



Bruker BioSpin

- **SampleJet**

Firmware 7
Users Manual

Version 4.0

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Contents

	Contents	3
1	Introduction	9
1.1	What is a SampleJet?	9
1.2	SampleJet Benefits Overview	10
1.3	SampleJet Overview	11
1.4	Inside the SampleJet	12
2	Safety	13
2.1	Warnings and Notes in this Manual	13
2.2	Potentially Hazardous Areas	13
2.3	Disclaimer	14
2.4	Emergency Stop	15
2.5	Site Considerations	15
2.6	Before Mounting the SampleJet	15
2.7	While Mounting the SampleJet	15
2.8	During Operation	15
3	Firmware Hints	17
3.1	What is new in Firmware 7	17
3.2	Upgrading to Firmware 7	19
4	First Steps	21
4.1	Getting Familiar with the SAMPLEJET	21
5	Using the SAMPLEJET	23
5.1	Introduction	23
5.2	SampleJet states	23
5.3	Accessing the SAMPLEJET	24
	Access from the Display	24
	Access from the Web Interface	27
5.4	Caps and Carriers	30
	Color Concept	30
	Caps	31
	Carriers	32
5.5	Loading and Unloading Probes	33
	System Locked by User	34
	Rotating the Carousel	35
	Loading Samples into the Openshop Ring	36
	Unloading Samples from the Openshop Ring	37
	Loading Racks	38
5.6	Sample Holder Numbers	40

5.7	Error Recovery	42
5.8	Hardware Offline	45
5.9	Emergency Stop	46
5.10	Important Things to Keep in Mind	46
6	<i>Operating Modes</i>	47
6.1	Introduction	47
6.2	SampleJet Operating Modes	47
6.3	The „X.Xmm Shuttle“ Operating Mode	48
6.4	The „Spinner“ Operating Mode	49
6.5	The „Manual“ Operating Mode	50
6.6	Changing the Mode	51
7	<i>User Settings</i>	53
7.1	Introduction	53
7.2	SampleJet User Settings	54
8	<i>Vision</i>	59
8.1	About Vision	59
8.2	Using the VISION for Bar Codes	60
	Rack Identification	60
	Bar Code Reading Behavior	60
	Bar Code Specifications	61
8.3	Using the VISION for Matrix Codes	62
	Tube Diameter Safety	62
	Requirements for matrix code reading	62
	Matrix Code Definitions	62
8.4	Code Reading Problems	63
9	<i>Carousel 99/5</i>	65
9.1	What is the Carousel 99/5?	65
9.2	Using the Carousel 99/5	67
	The Shuttle Storage	67
	Correct Placing of the Tubes on the Grate	68
9.3	Working with a Waste Rack	69
10	<i>Cooling (option)</i>	71
10.1	What is the Cooling?	71
10.2	Important Remarks	72
10.3	The carousel 30/5 cooled	73
10.4	Using the Cooling	74
10.5	Switching on and off the cooling	74
10.6	Cleaning the Heat Exchanger	75
11	<i>Carousel 47/5</i>	77
11.1	What is the Carousel 47/5?	77
11.2	Using the Carousel 47/5	78

12	<i>Using Bruker NMR Software</i>	79
12.1	Introduction	79
12.2	SAMPLEJET Together with TOPSPIN	79
12.3	SAMPLEJET Together with IconNMR	80
13	<i>Extension (Option)</i>	83
13.1	What is an Extension?	83
13.2	What is the Parking Unit used for?	84
13.3	What is the Preheating Unit used for?	84
13.4	Using the Parking	85
13.5	Using the Preheating	86
13.6	Preheating Settings	88
	The four preheating settings	88
	Examples of Preheating Settings	90
13.7	Preheating on a Power Failure	92
13.8	Extension Overview	93
14	<i>Remote Control (Option)</i>	95
14.1	What is the Remote Control used for?	95
14.2	How to Install the Remote Control	96
14.3	How to use the Remote Control	97
15	<i>Basic Service</i>	101
15.1	Basic Service carried out by the Operator	101
15.2	Calibrating the Device	101
15.3	Changing the O-Ring	101
15.4	Replacing the Pincer	102
15.5	Cleaning the SAMPLEJET	104
15.6	Storing the System Data and Log Files	105
	Log Files	105
	System Data	106
15.7	Loading new Firmware	107
16	<i>Initial Configurations</i>	109
16.1	Introduction	109
16.2	Readjusting the BSMS Lift	110
16.3	Setting up the Service Access with a Web Browser	110
	The Main Window	111
	The Log in Window	112
	Check Firmware Version	112
16.4	Setting up the System Settings	113
16.5	Setting up the Time and Date	113
16.6	Setting up TopSpin	113
16.7	Setting up IconNMR	116
	Setting up IconNMR for First-Time Use	116
16.8	Setting up the IconNMR if already in use	117

17	Calibration	121
17.1	Calibrating the SampleJet	121
17.2	Important Knowledge about the Calibration	122
17.3	Coordinate Calibration	123
17.4	Lift Calibration	124
	The Presetting for the Lift	125
	Running the Lift Calibration	126
17.5	Vision Calibration	127
18	Supplies and Accessories	129
18.1	SAMPLEJET on Workload	129
18.2	General statements	129
18.3	What is to consider	130
18.4	Where to get consumables	130
18.5	Remarks on the Hardware List	131
18.6	1mm Parts	132
18.7	1.7mm Parts	134
18.8	3mm Parts	136
18.9	5mm Parts	140
18.10	Limitations	145
19	Printout Section	147
19.1	What is this Chapter about?	147
19.2	Diameter Setup	148
19.3	Rack Enumerations	149
19.4	Content of a Rack	153
19.5	Loading a Rack Using the Display	154
19.6	Loading a Rack Using the Remote Control	155
19.7	Loading a Sample Using the Display	156
19.8	Loading a Sample Using the Remote Control	157
19.9	Changing the Operation Mode	158
19.10	Removing Measured Samples	159
20	Repair procedure	161
20.1	Information regarding repairs	161
20.2	Safety and Repair Declaration *	162
21	Technical Data	163
21.1	Shipping	163
21.2	Supply on Operation	163
21.3	Required Place in the Lab	164
21.4	Display	165
21.5	Cycle Times	165
21.6	Temperature Limitations	165
21.7	Sample Insertion Depth	166
21.8	Moving	167
21.9	Safety	167
21.10	Weight of components	168
21.11	Cooling Specifications	168

21.12	Extension Specifications	169
22	<i>Bruker Biospin Contact</i>	<i>171</i>
22.1	General Questions	171
22.2	Contact for Sales Information	171
22.3	Contact for Additional Technical Assistance	171
	<i>Figures</i>	<i>173</i>
	<i>Index</i>	<i>177</i>
	<i>Tables</i>	<i>179</i>

Introduction

1

What is a SampleJet?

1.1

The SAMPLEJET is a high capacity, high throughput sample robot system optimized for NMR applications. It is based on a modular concept.

The basic system takes care of common functionality of a sample handling robot and provides all parts to integrate the SAMPLEJET with standard AVANCE spectrometers. Although capable of stand-alone operation, the SAMPLEJET is connected to the console via a regular RS232 interface allowing standard control through IconNMR or the XwinNMR / TopSpin commands (B-ACS interface).

Figure 1.1. SAMPLEJET System



The SAMPLEJET is a push-button system, which runs under complete computer control enabling modern interfaces like Ethernet and a comprehensive communication link for service and diagnostics with web based mechanisms. It's built-in electronics control and continuously monitor all operations needed for an entirely automatic sample handling.

The basic system provides all the necessary parts (power supply, cables, etc.) to integrate a SAMPLEJET into a NMR laboratory.

The SAMPLEJET's capacity allows it to handle 5 racks of 96 samples (1 mm, 1.7mm, 3mm and 5 mm diameter) and 30, 47 or 99 samples (max. 7" length) on

the outer ring of the rotating tray. While the 5 racks are designed to hold tubes from batch jobs, the outer ring is great for open access operating type.

SampleJet Benefits Overview

1.2

- SAMPLEJET can be mounted on magnets from 300MHz to 700MHz.
- Fast, high capacity sample changer.
- For high throughput and openshop applications.
- 480 sample tubes arranged in 5 racks (in „96 well plate“ format) for batch operation (1mm, 1.7mm, 3mm and 5mm tubes possible).
- 47 sample tubes in spinners for open shop sequential operation (3mm and 5mm tubes).

or

96 short or long sample tubes (1mm, 1.7mm, 3mm and 5mm) without spinners for open shop sequential operation and 3 positions for tubes with spinners. In addition 6 positions will store the shuttles.

or

Cooling for the 5 rack positions and 30 sample tubes in spinners for open shop sequential operation (3mm and 5mm tubes).

- Easy access for manual sample handling.
- Simple IconNMR control.
- Identify racks from IconNMR by reading their barcodes with a camera. Read diameter of tubes and shuttles from a matrix code.
- Remote control (option) for changing openshop samples during measurement.
- Light and door switches kit for safer, faster and more convenient work with the SAMPLEJET.

