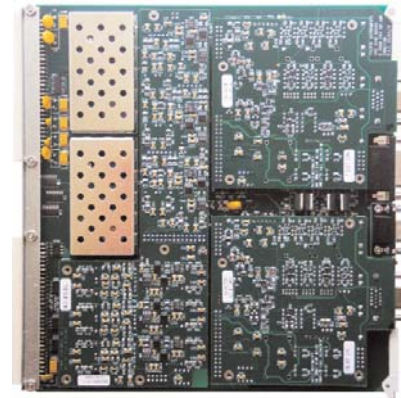


The 6068 is a two-channel signal conditioning amplifier-digitizer module featuring 100 kHz bandwidth and both digitized and analog outputs. The base board contains both constant voltage with remote sensing and constant current programmable excitation supplies, high-bandwidth instrumentation amplifier with programmable step and variable gain, continuously programmable six-pole low-pass filter and dual buffered outputs. A plug-on module configures the base board for multiple types of transducers including voltage, full and partial bridge, voltage output charge (IEPE) and charge output piezoelectric.

The input and excitation are isolated from the outputs, power and control interface. This gives the user complete freedom to ground the input without creating ground loops that introduce noise and offset errors. It also provides up to 300 Volt common mode operating voltage.

The differential instrumentation amplifier has programmable gains from 1 to 5,000 and automatic zero. The two analog outputs and the digitized output may be selected independently for wideband or filtered response. The digital output is provided by a successive approximation ADC at up to 200K samples per second providing excellent time alignment between channels. Voltage substitution using an external source that is distributed to all channel inputs provides traceable gain calibration.



FEATURES

- **Plug-in module configures channel for multiple transducer types and calibration modes**
- **Voltage & current excitation with remote sensing**
- **Isolated excitation and input**
- **300 Volts common mode**
- **Gains 1 to 5,000**
- **100 kHz bandwidth, 200K samples per second**
- **Voltage and shunt calibration**
- **High-level analog outputs**

FUNCTION CARDS

The 6068 uses a plug-in module to configure the input of each channel for a particular type of transducer or specific type of calibration. Modules can be easily modified or created to handle special customer requirements. The more popular modules are described here and include those for AC and DC coupled voltage, full and partial bridges, and IEPE or piezoelectric charge.

BRIDGE MODULES

The bridge input is eight or ten-wire shielded accommodating even the most complex transducer wiring schemes. The base board provides both programmable constant voltage with remote sensing and constant current excitation. Programmable completion is provided on the bridge module for quarter, half and full bridge transducers. Automatic bridge balance accommodates large unbalances without limiting dynamic range or loading the transducer output. It can be used to provide voltage offsets in the hundreds of millivolts for non-bridge transducers such as MEMS and variable capacitance.

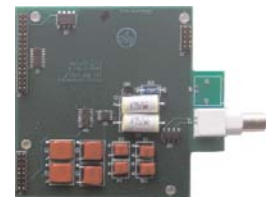


FC1 Bridge Module

The capability is provided for up to four-steps of bipolar resistive shunt calibration or DAC shunt calibration that provides 4096 calibration steps using a single calibration resistor. The FC1 Bridge Module shown has four steps of unipolar resistance shunt that can be applied to either an external bridge arm or strain gage or to the internal completion resistor. This module may also be used to apply low-level voltage inputs to the instrumentation amplifier on the base board.

IEPE MODULES

The IEPE module is for piezoelectric and other transducers with built-in electronics and a voltage output. It provides constant current excitation to the transducer that is programmable from 1 to 20 mA with 26 Volt compliance. The output of the transducer is AC coupled to the input of the instrumentation amplifier on the base board.



FC4 IEPE Module

CHARGE MODULES

The Charge Amplifier module accepts charge signals from piezoelectric transducers. It has two charge ranges that accommodate most charge transducers and applications. Other customer specified ranges can be provided. It has programmable time constant that can be made long or short as required and a two frequency four-pole high-pass filter between the charge amplifier output and the input to the instrumentation amplifier on the base board. The filter is used to eliminate noise such as cable whip. The filter may be bypassed for quasi-DC measurements.



