

INTERTECHNOLOGY

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2100 System

Multi-Channel Signal Conditioner/Amplifier



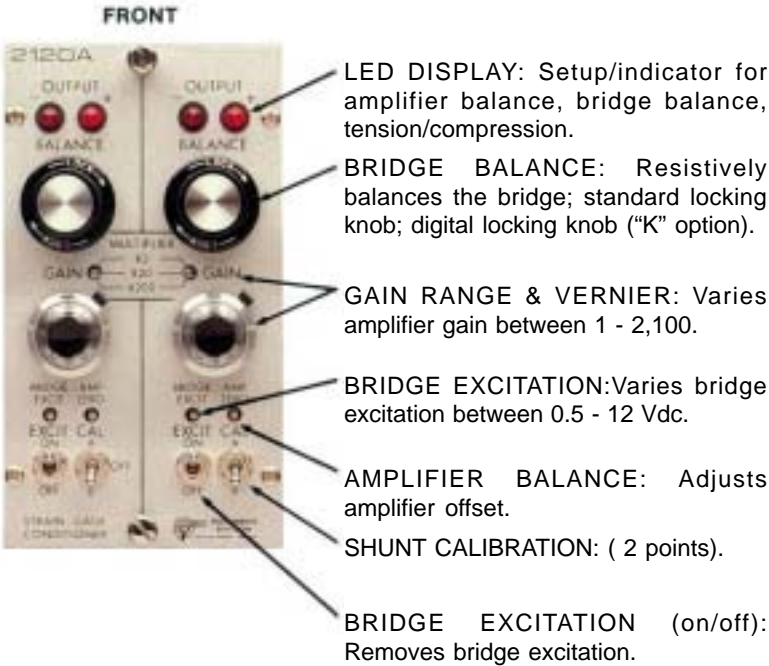
Eight-channel system
with digital output display

Conditions signals from strain gauges and transducers
when multiple-channel simultaneous dynamic
recording is required



Model 2120A Strain Gauge Conditioner/Amplifier

A two-channel plug-in amplifier module that includes bridge completion, bridge balance, amplifier balance, bridge-excitation regulator and shunt calibration.



LED DISPLAY: Setup/indicator for amplifier balance, bridge balance, tension/compression.

BRIDGE BALANCE: Resistively balances the bridge; standard locking knob; digital locking knob ("K" option).

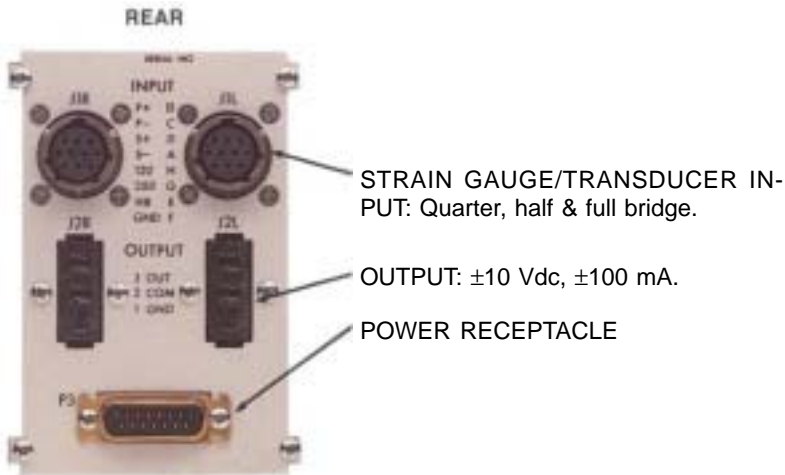
GAIN RANGE & VERNIER: Varies amplifier gain between 1 - 2,100.

BRIDGE EXCITATION: Varies bridge excitation between 0.5 - 12 Vdc.

AMPLIFIER BALANCE: Adjusts amplifier offset.

SHUNT CALIBRATION: (2 points).

BRIDGE EXCITATION (on/off): Removes bridge excitation.

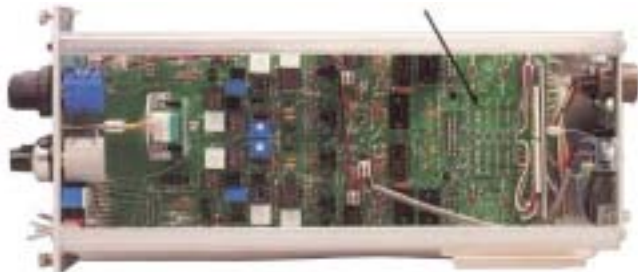


STRAIN GAUGE/TRANSDUCER INPUT: Quarter, half & full bridge.

