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VXI Technology™

8-channel Voltage Input SCPs



Overview

You can choose different Signal Conditioning Plug-ons (SCPs) for different groups of signals, based on the signal levels and characteristics. Each SCP is optimized for different input levels, and some of these SCPs have filtering to reduce sensor-based noise. Each SCP has eight input channels. Multiple SCPs can be combined on the Scanning A/D to provide the proper signal conditioning for a wide variety of inputs.

Each of these SCPs provides input over-voltage protection. Each SCP, except for the VT1513A, also provides open transducer detection on each channel.

Measurement applications of these SCPs include voltage, temperature, resistance, and strain measurements, as well as general measurements of voltage output sensors.

Refer to the VXI Technology Website for recent product updates, if applicable.

Model	Description
VT1501A	Direct Input
VT1502A	7 Hz Low-Pass Filter
VT1503A	Programmable Filter/Gain
VT1508A	8-channel x16 Gain & 7 Hz Low-Pass Filter
VT1509A	8-cahnnel x64 Gain & 7 Hz Low-Pass Filter
VT1512A	25 Hz Low-Pass Filter
VT1513A	Divide-by-16 Attenuator & 7 Hz Low-Pass Filter

Voltage Input SCP Selection Guide

VT1501A Direct Input (100 kHz BW)	Provides eight hardwired paths that directly connect the input signal to the FET MUX of the scanning A/D (the most basic SCP)
VT1502A Low-Pass Filter SCP	Provides eight fixed 2-pole, low pass filter channels with a 3 dB cutoff frequency of 7 Hz
VT1503A 8-channel Programmable Filter/Gain	Provides eight programmable, 2-pole, low-pass filters with cutoff SCP frequency settings of 2 Hz, 10 Hz, and 100 Hz, as well as a 1.5 kHz "pass-through" mode (filter OFF). Plus eight programmable input amplifiers provide input voltage ranges of ±0.25 V, ±2 V, and ±16 V
VT1508A 8-Ch. x16 Gain & 7 Hz Fixed Filter SCP	Provides eight fixed, 2-pole, low-pass filters with a 3 dB cutoff frequency of 7 Hz. **Plus** eight amplifiers with a fixed gain of 16

Features

Different Signal Gains to Match Different Input Signal Levels

Signal Filtering to Reduce Sensor-based Noise

SCPs Provide Over-voltage Protection

Use any of these SCPs with the VT1413C/VT1415A /VT1419A/ VT1422A Scanning A/Ds

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VT1509A 8-Ch. x 64 Gain & 7 Hz Fixed Filter SCP	Provides eight fixed, low-pass filters with a 3 dB cutoff frequency of 7 Hz. Plus eight amplifiers with a fixed gain of 64
VT1512A 8-ch. 25 Hz Fixed Filter SCP	Provides eight fixed, low-pass filters with a 3 dB cutoff frequency of 25 Hz (no gain)
VT1513A 8-Ch. ÷ 16 Attenuator & 7Hz Fixed Filter SCP	Provides eight fixed, low-pass filters with a 3 dB cutoff frequency of 7 Hz. Plus eight attenuators with a fixed attenuation of 16

Use the VT1501/02/03/08/09/12/13A SCPs with the following VXI modules:

Model	Description
VT1413C	64-channel Scanning A/D Converter
VT1415A	Algorithmic Closed Loop Controller
VT1419A	Multifunction Measurement and Control Module (only in SCP positions 5 - 8)
VT1422A	Remote Channel Multi-function DAC Module

Voltage Measurement

Each SCP is optimized for different input voltage levels, with some SCPs providing filtering to reduce sensor-based noise.

