

**Input:** Thermistor, or Custom Sensor  
**Output:** 0-1 V to 0-10 V,  $\pm 5$  V,  $\pm 10$  V, 0-2 mA to 4-20 mA

- One Model Covers All Common Thermistor Sensors
- Zero and Span for Output
- Full 1200 V Isolation
- Input LoopTracker® LED
- Output Test Function
- Built-In Loop Power Supply for Sink/Source Output

## Applications

- Convert/Isolate Thermistors for PLC Input, Control and/or Validation
- Interface Thermistors with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

## Input Types, Field Selectable

Thermistors: 44004/44033 2.252 k $\Omega$  at 25°C  
 44005/44030 3.000 k $\Omega$  at 25°C  
 44007/44034 5.000 k $\Omega$  at 25°C  
 44006/44031 10.00 k $\Omega$  at 25°C  
 44008/44032 30.00 k $\Omega$  at 25°C  
 YSI 400 2.252 k $\Omega$  at 25°C  
 Spectrum 1003k 1 k $\Omega$

Custom: Provide sensor specifications, temperature curve data, and temperature range

## LoopTracker

Variable brightness green LED indicates input level and status

## Status LED

Yellow LED for setup and operational status

## DC Output Ranges, Field Selectable

Voltage: 0-1 V, 0-2 V, 0-4 V, 0-5 V, 1-5 V,  
 0-8 V, 0-10 V, 2-10 V,  
 $\pm 5$  VDC,  $\pm 10$  VDC  
 Current: 0-2 mA, 0-4 mA, 0-8 mA,  
 0-10 mA, 2-10 mA, 0-16 mA, 0-20 mA,  
 4-20 mA  
 20 V compliance, 1000  $\Omega$  at 20 mA

Consult factory for reverse output

## Output Calibration

Zero and span set by using up/down buttons,  $\pm 10\%$  range

## Output Ripple and Noise

Less than  $\pm 0.2\%$  of span

## Output Loop Power Supply

20 VDC nom., regulated, 25 mADC, <10 mVrms max. ripple  
 May be selectively wired for sinking or sourcing mA output

## Output Test

Front push button switch enables/disables test level output  
 Adjustable 0-100% of span via up/down buttons

## Accuracy and Resolution

$\pm 0.1^\circ\text{C}$  accuracy,  $0.001^\circ\text{C}$  resolution, 18 bit

## Response Time

300 milliseconds typical

## Isolation

Full 3-way isolation: input, output, power, 1200 VRms min.  
 600 VACp or 600 VDC common mode protection  
 75 dB minimum common mode rejection  
 Simultaneous 50 Hz and 60 Hz rejection

## Ambient Temperature Range and Stability

$-10^\circ\text{C}$  to  $+60^\circ\text{C}$  operating ambient  
 Better than 0.02% of span per  $^\circ\text{C}$

## Housing and Connectors

IP 40, requires vertical installation on a 35 mm DIN rail inside a panel or enclosure  
 For use in Pollution Degree 2 Environment  
 Four 4-terminal removable connectors, 14 AWG max. wire size

## Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 3 W maximum  
 D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 3 W maximum

## Dimensions

Height includes connectors  
 0.89" W x 4.62" H x 4.81" D (22.5 x 117 x 122 mm)



Sink or Source  
mA Output

Setup and Status  
LED

Adjustable Output  
Test Function

Zero and Span for  
Output

Input LoopTracker  
LED

Universal  
Thermistor Input



Universal  
Power

Removable Plugs

Actual Size

## Description

The APD 4152 accepts a thermistor temperature input and provides an optically isolated and linearized DC voltage or current output.

The sensor type, temperature range and output range are field configurable. The input type is set with switches and its range is configured using front buttons, a multimeter and an input simulator. This provides a versatile solution that works with all commonly available thermistor sensors.

Microprocessor-based linearization uses 41 to 55 segments or up to a 14th order polynomial depending on the sensor type. The input is sampled, digitally converted to a linearized temperature signal and then passed through an optocoupler to the output stage.

Full 3-way isolation (input, output, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

The low noise 18 bit analog output is isolated and can be set up for common voltage and milliamp output types.

## How to Order

Models are field rangeable. For free setup specify the following.

