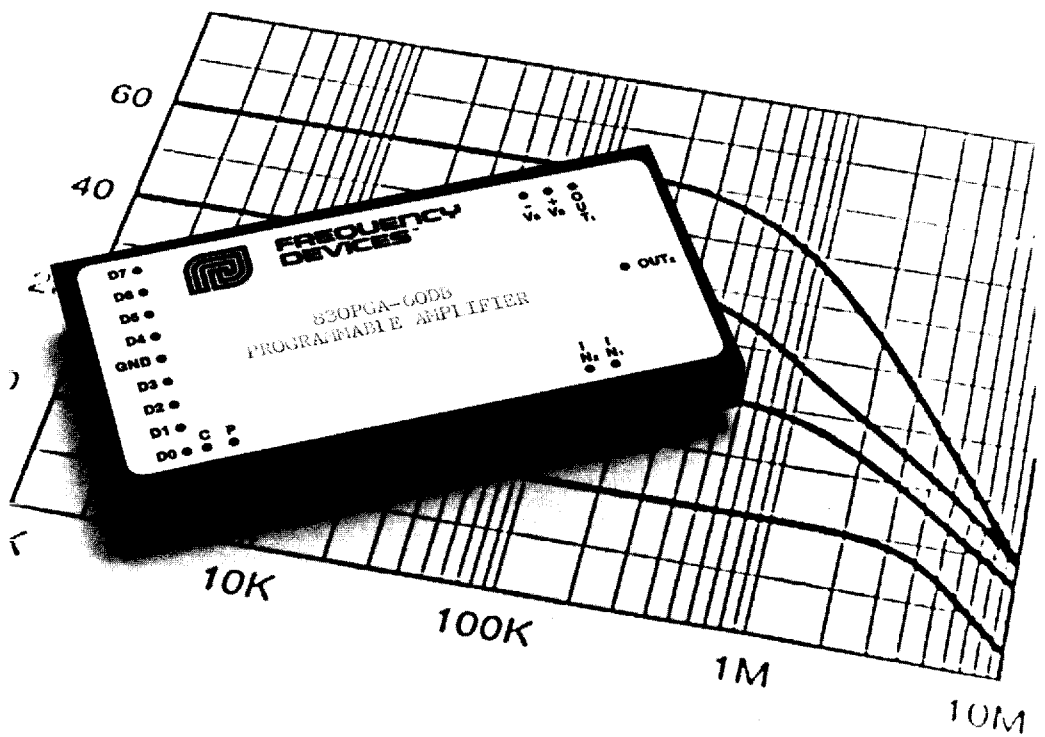
DS-00830-00

FREQUENCY DEVICES™

830PGA Series

Programmable Gain Amplifiers



FREQUENCY DEVICES™

830PGA Series Programmable Gain Amplifier

FEATURES

- **Adjustable Gain Selection up to 60 dB (1000X) in 0.5, 1.0, or 2.0 dB steps**
- **Digital Gain Selection (8 bit word) via Industry - Standard CMOS Interface Logic**
- **Differential Input**
- **Internally Latched Control Lines**
- **>100 kHz Full Power Bandwidth**
- **Plug-In Ready-to-Use**

APPLICATIONS

- **Data Acquisition**
- **Test Equipment**
- **Remote Instrumentation Systems**
- **Ground Loop Elimination in Remote measurements**
- **System Dynamic Range and Resolution Improvements**
- **Telemetry**
- **Process Control**
- **Medical, Scientific & Engineering Research**
- **Digitally controlled autoranging system**

General Description

The 830PGA Series programmable amplifiers are digitally controlled gain modules that were designed for conditioning DC-Coupled Wideband Signals in automated systems.

The 830 PGA Series of amplifiers are programmable from:

0 dB to 60 dB in 2 dB steps
or 0 dB to 40 dB in 1 dB steps
or 0 dB to 20 dB in 0.5 dB steps

and feature a fill power bandwidth in excess of 100 kHz.

The gain selection is accomplished with an 8-bit word which can be internally latched for easy microprocessor interfacing, or be simply controlled manually from an 8-bit DIP switch.

