Manual

Exspecta

Measurement Data Logging and System Control

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1 Introduction

This is the manual of Exspecta, an easy to use system for measurement data logging. On the following pages we will give you a survey on how to install and start up Exspecta. The main functions will be described. We added special datasheets for each type of sensor.

Feel free to contact us if there are any questions or suggestions. This also applies for discovering any mistakes in the software (you will find our address on the back of the title). Good luck with Exspecta!

1.1 Basics

Exspecta consists of a main device, which receives measuring data from connected sensors and archives it in an internal storage. You may access Exspecta over Ethernet simply by using an internet browser with the Java 2 plugin installed. This allows you both to observe your measuring data and to configure the device.

The sensors are connected with the main device via data bus. Each sensor contains a microprocessor controlled interface, that provides the main device with information about the sensor. That way you do not have to configure the main device extensively, for each sensor brings along its own 'brain power'.

1.2 Scope of supply

The complete device consists of the following components:

- Main device with line cord,
- sensors with connection cables RJ-45 and high performance hook and loop fasteners,
- CD-ROM with Java 2 plugin, a Windows version of Exspecta and 'Mein Exspecta' (My Exspecta) to search for main devices,
- this manual.

One main device is able to process measuring data of up to 105 sensors, but it can supply only eight sensors with power. Thus, you need so called bus nodes for every twelve further sensors. They can be linked together via uplink and to the main device. Each bus node comes with seven plugs to connect to the sensors.

1.3 History of versions

Here the most important improvements introduced in the current version 2.0:

- File export by FTP: As an alternative of exporting measurement data by XML you will be able now to transmit the complete record files automatically to an FTP server. Most servers contain such a FTP service from the outset.
- For presentation, export and printing of the recorded data there is a special program now, the so called Archive Viewer. Use it to examine your measuring results either directly on the main device or on a different computer to which the files have been exported (by FTP for instance). With this version you will also be enabled to display several curves in the same diagram. Events are shown at the timestamp they happened. Last but not least the zoom functionality has been improved significantly.
- Protocol display and chat dialog are now presented in separate windows which facilitates the inspection.

- *Alarm hold times* can now be assigned to each channel individually (see section 5.1).

This section describes in a few words news introduced in the version 1.0:

- Alternatively to the execution of Exspecta as Java applet we now also provide a Windows application. You can install it on the client computer with a conventional installation program and run it as a standalone application without internet browser. We recommend this option for slow computers (Pentium or Pentium II with 266 MHz or less).
- In the program 'Mein Exspecta' (My Exspecta) you can now change the device names in Windows NT 4.0 too.
- Sensor frames are now arranged within a raster, so that positioning gets easier.
- By *Configure* → *Main Device* you may view now the system clock and the IP address of the main device. In addition the system clock may be setted or synchronized with the client's time base.
- We improved the archive function relating to three points: First you can now maximize a selected archive view to the whole screen. Secondly, you may select areas now in an easier way by using the `Shift` key. And finally you can now also print the measurement runs (in addition to saving them in CSV files).
- The output to the protocol window can be filtered now by using the checkboxes under *Configure* → *Protocol display*.
- We introduced a user management according to the guidelines of the FDA. There are three different levels: 'Administrator', 'superuser' and 'guest'. For details please refer to section 6.2.
- The sensors can now trigger alarm states, e. g. after a cable break. In such an alarm state the sensor symbol changes to a flashing icon. Errors like this are added to the audit trail as well.

- Alarms and warnings can be posted now by e-mail and SMS (see sections 5.2 und 5.3). Besides information about the recipient you can enter here a delay that specifies, how long a warning or alarm limit must be exceeded so that the e-mail or SMS is sent. E-mail and SMS postings are logged in the audit trail.

- The program's desktop can be divided into several areas now by using tabs. Simply shift sensors/actuators from one tab card to another by dragging them onto the tab. A background image can be assigned to each tab individually.

- Exspecta has been internationalized to a large extent: Running on a PC system with a locale other than German, English is used automatically. You can add support for other languages by creating appropriate translation tables.

2 Initial operations

You can devide the initial operations into two steps: First start up the hardware (main device and sensors). The main device is self-sufficient and does not need a network connection for data recording.

Secondly you may configure the network clients which access Exspecta. You merely have to install the Java 2 plugin (version 1.4 or higher). The actual user program is then loaded on the fly from the main device. Installation of the plugin can be done by internet or by using the enclosed CD-ROM.

Alternatively it is possible to install a 'real' Windows application without use of an internet browser.

2.1 Setting up main device and sensors

In order to set up the main device and the sensors, please view figure 2.1 and follow the instructions below:

- Plug the main device (big device) with the attached line cord into a power outlet.
- Link together the sensor boxes (small boxes) with the enclosed RJ-45 connection cables so that they form a chain.
- Put one connector into the plug called 'Sensoren' (Sensors, 5) on the front side of the main device.
- Turn on the main device by using the power switch (2) on the back side of the device.

- In the beginning the LED's 'Fehler' (Error) and 'Meldung' (Message) must shine, while the LED 'Betrieb' (Power) is flashing (3).
- After approx. 45 seconds the LED's 'Fehler' and 'Meldung' go out, and 'Betrieb' changes to permanent shining.
- Exspecta ist now ready for use and starts recording measuring data.

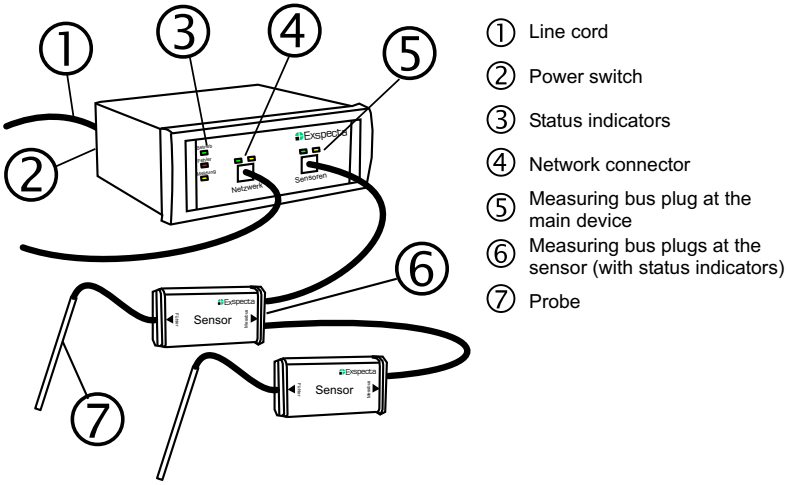

Figure 2.1: Connecting the main device and the sensors

Refer to the enclosed datasheets for information about connecting the various devices and probes (7) with the sensor boxes.

2.2 Installing the Java 2 plugin

In order to view the recorded data and to configure your main device and the sensors, you need a Java 2 plugin for your internet browser.

This plugin requires the following hard- and software specifications of your computer:

- Operating systems Windows, Linux, Mac OS or Solaris,
- at least SVGA display adapter (800 × 600 pixels) with 256 colors, better XGA (1024 × 768 pixels),
- 68 MB free harddisk space,
- 48 MB RAM.

Table 2.1 shows the combinations of browsers and operating system we tested successfully with Exspecta.[1] If you have problems with one of these or different combinations, feel free to contact us.

