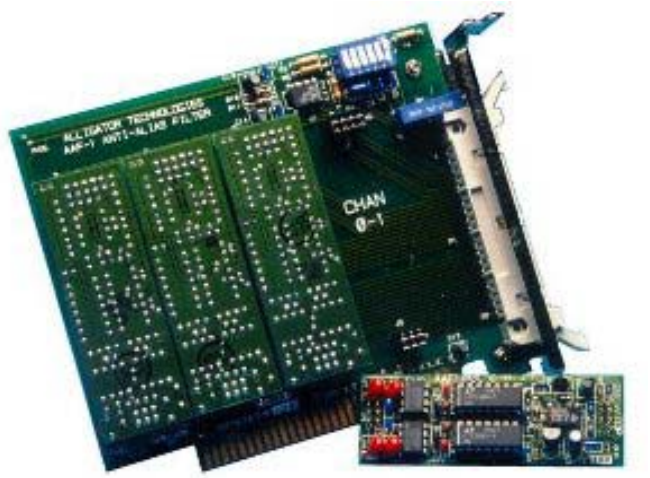
AAF-1

2 to 8 Channel Low-Pass Filter Card Series For PC/AT and Stand-Alone Data Acquisition Systems

Features

- 2, 4, 6, or 8 differential-input low-pass filter channels per card
- Variable cutoff frequency ranges between 0.1 Hz and 200kHz
- Choice of 8-pole Cauer, Bessel, Butterworth, high-speed Cauer, and linear phase delay filters
- ±500 Volt protected inputs
- ±200V common-mode input
- CMMR 86dB typ.



The AAF-1 is a multi-channel low-pass filter board designed for use in front of 12-bit A/D converters. It protects and filters 2, 4, 6, or 8 differential analog channels. Each 2-channel pair is available with any one of 8-pole Cauer, Bessel, Butterworth, high-speed Cauer, or high-speed linear phase filters. The Cauer filter provides rapid attenuation of unwanted high frequencies (120 dB/octave), while only minimally affecting frequencies in the passband (less than 0.15 dB ripple).

The cutoff frequency of the AAF-1 is set by an on-board potentiometer, which sets the same cutoff frequency for all filters on the board. Optionally, the cutoff frequency can be controlled with an external clock source for tracking filter applications, very low cutoff frequencies, or other special purposes.

Applications

The AAF-1 is ideally suited for removing unwanted higher frequency signals that can erroneously appear as lower frequencies below half the A/D sampling rate. This phenomenon, known as aliasing, cannot be removed with post-acquisition processing such as digital filters. The AAF-1 also is ideal for eliminating noise and interference introduced before the electrical signals from the sensors are digitized by the A/D board.

Filter Type	Strength/Weakness	Application
Cauer	Good passband flatness and low noise with sharpest cutoff ——— Non-uniform group delay	For frequency-domain applications requiring a sharp cutoff; also useful in the time domain
Bessel	Uniform group delay; lowest wideband noise ——— Drooping amplitude response in the frequency domain; gentler cutoff frequency	For time-domain applications requiring minimum distortion of rapid slope changes
Butterworth	Best passband flatness and very low noise ——— Non-uniform group delay (but more uniform than Cauer filters) and gentler cutoff slope	For frequency-domain applications requiring minimum noise or maximum passband flatness
High-Speed Cauer	Similar to Cauer with lower noise as well as higher cutoff frequency and higher stopband rejection ——— Non-uniform group delay (more uniform than Cauer	Similar applications to Cauer, but with a need for a cutoff higher than 50 kHz or a higher stopband rejection
High-Speed Linear Phase	Highest maximum cutoff frequency; sharper cutoff than Bessel ——— Reduced I/O voltage limits ±3V typ, ±4.5V max for high-speed linear phase	For highest-speed applications, especially in the time domain