OUTPUT: ±10 Vdc, ±100 mA.

POWER RECEPTACLE

SPECIAL PORTION OF PRINTED CIRCUIT BOARD FOR SHUNT CALIBRATION RESISTORS AND JUMPERS.



Specifications

These specifications apply for each of two independent channels per module.

INPUTS: Quarter (120Ω/1,000Ω & 350Ω), half and full bridge (50-1,000Ω).
Quarter-bridge dummy gauges provided.

BRIDGE EXCITATION: 0.5 to 12 Vdc (adjustable for each channel) with 120Ω full-bridge load.
Short-circuit current: < 40 mA.
Ripple, noise and 10% line change: ±2 mV max.
Load regulation: ±0.2% no-load to 120Ω load (10% line change).

BRIDGE BALANCE: ±2,000μe (quarter, half or 350Ω full bridge), range can be changed by internal jumper to ±4,000μe or ±6,000μe.

CALIBRATION: Two-position (center off) toggle switch.
Standard factory-installed resistors (±0.1%) simulate ±1,000μe at GF=2.

AMP GAIN: 1 to 2,100 continuously adjustable ±1%.

BANDPASS: DC to 5 kHz (min): -0.5 dB (-5%).
DC to 15 kHz: -3 dB.
Can be extended by internal jumper to:
DC to 17 kHz: -0.5 dB;
DC to 50 kHz: -3 dB.

AMP INPUT: Temperature Coefficient of Zero:
±1 μV/°C RTI*, ±210 μV/°C RTO**; -10° to +60°C (after 30 minute warm-up).

Noise RTI: (350Ω source impedance)

1μV p-p at 0.1 Hz to 10 Hz;

2μV p-p at 0.1 Hz to 100 Hz;

2 μVrms at 0.1 Hz to 50 kHz.

Noise RTO:

50μV p-p at 0.1 Hz to 10 Hz;

80μV p-p at 0.1 Hz to 100 Hz;

100 μVrms at 0.1 Hz to 15 kHz;

200 μVrms at 0.1 Hz to 50 kHz.

Input Impedance: > 100 MΩ (balance limit resistor disconnected).

Common Mode Rejection: (DC to 60 Hz).

Gain Multiplier	CMR (dB)
X2	67
X20	87
X200	100

Source Current: ±10 nA typical; ±40 nA max.

OUTPUT: ±10V (min at ±100 mA.)
Current Limit: 140 mA.

OPTIONAL FEATURE: May be ordered with, or be field upgraded for, remote-operation relays for control of shunt calibration and bridge excitation (off). Requires remote-operation capability in the Model 2150 or 2160. Contact Intertechnology Inc. for details.

SIZE: 5.25 H x 2.94 W x 10.97 D in (133 x 75 x 279 mm).

WEIGHT: 2.2 lb (1.0 kg).

*Referred to input

**Referred to output

All specifications in this bulletin are nominal or typical at +23°C unless noted.

Model 2110A Power Supply



BRIDGE-VOLTS METER: Used to set up/monitor bridge excitation, also line and power supply levels.

CHANNEL SELECTOR: AC monitors AC line input. DC monitors the power supplies. Positions 1-10 select and display bridge excitation for each channel.

POLIT LAMP: Indicates main power.

POWER SWITCH: Main power on-off.

EXTERNAL METER: Used with an external digital voltmeter to precisely adjust bridge excitation.

A plug-in module capable of powering up to ten channels (5 Model 2120A modules) at maximum rated voltage or current. Provides initial bridge and amplifier voltages. All supplies are current-limited against amplifier malfunction.

Specifications

OUTPUTS: $\pm 15V$ at 1.2A and +17.5V at 1.1A; all regulators current-limited against overload.

INPUT: 107, 115, 214, 230 Vac $\pm 10\%$ 50/60 Hz (selected internally).
Power: 40W typical, 100W max.

METER: 0 to 12 Vdc (with switch) to read bridge excitation. Also AC input and DC output go/no-go monitor.

SIZE: 5.25 H x 2.44 W x 12.34 D in (133 x 62 x 313 mm).

WEIGHT: 6.7 lb. (3.1 kg).