Thermistor: Sensor model/type, resistance  
 Custom: Complete sensor data over temperature range  
 Temperature: Range in  $^\circ\text{F}$  or  $^\circ\text{C}$   
 Output: Range and type (mV, V, mA)

| Model      | Description                   | Power                              |
|------------|-------------------------------|------------------------------------|
| APD 4152   | Thermistor input to DC output | 85-265 VAC, 50/60 Hz or 60-300 VDC |
| APD 4152 D | isolated transmitter          | 9-30 VDC or 10-32 VAC              |

## Output Sink/Source Versatility

Standard on the APD 4152 is a 20 VDC loop excitation supply for the milliamp output. The output can be selectively wired for sinking or sourcing allowing use with a powered or unpowered milliamp device.

## LoopTracker

An API exclusive feature includes a green LoopTracker LED that varies in intensity with changes in the process input signal.

It provides a quick visual picture of your process input at all times and can greatly aid in saving time during initial startup and troubleshooting.

## Output Test

An API exclusive feature includes an output test switch to provide a fixed output (independent of the input) when pressed. The output test greatly aids in saving time during initial startup and/or troubleshooting.

The test output level is adjustable from 0 to 100% of the output span.

## Options and Accessory

### Options—add to end of model number

NC5 5 point NIST traceable calibration certificate  
 NC11 11 point NIST traceable calibration certificate  
 U Conformal coating for moisture resistance  
 R Consult factory for reverse output

### Accessory—order as separate line item

API BP4 Spare removable 4 terminal plug, black

**Note:** An appropriate simulator and a multimeter are required for setup. We can set up the I/O ranges at no extra charge.

**Precautions**

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. See diagram for terminal designations and wiring examples. Consult factory for assistance.

**WARNING!** Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.

**Précautions**

**ATTENTION!** Tout le câblage doit être effectué par un électricien ou ingénieur en instrumentation qualifié. Voir le diagramme pour désignations des bornes et des exemples de câblage. Consulter l'usine pour assistance.

**ATTENTION!** Éviter les risques de choc! Fermez le signal d'entrée, le signal de sortie et l'alimentation électrique avant de connecter ou de déconnecter le câblage, ou de retirer ou d'installer le module.

**Range Selection**

Select ranges before installation. Use the tables on the next page to select the I/O ranges. The module side label lists output ranges. Ranges can also be found at [api-usa.com/4152](http://api-usa.com/4152)

Check the model/serial number label for module power, options, or custom range information. A custom range uses switch settings described in the Custom Range Table.

1. Set switches A, B, and C from the table to set input type and range.
2. Set switches D and E from the table to set the output range and set switch E: V for voltage or I for current output.

For output ranges that fall between the listed ranges use the next highest setting. The output can be trimmed using the zero and span buttons.

**Electrical Connections**

See wiring diagrams at right. A multimeter and a resistance simulator are required for setup. Observe polarity. If the output does not function, check wiring and polarity.

The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

**Input**

The thermistor sensor input is connected as shown in the wiring diagrams at right. If a custom input was specified, see the model/serial number label for sensor type, temperature range and options.

**Output**

For milliamp ranges, determine if your device provides power to the current loop or if the loop must be powered by the APD module. Typical voltage may be 9-24 VDC at your device's terminals if it provides power to the loop.

**Module Power**

Check model/serial number label for module operating voltage to make sure it matches available power.

When using DC power, either polarity is acceptable, but for consistency with similar API products, positive (+) can be wired to terminal 13 and negative (–) can be wired to terminal 16.

**Range Calibration**

1. Connect a multimeter to the output terminals 2 - 3, or 3 - 4 depending on output type. See wiring diagram at right.
2. Connect a resistance simulator to the input of the module.
3. Connect power to the unit (terminals 13, 14, and 16) and apply power to the module.
4. Wait until the yellow Status LED starts blinking once per second.

**Low End Input Calibration**

5. Use the simulator to apply the low end of the input signal.
6. Push the Set button to store the low end input value.
7. The Status LED will turn on to indicate the reading was saved.
8. Use the Up and Down buttons to adjust the output to the desired low output reading (i.e. 4 mA for a 4-20 mA output).
9. Press and release the Set button to store the low output.

