Ectron CORPORATION

Specializing in ruggedized, reliable metrology instrumentation designed to provide highly accurate data, even in harsh environmental conditions.

PRODUCTS:

- Thermocouple Simulator-Calibrator
- Thermocouple Cold-Junction Compensator
- Frequency-to-Voltage Converter
- Instrumentation Amplifiers
- Transducer Conditioner Amplifiers
- LVDT/RVDT Converter

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THE MOST ACCURATE THERMOCOUPLE SIMULATOR-CALIBRATOR ON THE MARKET

THERMOCOUPLE SIMULATOR-CALIBRATOR—MODEL 1140A

The Model 1140A provides four calibration functions: precise simulation of thermocouple signals, precise measurement of thermocouple signals, generation of accurate dc voltages from microvolt level to ±11 volts, and measurement of dc voltages over the same range. The thermocouple simulation and measurement accuracies are the highest in the industry, affording a margin of calibration accuracy heretofore unavailable.

Using a high-speed microcontroller, the 1140A offers such unique features as an autozero function to correct the zero reading of a non-ideal thermocouple. For repetitive operations, 100 sets of operating conditions can be committed to memory for future retrieval, including automatic sequencing from one condition to the next. Using one of the several interfaces, all functions can be programmed and executed under computer control.

With an output impedance of less than 0.05 Ω on all ranges, high accuracy is maintained with an absolute minimum of loading error.

FEATURES

- 0.06°C Accuracy for Common Thermocouple Types, including cold junction compensation (not including temperature extremes)
- Simulate and Measure Thermocouples
- Source and Measure dc Microvolts to Volts, nV Resolution
- Dc Accuracy of 0.0025% + 2.0 µV for Six Months, for both source and measure modes
- Output Impedance of 0.05 Ω, All Ranges
- USB Remote Interface Included

OPTIONS AND ACCESSORIES

- IEEE-488-2, Ethernet, and RS-232 interfaces
- Rechargeable battery
- Rack Mounting
- Carrying Case
- Calibration Kit

ALIGNMENT AND CALIBRATION

Calibration of the 1140A is a simple procedure that can be completed with a minimum of test equipment. In fact the majority of the instrument's alignment can be accomplished with only a short across the front-panel terminals.

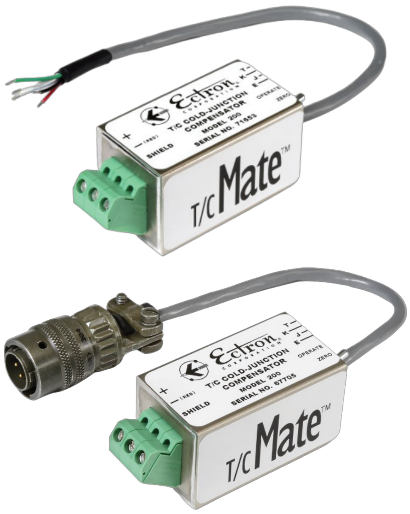
Alignment is performed by the instrument's firmware and the user is guided by front panel instructions. There are no potentiometers or other internal controls to adjust. A switch inside the unit enables the alignment function.

Alignment is carried out in several steps, allowing alignment of all functions or a subset to be performed separately. Full alignment calibration requires a known 10 V reference, a null meter with microvolt resolution, and a shorting jumper. These accessories are available from Ectron Corporation.

DATA SHEET

PRODUCT DEMO

COLD JUNCTION COMPENSATORS



T/C MATE™ THERMOCOUPLE COLD-JUNCTION COMPENSATORS

The T/C Mate Model 200 Thermocouple Cold-Junction Compensator allows any following instrumentation amplifier to be used as a thermocouple amplifier with thermocouple input. Ectron conditioner-amplifiers are ideal.

The T/C Mate accepts thermocouple signals, provides precision cold-junction compensation to copper wires, and adapts the signal for amplification. A jumper allows selection of the appropriate compensation for four thermocouple types.

A unique optical isolator provides power for the compensation circuitry from any 5 V dc to 15 V dc power source, eliminating the need for batteries. The strain-gage excitation supply available from Ectron conditioner-amplifiers provides ideal power. When connecting to computer I/O cards, the computer's 5 V or 12 V supply voltages can be used.

