# BMPC/2

Bruker Magnet Pump Control 2

Technical Manual

Version 005

NMR Spectroscopy

Innovation with Integrity

This manual was written by

Uwe Döttling and Reinhard Steppe



Rheinstetten, Germany

P/N: Z31823

DWG-Nr.: Z4D10373D

For further technical assistance on the BMPC/2 unit, please do not hesitate to contact your nearest BRUKER dealer or contact us directly at:

BRUKER BioSpin GmbH
am Silberstreifen
D-76287 Rheinstetten
Germany

Phone:+ 49 721 5161 0
FAX:+ 49 721 5171 01
E-mail:service@bruker.de
Internet:www.bruker.com

# Table of Contents

# Table of Contents

# Table of Contents

# Table of Contents

# 1 About

## 1.1 This Manual

This manual is intended to be a reference guide for operators and service technicians. It provides detailed information about the user level maintenance and service and overall use of the Bruker device.

The figures shown in this manual are designed to be general and informative and may not represent the specific Bruker model, component or software/firmware version you are working with. Options and accessories may or may not be illustrated in each figure.

**Carefully read all relevant chapters before working on the device!**

This manual describes parts and procedures relevant to the device version it is delivered with. For older hardware, please refer to the manual supplied at the time.

## 1.2 Policy Statement

It is the policy of Bruker to improve products as new techniques and components become available. Bruker reserves the right to change specifications at any time.

Every effort has been made to avoid errors in text and figure presentation in this publication. In order to produce useful and appropriate documentation, we welcome your comments on this publication. Support engineers are advised to regularly check with Bruker for updated information.

Bruker is committed to providing customers with inventive, high quality products and services that are environmentally sound.

## 1.3 Symbols and Conventions

Safety instructions in this manual are marked with symbols. The safety instructions are introduced using indicative words which express the extent of the harzard.

In order to avoid accidents, personal injury or damage to property, always observe safety instructions and proceed with care.

**DANGER**

This combination of symbol and signal word indicates an immediately hazardous situation which could result in death or serious injury unless avoided.

**⚠ WARNING**

This combination of symbol and signal word indicates a potentially hazardous situation which could result in death or serious injury unless avoided.

**⚠ CAUTION**

This combination of symbol and signal word indicates a possibly hazardous situation which could result in minor or slight injury unless avoided.

***NOTICE***

This combination of symbol and signal word indicates a possibly hazardous situation which could result in damage to property or the environment unless avoided.

This symbol highlights useful tips and recommendations as well as information designed to ensure efficient and smooth operation.

# 2 Introduction

The Bruker Magnet Pump Control 2 (BMPC/2) is a Windows XP based system that supervises and serves the pumps and valves that are needed for the stable operation of sub-cooled Bruker high field magnets.

The main functions include:

- Monitoring of the magnet status and the most important cryogen parameters.
- Monitoring and control of the pump system.
- Alarm system.

## 2.1 Modes of Operation

The BMPC/2 can be operated in two different modes, manual or automatic. The modes of operation are discussed in detail in the chapter "Principles of Operation" on page 15.

## 2.2 User Interface

The BMPC/2 is controlled by a **software user interface**. This interface contains three user levels:

1. **User** - Standard User Level
2. **Administrator** - System Administration and Configuration Level
3. **Service** - For Bruker Service

There are five different screen display modes and four different work display modes available within the user interface. These various software interface displays can be configured individually by the system Administrator or by Bruker Service. Refer to the chapter "Software" on page 21 for an overview of the user interface.

## 2.3 Parameter and System Configuration Overview

The BMPC/2 system is pre-configured by Bruker service personnel during installation.

The configuration parameters for the alarm and voice box systems can be adjusted by the system Administrator or by Bruker Service. Information for the Administrator on how to configure the system is available in the chapter "Configuration (administrator)" on page 87.

## 2.4 Alarm and Notification System

An integral part of the BMPC/2 system is the Alarm System and Voice Box System.

The **Alarm System** is needed for the supervision of the magnet system. A description of this system is available in the chapter "Alarm System" on page 39.

The **Voice Box System** is the telephone interface that is used for an alarm sequence or for requesting a remote status report. An overview of this system is available in the chapter "Voice Box System" on page 43.

## 2.5 Additional Information Available in This Manual

The following chapters have been included in this manual to provide additional information for the user:

# 3 Safety

The following safety issues are relevant for the Bruker Magnet Pump Control 2 (BMPC/2) unit:

- Service and maintenance should only be accomplished by qualified personal.
- Only personnel trained on the use of the BMPC/2 should operate the unit.
- Read this manual completely before operating the BMPC/2. Pay particular attention to any warning references made.

# 4 Principles of Operation

The BMPC/2 can be operated in two different modes:

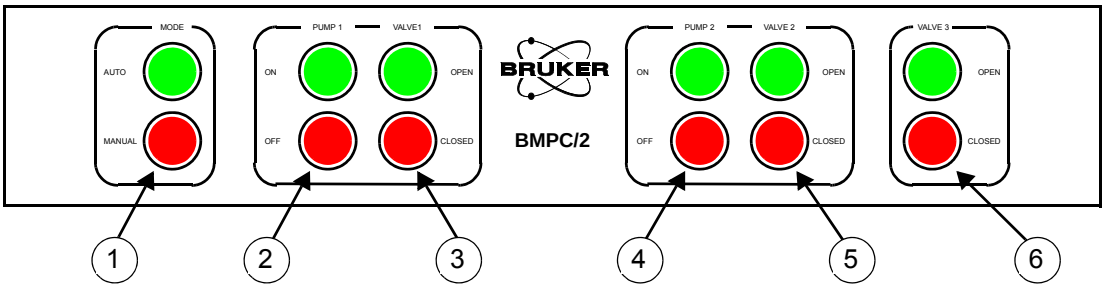
- **Manual** mode or,
- **Automatic Pump** mode.

The "Manual Mode" is the standard mode of operation after the unit is turned on or reset. In manual mode all the pumps and valves can be operated manually.

In "Automatic Pump Mode" all the pumps and valves are controlled automatically. This is the preferred mode for the BMPC/2.

## 4.1 Manual Mode

The operation of the pumps and valves in manual mode takes place with the help of the different buttons located on the front plate of the BMPC/2 control unit. The function of these buttons, which are illustrated in the following diagram, will be discussed in the following sections.




1. Mode Buttons
2. Pump 1 Buttons
3. Valve 1 Buttons
4. Pump 2 Buttons
5. Valve 2 Buttons
6. Valve 3 Buttons

Figure 4.1 BMPC/2 Control Unit Front Plate

### 4.1.1 Mode Buttons

The mode buttons are used to switch between manual and automatic mode.

To enter automatic mode press the AUTO mode button. The green lamp will activate when the unit switches to automatic mode.

To return to manual mode press the MANUAL button. The green light will deactivate and the red lamp will activate indicating that the unit is in manual mode.

### 4.1.2 Pump 1 and Valve 1 Buttons

The Pump 1 buttons allows you to turn the pump on or off in manual mode. Likewise, the Valve 1 buttons allow you to open or close valve 1. The pertinent lamps will indicate the current condition:

- The **green lights** will indicate that the pump is running or the valve is open.
- The **red lights** will indicate that the pump is off or the valve is closed.

### 4.1.3 Pump 2 and Valve 2 Buttons

The Pump 2 and Valve 2 buttons have the same function as the Pump 1 / Valve 1 described in the previous section, the only difference is that they affect Pump 2 and Valve 2.

### 4.1.4 Valve 3 Buttons

The Valve 3 buttons are intended for future extensions and presently are not used. When you press the buttons you will hear a click, but no function will be performed.

## 4.2 Pumps and Valves in Manual Mode

There are several pump and valve configurations available in manual mode:

- Pump 1 on together with Valve 1 opened,
- Pump 2 on with Valve 2 opened, or
- Both pumps on with both valves opened.

In manual mode the condition of the pumping system is not monitored, thus when a pump or valve is not working correctly the system will not react.

***NOTICE***

**Using the pump in manual mode**

When using a pump in manual mode it is possible that a return flow of air into the pump line occurs.

- ▶ Always switch the pump on first, then wait 10 to 15 seconds before you open the associated valve.
- ▶ Before switching a pump off, always close the associated valve first!

**⚠ CAUTION**

**Never use Pump 1 when Valve 2 is open, or Pump 2 when Valve 1 is open**

This can result in a return flow of air into the pump line and an increase in the magnet temperature.

- ▶ When using Pump 1, first close Valve 2.
- ▶ When using Pump 2, first close Valve 1.

***NOTICE***

**In manual mode the BMPC/2 will not react to critical magnet parameters**

When, for example, the helium flow is too low the Pump 2 will not automatically switch on. However, when the BMPC/2 software is operating in Monitor & Alarm mode, you will nevertheless be alarmed when important magnet parameters exceed or fall below their limit values.

- ▶ Always place the BMPC/2 software in Monitor & Alarm mode when working in manual mode.

Refer to the section "Monitor & Alarm Mode" on page 33 for more information on the BMPC/2 software.

## 4.3 Automatic Pump Mode

In automatic pump mode all the pumps and valves are controlled automatically. It is not possible to operate a pump or valve manually using the front panel buttons when the system is in automatic mode.

To change to automatic pump mode when you are in manual mode press the AUTO button. The green lamp indicates when the unit is in automatic pump mode.

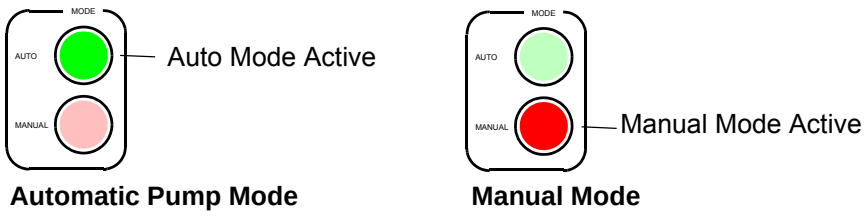



Figure 4.2 Automatic Pump Mode vs. Manual Pump Mode

### 4.3.1 The Default Pump

The default pump that is used when the unit is switched to automatic mode depends on which, if any, pump is operating:

- If one pump is running, this will become the default pump.
- If both pumps are running, they will both be regarded as default pumps.
- If no pump is running then, Pump 1 will be used as default.

#### 4.3.1.1 Default Pump Failure

The BMPC/2 continuously monitors the condition of the default pump(s) in operation. If one of the pumps or valves malfunctions:

1. The malfunctioning pump (or valve) and its corresponding valve (or pump) are stopped or closed.
2. Either the other pump switches on automatically and the corresponding valve is opened, or, when both pumps were operating, the other pump will continue to operate and its corresponding valve will remain open.
3. The BMPC/2 software will display an error message indicating the current problem.

## 4.4 Monitoring in Automatic Pump Mode

The BMPC/2 continuously supervises the following magnet parameters and compares these with their preset limit values (see "Limit Values" on page 100):

- P1 Pressure
- T1/T2 Temperature
- F1 Helium Flow

When one of these limit values is exceeded, the BMPC/2 activates the second pump, which will always operate for at least 1 hour. Afterwards the pump may continue to run for an additional hour or will be switched off depending on the actual system status.

### 4.4.1 P1 Pressure Monitoring

The P1 pressure is continuously monitored against a pre-specified upper and lower limit and the following actions taken if one of these limits is reached:

| Precondition | Condition | Action |
|---|---|---|
| | P1 pressure is **lower** than P1 **low warning** limit | A warning is **triggered**. |
| Software in Monitor & Alarm mode | P1 pressure is **lower** than the P1 **low alarm** limit | Alarm cycle is **activated** |
| | P1 pressure is **higher** than the P1 **high warning** limit | Second pump is started and a warning is **triggered** |
| Software in Monitor & Alarm mode | P1 pressure is **higher** than the P1 **high alarm** limit | Second pump is started and the alarm cycle is **activated** |

Table 4.1 P1 Pressure Monitoring

### 4.4.2 T1/T2 Temperature Monitoring

The T1 and T2 temperatures are continuously monitored against a pre-specified lower limit and the following actions taken if the limit is reached:

| Precondition | Condition | Action |
|---|---|---|
| | T1 or T2 temperature is **lower** than the T1/T2 **warning** value | Second pump is started and a warning is **triggered** |
| Software in Monitor & Alarm mode | T1 or T2 temperature is **lower** than the T1/T2 **alarm** value | Second pump is started and the alarm cycle is **activated** |

Table 4.2 T1/T2 Temperature Monitoring

### 4.4.3 Fl Helium Flow Monitoring

The Fl helium flow value is continuously monitored against a pre-specified lower limit and the following actions taken if the limit is reached:

| Precondition | Condition | Action |
|---|---|---|
| | Fl value is **lower** than the flow **warning** value | Second pump is started and a warning is **triggered** |
| Software in Monitor & Alarm mode | Fl value is **lower** than the flow **alarm** value | Second pump is started and the alarm cycle is **activated** |

Table 4.3 F1 Helium Flow Monitoring

# 5 Software

The BMPC/2 control & monitoring software is the user interface for the entire BMPC/2. The software is necessary for adjustment of all the important BMPC/2 and magnet system parameters, as well as for the monitoring of all functions during normal operation.

## 5.1 Starting the BMPC/2 Software

To start the BMPC/2 Control software you will need to enter your account ID and password and press „Enter“. The account ID and password can be delegated from the Administrator or Bruker Service. There are several different account levels available:

**User - Standard User Level**

This is the default user display mode. In this mode you can switch between the various display modes with the following restrictions:

- To change to the „Off mode“ it is necessary to reenter the user password.
- The functions under the *Tools* menu option are not available at this login level.
- The program can not be closed in user level.

**Administrator - Revisionary Level**

This mode is necessary for making changes in the BMPC/2 setup. Most of the functions under the menu option *Tools* are available at this level, with a few exceptions that are reserved for the Service level. The program can be closed while in administrator level.

**Service - Service Level**

This level is only accessible by Bruker service personnel and is only required during installation.For more information on accounts and passwords refer to the section "Password & Codes" on page 97.

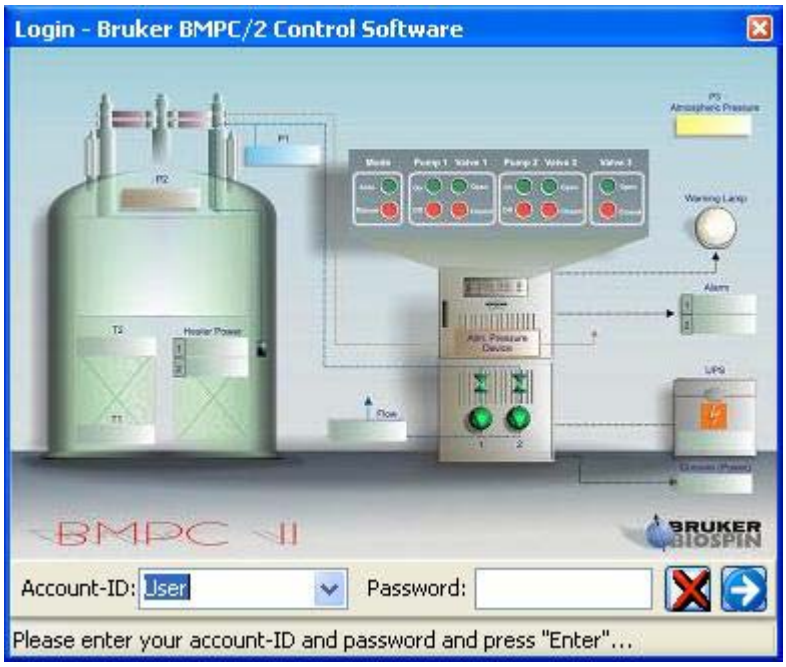



Figure 5.1 BMPC/2 Login Screen

## 5.2 Program Overview

The software interface consists of five different "Display Modes":

- Process Display
- Graphical Display
- Jumbo Display
- Data Log Display
- Present Values/Events Display

The interface also has four different "Operation Modes":

- Off
- Monitor Only
- Monitor & Alarm
- He Fill

These various display and work modes will be described in detail in this chapter. The following screen organization is used in all the display modes.

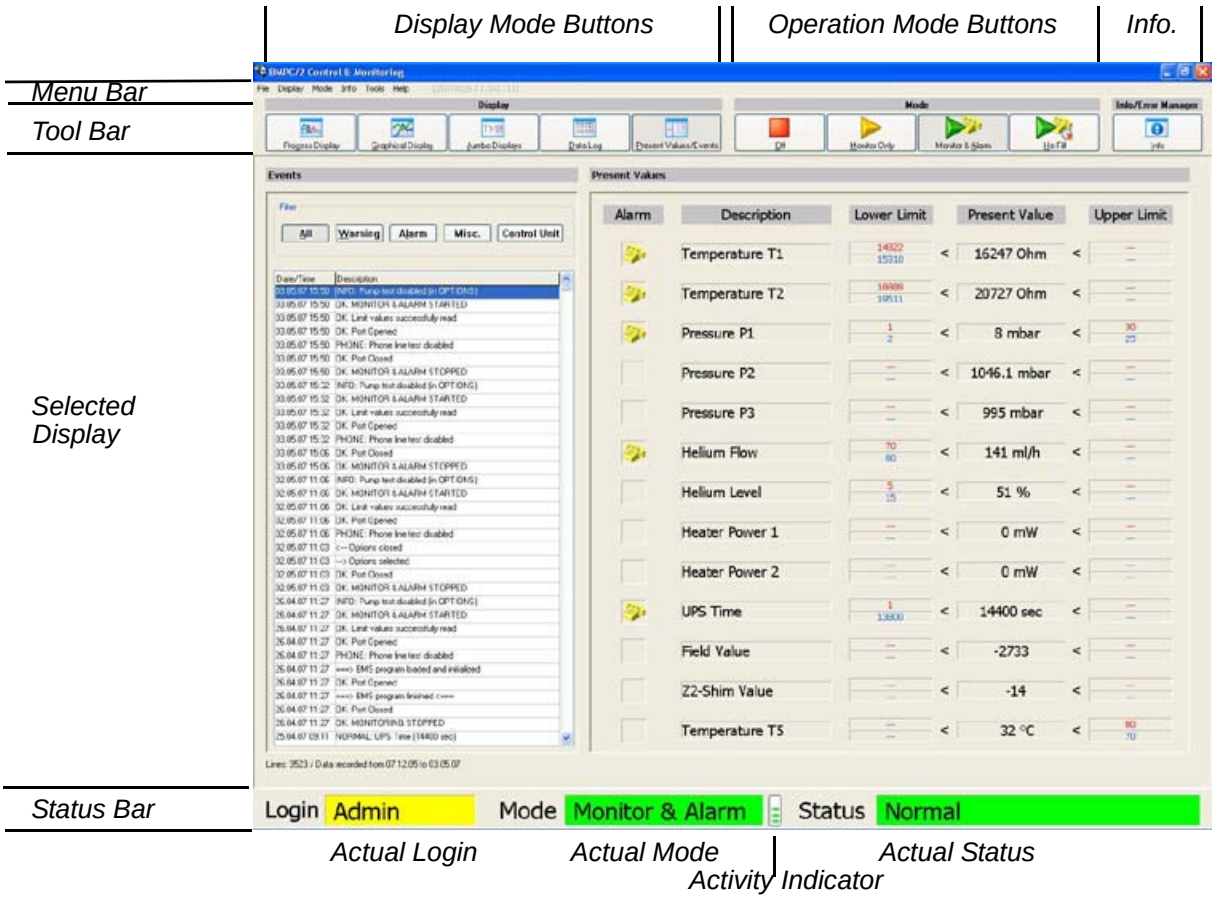



Figure 5.2 Display Organization

The top of the screen contains a standard Windows menu bar. Just under this is a tool bar which contains buttons providing quick access to the five different display modes, the four operation modes, as well as system information.

Under the tool bar is an area where the selected display mode is displayed. This will vary based on the mode you have selected. In the above example the Present Value/Event display is shown.

At the lower edge of the screen the current status of the system is shown. This includes the actual user login, the actual mode and the actual system status.

The activity level is also displayed at the bottom of the screen and indicates that communication between the PC and the control unit is taking place. This is continuously updated based on the current activity.

## 5.3 Display Modes

The five display buttons allow easy access between the five different display modes. To select a display mode click on one of the buttons.


Figure 5.3 Display Buttons

### 5.3.1 Process Display

The process display is the default display in display mode. All magnet and BMPC/2 parameters are indicated in a representative process image. Thus, a correlation of the parameters to their functions is available at any given time.

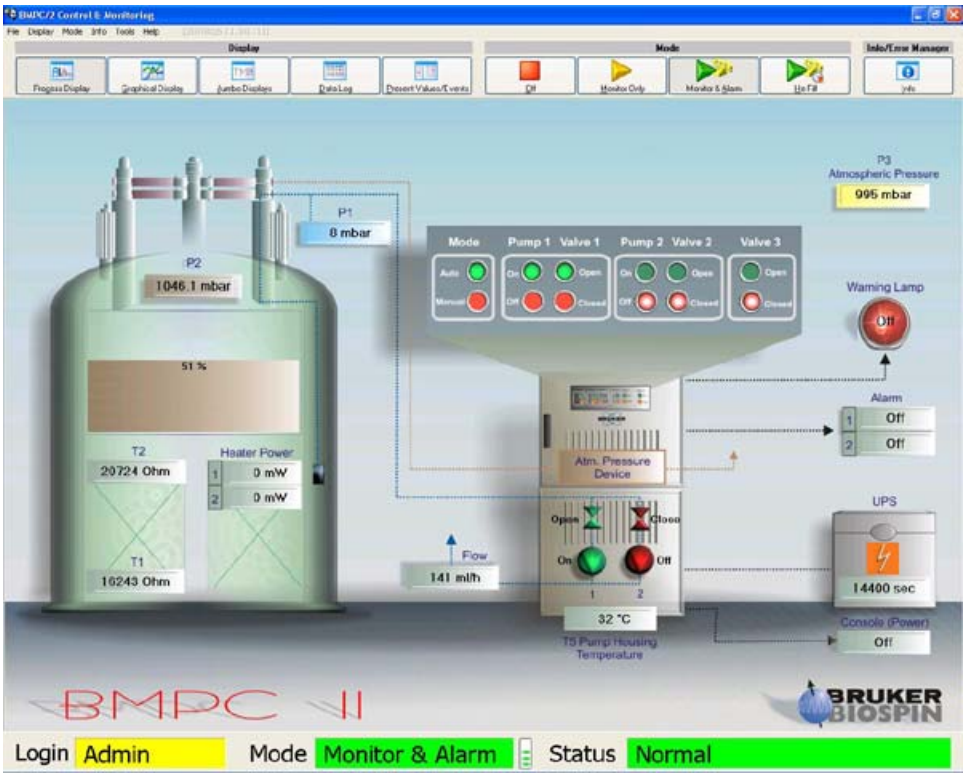



Figure 5.4 Process Display

## 5.3.2 Graphical Display

The graphical display allows you to plot arbitrary parameters on a timeline. Up to 3 different graphs can be represented simultaneously on the display screen. The graphical display is freely configurable based on specific needs.

*Configuration*

*Graph 1*
*T1 and T2*

*Graph 2*
*P2 and P3*

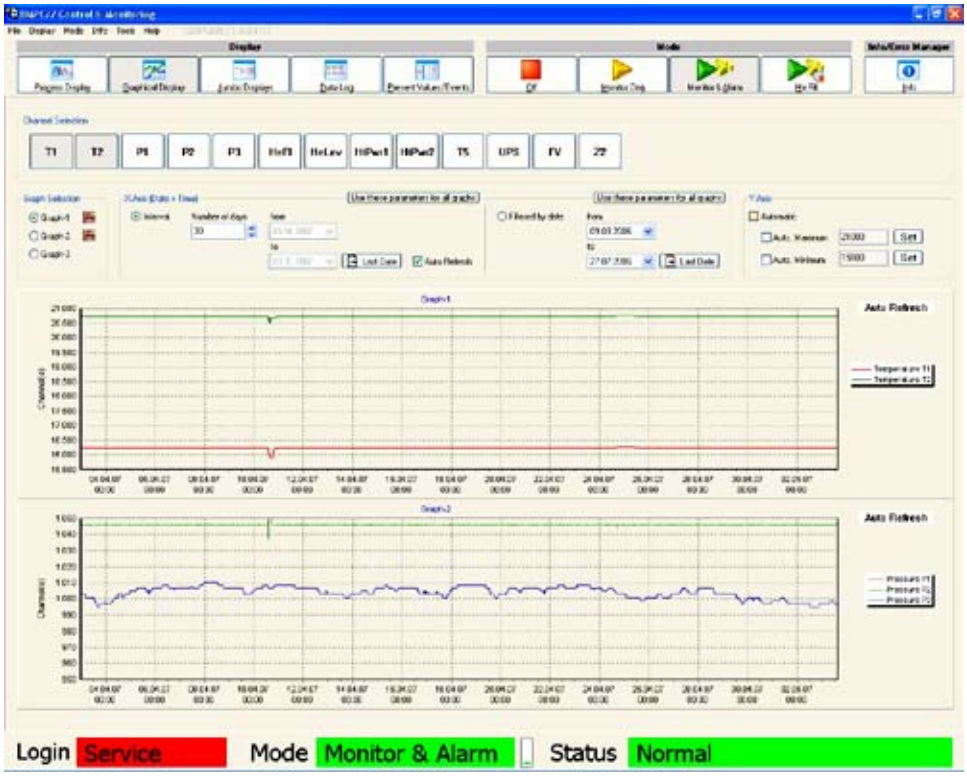



Figure 5.5 Graphical Display

In the example above is a configuration for two graphs. The settings for both graphs are identical. In both examples data for the last 30 days is represented. Whenever new data is added to the log file the graphical display is automatically updated (refreshed).

### 5.3.2.1 Configuration of the Graphical Display

At the top half of the Graphic Display are several checkbox‘s and fields that can be used to configure the graphical display representation to your individual needs. By selecting or deselecting checkbox‘s and/or entering parameters you can specify your requirements.

For example, you can select up to 3 channels from the Channel Selection bar to be displayed on the selected graph. In the example below T1 and T2 parameters for Graph 1 have been selected (Group Box „Graph Selection“).


1. Channel Selection T1 & T2
2. Graph Selection Graph 1
3. Interval Selection
4. Last Date
5. Auto Refresh
6. Filtered by Date Selection

Figure 5.6 Graphical Display - Configuration X-axis

For each graph you can subsequently configure the X-axis (time) and the Y-axis (size) display to conform to individual requirements.

The configuration of the X-axis can either be an interval display or a filtered display based on a specified date.

- **Interval display**: The desired number of day to be represented, as well as the final date can be entered. The last logbook entry can be displayed by clicking on „Last Date“. When you also select the auto-refresh option the graphical display will be automatically updated when a new logbook entry is made. In this case entering a Last Date is not possible.

- **Filtered display**: If you want to view the data within a certain timeframe, you can do so by entering a beginning and ending date.

The adjustments that have been made will automatically be used for all the other graphs when you click on the „Use these parameters for all graphs“ button. Subsequently they will all use the same time axis.

The adjustment of the Y-axis can take place automatically or manually.

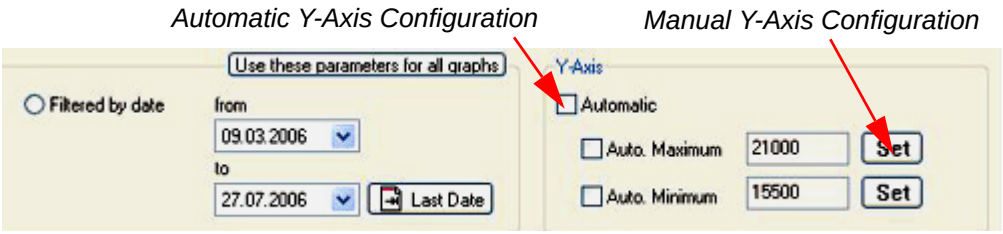



Figure 5.7 Graphical Display - Configuration Y-axis

- **Automatic:** When the checkbox Automatic is selected, the range of values is computed automatically based on the maximum and minimum values that have to be displayed. You can either select both, the maximum and the minimum to be computed automatically or just the maximum or just the minimum
- **Manual:** When the Automatic checkbox is not selected, you can manually select the values by pressing the corresponding Set button and entering the values in the dialog window that appears.

The manual mode is useful when a value does not change over the entire given period and thereby the display of the upper and lower margins will always appear in the field of view.

### 5.3.2.2 Zoom Function

To improve the resolution, you can use the zoom function to enlarge parts of the graphical data.

To zoom **in** press the left mouse button and select an area moving the mouse from the **upper left** corner of the **lower right** corner.

To zoom **out** press the left mouse button and select an area moving the mouse from the **lower right** to the **upper left** corner.

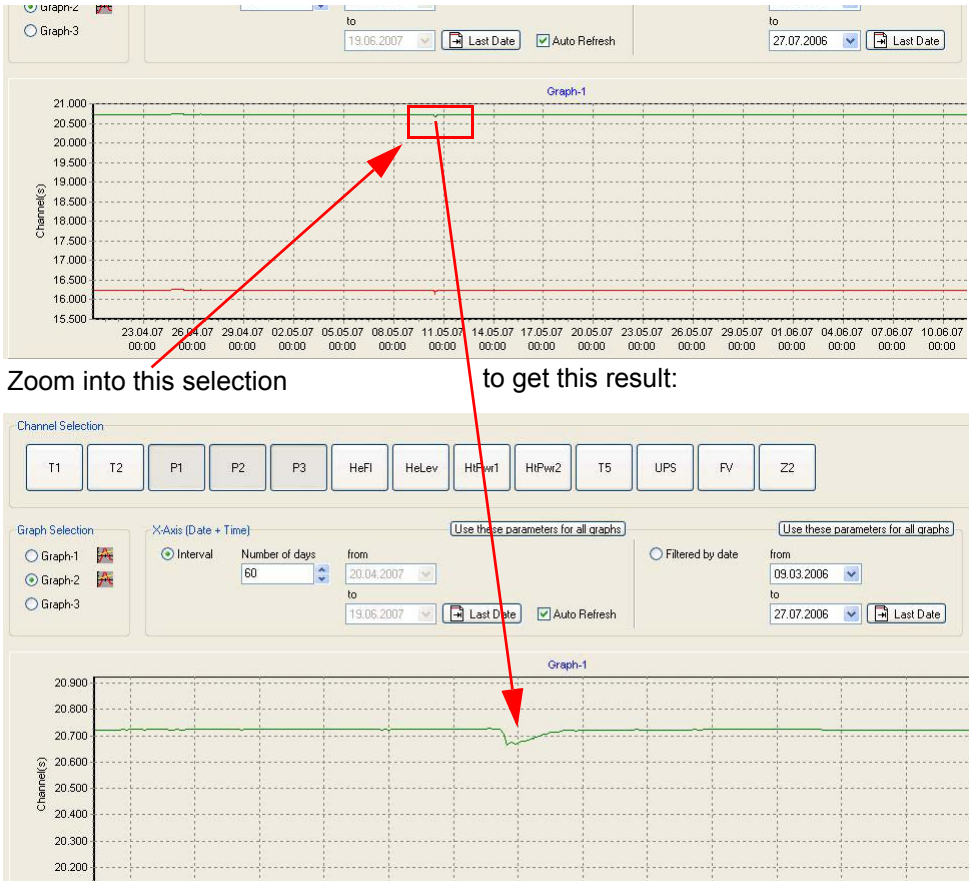



Figure 5.8 Graphical Display - Zoom Function

## 5.3.3 Jumbo Display

In Jumbo display mode you can display up to 5 parameters using an extra large font size. This is useful if you want to read the displayed values when you are a greater distance away from your monitor.

