Signal Conditioning Amplifier System

FEATURES

- Strain gage, transducer, and thermocouple inputs
- Frequency response to 110 kHz
- Analog output of ±10 VDC
- Operation with 12 to 15 VDC and 120/240 VAC power
- Scalable from 8 to 128 channels in high-density enclosures
- Digital control from both front panel and PC over Ethernet
- Remote channel-by-channel monitoring of signals by Ethernet

DESCRIPTION

The A2 is an analog signal conditioner and amplifier system for strain gages, strain-gage-based transducers, thermocouples and various other sensors with high-level signals. Scalable in multiples of eight channels to a maximum of 128 for each system, the A2 features digital control of the system instrumentation and monitoring of the analog outputs, both locally on the control panel and remotely by Ethernet from a PC. The Model A2 is an embedded web server. All system, card, and channel settings are accessible using simple HTTP (hypertext transfer protocol) commands or by using the graphical user interface provided by the system. Ordinary web browsers, such as Internet Explorer, can be used to control the system. The A2 is specially designed to function as the front-end for DAQ's and recorders accepting high-level analog signals.

Instrumentation hardware, available as individual eight-channel cards for strain gage, thermocouples, and high-level signals, features high stability with temperature and time. Strain-gage instrumentation accepts full-, half-, and quarter-bridge circuits and has built-in bridge completion resistors for 120-, 350- and 1000-ohm quarter bridges. Amplifiers gain, bridge excitation and balance, shunt calibration, and signal filtering are digitally controlled. Instrument design enables sensors to remain connected when cards are removed from the system for bridge configuration.

SPECIFICATIONS

General

All specifications are nominal or typical at +23°C unless noted. Performance may be degraded in the presence of high-level electromagnetic fields.

System Configuration

Each system consists of a Model A2-MC-8 Controller and at least one 8-channel instrumentation card. Stackable expansion cabinets are added when two or more instrumentation cards are used.

Physical Dimensions

Eight Channel Enclosure with Controller
17″ W x 12″ D x 8.5″ H
[43.2 cm W x 30.5 cm D x 21.6 cm H]

40 Channel Enclosure with Controller
17″ W x 12″ D x 17.5″ H
[43.2 cm W x 30.5 cm D x 44.6 cm H]

72 Channel Enclosure with Controller
17″ W x 12″ D x 26.5″ H
[43.2 cm W x 30.5 cm D x 67.3 cm H]

104 Channel Enclosure with Controller
17″ W x 12″ D x 35.5″ H
[43.2 cm W x 30.5 cm D x 90.2 cm H]

128 Channel Enclosure with Controller
17″ W x 12″ D x 44.5″ H
[43.2 cm W x 30.5 cm D x 113.0 cm H]

Input Power

115 or 230 VAC with optional external "line lump" power supply (15 VDC output). Will also work from a 12V battery with reduced specifications.

Controller with Model A2-EC Expansion Cabinet

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MODEL A2-MC-8 CONTROLLER

Supports hardware identification, setup and output data monitoring of each type of plug-in card via a local keyboard interface or remotely via an Ethernet Interface. Each controller supports 8 channels of signal conditioning and up to 128 channels of signal conditioning when expansion cabinets are added.

Front Panel User Interface
Membrane keypad with illuminated 128 x 64 pixel FSTN positive, gray transflective LCD

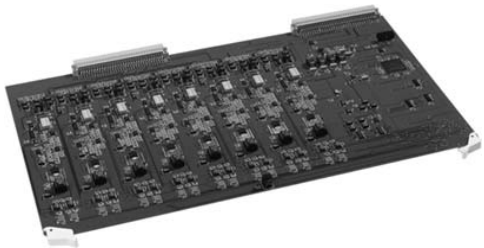
Communication Interface
Physical: 10/100 Base-T
Protocol: HTTP
IP Addressing: Static. Configurable by the front panel controls

Size
17″ W X 12″ D X 8.5″H
[43.2 cm W x 30.5 cm D x 21.6 cm H]

Weight
12.6 lbs [5.7 kg]

MODEL A2-SG-8-BX STRAIN GAGE CARD

(Specify **Model A2-SG-8-BW** (with Butterworth filter characteristics) or **Model A2-SG-8-BS** (with Bessel filter characteristics).