SampleJet Overview

1.3

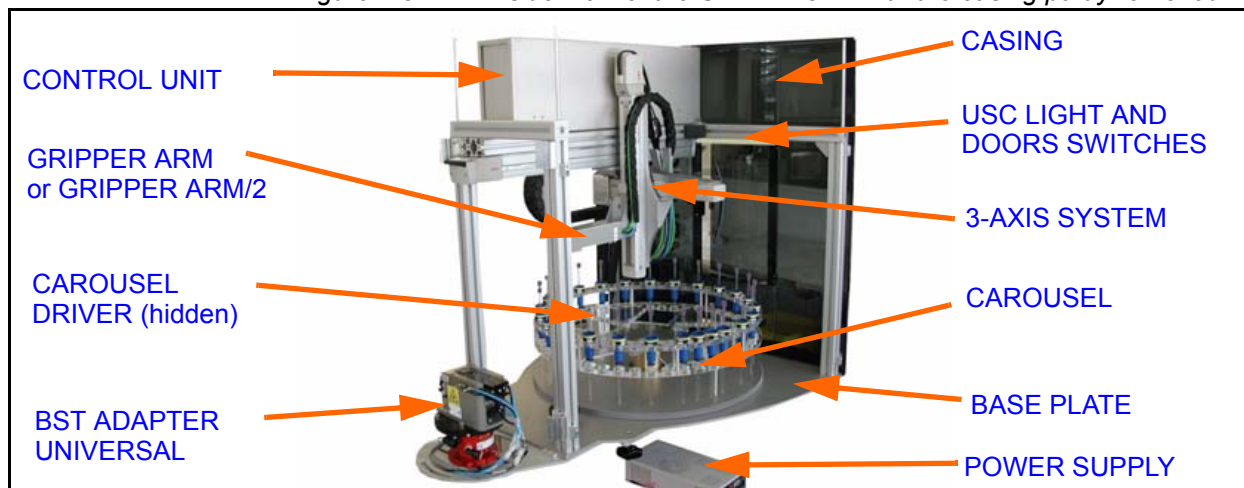
The SAMPLEJET is based on modules which are shown below.

Figure 1.2. SAMPLEJET front view with closed casing



It is mounted onto the magnet with the MAG MOUNTING. It accommodates the different heights of the BST shim upper part and magnet.

Figure 1.3. An inside view of the SAMPLEJET with the casing partly removed

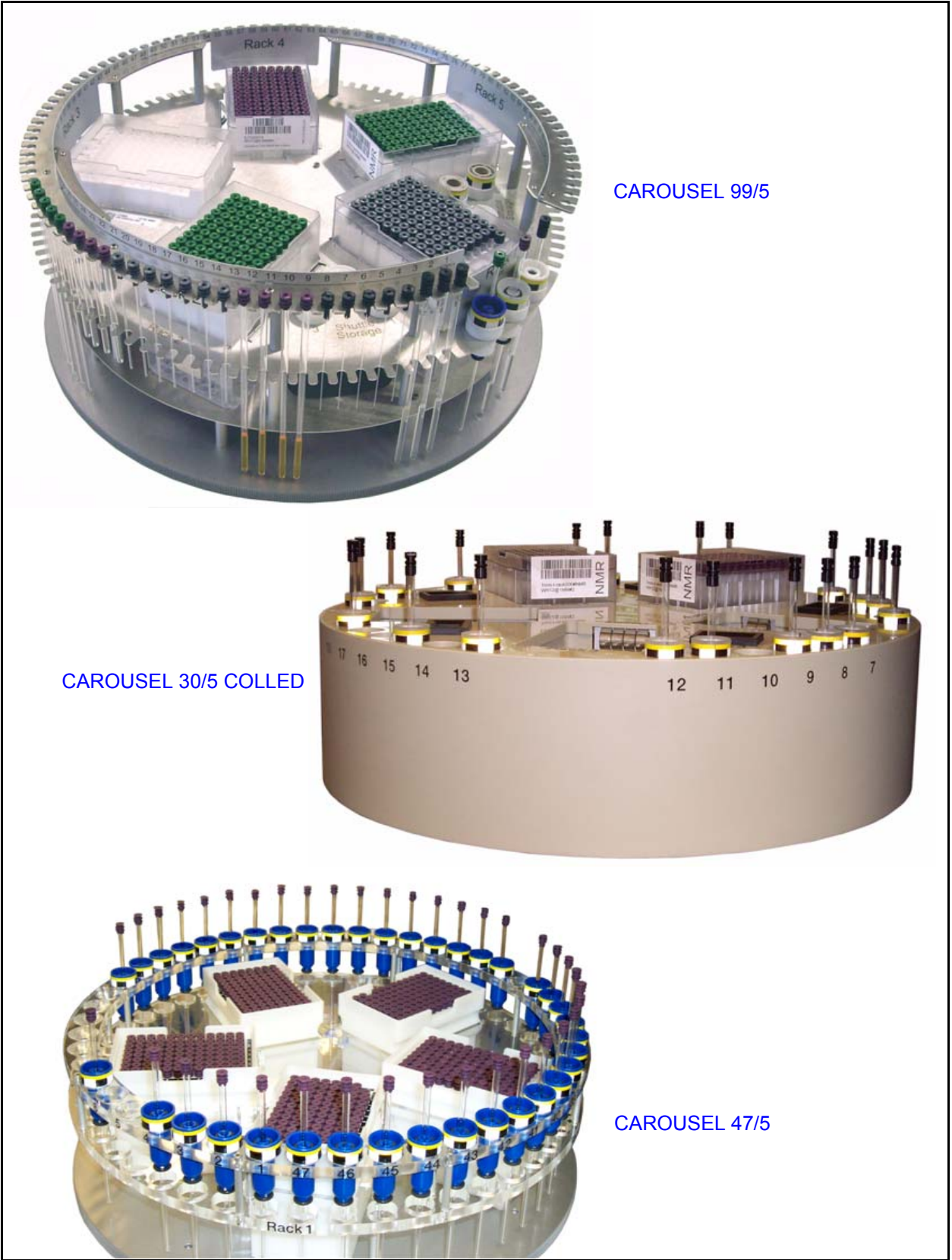


The SAMPLEJET will be placed on top of the MAG MOUNTING and tightened with 4 star screws.

Figure 1.4. SAMPLEJET Hardware



Figure 1.5. Different Carousels for the SAMPLEJET



Warnings and Notes in this Manual

2.1

There are two types of information notices used in this manual. These notices highlight important information or warn the user of a potentially dangerous situation. The following notices will have the same level of importance throughout this manual.



Note: Indicates important information or helpful hints



WARNING: Indicates the possibility of severe personal injury, loss of life or equipment damage if the instructions are not followed.

Potentially Hazardous Areas

2.2

The symbols shown below indicate a potentially hazardous area and strong LASER (ISO 3864; DIN 40008).

Figure 2.1. Warning hazardous area



The symbol is placed on the following areas of the SAMPLEJET:

1. On the front cover, just right of the door (side that is away from the magnet).

2. On the rear side left and right (side that is over the magnet). Warning: Keep cover closed unless manual action has to be done.

Figure 2.2. Warning LASER hazard



The symbol is placed on the following area of the SAMPLEJET:

1. On the „SAMPLEJET BST ADAPTER UNIVERSAL“ on top of the magnet. Do not remove any parts until the SAMPLEJET is turned off.



If one of these symbols is missing, please contact BRUKER BIOSPIN for a replacement!

Disclaimer

2.3

- The unit should only be used for its intended purpose as described in this manual.
- Use of the unit for any purpose other than that for which it is intended is done so at the users own risk and invalidates any and all manufacturers warranties.
- Service or maintenance work on the unit must be carried out by qualified personnel.
- Only those persons trained in the operation of the SAMPLEJET should operate the unit.
- Read this manual before operating the unit. Pay particular attention to any safety related information.



BRUKER BIOSPIN is not responsible or liable for any injury or damage that occurs as a consequence of non-approved manipulations of the SAMPLEJET.

Emergency Stop**2.4**

The red emergency button on top of the SAMPLEJET is used to disconnect the power supply to all the drives. This will immediately stop any movement of the carousel and the gripper. To turn off the power completely use the switch on the back side of the SAMPLEJET POWER SUPPLY.

Site Considerations**2.5**

The SAMPLEJET should be setup in a standard laboratory environment. Maximum room temperature should not exceed the range from 17-25°C. For more information refer to the Avance spectrometer manual on site planning available from BRUKER BIOSPIN.

Before Mounting the SampleJet**2.6**

- Make sure the magnet is firmly secured to its base in order to prevent the instrumentation from tipping over.
- Please check if this magnet needs a „sample changer foot“ to extend the magnet base to get the desired stability. This is the case for some 300 and 400 MHz magnets. Contact BRUKER BIOSPIN if in doubt.

