Model CP213
32/64/128-Channel, 16-bit CompactPCI/PXI ADC
User's Manual

Revision History

10/22/07	KG	Initial Draft of CP213 User Manual.

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Chapter 1: Introduction

Description

The CP213 is a single-width, 6U size, CompactPCI/PXI, 16-bit scanning ADC module with either 32 or 64 differential analog input channels that can alternately be configured as 64 or 128 single-ended analog input channels. The number of active channels and the scan rate are software selectable. The scan rate determines the frequency at which the channels are scanned. The internal scan rate frequency selections are from 0.0000232 Hz to 100 kHz (in 2^{32} steps). Scans may be triggered from either an internal clock, one of eight PXI backplane triggers, the PXI star trigger bus or an external SMB connector on the module front panel. Single and continuous scans are supported. If single-scan operation is chosen, an interrupt may be generated at the end of the scan. Digital data is stored in a 32, 64 or 128 word memory. DMA capability allows converted data to be stored directly on host memory with a minimum data rate of 64Mbytes/s.

The CP213 has programmable gain that can be set on a channel-by-channel basis. Gains from 1 to 1000 are available in a 1, 2, 5 progression. An on-board calibration reference is provided for end-to-end calibration of each channel. A front panel 2-pin LEMO connector is also provided for use as an external calibration source input or to measure the output of the internal calibrator. Optional fixed, 2-pole passive filters are available with cutoffs of 10Hz, 100Hz or 1kHz. The filters are implemented on 16 channel (differential) or 32 channel (single-ended) mezzanine cards. Under software control, channels 1 and 33 (differential) or channels 1 and 65 (single-ended) may be configured as isothermal reference channels for temperature measurement applications. Open thermocouple detection may also be enabled under software control.

In addition to the analog input channels, 16 multi-function digital I/O channels are provided. Any of these channels may be configured as digital in, digital out or selectively attached to a frequency in, counter in or timer out channel.

The analog inputs are available at a single 68-pin SCSI II shielded connector (32-channel differential/ 64-channel single-ended options) or a pair of 68-pin SCSI II shielded connectors (64-channel differential/ 128-channel single-ended options). The 16 multi-function digital I/O channels are available at a single 26-pin subminiature D connector.

The CP213 comes with a *Plug and Play* driver for configuring and using the device. The driver supports all hardware functionality.

CP213 Specifications

Analog Input Channels	
Item	Specifications
Number of analog input channels	32 differential / 64 single-ended or 64 differential / 128 single-ended
Input: Common Mode input range Differential Mode input range Input protection Input impedance Input coupling	 ±10 V ±10 V ±25 V continuous 1MΩ DC
Resolution	16-bits
Gain ranges	1, 2, 5, 10, 20, 50, 100, 200, 500 and 1000
Scan Rate (Per channel) Internal frequency selections External sources Duty cycle Backplane source	 0.0000232 Hz to 100 kHz (in 2^{32} steps) Front-panel SMB, TTL to 100 kHz 50% 1 of 8 PXI backplane triggers or the PXI star trigger bus
ADC Rate (Aggregate)	100 kHz (software programmable to 20kHz or 2kHz for lower noise)
Trigger Sources External Backplane	 Front panel SMB, negative-going TTL signal 1 of 8 PXI backplane triggers or the PXI star trigger bus
Initial accuracy, RTI (Referred to input): Differential Input Configuration Gain = 1 Gain = 10 Gain = 100 Gain = 1000 Single-ended Input Configuration Gain = 1 Gain = 10 Gain = 100 Gain = 1000	After automatic calibration: ± (1.2 mV + 0.01% of reading) ±(120 μV + 0.01% of reading) ±(13 μV + 0.015% of reading) ±(5 μV + 0.05% of reading) ± (1.2 mV + 0.01% of reading) ±(120 μV + 0.01% of reading) ±(13 μV + 0.015% of reading) ±(5 μV + 0.05% of reading)
Common mode rejection Noise, RTI Channel-to-channel crosstalk	75 dB minimum 5 μV rms @ gain = 1000, ADC rate = 2 kHz 14 μV rms @ gain = 1000, ADC rate = 20 kHz -90 dB
Analog input connector types	One or two 68P High Density One 2-pin LEMO (for external calibration input)

Technical specifications contained within this publication are subject to change without notice.