Model 2130/2131 Digital Display

A plug-in module that provides real-time digital readout on channel-by-channel basis. Will accept and switch up to 10 inputs. Peak hold/retention capability is provided with the Model 2131. (The Model 2131 is shown below).



BPEAK REST: Provides manual or automatic reset.

DIGITAL DISPLAY: 3-1/2 Digit LED, $\pm 1,999$ counts.

PEAK MODE ON: On/off switch.

PEAK MODE MAX/MIN: Selector for maximum or minimum peak mode.

CHANNEL SELECTOR: Positions 1-10 select input channel for display.

PILOT LAMP: Indicates main power.

POWER SWITCH: Main power on-off.

ATTENUATOR: Attenuates input signal to increase measurement range.

EXTERNAL: Front-panel jacks accept input, typically bridge voltage from 2110A external meter jacks.

Specifications

2130/2131 SPECIFICATIONS

INPUT

CAPABILITY: 10 channels, BNC (rear panel).
1 channel, banana jacks (front panel).

SWITCHED

OUTPUT: No attenuated, BNC (rear panel).

UPDATE RATE: 3 readings/sec, nominal.

INPUT VOLTAGE

RATE: $\pm 1,999$ mV (X1 range) - 2130/2131.
 $\pm 19,990$ mV (X10 range) - 2130.
 $\pm 10V$ (X10 range) - 2131.

INPUT

IMPEDANCE: 100 k Ω - 2130.
Greater than 1 M Ω - 2131.

COMMON MODE

INPUT RANGE: ± 100 mV (rear-panel input) min - 2130.
 $\pm 10V$ (rear-panel input) - 2131.

ACCURACY: $\pm(0.05\%$ reading +0.05% full scale) or better (Peak Mode Off - 2131).

SIZE: 5.25 H x 2.94 W x 10.97 D in (133 x 75 x 279 mm).

WEIGHT: 2 lb (0.8 kg).

2131 SPECIFICATIONS

STEP-INPUT

RESPONSE: ± 5 counts for 10 msec full-scale step input (worst case).

STORAGE

STABILITY: ± 3 counts/min (max).

PEAK MODES: MAX (usually positive) excursion and MIN (usually negative) excursion.

PEAK RESET: Manual or Automatic.

Model 2111 DC-Operated Power Supply

A plug-in module capable of powering up to eight channels (four Model 2120A modules) at maximum rated bridge voltage and output current, or up to ten channels when maximum bridge voltage and output current are not required. The 2111 functions similarly to the 2110A Power Supply, with the exception of the 12 Vdc nominal input which supports battery operation only. The front panel is similar in appearance to the Model 2110A.

Specifications

OUTPUTS:	$\pm 15\text{Vdc}$ at 1.0A and $+17.5\text{Vdc}$ at 1.0A; outputs are protected against overload.
INPUT:	12 Vdc nominal (9 to 18 Vdc range). Power: 60W max; 78% efficiency at full load. Reverse polarity protection: Internal shunt diode.
METER:	0 to 12 Vdc (with switch) to read bridge excitation.
SIZE:	5.25 H x 2.44 W x 12.34 D in (133 x 62 x 313 mm).
WEIGHT:	3.0 lb. (1.4 kg).

Model 2150 Rack Adapter, Model 2155 Enclosure, and Model 2160 Portable Enclosure

Model 2150: A prewired rack adapter which accepts one Model 2110A or 2111 and any combination of five Model 2120A, 2130 or 2131 plug-in modules. It has its own fuse and power cord and can be housed in any standard 19-in (483-mm) electronic equipment rack.

Model 2155: A sturdy cabinet (shown on front cover) for enclosing a complete eight- or ten-channel system for free-standing operation, while providing additional mechanical protection and increased portability. A Model 2150 is required.

Model 2160: A prewired, fused enclosure which houses one Model 2110a or 2111, one 2130 or 2131 and one 2120A module. A carrying handle ensures maximum portability. An additional snap-down bail support on the bottom can be used to elevate the 2160 for excellent work efficiency during bench-top operation. The Model 2160 (shown with the 2110A, 2131 and 2120A modules) would be substituted for the Model 2150 when two or four channels and maximum portability are required.



