eppendorf

New Brunswick™ TCA-3 Temperature Monitoring System

Operating manual

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1 Operating instructions

1.1 Using this manual

- Carefully read this operating manual before using the device for the first time.
- Also observe the operating manual enclosed with the accessories.
- The operating manual should be considered as part of the product and stored in a location that is easily accessible.
- When passing the device on to third parties, be sure to include this operating manual.
- If this manual is lost, please request another one. The latest version can be found on our website www.eppendorf.com (international) or www.eppendorfna.com (North America).

1.2 Symbols used

Example		Meaning
	▸	You are requested to perform an action.
	1. 2.	Perform these actions in the sequence described.
	•	List.
		References useful information.

2 Product description

2.1 Delivery package

2.1.1 Hardware checklist

1. TCA-3 monitoring system complete with ambient and freezer temperature probes	4. Mains/Power cord
2. User guide	5. Mains/Power adaptor
3. 2 x Ethernet patch cables	

2.1.2 Inspection of boxes

Inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage to the carrier and to your local Eppendorf Sales Order Department immediately.

2.1.3 Packing list verification

Unpack your order, saving the packing materials for possible future use. Save the operating manual for instruction and reference. Verify against your packing list that you have received the correct materials, and that nothing is missing. If any part of your order was damaged during shipping, is missing, or fails to operate, fill out the "Customer Feedback" form, available online at http://newbrunswick.eppendorf.com/.

3 Installation

3.1 Mounting the TCA-3 temperature monitoring system

The TCA-3 temperature monitoring system can be mounted using the Velcro supplied. The monitoring system should be placed such that the End Plate (with the LEDs) is visible.

3.2 Inserting the probe

Place the temperature probe(s) into the area to be measured using the access port on the back of the freezer, or by running the lead through the door seal on the hinge side of the freezer door.

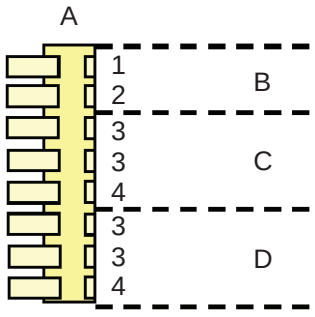
Secure the probe to a suitable fixed location e.g. shelf, with a cable tie.

Inside temperature of freezers and refrigerators varies within the chambers. Probe location within the refrigerator/freezer WILL affect the temperature reading. We recommend using a thermal dampener or liquid to simulate the product in the refrigerator/freezer.

3.3 Reconnecting probes to the TCA-3 temperature monitoring system

The TCA-3 temperature monitoring system is supplied with the probes connected. Use the following steps to reconnected the probes to the monitoring system if they become disconnected.

1. Slide open the access door at the bottom of the TCA-3 temperature monitoring system.
2. Insert the probes through the holes in the side of the case.
   The probe connection block shows connections for the 2 RTD and “T” type thermocouple probes.



A. Connector	1. TC+
B. ‘T’ Type Thermocouple	2. GND/TC-
C. RTD Probe number #2	3. Black or White
D. RTD Probe number #1	4. Red

3. Push down the tab on the connector and insert the stripped end of the probe into the connector, taking note of the color.

3.4 Connecting the power supply

3.4.1 Standard mains/power supply

1. Connect the TCA-3 temperature monitoring system to the Power Injector by inserting one end of an Ethernet cable into the port on the back of the TCA-3 temperature monitoring system and the other into the OUT port of the Power Injector.

2. Insert the second Ethernet cable into the IN port of the Power Injector and connect the other end of the cable to a LAN port.
3. Plug the Power Injector into 100-240 VAC mains/power outlet using the mains/power cord supplied.

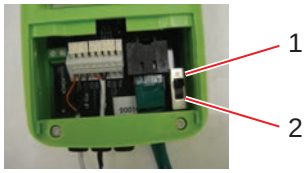
3.4.2 Power Over Ethernet (POE)

For Power-Over-Ethernet LANs, no Power Injector is necessary.

- Connect the TCA-3 temperature monitoring system directly into the network which supports Power Over Ethernet (POE).

3.4.3 Turning power supply switch On

1. Remove the TCA-3 temperature monitoring system from the refrigerator/freezer by separating the Velcro.
2. Slide open the access door on the bottom of the TCA-3 temperature monitoring system.



1 On **2 Off**

3. Slide the On-Off switch to the On position.

Follow standard mains/power supply or Power Over Ethernet instructions below.

4 Operation

4.1 LED guide

1. The internal battery powers down during shipment to save power. Disregard the initial "Internal Battery Low Voltage" alarm.
2. A solid blue "CONN" light indicates that Secure Server has received the last communication.
   A flashing "CONN" light indicates communication with Secure Servers.

1. CONN The CONN LED will flash blue when communicating to the server and solid blue when last communication is successful.	3. LNK LAN The LNK LAN LED will appear solid green when the LAN hardware connection is good.
2. PWR The PWR LED will appear solid green when the 5 V mains/power supply is working, flashing fast green when on internal battery power, or flashing slow green when the internal battery is low (4-Hour life).	4. ACT The ACT LED will flash green when communicating with the LAN.

4.2 IT information

The TCA-3 monitoring system is plug and play with the following settings:

- The server is DHCP.
- A Proxy server is not being used.
- The MAC address does not require registering.

The TCA-3 monitoring system can be set with a fixed IP address, this can be done with the Remote Gateway Configuration Utility which can be downloaded from the following link: http://www.accsense.com/sp_downloads.html

The TCA-3 monitoring system supports SOCKS4 and SOCKS5 Proxy servers, which can be set up using the Remote Gateway Configuration Utility. In environments where other proxy servers are used, a router may be required to act as a proxy client for the TCA-3 monitoring system.

Generally MAC numbers do not require registering on the network; if it is a requirement, register the unique MAC number for each TCA-3 monitoring system.

All communication to the hosts will be initiated from the TCA-3 monitoring system using HTTPS on port 443.

The TCA-3 monitoring system does not need to accept incoming sockets from the hosts, only to be able to open sockets to them.

All traffic is initiated from the TCA-3 monitoring system as out going secure web requests.

Aside from needing access to DNS servers, the TCA-3 monitoring system will not communicate with any other hosts on the Internet.

Useful destination addresses for communications for the TCA-3 monitoring system web application are as follows:

- 8.26.65.62 listener.sensornetworkonline.com
- 83.26.65.62 secure.sensornetworkonline.com

4.3 Internet security

Communication from the TCA-3 monitoring system to the Secure Servers utilizes the HTTPS protocol and only relies on an outbound connection over port 443. As communication between the TCA-3 monitoring system and the servers is initiated from the TCA-3 monitoring system, there is no need to open inbound ports on the firewall. HTTPS over port 443 is a standard communications protocol for secure Web traffic (e.g. credit card transactions).

Data sent over the Internet utilizes two forms of encryption:

- SSL Encryption, the same "padlock" feature that many Web sites use to ensure Web purchases are secure.
- Certificate Encryption, each gateway is issued a unique, digitally signed certificate that is associated with its serial number.

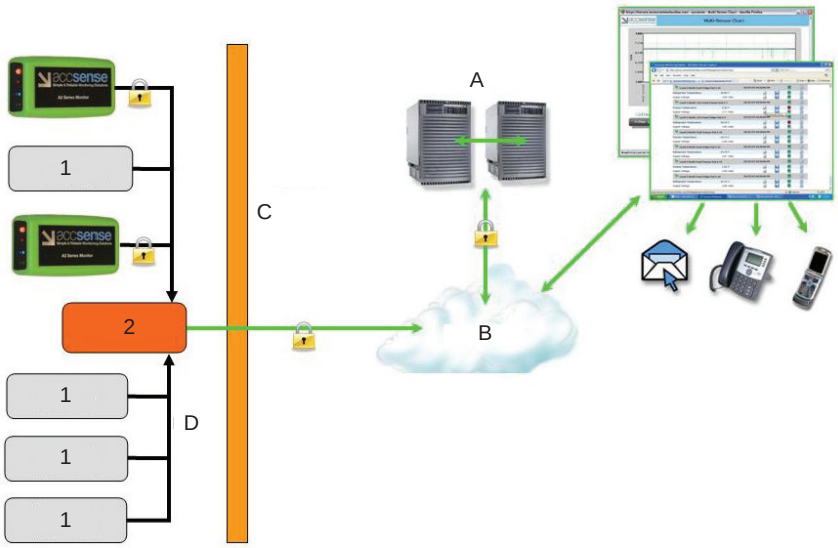


Fig. 4-1: LAN-Wired IT security

A. Rackspace secure servers	D. LAN
B. Internet	1. Customer computer
C. Customer firewall	2. Customer router

SSL and Certificate Encryption keeps your data safe from collection to transmission and storage in our Rackspace Secure Servers.

A combination of SSL and Certificate Encryption ensures the data has the highest level of security over the internet. Only devices with the SSL and Certificate Encryption digital signature are permitted to connect to the. Our Website is VeriSign Secured®, providing leading encryption and identity verification.

If a certificate is compromised, its unique signature can be revoked, making this virtually unexploitable to system hackers. These two forms of encryption prevent security problems such as Denial of Service attacks. Secondly, it is virtually impossible to maliciously insert or spoof data ensuring accurate data.

4.4 Login

4.4.1 Creating your account

Your Eppendorf web service account is created automatically as soon as the TCA-3 monitoring system contacts the secure server (indicated by a solid blue LED on the front of the TCA-3 monitoring system). The account will not exist until this first communication contact is made successfully.

You can login to your account via www.eppendorf.com/TCAStartup, then clicking Customer Login.

