



## Model Number Guide

Brimrose Corporation of America manufactures both standard (from the specification sheet) and custom (to customer specifications) Acousto-Optic Tunable Filters. The following Model Number Guide should be used to generate a model number for your special device.

- After review of the customers specifications, an alternate material may be recommended.

M	<b>AF</b>	S	-	W	-	W	-	P
---	-----------	---	---	---	---	---	---	---

### M= Material

- TE – Tellurium Dioxide (350-5000 nm)
- QZ – Crystal Quartz (250-450 nm)

### S= Aperture Size

- 3 - 3 mm x 3 mm
- 5 - 5 mm x 5 mm
- 7 - 7 mm x 7 mm
- 10 - 10 mm x 10 mm

W= Wavelength Range of Operation ( in  $\mu\text{m}$ ). Please note, that one AOTF will cover only a single RF Octane Bandwidth. Extended ranges can be provided per customer request at an additional cost.

### P= Options

- S – Standard Resolution
- H – High Resolution
- EX – Extra high Resolution
- UH – Ultra high Resolution
- I – Imaging Quality



## Acousto-Optic Tunable Filter

Model Number	Driver Number	Spectral Resolution	Spectral Range (nm)	DE %	Material
<b>QZAF-.25-.65</b>	AT	H	250-650	20-30	QZ
<b>TEAF_-36-.52_</b>	AT,PP,SP,VCO	S or H	360-520	70	TeO <sub>2</sub>
<b>TEAF_-40-.65_</b>	AT,PP,SP,VCO	S or H	400-650	70-90	TeO <sub>2</sub>
<b>TEAF_-45-.70_</b>	AT,PP,SP,VCO	S or H	450-700	70-90	TeO <sub>2</sub>
<b>TEAF_-55-1.0_</b>	AT,PP,SP,VCO	S or H	550-1000	70-90	TeO <sub>2</sub>
<b>TEAF_-40-1.0-2CH</b>	AT,PP,SP,VCO	S	400-1000	50 - 60	TeO <sub>2</sub>
<b>TEAF_-80-1.6_</b>	AT,PP,SP,VCO	S, H, or EH	800-1600	70-90	TeO <sub>2</sub>
<b>TEAF_-1.2-2.0_</b>	AT,PP,SP,VCO	S, H, or EH	1200-2000	25-35	TeO <sub>2</sub>
<b>TEAF_-1.5-3.0_</b>	AT,PP,SP,VCO	S, H, or EH	1500-3000	30	TeO <sub>2</sub>
<b>TEAF_-2.4-4.5_</b>	AT,PP,SP,VCO	S, H, or EH	2400-4500	40	TeO <sub>2</sub>
<b>TEAF_-0.8-1.6-UH</b>	AT,PP,SP,VCO	S, H, or EH	800-1600	50	TeO <sub>2</sub>
<b>TEAF_-1.2-1.7-UH</b>	AT,PP,SP,VCO	S, H, or, EH	1200-1700	50	TeO <sub>2</sub>
<b>TEAF_-1.5-2.4-UH</b>	AT,PP,SP,VCO	S, H, or, EH	1500-2400	40	TeO <sub>2</sub>
<b>TEAF_-2.4-3.2-UH</b>	AT,PP,SP,VCO	S, H, or, EH	2400-3200	35	TeO <sub>2</sub>
<b>TEAF_-3.2-4.5-UH</b>	AT,PP,SP,VCO	S, H, or, EH	3200-4500	30	TeO <sub>2</sub>



## UV-VIS AOTF

Item	Units	QZAF-.25-.65	TEAF5-.36-.52	
Substrate	-	SiO <sub>2</sub>	TeO <sub>2</sub>	
Spectral Range	nm	250 - 650	360 - 520	
Corresponding Drive Frequency	MHz	50 - 175	100 - 190	
Optical Aperture *	mm	2.0 x 5.0	5.0 x 5.0	
Acceptance Angle	deg	5.0 - 9.0	S 4.18-4.36	H 2.85-3.4
Spectral Resolution **	A	2.3 - 20	S 0.8-4	H 0.5-2.2
Drive Power	Watts	20	1	
Peak Diffraction Efficiency ***	% @ nm	20-30 @ 400	70	
Temperature Induced Wavelength Drift	nm/°C	0.008		
Package Type	-	#360	#170	