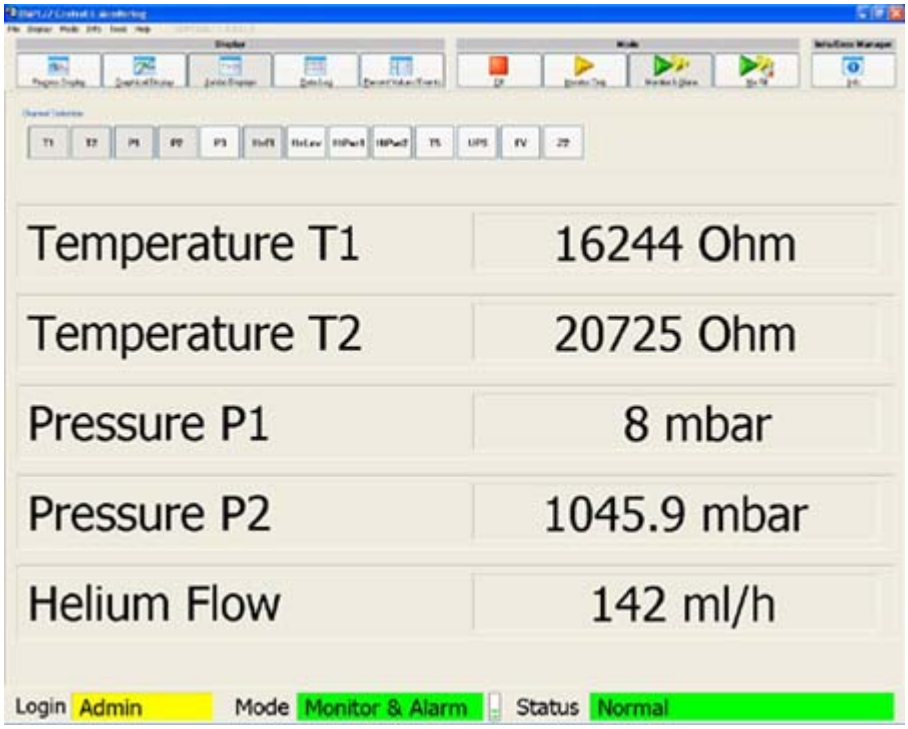



Figure 5.9 Jumbo Display

### 5.3.3.1 Configuration of the Jumbo Display

To activate or deactivate parameters displayed in the Jumbo Display press the corresponding channel button (e.g. T1, T2, etc.).


Figure 5.10 Jumbo Display Configuration

The buttons that are grayed out are the parameters that are currently displayed using the extra large font size in the Jumbo Display window.

The order in which the individual parameters are displayed in the Jumbo Display depend on the order in which the channels are selected.

## 5.3.4 Data Log Display

The Data Log display is in the broadest sense a database browser. In this display you can display all the parameter data that is stored in the database.

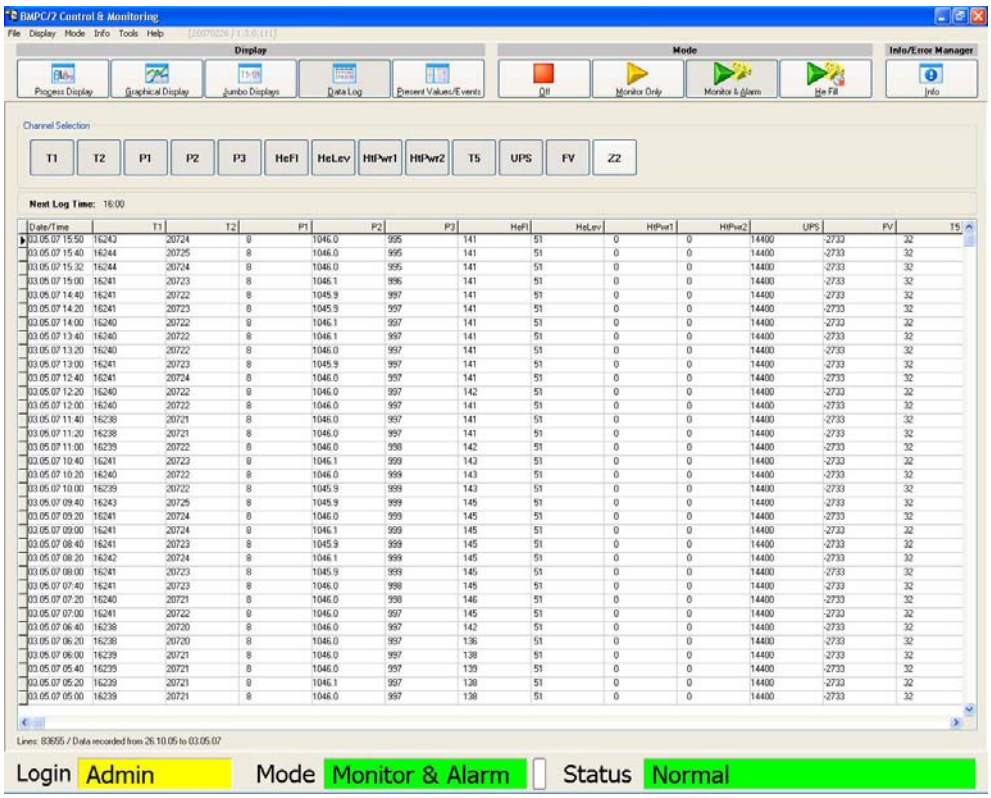



Figure 5.11 Data Log Display

To activate or deactivate a specific parameter press the corresponding channel select button. The channels are arranged from left to right in order of selection. When more channels are selected than can be displayed in one screen, a horizontal scrollbar will appear which allows you to scroll to the other parameters.

When a large quantity of data is stored in the data log file, it may take longer for the data to be displayed.

Refer to "Sensor Channels" on page 104 for details on how to configure database entries.

### 5.3.5 Present Values / Event Display

The Present Value/Event Display:

- Provides a quick overview of how the system is configured,
- indicates whether there are any events which must be examined,
- or can be used to present the current data in a simple table representation.

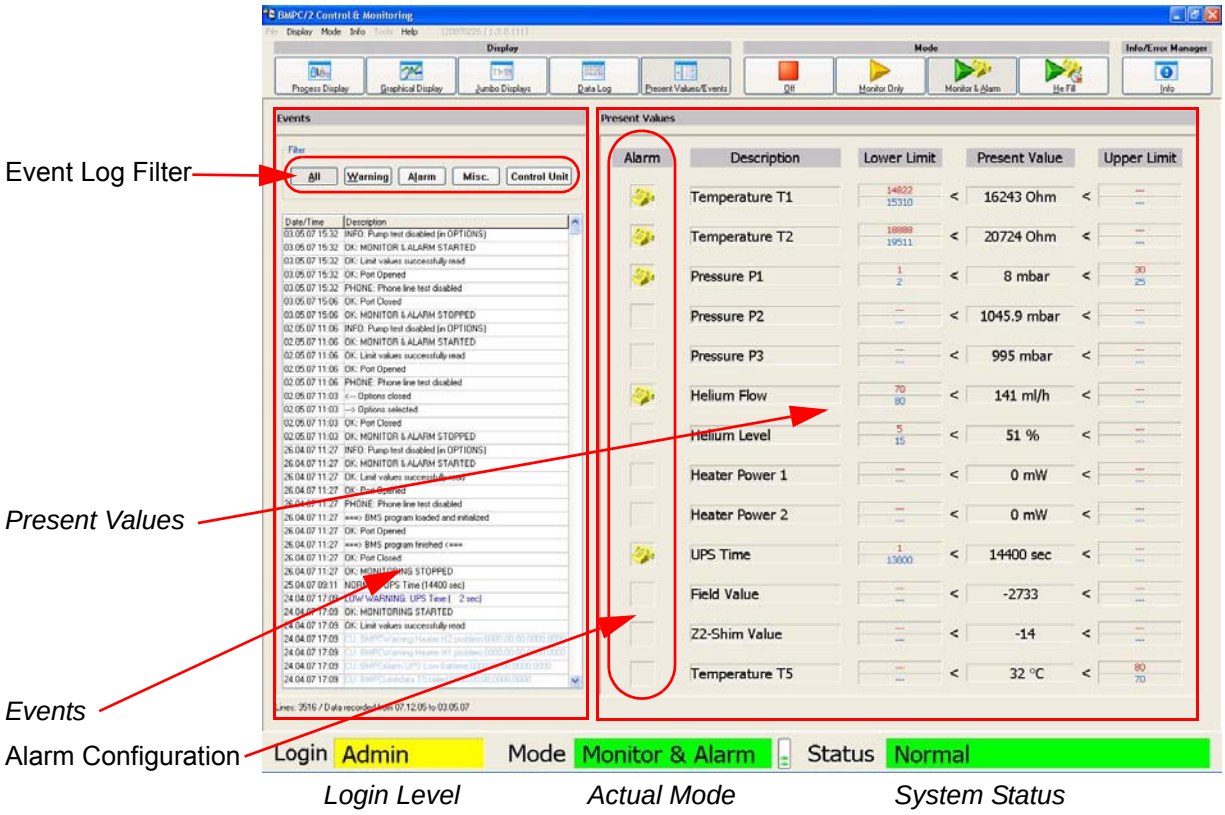



Figure 5.12 Present Values / Event Display

The Events section of the displays all the warnings, alarms, system messages, as well as, all error messages from the BMPC/2 Control Unit. The Event log filter buttons on the upper part of the display allow you to select data that is relevant for your purposes.

The alarm configuration field in the Present Values block indicates which channels will trigger an alarm when a malfunction occurs in Monitor & Alarm Mode (refer to "Monitor & Alarm Mode" on page 33). More information on configuring alarms can be found in "Alarm Configuration" on page 40.

If you are logged in as a user or administrator, the display automatically will change to the Present Values / Event mode every time a new entry is written in the Event log.

## 5.4 Operation Modes

The BMPC/2 user interface offers four different operational modes which can be accessed by pressing the corresponding mode buttons.


Figure 5.13 Mode Buttons

### 5.4.1 OFF Mode

The **OFF** mode is necessary when the Administrator needs to change the software attributes using the menu option *Tools*. The *Tools* menu option is only accessible when you press the *Off* button in the toolbar. If you are logged in as User or Administrator you will be required reenter your password to confirm the mode change.

The program can only be terminated if Off mode is selected.

In Off mode **no** data is written to the log files!
The alarms are deactivated in Off mode. When a magnet or BMPC/2 malfunction occurs you will **not** be informed through an alarm!

### 5.4.2 Monitor Only Mode

In this mode the current values of all magnet and BMPC/2 data are displayed, but the **alarms are deactivated**. The data is saved in the Data Log File when operating in this mode.

In this mode the alarms are deactivated, thus you must remember that you are not operating at the highest safety level. When a magnet or BMPC/2 malfunction occurs you will **not** be informed through an alarm!

### 5.4.3 Monitor & Alarm Mode

In this mode current values of all magnet and BMPC/2 data are displayed, and the **alarms are activated**, whereas you will be informed if a malfunction occurs. The data is saved in the Data Log File when operating in this mode.

In the following example the Temperature T1, Temperature T2, Pressure P1, Helium Flow and UPS Time channel alarms are enabled. When one of these values is exceeded an alarm will be activated.

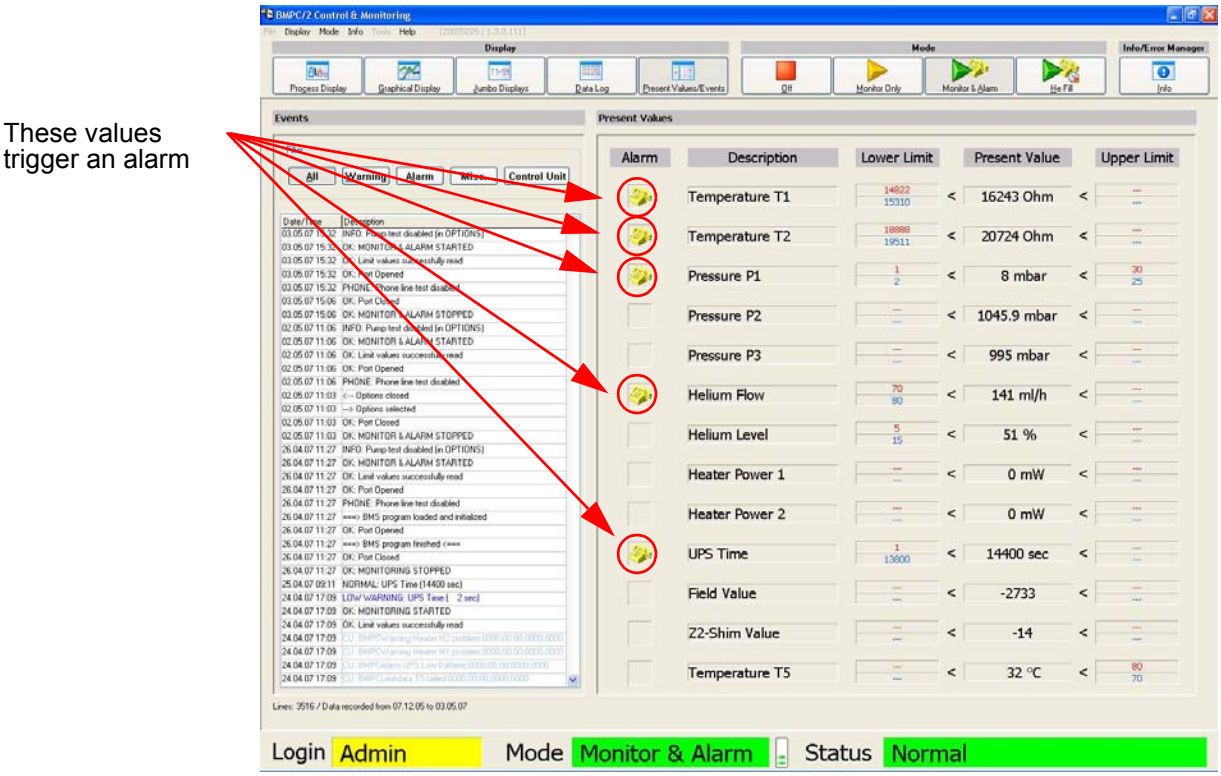



Figure 5.14 Present Values Display in Monitor & Alarm Mode

In the example below a low alarm limit of 14826 and a low warning limit of 15312 have been set for the Temperature T1 value. If the value for the Temperature T1 falls below the low warning limit value, the warning sequence is started. This means that the warning light appears and an entry is added to the event log file.

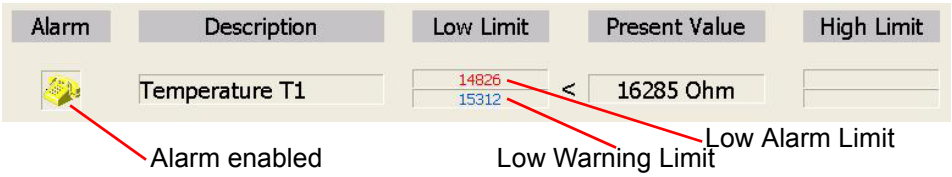



Figure 5.15 Temperature T1 in the Present Value Display

When an alarm is enabled, then an alarm will be triggered when a limit value is reached. In this case an entry will be added to the event log file and the telephone alert notification will begin. Details on alarm procedures are discussed in the chapter "Alarm System" on page 39.

### 5.4.4 He Fill Mode

The He Fill mode is necessary because the T1 and/or T2 parameters may briefly fall below the alarm threshold during the helium refill process. In order to avoid an alarm from being triggered the He Fill mode can be used to suppress the T1/T2 alarm for up to six hours.

The P2 pressure control heater is also disabled for one hour, as this is not efficient when the magnet is open and thus would only lead to unnecessary helium consumption.

When the He Fill mode is activated it is indicated in the status bar together with the length of fill time remaining.


Figure 5.16 He Fill Mode 292 Minutes

The suppressed alarms are represented in the Present Values/Event display as indicated in the figure below.

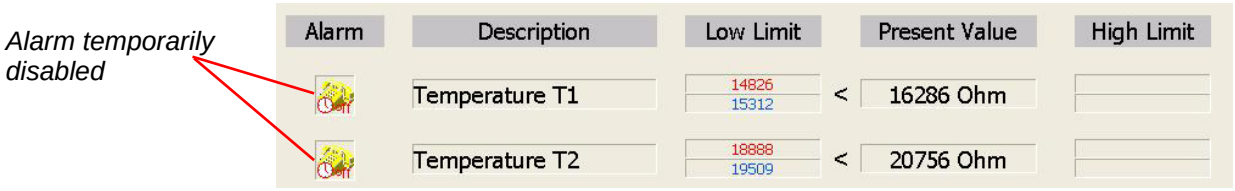



Figure 5.17 Alarm Temporarily Disabled

Once the helium refill is finished and the remaining time was expired, the program will automatically leave He Fill mode and return to monitoring mode.

For information on configuration the He Fill mode read "He-Refill / He Measurement" on page 106.

## 5.5 Automatic Pump Test

The Automatic Pump Test is a software activated test used to ensure that the second pump is operational. During normal operation only one of the BMPC/2 vacuum pumps is needed, the other pump is only required in the event of a malfunction. To ensure correct operation, the second pump should be tested on a regular basis using the Automatic Pump Test.

During the pump test the spare pump replaces the active pump and the P1 pressure and F1 helium flow are monitored. When the pump is working correctly, these parameters should only deviate within a given range.

To prevent false alarms during the automatic pump test, all alarms are temporarily disabled.

i The automatic pump test is only possible if the BMPC/2 is running in automatic mode!

### 5.5.1 Description of the Test Cycle

The automatic pump test consists of the following series of events:

1. The spare pump is switched on.
2. The helium flow is monitored for 1 minute.
3. When the pump is operating correctly, a short increase in the helium flow can be seen and the test will proceed to the next step.

   The spare pump‘s valve should now be open and the original valve closed. The pump under test is now working, but the original pump is also still operating.
4. The pump will run for a minute until the values for P1 and F1 have restabilized.
5. After the values have stabilized they will be monitored for a minute. When both parameters do not deviate more than +/- 15% from the original value than the **pump test is successful**.
6. After a successful test the valves are switched back to their original position, and after a 15 second delay, the pump under test is switched off.

   The original pump should be running and a decrease of the helium flow should be observed. This decrease is due to a backflow of gas between the helium flow sensor and the pump under test and its valve.
7. The cycle is complete after another minute when all the values have stabilized.

When a **problem occurs** during the automatic pump test the test cycle is immediately aborted and the original pump configuration restored. An error message is then displayed in the information window and in the event log.

## 5.5.2 Configuring the Automatic Pump Test

The automatic pump test can be configured to start at a pre-designated date and time.

To configure the automatic pump test:

1. Select the *OFF* mode in the menu bar.
2. Select *Tools - Options - Pump Control - Pump Test*
3. Check the „Enable Automatic Pump Test“ checkbox (Figure 5.18 1).
4. Select the date and time for the next test (Figure 5.18 2).
5. Select the interval for the test (Figure 5.18 3). A pump test once a month (every 4 weeks) is recommended.
6. Press *OK* to apply the configuration.

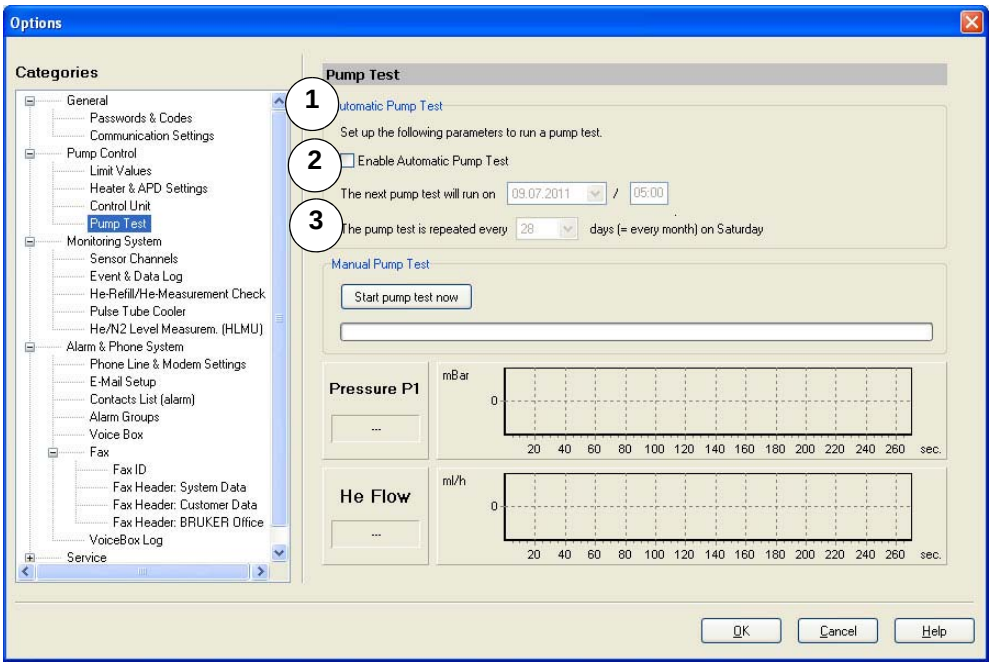



Figure 5.18 Tools - Options - Control Unit - Pump Test - Configuration

After the automatic pump test is configured it may be enabled or disabled using the checkbox listed in step 3 above. The date and time of the next scheduled test is shown in the event log window (display mode „Present Values/Events“) every time you start the Monitoring & Alarm mode (Figure 5.19 1). If the pump test is disabled this is also shown (Figure 5.19 2).

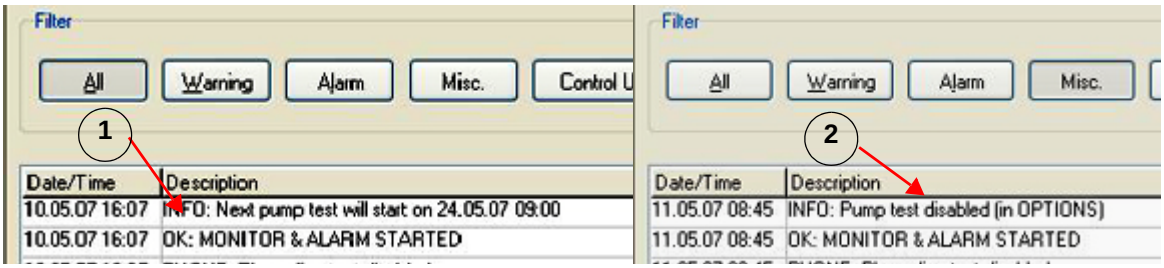



Figure 5.19 Event Log - Pump Test

The automatic pump test is only possible if the BMPC/2 is running in automatic mode!

### 5.5.3 Manual Start of the Pump Test

It is also possible to check the function of the spare pump manually. To start the pump test manually:

1. Select the *OFF* mode in the menu bar.
2. Select *Tools - Options - Pump Control - Pump Test*.
3. Ensure that the checkbox „Enable Automatic Pump Test“ is checked.
4. Press the „Start pump test now“ button (Figure 5.20 1).
5. The pump test will proceed as described in the automatic test. A status bar and text output will show the status of the pump test cycle.

   During the test the P1 field will display the P1 pressure and chart the values over time. Likewise the helium flow will be displayed in the He Flow field and the values over time will be charted. In both cases the x-axis will be adjusted automatically

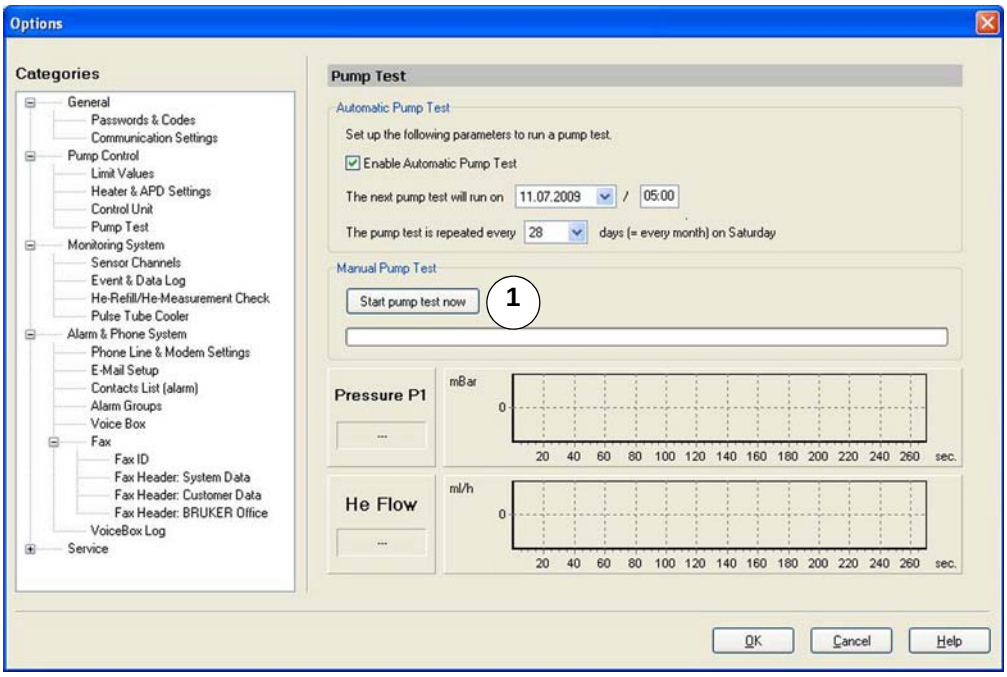



Figure 5.20 Tools - Options - Control Unit - Pump Test

If the automatic pump test is disabled, a faulty backup pump will not be recognized. Thus when the main pump fails there will be no backup up pump which could lead to instabilities of the magnet. This will also trigger an alarm cycle.

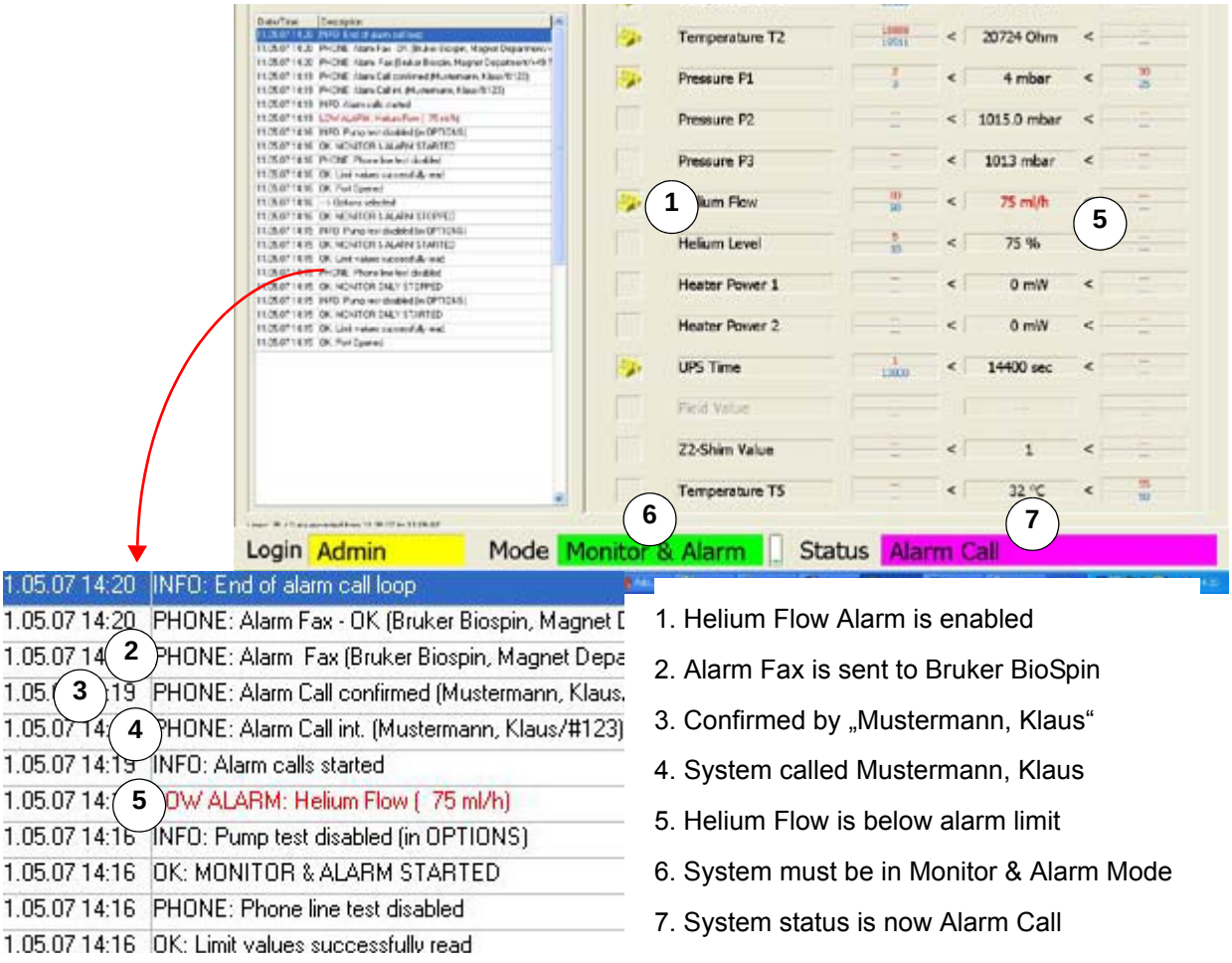
# 6 Alarm System

The alarm system is an important part of the BMPC/2 and is needed for the supervision of the magnet system. The alarm system uses an analog telecommunication network, based on an analog fax modem (with its own modem controller), and normally is available for use worldwide.

## 6.1 Alarm System Function

When the BMPC/2 is working in the Monitor & Alarm mode, all system parameters are continuously monitored and compared with their limit values. When a parameter exceeds or falls below a given alarm limit, an alarm cycle will be started.

In the following example the alarm cycle was triggered because of a low helium flow. The status field shows that an alarm call was activated and the resulting events logged in the Event Log section.




1. Helium Flow Alarm is enabled
2. Alarm Fax is sent to Bruker BioSpin
3. Confirmed by „Mustermann, Klaus“
4. System called Mustermann, Klaus
5. Helium Flow is below alarm limit
6. System must be in Monitor & Alarm Mode
7. System status is now Alarm Call

Figure 6.1 Present Values/Events in Alarm Mode

## 6.2 Alarm Configuration

All channels that have the option „Alarm Trigger“ checked can trigger an alarm cycle. The alarm trigger option can be configured using the function from the menu *Tools - Options - Sensor Channels*.(for additional information see "Sensor Channels" on page 104).

An alarm will also be triggered if the communication between the industrial PC and the BMPC/2 Control Unit (RS232) fails. This may occur, for example, when a power failure occurs, which lasts longer then the backup time of the external UPS, or which is not protected by the external UPS. The PC then will be powered for 30 more minutes using the internal UPS, whereas an alarm cycle can be initiated during this time.

## 6.3 Alarm Sequence

When the system detects a deviation above or below a limit value, then an alarm cycle will be started.

1. After 30 seconds a check will be made to see if the deviation still exists. When the deviation still exists, the alarm cycle will continue (start calling), otherwise, the alarm cycle will be terminated.

   **No Deviation**: Alarm cycle will be terminated

2. When the cycle continues the people from the "Internal Group" (see "Contact List (alarm)" on page 113) are called sequentially. To learn what you have to do when you receive an alarm call, please see "Voice Box System" on page 43.

   **Acknowledgement**: Alarm calls stopped. When the person who has assumed responsibility for the system (by acknowledging the alarm call) switches the system on site to „OFF“ mode, a confirmation fax will be sent to all alarm fax recipients to show that the magnet system is under control.

3. When no acknowledgement takes place the "External Group" is called sequentially.

   **Acknowledgement**: Alarm calls stopped. When the person who has assumed responsibility for the system (by acknowledging the alarm call) switches the system on site to „OFF“ mode, a confirmation fax will be sent to all alarm fax recipients to show that the magnet system is under control.

