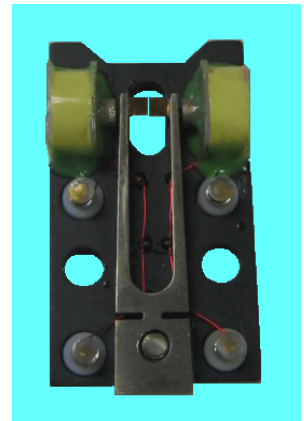


## RESONANT OPTICAL MODULATOR CH-20 TUNING FORK CHOPPER

### FEATURES AND ADVANTAGES:

- \*ONE FIXED FREQUENCY from the range of 200 Hz to 6 kHz
- \*Aperture up to 5mm
- \*Small size/lightweight
- \*Withstands shock and vibration
- \*Low power drive electronics
- \*Rugged, no wearing parts
- \*Maintenance free
- \*High reliability
- \*High frequency stability (to 0.005%)
- \*High amplitude stability <.01%
- \*Vacuum operation (to  $10^{-10}$  Torr) <sup>1</sup>
- \*High/low temperature operation (Cryo to 200°C) <sup>1</sup>
- \*Jitter free operation
- \*No radiated electromagnetic interference (EMI)
- \*Reference signal available
- \*Single vane for alternate beam chopping <sup>1</sup>
- \*Metal vanes are standard, mirrors, prisms or lenses optional<sup>1</sup>

<sup>1</sup> Available as a special order



### DESCRIPTION:

The FIXED FREQUENCY resonant optical modulator is an electromagnetically driven tuning fork device, which uses vanes, of different shapes and surface characteristics, attached to moving tines, to chop a light beam with a sinusoidal motion. A range of factory set fixed frequency modulation waveforms (sine, half sine and pulse) is available. The modulating frequency range of the CH-20 chopper is from 200 Hz to 6 kHz, **fixed at any one value** within the range. The aperture is inversely proportional to the frequency, and is a function of the size of the vanes and the type (duty cycle). Operation at the natural resonant frequency is sustained by a feedback amplifier, the **AGC** driver or the **ED** driver, supplied separately. The driver controls the aperture and provides a reference signal. The **PLD-1C** driver will phase lock the device to an external stable source. The **PLD-2C** driver will lock two choppers in a master/slave mode.

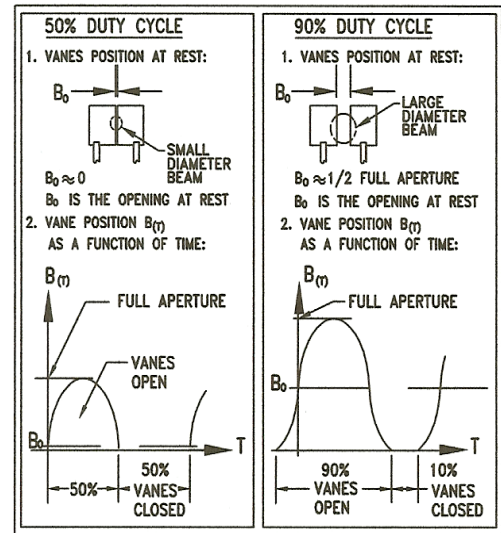
The most common type of aperture is the half open in the rest position, 90% duty cycle. It is used for a large beam diameter. When the modulator is operating in this configuration the maximum aperture is produced. The vanes are factory adjusted so that when fully illuminated the maximum excursion condition (controlled by the drive electronics) generates an almost complete sine wave as shown in figure 1.B. Typically, the light is transmitted for 90% of each cycle. The 50% duty cycle modulation is used for a small beam diameter, shown in figure 1.A. The vanes are factory adjusted to be just closed in the rest position. Full aperture for 50% duty cycle is one half of the 90% duty cycle. Balanced operation and high "Q" insure frequency stability, low electrical drive power and low reaction forces. High flexural stiffness provides good resistance to shock and vibration. The standard operating temperature is -40°C to +65°C. Tuning fork choppers are cryogenic and high temperature (200°C) capable. They can be constructed of low outgassing materials for ultra high vacuum ( $10^{-10}$  torr) applications.

Tuning fork choppers are especially suitable for long life, dedicated applications, OEM, built into an instrument/system, and for portable systems. When working in tight spaces or when high vacuum or cryogenic conditions are required, choppers are the best solution. An important use of the chopper is in the communication and data acquisition environments, where optical signals are obscured by noise. A fixed frequency modulated signal can be filtered from background noise much more readily than an unmodulated signal. This is best achieved using a lock-in amplifier. In this arrangement, the detected signal and the reference signal, mixed with the frequency of the tuning fork chopper, cause the frequency of interest to appear as a pure dc output level. All other signals are filtered with the low pass filter. Once noise