Table 1. Specifications

CP213 Specifications (continued)

Multi-function Digital I/O Channels	
Item	Specifications
Number of digital I/O channels	16 digital I/O channels (channels may be configured as digital in, digital out or selectively attached to 2 frequency in, 2 counter in, or 2 timer out channels)
I/O type	Single-ended TTL
Direction control	Yes
Input termination	Pulled-up
Input switching threshold "0" Level "1" Level	 0.8 V maximum 2 V minimum
Output voltage level "0" Level "1" Level	 0.4 V maximum (I_{out} = 2.5mA) 2.7 V minimum (I_{out} = 2.5mA)
Low level output current High level output current	24 mA, maximum -24 mA, maximum
Input current	TBD
Frequency channels (2) Frequency range Window period	0.06 Hz to 1 MHz TBD
Counter channels (2) Counter size	 32-bits
Timer channels (2) Timer size	 32-bits
Digital I/O connector type	One 26P Subminiature D connector

Power Requirements +5 V +3.3V +12 V -12 V	 TBD TBD TBD TBD
Environmental and Mechanical Temperature range Operational Storage Relative humidity Cooling requirements Dimensions Front-panel potential	 0°C to +50°C -25°C to +75°C 0 to 85%, non-condensing to 40°C 10 CFM 233.35 mm x 160 mm (6U CompactPCI module) Chassis ground

Technical specifications contained within this publication are subject to change without notice.

Table 1. Specifications (Continued)

Front Panel

Analog Input Connectors

The analog inputs are available at a single 68-pin SCSI II shielded connector (32-channel differential/ 64-channel single-ended options) or a pair of 68-pin SCSI II shielded connectors (64-channel differential/ 128-channel single-ended options). Orientation is shown in Figure 2.

Figure 1. Analog Input Connectors

Lower Channels and ISO1 Connector Pinout

Pin Number	Signal Description	Pin Number	Signal Description
1	Channel 1 + (Diff)/ Channel 1 (SE)	35	Channel 1 – (Diff)/ Channel 2 (SE)
2	Channel 2 + (Diff)/ Channel 3 (SE)	36	Channel 2 – (Diff)/ Channel 4 (SE)
3	Channel 3 + (Diff)/ Channel 5 (SE)	37	Channel 3 – (Diff)/ Channel 6 (SE)
4	Channel 4 + (Diff)/ Channel 7 (SE)	38	Channel 4 – (Diff)/ Channel 8 (SE)
5	Channel 5 + (Diff)/ Channel 9 (SE)	39	Channel 5 – (Diff)/ Channel 10 (SE)
6	Channel 6 + (Diff)/ Channel 11 (SE)	40	Channel 6 – (Diff)/ Channel 12 (SE)
7	Channel 7 + (Diff)/ Channel 13 (SE)	41	Channel 7 – (Diff)/ Channel 14 (SE)
8	Channel 8 + (Diff)/ Channel 15 (SE)	42	Channel 8 – (Diff)/ Channel 16 (SE)
9	Channel 9 + (Diff)/ Channel 17 (SE)	43	Channel 9 – (Diff)/ Channel 18 (SE)
10	Channel 10 + (Diff)/ Channel 19 (SE)	44	Channel 10 – (Diff)/ Channel 20 (SE)
11	Channel 11 + (Diff)/ Channel 21 (SE)	45	Channel 11 – (Diff)/ Channel 22 (SE)
12	Channel 12 + (Diff)/ Channel 23 (SE)	46	Channel 12 – (Diff)/ Channel 24 (SE)
13	Channel 13 + (Diff)/ Channel 25 (SE)	47	Channel 13 – (Diff)/ Channel 26 (SE)
14	Channel 14 + (Diff)/ Channel 27 (SE)	48	Channel 14 – (Diff)/ Channel 28 (SE)
15	Channel 15 + (Diff)/ Channel 29 (SE)	49	Channel 15 – (Diff)/ Channel 30 (SE)
16	Channel 16 + (Diff)/ Channel 31 (SE)	50	Channel 16 – (Diff)/ Channel 32 (SE)
17	Channel 17 + (Diff)/ Channel 33 (SE)	51	Channel 17 – (Diff)/ Channel 34 (SE)
18	Channel 18 + (Diff)/ Channel 35 (SE)	52	Channel 18 – (Diff)/ Channel 36 (SE)
19	Channel 19 + (Diff)/ Channel 37 (SE)	53	Channel 19 – (Diff)/ Channel 38 (SE)
20	Channel 20 + (Diff)/ Channel 39 (SE)	54	Channel 20 – (Diff)/ Channel 40 (SE)
21	Channel 21 + (Diff)/ Channel 41 (SE)	55	Channel 21 – (Diff)/ Channel 42 (SE)
22	Channel 22 + (Diff)/ Channel 43 (SE)	56	Channel 22 – (Diff)/ Channel 44 (SE)
23	Channel 23 + (Diff)/ Channel 45 (SE)	57	Channel 23 – (Diff)/ Channel 46 (SE)
24	Channel 24 + (Diff)/ Channel 47 (SE)	58	Channel 24 – (Diff)/ Channel 48 (SE)
25	Channel 25 + (Diff)/ Channel 49 (SE)	59	Channel 25 – (Diff)/ Channel 50 (SE)
26	Channel 26 + (Diff)/ Channel 51 (SE)	60	Channel 26 – (Diff)/ Channel 52 (SE)
27	Channel 27 + (Diff)/ Channel 53 (SE)	61	Channel 27 – (Diff)/ Channel 54 (SE)
28	Channel 28 + (Diff)/ Channel 55 (SE)	62	Channel 28 – (Diff)/ Channel 56 (SE)
29	Channel 29 + (Diff)/ Channel 57 (SE)	63	Channel 29 – (Diff)/ Channel 58 (SE)
30	Channel 30 + (Diff)/ Channel 59 (SE)	64	Channel 30 – (Diff)/ Channel 60 (SE)
31	Channel 31 + (Diff)/ Channel 61 (SE)	65	Channel 31 – (Diff)/ Channel 62 (SE)
32	Channel 32 + (Diff)/ Channel 63 (SE)	66	Channel 32 – (Diff)/ Channel 64 (SE)
33	Channel 1 Isothermal -	67	Channel 1 Isothermal +
34	Ground	68	Ground