4. When the fax group is enabled, a fax will be sent to the entire "Fax Group".

5. When this option is enabled, an e-mail will be sent to the entire "E-mail Group".

## 6.4 Alarm Groups

### 6.4.1 Internal Group

Only company internal phone numbers should be assigned to the „Internal Group”. Typically, during the week, the likelihood of reaching someone in the „Internal Group” is high so a response to the alarm should be very fast. Depending of the configuration it may need more than one loop through the „Internal Group” before anyone acknowledges the alarm call using the „Confirmation code”. (see also "Alarm Groups" on page 91).

### 6.4.2 External Group

The „External Group“ list normally stores the private telephone numbers or cell phone number for the individuals responsible for the system. If no one from the internal group acknowledges the alarm, the system will start calling all the people in the „External Group“.

### 6.4.3 Fax Group

When the fax group is enabled, the system will send an alarm fax to all phone numbers in the „Fax Group” during the alarm sequence.

When the person who has assumed responsibility for the system (by acknowledging the alarm call) switches the system on site to „OFF“ mode, a confirming fax will be sent to all alarm fax recipients to show that the magnet system is under control.

### 6.4.4 E-mail Group

This group is optional. When this option is enabled the system will send an e-mail to the E-mail Group.

For information on setting up e-mail for notification, see "E-mail Setup" on page 112.

## 6.5 Stopping the Alarm Sequence

To stop an alarm sequence on site, switch the system to „OFF” mode. Once the problem has been fixed, switch the system to „Monitor & Alarm” mode.

The behavior of the system in the case of an alarm is dependent on the settings.

The behavior described above is the case of the default settings (delivery state).

# Alarm System

# 7 Voice Box System

The voice box system is the telephone interface used for an alarm sequence or for requesting a remote status report.

To control the voice box system a standard Dual-Tone Multi-Frequency (DTMF) telephone (also called touch tone phone) is used. When the system requests an input for the voice box system, this is made by pressing the corresponding button on the DTMF phone.

The voice box system is a spoken menu of sorts. When connected with the system, the user will be asked to press a corresponding number button on the touch tone telephone in response to the system message or to select an option.

## 7.1 Alarm Call from the BMPC/2

When an alarm sequence is activated, the voice box system calls all the telephone numbers on the internal and the external phone list (also see "Contact List" on page 90) until the alarm is confirmed.

| Voice Box System Message | Response Required | Note |
|---|---|---|
| A salutation, followed by a request to press the star button on your touch tone telephone. | Press the **star button** on your touch tone phone. | This message will be repeated for up to 120 seconds. If you do not react during this time or if you hang-up the phone, the next phone number from the contact list will be called. |
| The system status message with a detailed problem description and request for authorization code. | Type in your **authorization code**, then press the star button (see "Password & Codes" on page 97). | Enter the numbers slowly (e.g. 1 second delay between the consecutive numbers), so that the voice box system can recognize the code. |
| Message „You are now responsible for the system“. | If the code is not recognized the authorization code must be entered a second time. | If this also fails, the alarm call will be aborted, letting you know there has been a communication problem and the next telephone number on the contact list then will be called. |

Table 7.1 Responding to an Alarm Call

When you enter the correct code and take over responsibility for the care of the system, the alarm sequence is stopped by the voice box system. The user can then request a report fax or e-mail through the mail menu (see "Voice Box Menu" on page 44).

If no one from the list confirms the alarm the first time, the voice box system will repeat trying to call the until a person is found that enters the correct authorization code.

The number of repetitions that the system will perform can be configured. For details on the alarm cycle refer to the section "Alarm System" on page 39.

## 7.2 Remote Status Request

It is possible to request a status report at any time from any place in the world via a touch-tone phone. To do so:

1. Dial the telephone number from the BMPC/2 modem.
2. Wait for the message greeting.
3. When queried, press the star button.
4. Enter the requested authorization code (see "Password & Codes" on page 97).
5. Press the star button.

You should then hear the actual status of the BMPC II. The program will then proceed to the voice box menu.

### 7.2.1 Voice Box Menu

While in the main menu of the voice box system, you can select between four options using the corresponding code:

- Press ’0’ to leave the system.
- Press ’1’ to enter the fax menu.
- Press ’2’ to hear the system status once more.
- Press ’9’ to enter to the e-mail menu.

### 7.2.2 Fax Menu

There are 4 options available in the fax menu, accessible by pressing the corresponding code number.

- Press ’0’ to exit to the main menu.
- Press ’1’ to request a report fax for the last 24 hours (data log file).
- Press ’2’ to request a report fax for the last 7 days (data log file).
- Press ’3’ to request a report fax for a special period (data log file).

For option ’3’, enter the start and the stop date for the data you want to receive using the date format dd/mm/yy (e.g. for May 11, 2009 enter 110509).

After selecting the period for the fax report, the user will be requested to type in a fax number. There are three options available:

1. You can type in the fax number where you want to receive the status report using the international phone number format (i.e. 49 721 9515149). To finish the input press the star button.

   The system will repeat the phone number. Press ’1’ if the phone number is correct or ’0’ if it is incorrect. In case of a wrong number you will have the opportunity to reenter the correct number.

   The system will then generate an **optimized number,** based on the parameters in "Phone Line & Modem Settings" on page 111.

2. You can type in a fax number including any „pre-codes“. In this case you will need to know the exact international access code, plus any code to get an outside line. **The system will use the exact number that you enter**, it will not optimize it for your area.

   Enter the number using the following format:

   # <code for outside line if required> <international access code> <area code and local fax number>

   For example: #9 011 512 123 4567

   The voice box system will repeat the number and you must confirm it.

3. You can use the **default** fax number which is configured in the "Phone Line & Modem Settings" on page 111. In this case use only the button combination ’#’ ’*’.
   The voice box system will repeat the stored number and you must confirm it.

After finishing the data input the voice box system will disconnect the connection and start the fax transmission.

### 7.2.3 E-mail Menu

There are 4 options available in the e-mail menu, accessible by pressing the corresponding code number.

- Press ’0’ to exit to the main menu.
- Press ’1’ to request a report e-mail for the last 24 hours (data log & event log file).
- Press ’2’ to request a report e-mail for the last 7 days (data log & event log file).
- Press ’3’ to request a report e-mail for a special period (data log & event log file).

For option ’3’, enter the start and the stop date for the data you want to receive using the date format is dd/mm/yy (e.g. for May 11, 2009 enter 110509).

After selecting the period for the e-mail report:

1. Type in a three digit number.
2. The system will repeat the number. Press ’1’ if the is correct or ’0’ if it is incorrect. In case of a wrong number you will have an opportunity to reenter the correct number.

After closing the voice box system the system will send the e-mail to a default e-mail address (normally „bmpc-request@bruker.de”).

The subject line of the e-mail will start with ‘[BmpcEmail#<three digit number>]. This number is a specific ID (i.e. BRUKER service engineer). This ID is used by BRUKER e-mail server to forward the incoming e-mail to the person which has requested the e-mail.

The data log and event log will be sent as two attached files (text file, comma separated format).

### 7.2.4 Using the Voice Box

To speed up the process while working with the voice box system it is possible to enter the corresponding codes while the system is still explaining the options.

For example, if you know which option you want, enter the option when the system begins with the text „You are now in the main menu. Press ’1’ to.....“. When you do this the voice box system will skip the rest of the text and proceed directly to the selected option.

Due to the varying quality of phone lines, it is possible that you need to enter the correct data more then once, before the voice box system recognizes it. Do not enter the DTMF data too quickly, rather use short delays (e.g. 1 second) between the button inputs.

When the line quality is very bad it might help to hang-up and establish a new connection to the voice box system.

# 8 Hardware Overview

## 8.1 System Block Diagram

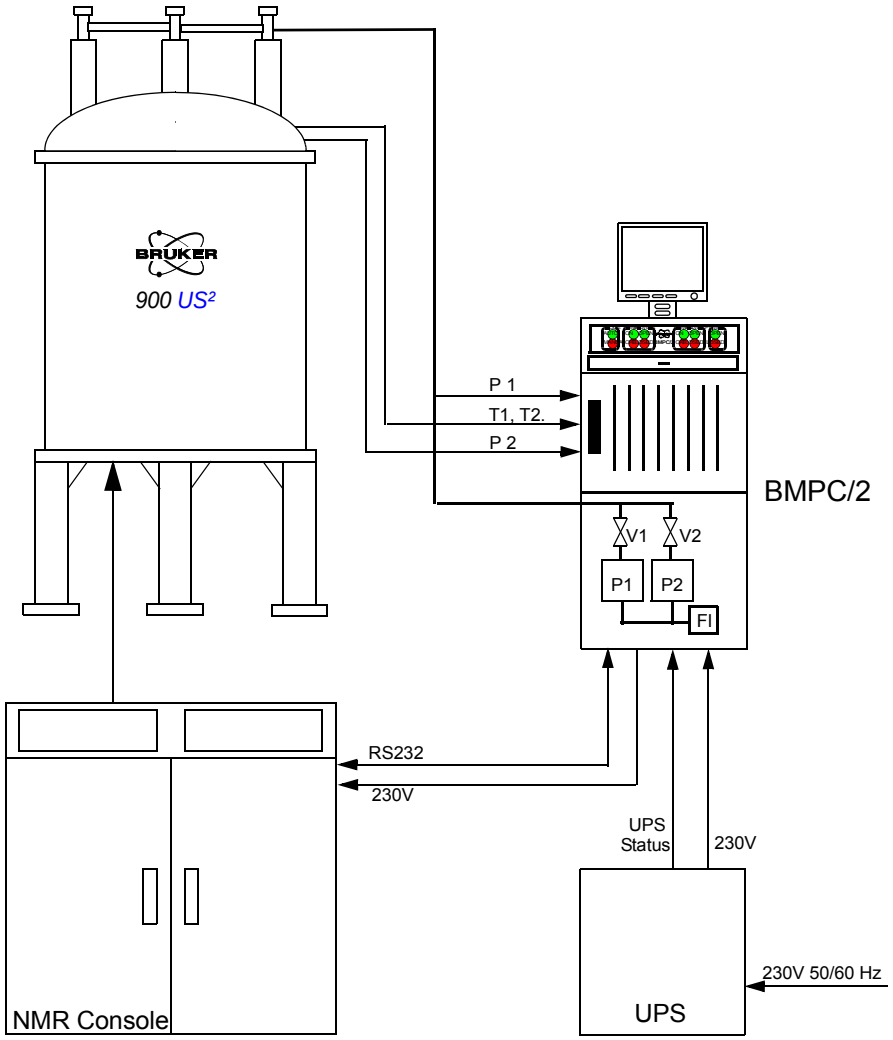



Figure 8.1 System Block Diagram

## 8.2 The BMPC/2 Magnet Pump Control

The BMPC/2 Magnet Pump Control Unit (P/N H13031) is equipped with:

- a "TFT Display",
- the "BMPC/2 Control Unit",
- the "Industrial PC",
- an additional "UPS" (Uninterruptable Power Supply),
- a "Pump Cabinet" (both vacuum pumps, their according valves, flow meter), and
- the "BMPC/2 Line Control Unit".

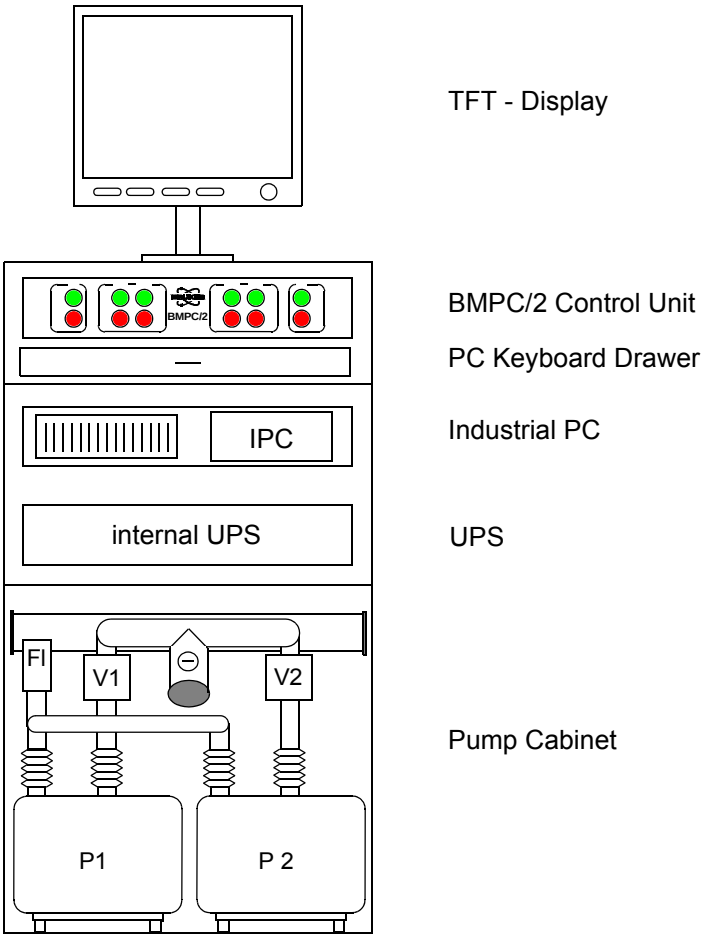



Figure 8.2 General Structure of the BMPC/2 Magnet Pump Control

### 8.2.1 TFT Display

The system utilizes a standard 19“ TFT display with a resolution of 1280 x 1024 pixels. The display also includes a 2 port USB hub for use with accessories.

### 8.2.2 BMPC/2 Control Unit

The BMPC/2 Control Unit (P/N H13029) consists of the following main components:

| Component | Description |
|---|---|
| BMPC/2 Manual Control Board | This board (P/N H13024) is used for manual control of the pumps and valves. |
| BMPC/2 Automatic Control Board | This Board (P/N H13022) is used to fulfill the following functions:<br>• CAN bus master.<br>• Output controller for pumps and valves.<br>• Interface to the industrial PC (RS232).<br>• Temperature measurement inside pump cabinet. |
| Power Supply | Power Supply Cosel LEB 100F (P/N 85348)<br>5V 5A<br>24V 4A<br>The power supply is used to supply the BMPC/2 control unit and the wiring box. |
| Absolute Pressure Device | The Absolute Pressure Device (APD) (P/N 87488) is used to control the pressure P2 in the helium tank of the magnet. It is controlled via the CAN bus. |

Table 8.1 BMPC/2 Control Unit Components

### 8.2.3 Industrial PC

Industrial PC with Windows XP meeting at least the following minimum requirements:

- Pentium M 2 GHz
- 512MB Ram
- 40GB Hard Disk
- DVD ROM
- 2 serial Ports (RS232)
- 19" rack mount 2HE
- Analog Voice Fax Modem (PCI)

### 8.2.4 UPS

Uninterruptable Power Supply (ECL < 01.00: P/N O10440; ECL ≥ 01.00: P/N 1802515)

- Input: 208V, 200V*, 208V**, 220V, 230V (default), 240V

  *100V and 200V are derated by 20%
  **110V and 208V are derated by 10%

  Voltage range at 100%: 180-276 Vac.
- 1000VA
- Bridging time: 7 minutes at full output load (1000VA)
- 19“ rack mount 2HE

For more details refer to the separate UPS manual.

### 8.2.5 Pump Cabinet

The pump cabinet consists of:

- 2 vacuum pumps (P1 and P2) and 2 valves (V1 and V2), connected to the pumping line.
- A helium flow meter which measures the helium flow at the exhaust of both pumps. The flow meter (P/N 87487) is connected to the BMPC/2 control unit via the CAN bus.
- A temperature sensor (PT100) to measure the temperature T5 inside the pump cabinet.

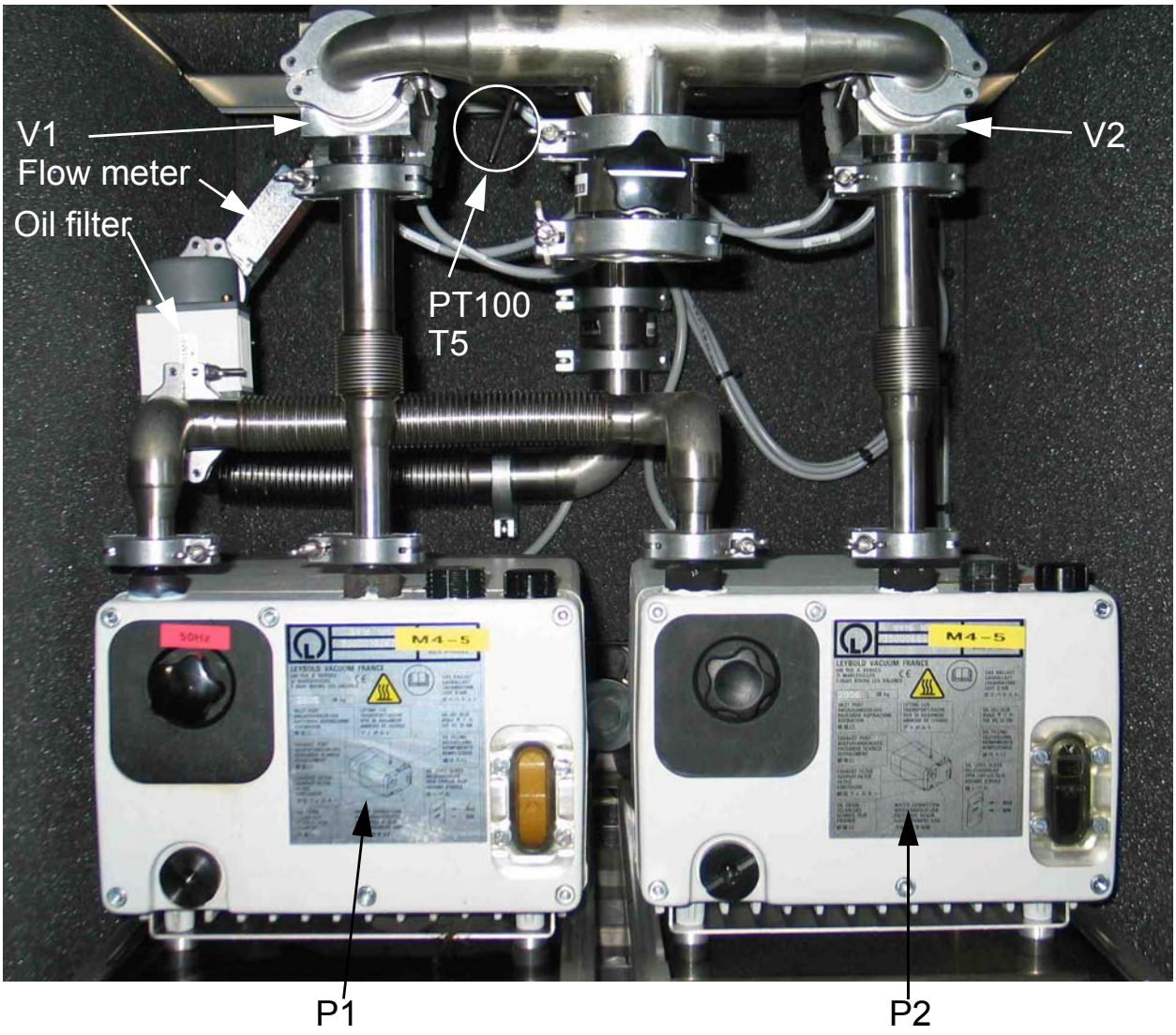



Figure 8.3 Pump Cabinet

### 8.2.6 BMPC/2 Line Control Unit

The BMPC/2 Line Control Unit is used as an interface between the BMPC/2 control unit, the vacuum pumps and their corresponding valves. All fuses, motor protection switches, conductors and relays needed for the function of the BMPC/2 are part of this unit.

The line control unit is located in the upper rear part of the BMPC/2. To access the line control unit, you have to open the upper rear door using a screwdriver to turn both screws (quarter turn to the left). The door can then be easily removed.

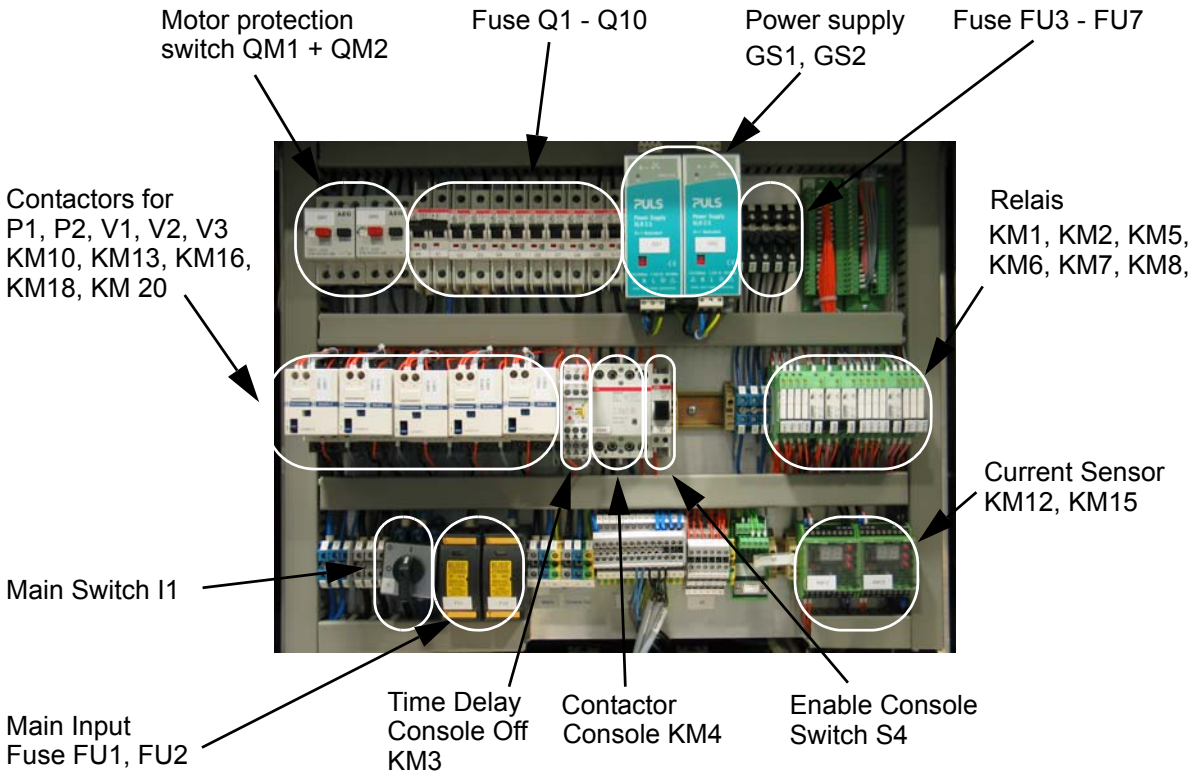



Figure 8.4 BMPC/2 Line Control Unit

| Fuse | Purpose of Fuse | Value |
|---|---|---|
| Q1 | Main fuse for:<br>Power Supply GS 1/2, Pump 1/2, Valve 1/2/3, Warning Lamp, Industrial PC, Control Unit, Fan 1/2/3 (Ventilator 1/2/3) | 16A |
| Q2 | Cryo Platform Out (X4:26) | 6A |
| Q3 | Console Out (X3:4) | 30A (ECL00: 32) |
| Q4 | Valve 1 (X4:17) | 6A |
| Q5 | Valve 2 (X4:18) | 6A |
| Q6 | Valve 3 (X4:19) | 6A |
| Q7 | Warning Lamp (X4:20) | 4A |
| Q8 | Cryo-PSU (X4:27) | 16A |
| Q9 | Industrial PC/Monitoring System (X4:21) | 4A |
| Q10 | Control Unit (X4:22) | 6A |
| FU1, 2 | Main Fuses - Main Input | 50A<br>P/N: 87570 |
| FU3 | Power Supply - GS1 | 0.4A/T<br>BRUKER P/N: 2247 |
| FU4 | Power Supply - GS2 | 0.4A/T<br>BRUKER P/N: 2247 |
| FU5 | Fan 1 (Ventilator 1) | 0.1A/T<br>BRUKER P/N: 2241 |
| FU6 | Fan 2 (Ventilator 2) | 0.1A/T<br>BRUKER P/N: 2241 |
| FU7 | Fan 3 (Ventilator 3) | 0.1A/T<br>BRUKER P/N: 2241 |

Table 8.2 Fuse Overview

## 8.3 BMPC/2 Wiring Box

The BMPC/2 Wiring Box (P/N H13030) is mounted on a flange in the upper region of the magnet. It is designed as a CAN BUS slave and connects the BMPC/2 to the temperature sensors T1 and T2 and to the heater resistors for H1 and H2. The wiring box also contains a small LC display where the main magnet parameters and system messages can be viewed.


*Wiring Box*
*Heater H1 connector*

*Connect cable HZ13813*
*to this connector and*
*to flange 2 St. A*

*Wiring Box*
*T1, T2, H2 connector*

*Connect cable HZ13811*
*to this connector and*
*to flange 1 St. A*

*Wiring Box*
*Power supply connector*
*to BMPC/2 control uni*

*Connect cable HZ13592*
*to this connector*

*Wiring Box*
*CAN bus connector*
*to P1 sensor*

*Connect cable 87496*
*to this connector*

*Wiring Box*
*Can Bus connector*
*to BMPC/2 control unit*

*Connect cable 87497*
*to this connector*

Figure 8.5 BMPC/2 Wiring Box

## 8.4 CAN Bus

A Controller Area Network (CAN) bus is an industrial standard bus used to establish communication between all the sensors, the BMPC/2 wiring box, and the BMPC/2.

### 8.4.1 CAN Bus Structure

The BMPC/2 control unit is designed as a CAN bus master. This means all communication on the bus is controlled and monitored from this master.

All sensors and the BMPC/2 wiring box are designed as CAN bus slaves. The BMPC/2 wiring box is also able to fullfill CAN bus master functions in case the BMPC/2 control unit is not functioning.