\*\*Measured using collimated linearly polarized laser

\*\*\*The wavelength (frequency) relation may change (±10%) upon device alignment in the optical system



## VIS AOTF

### Acousto-Optic Tunable Filter      TeO<sub>2</sub>

Model No.	Spectral Range (nm)	Frequency (MHz)	Spectral Resolution (nm)		Acceptance Angle (deg)		Separation Angle (deg)
			S	H	S	H	
<b>TEAF__-.40-.65</b>	400 - 650	220 - 110	1-5.1	0.5-2.5	4.8-6.2	3.4-4.4	7.7-6.5
<b>TEAF__-.45-.70</b>	450 - 700	180 - 100	1.7-6.2	0.8-3.2	5.2-6.5	3.6-5	7.2-6.2
<b>TEAF__-.55-1.0</b>	550 - 1000	155 - 70	1.5-8.3	0.9-5	4.3-5.9	3.2-4.5	6.8-5.9
<b>TEAF__-.40-1.0-2CH</b>	400 - 1000	220 - 70	1.2-8.3	0.7-5	3.8-5.9	2.8-4.6	7.1-5.9

Each of the above AOTF's is available with the following apertures:

	Standard Optical Apertures in mm			
Optical Aperture	3.0 x 3.0	5.0 x 5.0	7.0 x 7.0	10.0 X 10.0
Model No.	<b>TEAF3-XX-YY</b>	<b>TEAF5-XX-YY</b>	<b>TEAF7-XX-YY</b>	<b>TEAF10-XX-YY</b>
Peak Diffraction Efficiency	90 %	85 %	75 %	70 %
Drive Power (Watts)	0.5 - 1.0	0.5 - 1.0	1.0 - 1.5	1.0 - 1.5
Package Type	#170 (TE Cooled available upon request)		#170 (TE Cooled available upon request)	
RF Connector	Standard SMA			

The Separation Angle, Acceptance Angle, and Spectral Resolution are a function of the wavelength and are shown in the following figures:



## Imaging Quality VIS AOTF

### Acousto-Optic Tunable Filter      TeO<sub>2</sub>

Model No.	Spectral Range (nm)	Frequency (MHz)	Spectral Resolution (nm)		Acceptance Angle (deg)		Separation Angle (deg)
			S	H	S	H	
<b>TEAF__-.40-.65</b>	400 - 650	220 - 110	1-5.1	0.5-2.5	4.8-6.2	3.4-4.4	7.7-6.5
<b>TEAF__-.45-.70</b>	450 - 700	180 - 100	1.7-6.2	0.8-3.2	5.2-6.5	3.6-5	7.2-6.2
<b>TEAF__-.55-1.0</b>	550 - 1000	155 - 70	1.5-8.3	0.9-5	4.3-5.9	3.2-4.5	6.8-5.9
<b>TEAF__-.40-1.0-2CH</b>	400 - 1000	220 - 70	1.2-8.3	0.7-5	3.8-5.9	2.8-4.6	7.1-5.9

Each of the above AOTF's is available with the following apertures:

	Standard Optical Apertures in mm	
Optical Aperture	7.0	10.0
Model No.	<b>TEAF7-XX-YY-I __</b>	<b>TEAF10-XX-YY-I __</b>
Diffraction Efficiency	75 %	70 %
Spatial Resolution *	80 - 90 Line Pairs / mm	
Drive Power (Watts)	1.0 - 1.5	1.0 - 1.5
Package Type	#170 (TE Cooled available upon request)	
RF Connector	Standard SMA	

Other optical apertures are available upon request.

- ◆ See Model Number Guide.

(only offer 7x7 and 10x10)  
 However, custom request is available!