SPECIFICATIONS

- Thermocouple types: E, J, K, and T selectable by use of plug jumper.
- Input Thermocouple Connection: Two thermocouple wires plus shield attach to a terminal block assembly.
- Dc Power: 5 V dc to 15 V dc regulated at 50 mA nominal, usually supplied by the amplifier's excitation supply but can be any supply.
- Isolation Between Signal and Input Power: 100 MΩ and 75 pF. Breakdown voltage ±300 V.
- Accuracy (including ambient variation of 25°C ±25°C): Better than ±1°C for all thermocouple types.
- Reference Temperature: 0°C (32°F)
- Zero/Operate Switch: A toggle switch shorts the compensated T/C output to simplify zero adjustment of the following amplifier.
- Size: 30 mm H x 30 mm W x 51 mm L (1.15" H x 1.15" W x 2.005" L) plus 165 mm (6.5") cable.
- Weight: 65 g (2.3 oz) plus connector if installed.
- Output: Standard output for the Model 200 is a 165 mm (6.5") cable with wires for the compensated T/C output signal plus two leads for input power. It has soldered ends for terminal block or other connection.

FEATURES

- Precise compensation for type E, J, K, and T thermocouples
- Signal isolated from compensation power
- Use any instrumentation amplifier
- No batteries required
- Eliminate long-distance thermocouple wire

OPERATION

When thermocouple signals are amplified or converted to digital signals the T/C wires must first be connected to copper wires (amplifiers using T/C wires haven't yet been invented). Where the T/C to copper wires connect, unwanted T/C junctions are formed. To avoid these errors a "Cold Junction Compensator" (CJC) must be used.

Historically, CJC devices have taken several forms:

- An ice bath (slurry of pure water and ice).
- A thermoelectrically cooled chamber.
- A battery-powered bridge network that includes temperature correction.

The T/CMate is similar to Type 3, but instead of a battery almost any nonisolated power supply from 5 V to 15 V can be used. Within the T/CMate isolation between the low-level T/C signals and the power supply voltage is extremely high. Any number of T/CMates can be powered by a single power supply.

The T/CMate does not linearize the signal. Linearization to match thermocouple conversion characteristics is most accurately accomplished by a computer following a linear analog amplification of the actual thermocouple output.

OPTIONS

Model 200 – No connector provided

Model 201 with PT06A-10-6P[SR] connector

DATA SHEET

FREQUENCY-TO-VOLTAGE CONVERTER—MODEL 441AL

The Model 441AL Frequency-to-voltage Converter produces an analog output that precisely represents the frequency of an applied input signal. Adjustable input frequency to output voltage set points allow the user to closely bracket the frequency of interest. The unique crystal-controlled microcontroller design assures fast response, high conversion accuracy, and low output noise that is independent of frequency. The front-panel display shows the input frequency with up to five-digit resolution. All operating parameters are set using the display and the front-panel controls. These settings are retained in non-volatile memory.

The Model 441AL, designed for logic level signals, offers almost instantaneous response for fast acceleration and deceleration systems.

The Model 441AL combines the latest electronic microcontroller technology with surface-mount construction to produce a true breakthrough in frequency-to-voltage products. Indeed, these instruments represent a worthy addition to the Ectron line of 400 Series products that have provided exceptional performance and reliability in rugged applications for the past 25 years.

Designed into this model is rapid response to any change in frequency, low output noise that is independent of input frequency, and input-signal conditioning that automatically provides correct operation for a great variety of input signals, both in wave shape and amplitude.

Gone is the clutter of switches, knobs, pots, etc. associated with other frequency-to-voltage converters. All has been replaced with two easy-to-use, front-panel controls: the display and the encoder knob.

The backlit digital display/push-button has the dual function of display and screen selection. Seven easy-to-use, setup screens, six less frequently used screens, and the operate screen are accessible at the touch of the display.

The encoder, a rotary/push-button control, has the dual function of character selection and change. The user can easily configure the Model 441AL to any specific application desired.

With an input frequency range of 1 Hz to 50 kHz and an output voltage range of −10 V to +10 V, the Model 441AL offers precise frequency-to-voltage conversion for almost any application.

The Digital Periodic Filter virtually eliminates output noise that originates from cyclic variation caused by irregularly spaced wheel cogs or vanes of a flow meter. The user simply sets the filter to the number of pulses per revolution of the device under test and the Digital Periodic Filter stops the periodic variation on the output. Selectable filter settings are from 1 to 999 pulses per revolution.