VT1501A	Measure wide bandwidth signals (no filtering, no gain) from sensors with full-scale voltage outputs from 62 mV to 16 V.
VT1502A	Measure signals from sensors with full-scale voltage outputs from 62 mV to 16 V. Fixed 2-pole, 7 Hz low-pass filter (no gain) per channel.
VT1503A	Measure signals from sensors with full-scale voltage outputs from 3.9 mV to 16 V. Programmable 2-pole, low-pass filters (3 dB BWs of 2Hz, 10hz, or 100 Hz) can be switched into each channel. Each channel can have a gain of x1, x8, or x64.
VT1508A	Measure signals from sensors with full-scale voltage outputs from 3.9 mV to 1 V. Fixed 2-pole 7 Hz low-pass filter and x16 gain per channel.
VT1509A	Measure signals from sensors with full-scale voltage outputs from 3.9 mV to 256 mV. Fixed 2-pole, 7 Hz low-pass filter and x64 gain per channel.
VT1512A	Measure signals from sensors with full-scale voltage outputs from 62 mV to 16 V. Fixed 2-pole, 25 Hz low-pass filter (no gain) per channel.
VT1513A	Measure voltages from ±1 V dc to ±60 V dc. Fixed ÷ 16 attenuator and fixed 2-pole, 7 Hz low-pass filter per channel.

Temperature Measurement

The VT1501/02/03/08/09/12A can be used to make temperature measurements with thermocouples, thermistors, or RTDs. Engineering units conversion to degrees C are made on-card at full speed. While the VT1501/02/12A can directly read thermocouples, the VT1503A/ VT1508A/VT1509A SCPs provide higher accuracy thermocouple measurements due to their on-board signal gain. (Note: The 256 mV maximum voltage input of the VT1509A is not high enough to measure the on-board thermistor reference temperature. A higher-voltage SCP must be used for this thermistor measurement.)

Temperature measurements with thermistors or RTDs require one VT1505A 8-channel Current Source SCP to be used with each voltage input SCP. The VT1513A is not recommended for temperature measurements with low-output-level transducers such as thermocouples, thermistors, and RTDs.

Resistance Measurement

Resistance is measured using the VT1505A Current Source SCP with the VT1501/02/03/08/09/12A SCPs. Measurements are made by applying a dc current to the unknown and measuring the voltage drop across the unknown resistance. The current source is provided through the VT1505A. The recommended 4-wire configuration is shown in the description of the VT1505A Current Source SCP. Two-wire measurements are possible but not recommended since two 150 Ω series resistors protecting the scanning A/D's input FET multiplexer are included in the measurements.

Strain Measurement

These SCPs can be used to make strain measurements when combined with either the VT1506A or E1507A Strain Completion SCPs. While the VT1501/02/12A SCPs can be used for strain gage measurements, the VT1503A, VT1508A, and VT1509A SCPs provide higher accuracy strain measurements due to their on-board signal gain.

Specifications

The specifications for the VT1501/02/03/08/09/12/13A reflect the combined performance of the scanning A/D and the VT1501/02/03/08/09/12/13A SCP.

Acquisition

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Measurement Ranges

dc Volts:

VT1501/02/12A:	±62.5 mV to ±16 V full-scale
VT1503A:	±3.9 mV to ±16 V full-scale
VT1508A:	±3.9 mV to ±1 V full-scale
VT1509A:	±3.9 mV to ±256 mV full-scale
VT1513A:	±1 V to ±60 V full-scale

Resistance:*

VT1501A:	512 Ω to 131 k Ω FS
VT1502/09/12A:	128 Ω to 131 k Ω FS
VT1503A:	8 Ω to 131 k Ω FS
VT1508A:	8 Ω to 32.7 k Ω FS

Temperature:

Thermocouples:	-200 °C to +1700 °C
Thermistors:*	-80 °C to +160 °C
RTDs:*	-200 °C to +850 °C

Strain:** 25,000 με or limit of linear range of strain gage

*Requires VXI Technology VT1505A.
** Requires VXI Technology VT1506A/VT1507A

Input Characteristics

Maximum input voltage (normal mode plus common mode):

Operating:	< ±16 V peak (VT1513A: ±60 V dc)
Damage level:	< ±42 V peak (VT1513A: ±60 V dc*)

Maximum common mode voltage

Operating:	< ±16 V peak (VT1513A: ±60 V dc)
Damage level:	> ±42 V peak (VT1513A: ±60 V dc*) (* 60 V dc is the max. voltage allowed by VXI Technology safety guidelines for the SCP connector pin spacing at max. operating temperature and humidity.)