4.4.2 Login to your account

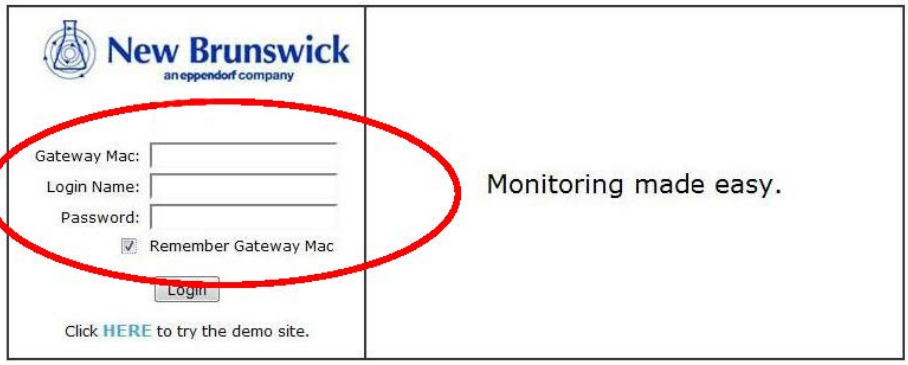


Fig. 4-2: Login screen

You can login to your account with the Gateway MAC number (found on the side of the TCA-3 monitoring system) and the default Login Name and Password:

Login Name: Admin

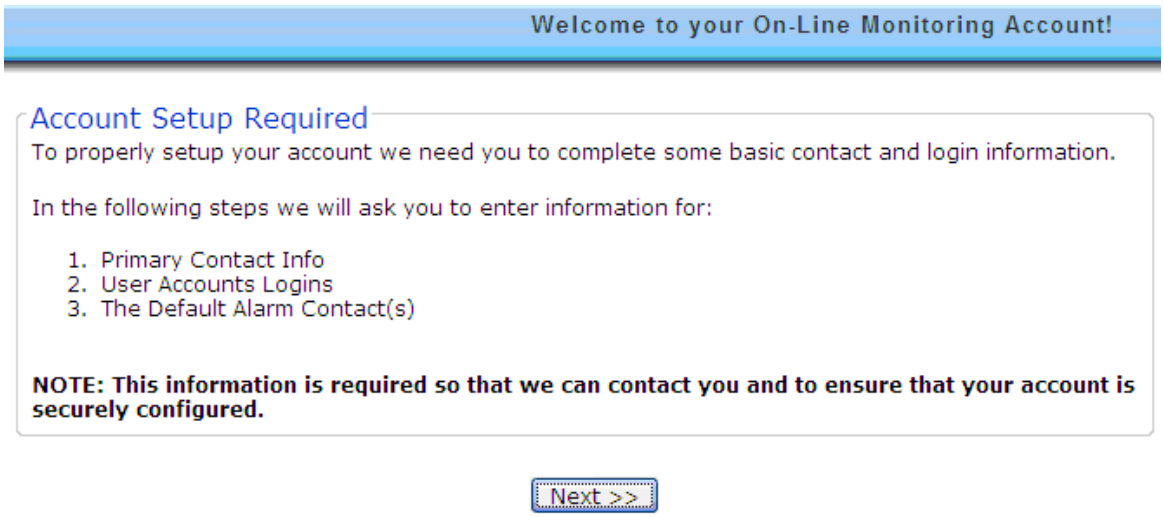
Password: Admin

Both the Login Name and Password are case sensitive.

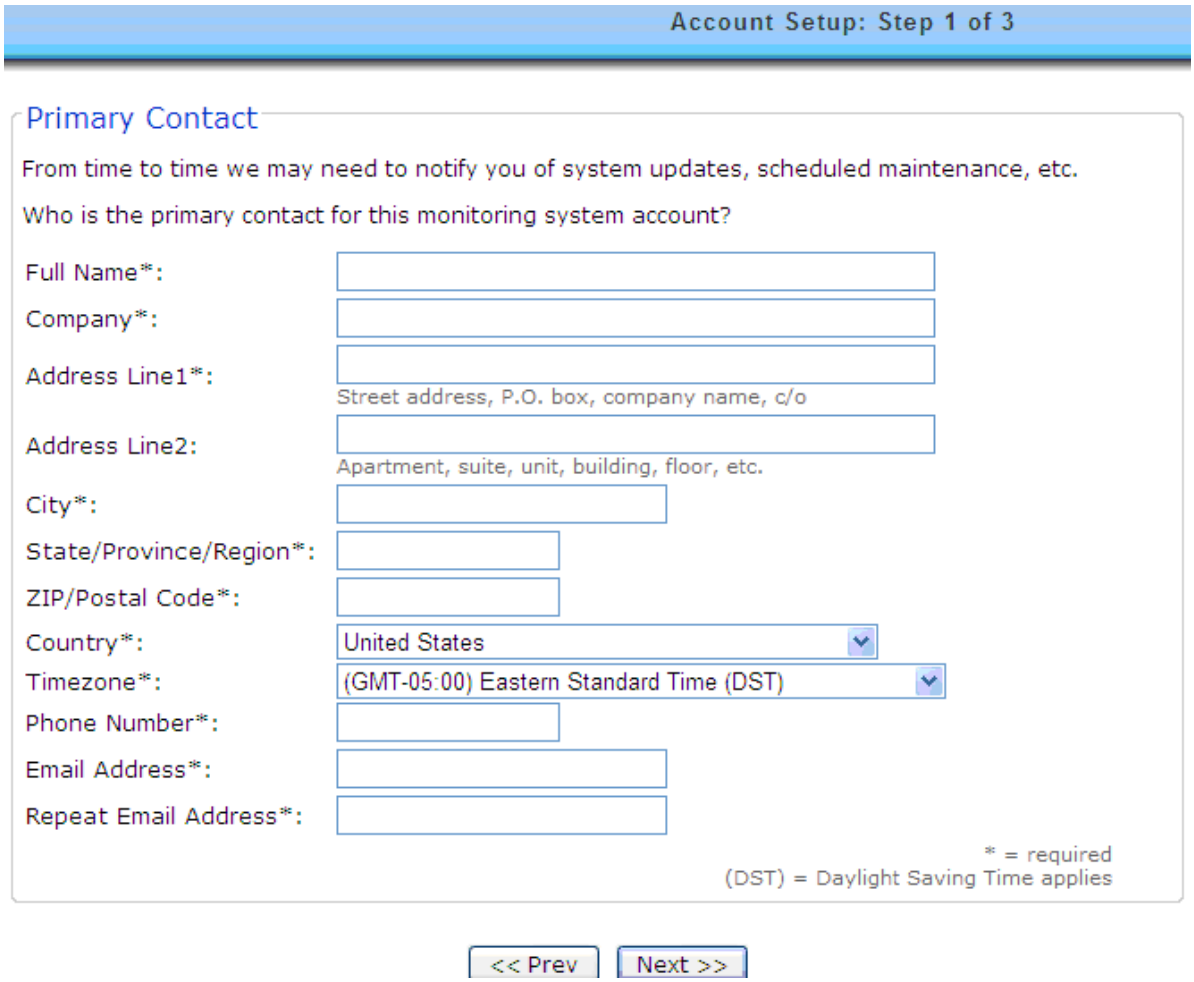
Your PC will remember the Gateway Mac number if you check the box.

4.4.3 Account setup

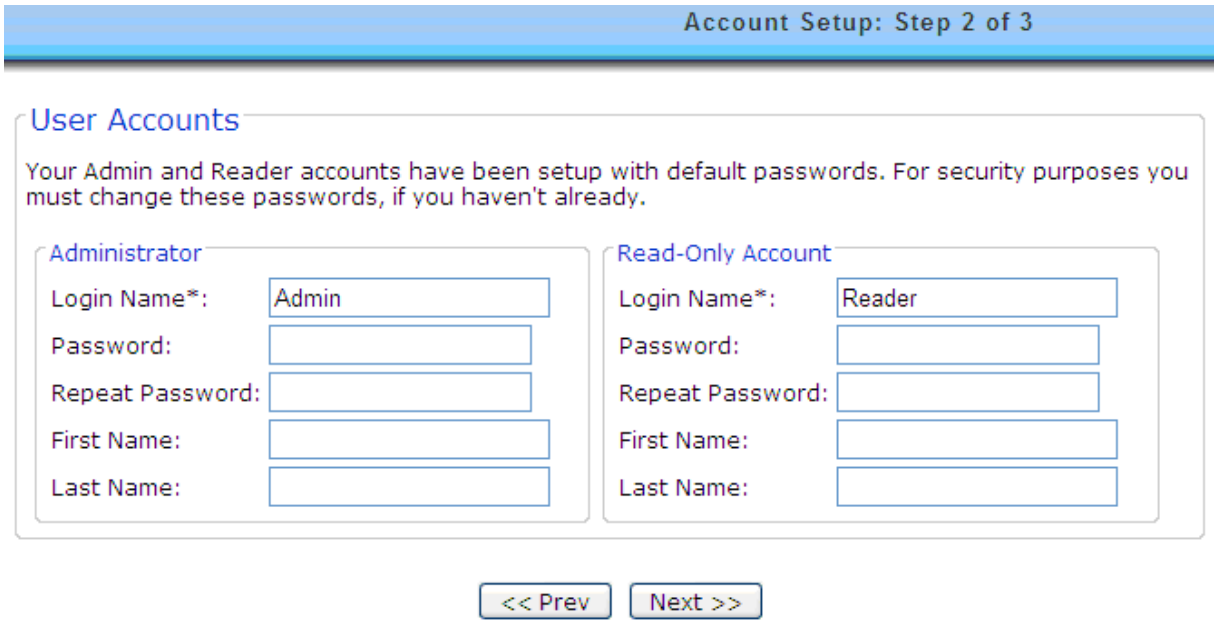
1. Login to account, then click next.



