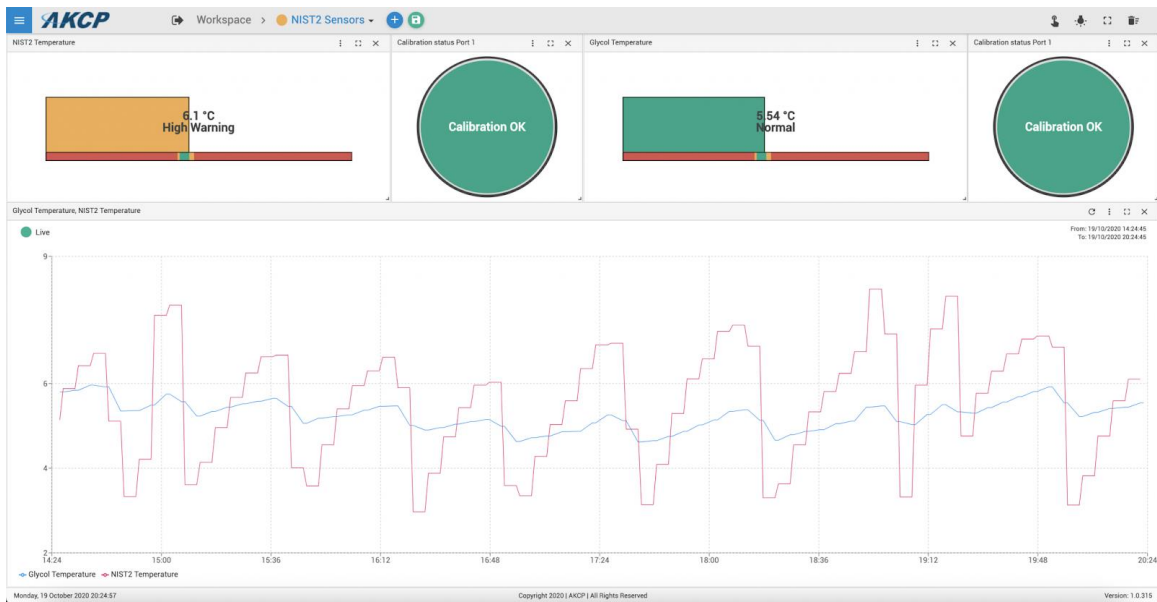# NIST Temperature & Temperature/Humidity Sensors

Quick Start Guide - 2023

NIST Sensors on sensorProbe+

The NIST2 sensors feature 2x NIST traceable, calibrated temperature sensors and an internal calibration integrity check.

With this technology, the sensors operate in pairs, with the values compared once a second. If a difference greater than the stated tolerance of the sensor is detected, an alarm is raised to warn that the sensor is out of calibration. For a higher level of accuracy, an average of the sensor pairs is calculated.

The NIST3 sensors feature 3x NIST traceable, calibrated sensors with internal calibration integrity check and failover. The NIST3 is suited to critical infrastructure monitoring where failover systems are required.

The average of each sensor is calculated. This results in a higher accuracy but also multiple failovers. When a sensor is detected as being out of calibration, its values are ignored and an alarm raised. In the event of a failure, you have a continuous operation, graphing and monitoring of the environmental conditions.

The WTS-NIST type sensors have the same features as the wired sensors, but can be used wirelessly with our WTG units.

NIST Sensor Compatibility

The wired NIST2 and NIST3 sensors are compatible with the F7 & H7 SP+ series units. These sensors will not work on the older F4 type SP+ units.

The wired NIST2 sensors are compatible with the securityProbe (SEC5) base units, however they are not supported on the E-sensor8 expansion modules. The firmware on the SEC units needs to be upgraded to the latest on our website support portal as well.

The wireless WTS-NIST2 and WTS-NIST3 sensors are compatible with the WTG units.

Sensor features:

- Multiple traceable, calibrated temperature sensors
- Value averaging between temperature sensors for more accuracy
- Internal calibration integrity checking
- Failover function (NIST3 only)
- 2 additional subports per sensor:
  a) Operable sensors count
  b) Calibration status

Important notes:

We do not recommend using NIST3 on the SPX+ Sensor4 module's port (including BEB units), it may not work properly due to hardware limitations on the Sensor4 module.