Other performance features includes differential input, tight gain and phase matching, and low noise and distortion, making this plug-in ready - to - use amplifier ideal for many signal conditioning applications.

These units contain 8-bit CMOS clocked "D" latches which can be digitally configured to operate in any of three modes:

a) Transfer frequency control input data into the latches on the STROBE (or CLOCK) rising edge.
b) As above, but on the STROBE falling edge.
c) Continuously follow the frequency tuning input data, in a non-latching transparent mode.

Analog Input Characteristics

Configuration	DC Coupled Differential Input AC Coupled Available
Impedance	1 Meg Ω ll 47 pF
Bias Current	1 µA Max.
Offset Current	10 nA Max.
Voltage Range	± 10 VPEAK
Maximum Safe Voltage	± 120 VPEAK
Common Mode Rejection Ratio	Typ. 80 dB at 1 kHz Min. 60 dB from 10 Hz to 100 kHz
Noise (Referred to input)	90 µVRMS (@ 4 MHz Bandwidth) 20 µVRMS (@ 100 kHz Bandwidth) typ 110 dB down from 7 VRMS

Analog Output Characteristics

Configuration	Single Ended DC Coupled
Impedance	<1 Ω
Current	± 10 mA Max. (for linear operation)
Initial Offset @ G = 0 dB (@ 25 °C)	< 2 mV Typ. 10 mV Max.
Initial Offset @ G = 60 dB (@ 25 °C)	± 30 mV Typ. ± 80 mV Max.
Offset vs. Temp. @ G = 0 dB (RTI)	50 µV/°C Typ. 100 µV/°C Max.
Offset vs. Temp. @ G = 60 dB (RTI)	20 µV/°C Typ. 40 µV/°C Max.

General Analog Characteristics

Gain	0 to 60 dB in 2 dB Steps
Gain Tolerance	± 0.02 dB
Gain Match (Channel to Channel @ 0 dB)	0.04 dB from 1 Hz to 100 kHz
Gain vs. Temp. @ G = 0 dB	0.001 dB/°C (0.01 %/°C)
Gain vs. Temp. @ G = 60 dB	0.005 dB/°C (0.05 %/°C)
Phase Match (Channel to Channel @ 0 dB)	0.5° from 1 Hz to 100 kHz
Distortion	0.003% @ 1 kHz 0.02% @ 90 kHz
Full Power Bandwidth	100 kHz

Power Requirements

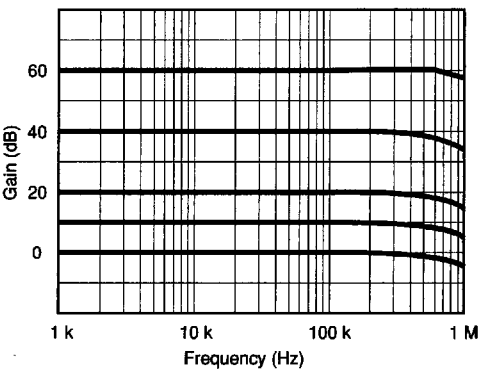
Rated Voltage	± 15 Vdc
Operating Range	± 12 Vdc to ± 18 Vdc
Max. Safe Voltage	± 18 Vdc
Quiescent Current	± 38 mA
	± 4 mA (7 VRMS In, Output open)

Environmental

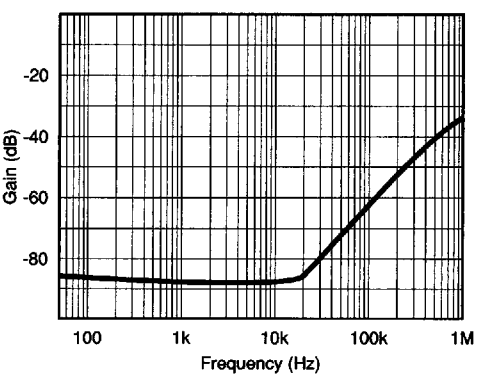
Operating Temperature	-25 °C to +85 °C
Storage Temperature	-40 °C to +85 °C
Altitude	10,000 Feet
Relative Humidity	0 % to 95 % @ 60 °C (non-condensing)