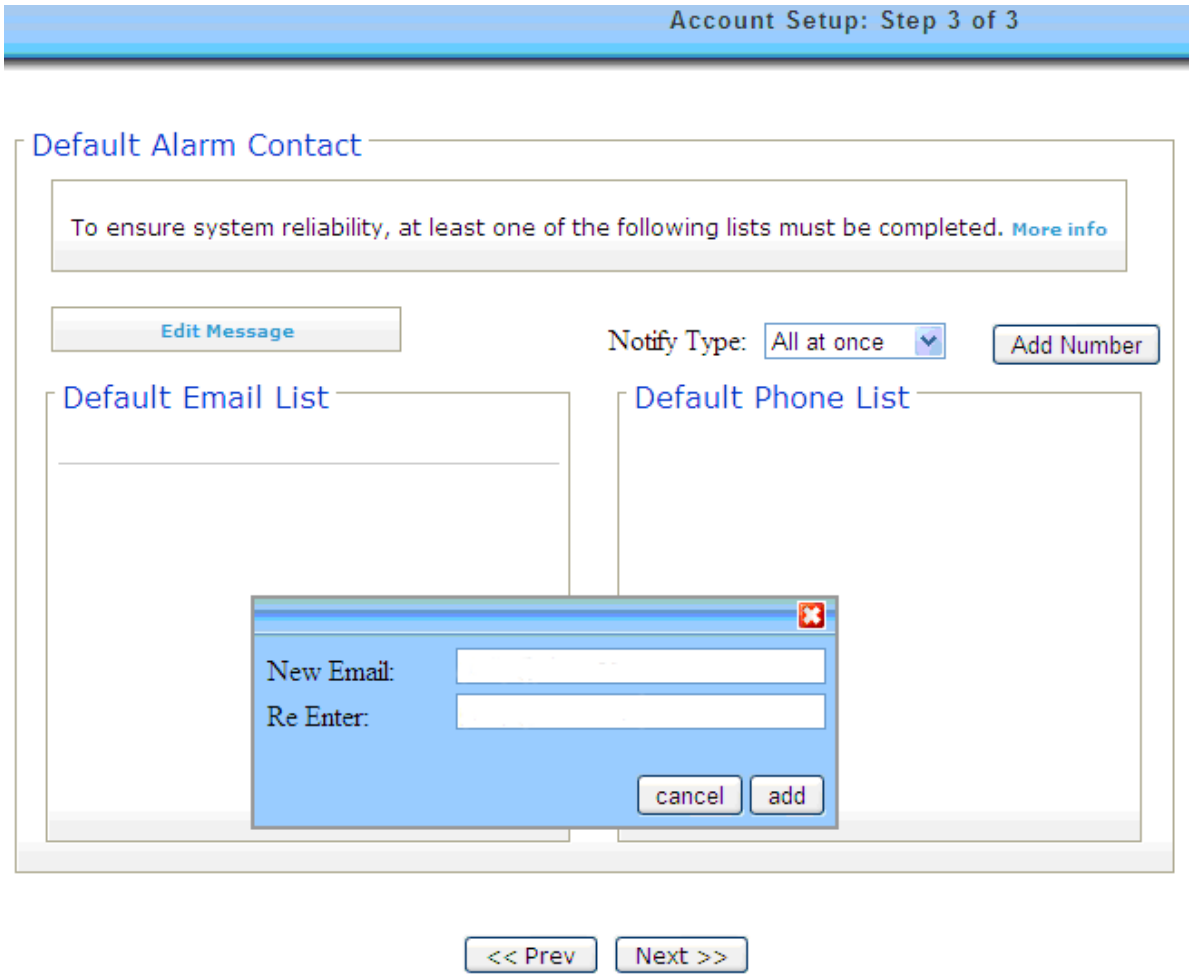
2. Enter Primary Contact information, then click next.



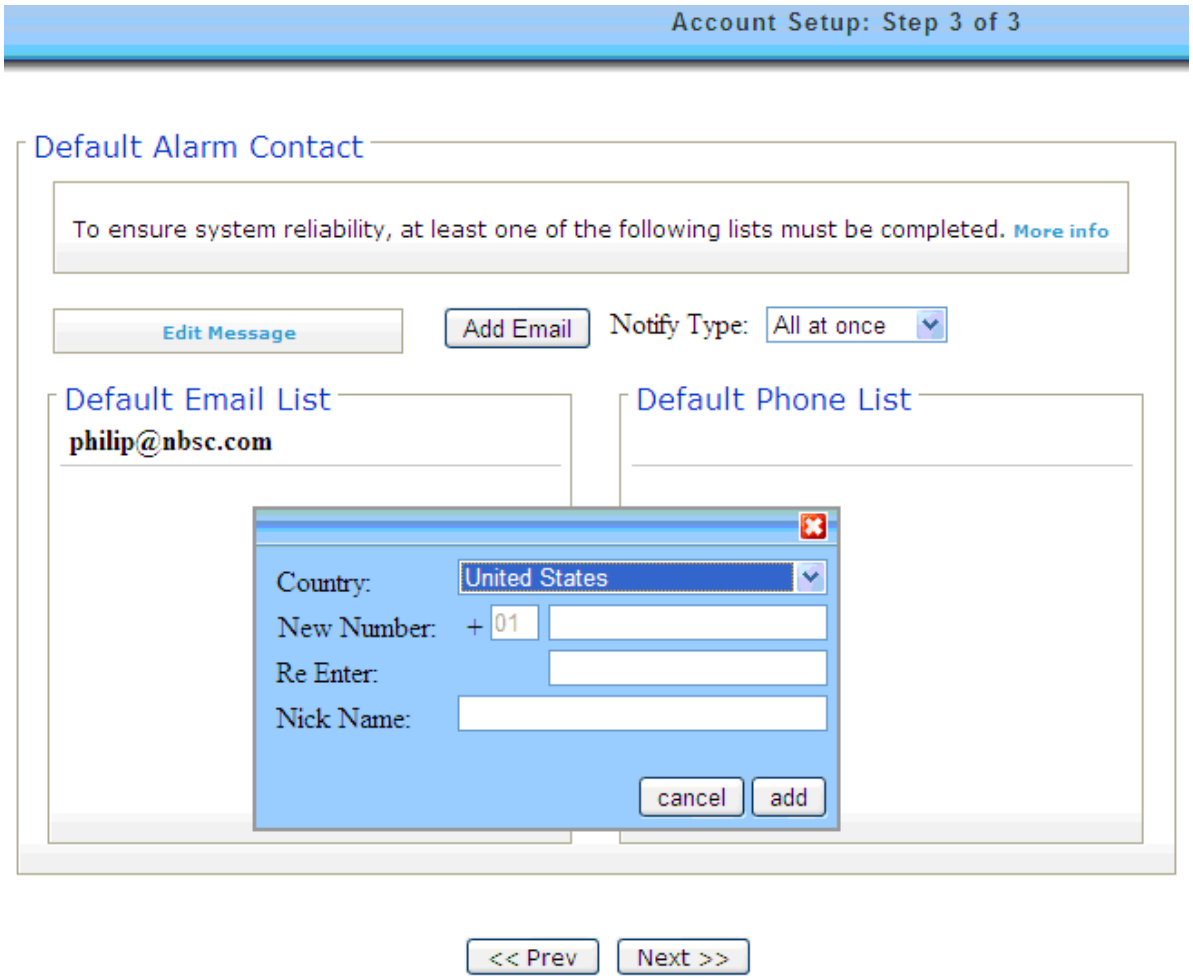
3. Enter desired password, then click next.



4. Click Add Email to enter default email addresses.

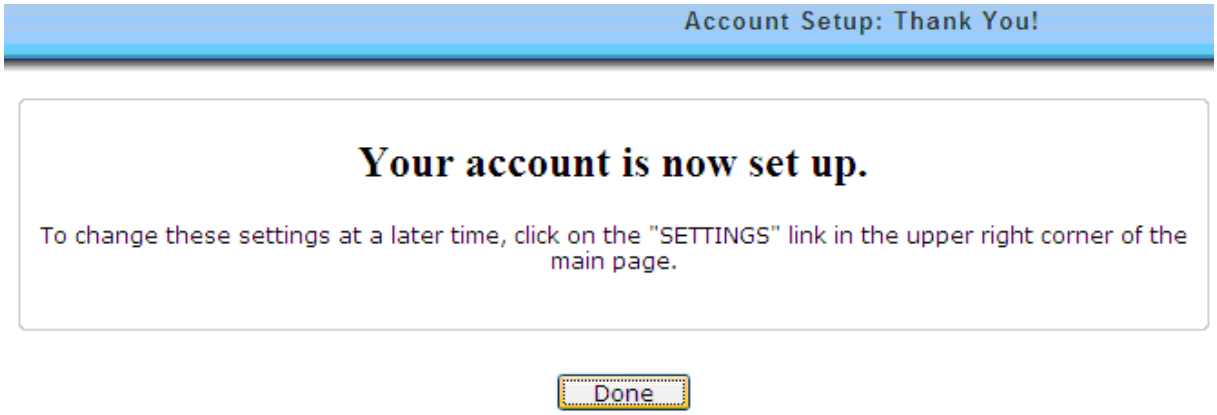


5. Click Add Number to enter default phone numbers.



Only phone numbers for the country and country code added during setup will be preselected in the Default Phone List. To change or add phone numbers for a different country, contact Eppendorf.