Only the wired NIST2 sensors are compatible with the securityProbe (SEC5) base units.
The NIST2 sensor on SEC5 works differently than on SP+ platform: it does not contain the additional "Calibration Status" and "Operable Sensors Count"
sensors.

Extending the NIST Sensors:

TMP00-NIST2

The sensor can be extended up to 50m (165ft) using standard CAT5 cable.

TMP01-NIST2

Fixed length sensor with 1ft cable

TMP00-NIST3

Just like the TMP00, this sensor can be extended up to 50m (165ft) using standard CAT5 cable.

TMP01-NIST3

Fixed length sensor with 1ft cable

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

Extending Through Patch Panels & RJ-45 Couplers

We also do not recommend connecting the NIST, or any of our AKCP sensors though patch panels or using the RJ-45 couplers to extend them.

You may find that this works, however it will be very inconsistent and this is due to the signal strength from the sensor to the base unit. The resistance of the extra connectors in a patch panel, or couplers is often enough to prevent the sensor from functioning correctly.

Reading Coverage Area of our Sensors:

As with all sensors and thermometers they do not have a set sensing radius, they sense the temperature or the air that they are in contact with.

The sensing radius, or coverage area per sensor really depends on how uniform the temperature in the room is. Any temperature sensor (the sensing element) will only cover the point at which the sensor is in contact with the air. A thermometer, a digital sensor they all function the same way.

Sensor description
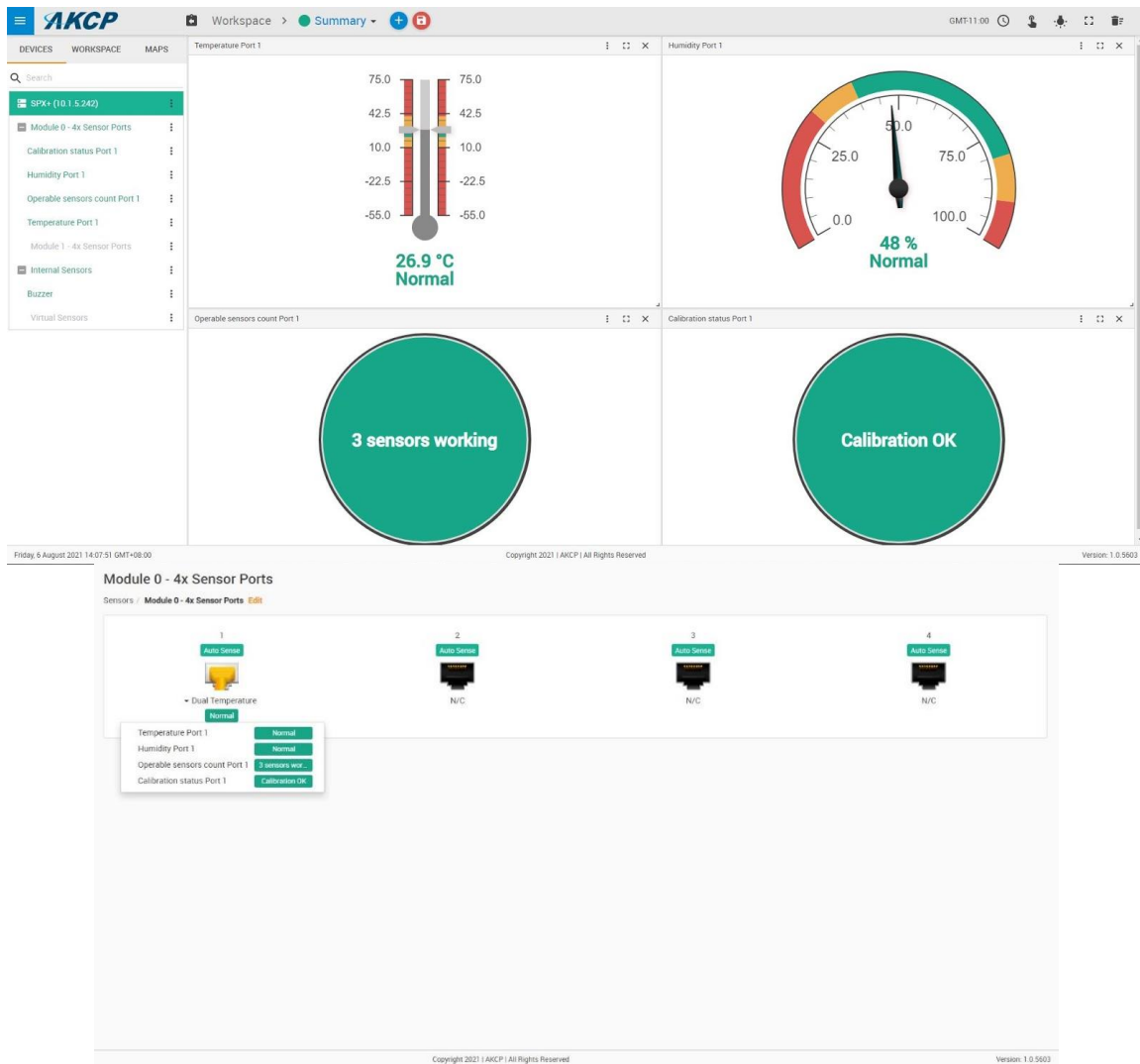
After plugging the NIST sensor to the main sensor port or Sensor4 module, the following sensors will be shown on the unit.

