SCS-816, SCS-817

Butterworth and Bessel 8-Channel Amplifier and Low-Pass Filter Modules for the SCS-800 Signal Conditioning System

Features

- 8 amplifiers/filters per module
- 8-pole Butterworth (SCS-816) or Bessel (SCS-817)
- All module parameters are software selectable
- Corner frequencies from 0.5 Hz to 70 kHz Butterworth
- Corner frequencies from 0.5 Hz to 40 kHz Bessel
- Independently adjustable cutoff frequency for each channel
- Amplifier gains of 1 to 1000 per channel
- AC/DC coupling
- Active input shield drive for each channel
- Proprietary DC transformer differential output drive
- Bi-polar (0 to 5volt) to Uni-polar ±2.5 volt offset
- A/D sample clock output for synchronization
- Four independent tracking filter input clocks
- Automatic DC offset compensation <2mV max.
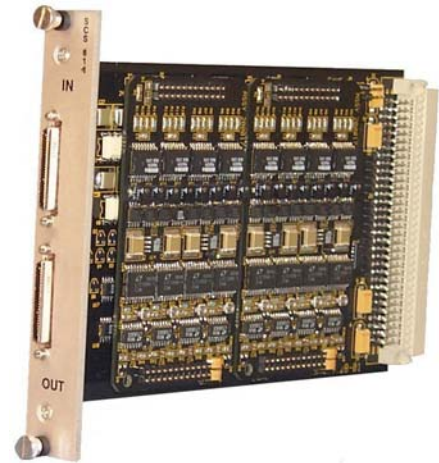- Graphical application software SystemView 800™ included

The SCS-816 and SCS-817 series of modules provide 8 programmable channels of low-pass filtering and high-quality instrumentation amplifiers for front-end signal conditioning of low level signals.

Each filter channel is tunable to any corner frequency, under software control, for the entire bandwidth of 0.5Hz to 70kHz for Butterworth and 0.5Hz to 40kHz for Bessel. Coupling may be either AC or DC, and is software selectable for the entire module. Alternatively, the corner frequency of each filter can be controlled for tracking applications with a selection of one of 4 external clocks.

High-quality instrumentation amplifiers on each channel provide software-selectable gain as well as differential inputs with 90 dB common mode rejection. Channels are independently programmable for gain settings of 1, 2, 5, 10, 20, 50, 100, 200, 500 or 1000.

Uni-polar to Bi-polar offset extends the range of the A/D converter by shifting 0 to 5 volt signals to be bi-polar ±2.5 volt output. This output can then be amplified to provide full-scale A/D input signals.

DC Offset. The module features automatic DC offset compensation provides a total DC offset (RTI) of 2 mV.

Support Software

The SCS-800 comes with the **SystemView 800™** graphical control menu-driven software. SystemView 800 software provides simple menu-selection using point and click options to configure any of the SCS-800 modules.

- **SystemView 800 for Windows 95/98/NT**
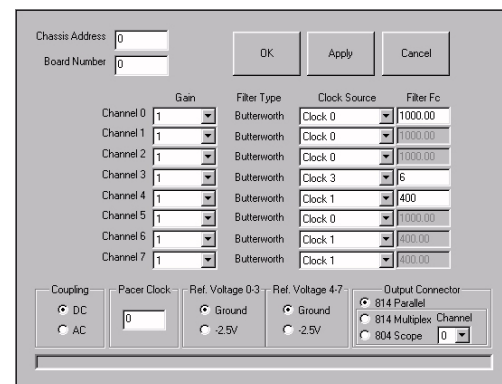
Point and click setup

SystemView 800 setup is as easy as pointing to the proper box and clicking on a selection. All module parameters are viewed simultaneously eliminating the hassle of bouncing back and forth from screen to screen.

Filter Specifications

	Cutoff Frequency	Passband Performance	Transition Slope	Total Wideband Noise
SCS-817 Bessel	0.5 Hz – 40 kHz	Group delay ±1% max to cutoff droop: @0.5f$_c$= 0.6dB@0.8f$_c$= 1.8dB typ	110 dB per decade	530μVRMS typ
SCS-816 Butterworth	0.5 Hz - 70 kHz	+0.05dB to -0.05dB max, to 0.85 cutoff	160 dB per decade	530μVRMS typ

Analog Input

DC offset .... Auto compensation, 2mV DC max
Amplifier gain accuracy .... ±0.08 dB max
Common-mode rejection ...... 75 dB in, 86 dB typ (gain = 1)
Common-mode voltage .... ±10 V max
Common-mode protection ... ±40 V max
Input voltage .... ±10 V max
Input protection .... ±50 V max
Input impedance .... 2 MΩ each side to analog ground
Input bias current .... ±2 pA type, ±100 pA max
Input offset current .... ±1 pA type, ±100 pA max
AC coupling cutoff 0.03Hz
Amplifier bandwidth .... Gain = 0.5 - 5, 1.2 MHz typ
                                            Gain = 10 - 100, 600 kHz typ
                                            Gain = 200 - 1000, 250 kHz typ
Amplifier slew rate .... (9/gain) V/μsec typ

Analog Output
Output voltage ....±10 V min
Load resistance.......... ....1KΩ min
Output impedance...... ....10 ± .05Ω

Miscellaneous
Power Watts (max.) ... .9.5 W
Power Watts (typ.) ....6.6 W
Operating temperature ....0°C to 55°C

Application
To pick the appropriate filter, it must be determined whether the data is to be analyzed in the time domain or the frequency domain. The Butterworth filter has a flat frequency response, which rolls off at 160dB/decade while the Bessel frequency response droops after 0.6f$_c$. The Butterworth step response exhibits approximately 15% overshoot while the Bessel step response exhibits less than 1% overshoot.

The Butterworth filter is more useful where the requirements are fast rolloff in the frequency domain. The Bessel filter is more useful where smooth step response is required. The Bessel filter provides constant group delay (linear phase) over the pass band out to approximately 2 times the corner frequency.

Step Response Comparison
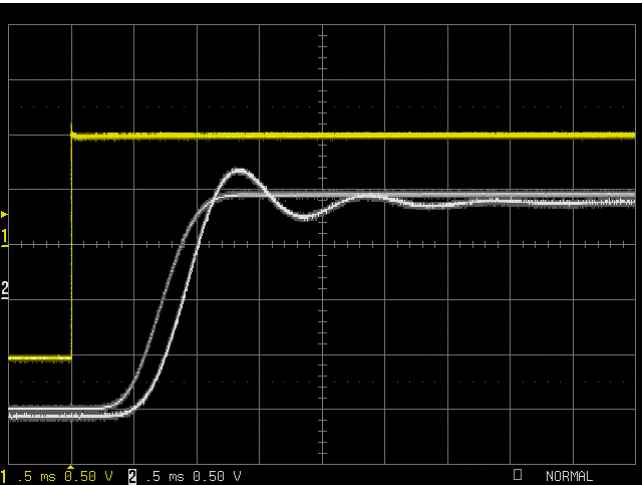
The smooth output waveform is from the SCS-817 Bessel filter, the step response with ringing is from the SCS-816 Butterworth filter.

System Configuration

Either the SCS-816 or SCS-817 may be installed in any SCS-800 slot. The combination of all slots gives a maximum of 64 channels of filtering and amplification. These modules may be mixed with other modules to provide a truly universal filter system.

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