³ RF drive power varies with optical wavelength
⁴ Drive electronics available. ME-70/ME-85 (analog), ME-70T/ME-85T (digital). OEM drivers also available.
MODEL AOM-40AF SERIES
ACOUSTO-OPTIC MODULATOR/FREQUENCY SHIFTER

- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- LASER BEAM DEFLECTION
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMPERATURE STABILITY

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>AOM-402AF1</th>
<th>AOM-405AF1</th>
<th>AOM-402AF3</th>
<th>AOM-402AF4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic Center Frequency</td>
<td>40 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Frequency Shift Range</td>
<td>±(30 to 50) MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acousto-optic Material</td>
<td>Dense Flint Glass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acoustic Velocity</td>
<td>3630 m/sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modulation Bandwidth (-3db)</td>
<td>2.7 MHz (1.0 mm beam diameter)</td>
<td>1.8 MHz (1.5 mm beam diameter)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Rise Time</td>
<td>177 nsec (1.0 mm beam diameter)</td>
<td>265 nsec (1.5 mm beam diameter)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static Optical Insertion Loss</td>
<td>2 Percent (633nm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Polarization</td>
<td>Any</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Input Impedance</td>
<td>50 Ohms (VSWR &lt; 1.25:1 at CF)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Connector</td>
<td>BNC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (less connector)</td>
<td>0.88 H x 2.94 D x 2.46 W inches</td>
<td>22.4 H x 74.7 D x 62.5 W mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MODEL</th>
<th>Optical Wavelength Range</th>
<th>Active Aperture Height</th>
<th>Diffraction Efficiency</th>
<th>Drive Power</th>
<th>Beam Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOM-402AF1</td>
<td>440-700 nm</td>
<td>2 mm</td>
<td>90 Percent</td>
<td>1.8 Watts</td>
<td>6.9 mrad (633 nm)</td>
</tr>
<tr>
<td>AOM-405AF1</td>
<td>440-700 nm</td>
<td>5 mm</td>
<td>90 percent</td>
<td>4.5 watts</td>
<td>6.9 mrad (633 nm)</td>
</tr>
<tr>
<td>AOM-402AF3</td>
<td>700-1100 nm</td>
<td>2 mm</td>
<td>90 Percent</td>
<td>3 Watts</td>
<td>8.6 mrad (780 nm)</td>
</tr>
<tr>
<td>AOM-402AF4</td>
<td>1064 nm</td>
<td>2 mm</td>
<td>85 Percent</td>
<td>5 Watts</td>
<td>11.7 mrad</td>
</tr>
</tbody>
</table>

1 Other center frequencies available.
2 Other active aperture heights available.
3 A complete line of analog, digital, dual frequency, OEM, and laboratory drive electronics are available.
MODEL AOM-40AF SERIES
ACOUSTO-OPTIC MODULATOR/FREQUENCY SHIFTER

- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- LASER BEAM DEFLECTION
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMPERATURE STABILITY

SPECIFICATIONS

Acoustic Center Frequency \(^1\) 40 MHz
Optical Frequency Shift Range ±(30 to 50) MHz
Acousto-optic Material Dense Flint Glass
Acoustic Velocity 3630 m/sec
Modulation Bandwidth (-3db) 2.7 MHz (1.0 mm beam diameter)
1.8 MHz (1.5 mm beam diameter)
Optical Rise Time 177 nsec (1.0 mm beam diameter)
265 nsec (1.5 mm beam diameter)
Static Optical Insertion Loss 2 Percent (633nm)
Optical Polarization Any
RF Input Impedance 50 Ohms (VSWR < 1.25:1 at CF)
RF Connector BNC
Size (less connector) 0.88 H x 2.94 D x 2.46 W inches
22.4 H x 74.7 D x 62.5 W mm

MODEL | AOM-402AF1 | AOM-405AF1 | AOM-402AF3 | AOM-402AF4
---|---|---|---|---
Optical Wavelength Range | 440-700 nm | 440-700 nm | 700-1100 nm | 1064 nm
Active Aperture Height | 2 mm | 5 mm | 2 mm | 2 mm
Diffraction Efficiency | 90 Percent | 90 percent | 90 Percent | 85 Percent
Drive Power | 1.8 Watts (633 nm) | 4.5 watts (633 nm) | 3 Watts (780 nm) | 5 Watts
Beam Separation | 6.9 mrad (633 nm) | 6.9 mrad (633 nm) | 8.6 mrad (780 nm) | 11.7 mrad

\(^1\) Other center frequencies available.
\(^2\) Other active aperture heights available.
\(^3\) A complete line of analog, digital, dual frequency, OEM, and laboratory drive electronics are available.
MODEL AOM-80  MODEL AOM-110
ACOUSTO-OPTIC MODULATOR

-HIGH OPTICAL POWER CAPABILITY
-INTENSITY MODULATION
-OPTICAL FREQUENCY SHIFTING
-HIGH RELIABILITY
-EXCELLENT TEMPERATURE STABILITY