Temperature sensor
The Temperature port of the NIST sensors use value averaging from the NIST calibrated temperature sensors to be the displayed value.

If any temperature sensor value pair gets a value difference of more than 1°C, it will be excluded from averaging.

Humidity sensor (THS NIST sensors only)
The Humidity sensor port of the NIST sensors displays the humidity reading from the NIST calibrated sensor.

Operable sensors count
This sensor status shows the number of sensors that are working (sensors which have successful communications with the base unit).

Calibration status
This sensor status shows the calibration status of the temperature sensors.
In case when all of the differences in value pairs are within 1°C, the status will be "Calibration OK".

In case when there are value pairs with differences of more than 1°C, the status will be "Calibration Check x"
Where x is the number of invalid value pairs.

Re-Calibration Details
If the NIST sensors are detected as out of calibration, they can be replaced, or they can be re-calibrated. There is also an offset in the web UI they can use to offset the value. The offset is covered in the AKCP base unit manuals. There are also accredited labs where you can submit the NIST sensors for calibration.

Please contact our sales, or support team directly if you require the calibration certificate for the NIST sensors.

SP+ and WTG Configuration

To configure temperature and humidity sensors, please refer to our existing "Specifications Features and Configuration" section of our "Temperature & Dual Temp + Humidity Sensors" manual.

You may customize the status texts of the "Operable sensors count" and "Calibration status" sensors.

