

Acousto-Optic Technology



- Modulators
- Frequency Shifters
- Deflectors
- Mode Lockers
- Q-Switches
- Driver Electronics
- X-Y Beam Scanning & Optical Tweezers



IntraAction Corp.
QUALITY PRODUCTS FOR LASER TECHNOLOGY

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Thank you for your interest in our products and capabilities. Enclosed is information describing **IntraAction's** acousto-optic products and related drive electronics.

IntraAction are based in Bellwood, Illinois (a suburb of Chicago, USA) and have many years experience of providing quality acousto-optic technology. They have in-house capability to design and manufacture a wide variety of standard, OEM, and custom acousto-optic devices, electronics and sub-systems.

One of **IntraAction's** advantages is the ability to 'tweak' designs to give the best solution for an application at little or no extra cost. This approach is based around the extensive experience of **IntraAction's** MD, John Lekavich.

This product catalogue represents only a small portion of **IntraAction's** capabilities. If you do not find a specific device here to meet your specifications, we will be happy to discuss your particular requirements in detail.

For all applications please fill in the 'Acousto-optic Worksheet' on the next page. Emailing this back to **Lambda Photometrics** will help us to determine the best solution for your application.

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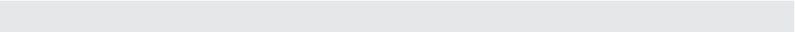
ACOUSTO-OPTIC WORKSHEET

DATE	CUSTOMER		
LASER DETAILS			
LASER TYPE =			
WAVELENGTH (λ) =		WAVELENGTH RANGE =	
BEAM DIAMETER (d) =		OPTICAL POWER =	
POLARIZED:	<input type="checkbox"/> NO		
	<input type="checkbox"/> YES	<input type="checkbox"/> HORIZONTAL	<input type="checkbox"/> VERTICAL
DIFFRACTION LIMITED	<input type="checkbox"/> YES	<input type="checkbox"/> NO	DIVERGENCE
SELECTION APPLICATION FROM BELOW:			
AMPLITUDE MODULATION			
MINIMUM ACCEPTABLE DIFFRACTION EFFICIENCY =			
MODULATION FREQUENCY (F_m) =		CONTRAST (C) AT F_m =	
RISE TIME (T_R) =	DRIVER: <input type="checkbox"/> ANALOGUE		<input type="checkbox"/> DIGITAL
FREQUENCY SHIFTING			
MINIMUM ACCEPTABLE DIFFRACTION EFFICIENCY =			
FREQUENCY SHIFT =		OR	SHIFT RANGE =
DEFLECTION			
MINIMUM ACCEPTABLE DIFFRACTION EFFICIENCY =			
RESOLUTION (N) / TIME BANDWIDTH PRODUCT ($\tau\Delta F$) =			
TOTAL DEFLECTION ANGLE (Θ_T) =			
DEFLECTION MODE:	<input type="checkbox"/> RANDOM ACCESS	ACCESS TIME =	
	<input type="checkbox"/> LINEAR	SCAN FREQUENCY =	
MODE LOCKING			
ACOUSTIC FREQUENCY (1/2 CAVITY MODULATION FREQUENCY) =			
WINDOW DESCRIPTON			
Q-SWITCHING			
MINIMUM ACCEPTABLE DIFFRACTION EFFICIENCY =			
OPERATING RF FREQUENCY: <input type="checkbox"/> 24MHz <input type="checkbox"/> 27.12MHz <input type="checkbox"/> 50MHz <input type="checkbox"/>			
OPTICAL WINDOW CONFIGURATION: <input type="checkbox"/> PARALLEL WITH A/R COATING <input type="checkbox"/> BREWSTER			

COMMENTS (APPLICATION DESCRIPTION/DIAGRAM) please continue overleaf if necessary

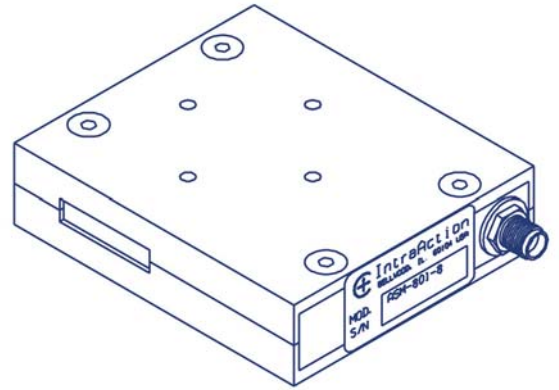
EMAIL TO CONTACT@LAMBDA PHOTO.CO.UK

CONTINUATION SHEET



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		
Optical Wavelength Range	300 to 400 nm	
Acousto-optic Material	UV Grade Fused Silica	
Optical Insertion Loss	<4%	
Optical Polarization	Linear vertical	
Weight	175g	
RF Connector	SMA	
Size (less connector)	2.80 L x 2.40 W x 0.70 H inches	
	71.2 L x 61.0 W x 17.8 H mm	
MODEL	ASM-851B8	ASM-702B8
Center Frequency ¹	85 MHz	70 MHz
Beam Separation ² (360 nm)	5.14 mrad	4.24 mrad
Frequency Shift Range	±(70 to 100) MHz	±(55 to 85) MHz
Active Aperture Height	1 mm	2 mm
Diffraction Efficiency	80%	80%
RF Drive Power ^{3,4} (360 nm)	2 Watts (360 nm)	2 Watts (360 nm)
Modulation Bandwidth(-3db)	20 MHz (0.22mm dia.)	8.8 MHz (0.5mm dia.)
Optical Rise Time	24 ns (0.22mm dia.)	55 ns (0.5 mm dia.)

¹ Other frequencies available upon request

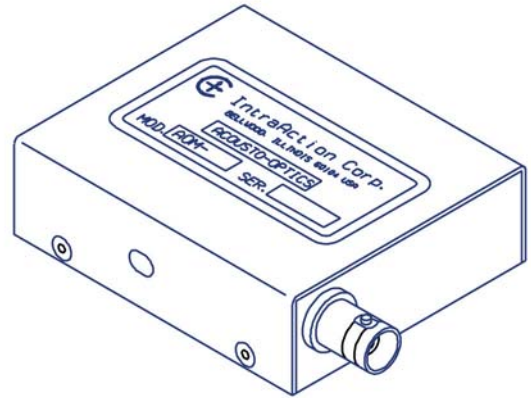
² Beam separation varies with optical wavelength

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-40 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		
Active Aperture Height ²	2 mm		
Modulation Bandwidth(-3db)	2.9 MHz (1.0 mm beam diameter)		
	1.9 MHz (1.5 mm beam diameter)		
Optical Rise Time	170 ns (1.0 mm beam diameter)		
	245 ns (1.5 mm beam diameter)		
Acousto-optic Material	Dense Flint Glass		
Static Optical Insertion Loss	2% (633nm)		
Optical Polarization	Any		
RF Input Impedance	50 ohms		
RF Connector	BNC		
Size(less connector)	2.94 L x 2.46 W x 0.88 H inches		
	74.7 L x 62.5 W x 22.4 H mm		
MODEL	AOM-40	AOM-40N	AOM-40R8
Optical Wavelength Range	440-700 nm	700-1100 nm	1.06 μm
Diffraction Efficiency	90%	85%	80%
Drive Power ³	2 Watts (633 nm)	3.5 Watts (830 nm)	5 Watts
Beam Separation	6.5 mrad (633 nm)	8.5 mrad (830 nm)	10.8 mrad

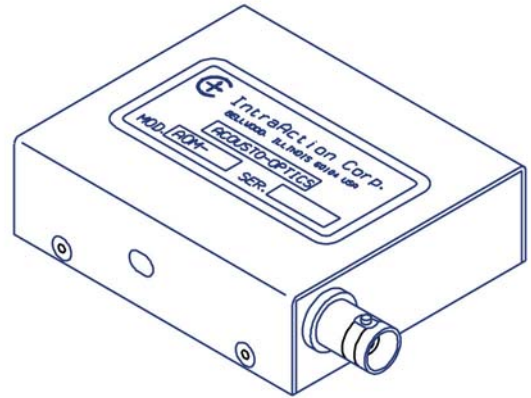
¹ Other center frequencies available.

² Other active aperture heights available.

³ A complete line of analog, digital, dual frequency, OEM, and laboratory drive electronics are available.

MODEL AOM SERIES ACOUSTO-OPTIC MODULATOR/ FREQUENCY SHIFTER

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



SPECIFICATIONS			
Optical Wavelength Range	440 to 700 nm		
Acousto-optic Material	Dense Flint Glass		
Active Aperture Height ¹	2 mm		
RF Input Impedance	50 ohms		
Modulation Bandwidth(-3db)	2.9 MHz (1.0 mm beam diameter) 1.9 MHz (1.5 mm beam diameter)		
Optical Rise Time	170 ns (1.0 mm diameter) 245 ns (1.5 mm diameter)		
Static Optical Insertion Loss	2% (633nm)		
Optical Polarization	Any		
RF Connector	BNC		
Size (less connector)	74.6 x 62.5 x 22.4 mm 2.94 x 2.46 x 0.88 inches		
MODEL	AOM-602	AOM-702	AOM-8028
Center Frequency ²	60 MHz	70 MHz	80 MHz
Optical Frequency Shift Range	±(50 to 70)MHz	±(55 to 85)MHz	±(65 to 95)MHz
Diffraction Efficiency	90%	85%	80%
Drive Power ³	2 Watts (633 nm)	2 Watts (633 nm)	2 Watts (633 nm)
Beam Separation	9.6 mrad (633 nm)	11.2 mrad (633 nm)	12.8 mrad (633 nm)

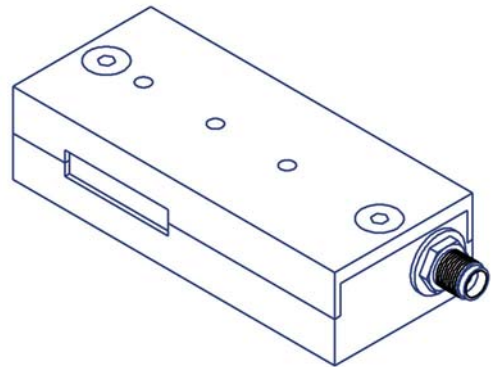
¹ Other active aperture heights available.

