

27658A OCTAL FIXED FREQUENCY 8-POLE FILTER/AMPLIFIERS

For the 28000 Signal Conditioning System



PRECISION 27658A FEATURES

- 8 channels per plug-in card
- 128 channels per 28016-M3 mainframe
- Switch selectable or programmable gain: x1, x2, x4, x8
- Selectable filtered or wide band operation
- Input protection: ± 40 Vpk
- 8-pole low-pass filters

27658A DESCRIPTION

The 27658A is an octal fixed frequency filter/amplifier card. Up to 128 fixed frequency filter/amplifiers can be housed in a 28016-M3 chassis.

The 27658A is suitable for accurate conditioning of DC signals. Ideal as a low-cost front-end for a data acquisition system, the 27658A provides a low-offset, low-drift DC amplifier followed by an 8-pole fixed frequency low-pass filter. The 27658A offers Elliptic, Butterworth, Bessel and Time-Delay low-pass filters with cutoffs available from 1 Hz to 200 kHz.

Options for the 27658A include selectable AC/DC input coupling and selectable IEPE current source for powering remote piezo-electric accelerometers. The 27658A comes standard with DIP switch selectable input gain of x1, x2, x4 and x8. Programmable input gain is optional.

Up to sixteen 27658A cards can be installed in the 28016-M3 chassis and up to eight cards can be installed in the 28008B-M3 chassis.

INPUT CHARACTERISTICS

Type: Balanced differential, DC coupled
 Z: 3.16 M Ω differential
 CMRR: 78 dB, DC to 400 Hz
 Drift: 5 μ V/ $^{\circ}$ C RTI
 Level: ± 10 Vpk, ± 40 Vpk without damage, Power on or off
 Level vs. Freq.: ± 10 Vpk for $f < 200$ kHz
 ± 10 Vpk x (200 kHz/f) for $f \geq 200$ kHz

Option 6: Selectable AC/DC input coupling and Selectable balanced differential or single-ended input
 Z: 0.1 μ F & 1.58 M Ω per side (1 Hz)

Option 9: Selectable IEPE current source (Requires Option 6)
 Current: 4 mA, typical
 Compliance: 24 V

27658A TRANSFER CHARACTERISTICS

Gain: x1, x2, x4, x8, selected with DIP switch

Option R: Programmable gain: x1, x2, x4, x8. Requires 28000 system chassis or 27000D-?-M0 chassis.

Spectral Noise: -153 dBV/ $\sqrt{\text{Hz}}$ RTI at 1 kHz with $F_c = 10$ kHz ($G=8$)

DC Accuracy: $\pm 0.1\%$

Filter Type: BE8, BU8, EL8, TD8B

Bandwidth: User specified cutoff frequency: 1 Hz to 200 kHz

Amplitude Accuracy: Filter characteristic ± 0.1 dB, DC to 0.8 F_c , for $F_c \geq 25$ kHz
 Filter characteristic ± 0.1 dB, DC to F_c , for $F_c < 25$ kHz

Amplitude Match: 0.1 dB DC to 0.8 F_c , $F_c \geq 25$ kHz
 0.1 dB DC to F_c , $F_c < 25$ kHz

Phase Match: 1° max, DC to 0.8 F_c , $F_c \geq 25$ kHz
 1° max, DC to F_c , $F_c < 25$ kHz (DC to F_c)

27658A OUTPUT CHARACTERISTICS

Type: Fully buffered, DC coupled, single ended, selectable for wide band or filtered operation

Z: 10 Ω , typical, filtered output
 < 10 Ω , typical, wideband output

Max Output: ± 10 Vpk, ± 10 mA pk with short circuit protection

Max Frequency: ± 10 Vpk for $f < 200$ kHz
 ± 10 Vpk x (200 kHz/f) for $f \geq 200$ kHz

Offset: 2 mV typical, 20 mV max (trimmable to 0 for filtered operation)

Wide Band Freq.