FC9 Charge Amplifier

ORDERING INFORMATION

- | | |
|----------|---|
| 6068 | Two-channel transducer amplifier, 100 kS/s, requires function card. |
| 6068-FC1 | Function card: Bridge, four-step shunt. |
| 6068-FC4 | Function card: IEPE, AC coupled voltage. |
| 6068-FC9 | Function card: Charge, piezoelectric. |
- Consult Sales or web site for additional function cards*

SPECIFICATIONS

CONSTANT VOLTAGE EXCITATION

Voltage.....	Programmable from 0.1 to 20 Volts with 0.5 mV resolution. Calibrated 2-Volt steps $\pm 0.1\%$.
Current.....	50mA limited to 70mA maximum.
Regulation	Each channel individually regulated. $\pm 0.01\%$ over input voltage range and no-load to full-load.
Stability	$\pm 0.01\%$ for 30 days. Temperature coefficient less than $\pm 0.005\%/^{\circ}\text{C}$
Noise	200 μV peak-to-peak, DC to 10 kHz
Monitor	Excitation voltage or current is read by a program instruction. Accuracy is $\pm 0.2\%$.

CONSTANT CURRENT EXCITATION

Output Range.....	Programmable 0.1mA to 51.2 mA with 1 μA resolution. Calibrated 5 mA steps $\pm 0.1\%$.
Compliance	0.1 to 20 Volts minimum.
Regulation	$\pm 0.01\%$ or $\pm 0.1\mu\text{A}$ for 10% line change.
Noise	2 μA or 5 μV peak-to-peak DC to 10 kHz.
Stability	$\pm 0.01\%$ or $\pm 2 \mu\text{A}$ for 30 days. Temperature coefficient is less than $\pm 0.005\%$ or $\pm 1 \mu\text{A}/^{\circ}\text{C}$.
Monitor	Excitation voltage or current is read by a program instruction. Accuracy is $\pm 0.2\%$.

AMPLIFIER

Input	$\pm 2 \text{ mV}$ to $\pm 10 \text{ Volts}$ full scale, DC or AC coupled.
Gain.....	Programmable from 1 to 5,000 with 0.05% resolution.
Gain Steps.....	Sixteen calibrated gain steps are provided: 1, 2, 3, 5, 10, 20, 30, 50, 100, 200, 300, 500, 1,000, 2,000, 3,000 and 5,000 with $\pm 0.05\%$ accuracy.
Gain Stability	$\pm 0.01\%$ for 30 days, $\pm 0.005\%/^{\circ}\text{C}$.
Linearity.....	$\pm 0.01\%$ for gains < 1000, $\pm 0.02\%$ gain 1000, and above
Input Impedance ..	50 Megohms, shunted by 500 pF DC coupled, 100K Ohms AC coupled.
Input Protection ..	$\pm 50 \text{ Volts}$, differential without damage.
Common Mode	60 dB plus gain in dB to 120 dB for balanced input and 110 dB for a 350 Ohm source unbalance, DC to 60 Hz.
CM Voltage.....	$\pm 300 \text{ Volts}$ operating, $\pm 350 \text{ Volts}$ without damage.
Zero.....	Automatic zero to $\pm 2 \mu\text{V}$ RTI or $\pm 1.0 \text{ mV}$ RTO whichever is greater.
Zero Stability	$\pm 5 \mu\text{V}$ RTI, $\pm 1\text{mV}$ RTO at constant temperature, $\pm 1 \mu\text{V}$ RTI, $\pm 0.2 \text{ mV}$ RTO/ $^{\circ}\text{C}$.
Source Current.....	$\pm 25 \text{ nA}$, $\pm 0.05 \text{ nA}/^{\circ}\text{C}$.
Noise (10 kHz)	2.0 μV RTI plus 0.3 mV RTO, RMS.
Bandwidth	100 kHz (-3 dB) for gains 1 to 1,000, 50 kHz (-3 dB) for gains above 1,000.
Overload Recovery	120 μs to within $\pm 0.1\%$ for a 10 times overload to $\pm 10 \text{ Volts}$.
Output	Two $\pm 10 \text{ Volt}$ full scale outputs. Each may be programmed for filtered or wideband response.

