TCXOs (50 kHz to 140 MHz)

Series CO-252 and CO-254 offer the highest stability alternatives and broadest range of options within Vectron's line of TCXOs. The TCXOs on the adjacent pages are more limited in input/output alternatives and other options, but are smaller in size.

	50 kHz to 20 MHz CO-252 SERIES	20.1 MHz to 140 MHz CO-254 SERIES
FREQUENCY	Sine: 1 MHz to 20 MHz TTL: 200 kHz to 20 MHz CMOS: 50 kHz to 15 MHz HCMOS: 50 kHz to 20 MHz	Sine: 20.01 MHz to 140 MHz TTL: 20.01 MHz to 100 MHz CMOS: 20.01 MHz to 15 MHz HCMOS: 20.01 MHz to 50 MHz ECL: 20.01 MHz to 140 MHz
STABILITY Temperature		
(Temp. Range **A**) +15°C to +35°C:	**CO-252A17:** $\pm 1 \times 10^{-7}$ **CO-252A58:** $\pm 5 \times 10^{-8}$	**CO-254A57:** $\pm 5 \times 10^{-7}$ **CO-254A17:** $\pm 1 \times 10^{-7}$
(Temp. Range **B**) 0°C to +50°C:	**CO-252B57:** $\pm 5 \times 10^{-7}$ **CO-252B27:** $\pm 2 \times 10^{-7}$ **CO-252B17:** $\pm 1 \times 10^{-7}$	**CO-254B16:** $\pm 1 \times 10^{-8}$ **CO-254B57:** $\pm 5 \times 10^{-7}$ **CO-254B27:** $\pm 2 \times 10^{-7}$
(Temp. Range **C**) 0°C to +70°C:	**CO-252C16:** $\pm 1 \times 10^{-6}$ **CO-252C57:** $\pm 5 \times 10^{-7}$ **CO-252C37:** $\pm 3 \times 10^{-7}$	**CO-254C36:** $\pm 3 \times 10^{-8}$ **CO-254C16:** $\pm 1 \times 10^{-8}$ **CO-254C37:** $\pm 3 \times 10^{-7}$
(Temp. Range **D**) –20°C to +70°C:	**CO-252D16:** $\pm 1 \times 10^{-6}$ **CO-252D57:** $\pm 5 \times 10^{-7}$	**CO-254D56:** $\pm 5 \times 10^{-8}$ **CO-254D16:** $\pm 1 \times 10^{-8}$ **CO-254D57:** $\pm 5 \times 10^{-7}$
(Temp. Range **E**) –40°C to +75°C:	**CO-252E56:** $\pm 5 \times 10^{-8}$ **CO-252E26:** $\pm 2 \times 10^{-8}$ **CO-252E16:** $\pm 1 \times 10^{-8}$	**CO-254E56:** $\pm 5 \times 10^{-8}$ **CO-254E26:** $\pm 2 \times 10^{-8}$ **CO-254E16:** $\pm 1 \times 10^{-8}$
(Temp. Range **F**) –55°C to +85°C:	**CO-252F56:** $\pm 5 \times 10^{-8}$ **CO-252F26:** $\pm 2 \times 10^{-8}$ **CO-252F16:** $\pm 1 \times 10^{-8}$	**CO-254F56:** $\pm 5 \times 10^{-8}$ **CO-254F26:** $\pm 2 \times 10^{-8}$ **CO-254F16:** $\pm 1 \times 10^{-8}$
(Temp. Range **G**) –55°C to +105°C:	**CO-252G56:** $\pm 5 \times 10^{-8}$	**CO-254G56:** $\pm 5 \times 10^{-8}$
(Temp. Range **H**) –55°C to +125°C:	**CO-252H15:** $\pm 1 \times 10^{-5}$	**CO-254H15:** $\pm 1 \times 10^{-8}$
Aging Rate	≤5 MHz: 5×10^{-7}/year (3×10^{-9}/day avg) >5 MHz: 1×10^{-6}/year (5×10^{-9}/day avg)	
Short Term (Allan Variance)	1×10^{-9}/second under constant conditions	
Frequency vs Supply	2×10^{-8} per percent in supply with 10 to 28 Vdc input; 1×10^{-7} per percent change in supply for 5 to 9 Vdc input	