6. Click Done



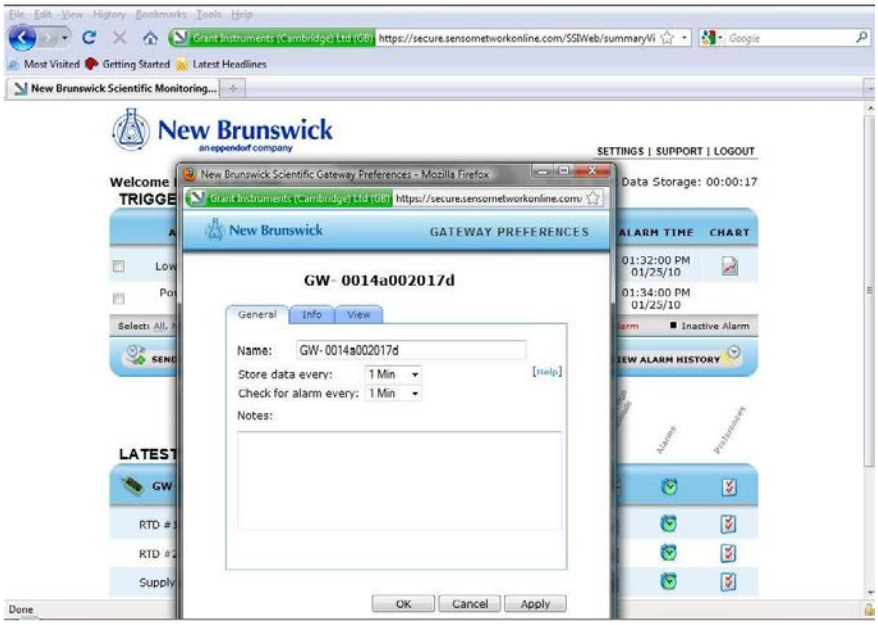
4.5 Software navigation

The main screen is divided into four areas.

1. User Information/Account Settings	3. Latest Measurements
2. Triggered Alarms	4. Alarm History

Clicking on the icons from the main screen brings up pop up windows.

The browser must be set to allow pop ups from the Eppendorf web site.



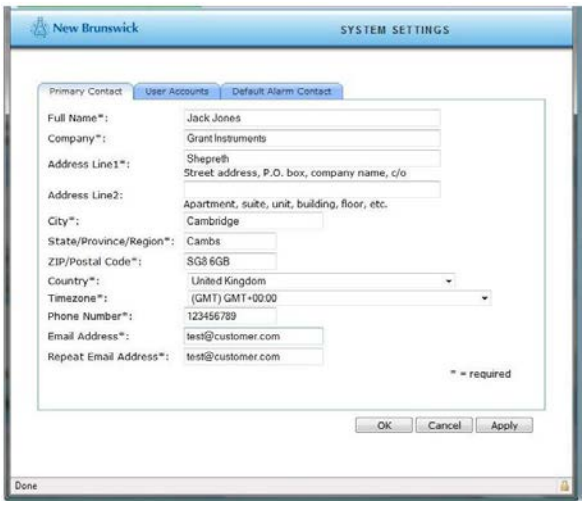
Closing a pop up window returns the user to the main screen.

4.6 Account settings

The Account Settings pop up has three tabs.

4.6.1 Primary contact

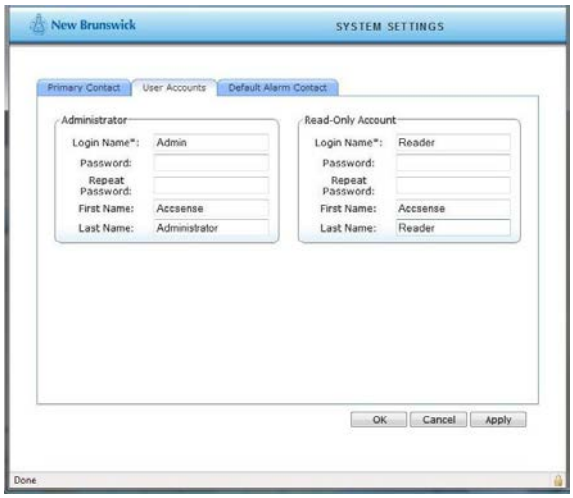
The Primary Contact tab provides information that can be used by Eppendorf if the need arises to contact the customer for any reason. It is important for the users to keep this information up to date.



4.6.2 User accounts

The User Accounts tab allows two levels of system access to be created:

- Administrator - Administrator can change any parameters such as alarm levels, details of the alarm contacts, etc.
- Reader-only - Reader-only can only view the information from the system, and cannot change any system parameters.



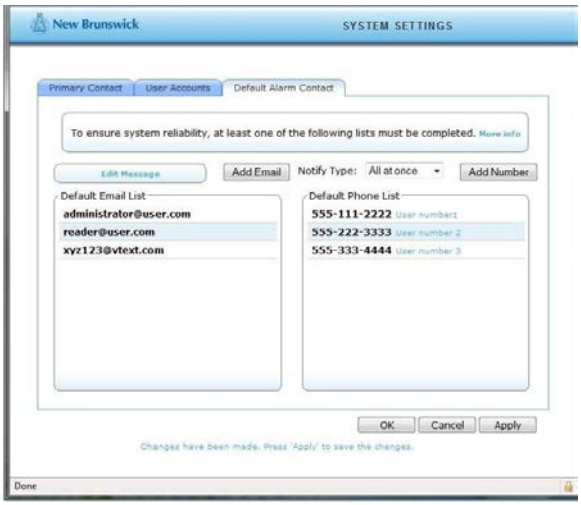
If the Administrator forgets their password, contact Eppendorf to have the password reset.

4.6.3 Default alarm contact

The Default Alarm Contact tab contains a list of E-mail addresses, and/or phone numbers. When enabled, phone numbers can be called in *sequence rather than all at once by selecting Default List when enabling an alarm for a sensor.

Alarms will be sent once per event, unless sequential alarming mode is selected.

In *sequential alarming mode, the list will be repeated twice if no user takes responsibility by pressing 5.



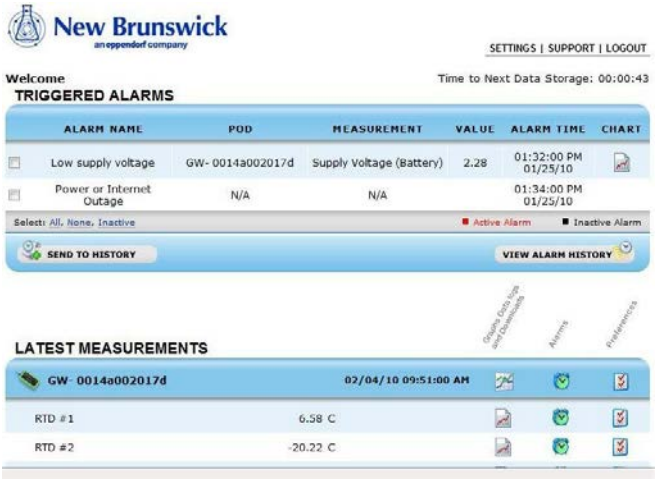
*sequential notification is currently only available in the US and the UK.

Only phone numbers for the country added during setup will be preselected in the Default Phone List. To add phone numbers for a different country, contact Eppendorf.

4.7 Latest measurements

The Latest measurements area of the main window displays the measurements set as visible in the Gateway Preferences View tab.

Multiple TCA-3 monitoring systems can be displayed in the same window, and merged accounts can be accessed by a single login.
Contact Eppendorf for information on merging accounts.



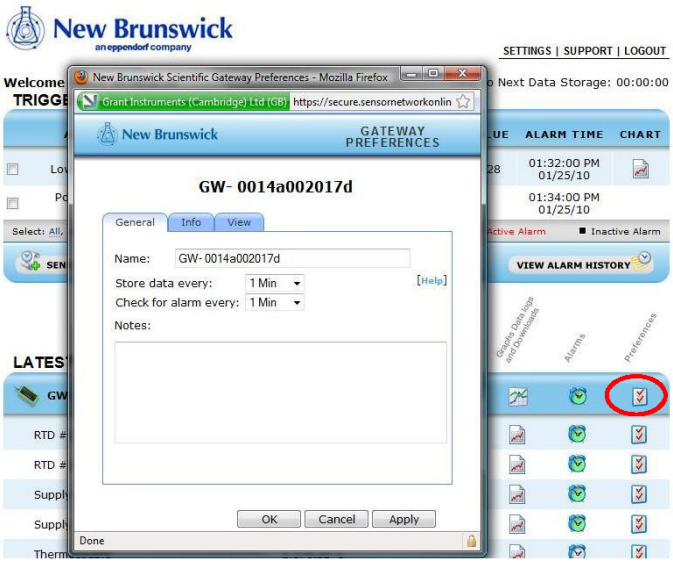
4.8 Gateway preferences icon

4.8.1 General tab

The General tab allows the users to name the TCA-3 monitoring system (TCA-3 monitoring systems will be listed on the screen in alphabetical order), set the sampling rates (how often measurements are made) and record notes about the TCA-3 monitoring system.

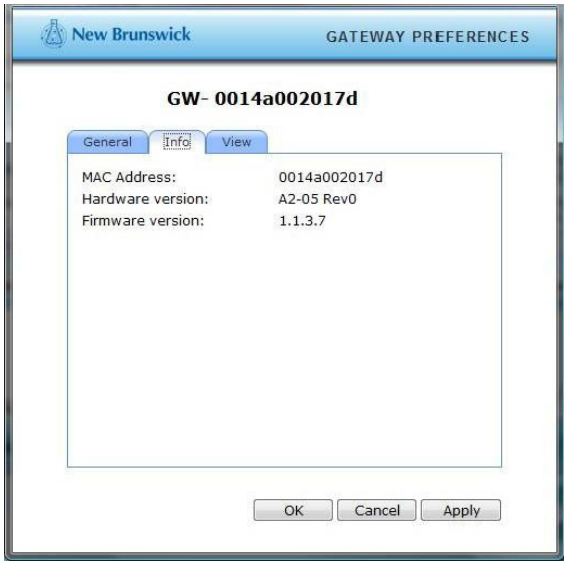
The following sampling rates can be selected:

- **Store data every:** This option records data if the measurements are within limits which can be slower
- **Check for alarm every:** This option checks measurements against alarm limits which can be faster



4.8.2 Info tab

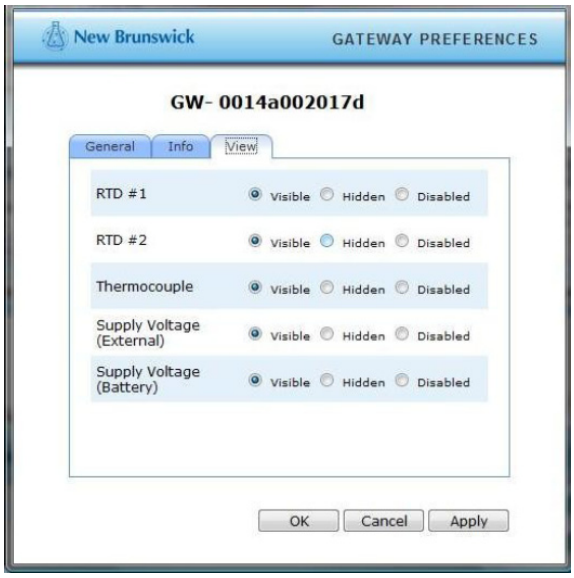
The Info tab provides information about the TCA-3 monitoring system and firmware. This information can be useful when diagnosing system problems remotely.