These specifications apply for each of eight independent channels of signal conditioning per removable card.

Amp Input

Inputs
Quarter (120 ohms, 350 ohms, and 1000 ohms), half and full bridge (50-1000 ohms)
Bridge completion resistors are provided for quarterbridge circuits

Input Impedance
>100 MΩ

Source Current
±5 nA typical; ±10 nA max.

Amplifier

Zero Temperature Stability
±1.7 µV/°C RTI*, ±100 µV/°C RTO**, after 30-minute warm-up

Input Range
4 to 80 mV full-scale input range (x2500 to x125)—adjustable by software control per channel

Output Range
±10V into 600Ω minimum load (When powered from 15 VDC)

DC Gain Accuracy and Stability
±0.10%; ±50 ppm/°C

Common-Mode Rejection (DC to 100 Hz)
105 dB typical

Common-Mode Voltage
±10V typical

Bandpass
Full Power Frequency response DC to 110 kHz;
-3 dB. (Wideband operation)
Slew Rate: 7 V/µs

Dynamic Characteristics

Noise RTI
1 µV p-p at 0.1 Hz to 10 Hz
6 µVRMS at 0.1 Hz to 110 kHz

Total Harmonic Distortion
0.014% at 1 kHz

Filter

Type
Software-settable 5th order filter—DC to 40 kHz max: -3 dB. (Butterworth or Bessel characteristics)

Settings
Wideband, 40 kHz, 20 kHz, 10 kHz, 5 kHz, 1 kHz, 100 Hz, and 10 Hz
Software-programmable per channel.

Bridge Excitation

Type
Constant voltage

Settings
0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5 and 10.0 VDC
Software-programmable per channel

Accuracy
±3 mV typical

Current
50 mA max. Over-current protected

Load Regulation
<0.05% of full scale for a load variation of 10% to 100% of full load

Temperature Stability
Better than ±0.005%/°C

*Referred to input
**Referred to output

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Bridge Balance
99% of measurement range

Calibration
Standard factory-installed resistors (±0.1%) simulate 5000 microstrain at GF=2 for 120-, 350-, and 1000-ohm quarter bridge

8 Channel Strain Gage Card Size
15.13″ W x 9″ D [38.4 cm W x 22.9 cm D]

8 Channel Strain Gage Card Weight
0.80 lbs [0.36 kg]

MODEL A2-TC-8-BX THERMOCOUPLE CARD

(Specify **Model A2-TC-8-BW** (with Butterworth filter characteristics) or **Model A2-TC-8-BS** (with Bessel filter characteristics).

These specifications apply for each of eight independent channels of signal conditioning per removable card.

Amp Input

Inputs
Thermocouple types J, K, T, E, N, R, S, B.
Built-in electronic cold-junction compensation
Software-selectable

Input Impedance
10 MΩ differential, 100 KΩ common mode

Source Current
±5 nA typical; ±10 nA max.

Amplifier

Zero Temperature Stability
±1.7 µV/°C RTI*, ±100 µV/°C RTO**, after 30-minute warm-up

Input Range
4 to 80 mV full-scale input range (X2500 to X125)—adjustable by software control per channel

Output Range
±10V into 600Ω minimum load (when powered from 15 VDC)

DC Gain Accuracy and Stability
±0.05%; ±50 ppm/°C

Common-Mode Rejection (dc to 100 Hz)
105 dB typical

Common-Mode Voltage
±10V typical

Bandpass
Full Power Frequency response DC to 110 kHz; -3 dB (Filter not selected)
Slew Rate: 7 V/µs

Dynamic Characteristics

Noise RTI
1 µVolt p-p at 0.1 Hz to 10 Hz
6 µVRMS at 0.1 Hz to 110 kHz

Total Harmonic Distortion
0.014% at 1 kHz

Filter

Type
Software-settable 5th order filter—
DC to 40 kHz: -3 dB (Butterworth or Bessel characteristics)

