Model 233
LOW COST
CHOPPER STABILIZED
AMPLIFER

DESCRIPTION
Model 233 is a low cost. low offset, chopper stabilized on. Use of integrated circuits and advanced technology have made it possible to effect a major price reduction for chopper stabilization. Size is reduced to 1.5" X 1.5" X 0.4".

USER ADVANTAGES
With its record low cost, the Model 233 now makes feasible incorporation of chopper stabilization in applications where cost was previously prohibitive. Users of other chopper stabilized amplifiers can effect both a profit increase, and a price reduction in their marketplace, by using the low-cost Model 233. Other advantages of the Model 233 over non-chopper stabilized systems include elimination of offset voltage adjustments in many applications and the superb long term stability of the chopper stabilized circuit. Even manufacturers who have made their own op amps "in-house" will find that the Model 233 allows them to free up their engineering and manufacturing talent for work more directly associated with their end item products.

LONG TERM STABILITY
One of the prime advantages of the chopper-stabilized system over other low drift amplifiers is long term stability. While non-chopper stabilized systems can achieve 0.25µV/°C offset voltage, the offset drift with time of a chopper stabilized system will be less. The Model 233's long term drift is 2µV/month. It is important to remember that long term drifts do not accumulate linearly. Experience has shown that the increase in long term drift will be approximately the square root of the time factor increase multiplied by the basic drift coefficient. For example, with a long term drift of 2µV/month, the yearly drift would be only 7µV.

OFFSET ADJUSTMENTS
The initial offset voltage of the Model 233J is 50µV, and only 20µV for the Models 233K and 233L. In many applications the use of the Model 233, as compared to non-stabilized amplifiers, will be justified simply by the elimination of the offset potentiometer and the cost of making this adjustment on the production line. Some users now providing front panel zero adjustments on their equipment will be able to eliminate this control, its associated costs, and sell a superior product.

LOW NOISE
Of prime importance in a low drift amplifier are low current and voltage noise. Good noise performance is mandatory if one is to be able to resolve the small signals that low drift amplifiers of this variety are normally called upon to amplify. In the Model 233, voltage noise has been reduced to lµV p-p (0.01-lHz), and current noise is 3pA p-p in the same bandwidth. For 0.1-l0Hz, the corresponding figures are 3µV p-p and 6pA p-p. These low values of noise make it possible to accurately amplify small signals and improve the design's overall signal to noise ratio. In particular, the low level of current noise makes it possible to use the Model 233 with moderately high (e.g. 500kΩ) input resistance without significantly degrading the overall noise performance.

INVERTING VS. NON-INVERTING AMPLIFICATION
Model 233 is designed for inverting operation, although it can be used as a non-inverting amplifier when combined with a floating power supply. For most low frequency non-inverting applications Model 260 non-inverting chopper amplifier is an excellent choice.

FEATURES
Low Drift, to 0.1µV/°C max
to 0.5pA/°C max
Low Offset, to 20µV max
Low Noise, 1µV p-P
0.01 -1 Hz

APPLICATIONS
Precision Amplification
Current & Voltage Summation
Integration
Reference Buffering
Controlled Current Source
Bridge Amplifier

Intronics
1400 Providence Highway, Building #2
Norwood, MA 02062
Phone (781) 551-5500
FAX (781) 551-5555
www.intronicspower.com