OUTPUT / SUPPLY	Output level	*Supply ±5%	Output level	*Supply ±5%
Standard	>1 Vrms/1kΩ (1-20 MHz)	+15 Vdc, 4-15mA	>0.5 Vrms/50Ω	+15 Vdc, 20mA
Option "**R**"	>1 Vrms/50Ω (+13 dBm), 1-20 MHz	+15 Vdc, <30 mA	≥1 Vrms/50Ω (+13 dBm)	+15 Vdc, <35 mA
Option "J**"	TTL	+15 Vdc, <10 mA & +5 Vdc, 10-50 mA	TTL (to 100 MHz)	+15 Vdc, <10 mA & +5 Vdc, <30 mA
Option "K**"	TTL	+5 Vdc, 15-60 mA	TTL (to 70 MHz)	+5 Vdc, <35 mA
Option "M**"			ECL	+15 Vdc, <15 mA & -8.2 Vdc, 30-60 mA
Option "**E**"			ECL (to 70 MHz)	-5.2 Vdc, <60 mA
Other Options	HCMOS (50 kHz-20 MHz) CMOS (50 kHz-15 MHz)	+15 Vdc, 10-20 mA 5 to 15 Vdc, 3-15 mA	HCMOS (to 50 MHz)	+5 Vdc, 10-30 mA

*Any supply in 10-24 Vdc range optional in lieu of +15 Vdc; current drain depends upon frequency
**Options J and M are more economical than Options K and E respectively

Harmonics and Sub-Harmonics (sine output)	20 dB below output. If internal multiplication is used (generally above 70 MHz but sometimes at lower frequencies) subharmonics are also down 20dB. Harmonics and subharmonic attenuation can be improved on special order.
Phase Noise	See page 37 for standard and low noise Option L2 specifications
FREQUENCY ADJUSTMENT Mechanical	Range sufficient to compensate for 5 to 10 years of crystal aging; settable to $<1 \times 10^{-7}$
Electronic Tuning Option Option "V"	VCXO operation permits remote frequency adjustment or locking onto an external frequency source. Add **"V"** to Model Number. Nominal range with 0 to +5 volt control input is 3×10^{-6} total (Wider deviations available). (For very wide deviation and/or linear voltage control, see TC/VCXOs in the VCXO section on page 76)
SIZE/CONFIGURATION Standard (See drawings on page 37)	2" x 2" x 3/4" (51 x 51 x 19mm); pins on base for pc board mounting. Most models available with reduced height, to 1/2". For smaller models, with height as low as 0.2" (5.1 mm), see our TCXOs on preceding pages.
Options	Option **"SW"**: 2" x 2 1/4" x 3/4" (51 x 57 x 19 mm) SMA output connector on side, pins for pc board mounting on base. Option **"W"**: 2" x 2" x 3/4" (51 x 51 x 19 mm) SMA output connector, solder header and mounting studs on base. Option **"U"**: 2" x 2" x 3/4" (51 x 51 x 19 mm) SMC output connector, solder header and mounting studs on base.
ENVIRONMENTAL	See page 98 for environmental specifications and screen test option.
HOW TO ORDER	See page 37

TCXOs (to 70 MHz)

FEATURES:

- **Frequencies to 70 MHz**
- **High stability in a low profile configuration**

The rf circuit is hybridized and packaged in a resistance welded case which is optionally available screened per chart on page 15. The hybrid, packaged crystal and compensation components are mounted on a printed circuit board which is housed in a solder sealed metal can. Models CO-258 and CO-259 use an identical rf hybrid circuit. The CO-259's larger size permits (1) additional circuitry allowing operation from a single 5V source and (2) internal mechanical frequency adjustment with a voltage tuning option (Model CO-258 uses tuning from and external potentiometer only).