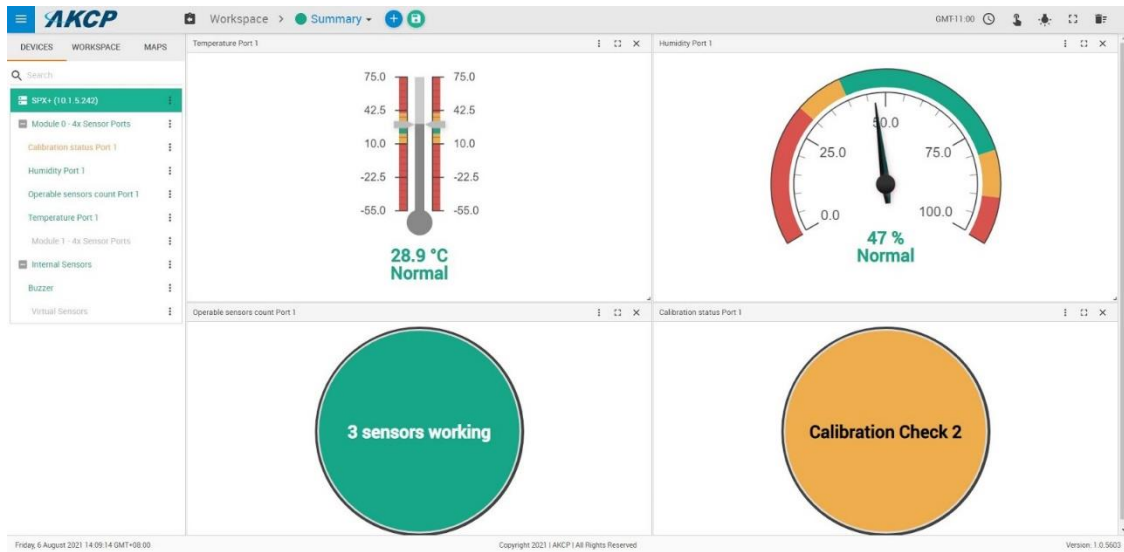## Examples of the NIST sensor status alerts
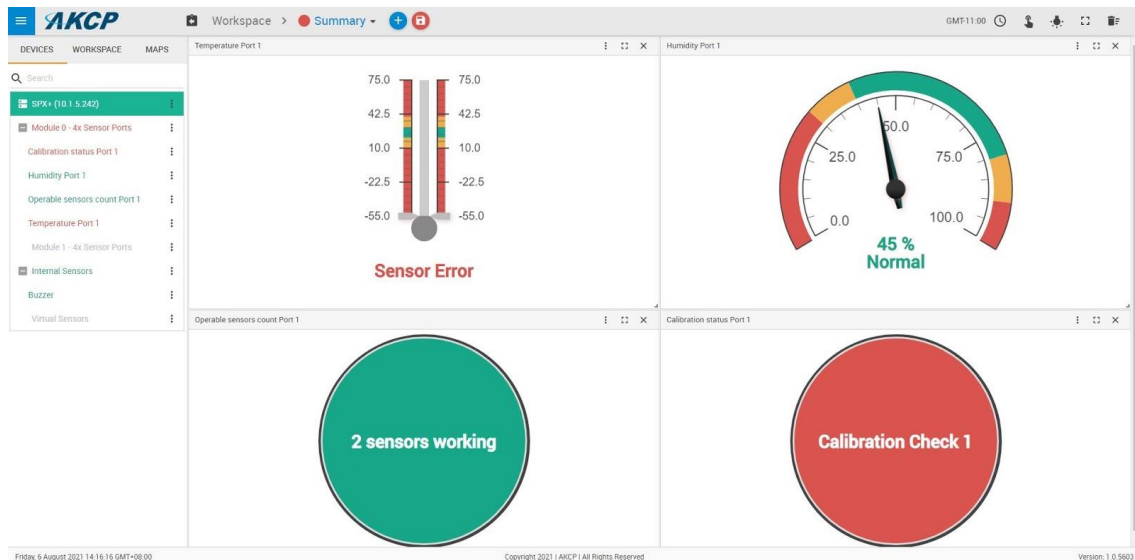
NIST2: Temperature sensors value difference is more than 1°C

Temperature: Sensor Error
Operable sensors count: 2 sensors working
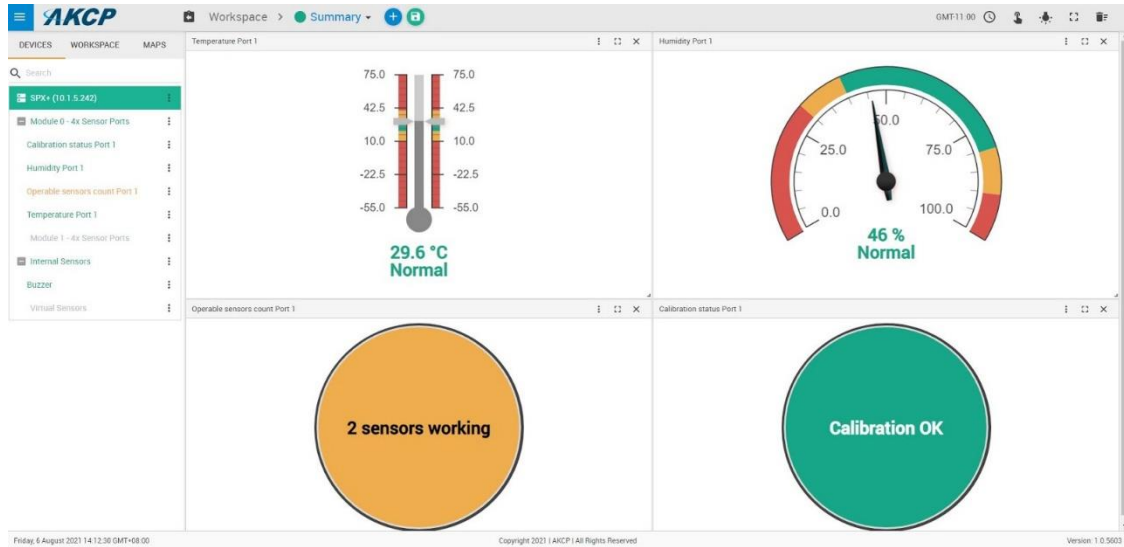**Calibration status: Calibration Check 1 (1 value pair difference is more than 1°C)**

