LogBox-AA

ELECTRONIC DATA LOGGER - MANUAL V1.1x

PRESENTATION

LogBox-AA is an electronic data logger with two analog input channels. Values measured by these channels (data) are stored in the logger electronic memory (acquisitions) for later download to a PC for visualization and analysis in the form of tables or graphs. Data can be easily exported to spreadsheets.

The **LogChart-II** is the software used to configure the logger, download and visualize data. The logger configuration allows define the logger operation mode, including the start/stop time of data acquisition. Other parameters such as signal input type, Logging interval, etc., are easily selected through the **LogChart-II** software.

The LogBox-AA also provides a signal for commanding an external power supply (battery) of a device connected to the logger. This feature allows that external devices, such as a transmitter, be powered only during the measurement sample time, thus extending the service life of these external batteries.

MEMORY CAPACITY

Two memory storage capacities are offered: 32K or 64K records:

- 32k Model: Allows up to 32,000 records;
- 64k Model: Allows up to 64,000 records (It is not PALM compatible);

Memory capacity is always shared between enabled channels. In case there are two channels enabled, each gets 50 percent of the memory available. When only a single channel is enabled, it has the entire memory at its disposal.

Memory capacity is indicated on the identification label placed on the logger case.
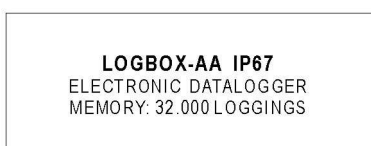
```
LOGBOX-AA  IP67
ELECTRONIC DATALOGGER
MEMORY: 32.000 LOGGINGS
```

Figure 1 –Identification label

INPUT SIGNALS

The input channels 1 and 2 measure analog electric signals, which can be Pt100, Thermocouple (J, K, T, E, N, R, S or B), voltage (0 to 50 mV or 0 to 10 V) or current (0 to 20mA or 4 to 20mA), according to user-defined settings.

Note: Besides configuration performed through the software, the definition of input signal requires two internal jumpers to be configured.

DATA ACQUISITION (LOGGING)

Data can be acquired through different modes. The logger can be configured to perform a single measurement within a time interval storing the value read or perform ten measurements within the time interval and store the mean of values measured. Yet, it can store the minimum or maximum values read in the interval.

OPERATION

The logger operation mode is user-defined in the **LogChart-II** software. To access or change this configuration, the **IR-LINK3** interface is required**.** The user must install the LogChart-II software in a computer and run the logger configuration according to instructions defined in the LogChart-II installation section of this manual.

After configuration and input electric connections are made, the device is ready to measure and log input signals. The status indicator shows the logger current status.

STATUS INDICATORS (LEDS)

The Status Indicators (see **Figure 2**) are located in the logger front panel. They indicate the current working conditions of the unit.

LOG Indicator (*Logging)*: While in stand-by (not logging) or after a series of acquisitions is ended, it flashes once at every four seconds. During login it flashes twice at every four seconds.

AL Indicator (*alarm***):** Alerts the user regarding alarm conditions. Whenever an alarm situation takes place it will flash once at every four seconds, until a new configuration is applied to the logger.
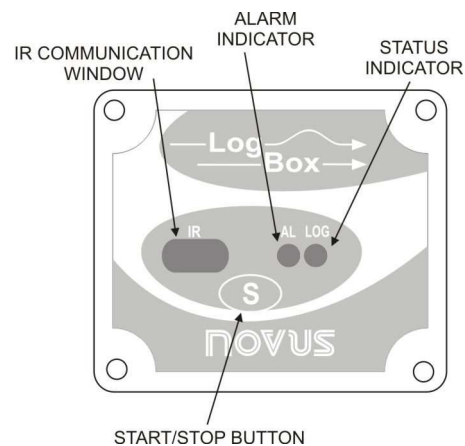

Figure 2 – LED Indicators and IR communication

LOGCHART-II

INSTALLING LOGCHART-II

The LogChart II is the software provided with the logger to allow for configuration and data collection. To install the LogChart II, execute the **LC_II_Setup.exe** program provided in the CD. The installation wizard will then guide you throughout the installation process.