	CO-258 SERIES *Lowest profile* *0.32" (8.2 mm) height*	**CO-259 SERIES** *0.4" (10.2 mm) height* *with mechanical tuning*
FREQUENCY	TTL output: 20 kHz to 70 MHz HCMOS output: 40 kHz to 50 MHz CMOS output: 400 Hz to 15 MHz ECL output: 5 MHz to 70 MHz	
STABILITY Temperature (Temp. Range **A**) +15°C to +35°C:	**CO-258A37:** $\pm 3 \times 10^{-7}$ **CO-258A17:** $\pm 1 \times 10^{-7}$	**CO-259A37:** $\pm 3 \times 10^{-7}$ **CO-259A17:** $\pm 1 \times 10^{-7}$
(Temp. Range **B**) 0°C to +50°C:	**CO-258B57:** $\pm 5 \times 10^{-7}$ **CO-258B27:** $\pm 2 \times 10^{-7}$	**CO-259B57:** $\pm 5 \times 10^{-7}$ **CO-259B27:** $\pm 2 \times 10^{-7}$
(Temp. Range **C**) 0°C to +70°C:	**CO-258C57:** $\pm 5 \times 10^{-7}$ **CO-258C37:** $\pm 3 \times 10^{-7}$	**CO-259C57:** $\pm 5 \times 10^{-7}$ **CO-259C37:** $\pm 3 \times 10^{-7}$
(Temp. Range **D**) –20°C to +70°C:	**CO-258D36:** $\pm 3 \times 10^{-6}$ **CO-258D16:** $\pm 1 \times 10^{-6}$ ***CO-258D57:** $\pm 5 \times 10^{-7}$	**CO-259D36:** $\pm 3 \times 10^{-6}$ **CO-259D16:** $\pm 1 \times 10^{-6}$ ***CO-259D57:** $\pm 5 \times 10^{-7}$
(Temp. Range **E**) –40°C to +75°C:	**CO-258E56:** $\pm 5 \times 10^{-6}$ **CO-258E26:** $\pm 2 \times 10^{-6}$ **CO-258E16:** $\pm 1 \times 10^{-6}$	**CO-259E56:** $\pm 5 \times 10^{-6}$ **CO-259E26:** $\pm 2 \times 10^{-6}$ **CO-259E16:** $\pm 1 \times 10^{-6}$
(Temp. Range **F**) –55°C to +85°C:	**CO-258F56:** $\pm 5 \times 10^{-6}$ **CO-258F26:** $\pm 2 \times 10^{-6}$ ***CO-258F16:** $\pm 1 \times 10^{-6}$	**CO-259F56:** $\pm 5 \times 10^{-6}$ **CO-259F26:** $\pm 2 \times 10^{-6}$ ***CO-259F16:** $\pm 1 \times 10^{-6}$
(Temp. Range **G**) –55°C to +105°C:	**CO-258G56:** $\pm 5 \times 10^{-6}$ ***CO-258G36:** $\pm 3 \times 10^{-6}$	**CO-259G56:** $\pm 5 \times 10^{-6}$ ***CO-259G36:** $\pm 3 \times 10^{-6}$
(Temp. Range **H**) –55°C to +125°C:	**CO-258H15:** $\pm 1 \times 10^{-5}$	**CO-259H15:** $\pm 1 \times 10^{-5}$
	*Asterisked models not available above 12 MHz	
Aging Rate	1×10^{-6} per year	
Short Term	1×10^{-8} per second under constant conditions (Allan Variance)	
Frequency vs Supply	2×10^{-8} per percent in supply for ≥10 Vdc 1×10^{-7} per percent in supply for <10 Vdc	
OUTPUT / SUPPLY **Standard**	Output level: TTL — *Supply ±5%: 15 Vdc, 5-15 mA & 5 Vdc, 10-40 mA	
Optional	Option "**K**" / ***TTL: 5 Vdc, 15-60 mA (CO-259 only) **HCMOS: 10-15 Vdc, 5-15 mA & 5 Vdc, 3-10 mA **HCMOS: 5 Vdc, 10-25 mA (CO-259 only) CMOS: 10-15 Vdc, 10-25 mA ECL: 10-15 Vdc, 5-15 mA & –5.2 Vdc, 40 mA	
	* Actual current drain depends upon frequency. Voltage range (e.g. 12-15 Vdc) means any specified voltage in that range. ** Drives 3 TTL loads, 10 LSTTL loads or HCMOS (output is from HCMOS gate) *** Drives 10 TTL loads; this option is more costly than standard product.	
FREQUENCY ADJUSTMENT	Tuning via external potentiometer with range sufficient to compensate for 10 years aging.	Multiturn adjustment with range sufficient to compensate for 10 years aging; settable to 1×10^{-7}. "**V**" Option: Range >3×10^{-6} for 0 to 5V control voltage; increasing voltage decreases frequency.
SIZE/CONFIGURATION (See drawings on page 37)	1.5" x 1.5" x 0.32" (38 x 38 x 8.2 mm)	1.5" x 2.0" x 0.4" (38 x 51 x 10.2 mm)
	Pins for printed circuit board mounting	
ENVIRONMENTAL	See page 98 for environmental specifications and screen test option (except for the CO-258/CO-259 internal hybrids, these are discrete oscillators)	
HOW TO ORDER	See page 37	