- The spatial resolution depends upon the optical magnification. The above values were measured using a 10x magnification imaging system.

*Other wavelength ranges are available upon customer request.*

The Separation Angle, Acceptance Angle, and Spectral Resolution are a function of the wavelength and are shown in the following figures:



## IR AOTF

### Acousto-Optic Tunable Filter      TeO<sub>2</sub>

Item		<b>TEAF -0.80-1.6</b>	<b>TEAF -1.2-2.0</b>	<b>TEAF -1.5-3.0</b>	<b>TEAF -2.4-4.5</b>
Spectral Range (nm)		800 - 1600	1200 - 2000	1500 - 3000	2400 - 4500
Frequency (MHz)		130 - 60	90 - 50	68 - 34	40 - 20
Spectral Resolution (nm)	S	4-10	6-16	9-37	25-83
	H	3-8	6-12	8-29	18-65
	EH	2-6	4-9	6-22	14-48
Acceptance Angle (deg)	S	5.39-7.71	6.78-8.56	7.4-9.26	8.43-11.38
	H	4.96-7.2	5.3-7.5	6.6-7.95	7.3-9.72
Separation Angle (deg)		7.5-7.3	7.4-7.18	7.34-7.64	7.64-7.6
Diffraction Efficiency	%	50	50	40	35

Each of the above AOTF's is available with the following apertures:

	Standard Optical Apertures in mm			
Optical Aperture	3.0 x 3.0	5.0 x 5.0	7.0 x 7.0	10.0 X 10.0
Model No.	<b>TEAF3-XX-YY</b>	<b>TEAF5-XX-YY</b>	<b>TEAF7-XX-YY</b>	<b>TEAF10-XX-YY</b>
Drive Power (Watts)	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0	2.0 - 4.0
Package Type	#170 (TE Cooled available upon request)		#170 (TE Cooled available upon request)	
Connectors	SMA			

Other optical apertures available upon request.

The Separation Angle, Acceptance Angle, and Spectral Resolution are a function of the wavelength and are shown in the following figures:



## Ultra-High Resolution IR AOTF

### Acousto-Optic Tunable Filter $\text{TeO}_2$

Item		<b>TEAF__-.80- 1.6-UH-__</b>	<b>TEAF__-1.2- 1.7-UH-__</b>	<b>TEAF__-1.5- 2.4-UH-__</b>	<b>TEAF__-2.4- 3.2-UH-__</b>	<b>TEAF__-3.2- 4.5-UH-__</b>
Spectral Range	nm	800 - 1600	1200 - 1700	1500 - 2400	2400 - 3200	3200 - 4500
Frequency	MHz	190 - 90	120 - 80	90 - 55	55 - 40	45 - 30
Spectral Resolution	S (UH)	2-6	5-7	6-14	14-25	24-48
	H (UH)	2-4.5	3-5	4.5-11	11-17	17.5-37
Acceptance Angle	S deg	9.9-15.2	11.9-14.68	13.4-16.95	16.95-19.8	19.8-23.44
	H deg	8.65-13.3	9.47-12.88	11.9-15.2	15.2-17.29	17.29-20.9
Separation Angle	deg	8.65-8.1	8.1-7.9	7.9	7.9	7.9
Diffraction Efficiency	%	50	50	40	35	30

Each of the above AOTF's is available with the following apertures:

	Standard Optical Apertures in mm			
Optical Aperture	3.0 x 3.0	5.0 x 5.0	7.0 x 7.0	10.0 X 10.0
Model No.	<b>TEAF3-XX-YY</b>	<b>TEAF5-XX-YY</b>	<b>TEAF7-XX-YY</b>	<b>TEAF10-XX-YY</b>
Drive Power (Watts)	3.0 - 4.0	3.0 - 4.0	3.0 - 5.0	3.0 - 5.0
Package Type	#190	#190	#190	#190
Connectors	SMA			

Other optical apertures are available upon request.