830PGA Series Typical Performance Curves

Frequency Response

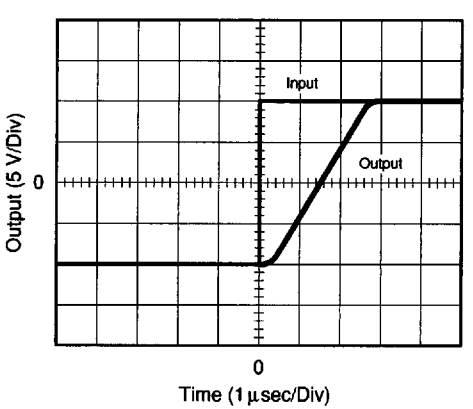


Common Mode Rejection Ratio



Step Response

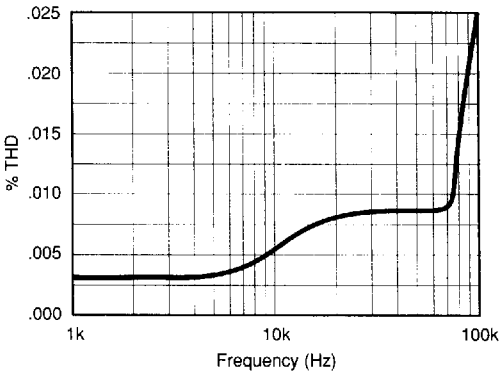
(Slew Rate V/T = 10 to 20 V/µs)



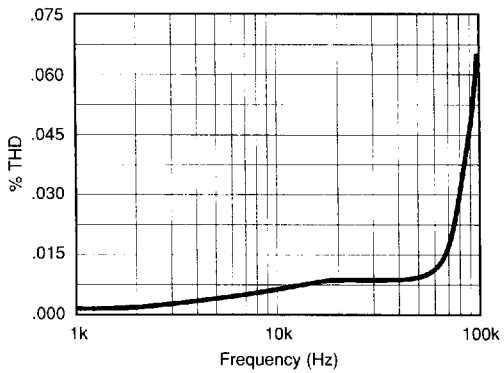
(Slew Rate Increases with Programmed Gain)

830PGA Series Typical Performance Curves

Total Harmonic Distortion
V_{OUT} = 3.5 V RMS (Gain = 0 dB)



Total Harmonic Distortion
V_{OUT} = 6.5 V RMS (Gain = 0 dB)



DATA LATCH CHARACTERISTICS

Data Control Lines

Functions	Latch Strobe (C) Transition Polarity (P)	

Data Control Modes

Mode 1 (Latch)	P = 0; C = 0 → 1	gain latched on rising edge
Mode 2 (Latch)	P = 1; C = 1 → 0	gain latched on falling edge
Mode 3 (Transparent)	P = 0; C = 0 or P = 1; C = 1	gain follows input

INPUT DATA LEVELS (CMOS LOGIC)

Input Voltage (Vs = 15V)	**Min.**	**Max.**
Low Level In	0 V	4 V
High Level In	11 V	15 V
Input Current		
High Level In	-10^{-5} µA Typ.	− 1 µA
Low Level In	$+10^{-5}$ µA Typ.	+ 1 µA
Input Capacitance	5 pF	7.5 pF
Latch Response		
Data Set Up Time[1]	25 ns	–
Data Hold Time[2]	50 ns	–
Strobe Pulse Width	80 ns	

PROGRAMMING WEIGHTS (Gain dB)

	LSB							MSB	
Model	D0	D1	D2	D3	D4	D5	D6	D7	Steps
830 PGA - 60	2	4	6	8	10	10	20	20	2 dB
830 PGA - 40	1	2	3	4	5	5	10	20	1 dB
830 PGA - 20	0.5	1.0	1.5	2.0	2.5	2.5	5.0	5.0	0.5 dB