PHASE NOISE (including Low Noise Option "L2")

Option "L2" offers ultra low phase noise characteristics, as follows:

Offset	Standard 3-20 MHz	Standard 20.1-70 MHz	Option **(L2)** 3-70 MHz
100 Hz	–115 dBc/Hz	–110 dBc/Hz	–115 dBc/Hz
1 kHz	–135 dBc/Hz	–130 dBc/Hz	–140 dBc/Hz
10 kHz	–140 dBc/Hz	–135 dBc/Hz	–155 dBc/Hz
50 kHz	–145 dBc/Hz	–140 dBc/Hz	–160 dBc/Hz

These apply to sine output to 70 MHz; degradation is 6 dB per octave above 70 MHz

L2 option is available as follows:

Frequency	rf connector preferred	pcb mount	Size
3-20 MHz	CO-252W, CO-252SW	CO-252	2" x 2" x 3/4" / 2" x 2 1/4" x 3/4"
20-280 MHz	CO-255	CO-255P (to 100 MHz)	2" x 3" x 3/4"

Standard output level of all L2 models is 0.5 Vrms/50Ω (+7 dBm); current drain is <30 mA for CO-252L2 and <50 mA for CO-255L2

ORDERING METHOD

For example, a 50 MHz TCXO with stability of ±1 x 10^{-6} over –20°C to +70°C and standard +7 dBm/50Ω sinewave output via SMA connector is

CO-254 □ □ □ □ □ □ at 50 MHz = CO-254D16W at 50 MHz

- CO-254 — Series
- □ — Temp. Range
- □ — Stability over Temp.
- 50 MHz — Frequency
- □ — *Low phase noise (L2)
- □ — *Mechanical option (W, U, SW, P)
- □ — *VCXO option (V)
- □ — *Input/output option (J, K, E, M, R)

NOTE: If none of our standard models with coded options meet your specific needs, please detail the differences from our closest standard model (e.g. CO-252D57 except 12 Vdc supply and +7dBm/50Ω output).

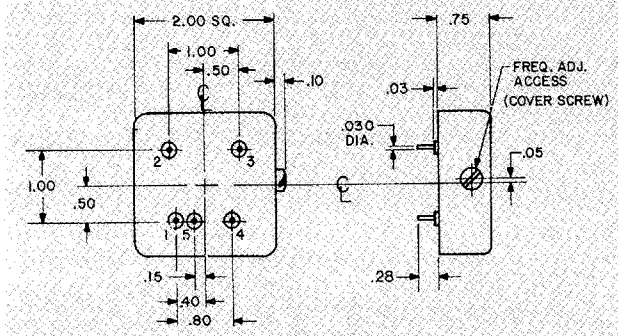
*Leave blank if option is not desired

OUTLINE/INSTALLATION DRAWINGS

CO-252, CO-254 SERIES

RF Connector options

PCB mount (standard)