Table 2. Lower Channels and ISO1 Connector Pinout

Upper Channels and ISO2 Connector Pinout

Pin Number	Signal Description	Pin Number	Signal Description
1	Channel 33 + (Diff)/ Channel 65 (SE)	35	Channel 33 – (Diff)/ Channel 66 (SE)
2	Channel 34 + (Diff)/ Channel 67 (SE)	36	Channel 34 – (Diff)/ Channel 68 (SE)
3	Channel 35 + (Diff)/ Channel 69 (SE)	37	Channel 35 – (Diff)/ Channel 70 (SE)
4	Channel 36 + (Diff)/ Channel 71 (SE)	38	Channel 36 – (Diff)/ Channel 72 (SE)
5	Channel 37 + (Diff)/ Channel 73 (SE)	39	Channel 37 – (Diff)/ Channel 74 (SE)
6	Channel 38 + (Diff)/ Channel 75 (SE)	40	Channel 38 – (Diff)/ Channel 76 (SE)
7	Channel 39 + (Diff)/ Channel 77 (SE)	41	Channel 39 – (Diff)/ Channel 78 (SE)
8	Channel 40 + (Diff)/ Channel 79 (SE)	42	Channel 40 – (Diff)/ Channel 80 (SE)
9	Channel 41 + (Diff)/ Channel 81 (SE)	43	Channel 41 – (Diff)/ Channel 82 (SE)
10	Channel 42 + (Diff)/ Channel 83 (SE)	44	Channel 42 – (Diff)/ Channel 84 (SE)
11	Channel 43 + (Diff)/ Channel 85 (SE)	45	Channel 43 – (Diff)/ Channel 86 (SE)
12	Channel 44 + (Diff)/ Channel 87 (SE)	46	Channel 44 – (Diff)/ Channel 88 (SE)
13	Channel 45 + (Diff)/ Channel 89 (SE)	47	Channel 45 – (Diff)/ Channel 90 (SE)
14	Channel 46 + (Diff)/ Channel 91 (SE)	48	Channel 46 – (Diff)/ Channel 92 (SE)
15	Channel 47 + (Diff)/ Channel 93 (SE)	49	Channel 47 – (Diff)/ Channel 94 (SE)
16	Channel 48 + (Diff)/ Channel 95 (SE)	50	Channel 48 – (Diff)/ Channel 96 (SE)
17	Channel 49 + (Diff)/ Channel 97 (SE)	51	Channel 49 – (Diff)/ Channel 98 (SE)
18	Channel 50 + (Diff)/ Channel 99 (SE)	52	Channel 50 – (Diff)/ Channel 100 (SE)
19	Channel 51 + (Diff)/ Channel 101 (SE)	53	Channel 51 – (Diff)/ Channel 102 (SE)
20	Channel 52 + (Diff)/ Channel 103 (SE)	54	Channel 52 – (Diff)/ Channel 104 (SE)
21	Channel 53 + (Diff)/ Channel 105 (SE)	55	Channel 53 – (Diff)/ Channel 106 (SE)
22	Channel 54 + (Diff)/ Channel 107 (SE)	56	Channel 54 – (Diff)/ Channel 108 (SE)
23	Channel 55 + (Diff)/ Channel 109 (SE)	57	Channel 55 – (Diff)/ Channel 110 (SE)
24	Channel 56 + (Diff)/ Channel 111 (SE)	58	Channel 56 – (Diff)/ Channel 112 (SE)