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

RUNNING LOGCHART-II

Start the program. The main window will appear on the screen, as in **Figure 3**.
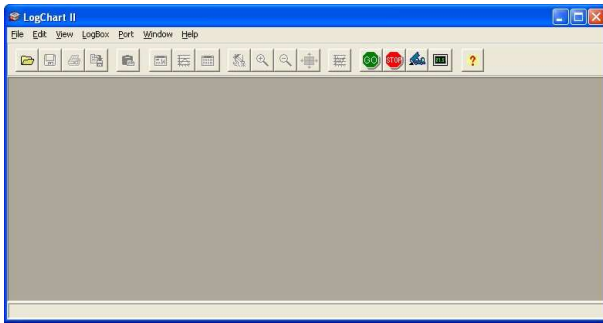
Figure 3 – LogChart-II main window

The LogChart II requires a communication port to talk to the logger. Select one and connect the corresponding wand IR-LINK3 to it. Click on the menu **Port.** Clicking on the menu **Port**, all free communication ports available in the computer will be listed (usually COM2, once the mouse is frequently connected at COM1). The chosen port will be remembered next times the LogChart II is initiated.

When the selected port is successfully opened, the LogChart II initial screen is opened, enabling the buttons below:

Figure 4 – Buttons enabled when the communication port of choice is valid

In case the user wants to stop the process while data logging is running, the button "Stop" must be pressed:

OPTIC INTERFACE IR-LINK3

Configuring, monitoring or downloading data from the logger through LogChart-II requires that the IR-LINK3 communication interface be connected to your PC. This interface is sold separately.

The IR-LINK3 interface sends and receives data to/from the logger through infrared signals.

IR-LINK3 FOR RS232

This interface has a DB9 terminal that must be connected to the PC serial port. In the "Port" menu, select the port which corresponds to the physical port where the interface is connected.

IR-LINK3 FOR USB

This interface has a USB terminal. Plugging this USB interface to the PC, the Windows wizard for new USB devices pops-up automatically. Select then the *IRLink* driver provided in **d:\IRLink_Driver**. (**d:** is the driver used in the installation). After installation is completed, the IR-LINK3 interface is recognized whenever it is connected to the PC.

After the USB driver installation, the LogChart II must be opened again. In the "Port" menu, choose the same port selected for the optical interface communication using the menu **Port.**

CONFIGURING THE LOGGER

Make sure the IR-LINK3 wand is connected to the PC. The interface must be pointed towards the logger communication window (see Figure below) at a distance of about 15 cm.
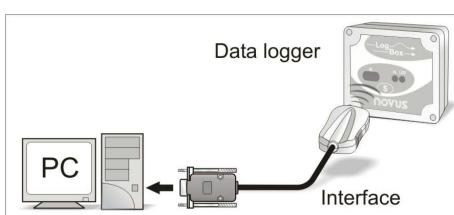

Figure 5 – Infrared interface position

Click the button to start the communication between the logger and the software; the **Parameters Configuration** window is then displayed (**Figure 6**), showing the current configuration and information about the logger. New configuration parameters defining the operation mode for a new application can be entered. The user can also obtain general information about the device.

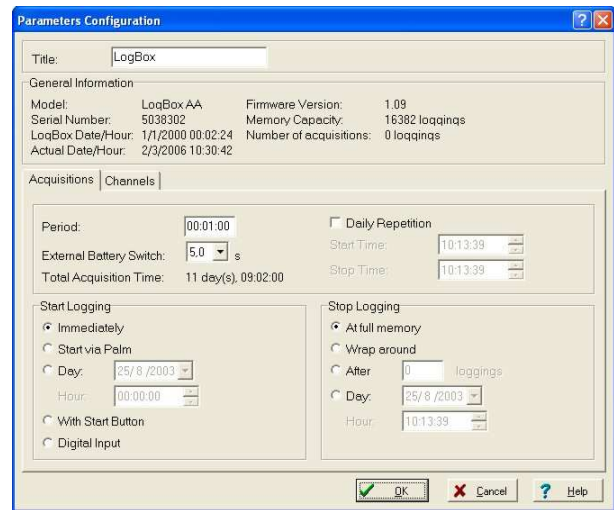The fields of the configuration window are described bellow.

Figure 6 – Configuration window

GENERAL INFORMATION FIELD

General information on the top of the screen informs the model, serial number, logger current date/time, PC date/time, firmware version (logger model version), memory capacity and used memory. This information is displayed in the upper part of the LogChart-II configuration screen.

The time is constantly updated in this screen, provided that the logger and the PC are communicating.

ACQUISITIONS FIELD

Interval: It determines the interval between readings in the hh:mm:ss format. New data is stored in the logger memory after each time interval.

In the **Instantaneous** reading mode, the value of the interval between acquisitions is the same as the time interval between measurements. For **Average, Minimum** and **Maximum** readings, the logger executes 10 readings within this interval.

External Battery Switch time: Defines the time when the logger turns on the power supply, before proceeding with any reading. This time is limited to 10 seconds and must be less than half of the interval between readings.

Estimated time: It informs the estimated time for the accomplishment of programmed readings based on the logging "**Interval**" and on the number of programmed readings.