Because the Model 441AL operates from any dc power from 10.5 V to 32 V, uses the same connector, and has the same pin assignments for signal input, output, and power as all other Ectron 400 Series products, it can be used – even intermixed – with Models 352, 418, T418, 428, 441A, and 451 Amplifier / Conditioners in all standard Ectron enclosures designed for these products.

FEATURES

- For very fast start-up applications
- Logic level signals 0 V to 5 V
- Follows fast frequency changes
- 1 Hz to 50 kHz Frequency Range
- Millisecond Response to Frequency Change (for input frequencies over 1 kHz)
- Adjustable Input Filtering and Sensitivity
- Front-panel Display of Frequency to 5 Digits
- Digital Periodic Filter
- Crystal-controlled Accuracy
- Precise Control of Output Voltage vs. Input Frequency
- Miniature size
- Rugged construction

APPLICATIONS

- Turbomachine Analysis/Control
- Drive-line Analysis
- Fast Response Governor Studies
- Engine Overspeed Monitor/Controller
- Accurate Flow Meter Monitoring
- Precise Tachometer
- ABS Evaluation
- Analysis of Synchro Gear Box Problems
- Clutch Response Evaluation

SPECIAL MODELS

Models have been supplied with the following characteristics:

- Conformance to US, Canadian, and European Safety and Hazardous Location regulations
- Dedicated overspeed monitor applications with RS-232 programmable set points, relay outputs
- Dual preset set points remotely selectable
- 4 mA to 20 mA output
- Frequency averages based on median, mean, or other algorithms
- Programmable set points
- Other Specials are available

400 SERIES ENCLOSURES

Ectron 400 Series enclosures provide connector interface for power and signal input and output connections for 400 Series products. Portable, bench mount, rack mount, and signal-conditioning systems are available with capacities from 6 to 22 conditioners. The following Ectron products are interchangeable in these enclosures: the Models 352 and 428 conditioner amplifiers, the Model 441A/AL frequency-to-voltage converter, and the Model 451 LVDT/RVDT signal conditioner. Thermocouple conditioning can be added using the 200 Series T/C Mate.

DATA SHEET

TRANSDUCER CONDITIONER AMPLIFIER—MODEL 563H

The Model 563H Transducer Conditioner Amplifier provides excitation, balance, calibration, and precise amplification for one-, two- or four-arm bridges and other transducer types. Excellent low level operation allows its use with very low output sources. A wide gain range from 0.01 to 2500 allows operation with a variety of sources. Versatility is further enhanced by the three step output zero control with ranges of ±0.1 V, ±1 V, and ±10 V.

Bandwidth is dc to 200 kHz. An optional five-step, two-pole Bessel filter has positions of 10 Hz, 100 Hz, 1 kHz, 10 kHz, and Wideband. An-other option provides 100 mA output capability. Both provide dual output signals.

FEATURES

- True Differential Input
- Dc to 200 kHz Bandwidth
- 0.1 V to 15 V Excitation
- Conditioning for 1/4, 1/2, or Full Bridges
- 100:1 Input Divider
- ±0.1 V, ±1 V, and ±10 V Output Zero Control
- Five-Step, Two-Pole Filter
- Bipolar Shunt Cal
- Null Indicator LEDs
- Remote Cal and Zero Check
- Ac Line Powered, 12 V dc optional

OPTIONS

J: Wideband Output-10mA; Filtered Output-None

K: Wideband Output-100mA; Filtered Output-None

L: Wideband Output-10mA; Filtered Output-10mA

M: Wideband Output-100mA; Filtered Output-10mA

N: Wideband Output-10mA; Filtered Output-100mA

ENCLOSURES

Available enclosures include a two unit portable bench mount, a six unit portable bench mount, and a sixteen unit standard 19-inch rack mount.

DATA SHEET

DC DIFFERENTIAL AMPLIFIER—MODEL 560H

The Model 560H Dc Differential Amplifier provides amplification and/or buffering for low and high-level signal sources. The Model 560H is directly interchangeable with the Model 563H Transducer Conditioning Amplifier and utilizes the same enclosures. Gain is front-panel selectable from 0.01 to 25 or 1 to 2500 in 10 calibrated gain steps in a 1, 2, 5 sequence plus a 2.5 gain vernier. Selection of gain range is by a board-mounted 100:1 input divider switch. Front panel controls include both RTI and RTO zero with the RTO zero range board-mounted switch selectable at ±10 V, ±1 V, or ±100 mV. Amplifier output monitor jacks and LED display of input offset is also provided.