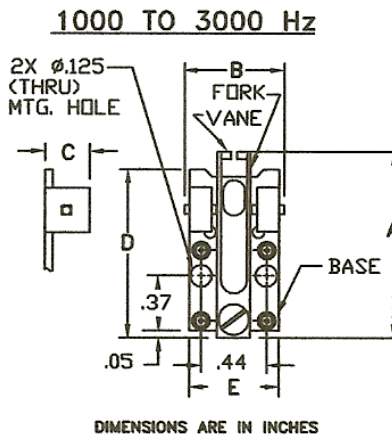
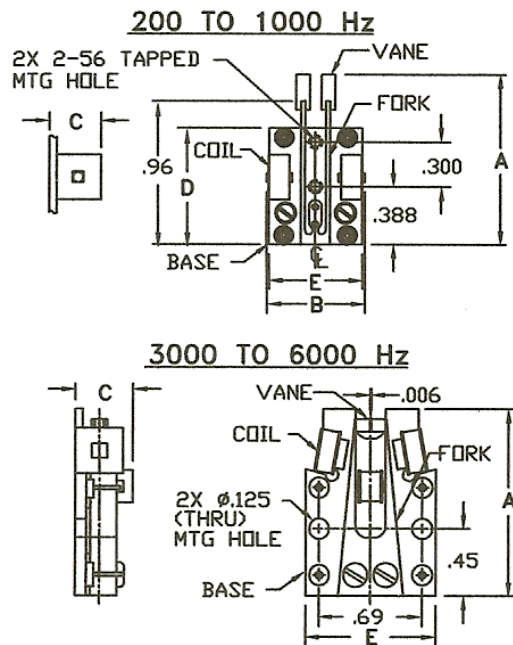
is removed, proper signal measurements can be obtained. Applications include: test equipment, noise detection (with a lock-in amplifier), pollution and gas detection, radiometry, radiation pyrometry, military, scientific, non-invasive medical research and laboratory research.

FREQUENCY (Hz)	CHOPPER			BASE		OPENING AT REST (Inches)
	A	B	C	D	E	
	LENGTH (Inches)	WIDTH (Inches)	HEIGHT (Inches)	LENGTH (Inches)	WIDTH (Inches)	
200-400	1.70	0.68	0.35	0.78	0.625	0.10
400-800	1.40	0.68	0.35	0.78	0.625	0.06
800-1000	1.30	0.68	0.35	0.78	0.625	0.04
1000-1200	1.62	0.68	0.30	1.13	0.625	0.03
1200-1500	1.52	0.68	0.30	1.13	0.625	0.03
1500-1700	1.33	0.68	0.30	1.13	0.625	0.02
1700-2000	1.25	0.68	0.30	1.13	0.625	0.02
2000-2500	1.25	0.68	0.30	1.13	0.625	0.01
2500-3000	1.06	0.68	0.30	1.13	0.625	0.007
3000	0.96	0.68	0.30	1.13	0.625	0.006
3000-6000	1.25	0.88	0.39	1.25	0.875	0.006

FREQUENCY (Hz)	50% DUTY CYCLE		90% DUTY CYCLE	
	(mm)	(Inches)	(mm)	(Inches)
200	2.5	0.10	5.0	0.20
400	1.5	0.06	3.0	0.12
800	1.0	0.04	2.0	0.08
1000	0.85	0.03	1.7	0.07
1500	0.70	0.03	1.4	0.06
2000	0.40	0.02	0.80	0.03
2500	0.25	0.01	0.50	0.02
3000	0.20	0.008	0.40	0.016
5000	0.15	0.006	0.30	0.012
6000	0.10	0.004	0.20	0.008



- NOTES: 1) FOR 50% DUTY CYCLE: THE OPENING AT REST IS ZERO  
 2) THE STANDARD BASE HOLDS A SINGLE COIL.  
 A BASE WITH TWO COILS IS RECOMMENDED FOR LOW FREQUENCIES AND HIGH AMPLITUDE STABILITY (WITH THE AGC DRIVER) AND FOR A WIDE TEMPERATURE RANGE  
 A BASE WITH THREE COILS IS RECOMMENDED FOR HIGH FREQUENCIES AND HIGH AMPLITUDE STABILITY (WITH THE AGC DRIVER) AND FOR A WIDE TEMPERATURE RANGE  
 3) THE VANE MOTION IS SINUSOIDAL



DIMENSIONS ARE IN INCHES  
 METRIC MOUNTING OPTIONAL

**ORDERING INFORMATION:**

TYPE [CH-20]; DUTY CYCLE [%]; VANE [B=bright or D=dark]; FREQUENCY [Hz]  
 Example: PART NO. CH20-50D3000. This part number specifies the model CH-20 chopper, with 50% duty cycle, dark vanes and a 3KHz operating frequency.

Special vane configurations, modulating waveforms and shapes are available on special order. Consult factory. Drive electronics with different packages, regulation, and reference signal and power supply options are available.

**Special pricing for OEM applications.**