4.8.3 View tab

View tab allows users to set which measurements are:

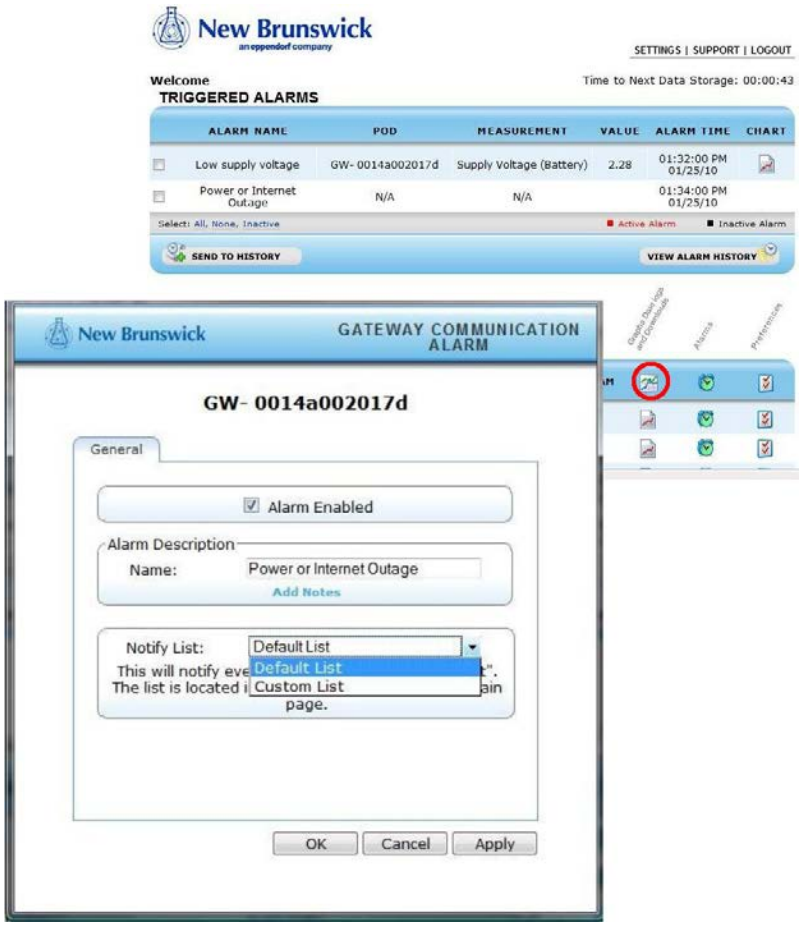
- Visible (Displayed in measurement window)
- Hidden (Recorded but not displayed)
- Disabled (Not recorded or displayed)



4.9 Gateway alarms

The Gateway alarm window allows users to set alarms which are triggered if the secure remote servers lose contact with the TCA-3 monitoring system.

Only one alarm is issued in the event of loss of communication.



4.10 Sensor preferences

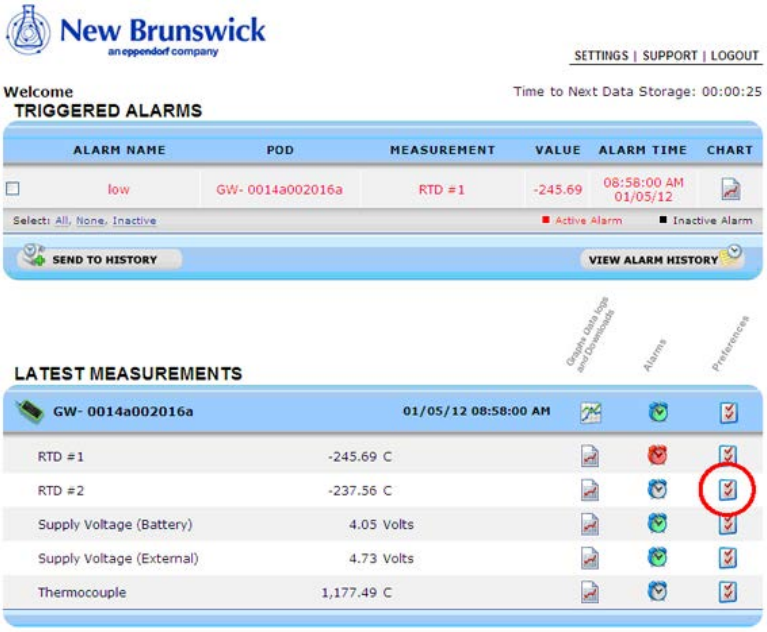
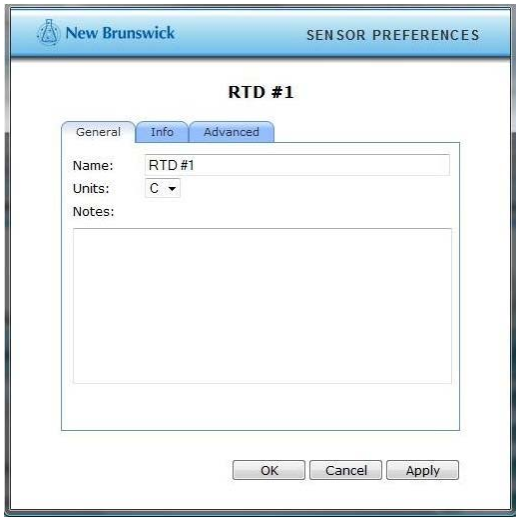


Fig. 4-3: Preferences icon

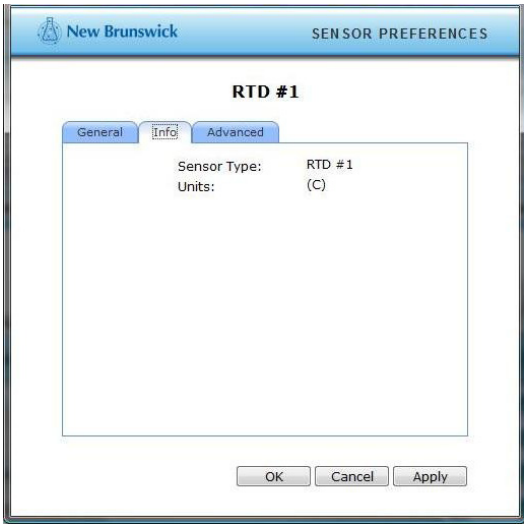
4.10.1 General tab

The General tab allows users to name the sensor and select or enter the measurement units.



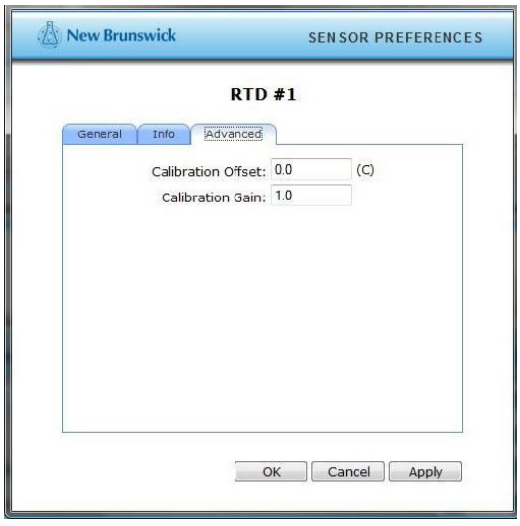
4.10.2 Info tab

The Info tab provides information such as Sensor Type and measurement units of the sensor.



4.10.3 Advanced tab

The Advanced tab provides calibration information about the sensor.



4.11 Sensor alarms

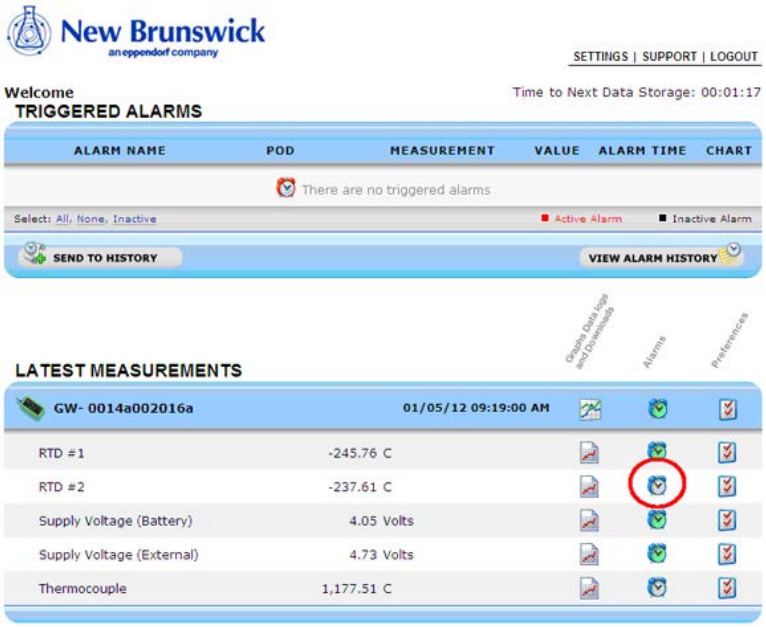


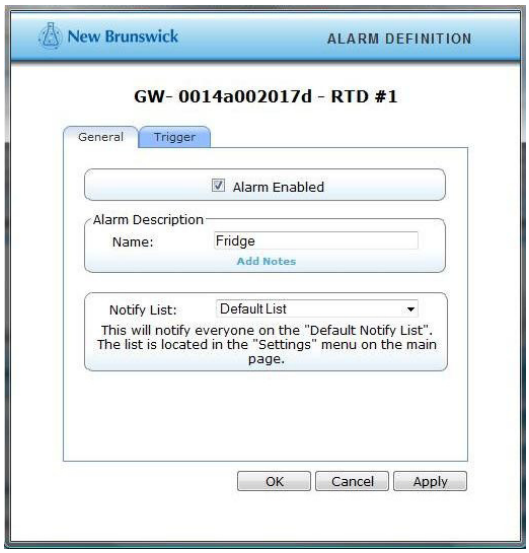
Fig. 4-4: Sensor alarm icon

4.11.1 General tab

The General tab allows users to enable, disable, and name alarms.