The amplifier bandwidth is dc to 200 kHz and an optional two pole Bessel filter with front-panel selectable frequency cut-offs of 10 Hz, 100 Hz, 1 kHz, 10 kHz, and a wideband position permit user selection of lower bandwidth.

The standard output is ±10 V at 10 mA with optional capability to 100 mA. Dual output is provided with the filter option.

This low noise, low drift amplifier features input impedance of 50 MΩ, common mode rejection of 110 dB with up to 300 V common mode voltage capability.

The Model 560H was designed to accurately process low-level signals in electrically noisy environments by providing excellent common mode and normal mode noise rejection and RFI / EMI immunity.

FEATURES

- Gains from 0.01 to 2500
- 16 channels per 5-1/4" rack mount
- LED indicators for zero offset
- Bandwidth dc to 200 kHz
- Selectable 5 step filter
- 100 to 1 input divider

OPTIONS

J: Wideband Output-10mA; Filtered Output-None

K: Wideband Output-100mA; Filtered Output-None

L: Wideband Output-10mA; Filtered Output-10mA

M: Wideband Output-100mA; Filtered Output-10mA

N: Wideband Output-10mA; Filtered Output-100mA

ENCLOSURES

Available enclosures include a two unit portable bench mount, a six unit portable bench mount, and a sixteen unit standard 19-inch rack mount.

DATA SHEET

TRANSDUCER CONDITIONER AMPLIFIERS

DIFFERENTIAL DC AMPLIFIER AND SIGNAL CONDITIONER— MODEL 428

The auto industry standard for on-board vehicle test, the Model 428 is small and rugged but is able to condition and amplify the signals from almost any bridge type transducer including strain gages, load cells, and RTDs. On the test tracks, the Model 428 can produce high accuracy data despite temperature extremes and high shock and vibration conditions. RFI/EMI protection is available to minimize the effects of the many spurious signals from today's on-board electronics or even telemetry transmitters. Models with compatible enclosures are available for crash test and other extreme applications.

The Model 428 is a true differential amplifier with transformer isolation between input, output and the power source. An internal dc/dc converter provides bi-polar voltages for the circuitry while accepting power from a single external dc power supply or battery. This is 12 volts for automotive applications or 28 volts for airborne systems. In addition to the high performance dc amplifier, the units can be optionally supplied with integral strain gage excitation supplies and bridge balance or zero suppression. Transformer coupling contributes to high common mode rejection and the chopper design results in superior zero stability. The use of top grade components and a rigorous testing program ensures reliable operation over a wide range of ambient temperatures.

The Model 428 amplifier is packaged in a rugged, compact steel case and will withstand high shock and vibration levels under fully operational conditions. The Model 428 is intended for rack mounting and is equipped with a front panel gain switch. Zero controls are also located on the front panel in accordance with the options selected. The front panel dimensions are 1.1" by 2.37" and the depth is 4" (plus connector and controls). The R408 Series enclosures are 3.5" high and optionally contain 115 V ac power supplies. A full one year warranty applies when the equipment is used under any environmental conditions within its rating.

FEATURES

- Dual Gain Ranges
- 100 g Shock, 20 g Continuous Vibration
- −55°C to +100°C Operation
- 90% Relative Humidity
- Thermal Shock Resistant
- <0.5 µV/°C Stability
- True Differential Amplifier
- Zero Suppression
- EMI Protected
- Autozero
- Small size ~1" x 2" x 4"

OPTIONS

Option B: changes the amplifier output capability from ±10 volts to a limited 0 to +5 volt output.

Option G: changes the dual gain-step ranges to binary.

Option L: adds latched front-panel LED indication of output overvoltage with a front-panel reset switch.

Option O: adds autozero with front-panel manual control and remote control capability.

400 SERIES ENCLOSURES

Ectron 400 Series enclosures provide connector interface for power and signal input and output connections for 400 Series products. Portable, bench mount, rack mount, and signal-conditioning systems are available with capacities from 6 to 22 conditioners. The following Ectron products are interchangeable in these enclosures: the Models 352 and 428 conditioner amplifiers, the Model 441A/AL frequency-to-voltage converter, and the Model 451 LVDT/RVDT signal conditioner. Thermocouple conditioning can be added using the 200 Series T/C Mate.