Table 2.1: Successfully tested combinations of operating systems and browsers

Operating system	Browser
Microsoft Windows NT 4.0/98 SE/ME/2000/XP	Internet Explorer 5/5.5/6 Netscape Navigator 4.7/6.0/6.1/6.2/7.1 Opera 5 and higher Firefox 0.9/1.0 Mozilla 1.4 and higher
SuSE Linux 7.2/8.0/9.0	Netscape Navigator 6.2/7.1
Apple Mac OS X (10.3.2 and higher)	Safari 1.2

The installation under Windows NT 4.0 requires service-pack 6. You will find details on Sun Microsystems' homepage: *http://www.java.com/en*

If you have access to a highspeed internet connection (ISDN or DSL), you may install the plugin online (download size approx. 14 MB). For a Windows operating system you can also use the enclosed CD-ROM.

[1] We used Java 2 plugin version 1.4.2.

Windows executable

Let's assume you want to run Exspecta on a slow machine (Pentium or Pentium II with 266 MHz or less), you should go back to a third, conventional way of installation (by using the enclosed CD-ROM as well): In this case the Exspecta program is an executable Windows application, which is installed *directly* on the PC. The Java 2 plugin is no longer required then. As an important disadvantage of this variant you should take into account, that program updates cannot be deployed automatically by updating the main device, but must be installed manually on each client.

The following sections deal more detailed with the three ways of installation mentioned above and about uninstallation.

2.3 Installing by internet

The easiest way is an installation by internet. You can also have a first contact to your main device by internet, if the Java 2 plugin has already been installed on your device. Please proceed as follows:

1. Connect the main device with your network using the socket named 'Netzwerk' (network).

2. Start our homepage: *http://www.exspecta.com*

3. By means of the navigation menu on the left side you will reach *Mein Exspecta* (My Exspecta) via *Produkte* (Products).

4. Attempting to load a Java applet for searching the devices, the Java 2 plugin will be installed if needed. When you are using Microsoft's Internet Explorer, the plugin will be automatically loaded and installed. This may take several minutes. In the case of Netscape Navigator or Mozilla, you will be redirected to the Java download page, as soon as you click on 'Click here to get the plugin'. Click 'Jetzt holen' (Get It Now) on the download page and choose the appropriate plugin for your operating system. Follow the instructions for installation there. Under Apple Macintosh you need the operating system Mac OS X. The Java 2 plugin is here installed by default;

Netscape

Mac OS

when any problems occur, please check the installed plugins in the browser (e. g. Safari). A version 1.4.0 or higher must be available. If not, you must perform an automatic system-update which includes a new Java version. *Advice: For the latest Java version 1.4.2 Mac OS X 10.3 is required.*

Security

5. After you have installed the plugin, the dialog for searching devices is opened. For the first start you will be asked to confirm your trust in the owner of the Java applet. So you allow the applet to access your harddisk. The trustability of the applet is secured by a digital certificate, that we purchased at Thawte Consulting (Pty) Ltd. If you click the *Always* button, the dialog will not appear again.

6. Now the dialog for searching Exspecta devices comes onto the screen. Your main device should be listed in the device list. Double-click on the entry of the IP address to adapt it to your network. To specify a valid IP address, you need the address of your computer (at the top of the dialog) and the so called subnet mask. The subnet mask indicates, which of the four digits of the IP address identify the network as a whole (expressed by 255) and which stand for a particular computer within the network (expressed by 0). If your subnet mask is *255.255.255.0* for example, then all of the PC's in your network must have equal IP addresses referring to the first, second and third digit. Whereas in the forth digit they must be different. Choose a free IP address in your network for the Exspecta main device. If you are not sure, ask your system administrator.

7. By double-clicking on the name field you can assign a unique identifier to each Exspecta device. Later on this identifier may serve as device address, e. g. *http://exspecta*

8. When you have finished your configuration, click on 'Los' (which means 'Go') to start the display of the main device. For that purpose the applet will be loaded from the main device and executed in your browser frame.

2.4 Installing by CD-ROM

Installing by CD-ROM is only available for Windows PC's. Choose this way of installation, if there is no access to a fast internet connection:

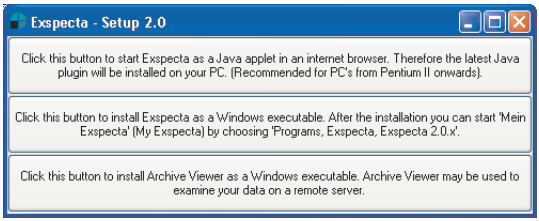

Figure 2.2: Selecting the installation mode from CD-ROM

- Insert the CD-ROM into the drive. Usually it will start automatically showing a dialog as shown in figure 2.2.

- If the CD-ROM does not start automatically, double-click on the application `Setup.exe` in the main directory of the disk. After a few seconds the dialog will appear.

- Choose the upper button. If necessary the Java 2 plugin will be installed then. Follow the instructions on the screen (you can always choose standard options). After successful installation your standard browser will be started automatically and the applet for searching devices will be launched. Proceed as described in section 2.3 beginning with item 5.

- The installation of the Java 2 plugin may take a couple of minutes depending on the computer's performance.

2.5 Installing the Exspecta application

Supposed you have finished the installation successfully according to section 2.3 or 2.4, you may skip the following paragraph. When using an older PC (Pentium or Pentium II with 266 MHz or less) the applet might be executed very slowly within the browser window. In this case - and if you are using a Windows OS - you should consider to install the Exspecta Windows application, which is also included on the CD-ROM.

Start the setup by inserting the CD and choosing the second button on the initial dialog (figure 2.2). Follow the instructions on the screen. The program 'Mein Exspecta' (My Exspecta) will be installed as well, so that it is even possible to adjust the IP addresses without browser support.

After the installation you will find 'Mein Exspecta' (My Exspecta) under *Programs* → *Exspecta* → *Exspecta 2.0.x* → *Mein Exspecta*.

2.6 Installing the Archive Viewer

If you are planning to export your measuring data on a special data server (e. g. for long time storage) you may also want to install the Archive Viewer as a standalone application on this server. The Archive Viewer enables you to access your stored data at any time.

Start the setup by inserting the CD and choosing the third button on the initial dialog (figure 2.2). Follow the instructions on the screen.

After the installation you will find 'Archive Viewer' under *Programs* → *Exspecta* → *ArchiveViewer 2.0.x* → *Archive Viewer*.

When starting the application for the first time you have to choose the directory your archived data has been transfered to. Please make sure that this directory corresponds to the path specified in the FTP export dialog in Exspecta (see section 5.5).

2.7 Uninstalling

Uninstalling the Java 2 plugin under Windows is done by *Start* → *Settings* → *Control Panel* → *Software*. Choose the entry *Java Runtime Environment* from the list of installed software and press the *Delete* button. Follow the instructions on the screen.

If you have installed the complete Exspecta application for Windows or the ArchiveViewer, please choose

Start → *Programs* → *Exspecta* → *Exspecta 2.0.x* → *Uninstall*

or

Start → *Programs* → *ArchiveViewer* → *ArchiveViewer 2.0.x* → *Uninstall*

respectively. Follow the instructions on the screen.

3 Main functions

Read this chapter to make yourself familiar with the main functions of the Exspecta desktop. You will come to know how to log on (section 3.1) and how to close a session (section 3.5). Furthermore the online display (section 3.2), the protocol display and the chat window (section 3.3) will be discussed.

3.1 Login

When you start the user desktop, you will be asked for a user name and a password. Figure 3.1 shows the login dialog. By default there are passwords defined as described in table 3.1:

Table 3.1: Default passwords

User name	Password
administrator	exspecta
gast	exspecta

Usually you enter the system as a guest or as a superuser. In the first case you can view data and make some analysis. As superuser you are additionally allowed to make configurations as described in chapter 5.

When you log in as *administrator*, you are also able to adjust passwords and add or remove users in the user management. For details please refer to section 6.2.

