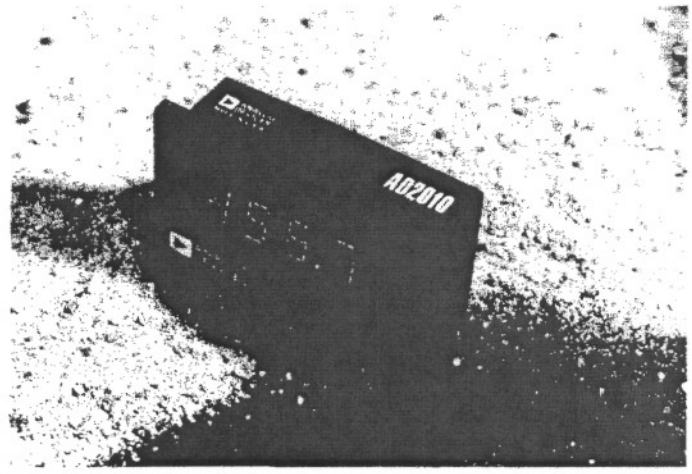
ANALOG DEVICES

Low Cost, 3 1/2 Digit DPM for OEM Applications

AD2010

FEATURES
LED Display with Latched Digital Outputs
Small Size, Lightweight
Automatic Zero Correction; Max Error: 0.05% ±1 Digit
High Normal Mode Rejection: 40dB @ 50 or 60Hz
Optional Ratiometric Operation
Leading "0" Display Blanking
5VDC Powered

APPLICATIONS
Medical/Scientific/Analytic Instruments
Data Acquisition Systems
Industrial Weighing Systems
Readouts in Engineering Units
Digital Thermometers



GENERAL DESCRIPTION

Analog Devices' model AD2010 represents an advance in price/performance capabilities of 3½ digit digital panel meters. The AD2010 offers 0.05% ±1 digit maximum error with bipolar, single ended input, resolution of 100μV, and a common mode rejection ratio of 60dB (CMRR) at ±200mV (CMV).

The AD2010 features a light-emitting-diode (LED) display with a full scale range of 0 to ±199.9 millivolts, latched digital data outputs and control interface signals, and leading zero display blanking. Automatic-zero correction circuitry measures and compensates for offset and offset drift errors, thereby providing virtually no error. Another useful feature of the AD2010 is its 5V dc operation. The AD2010 can operate from the users' 5V dc system supply, thereby eliminating the shielding and decoupling needed for line powered units when the ac line must be routed near signal leads.

To satisfy most application requirements, the conversion rate of the AD2010 is normally 4 readings per second. However, an external trigger may be applied to vary the sampling rates from a maximum of 24 readings per second down to an indefinite hold time. The AD2010 can also be connected for automatic conversion at its maximum conversion rate. During conversion, the previous reading is held by the latched logic. The numeric readout is available as BCD data. Application of the metering system in a computer or data logging system is made easy with the availability of the "overrange," "polarity," "overload," and "status" signals.

A simplified block diagram of the AD2010, illustrating the features described above is shown in Figure 1.

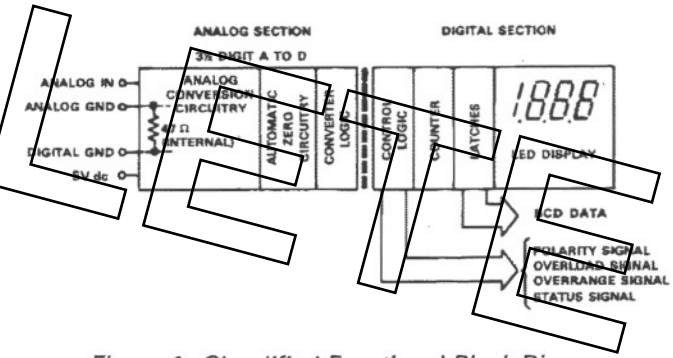


Figure 1. Simplified Functional Block Diagram

IMPROVED NOISE IMMUNITY, ACCURACY AND ZERO STABILITY

Dual-slope integration, as used in the AD2010 and as described in the theory of operation section, offers several design benefits.

- Conversion accuracy, for example, is independent of both the timing capacitor value and the clock frequency, since they affect both the up ramp and down ramp integration in the same ratio.
- Normal mode noise at line frequencies or its harmonics is rejected since the average value of this noise is zero over the integration period.
- To achieve zero stability, a time interval during each conversion is provided to allow the automatic-zero correction circuitry to measure and compensate for offset and offset drift errors, thereby, providing virtually no zero error.

For detailed information, contact factory.

REV. A

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AD2010—SPECIFICATIONS (typical at +25°C and +5V dc unless otherwise noted)

DISPLAY OUTPUT
- Display consists of four LED's (0.27″ (6.9mm) high). for data digits plus 100% overrange and polarity indication.
- Overload – three data digits display zeros and flashes.
- Decimal Points – selectable at input connector.
- Leading "0" Display Blanking – controlled externally.