Daily Repetition: Allows loggings to be repeated everyday, for example, recording data from 8 AM to 5 PM day after day. The start and stop times are defined in the fields "**Start time**" and "**Stop time.**"

START LOGGINGS FIELD

Immediately: The logger starts logging as soon as the configuration is applied. Not valid when the option 'Daily Repetition' is selected.

Start via Palm: Logging is started via Palm. The LogPalm software must be installed in the PDA. (See **Palm User** section in this manual.)

Day / Hour: Logging starts at a defined date and time. The date defined is used for the Daily Repetitions option as well.

Through Start Button Starts and stops logging by pressing the Star button for two seconds.

Digital Input: Starts readings when the digital input is activated (closed) and stops readings when the digital input is deactivated (open).

STOP LOGGINGS

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

Wrap around: Logging never stops. The LogBox-AA will keep on recording the readings and when the memory is full it will overwrite the oldest record in a circular or wrap around manner.

After a defined number of readings: The logger will stop logging after the number of readings here defined is reached. Not valid when the option 'Daily Repetition' is selected.

Day / Hour: The LogBox-AA will stop logging at the user-defined date and time. Not valid when the option 'Daily Repetition' is selected.

CHANNELS FIELD

By selecting the "**Channels**" option, the user is able to choose the individual settings for each input channel, as **Figure 7** shows.
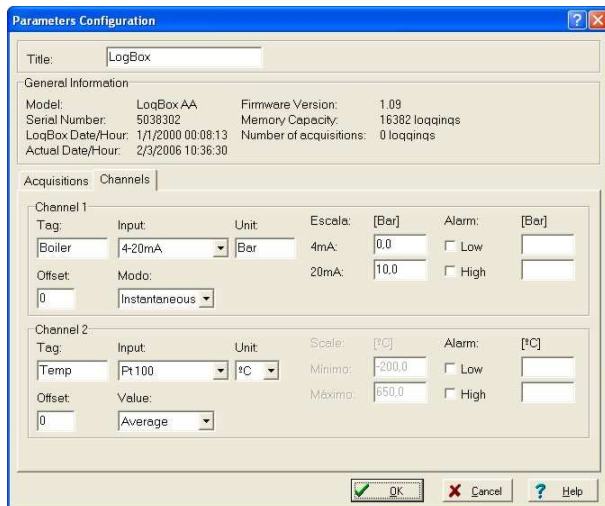

Figure 7 – Parameters for Input Channels Configuration

Such parameters are:

Tag: Defines a name (up to 8 characters) for identifying the variable to be measured.

Inputs: The signal applied to the logger second input is defined here. The list shows all the input options available. The selected option must be in accordance with the internal configuration of the jumper, as **Table 1** shows.

Unit: Defines the variable unit.

Scale: Defines the range, in engineering units, for representing the input variable measured.
Adjustable from –32000 to +32000 for *4-20 mA, 0-20 mA, 0-50 mV and 0-10 inputs*, for the remaining input times the scale is fixed.
Offset: Allows fine offset corrections on the measured value.

**Value:** Defines readings recording mode:

- **Instantaneous:** The instant value read at the logging time.

- **Average:** Ten readings at each reading interval. The average value of readings is the value recorded;

- **Minimum:** Ten readings at each reading interval. The lowest value found is recorded;

- **Maximum:** Ten readings at each reading interval. The highest value found is recorded;

Alarm: defines a limit range of variables measured that, once exceeded, trigger the alarm.
Once activated, the alarm LED indicator stays so even after the alarm-triggering situation has ceased.
LOW defines the minimum value under which the alarm is triggered; HIGH defines the maximum value above which the alarm sensor is triggered.
After filling all the fields, send the configuration to the logger by clicking on the button
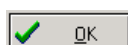
New settings and PC current date/time are then sent to the logger.

ELECTRICAL CONNECTIONS

Only the input connections and the External Battery Switch (when used) are needed. The logger is exclusively powered by its internal battery.

In the IP65 models, the inputs and the signal for activating the external power supply are located inside the logger case, which must be opened for accomplishing the connections.

In the IP67 and IP68 models, proper connectors are provided for this purpose, as shown in **Figure 9**.

IP65 MODEL

Open the logger's cover to get access to the block terminals and the configuration jumpers. Connection cables must pass through the compress fitting located at the bottom of the case. **Figure 8** shows the internal terminals distribution.

