4371 MULTIFUNCTION OPERATOR

Teledyne Philbrick Models 4371 and 4371-01 compute the function: $E_O = Y(\frac{Z}{X})m$ where exponent "m" can be externally programmed for any value between 0.2 and 5. With a few external connections, multiplication, division, squaring, square-rooting, and raising voltages or ratio of voltages to the "m^{th}" power can be accurately performed.

EXTERNAL PROGRAMMING
(See Outline Drawing for Pin locations).

These devices are internally trimmed, and therefore need no external adjustment to obtain rated accuracy. However, external jumpering is required to program the device for various functional modes.

With terminals A, B, and C connected together, the exponent m = 1; and the transfer function becomes:

$$E_O = Y(\frac{Z}{X})$$ Where each input must be positive.

Where only two terms are to be multiplied or divided, it is recommended to connect the internal +10 V reference to the Y input to yield: $E_O = \frac{10Z}{X}$ or to the X input to produce: $E_O = Y(\frac{Z}{10})$ as shown in Figures 2 and 3.

To compute powers of $\frac{Z}{X}$, connect external resistors as shown in Figures 4 and 5. Use connections shown in Figure 4 when $1 \leqslant m \leqslant 5.0$, and use connections shown in Figure 5 when $0.2 \leqslant m \leqslant 1.0$.
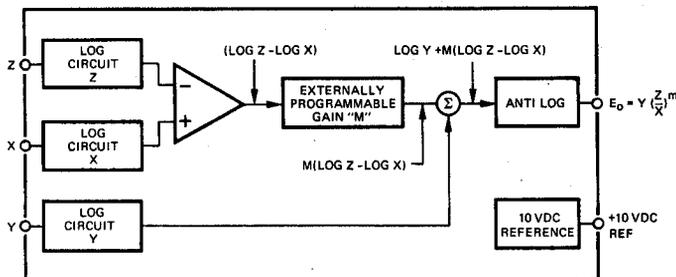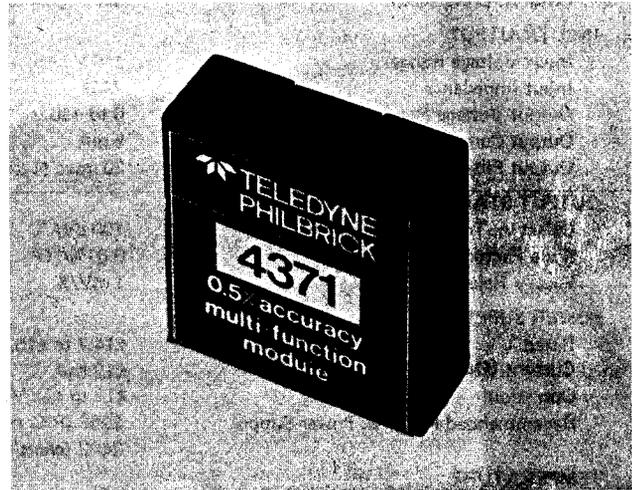
FEATURES
- **Multiplication and Division in One Package**
- **Internal 10 V Reference**
- **No External Gain or Offset Adjustment**
- **100:1 Dynamic Range**

APPLICATIONS
- **Multiplication and Division**
- **Raising Voltages to Powers of 0.2 to 5.0**
- **Transducer Linearization**
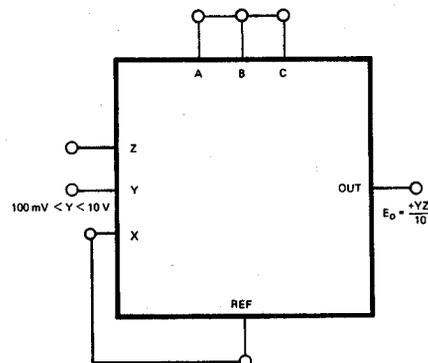- **Rectangular to Polar Conversion**
- **Vector Computation**

