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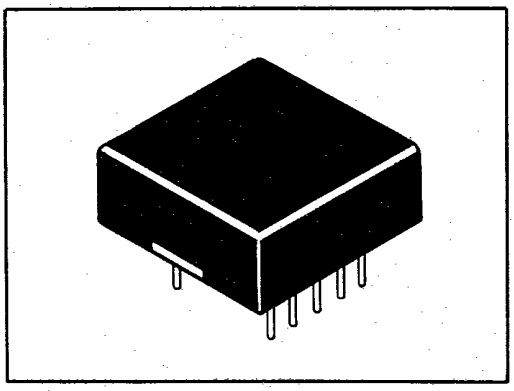
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Find the *Teledyne / Philbrick 1702* at our website: *Click HERE*

1702

5 Femtoampere Bias Current Operational Amplifier



The 1702, with 5 femtoamp bias current (5×10^{-15}A) maximum, is designed to be used in circuits where extremely low error currents, low current noise, high input impedance, high common mode voltage and high common mode rejection ratio are critical design requirements.

Features include a D.C. open loop gain of 100dB min., common mode voltage range of ±100V min., CMRR of 100dB min., and an offset voltage drift of 30μV/° C max. These features are complemented by its small size (1.5 inches square by 0.6 inches high) and epoxy encapsulation for reliability in areas of shock and vibration. The epoxy also forms an isothermal environment for protection against thermal spikes. The unit is totally enclosed by a metal cup for protection against spurious signals from associated circuitry.

Input bias current of the 1702 is measured as the maximum into either input. Therefore, the 1702 can be used for inverting, non-inverting, and differential application. For DC applications where the initial voltage offset may affect performance, an optional 50kΩ pot will zero this voltage. Complete short circuit protection of the input and output circuitry is provided for added reliability.

FEATURES

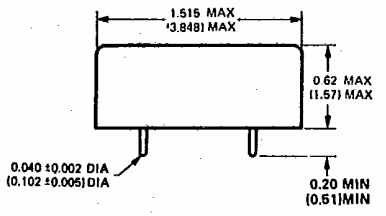
- 2fA Bias Current Typical
- 1fA/°C Bias Current T.C., Typical
- 10μV/°C E_{os} T.C.
- 100V Common Mode Voltage @ $V_{cc} = \pm 12V$.

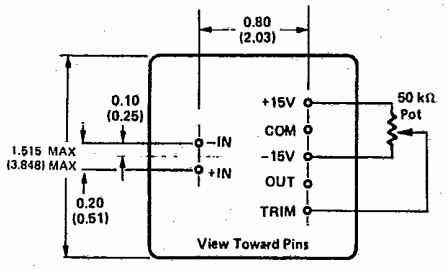
APPLICATIONS

- Electrometers
- Photo-Diode Amplifiers
- pH Meters
- Long Term Integrators
- Charge Amplifiers
- Femto-Ammeters

PACKAGE DIMENSIONS

Dimensions in parentheses are expressed in centimeters.





±0.01 NON-CUMULATIVE TOLERANCE BETWEEN PINS
±0.02 TOLERANCE FROM CASE EDGE TO CENTER OF PIN

SPECIFICATIONS (+25°C, V_{CC} = ±15V, unless otherwise indicated.)

PARAMETER	TYPICAL	GUARANTEED
OUTPUT RANGE		
Voltage (Peak)	---	±10V
Current	---	±5mA
VOLTAGE GAIN (DC Open Loop)		
Rated Load	---	100dB
FREQUENCY RESPONSE (Inverting)		
Small Signal (Unity Gain, Open Loop)	500Hz	---
Gain @ 5Hz	---	37dB
Large Signal Full Output (Undistorted)	---	20Hz
Large Signal Full Output (Peak to Peak)	50Hz	---
Slew Rate	0.5V/msec	---
Max. Capacitive Load Without Instability	0.1µF	---
INPUT VOLTAGE RANGE		
Common Mode DC Linear Operation (1)	----	±100V
Common Mode Fault	---	±200V
Differential (Betweeen Inputs)	±300V	---
Common Mode Rejection Ratio	---	100dB
INPUT VOLTAGE OFFSET		
Initial (Without External Trim) @ 25°C	---	±5mV
Zero Adjustment (Optional)	50kΩ pot	---
Vs. Temperature (Avg. 0° to +70°C)	---	±30µV/°C
NOISE		
Flicker (0.016Hz to 1.6Hz)	7µVp-p	---
Midband (1Hz to 100Hz)	10µV(RMS)	---
INPUT BIAS CURRENT		
Initial @25°C	---	0.005pA
Vs. Temperature (Avg. 0° to +70°C)	0.001pA/°C	0.002pA/°C
Vs. Power Supply	0.0005pA/V	---
INPUT IMPEDANCE		
Differential	$3 \times 10^{11}\ \Omega \| 15pF$	---
Common Mode (Either Input to Common)	$10^{14}\ \Omega$	---
POWER REQUIREMENTS		
Nominal Supply Voltage	±15V	---
Supply Voltage Range	±12 to ±18	---
Quiescent Current	---	+13mA, −8mA
TEMPERATURE RANGE		
Operating (Rated)	---	0°C to +70°C
Operating (Derated)	−25°C to +85°C	---
Storage	---	−55°C to +125°C

NOTE:
1. The 1702 can operate with ±100V of common mode voltage when V_{CC} = ±12V.

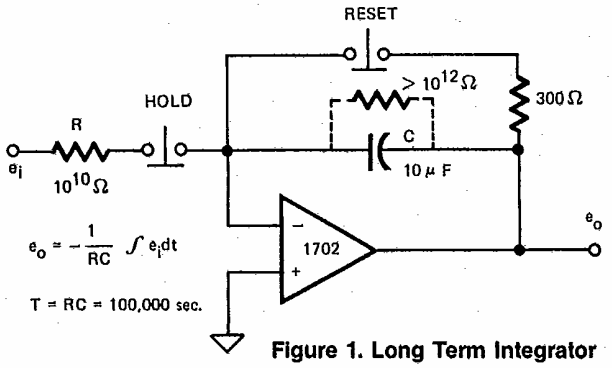


Figure 1. Long Term Integrator

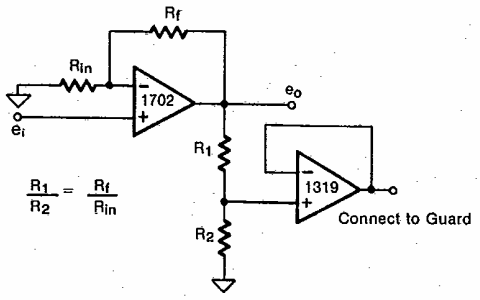


Figure 2. Follower With Gain-Guard Drive

To minimize errors caused by leakage currents, a "foil guard" should be put around the input pins. The guard conductor should be connected to a potential that is very close to or equal to the voltage being applied to the input. In this manner any stray leakage currents will be intercepted before they reach the inputs, and since the guard is at approximately the same potential as the inputs, no leakage currents will be generated.

Connect the guard to ground for inverters or I to Vs, to the output for unity gain followers, and to a buffered attenuator (see Figure 2) for follower with gain.

For additional application information, request AN-3.

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