² Other center frequencies available.

³ A complete line of analog and digital OEM and laboratory drive electronics are 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				
Acousto-optic Material	AMTIR-I Chalcogenide Glass			
Optical Wavelength ¹	1.2 to 1.6 μm			
Optical Power Capability	50 kW / cm^2			
Active Aperture Height ²	2 mm			
Diffraction Efficiency	90%			
RF Drive Power ³	600 mW (1.55 μm)			
RF Input Impedance	50 ohms			
Modulation Bandwidth (-3db)	1.25 MHz (1.5 mm diameter)			
Optical Rise Time	255 ns/mm beam diameter			
Static Optical Insertion Loss	5% (1.55 μm)			
Optical Polarization	Any			
RF Connector	SMA			
Size (less connector)	2.80 L x 1.25 W x 0.70 H inches			
	71.2 L x 31.8 W x 17.8 H mm			
MODEL	ACM-402AAI	ACM-502AAI	ACM-802AAI	ACM-1002AAI
Center Frequency ⁴	40 MHz	50 MHz	80 MHz	100 MHz
Optical Frequency Shift	± 30 to 50 MHz	± 40 to 60 MHz	± 65 to 95 MHz	± 80 to 120 MHz
Beam Separation (1.55 μm)	24.6 mrad	30.8 mrad	49.2 mrad	61.5 mrad

¹ Wavelengths available in the range of 1.2 to 2.5 μm with appropriate antireflection coating. Specifications vary with optical wavelength.

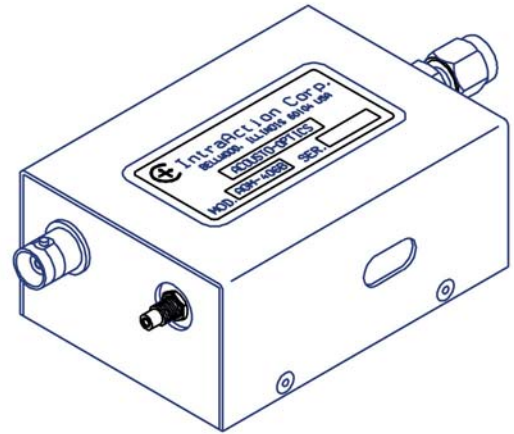
² Other active aperture heights available with modified specifications.

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 AGM-406BI IR ACOUSTO-OPTIC MODULATOR/ FREQUENCY SHIFTER

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



SPECIFICATIONS	
Optical Wavelength ¹	10.6 μm
Acousto-optic Material	Optical Single Crystal Germanium
Acoustic Velocity	5.5 mm/ μs
Center RF Frequency ²	40 MHz
RF Bandwidth	20 MHz
Optical Frequency Shift Range	\pm (30 MHz to 50 MHz)
Beam Separation	77 mrad (40 MHz)
Bragg Angle	38.5 mrad (40 MHz)
Diffraction Efficiency	85%
RF Drive Power ³	30 Watts
Active Aperture Height	6 mm
Modulation Bandwidth (-3db)	750 kHz (5.5 mm diameter)
Optical Rise Time	117 ns / mm beam diameter
RF Input Impedance	50 ohms
Optical Insertion Loss	<12%
Optical Power Capability	100 Watts full aperture
Optical Polarization	Parallel to mounting surface
Water Cooling	500 ml / min at 20°C
Thermal Interlock Switch	NC opens at 45°C
Size (less connectors)	2.97 D x 1.50 H x 2.42 W inches
	75.4 D x 38.1 H x 61.5 W mm

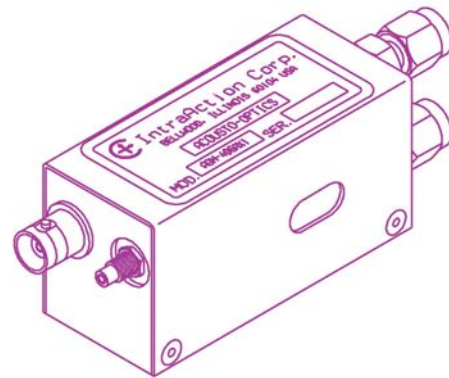
¹ Other wavelengths and ranges from 2.5-11.5 μm available. Note: Specifications change with optical wavelength.

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 / μ s			
RF Center Frequency ¹	40 MHz			
Optical Frequency Shift Range	\pm (30 to 50) MHz			
RF Input Impedance	50 ohms			
Optical Insertion Loss	<7%			
Optical Power Capability	25 Watts full aperture			
Laser Polarization	Parallel to Base			
Water Cooling	250 ml / min, 20° 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	AGM-402A1	AGM-406A1	AGM-402A3	AGM-406A3
Optical Wavelength ²	10.6 μ m	10.6 μ m	3.39 μ m	3.39 μ m
Active Aperture Height	2 mm	6 mm	2 mm	6 mm
Optical Rise Time (diameter)	116 ns (1 mm)	582 ns (5 mm)	116 ns (1 mm)	582 ns (5 mm)
Modulation -3 dB Bandwidth	4.1 MHz (1 mm)	825 kHz (5 mm)	4.1 MHz (1 mm)	825 kHz (5 mm)
Beam Separation	77 mrad	77 mrad	24.7 mrad	24.7 mrad
Bragg Angle	38.5 mrad	38.5 mrad	12.3 mrad	12.3 mrad
Diffraction Efficiency	70%	50%	70%	70%
RF Drive Power ³	20 Watts	25 Watts	2 Watts	6 Watts

¹ Other frequencies available

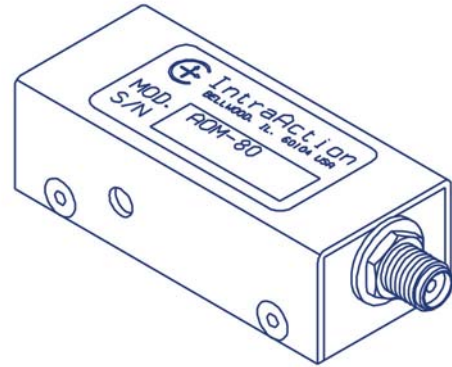
² Narrow and broadband A/R coatings in the range of 2.2 μ m to 12 μ m are available.

³ Laboratory and OEM drive electronics available.

NOTE: Operating specifications change with optical wavelength.

MODEL AOM-80 MODEL AOM-110 ACOUSTO-OPTIC MODULATOR

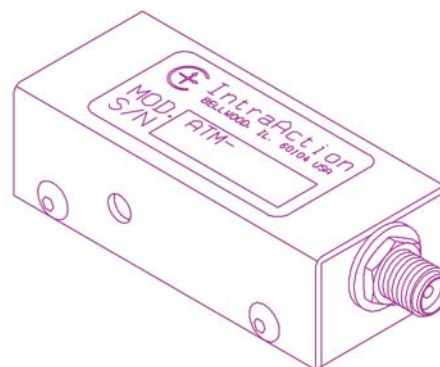
- HIGH OPTICAL POWER CAPABILITY
- INTENSITY MODULATION
- OPTICAL FREQUENCY SHIFTING
- HIGH RELIABILITY
- EXCELLENT TEMPERATURE STABILITY



SPECIFICATIONS				
Optical Wavelength Range	440 nm to 700 nm			
Acousto-optic Material	Dense Flint Glass			
Static Optical Insertion Loss	2% (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		AOM-110	
Acoustic Frequency	80 MHz		110 MHz	
Active Aperture Height	1 mm		0.6 mm	
Optical Wavelength	442 nm	633 nm	442 nm	633 nm
Beam Separation	9.7 mrad	13.9 mrad	13.4 mrad	19.2 mrad
RF Drive Power	1 Watt	2 Watts	1 Watt	2 Watts
Static Optical Insertion Loss	7%	2%	5%	2%
Beam Diameter	0.18 mm/0.36 mm	0.18 mm/0.36 mm	0.14 mm/0.28 mm	0.14 mm/0.28 mm
Optical Rise Time	35 ns/70 ns	35 ns/70 ns	24 ns/48 ns	24 ns/48 ns
Modulation Bandwidth	15 MHz/7.5 MHz	15 MHz/7.5 MHz	20 MHz/10 MHz	20 MHz/10 MHz
Diffraction Efficiency	80%/85%	70%/80%	80%/80%	70%/70%

MODEL ATM SERIES ACOUSTO-OPTIC MODULATOR

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



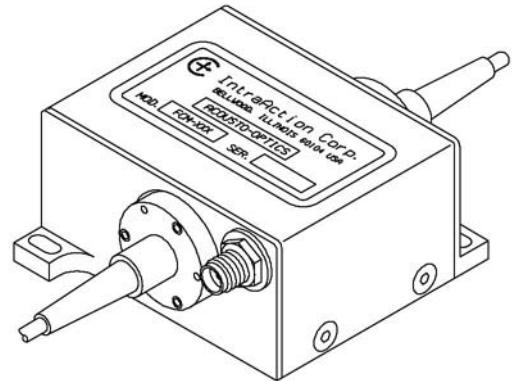
SPECIFICATIONS			
Optical Wavelength Range ¹	440 nm to 700 nm		
Acousto-optic Material	Tellurium Dioxide (TeO ₂)		
Sound Velocity	4260 m/sec (longitudinal)		
Input Impedance	50 ohms		
Input VSWR	<1.3:1 at center frequency		
Static Optical Insertion Loss	4%		
Size (less SMA connector)	2.00 D X 0.63 H X 0.9 W inches		
	5.08 D X 1.60 H X 2.28 W cm		
MODEL	ATM-80A I	ATM-125B I	ATM-200C I
Center Frequency	80 MHz	125 MHz	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
Diffraction Efficiency	85%	80%	70%
RF Drive Power ² (633 nm)	700 mW	800 mW	900 mW
RF Drive Power ² (514 nm)	500 mW	550 mW	600 mW
Optical Rise Time (beam diameter)	31 ns (0.2 mm)	20 ns (0.13 mm)	9.2 ns (0.06 mm)
	77 ns (0.5 mm)	38 ns (0.25 mm)	15.5 ns (0.1 mm)
Modulation Frequency (-3 db)	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)

¹ Specifications vary with optical wavelength.