**High End Input Calibration**

10. Wait until the Status LED blinks once per second.
11. Use the simulator to apply the high end of the input signal.
12. Push the Set button to store the high end input value.
13. The Status LED will turn on to indicate the reading was saved.
14. Use the Up and Down buttons to adjust the output to the desired high output reading (i.e. 20 mA for a 4-20 mA output).
15. Press and release the Set button to store the high output.

**Blinking Yellow LED Setup Error Codes**

If an error occurred or invalid selection was made, the yellow Status LED blinks an error code. Check switches A, B, C, and input wiring.

- |  |  |
|--|--|
| 2 1 Invalid sensor selected                        |  |
| 2 4 Invalid thermistor selected                    |  |
| 2 7 Invalid input setting (Zero greater than Span) |  |

**Output Test Level Adjustment**

16. Wait until the Status LED turns on and stays on.
17. Using the Up and Down buttons adjust the test output for the desired level (i.e. 12 mA for a 4-20 mA output).
18. Press and release the Set button to store the test output.
19. Wait until the Status LED starts blinks once per second.
20. To change any value, turn off the power and repeat steps 1 to 19.

**Saving Setup**

21. Press and release the Set button to store the settings and lock them into memory. The Status LED will turn on during the storing process.

22. Once the Status LED turns off, setup and configuration is complete. Turn off power to the unit and remove the simulator and multimeter.

**Changing I/O Setup**

To reset the unit back to factory default without changing any input switch settings press and hold the Set button while the module is being powered up.

If using a new input switch setting, the unit will automatically start in setup mode to allow you to calibrate and store your new configuration.

**Mounting to a DIN Rail**

Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow.

1. Tilt front of module downward and clip the lower mount with spring clips to the bottom edge of DIN rail.
2. Push front of module upward until upper mount snaps into place.

**Removal**

Avoid shock hazards! Turn signal input, output, and power off before removing module.

1. Push up on bottom back of module.
2. Tilt the front of module downward to release upper mount from top edge of DIN rail.
3. The module can now be removed from the DIN rail.

**Output Test Function**

When the Test button is pressed it will drive the output with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When pressed again, the output will return to normal. The button allows hands-free operation of the Test Mode.

The Test level can be adjusted by using the Up and Down buttons.

The level can be set by pressing the Set button, or it can default back to the setup value by not pressing the Set button.

**Operation**

The APD 4152 accepts a thermistor input and provides a linearized and optically isolated DC voltage or current output.

The green LoopTracker® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

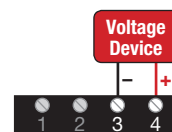
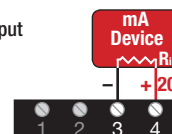
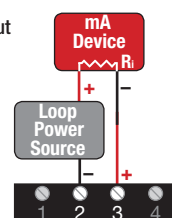
The yellow status LED provides a visual indication of operational modes.

Normal operation: Off  
Push-to-Test mode: Steadily on  
User setup mode: Blinking

**Blinking Yellow LED Operational Error Codes**

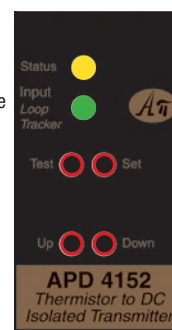
If an error occurs during operation, the yellow Status LED blinks an error code. Check sensor, wiring, or consult factory.

- |   |  |
|---|--|
| 1 1 Analog-digital converter out-of-range           |  |
| 1 2 Sensor under range                              |  |
| 1 3 Sensor over range                               |  |
| 1 6 Hard ADC out-of-range                           |  |
| 1 7 Sensor hard fault, open circuit, hard ADC fault |  |

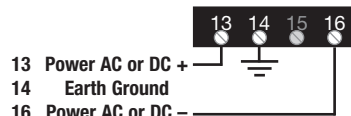
**Voltage Output  
Switch E set to "V"****Current Sourcing Output  
Switch E set to "I"****Current Sinking Output  
Switch E set to "I"****Do Not Connect to  
Unused Terminals  
1, 5, 6, 7, 8**

Yellow status LED Setup: blinks once per second  
Off: normal operation  
2 digit code: error code

**To maintain full isolation and avoid malfunctions, do not connect power supplies in common with input, output or unit power.**  
**Do not connect any devices to unused terminals.**



Green LoopTracker LED brightness varies with input level

**Thermistor Input**

Cu 60/75°C conductors 14 AWG max.