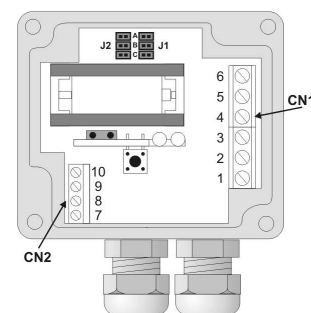|	
Channel 1:	CN1 connector – Terminals 1, 2 and 3
Channel 2:	CN1 connector – Terminals 4, 5 and 6
External Battery Switch	CN2 connector – Terminals 7, 8 and 9
Digital Input	CN2 connector – Terminals 7, 10 and 9

Figure 8 – IP65 connections internal view

Note: Make sure that the compress fitting is perfectly tightening the cables, thus assuring proper IP65 protection: (totally dust-tight and protected against water jets).

IP67/IP68 MODEL

In theIP67/IP68 version, an M8 connector is provided for signal input. Two connectors provide external access to the input channels, as shown in **Figure 9**. The cables are supplied with the logger.

Note: The case cover should not be opened unless battery replacement is required. If this is the case, the cover must be properly tightened back in its place such as to assure the IP67 / 68 protection.

IP67 - Totally dust-tight and protected from temporary immersion in water.
IP67 - Totally dust-tight and protected from submersion in water.
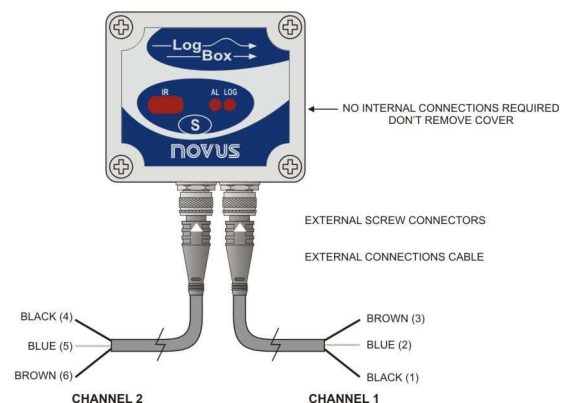

Figure 9 – IP67/IP68 external connectors

Wire connections:

Channel 1 cable (right)	Connection
Brown	CN1 – 3
Blue	CN1 - 2
Black	CN1 -1

Channel 2 cable (left)	Connection
Brown	CN1 -6
Blue	CN1 – 5
Black	CN1 – 4

INPUT CONNECTIONS
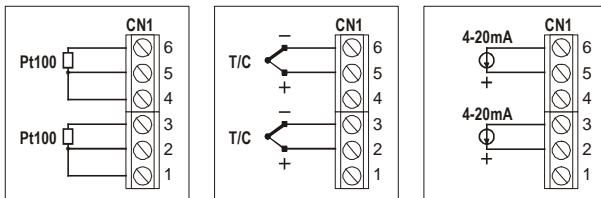
Both models have the same input connections schema:

Figure 9 – Input signal connections

Before using the logger, the internal jumpers positioning must be set according to the input type used.

Te factory setting of these jumpers is for measurement of Pt100 / Thermocouple / 0-50mV signals.

Figures below show some positioning for possible input types.

Input signal	CHANNEL 1 J1 position	CHANNEL 2 J2 Position
4-20 mA / 0-20 mA	A	A
Pt100 / Thermocouple / 0-50mV	B	B
0-10V	C	C

Table 1 – J1 and J2 positioning

EXTERNAL BATTERY SWITCH

The example below shows the usage of the external battery switch for commanding the power supply of external devices. - Channel 1 is configured to 4-20mA input signal. A battery is used to provide power to the 4-20 mA loop. The battery switch "turns on" the power to the loop a moment (defined in the configuration) before the measurement is taken, enabling the transmitter (pressure, temperature, etc) to start up and stabilize the output.
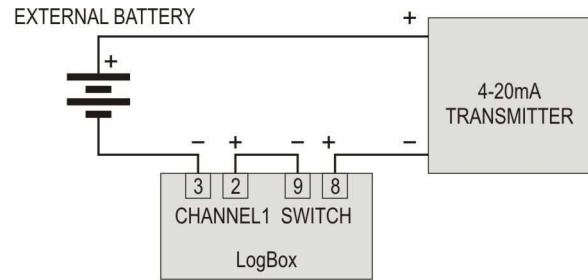
Figure 10 – Example of the battery switch powering a transmitter.

DIGITAL INPUT (DI)

The Digital Input that can be used to guide the logger readings is available in terminals 7 (-) and 10 (+) of CN2.

INSTALLATION RECOMMENDATIONS

Signal wires should be installed in grounded conduits and away from power or contactor wires.

Instruments must be powered only by an exclusive power supply.

System failure should always be taken into account when designing a control panel to avoid irreversible damage to equipment or people.