While Mounting the SampleJet**2.7**

- Lifting the SAMPLEJET up to the magnet requires at least two people (ca. 40 kg). Do not try to do it on your own. You may get hurt.
- Beware of the strong magnetic field while working around the magnet. Keep all metal objects, such as tools, screws, or any metallic parts away from the magnet. Remove any mechanical watches or metallic objects while working around the magnet.
- Do not turn the SAMPLEJET on during installation.

During Operation**2.8**

- Use only new sample tubes in the specified diameter range or otherwise the caps may fall off while the system is running.
- Avoid putting hands or objects in the path of the gripperarm or tray when the SAMPLEJET is running, as this may cause personal injury or damage to the equipment. Therefore it is recommended to keep the doors on the front and back side closed during normal operation.
- Be aware that the SAMPLEJET's horizontal and vertical axes, the tray or the gripper may start a movement unexpectedly.
- Glass tubes may contain hazardous substances. If a glass tube breaks, refer to the corresponding precautions and cleaning/disinfection instructions. Only trained personnel should be allowed to operate the SAMPLEJET. Staff training

is the responsibility of the owner of the system, BRUKER BIOSPIN will not be responsible for damage resulting from improper training.

- The use of nitrogen as an operating resource instead of compressed air may lead to an oxygen deficiency in the laboratory, e.g. through a technical defect (burst in pneumatic hose). It is highly recommended that oxygen warning device(s) be installed in the laboratory.
- Always have the covers closed while working with the system.

- **Support for new clampable shuttles with metal inset**
The clampable shuttles got a new design (higher temperature limit!) and needed some adjustment in shuttle handling for the lift, the automated change of operating modes and in the error recovery.
- **Error recovery redesigned: fast recovery possible now**
In some cases the error recovery does not need to operate the lift. Therefore the SampleJet knows now a fast error recovery for actions which does not touch the shim system.
- **Remote control functionality added to touchscreen**
In the default screen on the display, the „System State, we built in two big invisible buttons. Just press on the left or the right half of the display to rotate the carousel. The system will be locked for the user with a countdown of 60s.
- **New commands for communication with IconNMR added**
IconNMR and SampleJet are now closer working together. Current IconNMR version 4.3 will now tell the SampleJet if all measurements of a tube are finished and if a tube should be put in the waste rack. While the first one is important when working with day and night experiments, the second one can separate tubes to throw away from tubes that needs to be kept.
- **Guided clearing out of measured tubes from open shop**
Tubes in the open shop ring will be marked as measured after they were in the magnet or even more intelligent controlled by IconNMR. A new menu on the display will now help you to remove those already measured tubes.
- **Static warnings added**
The system will now show warnings if critical states were detected but the SampleJet is currently still able to operate normal. Those static warnings are filling the last gap in exception reporting between dynamic warnings (in the log-files), dynamic failures (errors) and static failures (hardware offline).
- **Insertion depth can be set now rack and shuttle dependent**
Since different racks may have different filling heights of the tubes and since the optimal insertion depth of a tube in the probe head is related to this filling height, the insertion depth can now also be set per rack.
- **Long tubes in carousel 99/5: Labeling now allowed**
Since long tubes will no longer be inserted into the shuttle entirely, labelling on the glass below the cap is not problematic anymore.
- **New safety stops for tubes with spinner added**
The system will stop when a tube with spinner in the openshop exceeds the upper height of 60mm or if the shuttle will be detached on the way from the storage to the magnet.

- **Countdown when waiting for preheating or gas pressure shown**
If a sample transport gets delayed this will be shown on the display and on the web interface. This delays could be caused of the system waiting for a previously cooled tube to gets warm or the gas supply to reach a minimum pressure.
- **New light mode in user settings**
Some users like to observe the SampleJet running sometimes. The new light mode „observe“ will switch on the interior light whenever the SampleJet is working.
- **New counter for „gate“ and „clamp“ slider**
With those two additions on the statistic counters every actor has now an indication of how intense this hardware was used in past.
- **New look for the „System Database“ page**
The system database contains new data about if a tube was measured. The web page is restructured to remain still clearly arranged.
- **Minor bug fixes**
Of course we are fixing any known problems as soon as we learn about.

Upgrading to Firmware 7**3.2**

There are some important things to know when updating to Firmware 6. They are listed below.

- Since Firmware 7 has a new lift algorithm all the lift calibrations needs to be repeated. Without those calibrations, the system will refuse working.



Repeat all the lift calibrations you may have from an older firmware.

- If the software runs into a „Hardware Offline“ (see **„Hardware Offline“ on page 45**) after restarting the SAMPLEJET the „System Configuration“ may be wrong or has not supported hardware. Contact BRUKER BIOSPIN for assistance.
- To upgrade to new firmware read the instructions in **„Loading new Firmware“ on page 107**.
- After the installation you should check the „User Settings“ for your original values and set the new options.

First Steps

4

Getting Familiar with the SAMPLEJET

4.1

This chapter describes the SAMPLEJET for users working with the device for the very first time. Of course you will find more detailed information in the following chapters.



Caps

Every tube transported with the SAMPLEJET needs a special cap. The SAMPLEJET will hold the tube on this cap when transported. This makes the system versatile, it can transport different sample diameters with the same gripper.



Shuttles

In addition to the well known spinners the SAMPLEJET works with special shuttles. A shuttle always remains in the magnet and simply transports the tubes up and down. For every sample diameter a specific shuttle must be used.

Operating Modes

The SAMPLEJET has particular operating modes. Basically every diameter has its own operating mode and associated shuttle types.

Modes can be changed manually but also automatically.



Storing Tubes

The NMR tubes are stored in the round tray. In the centre 5 slots for racks with 96 tubes each, are located. The outer ring (the so called openshop ring) contains single tubes.

States

The SAMPLEJET always indicates a state. Before a command is sent, it is in the „idle“ state, then it changes to „busy “ when transporting a sample. If something goes wrong the system changes to „error“ state.

Human Interfaces

There is a touchscreen on the front of the SAMPLEJET. It is mainly used for loading and unloading tubes. With a standard browser you can access a web interface. This is used for setup and installation.

Running the Device

You can use „sx“ commands from TopSpin or set up jobs from IconNMR.

Using the SAMPLEJET

5

Introduction

5.1

In this chapter the handling of the SAMPLEJET for standard use is defined.

SampleJet states

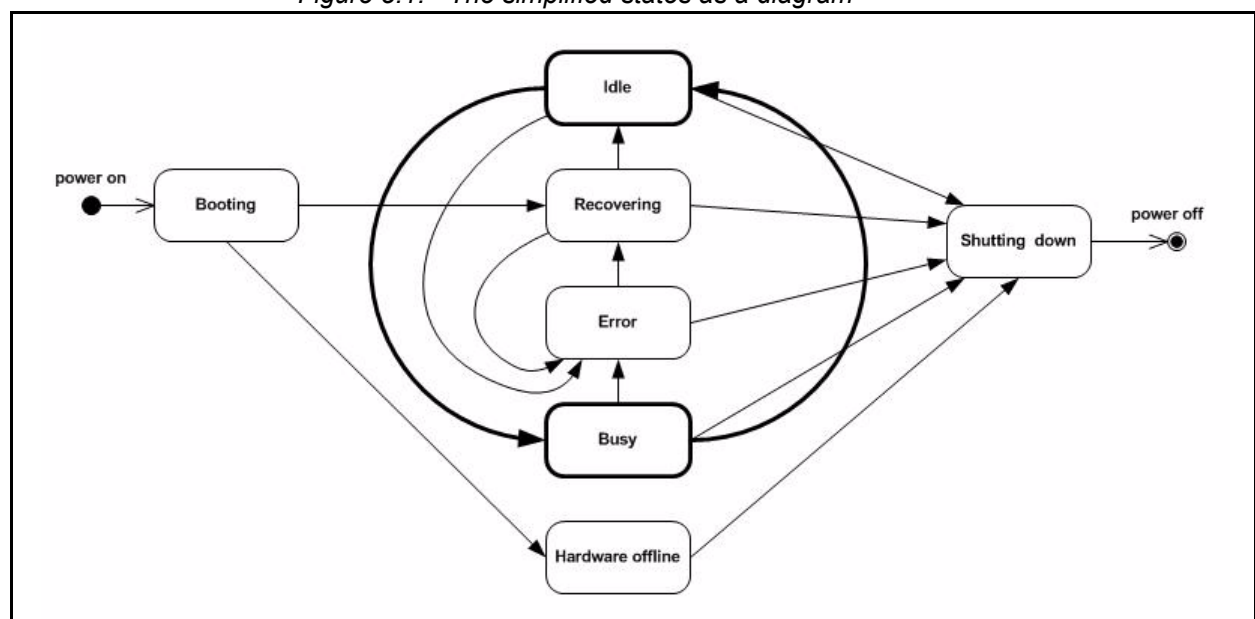
5.2

Before operating the SAMPLEJET it is important to know the general behavior of the device. It works as a state machine, that means it jumps from one defined state to an other. These are the simplified states:

- Booting
- Idle
- Busy, defined action
- Recovering
- Error, defined error
- Shutting down
- Hardware offline

During operation the SAMPLEJET jumps from the „idle“ to „busy“ state and back again.

