



# 16-bit Analogue Board

16 channel differential analogue inputs for  
Module Bus and VMEbus systems

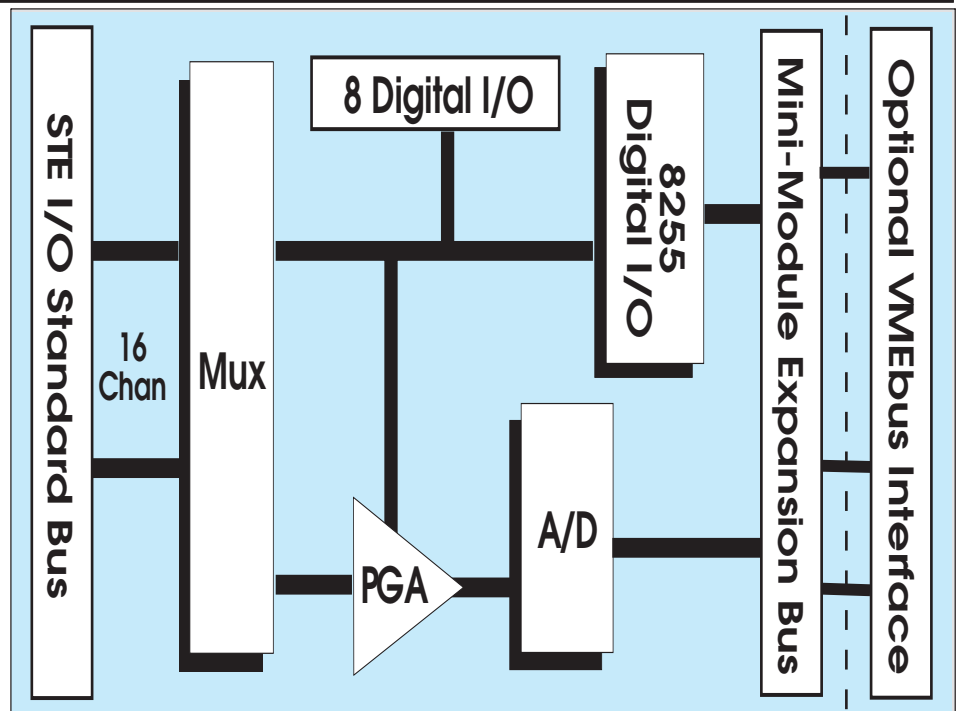
## Features

- 16-bit A/D converter
- 16 differential inputs
- Linearity error 0.0015% or 0.25 LSB typ
- On board self calibration
- 120dB 50/60Hz rejection
- 20 conversions per second
- Unipolar/Bipolar operation
- Software gains 1, 10, 100, 200 or 500
- Superior performance to voltage to frequency or integrating converters
- Temperature sensor 10mV/degC  
+/- 0.4 degC
- 5 Volt only operation
- Very Low power CMOS design
- Up to 8 boards per system
- 16-Byte address space
- Module Bus Slave**
  - Compatible with Module products
  - Software drivers and examples
  - Low cost target
  - Small size 100\*118mm
- VMEbus Slave Rev C.1**
  - 3U single height euro-card
  - 100\*160mm

## Description

This dual purpose board extends the I/O facilities of the CPU by adding 16 differential 16-bit analogue inputs. The board has been designed to give access to a wide variety of signals on both the Module and VMEbus systems.

Any channel can be multiplexed to an on



board instrumentation amplifier of programmable gain. The signal is then converted by a Delta Sigma type A/D which has a very small linearity error (typically 0.0015%). Maximum sampling rate is a respectable 20 times per second. The on board digital filter provides better than -120dB rejection at 50 and 60Hz and their harmonics providing extremely good mains noise rejection.

The card is suitable for any application requiring the measurement of low frequency signals representing physical, chemical and biological processes such as strain gauges, load cells and thermocouples.

The card is one from the range of 'Dual-bus' cards. It can be supplied in standard single euro-card VMEbus form or as a two thirds size on PRObus<sub>+</sub>. The PRObus<sub>+</sub> is effectively the PROcessor bus with minimum bus buffering. It is compatible with the Module Bus controllers and becomes very cost effective when targeting small systems.

The 16-bit Analogue board is fabricated with low power CMOS components and requires only a single 5 Volt supply. The A/D is the CS5505 Delta Sigma charge balance converter with an on board reference and digital filter. This offers true 16-bit per-

formance. The conversion technique is superior to voltage to frequency or integrating converters.

Software can select either bipolar or unipolar signals and the chip uses self-calibration to ensure excellent offset and gain accuracy. Operating from a 32.768kHz crystal the digital filter has zeros at 50 and 60Hz mains frequencies and multiples thereof giving better than 120dB rejection of mains bourn interference. Each channel requires 50ms to convert so a maximum sampling rate of 20Hz is achieved.