Installing RC filters (47R and 100nF, serial) is strongly recommended at contactor coils or any other inductors.

OFFLOADING AND DATA VISUALIZATION

The transference of data to a PC is accomplished by using the LogChart II software. Data can be collected anytime and saved in files for future analysis (menu "File Save" or "File Save as"). Help can be accessed from the LogChart-II software when necessary.

Offloading data: data offload is accomplished by clicking on the button

Or using the LogChart-II menu. During data transference, a status bar indicates remaining data to be transferred. Data offloading time is proportional to the number of readings logged. At the end of data transference, the *Graph* window is displayed.

Graph window

The Graph is a convenient tool for analysis. It enables the logger acquisitions to be read in the form of a "values x time" graph. As one moves the mouse in the chart area, the time and the value of the records of each channel are shown in the field located in the bottom of the window.

Zooming in and out are implemented. It is possible to select an area by clicking and dragging the mouse, thus creating a zoom region, starting at the upper left position of the region of interest.
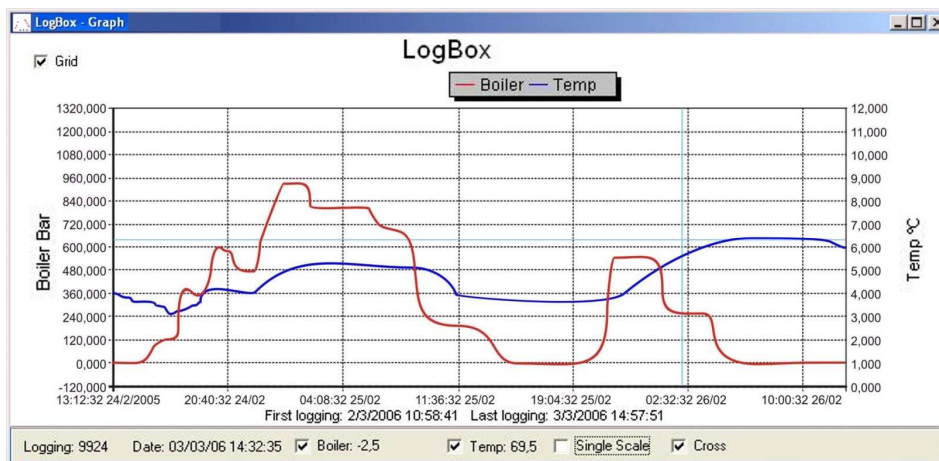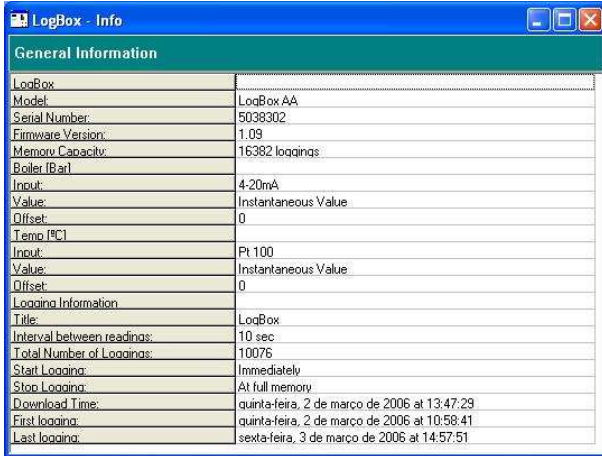
Figure 11 - Graph window.

The command **Offload acquisitions** does not interrupt the process of data logging and reading.

Other two windows can be easily opened: General information window and Tables window.

General information table

Displays information about the logger that registered data: its features and configurations, and details about data acquired.
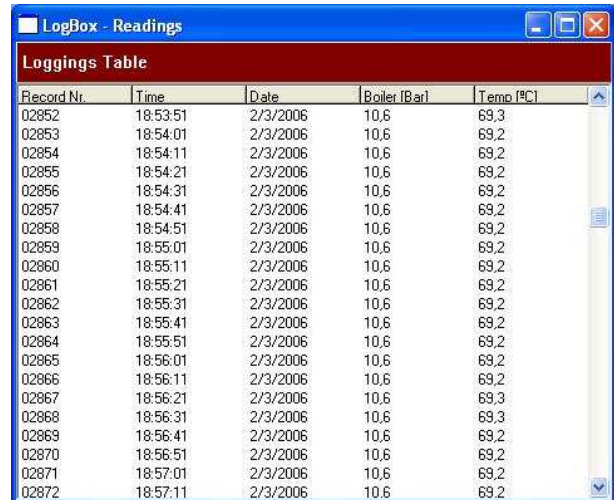

Figure 12 - General Information window

Acquisitions Table Window

Data acquired by one or both input channels (user-defined) are displayed in engineering units in a table format. The table displays register number, date/time and the record values.