SPECIFICATIONS
Optical Wavelength Range 440 nm to 700 nm
Acousto-optic Material Dense Flint Glass
Static Optical Insertion Loss 2 Percent (633nm)
Optical Polarization Any
RF Input Impedance 50 Ohms
RF Connector SMA
Size (less connector) 2.00 D x 0.63 H x 0.88 W inches
50.8 D x 16.1 H x 22.4 W mm

MODEL AOM-80
Acoustic Frequency 80 MHz
Active Aperture Height 1 mm
Optical Wavelength 442 nm  633 nm
Beam Separation 9.7 mrad  13.9 mrad
RF Drive Power 1 watt  2 watts
Static Optical Insertion Loss 7 percent  2 percent
Beam Diameter 0.18 mm / 0.36 m  0.18 mm / 0.36 mm
Optical Rise Time 35 nsec / 70 nsec  35 nsec / 70 nsec
Modulation Bandwidth 15 MHz / 7.5 MHz  15 MHz / 7.5 MHz
Diffraction Efficiency 80 % / 85 %  70 % / 80 %

MODEL AOM-110
Acoustic Frequency 110 MHz
Active Aperture Height 0.6 mm
Optical Wavelength 442 nm  633 nm
Beam Separation 13.4 mrad  19.2 mrad
RF Drive Power 1 watt  2 watts
Static Optical Insertion Loss 5 percent  2 percent
Beam Diameter 0.14 mm / 0.28 mm  0.14 mm / 0.28 mm
Optical Rise Time 24 nsec / 48 nsec  24 nsec / 48 nsec
Modulation Bandwidth 20 MHz / 10 MHz  20 MHz / 10 MHz
Diffraction Efficiency 80 % / 80 %  70 % / 70 %
MODULATOR

MODEL ATM SERIES
ACOUSTO-OPTIC MODULATOR

- INTENSITY MODULATION
- FAST MODULATION CAPABILITY
- OPTICAL FREQUENCY SHIFTING
- BEAM DEFLECTION
- LOW DRIVE POWER
- HIGH RELIABILITY

SPECIFICATIONS

Optical Wavelength Range: 440 nm to 700 nm

Acousto-optic Material: Tellurium Dioxide (TeO₂)

Sound Velocity: 4260 m/sec (longitudinal)

Input Impedance: 50 ohms

Input VSWR: <1.3:1 at center frequency

Static Optical Insertion Loss: 4 percent

Size (less SMA connector): 2.00 D X 0.63 H X 0.9 W inches
5.08 D X 1.60 H X 2.28 W cm

MODEL

Center Frequency
ATM-80A1  80 MHz
ATM-125B1  125 MHz
ATM-200C1  200 MHz

Active Aperture Height
1 mm
0.6 mm
0.3 mm

Beam Separation (633 nm)
11.9 mrad
18.6 mrad
29.7 mrad

Beam Separation (514 nm)
700 milliwatts
800 milliwatts
900 milliwatts

500 milliwatts
550 milliwatts
600 milliwatts

Diffraction Efficiency
85 percent
80 percent
70 percent

RF Drive Power₂ (633 nm)
31 nsec (0.2 mm)
20 nsec (0.13 mm)
9.2 nsec (0.06 mm)

77 nsec (0.5 mm)
38 nsec (0.25 mm)
15.5 nsec (0.1 mm)

Optical Rise Time (beam diameter)
31 nsec (0.2 mm)
20 nsec (0.13 mm)
9.2 nsec (0.06 mm)

15.8 MHz (0.2 mm)
24.5 MHz (0.13 mm)
50 MHz (0.06 mm)

6.3 MHz (0.5 mm)
12.8 MHz (0.25 mm)
30 MHz (0.1 mm)

MODULATION

-3 dB

1 Specifications vary with optical wavelength.
OEM drivers also available.
MODEL ACM SERIES
ACOUSTO-OPTIC MODULATOR / FREQUENCY SHIFTER

- NEAR IR WAVELENGTH RANGE
- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- OPTICAL ISOLATION
- LOW RF DRIVE POWER
- HIGH RELIABILITY
- HIGH OPTICAL POWER CAPABILITY

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>ACM-402AA1</th>
<th>ACM-502AA1</th>
<th>ACM-802AA1</th>
<th>ACM-1002AA1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acousto-optic Material</td>
<td>AMTIR-1 Chalcogenide Glass</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical Wavelength¹</td>
<td>1.2 to 1.6 (\mu) m</td>
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<tr>
<td>Optical Power Capability</td>
<td>50 Kwatts / cm²</td>
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<td>Active Aperture Height²</td>
<td>2 mm</td>
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<tr>
<td>Diffraction Efficiency</td>
<td>90 percent</td>
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</tr>
<tr>
<td>RF Drive Power³</td>
<td>600 milliwatts (1.55 : (\mu) m)</td>
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</tr>
<tr>
<td>RF Input Impedance</td>
<td>50 ohms</td>
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</tr>
<tr>
<td>Modulation Bandwidth (-3db)</td>
<td>1.25 MHz (1.5 mm diameter)</td>
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<tr>
<td>Optical Rise Time</td>
<td>255 nsec / mm beam diameter</td>
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<tr>
<td>Static Optical Insertion Loss</td>
<td>5 percent (1.55 (\mu) m)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Optical Polarization</td>
<td>any</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Connector</td>
<td>SMA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size (less connector)</td>
<td>2.80 L x 1.25 W x 0.70 H inches</td>
<td>71.2 L x 31.8 W x 17.8 H mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MODEL ACM-402AA1
Center Frequency⁴ 40 MHz
Optical Frequency Shift "30 to 50 MHz
Beam Separation (1.55 \(\mu\) m) 24.6 mrad