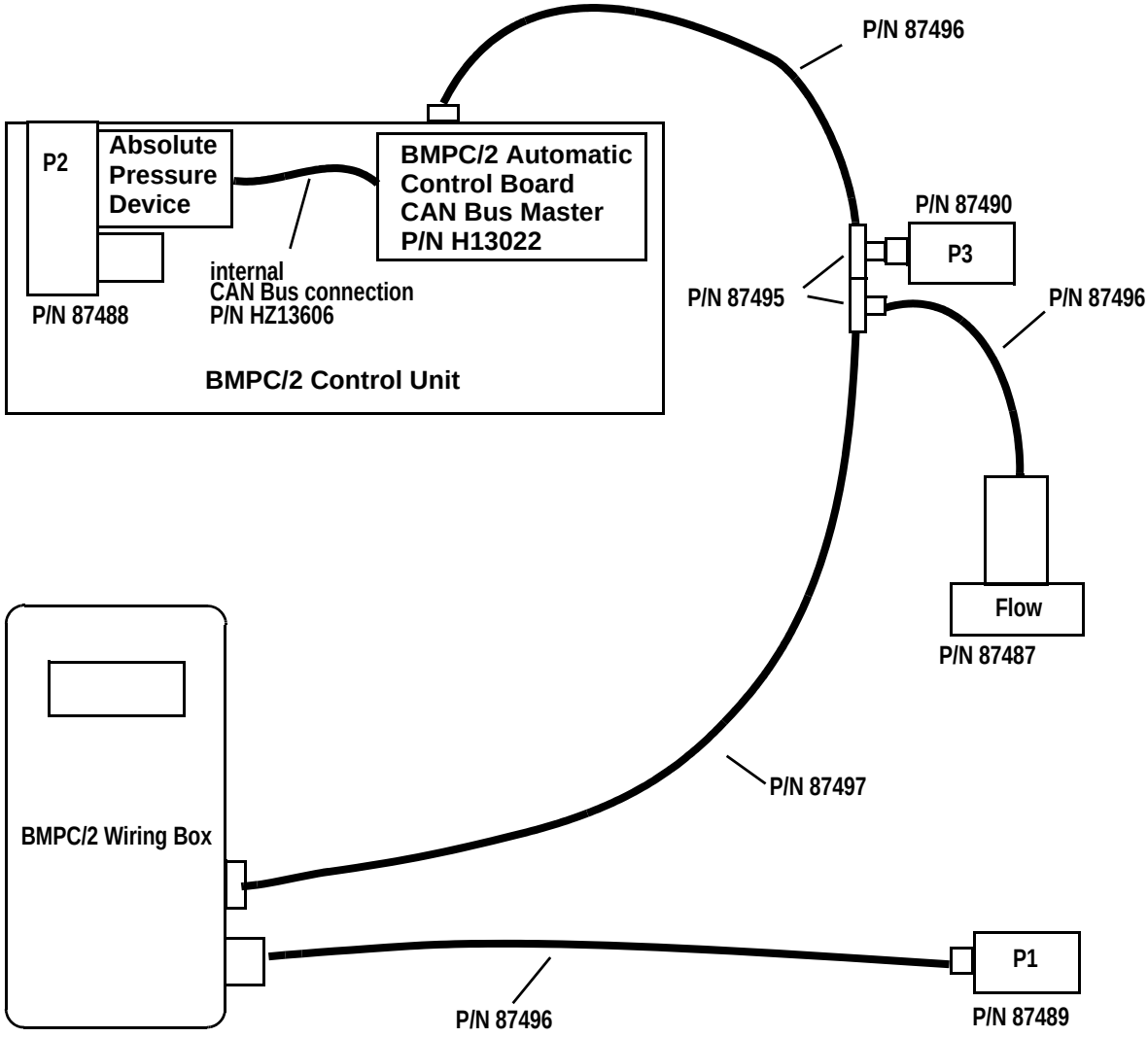



Figure 8.6 CAN Bus Structure

## 8.5 Wiring Overview

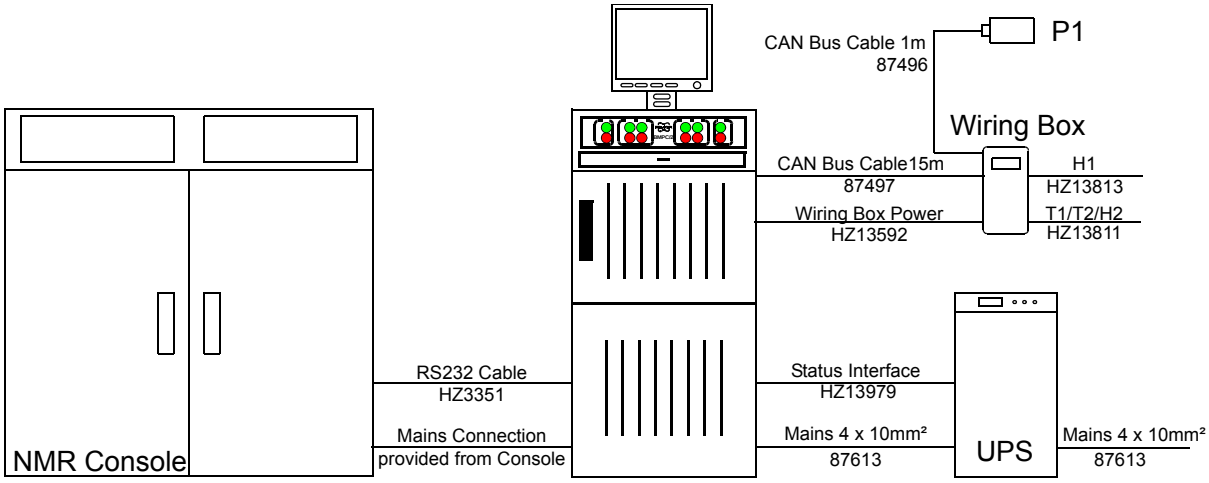



Figure 8.7 External Wiring Overview

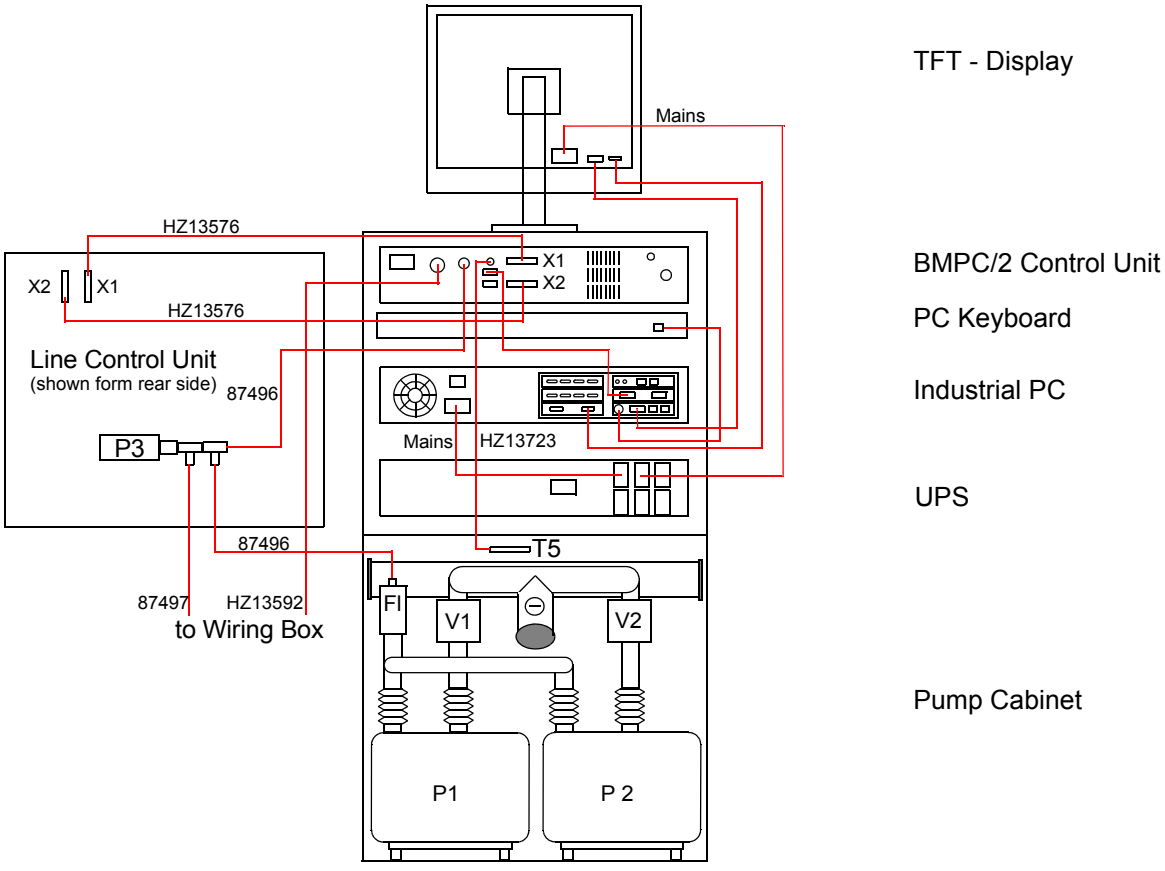



Figure 8.8 Internal Wiring Overview

## 8.6 Electrical Connections Overview

### 8.6.1 BMPC/2 Control Unit

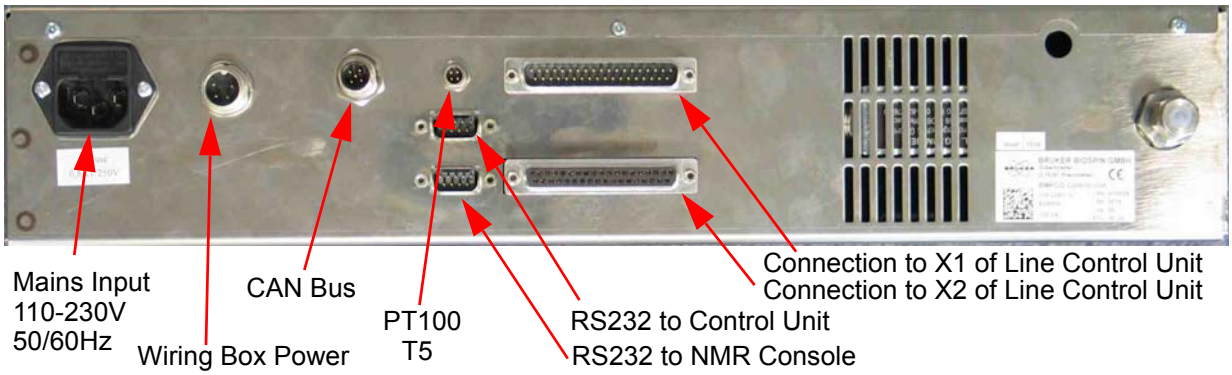



Figure 8.9 BMPC/2 Control Unit Rear Panel

### 8.6.2 Industrial PC

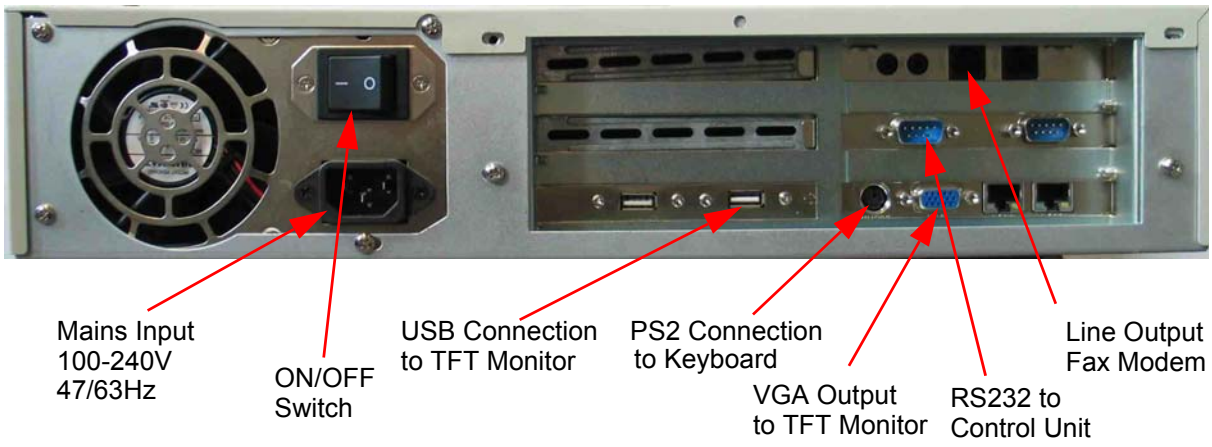



Figure 8.10 Industrial PC Rear Panel

### 8.6.3 UPS

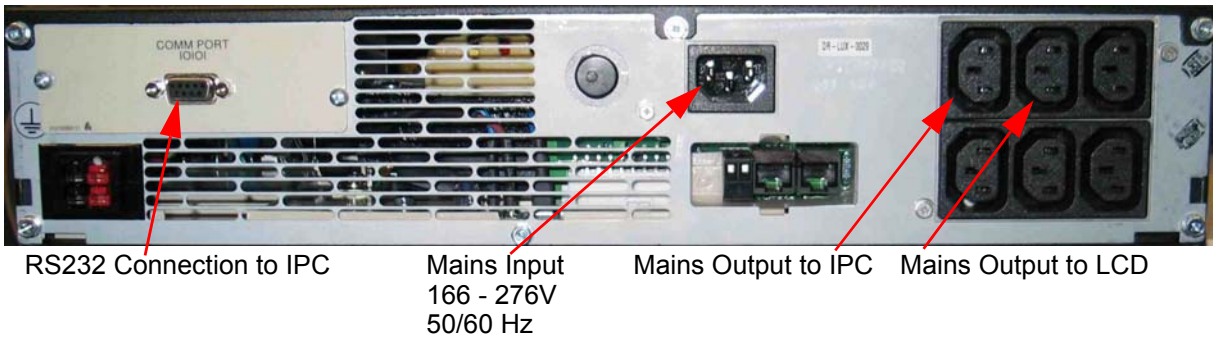



Figure 8.11 UPS - Uninterruptible Power Supply (P/N O10440)

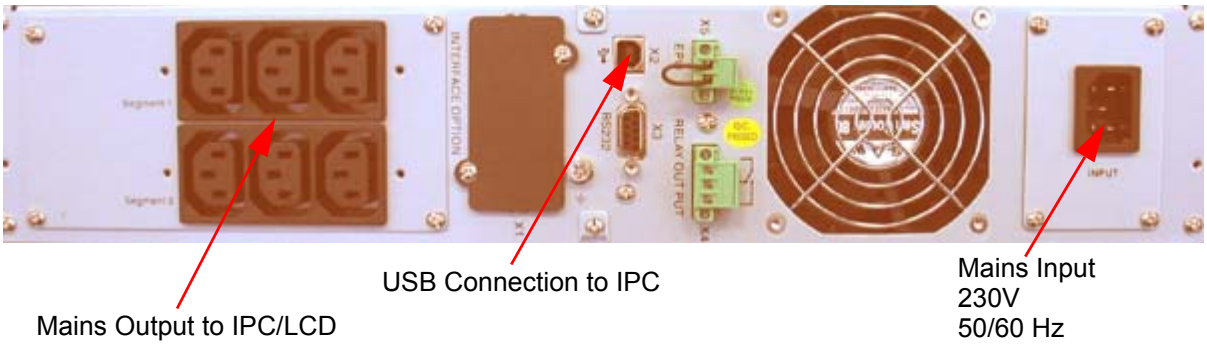



Figure 8.12 UPS - Uninterruptible Power Supply (P/N 1802515)

## 8.6.4 Line Control Unit

### 8.6.4.1 Connector X3 / X4 / X5

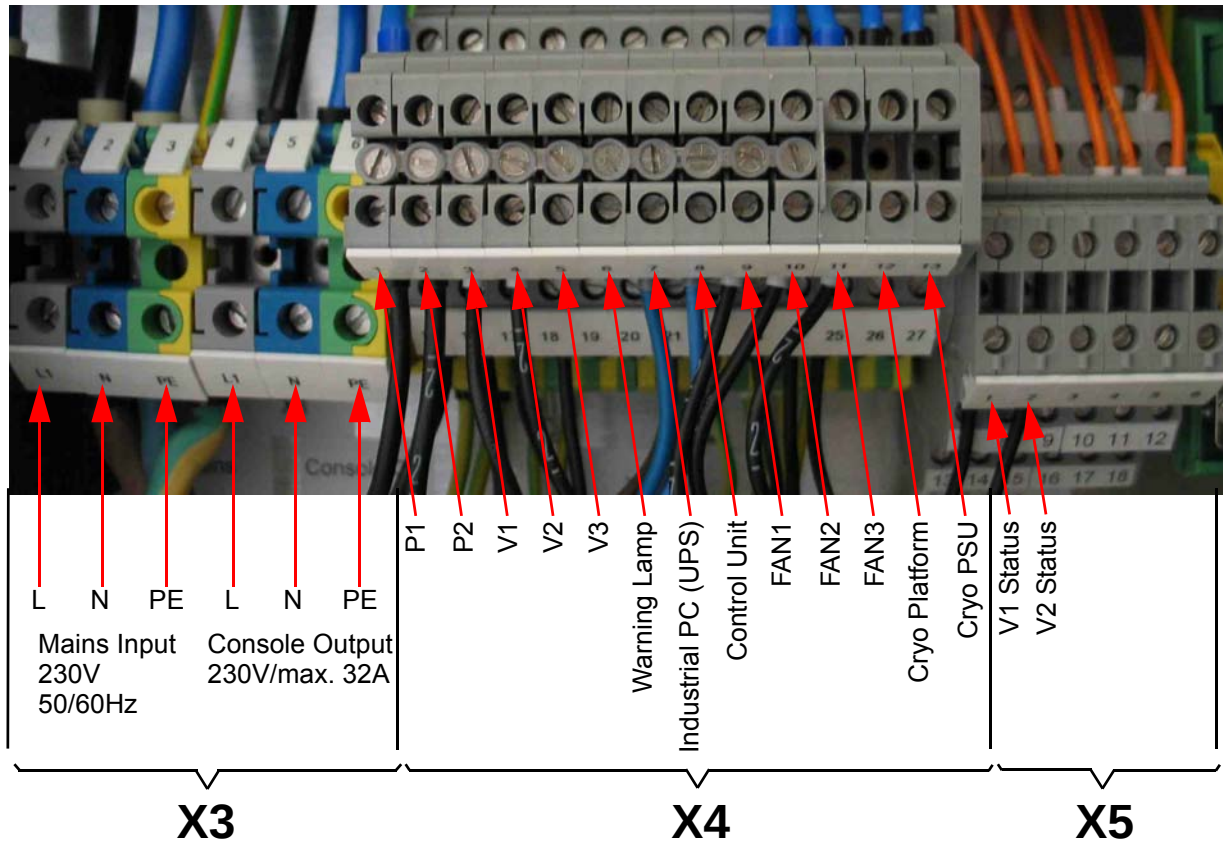



Figure 8.13 Line Control Unit Connector X3 / X4 / X5

| | Neutral | Line | PE |
|---|---|---|---|
| Mains Input | 2 | 1 | 3 |
| Console Output | 5 | 4 | 6 |

Table 8.3 Pin Count Connector X3

| Output | Neutral | Line | PE |
|---|---|---|---|
| P1 | 1 | 15 | 29 |
| P2 | 2 | 16 | 30 |
| V1 | 3 | 17 | 31 |
| V2 | 4 | 18 | 32 |
| V3 | 5 | 19 | 33 |
| Warning Lamp | 6 | 20 | 34 |
| Industrial PC | 7 | 21 | 35 |
| Control Unit | 8 | 22 | 36 |
| FAN 1 | 9 | 23 | 37 |
| FAN2 | 10 | 24 | 38 |
| FAN 3 | 11 | 25 | 39 |
| Cryo Platform | 12 | 26 | 40 |
| Cryo PSU | 13 | 27 | 41 |

Table 8.4 Pin Count Connector X4

| Pin No. | Function | Pin No. | Function | Pin No. | Function |
|---|---|---|---|---|---|
| 1 | Valve1 Pin b | 7 | NC | 13 | Valve1 Pin d |
| 2 | Valve2 Pin b | 8 | NC | 14 | Valve2 Pin d |
| 3 | NC | 9 | NC | 15 | NC |
| 4 | NC | 10 | NC | 16 | NC |
| 5 | NC | 11 | NC | 17 | NC |
| 6 | NC | 12 | NC | 18 | NC |

Table 8.5 Pin Count Connector X5

NC = Not Connected

### 8.6.4.2 Connector X6 UPS Status Interface

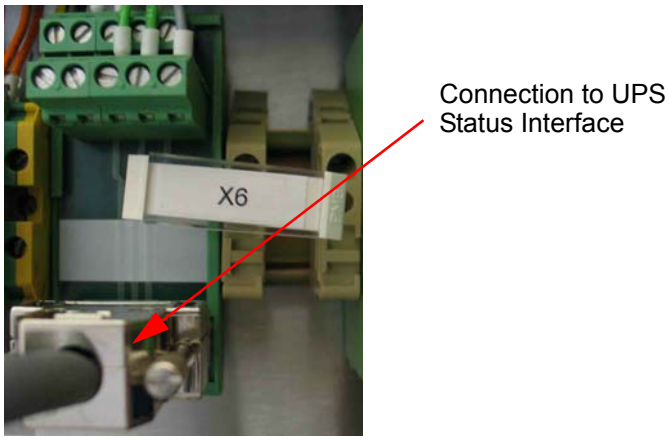



Figure 8.14 Line Control Unit Connector X6

| Pin Number | Pin Function |
|---|---|
| 1 | Not connected |
| 2 | Not connected |
| 3 | General alarm (normally opened) |
| 4 | On commercial AC (normally opened) |
| 5 | Ground |
| 6 | UPS on bypass (normally opened) |
| 7 | Battery low (normally opened) |
| 8 | UPS present (normally closed) |
| 9 | Not connected |

Table 8.6 Pin Count Connector X6

The cable HZ13979 must be connected to connector X6 or it is not possible to switch on the console output and to detect commercial power failures.

# 9 Maintenance and Cleaning

## 9.1 Maintenance Work

To prolong the life of the BMPC/2, Bruker recommends that the maintenance work in this chapter be carried out on a regular basis.

### 9.1.1 Exchanging the Internal UPS Battery

The batteries for the internal UPS (Uninterruptable Power Supply) have a limited life-time. After 4 to 6 years the capacity normally is reduced significantly.

Bruker recommends that the batteries be exchanged every 5 years. Please call Bruker service for assistance.

**⚠ WARNING**

**High voltage present inside the UPS**

There is high voltage present inside the UPS, even when the UPS is switched off or disconnected!

► Exchanging the batteries must be done by trained personal.

When the „Battery Fault“ indicator appears during operation, refer to the appropriate chapter in the UPS manual for troubleshooting instructions.

## 9.2 Cleaning

No special cleaning have to be carried out. Impurities can be cleaned using a standard household cleaner and cleaning tissues.

Do not use strong cleaning solvents, as they may damage the surface of the BMPC/2.

To clean the LCD panel use a special LCD detergent manufactured for this purpose.

# 10 Setup and Diagnostics Tool

The BMPC/2 Setup Tool is used to:

- Download new firmware.
- Recalibrate the temperature sensors for T1 and T2.
- Perform CAN bus diagnostics.

To use the setup tool, first stop and close the BMPC/2 control program.

## 10.1 Starting the Setup Tool

If you are logged in as Windows Administrator you can start the setup tool by clicking the corresponding setup tool icon. If you are logged in as a standard Windows user use the Windows XP *Start* feature to start the program.

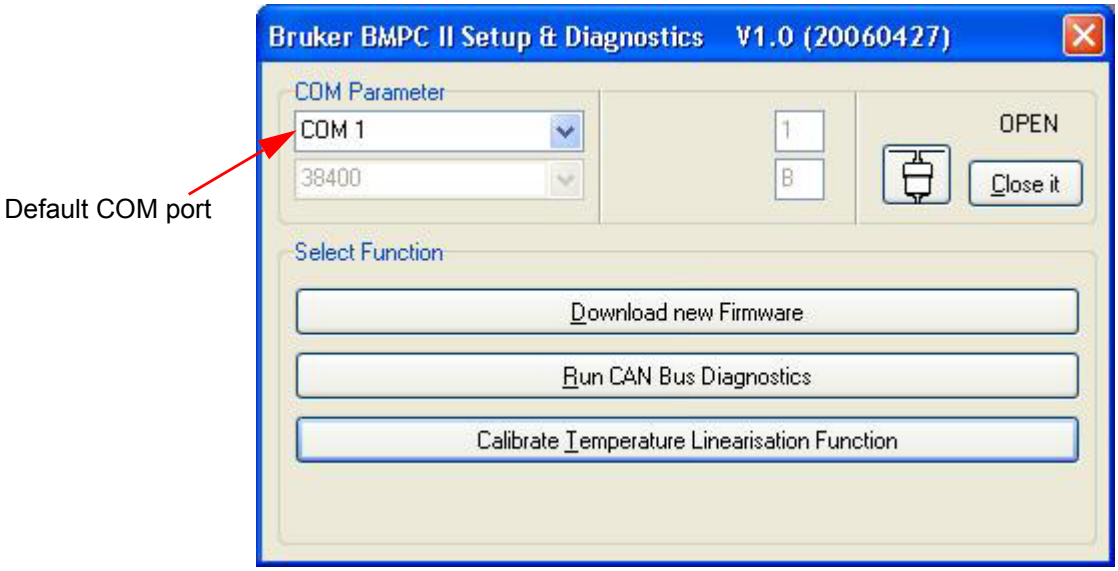



Figure 10.1 Setup Tool Start Window

## 10.2 Downloading New Firmware

This function is used to download a new firmware version simultaneously to the BMPC/2 Control Unit and Wiring Box. The firmware download typically requires around 10-12 minutes.

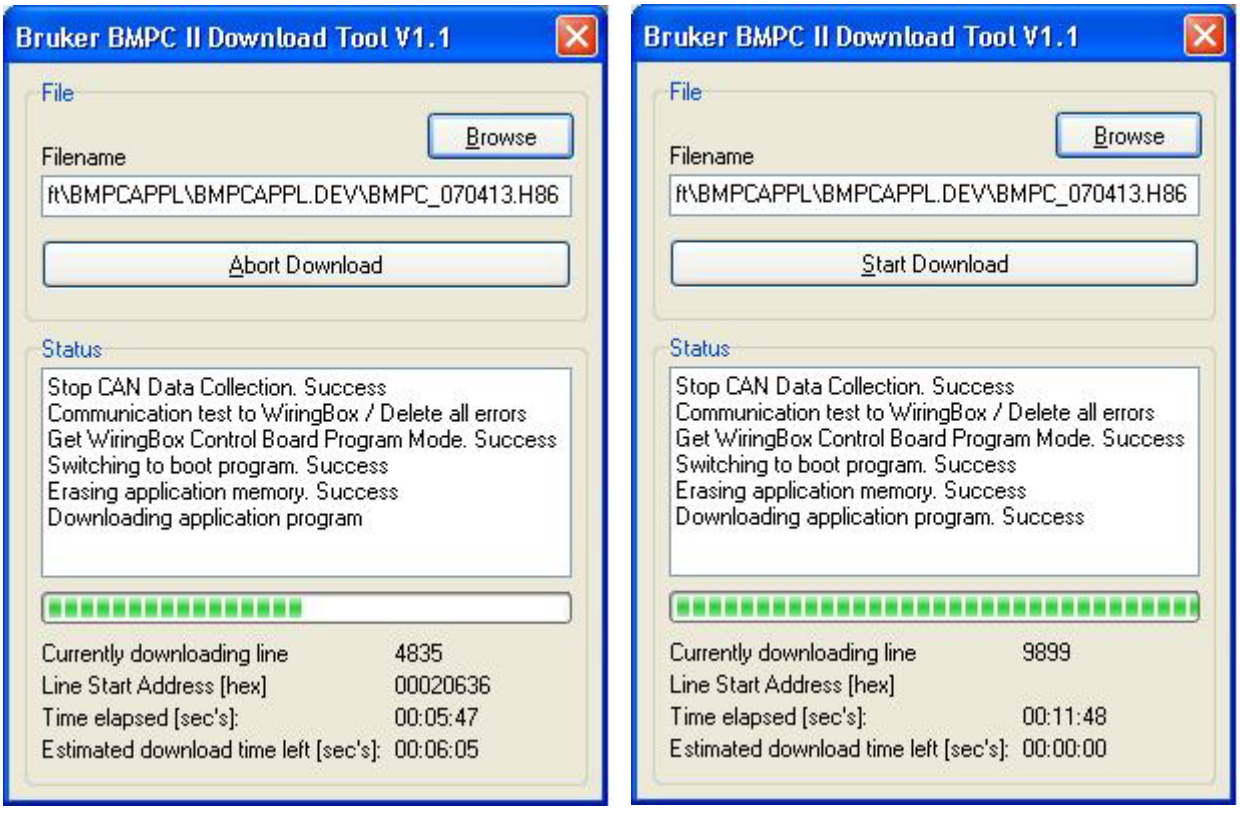
i Notice: Take care when exchanging the Control Unit or Wiring Box, that the same firmware is on the Control Unit and the Wiring Box. The firmware on both units must be the same!

Normally a BMPC/2 Control Software version works only with a corresponding firmware version in the Control Unit and the Wiring Box. For example, the firmware „BMPCAPPL_100201v5.0.H86 has the release date of February 1, 2010, and Version 5.0. When the BMPC/2 is started, it checks if the version V5.0 corresponds to the internal stored version Vx.y. If the major release value („x“) is equal, the software will start, otherwise a warning window will appear and the software will not start.

After selecting this function, browse for the actual firmware file which should be stored before in the directory:

c:\program files\bruker\bmpc2\Firmware\bmpc*.h86

After selecting the current version, you can start the download by pressing the button *Start Download*.




Download in progress

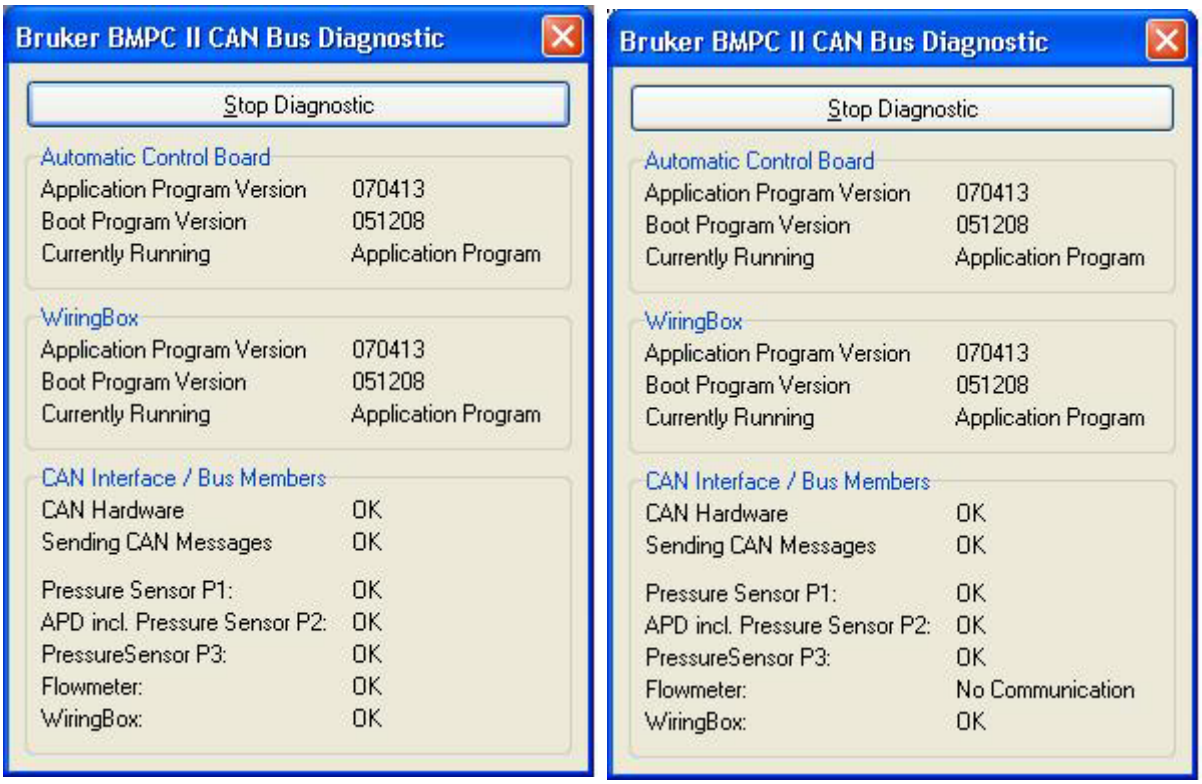
Download finished

Figure 10.2 Setup Tool - Download

When a download process terminates without finishing the download, an error message is displayed. In this case you will need to try again. Should the download fail a second time, call Bruker service for assistance.

## 10.3 Run CAN Bus Diagnostic

If there are functional problems with the CAN bus, you can use the CAN Bus Diagnostics to search for the problem. After starting this function, all CAN bus functions will be checked to see if they operate correctly.




Test finished CAN BUS OK

Test finished flow meter failed

Figure 10.3 Setup Tool - Can Bus Diagnostic

In the above example a communication problem with the flow meter was detected.

If the test fails, read the section "When the Value of a Parameter is Displayed as NAN" on page 79 for tips on handling this problem. If this does not help contact Bruker service for assistance.

## 10.4 Calibrate Temperature Linearization Function

This function is used to recalibrate the temperature sensors for T1 or T2. To use this function you need both calibration connectors BMPC/2 T1/T2 Calibration Connector High (P/N HZ13703) and BMPC/2 T1/T2 Calibration Connector Low (P/N HZ13704).

Start the calibration by selecting the Calibrate Temperature Linearization Function.

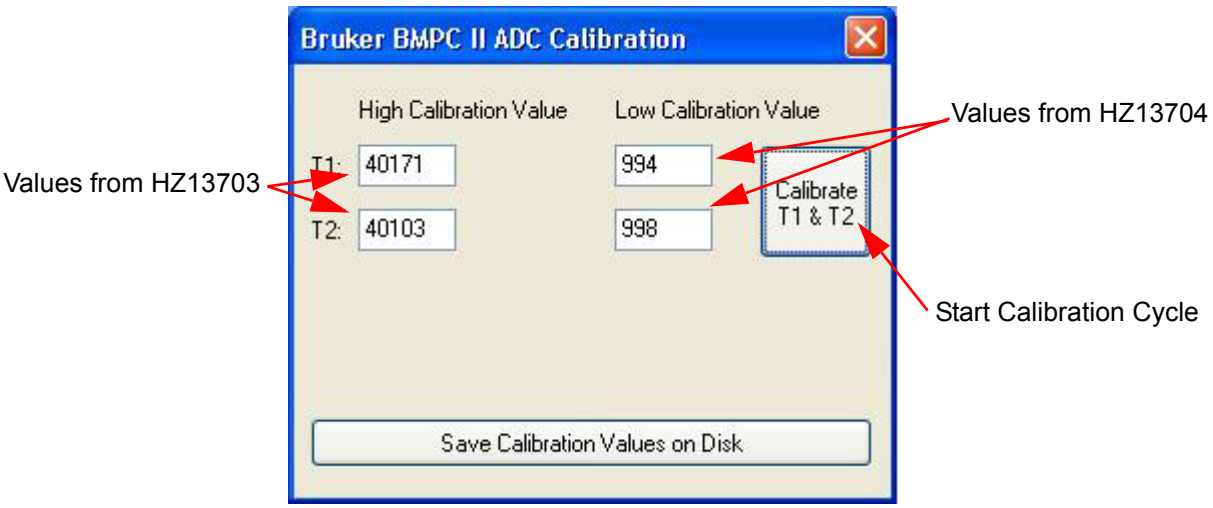



Figure 10.4 Setup Tool - Calibrate Temperature

1. First input the values of both calibration connectors in the fields shown in the figure above and press the **Save Calibration Values on Disk** button. These values are printed on a small label on the calibration connector. Once entered the values will be stored on the hard drive for future use.
2. Press the button *Calibrate T1 & T2* and follow the instructions that will be displayed.

i Store the calibration connectors very carefully. Without these parts it is not possible to recalibrate the BMPC/2.

# 11 Troubleshooting

## 11.1 Information Window Messages

When an error occurs an error message is displayed inside the information (Info) window and must be acknowledged by the user.

These error messages typically need intervention by the user. For example, the error message „Warning possible fan failure pump cabinet“ may be generated because of a faulty fan inside the pump cabinet. This should alert the user to check the function of the three fans inside the pump cabinet.

After the error has been corrected, the error message can be acknowledged by pressing the **Acknowledge** button. If the error still remains, it is possible that the same error message will be repeated a few minutes later.

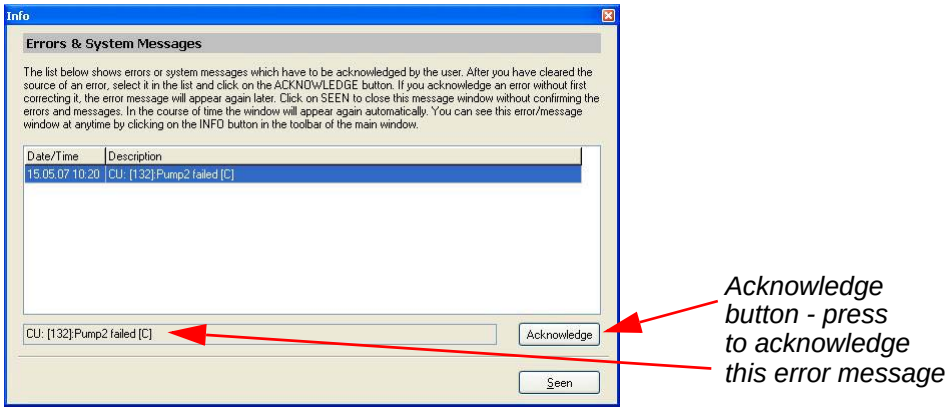



Figure 11.1 Information Window

The information can be closed temporarily by pressing the **Seen** button. The error messages will be periodically displayed in the information window as long as they have not been acknowledged. If all the error messages have been acknowledged, then the information window will remain closed.