NIST3: Temperature sensors value difference is more than 1°C

Temperature: has valid reading
Operable sensors count: 3 sensors working
Calibration status: Calibration Check 2 (2 value pairs have a difference of more than 1°C)
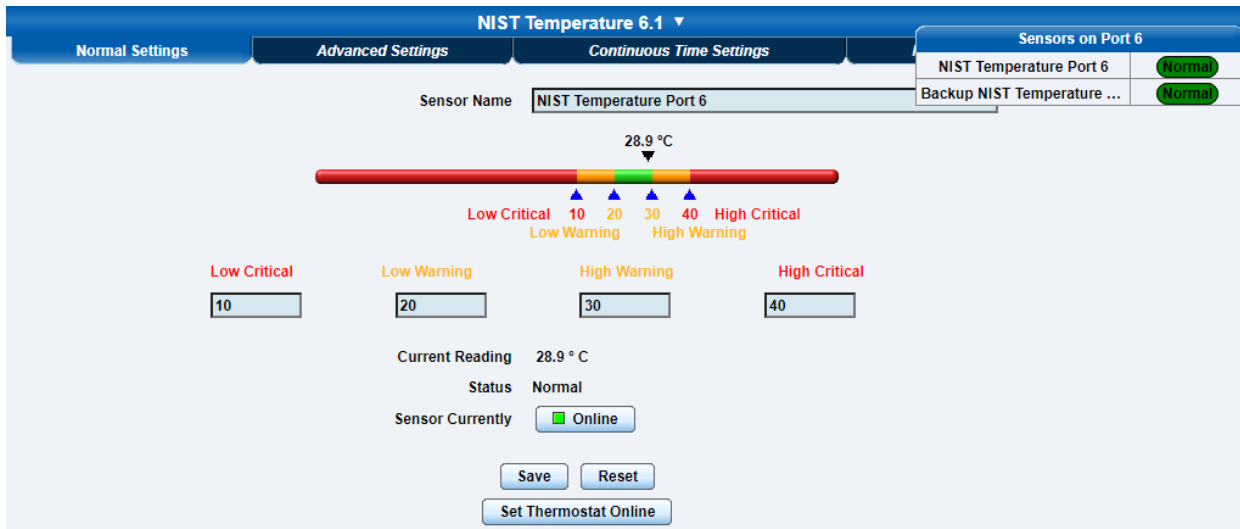

NIST3: 1 temperature sensor stopped working (communication failure)

Temperature: has valid reading
Operable sensors count: 2 sensors working
Calibration status: Calibration OK

NIST2 Sensors on securityProbe

The NIST2 sensors feature 2x NIST traceable, calibrated temperature sensors.
With our provided Virtual Sensor script, users can set customizable thresholds to raise an alarm to warn that the sensor is out of calibration.

Sensor features:
- Multiple traceable, calibrated temperature sensors
  Main and Backup Temperature sensor subports
- Value averaging between temperature sensors for more accuracy (via Custom Script VS)
- Failover function (via Custom Script VS)

SEC5 Configuration

Temperature Sensor Subports

To configure temperature sensors, please refer to our existing "Specifications Features and Configuration" section of our securityProbe user manual.

Virtual Sensor Custom Script

We provide 2 scripts to be used with the NIST2 sensor.

1. Value averaging (For more accurate value representation)
2. Value difference (For sensor accuracy check)

Click here to download both scripts in a ZIP file.

These script files are also included at the end of this manual.

In order to create a Custom Script Virtual Sensor, please follow the following steps.

These are example steps on how to create Virtual Sensor for the Value averaging script.