Normal mode rejection:

VT1501A:	0 dB
VT1502/08A (10 Hz LPF) 10 Hz:	> -6 dB
VT1502/08A (10 Hz LPF) 50 Hz:	> -23 dB
VT1502/08A (10 Hz LPF) 60 Hz:	> -25 dB
VT1512A (25 Hz LPF) 25 Hz:	> -3 dB
VT1512A (25 Hz LPF) 60 Hz:	> -20 dB
VT1513A (7 Hz LPF) 7 Hz:	> -3 dB
VT1513A (7 Hz LPF) 50 Hz:	> -24 dB
VT1513A (7 Hz LPF) 60 Hz:	> -27 dB

Common mode rejection, 0 to 60 Hz:

VT1501A:	> -105 dB
VT1502/08/12A min.:	> -100 dB
VT1502/08/12A typ:	> -108 dB
VT1503A Gain x1:	> -100 dB
VT1503A Gain x8:	> -116 dB
VT1503A Gain x64:	> -132 dB
VT1509A:	> -100 dB
VT1513A:	> -60 dB

Input impedance: > 100 MΩ differential (VT1513A: 1 MΩ differential)

Input capacitance:
VT1501A: 80 pF typical

Measurement Accuracy dc Volts

Total dc Voltage Error =
$[(\text{Linearity error})^2 + (\text{Offset error})^2 + (\text{Noise})^2]^{1/2}$

- For the VT1501/02/03/08/09/12A, if auto-ranging is ON, add ±0.02% of Full-scale to accuracy specifications.
- For the VT1513A, if auto-ranging is ON, add ±0.05% of reading for input voltages > ±4 V dc.

E1501A (x1Gain)

A/D Range ±V FS	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
0.0625	0.01%	5.3 μV	18 μV	8 μV
0.25	0.01%	10.3 μV	45 μV	24 μV
1	0.01%	31 μV	110 μV	90 μV
4	0.01%	122 μV	450 μV	366 μV
16	0.01%	488 μV	1.8 mV	1.5 mV

*A/D filter ON (min sample period ≥145 μs: ≤100 Hz scan rate 64 ch)

Temperature Coefficients

	Temp Range	Tempco
Gain:		10 ppm/°C
Offset:	0-40 °C	0.14 μV/°C
	40-55 °C	0.38 μV/°C + 0.8 μV

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VT1502A/VT1512A (x1 Gain)

A/D Range ±V FS	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
0.0625	0.01%	7.2 µV	34 µV	15 µV
0.25	0.01%	12.2 µV	60 µV	28 µV
1	0.01%	33 µV	110 µV	92 µ V
4	0.01%	122 µV	450 µV	366 µV
16	0.01%	488 µV	1.8 mV	1.5 mV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)

Temperature Coefficients

	Temp Range	Tempco
Offset:	0 -30 °C	No added error
	30 -40 °C	0.1 µV/°C
	40 -55 °C	0.27 µV/°C + 2.4 µV

VT1503A (x1Gain)

A/D Range ±V FS	Linearity % of Reading	Offset Error 2 Hz	10 Hz	100 Hz	Filt Off	Noise 3σ	Noise* 3σ
0.0625	0.01%	13µV	9.5 µV	6.8 µV	6.3 µV	45 µV	26 µV
0.25	0.01%	15 µV	12.5 µV	11.2 µV	10.8 µV	63 µV	31 µV
1	0.01%	33 µV	31.8 µV	31.3 µV	31.2 µV	112 V	93 µV
4	0.01%	123 µV	122 µV	122 µV	122 µV	450 µV	366 µV
16	0.01%	488 µV	488 µV	488 µV	488 µV	1.8 mV	1.5 mV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)

Temperature Coefficients

For offset, add Tempco and fixed offset to the offset above.

	Temp Range	Tempco	2 Hz	10 Hz	100 Hz	Filt Off
Gain:		15 ppm/° C				
Offset:	0 -30 °C	0.16 µV/°C	0 µV	0 µV	0 µV	0 µV
	30 -40 °C	0.18 µV/°C	13 µV	9 µV	1.1 µV	0.2 µV
	40 -55 °C	0.39 µV/°C	31 µV	22 µV	6.4 µV	1.1 µV

VT1503A (x8 Gain)

