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LogBox-RHT-LCD

TEMPERATURE AND HUMIDITY LOGGER – INSTRUCTIONS MANUAL V1.1x

1 PRESENTATION

LogBox-RHT-LCD is an electronic logger of temperature and relative humidity. There are sensors that measure such data and values (data) obtained are displayed in an LCD screen and stored in an electronic memory. Data can be later viewed and analyzed on a PC where they can be opened in tabular and graphical forms. The humidity output can be configured to display **Relative Humidity** values or the temperature value of **Dew Point**.

The logger is supplied with **LogChart-II** software, which enables to set up the logger operation mode. It is also used for visualization of collected data. Other parameters such as end of measurements, logging interval, etc., are easily defined through the **LogChart-II** software.

Measurements can be exported to and opened in other applications, such as spreadsheet programs.

1.1 Identification

The identification label is on the logger body. Check if the features described are in accordance with your order. The **RHT-LCD** model is designed to measure temperature and relative humidity.

The following elements are shown in the logger front:

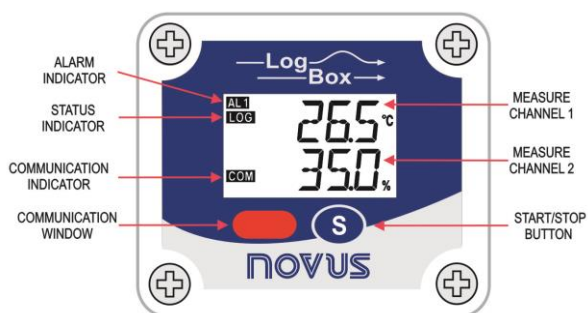


Figure 1 – Logger Front

START / STOP button: Can be configured to start or stop logging when pressed. It can also be used to browse and change screens.

Status indicator (LOG): Indicates when the device is logging.

Note: When logs are finished or not started, the indicator remains deactivated.

Alarm Indicator (AL1 and/or AL2): Warns the user as to alarm conditions. It remains active whenever an alarm condition occurs, until a new configuration is applied to the logger.

IR Communication Window (COM): Activated when there is a communication attempt or when communication between logger and PC/Palm is activated.

2 SPECIFICATIONS

Operating temperature	From –40 °C to 70 °C
Sensor Measure Range	Temperature: –40.0 °C to 80.0 °C. Relative Humidity (RH): 0.0 to 100.0 %. Dew Point: –40.0 °C and 100.0 °C
Accuracy	See Figure 2 . Note: A measure error can be ruled out using the OFFSET parameter in the LogChart-II software.
Measurement Resolutions	Temperature: 0.1 °C. 14 bits (16383 levels) Relative Humidity (RH): 0.1 %. 12 bits (4095 levels)
Response Time	Temperature: up to 30s in fairly still air. Humidity: up to 8s in fairly still air (20 to 80%RH).
Memory capacity	32,000 (32 k) logs or 64,000 (64 k): Half for each channel or total when one of the channels is not enabled.
Measurement Interval	1 second min. 18 hours max.
Supply	3.6 Vdc lithium battery (1/2 AA), built-in
Estimated autonomy	Higher than 200 days, with weekly data reading. Frequent logged data readings may shorten battery life and the interval between acquisitions is too short.
Case	Polycarbonate
Protection	Suitable for products with protection level IP65 . Electronic module case: IP65; Sensors Case: IP40
Dimensions	60 x 70 x 35 mm
Logger-PC data transfer time	According to the number of logs. 40 seconds for 16,000 logs.
PC Interface	Interface Ir/USB or Ir/Serial.
LogChart-II software operation environment	Set up Software for Windows 98, NT, 2000, XP, Vista and 7. Menus in Portuguese, English or Spanish. Sets up, reads and displays data on the screen.

