

FEATURES

EASY TO USE

Gain Set with One External Resistor

(Gain Range 1 to 1000)

Wide Power Supply Range (± 2.3 V to ± 18 V)

Higher Performance than Three Op Amp IA Designs

Available in 8-Lead DIP and SOIC Packaging

Low Power, 1.3 mA max Supply Current

EXCELLENT DC PERFORMANCE ("B GRADE")

50 μ V max, Input Offset Voltage

0.6 μ V/ $^{\circ}$ C max, Input Offset Drift

1.0 nA max, Input Bias Current

100 dB min Common-Mode Rejection Ratio (G = 10)

LOW NOISE

9 nV/ $\sqrt{\text{Hz}}$, @ 1 kHz, Input Voltage Noise

0.28 μ V p-p Noise (0.1 Hz to 10 Hz)

EXCELLENT AC SPECIFICATIONS

120 kHz Bandwidth (G = 100)

15 μ s Settling Time to 0.01%

APPLICATIONS

Weigh Scales

ECG and Medical Instrumentation

Transducer Interface

Data Acquisition Systems

Industrial Process Controls

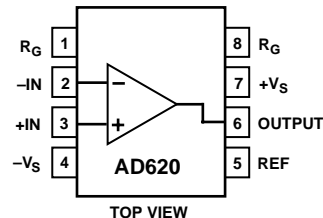
Battery Powered and Portable Equipment

PRODUCT DESCRIPTION

The AD620 is a low cost, high accuracy instrumentation amplifier that requires only one external resistor to set gains of 1 to

CONNECTION DIAGRAM

8-Lead Plastic Mini-DIP (N), Cerdip (Q)
and SOIC (R) Packages



1000. Furthermore, the AD620 features 8-lead SOIC and DIP packaging that is smaller than discrete designs, and offers lower power (only 1.3 mA max supply current), making it a good fit for battery powered, portable (or remote) applications.

The AD620, with its high accuracy of 40 ppm maximum nonlinearity, low offset voltage of 50 μ V max and offset drift of 0.6 μ V/ $^{\circ}$ C max, is ideal for use in precision data acquisition systems, such as weigh scales and transducer interfaces. Furthermore, the low noise, low input bias current, and low power of the AD620 make it well suited for medical applications such as ECG and noninvasive blood pressure monitors.

The low input bias current of 1.0 nA max is made possible with the use of Super β processing in the input stage. The AD620 works well as a preamplifier due to its low input voltage noise of 9 nV/ $\sqrt{\text{Hz}}$ at 1 kHz, 0.28 μ V p-p in the 0.1 Hz to 10 Hz band, 0.1 pA/ $\sqrt{\text{Hz}}$ input current noise. Also, the AD620 is well suited for multiplexed applications with its settling time of 15 μ s to 0.01% and its cost is low enough to enable designs with one in-amp per channel.

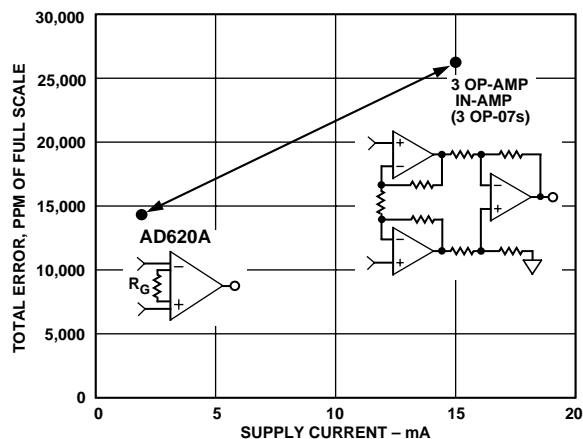


Figure 1. Three Op Amp IA Designs vs. AD620

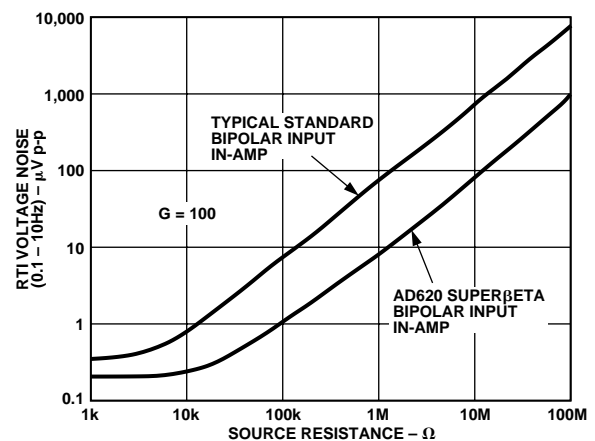


Figure 2. Total Voltage Noise vs. Source Resistance

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AD620—SPECIFICATIONS

(Typical @ +25°C, $V_S = \pm 15\text{ V}$, and $R_L = 2\text{ k}\Omega$, unless otherwise noted)