Advice: Possibly there is a further text field on the login dialog, if you have

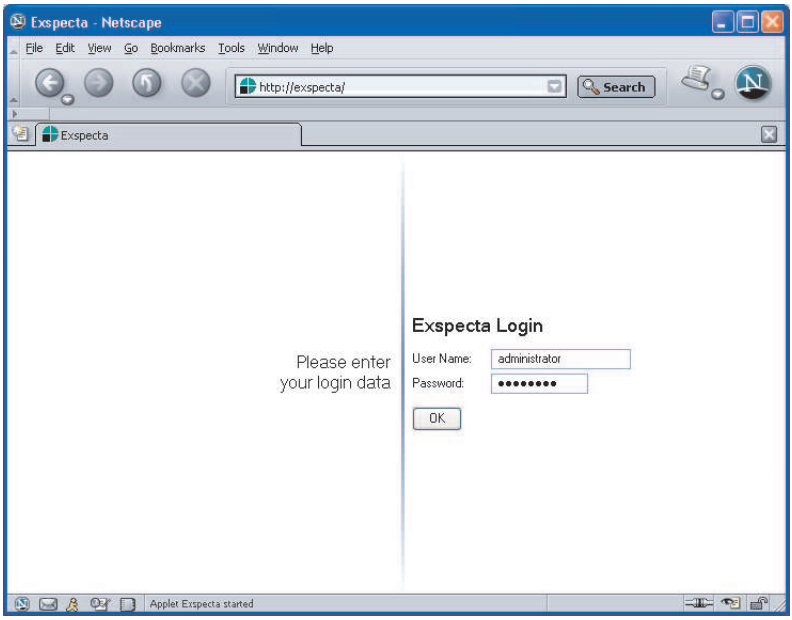

Figure 3.1: Logging in to Exspecta

installed the Windows version of the application. That field asks for the address of your Exspecta device. Please enter here the same address as you have determined in the program 'Mein Exspecta' (My Exspecta), e. g. `http://192.168.0.1` *or* `exspecta.1` *(the instructions for the browser in section 2.3 apply analogously to this case).*

By clicking on *System* → *Relogin* you may log in with a different user name, provided that you have been logged on yet. Please note that one user can be logged only once at the same time.

3.2 Displaying online data

After you have logged in, you will see the display of your online data on the screen. For that purpose every measurand (i. e. every sensor channel) is assigned to a small box on the desktop. There you can find the measuring category, the sensor identifier, its channel name (if there is more than one channel in a physical sensor), the current value, as well as the dimension, the unit and an appropriate icon. Figure 3.2 exemplifies two sensors.

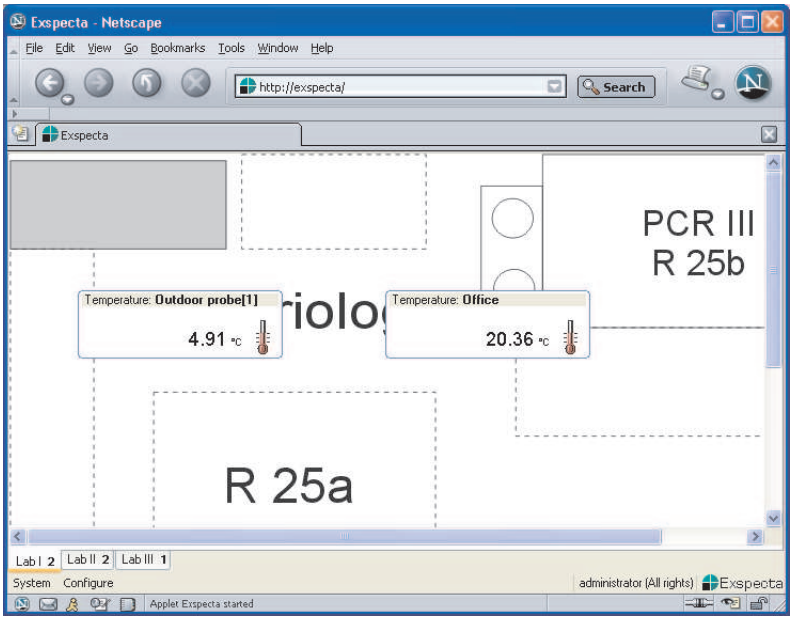

Figure 3.2: Online data of two sensors

The icon on the right side of the box does not only give a graphical hint on the measuring category but also represents the status of the sensor: When a sensor has been pulled off the bus, a red prohibition sign appears on the icon, as shown in figure 5.2. The sensor is inactive then. Nevertheless all

configurations of this sensor persist, until it is removed manually in the software (see section 5.1).

Probe failure

Moreover, the sensors are able to generate warning and error messages in the case of failures occurring at the probe or at the interface to the measuring object. The error message 'communication error' is of particular interest: While all other messages are only reported in the protocol (see section 3.3), this one is represented additionally by showing a flashing broken cable instead of the sensor's icon.

Using tabs

It often makes sense to divide those sensors, that are spread over several rooms or areas in reality, into sections even in the graphical representation. For this purpose you can use the tabs at the lower edge of the display area: Click onto one of those tabs and the selection will change. The tab's names are followed by a count which stands for the number of sensors placed on the very tab card. Learn in section 5.7 how to adapt the tabs.

3.3 Protocol and chat window

The menu options *System* → *Protocol* and *System* → *Chat* respectively let you enable the protocol window or the chat window respectively.

Protocol window

In the protocol window, events arising during measuring activity are listed. These events are also archived in the *audit trail*. Besides timestamp and device name you will find here a short description of the event. The display buffer of the protocol window is limited to events of the last 24 hours. Use the Archive Viewer (see chapter 4) to get earlier entries. Next to the timestamp there is a little icon indicating the importance of the message: information (blue 'i'), warning (yellow exclamation mark) or alarm (stop sign).

To arrange the messages in a more concise way, you may hide certain groups of events by pressing the right mouse button within the protocol window. Note that independently of these settings all events are recorded all the time.

The following groups of events are distinguished:

- *User management:* These messages are generated when a user gets or looses superuser rights or logs in or out as administrator.
- *Device status:* These messages are generated when a device (sensor/actuator) changes its state. This includes the device's login and logoff on the bus, error messages of the device like cable break, or when the device produces invalid data.
- *Configuration by user:* These messages are generated when a superuser or administrator changes any settings (e. g. the warning or alarm limits or a device's position on the screeen).
- *Limit value monitoring:* These messages are generated when warnings or alarms are raised or cancelled.
- *Reporting:* These messages are generated when sending e-mails or SMS messages.

Chat window

Whenever two or more clients are connected to the main device, the chat window can be used to communicate among them. Enter your text in the lower text field and press *Return*. The message will appear in the chat windows of all logged users. The last 50 entries are buffered in the main device. You can erase the entries by choosing the appropriate option of the context menu (right mouse button). Further options allow to copy selected text areas to the clipboard.

Figure 3.3 shows both protocol and chat window.

3.4 About Exspecta

By choosing *System* → *About* you will reach an information dialog, which contains the version number of the Exspecta program. When you click the displayed internet address you can reach our homepage directly (only available in the applet version).