² Drive electronics Model ME-80I/ME-125I/ME-200I analog input, ME-80IT/ME-125IT/ME-200IT digital input. OEM drivers also available.

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-I Chalcogenide Glass			
Optical Fiber ¹	Singlemode			
Fiber Connector ¹	FC-PC			
Optical Back Reflection ²	-40 dB			
Optical Polarization	Any			
Input Impedance / VSWR	50 ohms / 1.2:1			
Size	See outline drawing			
MODEL (MODULATOR)³	FCM-40.8E5C	FCM-40.8E6C	FCM-40IE5C	FCM-40IE6C
Optical Wavelength	1.55 μm	1.3 μm	1.55 μm	1.3 μm
RF Frequency ⁴	40 MHz	40 MHz	40 MHz	40 MHz
Optical Frequency Shift	+ 40 MHz	+ 40 MHz	+ 40 MHz	+ 40 MHz
RF Drive Power ⁵	600 mW	500 mW	500 mW	400 mW
Insertion Loss (RF on)	< 3 dB	< 3 dB	< 2.4 dB	< 2.4 dB
Extinction Ratio (RF on/RF off) ⁵	>55 dB	> 55 dB	> 55 dB	> 55 dB
Modulation Bandwidth (-3 dB)	7.5 MHz	7.5 MHz	4 MHz	4 MHz
Optical Rise Time	60 ns	60 ns	120 ns	120 ns
MODEL (ATTENUATOR)³	FCM-40.8E5CA	FCM-40.8E6CA	FCM-40IE5CA	FCM-40IE6CA
Optical Wavelength	1.55 μm	1.3 μm	1.55 μm	1.3 μm
RF Frequency ⁴	40 MHz	40 MHz	40 MHz 4	0 MHz
RF Drive Power ⁵	600 mW	500 mW	500 mW	400 mW
Insertion Loss (RF off)	< 1 dB	<1 dB	< 1 dB	< 1 dB
Extinction Ratio (RF off/RF on)	7 dB	7 dB	7 dB	7 dB
Modulation Bandwidth (-3 dB)	7.5 MHz	7.5 MHz	4 MHz	4 MHz
Optical Rise Time	60 ns	60 ns	120 ns	120 ns

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.

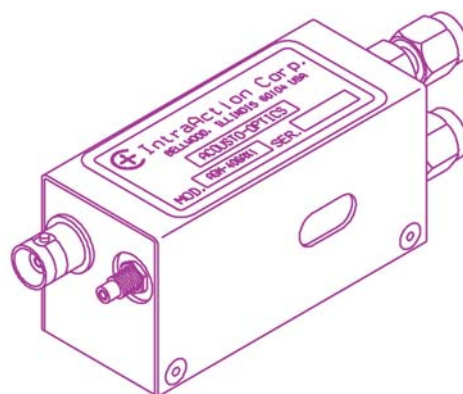
³ Modulator... first order diffracted beam is transmitted to output fiber; Attenuator... zero order beam is transmitted to output fiber.

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-AI HIGH FREQUENCY SERIES IR ACOUSTO-OPTIC MODULATOR/FREQUENCY SHIFTER

- OPTICAL FREQUENCY SHIFTING
- INTENSITY MODULATION
- LASER BEAM DEFLECTION
- HIGH RELIABILITY



SPECIFICATIONS			
Spectral Wavelength ¹	10.6 μm		
Acousto-optic Material	Optical Single Crystal Geranium		
Acoustic Velocity	5.5 mm/ μsec		
Active Aperture Height	3 mm		
Modulation Bandwidth (-3db)	1.6 MHz (2.5 mm beam diameter)		
Optical Rise Time	290 ns (2.5 mm beam diameter)		
RF Input Impedance	50 ohms		
Optical Insertion Loss	<7%		
Optical Power Capability	25 Watts full aperture		
Laser Polarization	Linear, parallel to mounting surface		
Water Cooling	250 ml / min, 20°C		
Thermal Interlock Switch	NC, opens at 45°C		
Size (less connectors)	3.00 D x 1.50 H x 1.30 W inches		
	76.2 D x 3.81 H x 33.0 W mm		
MODEL	AGM-903AI	AGM-1003AI	AGM-1103AI
Center Frequency ²	90 MHz	100 MHz	110 MHz
Frequency Shift Range ²	$\pm(80 \text{ to } 100)$ MHz	$\pm(90 \text{ to } 110)$ MHz	$\pm(100 \text{ to } 120)$ MHz
Beam Separation	173 mrad (90 MHz)	192 mrad (100 MHz)	212 mrad (110 MHz)
Bragg Angle	86.7 mrad (90 MHz)	96 mrad (100 MHz)	106 mrad (110 MHz)
Diffraction Efficiency	60%	60%	50%
RF Drive Power	20 Watts	20 Watts	20 Watts

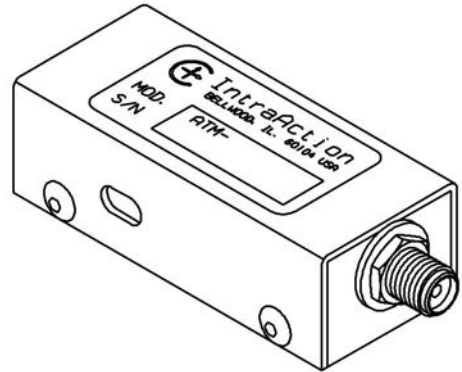
¹ Narrow and broadband A/R coatings in the range of 2.2 μm to 11 μm are available.

² Other frequencies available.

NOTE: Operating specifications change with optical wavelength.

MODEL ATM-A1/A2 SERIES ACOUSTO-OPTIC FREQUENCY SHIFTER

- WIDE CENTRE FREQUENCY CHOICE
- USER SPECIFIED CENTER FREQUENCY¹
- WIDE FREQUENCY SHIFTING RANGE
- HIGH DIFFRACTION EFFICIENCY
- BEAM DEFLECTION
- LOW DRIVE POWER
- HIGH RELIABILITY



SPECIFICATIONS		
Range of Center Frequency Choice ¹ (F)	80 MHz - 350 MHz	
Frequency Shifting Bandwidth	50% of center frequency	
Acousto-optic Material	Tellurium Dioxide (TeO ₂)	
Active Aperture Height	1 mm	
Sound Velocity (V)	4260 m/sec (longitudinal)	
Beam Separation	$(\lambda \times F) / V$	
Optical Rise Time	151 ns/mm beam diameter	
Static Optical Insertion Loss	<4%	
Input Impedance	50 ohms	
Input VSWR	<1.5:1 at center frequency	
Size (less SMA connector)	2.00 L x 0.63 H x 0.9 W inches	
	5.08 L x 1.60 H x 2.28 W cm	
MODEL	ATM-A1 SERIES	ATM-A2 SERIES ⁸
Optical Wavelength Range ² (?)	440 nm - 700 nm	700 nm - 1100 nm
Diffraction Efficiency ³	85% (80 MHz)	80% (80 MHz)
	70% (350 MHz)	65% (350 MHz)
RF Drive Power ^{3,4}	1 Watt (633 nm)	1.5 Watts (780 nm)
Example: (90 MHz center frequency)	ATM-90IA1	ATM-90IA2
Example: (270 MHz center frequency)	ATM-270IA1	ATM-270IA2

¹ Choose center frequency to match application.

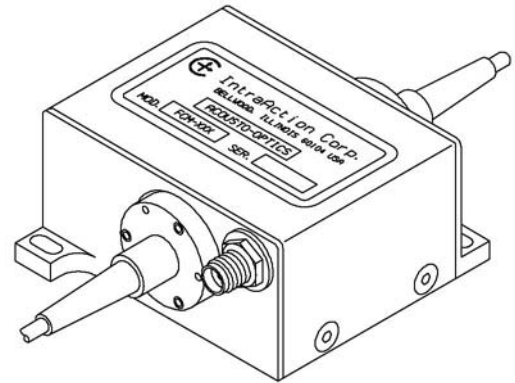
² Specifications vary with optical wavelength.

³ RF drive power required varies as the square of the optical wavelength.

⁴ A complete line of drive electronics is available. See VFE series, ME series, and DE series drivers. OEM drivers also available.

MODEL FCM SERIES FIBER PIGTAILED ACOUSTO-OPTIC MODULATOR/ FREQUENCY SHIFTER

- NEAR IR WAVELENGTH RANGE
- OPTICAL FREQUENCY SHIFTING
- CHOICE OF FREQUENCY SHIFT³
- INTENSITY MODULATION
- LOW RF DRIVE POWER
- HIGH RELIABILITY



SPECIFICATIONS				
Acousto-optic Material	AMTIR-I Chalcogenide Glass			
Optical Fiber ¹	Singlemode			
Fiber Connector ¹	FC-PC			
Modulation Bandwidth (-3dB)	4.0 MHz			
Optical Rise Time	120 ns			
Insertion Loss ²	< 2.0 dB			
Extinction Ratio (On/Off)	> 55 dB			
Optical Polarization	Any			
Input Impedance / VSWR	50 ohms / 1.2:1			
Size (less connectors)	2.24(5.7)D x 1.10(2.8)H x 2.29(5.82)W inches(cm)			
MODEL	FCM-40IE6C	FCM-50IE6C	FCM-80IE6C	FCM-100IE6C
RF Frequency ³	40 MHz	50 MHz	80 MHz	100 MHz
Optical Frequency Shift ^{3,4}	+ 40 MHz	+ 50 MHz	+ 80 MHz	+100 MHz
Optical Wavelength	1.3 μm	1.3 μm	1.3 μm	1.3 μm
RF Drive Power ⁵	500 mWatts	500 mWatts	700 mWatts	1.0 Watt
MODEL	FCM-40IE5C	FCM-50IE5C	FCM-80IE5C	FCM-100IE5C
RF Frequency ³	40 MHz	50 MHz	80 MHz	100 MHz
Optical Frequency Shift ^{3,4}	+ 40 MHz	+ 50 MHz	+ 80 MHz	+100 MHz
Optical Wavelength	1.55 μm	1.55 μm	1.55 μm	1.55 μm
RF Drive Power ⁵	700 mW	1.0 Watt	1.0 Watts	1.5 Watt

¹ Other optical fiber such as polarization maintaining, and other connectors such as FC-APC are also available.

² Does not include connector losses.

