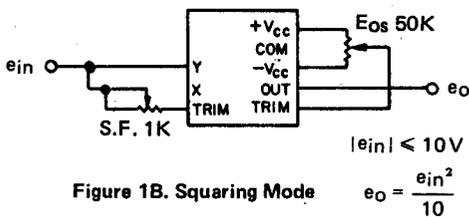
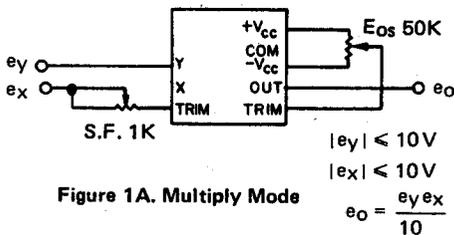
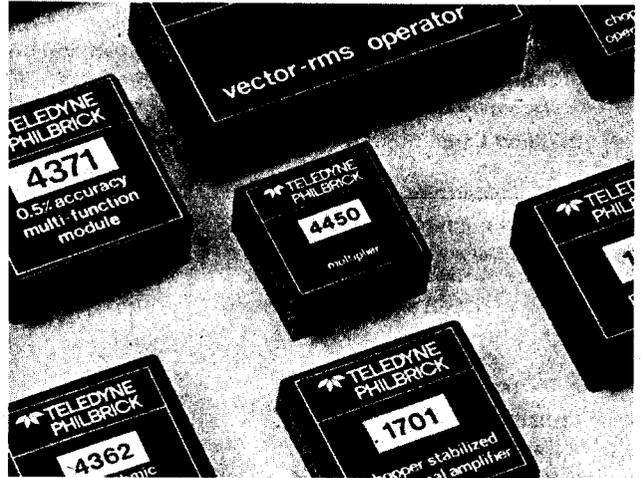


4450 GENERAL PURPOSE MULTIPLY-DIVIDE-SQUARE, SQUARE ROOT OPERATOR

Teledyne Philbrick Model 4450 is a four-quadrant multiplier whose output represents the instantaneous product of two input signals. Its small size and high degree of accuracy make it valuable for use as a computing element in the laboratory, in manufactured equipment, and wherever an accurate multiplication process is required with no limitations as to the polarity of the input signals.

In addition to these benefits, the unit operates at rated accuracy to 10 kHz, with full output voltage capabilities to 100 kHz. Also logarithmic circuitry performs the multiplication function for greatest accuracy.

Only one external trim is required for simplified, trouble-free setup of the unit. A second optional trim may also be used to improve accuracy. No special trimming or other design considerations are required for operation with any combination of input signal polarities. For zero trim (50 kΩ), ground the X and Y input pins and adjust for a zero output. For an optional scale factor trim (1 kΩ), apply 10 volts to input pins X and Y, and adjust for maximum accuracy.



Multiplication and Squaring Mode

1. Set X = 0 volts and Y = 0 volts. Adjust offset trim for minimum output null as displayed on an oscilloscope.
2. Set Y = +10 volts and X = +/-10 volts. Adjust scale factor trim for minimum output error.
3. For use as a squarer, connect terminal Y to terminal X.
4. For use as a modulator, the carrier should be applied to the X terminal and the modulator to the Y terminal. Carrier null suppression is performed adjusting the offset potentiometer for dc offset, and the scale factor potentiometer for symmetry.

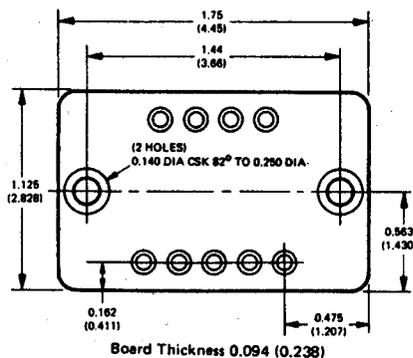
Note: If Scale Factor Trim is not used, connect e_x or e_{in} to X input.