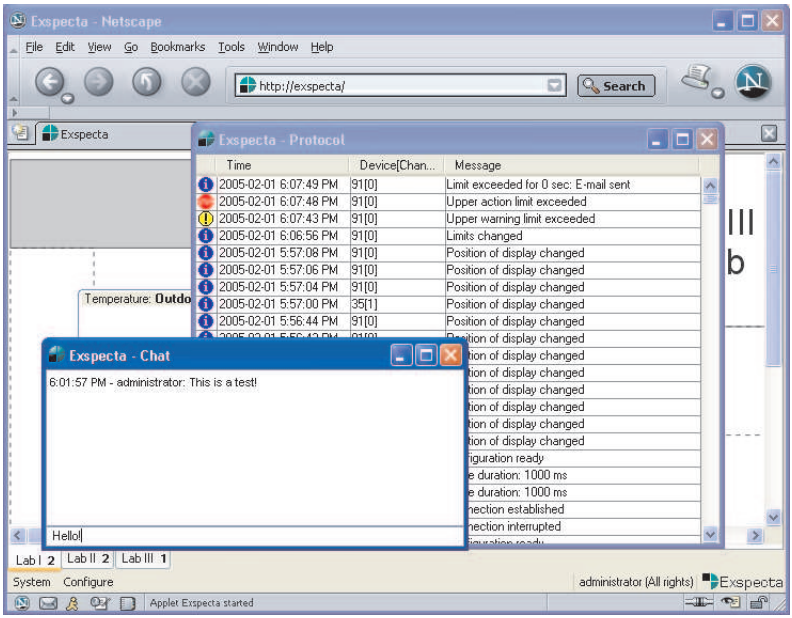

Figure 3.3: Protocol window and chat dialog in Exspecta

3.5 Closing a session

In order to finish a client session, simply close the browser or select a different homepage (in case of the windows application just quit). As long as the browser stays open, you do not have to log in again when you return to Exspecta.

Power down

For turning off the main device it should be shut down (if possible). Therefore you must log in as administrator. Read the instructions in section 6.4.

4 The Archive Viewer

This chapter describes how to use the Archive Viewer, which allows you to get data out of main device, to view it and to send it to a file or to the printer. At the moment Exspecta supports the CSV format (Comma Separated Values), which can be imported without any problems in Microsoft Excel for instance.

The Archive Viewer is used in two different application areas:

1. Displaying data that is stored in the main device: The Archive Viewer is an inherent part of the main device. Log on the main device an click with the right mouse button on one of the sensors/actuators. Choose *Browse archive* in the context menu. Alternatively you may double click on the sensor's/actuator's display area.
2. Displaying of data that is stored on a data server: In order to use this function, an FTP server must have been established (section 5.5). The Archive Viewer must be installed as a standalone application (section 2.6) on a PC that has file access to the server.

In either case the same application is used. Therefore, unless otherwise noted, all explanations given in the following sections refer to both the inherent and the standalone version of Archive Viewer.

4.1 The user interface

Figure 4.1 shows the user interface of the Archive Viewer. The following functions are represented by the tool buttons on the upper side of the window:

- *Zoom in:* Magnifies the area that is currently selected either in the timelime or in the diagram until the maximum magnification is reached. You may also zoom into the timeline by double clicking onto the selected interval rectangles.

- *Zoom out:* Scales down to the area in the timeline or in the diagram that has been selected before. You may also zoom out in the timeline by double clicking outside the interval rectangles.

- *Protocol:* Opens the protocol window (see section 3.3). All events that occurred in the interval of the currently shown diagram are displayed.

- *Transfer archive:* Copies the actual archive (all files) into a desired directory.

- *Export:* Exports the selected interval of the main channel in CSV format into the desired file (see section 4.4).

- *Print:* Prints the actually displayed diagram with all selected curves (see section 4.4).

- *Start searching:* Loads data for the area that has been selected in the timeline and displays the appropriate diagram.

Just below this toolbar you find the channel selector (1 in figure 4.1) and the timeline (2). With the channel selector you can choose the main channel you want to display. All intervals that contain data of this selected channel are represented by blue rectangles in the timeline.

In addition to the main channel you may choose further channels in the table (3) to be displayed within the same diagram (4). This only works with channels of the same physical unit (e. g. °C for temperature channels).

On top of the diagram all events corresponding to one of the displayed channels are noted (5).

Hint: Move the mouse pointer over one of the event icons and you will get more information.

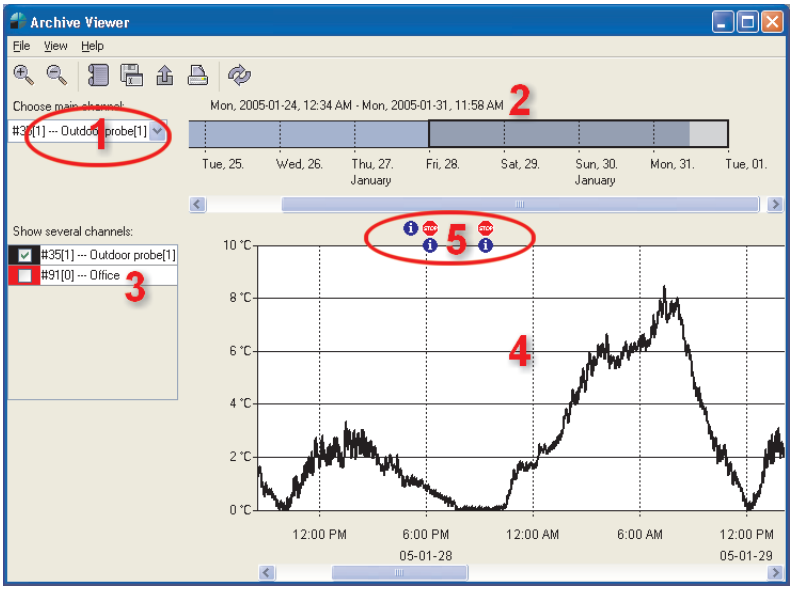

Figure 4.1: User interface of the Archive Viewer

4.2 Showing a diagram

In order to show recorded data in a diagram, first choose the main channel (2). Now select the interested interval in the timeline. You can click single rectangles and groups of rectangles by using the `Ctrl` and `Shift` keys. As an alternative you can span a large time selection just by clicking next to timeline and dragging the mouse over the desired area. Use the *Zoom in* and *Zoom out* functions to change the resolution if necessary.

When your selection is ready, press the *Start searching* button and the diagram will be updated. The y-axis will be automatically adjusted to the maximum and minimum values of the given interval unless you have defined limits yourself. Figure 4.2 shows such an archive display.

Hint: The dialog of the archive display can be arbitrarily resized. You can also show more than one dialog at the same time.

Figure 4.2: Example for a measurement run

4.3 Exporting measurement runs

Within the Archive Viewer you can press the button *Export* to save the selected measuring record in a file. At the moment only the CSV (Comma Separated Value) format is available. This format is text based and supported by almost any data base and spread sheet program.

Microsoft Excel

Enter a filename in the save dialog and press *Save*. The generated CSV file can be opened directly by Microsoft Excel for instance. Figure 4.3

shows the result.

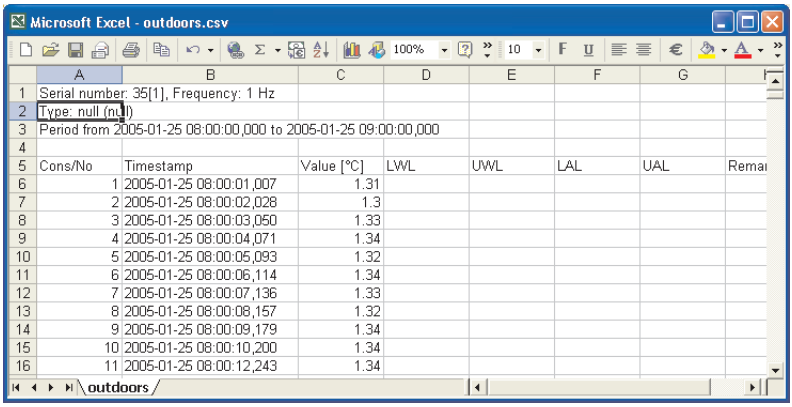

Figure 4.3: Import of measuring data in Microsoft Excel

The following data is stored in a CSV file:

- Header: Device name and channel name of the sensor channel, frequency (when recording is started),
- Header: Name and description of the sensor type,
- Header: Interval (start and end time),
- Column *Cons/No*: Consecutive numbering of the records, starting with 1,
- Column *Timestamp*: Year-month-date hour:min:sec,millisec (possibly you must adjust the format of the display program in order to get the full time resolution),
  e. g. `2004-06-01 20:12:34,449`,
- Column *Value[Unit of the measurand]*: measured value with decimal point (including the exponent),
  e. g. `19.2`,

- Column *LWL*: Lower warning limit,
- Column *UWL*: Upper warning limit,
- Column *LAL*: Lower action limit,
- Column *UAL*: Upper action limit,
- Column *Remarks*: Changes in the configuration during the measurement will be noted here, e. g. change of frequency, limits, device name.

