

### FEATURES

- Automatic Self-Calibration for Gain, Offset, Cold Junction Compensation and Thermocouple Linearization
- J, K, T, E, R, S Thermocouple Selections (AD2050)
- Universal Meter (AD2051), User Programmable
- Character Serial ASCII Digital Output
- Optional Linearized Analog Output: 1mV/degree
- Optional Isolated 20mA Loop/TTL Serial Outputs
- Meets DIN/NEMA Dimension Specifications
- Temperature Ranges: -265°F to +1999°F
- 165°C to +1760°C
- Power Options: 120V ac, 240V ac, +7.5V dc to +28V dc

### APPLICATIONS

- Temperature Monitoring in Laboratory, Manufacturing, and Quality Control Environments
- Process Control Temperature Measurements
- Remote Data Logging

### GENERAL DESCRIPTION

The AD2050 and AD2051 are high performance, single channel, 3½ digit thermocouple meters that can measure temperatures accurately between -265°F to +1999°F or from -165°C to +1760°C. The AD2050 is factory programmed for any of the following six thermocouple types: J, K, T, E, R and S. The AD2051 is a universal meter that allows the user to select one of the six thermocouple types via switch programming. The microprocessor-based AD2050 and AD2051 provide gain and offset error corrections, cold junction compensation, thermocouple linearization, and °C/°F scaling automatically performed in firmware.

The AD2050 and AD2051 display temperature information on large 0.56" (14.3mm) high LEDs. Digital information is provided in standard ASCII character serial format with rate selection for easy interface to printers, terminals, and other peripherals. For remote data acquisition applications, an optional isolated 20mA



serial loop/TTL compatible interface is available. Also an optional analog output linearized to 1mV/degree is provided for driving recorders and other analog instruments. Selection of °C or °F scaling is accessed by removing the front panel lens and setting the selector switch to its proper position.

The AD2050 and AD2051 can also be ordered with any of the following power versions: 120V ac, 240V ac, or +7.5V dc to +28V dc. Input overvoltage protection for 300V peak (thermocouple to ac line shorts) and common mode voltages as high as 1400V peak (ac version) with overrange and open thermocouple detection are provided. These meters are rated for operation over the +10°C to +40°C temperature range. Each meter is burned in for 168 hours @ 50°C with on/off power cycles for increased reliability. The AD2050 and AD2051 are supplied in rugged, molded, plastic cases that meet UL94V-0 and DIN/NEMA standard dimensions.