1. Access the Virtual Sensor setting page via Sensor => Virtual Sensors.
   Select a desired free Virtual Sensor port.
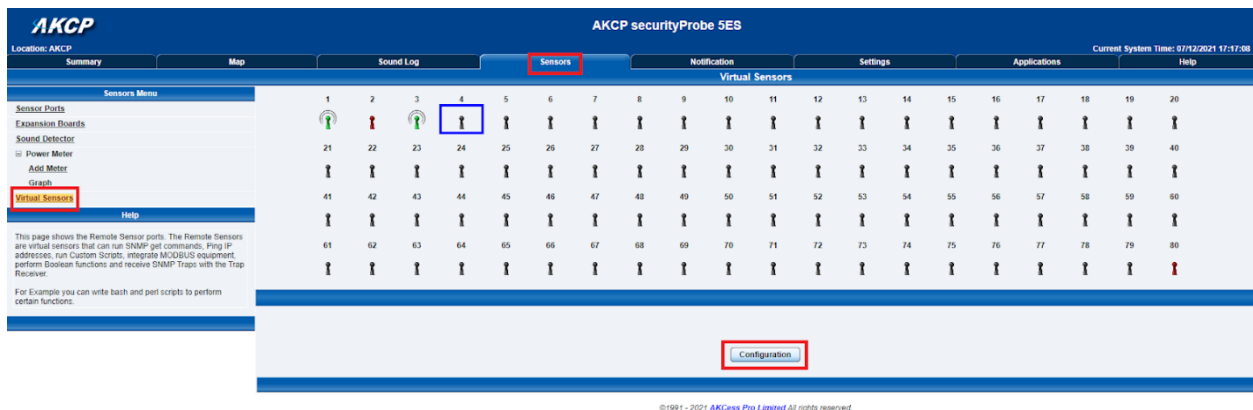
2. Click "Configuration" to start configuring the sensor.

3. Choose Source: Custom Script, and click "Next"
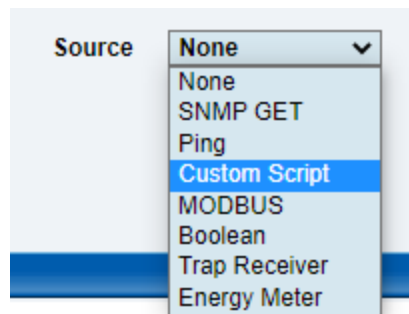
4. Click on "Add Your Own Script"

5. In the popup window click Choose File => Browse to the script => Add File => Close

6. Next you will need to configure the sensor.

   Sensor Name: Configure the sensor name as desired
   Script Name: Select the desired script
   Script Parameters: Set the sensor port where you plugged in the NIST2 sensor
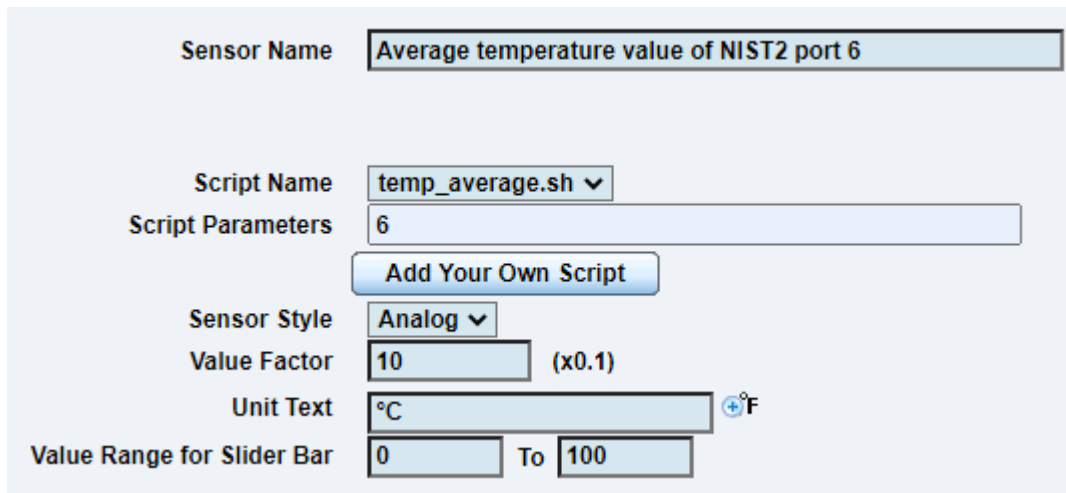   Sensor Style: Analog
   Value Factor: 10
   Unit Text: Configure according to the sensor unit of the NIST2 sensors (°C / °F)
   Value Range for Slider Bar: Configure as desired