4.4 Printing runs

Printing

Selecting the button *Print* in the Archive Viewer lets Exspecta print the chosen measurement run. By default the printout is arranged in portrait, two lines of the run above each other. You can change the settings of print orientation an margins within the *Page setup* tab as shown in figure 4.4.

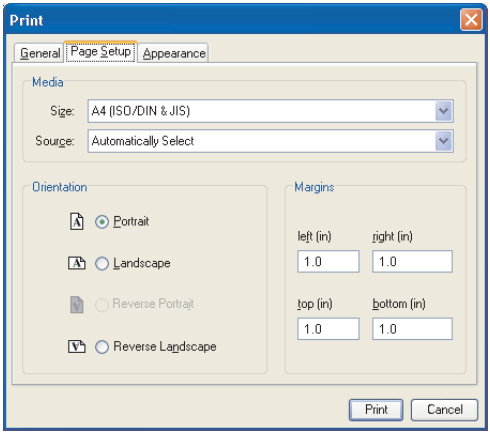

Figure 4.4: Page settings for printing

5 Configuring the system

You need superuser or administrator privileges for all configurations described in this chapter. These adjustments are also recorded in the audit trail mentioning user name and timestamp.

If you are already logged in as a superuser, you can turn on the superuser functions by selecting the checkbox called *Activating changes* in the bottom line. This option is not available while another superuser or the administrator is online.

5.1 Configuring sensors

The menu *Configure sensor* allows you to make adjustments that cannot be covered by automatic configuration. Among other functions you may tune the measuring frequency in a given range or set warning and alarm limits. Warnings and alarms are indicated by changing colors in the online display. Additionally the LED called 'Meldung' (message) at the front of the main device starts shining. It does not go out until all warnings and alarms have disappeared.

Alarm hold time

The sections 5.2 and 5.3 describe how to use these limits for sending e-mails and SMS messages dependant on warnings and alarms. With the *alarm hold time* you determine, how long the alarm limit must be continuously exceeded. You can set alarm hold times for each channel independently. Figure 5.1 shows a configuration dialog for a temperature sensor.

In order to set the parameters, select one of the buttons on the left side of the dialog. This opens the particular control panel.

Remove limits

In order to remove warning and alarm limits, leave the appropriate field

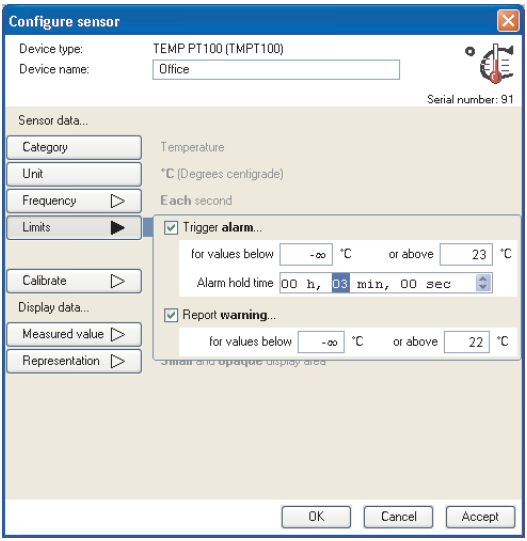

Figure 5.1: Configuration dialog for a temperature sensor

blank. The infinite sign (∞) shows that there is no limit set.

Calibration

For certain sensors there is a occasional *Calibration* necessary. Use the button *Calibrate* at the bottom for this purpose.

Remove sensor

When a sensor has been removed from the bus, it is marked as inactive (see the prohibition sign in the display) and can be removed even from the screen and from the sensor list of the main device by clicking *Remove sensor* in the context menu (right mouse button). All settings, you have made for the sensor (position, limits etc.), are then lost. See figure 5.2 for illustration.

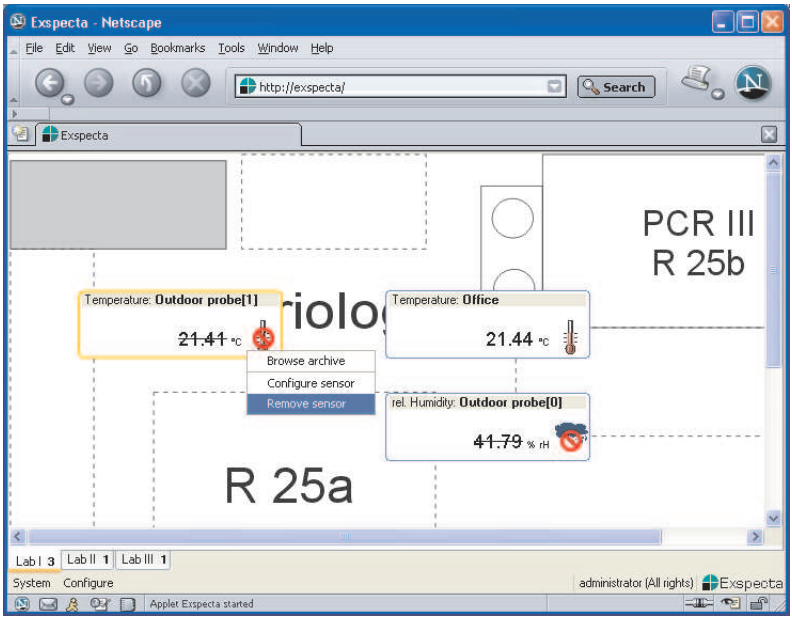

Figure 5.2: Removal of inactive sensors by using the context menu

5.2 Alerting by e-mail

Exspecta contains an internal e-mail client, that can send messages, as soon as warning or alarm limits have been exceeded for a given amount of time. Enter the desired limits for each sensor (see section 5.1) and define the destination of the e-mail by *Configure* → *Alerting* → *E-mail*.

If your Exspecta device contains an integrated GPRS Modem (mobile phone), you can also send your e-mail by radio transmission. Read appendix D to prepare the mobile phone.

Figure 5.3 shows the dialog for e-mail configuration. The choice at the

top of the dialog lets you select the way your e-mails shall be transmitted. Depending on whether a GPRS modem has been installed or not, some or all of the following options are available:

- *Do not send e-mails:* No e-mails are sent. The function *Status report* if disabled as well.
- *Send e-mails only by network:* Exspecta only tries to transmit e-mails over the network. If there is a connection to the internet you may send e-mails this way.
- *Send e-mails only by phone:* Exspecta only tries to transmit e-mails over the integrated mobile phone. (If there is no phone, this option does not exist.)
- *Sens e-mails by phone if there is no network connection:* Exspecta tries to send the e-mail via network; in the case of failure an internet connection over the integrated phone will be established. (If there is no phone, this option does not exist.)