Figure 5.1. The simplified states as a diagram



Accessing the SAMPLEJET

5.3

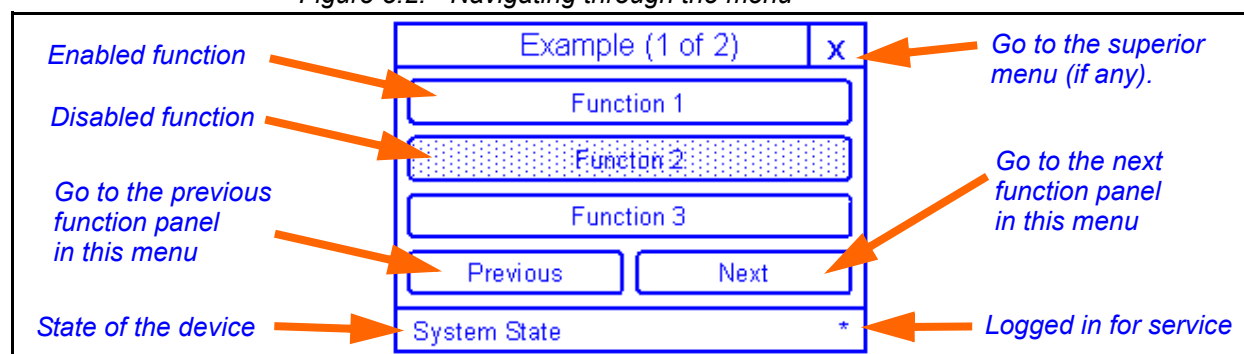
In addition to the display on the front of the SAMPLEJET, there is also a built-in web server accessible. The web interface is used for setup and service, the display for normal operation. Both of them depend on the firmware and can be different in any versions.

Access from the Display

5.3.1

The Display on the SAMPLEJET is equipped with a touchscreen. The menu is built as a tree shown in ***"The display menu tree" on page 26***, all functions are guided.

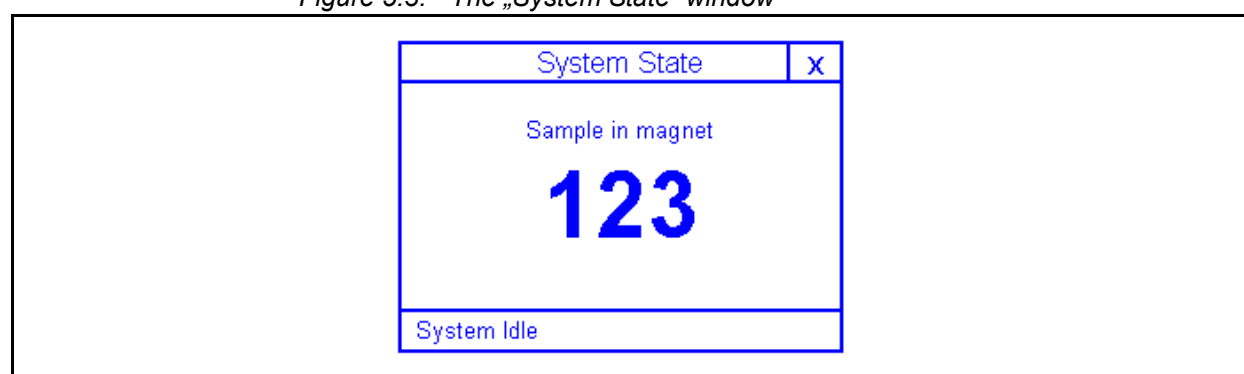
Figure 5.2. Navigating through the menu



It is possible to protect the „service“ menu by setting a code in „User Settings“ on the web interface. If no password is set you do not have to log in and out. The „Logout“ button is then disabled.

If the display is not accessed for 3 minutes it shows the „System State“ and is dimmed. The dimming options can be set through the web interface in the „Basic Service“ menu on the „User Settings“ page. Dimming the display will increase the lifetime of the background light.

Figure 5.3. The „System State“ window





Hint: The background light of some of the displays is getting darker and darker with increasing operating hours. If it is unreadable contact BRUKER BIOSPIN.

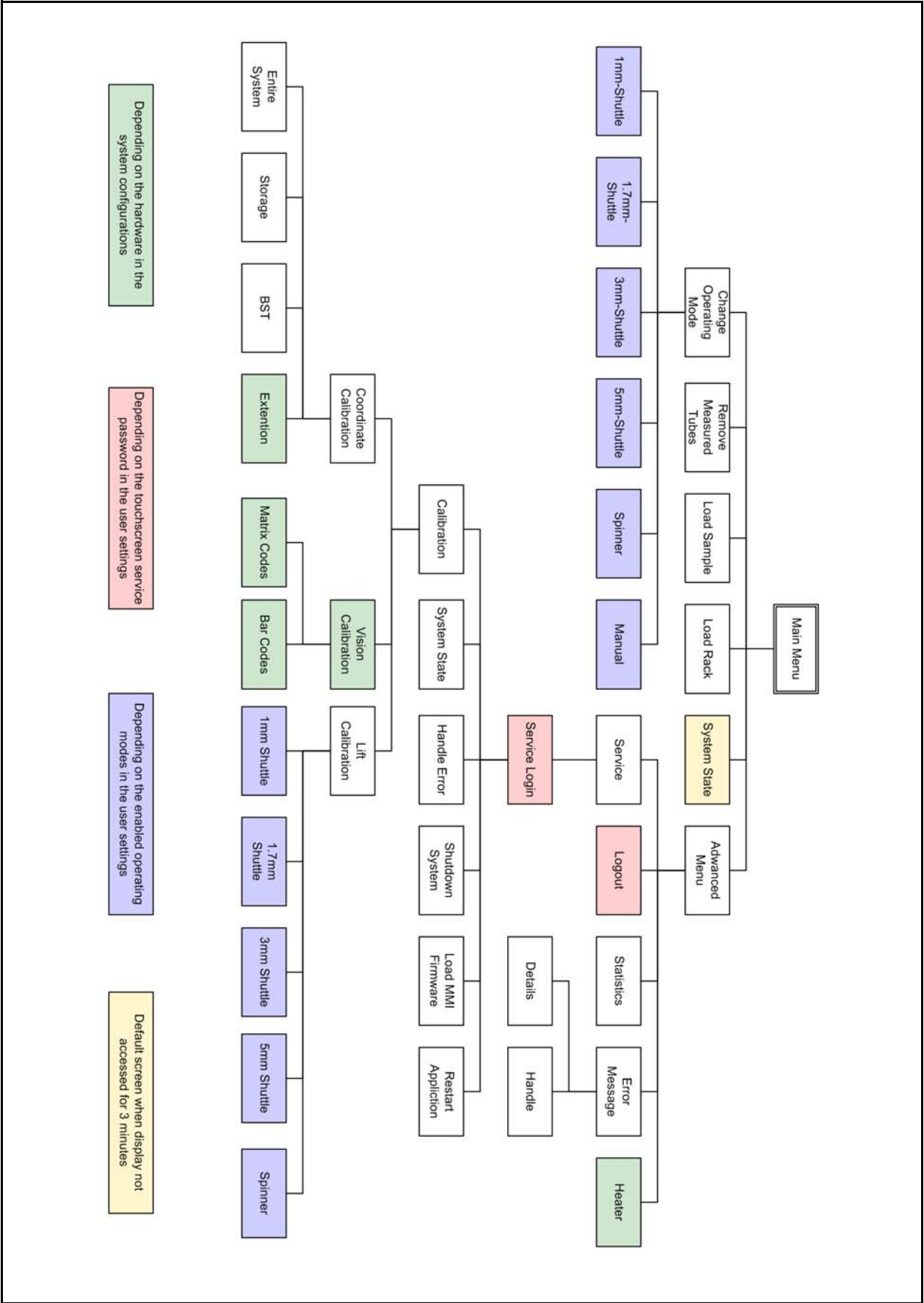


Be careful with the touch screen! If you apply too much force to the display, the glass will break.



If the SAMPLEJET does not respond, press the emergency button and release it. This will restart the application.

