

4452 GENERAL PURPOSE MULTIPLY-DIVIDE-SQUARE-SQUARE ROOT OPERATOR

The Model 4452 is an economy multiplier/divider that requires only two external components to achieve maximum performance. Its small size and low cost make it an excellent choice for use as a computing element in the laboratory, in manufactured equipment, or wherever a multiplication process is required with no limitations on the polarity of input signals.

Unlike monolithic IC multipliers and most discrete multipliers, the Model 4452 requires no external amplifiers or circuitry, other than the two 50kΩ trimming potentiometers, for performing multiplication, division, squaring, or square-rooting. Selecting the mode of operation is determined by connecting the output of the module to the appropriate input pins.

The Model 4452 is fully encapsulated in epoxy for complete mechanical protection and for an almost completely isothermal environment for superior stability. The unit is short-circuit protected and the inputs are protected against overvoltage.

APPLICATIONS

As a multiplier there are no limitations on the polarity of input signals. Like other multipliers, when the 4452 is connected as a divider, the numerator, Z, can be either polarity, but the denominator, Y, must be positive and of such a magnitude that the output will not be required to exceed 10 volts in magnitude.



FEATURES

- Low Cost
- Small Size
- High Input Impedance
- 4 Quadrant Operation
- No External Amplifiers Required

APPLICATIONS

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

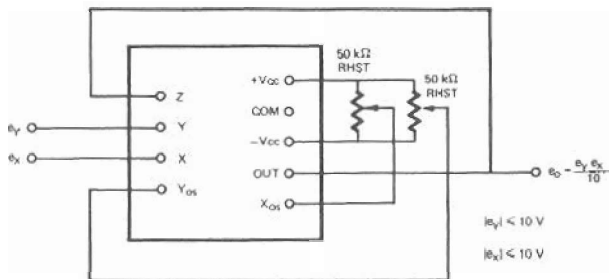


Figure 1A. Multiplication Mode

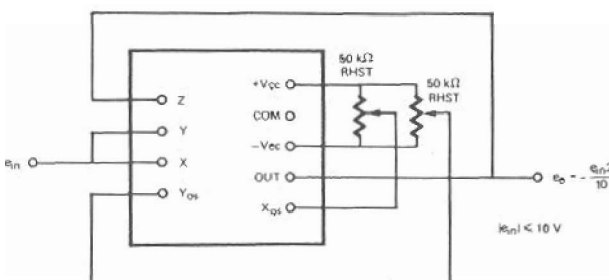


Figure 1B. Squaring Mode

Multiplication and Squaring Mode

1. Connect the Z terminal to the OUT terminal.
2. Set X = 0 volts and Y = ±10 volts at 100 Hz. Adjust X_{OS} for minimum output null as displayed on an oscilloscope.
3. Set Y = 0 volts and X = ±10 volts at 100 Hz. Adjust Y_{OS} for minimum output null as displayed on an oscilloscope.
4. For use as a squarer, connect terminal Y to terminal X.
5. 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 by adjusting the X_{OS} potentiometer for dc offset, and the Y_{OS} potentiometer for symmetry.

SPECIFICATIONS Typical @ 25°C $V_{CC} = \pm 15$ V (unless noted otherwise)

TRANSFER FUNCTION

Multiply Mode

$$V_{out} = \frac{-x \cdot y}{10}$$

Divide Mode

$$V_{out} = \frac{-10z}{y}$$

Accuracy, % of Full Scale Trimmed

4-Quadrant Operation

2% max.

2-Quadrant Operation

1% max.

INPUT

Voltage		± 10 V
Impedance	X Input	40 k Ω min.
	Y Input	30 k Ω min.
	Z Input	90 k Ω min.

