

Input: RTD 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/apd4151](http://api-usa.com/apd4151)

- One Model Covers All Common RTD 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 RTD Sensors for PLC Input, Control and/or Validation
- Interface RTD Sensors with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

Input Types, Field Selectable

RTDs: 2, 3, or 4 wire, 10 Ω to 8000 Ω RTDs
 4 wire with or without current rotation
 Cu-10, Cu-100, Ni-100, Ni-120,
 Ni-Fe-500, Ni-Fe-1000, Ni-Fe-2000,
 Pt-10, Pt-25, Pt-50, Pt-100, Pt-200,
 Pt-470, Pt-500, Pt-1000

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 input accuracy, 0.001°C input 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 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

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



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

Free Factory I/O Setup!

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)

Description

The APD 4151 accepts an RTD temperature input and provides an optically isolated and linearized DC voltage or current output.

The RTD type, temperature range and output range are field configurable. The RTD 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 RTD 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.

- RTD:** Model/type, resistance, curve, no. of wires
 If 4 wire: with or without current rotation
- Custom:** Complete sensor data over temperature range
- Temperature:** Range in °F or °C
- Output:** Range and type (mV, V, mA)
- Default:** Pt100, 385 curve, 4 wire, 100 to 500°C, 4-20 mA output

Model	Description	Power
APD 4151	RTD input to DC output isolated	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 4151 D	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 RTD 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 4151 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

Range Selection

Select ranges before installation. A 4 wire RTD with current rotation input requires changing an internal jumper. Use the tables on the next pages to select the I/O ranges and jumper settings. The module side label lists output ranges. Ranges can also be found at api-usa.com/4151

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 an RTD 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 RTD 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

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 an RTD 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 3 Invalid RTD 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.

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.

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.

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 4151 accepts an RTD 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 |  |



To avoid damage to the module, do not make any connections to unused terminals

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

Mounting to a DIN Rail

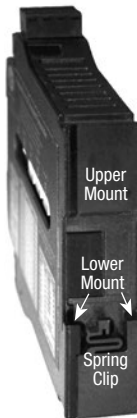
Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1" (25 mm) above and below housing vents for air circulation.

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.

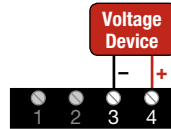
Removal

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

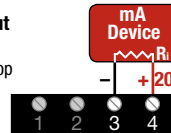
1. Push up on bottom back of module.
2. Tilt the front of module downward to release upper mount from top edge of DIN rail.
3. The module can now be removed from the DIN rail.



Voltage Output
Switch E set to "V"

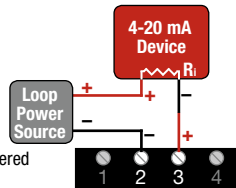


Current Sourcing Output
Switch E set to "I"
Module powers mA output loop

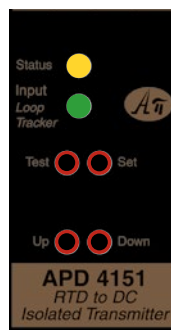


Current Sinking Output
switch E set to "I"
External loop supply

Module mA output is unpowered



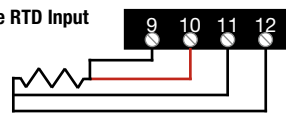
Do Not Connect to Unused Terminals 1, 5, 6, 7, 8



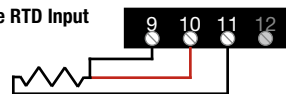
Yellow status LED
Setup: blinks once per second
Off: normal operation
2 digit code: error code
Green LoopTracker LED brightness varies with input level

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

4 Wire RTD Input



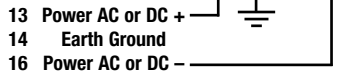
3 Wire RTD Input



2 Wire RTD Input



Cu 60/75°C
conductors
14 AWG
max.



Range Table: 2 Wire and 3 Wire RTDs

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



Table with columns for RTD Type, Output, and various temperature ranges (±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). Rows include materials like Cu-100, Ni-100, Ni-120, Ni-Fe-500, Pt-100, and Pt-200.