Filter Characteristics

	Cutoff Frequency	Passband Gain (to 85% of fc)	Stopband Rejection	Attenuation Slope	Total Wideband Noise	Phase Match
Bessel	0.1 Hz - 33 kHz standard* (150:1)					
	0.1 Hz - 67 kHz modified (75:1)	**	84dB Typ.	45dB/octave Typ.	60μVRMS Typ.	1.2° Typ.
Butterworth	0.1 Hz - 50 kHz standard (100:1)	0dB + 0.15				
	0.1 Hz - 100 kHz modified (50:1)	- 0.5dB	90dB Typ.	48dB/octave Typ.	80μVRMS Typ.	1.2° Typ.
Cauer	0.1Hz - 50 kHz (100:1)	0dB ± 0.4dB	75dB Typ.	120dB/octave Typ.	165μVRMS Typ.	2.5° Typ.
High-Speed	0.1 Hz - 50 kHz standard (100:1)	0dB - 0.5				
Cauer	0.1 Hz - 100 kHz modified (50:1)	+ 0.1 dB	90dB Typ.	90dB/octave Typ.	135μVRMS Typ.	1.0° Typ.
High-Speed	0.1 Hz - 100 kHz standard (50:1)					
Linear Phase	0.1 Hz - 200 kHz modified (25:1)	***	75dB Typ.	55dB/octave Typ.	175μVRMS Typ.	1.7° Typ.

NOTE; Please indicate cutoff frequency choice at the time the order is placed.

* To 47 kHz below 55°C with external clock.

** Bessel passband performance: Group delay approximately ½ of one cycle at fc, passband group delay variation <1%; amplitude 3 dB down at fc.

*** High-speed linear phase passband performance: Group delay approximately one cycle of fc; passband group delay variation < 2% max., 1% typ.

Connector Pin Assignments

All I/O connections from the AAF-1 are made via a keyed 40-pin dual-row male connector that extends out of the rear of the computer.

SCF CLOCK	1	2	DIGITAL GROUND
FREQ IN	3	4	DIGITAN GROUND
ANALOG GROUND	5	6	CHAN 0 OUT HI
CHAN 0 OUT LO	7	8	CHAN 1 OUT HI
CHAN 1 OUT LO	9	10	CHAN 2 OUT HI
CHAN 2 OUT LO	11	12	CHAN 3 OUT HI
CHAN 3 OUT LO	13	14	CHAN 4 OUT HI
CHAN 4 OUT LO	15	16	CHAN 5 OUT HI
CHAN 5 OUT LO	17	18	CHAN 6 OUT HI
CHAN 6 OUT LO	19	20	CHAN 7 OUT HI
CHAN 7 OUT LO	21	22	ANA LOG GROUND
ANALOG GROUND	23	24	CHAN 7 IN LO
CHAN 7 IN HI	25	26	CHAN 6 IN LO
CHAN 6 IN HI	27	28	CHAN 5 IN LO
CHAN 5 IN HI	29	30	CHAN 4 IN LO
CHAN 4 IN HI	31	32	CHAN 3 IN LO
CHAN 3 IN HI	33	34	CHAN 2 IN LO
CHAN 2 IN HI	35	36	CHAN 1 IN LO
CHAN 1 IN HI	37	38	CHAN 0 IN LO
CHAN 0 IN HI	39	40	ANALOG GROUND

Options

Stand-alone System. Up to 8 AAF-1 may be mounted in our AT-SYS400. This system provides power and a rugged chassis for the AAF-1.

Screw Terminal Card. The STA-AAF-1 provides screw terminals for connection of the customer wiring, a breadboard area, and a 40 pin I/O connector which is identical to the AAF-1 I/O.

Custom Cable Accessories. A variety of custom cable accessories, including twisted-pair ribbon cables and BNC connector boxes and cables, are available for connecting the AAF-1 to any A/D board.

Specification

Input Characteristics

Input impedance ..... 800 kΩ differential, 400 kΩ common-mode
Differential Input Voltage ..... ±5V
Common-Mode Voltage ..... ±200V
Common-Mode Rejection ..... 70 dB min, 80 dB typ
DC Offset ..... ±30mV typ
Input Protection ..... Metal oxide varistor to ground
(Common & Differential) ..... (±250V to 350V)

Output Characteristics

Load Resistance ..... 2 kΩ min
Output resistance 50Ω
Linear Voltage Range ..... ±5V

Environment & Installation

Power Requirements ..... ISA bus power
Nominal Voltage ..... Maximum Load
+12V ..... 30mA per filter channel
+5V 50mA
-5V 10mA
-12V ..... 35mA per filter channel
Operating temperature ..... 0°C to 70°C
Dimensions ..... 5" (W) x 3.9" (H) (195mm x 100mm)

For more information, contact Alligator Technologies or your local Alligator Distributor