Settings
Wideband, 40 kHz, 20 kHz, 10 kHz, 5 kHz, 1 kHz, 100 Hz, and 10 Hz
Software-programmable per channel

8 Channel Thermocouple Card Size
15.13″ W x 9″ D [38.4 cm W x 22.9 cm D]

8 Channel Thermocouple Card Weight
0.80 lbs [0.36 kg]

MODEL A2-HL-8-BX HIGH LEVEL CARD

(Specify **Model A2-HL-8-BW** (with Butterworth filter characteristics) or **Model A2-HL-8-BS** (with Bessel filter characteristics)

These specifications apply for each of eight independent channels of signal conditioning per removable card.

Amp Input

Inputs
DC voltage (differential)

Input Impedance
>100 MΩ

Source Current
±5 nA typical; ±10 nA max.

Amplifier

Zero Temperature Stability
±1.7 µV/°C RTI*, ±100 µV/°C RTO**, after 30-minute warm up

Input Range
1 to 10V full-scale input range—adjustable by software control per channel

Output Range
±10V into 600Ω minimum load (when powered from 15 VDC)

DC Gain Accuracy and Stability
±0.10%; ±50 ppm/°C

Common-Mode Rejection (dc to 100 Hz)
105 dB typical

Common-Mode Voltage
±10V typical

Bandpass
Full Power Frequency response DC to 110 kHz; -3 dB. (Filter not selected)
Slew Rate: 7 V/µs

Dynamic Characteristics

Total Harmonic Distortion
0.014% at 1 kHz

*Referred to input
**Referred to output

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Filter

Type
Software-settable 5th Order filte—DC to 40 kHz max: -3 dB. (Butterworth or Bessel characteristics)

Settings
Wideband, 40 kHz, 20 kHz, 10 kHz, 5 kHz, 1 kHz, 100 Hz, and 10 Hz
Software-programmable per channel

Bridge Excitation

Type
Constant voltage

Settings
0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5 and 10.0 VDC
Software-programmable per channel

Accuracy
±3 mV typical

Current
50 mA max. Over-current protected

Load Regulation
<0.05% of full scale for a load variation of 10% to 100% of full load

Temperature Stability
Better than ±0.005%/°C

8 Channel High Level Card Size
15.13″ W x 9″ D [38.4 cm W x 22.9 cm D]

8 Channel High Level Card Weight
0.80 lbs [0.36 kg]

Front View Back View

Controller with Model A2-EC Expansion Cabinet

Expansion Cabinets Size

Model A2-EC-8 Expansion Cabinet:
17″ W X 12″ D X 3.0″ H
[43.2 cm W x 30.5 cm D x 7.6 cm H]

Model A2-EC-16 Expansion Cabinet:
17″ W X 12″ D X 5.0″ H
[43.2 cm W 30.5 cm D x 12.7 cm H]

Model A2-EC-32 Expansion Cabinet:
17″ W X 12″ D X 9.5″ H
[43.2 cm W x 30.5 cm D x 24.1 cm H]

Expansion Cabinets Weight

Model A2-EC-8 Expansion Cabinet: 4.5 lbs [2.04 kg]
Model A2-EC-16 Expansion Cabinet: 6.8 lbs [3.08 kg]
Model A2-EC-32 Expansion Cabinet: 12.0 lbs [5.44 kg]

MODEL A2-EC-X EXPANSION CABINET

(Specify **Model A2-EC-8** (supports one additional instrumentation card) or **Model A2-EC-16** (supports two additional instrumentation cards) or **Model A2-EC-32** (supports four additional instrumentation cards).

Stackable expansion cabinets are added when two or more instrumentation cards are used. Up to 16 instrumentation cards (128 channels) can be used with one Model A2-MC Master Controller. Control and power are routed via the Model A2-MC-8 Controller.

MODEL A2 CONTROL AND MONITORING SOFTWARE

Recommended Browser (User Supplied): Internet Explorer version 6 or later, running under a Windows operating system (XP, Vista, and 7). A PC with Intel Pentium class, or better, processor (450 MHz or higher), 64 MB RAM and a 100 Base-T Ethernet interface is recommended.

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