25	Channel 57 + (Diff)/ Channel 113 (SE)	59	Channel 57 – (Diff)/ Channel 114 (SE)
26	Channel 58 + (Diff)/ Channel 115 (SE)	60	Channel 58 – (Diff)/ Channel 116 (SE)
27	Channel 59 + (Diff)/ Channel 117 (SE)	61	Channel 59 – (Diff)/ Channel 118 (SE)
28	Channel 60 + (Diff)/ Channel 119 (SE)	62	Channel 60 – (Diff)/ Channel 120 (SE)
29	Channel 61 + (Diff)/ Channel 121 (SE)	63	Channel 61 – (Diff)/ Channel 122 (SE)
30	Channel 62 + (Diff)/ Channel 123 (SE)	64	Channel 62 – (Diff)/ Channel 124 (SE)
31	Channel 63 + (Diff)/ Channel 125 (SE)	65	Channel 63 – (Diff)/ Channel 126 (SE)
32	Channel 64 + (Diff)/ Channel 127 (SE)	66	Channel 64 – (Diff)/ Channel 128 (SE)
33	Channel 33 (Diff)/ Channel 65 (SE) Isothermal-	67	Channel 33 (Diff)/ Channel 65 (SE) Isothermal+
34	Ground	68	Ground

Table 3. Upper Channels and ISO2 Connector Pinout

Digital I/O Connector

The digital I/O channels are available at a single 26P subminiature D connector.

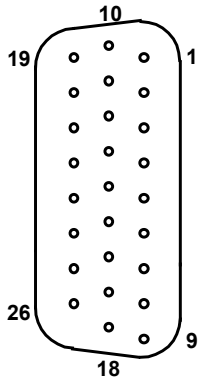

Figure 2. Digital I/O Connector

Digital I/O Connector Pinout

Pin Number	Signal Description
1	Channel 1
2	Channel 2
3	Channel 3
4	Channel 4
5	Channel 5
6	Channel 6
7	Channel 7
8	Channel 8
9	Channel 9
10	Channel 10
11	Channel 11
12	Channel 12
13	Channel 13
14	Channel 14
15	Channel 15
16	Channel 16
17	Ground
18	Ground
19	No Connect
20	No Connect
21	No Connect
22	No Connect
23	No Connect
24	No Connect
25	Ground
26	Ground

Table 4. Digital I/O Connector Pinout

CAL Connector

A front panel 2-pin LEMO connector is provided for use as an external calibration source input or to measure the output of the internal calibrator.

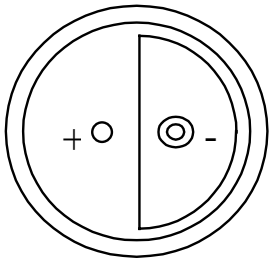

Figure 3. CAL Connector

SMB I/O 1 and I/O 2 Connectors

Two front panel SMB connectors are provided. Either of these connectors can be configured via software as a trigger input, scan clock input/output or limit violation output. The SMBs may be routed via software to any PXI trigger line (0-7 or star) and can be used to start and stop acquisition or trigger a transient.