   Note: For Value difference script, we recommend -5 to 5
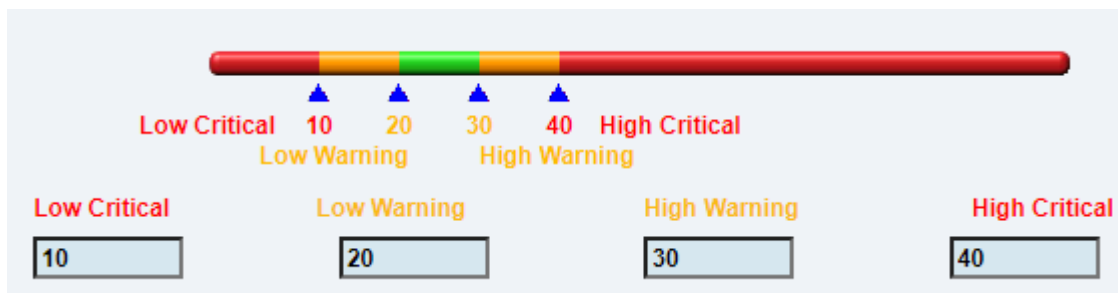
   When you are done, click "Next"

Sensor Name	Average temperature value of NIST2 port 6
Script Name	temp_average.sh ⌄
Script Parameters	6
	Add Your Own Script
Sensor Style	Analog ⌄
Value Factor	10 (x0.1)
Unit Text	°C ⊕°F
Value Range for Slider Bar	0 To 100

7. Configure sensor thresholds as desired.

   Note: For the Value difference script, we recommend -5, -1, 1, 5

   Click "Next"

| Low Critical	Low Warning	High Warning	High Critical
10	20	30	40

8. Configure the Virtual Sensor execution settings as follows.

Note: The Minimum Polling Interval of the Virtual Sensor is 5 seconds. This means that the value averaging and value difference scripts can update the Virtual Sensors value at a maximum rate of 5 s.

Click on "Finish" to create the virtual sensor.

Polling Interval	5	5 secs
Execute Time Out	5	5 secs
Retry	3	Times

Example of a configured Averaging Custom Script
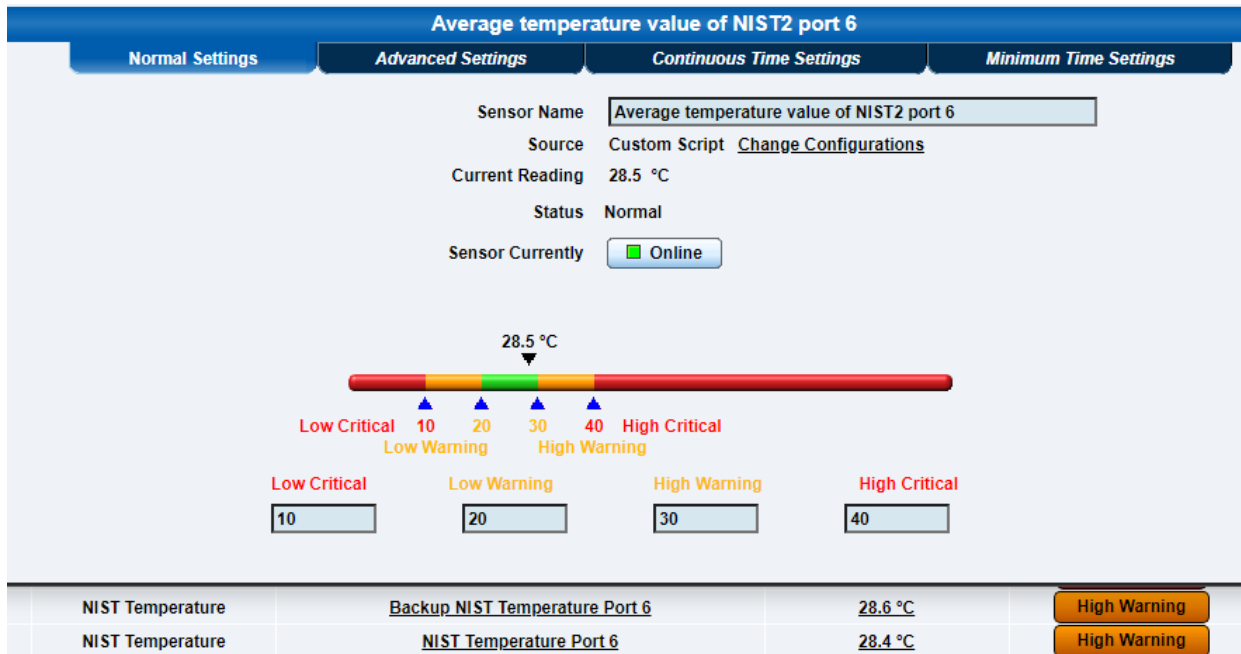
This is an example of the configured value averaging virtual sensor for the NIST2 sensor that is plugged on sensor port 6.