MODEL ACM-502AA1
Center Frequency⁴ 50 MHz
Optical Frequency Shift "40 to 60 MHz
Beam Separation (1.55 \(\mu\) m) 30.8 mrad

MODEL ACM-802AA1
Center Frequency⁴ 80 MHz
Optical Frequency Shift "65 to 95 MHz
Beam Separation (1.55 \(\mu\) m) 49.2 mrad

MODEL ACM-1002AA1
Center Frequency⁴ 100 MHz
Optical Frequency Shift "80 to 120 MHz
Beam Separation (1.55 \(\mu\) m) 61.5 mrad

¹ Wavelengths available in the range of 1.2 to 2.5 \(\mu\) m with appropriate antireflection coating. Specifications vary with optical wavelength.
² Other active aperture heights available with modified specifications.
³ Fixed frequency, synthesized variable frequency, or OEM drivers are available.
⁴ Any RF frequency from 40 to 250 MHz is available. Specifications vary with RF frequency.
MODEL FCM SERIES
FIBER PIGTAILED
ACOUSTO-OPTIC MODULATOR/ATTENUATOR

- NEAR IR WAVELENGTH RANGE
- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- CHOICE OF FREQUENCY SHIFT
- LOW RF DRIVE POWER
- HIGH RELIABILITY

SPECIFICATIONS
Acousto-optic Material: AMTIR-1 Chalcogenide Glass
Optical Fiber: Singlemode
Fiber Connector: FC-PC
Optical Back Reflection: -40 dB
Optical Polarization: any
Input Impedance / VSWR: 50 Ohms / 1.2:1
Size: See outline drawing

MODEL (Modulator)

- FCM-40.8E5C
  - Optical Wavelength: 1.55 µm
  - RF Frequency: 40 MHz
  - Optical Frequency Shift: + 40 MHz
  - RF Drive Power: 600 mW
  - Insertion Loss (RF on): < 3 dB
  - Extinction Ratio (RF on/RF off): > 55 dB
  - Optical Rise Time: 60 nsec
  - Modulation Bandwidth (-3 dB): 7.5 MHz

- FCM-40.8E6C
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - Optical Frequency Shift: + 40 MHz
  - RF Drive Power: 500 mW
  - Insertion Loss (RF on): < 3 dB
  - Extinction Ratio (RF on/RF off): > 55 dB
  - Optical Rise Time: 60 nsec
  - Modulation Bandwidth (-3 dB): 7.5 MHz

- FCM-401E5C
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - Optical Frequency Shift: + 40 MHz
  - RF Drive Power: 500 mW
  - Insertion Loss (RF on): < 2.4 dB
  - Extinction Ratio (RF on/RF off): > 55 dB
  - Optical Rise Time: 60 nsec
  - Modulation Bandwidth (-3 dB): 4 MHz

- FCM-401E6C
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - Optical Frequency Shift: + 40 MHz
  - RF Drive Power: 400 mW
  - Insertion Loss (RF on): < 2.4 dB
  - Extinction Ratio (RF on/RF off): > 55 dB
  - Optical Rise Time: 120 nsec
  - Modulation Bandwidth (-3 dB): 4 MHz

MODEL (Attenuator)

- FCM-40.8E5CA
  - Optical Wavelength: 1.55 µm
  - RF Frequency: 40 MHz
  - RF Drive Power: 600 mW
  - Insertion Loss (RF off): < 1 dB
  - Extinction Ratio (RF off/RF on): > 7 dB
  - Optical Rise Time: 60 nsec
  - Modulation Bandwidth (-3 dB): 7.5 MHz

- FCM-40.8E6CA
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - RF Drive Power: 500 mW
  - Insertion Loss (RF off): < 1 dB
  - Extinction Ratio (RF off/RF on): > 7 dB
  - Optical Rise Time: 60 nsec
  - Modulation Bandwidth (-3 dB): 7.5 MHz

- FCM-401E5CA
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - RF Drive Power: 500 mW
  - Insertion Loss (RF off): < 1 dB
  - Extinction Ratio (RF off/RF on): > 7 dB
  - Optical Rise Time: 120 nsec
  - Modulation Bandwidth (-3 dB): 4 MHz

- FCM-401E6CA
  - Optical Wavelength: 1.3 µm
  - RF Frequency: 40 MHz
  - RF Drive Power: 400 mW
  - Insertion Loss (RF off): < 1 dB
  - Extinction Ratio (RF off/RF on): > 7 dB
  - Optical Rise Time: 120 nsec
  - Modulation Bandwidth (-3 dB): 4 MHz