## Ultra High Resolution AOTF for Raman Spectroscopy

PARAMETER	UNIT	TEAF5-.40-.65 UH
Wavelength Range	nm	400 - 650
Corresponding RF Frequency	MHz	200 - 400
Spectral Resolution	Å	1.5 @ 400 nm 3.2 @ 633 nm
RF Drive Power	Watt	2.0
Time Delay	isec	10
Rise Time	isec	30
Input/Output Polarization	-	Vertical/Horizontal
RF Connector	-	SMA
Acceptance Angle	deg	±1.5°
Diffraction Efficiency	%	> 50
Aperture	mm	5 x 7



## AOTF Controller System

The SPF II Model AOTF Controller is a high performance radio frequency generator. It provides fast frequency sweep using direct digital synthesizer incorporated into a self-contained case with AC power supply. A modular cable with a DB9 connector interface allows frequency control via the personal computer's serial port. Applications for this driver include AOTF wavelength controller for both TeO<sub>2</sub> and Quartz devices and level intensity output of incoherent or coherent light source at any wavelength with built-in feedback loop. The synthesizer software provides frequency and amplitude control of the output RF signal when the synthesizer is connected to a PC's serial port. Operating systems of Windows 95/98/98SE/2000/XP versions are all supported. The program has an easy to use graphical interface for controlling the SPF II, which can control up to 4 channels of RF signal.

The features of this driver include

- Control of AO operation in either frequency or wavelength domain.
- Wavelength-frequency calibration by customer allowed.
- Three scan modes (stop, loop, and bounce) for both sweep and hopping.
- Control up to 4 RF output channels.
- Sweep or hopping of more than one channel at the same time.
- Minimum 8ns frequency sweep interval (8ns increment).
- Minimum 1ms frequency hopping interval.
- Standard 1000 frequency hopping steps\*. Up to 65000 steps upon customer's request\*.
- Synchronization output signal during scan operation (option).
- External trigger input for frequency sweep/hopping (option).
- Customer accessible configuration file (including frequency and amplitude range control)

\* For PC controlled frequency hopping.

### Computer Requirements

- PC Compatible Computer (Pentium 200MHz or Faster)
- Windows 95/98/98SE/2000/XP
- One Available RS-232 Port
- 10MB available Hard Drive Space

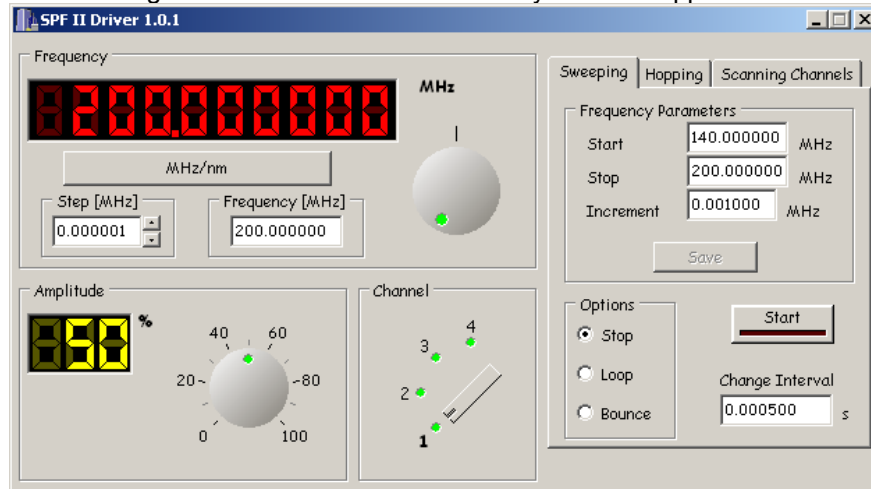
### Software Provided Software Provided

1. A program written in C++ allows for frequency and timing control of the synthesizer when connected to a PC's serial port.