The alarm name will be carried by voice alarms

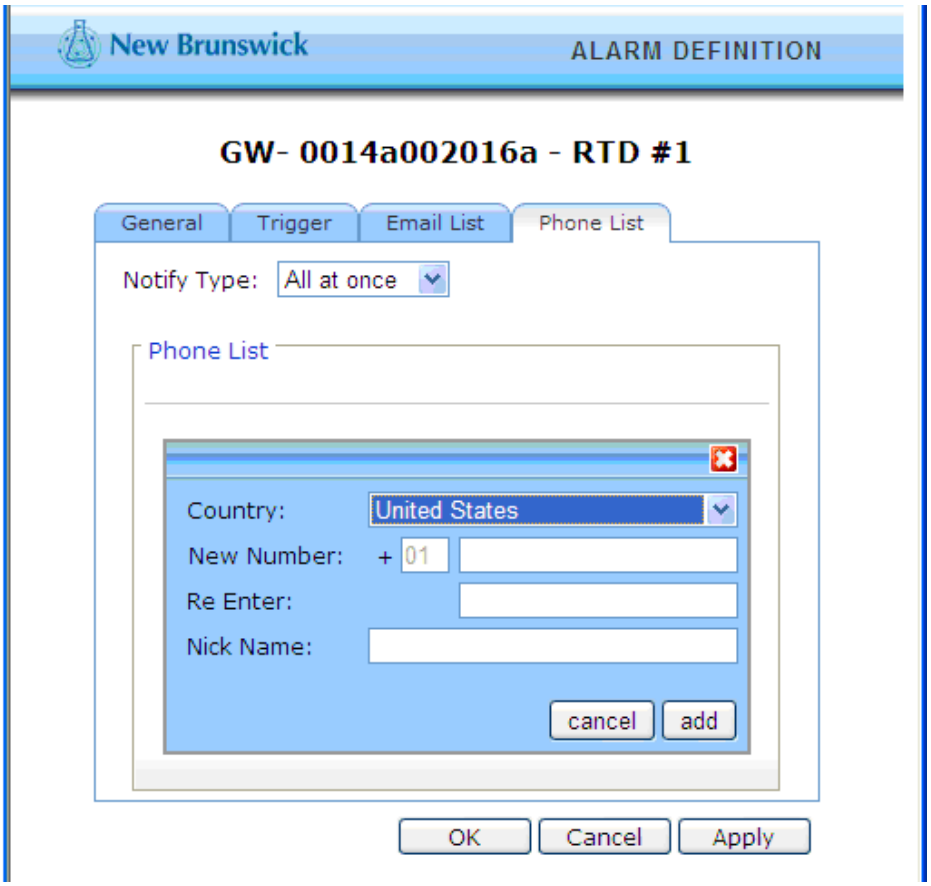
The Notify List of the Alarm Definition General tab allows users to specify the default or custom list of users who will be notified of the alarm for this sensor only.



4.11.1.1 Adding custom notification list

Adding a custom notification list will enable and display the Email List tab and Phone List tab.

Only phone numbers from the preselected country can be added to the phone list. To add phone numbers for a different country, contact Eppendorf.



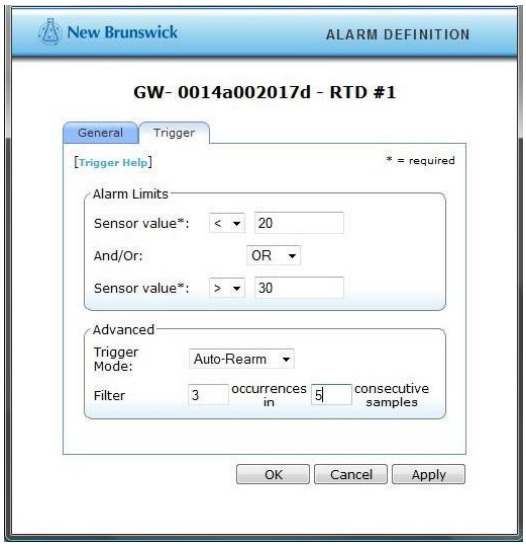
1. Select Custom list from the Notify List field on general tab.
2. Add Email address and phone number to the list.

4.11.2 Trigger tab

The Trigger tab allows users to specify the conditions under which an alarm will be sounded.

The trigger mode of Auto-Rearm means that every time an alarm is triggered an alarm will be sounded. For Example, if an alarm condition is triggered one after the other, two alarms will be heard.

The filter setting of more than 1 occurrence means that the alarm condition must exist for more than ONE measurement. This prevents multiple alarms being sent for what really is a single alarm event.



4.12 Sensor graph

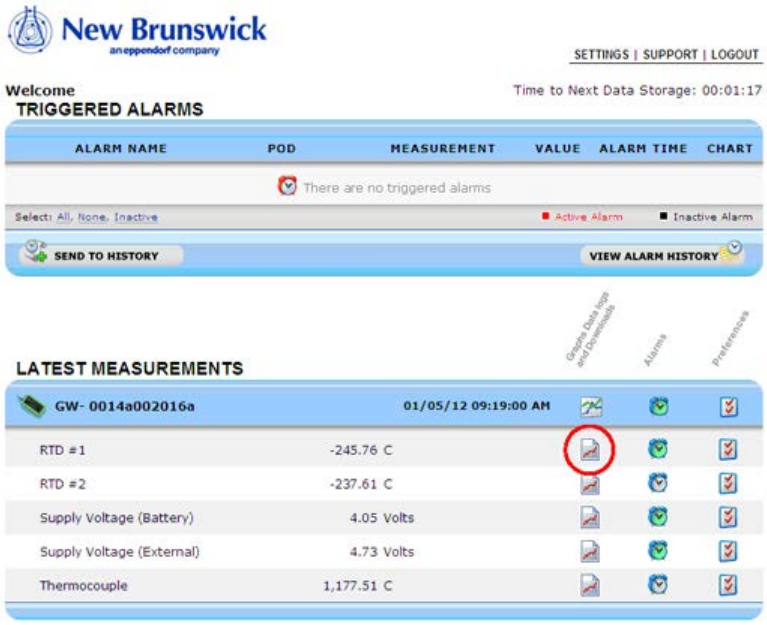
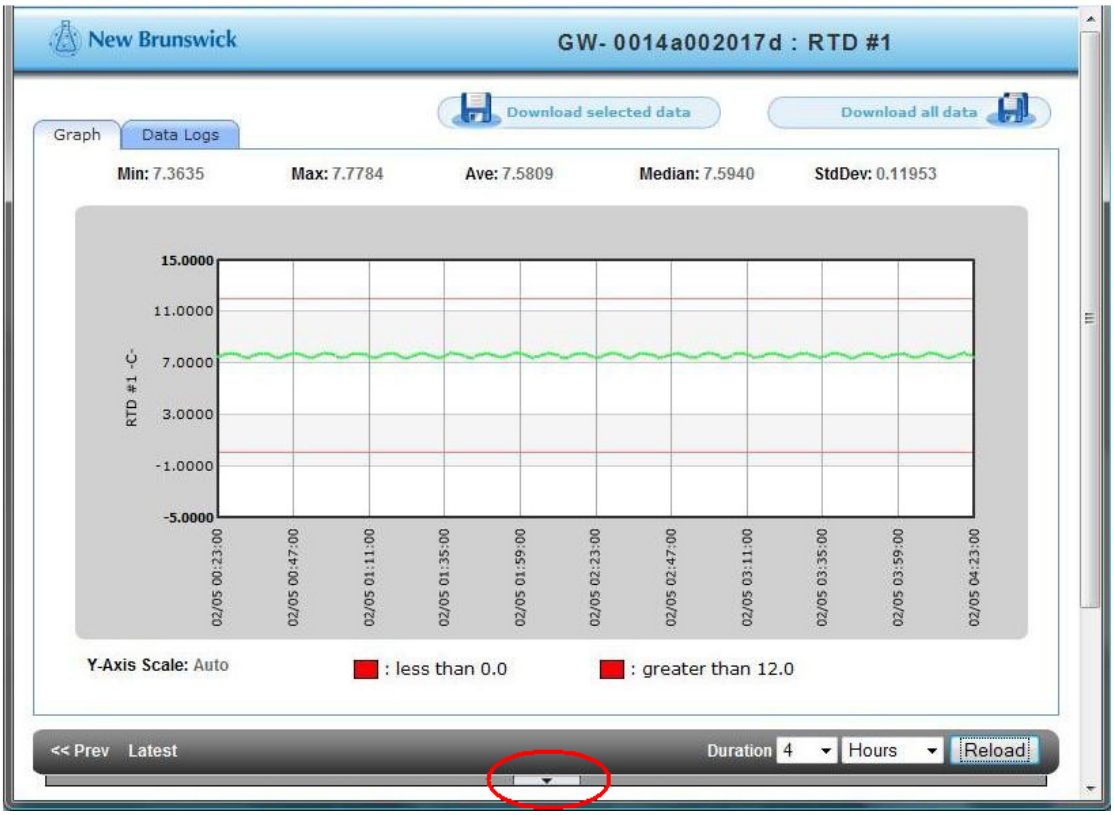


Fig. 4-5: Sensor graph icon

Graphing application uses Flash animation, and will not display on iPhones, iPads, Mac PC's, or other devices that do not support Flash. Data Logs with tabular data will be visible.