Figure 13 – Screenshot showing the acquisitions table

VISUALIZING THE DATA

Three windows support data visualization: Graph, Acquisitions Table and General Information windows. Data can be originated from direct reading from the logger or from a file previously recorded in a computer.

Once the windows are open, data can be saved in a file (.lch), printed on a graph or exported to a text file (.txt or .dat).

MONITORING ACQUISITIONS

To visualize current measurements in a graph format, use the *Monitor On-Line* command by clicking on the button

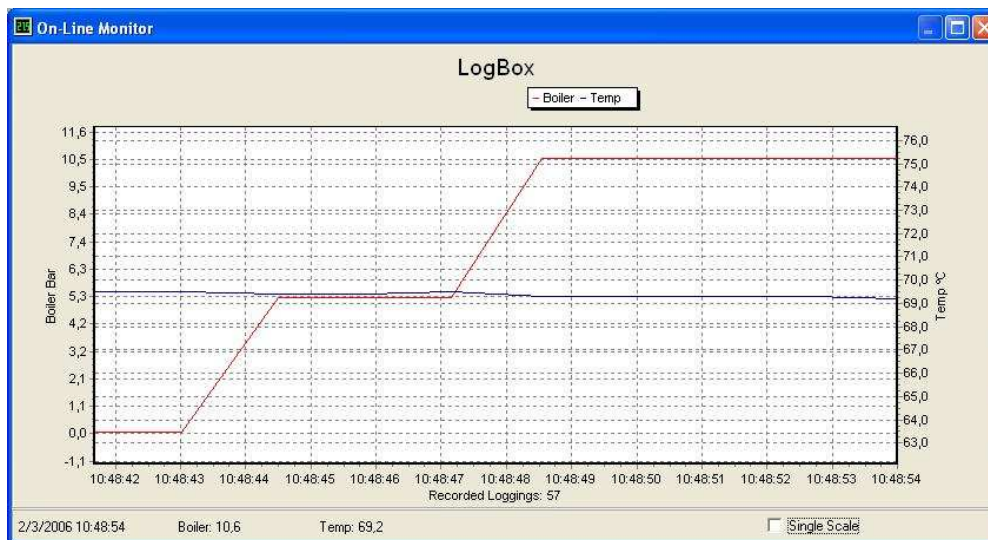

while pointing the IR-LINK3 interface to the logger.

Figure 14 – Online monitoring graph

PALMTOP USER

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

The program is delivered with the logger. The stalled in the Palmtop through a HotSync process (data synchronization between a Palmtop and a PC).

INSTALLING THE LOGCHART PALM-OS

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. Then, type

d:\LogChart PalmOS\LCP_Setup,

d: is the driver used in this example.

Press "OK". The software will guide you over 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.

RUNNING THE LOGCHART PALM-OS

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 collect data, as well as to access collected data.
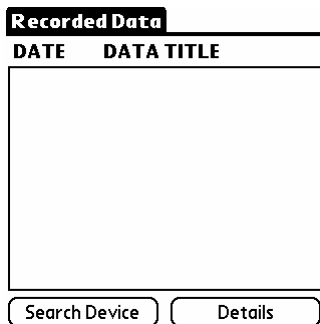

Figure 15 – Recorded Data screen

ACCESSING THE LOGGERS

To set up the communication between the handheld device and the logger(s), run LogChart Palm-OS, press the **Search Device** button from the **Recorded Data** screen and align the Infrared Port of the PDA to the logger(s) communication window. (See **Figure 2**).

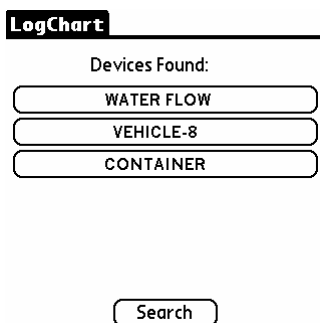If more than one logger are detected, the Devices Found screen is exhibited.

Figure 16 – Devices Found screen

The user must select a device to start the communication. The **Monitoring** screen is soon displayed.

If your Palm detects only one device, the **Devices Found** screen is skipped and the **Monitoring** screen is exhibited.
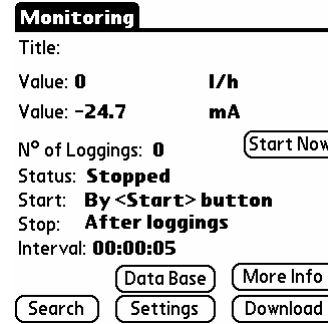

Figure 17 – Monitoring screen

The screen exhibits instant values of variables measured, configuration information and current logger status.