2.1 Measurement Accuracy

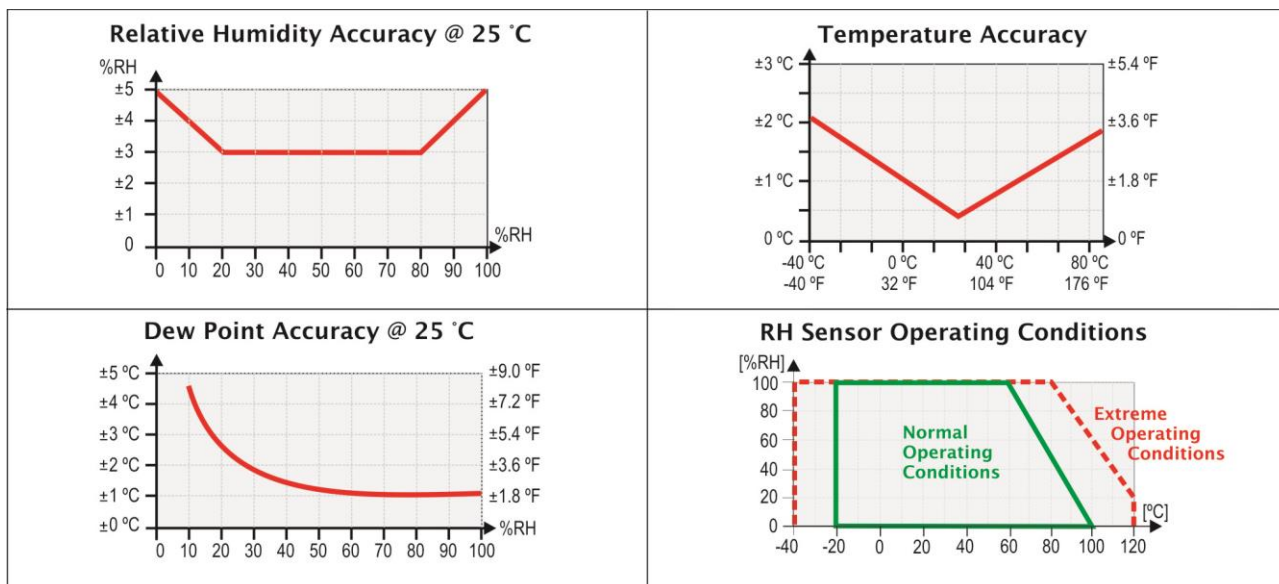


Figure 2 - Accuracy

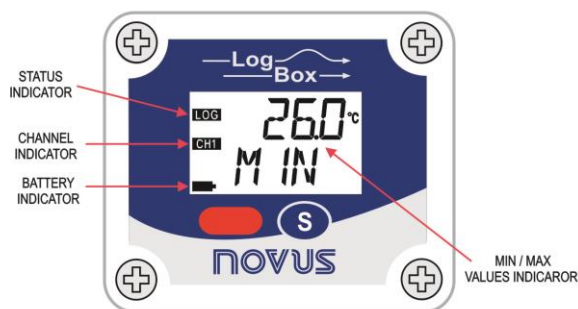


Figure 3 - Logger front (CH1)

Channel Indicator: Indicates the channel selected.

Battery Indicator: The battery symbol is shown when the battery voltage is low.

MIN / MAX values indicator: Minimum and maximum value of each channel during readings.

3 OPERATION

It is only possible to operate the logger after the LogChart-II software is installed to a PC, according to the steps described in **LogChart-II Software** section of this manual.

The communication between logger and PC is performed with the use of the **IR-Link Interface**.

The logger operation mode set up is defined in advance by using the **LogChart-II** software. The configuration is sent to the logger through the IR-Link Interface.

The logger starts and stops logging as defined in the setup.

3.1 Registers Screens

Battery Saving Mode - idle

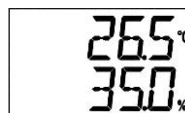
Low battery consumption mode the register does not communicate. It always stays in this mode after reset; register does not make acquisitions and does not up-date screen measures. For skipping **idle** mode, press button **S** for activating communication temporarily. After an acquisition configuration has been sent, it will definitely be out of **idle** mode.



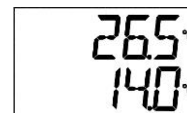
Battery Saving Mode

Main Screen

Indication screen for values measured by the register:



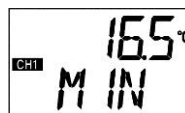
1st Screen - Temperature and Humidity



2nd Screen - Temperature and dew point

Indicator Screen MIN / MAX - CH1

It indicates the minimum and maximum value of **Channel 1** during the acquisitions.



3rd Screen - CH1 Minimum Value



4th Screen - CH1 Maximum Value

Indicator Screen MIN / MAX - CH2

It indicates the minimum and maximum value of **Channel 2** during the acquisitions.



5th Screen - CH2 Minimum Value



6th Screen - CH2 Maximum Value

Communication Screen IR - COM

It sets IR communication to automatic or manual:

- In the **automatic** mode (**aut**), communication will be always active. For communicating, just direct the interface and use **LogChart-II** software. It always stays in this mode after **reset**.
- In the **manual** mode (**man**) communication will be active 20 seconds, after pressing the **S** button. During this time, a communication shall be initiated for keeping the IR Communication active.

