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Bridge Transducer Signal Conditioner

ENDEVCO MODEL 4430A

Model 4430A

- **Manual or IEEE 488 Computer-Controlled**
- **100 KHz Bandwidth**
- **300 V Common Mode Rejection**
- **Automatic and Manual Bridge Balance and Amplifier Zero**
- **0.1% Gain Accuracy**



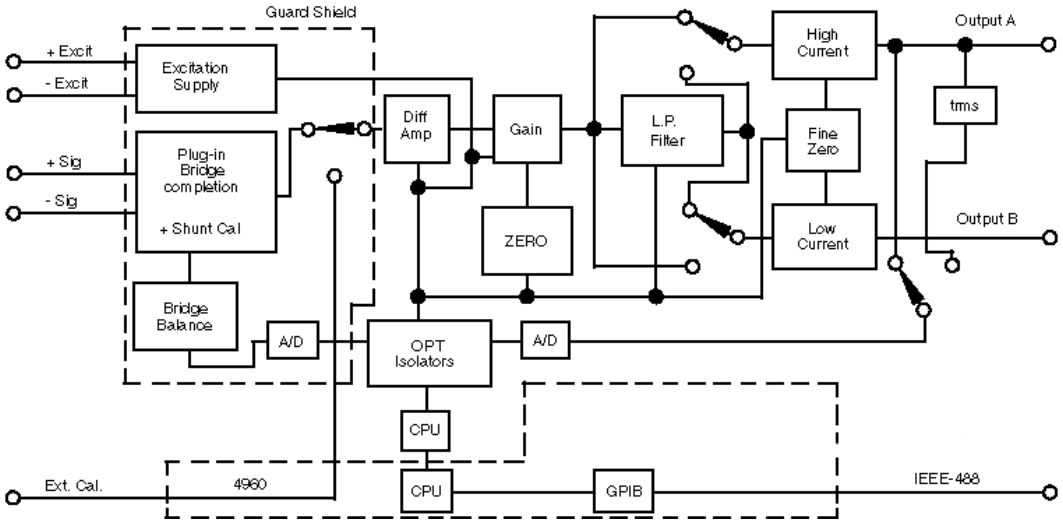
DESCRIPTION

The ENDEVCO® Bridge Transducer Signal Conditioner Model 4430A can be used with any of the bridge-type transducers, such as pressure gages, strain gage potentiometers and ISOTRON® type accelerometers.

The Model 4430A Ultra Low Noise Programmable Bridge Signal Conditioner provides: Amplifier gain (1 to 1000 or 1 to 10 000 for 4430A-1); a low pass filter (selectable from 10 Hz to 30 kHz); isolated, programmable voltage excitation (0.100 to 15.000 Vdc in 5 mV steps); programmable current (0.5 mA to 100 mA in 0.1 mA steps); bridge balancing, amplifier zeroing (to within less than 1 mV RTO); and calibration modes. The unit can perform both automatic and manual amplifier zeroing and bridge balancing.

All functions can be manually programmed from the front panel by means of EDIT keys, two MENU SELECT keys, an LED bar graph (MENU and LEVEL indicator), and an ENTER key. All setups are verified on the five-character alpha numeric LCD display.

Optional IEEE-488 programmability is provided by the ENDEVCO Model 4960A Rack, which can house up to ten Model 4430A units. The optional power pack (P/N 4961) provides stand-alone, single-channel, front panel operation of the 4430A.



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ENDEVCO
MODEL
4430A

Bridge Transducer Signal Conditioner

SPECIFICATIONS

INPUTS

SIGNAL INPUT	True differential input; programmable AC or DC coupling
MAXIMUM INPUT VOLTAGE	± 50V differential and ± 300 V common mode (DC or AC pk)
Input Impedance	DC Coupled, 50 MΩ, minimum AC Coupled, 1 MΩ, typical
Common Mode Rejection Ratio	120 dB minimum, DC to 60 Hz for Gain ≥ 100
Common Mode Voltage	300 Vdc or AC peak maximum operating
Maximum Conductors	9 conductors for full, half or quarter bridge devices
EXTERNAL CALIBRATION	The differential input can be switched to the Calibration Voltage Input