Model	Conditions	AD620A			AD620B			AD620S ¹			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
GAIN											
Gain Range	$G = 1 + (49.4\text{ k}/R_G)$	1		10,000	1		10,000	1		10,000	
Gain Error ²	$V_{OUT} = \pm 10\text{ V}$										
G = 1			0.03	0.10		0.01	0.02		0.03	0.10	%
G = 10			0.15	0.30		0.10	0.15		0.15	0.30	%
G = 100			0.15	0.30		0.10	0.15		0.15	0.30	%
G = 1000			0.40	0.70		0.35	0.50		0.40	0.70	%
Nonlinearity,	$V_{OUT} = -10\text{ V to } +10\text{ V}$,										
G = 1–1000	$R_L = 10\text{ k}\Omega$		10	40		10	40		10	40	ppm
G = 1–100	$R_L = 2\text{ k}\Omega$		10	95		10	95		10	95	ppm
Gain vs. Temperature	G = 1			10			10			10	ppm/°C
	Gain > 1 ²			–50			–50			–50	ppm/°C
VOLTAGE OFFSET											
(Total RTI Error = $V_{OSI} + V_{OSO}/G$)											
Input Offset, V_{OSI}	$V_S = \pm 5\text{ V to } \pm 15\text{ V}$		30	125		15	50		30	125	μV
Over Temperature	$V_S = \pm 5\text{ V to } \pm 15\text{ V}$			185			85			225	μV
Average TC	$V_S = \pm 5\text{ V to } \pm 15\text{ V}$		0.3	1.0		0.1	0.6		0.3	1.0	$\mu\text{V}/^\circ\text{C}$
Output Offset, V_{OSO}	$V_S = \pm 15\text{ V}$		400	1000		200	500		400	1000	μV
Over Temperature	$V_S = \pm 5\text{ V}$			1500			750			1500	μV
Average TC	$V_S = \pm 5\text{ V to } \pm 15\text{ V}$		5.0	15		2.5	7.0		5.0	15	$\mu\text{V}/^\circ\text{C}$
Offset Referred to the Input vs. Supply (PSR)	$V_S = \pm 2.3\text{ V to } \pm 18\text{ V}$										
G = 1		80		100	80		100	80		100	dB
G = 10		95		120	100		120	95		120	dB
G = 100		110		140	120		140	110		140	dB
G = 1000		110		140	120		140	110		140	dB
INPUT CURRENT											
Input Bias Current			0.5	2.0		0.5	1.0		0.5	2	nA
Over Temperature				2.5			1.5			4	nA
Average TC			3.0			3.0			8.0		$\text{pA}/^\circ\text{C}$
Input Offset Current			0.3	1.0		0.3	0.5		0.3	1.0	nA
Over Temperature				1.5			0.75			2.0	nA
Average TC			1.5			1.5			8.0		$\text{pA}/^\circ\text{C}$
INPUT											
Input Impedance											
Differential			10 2			10 2			10 2		$\text{G}\Omega \text{pF}$
Common-Mode			10 2			10 2			10 2		$\text{G}\Omega \text{pF}$
Input Voltage Range ³	$V_S = \pm 2.3\text{ V to } \pm 5\text{ V}$	$-V_S + 1.9$		$+V_S - 1.2$	$-V_S + 1.9$		$+V_S - 1.2$	$-V_S + 1.9$		$+V_S - 1.2$	V
Over Temperature		$-V_S + 2.1$		$+V_S - 1.3$	$-V_S + 2.1$		$+V_S - 1.3$	$-V_S + 2.1$		$+V_S - 1.3$	V
Over Temperature	$V_S = \pm 5\text{ V to } \pm 18\text{ V}$	$-V_S + 1.9$		$+V_S - 1.4$	$-V_S + 1.9$		$+V_S - 1.4$	$-V_S + 1.9$		$+V_S - 1.4$	V
Over Temperature		$-V_S + 2.1$		$+V_S - 1.4$	$-V_S + 2.1$		$+V_S - 1.4$	$-V_S + 2.3$		$+V_S - 1.4$	V
Common-Mode Rejection Ratio DC to 60 Hz with 1 k Ω Source Imbalance	$V_{CM} = 0\text{ V to } \pm 10\text{ V}$										
G = 1		73		90	80		90	73		90	dB
G = 10		93		110	100		110	93		110	dB
G = 100		110		130	120		130	110		130	dB
G = 1000		110		130	120		130	110		130	dB
OUTPUT											
Output Swing	$R_L = 10\text{ k}\Omega$,										
Over Temperature	$V_S = \pm 2.3\text{ V to } \pm 5\text{ V}$	$-V_S + 1.1$		$+V_S - 1.2$	$-V_S + 1.1$		$+V_S - 1.2$	$-V_S + 1.1$		$+V_S - 1.2$	V
Over Temperature		$-V_S + 1.4$		$+V_S - 1.3$	$-V_S + 1.4$		$+V_S - 1.3$	$-V_S + 1.6$		$+V_S - 1.3$	V
Over Temperature	$V_S = \pm 5\text{ V to } \pm 18\text{ V}$	$-V_S + 1.2$		$+V_S - 1.4$	$-V_S + 1.2$		$+V_S - 1.4$	$-V_S + 1.2$		$+V_S - 1.4$	V
Over Temperature		$-V_S + 1.6$		$+V_S - 1.5$	$-V_S + 1.6$		$+V_S - 1.5$	$-V_S + 2.3$		$+V_S - 1.5$	V
Short Current Circuit			± 18			± 18			± 18		mA