Product Ordering Information

Model CP213-AA11	16-bit Scanning ADC, No Filters, 32-ch Differential/64-ch Single-Ended
Model CP213-ABB1	16-bit Scanning ADC, 10Hz Filters, 32-ch Differential
Model CP213-AEB1	16-bit Scanning ADC, 100Hz Filters, 32-ch Differential
Model CP213-AHB1	16-bit Scanning ADC, 1kHz Filters, 32-ch Differential
Model CP213-ABC1	16-bit Scanning ADC, 10Hz Filters, 64-ch Single-Ended
Model CP213-AEB1	16-bit Scanning ADC, 100Hz Filters, 64-ch Single-Ended
Model CP213-AHC1	16-bit Scanning ADC, 1kHz Filters, 64-ch Single-Ended
Model CP213-BA11	16-bit Scanning ADC, No Filters, 64-ch Differential/128-ch Single-Ended
Model CP213-BBB1	16-bit Scanning ADC, 10Hz Filters, 64-ch Differential
Model CP213-BEB1	16-bit Scanning ADC, 100Hz Filters, 64-ch Differential
Model CP213-BHB1	16-bit Scanning ADC, 1kHz Filters, 64-ch Differential
Model CP213-BBC1	16-bit Scanning ADC, 10Hz Filters, 128-ch Single-Ended
Model CP213-BEB1	16-bit Scanning ADC, 100Hz Filters, 128-ch Single-Ended
Model CP213-BHC1	16-bit Scanning ADC, 1kHz Filters, 128-ch Single-Ended

Related Products

Model 5868-B001	Shorting Connector for CP213
Model 5868-Bxyz	Cable: 68S High Density to Unterminated
Model 5868-Dxyz	Cable: 68S High Density to 68P High Density
Model 5868-Exyz	Cable: 68S High Density to 68S High Density
Model 5857-Cxyz	Cable: 2-contact LEMO to Unterminated
Model 5857-Gxyz	Cable: 2-contact LEMO to BNC; shielded
Model T910-Axyz	Cable: SMB to SMB; shielded
Model T910-Bxyz	Cable: SMB to BNC; shielded
Model T910-Cxyz	Cable: SMB to Unterminated
Model 59XX-wxyz	Mating Connector, 26P Subminiature D; solder cup
Model V765-ZA11	Rack-mount Termination Panel
Model V792-ZA11	Rack-mount Isothermal Termination Panel

KineticSystems VISA Layer Software
KineticSystems CPCI VISA Plug-in Software
KineticSystems 213 VXI/PXI Interworking Library Software

Chapter 2: Installation

⚠ Do not install hardware before installing accompanying software. Installing the software before the hardware ensures that the information in the module description file is available to the operating system when it needs to identify the hardware. A brief overview of the installation steps are as follows:

1. Install software
2. Run the *Resource Manager* to register the module type with VISA
3. Power the system down
4. Install the module.
5. Power the system up. The operating system will automatically identify the new hardware and install kernel mode drivers.

Software Installation

The CP213 Plug and Play driver depends on an installed VISA layer. This procedure assumes that VISA has already been installed.

1. Insert the accompanying CD into your system and run setup.exe. This will install the Plug and Play driver code and libraries, as well as the module.ini file.
2. Run the VISA *Resource Manager* tool. The *Resource Manager* will identify the newly installed module.ini file and register the module type with VISA and build appropriate kernel mode driver files for the operating system.

Directory Structure

Software installation will place files as described below. `<VXIPNP>` denotes where VISA is installed (e.g., by default `C:\vxipnp\winnt` on a Windows based machine).

- `<VXIPNP>\include`: ks213.h (API header file)
- `<VXIPNP>\bin`: `ksp213.dll` (API library)
- `<VXIPNP>\lib\`*<format>*: (API lib file `ksp213.lib`, in various formats)
- `<VXIPNP\cp213`: `ksp213.c` (API source code)

In addition, the module_cp213.ini file will be installed in the directory specified by registry setting `HKEY_LOCAL_MACHINE\SOFTWARE\PXISA\CURRENT_VERSION`, value `ModuleDescriptionFilePath`, or simply `<VXIPNP>` if the registry value is not set or does not exist.