In this application the user can control the RF synthesizer's frequency and amplitude. The top left section of the main window displays the frequency. The user can change the RF frequency by typing the value in the edit box provided or by changing the knob position. The knob's position can be changed with the mouse or by pressing the arrow keys or page up/down keys. The arrow keys change the frequency by the step while the page up/down keys change by the step times 10.



### Single or Multichannel Channel RF Synthesizer Application



The bottom left section is used to set the amplitude of the RF signal. The amplitude can be set by changing the knob position. The arrow keys change by 1% and the page up/down keys by 10%. The middle bottom section is used in the multichannel driver. When the software controls the single channel driver the rotary switch is disabled. The right section of the main window is used to specify parameters for the sweeping and hopping modes. In a multichannel version, the software allows to sweep or hop on multiple channels at a time.

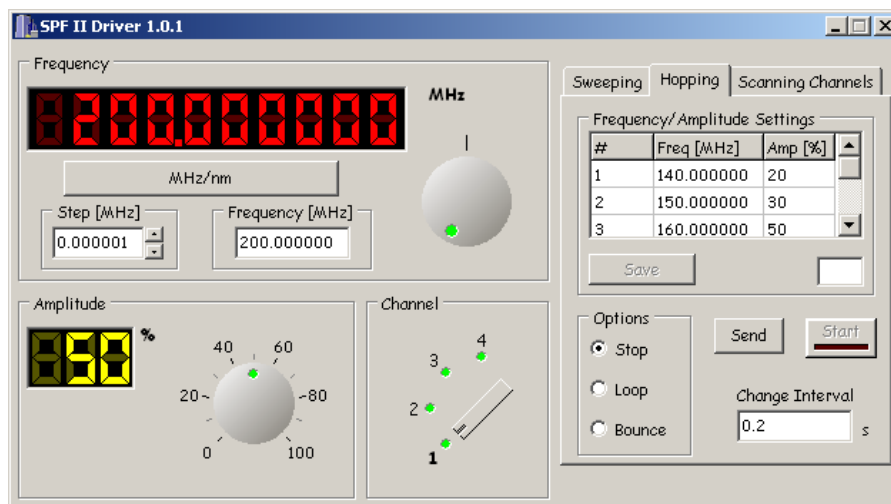
The additional options specify the way the sweep will be executed.

STOP - at the end of the range the sweeping will stop

LOOP - when the end of the range is reached the sweep starts over from the start frequency until the stop button is pressed.

BOUNCE - at the end of the range the sweep will start in the other direction towards the beginning of the range. When the beginning of the range is reached the sweep will start again. This sequence will be repeated until the stop button is pressed.

Interval specifies, in seconds, the gap between the consecutive frequency updates.

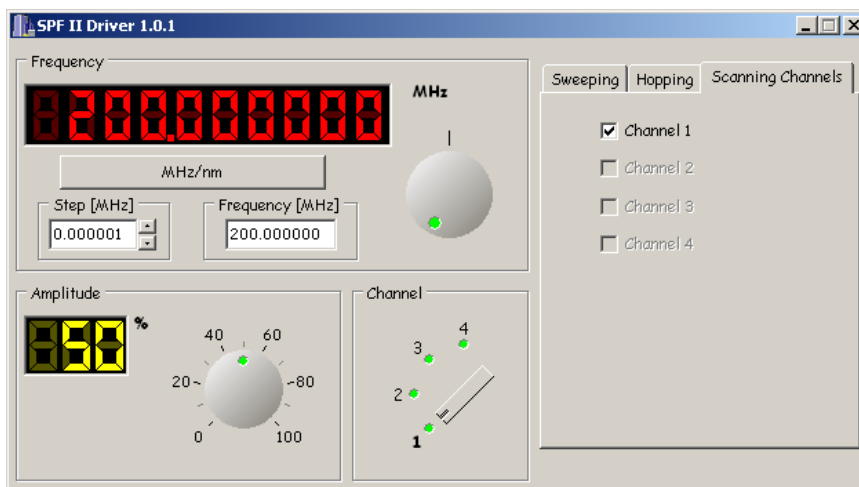


NOTE: Since Windows is not a real time operating system the time interval is the application time not a real time. It means that if the operating system schedules some time to execute other applications in the system the real time interval can be different then the specified.



