Introduction
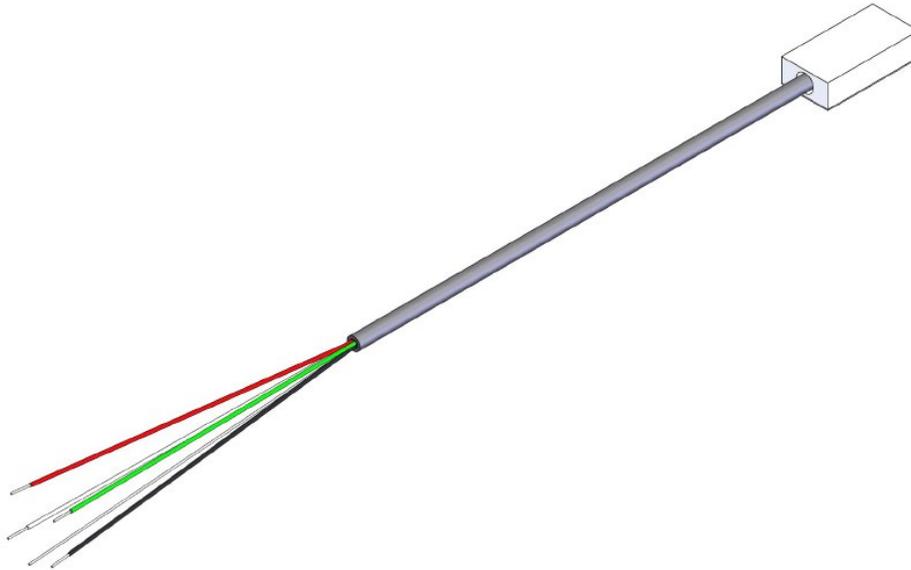
The NRG PVT1 module temperature sensor (introduced June, 2020) provides PV module temperature for PV performance monitoring. The sensor includes an adhesion kit for affixing the sensor to PV modules to ensure proper installation, and is compatible with the NRG SymphoniePRO as well as data acquisition systems which can accept a 2 or 4 wire thermistor input.

Sensor Identification

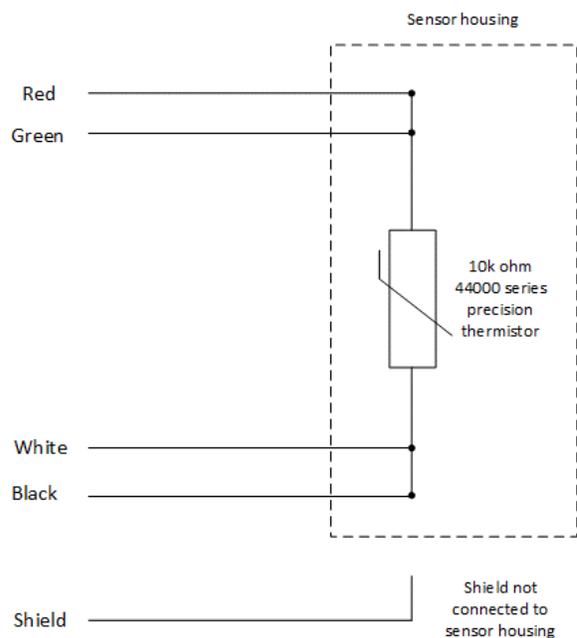The NRG PVT 1 can be identified by a label that is on the cable.
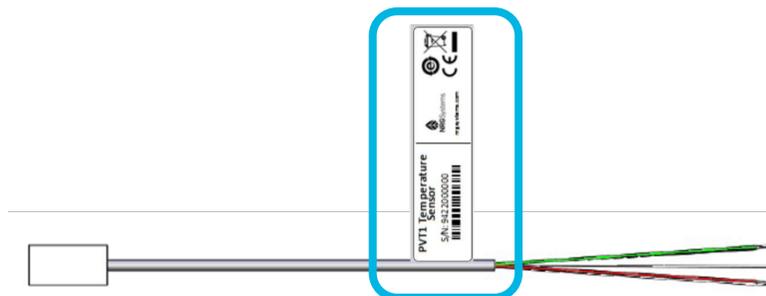
PVT1 | PV Module Temperature Sensor

Theory of Operation

The sensor utilizes a precision 44000 series 10k thermistor connected using a 4-wire scheme; the resistance of the thermistor changes with temperature and follows a curve defined by the Steinhart-Hart coefficients. A constant current source is externally applied to the sensor to create a voltage which can in turn be measured by the data logger or data acquisition system. The sensor may be connected to equipment compatible with either a 2-wire or 4-wire topology. To meet demanding accuracy specifications, it is recommended to run the sensor in a 4-wire configuration, especially with longer wire runs.