OUTPUTS

EXCITATION	Programmable on/off. Programmable constant current or constant voltage excitation
Constant Voltage	Plug-in module must be present to enable excitation
Voltage Range	0.100 to 15.000 Vdc minimum in 5 mV steps ± 5 mV accuracy
Compliance Current	100 mA minimum
Short Circuit Current Limit	130 mA typical
Voltage Regulation	≤ ± 0.01% or ± 250 µV for 10% line charge ≤ ± 0.02% or ± 500 µV for no load to full load
Voltage Stability	≤ ± 0.01% or ± 500 µV for 8 hours after a 1 hour warm-up; ± 100 µV/°C
Voltage Noise	≤ 300 µV pk-pk (0.1 Hz to 20 kHz)
Remote Sense	Sense current is < 0.1 mA
Constant Current	
Current Range	0.5 to 100 mA DC in 0.1 mA steps ± 0.1 mA accuracy
Compliance Voltage	15 V minimum
Current Regulation	≤ ± 0.01% or ± 0.1µA for 10% line variation
Current Noise	≤ 2 µA, or 5 µV pk-pk referenced to 350 Ω bridge (0.1 Hz - 20 kHz)
Current Stability	≤ ± 0.01% of the excitation, or ± 2 µA for 8 hours; 1 µA/°C
SIGNAL OUTPUTS A AND B	Short-circuit protected
Linear Current Range (Output A)	80 mA, minimum. Current limited at 110 mA
Linear Current Range (Output B)	10 mA, minimum. Current limited at 20 mA
Output Resistance	≤ 0.5 Ω
Output Zero Stability	≤ ±5 µV RTI, or ± 500 µV RTO for 8 hours after a 1 hour warm-up
Residual Noise (with 350 Ω bridge)	≤ 1 µV pk-pk RTI plus 1 mV pk-pk RTO (0.1 - 10 Hz) ≤ 7 µV RMS RTI plus 0.6 mV RMS RTO (10 Hz- 100 kHz)
AMPLIFIER ZERO	Performed whenever there is a change in gain, filter, or coupling change
Accuracy	≤ ± [1 µV RTI +1 mV RTO]
Manual Zero Resolution	±20 µV resolution RTO typical
BRIDGE BALANCE	
Range	Up to 10 Vdc for gains ≥ 1 and < 10 Up to 1.0 Vdc for gains ≥ 10 and < 100 Up to 100 mVdc for gains ≥ 100
Accuracy	≤ ± [1µV RTI and 1mV RTO] when "ABEXE" is performed
Manual Balance Resolution	± 2.50 µV RTI for gains ≥ 1 but < 10 ± 0.25 µV RTI for gains ≥ 10 but < 100 ± 0.025 µV RTI for gains ≥ 100
Stability	± 5 µV RTI or ± 500 µV RTO for 8 hours after a 1 hour warm-up and source resistance ≤1 KΩ

TRANSFER CHARACTERISTICS

AMPLIFIER GAIN	
Range	1 to 1000 (1 to 10 000 for -1 option)
Accuracy	± 0.1% of setting, maximum
Linearity	± 0.005% of F.S., best fit straight line at DC
Gain Sensitivity to Line Voltage	± 0.01%, of F.S. maximum
FREQUENCY RESPONSE	
Filters Bypassed (wideband)	DC to 100 kHz (100 kHz -3 dB minimum)
AC Coupling (wideband)	2 Hz to 100 kHz; -3 dB minimum
LOW PASS FILTER CHARACTERISTICS	
Filter Type	4 pole Low Pass Butterworth (24 dB/octave slope)
Corner Frequency (-3dB)	Programmable from 10 Hz to 10 kHz in 5 Hz steps and two fixed corner filters at 20 kHz and 30 kHz
PHASE	Non-inverting DC to 1 kHz, < 2°; 1 kHz to 10 kHz, < 5°
ISOLATION	
Differential Sensor Inputs to Signal Output	≤ 1.0 pF
Sensor Inputs to Output Ground	≥ 1000 MΩ
Sensor Inputs to AC Power Line	≥ 1000 MΩ
Input Ground to Output Ground	≥ 1000 MΩ
Guard Shield to Output Ground	≥ 1000 MΩ at 60 Hz

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SPECIFICATIONS Continued

OPERATING MODES (continued)

QUERY/PROGRAMMING STATE

The Programming state allows for manual programmability and querying of the programmable functions (listed next to LED bar graph: Input Selection, Shunt Calibration, Excitation, Vexc Level, Iexc Level, Auto-Balance, Auto-Zero, Manual Balance, Manual Zero, Low Pass, Monitor, Store, Recall, Address, Error List).