Note: In case of "sensor error" reading, we have the following error message format from our NIST2 scripts:

Error Message: NIST2 sensors on RJ45 port {Port} have invalid status   ({MainSensorStatus}, {BackupSensorStatus})

For example: "NIST2 sensors on RJ45 port 6 have invalid status (7, 7)" will be shown if the NIST2 port 2 is unplugged.

Quick reference for Sensor Status values:

2 => Normal, 3 => High Warning, 4 => High Critical, 5 => Low Warning, 6 => Low Critical, 7 => Sensor Error

SEC5 custom scripts for reference

[Click here](#) to download both scripts in a ZIP file.

[Value averaging](#)

This script is used for the NIST2 sensor to provide more accurate value representation

```sh
#!/bin/sh


IP_ADDRESS="127.0.0.1"
PORT=$1


OID_BASE=".1.3.6.1.4.1.3854.2.5.2.1"
T1_OID_STATUS=${OID_BASE}".6.0.0."${PORT}".1"
T2_OID_STATUS=${OID_BASE}".6.0.0."${PORT}".2"
T1_OID_VALUE=${OID_BASE}".20.0.0."${PORT}".1"
T2_OID_VALUE=${OID_BASE}".20.0.0."${PORT}".2"


T1_STATUS=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T1_OID_STATUS}`
T2_STATUS=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T2_OID_STATUS}`
T1_VALUE=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T1_OID_VALUE}`
T2_VALUE=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T2_OID_VALUE}`


# Output the value averaging if both NIST2 sensors are in good sensor
status (Normal/HighWarning/HighCritical/LowWarning/LowCritical).
if [ ${T1_STATUS} -ge 2 -a ${T1_STATUS} -le 6 -a ${T2_STATUS} -ge 2 -a
${T2_STATUS} -le 6 ];
then
    awk "BEGIN {printf \"%.2f\",(${T1_VALUE}+${T2_VALUE})/2}";
    exit 0;
elif [ ${T1_STATUS} -ge 2 -a ${T1_STATUS} -le 6 ]; # Output main sensor
value if the backup failed.
then
    echo ${T1_VALUE};
    exit 0;
elif [ ${T2_STATUS} -ge 2 -a ${T2_STATUS} -le 6 ]; # Output backup sensor
value if the main failed.
then
```

```sh
    echo ${T2_VALUE};
    exit 0;
else
    echo "NIST2 sensors on RJ45 port $PORT have invalid status
($T1_STATUS, $T2_STATUS)"; # Output error message to "Error Message"
section on the Virtual Sensor setting page.
    exit 1;
fi
```

Value difference

This script is used for the NIST2 sensor's accuracy check

```sh
#!/bin/sh


# Value preparation
IP_ADDRESS="127.0.0.1"
PORT=$1


OID_BASE=".1.3.6.1.4.1.3854.2.5.2.1"
T1_OID_STATUS=${OID_BASE}".6.0.0."${PORT}".1"
T2_OID_STATUS=${OID_BASE}".6.0.0."${PORT}".2"
T1_OID_VALUE=${OID_BASE}".20.0.0."${PORT}".1"
T2_OID_VALUE=${OID_BASE}".20.0.0."${PORT}".2"


T1_STATUS=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T1_OID_STATUS}`
T2_STATUS=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T2_OID_STATUS}`
T1_VALUE=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T1_OID_VALUE}`
T2_VALUE=`snmpget -v1 -Oqv -c public ${IP_ADDRESS} ${T2_OID_VALUE}`


# Only output the difference if both NIST2 sensors are in good sensor
status (Normal/HighWarning/HighCritical/LowWarning/LowCritical).
if [ ${T1_STATUS} -ge 2 -a ${T1_STATUS} -le 6 -a ${T2_STATUS} -ge 2 -a
${T2_STATUS} -le 6 ];
then
    expr ${T1_VALUE} - ${T2_VALUE}
    exit 0
else
    echo "NIST2 sensor(s) on RJ45 port $PORT have invalid status
($T1_STATUS, $T2_STATUS)"; # Output error message to "Error Message"
section on the Virtual Sensor setting page.
    exit 1
fi
```

Please contact support@akcp.com if you have any further technical questions or problems.

Thanks for Choosing AKCP!