## 11.1.1 Description of Error Messages

The following section contains a description of some of the common error messages that might be displayed, as well as a solution to the problem.

### 11.1.1.1 Limit Data P1 failed

It was not possible to read the limit data for the pressure P1 from the EEProm, thus supervision of the Pressure P1 is not possible.

**Solution:** Using the function „Read from Backup Database“ from the menu *Tools - Options - Limit Values (see* "Limit Values" on page 100) you are able to read the limit values stored on the PC’s hard disk.

To solve this problem you will need to reload the values from the backup database to the BMPC/2 Control Unit using the „Write Values“ function.

### 11.1.1.2 Limit Data T1 Failed

It was not possible to read the limit data for the temperature T1 from the EEProm, thus supervision of the temperature T1 is not possible.

**Solution**: Reload the values from the backup database to the BMPC/2 as shown for Limit Data P1 fail.

### 11.1.1.3 Limit Data T2 Failed

It was not possible to read the limit data for the temperature T2 from the EEProm, thus supervision of the temperature T2 is not possible.

**Solution**: Reload the values from the backup database to the BMPC/2 as shown for Limit Data P1 fail.

### 11.1.1.4 Limit Data T5 Failed

It was not possible to read the limit data for the temperature T5 from the EEProm, thus supervision of the temperature T5 is not possible.

**Solution**: Reload the values from the backup database to the BMPC/2 as shown for Limit Data P1 fail.

### 11.1.1.5 Limit Data Flow Failed

It was not possible to read the limit data for the helium flow FI from the EEProm, thus supervision of the helium flow FI is not possible.

**Solution**: Reload the values from the backup database to the BMPC/2 as shown for Limit Data P1 fail.

#### 11.1.1.6 Limit Data Helium Level Failed

It was not possible to read the limit data for the helium level from the EEProm, thus supervision of the helium level is not possible.

**Solution**: Reload the values from the backup database to the BMPC/2 as shown for Limit Data P1 fail.

#### 11.1.1.7 Calibration T1 Failed

It was not possible to read the calibration values for the calculation of the magnet temperature T1 from the EEProm, thus calculation and supervision of the temperature T1 is not possible.

**Solution:** A software reset of the BMPC/2 Control Unit usually helps (see also "Control Unit" on page 103). If not, you will need to recalibrate the temperature T1 (see also chapter "Calibrate Temperature Linearization Function" on page 68).

#### 11.1.1.8 Calibration T2 Failed

It was not possible to read the calibration values for the calculation of the magnet temperature T2 from the EEProm, thus calculation and supervision of the temperature T2 is not possible.

**Solution:** A software reset of the BMPC/2 Control Unit usually helps (see also "Control Unit" on page 103). If not, you will need to recalibrate the temperature T2 (see also chapter "Calibrate Temperature Linearization Function" on page 68).

#### 11.1.1.9 Calibration T5 Failed

It was not possible to read the calibration values for the calculation of the pump cabinet temperature T5 from the EEProm, thus calculation and supervision of the temperature T5 is not possible.

**Solution:** A software reset of the BMPC/2 Control Unit usually helps (see also "Control Unit" on page 103).

#### 11.1.1.10 Heater Initialization Failed

The initialization values for the pressure regulation for pressure P2 using the magnet heater could not be read from the EEProm, thus the pressure regulation could not be activated.

**Solution:** Reenter the data for the pressure regulation using the menu *Tools - Options - Heater & APD Setting*.

#### 11.1.1.11 Resistor Initialization Failed

It was not possible to read the data for the heater resistors H1 and H2 from the EEProm. For the calculation of the heater power, the default values are used (100 Ohm), therefore the calculation may be wrong.

**Solution:** Reenter the data for the heater resistor using the menu *Tools - Options - Heater & APD Setting*.

#### 11.1.1.12 APD Initialization Failed

It was not possible to read the configuration data for the absolute pressure device (APD) from the EEProm, thus the pressure regulation via the APD could not be started.

**Solution:** Reenter the data for the heater resistor using the menu *Tools - Options - Heater & APD Setting*.

#### 11.1.1.13 Heater Regulation Initialization Failed

The parameters for the pressure regulation using the heater H1 could not be read from the EEProm, thus the default data was loaded. This data may not be optimal for your type of magnet, and therefore the pressure regulation may be imprecise.

#### 11.1.1.14 Warning, Power Supply GS1 failed

The power supply GS1 in the BMPC/2 Line Control Unit failed.

**Solution:** The redundant power supply GS2 has taken over the function of GS1. Please check the GS1 fuse as shown in section "Exchanging the GS1 or GS2 Power Supply Fuses" on page 85**.** If this does not solve the problem the power supply GS1 must be replaced with a new one. Please contact your local Bruker Service department.

The Bruker part number for this power supply is: **87491**.

#### 11.1.1.15 Warning, Power Supply GS2 failed

The power supply GS2 in the BMPC/2 Line Control Unit failed.

**Solution:** The redundant power supply GS1 has taken over the function of GS2. Please check the GS2 fuse as shown in section "Exchanging the GS1 or GS2 Power Supply Fuses" on page 85**.** If this does not solve the problem the power supply GS2 must be replaced with a new one. Please contact your local Bruker Service department.

The Bruker part number for this power supply is: **87491**.

**NOTICE**

**Power Supply Failure**

Even though the BMPC/2 works with a faulty power supply, it is strongly recommended that you replace the fuse and/or the power supply as soon as possible. If the second redundant power supply also fails you can no longer control the BMPC/2.

- ▶ Replace the fuse and/or power supply as soon as possible.

#### 11.1.1.16 Warning, Possible Fan Failure Pump Cabinet

A strong temperature rise inside the pump cabinet could be caused by a defective fan.

**Solution:** Check the fans inside the pump cabinet to see if they are functioning. It is possible that a fuse from one of the fans has blown. For instructions on how to exchange a fuse please read the section "Exchanging the Pump Cabinet Ventilator Fuse" on page 84.

**Remark:** This situation also can appear while opening or closing the front door of the pump cabinet.

#### 11.1.1.17 Helium Measurement Error

The value for the helium level has not changed for a longer period of time, which indicates that the value for the helium level is probably wrong. For more information read the section ""He-Refill / He Measurement" on page 106.

**Solution:**

1. Check the function of the Helev transfer program. This program transfers the helium level information and some other data once a day from the BSMS to the BMPC/2. This program must be running in order for the BMPC/2 to receive the newest data.
2. Check for a good cable connection between the He-Lev Sensor and the BSMS.
3. The calibration of the He-Lev Sensor may also be wrong.

#### 11.1.1.18 Pump 1 Failed

Pump P1 has failed or does not work correctly. If the pump was working in automatic mode the BMPC/2 is now using pump P2.

**Solution:**

1. Switch to manual pump mode.
2. Switch on P1, but do not open valve V1, and check to see if the pump is working correctly.
3. If not, check the motor protection switch QM1. To do this open the upper rear panel of the BMPC/2, QM1 is located on the upper left side of the BMPC/2 line control unit.

4. Press the black QM1 button and check if the pump now works.
5. If the pump still does not work, check the on/off switch for the pump itself. The on/off switch is located near to the mains cable input of the pump.
6. If the pump still fails, it must be replaced.

For instruction on how to exchange a pump please read section "Replacing the Vacuum Pump" on page 80.

#### 11.1.1.19 Valve 1 Failed

The valve V1 could not be switched or is not working correctly.

**Solution:**

1. Switch to the manual pump mode.
2. Switch on pump P1, and check the function of the valve by switching it on and off.
3. If the valve does not work, check the fuse Q4. To do this open the upper rear panel of the BMPC/2, the Q4 fuse is located on the upper left side of the BMPC/2 line control unit. The black Q4 switch must be in the up position.
4. Recheck if the valve works, if it still does not work call bruker service for assistance.

#### 11.1.1.20 Pump 2 Failed

Pump P2 has failed or does not work correctly. If the pump was working in automatic mode the BMPC/2 is now using pump P1.

**Solution:**

1. Switch to the manual pump mode.
2. Switch on P2, but do not open valve V2, and check to see if the pump is working correctly.
3. If not, check the motor protection switch QM2. To do this open the upper rear panel of the BMPC/2, and press the black QM2 button located on the upper left side of the BMPC/2 line control unit.
4. Check if the pump now works.
5. If the pump still does not work check the on/off switch of the pump itself. The on/off switch is located near the mains cable input of the pump.
6. If the pump is not working, it must be replaced.

For instruction on how to exchange a pump please read section "Replacing the Vacuum Pump" on page 80.

#### 11.1.1.21 Valve 2 Failed

The valve V2 could not be switched or is not working correctly.

**Solution:**

1. Switch to the manual pump mode.
2. Switch on pump P2, and check the function of the valve, switching it on and off.
3. If the valve does not work, check the fuse Q5. To do this open the upper rear panel of the BMPC/2, the Q5 fuse is located on the upper left side of the BMPC/2 line control unit. The black Q5 switch must be in the up position.
4. Recheck if the valve works, if it still does not work call Bruker service for assistance.

#### 11.1.1.22 Warning Commercial Power Failed

The input power to the external UPS has failed due to a commercial power failure.

**Solution:** If the power failure was not due to a commercial power outage, check the mains supply chain, perhaps one of the facility fuses has blown.

#### 11.1.1.23 Alarm UPS Low Battery

The backup battery is low and will only supply power for a few more minutes.

**Solution:** Reestablish power to the unit (e.g. emergency generator or similar if power is not available).

#### 11.1.1.24 Warning UPS on Bypass

The UPS is working in automatic bypass mode. This means that the UPS cannot switch to battery backup mode in case of a power failure.

**Solution:** Check the output load of the UPS. If this is too high (load on the NMR console), the UPS switches to the automatic bypass mode.

#### 11.1.1.25 Warning UPS General Alarm

The warning message for the UPS may vary according to the make and model of the unit. Read the UPS manual that was delivered with the UPS for information on the meaning of the general alarm message.

#### 11.1.1.26 Warning UPS Not Connected

The status interface between the BMPC/2 and the UPS is not connected. Therefore the BMPC/2 will not receive any information about the UPS status. In the event of a longer power failure no alarm procedure will be activated when the UPS battery fails. Additionally it is not possible to enable the console output.

**Solution:** Check the connection between the UPS and the BMPC/2. The cable HZ13979 must be connected at X6, which is located on the lower right side of the BMPC/2 line control unit and to the external UPS status interface.

#### 11.1.1.27 Warning Heater H1 Problem

This warning indicates that there is a possible problem with the heater H1. The real output power does not correspond to the desired output power.

**Solution:** Please check the connection between the wiring box and the heater H1 (cable HZ13813).

#### 11.1.1.28 Warning Heater H2 Problem

This warning indicates that there is a possible problem with the heater H2. The real output power does not correspond to the desired output power.

**Solution:** Please check the connection between the wiring box and the heater H2 (cable P/N HZ13811).

#### 11.1.1.29 Pump Test Not Possible in Manual Mode

The automatic pump test can not be started in manual pump mode.

**Solution:** Use the automatic pump mode.

#### 11.1.1.30 Pump Test Not Started

The automatic pump test could not be started due to an internal error. Notify Bruker service.

#### 11.1.1.31 Pump Test Not Possible, Both Pumps in Use

The automatic pump test could not be started because both pumps were in use when the pump test was started.

**Solution:** Wait until the next automatic pump test or start the pump test manually. To start the pump test manually select *Tools - Options - Pump control - Pump Test*.

#### 11.1.1.32 Pump Test Pump 1 Failed

The automatic pump test detected that the pump P1 does not work reliably.

**Solution:** Check the pump very carefully, if it is not working properly, exchange the pump with the spare pump. To change the pump read the section "Replacing the Vacuum Pump" on page 80.

#### 11.1.1.33 Pump Test Pump 2 Failed

The automatic pump test detected that the pump P2 does not work reliable.

**Solution:** Check the pump very careful. If it is not working correctly, exchange the pump with the spare pump. To change the pump read the section "Replacing the Vacuum Pump" on page 80.

#### 11.1.1.34 Pump Test Not Possible, Parameter Error

The automatic pump test could not be started because the parameters for helium flow „FI“ and/or pressure1 „P1“ could not be read correctly.

**Solution:** Read the section "When the Value of a Parameter is Displayed as NAN" on page 79.

## 11.2 Messages in the Event Log

Any messages that appear during operation of the BMPC/2 are displayed In the Event Log of the „Present Values/Events“ window. In addition the messages are stored in the Event Log file.

There are several different kinds of messages, which can be displayed or faded out using the filter adjustment of the event log browser:

- **Warning**: The upper or lower limits of a warning limit have been surpassed.
- **Alarm**: The upper or lower limits of an alarm limit have been surpassed.
- **Misc**: A general message, e.g. change of mode.
- **Control Unit**: All messages are transferred from the BMPC/2 through the serial port. These error message are marked with the prefix „CU“.

### 11.2.1 Additional Error Messages in the Event Log

**CAN Network Reboot**

**CAN Slave General**

**CAN Slave No Data**

**CAN Slave Initialization Failed**

**CAN Slave Unexpected Answer**

**CAN Slave Hardware Error**

**CAN Slave SBS Error**

**CAN Slave Reset Event**

**CAN Fatal RTX Initialization Failed**

**CAN Fatal RTX Internal**

All of these error messages relate to a malfunction of the CAN bus. Carry out the step listed in the section "When the Value of a Parameter is Displayed as NAN" on page 79. When this does not correct the error, contact Bruker service.

## 11.3 Error Message at the Start of BMPC/2 Control Program

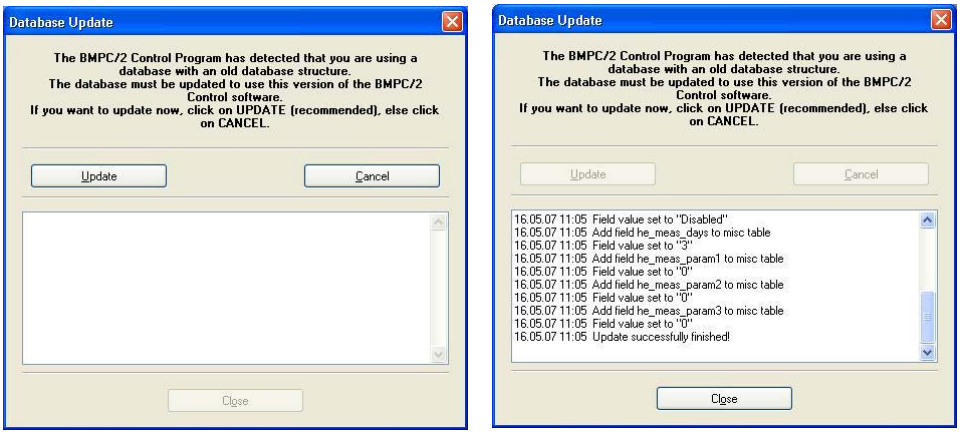
The following error messages may occur at the start of the BMPC/2 control program:

- Database Update Error
- Version Check Error
- COM Port Error

These errors are described in the following sections.

### 11.3.1 Database Update Error

When the BMPC/2 control program is started and the Database Update window appears it normally means the program has loaded an old version of the database structure due to a recent program update.




Display before the Update  Display after the Update

Figure 11.2 Update Database Error

To use the new program version you will need to update the database. Press the **Update** button to actualize the database, or **Cancel** to close the window. If you close the window without updating the database you ***will not*** be able to start the control program. Once you have actualized the database you can then press **Close** and you will be able to start the control program.

### 11.3.2 Version Check Error

The BMPC/2 control program requires a firmware version of VX.Y or higher. When this is not the case, the communication between the PC and the BMPC/2 control unit will not function properly. Refer to the section "Downloading New Firmware" on page 66 for information on how to download the latest version of firmware.

#### 11.3.2.1 COM Port Error

When a COM Port error occurs, it means that the communications port used for communication with the BMPC/2 cannot be used.

Either the port is in use from another program (e.g. SBS terminal or the BMPC/2 Setup Tool), or the cable connection to the control unit is not functioning correctly.

The standard configuration for the COM Port is COM1. Please check this configuration in *Tools - Options - General - Communication Setting*. Also refer to section "Communication Settings" on page 99.

## 11.4 Other Errors

### 11.4.1 When the Value of a Parameter is Displayed as NAN

When the value of a parameter is displayed as NAN (Not A Number), it means that the value of a sensor that is connected to the CAN bus cannot be read. This can lead to various consequences.

**Solution:**

1. Try to re-initialize the CAN bus by doing a software reset of the BMPC control unit (see "Control Unit" on page 103).
2. If this is not successful, try to turn the control unit on and off by opening and closing the Q10 safety fuse on the BMPC/2. This is accessible by opening the rear side, upper cover of the BMPC. The Q10 safety fuse is on the upper left-hand side.

When this still not solves the problem, check the CAN bus wiring (see "CAN Bus" on page 55).

## 11.5 Replacing the Vacuum Pump

When the vacuum pump needs to be replaced, the following steps have to be carried out in sequential order:

1. Switch the BMPC/2 to Monitor Only Mode, so that an alarm is not activated during the service work.
2. Switch the BMPC/2 to Manual Pump Mode. Use the intact pumps and the associated valve to pump to the magnet.
3. Loosen the 4 locking screws on the pump cabinet a quarter turn to the left and remove the front cover. You should now see the P1 pump on the left side and the P2 pump on the right side.

**⚠ WARNING**

**Pump surface can cause serious burns!**

The surface of the pumps can be extremely hot! Contact with this surface can result in a serious burn.

► Be sure that the valve from the pump you want to exchange is closed!

4. Loosen the two small flange screw connections that attach the evacuating hoses to the pump.

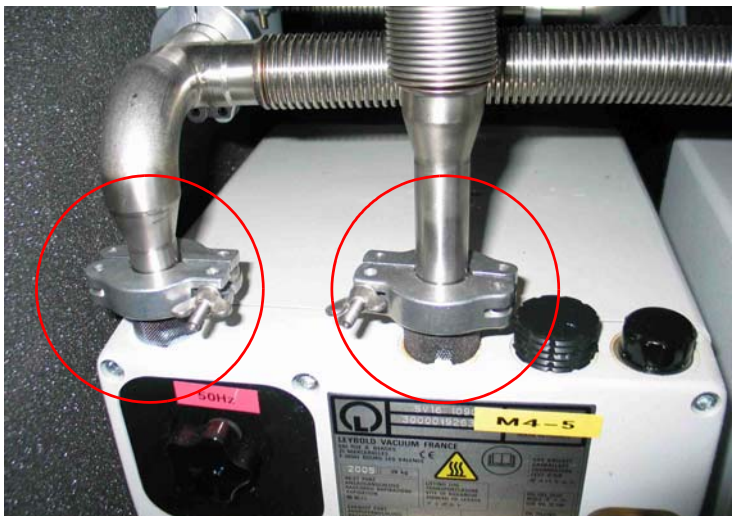



Figure 11.3 Remove the Small Flange Screws

5. Remove the flange screw connections and the associated seals.
6. Remove the.mains connection from the backside of the pump.
7. Unscrew the screws holding the pump unit using an 8 mm open-end wrench.
8. Move the locking mechanism so that the pump tray with the defective pump can be freely moved.

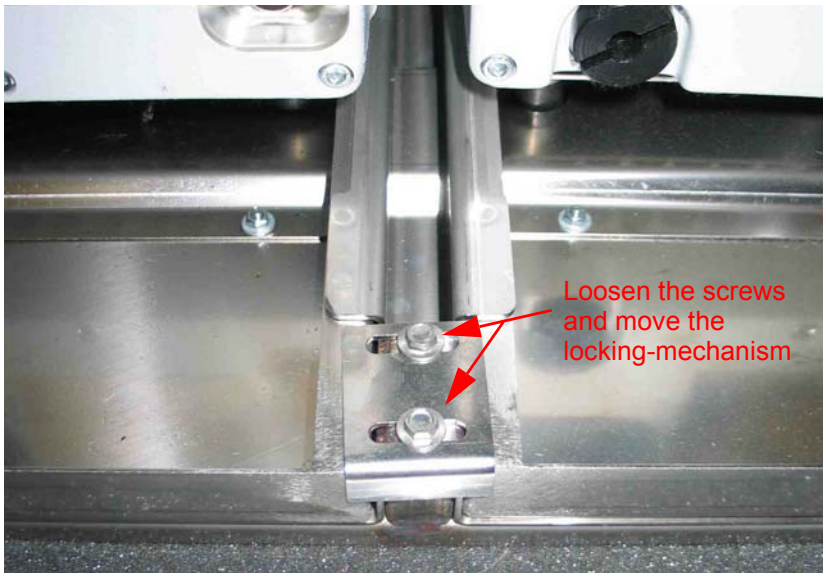



Figure 11.4 Pump Tray Locking Mechanism

9. Pull the pump forward on the pump tray. The tray can not be pulled out all the way, this is a safety measure which prevents it from falling out.
10. Exchange the defective pump with a new one.

---

Check to make sure the new pump is ready for use before mounting it. This includes checking and refilling the oil level as required in the vacuum pump manual.

---

11. Push the pump tray back to its original position and reconnect the locking mechanism.
12. Mount both of the small flange screws including the seals on the new pump. Proceed carefully, the connections need to be completely sealed!
13. Plug in the mains cable on the pump and turn on the pump switch (beside the mains connection).
14. Test the new pump by turning the pump on manually (P1 or P2 On).
15. Test the new pump by comparing the pressure P1 and helium flow FI values established by the new pump with the values of the old pump. These values should be nearly identical. It is possible you will need to wait one hour until the temperature of the pump has settled before the values stabilize.
16. Mount and close the front cover.
17. Place the BMPC/2 in Automatic Pump mode and in Monitor & Alarm mode.

## 11.6 The NMR Console Switches Off Too Fast

The voltage supply for the NMR console supplies power to the BMPC/2. The NMR console is attached to terminal X3 of the BMPC/2 line control unit (see "Line Control Unit" on page 59). Since the NMR console may be supplied only for a short time by the batteries of the USP during a power failure, it is automatically switched off by a time delay relay after a preset time.

The preset time can be adjusted anywhere between 1.5 minutes and 30 minutes. The following section explains how to adjust the time delay.

### 11.6.1 Adjusting the NMR Console Turn-off Time

The adjustment of the turn-off time is made through the KM3 relay. To access the relay open the upper back cover, the KM3 relay is found almost exactly in the middle of the line control unit.

To change the time you need to move the yellow turning wheel. Turn the wheel downwards to shorten the time (minimum of 1.5 minutes), upwards to lengthen the time (maximum of 30 minutes).

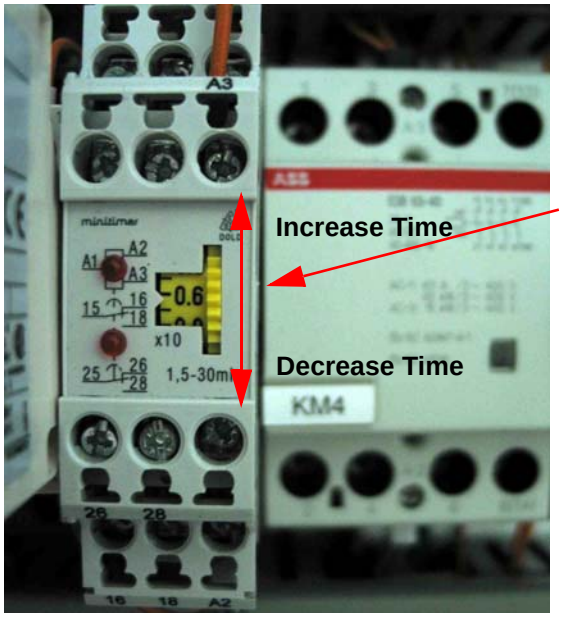



Figure 11.5 Adjusting the NMR Console Turn-off Time

In the event of a **power failure**, the longer the console remains on the UPS, the shorter the time that the vacuum pumps will be powered. A favorable value is within the range of a maximum of 5 minutes.

## 11.7 Turning on the NMR Console After a Power Failure

When the NMR console switches off due to a power failure there are two different ways to restart it: when the power is restored:

- Restart the console through the software.
- Restart the console using the mains switch.

### 11.7.1 Restarting the NMR Console Through the Software

In the menu *Tools* you will find the options *Enable NMR Console* and *Disable NMR Console*. When you are logged in as Administrator you can use these functions to turn the NMR console on or off.

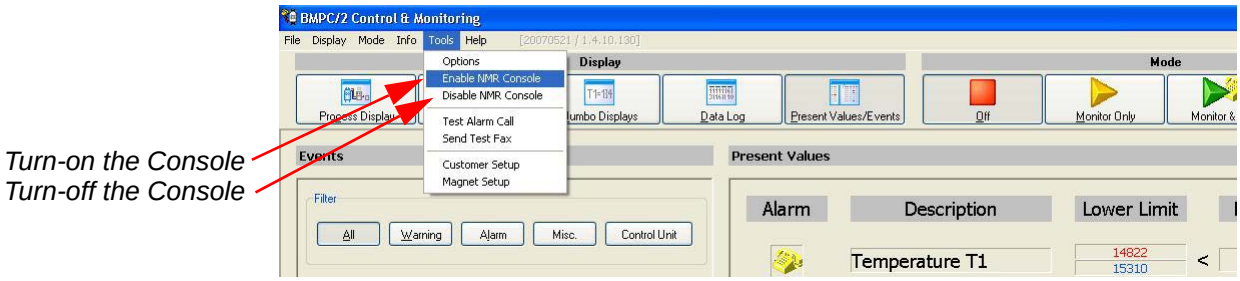



Figure 11.6 Restarting the NMR Console Through Software

### 11.7.2 Restarting the NMR Console Using the Mains Switch

If you cannot switch on the console using the software, you can alternatively use the S4 switch. The S4 switch is found behind the rear cover, roughly in the middle. As soon as you turn on this switch the KM4 protection will be activated and the console will be provided with power.

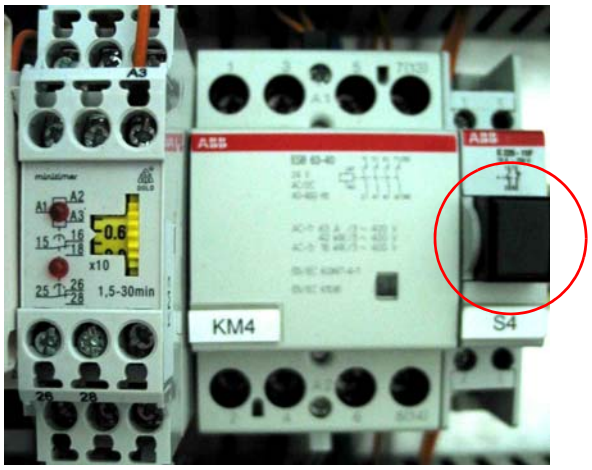



Figure 11.7 Restarting the NMR Console Using the Main Switch

The console can only be switched on if the following conditions are fulfilled:

- The UPS must not be running under battery power.
- The status interface to the UPS must be attached.

## 11.8 Exchanging Fuses

Several fuses are used within the BMPC/2. The following sections contain detailed instructions on how to change these fuses.

### 11.8.1 Exchanging the Pump Cabinet Ventilator Fuse

In the pump cabinet are a total of 3 ventilator fans. Each of these fans is protected by its own fuse.

The following fuse type is required for the pump cabinet fans:

- Cartridge fuse 5 x 20 mm 0.1 A time lag. The Bruker part number is **2241**.

To replace a fuse open the upper back cover of the BMPC/2. The fuse for the fans are located on the upper right side, marked as FU5, FU6 and FU7.

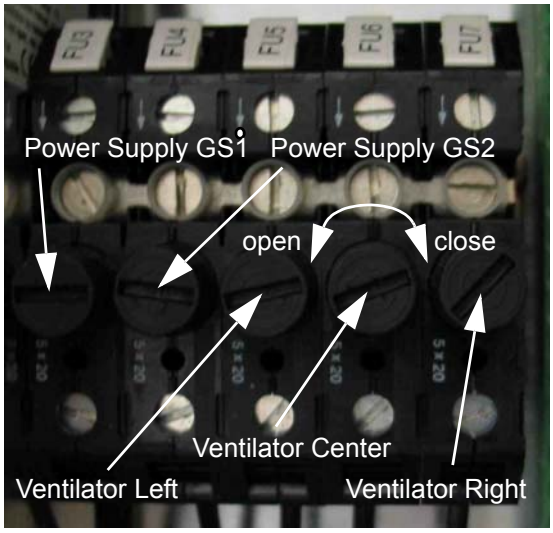



Figure 11.8 Exchanging the Ventilator Fuses

The FU6 fuse is found on the left side, the FU7 fuse in the center, and the FU8 fuse on the right side as shown in the figure above. To exchange a fuse you will need to unscrew the fuse caps with a flat-head screwdriver. Remove the fuse and insert a new one, then use the screwdriver to replace the fuse cap.

## 11.8.2 Exchanging the GS1 or GS2 Power Supply Fuses

There are two power supplies in the BMPC line control unit. Each of these power supplies has its own safety fuse.

The following fuse type is required for the power supplies:

- Cartridge fuse 5 x 20 mm 0.8 A time lag. The Bruker part number is **2250**.

The fuse for power supply GS1 is FU1 and the fuse for power supply GS2 is FU2. See the previous section (11.8) for instructions on how to exchange the fuse.

## 11.8.3 Exchanging the Control Unit Fuse

The BMPC/2 control unit utilizes two safety fuses.

The following fuse type is required for the control unit:

Cartridge fuse 5 x 20 mm 0.8 A time lag. The Bruker part number is **2250**.

To exchange a fuse in the control unit:

1. Remove the upper rear cover. To access the back of the control unit, unscrew the left and right side screws securing the line control unit using a cross-tip screwdriver and tilt the unit outwards.


Figure 11.9 Tilt Open the Line Control Unit

2. Remove the power supply plug from the control unit and open the fuse holder as shown in the figure below.
3. Remove the fuse insert and exchange both safety fuses.
4. Reassemble the unit in reverse order.


Figure 11.10 Replacing the Control Unit Fuse

# 12 Configuration (administrator)

The configuration of the BMPC/2 is limited to the Administrator and Bruker service personnel.

For optimal operation of the BMPC/2 several system parameters must be adjusted. In addition, some local adjustments are needed concerning the telephone system that is used and the error alerts that are required.

During installation all settings for the magnet system are adjusted using the "Magnet Setup Wizard". Likewise, the laboratory environment settings are adjusted using the "Customer Setup Wizard".

Changes to an existing configuration can be made in the "The Options Menu".

## 12.1 Magnet Setup Wizard

The Magnet Setup Wizard is used to change the magnet dependent data, including all limit adjustments and adjustments for the magnet heater.

***Important: The Magnet Setup Wizard will overwrite the previous setup!***

To access the Magnet Setup Wizard select *Tools - Magnet Setup* from the main menu. Press the **Next** button to the next step.