1 Other optical fiber such as polarization maintaining, and other connectors such as FC-APC are also available.
2 Optical back reflection varies with fiber type and connectors.
3 Modulator...first order diffracted beam is transmitted to output fiber, Attenuator...zero order beam is transmitted to output fiber.
4 Operation at other RF frequencies is available. See Frequency Shifter/FCM Series product sheet.
5 High extinction digital drivers are available. Laboratory and OEM drivers are available.
MODEL AGM-406B1
IR ACOUSTO-OPTIC MODULATOR / FREQUENCY SHIFTER

- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- OPTICAL ISOLATION
- LASER BEAM DEFLECTION
- HIGH RELIABILITY
- HIGH OPTICAL POWER CAPABILITY

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical Wavelength</td>
<td>10.6 µm</td>
</tr>
<tr>
<td>Acousto-optic Material</td>
<td>Optical Single Crystal Germanium</td>
</tr>
<tr>
<td>Acoustic Velocity</td>
<td>5.5 mm/µsec</td>
</tr>
<tr>
<td>Center RF Frequency</td>
<td>40 MHz</td>
</tr>
<tr>
<td>RF Bandwidth</td>
<td>20 MHz</td>
</tr>
<tr>
<td>Optical Frequency Shift Range</td>
<td>± (30 MHz to 50 MHz)</td>
</tr>
<tr>
<td>Beam Separation</td>
<td>77 mrad (40 MHz)</td>
</tr>
<tr>
<td>Bragg Angle</td>
<td>38.5 mrad (40 MHz)</td>
</tr>
<tr>
<td>Diffraction Efficiency</td>
<td>85 percent</td>
</tr>
<tr>
<td>RF Drive Power</td>
<td>30 watts</td>
</tr>
<tr>
<td>Active Aperture Height</td>
<td>6 mm</td>
</tr>
<tr>
<td>Modulation Bandwidth (-3db)</td>
<td>750 KHz (5.5 mm diameter)</td>
</tr>
<tr>
<td>Optical Rise Time</td>
<td>117 nsec / mm beam diameter</td>
</tr>
<tr>
<td>RF Input Impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Optical Insertion Loss</td>
<td>&lt;12 percent</td>
</tr>
<tr>
<td>Optical Power Capability</td>
<td>100 watts full aperture</td>
</tr>
<tr>
<td>Optical Polarization</td>
<td>Parallel to mounting surface</td>
</tr>
<tr>
<td>Water Cooling</td>
<td>500 ml / min at 20°C</td>
</tr>
<tr>
<td>Thermal Interlock Switch</td>
<td>NC opens at 45°C</td>
</tr>
<tr>
<td>Size (less connectors)</td>
<td>2.97 D x 1.50 H x 2.42 W inches</td>
</tr>
<tr>
<td></td>
<td>75.4 D x 38.1 H x 61.5 W mm</td>
</tr>
</tbody>
</table>

1 Other wavelengths and ranges from 2.5-11.5 µm available. Note: Specifications change with optical wavelength.
2 Other frequencies available.
3 A complete line of drive electronics are available. Model GE-4030 analog input, GE-4030T digital input. OEM drivers are available.
MODEL AGM-40 SERIES
IR ACOUSTO-OPTIC MODULATOR/FREQUENCY SHIFTER

-Intensity Modulation
-Optical Frequency Shifting
-Laser Beam Deflection
-High Reliability

SPECIFICATIONS
Acousto-optic Material          Optical Single Crystal Geranium
Acoustic Velocity               5.5 mm / µsec
RF Center Frequency\(^1\)        40 MHz
Optical Frequency Shift Range   " (30 to 50) MHz
RF Input Impedance             50 ohms
Optical Insertion Loss          <7 percent
Optical Power Capability        25 watts full aperture
Laser Polarization              Parallel to Base
Water Cooling                   250 ml / min, 20 degrees C
RF Connector                    BNC
Size (less connectors)          2.95 L x 1.2 H x 1.3 W inches
                                  7.50 L x 3.1 H x 3.3 W cm

MODEL

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical Wavelength(^2)</td>
<td>10.6 µm</td>
<td>10.6 µm</td>
<td>3.39 µm</td>
<td>3.39 µm</td>
</tr>
<tr>
<td>Active Aperture Height</td>
<td>2 mm</td>
<td>6 mm</td>
<td>2 mm</td>
<td>6 mm</td>
</tr>
<tr>
<td>Optical Rise Time (diameter)</td>
<td>116 nsec (1 mm)</td>
<td>582 nsec (5 mm)</td>
<td>116 nsec (1 mm)</td>
<td>582 nsec (5mm)</td>
</tr>
<tr>
<td>Modulation -3 dB Bandwidth</td>
<td>4.1 MHz (1 mm)</td>
<td>825 KH (5 mm)</td>
<td>4.1 MHz (1 mm)</td>
<td>825 KH (5 mm)</td>
</tr>
<tr>
<td>Beam Separation</td>
<td>77 mrad</td>
<td>77 mrad</td>
<td>24.7 mrad</td>
<td>24.7 mrad</td>
</tr>
<tr>
<td>Bragg Angle</td>
<td>38.5 mrad</td>
<td>38.5 mrad</td>
<td>12.3 mrad</td>
<td>12.3 mrad</td>
</tr>
<tr>
<td>Diffraction Efficiency</td>
<td>70 percent</td>
<td>50 percent</td>
<td>70 percent</td>
<td>70 percent</td>
</tr>
<tr>
<td>RF Drive Power(^3)</td>
<td>20 watts</td>
<td>25 watts</td>
<td>2 watts</td>
<td>6 watts</td>
</tr>
</tbody>
</table>

