MODEL 6068
2-Channel Transducer Amplifier-Filter-Digitizer, 300CMV

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, 4 Hz to 30 kHz, 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 DC or AC input coupling, 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 substation using an external source that is distributed to all channel inputs provides traceable gain calibration.

FEATURES 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

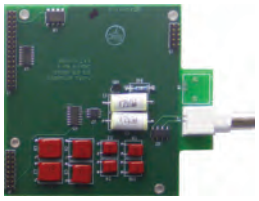
Depending on the function card selected the capability is provided for up to four-steps of bipolar resistive shunt calibration or DAC shunt calibration that provides 4096 calibration steps using a single calibration resistor. The FC1 Bridge Module shown has four steps of unipolar resistance shunt that 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.

FEATURES

- **Plug-in module configures channel for multiple transducer types & calibration modes**
- **Voltage & current excitation with remote sensing**
- **Isolated excitation & input with 300 Volts common mode**
- **Voltage & shunt calibration**
- **Gains 1 to 5,000 with 100kHz bandwidth**
- **Up to 200kS/s per channel with 16-bit resolution**
- **Continuously programmable 6-pole low pass filter**
- **Dual buffered 10 Volt analog outputs**

IEPE MODULES

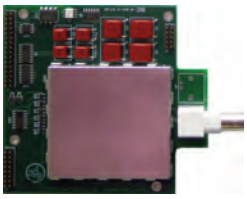
The IEPE module is for piezoelectric and other transducers with built-in electronics and a voltage output. It provides constant current excitation to the transducer that is programmable from 1 to 20 mA with 26 Volt compliance. The output of the transducer is AC coupled to the input of the instrumentation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

FEATURES CARDS ORDERING INFORMATION

6068-FC1.....Features Card: Bridge, 4-step shunt.
6068-FC2.....Features Card: Bridge, single-step shunt.
6068-FC3.....Features Card: Bridge, DAC shunt.
6068-FC4.....Features Card: IEPE, AC coupled voltage.
6068-FC5.....Features Card: 4-20mA.
6068-FC8.....Features Card: RTD.
6068-FC9.....Features Card: Charge, piezoelectric.

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PACIFIC INSTRUMENTS
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INPUT

Configuration .....Input configuration based on installed Features Cards. Features cards available for Bridge, IEPE, Charge and RTD. Other features cards available upon request.

BRIDGE INPUT W/ FC1 FEATURES CARD

Bridge Configuration ..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 ±0.05% of range, ±1 mV RTO. Stability ±0.02% for 8 hours, ±0.005%/°C.

IEPE INPUT W/ FC4 FEATURES CARD

IEPE Configuration ...Voltage input, AC-coupled, 2-wire with shield.

IEPE Excitation.....Current source 1 to 20 mA, set for 6 mA.

IEPE Input Impedance..100K Ohms.

IEPE Input Protection ..±30 Volts without damage.

CHARGE MODE INPUT W/ FC9 FEATURES CARD

Charge Configuration...Two ranges: 1 mV/pC (high) and 0.1 mV/pC (low).

Charge Gain Range...0.05 mV/pC to 2,500 mV/pC with 0.05% resolution.

Charge 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 ±0.1% accuracy.

Charge Stability .....±0.005%/°C.

Charge 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.

Charge Calibration ....Signal from external calibration source applied through a 2,000 pF capacitor to the charge input and calibrated to ±0.1%.

Charge Test.....Signal from external calibration source applied in series with the input transducer for testing transducer, cable, connections and amplifier.

VOLTAGE EXCITATION / TRANSDUCER POWER

Voltage Excitation ..Programmable from 0.1 to 20 Volts with 0.5 mV resolution. Calibrated in 2-Volt steps ±0.1%. 50mA limited to 70mA maximum.

Voltage Regulation....Each channel individually regulated. ±0.01% over input voltage range and no-load to full-load.