A/D Range ±V FS	Linearity % of Reading	Offset Error 2 Hz	10 Hz	100 Hz	Filt Off	Noise 3σ	Noise* 3σ
0.0078	0.01%	4.6 µV	4.2 µV	3.8 µV	3.7 µV	5.8 µV	4.9 µV
0.031	0.01%	4.8 µV	4.6 µV	4.4 µV	4.3 µV	6.9 µV**	5.9 µV**
0.125	0.01%	6 µV	5.3 µV	5 µV	4.9 µV	14 µV	12 µV
0.5	0.01%	16 µV	16 µV	16 µV	16 µV	56 µV	46 µV
2	0.01%	61 µV	61 µV	61 µV	61 µV	225 µV	188 µV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch).
** 7.4 µV and 6.3 µV when temperature ≥40 °C

Temperature Coefficients

For offset, add Tempco and fixed offset to the offset above.

	Temp Range	Tempco	2 Hz	10 Hz	100 Hz	Filt Off
Gain:		15 ppm/°C				
Offset:	0 - 30 °C	0.16 µV/°C	0 µV	0 µV	0 µV	0 µV
	30 - 40 °C	0.18 µV/°C	4.3 µV	2.7 µV	1 µV	0.2 µV
	40 - 55 °C	0.39 µV/°C	13 µV	10 µV	6.2 µV	0.8 µV

VT1503A (x64 Gain)

A/D Range ±V FS	Linearity % of Reading	Offset Error 2 Hz	10 Hz	100 Hz	Filt Off	Noise 3σ	Noise* 3σ
0.0039	0.01%	2.9 µV	2.3 µV	2.1 µV	2.1 µV	1.6 µV**	1.3 V**
0.0156	0.01%	3 µV	2.4 µV	2.2 µV	2.2 µV	2.2 µV***	1.9 V***
0.0625	0.01%	3.5 µV	3 µV	2.9 µV	2.9 µV	7 µV	5.7 µV
0.25	0.01%	8.2 µV	8 µV	8 µV	8 µV	28 µV	23 µV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)
** 1.9 µV and 1.7 µV for 100 Hz filter *** 2.5 µV and 2.2 µV when temperature 40 °C

Temperature Coefficients

For offset, add Tempco and fixed offset to the offset above

	Temp Range	Tempco	2 Hz	10 Hz	100 Hz	Filt Off
Gain:		15 ppm/°C				
Offset:	0 - 30 °C	0.16 µV/°C	0 µV	0 µV	0 µV	0 µV
	30 - 40 °C	0.18 µV/°C	1.1 µV	0.2 µV	0.1 µV	0.1 µV
	40 - 55 °C	0.39 µV/°C	6 µV	1.4 µV	0.6 µV	0.6 µV

Acquisition

8-channel Voltage Input SCPs

VT1508A (x16 Gain)

Fixed Gain x16 Range ±V FS	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
0.0039	0.01%	3.8 µV	3.4 µV	2.9 µV
0.0156	0.01%	4.2 µV	4.4 µV	3.8 µV
0.0625	0.01%	4.9 µV	7.5 µV	6.3 µV
0.256	0.01%	8 µV	28 µV	23 µV
1.0	0.01%	31 µV	113 µV	64 µV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)

Temperature Coefficients

	Temp Range	Tempco
Gain:		15 ppm/°C
Offset:	0 - 30 °C	0.16 µV/°C
	30 - 40 °C	0.18 µV/°C
	40 - 55 °C	0.39 µV/°C

VT1509A (x64 Gain)

Fixed Gain x16 Range ±V FS	Linearity % of Reading	Offset Error	Noise 3σ	Noise* 3σ
0.0039	0.01%	2.3 µV	1.7 µV	1.4 µV
0.0156	0.01%	2.4 µV	2.5 µV	2.2 µV
0.0625	0.01%	3.0 µV	7.0 µV	5.7 µV
0.256	0.01%	8.0 µV	28 µV	23 µV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)

Temperature Coefficients

	Temp Range	Tempco
Gain:		15 ppm/°C
Offset:	0 - 30 °C	0.16 µV/°C
	30 - 40 °C	0.18 µV/°C
	40 - 55 °C	0.39 µV/°C

VT1513A (÷16 Attenuation)

A/D Range ±V FS	Linearity % of Reading	Offset Error	Common Mode Error % of Vcm	Noise 3σ	Noise* 3σ
0.0625**(1 V)	0.02%	0.1%	100 µV	700 µV	280 µV
0.25**(4 V)	0.02%	0.1%	175 µV	860 µV	430 µV
1 (16 V)	0.02%	0.1%	500 µV	1.8 mV	1.4 mV
4 (60 V)	0.02%	0.1%	1.95 mV	7.0 mV	5.8 mV

*A/D filter ON (min sample period ≥145 µs: ≤100 Hz scan rate 64 ch)
** These ranges are not recommended.