Select the magnet type

Enter the data for the glass carbon sensors T1 + T2

These values will be automatically calculated

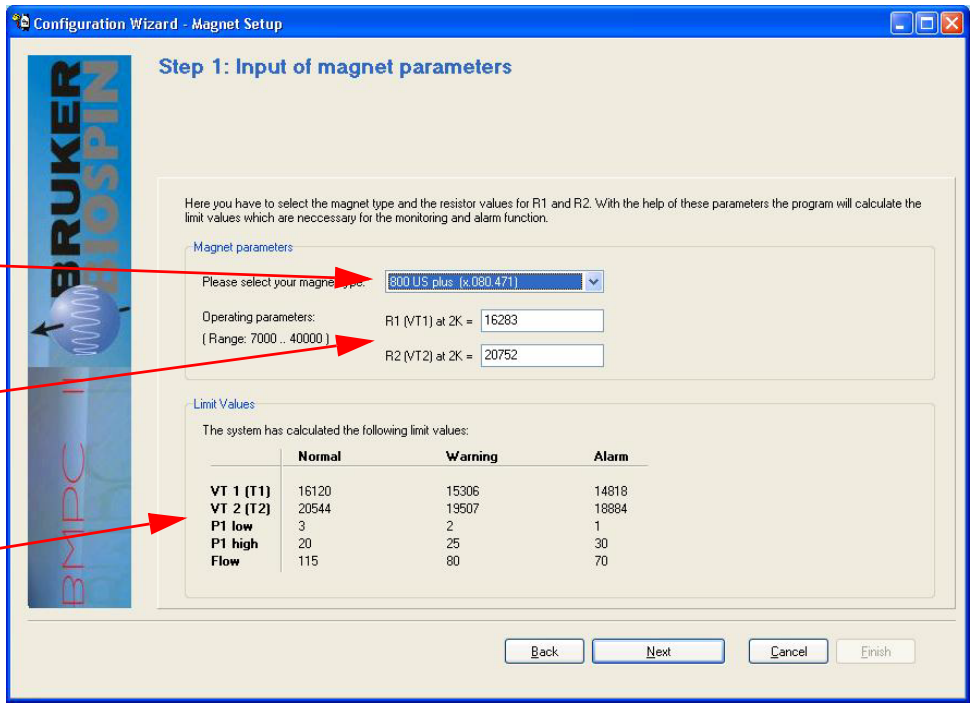



Figure 12.1 Magnet Setup Step 1

1. Select your magnet from the pull-down list.
2. Enter the temperature measuring resistance for T1 and T2. The limit data is then calculated automatically.
3. Press the **Next** button to continue to the next magnet setup step.

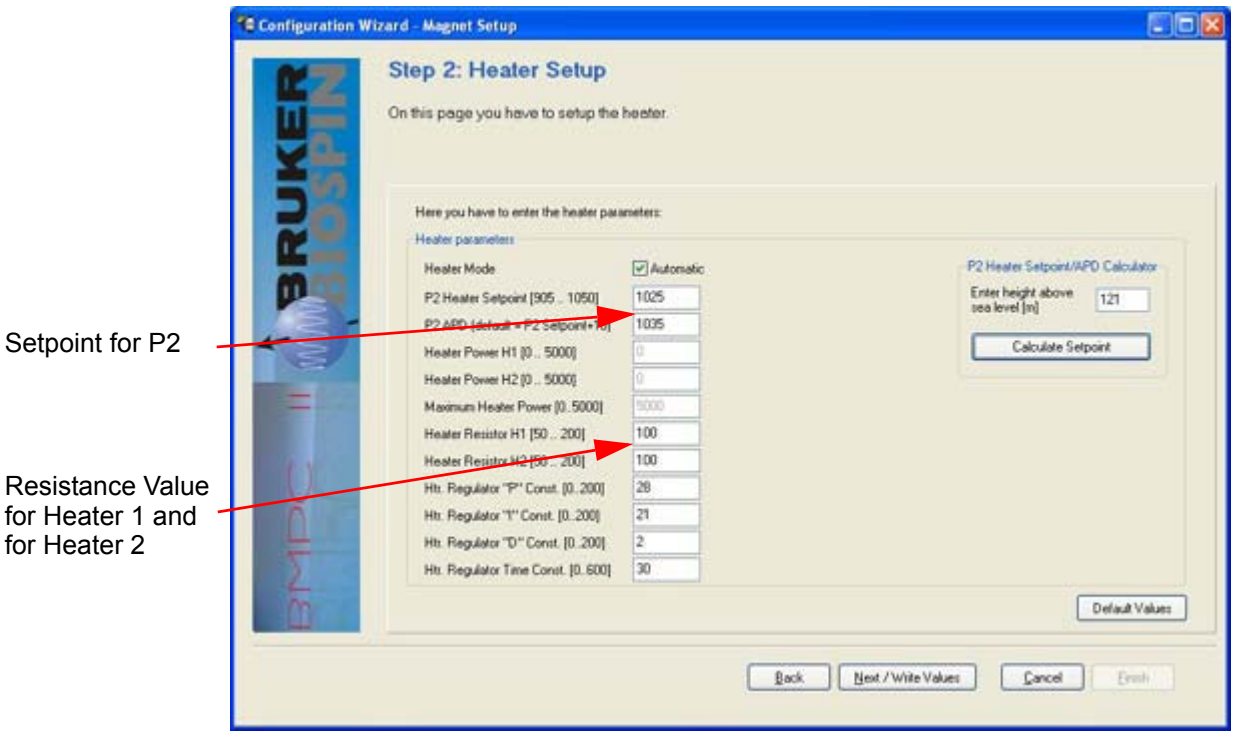



Figure 12.2 Magnet Setup Step 2

4. Enter the setpoint for pressure value P2. The correct setting depends on the height above sea level where the magnet is installed.

   Alternatively, to calculate the P2 heater setpoint, enter the height value in the field provided press the **Calculate Setpoint** button.

   The setpoint is the pressure that is to be reached with the help of the heating regulator.

   The P2 APD value will be calculated automatically.
5. Enter the resistance values for the two heating resistors. These are usually 100 Ohms. More detailed information can be found in the magnet manual.
6. Press the **Next/Write Values** button to assume the configuration data.
7. When prompted, confirm that the configuration is correct by pressing **Yes**, or **No** if you need to revise the data.

## 12.2 Customer Setup Wizard

The telephone system, modem adjustments and alarm system for the BMPC/2 can be configured using the Customer Setup Wizard.

***Important: The Customer Setup Wizard will overwrite the previous setup!***

To start the wizard select *Tools - Customer Setup* from the main menu.

Press the **Next** button to advance to the first step, Phone Line and Modem Settings.

### 12.2.1 Phone Line & Modem Setting

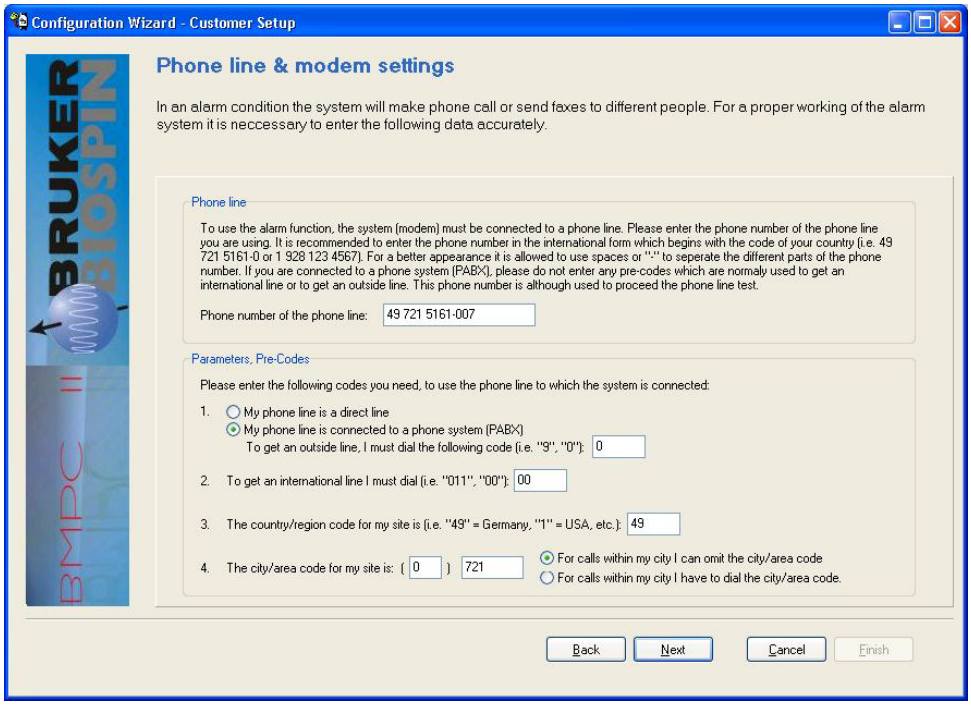



Figure 12.3 Customer Setup - Phone Line & Modem Settings

Enter the requested information and confirm it by pressing **Next**. This will advance you to the next step, the Contacts List setup.

## 12.2.2 Contact List

In this step data for the individuals that will be called in case of an emergency will be registered. Enter the following data of at least 4 individuals responsible for the magnet system in case of a malfunction:

1. Name.
2. In-house work telephone number (proceeded with a „#“ symbol).
3. External telephone number in international format.
4. When available, the E-mail address for each of the responsible individuals.

At least 4 individual external telephone numbers and 2 individual internal telephone numbers are required. Cell phone numbers may be entered for the internal telephone numbers.

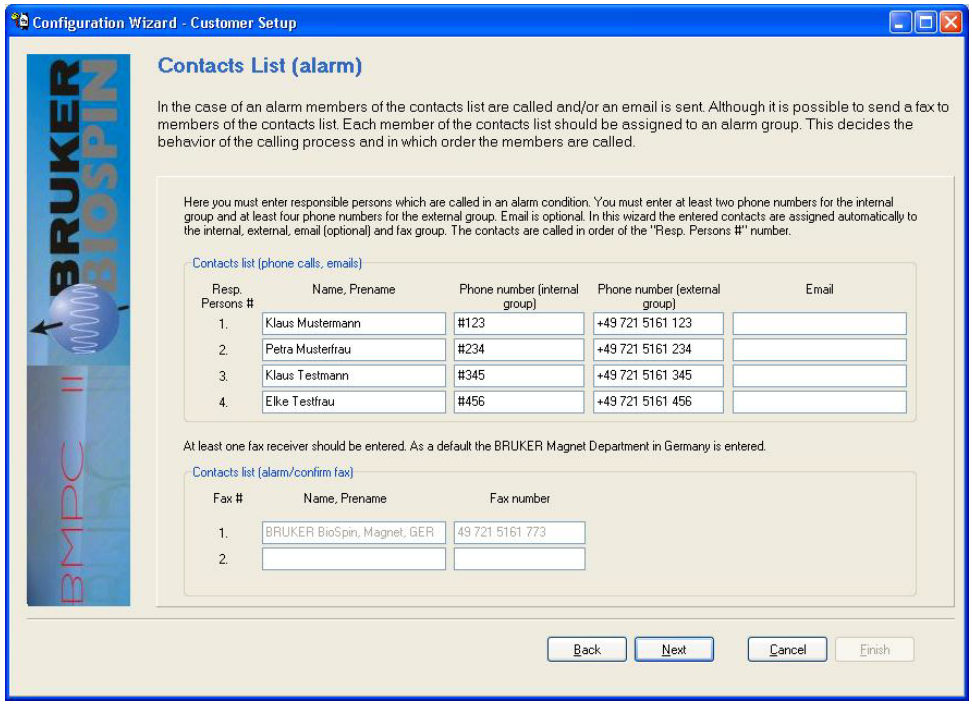



Figure 12.4 Customer Setup - Contacts List (alarm)

When you desire that an additional fax (in addition to Bruker Germany) be sent in case of an alarm, enter the fax number in the space provided.

---

The four responsible individuals should be able to carry out the necessary steps required to stabilize the system in the event of a malfunction. Routine training of these individuals is highly recommended!

---

Once you have entered the required data, press the **Next** button to precede to the next step, Alarm Groups setup.

### 12.2.3 Alarm Groups

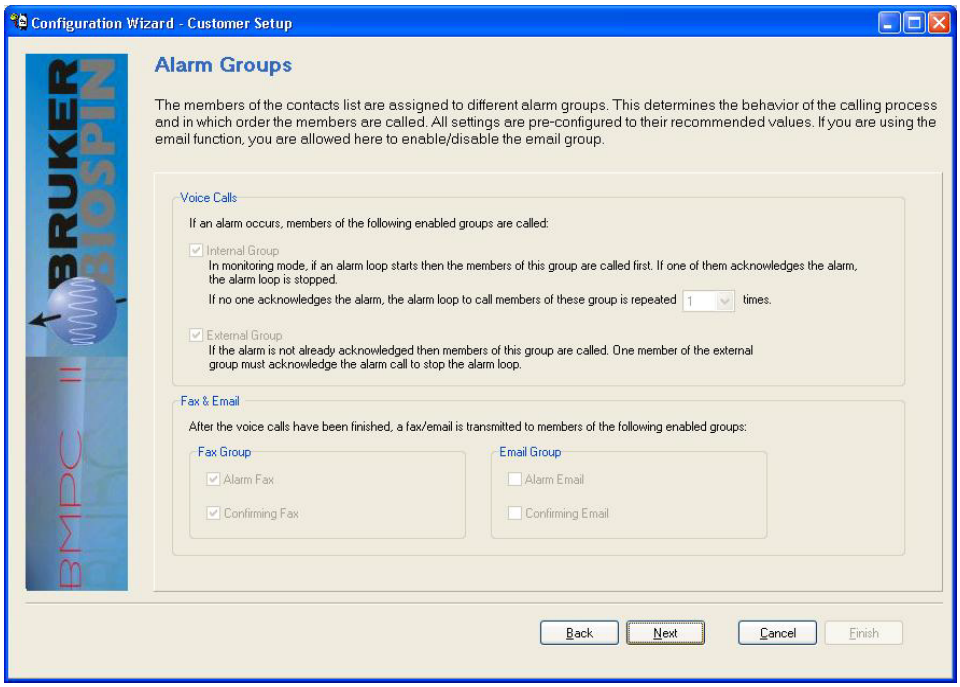



Figure 12.5 Customer Setup - Alarm Groups

The Alarm Groups have already been pre-configured. Press the **Next** button to continue to the Fax Setup.

## 12.2.4 Fax Setup - Fax ID

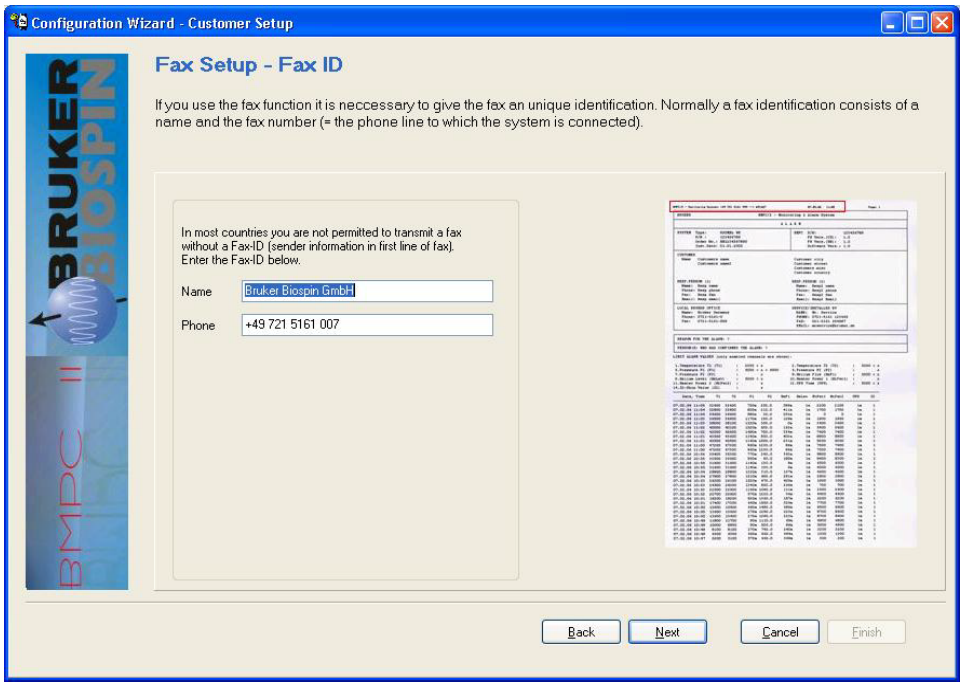



Figure 12.6 Customer Setup - Fax Setup - Fax ID

1. Enter the name of your company or institution.
2. Enter the appropriate fax number for the sender.

These entries serve for the identification of the fax and do not influence the fax dispatch. Some countries require that this data be imprinted on each fax that is dispatched. This data appears on the fax as shown in the red marked area of Figure 12.6

3. Press the **Next** button to continue to the System Fax Header setup.

## 12.2.5 Fax Setup - Fax Header (System)

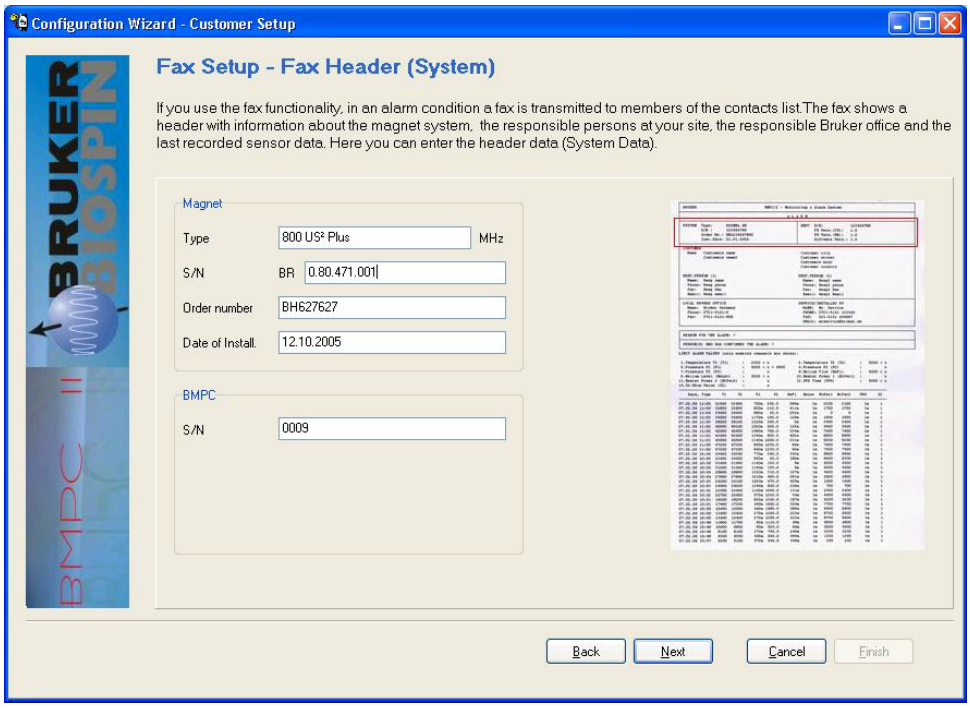



Figure 12.7 Customer Setup - Fax Setup - Fax Header

In this window you will be required to enter all the data related to your magnet system. When an alarm or status fax is sent this information will appear in the header of the fax, as indicated in the red marked area of Figure 12.7.

When you have entered the required information press the **Next** button to continue to the Customer Fax setup.

## 12.2.6 Fax Setup - Fax Header (Customer)

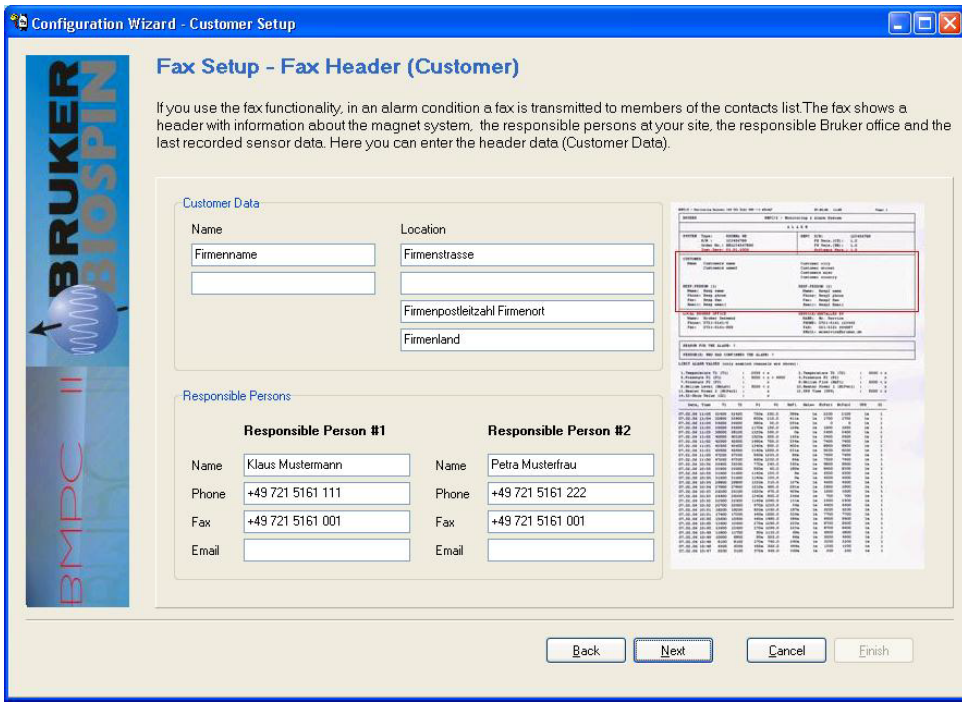



Figure 12.8 Customer Setup - Fax Setup - Fax Header (Customer)

1. Enter the appropriate data for your company or institution in the Customer Data area of the setup form.
2. Enter the individuals responsible for the magnet system in the space provided.

---

**i** In the event of an alarm, Bruker can only provide effective assistance if all the information is entered in this setup window for the detailed fax alarm!

---

The data that is entered in this setup window will appear on the Alarm/Status fax as indicated in the red marked area of Figure 12.8.

3. Press the **Next** button to continue to the Bruker Office Fax setup.

## 12.2.7 Customer Setup - Fax Setup - Fax Header (Bruker)

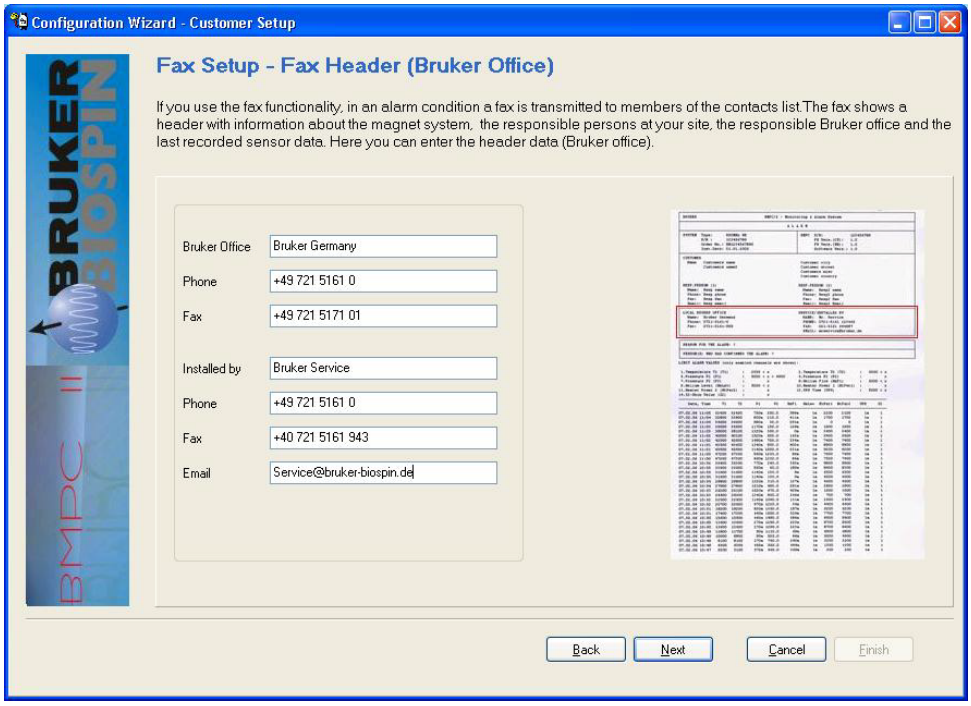



Figure 12.9 Customer Setup - Fax Setup - Fax Header (Bruker)

1. Enter the data for your local Bruker office in the upper fields of the setup window.
2. In the lower fields enter the necessary information concerning the service engineer who installed the system.

The data that is entered in this setup window will appear on the Alarm/Status fax as indicated in the red marked area of Figure 12.9.

3. Press the **Next** button to view a summary of the customer setup.

## 12.2.8 Customer Setup - Summary

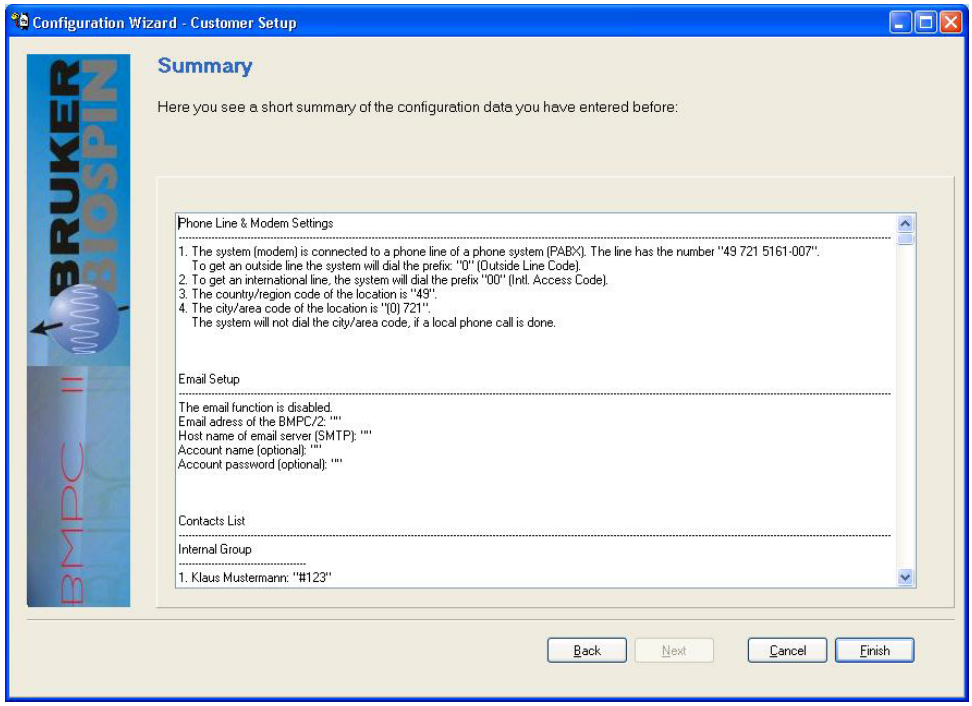



Figure 12.10Customer Setup - Summary

Verify the information in the summary for accuracy and completeness. If the information is correct press **Finish** to complete the setup, or **Back** to correct any setup data.

## 12.3 The Options Menu

The Options Menu allows you to make basic adjustments to the BMPC/2. The adjustments that are allowed are based on the login level. You need to login as an administrator to make changes using the Tools - Options menu.

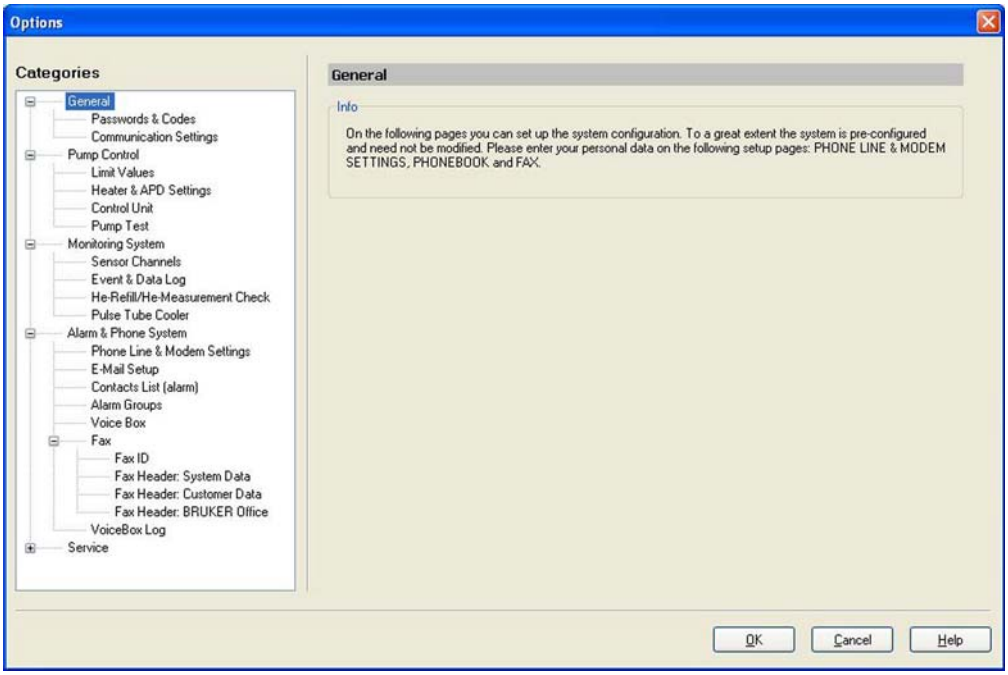



Figure 12.11 Tools - Options Menu

### 12.3.1 Options - General

#### 12.3.1.1 Password & Codes

The Passwords & Codes option allows you to assign passwords to access different rights of access. You can also change the codes necessary for controlling the system voice box. Changing a password is only possible if you are logged in as administrator.

The codes shown in the figure below are the default passwords which are valid after a new software installation. Only the passwords that are relevant for the current login level are displayed in the setup window. In this example the user was logged in as administrator.

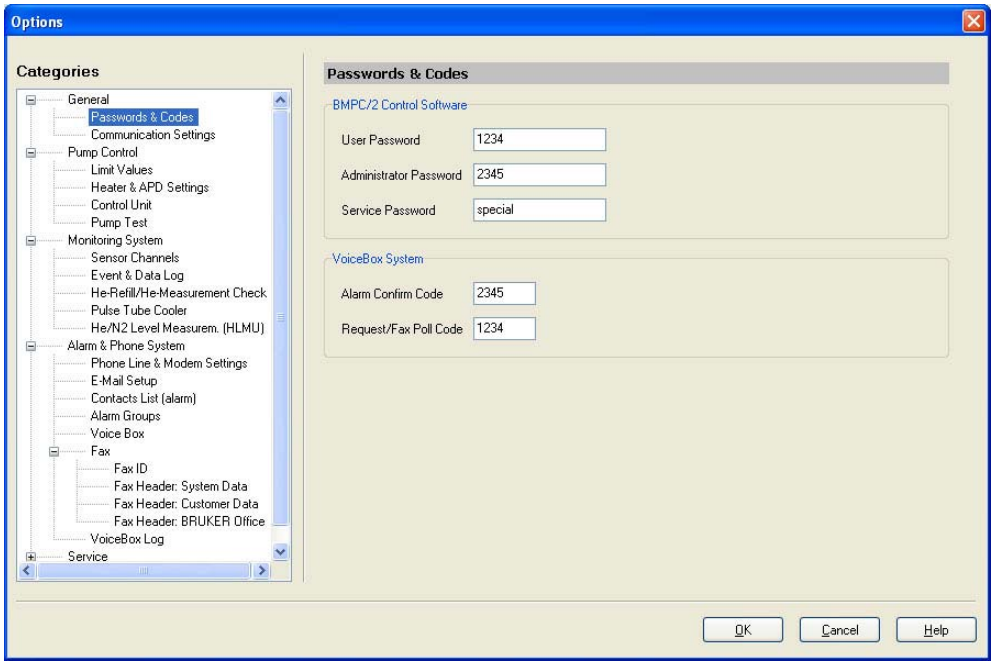



Figure 12.12Tools - Options - Passwords & Codes

### User Password

When you are logged in as a normal user you are able to control the BMPC/2. You are also allowed to change between the different displays and to select between the operating modes.