DATA SHEET

TRANSDUCER CONDITIONER AMPLIFIERS

RUGGEDIZED CONDITIONER-AMPLIFIER—MODEL 416

The Model 416 is a transducer conditioner with a precision instrumentation amplifier for use in poor environmental conditions. Designed for use with almost any transducer, this conditioner-amplifier provides outstanding performance despite temperature extremes and high levels of shock and vibration.

Featuring complete ohmic isolation between the signal input, output, excitation, power supply and case, it is a solid-state chopper-stabilized differential dc amplifier with an internal excita-tion voltage supply. The high input impedance permits operation with a large variety of signal sources; and the low output impedance allows operation into highly reactive loads, telemetry equipment and most recording and/or storage devices.

OPTIONS

- Output can be limited to 0 V to +5 V
- Gain sequence can be changed to binary
- (2-4-8 sequence) with gains from 16 to >2500

FEATURES

- Ruggedized for environmental extremes
- ±10 V amplifier output
- Continuous gain in a 1-2-5 sequence from 10 to >2500
- Customer-selectable excitation voltage
- ±40 mV input zero suppression
- EMI / RFI filtering on all connector pins
- Operation from any dc voltage from +10.5 V dc to +32 V dc

DATA SHEET

LVDT/RVDT CONDITIONER

PRECISION LVDT/RVDT CONDITIONER - MODEL 451

The Model 451 is a unique advance in conditioners for LVDT* and RVDT* transducers. For the first time, the conditioner can be calibrated to the transducer without using a costly and time-consuming laboratory procedure. And autozero can be commanded at any time. Plus, the Model 451's display indicates the analog output voltage and actual transducer displacement in real time!

The Model 451 excites the transducer according to user set parameters for voltage and frequency. A variable gain differential amplifier receives the resulting signal which is then coupled to a synchronous detector, user controlled four-step filter, analog-to-digital converter, and micro-controller. Here, all functions from arithmetic calculations, to front-panel data and menu displays, to user interface operations are controlled. In parallel, the displacement data is calculated and coupled to the front panel for display. Finally, a digital-to-analog converter and output analog stages produce the desired analog output signal. The display indicates both the analog voltage and the actual transducer displacement. Settings, maintained in nonvolatile memory, are entered into the Model 451 using the front panel controls.

FEATURES

- Calibrated Performance Without CAL Lab Testing
- Front-Panel Display of Voltage and Actual
- Displacement in mils, mm, or degrees
- Precision Digital Processor Design
- Calibration of Transducer and Conditioner While Installed
- Autozero on Command
- Three Modes of Operation: Example, Scale, and Gain
- LVDT* and RVDT* Operation
- Operates as a Carrier Amplifier for Bridge Transducers
- Designed for Poor Environments
- Measurement of an LVDT's or RVDT's Sensitivity Constant

400 SERIES ENCLOSURES

Ectron 400 Series enclosures provide connector interface for power and signal input and output connections for 400 Series products. Portable, bench mount, rack mount, and signal-conditioning systems are available with capacities from 6 to 22 conditioners. The following Ectron products are interchangeable in these enclosures: the Models 352 and 428 conditioner amplifiers, the Model 441A/AL frequency-to-voltage converter, and the Model 451 LVDT/RVDT signal conditioner. Thermocouple conditioning can be added using the 200 Series T/C Mate.

OPERATING MODES

Example Mode

Mount the LVDT; then position the apparatus under test to one position of its motion (usually one extreme) and command the Model 451 to "capture" Point 1. Repeat with a second position to "capture" Point 2. Then key in the desired output voltages corresponding to the two points and you're through! For exact indication of displacement, the sensitivity constant** for the transducer must be entered.

Scale Mode

For the LVDT in use, key in two points of the expected motion in units of displacement and the corresponding desired output voltages, plus the sensitivity constant** of the transducer. That's it.

Gain Mode

Key in the desired conditioner gain. The analog output voltage will equal the input voltage (from the transducer) times this gain. This is the conventional operating mode of existing LVDT conditioners. The Model 451 front panel will display distance if the sensitivity constant** of the transducer has been entered as well as the corresponding output voltage. If desired, an autozero can be commanded at any time.

* LVDT—Linear Variable Differential Transformer

* RVDT—Rotary Variable Differential Transformer

** The sensitivity constant of an LVDT, usually supplied by the manufacturer, is a factor linking excitation voltage and output voltage change to displacement. It is normally expressed in mV output per volt of excitation voltage per mil of displacement. For RVDT's, the displacement is normally in degrees. This constant can be accurately measured using the Model 451.

DATA SHEET