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 a new Monitoring screen with the logger information. When other loggers are found, the Devices Found screen is exhibited again.

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

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

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

Data Base: Exhibits the Recorded Data screen listing all the processes stored and processed in the PDA data base. To access the data, tap on Details. Information required is displayed. View Data: displays data in a list containing date, time and measured value.
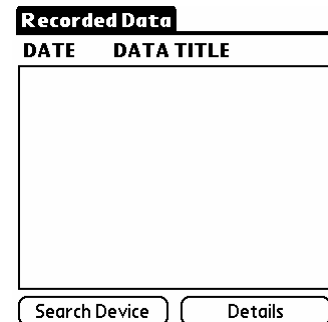

Figure 18 – Recorded Data screen

CONFIGURING THE LOGGER - SETTINGS

During configuration, the logger and the Palm ports must be aligned. Tap on **Settings** in the **Monitoring** screen. The screen **Settings** is opened and contains the required parameters for configuring the logger.
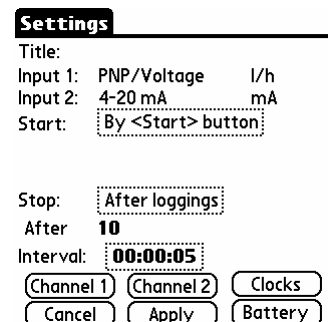

Figure 19 – Settings screen

The parameters are analogous to the LogChart II parameters. They are:

Title: Name of the process.

Input 1 and 2: Informs the inputs used by channels 1 and 2 respectively.

Start: Defines the strategy for the logging start. 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.

By LogBox Button:Press the **Start_Now** button from the **Monitoring** screen, the Palmtop should be pointed towards the logger.

By Digital Input: Readings are performed while the digital input is enabled (closed / 1) and interrupted when the digital input is disabled (open / 0).

Stop: Defines logging stop mode: Options are:

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

Wrap around: Logging never stops. The LogBox will keep on recording the readings and when the memory is full it will overwrite the oldest record in a circular or wrap around manner.

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

By date/time: Logging is stopped on user-defined day and time.

Interval: Defines the interval between readings: hour, minute and second. For mean, maximum and minimum values, the shortest interval between loggings is 10 seconds.

Channel 1: Opens the Input 1 Settings screen.

Tag: Defines a name for Channel 1.

Input: Informs the input type used in Channel 1:

Unit: Defines the unit of the variable. For 0-20mA, 4-20mA, 0-50mV and 0-10V the user should write the required unit.

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

Instantaneous: One reading and one logging at each reading "Interval";
Average: Ten readings at each reading interval. The average value of readings is the value recorded;
Minimum: Ten readings at each reading interval. The lowest value found is recorded;
Maximum: Ten readings at each reading interval. The highest value found is recorded;

Lower/Upper Range Value: Allows the user to define the reading range for the 0-20mA, 4-20mA, 0-50mV and 0-10V inputs.

Offset: This parameter is used to correct small known mistakes the input signal may present, such as during sensor switching, transmitter replacement, etc.

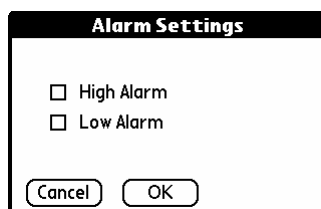**Alarms:** Enables an alarm that is triggered according to user-defined parameters.

Figure 20 – Alarm settings screen

Cancel and **OK** buttons cancel and save configurations defined in Channel 2 screen.

Channel 2: Has the same parameters as described for Channel 1.

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

Battery: Defines the moment when the logger turns on the battery switch, before each reading is performed. Time (up to 10 seconds) can not exceed the mean time between measurements.

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

DOWNLOADING DATA FROM THE LOGGER

In the **Monitoring** screen, the **Download** button performs the transfer of the data from de 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 **Recording Data** screen, identified with the name assigned to the process (Title) and the date it was downloaded.

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

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 tap on **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.