Range Table: 4 Wire RTD

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

4 Wire RTD	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
	Switches	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE	ABCDE
Type	Curve																		
Cu-10	0.00427	4185V	4183V	4184V	4187V	4182V	4189V	4186V	4181V	4188V	4180V	4183I	4187I	4182I	4189I	4186I	4181I	4188I	4180I
Cu-100	0.00427	4285V	4283V	4284V	4287V	4282V	4289V	4286V	4281V	4288V	4280V	4283I	4287I	4282I	4289I	4286I	4281I	4288I	4280I
Ni-100	0.00618	4385V	4383V	4384V	4387V	4382V	4389V	4386V	4381V	4388V	4380V	4383I	4387I	4382I	4389I	4386I	4381I	4388I	4380I
Ni-120	0.00672	4485V	4483V	4484V	4487V	4482V	4489V	4486V	4481V	4488V	4480V	4483I	4487I	4482I	4489I	4486I	4481I	4488I	4480I
Ni-Fe-500	0.00518	4585V	4583V	4584V	4587V	4582V	4589V	4586V	4581V	4588V	4580V	4583I	4587I	4582I	4589I	4586I	4581I	4588I	4580I
Ni-Fe-1000	0.00527	4685V	4683V	4684V	4687V	4682V	4689V	4686V	4681V	4688V	4680V	4683I	4687I	4682I	4689I	4686I	4681I	4688I	4680I
Ni-Fe-2000	0.00527	4785V	4783V	4784V	4787V	4782V	4789V	4786V	4781V	4788V	4780V	4783I	4787I	4782I	4789I	4786I	4781I	4788I	4780I
Pt-10	0.00385	48A5V	48A3V	48A4V	48A7V	48A2V	48A9V	48A6V	48A1V	48A8V	48A0V	48A3I	48A7I	48A2I	48A9I	48A6I	48A1I	48A8I	48A0I
Pt-10	0.003911	48B5V	48B3V	48B4V	48B7V	48B2V	48B9V	48B6V	48B1V	48B8V	48B0V	48B3I	48B7I	48B2I	48B9I	48B6I	48B1I	48B8I	48B0I
Pt-10	0.003916	48C5V	48C3V	48C4V	48C7V	48C2V	48C9V	48C6V	48C1V	48C8V	48C0V	48C3I	48C7I	48C2I	48C9I	48C6I	48C1I	48C8I	48C0I
Pt-10	0.003926	48D5V	48D3V	48D4V	48D7V	48D2V	48D9V	48D6V	48D1V	48D8V	48D0V	48D3I	48D7I	48D2I	48D9I	48D6I	48D1I	48D8I	48D0I
Pt-25	0.003926	49D5V	49D3V	49D4V	49D7V	49D2V	49D9V	49D6V	49D1V	49D8V	49D0V	49D3I	49D7I	49D2I	49D9I	49D6I	49D1I	49D8I	49D0I
Pt-50	0.00385	4AA5V	4AA3V	4AA4V	4AA7V	4AA2V	4AA9V	4AA6V	4AA1V	4AA8V	4AA0V	4AA3I	4AA7I	4AA2I	4AA9I	4AA6I	4AA1I	4AA8I	4AA0I
Pt-50	0.003911	4AB5V	4AB3V	4AB4V	4AB7V	4AB2V	4AB9V	4AB6V	4AB1V	4AB8V	4AB0V	4AB3I	4AB7I	4AB2I	4AB9I	4AB6I	4AB1I	4AB8I	4AB0I
Pt-50	0.003916	4AC5V	4AC3V	4AC4V	4AC7V	4AC2V	4AC9V	4AC6V	4AC1V	4AC8V	4AC0V	4AC3I	4AC7I	4AC2I	4AC9I	4AC6I	4AC1I	4AC8I	4AC0I
Pt-50	0.003926	4AD5V	4AD3V	4AD4V	4AD7V	4AD2V	4AD9V	4AD6V	4AD1V	4AD8V	4AD0V	4AD3I	4AD7I	4AD2I	4AD9I	4AD6I	4AD1I	4AD8I	4AD0I
Pt-100	0.00385	4BA5V	4BA3V	4BA4V	4BA7V	4BA2V	4BA9V	4BA6V	4BA1V	4BA8V	4BA0V	4BA3I	4BA7I	4BA2I	4BA9I	4BA6I	4BA1I	4BA8I	4BA0I