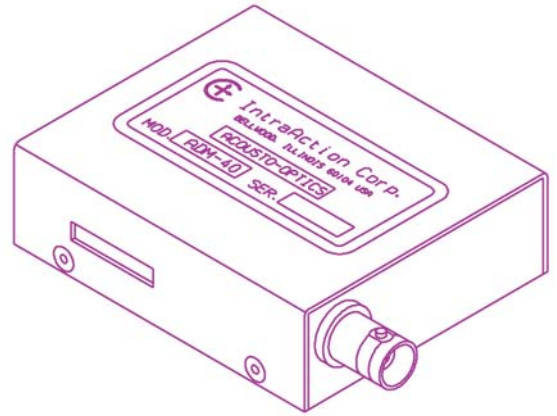
³ User defined frequencies available from 40 MHz to 250 MHz. Note: Specifications change with frequency.

⁴ Negative frequency shift available. Specify when ordering.

⁵ Single frequency or phase locked dual frequency, laboratory, or OEM drivers are available. High extinction drivers also available.

MODEL ADM-40 ACOUSTO-OPTIC DEFLECTOR-MODULATOR

- LASER BEAM DEFLECTION
- INTENSITY MODULATION
- FLAT OPTICAL SCAN RESPONSE¹
- OPTICAL FREQUENCY SHIFTING
- OPTICAL SIGNAL PROCESSING
- MULTIPLE BEAM GENERATION
- HIGH OPTICAL POWER CAPABILITY
- EXCELLENT TEMP. STABILITY & RELIABILITY



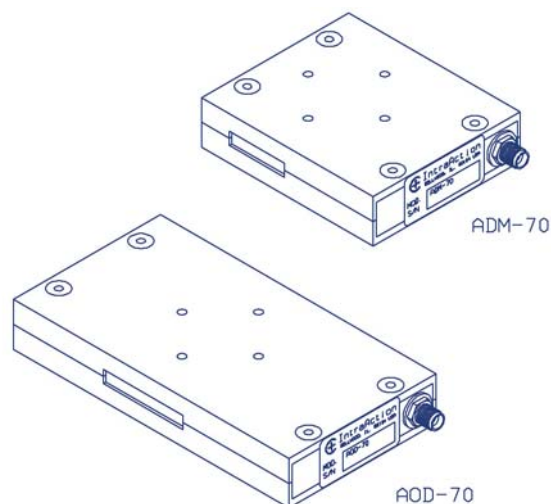
SPECIFICATIONS	
Optical Wavelength Range	440 to 700 nm
Acousto-optic Material	Dense Flint Glass
Center RF Frequency	40 MHz
Deflection RF Bandwidth	20 MHz
Optical Frequency Shift Range	± (30 to 50) MHz
Beam Separation	6.5 mrad (633 nm)
Angular Deflection	3.2 mrad (633 nm)
Diffraction Efficiency	85%
Active Optical Aperture	2 x 20 mm
Access Time	252 ns / mm beam width
Time-Bandwidth Product	100 (full aperture)
Intensity Modulation Bandwidth	2.9 MHz (1.0 mm beam diameter) 4.5 MHz (0.65 mm beam diameter)
Optical Rise Time	162 ns / mm optical beam width
Optical Polarization	Any
Static Optical Insertion Loss	2% (633 nm)
RF Drive Power	2 Watts (nominal at 633 nm)
RF Impedance	50 ohms (nominal)
RF Connector	BNC
Size (less connector)	2.94 D x 0.88 H x 2.46 W inches 74.6 D x 22.4 H x 62.5 W mm

¹ The Model ADM-40 incorporates an acoustic phased-array beam steering design which produces a relatively flat first order diffraction efficiency across the deflection bandwidth. A complete line of analog and digital OEM and laboratory drive electronics are available.

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 DESIGN¹
- OPTICAL SIGNAL PROCESSING
- OPTICAL FREQUENCY SHIFTING
- HIGH RELIABILITY



SPECIFICATIONS			
Design Optical Wavelength ²	633 nm		
Acousto-optic Material	Dense Flint Glass		
Diffraction Efficiency (center of scan)	80%		
Diffraction Efficiency (edges of scan)	60%		
Center Frequency	70 MHz		
Deflection Bandwidth	40 MHz		
Beam Separation	11.4 mrad (70 MHz)		
Deflection Range	6.5 mrad		
RF Drive Power ³ (nominal)	2.5 Watts		
Input Impedance (nominal)	50 ohms		
Optical Polarization	Any		
MODEL	ADM-70	AOD-70	
Time-Bandwidth Product(resolution) ⁴	200(spots)	400(spots)	
Access Time (full aperture width)	5 μs	10 μs	
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.

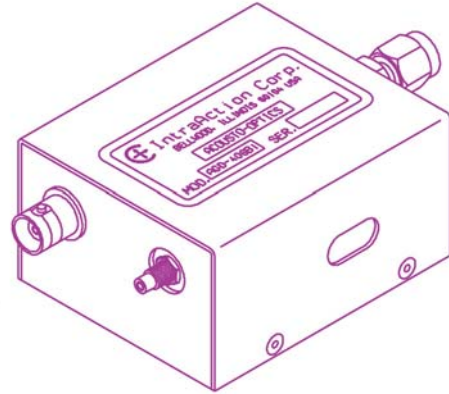
² Useful at other wavelengths with modified specifications.

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.

MODEL AGD-406B I INFRARED ACOUSTO-OPTIC DEFLECTOR

- LASER BEAM DEFLECTION
- FLAT OPTICAL SCAN RESPONSE¹
- OPTICAL FREQUENCY SHIFTING
- INTENSITY MODULATION
- HIGH OPTICAL POWER CAPABILITY
- EXCELLENT TEMP. STABILITY & RELIABILITY



SPECIFICATIONS	
Design Optical Wavelength ²	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%
RF Drive Power	30 Watts (nominal)
Active Aperture Height	6 mm
Access Time	182 ns / 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 ns / mm optical beam width
Optical Polarization	Parallel to mounting surface
Static Optical Insertion Loss	<12%
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-406B I 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.

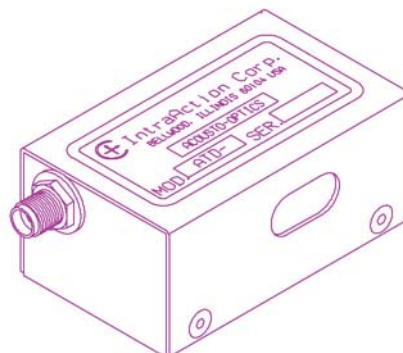
² Deflectors can be designed to operate at other wavelengths in the range of 2.5 to 11 μm.

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 (TeO ₂)	
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 ¹	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%	
RF Drive Power ²	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	ATD-805AAI	ATD-805RAI
Optical Wavelength	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 μs / mm beam width	1.51 μs / 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.

MODEL DTD COLLINEAR¹ SERIES 2-AXIS ACOUSTO-OPTIC DEFLECTOR FOR 1064 NM

- LASER BEAM DEFLECTION
- COLLINEAR DESIGN¹
- OPTICAL TWEEZERS
- LINEAR SCANNING
- LOW RF DRIVE POWER
- RELIABLE OPERATION



SPECIFICATIONS		
Acousto-optic Material	Tellurium Dioxide (TeO ₂)	
Operating Mode	Slow shear / off axis	
Optical Wavelength (8)	1064 nm (nominal)	
Optical Insertion Loss	< 5%	
First Order Diffraction Efficiency	> 50% (total for both axes)	
Optical Intensity Variation	< 0.25 dB	
Optical Input and Output Polarization ²	Linear	
Active Aperture Height ³	4 mm	
RF Drive Power ^{4,5}	< 1 Watt	
Input Impedance	50 ohms (nominal)	
RF Connectors	SMA	
Size (less connectors) ⁶	1.50 D x 1.50 H x 2.0 W inches	
	38.1 D x 38.1 H x 50.8 W mm	
MODEL	DTD-274HD6	DTD-464RE6
Center RF Frequency (CF)	27 MHz	46 MHz
Deflection Bandwidth (BW at -1.5 dB)	16 MHz	28 MHz
Time-Bandwidth Product (4 mm)	100	165
Access time (per mm beam diameter)	1.58 μs	1.5 μs
Beam Separation (at CF)	45.4 mrad	73.8 mrad
Deflection Range	27 mrad	45 mrad

¹ The nominal center of the 2-axis deflection area is collinear with the input optical beam. (Eliminates typical AO off-axis alignment)

² Input and output polarizations are in the same direction. Orientation is indicated on the input face of the DTD.

³ 6 mm Active Aperture Height is also available.