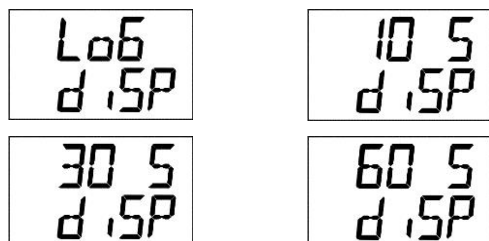


7th Screen - IR Communication Screens

Display Updating Interval Screen - disp

It sets the reading time of the sensor for the display updating. When selected by **lo6**, it performs the sensor reading and the display updating, according to the interval set for acquisition.

When selected by **10 s**, **30 s** or **60 s** it performs sensor reading for display updating every 10, 30 or 60 seconds. In this mode if the acquisition interval is shorter than the time set in the screen **disp**, display will be updated according the acquisition interval.



8th Screen – Updating Interval Screens

4 BATTERY AUTONOMY

The estimated battery autonomy is above 200 days. This autonomy is directly related to the register using mode. The shorter is the interval of the sensor reading, the smaller will be the autonomy, and it can last only 30 days, in the worse case.

For saving battery energy it has to set the longest interval possible between acquisitions, as well as for display updating.

Examples:

Ex. 1: Acquisitions interval equal to 10 minutes and **disp** screen in **lo6** mode. In this case register remains sleeping and activates only in every 10 minutes to read the sensor, update the display and make the acquisitions.

Ex. 2: Acquisitions interval equal to 10 minutes and **disp** screen in **60 s** (60 seconds). In this case, register remains sleeping and activates in every 1 minute to measure the sensor and update the display. And every 10 minutes, it activates and measures the sensor for making the acquisitions.

Comparing the **Ex. 1** and the **Ex. 2** with same acquisitions interval, the second example consumes 10 times more battery regarding the first one, due to the constant sensor reading for display updating.

Ex. 3: Medium, minimum and maximum mode.

When one of these acquisition modes is used, 10 sensor readings are performed to make one acquisition. If the acquisition interval is equal to 10 minutes and **disp** screen is in **lo6** mode, in every 1 minute a measure will be made to make the 10 necessary measures for an acquisition. In this case consumption will be same as **Ex. 2**.

Ex. 4: Starting and ending of acquisitions.

It has to observe the best start and end acquisitions mode to save battery, due to necessity of the measures.

If the process in which the measures are performed, only a short interval happens. The best is to use start and end of acquisitions by **S** button.

If process occurs on a daily basis during the day, the best way is to use the start and end by date and daily repetition.

5 INTERFACE INSTALLATION

In the **Ir-Link3/RS232** model there is a RSR232/Ir communication interface. It must be connected to the serial port at the PC.

In the **Ir-Link3/USB** model there is a USB/Ir communication interface, which must be connected to the available USB port. Windows will request the proper driver installation, which is found in the CD that is provided with the logger.

5.1 USB Drivers Installation

The drives installation steps may vary according to the machine, even for the same version of an operating system. The following screenshots and steps are only to provide guidance.

1. Insert the CD shipped with the logger in the CD-ROM drive.
2. Connect the serial communication interface IrLink-3 to the PC USB port. Windows® will acknowledge the presence of new hardware and a few seconds later it will start the drivers installation process.
3. The found new hardware wizard will be displayed, and you will be asked if you want to install the driver from the Windows Update website. Select "No, not this time", and then click Next (**Figure 4**).
4. Select "Install from a list or specific location (Advanced)" and click "Next" (**Figure 5**).
5. Select "Search for the best driver in these locations" and check "Search removable media". Click "Next". If installation files are not in a CD, check "Include this location in the search" and show the file path (**Figure 6**).
6. If a prompt warns you that it does not support Windows® XP, click "Continue anyway".
7. The interface driver files will be copied to the computer and after a few seconds a screen is displayed informing that the software installation as been concluded. Click "Finish" (**Figure 7**).
8. In some situations, the steps described above may be repeated again. Follow the same procedures.

In later uses of the interface, Windows® may require the driver installation again. In this case, the same installation wizard will be displayed, and you will have to select the option "Install software automatically (recommended)", as the driver may already be in the computer.

The following screenshots show examples of Windows XP® installation wizard. The screens in Windows 2000® are slightly different, but the content is basically the same.