\(^1\) Other frequencies available
\(^2\) Narrow and broadband A/R coatings in the range of 2.2 µm to 12 µm are available.
\(^3\) Laboratory and OEM drive electronics available.
NOTE: Operating specifications change with optical wavelength.
AOD-70 ACOUSTO-OPTIC DEFLECTOR
ADM-70 ACOUSTO-OPTIC DEFLECTOR-MODULATOR

- Laser Beam Deflection
- Intensity Modulation
- Multiple Beam Generation
- Flat Optical Scan Response
- Acoustic Phased-array Design
- Optical Signal Processing
- Optical Frequency Shifting
- High Reliability

SPECIFICATIONS
Design Optical Wavelength 633 nm
Acousto-optic Material Dense Flint Glass
Diffraction Efficiency (center of scan) 80 percent
Diffraction Efficiency (edges of scan) 60 percent
Center Frequency 70 MHz
Deflection Bandwidth 40 MHz
Beam Separation 11.4 mrad (70 MHz)
Deflection Range 6.5 mrad
RF Drive Power (nominal) 2.5 watts
Input Impedance (nominal) 50 ohms
Optical Polarization any

MODEL
ADM-70 AOD-70
Time-Bandwidth Product (resolution) 200(spots) 400(spots)
Access Time (full aperture width) 5 : sec 10 : sec
Active Aperture Height 2 mm 2 mm
Active Aperture Width 20 mm 40 mm
Size (less connector) 2.8 L x 0.7 H x 2.4 W inches 4.5 L x 0.7 H x 2.4 W inches
7.1 L x 1.8 H x 6.1 W cm 11.5 L x 1.8 H x 6.1 W cm

1 These deflectors incorporate an acoustic phased-array beam steering design to produce a relatively flat first order diffraction efficiency across the deflection bandwidth. Because of this design feature, the deflectors require a single RF power amplifier to drive the multiple transducer array.
2 Useful at other wavelengths with modified specifications.
3 A complete line of VCO, synthesized, laboratory, and OEM drive electronics are available.
4 This is resolution as defined by the Rayleigh criterion for a uniformly illuminated optical beam.

1 These deflectors incorporate an acoustic phased-array beam steering design to produce a relatively flat first order diffraction efficiency across the deflection bandwidth. Because of this design feature, the deflectors require a single RF power amplifier to drive the multiple transducer array.
2 Useful at other wavelengths with modified specifications.
3 A complete line of VCO, synthesized, laboratory, and OEM drive electronics are available.
4 This is resolution as defined by the Rayleigh criterion for a uniformly illuminated optical beam.
MODEL AGD-406B1
INFRARED ACOUSTO-OPTIC DEFLECTOR

- LASER BEAM DEFLECTION
- FLAT OPTICAL SCAN RESPONSE
- OPTICAL FREQUENCY SHIFTING
- INTENSITY MODULATION
- HIGH OPTICAL POWER CAPABILITY
- EXCELLENT TEMP. STABILITY & RELIABILITY

SPECIFICATIONS

Design Optical Wavelength: 10.6 µm
Acousto-optic Material: Optical Single Crystal Germanium
Center RF Frequency: 40 MHz
Deflection RF Bandwidth: 20 MHz
Optical Frequency Shift Range: (30 to 50) MHz
Beam Separation: 77 mrad
Angular Deflection: 38.5 mrad
Diffraction Efficiency: 80 percent
RF Drive Power: 30 watts (nominal)
Active Aperture Height: 6 mm
Access Time: 182 nsec / mm beam width
Time-Bandwidth Product: 20 (5.5 mm beam width)
Intensity Modulation Bandwidth: 750 KHz (5.5 mm beam diameter)
Optical Rise Time: 117 nsec / mm optical beam width
Optical Polarization: Parallel to mounting surface
Static Optical Insertion Loss: <12 percent
RF Impedance: 50 ohms (nominal)
RF Connector: BNC
Size (less connector): 2.97 D x 1.50 H x 2.42 W inches
75.4 D x 38.1 H x 61.5 W mm

1 The Model AGD-406B1 incorporates an acoustic phased-array beam steering design which produces a relatively flat first order diffraction efficiency across the deflection bandwidth. Because of this design feature, the deflector requires a single RF power amplifier to drive the multiple transducer array.
2 Deflectors can be designed to operate at other wavelengths in the range of 2.5 to 11 µm.
3 Two deflectors can be cascaded for various frequency shift ranges to produce an angular nonvariant frequency shifted optical beam.
4 A complete line of VCO, synthesized, and OEM drive electronics are available.
MODEL ATD-80 SERIES
SLOW SHEAR MODE DEFLECTOR