The contents for SMTP server and receiver are similar to those of conventional e-mail programs. If the SMTP server needs an authentification, enter username and password accordingly.

The field *Localhost* allows you to enter a name, which uses Exspecta to log on to the e-mail server. Generally this name should be `exspecta`.

Test e-mail Click the button *Send test-e-mail* to check your settings. The shipping may cost some seconds and will be acknowledged by a success or error message (compare appendix B).

5.3 Alerting by SMS (optional)

Like alerting by e-mail (section 5.2) messages are also generated for optional SMS reports, as soon as a warning or alarm limit has been exceeded for a certain amount of time.

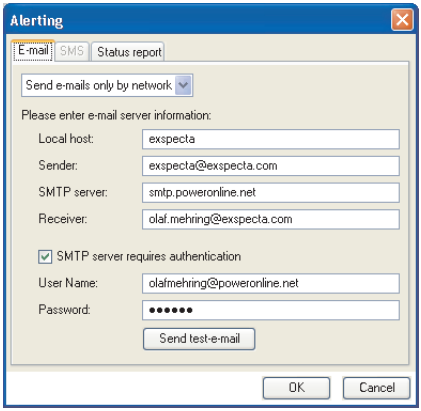

Figure 5.3: Configuring the e-mail delivery

SIM card

Unlike e-mail delivery SMS alarm on principle takes place independently from the network by using the internal GPRS modem. Supposed such a modem has been built into your main device and is activated by a valid SIM card for mobile phones (by contract or prepaid), you can enable this function by means of the tab *SMS* in the dialog *Configure* → *Alerting* (checkbox *Enable SMS sending*). See further instructions for enabling the GPRS modem in appendix D.

Phone numbers

You just have to enter the receiver's phone numbers and the PIN. Add all users that have to informed by SMS to the user management (if not done already). Enter the appropriate phone number in the field *Mobile phone* without any blanks or special characters and choose the option *SMS receiver*.

Press the button *Send test-SMS* to check your settings. The delivery will be acknowledged by a success or error message (compare appendix B).

5.4 Sending status reports

By using the same way of delivery as for e-mails, you can also send daily status reports. Select the tab *status report* and choose the option *Enable sending of status reports* as shown in Figure 5.4. You can enter one or more receivers: separate single addresses by comma and blank, e. g.:

```
info@exspecta.com, smith@abccompany.com
```

Additionally enter the time of the day, the report is to be sent.

Use the button *Send report now* to trigger an unscheduled report. Take into consideration that it can take, dependant on the length of the report, up to 35 seconds to generate the report. The delivery will be acknowledged by a success or error message.

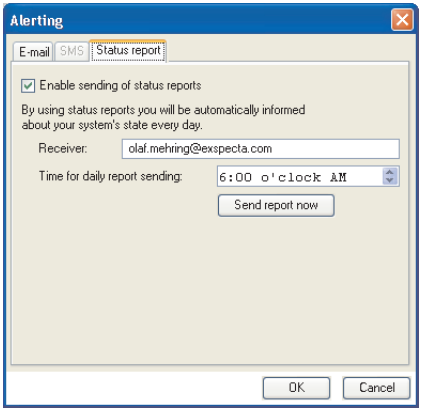

Figure 5.4: Configuring the status report

5.5 FTP export

As shown in figure 5.5 you can use the dialog *Configure → FTP export* to swap out your measurement data regularly on a system that acts as an FTP server. On the main device the measurement data is stored in zipped files that contain about 50,000 records. With activated FTP export each newly produced file is transferred to the FTP server automatically.

Use the button *Test the connection* to verify your settings.

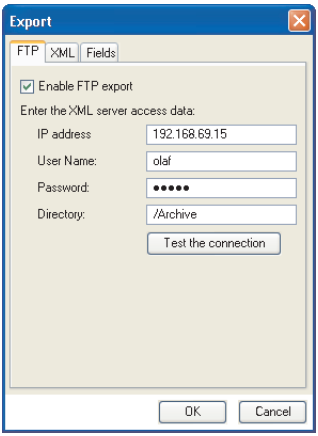

Figure 5.5: XML export: General settings and field relations

Hint: If your server does not contain a built-in FTP server support, you might use one of the freeware servers, that you can download from the internet, e. g. Cerberus (www.cerberusftp.com).

5.6 XML export

With *Configure* → *XML export* you can configure an XML interface in Exspecta that permits the transfer of measuring records to the Dr. Doc archive system. The left side of figure 5.6 shows an example for the general settings. The three dates in the lower part of the dialog have the following meanings:

- *Start time:* When the given time is in the future, the counts for the export and selection intervals begin with the start time. Is it in the past, the present time is used.
- *Export interval:* Here you can enter, in what a time interval (beginning with the start time) the samples, collected so far, will be sent over XML to Dr. Doc. Usually this interval is longer than the selection interval.
- *Selection interval:* In this interval (beginning with the start time) measuring data of all connected channels is sampled.

On the right side of figure 5.6 you see possible relations between column identifiers of Dr. Doc and measurement attributes in Exspecta. With the right mouse button you can add and remove identifiers.

5.7 Adapting the display

Size and opacity

In the dialog *Configure sensor*, that you reach by choosing the context menu on the sensor/actuator area, you cannot only adjust settings related to measurement as described in section 5.1, but also those related to the appeareance of the sensors and actuators on the screen. Under the paragraph *Display data...* you may either press the button *Measured value* to set the number of decimals, or *Representation* to determine *size* and *opacity*.

Invisible

The value *Invisible* lets the chosen sensor/actuator disappear unless a

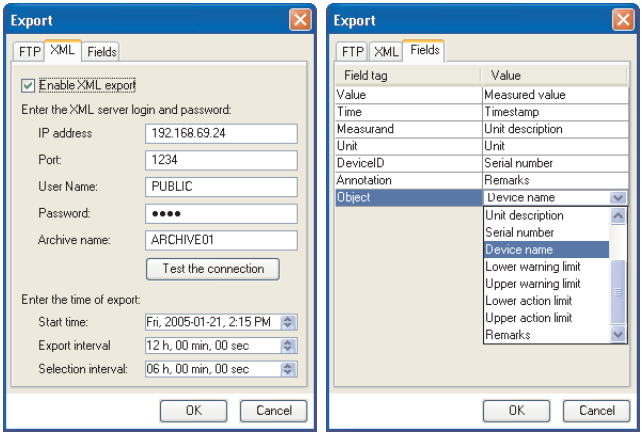

Figure 5.6: XML export: General settings and field relations

warning or an alarm limit has been exceeded. Click *Make all sensors visible* in the context menu out of the sensor/actuator area, to make all elements visible again.

Background image

As a further feature of this context menu you are able to select a new background image by choosing *Background...* for the present tab card. The background image must be a GIF or JPEG file and its size should not go beyond 200 KB, for the image is stored in the main device. Consider that the picture is transferred in a scale of 1:1, so that the dimensions have to be adjusted in advance.

Changing tabs

By using the right mouse button on a tab you can add, remove or rename the tab cards. However, one tab card must remain. Figure 5.7 shows a tab arrangement unter Mac OS.

Click into place

In superuser mode the sensors and actuators can be repositioned simply by drag and drop. After dropping they will be clicked in place along a raster, that corresponds horizontally with a sixth of a sensor's width and vertically with the height of the *tiny* layout. You can shift a sensor/actuator onto a

different tab card by dragging it on the tab. The card display will change then, so that you can drop your element at the desired place.