### Administrator Password

In addition to the user functions, the Administrator can also change the configuration of the BMPC/2.

### Service Password

The service mode is restricted to Bruker Service personnel. The service access password for your system is shadowed out and cannot be modified.

### Alarm Confirm Code

The Alarm Confirm Code is needed during an alarm cycle to control the voice box system. Entering this code using a DTMF telephone will stop the alarm cycle.

### Request Fax/Poll Code

This code is needed if you want to poll the actual status of the BMPC/2 or if requesting a status fax, using a DTMF telephone.

Press the **OK** button in the main Options window to confirm the changes when you finished.

After a software update the codes you have changed are still valid. After a complete software reinstallation, the passwords are changed back to the defaults.

If you have changed a password which was used by another person, do not forget to inform them about the changes!

### 12.3.1.2 Communication Settings

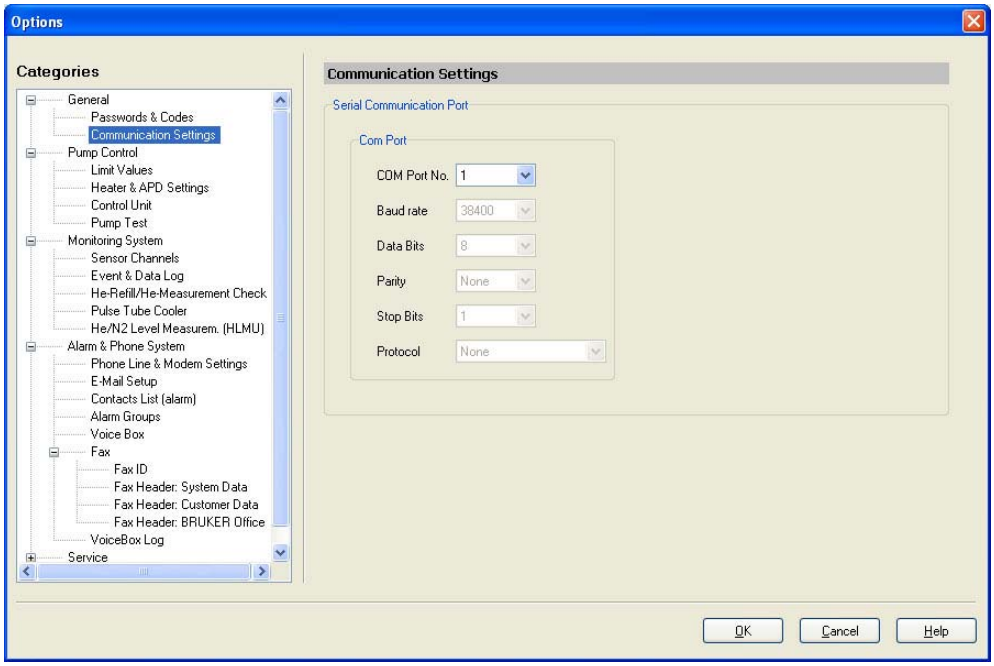



Figure 12.13Tools - Options - Communication Settings

The default value for the Com Port is „**1**“. The other communication parameters are only displayed for information purposes, they cannot be changed.

## 12.3.2 Pump Control

### 12.3.2.1 Limit Values

The Pump Control option setup window allows you to set the various limit values for site conditions. Default values are normally already assigned during the magnet setup wizard, thus an adjustment is only needed in rare cases.

**NOTICE**

**Changing the limit values**

Changing the limit values may result in the system reacting differently then expected and may delay the triggering of alarms.

- ► Changes should only be made by experienced personnel that understand the implications of these changes.

When you want to change a limit value, first select the parameter, then enter the new upper and lower limit values. To transfer the new values to the BMPC/2 press the Write Values button.

Selected Parameter

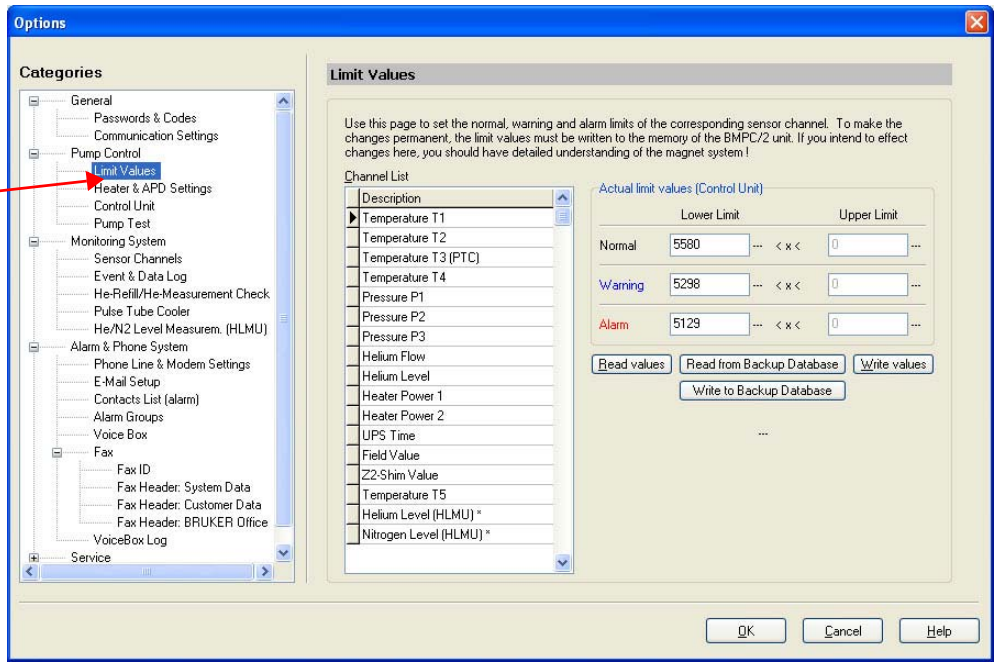



Figure 12.14Tools - Options - Limit Values

- Read Values: Pressing this button will result in the display of the actual values from the BMPC/2. This is useful when you have changed the values, but not written them to the unit and want to reload the actual values.

- Read from Backup Database: With this button you can read the values backwards from the backup database. This is useful if you want to reuse a former configuration.
- Write Values: Pressing this button will write the current field values to the unit. **Warning: This will overwrite the current values saved in the control unit memory.**

Write to Backup Database: When you press this button you can save the current field values in the database of the BMPC/2 control program.

---

i Changes to the limit values will first take effect when you press the Write Values button. Once you are certain that the values are suitable you can add them later to the backup database by pressing the Write to Backup Database button.

---

### 12.3.2.2 Heater & APD Settings

In this settings window you can adjust the settings for the magnet heater.

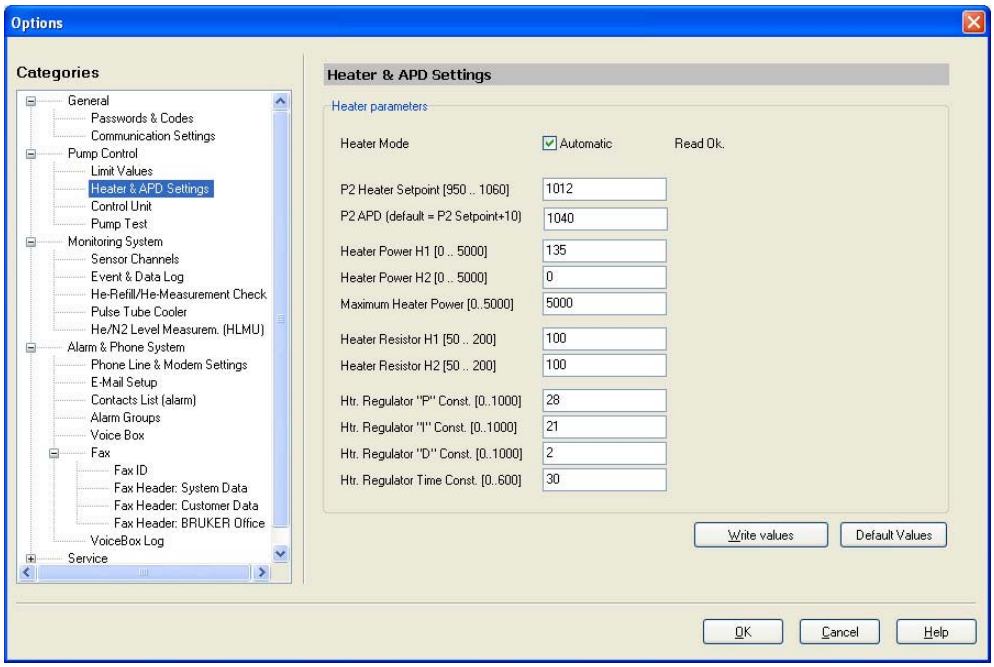



Figure 12.15Tools - Options - Heater & APD Setting

These values are normally entered during the installation and in most cases do not need to be modified.

- Heater Mode: It is possible to operate in automatic or manual heater mode. As default Automatic mode is selected. In automatic mode, internal regulation ensures that the P2 pressure remains constant in the magnet dewar, based on the values entered. In manual mode (Automatic must be deselected) the unit will be heated using a constant heater power.

- P2 Heater Set Point: This is the target value of the automatic heater control. This value must be at least 1 mBar lower as the P2 APD target value.
- P2 APD: This is the target value for the P2 absolute pressure regulator. The absolute pressure regulator ensures that the magnet remains at a constant pressure even when working in the over pressure range.
- Heater Power H1: This field allows you to enter the H1 heater heat value for heater operation in manual mode.
- Heater Power H2: This field allows you to enter the H2 heater heat value for heater operation in manual mode.
- Heater Resistor H1: This field is used to enter the resistance value for the H1 heater.
- Heater Resistor H2: This field is used to enter the resistance value for the H2 heater.

Press the **Write Values** button to write the values to the unit.

**⚠ CAUTION**

**Heater and APD Settings**

Changes in these adjustments may cause low pressure in the magnet dewar. This could lead to a dangerous icing of the magnet.

► Changes should only be made by experienced personnel that understand the implications of these changes.

### 12.3.2.3 Control Unit

This option window allows you to read the current firmware version from the BMPC II, and to reset the control unit.

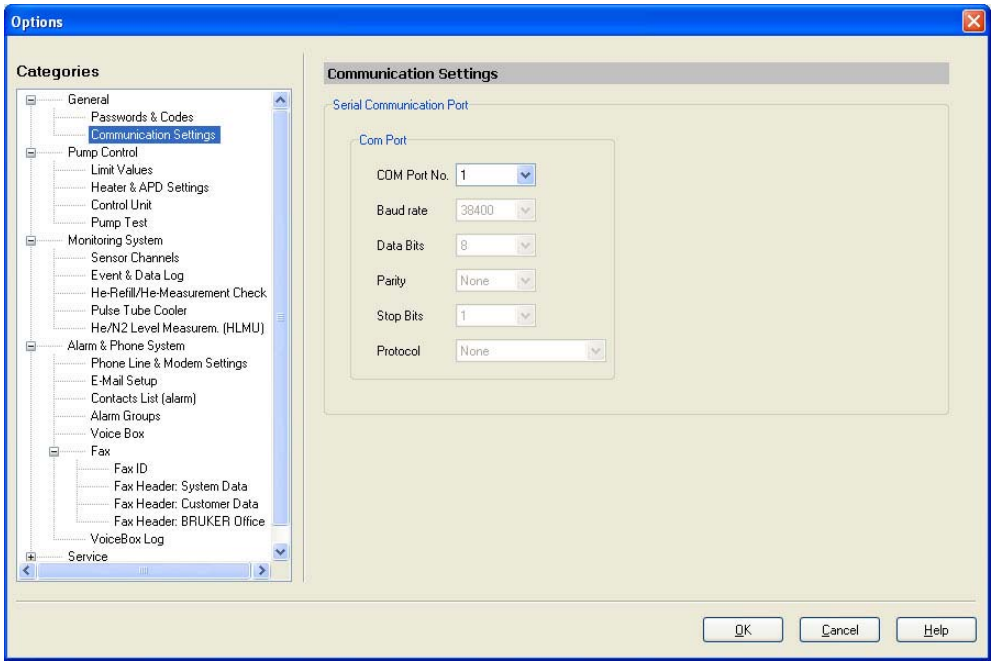



Figure 12.16Tools - Options - Control Unit

A software reset may be necessary when, during a system start or a firmware download, communication to various sensors does not start correctly.

To reset the control unit press the button and wait until the reset procedure is finished.

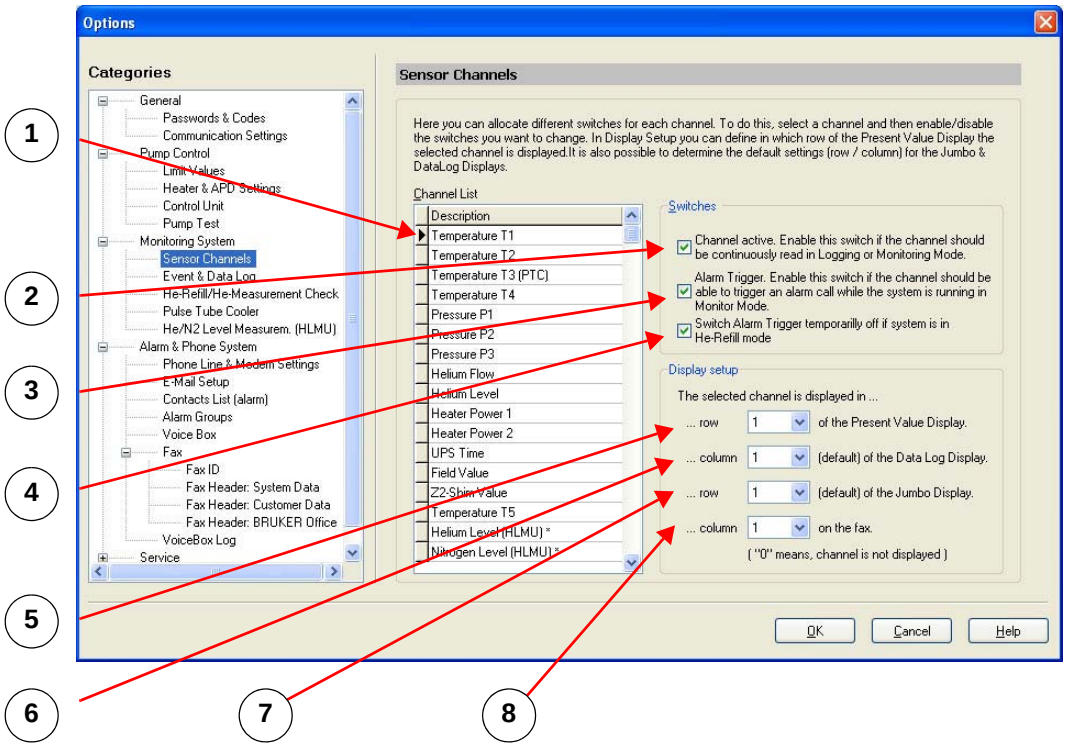
### 12.3.2.4 Pump Test

This option window allows you to adjust the automatic pump test. Please read the section "Configuring the Automatic Pump Test" on page 36.

## 12.3.3 Monitoring System

### 12.3.3.1 Sensor Channels

In this settings window you can configure the effect of the individual sensor channels on the alarms, as well as the representation of the channels in the various display options.




| | | | |
|---|---|---|---|
| **1** | Selected Sensor Channel | **5** | Row in Present Value Display |
| **2** | Channel Active | **6** | Column in Data Log Display |
| **3** | Enable/Disable Telephone Alaram | **7** | Row in Jumbo Display |
| **4** | Alarm disabled during He-Refill | **8** | Column in Alarm/Call Fax |

Figure 12.17Tools - Options - Sensor Channels

- Channel Active: When this option is selected, the data for this channel is updated continuously. When the option is not selected the channel information in the present value display is not actualized.
- Alarm Trigger: When this option is selected, the telephone-supported alert will be started when an alarm situation occurs (e.g. When a limit value is exceeded).
- Switch Alarm Trigger: When this option is selected the telephone alerting will be deactivated during the duration of the He-Fill cycle.

In the Field Display Setup you can adjust the position of the selected channel in the Present Value Display, Data Log Display, Jumbo Display as well as the Status/Alarm fax.

When a channel is not to be represented in the corresponding display then position „0“ must be selected for this field.

### 12.3.3.2 Event & Data Log

In this settings window you can adjust the properties of the Event Log and the Data Log.

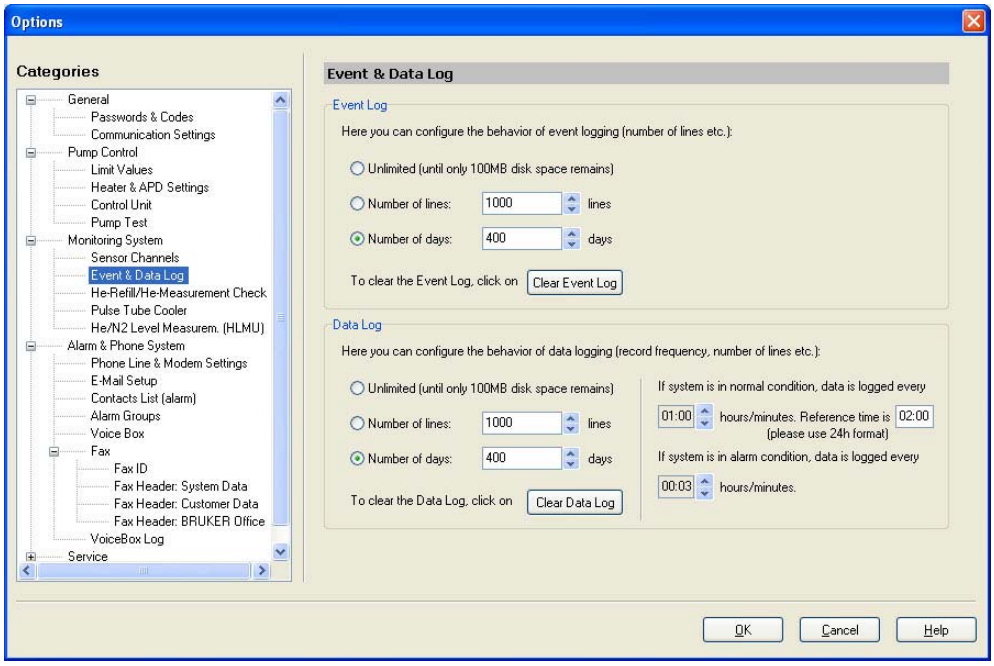



Figure 12.18Tools - Options - Event & Data Log

1. **Event Log** (see also "Present Values / Event Display" on page 31)

   The following possibilities can be selected:

   **Unlimited**: The log data will be saved until the maximum disk space has been reached.

   **Number of lines**: The maximum number of event log entries can be selected. When the maximum number is reached, the oldest entry will be overwritten.

   **Number of days**: A maximum number of days for which the event log will be stored can be selected. When the maximum number is surpassed, the oldest entry will be overwritten.

2. **Data Log** (see also "Data Log Display" on page 29)

   The same adjustments are available for the Data Log as the Event Log. In addition, there are also several adjustment possibilities for the frequency of entries:

   **Data Log Interval**: Here you can select the interval time for the Data Log. You can chose between the 3 minutes and up to 24 hours. If you select 3 minutes, for example, the complete data set will be written to the data log every 3 minutes. The recommended interval is 1 hour.

**Reference Time**: The memory cycle is synchronized using this value.

**Data Log Interval in Alarm Condition**: In alarm condition substantially more data needs to be stored in the log file. Default is 3 minutes. The system switches automatically to a shortened log interval when an emergency occurs.

3. **Clear Event / Data Log**

   In order to delete the entire data or event log file, you must use the Clear Data Log button.

Warning: Using the Clear Data Log button will delete all the data in the file!

It is advisable that you backup the log files on an external storage device (e.g. CD-ROM) before using the Clear Data Log function. To do this you can use the Export Data and Event Log button and/or save the complete log.mdb and log.ldb file from the database directory.

### 12.3.3.3 He-Refill / He Measurement

This settings window is used to adjust the properties of the helium refill function (refer to the section "He Fill Mode" on page 34).

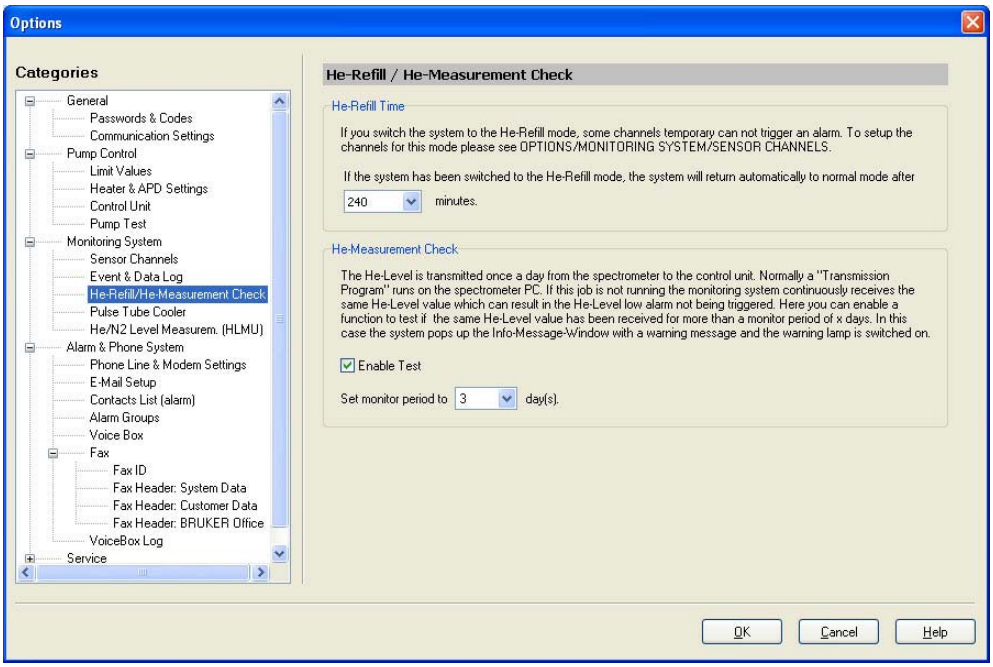



Figure 12.19Tools - Options - He-Refill / He Measurement

The helium refill time setting allows you to set the amount of time that the selected alarms will be deactivated during the helium refill. These alarm parameters are set in the Sensor Channels section under the Monitoring System settings (see also "Sensor Channels" on page 104).

In the He Measurement Check window you can activate the helium level monitoring. During the monitoring you can examine whether the helium changes over a preset period of time. This time period can be varied within a range of 1 and 7 days using the field „Set Monitor Period to x days“. When the value of the helium level remains stable for the selected time a warning will be given and a warning light will be activated. With this a missing or incorrectly initialized helium level measurement can be recognized.

### 12.3.3.4 Pulse Tube Cooler

If your magnet system includes a Pulse Tube Cooler (PTC) it is recommended that this be monitored. The PTC is not monitored directly, but by monitoring the heater power (Heater Power 1), it can be determined whether the PTC is operating properly.

Normally the heater power (Heater Power 1) must be above the set value. If the heater power is below this limit for more than the set time this usual indicates there is a problem.

In this case the system turns on the warning lamp and the software causes the "Info-Dialog" to popup.

To clear the warning and to switch off the warning lamp you must confirm the warning in the "Info-Dialog".

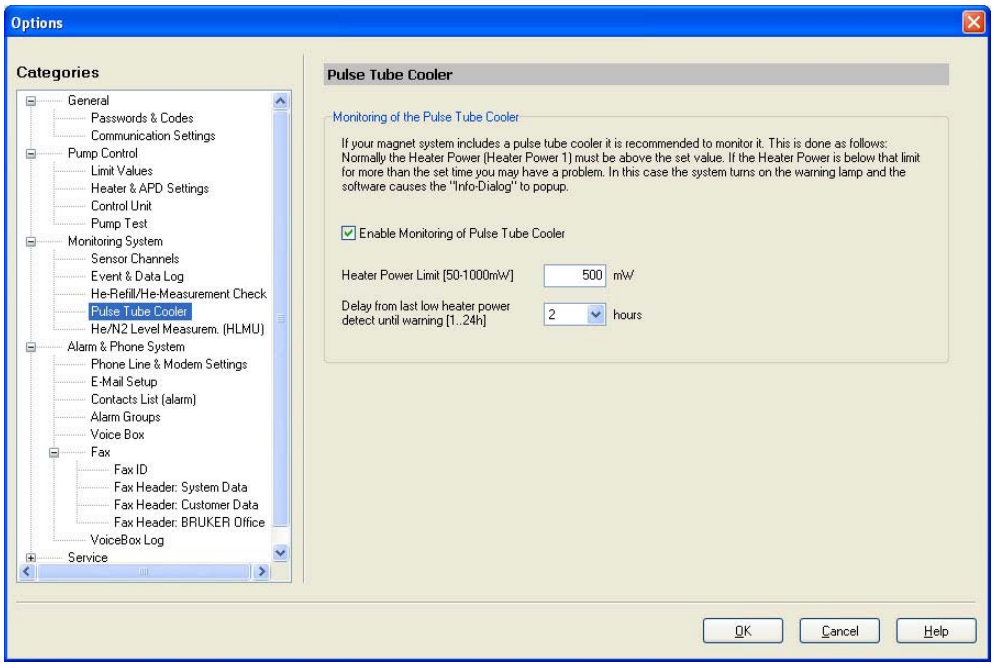



Figure 12.20Tools - Options - Pulse Tube Cooler

### 12.3.3.5 He/N2 Measurement with the HLMU

When a BRUKER spectrometer console is not available, you will need a HLMU (Helium/ Nitrogen Level Measurement Unit) to measure the helium (or optionally, the nitrogen) level. In this case the BMPC/2 Control software will read the helium level from the HLMU, instead of the BMPC/2 Control Unit, for monitoring.

Before you can use the HLMU to measure the helium level, you have to connect the HLMU to one of the Ethernet ports of the BMPC/2 PC, and setup the Windows network settings for this port.

It is recommended to use the following parameters:

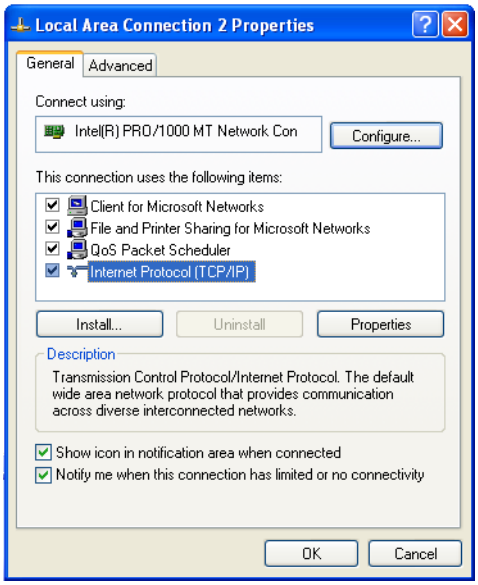



Figure 12.21Local Area Network Connections

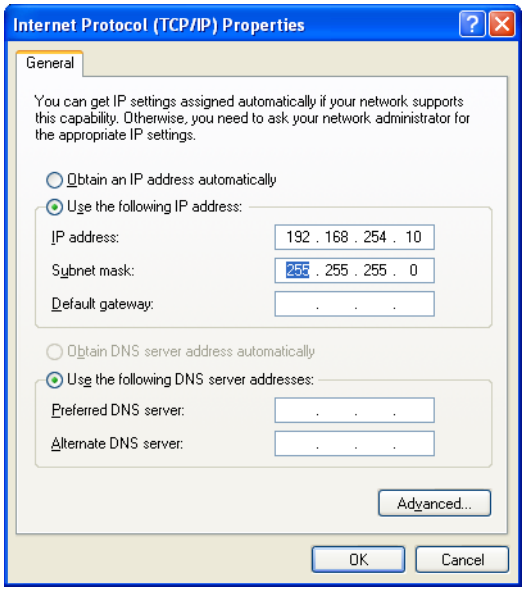



Figure 12.22Internet Protocol TCP/IP Properties

The default IP address for the HLMU (see the figure above) is: 192.168.254.100.

For details on how to setup and check the settings of the HLMU refer to the HLMU manual.

To use the measurements from the HLMU, you must enable „Monitoring of H2/N2 Level with HLMU“ in the BMPC/2 Options window.

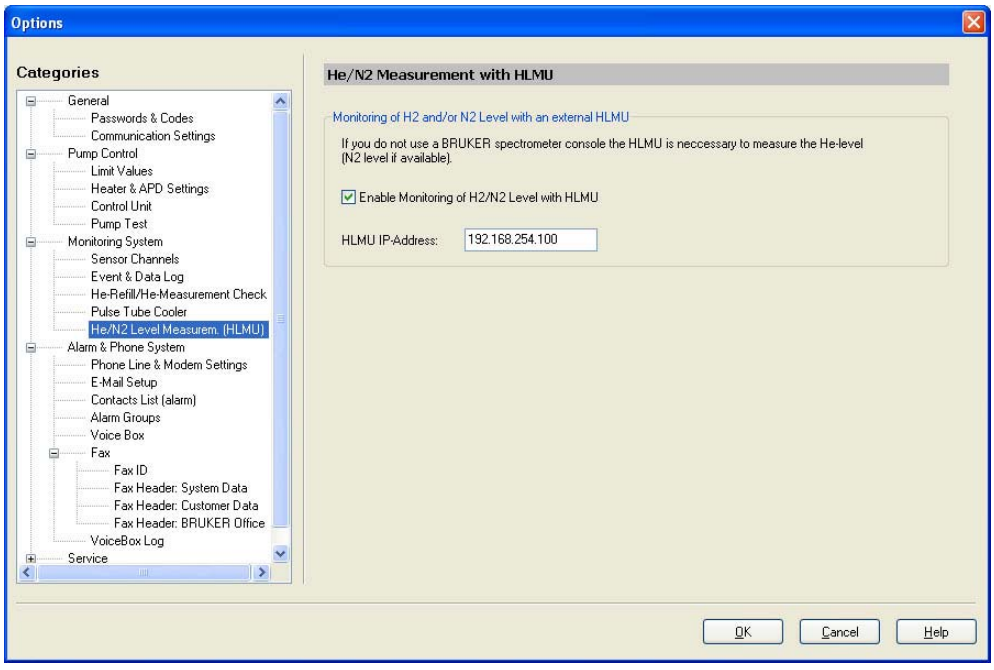



Figure 12.23Helium/Nitrogen Measurement with the HLMU

In the setup category LIMIT VALUES (see chapter "Limit Values") you will find among others the following two entries used to setup the limit values for use with the HLMU:

- Helium Level (HLMU)

- Nitrogen Level (HLMU)

It is recommended to use the given default parameters (Normal = 70, Warning = 60, Alarm = 50).

---

Note: If you are using the HLMU for helium (nitrogen) level measurements, the channel "Helium Level" that is normally used, must be disabled (see "Sensor Channels" on page 104), and the two channels Helium Level (HLMU) and Nitrogen Level (HLMU) must be enabled.

---

When you now start the Monitoring Mode/Monitoring & Alarm Mode the system will first try to establish a connection to the HLMU. If it fails, the system will not start and an entry will be logged in the Event Log. When the connection is successful, the system will begin continuously reading the level(s) values from the HLMU.

## 12.3.4 Alarm & Phone System

For complete information on using the alarm and telephone system, also read "Alarm System" on page 39.

### 12.3.4.1 Phone Line & Modem Settings

In this settings window the most important adjustments for the telephone supported alarm system are configured.