Figure 5.4. The display menu tree





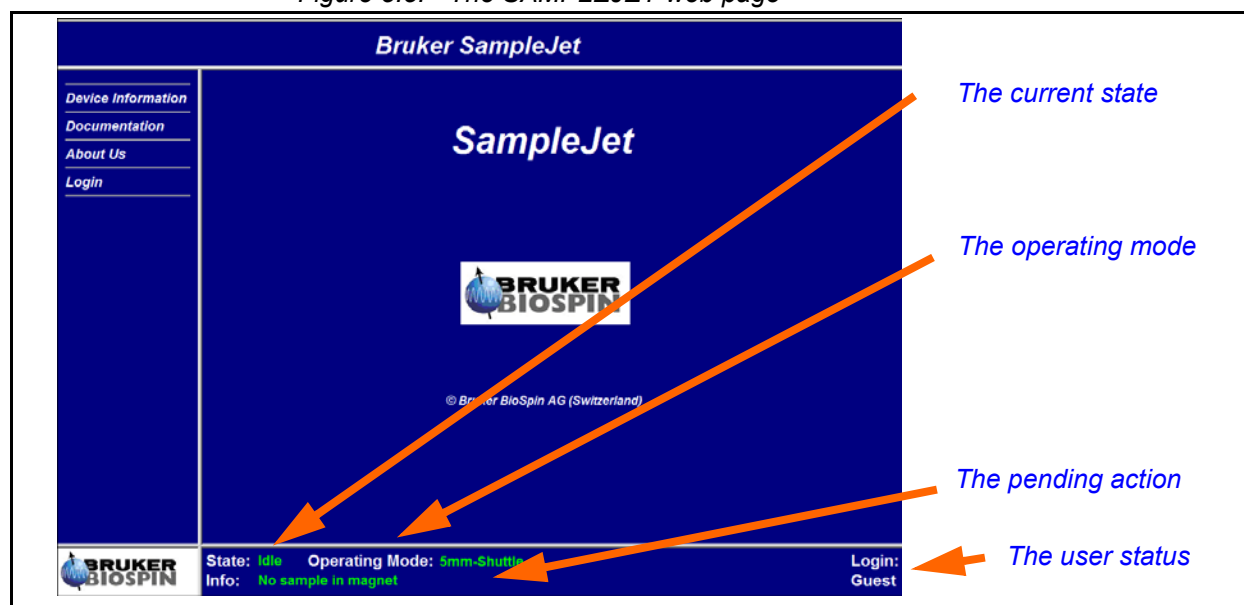
The web interface was built for setup and service only. The display on the SAMPLEJET is to be used for manual operation.

The SAMPLEJET is connected to an ethernet switch in the console. This switch connects all the NMR system internal devices in a closed network. This closed network is not connected to any other networks such as the company internal network. Do not connect the SAMPLEJET to another network, because the fixed IP addresses may cause problems.

The only computer that can access the web interface is the spectrometer computer from the NMR system. One of the two installed ethernet cards belongs to the closed network of the spectrometer.

Every SAMPLEJET has the IP 149.236.99.55, which is defined in the hostfile of the spectrometer computer as „samplejet“.

Figure 5.5. The SAMPLEJET web page





To access the SAMPLEJET just enter „samplejet “ or „http://149.236.99.55“ in a web browser window.

The web pages are dynamically created on the web server, the web browser will receive html pages only. Therefore no java extension is needed.



Always use the mouse to press the buttons on the web page instead of hitting the „Enter“ key.

The SAMPELJET shows different pages, depending on the user level. The „user“ account should be used only by the NMR system administrator.

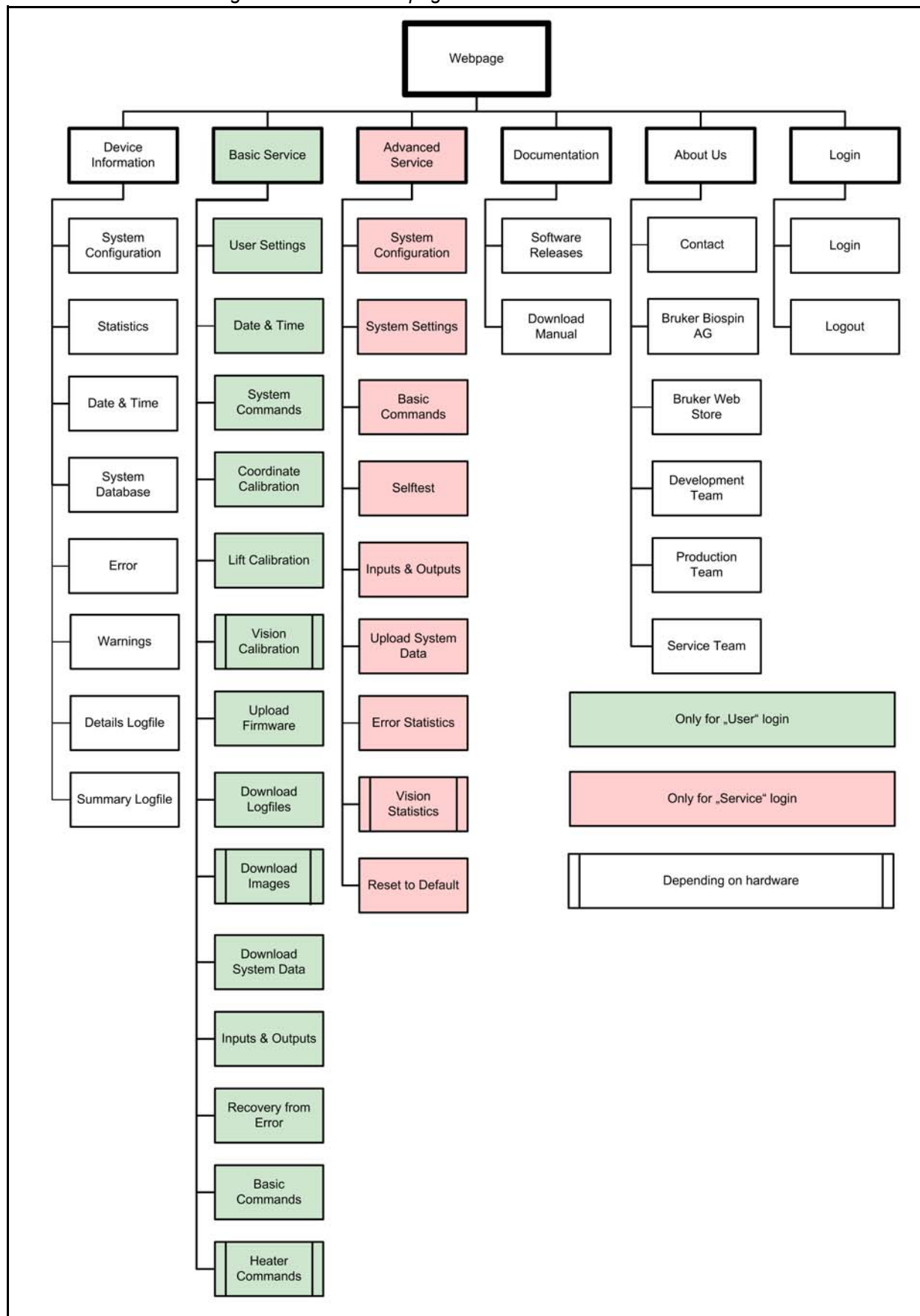
Table 5.1. Login table

Login	Password	Rights
Guest	default, when logged out	read only access
User	bruker	start simple action, change values
Service		start service action



If you log in as a „User“, you can harm the system if you are not careful.

Figure 5.6. The web page menu tree



Caps and Carriers

5.4

The SAMPLEJET can accommodate different sample diameters. The cap on top of each sample serves as an interface between the different samples and the gripper.

Different sample carriers and caps are used, depending on the operating mode of the SAMPLEJET, see **"Introduction" on page 47**.

Color Concept

5.4.1

In future all caps and carriers of the same diameter will be labeled with the same color. Every diameter has its own color. (The colors refer to the BRUKER match system as close as possible)

Table 5.2. The defined colors

Color		Diameter
	Black	1mm
	Gray	1.7mm
	Green	3mm
	Violet	5mm



The colors on the shuttles and caps serve as a visual check of having the right shuttle for the right tube diameter.

Caps

5.4.2

BRUKER BIOSPIN delivers factory assembled sample tubes and caps. There is a hole in the cap where sample liquid may be filled through. The Gilson liquid handler's needle fits through this hole. It can be closed once with a pellet.



If the cap does not hold onto the sample with sufficient force (6 Newton), the sample could be lost during transportation in the SAMPLEJET.



The SAMPLEJET caps are consumables, they can only be used once. If caps are used over again, they might not sit tight enough on the tubes.

Carrier names

- Shuttle
A shuttle is a carrier which stays in the shim system during operation. It simply transports a sample up and down. Some of the shuttles clamp the sample for sample spinning.
- Spinner
All the rest of the carriers are named spinners.