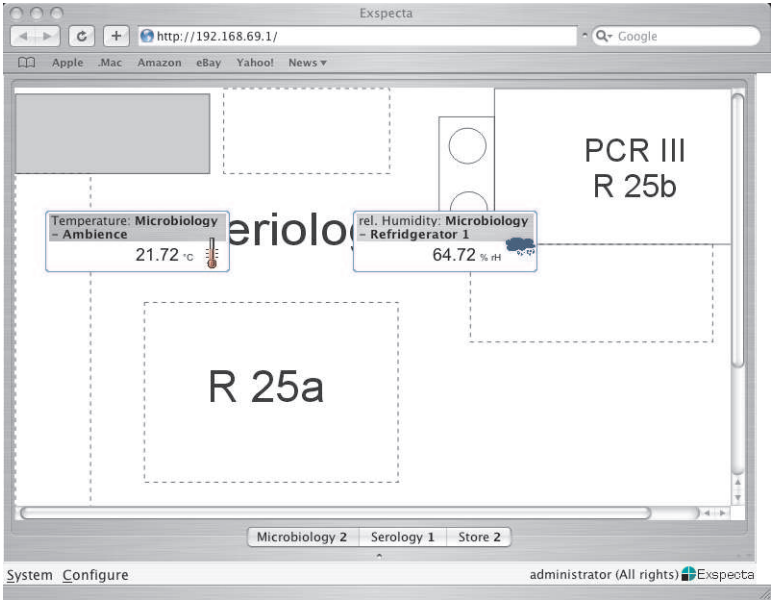

Figure 5.7: Use of tabs under Mac OS X

6 Administrator rights

When you log in as administrator (user name: `administrator`, password at delivery: `exspecta`), you have access to all superuser functions and in addition to functions of the system and user management.

Advice: Administrator rights ought to be delegated only to selected persons.

6.1 Basic configurations

System clock

By *Configure* → *Main device...* you can make settings in the server itself. At the moment this is limited to the correction of the system clock (tab *Time and date*).

You may either enter the changed time directly into the combo box or select the check box *Synchronize with this computer*. In the second case the time base of the client PC will be adopted when you click *Accept*.

If the new time varies not more than 10 seconds from the old one, time is adjusted smoothly, i. e. all timestamps run monotonously and without any breaks; in other words: the clocks runs a little bit faster or slower for some time.

In case of more than 10 seconds, the change-over is performed abruptly. You are informed by a message about the kind of setting (see appendix B).

Advice: The time in the main device is based on the UTC (Universal Time Coordinated) and converted to local time for each display or setting at a client PC.

IP address

The tab *IP address* only provides some information about the IP address the main device is assigned to. Changes are possible when using the program 'Mein Exspecta' (My Exspecta; see also section 2.3).

6.2 User management

The user management complies with the requirements of the U. S. Food and Drug Administration (FDA), that developed approved guidelines for measurement data logging in biochemical and medical laboratories:[1]

- The administrator has full access to the system. There is exactly one administrator; the administrator is also a superuser.
- Superusers are allowed to make settings that are conformable to the guidelines of the FDA. This includes for example changing of warning and alarm limits. Superusers have also guest rights.
- A guest ist any user, that accesses the system only as an observer. The guest is allowed to view, collect and process measuring data in different ways.
- Whereas there can only be *one* superuser be logged in the system at the same time, any number of guests is allowed. Logging in and out by superusers is recorded in the audit trail mentioning user name and timestamp, so that each configuration can be assigned to a certain person afterwards.
- There may be deposited additional information on each user like full name, postal address and e-mail address.
- The field *Mobile phone* can be used additionally for SMS shipping as described in section 5.2.

Changing user data

You reach the user management by selecting *System* → *User management*. The dialog allows to add and remove users and to change user data. The user `administrator` can be changed (except its name), but not deleted.

[1] Title 21 Code of Federal Regulations (21 CFR Part 11) Electronic Records; Electronic Signatures

6.3 Output in the console window

There is a console window that shows some output for debugging purposes. You reach the dialog by selecting (*System* → *Console*). The dialog shows configuration messages, which are transmitted by port 51012 from the main device to the clients. This information will not be of interest to the common user.

6.4 Shutdown and restart

Click *System* → *Switch off main device...* and choose *Power down* in the dialog to turn off the main device (see figure 6.1). When the LED 'Betrieb' (power) flashes, you can switch off the power on the back side of the device.

Restart

By selecting*Restart* the main device performs a reboot. The option *Stop server program* stops the server on the main device and is not used in regular operation. Have you performed this option by mistake, you can restart the main device simply by turning it off and on again.

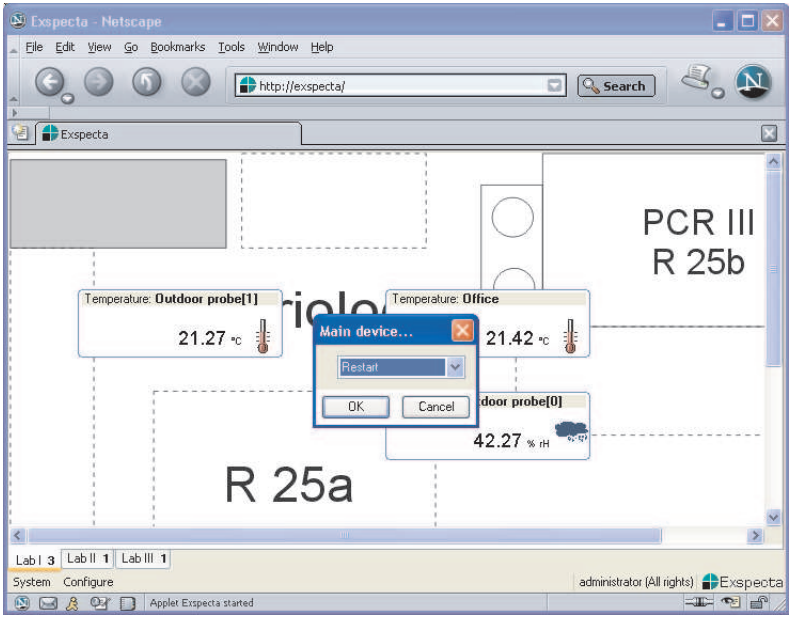

Figure 6.1: Shutting down Exspecta in administrator mode

A Frequently asked questions (FAQ)

? I'd like to use an older PC with Windows for visualizing Exspecta. The Java applet is executed there very slowly. Is there any alternative?

Yes. We developed a version of Exspecta especially for older PC's with Windows, that must be installed on the computer and will be executed then like a normal application (not in a browser window). This version is faster than the Java applet, for it is no longer downloaded from the main device. However, when you have access to Exspecta from a number of clients with the Windows application installed on each of them, you must also update them individually (using the applet means only to update the main device). The Windows version is contained on the installation CD (version 1.3 or higher); we recommend it on PC's with clock speed less than 800 MHz as well as some Celeron/Duron variants with higher clock speeds.

? What hardware requirements has my PC to meet, so that the Windows version of Exspecta works?

You need one of the following operating systems: Windows 98 SE, Windows NT 4.0, Windows 2000, Windows ME or Windows XP. For the use with Windows NT 4.0 service pack 6 is necessary; you'll find it on the installation CD. In addition you should have at least 64 MB of working memory. Apart from that the same requirements apply as in the applet version of Exspecta.

? I'd like to move the Exspecta main device to a different location. Is it sufficient to pull the power plug or to turn off the power switch on the back of the device? What do I have to bear in mind?

Basically, you are allowed to pull the power plug or turn off the power switch, in order to switch off the main device. When you turn it on again

later, it will examine the ChipDisk (which takes a few seconds) and then boot up normally. Nevertheless, some records that came in just before turning off might be lost, because they couldn't be recorded in time. To be on the safe side, log in as administrator and select *System → Switch off main device → Power down*. Turn off when the status indicators are flashing.