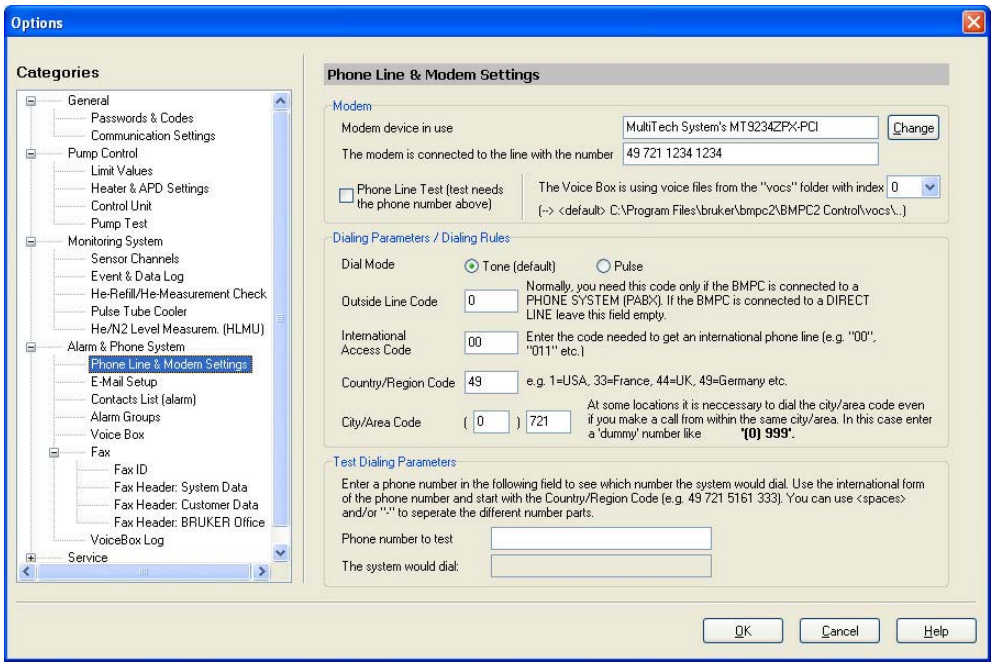



Figure 12.24 Tools - Options - Phone Line & Modem Settings

In order to use a modem with the system the modem information must be entered in the Modem settings area. Normally the system is pre-configured and this step is not necessary, but if this step is required, press **Change** to select the modem device from a list of devices.

Enter the telephone number of the phone to which the system is connected. This number is used for the „Phone Line Test“. When the system is set to „Monitoring & Alarm Mode“ and the „Phone Line Test“ is enabled, the system tries to call itself to test the phone line.

Notice: On some phone systems it is possible that this test does not work properly. In this case disable the „Phone Line Test“.

The system has an integrated „Voice Box System“ which is used for an alarm sequence, or for requesting a remote status report (see "Voice Box System" on page 43).

This voice box system uses „Voice files“ for the speech output. This set of files is stored in folders on the hard disk named „vocs“, „vocs1, and so on.

For future expansion of this system it may be necessary to have more than one set of voice files, for example for other modems, languages etc. To allow for this expansion, it is possible to set an index for the „vocs“ folder used. The default index is „0“ and means that the software uses the voice files stored in the folder „vocs“. When the index is set to „**1**“ the software will use the files stored in folder „vocs**1**“, and so on.

Once the modem and telephone number is entered you need to enter the following parameters in the *Dialing Parameters / Dialing Rules* fields:

- Dial Mode: Tone (default) or Pulse
- Outside Line Code. This may be required if the BMPC/2 is connected to, for example, a PABX telephone system.
- The international access code.
- The international country/region code where the unit is located.
- The city/area code where the unit is located.

To see what will be dialed for a given telephone number, simply enter this number in the *Test Dialing Parameters* field. The system shows you the number which would be dialed. If you are entering a number in the preselected area code, then the system should only show the local telephone number as shown in the above example.

### 12.3.4.2 E-mail Setup

The parameters for the e-mail settings can be supplied by the local system administrator. In some cases it may not be necessary to use a user name and password, whereas the fields will remain blank.

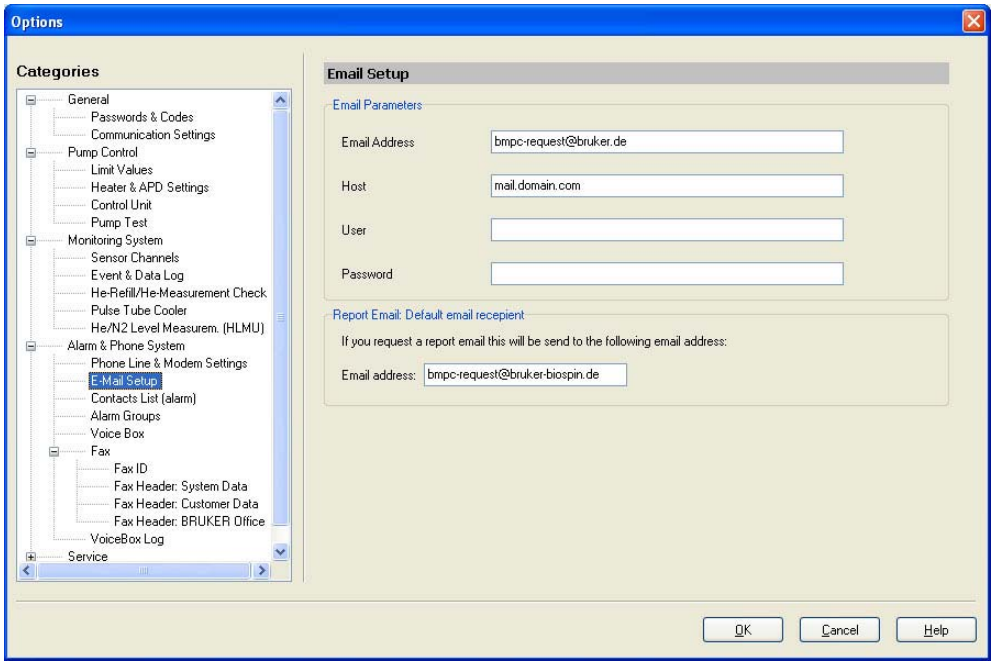



Figure 12.25Tools - Options - E-Mail Setup

### 12.3.4.3 Contact List (alarm)

In this window you can make changes to the contact list used for alarms. Press the corresponding button in order to add, edit, delete records or to scroll through the list.

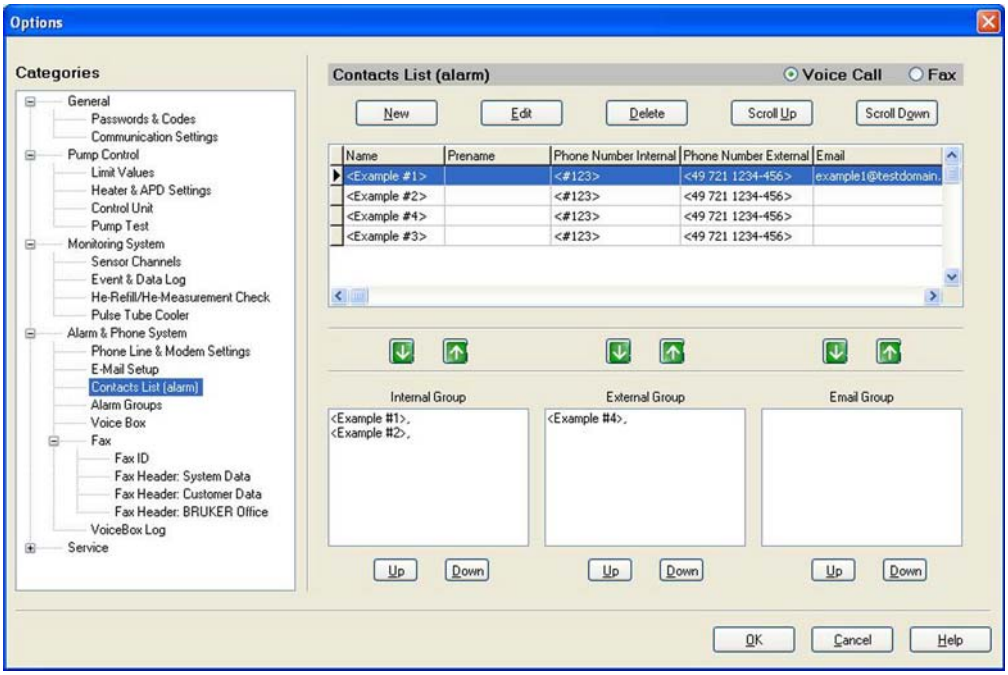



Figure 12.26Tools - Options - Contact List (alarm)

Through use of the Voice Call and Fax radio buttons, you can determine whether the Voice Call or Fax contact list is displayed.

When you highlight a record from the contact list or one of the groups on the bottom you can add member to or remove members from a notification group using the green arrow buttons.

A description of the various groups and the notification process is found in the section "Alarm Sequence" on page 40.

You can change the sequence within these groups (and therefore the sequence in which they will contacted) by highlighting the name and using the up and down buttons.

You can also make changes to the groups through the use of Drag & Drop with your mouse.

If you want to add new individuals to the Contact List or you need to change data for an individual on the list, use the functions ***New*** or ***Edit***. Enter or edit the data as shown in Figure 12.27 and press **OK** to accept.

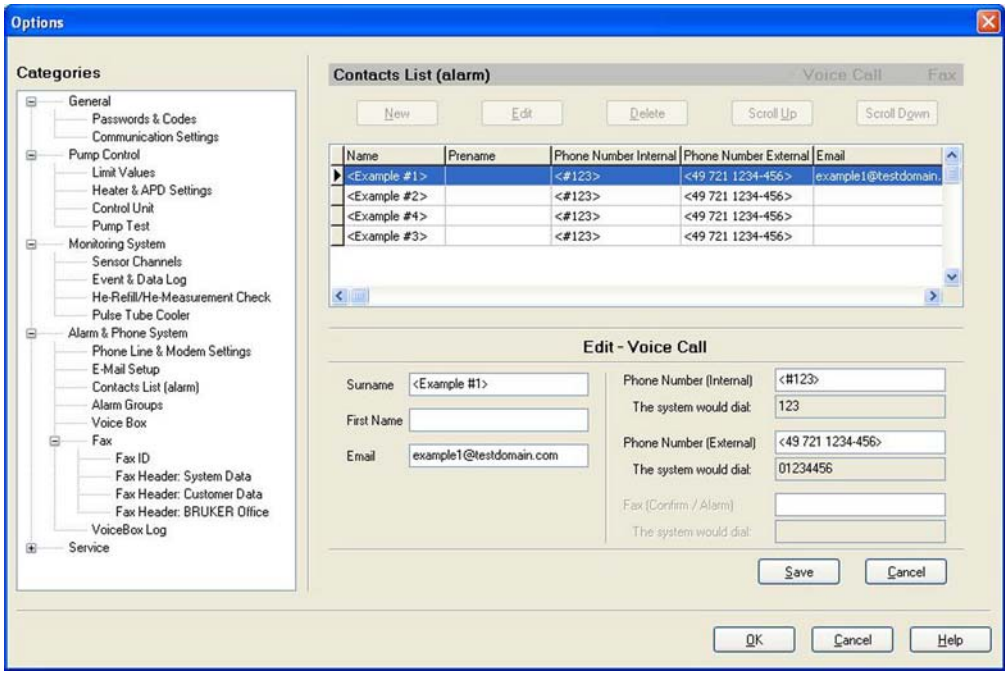



Figure 12.27 Tools - Options - Contact List (alarm) Edit Data

### 12.3.4.4 Alarm Groups

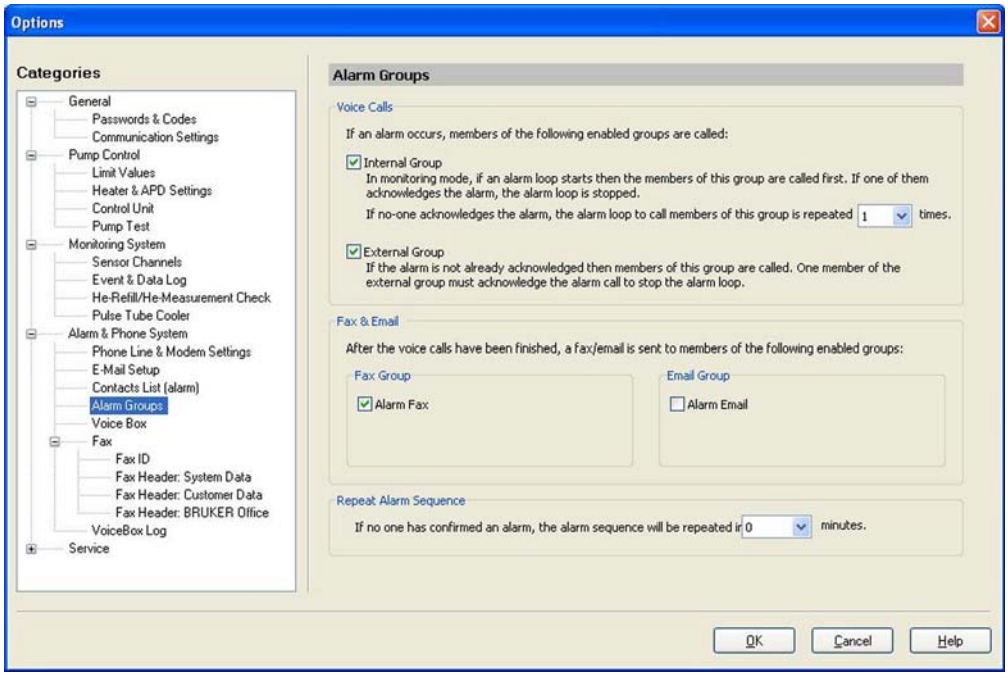



Figure 12.28 Tools - Options - Alarm Group Settings

In this window you can modify the group alarm settings.

- Internal Group: When this box is checked the members of the internal contact list are called when an alarm occurs. You can also specify how many times the call will be repeated if no one responds.
- External Group: When this box is checked the members of the external contact list are called if the internal group does not acknowledge the alarm. The call will be repeated until a member of the group responds.
- Fax Group: After the internal and/or external group is contacted a fax is sent to one or more of the fax groups if the boxes are checked. When an alarm fax is sent to an external receiver it is always meaningful to also send a confirmation fax to the same receiver so they are informed about the situation.
- E-mail Group: When this box is checked e-mails are sent to the members of the group after the fax group has been notified.
- Repeat Alarm Sequence: Here you can enter an interval for how long the system should wait before it repeats the alarm sequence when no one confirmed the alarm previously. Default is zero minutes.

### 12.3.4.5 Voice Box

The voice box editor is used to setup the voice box system. This system is pre-configured by Bruker service and does not need to be modified.

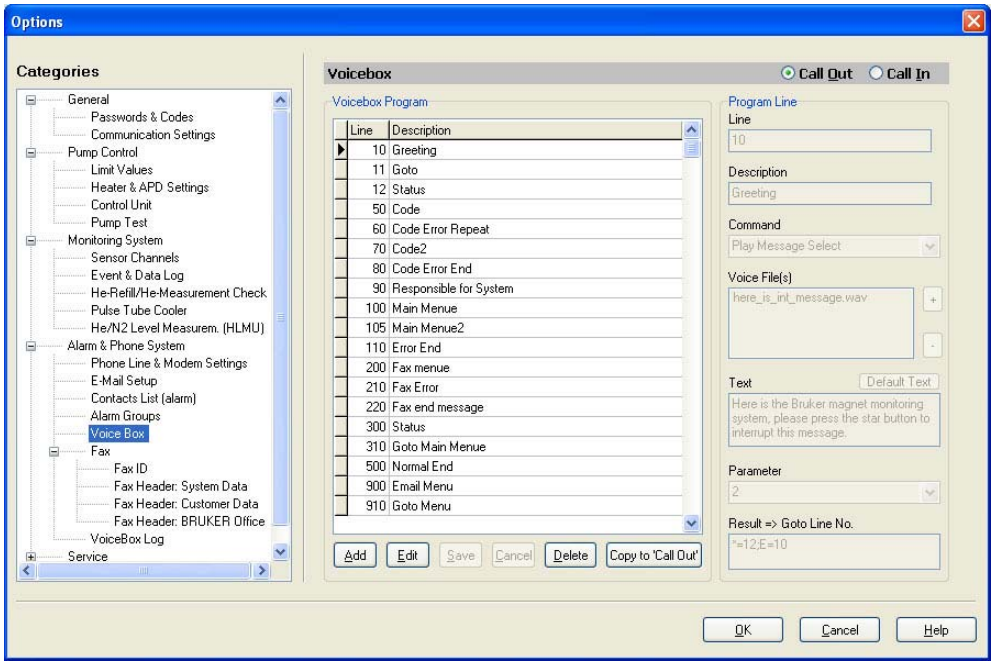



Figure 12.29Voice Box Configuration Editor

### 12.3.4.6 Fax

In this window you can enter a default fax number. This fax number will be used, when selecting the default fax number while requesting a status fax. Please refer to section "Remote Status Request" on page 44.

### 12.3.4.7 Fax - Fax ID

All adjustments in the Fax settings window are used to configure the fax text. The Fax ID fields appear in the header of the fax that is sent.

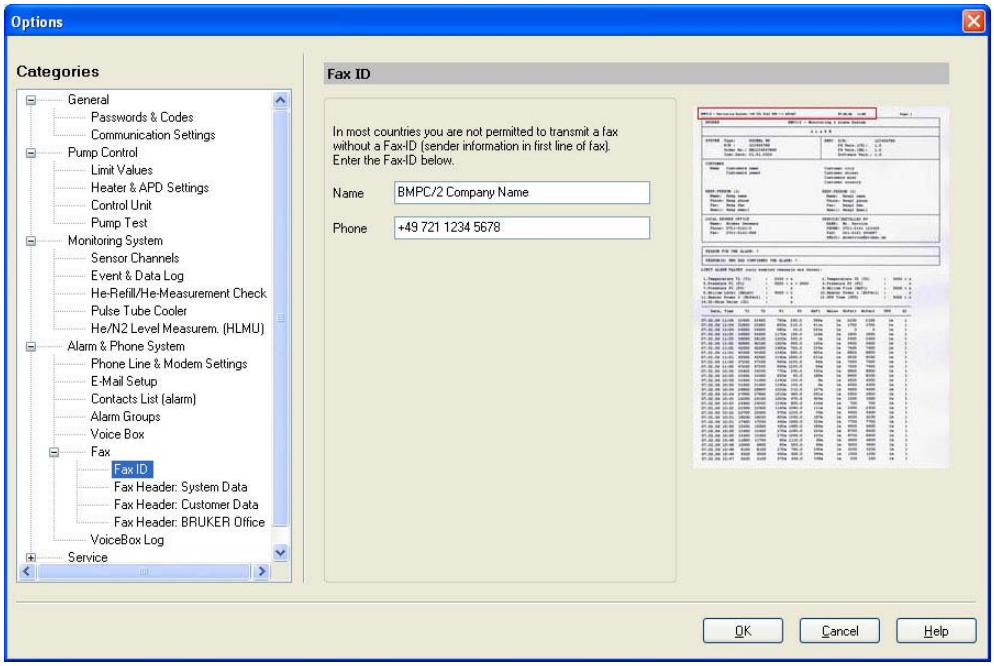



Figure 12.30 Tools - Options - Fax ID

- Name: Enter a meaningful name, such as your company and device name. This information will appear in the status line of the fax.
- Phone: Enter the number used to reach the BMPC/2.

### 12.3.4.8 Fax - Fax Header - System Data

This window is used to enter all the data concerning the magnet system and BMPC/2.

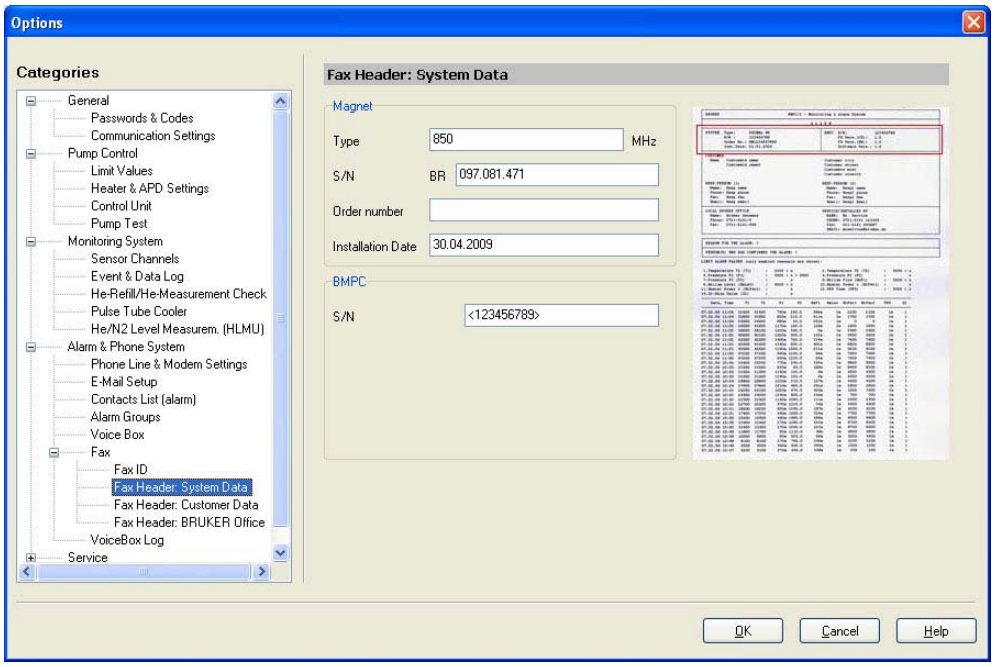



Figure 12.31Tools - Options - Fax Header: System Data

- Magnet Type: The magnet frequency and design.
- Magnet S/N: The serial number of the magnet.
- Magnet Order Number: The Bruker order number.
- Magnet Installation Date: The date of the installation.
- BMPC S/N: The serial number of the BMPC/2 H13031.

### 12.3.4.9 Fax - Fax Header - Customer Data

In this window the data for your company, including the name and contact information of the individuals responsible for the system must be entered. This information is used to contact your company, if necessary, when Bruker receives an alarm fax.

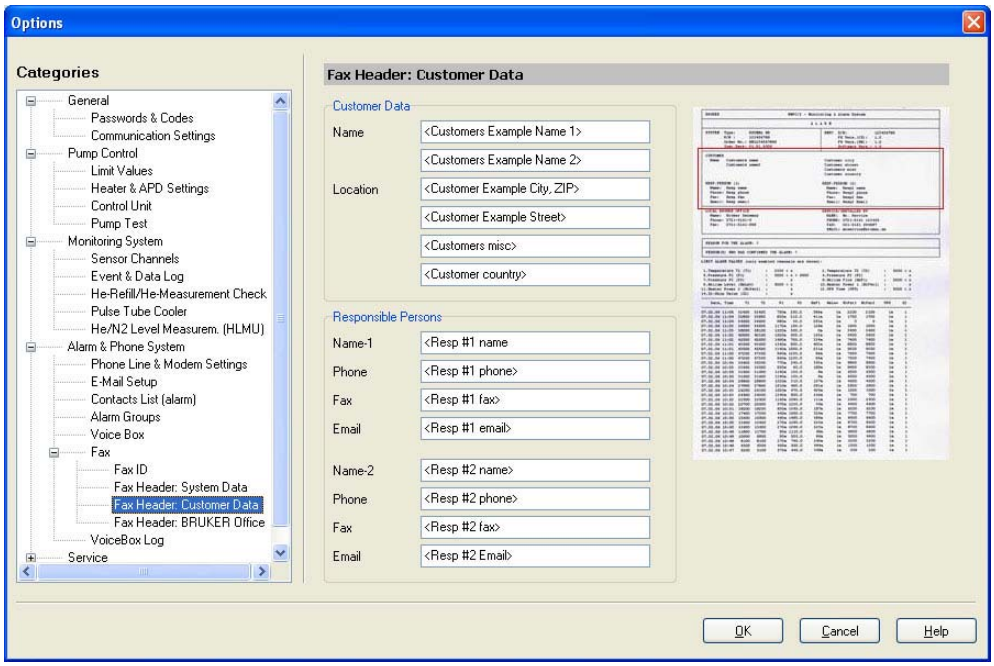



Figure 12.32Tools - Options - Fax Header: Customer Data

### 12.3.4.10 Fax - Fax Header - Bruker Office

In this window the data for your local Bruker office and the name of the service engineer that installed the system are maintained.

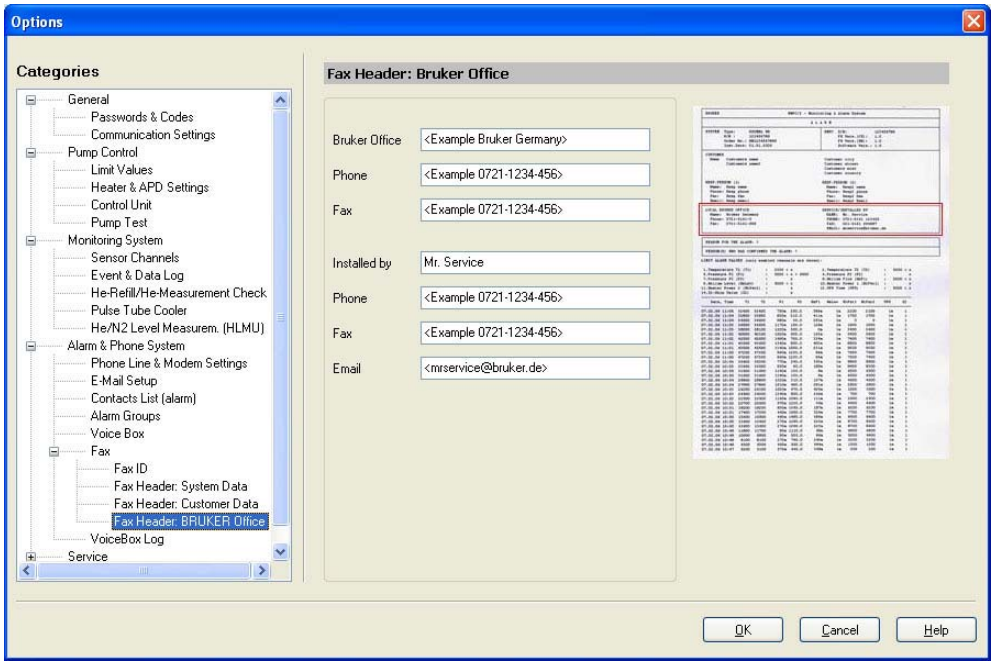



Figure 12.33Tools - Options - Fax Header: Bruker Office

### 12.3.4.11 Fax - Voice Box Log

In this window you can adjust the settings for the Voice Box Log. Since this function serves primarily for error tracing in telephone systems you can use a relatively short log recording interval. It is the same rules as for the Data and Event logs (see "Event & Data Log" on page 105).

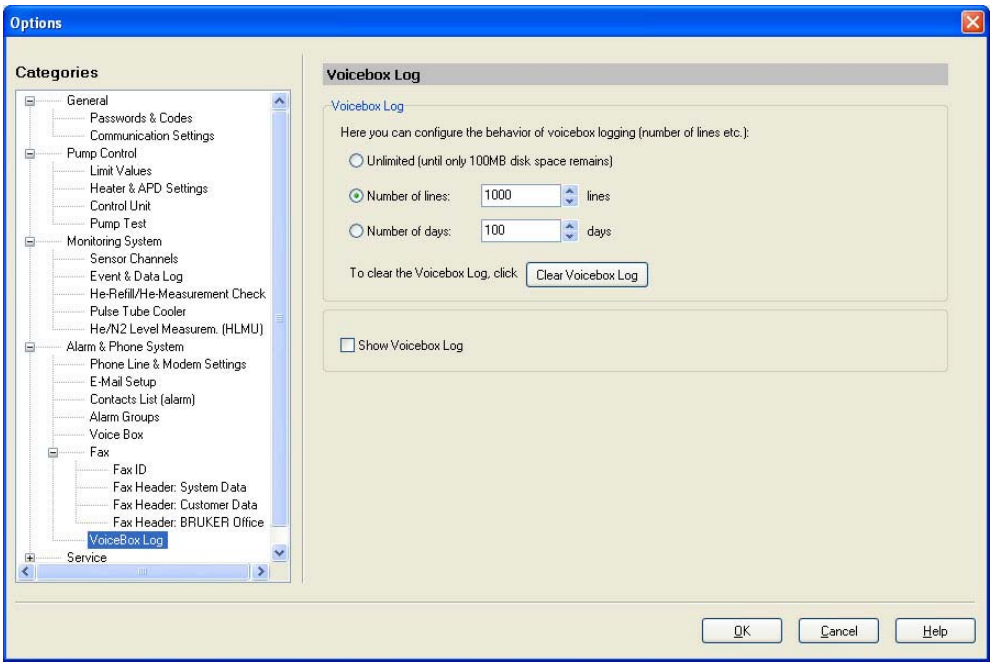



Figure 12.34Tools - Options - Fax Voice Box Log

When you check the Show Voice Box Log check box, the Voice Box Log window will be displayed as long as you remain in this window.

## 12.3.5 Service

The service area is only accessible by Bruker service personnel.

# 13 Technical Data

## 13.1 Voltage Supply Requirements

| | |
|---|---|
| Input Voltage: | 208 -230 VAC (fluctuations of less than ± 10%) |
| Input Frequency Range: | 50 - 60 Hz |
| Pollution Scale: | 2 |
| Over Voltage Category: | 2 |

## 13.2 Site Conditions

The BMPC/2 should only be used:

- In a standard laboratory environment.
- Up to a maximum elevation of 2000 meters.
- At a temperature between 15-35 °C.
- A relative humidity of a maximum of 80% for temperatures up to 31°C, linearly decreasing to 67% at a temperature of 35 °C.

## 13.3 Noise Level

The measured noise level for the BMPC/2 is less than 45 dBA.

## 13.4 Power Input Safety Fuse

The power input safety fuse for the BMPC/2 is a 50A dual-element time delay fuse Class J 600V. The Bruker part number for this fuse is **87570**. Two fuses of this type are used in the unit.

# 14 Contact

**Manufacturer:**
Bruker BioSpin NMR
am Silberstreifen
D-76287 Rheinstetten
Germany
Phone: +49 721-5161-0
http://www.bruker.com

### NMR Hotlines

Contact our NMR service centers.

Bruker BioSpin NMR provide dedicated hotlines and service centers, so that our specialists can respond as quickly as possible to all your service requests, applications questions, software or technical needs.

If contacting Bruker always provide the serial number of your BMPC/2.

Please select the NMR service center or hotline you wish to contact from our list available at:

http://www.bruker-biospin.com/hotlines_nmr.html

# Contact

# Appendix A

## A.1 Warning Signs

# Warning Signs

## A.2 Figures

# Figures

# Figures

## A.3 Tables

# Tables

## A.4 Index

### Numerics



### A



### B



### C



### D



### E



### F



### G



### H



### I



### J



### L



### M



### N



### O



### P



### S



### T



### U

## V



## W



## Z

# Bruker,
# your solution partner

Bruker provides a world class, market leading range of analytical solutions for your molecular and material research needs. Our solution-oriented approach enables us to work closely with you to identify your specific needs and determine the best solution package for you from our comprehensive range. Furthermore, we offer you the opportunity to collaborate with us on new developments.

Our ongoing efforts and substantial investment in research and development demonstrate our long term commitment to technological innovation on behalf of our customers. With 50 years of experience in meeting the needs of the scientific community across a range of specialist disciplines, Bruker has built a sound rapport with professionals from the community through understanding specific requirements.

This cooperative relationship with our customers allows us to provide them with effective solutions and a service of unmatched quality.

**Bruker Corporation**

info@bruker.com
www.bruker.com