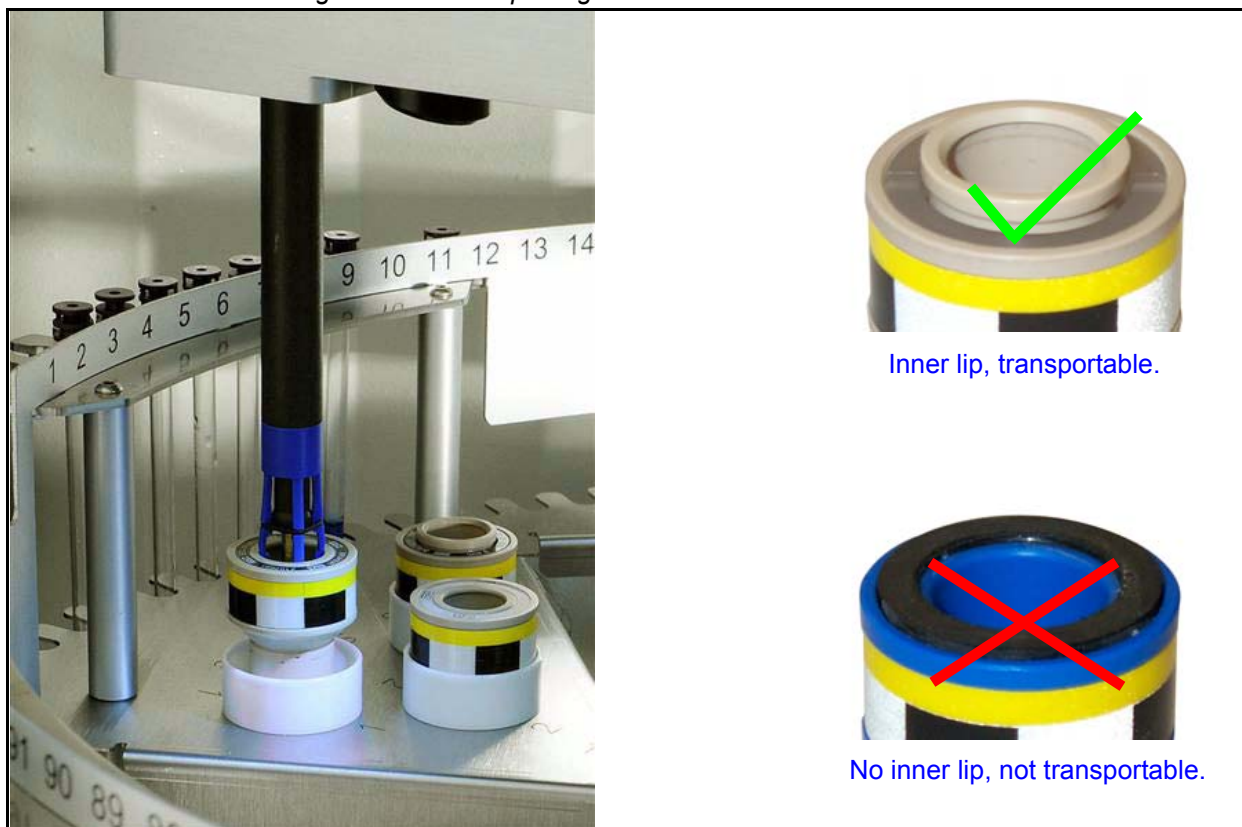


Check if existing carriers can be used with the SAMPLEJET. See ["Supplies and Accessories" on page 129](#)

Transportable Shuttles

Some of the first shuttles will not allow a shuttle transport with the gripper. This depends on the inner lip of the shuttle.

Figure 5.7. Transporting a shuttle



Loading and Unloading Probes

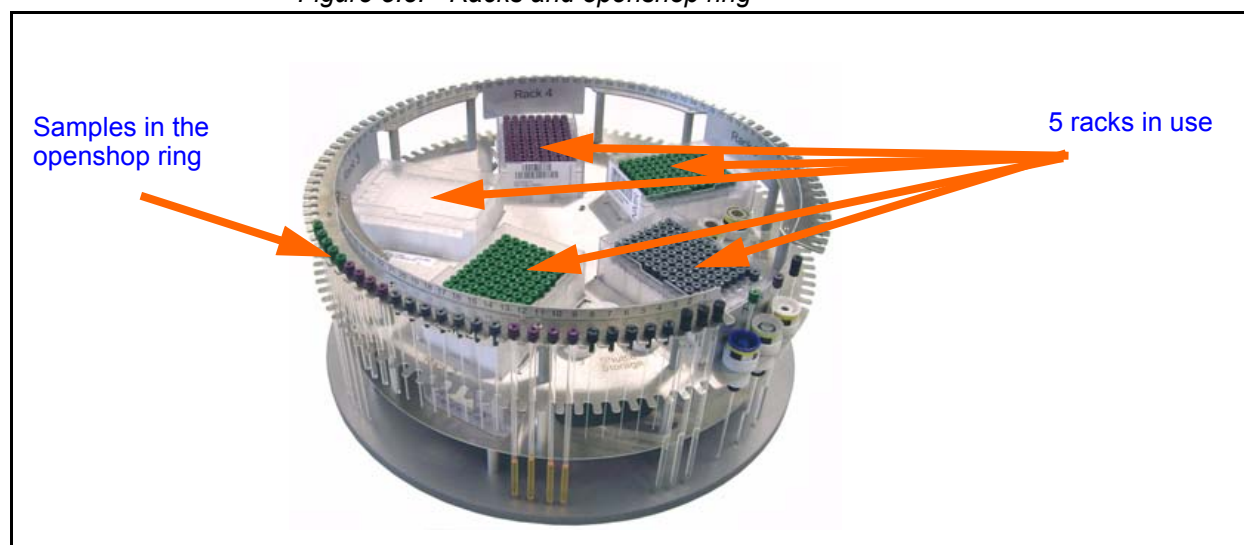
5.5

To gain access to the probes, the „Load Sample“ and „Load Rack“ functions have to be used in the main menu on the display.

If the SAMPLEJET is equipped with a remote control, accessing a sample is even easier. Read the chapter **„Remote Control (Option)“ on page 95.**

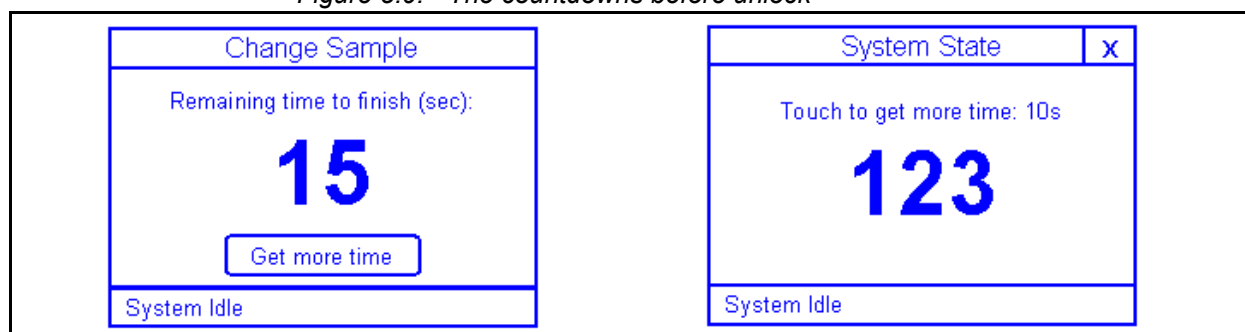
The tray will rotate quickly if no sample is in the magnet. If there is a sample in the magnet, the tray will rotate very slowly to not disturb the NMR experiment. This speed reduction can be switched off in the „User Settings“. Read the chapter **„User Settings“ on page 53**

Figure 5.8. Racks and openshop ring



Display options to load and unload the SAMPLEJET will lock the system for 60 seconds for the user. During this time the user can safely access carousel and the SAMPLEJET will not move. During the last 15 seconds of this countdown the user can repetitive lock the SAMPLEJET for another 60 seconds by choosing „Get more time“.

Figure 5.9. The countdowns before unlock



The system can be locked either from display actions or from remote control. If locked by one of these, actions on the other device will lead to a „Command refused: Other user active“ message.

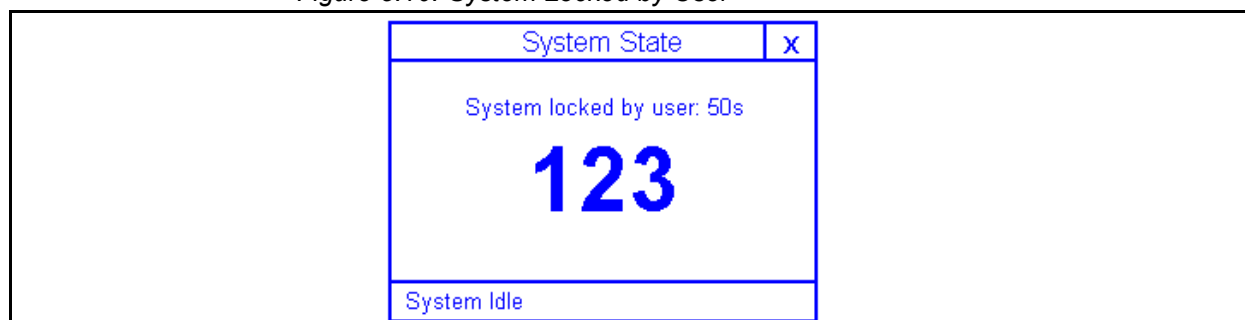
These actions will lock the system:

- Rotating the carousel from display
- Rotating the carousel with the remote control (option)
- The „Load Rack“ function
- The „Load Sample“ function
- The „Remove Measured Samples“ function



Opening the front door will not lock the SAMPLEJET for user actions.

