

Input: Thermistor, or Custom Sensor
Output: 0-1 V to 0-10 V, ±5 V, ±10 V, 0-2 mA to 4-20 mA, Reverse Acting Optional

[Quick Link: api-usa.com/apd4152](http://api-usa.com/apd4152)

- One Model Covers All Common Thermistor Sensors
- Easy Setup—No Computer or Software Needed
- Zero and Span Output Calibration Buttons
- 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 kΩ at 25°C
 44005/44030 3.000 kΩ at 25°C
 44007/44034 5.000 kΩ at 25°C
 44006/44031 10.00 kΩ at 25°C
 44008/44032 30.00 kΩ at 25°C
 YSI 400 2.252 kΩ at 25°C
 Spectrum 1003k 1 kΩ

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,
 ±5 VDC, ±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 Ω at 20 mA

Reverse Acting Output, Factory Set

R option: Reverse acting output
 increasing input = decreasing output signal

Reverse acting models cannot be converted to direct acting

Output Calibration

Zero and span set by using up/down buttons, ±10% range

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

Output Resolution

18 bit

Output Ripple and Noise

Less than ±0.2% of span

Accuracy

±0.1°C accuracy and 0.001°C resolution

Ambient Temperature Range and Stability

-10°C to +60°C operating ambient
 Better than ±0.02% of span per °C stability

Response Time

300 milliseconds nominal

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

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



[Applications Link](http://api-usa.com/apps)
api-usa.com/apps

Free Factory I/O Setup!



Dimensions

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

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 °F or °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

Sink or Source mA Output



1 2 3 4 Removable Plugs
 5 6 7 8
 Setup and Status LED
 Adjustable Output Test Function
 Zero and Span for Output
 Input LoopTracker LED
 Universal Thermistor Input
 9 10 11 12
 Universal Power 13 14 15 16
 See Wiring Diagrams on Next Page

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** Reverse acting 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.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. See api-usa.com for latest product information. Consult factory for your specific requirements.

 **WARNING:** This product can expose you to chemicals including nickel, which are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Electrical Connections

See wiring diagrams. Observe polarity.

* Do not make any connections to unused terminals or use them as wiring junctions for external devices. This may cause permanent damage to the 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

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.

Models with **R** reverse acting output use the same switch settings, except the output range is reversed (4-20 mA is 20-4 mA).

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

Input and output ranges, if specified on your order, are factory pre-configured (at 24°C ±1°C).

Note: Perform the following calibration procedure any time input or output settings are changed.

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


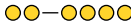

5. Use the simulator to apply the low end of the input signal.
6. Push the Set button to store the low end input value.
7. The Status LED will turn on to indicate the reading was saved.
8. Use the Up and Down buttons to adjust the output to the desired low output reading. For example: 4 mA for a 4-20 mA output or -10 V for a ±10V 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 be on during this 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.

Adjusting Output After Installation

It may be necessary to fine-tune the output signal after installation to account for offset, tare, lead length, or operating temperature.

1. Press and release the **Set** button. This will turn on the yellow Status LED.
2. Use the **Up** and **Down** buttons to adjust the output to the desired level. The Status LED will turn off during the adjustment.
3. Once the desired output level has been met, press and release the **Set** button to save the adjustment. The "Status" LED will flash indicating that the change has been made.

The unit has an auto Zero/Span detection for knowing which to adjust. If the output signal is greater than 50% of the Span, the unit will adjust the output signal Span.

If the output signal is less than 50% of the Span, the unit will adjust the output signal Zero.

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.

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 |  |

For models with "R" option, output ranges are reversed

Thermistor Type	Output Ohms	±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
		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

For models with "R" option, output ranges are reversed

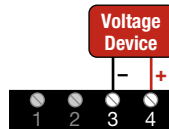
Custom Input Type	Output Switches	±10 V	0-10 V	±5 V	2-10 V	0-8 V	0-5 V	1-5 V	0-4 V	0-2 V	0-1 V	0-20 mA	4-20 mA	0-16 mA	0-10 mA	2-10 mA	0-8 mA	0-4 mA	0-2 mA
		ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE
See module side label		FF85V	FF83V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



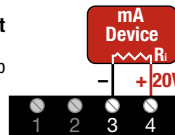
⚠ * Do not make connections to unused terminals!

Wire terminal torque
0.5 to 0.6 Nm or
4.4 to 5.3 in-lbs

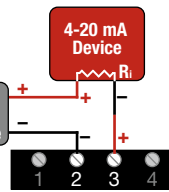
Voltage Output
Switch E set to "V"



Current Sourcing Output
Switch E set to "I"
Module powers mA output loop



Current Sinking Output
switch E set to "I"
External loop supply
Module mA output is unpowered



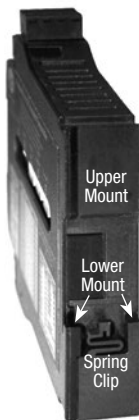
Do Not Connect to Unused
Terminals 1, 5, 6, 7, 8



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. Allow 1" (25 mm) above and below housing vents for air circulation.

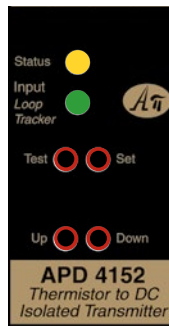
1. Tilt front of module downward and clip the lower mount with spring clips to the bottom edge of DIN rail.
2. Push front of module upward until upper mount snaps into place.



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.

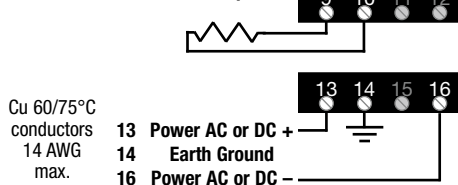


Yellow status LED
Setup: blinks once per second
Off: normal operation
2 digit code: error code

Green LoopTracker LED brightness varies with input level

To maintain full isolation and avoid malfunctions, do not connect power supplies in common with input, output or unit power.

Thermistor Input



Cu 60/75°C
conductors
14 AWG
max.

⚠ * Do not make connections to unused terminals!

Range Setup Record

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