4.12.1 Main graph

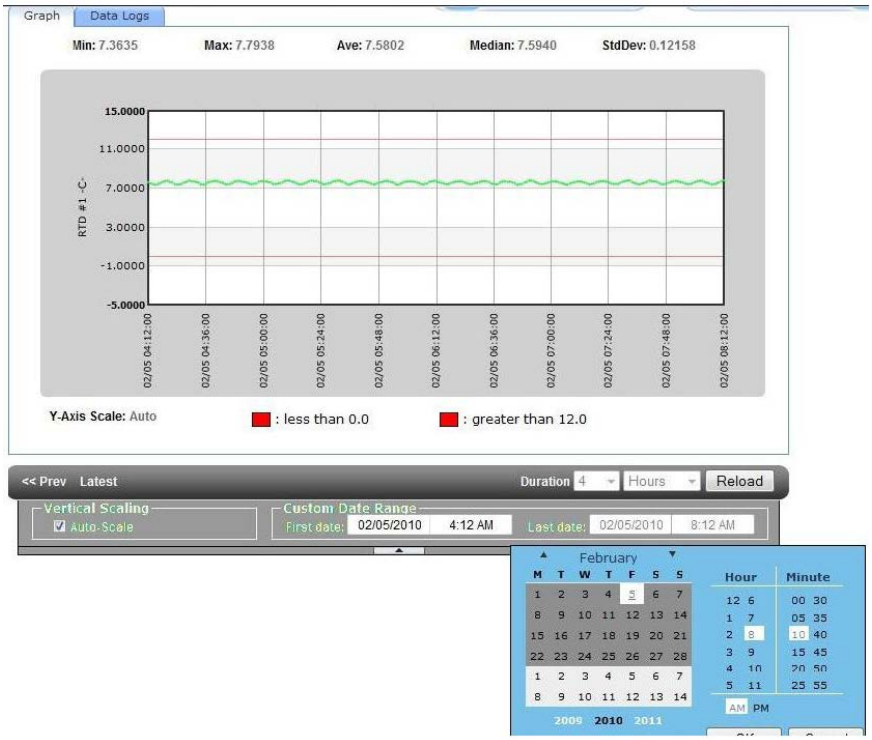
The Sensor Graph Icon brings up a pop up graph with a default time window of 1 day. Statistics for the data displayed are located across the top of the graph. If alarms are set, red bars will appear across the graph at the one or two alarm levels set.



4.12.2 Change data range

To view data for specific ranges of values and time:

1. Click on the small arrow at the bottom of the graph to open the manual range selection area.



2. Set the ranges as desired, then press the Reload button.

The Duration of the data displayed on the graph can be changed to Hours, Days, or Months with up to 3 Months of data being displayed on the graph at any one time.

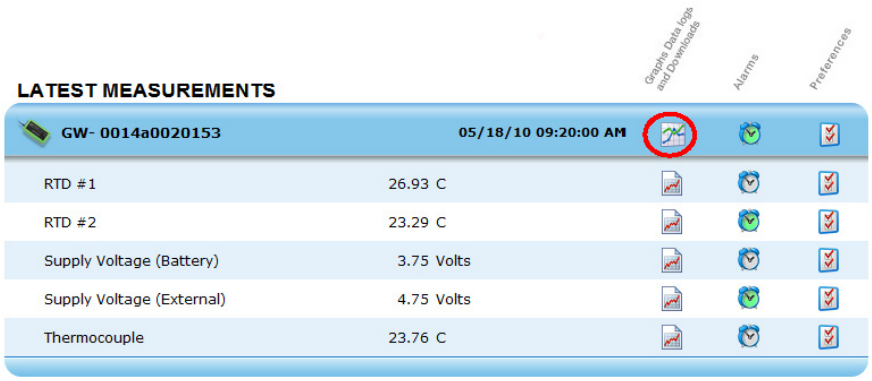
- This can be changed by clicking on the drop down arrows for the Duration times and then clicking on Reload.

The graph can display a maximum of 360 data points. When this has been reached there will be a footnote under the lower right hand side of the graph to signify that the data has been condensed to fit the screen. Even though the data is condensed it is done so any spikes will be viewable.

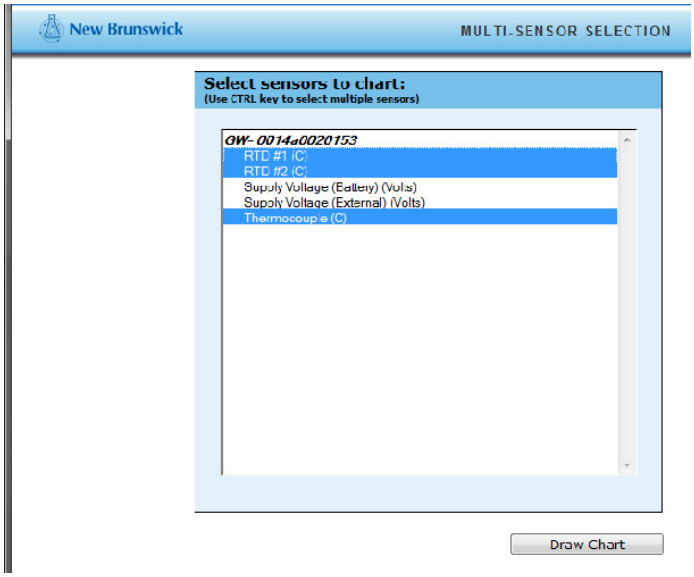
4.12.3 Multiple traces on a graph

It is possible to display more than one trace on a graph for each TCA-3 monitoring system, this could be used to compare temperature graphs from two different probes.

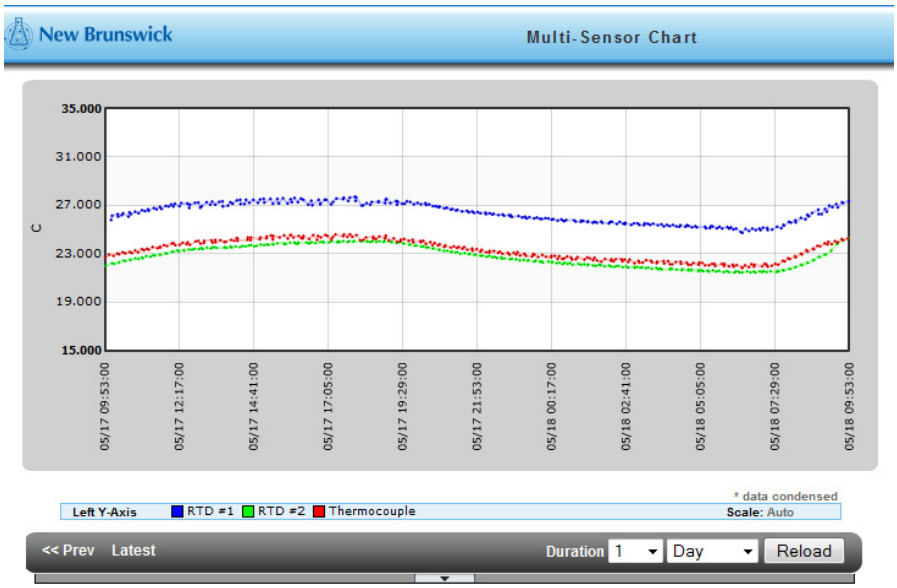
1. In the Latest Measurements click on the graph icon for the TCA-3 monitoring system.



2. Highlight the required sensors to be displayed in the Multi Sensor Selection by clicking on the sensors while holding down the Ctrl key. When the sensors required are highlighted click on Draw Chart.



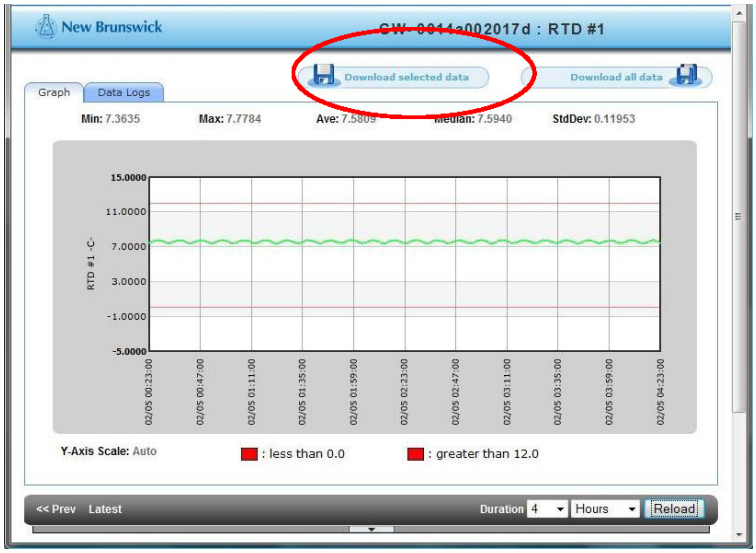
The multiple traces will then be displayed on the graph and the date range can then be changed as required.