Model	Conditions	AD620A			AD620B			AD620S ¹			Units	
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
DYNAMIC RESPONSE												
Small Signal -3 dB Bandwidth	10 V Step											
G = 1			1000			1000			1000		kHz	
G = 10			800			800			800		kHz	
G = 100			120			120			120		kHz	
G = 1000			12			12			12		kHz	
Slew Rate			0.75	1.2		0.75	1.2		0.75	1.2	V/μs	
Settling Time to 0.01%												
G = 1-100			15			15			15		μs	
G = 1000			150			150			150		μs	
NOISE												
Voltage Noise, 1 kHz	f = 1 kHz	$Total\ RTI\ Noise = \sqrt{(e_{ni}^2) + (e_{no}/G)^2}$										
Input, Voltage Noise, e_{ni}			9	13		9	13		9	13	nV/√Hz	
Output, Voltage Noise, e_{no}			72	100		72	100		72	100	nV/√Hz	
RTI, 0.1 Hz to 10 Hz												
G = 1				3.0			3.0	6.0		3.0	6.0	μV p-p
G = 10				0.55			0.55	0.8		0.55	0.8	μV p-p
G = 100-1000			0.28			0.28	0.4		0.28	0.4	μV p-p	
Current Noise			100			100			100		fA/√Hz	
0.1 Hz to 10 Hz			10			10			10		pA p-p	
REFERENCE INPUT												
R_{IN}	$V_{IN+}, V_{REF} = 0$		20			20			20		kΩ	
I_{IN}			+50	+60		+50	+60		+50	+60	μA	
Voltage Range			- $V_S + 1.6$		+ $V_S - 1.6$	- $V_S + 1.6$		+ $V_S - 1.6$	- $V_S + 1.6$		+ $V_S - 1.6$	V
Gain to Output				1 ± 0.0001			1 ± 0.0001			1 ± 0.0001		
POWER SUPPLY												
Operating Range ⁴	$V_S = \pm 2.3\text{ V to } \pm 18\text{ V}$		±2.3			±2.3			±2.3		V	
Quiescent Current				0.9	1.3		0.9	1.3		0.9	1.3	mA
Over Temperature				1.1	1.6		1.1	1.6		1.1	1.6	mA
TEMPERATURE RANGE												
For Specified Performance			-40 to +85			-40 to +85			-55 to +125		°C	

NOTES

¹See Analog Devices military data sheet for 883B tested specifications.²Does not include effects of external resistor R_G .³One input grounded. G = 1.⁴This is defined as the same supply range which is used to specify PSR.

Specifications subject to change without notice.