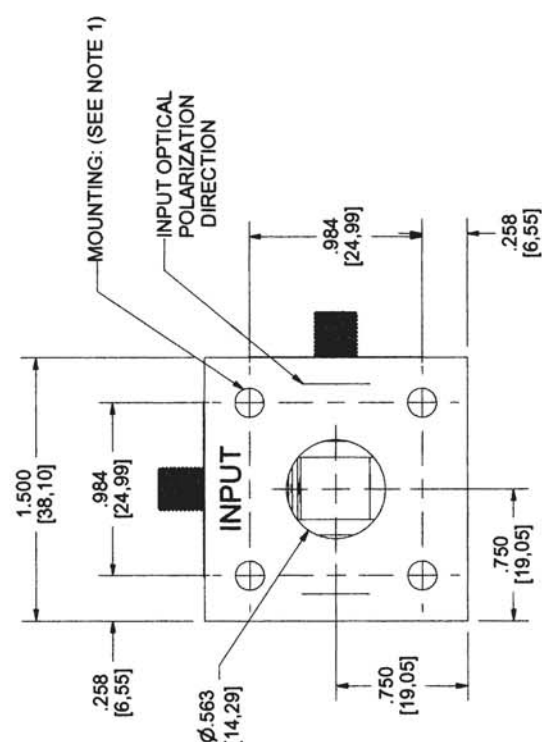
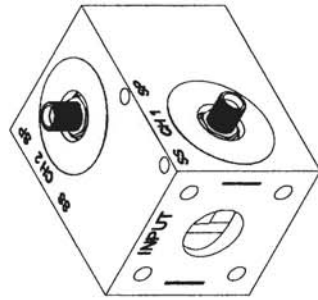
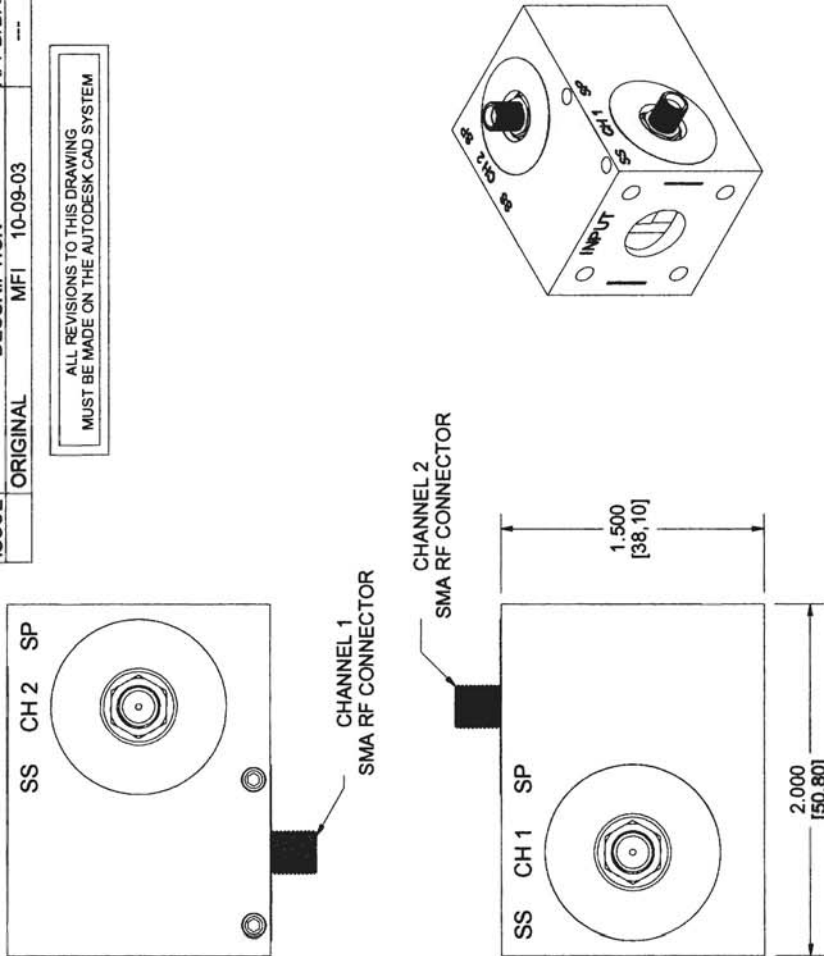
⁴ For Optical Tweezers applications: Model DVE-120 synthesized RF frequency PCI computer card and DPA series power amplifier.

⁵ For Linear Scanning applications: DE series Voltage Controlled Oscillator drivers.

⁶ Since both deflection angles can not originate at the same point, the origins are as close together as physically possible.

ISSUE	ORIGINAL	MFI	10-09-03
REVISION HISTORY	DESCRIPTION		
APPD/DATE	---		

ALL REVISIONS TO THIS DRAWING
MUST BE MADE ON THE AUTODESK CAD SYSTEM

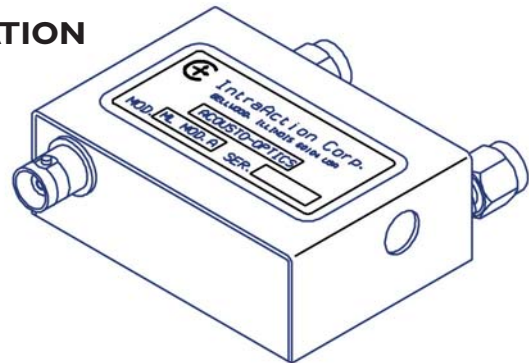


NOTES:
1. MOUNTING SCREW HOLES: (4X)
DTD-274HD6: #8-32 X .275 MAX. DEEP.
DTD-274HD6M: M4 X .7 X 6.5 MAX. DEEP.

IntraAction Corp. 3719 WARREN AVE. BELLWOOD, IL 60104 PHONE (708) 547-6644	APPROVED DATE	DATE	
	CHECKED	MFI	10-09-03
UNLESS OTHERWISE SPECIFIED TOLERANCES AND DIMENSIONS ARE IN INCHES LINEAR : .XX ± .01 .XXX ± .005 ANGULAR ± 1' / DIAMETERS ± .005 LIMITS MAY APPLY BEFORE FINISHING DO NOT SCALE THIS PRINT	DRAWN	MFI	10-09-03
	FINISH		
MATERIAL			
MFG. INSTR.			
Q. C. INSTR.			
FCSM NO.	B	DWG. NO.	DTD-274HD6 / HD6M
SIZE	OUTLINE	ISSUE	1
SCALE	1.5 : 1	UNIT WEIGHT	SHEET 1 OF 1

MODEL ML SERIES ACOUSTO-OPTIC MODE LOCKER

- CHOICE OF WINDOW CONFIGURATION
- USER SPECIFIED FREQUENCY
- CHOICE OF MODE SPACING
- HIGH EFFICIENCY
- WIDE RF BANDWIDTH
- TEMPERATURE TUNING



DESCRIPTION

The ML series Mode Lockers are manufactured from high quality fused silica acousto-optic material. The RF sound field is generated with Lithium Niobate transducers. The user can specify window configuration, operating frequency, and mode spacing in order to optimize system performance.

The Mode Locker is an acoustic standing-wave device with resonant mode spacing determined by the thickness of the acousto-optic material. When an integral number of acoustic half wavelengths are present across the material, standing waves are formed and modulate the laser cavity at twice the applied RF frequency. The C/2L frequency of the laser cavity should be set to the Mode Locker modulation frequency. Standard acoustic RF frequencies are from 20 to 70 MHz with higher frequencies available upon request. Water flow through the Mode Locker is used to stabilize the mode resonant frequency when used in the CVW operating mode and may not be required for low duty cycle pulse operation. The frequency of the resonant mode peak can be temperature tuned +7 kHz/°C by changing the temperature of the Mode Locker.

A variety of window configurations have been found to be most useful and are tabulated below. For optimum performance, optical polarization should be parallel to the housing mounting surface.

SPECIFICATIONS	MODEL ML-* * 3 () I	
Optical Antireflection (AR) Coating ¹	1064 nm	
Choice of Acoustic RF Frequency (* *) ²	20 MHz to 70 MHz	
Mode Spacing	330 kHz or 460 kHz	
RF Bandwidth	±10 percent of center frequency	
Active Optical Aperture ³	3 H x 5 W mm	
Diffraction Efficiency	50%	
RF drive power	2 Watts	
Temperature Tuning	+7 kHz / °C	
Static Optical Insertion Loss	0.3%	
WINDOW DESCRIPTION	DESIGNATION ()	MODE SPACING
4° Wedge	A	460 kHz
2° Rhomboid	B	460 kHz
1° Wedge	C	460 kHz
Brewster	D	460 kHz
1° Wedge	J	330 kHz
Brewster	Q	330 kHz

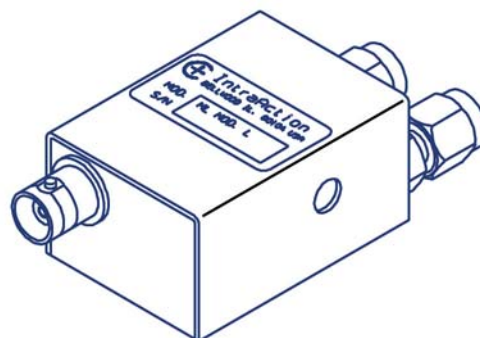
¹ Non-Brewster window devices are AR coated with a high damage threshold coating for 1064 nm; other wavelengths are available. Designator I in the model number is for the AR coating at 1064 nm. This designator will be different for other AR coatings.

² Frequency * * can be specified up to and above 100 MHz.

³ Active optical apertures of 4 x 5 and 5 x 5 mm can also be specified. Change designator 3 to either 4 or 5.

MODEL MLR SERIES MODE LOCKER FOR Ti:Sapphire LASER

- CONCURRENT CW MODE SUPPRESSION
- SHORT OPTICAL PATH LENGTH
- LOW ACOUSTIC Q
- USER SPECIFIED FREQUENCY
- REGENERATIVE LASER SYSTEMS
- CUSTOM DESIGNS AVAILABLE¹
- HIGH RELIABILITY



SPECIFICATIONS	
Material	Schlieren Grade Fused Silica
Material	Path Length 1.5 cm
Window Configuration ²	User specified
Wavelength Range ³	700 - 1100 nm
Optical Insertion Loss	< 0.5%
RF Frequency ⁴ (nominal)	User specified up to 150 MHz
RF Bandwidth	+/- 15%
Mode Spacing	330 kHz or 460 kHz (nominal)
Mode Bandwidth (-3 dB)	200 kHz (near center RF frequency)
Loss Diffraction Efficiency ⁵	50%
RF Drive Power ⁵	5 Watts
Sound Field Height ⁶	3 mm
Laser Polarization	Linear (parallel to mounting surface)
Size (less connectors)	1.98 D x 1.01 H x 1.19 L inches 5.03 D x 2.57 H x 3.03 L cm
Temperature Stabilization ⁷	Water Cooling
MODEL	MLR-403DB23 MLR-403BB10
RF Frequency	40 MHz (nominal) 40 MHz (nominal)
Active Aperture	2 mm 3 mm
Window Configuration ²	Brewster 2° rhomboid
Wavelength Range	700 - 1100 nm 700 - 900 nm

¹ Specify RF frequency, optical beam diameter, window configuration, and optical wavelength or range.

² Rhomboid, wedge, or Brewster.

³ Antireflection coatings have a reflectance < 0.1 percent for a 200 nm range. Specify range.

⁴ RF frequency should be 1/2 of the C/2L frequency of the laser cavity.