Figure 4 – USB drivers installation wizard screen (First)



Figure 5 – USB drivers installation wizard screen (Second)

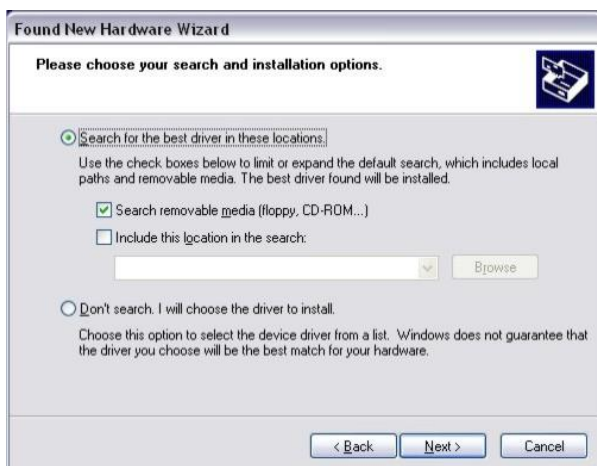


Figure 6 – USB drivers installation wizard screen (Third)



Figure 7 – USB drivers installation wizard screen (Conclusion)

6 LOGCHART-II SOFTWARE

6.1 Installing LogChart-II

LogChart II is the software provided with the logger to allow for configuration and data offload. To install, run the **LC_II_Setup.exe** file provided with the CD.

Note: Be sure your Windows date separator is configured as a slash: dd/mm/yy or dd/mm/yyyy.

6.2 Running LogChart-II

When you open LogChart-II the main window is displayed:

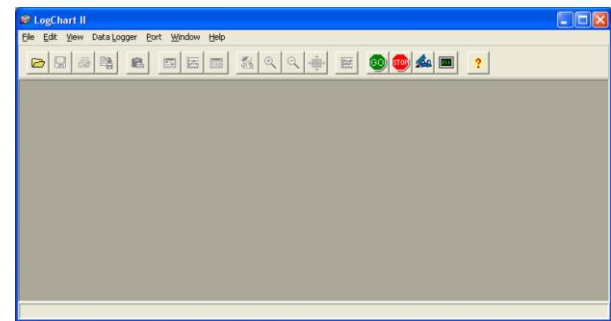


Figure 8 – LogChart-II main window

Next, select the serial port that the communication interface will use in the "Port" menu.

- For **IR-Link3/RS232** model:

Check which is the free serial port in your computer. The selected COM port will be considered as the standard port next times the LogChart-II is run.

- For **IR-Link3/USB** model:

Select the USB serial port where the interface is connected.



Figure 9 – Icons enabled when the communication port selected is a valid port

6.3 Configuring the logger

Make sure the communication interface is connected to the PC port selected. The interface must be constantly directed towards the front part of the logger (communication window) at a maximum distance of 50 cm. (See Figure 10).

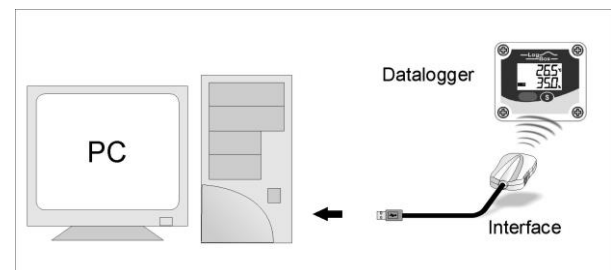


Figure 10 – Infrared communication interface position



When communication is established, select

The **Parameters Configuration** screen is displayed. In this screen the user can define the logger operation mode and also obtains general information about the device (Figure 11).

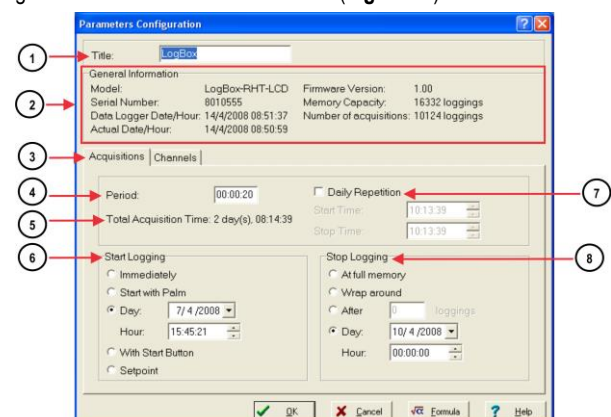


Figure 11 – Logger Set Up (Readings)

Fields are:

① **Title:** In this field, the user identifies the logger by assigning it a name.

② **General Information:** Area with information about the logger, such as Model, Serial Number, Logger current Date/Time, PC Date/Time, firmware version, memory capacity and number of acquisitions stored in memory.