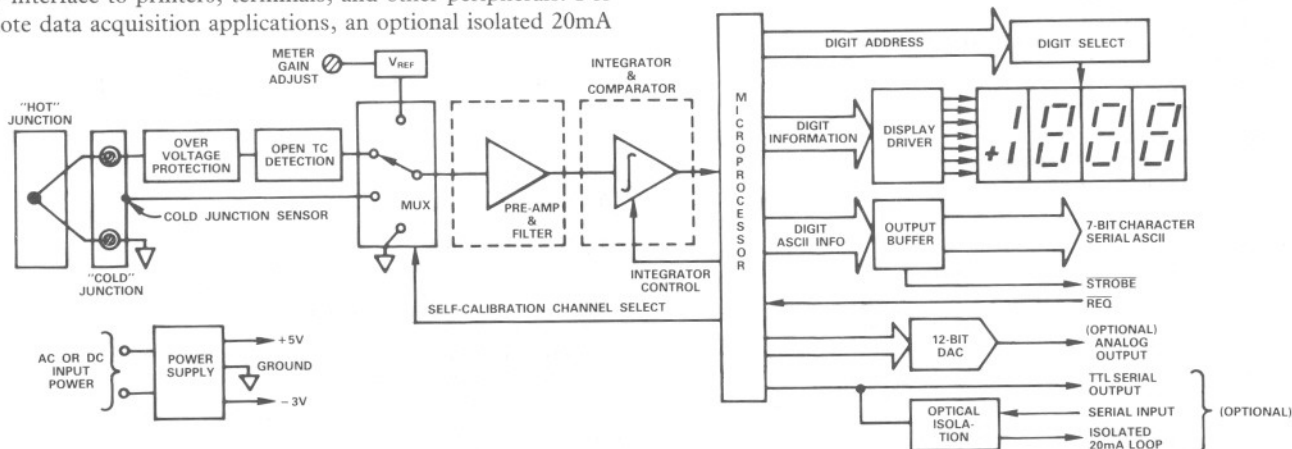


Figure 1. AD2050 & AD2051 Functional Block Diagram

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# SPECIFICATIONS (typical @ +25°C and rated supply voltages unless otherwise specified)

## THERMOCOUPLE INPUTS

- Thermocouple Types: J, K, T, E, S, R
- Input Impedance: >100MΩ
- External (Lead) Resistance Effect: <20μV per 350Ω of Lead Resistance
- Cold Junction Compensation Error: ±0.5°C max (+10°C to +40°C)
- Open Thermocouple: +EEE Display; +EEEE ASCII Digital Output; +2.048V Analog Output
- Thermocouple Short to ac Line: Internal Protection Provided to 300V peak (200V ac rms)
- Common Mode Voltage: 1400V peak (dc or ac), between Input and Power Line Ground (ac Versions)
- Common Mode Rejection Ratio: >130dB with 250Ω Source Imbalance (ac Versions); (dc to 60Hz)
- Normal Mode Rejection Ratio: >80dB @ 50/60Hz

## DIGITAL OUTPUTS

- Character Serial ASCII
  - Data: Nine transmitted characters, (each 7 bits plus strobe)
  - Drive Capability: 2TTL loads, CMOS/TTL compatible
  - Strobe: Negative transition determines when character serial data is valid. CMOS/TTL compatible.
  - Character Rate: Selectable on P1 (pin 32)
  - Grounded: 25 characters/sec. (SLOW)
  - Open: 100 characters/sec. (FAST)
- Isolated Serial Output (Optional)
  - Data: Asynchronous ASCII 20mA current loop (Optically isolated to ±600V peak)
  - Baud Rate: Selectable on P1 (Pin 32)
  - Grounded: 300 baud (SLOW)
  - Open: 1200 baud (FAST)
  - Distance: 10,000ft. max
- Serial Output (Nonisolated, Optional)
  - Data: Serial ASCII
  - Drive Capability: 2TTL Loads, CMOS/TTL compatible
  - Baud Rate: (same as Isolated Serial Output)
- Overrange: ±EEEE
- Minimum Time Between New Data Update: 150ms

## DIGITAL INPUTS

- REQ: Low-Level Triggered: Must go low at any time other than during data transmission to be recognized. REQ line taken low during data transmission will not be acknowledged and the ASCII digital output transmission will not occur. Display readings are not effected by REQ.
- SERIAL INPUT (Optional): Edge Triggered, Current On to Current Off: Must be triggered at any time other than during data transmission to be recognized. Serial Input triggered during data transmission will not be acknowledged and the 20mA isolated/TTL compatible serial output transmission will not occur. Display readings are not effected by Serial Input.

## ANALOG OUTPUT (OPTIONAL)

- Voltage: 1mV/degree, linearized
- Current: ±2mA max drive
- CMV: 1400V peak (ac or dc) Peak between Analog Output Ground & ac Power Line Ground
- Overrange: +2.048V, -0.512V

## ACCURACY

- Temperature Resolution: 1°C/1°F
- All Ranges are Guaranteed Monotonic
- Range Temperature Coefficient: ±25ppm/°C typ, ±60ppm/°C max
- Readout Accuracy @25°C:

Sensor Type	Range	Accuracy
J	-165°C to 760°C	±0.7°C ±1/2LSD
J	-265°F to 1400°F	±1.3°F ±1/2LSD
K	-50°C to 1250°C	±0.9°C ±1/2LSD
K	-58°F to 1999°F	±1.6°F ±1/2LSD
T	-150°C to 400°C	±0.8°C ±1/2LSD
T	-238°F to 752°F	±1.4°F ±1/2LSD
E	-100°C to 870°C	±1.0°C ±1/2LSD
E	-148°F to 1598°F	±2.0°F ±1/2LSD
S, R	+300°C to 1760°C	±1.5°C ±1/2LSD
	0° to 299°C	±6.0°C ±1/2LSD
S, R	+572°F to 1999°F	±3.0°F ±1/2LSD
	+32°F to 571°F	±12.0°F ±1/2LSD

## ANALOG TO DIGITAL CONVERSION

- Technique: Offset Dual Slope with Gain and Offset Error Correction

- Rate: 2.5 Conversions/Second Typical
- Input Integration Period: 100ms for 50/60Hz Noise Rejection

## POWER REQUIREMENTS (Choice of Three Supply Ranges)

- ac: 90V ac to 132V ac @ 25mA (47Hz to 500Hz)
- 198V ac to 264V ac @ 12.5mA (47Hz to 500Hz)
- dc: +7.5V to +28V dc @ 200mA (Protected Against Supply Reversals)

## DISPLAY

- Type: Seven Segment Orange LED 0.56" (14.3mm) high
- Polarity Indication: "+" or "-" displayed
- Overrange Indication: ±EEE
- Display Test: At Power Turn-On, 3 Second Display of "+1888" Tests all Segments of Display

## ENVIRONMENTAL

- Rated Temperature Range: +10°C to +40°C
- Operating Temperature Range: -10°C to +50°C
- Storage Temperature Range: -40°C to +85°C
- Relative Humidity: Meets MIL-STD-202E, Method 103B

## DIMENSIONS

- Case: 3.78" × 1.89" × 5.13" (96.8mm × 48.9mm × 131.3mm), high impact molded plastic case. DIN/NEMA Standard
- Weight: 15.2 oz (431 grams) max, ac powered
- 12.0 oz (341 grams) max, dc powered.

## RELIABILITY

- Burn In: 168 Hours at +50°C and Power ON/OFF Cycles.
- Calibration: NBS Traceable
- Recalibration: Recommended 15-Month Intervals
- Warranty: 12 months

## CONNECTOR

- One 44 pin 0.1" (2.54mm) spacing card edge connector
- Viking 8VH22/1 JN5 or equivalent
- Optional: Order AC2680

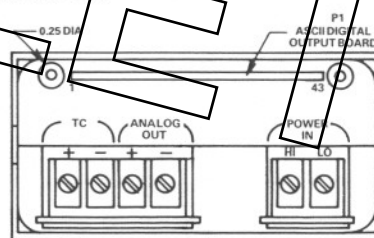


Figure 2. Rear Panel View

## ORDERING GUIDE

### THERMOCOUPLE TYPE\*

- J
- K
- T
- E
- R
- S

### POWER OPTION\*

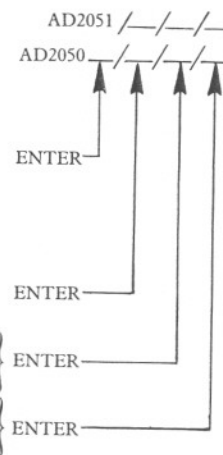
- (1) 120V ac
- (2) 240V ac
- (3) +7.5V dc to +28V dc

### ANALOG OUTPUT OPTION

- (A) Contains Analog Output
- (Blank) Does Not Contain Analog Output

### SERIAL OUTPUT OPTION

- (S) Contains Serial Output
- (Blank) Does Not Contain Serial Output



\*Only one option can be ordered. The thermocouple type does not need to be specified when ordering the AD2051 since it is user programmable. Specifications subject to change without notice.