Sensor housing

Red

Green

10k ohm
44000 series
precision
thermistor

White

Black

Shield

Shield not
connected to
sensor housing

Mounting

The PVT1 comes with a self-adhesive backing as well as protective overlay and strain relief stickers.

Self-Adhesive
(peel and stick)

Protective
Overlay
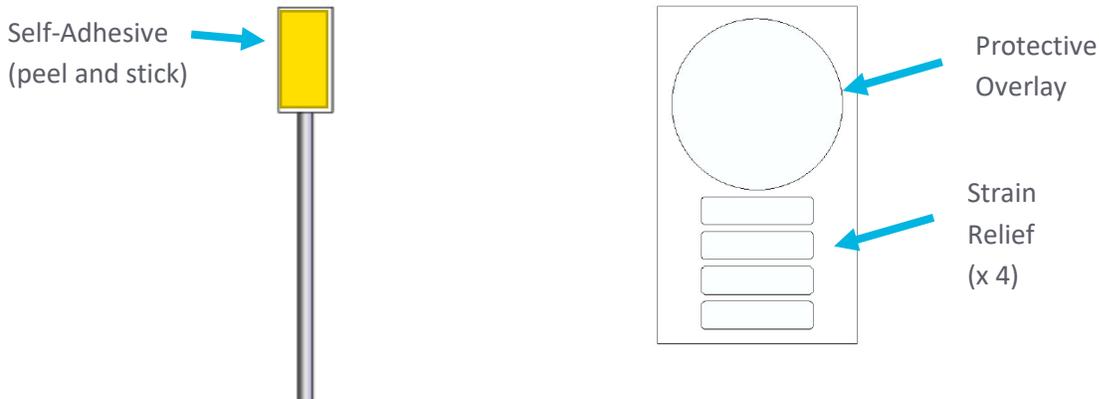
Strain
Relief
(x 4)

Identify desired mounting location on the PV panel, clean the panel, affix the sensor, affix the additional protective sticker and strain relief.

Typical PV Module
(72 cells)

Step 1:

Identify mounting location
(typically center of panel,
center of cell, 4 useable cells
highlighted).

Step 2:

Clean the PV cell with an
alcohol wipe.

Step 3:

Peel the protective tape
cover from the PVT1 and
affix to the center of the
cell.

Step 4:

Place the adhesive circle
over the PVT1 and use the
four adhesive strips for cable
strain relief and routing.

Note: It is important to clean the PV module surface with an alcohol wipe before affixing the PVT1.

PVT1 | PV Module Temperature Sensor
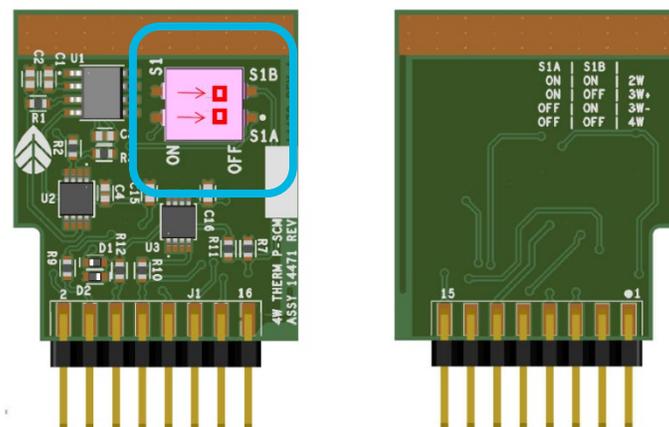
SymphoniePRO

Compatibility

The sensor is compatible with SymphoniePRO loggers running firmware 3.3 or higher, and Desktop Application 3.9 and higher. Additionally, P-SCM #9420 {P-SCM, Thermistor Input, 2 or 4 wire} is required.

NOTE: The desktop software and logger firmware MUST be up to date before performing logger configuration and/or data processing tasks. The latest versions of software, firmware and documentation can be downloaded from this page: https://www.nrgsystems.com/services-support/resources/documentation-and-downloads/ .

Wiring

Wiring the sensor to the SymphoniePRO requires P-SCM #9420 installed into the slot corresponding to the correct channel. P-SCM switches S1A and S1B both set to the OFF position for 4 wire operation.

Channels 20-26 (P-SCM #9420)		
NRG PVT1 Module Temperature Sensor	Wire Color	SymphoniePRO Logger
Signal +	Red	EXC
Signal +	Green	SIG +
Signal -	White	SIG -
Signal -	Black	GND
Shield	Bare	SHD

Note: Prior to June 2020, NRG shipped a 2-wire thermistor P-SCM #9136. To use this P-SCM with the PVT1 sensor, leave the Red and Black wires disconnected.

