INSTRUMENTATION AMPLIFIER
AD520

OBSOLETE

GENERAL DESCRIPTION

The Analog Devices' AD520 is the first instrumentation amplifier to be manufactured in integrated circuit form. It is a closed loop gain block with differential inputs and an accurately predictable input-to-output gain relationship. The AD520's performance is unlike that of conventional IC operational amplifiers because of an internal feedback design which permits gain adjustment from 1 to 1000 by varying the value of a single resistor. Further, high input impedance is achieved at both inputs and both input impedance and CMRR remain high at all gain settings.

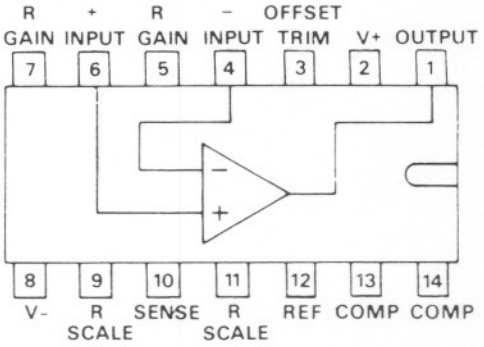
The AD520 performs like a modular instrumentation amplifier. Because of its monolithic construction, however, its cost is significantly below that of modules, and becomes even lower with larger quantity requirements. The AD520 features low bias and offset currents, high gain linearity, excellent frequency response, and is short circuit protected and offset voltage nullable. Thus it is ideally suited for all general purpose, high accuracy amplifier requirements. Its small size, low cost, and complete-on-a-chip ease of application offer the circuit designer an attractive alternative to both modular instrumentation amplifier packages, and user-wired collections of IC op amps and high-precision external components. The AD520 finds excellent application in the amplification of low level signals from bridge circuits, thermocouples, strain gauges, and other transducers. Other applications include chart recorders, line reviewers, and in medical electronics. For increased versatility, the amplifier has a remote sense terminal for current-

SPECIFICATIONS (Typical at V_S = ±15V and T_A = +25°C unless otherwise noted)

Parameter	AD520J	AD520K	AD520S
Gain			
Range	1 to 1000	•	•
Equation	$G = (10^5/R_{gain})V/V$	•	•
Error from Equation Value	adjustable to zero	•	•
Non-Linearity (% of FS max)	±0.05% (±0.02% typ)	•	•
Output Characteristics			
Rated Output — Voltage (min)	±10V	•	•
Current (min)	±5mA	•	•
Impedance at G = 100, dc to 100Hz	2Ω	•	•
Frequency Response			
Small Signal Bandwidth (-3dB)			
G = 1	200kHz	•	•
G = 10	175kHz	•	•
G = 100	125kHz	•	•
G = 1000	25kHz	•	•
Full Power Response (min)	50kHz (75kHz typ)	•	•
Slew Rate (all gain settings) (min)	2.5V/μsec (4.0V/μsec typ)	•	•
Offset Voltage			
Initial Offset Voltage (Note 1)	adjustable to zero	•	•
Input Offset at G = 1000 (RTI) (Note 2)			
vs Temperature, 0 to +70°C (max)	±10μV/°C (±5μV/°C typ)	±5μV/°C (±2μV/°C typ)	
vs Temperature, -55°C to +125°C (max)			±5μV/°C (±2μV/°C typ)
vs Supply (RTI)	±50μV/V	•	•
Input Offset at G = 1 (RTI) (Note 2)			
vs Temperature, 0 to +70°C (max)	±1.0mV/°C (±0.5mV/°C typ)	±0.5mV/°C (±0.25mV/°C typ)	
vs Temperature, -55°C to +125°C (max)			±0.5mV/°C (±0.25mV/°C typ)
vs Supply (RTI)	±400μV/V	•	•
Bias Current (either input)			
at +25°C (max)	±80nA (±40nA typ)	±40nA (±20nA typ)	••
vs Temperature, 0 to +70°C	±0.5nA/°C	±0.2nA/°C	
vs Temperature, -55°C to +125°C			±0.5nA/°C
Offset Current			
at +25°C (max)	±40nA (±10nA typ)	±20nA (±10nA typ)	••
Input Impedance			
Differential	$2 \times 10^9\Omega$	•	•
Common Mode	$2 \times 10^9\Omega$	•	•
Noise			
dc to 10Hz (p-p), G = 1000 (RTI)	5μV	•	•
10Hz to 200kHz (rms), G = 1 (RTI)	1mV	•	•
1Hz to 5kHz (rms), G = 1000 (RTI)	2μV	•	•

PIN CONFIGURATION

Top View



controlled load applications. A separate output reference terminal is also provided so that the output can be biased independently of the gain setting.

Both the AD520J and AD520K are supplied in a 14-lead hermetically-sealed dual-in-line package, and are specified for operation from 0 to +70°C. The AD520S, in the same package, is specified for -55°C to +125°C operation.

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SPECIFICATIONS (continued)

Parameter	AD520J	AD520K	AD520S
Input Voltage Range			*
Differential, max safe	$\pm V_S$	*	*
Differential, max linear	±10V	*	*
Common Mode, max safe	$\pm V_S$	*	*
Common Mode, max linear	±10V	*	*
Common Mode Rejection Ratio			
dc to 100Hz, R_S imbalance = 1kΩ			
G = 1 (min)	65dB (80dB typ)	70dB (80dB typ)	**
G = 10 (min)	75dB (90dB typ)	86dB (100dB typ)	**
G = 100 (min)	90dB (100dB typ)	100dB (110dB typ)	**
G = 1000 (min)	95dB (106dB typ)	106dB (110dB typ)	**
G = 1000, f = 1.0kHz	86dB	*	*
Power Supply Requirements			
Rated Supply Voltage (Note 3)	±15VDC	*	*
Voltage, Operating	±(5 to 18)VDC	*	*
Current, Quiescent (max)	±6.0mA (±4.0mA typ)	*	*
Reference Terminal Characteristics			
R_{in}	$5 \times 10^7 \Omega$	*	*
Output Offset Range	±10V	*	*
Gain to Output	±1	*	*
Bias Current	500nA	*	*
Temperature Range			
Rated Performance	0 to +70°C	*	-55°C to +125°C
Operating	-25°C to +85°C	*	-55°C to +125°C
Storage	-65°C to +150°C	*	*
Price			
1-24	$18.00	$24.00	$33.00
25-99	$14.40	$19.20	$26.50
100-999	$12.00	$16.00	$22.00

NOTES:

1. Trim terminal must be connected.
2. Maximum drift specifications are guaranteed using a 50ppm T.C. trim potentiometer for offset nulling at each gain setting per the recommended nulling procedure.
3. Supply voltage must always be present before applying an input signal.

*Specifications same as AD520J.

**Specifications same as AD520K.