FEATURES

- Small Size
- 4-Quadrant Operation
- High Input Impedance
- 1% Accuracy

APPLICATIONS

- Automatic Gain Control
- Power Measurements
- Carrier Modulator/Demodulator
- Auto-Correlator
- Phase Detection



DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS

Optional Socket: NSK-20

SPECIFICATIONS		Typical @ +25°C, V _{cc} = ±15 V, Rated Load	
FUNCTION			
Multiply Mode		$\frac{+XY}{10}$	
Accuracy, % of Full Scale Factor		1% max; 0.6% typ	
Trimmed		2% max; 1% typ	
Untrimmed			
INPUT			
Voltage		±10 V	
Impedance	X-Input	25 kΩ min	
	Y-Input	10 MΩ min	
OUTPUT			
Voltage		±10 V	
Current		±2 mA	
Impedance		3 Ω	
NULL SUPPRESSION dc to 10 kHz			
	X-Input	50 dB	
	Y-Input	60 dB	
NOISE-WIDEBAND			
		2.5 mV rms	
FREQUENCY RESPONSE			
	-3 dB Point	1 MHz	
	1° Phase Shift	10 kHz	
	Full Output	100 kHz	
STABILITY			
	Output Offset vs Temp	3 mV/°C	
	Scale Factor vs Temp	0.02%/°C	
TEMPERATURE RANGE			
	Operating	-25°C to +85°C	
	Storage	-55°C to +100°C	
POWER REQUIREMENTS			
	Supply Voltage	±15 V dc, ±1%	
	Current, Rated Output	±12 mA	
	Quiescent Current	±6 mA	
	Supply Rejection	10 mV/V	

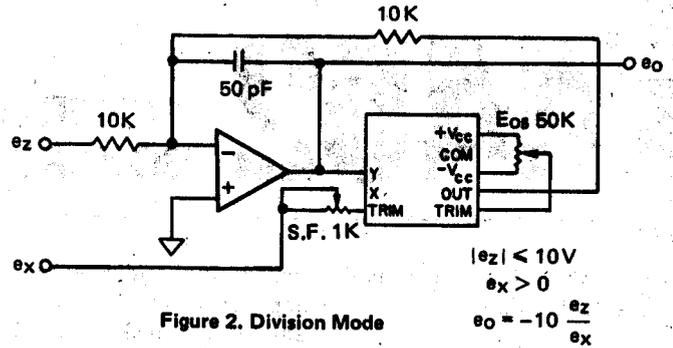


Figure 2. Division Mode

Division Mode

1. Connect the circuit as shown.
2. Set X = +10 volts and Z = 0 volts. Adjust offset trim for a minimum output null as measured on an oscilloscope.
3. Set Y = +10 volts and Z = +10 volts. Adjust scale factor trim for -10 volts output.
4. Accuracy as a divider is 1% maximum when |e_x| ≥ 1 volt. Versus frequency, accuracy is < 2% over dc to 10 kHz.

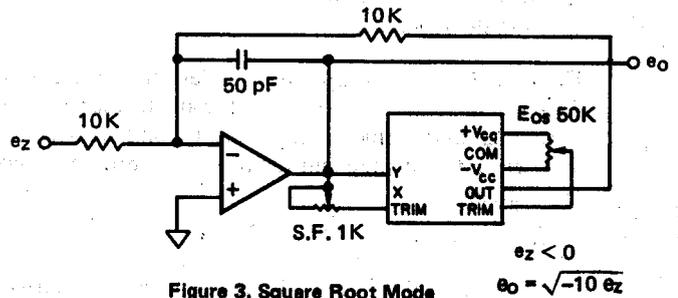
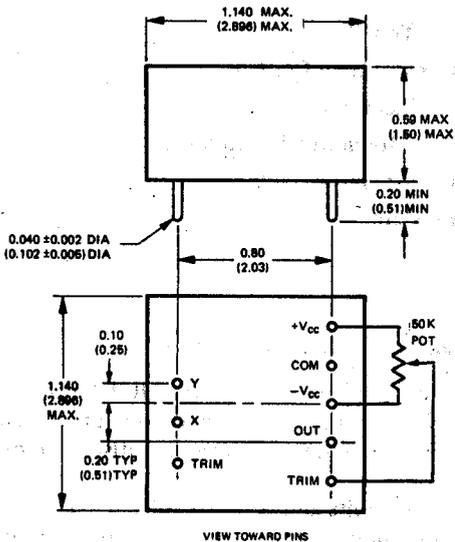


Figure 3. Square Root Mode

Square Root Mode

1. Connect terminals X and Y.
2. Set both potentiometers to approximately mid-range.
3. Set Z for -10 volts. Adjust the scale factor potentiometer for an output of +10 volts.
4. Set Z for -1 volt. Adjust the offset potentiometer for an output of +3.16 volts.
5. Repeat steps 3 and 4 until the required outputs have been obtained.
6. Voltage applied to Z should be between -1 volt and -10 volts.



±0.01 Non-cumulative tolerance between pins
±0.02 Tolerance from case edge to center of pin

DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS

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