Manual Registration with VISA

In the event that your VISA *Resource Manager* does not or cannot automatically register the CP213 with VISA via the module.ini file, you will probably need to manually register it with VISA. This will probably be accomplished by running a tool or wizard distributed with your VISA; consult your VISA documentation for details.

CP213

To manually register the CP213 with VISA, you will need the following information:

- Module Name: “CP213”
- Module Vendor: “KineticSystems Company, LLC”
- Model Code: 0x213
- Manufacturer Code: 0x11f4
- Interrupt Detect and Quiescent: The CP213 generates 1 source of interrupt.
  - Detect: true if a 32 bit read of space BAR2, offset 0xd8 returns bits 0 on.
  - Quiesce: Quiesce: To deassert the interrupt, perform a 32 bit write of value 0x1 to space BAR2, offset 0xd8

  In PXI terms:

```
NumDetectSequences = 1

InterruptDetect0 = "C32 BAR2 0xd8 0x1 0x1;"
InterruptQuiesce = "W32 BAR2 0xd8 0x1;
```

Unpacking the CP213

The CP213 comes in an anti-static bag to avoid electrostatic damage to the module. Please take the following precautions when unpacking the module:

- Ground yourself with a grounding strap or by touching a grounded object.
- Touch the anti-static package to a metal part of your CompactPCI chassis before removing the module from the package.
- Remove the module from the package and inspect the module for damage.
- Do not install the module into the CompactPCI chassis until you are satisfied that the module exhibits no obvious mechanical damage and is configured to conform to the desiring operating environment.

Chapter 3: Device Operation

Overview

The CP213 analog input channels are multiplexed to a high-speed programmable gain amplifier (PGA) that provides full-scale input ranges of ±10 volts at a gain of 1 down to ±10 millivolts at a gain of 1000. The PGA supports scan rates up to 100 kHz at all gain settings. The analog input channels may be configured as single-ended or differential inputs via software control. The number of channels scanned and the scan rate are also software programmable. A 16-bit Successive Approximation Register (SAR) ADC samples the output of the PGA. Converted data from the ADC is stored in a 32, 64 or 128 word memory, allowing "present value monitoring". DMA capability allows converted data to be stored on host memory at the required data rates.

An on-board calibration reference is provided for end-to-end calibration of each channel. Optional fixed, 2-pole passive filters are available with cutoffs of 10Hz, 100Hz or 1kHz. The filters are implemented on 16 channel (differential) or 32 channel (single-ended) mezzanine cards. Under software control, channels 1 and 33 (differential) or channels 1 and 65 (single-ended) may be configured as isothermal reference channels for temperature measurement applications. Open thermocouple detection may also be enabled via software control. Once enabled, any channel that is open will be set to full scale. Any other channel will remain in its normal range.

The CP213 also provides 16 multi-function digital I/O channels. Any of these channels may be configured as digital in, digital out or selectively attached to 2 frequency in, 2 counter in and/or 2 timer out channels. Two channels each of frequency in, counter in and timer out are provided. These channels operate at standard TTL levels.

The following diagram shows the internal architecture of the CP213.