INPUT
- Full Scale Range – 0 to ±199.9 millivolts
- Automatic Zero
- Automatic Polarity
- Bias Current – 3nA
- DC Impedance – 100MΩ
- Overvoltage Protection – 20V sustained, 50V momentary without damage.
- Decimal Points (3) – illuminate with logic "1", extinguish with logic "0".

ACCURACY
- Maximum Error – 0.05% of reading ±1 digit
- Resolution – 0.1 millivolt
- Temperature Range – 0 to +50°C operating
  -30°C to +85°C storage
- Temperature Coefficient – ±50ppm/°C

NORMAL MODE REJECTION
- 40dB @ 60Hz

COMMON MODE REJECTION
- 60dB @ ±200mV

CONVERSION RATE
- External Trigger – up to 24 conversions per second
- Internal Trigger – 4 conversions per second
- Automatic – A new conversion is initiated automatically upon completion of conversion in process; conversion rate will vary from 24/sec to 40/sec depending on input magnitude.
- Hold and Read upon command.

CONVERSION TIME
- Normal Conversion – 42ms max (full scale input)
- Overload Conversion – 62ms max

INTERFACE SIGNALS
- DTL/TTL Compatible

	IN	OUT
logic "0"	<0.8V	<0.4V
logic "1"	>2.0V	>2.4V

- Inputs

  External Trigger – Operation in the "External Trigger" mode requires that the "External Hold" input be a logic "0" or ground.

  Negative Trigger Pulses – Applying a logical "low" to the "HOLD" input disables the internal trigger. A negative trigger pulse (logic "1" to logic "0") of 1.0μs minimum applied to the "EXT TRIGGER" input will initiate conversion in the same manner as the internal oscillator. The external trigger should not be repeated, however, until the "status" indicates completion of the conversion in process.

  Positive Trigger Pulses – The "HOLD" input can be used to trigger the AD2010 from a "normally low" signal with the "EXT TRIGGER" input open or logic "1". Following a "hold" a new reading will be initiated on the leading edge of the "hold" signal. Thus, a momentary positive pulse on the "HOLD" input can be used to trigger the AD2010. The drift correct interval, however, begins on the trailing edge of the positive pulse, so if the pulse width exceeds 1ms, the conversion will actually be initiated by the internal trigger.

  Maximum Conversion Rate - Automatic – The AD2010 can also be connected for automatic conversion at its maximum conversion rate by connecting the "status" output back into the "hold" input. In this manner the status signal going high at the end of one conversion immediately initiates a new conversion. The pulses appearing on the status line can be used to step a multiplexer directly, since the built-in drift-correct delay of 8.33ms will allow settling of the input prior to conversion. A logic "0" applied to the "EXT TRIGGER" will inhibit the automatic trigger mode.

  External Hold – Logic "0" or ground applied to this input disables the internal trigger and the last conversion is held and displayed. For a new conversion under internal control the input must be opened or at logic "1". For a new conversion under external control, a positive pulse of less than 1.0ms can be applied (as previously explained).

OUTPUTS
- 3 BCD Digits (8421 Positive True) - latched - 3TTL loads
- Overrange - logic "1" - latched - 6TTL loads, indicates overrange.
- Overload - logic "0" indicates overload (>199.9mV) logic "1" - latched - 6TTL loads, indicates data valid.
- Polarity - logic "1" - latched - 6TTL loads, indicates positive polarity input.
- Status - logic "0" - conversion in process logic "1" - latched - 6TTL loads, indicates conversion complete.

POWER
- +5V dc ±5%, 500mA

WARM UP
- Essentially none to specified accuracy

ADJUSTMENTS
- Range potentiometer for full scale calibration. Calibration recommended every six months.

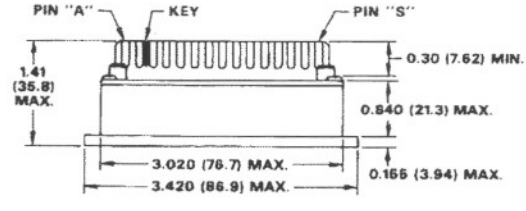
SIZE
- 3″W x 1.8″H x 0.84″D (76.2 x 45.7 x 21.3mm) (overall depth for case and printed circuit board extension is 1.40″ (35.6mm)).

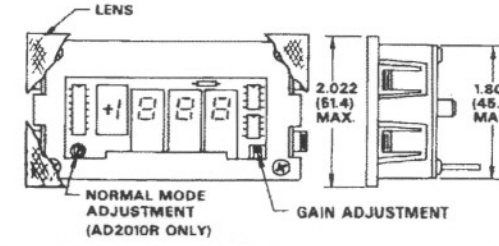
ORDERING GUIDE
- AD2010 - Standard AD2010 as described above - tuned for peak normal mode rejection at 60Hz and its harmonics.

WEIGHT
- 4 oz. (113.5gm)

OVERALL DIMENSIONS

All dimensions are given in inches and (mm).





Specifications subject to change without notice.