? I've to record measuring data in several rooms. At one location there's no way to lay a cable to Exspecta. Can I use Exspecta though?

There is a wireless variant of Exspecta under construction at the moment. By means of Bluetooth it will be possible to connect Exspecta sensors and the main device by radio. Certain difficult local conditions (e. g. two or more reinforced concrete floors between sensor and main device) can yet be a massive obstacle. Otherwise the range of transmission is approx. 30 m in buildings and up to 100 m in the free field.

? How many sensors at most can I connect with the main device?

Software and measuring bus support connections of up to 105 sensors and actuators to the main device. Because the sensors are also supplied with energy by the main device, you can only link eight sensors directly to it. We offer so called bus nodes, which make it possible to connect up to twelve further sensors each.

? I'd like to send messages by SMS. Is that possible?

Yes. We offer an optional GPRS modem for Exspecta, which can be integrated into the main device. So you can send SMS messages directly without being connected to the network. You just need a commercial SIM card for mobile phones (by contract or prepaid). Alternatively it is always possible to forward e-mails that Exspecta has sent via network. Some telephone systems even support e-mail to SMS forwarding.

B Information and error messages

In this section information and error messages, displayed by the program, are listed in alphabetical order.

Table B.1: Hints and error messages

Message	Subject	Description
No route to host address.	Export	The given IP address for the XML server is wrong. Presumably the network connection to the XML server is broken.
Main device does not answer.	Login	The server program on the main device is no longer active. This happens if you choose *System → Switch off main device... → Stop server program*. Turn off the main device and restart it.
The user 'xxx' is already logged in.	Login	Each user can only be logged in once at the same time. You might want to stop the other session by choosing *System → Relogin*.
The user called 'administrator' cannot be removed.	User management	The user 'administrator' must persist so that you can enter the user management.
The user called 'xxx' already exists.	User management	Each user name can be assigned only once and must be unique.
The user name 'xxx' is unknown.	Login	You tried to enter with a user name that does not exist in the user management. The administrator is able to add the desired user name.
Sending of e-mail failed. The server reports: 'xxx'.	Alerting	Depending on the server message a problem occurred with the e-mail delivery to SMTP.
You cannot delete the last tab.	Tabs	At least one tab must remain. But you can rename it or change its background image.
The tab cannot be deleted with components on it.	Tabs	Drag and drop all components from the tab you want to delete to other tabs. After that, the erasing can be performed.
Sending of SMS failed. The server reports: 'xxx'. *(optional)*	Alerting	Depending on the server message a problem occurred with the SMS delivery to the built-in mobile phone.

Table B.1: Hints and error messages (cont'd)

Message	Subject	Description
System time will be adjusted smoothly.	Main device	The desired new system time for the main device differs by at most 10 seconds from the present one. The change-over will be smoothly, i. e. all timestamps will occur in a monotonic sequence.
System time has been adjusted abruptly.	Main device	If desired new time and the present time of the main device differ by more than 10 seconds, the new time will be set abruptly. Please take into account that abrupt time setting bothers the timestamps.
A former adjustment of system time is still in progress.	Main device	While a former time adjustment has not yet been finished, you cannot initiate a new one.
Wrong repetition.	User management	Please enter for security reasons the same password twice.
There is already a superuser online. You will enter as a guest.	Login	Only one superuser is allowed to change configurations at the same time. As soon as the other superuser or administrator has exited, you can enable the 'Activating changes' checkbox.
Wrong password.	Login	The entered user password is wrong. The administrator can change the password within the user management.
No route to main device.	Login	The network connection to the main device is interrupted. Check the network cable and the IP address.
Invalid address	Login	The entered IP address has an invalid format. Please enter the correct address or use 'Mein Exspecta' (My Exspecta).
Adjusting of system time failed.	Main device	A service application failed while adjusting the system time and reported an error. Please contact us.
Connection failed to XML server.	Export	An Error occurred while exporting data to the specified XML server. Possibly the server program ist not ready.

C Specifications

Main device	
Processor	AMD SC 520, 133 MHz (fanless)
Working memory	32 MB DRAM
Storage	ChipDisk IDE 128 MB
Operating system	Linux (Kernel 2.2.16)
Network	10/100 BaseT Ethernet
Server software	C, Java
Client software	Java-Applet, executable in any internet browser supporting Java 2 plugin (version 1.4 or higher)
Ports in use	80 (http), 51012 (configuration), 51013 (online data), 51014 (file transfer)
Sensor connection	Measurement bus (base protocol CAN); up to 105 sensors lockable[1]
Measuring frequency	max. 1,000 Hz (integrated sample rate)
Buffer for measuring data	approx. 8 mill. records (GZIP compression)
Power supply	100 .. 240 V∼, 50/60 Hz
Dimensions (W × H × D)	230 × 85 × 190 mm
Enclosure	Al and al-pressure die casting powder-coated, light gray, front panel al uncoated
Protection class	IP 52
Weight	2,500 g (without optional GPRS-Modem)

[1] If connecting more than 8 sensors you need additional bus nodes for power supply.

Sensors

Measuring categories	according to sensor type (description on separate datasheets)
Connection of serial devices per	RS 232, RS 422, RS 485
Measuring channels	max. 15 per sensor
Power supply	12 V= (via measuring bus)
Dimensions (W × H × D)	116 × 56 × 35 mm
Enclosure	Al and Al-pressure die casting powder-coated, light gray
Protection class	IP 52
Weight	approx. 160 g

D Mounting a SIM card for the GPRS modem

If your main device contains the optional GPRS modem, you need a valid SIM card for operation. You get those SIM cards either by contract or prepaid from your media company. There are also special contracts that allow only SMS and/or data transfer.

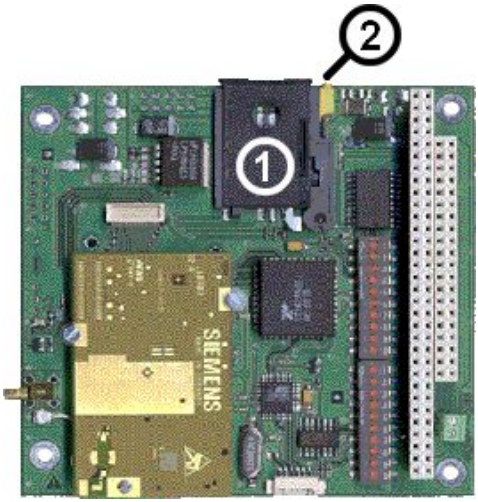

Figure D.1: Mounting a SIM card on the modem circuit board

Perform the following steps to mount the SIM card:

- If necessary, shut down the main device and switch it off. Pull out the power plug.

- Unplug the cables for network and sensors at the front of the device.
- Put the device with the front side down onto the table, so that you are facing the device's rear side with the screws.
- With a Phillips screwdriver loosen the four screws near to the left and right side plates. Leave the other four screws unchanged.
- Keep now the upper end of the base plate you just detached and drag it down so that it lies in front of you on the table.
- The SIM card must be mounted into the holding (1). Press the yellow button (2), so that the black plastic fastener is pushed backwards.
- Remove the holding, turn it round and press the SIM card of your media company into the socket, so that you can hear it snap in. Pay attention that the brass-colored contact areas are on the top.
- Push the holding (2) back into the socket on the circuit board; it snaps in audibly as well.
- Lift up the base plate again and close the housing. Be careful not to shut any cables.
- Tighten the four screws.
- Continue as described in section 2.1. For entering the PIN number read chapter 5.3.

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