- LASER BEAM SCANNING
- OPTICAL SIGNAL PROCESSING
- RANDOM ACCESS DEFLECTION
- LOW DRIVE POWER
- RELIABLE

SPECIFICATIONS
Optical Wavelength Range 488 - 680 nm
Acousto-optic Material Tellurium Dioxide (TeO₂)
Operating Mode Slow shear, off axis
Center Frequency 80 MHz
RF Bandwidth 50 MHz
Diffraction Efficiency 80% (minimum at center frequency)
Intensity Variation <1 dB
Active Aperture 5 H x 13 W mm
Input Optical Polarization Linear, parallel to mount surface
Output Optical Polarization Linear, perpendicular to mount surface
Static Optical Insertion Loss 5 percent
RF Drive Power 1 Watt (514 nm)
Input Impedance 50 Ohms (nominal)
VSWR <2.5:1
RF Connector SMA
Size (less connector) 2.63 D X 1.00 H X 1.42 W inches
6.68 D X 5.08 H X 3.61 W cm

MODEL
Optical Wavelength ATD-805AA1 ATD-805RA1
514 nm 633 nm
Beam Separation (80 MHz) 64.2 mrad 76.3 mrad
Deflection Angle 40.1 mrad 47.7 mrad
Acoustic Velocity 640 m / sec 663 m / sec
Access Time 1.56 : sec / mm beam width 1.51 : sec / mm beam width
Time-Bandwidth Product 78 / mm beam width 75 / mm beam width

1 Other active aperture sizes are available.
2 A complete line of frequency synthesized and VCO deflector drivers and RF power amplifiers are available.
Note: The DTD Series of 2-axis deflectors are also available.
IntraAction Corp.
QUALITY PRODUCTS FOR LASER TECHNOLOGY

MODEL ATD / DTD COLLINEAR SERIES
1-AXIS / 2-AXIS ACOUSTO-OPTIC DEFLECTOR

- LASER BEAM DEFLECTION
- COLLINEAR DESIGN
- OPTICAL TWEEZERS
- LINEAR SCANNING
- LOW RF DRIVE POWER
- RELIABLE OPERATION

SPECIFICATIONS

Acousto-optic Material
Tellurium Dioxide (TeO₂)

Operating Mode
Slow shear / off axis

Optical Insertion Loss
< 5 percent

First Order Diffraction Efficiency
>75 percent (per axis)

Optical Intensity Variation
<1 dB

Optical Input and Output Polarization
Linear

Active Aperture Height
4 mm

RF Drive Power
< 1 watt

Input Impedance
50 ohms (nominal)

RF Connectors
SMA

Size (less connectors), DTD(ATD)
1.50(1.50)D x 1.50(1.50)H x 2.0(1.50)W inches
38.1(38.1)D x 38.1(38.1)H x 50.8(38.1)W mm

MODEL (ATD, 1-Axis; DTD, 2-Axis)

<table>
<thead>
<tr>
<th></th>
<th>DTD-274HD6</th>
<th>DTD-604RC25</th>
<th>DTD-804RC17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical Wavelength (λ)</td>
<td>1064 nm</td>
<td>780-785 nm</td>
<td>630-660 nm</td>
</tr>
<tr>
<td>Center RF Frequency (CF)</td>
<td>27 MHz</td>
<td>60 MHz</td>
<td>80 MHz</td>
</tr>
<tr>
<td>Deflection Bandwidth (BW at -1 dB)</td>
<td>18 MHz</td>
<td>36 MHz</td>
<td>50 MHz</td>
</tr>
<tr>
<td>Time-Bandwidth Product (4 mm)</td>
<td>110</td>
<td>215</td>
<td>300</td>
</tr>
<tr>
<td>Access time (per mm beam diameter)</td>
<td>1.6 µsec</td>
<td>1.5 µsec</td>
<td>1.5 µsec</td>
</tr>
<tr>
<td>Beam Separation (at CF)</td>
<td>45 mrad</td>
<td>71 mrad</td>
<td>76.6 mrad</td>
</tr>
<tr>
<td>Deflection Range (λ, BW)</td>
<td>30 mrad</td>
<td>42.4 mrad</td>
<td>47.5 mrad</td>
</tr>
</tbody>
</table>

1 The nominal center of deflection area is collinear with the input optical beam. (Eliminates typical AO off-axis alignment)
2 Input polarization is linear. 1-Axis output polarization is linear, rotated 90°; 2-Axis output polarization is linear, same as input.
3 5 or 6 mm Active Aperture Height is also available.
4 For Optical Tweezers applications: Model DVE-120 synthesized, RF frequency, PCI computer card and DPA series power amplifier.
5 For Linear Scanning applications: DE series Voltage Controlled Oscillator drivers.
6 For 2-Axis: since both deflection angles can not originate at the same point, the origins are as close together as physically possible.
7 For 2-axis operation, 2 relay lenses between 2 ATD can make the deflection origins of each axis the same.
DESCRIPTION
The Model ME series Modulator Drivers include a crystal controlled RF oscillator, fast modulation circuit, and a broadband RF power amplifier in a housing with power supply, RFI line filter, and line switch. The standard crystal controlled oscillator has a calibration tolerance of 25 ppm. Crystals at other than the specified frequencies can be factory installed. The standard modulation input configuration is analog with a digital input option available. A cw RF output level is adjusted by the front panel level control which inserts a dc offset to the input of the modulation circuit with no modulation input voltage. The class AB broadband amplifier has sufficient bandwidth for pulsed operation. RF output power capability can be up to 10 watts for some models. Configuration options include a front panel user accessible connection between the oscillator and modulation circuit (N) so that an external source frequency can be used in place of the internal crystal oscillator. Also available is an optional front panel connection between the modulation circuit and the RF power amplifier (H) to give the Model ME drivers capability to be used as a stand alone RF power amplifier. Drivers with option E provide a cw +10 dBm crystal oscillator reference output.