The supplies for the converter are derived from an on board DC-DC converter with twin regulators giving very low noise performance. This also supplies the programmable gain amplifier and multiplexers allowing a +/-10 Volt input range for gain 1. The programmable gain has 3 settings of 1, 10 and X where X can be set by hardware links from 1, 10, 100, 200 or 500.

With these gain ranges it is possible to take in many transducer signals directly. For example strain gauge 0-20mV / gain 500, load cells 0-100mV / gain 100, platinum resistance thermometers 0-100mV / gain 100 and thermocouples -270 to 1,232 degC / gain 200. Any type of thermocouple can be

directly connected to the boards inputs as the on board temperature sensor can be used as a compensating junction. All the analogue inputs use fault protected devices and can withstand up to +/-35 Volts at only 2uA peak.

Up to 8 boards can individually addressed by switch option.

## Specification

### Analogue to digital converter

16-bit resolution

+/-1 LSB linearity (gain=1)

50ms conversion time

### Inputs

16 differential

Noise 1uV

Common mode +/-10 Volts

Bias current 0.1nA (25 degC)

200nA (0-70 degC)

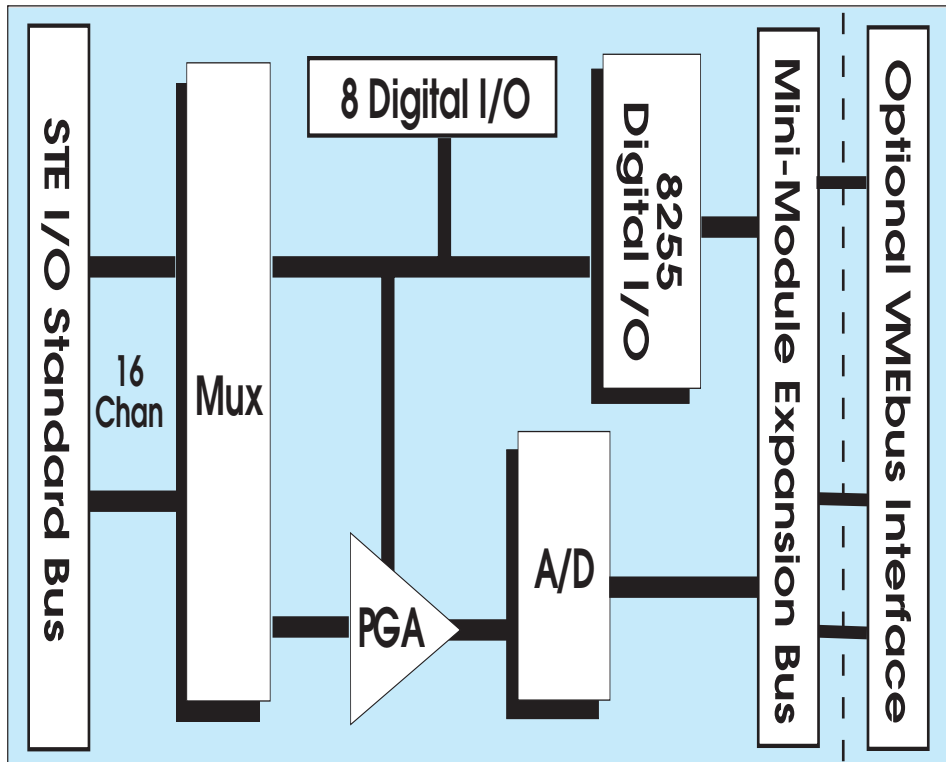
Absolute max. +/-35 Volts, 2uA

ESD protection 4,000 Volts

### Gain by software switching

1, 10, X where X can be linked for 100, 200 or 500

Gain	Linearity %	Accuracy %
1	0.001	0.002
10	0.002	0.01
100	0.004	0.02
200	0.006	0.04
500	0.010	0.10



### Temperature sensor

10mV / degC +/-0.4 degC

### Module Bus

A14:D16 16-byte peripheral bus space

Mini-Module Compatible

Size 100\*118mm

### VMEbus

A16:D16 16-byte short address space

\$29, \$2D modifiers

Interrupter IRQ(1-7)

Size 100\*160mm

### Connectors

50-way box IDC STE I/O

64 way Module Bus or 96 way VMEbus DIN

Power consumption at 5 Volts typ. 100mA

VMEbus boards add 100mA

### Temperature Range

0 to 70 degC

## Order Codes

### Module Bus Version

K-316 Module Bus 16 Bit Analogue

### VMEbus Version

D-316 VMEbus 16 Bit Analogue Board

### Miscellaneous

MK-316 Technical Manual

ADC16.970307



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