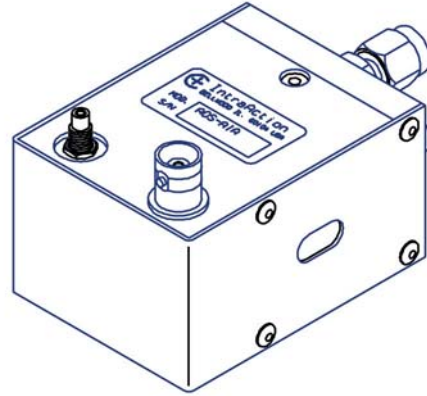
⁵ Diffraction efficiency and RF drive power vary with optical wavelength and sound field height.

⁶ Other sound field heights to 5mm are available.

⁷ Thermoelectric cooling is available.

MODEL AQS-AI SERIES ACOUSTO-OPTIC Q-SWITCH

- CAVITY LOSS MODULATION
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMP. STABILITY



SPECIFICATIONS				
Optical Wavelength ¹	1.06 μm			
Anti-reflection Coating	Reflectance < 0.05%			
Optical Power Capability	500 mW/cm ²			
Optical Rise Time	110 ns/mm optical beam diameter			
Static Optical Insertion Loss	0.3%			
Optimum Polarization ⁴	Perpendicular to mounting surface			
Input Impedance / VSWR	50 ohms/1.25			
RF Connector	BNC			
Heat Exchange	Water cooled 250 ml/min			
Size (less connectors)	2.73 D x 1.50 H x 2.16 W inches			
	6.94 D x 3.81 H x 5.49 W cm			
MODEL	AQS-242A1A	AQS-244A1A	AQS-245A1A	AQS-504A1AC
	AQS-272A1A	AQS-274A1A	AQS-275A1A	
Center Frequency ²	24 MHz	24 MHz	24 MHz	50 MHz
	27.12 MHz	27.12 MHz	27.12 MHz	
Beam Separation	4.3 mrad	4.3 mrad	4.3 mrad	8.9 mrad
	4.8 mrad	4.8 mrad	4.8 mrad	
Active Aperture ³	2 x 12 mm	4 x 12 mm	5 x 12 mm	4 x 12 mm
Loss Efficiency	40%	40%	40%	40%
RF Drive Power	5 watts ⁴	10 watts ⁴	12 watts ⁴	15 watts ⁴
	20 watts ⁵	40 watts ⁵	50 watts ⁵	

¹ Other wavelengths are available.

² Other frequencies are available.

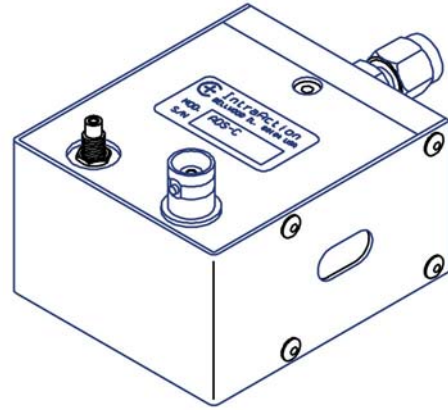
³ Active aperture heights to 10 mm are available.

⁴ Vertical polarization

⁵ Random polarization

MODEL AQS-C SERIES BREWSTER WINDOW ACOUSTO-OPTIC Q-SWITCH

- CAVITY LOSS MODULATION
- BREWSTER WINDOWS
- W / LOW OH - CONTENT MATERIAL
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMP. STABILITY



SPECIFICATIONS

Optical Power Capability	500 mW/cm ²
Optical Rise Time	160 ns/mm optical beam diameter
Static Optical Insertion Loss	0.3%
Optical Polarization	Perpendicular to mounting surface
Input Impedance/VSWR	50 ohms/1.25
RF Connector	BNC
Heat Exchange	Water cooled 250 ml/min
Size (less connectors)	2.73 D x 1.50 H x 2.5 W inches

6.94 D x 3.81 H x 6.4 W cm

MODEL	AQS-245CI	AQS-245CWI	AQS-244CWI2
	AQS-275CI	AQS-275CWI	
Optical Wavelength	0.7 - 1.1 μm	1.32 μm	2 μm
Fused Silica Material	standard 4101	low OH- content	low OH- content
Center Frequency ¹	24 MHz	24 MHz	24 MHz
	27.12 MHz	27.12 MHz	
Beam Separation	4.3 mrad(1.06 μm)	5.3 mrad	8.1 mrad
	4.8 mrad(1.06 μm)	6.0 mrad	
Active Aperture ²	3 x 12 mm	3 x 12 mm	2.5 x 12 mm
Loss Efficiency	40%	40%	40%
RF Drive Power ³	12 Watts(1.06μm) ³	20 Watts	40 Watts

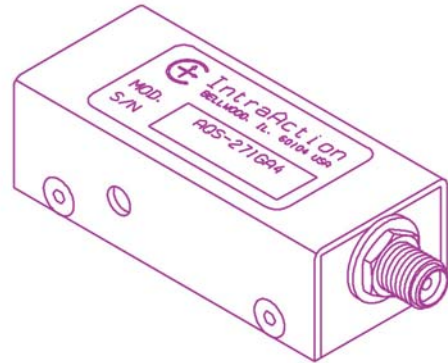
¹ Other frequencies are available.

² Active aperture heights to 4 mm are available.

³ RF drive power required is proportional to optical wavelength squared.

MODELS AQS-GA4 SERIES ACOUSTO-OPTIC Q-SWITCH

- CAVITY LOSS MODULATION
- HIGH OPTICAL POWER CAPABILITY
- HIGH RELIABILITY
- EXCELLENT TEMPERATURE STABILITY
- SMALL SIZE



SPECIFICATIONS	
Acousto-optic Material ¹	Dense Flint Glass
Optical Wavelength ²	1.047-1.064 μm
Optical Power Capability	>500 mW/cm ²
Optical Polarization	Any
Static Optical Insertion Loss	0.3%
Active Aperture Height ³	1 mm
Optical Rise Time	177 ns/mm optical beam diameter
Diffraction Loss Efficiency	50%
RF Drive Power ⁴	2 Watts
Input Impedance/VSWR	50 ohms/1.25
RF Connector	SMA
Size (less connector) ⁵	2.00 D X 0.63 H X 0.90 W inches 5.08 D X 1.60 H X 2.28 W cm
MODEL	AQS-271GA4 AQS-4E1GA4 AQS-801GA4
Acoustic Frequency ⁶	27.12 MHz 40.68 MHz 80 MHz
Beam Separation (1.06 μm)	7.9 mrad 11.9 mrad 23.3 mrad

¹ Fused silica and TeO₂ materials are also available.

² Designs for other optical wavelengths are available.

³ Other active aperture heights are available.

⁴ A complete line of laboratory and OEM drivers are available.

⁵ Smaller OEM housings are available.

⁶ Other acoustic frequencies are available.

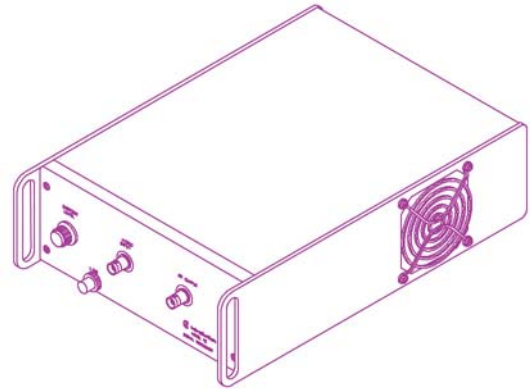
MODEL ME SERIES MODULATOR DRIVER

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 ns
Harmonics (at full power)	-20 dBc
Output Mismatch Tolerance	100%
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
(cm)	22.9 W x 8.9 H x 34.3 D

MODEL	ME-40	ME-405	ME-4010	ME-80	ME-110	ME-200I
Oscillator Frequency ¹	40 MHz	40 MHz	40 MHz	80 MHz	110 MHz	200 MHz
RF Output Power ²	2 Watts	5 Watts	10 Watts	2 Watts	2 Watts	1 Watt

OPTIONS:

- D Inverse digital, input < 0.8 volts for RF/on, input > 2 volts to 5 volts for RF off, 50 ohm 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 ohm 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.

OEM drivers available - please contact us with your requirements

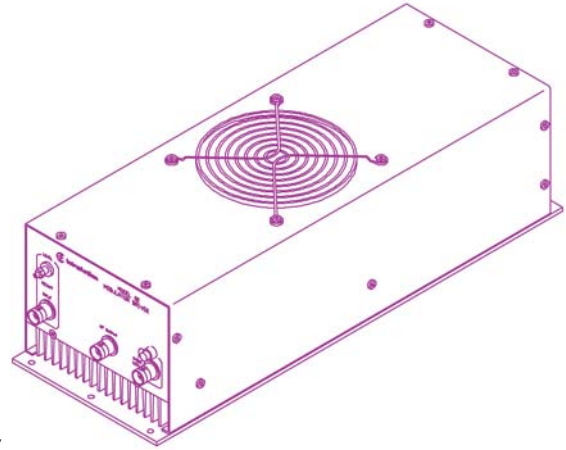
MODEL GE SERIES HIGH POWER ACOUSTO-OPTIC MODULATOR DRIVER

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 ns
Harmonics (at full power)	-20 dBc
Output Mismatch Tolerance	100%
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 ohm 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 ohm 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.

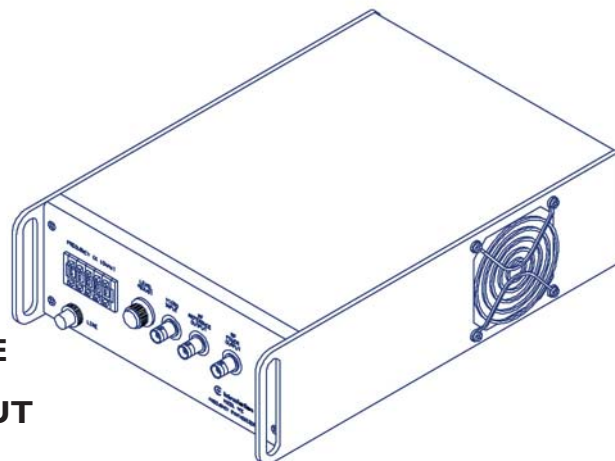
¹ Other frequencies available.

² Other RF output power levels available.