Notes

1. The time data must be present before occurrence of the strobe edge.

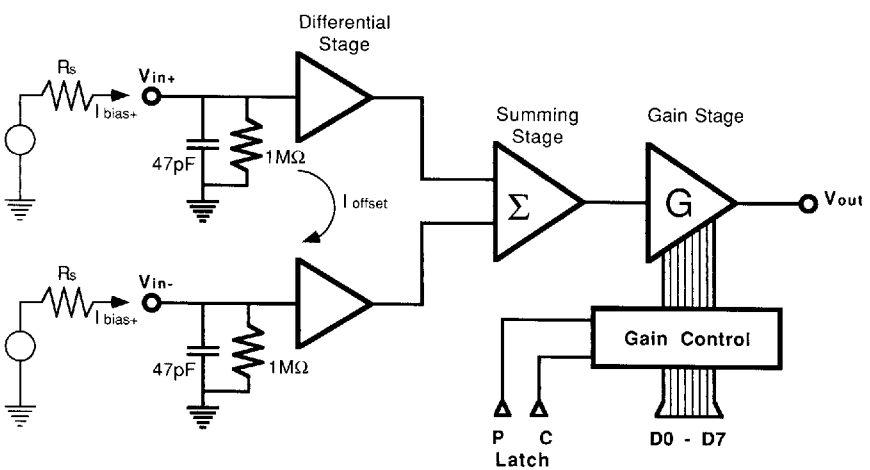
2. The time data must be present after occurrence of the strobe edge.

INPUT DATA FORMAT

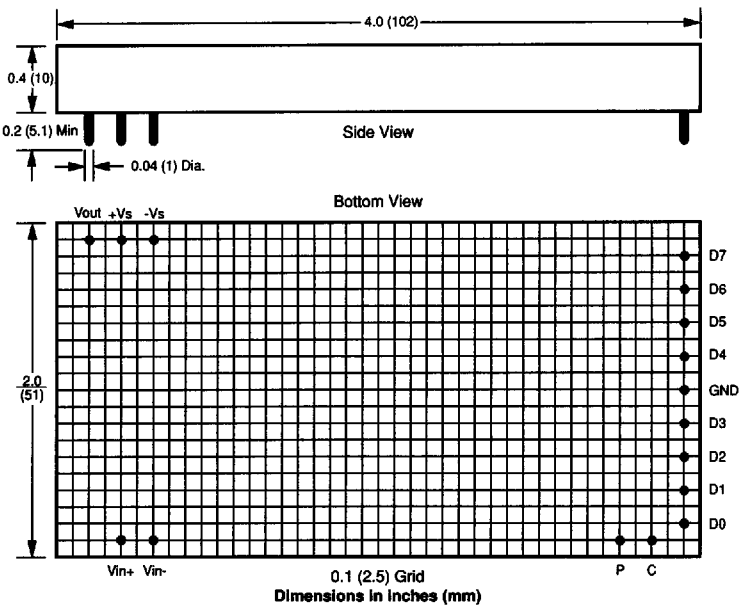
Gain Select Bits

Positive Logic	Logic "1" = +Vs Logic "0" = Gnd	Logic threshold typ. = 0.45 Vs
Bit Weighting (Binary-Coded)	D0 = LSB D7 = MSB	Least Significant Bit Most Significant Bit
Gain Range	1000:1	Programmed Weighted

Functional Schematic



830PGA Series Package Data and Pin Designation



Pin Designation

Vin+	Input Signal Positive	D_0	Gain Bit 0 (LSB)
Vin-	Input Signal Negative	D_1	Gain Bit 1
Vout	Output Signal	D_2	Gain Bit 2
"P"	Transition Polarity Bit	D_3	Gain Bit 3
"C"	Gain Strobe Bit	D_4	Gain Bit 4
+ Vs	Supply Voltage, Positive	D_5	Gain Bit 5
– Vs	Supply Voltage, Negative	D_6	Gain Bit 6
Gnd	Power and Signal Return	D_7	Gain Bit 7 (MSB)

Grounding

To achieve specified precision, all analog and digital grounds are connected internal to the filter. Should this cause a problem, all digital inputs (C, P, and D0 - D7) can be optically isolated.

Standard Models

Model Number	Max. Gain (dB)	Gain Step (dB)
830PGA-60	60	2.0
830PGA-40	40	1.0
830PGA-20	20	0.5

Input and Output Options

Suffix Added to Model Number	Description
/AC	AC Coupled Input and Output
/SN	Single Ended Input
/DF	Differential Output

Custom Features

For custom models, please contact our sale office.