Voltage Exc Stability ..±0.01% for 30 days. Temperature coefficient less than ±0.005%/°C

Voltage Exc Noise ....200 µV peak-to-peak, DC to 10 kHz

Voltage Monitor ....Excitation voltage or current is read by a program instruction. Accuracy is ±0.2%.

CURRENT EXCITATION / TRANSDUCER POWER

Curent Excitation ..Programmable 0.1mA to 51.2 mA with 1 µA resolution. Calibrated 5 mA steps ±0.1%.

Compliance .....0.1 to 20 Volts minimum.

Current Regulation ..±0.01% or ±0.1µA for 10% line change.

Current Exc Noise....2 µA or 5 µV peak-to-peak DC to 10 kHz.

Current Exc Stability ..±0.01% or ±2 µA for 30 days. Temperature coefficient is less than ±0.005% or ±1 µA/°C.

Current Monitor ....Excitation voltage or current is read by a program instruction. Accuracy is ±0.2%.

AMPLIFIER

Input Range.....±2 mV to ±10 Volts full scale, DC or AC coupled.

Gain.....Programmable from 1 to 5,000 with 0.05% accuracy.

Gain Stability .....±0.01% for 30 days, ±0.005%/°C.

Gain Linearity.....±0.01% for gains < 1000, ±0.02% gain 1000, and above

Input Impedance ..50 Megohms, shunted by 500 pF DC coupled, 100K Ohms AC coupled.

Input Protection ....±50 Volts, differential without damage.

Common Mode.....74 dB plus gain in dB to 120 dB for balance input and 110 dB for a 350 Ohm source unbalanced, ±300 Volts, DC to 60Hz..

CM Voltage.....±300 Volts operating, ±350 Volts without damage.

Zero .....Automatic zero to ±2 µV RTI or ±1.0 mV RTO whichever is greater.

Zero Stability .....±5 µV RTI, ±1mV RTO at constant temperature, ±1 µV RTI, ±0.2 mV RTO/°C.

Source Current .....±40 nA, ±0.05 nA/°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. Slew rate is 5 V/µS.

Overload Recovery....120 µS to within ±0.1% for a 10 times overload to ±10 Volts.

Analog Output .....Two ±10 Volt full scale outputs. Accuracy is ±0.05%. Each may be programmed for filtered or wideband response.

FILTER

Type.....Six-pole, low-pass Bessel (36dB/octave).

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.

Other .....Other filter characteristics and cut offs available.

DIGITIZER

Sample.....±50 nS channel-to-channel time correlation.

Resolution .....16 bits, two's complement output.

Rate .....Programmable up to 200 kS/s per channel.

Linearity .....±1½ LSB (±0.004%)

Continuity .....Monotonic to 15 bits.

Alarms.....Two alarms each with upper and lower limits that are programmable from negative to positive full scale. Limits checked on each ADC sample.

CALIBRATION

Voltage Subst.....Voltage substitution, signal from external calibration source is applied to the amplifier input. Programmable attenuator with steps of 1, 0.1 and 0.01, ±0.02% accuracy. Output of the attenuator is provided for calibration.

Zero.....Amplifier input disconnected and shorted.

Shunt Calibration ...Shunt Calibration based on capability of Installed Features Card FC1: 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.

MECHANICAL

Mounting .....Occupies one slot in Series 6000 enclosures.

Connectors.....Bridge Inputs are 15-pin and Charge/IEPE are BNC. Outputs are 9-pin Type D. Mating connectors supplied for bridge input.

Temperature.....0°C to +50°C operating.

ACCESSORIES

6087-6060 .....Test Fixture. Attached to the test connector on the 6068 module it provides test points for: Transducer input, amplifier input, shunt calibration, excitation output, excitation sense and amplifier output.

ORDERING INFORMATION

6068-PF4/30K-BE6.....2-Ch Transducer Amp, PF 4Hz-30kHz 6-Pole Bessel.

6068-PF4/30K-BU6.....2-Ch Transducer Amp, PF 4Hz-30kHz 6-Pole Butterworth

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