In this field, time is constantly updated while the communication between logger and computer is taking place.

③ **Acquisitions:** Presents a series of parameters that define how measurements will take place.

④ **Interval:** Defines the interval between readings: Minimum interval is 1 (one) second.

Note: When the type of value logged is mean, maximum and minimum values, the minimum interval is 10 seconds.

In **Daily repetitions** the user defines the time that daily logs will take place.

⑤ **Estimated time:** In this parameter, the logger informs the user how long it will take to occupy the full memory, in the conditions set up during configuration.

⑥ **Start of Readings:** Readings can be started in one of five different modes:

- **Immediately:** start as soon as programming is considered to be ready, and is then sent (OK) to the logger.
- **Start via Palm:** start with a command sent via Palmtop, which runs the software Log Chart Palm-OS.
- **Date:** readings start at predefined date and time.
- **Through Start Button:** starts and interrupts readings by pressing the Start button, in the frontal part of the logger, for two seconds. See **Figure 1**.
- **Setpoint:** measurements start when a **temperature** setpoint is reached. In this option, the setpoint value is defined in the Channels field, where the Alarm parameter is replaced by setpoint.

⑦ **Daily Repetition:** In **Daily repetitions** the user defines the time that daily logs will take place.

⑧ **Stop loggings:** Options for the end of readings are:

- **Full Memory:** readings can be stored up to the full memory capacity is reached.
- **Wrap around:** readings are continuous, replacing old records with new ones as the number of readings overpass the memory capacity.
- **After:** the logger stops readings after a certain number of readings.
- **Date:** Readings stop at user-predefined date and time. In case the logger memory capacity is reached before the date defined, readings are stopped.

⑨ **Channels:** Shows parameters referring to each channel separately. Channel 1 is the Temperature channel, and Channel 2 the Relative Humidity channel.

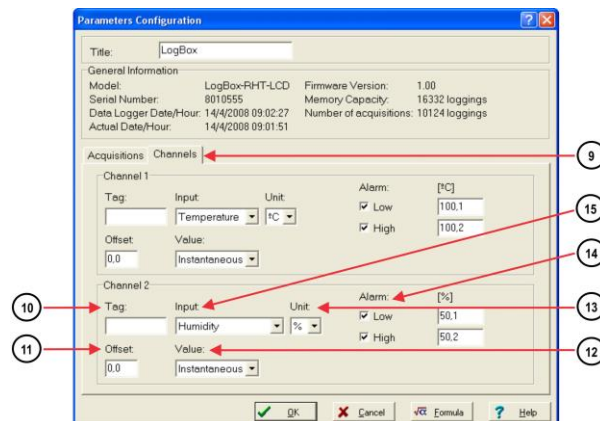


Figure 12 – Logger Set Up (Channels)

⑩ **Tag:** Defines a name for the temperature registers.

⑪ **Offset:** Makes possible to correct the value logged.

⑫ **Value:** It defines how the value measured will be registered. Options are:

- **Instantaneous:** The value logged will be exactly the value measured at each interval defined. The minimum interval between measurements is 1 seconds.
- **Average:** The value logged will be the mean of ten measures taken within a predefined interval. The minimum interval between measurements is 10 seconds.
- **Maximum:** The value logged will be the maximum value found within ten measurements taken within a predefined interval. The minimum interval between measurements is 10 seconds.
- **Minimum:** The value logged will be the minimum value found within ten measurements taken within a predefined interval. The minimum interval between measurements is 10 seconds.

⑬ **Unit:** Defines the unit of the value measured: °C or °F for channel 1 (temperature) and only % for channel 2 (relative humidity or dew point).

⑭ **Alarm:** Defines limit values that, when exceeded, characterize an alarm condition. Alarm events are informed to the user through the **Alarm Indicator**. The alarm limit value is shown with a dotted line with the same color of the channel in the chart from **LogChart-II** software.

⑮ **Input:** Parameter available in channel 1 (**temperature**) and channel 2 (**humidity** or **dew point**). It is also possible to deactivate channel 1 and keep the entire memory for humidity. It is possible to select the Dew Point logging.

After filling all the fields select OK and settings are sent to the logger.

7 OFFLOAD AND DATA VISUALIZATION

The transference of data to a PC is accomplished with the LogChart-II software. Measurements are displayed in tabular and graphical form. Data can be saved in files for future analysis and comparisons.

7.1 Offloading data



To offload data, click the icon **Offloading Data**, and turn the interface towards the logger front. During data transference, a status bar indicates remaining data to be transferred. Data offloading time is proportional to the number of readings logged.