Pt-100	0.003911	4BB5V	4BB3V	4BB4V	4BB7V	4BB2V	4BB9V	4BB6V	4BB1V	4BB8V	4BB0V	4BB3I	4BB7I	4BB2I	4BB9I	4BB6I	4BB1I	4BB8I	4BB0I
Pt-100	0.003916	4BC5V	4BC3V	4BC4V	4BC7V	4BC2V	4BC9V	4BC6V	4BC1V	4BC8V	4BC0V	4BC3I	4BC7I	4BC2I	4BC9I	4BC6I	4BC1I	4BC8I	4BC0I
Pt-100	0.003926	4BD5V	4BD3V	4BD4V	4BD7V	4BD2V	4BD9V	4BD6V	4BD1V	4BD8V	4BD0V	4BD3I	4BD7I	4BD2I	4BD9I	4BD6I	4BD1I	4BD8I	4BD0I
Pt-200	0.00385	4CA5V	4CA3V	4CA4V	4CA7V	4CA2V	4CA9V	4CA6V	4CA1V	4CA8V	4CA0V	4CA3I	4CA7I	4CA2I	4CA9I	4CA6I	4CA1I	4CA8I	4CA0I
Pt-200	0.003911	4CB5V	4CB3V	4CB4V	4CB7V	4CB2V	4CB9V	4CB6V	4CB1V	4CB8V	4CB0V	4CB3I	4CB7I	4CB2I	4CB9I	4CB6I	4CB1I	4CB8I	4CB0I
Pt-200	0.003916	4CC5V	4CC3V	4CC4V	4CC7V	4CC2V	4CC9V	4CC6V	4CC1V	4CC8V	4CC0V	4CC3I	4CC7I	4CC2I	4CC9I	4CC6I	4CC1I	4CC8I	4CC0I
Pt-200	0.003926	4CD5V	4CD3V	4CD4V	4CD7V	4CD2V	4CD9V	4CD6V	4CD1V	4CD8V	4CD0V	4CD3I	4CD7I	4CD2I	4CD9I	4CD6I	4CD1I	4CD8I	4CD0I
Pt-470	0.003926	4DD5V	4DD3V	4DD4V	4DD7V	4DD2V	4DD9V	4DD6V	4DD1V	4DD8V	4DD0V	4DD3I	4DD7I	4DD2I	4DD9I	4DD6I	4DD1I	4DD8I	4DD0I
Pt-500	0.00385	4EA5V	4EA3V	4EA4V	4EA7V	4EA2V	4EA9V	4EA6V	4EA1V	4EA8V	4EA0V	4EA3I	4EA7I	4EA2I	4EA9I	4EA6I	4EA1I	4EA8I	4EA0I
Pt-500	0.003911	4EB5V	4EB3V	4EB4V	4EB7V	4EB2V	4EB9V	4EB6V	4EB1V	4EB8V	4EB0V	4EB3I	4EB7I	4EB2I	4EB9I	4EB6I	4EB1I	4EB8I	4EB0I
Pt-500	0.003916	4EC5V	4EC3V	4EC4V	4EC7V	4EC2V	4EC9V	4EC6V	4EC1V	4EC8V	4EC0V	4EC3I	4EC7I	4EC2I	4EC9I	4EC6I	4EC1I	4EC8I	4EC0I
Pt-500	0.003926	4ED5V	4ED3V	4ED4V	4ED7V	4ED2V	4ED9V	4ED6V	4ED1V	4ED8V	4ED0V	4ED3I	4ED7I	4ED2I	4ED9I	4ED6I	4ED1I	4ED8I	4ED0I
Pt-1000	0.00375	4F95V	4F93V	4F94V	4F97V	4F92V	4F99V	4F96V	4F91V	4F98V	4F90V	4F93I	4F97I	4F92I	4F99I	4F96I	4F91I	4F98I	4F90I
Pt-1000	0.00385	4FA5V	4FA3V	4FA4V	4FA7V	4FA2V	4FA9V	4FA6V	4FA1V	4FA8V	4FA0V	4FA3I	4FA7I	4FA2I	4FA9I	4FA6I	4FA1I	4FA8I	4FA0I
Pt-1000	0.003911	4FB5V	4FB3V	4FB4V	4FB7V	4FB2V	4FB9V	4FB6V	4FB1V	4FB8V	4FB0V	4FB3I	4FB7I	4FB2I	4FB9I	4FB6I	4FB1I	4FB8I	4FB0I
Pt-1000	0.003916	4FC5V	4FC3V	4FC4V	4FC7V	4FC2V	4FC9V	4FC6V	4FC1V	4FC8V	4FC0V	4FC3I	4FC7I	4FC2I	4FC9I	4FC6I	4FC1I	4FC8I	4FC0I
Pt-1000	0.003926	4FD5V	4FD3V	4FD4V	4FD7V	4FD2V	4FD9V	4FD6V	4FD1V	4FD8V	4FD0V	4FD3I	4FD7I	4FD2I	4FD9I	4FD6I	4FD1I	4FD8I	4FD0I

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

Range Setup Record

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