4.12.4 Download to Excel

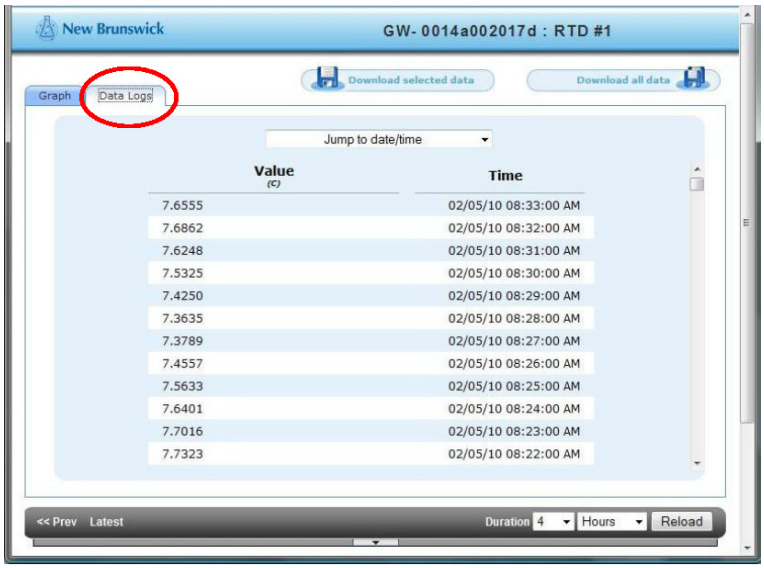
Perform the following steps to download the data shown on the graph to an Excel spreadsheet (.csv format).

- Press the Download Selected Data button at the top right of the screen.



To view the data as a table.

- Click on the Data Logs tab and scroll through the data.



The time stamps on the Data Logs tab are the times the data was actually recorded.

5 Troubleshooting

5.1 General errors

Symptom/message	Cause	Remedy
LINK LED does not light up after connecting Ethernet port	• The port may not be connected or active.	▸ Verify the connection by removing the cable from the TCA-3 monitoring system, then plug it into a computer to ensure that the Ethernet port is active.

Symptom/message	Cause	Remedy
STAT1 LED is on	• Static IP address is being used instead of DHCP.	▸ Use the Remote Gateway Configuration tool to establish a local connection to the TCA-3 monitoring system and manually configure it. The tool can be downloaded at www.accsense.com/sp_downloads.html. 1. Install the software on a PC that is on the same subnet as the TCA-3 monitoring system. 2. Start the program and it will search the local network for any Eppendorf system. If it finds them, they will be displayed in the list box on the left of the configuration tool. 3. Click on the MAC address of the TCA-3 monitoring system that requires configuration, go to the IP tab and uncheck “Obtain Network Address Automatically”. Then, fill in the IP address that you want to assign to the TCA-3 monitoring system along with the subnet mask, at least one DNS address and the route or gateway address. Note: that the TCA-3 monitoring system may take several tries, as this unit will keep rebooting in an attempt to get an address. 4. Once this is done, click the submit changes button to save the settings in the TCA-3 monitoring system. This will then restart with the new settings and after about a minute it should show up in the Gateway Configuration software. Verify that the new settings are correct and check to see that the Connect LED is on for the TCA-3 monitoring system.
Internet connection cannot be established	• Proxy server for communication to the Internet was not correctly configured.	▸ Use the Remote Gateway Configuration software to enter the information for the Proxy server. Click on the Proxy tab and enter the information for your server.

Symptom/message	Cause	Remedy
The facility has blocked outgoing communications.	• Port 443 in the firewall between the local network and the internet is blocked. • Unsolicited outgoing communications for the facility to the internet is blocked.	▸ The IT department will be required to open port 443 for HTTPS communication. ▸ This may have been done to prevent malicious software from sending data out. The IT department will need to add the address of the Eppendorf servers to the whitelist in the firewall this is to allow the outgoing communications from the system to pass through.

6 Calibration instructions

6.1 Calibration requirements

The calibration requirements for the TCA-3 monitoring system will depend on the quality processes of the end user, generally this would be once a year.

6.2 Single point calibration

Single point calibration is needed if the temperature being measured is always going to be around the value of ±5 °C.

6.2.0.1 Requirements

- TCA-3 monitoring system
- Temperature probe connected to the TCA-3 monitoring system
- Access to Eppendorf software including login and password
- Calibrate temperature source/thermometer

6.2.0.2 Calibration instructions

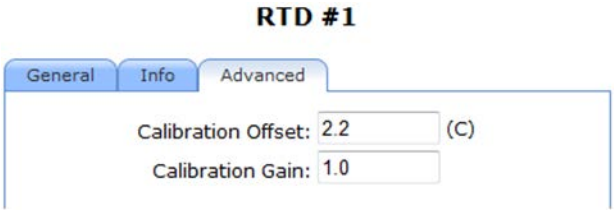
In the Sensor Preferences make sure the Calibration Offset is set to 0.0 and the Calibration Gain is set to 1.0.

This is done by clicking on the Preferences Icon for that probe. In the Sensor Preferences window click on the Advanced Tab, and then enter the two values.

- Set the temperature source to the required temperature (this will need to be the temperature that is being permanently measured) if it is not calibrated verify using a thermometer.
- Place the temperature probe installed in the TCA-3 monitoring system into the temperature source and allow to settle down, this may take a while.
- Take a note of the temperature of the temperature/thermometer and the temperature probe connected to the TCA-3 monitoring system through the Eppendorf web service.
- If both readings are the same then the calibration of the TCA-3 monitoring system is correct.
- If there is a difference between the two readings then work out the value of the temperature source reading the TCA-3 monitoring system reading.
- This value now needs to be entered into the Eppendorf web service for that probe. This is done by clicking on the Preferences Icon for that probe. In the Sensor Preferences window click on the Advanced Tab. Enter the value of the difference between the two readings into the Calibration Offset box.

The Calibration Gain stays as 1.0.

Example: If the source reading is 25.00 °C and the TCA-3 monitoring system reading is 22.80 °C. The Calibration Offset would be 25.00 – 22.80 = 2.2 °C (2.2 is the value entered into the Calibration Offset box.)



If the other sensors need calibrating on the TCA-3 monitoring system they are done in the same way.

6.3 Two point calibration

If the temperature being measured is across a range (for example between +25 °C and -25 °C) then a two point calibration should be used.

6.3.0.1 Requirements

- TCA-3 monitoring system
- Temperature probe connected to the TCA-3 monitoring system
- Access to Eppendorf software including login and password
- Calibrate temperature source/thermometer

6.3.0.2 Calibration instructions

In the Sensor Preferences make sure the Calibration Offset is set to 0.0 and the Calibration Gain is set to 1.0.

This is done by clicking on the Preferences Icon for that probe. In the Sensor Preferences window click on the Advanced Tab, and then enter the two values.

- Set the temperature source to the required temperature (this will need to be the temperature that is being permanently measured) if it is not calibrated verify using a thermometer.
- Place the temperature probe installed in the TCA-3 monitoring system into the temperature source and allow to settle down, this may take a while.
- Take a note of the temperature of the temperature/thermometer and the temperature probe connected to the TCA-3 monitoring system through the Eppendorf web service. Note: This needs to be done at the two calibration points that are required.
- When there are two points then the gain needs to be worked out first which can be found from (higher calibration point – lower calibration point) / (higher TCA-3 monitoring system value – lower TCA-3 monitoring system value).
  For example, if the calibration points are 25.00 °C and 73.00 °C, and the TCA-3 monitoring system reads 26.25 °C and 76.25 °C, then the gain is (73.00 – 25.00) / (76.25 – 26.25) = 48.00 / 50.00 = 0.96.
- Next the offset needs to be calculated by multiplying either (or both) of the TCA-3 monitoring system values by the gain and then subtracting that from the calibration value as before.

Carrying on with the above example, 26.25 * 0.96 = 25.20 °C and 25.00 – 25.20 = -0.20 °C and similarly 76.25 * 0.96 = 73.20 and 73.00 – 73.20 = -0.20 °C so the offset is still -0.20 °C. If there are two different answers (allowing for rounding errors) then please check your calculations.

6.3.1 Using Excel for calculation

By using excel to do the calculation a multi point (two or more) calibration can be achieved using linear regression (least squares linear regression).

- As above take the calibration reading and the TCA-3 monitoring system readings, and then using linear regression (least squares linear regression) on a computer is the best to find the Offset and Gain values.
- Using Excel, enter two columns of figures with the calibration values in the left hand column and the TCA-3 monitoring system values in the right hand column. Next highlight two cells where the result is to appear and use the array function LINEST to calculate the least squares result.

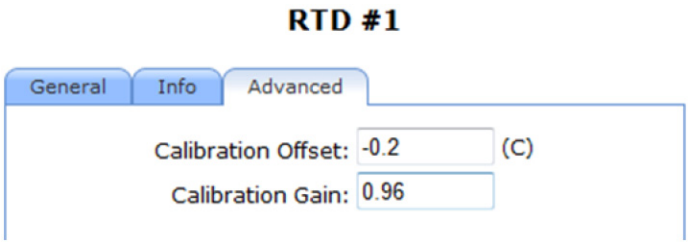
The LINEST function is an array function, press CTRL+SHIFT+ENTER to run the function. The function will produce two results. An example is shown below.

Calibration	A2-05		
values	values		
25.00	26.25		
55.00	57.50		
73.00	76.25		
		gain	offset
		0.96	-0.20

- These values need to be entered into the Eppendorf web service for that probe.

  This is done by clicking on the Preferences Icon for that probe. In the Sensor Preferences window click on the Advanced Tab. Enter the Offset value into the Calibration Offset box and the gain value into the Calibration Gain box

The example figures can be seen in the Sensor Preferences window below.



If the other sensors need calibrating on the TCA-3 monitoring system they are done in the same way.

7 Certificates

eppendorf

Declaration of Conformity

The product named below fulfills the requirements of directives and standards listed. In the case of unauthorized modifications to the product or an unintended use this declaration becomes invalid.

Product name:

TCA-3

including accessories

Product type:

Remote logging temperature monitor

Relevant directives / standards:

2004/108/EC	EN 61326-1
2006/95/EC	EN 61010-1
2011/65/EU	

H.-G. Kühl

Management Board

Portfolio Management

Date: January 06, 2014

M1288-9999-00

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