The frequency hopping section provides the table for the frequency and amplitude values. The parameters change start with the first entry in the table. The maximum number of frequency-amplitude pairs is 10. As with the sweeping setting the RF signal parameters can be changed in STOP, LOOP or BOUND modes.

In multichannel type of drivers user can scan (sweep or hop) more than one channel at the same time, while keep the rest unchanged. This is done by uncheck those channels the user wants to keep a constant frequency and amplitude in the "Scanning Channels" tab. When the program is start, all available channels are set as scanning by the program.



The user can specify which channels to scan when the start button is clicked.

2. Direct access to the driver is also available using dynamic link library (upon request) to control the frequency and amplitude of RF output through the RS232 port.

## Options

### *R.F. Modulation Options*

A.M.: Analog Amplitude Modulation

A.S.K.: Amplitude Shift Keying or Digital Amplitude Modulation

F.M.: Analog Frequency Modulation

F.S.K.: Frequency Shift Keying or Digital Frequency Modulation

P.A.M.: Pulse Amplitude Modulation (internal or external pulse generator available)

### *Other Options*

DCn: Customer Supplied DC "n" volts

B: BNC connectors in place of SMAs for RF output

E: 200-250 VAC 50-400 Hz power

M: O.E.M. or customer specified enclosure or outline

X,Y,Z: Customer specific option



## AOTF Controller System

- **SPS**

PC controlled AOTF drivers

Model	-SPS
Frequency Range*	100.0 to 200.0 MHz
Frequency Step Size	15,625 Hz
Frequency Accuracy	0.010% absolute (100 ppm); 0°C to 60°C
Frequency Switching Speed	15 ms typ (from $f_{min}$ to $f_{max}$ )
Phase Noise	< -45 dBc/Hz @ 1 KHz in 1 Hz bandwidth
Power Output	+33.0 dBm typ.(2.0 W)**
Power Control	Optional 20dB variable amplitude
Modulation	Optional TTL or Analog AM Optional Analog FM
Output Impedance	50 ohms
Output Connector	SMA jack on front panel

- The frequency range will be adjusted based on AOTF requirements.

\*\* 2.0 Watt standard, output 30 Watt optional. Maximum power level preset at factory for optimum AOTF performance.

The SPS Model AOTF Controller is a high performance RF frequency synthesizer incorporated into a self contained case with AC power supply. A modular cable with a DB9 connector interface allows frequency control via the Personal Computer serial port.

Applications for this driver include:

- AOTF Wavelength Controller for both TeO<sub>2</sub> and Quartz AOTF devices
- Level intensity output of incoherent or coherent light source at any wavelength with built-in feedback loop.

- SPS



## Front Panel Controls:

1. Power switch.
2. Power output connector (SMA).

## Computer Requirements:

Any IBM compatible computer (PC, XT, AT) with a serial port can be used. Any language able to communicate with the serial port may be used.

## Software Provided:

The synthesizer software provides frequency and amplitude control of the output RF signal when the synthesizer is connected to a PC's serial port. Both DOS and Windows 3.11/95 versions are available. Both versions provide an easy to use graphical interface for controlling the SPS. Software is written in C++ and header files are provided with the DOS version for inclusion in the user's custom programs.

## Options:

### *R.F. Modulation Options*

- A.M.: Analog Amplitude Modulation
- A.S.K.: Amplitude Shift Keying or Digital Amplitude Modulation
- F.M.: Analog Frequency Modulation
- F.S.K.: Frequency Shift Keying or Digital Frequency Modulation
- P.A.M.: Pulse Amplitude Modulation (internal or external pulse generator available)

### *Other Options*

- DCn: Customer Supplied DC "n" volts
- B: BNC connectors in place of SMAs for RF output
- E: 200-250 VAC 50-400 Hz power
- M: O.E.M. or customer specified enclosure or outline
- X,Y,Z: Customer specific option