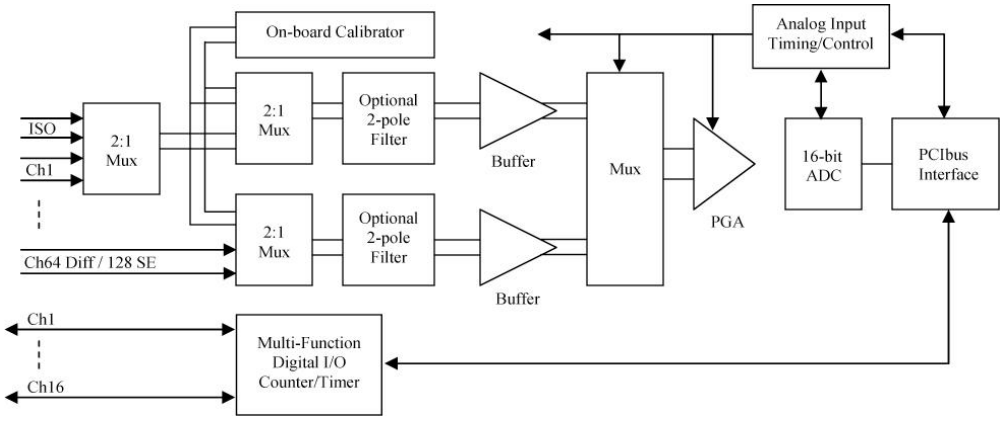

Figure 4. CP213 Block Diagram

Analog Input Configuration

For unfiltered options of the CP213, the analog input channels may be configured as single-ended or differential inputs via software control. Filtered options of the CP213 may only be operated in one mode or the other due to the filter mezzanine cards fixed as differential or single-ended configuration. When operating the CP213 in noisy environments and with long input signal wiring, the differential mode will provide higher common-mode noise immunity.

When open thermocouple detection is disabled, the analog channel inputs are connected to ground through 1MΩ resistors. This configuration provides a bias current return path for the analog input amplifiers, which is necessary when channels are unterminated. If unused channel inputs were left unterminated with no bias current return path, it is possible that data for the channel in SCAN RAM that follows an unterminated channel will be affected. This is because the gain instrumentation amp on the CP213 cannot recover from saturation before the next channel is converted. This is primarily a problem at high gain settings and sample rates.

Setting up Gain For Isothermal Channels

The CP213 can have up to two isothermal reference channels, one for each connector. Under software control, channels 1 and 33 (differential) or channels 1 and 65 (single-ended) may be configured as isothermal reference channels for temperature measurement applications. When the CP213 is connected to a KineticSystems V792 isothermal panel, these reference channels will output voltage at 1 mV/°K. When switched to the isothermal reference, the gain for channel 1 or 33 (differential) or 1 and 65 (single-ended) should be set to 20 and should be calibrated the same as all other channels.

Accuracy

The accuracy of the CP213 can be optimized by following a few simple rules:

1. If the scanlist includes channels at multiple gains, order the channels in the scanlist with the highest gains first.
2. When possible, reduce the ADC rate from 100 kHz to 20 kHz or 2 kHz. For example, if 32 channels are in the scanlist and the scan rate is set to 10 Hz, the ADC could be slowed to 2 kHz for higher accuracy and lower noise.

Open Thermocouple Detection

The CP213 provides a mechanism for the detection of open thermocouples. Open thermocouple detection may be enabled simultaneously on all channels via software control. When open thermocouple detection is enabled, the channel inputs are connected to ±12 V through 1MΩ

resistors via a relay. Once enabled, any channel that is open will be set to full scale. Any other channel will remain in its normal range. Note that when open thermocouple detection is enabled, channels may not be calibrated nor can valid data be taken.

System Calibration/Diagnostics

In any system, particularly with larger data acquisition systems, verifying the proper functioning of the system and the calibration of analog I/O is essential. Generally, it is possible to check out some digital system components through exercising the hardware under software control.

To audit analog channels to any degree requires that a series of known analog signals be injected into each channel of the system. This can be accomplished either by operator intervention or by providing the capability to switch known calibration signals into the input under software control. Switching of calibration signals by hand can be very time-consuming and is subject to errors.

For these reasons, DynamicSignals has chosen an implementation with full end-to-end calibration features. To accomplish this goal with the architecture described, a known signal must be injected at the input to each channel. An on-board calibration reference and calibration input multiplexers are provided on the CP213 for this purpose. A front panel 2-pin LEMO connector is also provided for use as an external calibration source input or to measure the output of the internal calibrator.

Calibration Interval

The CP213 should be calibrated at regular intervals as defined by the measurement accuracy requirements of your application. DynamicSignals recommends that calibration be performed at least once a year. Based on your measurement accuracy needs, this interval may be shortened. Calibration consists of adjustment of the on-board 10 V calibration reference, input offset potentiometer adjustment, and the generation of calibrator offset and gain correction coefficients, which are stored in non-volatile memory. Consult the DynamicSignals factory for information on calibration services.