2150 FRONT



LINE CORD
FUUSE
AUXILIARY RECEPTACLE
2150 REAR



2160

Specifications

2150 SPECIFICATIONS

POWER:	2-ft. (0.6-m) 3-wire line cord; 10-ft. (3-m) extension available. Fuse: 1A size 3 AG (32 x 6.5 dia. mm). Receptacle to accept line cord from adjacent 2150 Rack Adapter.
SIZE:	5.25 H x 19 W x 14.17 D in (133 x 483 x 360 mm).
WEIGHT:	6.6 lb (3.0 kg).

2155 SPECIFICATIONS

SIZE:	5.25 H x 19 W x 13 D in (133 x 483 x 330 mm).
WEIGHT:	18.8 lb (9.5 kg).

2160 SPECIFICATIONS

SIZE:	5.55 H x 8.75 W x 13.80 D in (141 x 222 x 350 mm).
WEIGHT:	5.2 lb (2.4 kg).

MAXIMUM PERFORMANCE/MINIMUM COST

The demands of today's measurement applications are more exciting than ever before. An instrumentation system must provide durability and versatility; reliability with ease of operation; and economy with no sacrifice of accuracy.

The 2100 System was engineered with all of these requirements in mind, and to provide a durable, multi-channel signal conditioner/amplifier system capable of performing equally well in a wide variety of test applications and environments. And the 2100 System has proven itself through applications ranging from measurements on the ocean floor to testing of the space shuttle.

The 2100 System has become the standard by which others are measured for a broad range of signal conditioning applications.

Description

The 2100 System accepts low-level signals and conditions and amplifies them into high-level outputs suitable for multiple-channel simultaneous dynamic recording. The 2100 System is compatible with strip chart, magnetic tape and X-Y recorders, as well as the Measurements Group Model 2000 A/D Converter.

Strain gauge, load/pressure transducer and nickel temperature sensor inputs can be handled by the 2100 System without any rewiring. Thermocouples can also be accommodated.

An important design objective achieved is miniaturization of the system while maintaining adequate spacing around the front-panel controls. All operational controls are located on the front panel for maximum setup efficiency. Frequently used controls are finger-operated, while initial setup adjustments are made through the front panel with a screwdriver.

Continuously variable amplifier gain is achieved via a locking ten-turn concentric-dial counting knob, which permits resetting to a predetermined value for repeating routine tests.

A combination of integrated circuits and discrete components assures maximum performance and ease of service at the lowest possible price.

The Model 2130 or 2131 Digital Display expands the capabilities of the 2100 System to include direct channel-by-channel display of data. Peak hold/retention capability is provided with the Model 2131.

Configuration

A 2100 System consists of:

- One to five modules - Model 2120A Strain Gauge Conditioner/Amplifier (two channels/module).
- One Model 2110A or 2111 Power Supply.
- One Model 2150 Rack Adapter (Model 2155 Enclosure optional).

- OR -

- One or two modules - Model 2120A Strain Gauge Conditioner/Amplifier (two channels/module).
- One Model 2110A or 2111 Power Supply.
- One Model 2160 Portable Four-Channel Enclosure.