TRANSFERRING DATA TO YOUR DESKTOP

HotSync of data stored in a PDA to a PC 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 with the right mouse button on the HotSync Manager in the Windows Taskbar. Select in the drop-down menu the option *Custom.* Select **Novus LogChart Conduit** and click *Change.* The following window will be exhibited:
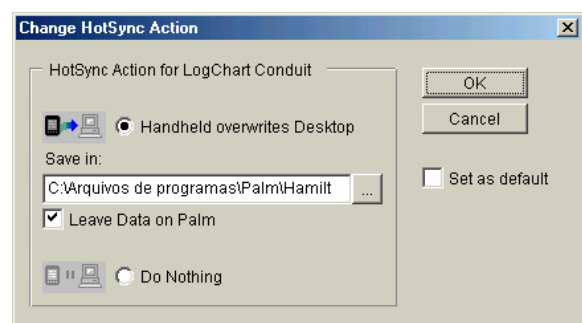
Figure 21 – LogChart Conduit options

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 after HotSync.

Do nothing: Data synchronization will not be performed;

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

OBSERVATIONS

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.

– When the device is opened, avoid liquid and/or dust contact.

– Use a screwdriver to open the case cover.

– Pay attention to batteries polarity: The positive terminal should be placed directed towards the center of the device.

– Worn batteries should not be recharged, dismantled or incinerated. After use, batteries must be disposed according to local legal rules or returned to Novus.

– After placing batteries back to the logger, make sure the cover is firmly attached to the socket.

MOST FREQUENTLY PROBLEMS

The LED is not flashing.

The LED flashing light is intentionally weak, and it can be difficult to see it in illuminated environments. Make sure it is not flashing at all.

Make sure the battery is installed correctly;

Make sure the battery is not discharged;

Communication with the logger fails

Make sure the COMM 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;

ADDITIONAL INFORMATION

If you have any doubt concerning this or other NOVUS products, e-mail us at info@omniinstruments.co.uk or visit our home page: www.omniinstruments.co.uk

SPECIFICATIONS

Inputs:

Thermocouples according to the NBR 12771/99 standard;

Pt100 RTD's NBR 13773/97;

TYPE	CHARACTERISTICS
J	range: -50 to 760 °C (-58 to 1400ºF)
K	range: -90 to 1370 °C (-130 to 2498ºF)
T	range: -100 to 400 °C (-148 to 752ºF)
N	range: -90 to 1300 °C (-130 to 2372ºF)
R	range: 0 to 1760 °C (32 to 3200ºF)
S	range: 0 to 1760 °C (32 to 3200ºF)
B	range: 150 to 1820 °C (32 to 3308ºF)
Pt100	range: -200.0 to 650.0 °C (-328 to 1202ºF)
0-50mV	Linear. Programmable range of -32768 to 32767
4-20 mA	Linear. Programmable range of -32768 to 32767
0-20 mA	Linear. Programmable range of -32768 to 32767
0-10Vdc	Linear. Programmable range of -32768 to 32767

Input resistance: 0-50mV, Pt100 and thermocouples: >10MΩ

0-10V: > 1MΩ

0 to 20mA and 4 to 20mA: 100Ω + 2 Vdc

Accuracy: Thermocouple J, K and T: 0.25% of max. range ±1°C;

Thermocouple N,R,S,B: 0.25% of max. range ±3°C;

Pt100: 0.2% of the max. range;

mA, mV and V: 0.2% of the max. range;

Memory capacity: 32k or 64k loggings.

Interval between readings: Minimum: 1 second, maximum: 18 hours

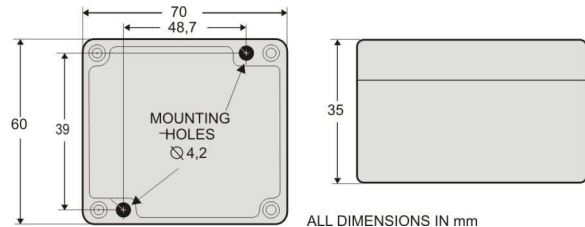**External battery switch time:** 3.6V lithium battery (1/2 AA)

Typical battery life: 1 year (one download daily, 5 minutes acquisition interval)

Working temperature: From –40°C to 70°C.

Protection: IP65, IP67 and IP68 models (see lateral label on product)

Material: ABS with polycarbonate film case; Polycarbonate film

Dimensions: 60x70x35mm

ALL DIMENSIONS IN mm

PACKAGE CONTENTS

Besides this manual, the user must check if the items below accompany the product.

- The electronic logger LogBox-AA;

- The LogChart-II software installation disk. The disk includes the USB IRLink driver and the LogChart PalmOS installer;

- Two cables for sensor wiring (IP67 or IP68 models only);

- An IR-LINK3 wand (ordered separately).

WARRANTY

Novus Produtos Eletrônicos Ltda. 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. Please retain the dated sales receipt as evidence of the date of purchase. You will need it for any warranty service

♦ 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 in Porto Alegre. Expenses and transportation risks are under the purchaser's responsibility

♦ This warranty does not cover any damage due to accident, misuse, abuse, or negligence.

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