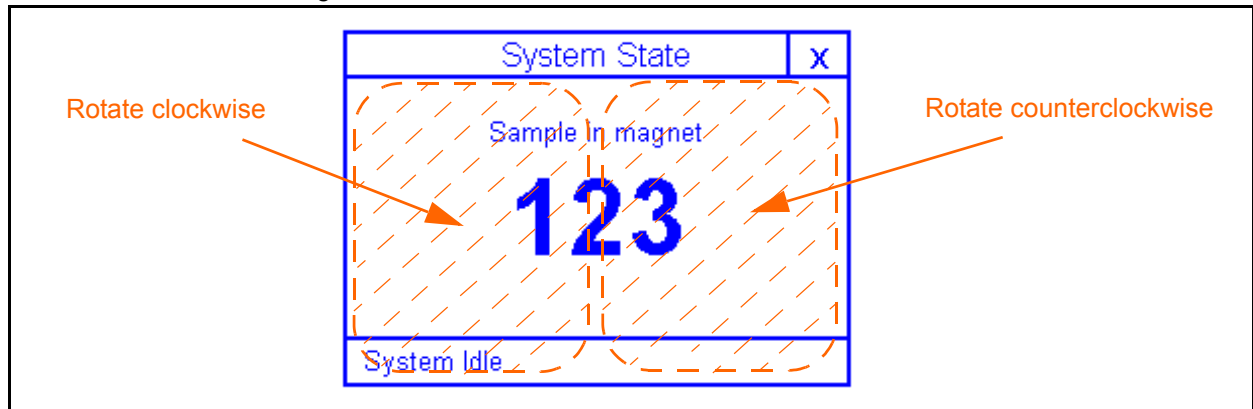
Figure 5.10. System Locked by User



Rotating the Carousel**5.5.2**

The carousel in the SAMPLEJET can be rotated with two hidden buttons on the „System State“ page on the Display. For directly accessing a specific sample or rack the functions described in the next chapters will be more convenient and faster.

Figure 5.11. The hidden buttons



The first press on one of the hidden buttons will:

- Brighten the display if dimmed.

The second press on one of the hidden buttons will:

- Lock the system
- Switch on the light
- Move away the gripper
- Rotate the carousel 1/10 of a full rotation
- Set the countdown to unlock the system to 60 seconds

Any further press on one of the hidden buttons will:

- Rotate the carousel 1/10 of a full rotation
- Reset the countdown to unlock the system to 60 seconds

While „Touch to get more time“ countdown a press on one of the hidden buttons will:

- Reset the countdown to unlock the system to 60 seconds

Closing the last open door will:

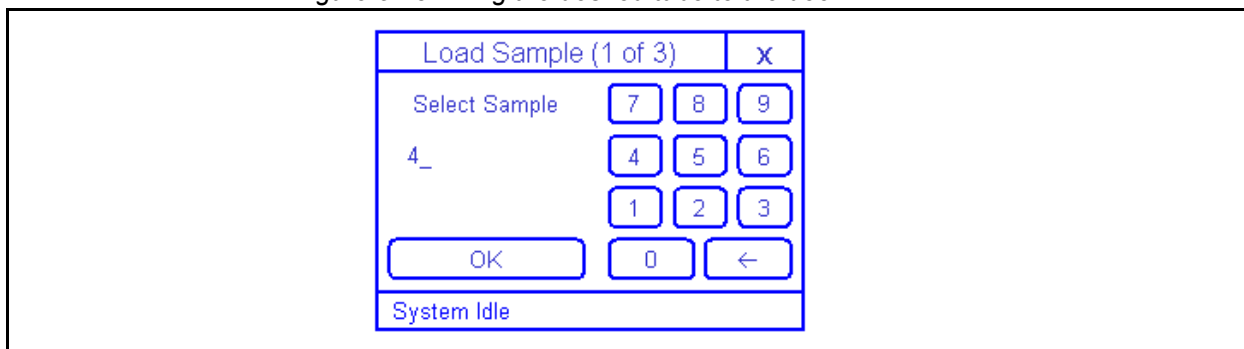
- Unlock the system immediately

Figure 5.12. Loading samples



To access a sample in the openshop ring storage use the „Load Sample“ function in the „Main menu“ of the SAMPLEJET display. This will rotate the chosen sample position to the front door.

Figure 5.13. Bring the desired tube to the door



See also the detailed description in chapter **"Loading a Rack Using the Display" on page 154**

Unloading Samples from the Openshop Ring**5.5.4**

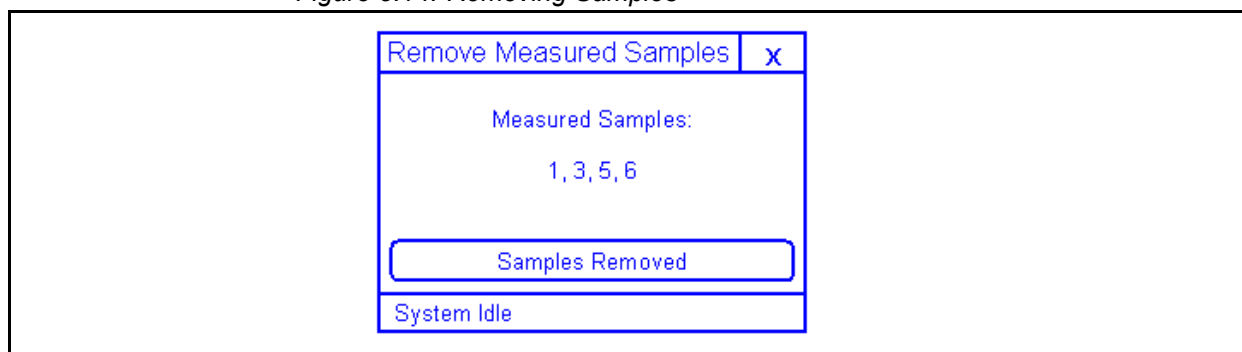
Already measured samples will be flagged in the software and can be easily removed guided by the display.

Newer IconNMR software will control this status flag itself and can therefore even handle several interrupted NMR measurements on the same tube correctly. Those interruptions are common if you are working with priorities of measurements (e.g. nighttime / daytime experiments). Read more in chapter **"SAMPLE-JET Together with IconNMR" on page 80**

Through the web interface you can have a overview of already measured samples on the „System Database“ page from the „Device Information“ menu.

To reset the status flags you can press the „All measured samples removed“ on the „Basic Commands“ page from the „Basic Service“ menu.

Figure 5.14. Removing Samples



See also the detailed description of how to use this function from the display in chapter **"Removing Measured Samples" on page 159**

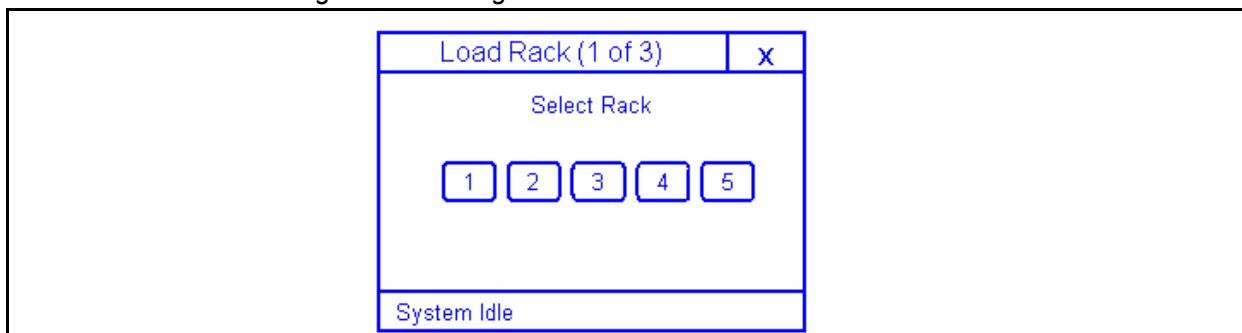
Figure 5.15. Loading Racks



The rack mode uses the samples stored in the five racks in the carousel. Since these samples are not stored with a spinner, a shuttle is used.

Use the „Load Rack“ function in the „Main menu“ of the SAMPLEJET display for inserting or removing racks. This will rotate the chosen rack position to the front door.

Figure 5.16. Bring the desired rack to the door



See also the detailed description in chapter **"Loading a Rack Using the Display" on page 154**



A check of the rack cover and positioning is activated in the „User Settings“.