OEM drivers available - please contact us with your requirements

MODEL VFE SERIES VARIABLE FREQUENCY SOURCE

- A/O TUNABLE FILTER DRIVER
- A/O FREQUENCY SHIFTING
- LDV APPLICATIONS
- INTERFEROMETRY
- STABLE FREQUENCY SOURCE
- COMPUTER INTERFACE AVAILABLE
- LOW LEVEL RF REFERENCE OUTPUT



SPECIFICATIONS	
Frequency Setting Control	Front panel switches (standard all models)
Optional Addition Computer Interface ¹	Parallel and serial ports
Frequency Access Time	< 10 ms
Frequency Resolution	10 kHz
Frequency Stability	TCXO ² stability +/- 1 ppm (0-50°C)
Spurious Content	-45 dBc
RF Output Power Capability ³	4 Watts (level control maximum, no input)
Amplitude Modulation ⁴	Analog (0-2 watts RF output for 0-1 volt input)
Harmonic Output	< -20 dBc (at full rated RF output)
Input / Output Impedance	50 ohms
RF Reference Output	+10 dBm
Main Power	115/230 VAC, 50-60 Hz
Size	9.0(22.9)W x 3.5(8.9)H x 13.5(34.3)D inches(cm)
MODEL	VFE-404A4 VFE-604A4 VFE-754A4 VFE-1104A4 VFE-1204A4
(Frequency Range (MHz))	30-50 40-80 50-100 70-140 80-160

¹ In model designation, change A to C.

² TCXO...Temperature Compensated Crystal Oscillator.

³ 5 watt RF output available, 0-5 watts RF output for 0-1 input.

⁴ Optional digital and inverse digital modulation capability available.

Note: Also available is the DFE series Dual Frequency Source with two RF outputs - one fixed frequency and one variable frequency.

OEM drivers available - please contact us with your requirements

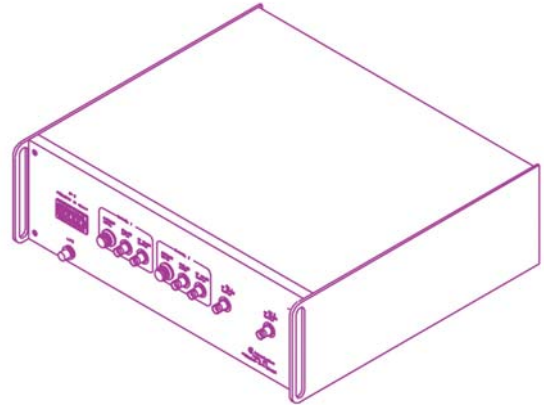
MODEL DFE-A4 SERIES DUAL FREQUENCY SOURCE

DESCRIPTION

The DFE Dual Frequency Source series are twochannel 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

Variable Frequency Setting Resolution	10 kHz
Frequency Stability (0 to 50°C)	1 ppm (TCXO stability)
CW RF Output Power Capability	4 watts (0-4 watts for level control 0 - maximum)
Amplitude Modulation ²	Analog (0-2 watts RF output for 0-1 volt input)
Harmonics at 4 Watts	- 20 dBc
Extinction Ratio (on/off)	40 dB
RF Reference Output	+10 dBm
Input / Output Impedance	50 ohms
RF Connectors	BNC
Line Power	115/230 Vac, 50-60 Hz
Size	5.5 H x 17.0 W x 13.5 D inches 14.0 H x 43.2 W x 34.3 D cm

MODEL	DFE-404A4	DFE-604A4	DFE-804A4	DFE-1004A4	DFE-1504A4
Fixed Frequency ¹	40 MHz	60 MHz	80 MHz	100 MHz	150 MHz
Variable Frequency	30-50 MHz	40-80 MHz	60-100 MHz	75-125 MHz	100-200 MHz

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.

OEM drivers available - please contact us with your requirements

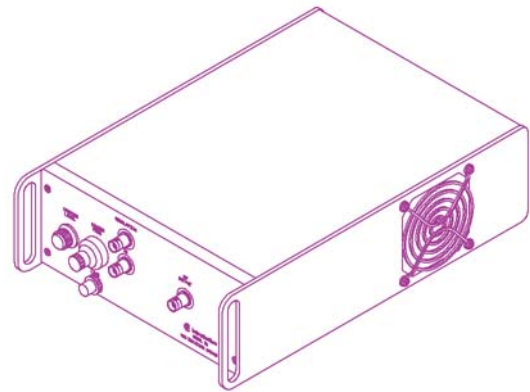
MODEL DE SERIES DEFLECTOR DRIVER

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 $1 \mu\text{s}$ 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	$1 \mu\text{s}$ (total frequency range)				
RF Amplifier Operation	Class AB				
Rise/Fall Time (modulation option)	30 ns				
Harmonics (at full power)	-20 dBc				
Output Mismatch Tolerance	100%				
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				
(cm)	22.9 W x 8.9 H x 34.3 D				
MODEL	DE-40	DE-40S	DE-80	DE-1002	DE-1502
Center Frequency ¹	40 MHz	40 MHz	80 MHz	100 MHz	150 MHz
Frequency Range	20 MHz	20 MHz	40 MHz	50 MHz	100 MHz
RF Output Power Capability	2 Watts	5 Watts	2 Watts	2 Watts	2 Watts

OPTIONS:

- D Inverse digital, input < 0.8 volts for RF/on, input > 2 volts to 5 volts for RF off, 50 ohm 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 ohm input impedance.

¹ Other frequencies available.

OEM drivers available - please contact us with your requirements

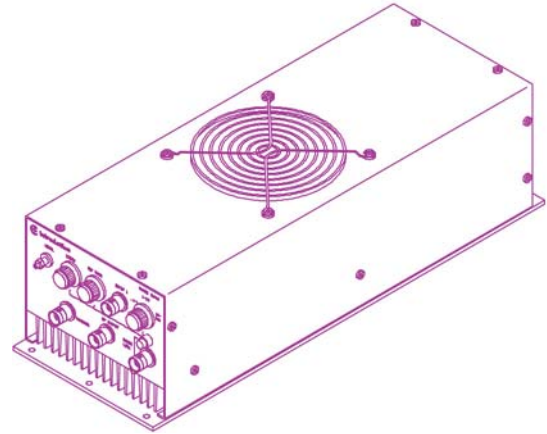
MODEL QE SERIES ACOUSTO-OPTIC Q-SWITCH DRIVER

DESCRIPTION

The QE series of acousto-optic Q-switch drivers contain a crystal controlled RF oscillator; fast modulation circuit, free running pulse generator circuit with trigger capability, and a broadband RF power amplifier in a housing with power supply, RFI line filter, line switch, and fault/interlock circuit.

When the input gate voltage is < 0.8 Volts, the RF output is continuously on for CW operation. For gated operation with the input gate voltage > 2 Volts, the internal pulse generator controls the RF off pulse repetition rate (PRR) which is set via a front panel control. When the input trigger PRR is faster than the PRR setting on the front panel, the RF off PRR is externally controlled for triggered operation.

For gated or triggered operation the pulse width is determined by the front panel setting. A monitor output, which is the inverse of the RF output envelope, is provided. The fault/interlock circuit which can be connected to the thermostat of a Q-switch will latch the power supply off when an open condition is present. High VSWR, over power, and low power indicator options are available.



SPECIFICATIONS

Pulse Repetition Rate (3 ranges)	100 Hz - 100 kHz
Pulse Width ¹	0.5 - 5 μ s
CW Operation Input (RF on, no pulsing)	< +0.8 volts (0 volts minimum)
Gated/Triggered Operation Input	> +2 Volts (+5 volts maximum)
Trigger Pulse Width	50 ns minimum
Monitor Output	0.5 volts into 50 ohms
Interlock Input Conditions	Shorted (power supply operational) Open (power supply latched off)
RF Amplifier Operation	Class AB
Rise/Fall Time	30 ns
Output Mismatch Tolerance	100%
Input / Output Impedance	50 ohms
Line Voltage (standard)	115/230 Vac, 50-60 Hz
(option J)	100 Vac, 50-60 Hz
Size	5.7 W x 4.5 H x 16 D inches 14.5 W x 11.5 H x 40.7 D cm

MODEL	QE-2425	QE-2725	QE-2450	QE-2750	QE-5025
Center Frequency ²	24 MHz	27.12 MHz	24 MHz	27.12 MHz	50 MHz
RF Output Power ³	25 Watts	25 Watts	50 Watts	50 Watts	25 Watts

¹ Can be user specified in a 10:1 range.

² Other frequencies are available.

³ Power levels to 100 watts for some models.

OEM drivers available - please contact us with your requirements

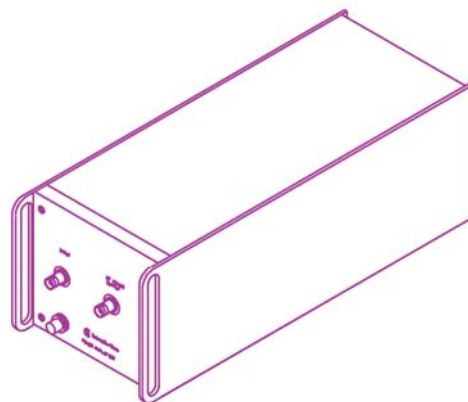
MODEL PA-4 RF POWER AMPLIFIER

DESCRIPTION

The Model PA-4 is a linear class A broadband RF power amplifier capable of four Watts power output over the frequency range of 10 MHz to 100 MHz. The amplifier includes the power supply, RFI line filter, and line switch.

It can be used to increase the RF power capability of laboratory signal generators, sweep generators, frequency synthesizers, and other signal sources.

The Model PA-4 can also be used to drive acousto-optic modulators, deflectors, and mode lockers. It can also be used for antenna and component testing, for line drivers in signal distribution networks, and for RFI/EMI testing.