Optional

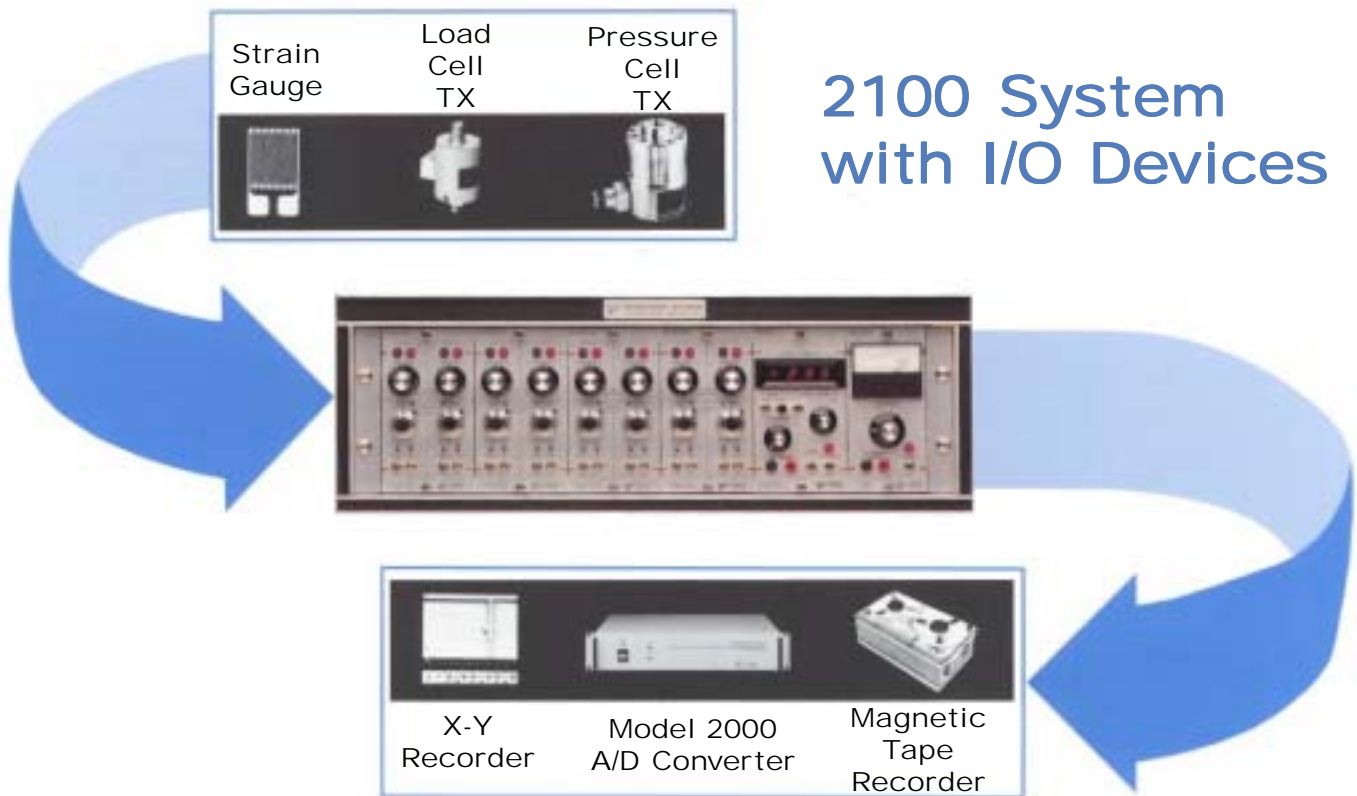
- Remote operation of shunt calibration and excitation (on/off).
- One Model 2130 Digital Display (replaces one 2120A module).

- OR -

- One Model 2131 Digital Display (replaces one 2120A module).

Features

- Accepts full, half or quarter bridges; all bridge-completion gauges built in, including 120/1,000- and 350- Ω dummies.
- Fully adjustable and regulated bridge excitation on each channel; up to 12 Vdc by front-panel control.
- Continuously variable amplifier gain up to 2,100 by front-panel control
- Separate bridge-power switch.
- Output 10 Vdc at 100 mA, short-circuit-proof and current limiting standard.
- LED null indicators provided on each channel to indicate amplifier and bridge-balance condition.
- High stability with temperature and time.
- Frequency response up to 50 kHz.
- Direct channel-by-channel display of data, with optional peak hold/retention capability.



The 2100 System provides better data . . .

A **separate bridge power switch** removes bridge excitation, enabling the operator to detect unwanted signals due to electrical interference and/or noise, thermocouple effects and shifts of the instrument zero during a long-term test. This feature is an absolute must for dynamic testing and for validating test results.

An **adjustable bridge excitation control** on each channel permits excitation to be set as specified by the strain gauge or transducer manufacturer. It also allows for any special consideration which may be dictated by the test material; for example, the poor thermal conductivity normally associated with plastics.

In addition to adjustable bridge excitation, each channel has its own **regulator circuit**. This prevents interaction of adjacent channels during setup or operation.

Each channel has a **continuously variable gain control**. In combination with recommended excitation, the independent gain control can provide a large output signal so that small signals can be resolved without overpowering the strain gauge or transducer.

An **LED display for each channel** gives positive indication of amplifier or resistive balance. This capability accelerates setup, minimizes the risk of destroying galvanometers and verifies tension/compression loading.

Easily read **reference marks** on the setup meter indicate acceptable line voltage and proper operation of internal power supplies.

A switch contained in the Model 2110A Power Supply allows adjustment when the **line voltage** is too high or too low.

The 2100 System provides **true quarter-bridge, three-leadwire capability**, including internal dummies and sufficient plug connections for remote shunt calibration.

A convenient network in the Model 2120A Strain Gauge Conditioner/Amplifier **allows the operator to change the factory-supplied shunt values**, as well as shunt any arm of the bridge, as required.