Figure 1. Models 4371 and 4371-01 Block Diagram

Figure 2. Multiplication Mode

SPECIFICATIONS Typical @ +25 °C, unless otherwise noted

	MODEL 4371	MODEL 4371-01
TRANSFER FUNCTIONS		
General Expression	$E_O = Y(Z/X)^m$	*
Divide Mode (M = 1)	$E_O = 10Z/X$	*
Multiply Mode (M = 1)	$E_O = YZ/10$	*
External Adj. of M	0.2 to 5.0	*
INPUT		
Voltage Range (X, Y, Z)	+1 mV to 10 V	*
Resistance X	25 kΩ	*
Y	25 kΩ	*
Z	25 kΩ	*
OUTPUT		
Rated Voltage	0 to +10 V at 5 mA	*
Offset Y = Z = +10 mV, X = +10 V	±5 mV max.	±2 mV max.
Vs. Temperature	1 mV/°C	*
INTERNAL REFERENCE		
Accuracy	+10 V ±0.25% @ 5 mA	*
Vs. Temperature	0.005%/°C	*
MULTIPLICATION MODE	$E_O = YZ/10$	*
Total Output Error, Z = X = +10 mV to +10 V		
Typical	+5 mV ±0.3% of output	+1 mV ±0.15% of output
Max.	50 mV	25 mV
Vs. Temperature	1 mV/°C	*
DIVISION MODE	$E_O = 10Z/X$	*
Total Output Error, Z = X = +100 mV to +10 V	50 mV max.	25 mV max.
FREQUENCY RESPONSE		
X = Y = Z = +10 VDC (−3dB)**	100 kHz	*
X = Y = Z = 100 mV (−3dB)**	5 kHz	*
Full Power (20 V p-p) out	5 kHz	*
POWER SUPPLY		
Voltage	±(14.7 to 15.3) VDC	*
Current	±15 mA	*
Recommended Philbrick Power Supply	2209 (P.C. mount) or 2403 (chassis mount)	
TEMPERATURE RANGE		
Specified	0 °C to +70 °C	−25 °C to +85 °C
Storage	−25 °C to +85 °C	−25 °C to +85 °C

*Same as 4371.
**P-P AC level, 10% of DC level.

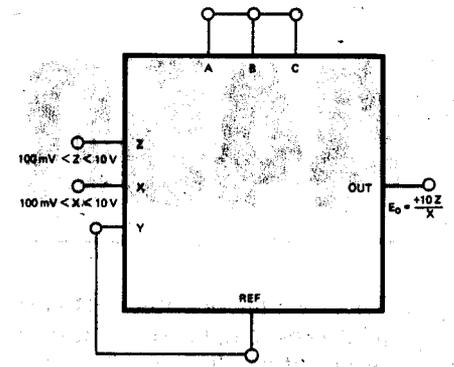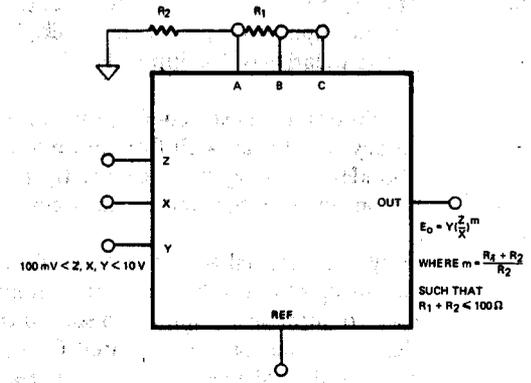The input circuits of these units are protected to ±Vcc. Output circuits are short-circuit protected to ground.

Figure 3. Division Mode

Figure 4. Connections for Exponents (1.0 ≤ m ≤ 5.0)
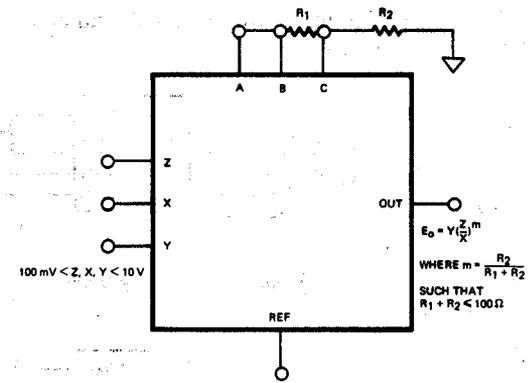
Figure 5. Connections for Exponents (0.2 ≤ m ≤ 1.0)
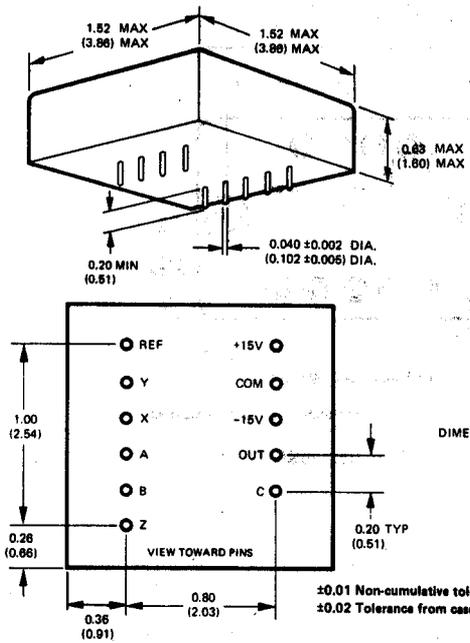
Optional Socket: Model 6129

BOARD THICKNESS: 0.09 (0.23) EPOXY
OVERALL HEIGHT: 0.50 (1.27)
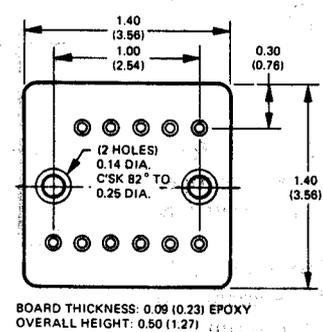
DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS

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

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