Temperature Coefficients

	Temp Range	Tempco
Gain:		15 ppm/°C
Offset:	0 - 40 °C	0.14 mV/°C
	40 - 55 °C	0.8 mV/°C + 0.38 mV/°C

Maximum Tare Cal Offset

This is the maximum voltage offset, the effect of which can be eliminated by the Tare Cal D/A on the Scanning A/D. Maximum tare cal offset depends on A/D range and SCP gain.

A/D Range ±V FS	VT1501A VT1502A VT1503A VT1512A	VT1503A	VT1508A	VT1503A VT1509A	VT1513A
	Gain x1	Gain x8	Gain x16	Gain x64	Atten ÷16
0.0625 V	0.03792 V	0.00312 V	0.00112 V	n/a	0.606 V
0.25 V	0.07581 V	0.00786 V	0.00349 V	0.00055 V	1.212 V
1 V	0.23061 V	0.02721 V	0.01317 V	0.00297 V	3.689 V
4 V	0.82101 V	0.10101 V	0.05007 V	0.01220 V	13.13 V
16 V	3.2213 V	0.40104 V	0.20009 V	0.04970 V	49.95 V

Temperature Measurement Accuracy

The thermocouple tables (see manual for graphs) following this description include the errors due to measuring the voltage output of the thermocouple, and the algorithm errors due to converting the thermocouple voltage to temperature; this is the Measurement/Conversion Error (MCE). To this error the Reference Junction Measurement Error (RJME) must be added due to measuring the reference junction temperature with an RTD or thermistor (this measurement requires an VT1505A).

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Also, the Isothermal Reference Gradient Errors (IRGE) must be added due to gradients across the isothermal reference. If an external isothermal reference panel is used, consult the manufacturer's specifications. If VXI Technology terminal blocks are used as the isothermal reference, see the notes below.

Total Temperature Error = [(MCE)2+ (RJME)2+ (IRGE)2]1/2

The linearization algorithm used is based on the ITS-90 transducer curves. Add your transducer accuracy to determine total measurement error.

Most of the temperature accuracy graphs and tables show the Measurement Conversion Error (MCE) for the applicable combination of SCP and transducer.The graphs and tables marked "REF" show the Reference Junction Measurement Error (RJME) for the combination of SCP and either Thermistor or RTD reference junction measurement.

For Isothermal Reference Gradient Errors (IRGE), use the following guidelines.

1. When using the Terminal Block as the isothermal reference, add ±0.6 °C to the thermocouple accuracy specs to account for temperature gradients across the Terminal Block. The ambient temperature of the air surrounding the Terminal Block must be within ±2 °C of the temperature of the inlet cooling air to the VXI mainframe.

2. When using the VXI Technology VT1586A Rackmount Terminal Panel as the isothermal reference, add ±0.2 °C to the thermocouple accuracy specs to account for temperature gradients across the VT1586A. For best performance, the VT1586A should be mounted in the bottom part of the rack, below and away from other heat sources.

VT1512A Thermistor Measurement Accuracy

2252 Ω

A/D Filter:	0 to 30 °C	30 to 70 °C	70 to 80 °C	80 to 100 °C
OFF:	0.012 °C	0.013 °C	0.014 °C	0.024 °C
ON*:	0.010 °C	0.012 °C	0.010 °C	0.014 °C

5 kΩ

A/D Filter:	0 to 30 °C	30 to 70 °C	70 to 85 °C
OFF:	0.014 °C	0.027 °C	0.048 °C
ON*:	0.011 °C	0.017 °C	0.027 °C

5 kΩ Reference

A/D Filter:	-10 to 65 °C	65 to 85 °C
OFF:	0.011 °C	0.021 °C
ON*:	0.0095 °C	0.0115 °C