OUTPUT

Voltage	± 10 V
Current	± 5 mA
Impedance	1 Ω

FREQUENCY RESPONSE

-3 dB point	400 kHz
1° phase shift	2 kHz
Full Output	40 kHz

STABILITY

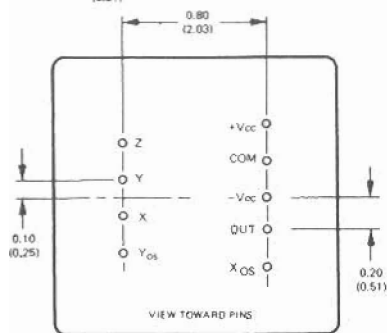
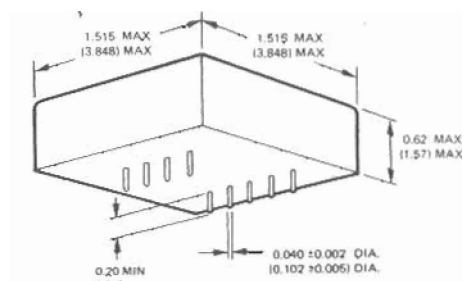
Output Offset vs Temperature	3 mV/°C
Output Noise	2.5 mV RMS

TEMPERATURE RANGE

Operating	0°C to +70°C
Storage	-25°C to +85°C

POWER REQUIREMENTS

Supply Voltage	± 15 VDC $\pm 1\%$
Current, Rated Output	± 15 mA
Quiescent	± 5 mA



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

DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS

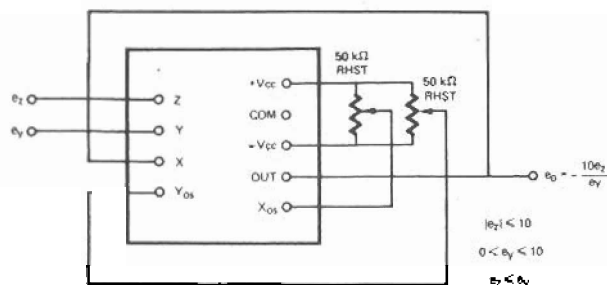


Figure 2. Division Mode

Division Mode

1. Connect the X terminal to the OUT terminal.
2. Set Y = +10 volts and Z = 0 volts. Adjust X_{OS} for a minimum output null as measured on an oscilloscope.
3. Set Y = +10 volts and Z = +10 volts. Adjust Y_{OS} for -10 volts output.

Note: Y must be positive when used as a divider, and of such value as will not require the output to exceed 10 V magnitude.

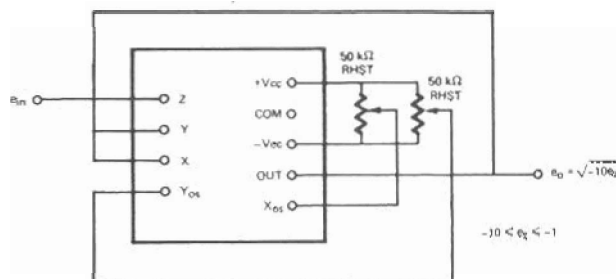
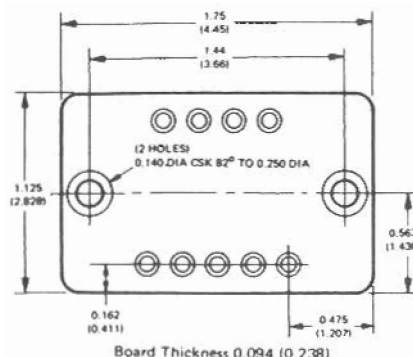


Figure 3. Square Root Mode

Square Root Mode

1. Connect terminals X and Y to the OUT terminal.
2. Set both potentiometers to approximately mid range.
3. Set Z for -10 volts. Adjust the Y_{OS} potentiometer for an output of +10 volts.
4. Set Z for -1 volt. Adjust the X_{OS} 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.



Optional Socket: NSK-20

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TELEDYNE PHILBRICK

Allied Drive at Route 128, Dedham, Massachusetts 02026