SPECIFICATIONS
Input Configuration
Analog (0-1 volt for 0-specified RF power)
RF Amplifier Operation
Class AB
Rise/Fall Time
30 nsec
Harmonics (at full power)
-20 dBc
Output Mismatch Tolerance
100 percent
Input / Output Impedance
50 ohms
Extinction Ratio (RF on / RF off)
40 dB
Line Voltage (standard)
115/230 Vac, 50-60 Hz
100 Vac, 50-60 Hz (option J)
Size (inches)
9.0 W x 3.5 H x 13.5 D
22.9 W x 8.9 H x 34.3 D

MODEL ME SERIES
MODULATOR DRIVER

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oscillator Frequency</td>
<td>40 MHz</td>
<td>40 MHz</td>
<td>40 MHz</td>
<td>80 MHz</td>
<td>110 MHz</td>
<td>200 MHz</td>
</tr>
<tr>
<td>RF Output Power</td>
<td>2 watts</td>
<td>5 watts</td>
<td>10 watts</td>
<td>2 watts</td>
<td>2 watts</td>
<td>1 watt</td>
</tr>
</tbody>
</table>

OPTIONS:
D...Inverse digital, input<0.8 volts for RF/on, input>2 volts to 5 volts for RF off, 50 S input impedance.
E...Low level oscillator RF output, +10 dBm level.
H...Front panel access between modulator circuit and RF power amplifier.
J...100 Vac line voltage for Japan.
N...Front panel access between oscillator and modulator circuit.
P...Internal pulse generator for q-switch applications with triggered, gated, and free running capability.
T...Digital input, input<0.8 volts for RF/off, input>2 volts to 5 volts for RF/on, 50 S input impedance.
T7...Same as option T, but with 70 dB extinction ratio.
-6...Analog input plus option T (analog + digital), total extinction ratio is 70 dB.

1 Other frequencies available.  2 Other RF output power levels available.
DESCRIPTION
The Model GE series high power acousto-optic modulator drivers include a crystal controlled RF oscillator, fast modulation circuit, and a broadband RF power amplifier in a housing with power supply, RFI line filter, line switch, and fault/interlock circuit. The standard crystal controlled oscillator has a calibration tolerance of 25 ppm. Crystals at other than the specified frequencies can be factory installed. The standard modulation input configuration is analog with a digital input option available. A CW RF output level is adjusted by the front panel level control which inserts a dc offset to the input of the modulation circuit with no modulation input voltage. The class AB broadband amplifier has sufficient bandwidth for pulsed operation. RF output power capability can be up to 100 watts for some models. Configuration options include a front panel user accessible connection between the oscillator and modulation circuit (H) so that an external source frequency can be used in place of the internal crystal oscillator. Also available is an optional front panel connection between the modulation circuit and the RF power amplifier (N) to give the Model GE drivers capability to be used as a stand alone RF power amplifier. The fault/interlock circuit will latch the power supply off when an open circuit condition is present and can be connected to the thermal switch of a Germanium infrared modulator or in a normally closed system interlock circuit.

SPECIFICATIONS
Crystal Oscillator Stability: 30 ppm
Input Configuration: Analog (0-1 volt for 0-maximum RF power)
RF Amplifier Operation: Class AB
Rise/Fall Time: 30 nsec
Harmonics (at full power): -20 dBc
Output Mismatch Tolerance: 100 percent
Input / Output Impedance: 50 ohms
Interlock Input Conditions: Shorted (power supply operational), Open (power supply latched off)
Line Voltage (standard): 115/230 Vac, 50-60 Hz (100 Vac, option J)
Size (inches)(cm): 5.7(14.5) W x 4.5(11.5) H x 16.0(40.7) D

MODEL | GE-4030 | GE-6030 | GE-8030 | GE-9020 | GE-11020
--- | --- | --- | --- | --- | ---
Oscillator Frequency\(^1\) | 40 MHz | 60 MHz | 80 MHz | 90 MHz | 110 MHz
RF Output Power\(^2\) | 30 watts | 30 watts | 30 watts | 20 watts | 20 watts

OPTIONS:
D…Inverse digital, input<0.8 volts for RF/on, input>2 volts to 5 volts for RF off, 50 S input impedance.
E…Low level oscillator RF output, +10 dBm level.
H…Front panel access between oscillator and modulator circuit.
N…Front panel access between modulator circuit and RF power amplifier.
T…Digital input, input<0.8 volts for RF/off, input>2 volts to 5 volts for RF/on, 50 S input impedance.
T7…Same as option T (40 dB extinction ratio), but with 70 dB extinction ratio.
-6…Analog input plus option T (2 inputs), total extinction ratio is 70 dB.

