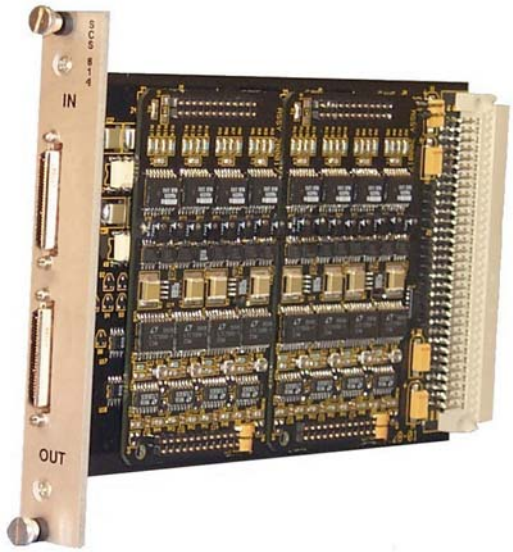
# SCS-814 / SCS-815
# Butterworth or Bessel 8-Channel Amplifier and Low-Pass Filter Module for the SCS-800 Signal Conditioning System

## Features

- Butterworth or Bessel 6-pole filter
- 8 amplifiers/filters per module
- Independent channel corner frequency selector
- Corner frequencies from 0.5Hz to 70kHz Butterworth
- Corner frequencies from 0.5Hz to 60kHz Bessel
- Independent gain control
- Programmable A/D clock output
- ±10V input and output
- Uni-polar to Bi-polar (0 to 5 V > ± 2.5V)
- Automatic DC offset compensation
- Offset guaranteed <2mV @ G = 1
- Differential output, drives up to 30 meter output cable
- Onboard channel and module multiplexers
- Input cable shield drive




## Introduction

The SCS-814 provides 8 programmable channels of Butterworth low-pass filtering and high-quality instrumentation amplifiers for front-end signal conditioning of low level signals, while the SCS-815 offers the same performance with a linear phase Bessel filter.

Each filter channel is tunable to any corner frequency, under software control, for the entire bandwidth of 0.5Hz to 70kHz for the Butterworth SCS-814 and 0.5Hz to 60kHz for the Bessel SCS-815. 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 and provides a total DC offset (RTI) of 2 mV.

## Input

The SCS-814/815 has eight separate differential inputs, which may be DC or AC coupled to the instrumentation amplifier. The amplifier has an input voltage range of ±10V and is protected to ±40V. A common mode shield drive amplifier protects input signals.

## Output

A proprietary DC transformer™ circuit provides true differential signal outputs. This circuit allows for use of single ended inputs on the A/D converter, which doubles the number of A/D channels while guaranteeing that common-mode noise will not effect the signal.

The SCS-800 provides two multiplexing methods for bringing outputs to a data acquisition host:

All output signals can be time-multiplexed onto one set of analog output lines via the SCS-814/815's front-panel output connector, or can be time-multiplexed with all other module outputs via output connector on the SCS-804 System Controller Module. This method provides channel multiplexing, or channel and module multiplexing.

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## Filter Specifications

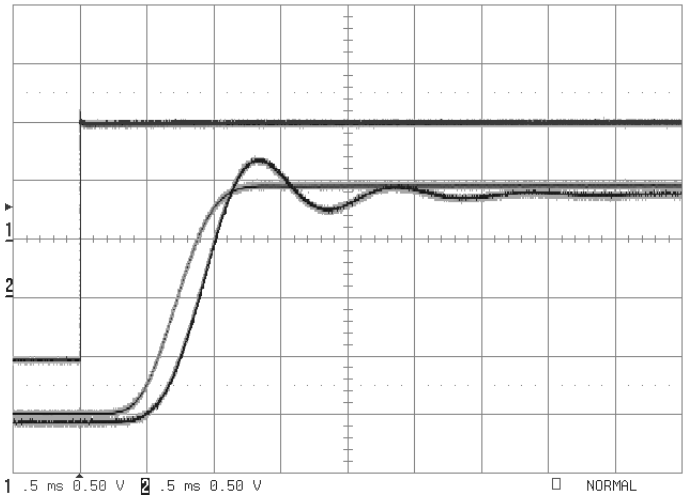
| | Cutoff Frequency | Passband Performance | Transition Slope | Total Wideband Noise |
|---|---|---|---|---|
| **6-Pole Butterworth** | 0.5 Hz - 70 kHz | +0.1dB, -0.1dB max | 120 dB per decade | 530μVRMS typ |
| **6-Pole Bessel** | 0.5 Hz - 60 kHz | +0.1dB, -0.1dB max, droop is per classical response and –0.2dB @ $0.3F_c$, –1dB @ $0.6F_c$, –2dB @ $0.83F_c$ | 90 dB per decade | 530μVRMS typ |

### Filter Type Selection

The selection of the filter module depends upon the type of data analysis that is to be performed.

The Butterworth filter has a flat frequency response in the pass band, and a relatively fast cutoff. It has significant delay distortion especially near the cutoff frequency. Its' time domain step response has significant overshoot.

The Bessel filter has linear phase response and nearly no overshoot in the step response. The filter rolloff in the frequency domain is very slow compared to the Butterworth filter, and has droop over the passband starting as low as $1/10^{th}$ of the cutoff frequency.




### Step Response

The Bessel response is the smooth trace with no overshoot, the Butterworth response is the trace with significant overshoot.

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

### Specifications

**Coupling**

AC cutoff…….. 0.03Hz typical

**Input**

Voltage range…….. ±10V
Common mode rejection… 80dB min, 92dB typ
Noise (RTI @G=1)…….. 30ηV per Hz
Coupling…… AC or DC
Impedance…… 2MΩ/20pF
Protection…….. ±40V
Bias current…….. ±2pA typ, ±100pA max

**Offset**

Voltage…….. ±0.1mV typ, ±1.0mV max
Current…….. ±1pA typ, ±100pA max

**Gain**

Steps…… 1,2,5,10,20,50,100,200, 500, 1000
Accuracy……. 0.5%

**Output**

Impedance…….. 10Ω
Voltage Range…….. ±10V

**General**

Temperature, operating… 0°C to 55°C
Temperature, storage…… -25°C to 85°C
Humidity…….. 0% to 95% non-condensing

**Multiplexer**

Minimum switching time… 100μS
Settling time (controller card specification)…….. 10μS to 0.1%

**Connector**

Input and output…….. Amp 787096-1
Latch…… Amp 787003-3

**Mating Connector**

Input and output…….. Amp 787131-1
Backshell…… Amp 787133-1

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