## Range Table: Thermistor

APD 4152 

| Thermistor    | Output   | ±10 V | 0-10 V | ±5 V  | 2-10 V | 0-8 V | 0-5 V | 1-5 V | 0-4 V | 0-2 V | 0-1 V | 0-20 mA | 4-20 mA | 0-16 mA | 0-10 mA | 2-10 mA | 0-8 mA | 0-4 mA | 0-2 mA |
|---------------|----------|-------|--------|-------|--------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|---------|--------|--------|--------|
| Type          | Switches | ABCDE | ABCDE  | ABCDE | ABCDE  | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE   | ABCDE   | ABCDE   | ABCDE   | ABCDE   | ABCDE  | ABCDE  | ABCDE  |
| 44004/44033   | 2.252 k  | 6185V | 6183V  | 6184V | 6187V  | 6182V | 6189V | 6186V | 6181V | 6188V | 6180V | 6183I   | 6187I   | 6182I   | 6189I   | 6186I   | 6181I  | 6188I  | 6180I  |
| 44005/44030   | 3 k      | 6285V | 6283V  | 6284V | 6287V  | 6282V | 6289V | 6286V | 6281V | 6288V | 6280V | 6283I   | 6287I   | 6282I   | 6289I   | 6286I   | 6281I  | 6288I  | 6280I  |
| 44007/44034   | 5 k      | 6385V | 6383V  | 6384V | 6387V  | 6382V | 6389V | 6386V | 6381V | 6388V | 6380V | 6383I   | 6387I   | 6382I   | 6389I   | 6386I   | 6381I  | 6388I  | 6380I  |
| 44006/44031   | 10 k     | 6485V | 6483V  | 6484V | 6487V  | 6482V | 6489V | 6486V | 6481V | 6488V | 6480V | 6483I   | 6487I   | 6482I   | 6489I   | 6486I   | 6481I  | 6488I  | 6480I  |
| 44008/44032   | 30 k     | 6585V | 6583V  | 6584V | 6587V  | 6582V | 6589V | 6586V | 6581V | 6588V | 6580V | 6583I   | 6587I   | 6582I   | 6589I   | 6586I   | 6581I  | 6588I  | 6580I  |
| YSI 400       | 2.252 k  | 6685V | 6683V  | 6684V | 6687V  | 6682V | 6689V | 6686V | 6681V | 6688V | 6680V | 6683I   | 6687I   | 6682I   | 6689I   | 6686I   | 6681I  | 6688I  | 6680I  |
| Spectrum 1003 | 1 k      | 6785V | 6783V  | 6784V | 6787V  | 6782V | 6789V | 6786V | 6781V | 6788V | 6780V | 6783I   | 6787I   | 6782I   | 6789I   | 6786I   | 6781I  | 6788I  | 6780I  |

## Range Table: Custom Input Range

APD 4152 

| Custom Input          | Output   | ±10 V | 0-10 V | ±5 V  | 2-10 V | 0-8 V | 0-5 V | 1-5 V | 0-4 V | 0-2 V | 0-1 V | 0-20 mA | 4-20 mA | 0-16 mA | 0-10 mA | 2-10 mA | 0-8 mA | 0-4 mA | 0-2 mA |
|-----------------------|----------|-------|--------|-------|--------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|---------|--------|--------|--------|
| Type                  | Switches | ABCDE | ABCDE  | ABCDE | ABCDE  | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE | ABCDE   | ABCDE   | ABCDE   | ABCDE   | ABCDE   | ABCDE  | ABCDE  | ABCDE  |
| See module side label |          | FF85V | FF83V  | FF84V | FF87V  | FF82V | FF89V | FF86V | FF81V | FF88V | FF80V | FF83I   | FF87I   | FF82I   | FF89I   | FF86I   | FF81I  | FF88I  | FF80I  |

## Range Setup Record

APD 4152 

| Date installed | Model | Serial number | Location | Input range | Output range | A | B | C | D | E |
|----------------|-------|---------------|----------|-------------|--------------|---|---|---|---|---|
|                |       |               |          |             |              |   |   |   |   |   |