Digital I/O Channels

The CP213 provides 16 multi-function digital I/O channels. Any of these channels may be configured as digital in, digital out or selectively attached to 2 frequency in, 2 counter in and/or 2 timer out channels These channels operate at standard TTL levels. The channels are able to source or sink a minimum of 24 mA. Two channels each of frequency in, counter in and timer out are provided. The frequency input range for a channel configured as a frequency input is 0.06 Hz to 1 MHz.

Limit Checking

The CP213 supports two types of limit checking, Min/Max and Threshold/Slope. Min/Max is used to check for upper and lower limits of the input signal. The CP213 can generate an interrupt or output on a specified trigger line (PXI only) if the channel input is above the upper limit or below the lower limit. Once the limit violation is detected the input signal must fall back in range plus a “dead band” (256 counts) before it will detect another violation. This band will reduce or remove multiple events caused by input noise. The CP213 can also be configured for Threshold/Slope limit detection. The CP213 can generate an interrupt or output a pulse on a specified trigger line (PXI only) if the channel crosses a voltage level (threshold) in the direction selected by the slope (positive or negative). Limit checking is configured by via software.

Chapter 4: Programming

Please refer to Software User Manual for CP213.

Appendix A

Technical Support and Warranty

DynamicSignals warrants its standard hardware products to be free of defects in workmanship and materials for a period of one year from the date of shipment to the original end user. DynamicSignals warrants its software products to conform to the software description applicable at the time of purchase for a period of ninety days from the date of shipment. Products purchased for resale by DynamicSignals carry the original equipment manufacturer's warranty.

DynamicSignals will, at its option, either repair or replace products that prove to be defective in materials or workmanship during the warranty period.

Transportation charges for shipping products to DynamicSignals are prepaid by the purchaser, while charges for returning the repaired product to the purchaser, if located in the United States, are paid by DynamicSignals. Return shipments are made by UPS, where available, unless the purchaser requests a premium method of shipment at his expense. The selected carrier is not the agent of DynamicSignals, and DynamicSignals assumes no liability relating to the services provided by the carrier.

The product warranty may vary outside the United States and does not include shipping, customs clearance or any other charges. Consult your local authorized representative for more information regarding specific warranty coverage and shipping details.

Product specifications and descriptions in this document subject to change without notice.
DynamicSignals specifically makes no warranty of fitness for a particular purpose or any other warranty either expressed or implied, except as is expressly set forth herein. This warranty does not cover product failures created by unauthorized modifications, product misuse or improper installation.

Products are not accepted for credit or exchange without prior written approval. If it is necessary to return a product for repair replacement or exchange, a Return Authorization (RA) Number must first be obtained from the Repair Service Center before shipping the product to DynamicSignals.

Please take the following steps if you are having a problem and feel you may need to return a product for service:

Contact DynamicSignals and discuss the problem with a Technical Service Engineer.
Obtain a Return Authorization (RA) Number.
Initiate a purchase order for the estimated repair charge if the product is out of warranty.
Include with the product a description of the problem and the name of the technical contact person at your facility.
Ship the product prepaid with the RA Number marked on the outside of the package to:

DynamicSignals, LLC
Repair Service Center
900 North State Street
Lockport, IL 60441

Telephone: (815) 838-0005
Fax: (815) 838-4424

Ways to contact us:

DynamicSignals, LLC
900 N. State Street
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Feedback

The purpose of this manual is to provide you with the information you need to make the CP213 as easy as possible to understand and use. It is very important that the information is accurate, understandable and accessible. To help us continue to make this manual as "user friendly" as possible, we hope you will fill out this form and Fax it back to us at (815) 838 0095. Or mail a copy to DynamicSignals, LLC 900 N. State, Lockport, IL 60441. Your input is very valuable.

Please rate each of the following.

The information in this manual is:

	Yes								No
Accurate	10	9	8	7	6	5	4	3	2	1
Readable	10	9	8	7	6	5	4	3	2	1
Easy to find	10	9	8	7	6	5	4	3	2	1
Well organized	10	9	8	7	6	5	4	3	2	1
Sufficient	10	9	8	7	6	5	4	3	2	1

We would appreciate receiving any thoughts you have about how we can improve this user's manual:

(Include additional sheets if needed)

Name Phone

Company