7.2 Visualizing data

At the end of values transfer, data can be displayed in a graphical form.

7.2.1 Chart window



It is possible to select a region of the chart to zoom in. Zoom commands can be accessed through the **View** menu or through zoom icons from the task bar.

It is also possible to select an area from the chart to zoom in by clicking and dragging the mouse, thus creating a zoom region starting from the upper left corner on the chart area.

This window shows minimum and maximum values of each channel. It also shows the horizontal line of alarm values defined.

A text can be associated to the chart points by double-clicking a curve point.

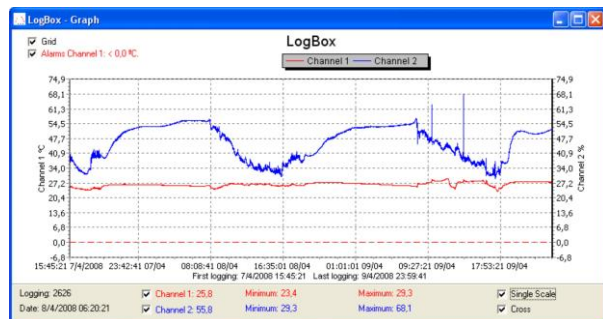


Figure 13 - Logged data graph window.

Offloading measurements does not stop the process of data logging and reading.

7.2.2 Measurements Table Window



To display measurements in a tabular form, press the icon **Table View**. Values are presented in a tabular form, listing the measurement time and value (Figure 14).

LogBox - Loggings Table				
Loggings Table				
Logging Nr.	Time	Date	Oven 1 [°C]	Oven 2 [%]
00001	10:06:00	14/4/2008	24,5	41,7
00002	10:06:20	14/4/2008	24,6	41,1
00003	10:06:40	14/4/2008	24,6	41,7
00004	10:07:00	14/4/2008	24,6	41,4
00005	10:07:20	14/4/2008	24,6	41,0

Figure 14 - Acquisitions table

7.2.3 General information table



This window shows some information about the logger whose data were just read and its configuration. The screen can be displayed by pressing the icon **Parameter Viewing**.

A text with notes about offloaded data can be inserted in the **General Information** window (Figure 15).

Figure 15 - General Information

8 PALMTOP USER

Most of the functionality of the LogChart-II is available for the PDA Palm running the **LogChart PalmOS** software.

The application **LogChart Palm-OS** is shipped with the logger. It is installed in the Palmtop through a **HotSync** process (data synchronization between a Palmtop and a PC).

The user needs the **Palm Desktop** and the **LogChart-II** software installed in his machine. It is recommended to execute the **Palm HotSync** before installing the **LogChart PalmOS**.

To install the software, insert the disk in the driver, click on **Start** and **Execute** in the windows task bar. Type **d:\LogChart Palm-OS\LCP_Setup**, where **d:** is the disk driver unit. Press **OK**. The installation wizard will guide you through the installation process.

Executing a new **HotSync** will install the **LogChart PalmOs** software in the Palm. The LogChart icon will be added to the Palm home screen.

Starting the **LogChart PalmOS** application will display the **Recorded Data** screen on the PDA. Starting the LogChart PalmOS application will display the **Recorded Data** screen on the Palm where from it is possible to access the logger to change settings and offload data, as well as to access recorded data.

Recorded Data	
DATE	DATA TITLE
31/01/08	LogBox RHT LCD
31/01/08	Vaccine Transit
31/01/08	Room #311
31/01/08	Warehouse
31/01/08	TagTemp
31/01/08	Logbox AA
<input type="button" value="Search Device"/> <input type="button" value="Details"/>	

Figure 16 - Recorded Data Palmtop screen

8.1 Accessing the Loggers

To have communication between the logger and the Palmtop established the user must align the Palm infrared wand to the logger, run the LogChart Palm-OS software and press **Search Device** in the **Recorded Data** screen of the software.

When the Palmtop finds the logger, the **Monitoring** screen will pop up. The screen displays values of variables measured, configuration information and current logger status.

Figure 17 – Palmtop Monitoring screen

Buttons are assigned the following functions:

Search: It allows you to "search" for another logger or reconnect communication lost for any reason. When the handheld device finds a logger, it exhibits the new **Monitoring** screen with the logger information.

Download: Offload logged data. Download can be partial and it does not interfere in the ongoing measurement process.

More Info: Display further information on the connected logger: such as model, serial number, version and memory capacity.