\(^1\)Other frequencies are available. \(^2\)Other RF power levels are available.
MODEL DE SERIES
DEFLECTOR DRIVER

DESCRIPTION
The Model DE series Deflector Drivers include a voltage controlled RF oscillator and a broadband RF power amplifier in a housing with power supply, RFI line filter, and line switch. An optional (M) analog amplitude modulation circuit is available. Standard frequency linearity is 0.25 percent. Standard frequency slew rate is 1 sec for total frequency range. RF output power capability can be up to 10 watts for some models. Configuration options include a front panel user accessible connection between the voltage controlled oscillator and level/modulation circuit (H) so that an external source frequency can be used in place of the internal voltage controlled oscillator. Also available is an optional front panel connection between the level/modulation circuit and the RF power amplifier (N) to give the Model DE drivers capability to be used as a stand alone RF power amplifier. Drivers with option E provide a cw +10 dBm voltage controlled oscillator RF reference output.

SPECIFICATIONS
Frequency Control Voltage
Analog (1 volt peak-to-peak)
Frequency Slew Rate
1 sec (total frequency range)
RF Amplifier Operation
Class AB
Rise/Fall Time (modulation option)
30 nsec
Harmonics (at full power)
-20 dBc
Output Mismatch Tolerance
100 percent
Input / Output Impedance
50 ohms
Line Voltage (standard)
115/230 Vac, 50-60 Hz
100 Vac, 50-60 Hz (option J)
Size (inches)
9.0 W x 3.5 H x 13.5 D
22.9 W x 8.9 H x 34.3 D

MODEL
<table>
<thead>
<tr>
<th>CENTER FREQUENCY</th>
<th>DE-40</th>
<th>DE-405</th>
<th>DE-80</th>
<th>DE-1002</th>
<th>DE-1502</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>40 MHz</td>
<td>40 MHz</td>
<td>80 MHz</td>
<td>100 MHz</td>
<td>150 MHz</td>
</tr>
<tr>
<td>Range</td>
<td>20 MHz</td>
<td>20 MHz</td>
<td>40 MHz</td>
<td>50 MHz</td>
<td>100 MHz</td>
</tr>
<tr>
<td>RF Output Power Capability</td>
<td>2 watts</td>
<td>5 watts</td>
<td>2 watts</td>
<td>2 watts</td>
<td>2 watts</td>
</tr>
</tbody>
</table>

OPTIONS:
D...Inverse digital, input<0.8 volts for RF/on, input>2 volts to 5 volts for RF off, 50 S input impedance.
E...Low level oscillator RF output, +10 dBm level.
H...Front panel access between oscillator and modulator circuit.
J...100 Vac line voltage for Japan.
M...Amplitude modulation (0-1 volt for 0 to specified RF output)
N...Front panel access between modulator circuit and RF power amplifier.
T...Digital input, input<0.8 volts for RF/off, input>2 volts to 5 volts for RF/on, 50 S input impedance.

1 Other center frequencies and frequency ranges are available.
MODEL DFE-A4 SERIES
DUAL FREQUENCY SOURCE

DESCRIPTION
The DFE Dual Frequency Source series are two-channel frequency generators capable of delivering up to four watts of RF power from each channel into a 50 ohm load. The DFE is used in applications where a very stable frequency difference is required. The fixed frequency and the variable frequency channels are both synthesized from the same temperature compensated crystal oscillator (TCXO). The variable frequency is set via front panel thumbwheel switches with a setting resolution of 10 kHz. Additional variable frequency control is available with optional parallel and serial port computer interfaces. Software is provided with the computer interface although instrument control software such as LabVIEW can be used. CW RF output is obtained by adjusting the front panel Carrier Level control. Amplitude modulation is electronically controlled with a 0 to 1 volt signal applied to the Video Input. A fixed +10 dBm RF reference output is also provided from each channel.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>DFE-404A4</th>
<th>DFE-604A4</th>
<th>DFE-804A4</th>
<th>DFE-1004A4</th>
<th>DFE-1504A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Frequency Setting Resolution</td>
<td>10 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Frequency Stability (0 to 50°C)</td>
<td>1 ppm</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CW RF Output Power Capability</td>
<td>4 watts</td>
<td>0-4 watts</td>
<td>0-4 watts</td>
<td>0-4 watts</td>
<td>0-4 watts</td>
</tr>
<tr>
<td>Amplitude Modulation</td>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmonics at 4 Watts</td>
<td>-20 dBc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extinction Ratio (on/off)</td>
<td>40 dB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Reference Output</td>
<td>+10 dBm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input / Output Impedance</td>
<td>50 ohms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF Connectors</td>
<td>BNC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Power</td>
<td>115/230 Vac, 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>5.5 H x 17.0 W x 13.5 D inches</td>
<td>14.0 H x 43.2 W x 34.3 D cm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The fixed frequency can be specified as any fixed frequency within the variable frequency range.
2 Optional digital modulation capability is also available. Input impedance is 50 ohms.