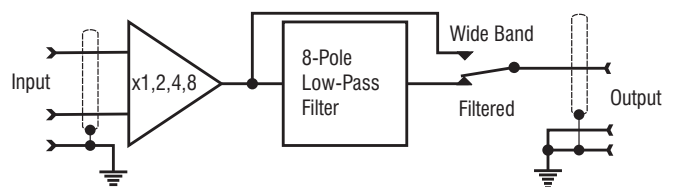
Response (-3 dB): 600 kHz typical at max gain

DC Offset Stability: 120 μ V/ $^{\circ}$ C

DC Gain Stability: 10 ppm/ $^{\circ}$ C typical

THD + Noise: No more than 0.01% re input w/ $F_c=1$ kHz and a 1 Vrms input at 100 Hz

Broad Band Noise: 200 μ Vrms into 20 MHz for LP Filters



27658A Channel Block Diagram

27658A FILTER CHARACTERISTICS

EL8: 8 Pole, 8 Zero Elliptic Low Pass Filter. The EL8 has 0.1 dB pass-band ripple, 0.1 dB of attenuation at the cutoff frequency, 90 dB attenuation at 1.77 F_c and 90 dB minimum stop-band attenuation. The EL8 has 19.8% overshoot in response to a step input. Phase distortion at F_c is 84.9°.

TD8B: 8 Pole, 8 Zero Constant Time Delay (Linear Phase) Low Pass Filter. The TD8B gives greatly improved pass-band flatness and roll-off when compared to an 8 Pole Bessel while maintaining linear phase over the entire pass-band of the filter. The TD8B has 5% overshoot in response to a step input. Phase distortion is less than 0.23° at F_c. The TD8B amplitude response is 0.1 dB at 0.569 F_c, 3.01 dB at F_c and 80 dB at 3.335 F_c.

BU8: 8 Pole Butterworth Low Pass Characteristic. The Butterworth is flat but monotonically increasing in attenuation. The filter is 0.1 dB at 0.79 F_c, 3.01 dB at F_c and 80 dB at 3.16 F_c. The BU8 overshoots 16.7% in response to a step input and has 66.2° of phase distortion at F_c.

BE8: 8 Pole Bessel Low Pass Characteristic. The Bessel provides a broadly rounded pass-band in exchange for a low overshoot and fast settling step response. Overshoot in response to a step input is 0.34%. The filter has less than 0.1° of phase distortion at F_c. The BE8 is -0.1 dB at 0.19 F_c, 3.01 dB at F_c and 80 dB at 6.07 F_c.

ORDERING INFORMATION

27658A Octal Filter/Amplifier Card

27658A-???-XXX-? Octal DC filter amplifier with user specified cutoff frequency
 ? Options: 6, 9* or R
 XXX = Low-pass filter type: BE8, BU8, EL8 or TD8B
 ??? = Fixed cutoff frequency 1 Hz to 200 kHz

*: Option 9 must be accompanied by Option 6.

Blank Front Panel

28000-BP-1-27K One blank front panel is required for each 27000 card installed in a 28000 frame.

27658A GENERAL CHARACTERISTICS

Card Size: 5.68 x 13.15 x 0.75 inches
 Card Weight: 1.3 lb. net, 3 lb. shipping
 Temperature: 0°C to 40°C (operating)
 -20°C to 70°C (storage)

8-Pole Filter Selection Guide				
	EL8	TD8B	BU8	BE8
Filter Type	LP	LP	LP	LP
Function	Cauer	Bessel w/Z	Butterworth	Bessel
Number of Poles, Zeroes	8p, 8z	8p, 8z	8p	8p
DC Gain (dB)	-0.1	0	0	0
Pass-band Ripple (dB p-p)	0.1	0.2	n/a	n/a
-0.1 dB Frequency	F _c	0.569 F _c	0.791 F _c	0.185 F _c
-3.01 dB Frequency	1.099 F _c	F _c	F _c	F _c
-20 dB Frequency	1.266 F _c	1.694 F _c	1.333 F _c	2.347 F _c
-40 dB Frequency	1.441 F _c	2.340 F _c	1.778 F _c	3.337 F _c
-60 dB Frequency	1.618 F _c	2.951 F _c	2.371 F _c	4.522 F _c
-80 dB Frequency	1.750 F _c	3.332 F _c	3.162 F _c	6.069 F _c
Stop-band Frequency	1.788 F _c	3.332 F _c	n/a	n/a
Stop-band Attn. (dB)	90.75	80.28	n/a	n/a
Phase at F _c (°)	-359.20	-301.88	-360.00	-182.16
Phase Distortion at F _c (°)	84.9	0.23	66.2	0.00
Overshoot (%)	19.8	5.56	16.7	0.34
1% Settling Time (sec)	5.15/F _c	1.54/F _c	3.45/F _c	0.79/F _c
0.1% Settling Time (sec)	7.97/F _c	2.23/F _c	5.08/F _c	1.14/F _c