PVT1 | PV Module Temperature Sensor

Channel Configuration

Create the following configuration in the SymphoniePRO Desktop Application (Version 3.9 or later). Note, if you do not see the 200M in the "Load From Defaults" drop-down menu, please update your software from the "Services and Support" section of our website (https://www.nrgsystems.com).

Default Scale Factors (Desktop Application 3.9 and later)

The SymphoniePRO Desktop Application contains default scaling information for the sensor in the form of Steinhart-Hart coefficients.
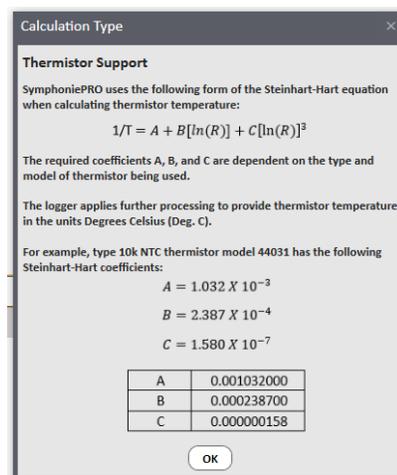
P-SCM Channels 20-26

Choose "NRG PVT1 Module Temp." from the "Load From Defaults" drop down menu.
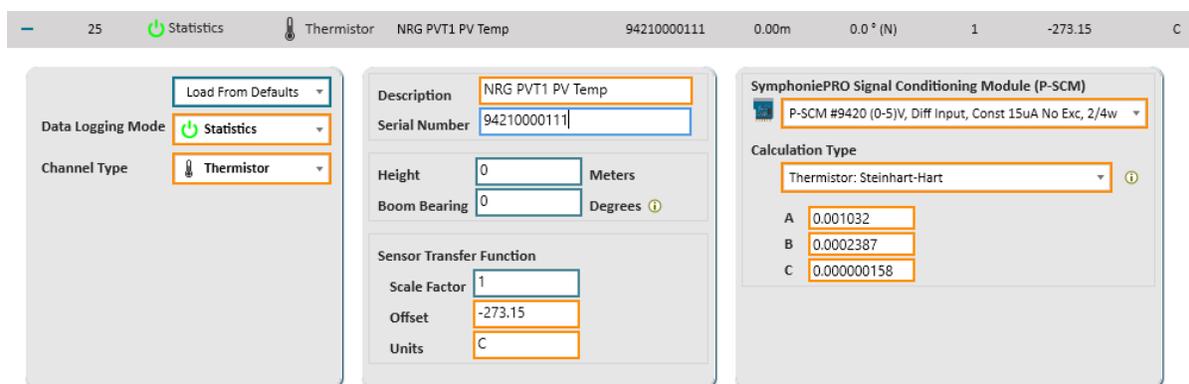
The Steinhart-Hart Coefficients for the sensor are:

A =   0.001032

B =   0.0002387

C =   0.000000158

Specifications

Please see nrgsystems.com for up-to-date product specifications.

Description	Sensor type	10 kΩ NTC thermistor
	Applications	⯀ Solar resource monitoring ⯀ Surface temperature measurement
	Sensor range	-55 °C to 150 °C (-67 °F to 302 °F)
	Instrument compatibility	NRG SymphoniePRO Data Logger
Output signal	Transfer function	Steinhart-Hart Coefficients: A = 0.001032 B = 0.0002387 C = 0.000000158 Beta Value: 3694 K Beta Value Tolerance: 0.80%
	Accuracy	± 0.2 °C from 0 to 70 °C (±0.36 °F from 32 to 158 °F)
Power requirements	Supply current	15 µA maximum (supplied by logger)
Installation	Mounting	Adhere to back of PV module (adhesive tape included)
Environmental	Operating temperature range	-40 °C to 105 °C (-40 °F to 221 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	Wire leads: ⯀ Excitation (red wire) ⯀ Ground (black wire) ⯀ Signal + (green wire) ⯀ Signal - (white wire) ⯀ Drain wire for earth ground
	Cable length	3.0 m (9.8 ft)
	Weight	46.7 g (0.10 lbs)
	Dimensions	Probe only: 25 mm (1") long x 12.7 mm (0.5") width x 6.2 mm (.25") thick
Materials	Cable	4 conductor 28 AWG, with foil shield and drain wire, PUR jacket
	Probe	Aluminum, epoxy filled

NRG PVT1 Associated Items List

Item	Description
9421	Sensor, Temperature, PV Panel, 3 m Cable
9422	Sensor, Temperature, PV Panel, 10 m Cable
9423	Sensor, Temperature, PV Panel, 20 m Cable
9424	Sensor, Temperature, PV Panel, 50 m Cable
9426	Sensor, Temperature, PV Panel, 100 m Cable
9420	PCBAssy- P-SCM, Thermistor Input, 2 or 4 Wire
15151	Matched Pair PV Panels, 3-meter Cable