10 kΩ

A/D Filter:	0 to 30 °C	30 to 60 °C	60 to 90 °C	90 to 115 °C
OFF:	0.015 °C	0.024 °C	0.034 °C	0.059 °C
ON*:	0.013 °C	0.016 °C	0.021 °C	0.032 °C

VT1512A RTD Measurement Accuracy

100 Ω

A/D Filter:	-200 to 75 °C	75 to 300 °C	300 to 600 °C	600 to 970 °C
OFF:	0.19 °C	0.37 °C	0.43 °C	0.53 °C
ON*:	0.11 °C	0.21 °C	0.36 °C	0.46 °C

100 ΩReference

A/D Filter:	-125 to 75 °C
OFF:	0.75 °C
ON*:	0.36 °C

VT1512A Thermocouple Measurement Accuracy

Type E

A/D Filter:	-200 to 0 °C	0 to 200 °C	200 to 400 °C	400 to 800°C
OFF:	2.25 °C	0.65 °C	0.50 °C	0.45 °C
ON*:	1.65 °C	0.34 °C	0.24 °C	0.23 °C

Type E Extended

A/D Filter:	-200 to 0 °C	0 to 200 °C	200 to 600 °C	600 to 800 °C
OFF:	14.7 °C	0.80 °C	0.50 °C	0.80 °C
ON*:	13.8 °C	0.49 °C	0.30 °C	0.45 °C

Type T

A/D Filter:	-200 to -100 °C	-100 to 0 °C	0 to 200 °C	200 to 400 °C

Acquisition

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OFF:	3.40 °C	1.90 °C	0.90 °C	0.70 °C
ON*:	2.25 °C	0.78 °C	0.46 °C	0.33 °C

Type S

A/D Filter:	**0 to 100 °C**	**100 to 200 °C**	**200 to 800 °C**	**800 to 1750 °C**
OFF:	8.00 °C	5.60 °C	4.45 °C	3.30 °C
ON*:	5.20 °C	3.25 °C	2.40 °C	1.60 °C

Type R

A/D Filter:	**0 to 100 °C**	**100 to 200 °C**	**200 to 600 °C**	**600 to 1000 °C**
OFF:	6.90 °C	5.00 °C	4.00 °C	3.10 °C
ON*:	3.80 °C	2.60 °C	1.95 °C	1.70 °C

Type K

A/D Filter:	**-200 to 0 °C**	**0 to 400 °C**	**400 to 800 °C**	**800 to 1400 °C**
OFF:	4.30 °C	0.90 ° C	0.85 ° C	1.10 ° C
ON*:	3.35 °C	0.50 ° C	0.40 ° C	0.52 ° C

Type J

A/D Filter:	**-200 to 0 °C**	**0 to 200 °C**	**200 to 600 °C**	**600 to 775 °C**
OFF:	2.65 °C	0.75 °C	0.63 °C	0.63 °C
ON*:	2.00 °C	0.38 °C	0.32 °C	0.32 °C

**[SENSe:]FILTer[:LPASs][:STATe] ON (max scan rate 100 readings/second/channel)*

Current Requirements (Amps)

	5 V typ	**5 V max**	**24 V typ**	**24 V max**	**-24 V typ**	**-24 V max**
VT1501A:	0.01	0.01	0.006	0.01	0.006	0.01
VT1502A:	0.01	0.01	0.015	0.02	0.015	0.02
VT1503A:	0.01	0.01	0.04	0.06	0.04	0.06
VT1508A:		0.01		0.02		0.02
VT1509A:		0.01		0.02		0.02
VT1512A:		0.01		0.02		0.02
VT1513A:		0.0054		0.02		0.02

Ordering Information

VT1501A	8-channel Direct Input SCP
VT1502A	8-channel 7 Hz Low-pass Filter SCP
VT1503A	8-channel Programmable Filter/Gain SCP
VT1508A	8-channel x16 Gain & 7 Hz Fixed Filter SCP
VT1509A	8-channel x64 Gain & 7 Hz Fixed Filter SCP
VT1512A	8-channel 25 Hz Fixed Filter SCP
VT1513A	8-channel ÷ 16 Fixed Attenuator & 7 Hz Low-pass Filter SCP

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