This state is activated by pressing any of the keys on the front panel. The ENTER key selects the “Input Sel” function (at the top of the bar graph). The UP/DOWN MENU SELECT keys selects the next function (up/down correspondingly) that was last selected. Any of the four EDIT keys selects the function that was last selected.

A function is queried by selecting it on the LED bar graph using the UP/DOWN MENU SELECT keys (located next to the ENTER key on the front panel). The current setting for the selected function is displayed on the LCD display. The entry in the LCD display is edited by using the four EDIT keys (located just below the LCD display).

The new setting will be implemented into the unit hardware whenever the ENTER key or the UP/DOWN MENU SELECT keys are pressed. The unit returns to the Monitoring or No-Monitoring state by pressing the ENTER key.

“INPUT SEL”

This setup menu provides an Amplifier’s input selection. The up-down EDIT keys scroll the LCD display through the available choices, which are:

"AC"	Amplifier's input routed to sensor (±S) with AC coupling (high pass filter at amplifier's input enabled).
"DC"	Amplifier's input routed to sensor (±S) with DC coupling (high pass filter at amplifier's input disabled).
"EXCAL"	Amplifier's input routed to the external calibration input (sensor disconnected).
"ISHRT"	Amplifier's input shorted to ground (P-) (sensor disconnected).
"PSEN"	Amplifier's input routed to the excitation sense lines (±PSEN) (sensor disconnected).

“GAIN”

This menu selection provides for programming of the amplifier’s gain from 1 to 1000 (10 000 for -1 option). The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number.

“FILTER”

This menu selection provides for selection of one of three available low pass filters to be routed to the amplifier’s outputs. The up-down EDIT keys scroll the LCD display through the available choices:

“LP30K"	30 KHz fixed enabled
"LP20K"	20 KHz fixed enabled
"LPRG"	Programmable filter enabled
"NONE”	All filters disabled

“LOW PASS”

This menu selection provides for setting the filter -3dB corner frequency of the programmable low pass from 10 Hz to 10 000 Hz in 5 Hz steps. The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number.

“EXC”

This menu selection chooses constant voltage, constant current or no excitation. When EXC is selected, the bar graph LED labeled “EXC” will light and constant voltage, “VOLTS”, or constant current, “AMPER”, or excitation supply disable, “ OFF” is displayed on the LCD display. Pressing the up-down EDIT keys selects “VOLT” or “AMPER” or “OFF” on the LCD display.

“V LEVEL”

This menu selection provides for setting the voltage level of the constant voltage excitation supply from 0.100 to 15.000 volts in 0.005 V steps. The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number. The new setting will be implemented into the unit hardware as soon as the level displayed on the LCD display is modified (no need to press the ENTER or MENU SELECT keys).

“I LEVEL”

This menu selection provides for setting the constant current excitation supply from 1.0 to 100.0 mA in 0.1 mA steps. The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number. A new setting is implemented into the unit hardware as soon as the level displayed on the LCD display is modified (no need to press the ENTER or MENU SELECT keys).

“AUTO BAL”

This menu selection provides three choices for auto balancing of the bridge. Auto balance is accomplished by leaving the amplifier’s differential input connected to the sensor while setting the DC offset of output A to zero. When “Auto Bal” is selected, “ABEXE”, "ON" or "OFF" is shown on the LCD display. The unit will perform an auto balance when "ABEXE" is displayed and left-right EDIT keys are pressed. If the auto balance is successful, the LCD display will show "PASS" and the setting will default to "ON", otherwise the LCD will show "FAIL". While in the auto balance "ON" mode, the calculated value for the balance offset will be used for all future Auto Zero operations. The "OFF" state does not keep the sensor balance. The auto balance is set to "OFF" after any coupling change.