Settings: Accesses the Settings screen, which allows for modifying the logger configuration.

Data Base: Exhibits the **Recorded Data** screen listing all the processes stored and processed in the PDA data base.

Figure 18 - Recorded Data Details Palm screen

8.2 Configuring the Logger – Settings

During configuration, the logger and the Palm ports must be aligned.

Press **Settings** in the **Monitoring** screen. The screen **Settings** is opened and provides the required parameters for configuring the logger.

Figure 19 – Settings Palmtop screen

The parameters to be defined are:

Title: Name of the process to be monitored.

Input 1 and 2: Informs the variables measured. Monitoring of relative humidity can be disabled.

Start (start of acquisitions): Defines the measurement start mode. Options are:

Immediately: The logger starts logging as soon as configuration is sent to the logger.

By date/time: Start in defined data and time, always after current time. It is possible to perform daily repetitions. If this option is selected, a new box to define the stop logging time is displayed.

By <Start> Button: Press the **Start Now** button from the **Monitoring** screen to start logging. The PDA must be turned towards the logger. It also configures the **Start Button** of the logger to operate.

By Setpoint value: Measurements start when a temperature setpoint is reached. With this option it is also possible to start measurements above (**log Above**) or below (**log Below**) a temperature setpoint (Channel 1). This option is not valid for alarms that have already been set up.

By <Start/Stop> Button: Starts when the **Start/Stop** button at the frontal side of the logger is pressed.

Stop (Stop logs): Defines the measurements stop mode: Options are:

Full memory: Loggings can be stored up to the logger full memory capacity is reached.

Wrap around: Logging is continuous. When the logger maximum memory capacity is reached, oldest records are overwritten by newest data.

After loggings: The logging will stop after the number of readings are defined.

By date/time (Data/Horário): Logging is stopped on user-defined date and time.

Interval: Defines the interval between readings: hour, minutes and seconds. When the logging mode is set to the **instantaneous** the minimum interval is 1 second. For mean, maximum and minimum values, the minimum interval is 10 seconds in both models.

Channel 1: Opens the **Channel 1 Settings** screen, where channel 1 can be set up. This channel is for temperature measurements.

Tag: Defines a name for the temperature registers.

Input: Informs the sensor present in channel 1: NTC. Sensor can not be disabled.

Unit: Defines the measurement unit: °C or °F.

Limits: Informs the temperature measurement range. It can not be changed.

Logging Mode: It defines how the value measured will be registered. Options are:

Instantaneous: The value logged will be exactly the value measured. The minimum interval between measurements is 1 second.

Average: The value logged will be the mean of ten consecutive measurements taken within a minimum predefined interval of 10 seconds.

Minimum: The value logged will be the minimum value found in ten consecutive measurements taken within a minimum interval of 10 seconds.

Maximum: The value logged will be the maximum value found in ten consecutive measurements taken within a maximum interval of 10 seconds.

Alarms: Enables an alarm that is triggered according to user-defined parameters.

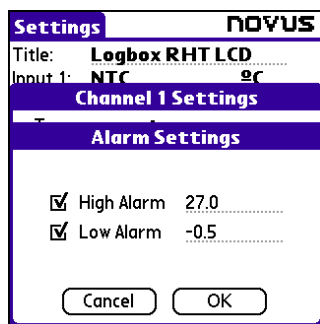


Figure 20 – Alarm settings Palm screen

Channel 2: Opens the **Channel 2 Settings** screen, where channel 2 can be set up. This channel is for relative humidity measurements.

Note: Fields in this screen are identical to fields in the **Channel 1 Setting** screen.

Cancel and **OK** buttons cancel and save configurations defined in the **Channel Settings** screen.

Clocks: Provides access to Logger and Palm clocks. When a new configuration is sent to the logger, clocks are updated.

Offset: Allows fine offset adjustment to the measured value. The **Reset** button clears changes made and the logged values are the measured values again.

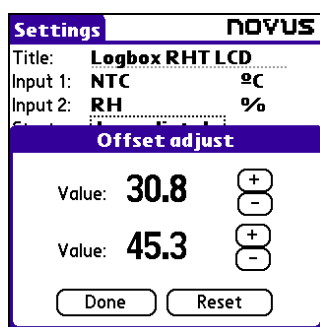


Figure 21 – Offset adjust screen

After configuring clocks in the **Settings** screen, click **Apply** to send this configuration to the Logger, returning to the **Monitoring** screen.

Sending a new configuration implies the **exclusion** of all data collected present in the logger memory.