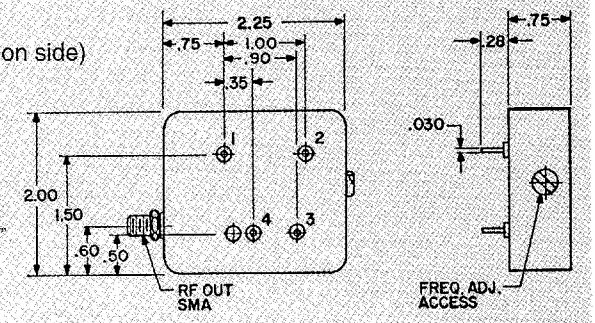
Pin	WITH SINGLE SUPPLY No "V" Option	WITH SINGLE SUPPLY "V" Option	WITH SEPARATE TTL SUPPLY No "V" Option	WITH SEPARATE TTL SUPPLY "V" Option
1	Output	Output	Output	Output
2	Supply (+)	Supply (+)	Supply (+)	Supply (+)
3	0 Volt/case	0 Volt/case	*0 Volt/case	*0 Volt/case
4	0 Volt/case	VCXO in	+5V	VCXO in
5	*rf return	*rf return	*rf return	+5 Vdc

*Internally connected (except pin 5 is not internally connected with sine output in CO-252 series)

Option **SW**
(SMA connector on side)

Pin	Function
1	Supply (+)
2	0 volts, case
*3	Case
4	Case

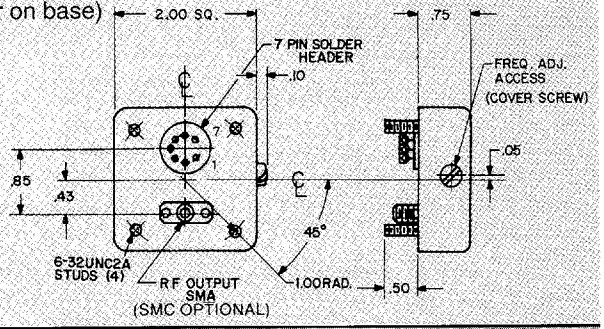
*In units with electronic tuning ("V" option), control voltage is applied from pin 3 to pin 2.



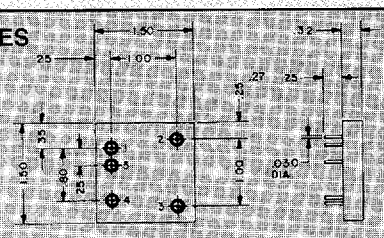
Option **W**
(SMA connector on base)

Pin	Function
1	Supply (+)
2	N/C
3	0 volts, case
4	N/C
5	Case
6	N/C
*7	N/C

*In units with electronic tuning ("V" option), control voltage is applied from pin 7 to pin 3.



CO-258 SERIES

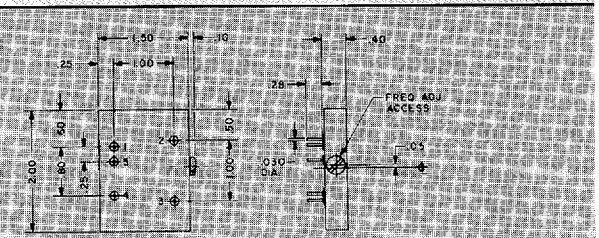


Pin	With Separate TTL Supply	With Single Supply
1	Output	Output
2	Supply (+)	Supply (+)
3	0 Volt/case	*0 Volt/case
4	**tuning	**tuning
5	+5V	*rf return

*Internally connected

** For external tuning, connect as follows: Pin 3 — 20 kΩ — Pin 4

CO-259 SERIES



Pin	WITH SEPARATE TTL SUPPLY No "V" Option	WITH SEPARATE TTL SUPPLY "V" Option	WITH SINGLE SUPPLY No "V" Option	WITH SINGLE SUPPLY "V" Option
1	Output	Output	Output	Output
2	Supply (+)	Supply (+)	Supply (+)	Supply (+)
3	*0 Volt/case	0 Volt/case	*0 Volt/case	*0 Volt/case
4	+5V	VCXO in	*0 Volt/case	VCXO in
5	*rf return	+5V	*rf return	*rf return

*Internally connected

Markings do not appear on oscillators; they are for reference only. Dimensions are in inches. Case dimension tolerances are ± .02"