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ENDEVCO
MODEL
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Bridge Transducer Signal Conditioner

SPECIFICATIONS Continued

OPERATING MODES (continued)

"MAN BAL"
This menu selection provides a manual balance with a range count of ± 2047. This count is reset to zero (0) whenever an auto balance is implemented. The RTI offset adjustment represented by one (1) count is dependent on the amplifier's gain:

Amplifier's Gain	Offset Adjustment (RTI) of 1 count
1 to 9	2.500 µVdc
10 to 99	0.250 µVdc
100 to 1000	0.025 µVdc

The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number.

"AUTO ZERO"
This menu selection provides three choices for amplifier auto zero. Auto Zero is accomplished by connecting the amplifier's differential input to ground (P-) while setting the DC offset of output A to zero. When "Auto Zero" is selected, "AZEXE," "ON" or "OFF" is shown on the LCD display. The unit will perform an auto balance when "AZEXE" is displayed and the left or right EDIT keys are pressed. If the auto balance is successful the LCD display will show "PASS" and the setting will default to "ON", otherwise the LCD display will show "FAIL". While in the Auto Zero "ON" mode, Auto Zero will be performed after every gain, coupling or filter change. Selecting "OFF" disables the Auto Zero operation.

"MAN ZERO"
This menu selection provides a manual balance with a overall range count of 256. This count is reset to zero (0) whenever an auto zero is implemented. The positive and negative range around zero is not symmetrical and it will change whenever an auto zero is implemented, but the total count (from lowest number to highest number) will always be 256. The RTO offset adjustment represented by one (1) count is 20 µV. The left-right EDIT keys select the number position in the LCD display, and the up-down EDIT keys increment or decrement the selected number.

"STORE"
This menu selection provides for storage of 1 to 9 unit setups. The up-down EDIT keys scroll the LCD display through the available choices: 1 through 9 and "NO" option as default. Pressing ENTER or the UP/DOWN MENU SELECT keys stores the current unit setup into Non-Volatile Memory under the setup number selected on the digital display.

"RECALL"
This menu selection provides for recalling of 0 to 9 unit setups (0 is the default factory setting). The up-down EDIT keys scroll the LCD display through the available choices: 1 through 9 and "NO" option as default. Pressing ENTER or the UP/DOWN MENU SELECT keys recalls the unit setup from Non-Volatile Memory and re-configures the unit hardware to the setup number recalled.

"ADDRESS"
This menu selection displays a unit address from 1 to 200 when the unit is installed in a rack. Unit address is derived from the rack address (1 to 20) and the channel number within the rack (1 to 10).

ENVIRONMENTAL

TEMPERATURE	
Operational	32° F to 122° F (0°C to 50°C)
Storage	-40° F to 185° F (-40°C to 85°C)
HUMIDITY	90 % R.H. maximum

POWER

VOLTAGE INPUT	110-132 V RMS, 50/60 Hz or
200-264 V RMS, 50/60 Hz	

PHYSICAL

DIMENSIONS	5.25"h x 1.5"w x 15"d (133 mm x 38 mm x 381 mm)
CASE MATERIAL AND FINISH	Aluminum
WEIGHT	4 lbs typical

ACCESSORIES

IM4430A	Instruction Manual
30576	Resistor Plug-in Module

OPTIONS

4430A-1	Extends the programmable gain from 1-1000 to 1-10 000

OPTIONAL ACCESSORIES

4960A	Rack provides power and I/O interface for up to ten 4430A's
EJ724	9 Pin "D" Connector Kit
31255	Blank Panel Assembly
27973-X	GPIB Cable (X indicates length in meters)
4961	Single Channel Power Unit
35918	Plug-in Charge Amp Module

Notes
Maintain high levels of precision and accuracy using Endevco's factory calibration services. Call Endevco's inside sales force at 800-982-6732 for recommended intervals, pricing and turn-around time for these services as well as for quotations on our standard products.

Continued product improvement necessitates that Endevco reserve the right to modify these specifications without notice. Endevco maintains a program of constant surveillance over all products to ensure a high level of reliability. This program includes attention to reliability factors during product design, the support of stringent Quality Control requirements, and compulsory corrective action procedures. These measures, together with conservative specifications have made the name Endevco synonymous with reliability.

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