FILTER

Type.....	Six-pole, low-pass Bessel (36dB/octave). Other filter responses are available.
Frequency	Continuous programmable filter frequency from 4 Hz to 30 kHz with 1 Hz resolution below 1 kHz and 10 Hz resolution above 1 kHz and wideband.

ANALOG-TO-DIGITAL CONVERTER

Sample.....	$\pm 50 \text{ nS}$ channel-to-channel time correlation.
Resolution	16 bits, two's complement output.
Rate	Programmable up to 200 kS/s per channel.
Linearity	$\pm 1\frac{1}{2}$ LSB ($\pm 0.004\%$)
Continuity.....	Monotonic to 15 bits.

GENERAL

Mounting.....	Occupies one slot in Series 6000 enclosures.
Temperature.....	0°C to $+50^{\circ}\text{C}$ operating.

BRIDGE FEATURES CARD (FC1)

Input

Bridge	2 to 10 wire plus shield; input (2), excitation (2), sense (2) and shunt calibration (4). Programmable bridge completion for half bridges and 120 Ohm and 350 Ohm quarter bridges. Other gage resistances by request.
Bridge Balance.....	Automatic by program control. Balance accuracy $\pm 0.05\%$ of range, $\pm 1 \text{ mV}$ RTO. Stability $\pm 0.02\%$ for 8 hours, $\pm 0.005\%/^{\circ}\text{C}$.

Calibration

Shunt	Four steps of unipolar resistive shunt (8-wire). Four-step bipolar resistive shunt (10-wire) is optionally available. Jumpers provided for 4 and 6-wire connections and for shunting the internal completion resistor.
Voltage.....	Voltage substitution, signal from external calibration source is applied to the amplifier input
Zero Calibration	Amplifier input disconnected and shorted for zero calibration.

IEPE FEATURES CARD (FC4)

Input

Configuration	Voltage input, AC-coupled, 2-wire with shield.
Excitation	Current source 1 to 20 mA programmable in 1 mA $\pm 1\%$, steps.
Input Impedance ...	100K Ohms.
Input Protection	$\pm 30 \text{ Volts}$ without damage.
Calibration	Voltage substitution, signal from external calibration source is applied to the amplifier input

CHARGE FEATURES CARD (FC9)

Input

Charge.....	Two ranges: 1 mV/pC (high) and 0.1 mV/pC (low).
Gain Range.....	0.05 mV/pC to 2,500 mV/pC with 0.05% resolution.
Gain Steps.....	Calibrated gains of 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1,000, 2,000, and 5,000 mV/pC with $\pm 0.1\%$ accuracy.
Stability.....	$\pm 0.005\%/^{\circ}\text{C}$.
Linearity	0.1% of full scale at 1 kHz.
Noise (10 kHz).....	0.02 pC RMS plus 0.006 pC RMS per 1000 pF of source capacitance referred to input.
Max. Input.....	200,000 pC on low range (0.05 to 250 mV/pC), 20,000 pC on high range (0.5 to 2,500 mV/pC) without charge converter overload.
Overload Flag.....	Overload flag set when output of charge converter exceeds full scale.
O.L. Reset	Program command provides recovery when using long time constants.
Filter	Four-pole, high-pass with programmable frequencies of 10 Hz and 30 Hz. Bypass provides high-pass response less than 0.5 Hz.
Source Imped.	Less than 30,000 pF. Greater than 10 Meg Ohms
Input Protection	$\pm 30 \text{ Volts}$ common mode without damage.

Calibration

Charge Cal.....	Signal from external calibration source applied through a 2,000 pF capacitor to the charge input and calibrated to $\pm 0.1\%$.
Charge Test.....	Signal from external calibration source applied in series with the input transducer for testing transducer, cable, connections and amplifier.

CALIBRATION SOURCE

Input	Differential, 2-wire with shield. Located on the rear panel of enclosure.
Attenuator.....	Programmable 1, 0.1 and 0.01, attenuation with $\pm 0.01\%$ accuracy. Attenuator output may be connected to bus for verification.