## *AOTF Controller System*

- VCO Voltage controlled AOTF drivers

Model	-VCO
Frequency Range*	100.0 to 200.0 MHz
Frequency Control	0-10 V via front panel BNC input (0-5 V optional)
Frequency Accuracy	1% nominal after 15 minute warmup, constant temperature
Scanning Speed	50 microseconds minimum, from min to max frequency with step change in tuning voltage.
Power Output	+33.0 dBm typ.(2.0 W)**
Power Control	Optional 20dB variable amplitude
	Optional TTL or Analog AM Optional Analog FM
Output Impedance	50 ohms
Output Connector	SMA jack on front panel

- The frequency range will be adjusted based on the AOTF requirements.

\*\* 2.0 Watt standard, output to 30 Watt optional. Maximum power level preset at factory for optimum AOTF performance.

The VCO Model AOTF Controller is a high performance RF frequency driver incorporated into a self contained case with AC power supply.

Applications for this driver include:

- AOTF Wavelength Controller for both TeO<sub>2</sub> and Quartz AOTF devices.
- Level intensity output of incoherent or coherent light source at any wavelength with built-in feedback control loop.



# VCO

## Front Panel Controls:

1. Amplitude control knob (optional).
2. Power switch.
3. Power output connector (SMA).
4. Frequency control voltage connector (BNC) (Optional).

## Options:

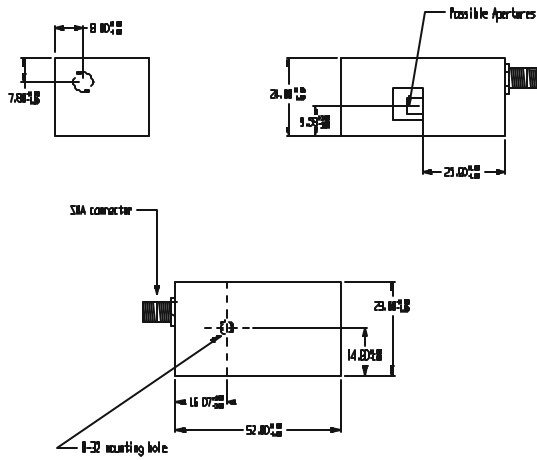
### *R.F. Modulation Options*

- A.M.: Analog Amplitude Modulation  
A.S.K.: Amplitude Shift Keying or Digital Amplitude Modulation  
F.M.: Analog Frequency Modulation  
F.S.K.: Frequency Shift Keying or Digital Frequency Modulation  
P.A.M.: Pulse Amplitude Modulation (internal or external pulse generator available)

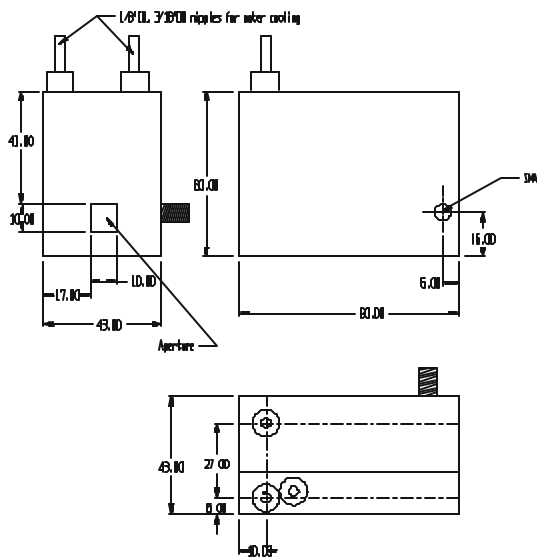
### *Other Options*

- DCn: Customer Supplied DC "n" volts  
B: BNC connectors in place of SMAs for RF output  
E: 200-250 VAC 50-400 Hz power  
M: O.E.M. or customer specified enclosure or outline  
X,Y,Z: Customer specific option

## Package Drawing 170



## Package Drawing 360





## Package Drawing 190