8.3 Downloading Data from the Logger

In the **Monitoring** screen, the **Download** button performs the transfer of the data from the LogBox to the PDA. Download can be partial and it does not interfere in the ongoing acquisition process.

The data base of loggings is displayed in the **Recorded Data** screen, identified with the name assigned to the process (**Data Title**) and the date it was downloaded.

Should the PDA batteries be discharged, all readings will be lost.

8.4 Files Visualization

The **Recorded Data** screen lists the data base logged and stored in the PDA. To access data, select the desired data base and press **Details**. **Recorded Data Details** screen shows several information about the data base.

View Data shows in table format the logged values and the date and time they were performed.

Press **Delete** to erase the selected data base.

8.5 Transferring Data to your Desktop

HotSync of data stored in a PDA to the Desktop is performed through a conduit installed together with the LogChart Palm-OS. The conduit converts the data collected by the LogChart Palm-OS to a file compatible with the LogChart-II software.

To access the conduit options, the **HotSync Manager** software must be active. Click on the HotSync Manager in the Windows taskbar. Select in the drop-down menu the option **Custom**. Select **LogChart Conduit** and click **Change**. The following window will display:

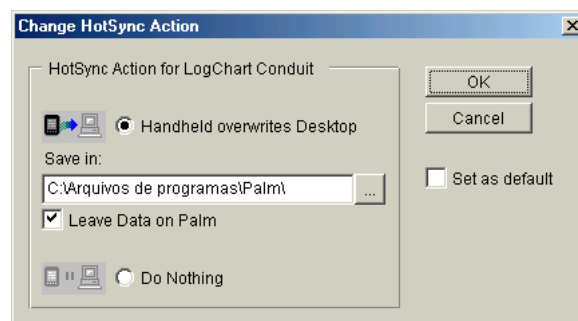


Figure 22 – LogChart Conduit options

Handheld overwrites Desktop: LogChart Palm-OS files are transferred to the Desktop.

Save in: Choose a directory to record files generated during data synchronization.

Leave Data on Palm: Option to keep or delete the data in the PDA.

Do nothing: Data synchronization will not be performed.

Set as default: The same settings will be used in the next **HotSync** processes.

9 MOST FREQUENTLY FOUND PROBLEMS

Communication with the logger fails:

Make sure the COM port is selected correctly and there is no other program using the same port during communication attempts.

Make sure there is no physical obstacle blocking the infrared signal.

Make sure the cable is well connected to the PC port.

Make sure the port selected does not present any problem.

9.1 Logger Reset

When the user is not sure about the real condition of the logger operation, it is possible to perform an enforced Reset by removing the battery and waiting for 2 seconds to replace it. The logger will return to the stand-by mode. If measurements were being made, it will interrupt the process and start measurements again only when a new set up is made. Implemented setup remains the same after reset.

9.2 Additional Information

For further information, see the manufacturer web site.

10 SPECIAL CARE

The logger is an electronic device and some basic care is required:

- When opening the device for battery replacement or connecting sensors avoid touching the circuit for not causing damages resulting from static electricity.
- Check battery polarity carefully.
- When closing the case, the cover must be properly tightened back in its place such as to assure the sealing protection.
- Worn batteries should not be recharged, dismantled or incinerated. After use, batteries must be disposed according to local legal rules or returned to supplier.

10.1 ATTENTION WITH SENSORS

Calibration of the humidity sensor can be changed whenever it is exposed to contaminant vapour or external conditions of temperature and humidity for prolonged time. To configure this function, follow the steps below:

- Take the sensor out from the case.
- In case there are solid specks on the sensor, clean it with water.
- Put the sensor in an oven at 80°C (+ -10 °C) for 24 hours.
- Let the sensor for 48 hours in a place with temperature between 20 and 30 °C and humidity over 75 % RH.
- Replace the sensor in the case.

NOTE

The sensor from this device may be damaged or uncalibrated if exposed to chemical agents-contaminated atmosphere. Chloridric Acid, Nitric Acid, Sulphuric Acid and Ammonia in high concentrations may damage the sensor. Acetone, Ethanol and Propylene Glycol may cause a reversible measure error.

11 WARRANTY

The manufacturer products are covered by a 12-month warranty provided the purchaser presents the sales receipt and the following conditions are met:

- Products are covered for one year from the original date of purchase.
- Within this period, warranty against defects in material and workmanship under normal use is free of charge.
- For repair, send the product and the sales receipt to our address. Expenses and transportation risks are under the purchaser's responsibility.
- This warranty does not cover any damage due to accident, misuse, abuse, or negligence.