SPECIFICATIONS

Operation	Class A
Frequency Range	10 MHz to 100 MHz
Power Output	4 watts CW (+36 dBm) into 50 ohms
Flatness	1 dB at 4 watts
Power Gain	40 dB minimum
Input Impedance	50 ohms, VSWR 1.5:1 max.
Output Impedance	50 ohms, VSWR 2.0:1 max.
Harmonic Distortion	Minus 20 dBc maximum at 4 Watts
Intermodulation Distortion	IM products minus 25 dBc at 2 Watts
Noise Figure	8 dB typical
Mismatch Tolerance	100%
RF Connectors	BNC
Primary Power	115/230 VAC, 50/60 Hz
Weight	8 Lbs (3.7 Kg)
Size	12.5 D x 5.0 W x 5.5 H inches
	31.8 D x 5.1 W x 5.5 H cm

OEM drivers available - please contact us with your requirements

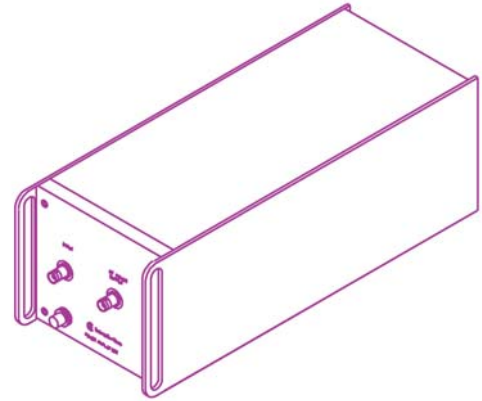
MODEL PA-8 SERIES HIGH POWER RF POWER AMPLIFIER

DESCRIPTION

The Model PA-8 Series Amplifiers are linear class AB broadband RF power amplifiers capable of from 10 to 100 Watts power output over the frequency range of 5 MHz to 120 MHz. The amplifier includes the power supply, RFI line filter, line switch, and interlock circuit. It can be used to increase the RF power capability of laboratory signal generators, sweep generators, frequency synthesizers, and other signal sources.

The Model PA-8 Series Amplifiers can also be used to drive acousto-optic modulators, frequency shifters, deflectors, and mode lockers. It can also be used for antenna and component testing, for line drivers in signal distribution networks, and for RFI/EMI testing.

The fault/interlock circuit will latch the power supply off, when an open circuit condition is present at the interlock input BNC, and can be connected to the thermal switch of a high power acousto-optic device or in a normally closed interlock circuit.



SPECIFICATIONS

Operation	Class AB
Power Gain	52 dB minimum
Harmonic Distortion	-20 dBc at maximum output
Intermodulation Distortion	IM products -25 dBc
Input Impedance	50 ohms, VSWR 1.5:1 max.
Output Impedance	50 ohms, VSWR 2.0:1 max.
Noise Figure	8 dB typical
Mismatch Tolerance	100%
RF Connectors	BNC
Primary Power	115/230 VAC, 50/60 Hz
Flatness	1 dB at rated output
Size	12.5 D x 5.0 W x 5.5 H inches 31.8 D x 5.1 W x 5.5 H cm

MODEL	PA-20100-8	PA-4030-8	PA-4050-8	PA-10025-85
Frequency Range	5 – 30 MHz	20 – 60 MHz	20 – 60 MHz	80 – 120 MHz
Output Power Capability	100 Watts	30 Watts	50 Watts	25 Watts

OEM drivers available - please contact us with your requirements

2-AXIS COLLINEAR ACOUSTO OPTIC DEFLECTION SYSTEMS

- LASER BEAM DEFLECTION
- COLLINEAR DESIGN
- FOR OPTICAL TWEEZERS APPLICATIONS
- LINEAR SCANNING
- LOW RF DRIVE POWER
- DRIVER ELECTRONICS & COMPUTER CONTROL



1. DTD-274HD6M 2-AXIS DEFLECTOR

SPECIFICATIONS FOR EACH AXIS:	
Material	Tellurium dioxide (4 degree slow shear mode)
A/R coating	1053/1064 nm (r<0.25% per surface)
Active aperture	4 x 4mm
Centre frequency	27 MHz (@1064nm)
Deflection bandwidth	16 MHz
Time bandwidth product	100 (4 mm beam diameter, 16MHz BW)
Access time	1.6 μ sec/mm beam diameter
Beam separation ¹	45 mrad (@1064nm, 27MHz)
Total deflection angular range ¹	26.9 mrad (1064 nm, 16MHz BW)
Input optical polarization	Linear (perpendicular to base)
Output optical polarization	Linear (perpendicular to base)
Diffraction efficiency	75% centre, 70% edges (56% centre, 49% edges for both axes combined)
RF drive power	<1W (@ 1064 nm)
Input impedance	50 Ohms (nominal)
Optical polarisation	Linear
Connector	SMA
Size (less SMA)	1.5(38.1)H x 1.5(38.1)D x 2.35(59.7)W inches(mm)

¹ The nominal centre of the 2-axis deflection range will be collinear with the input optical beam.

2. DVE-120 TWO CHANNEL VARIABLE FREQUENCY SOURCE

Hardware platform	Intel Pentium or compatible
Computer interface	PCI bus
Format	Standard 1/2 size computer card
Drivers provided	Windows NT, 2000 & XP

SPECIFICATIONS FOR EACH AXIS:

Type	Direct digital synthesizer
Frequency range	1 – 125MHz
Frequency resolution	48 bit capability

Frequency calibration accuracy	+/- 1 ppm
Frequency stability ¹	+/- 1 ppm (0 - 50°C)
Frequency acquisition time ²	1 microsecond
Spurious levels	-50 dBc (typical)
Harmonic distortion	-30 dBc
RF output capability	+10 dBm (10mW)
Amplitude adjustment ¹	12 bits
Output impedance	50 Ohms
RF output connectors	SMA

¹ Frequencies for each channel are synthesized from the same TCXO (temperature compensated crystal oscillator) reference oscillator. If the temperature of the TCXO were to change, the frequency difference between the two channels will remain relatively constant.
² This is the intrinsic acquisition time for the DVE-120 frequency source. When used with a CPU, the total system acquisition time will be longer.

3. DPA-502D DUAL RF POWER AMPLIFIER

Number of RF power amplifiers 2

SPECIFICATIONS FOR EACH AMPLIFIER:

Frequency range	10-90 MHz
RF output power capability	2 W
Power gain	23 dB
Harmonic distortion	-20 dBc
Input impedance/VSWR	50 Ohms/1.5:1
Output impedance/VSWR	50 Ohms/2:1
Input/output connectors	BNC

GENERAL SPECIFICATIONS:

Mains power 115/230VAC 50-60Hz
 Size 5.3(13.5)H x 13.5(34.3)D x 9.0(22.9)W inches(cm)

Technical drawing showing top, front, and isometric views of the DTD-274HD6M amplifier. Dimensions are provided in inches and millimeters. Key features include:

- Top view: SS, CH 2, SP labels; Channel 1 SMA RF Connector; Channel 2 SMA RF Connector.
- Front view: SS, CH 1, SP labels; 1.500 [38,10] height; 2.000 [50,80] width.
- Isometric view: Shows the 3D perspective of the unit with input and output ports.
- Input section: Shows a circular input with a diameter of 0.563 [14,29] and a mounting hole diameter of 0.258 [6,55].

REVISION HISTORY		
ISSUE	DESCRIPTION	APPROX. DATE
ORIGINAL	MFI	10-09-03

ALL REVISIONS TO THIS DRAWING MUST BE MADE ON THE AUTODESK CAD SYSTEM

UNLESS OTHERWISE SPECIFIED TOLERANCES AND DIMENSIONS ARE IN INCHES

LINEAR: .XX ± .01
 .XXX ± .005

ANGULAR ± 1° / DIAMETERS ± .005

LIMITS MAY APPLY BEFORE FINISHING DO NOT SCALE THIS PRINT

NOTES:
 1. MOUNTING SCREW HOLES: (4X)
 DTD-274HD6: #8-32 X .275 MAX. DEEP.
 DTD-274HD6M: #4 X .7 X 6.5 MAX. DEEP.

APPROVED DATE		<p>IntraAction Corp. 3719 WARREN AVE. BELLWOOD, IL 60104 PHONE (708) 547-6644</p>												
CHECKED	DATE													
MFI	10-09-03	<p>DTD-274HD6M OUTLINE</p>												
DRAWN	DATE													
MFI	10-09-03	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>FC5M NO.</td> <td>B</td> <td>DWG. NO.</td> <td>ISSUE</td> </tr> <tr> <td>MFG. INSTR.</td> <td>SIZE</td> <td>DTD-HD6 / HD6M</td> <td></td> </tr> <tr> <td>Q.C. INSTR.</td> <td>UNIT WEIGHT</td> <td></td> <td></td> </tr> </table>	FC5M NO.	B	DWG. NO.	ISSUE	MFG. INSTR.	SIZE	DTD-HD6 / HD6M		Q.C. INSTR.	UNIT WEIGHT		
FC5M NO.	B	DWG. NO.	ISSUE											
MFG. INSTR.	SIZE	DTD-HD6 / HD6M												
Q.C. INSTR.	UNIT WEIGHT													

SCALE 1.5 : 1 SHEET 1 OF 1

MODEL VS-3 I

VIDEO RASTER SCANNING SYSTEM

SPECIFICATIONS	
Optical Wavelength ¹	514.5 nm
Input Laser Beam Diameter ²	0.8 mm - 1.5 mm
Optical Thruput Efficiency	25%
Projection Distance	0.1 metre to infinity
Electronic Input Signal	RS-170 (composite video)
Input Options	a) external video b) external sync c) external blanking
Input Impedance	75 ohms
Line Power	115/230 Vac, 50-60 Hz
Raster Aspect Ratio	4:3
Fields per second	60
Frames per second	30
Interlace Ratio	2:1
Modulator Type	Acousto-Optic
Video Modulation Capability	10 MHz
Horizontal Deflector Type	Acousto-Optic
Horizontal Resolution	500 spots
Horizontal Scan Rate	15.75 KHz
Horizontal Scan Linearity	± 0.5%
Horizontal Scan Direction	a) left to right b) right to left
Vertical Deflector Type	Galvanometer
Vertical Resolution	500 lines
Vertical Scan Rate	60 Hz
Vertical Scan Linearity	± 0.5%
Vertical Scan Direction	a) top to bottom b) bottom to top
Optical Scanner Size	7.9" W x 6.4" H x 23" L
Electronics Size	7" high rack mount

¹ Other wavelength operation available upon request

² Input laser beam diameter & power to be specified upon order.



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- **Optical components**
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- **Machine vision systems**
- **Fibre optic components and test systems**
- **Microscopy & surface metrology instruments**
- **Optical metrology & EO/IR test systems**
- **Non-contact vibration and velocity measurement systems**

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