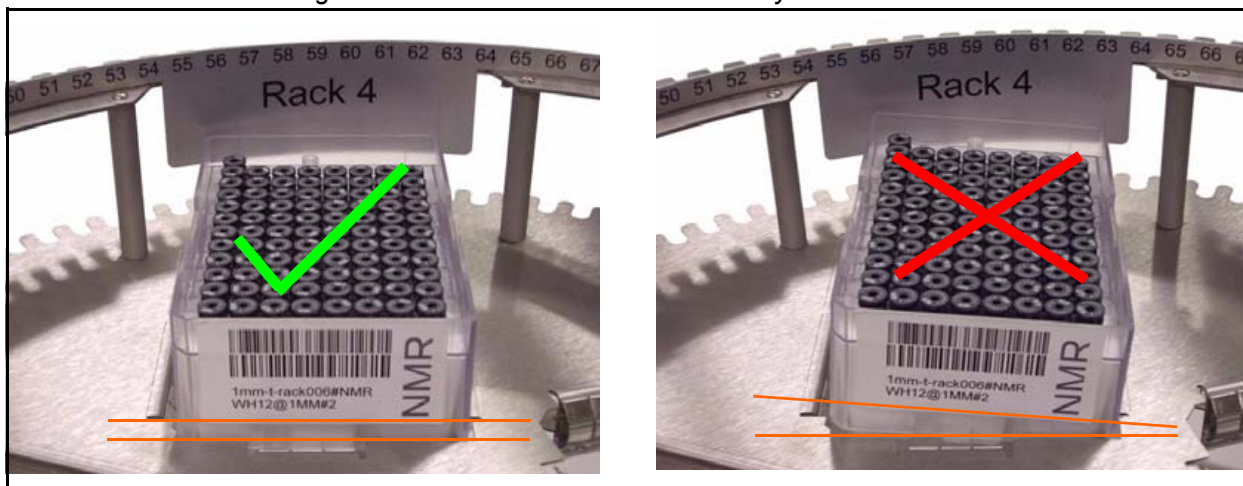
Never insert a covered rack into the SAMPLEJET.

Figure 5.17. Remove the cover of the rack.



Do always insert the racks entirely that they will stand leveled.

Figure 5.18. How to insert a rack correctly



Sample Holder Numbers

5.6

In TopSpin and IconNMR the samples are addressed by numbers. Newer versions of IconNMR will show the rack enumeration. For details see **"SAMPLEJET Together with IconNMR" on page 80**

There are gaps within the list. They should not be used, otherwise the SAMPLEJET will return a „sample missing“ message.

The exact numbers of the holders is depending on the carousel. See the holder numbers in the corresponding chapter of the carousel:

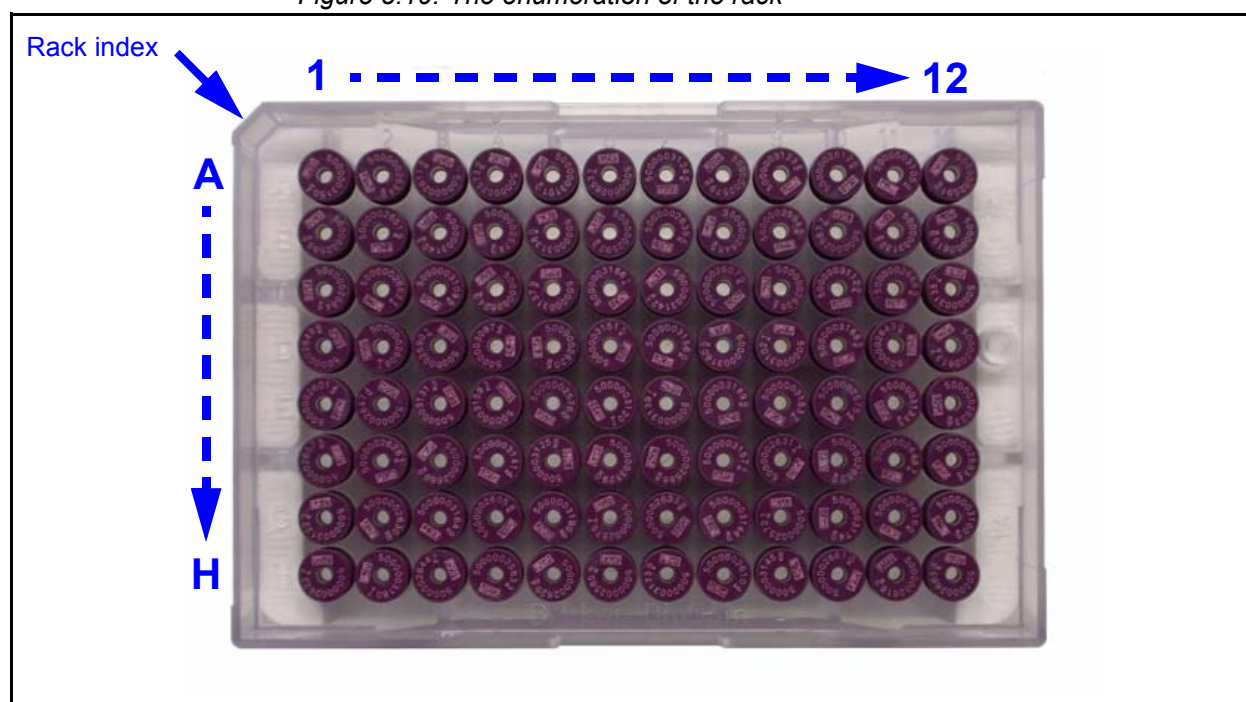
- For carousel 99/5 read **"Carousel 99/5" on page 65**
- For carousel 30/5 cooled read **"Cooling (option)" on page 71**
- For carousel 47/5 read **"Carousel 47/5" on page 77**

Table 5.3. The holder numbers

Previous IconNMR sx commands	Newer IconNMR	Number of slots	Used for
1 - 30, 47 or 99	1 - 30, 47 or 99	30, 47 or 99	Samples in the openshop ring.
101 - 196	1A1-1H12	96	For short samples in the rack 1
201 - 296	2A1-2H12	96	For short samples in the rack 2
301 - 396	3A1-3H12	96	For short samples in the rack 3
401 - 496	4A1-4H12	96	For short samples in the rack 4
501 - 596	5A1-5H12	96	For short samples in the rack 5



To set the sample position enumeration according to your needs, check the **"User Settings" on page 53**. The default starts with A1, B1 ... H1 and jumps to A2.

Figure 5.19. The enumeration of the rack

The error recovery is used to set the SAMPLEJET in a well defined state. There are 3 occasions when an error handling is carried out.

- After a power up
- After a restart of the application (e.g. after an emergency stop)
- If an error occurs during operation

To handle an error just click „Handle“ on the SAMPLEJET display and follow the instructions.



If the SAMPLEJET application is restarted, an error recovery has to be started by pressing „Start“ on the display.

Error Messages:

Figure 5.20. An error message



The error messages do always containing 4 screens:

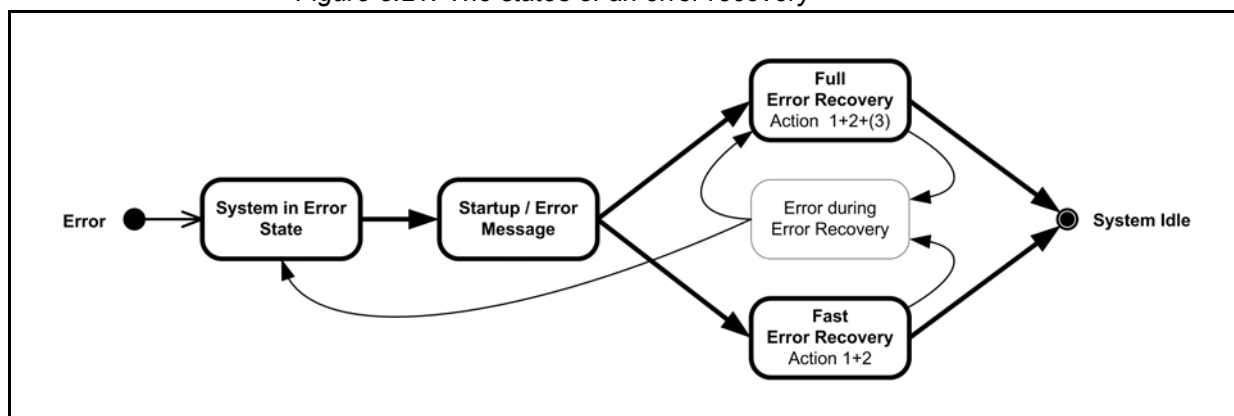
1. A short error message
2. A detailed error message
3. The cause of the error.
4. Instructions about how to get rid of this error.

Error during error recovery

If the system runs into another error while carrying out an error recovery, these are two options.

- Repeat the error recovery.
If you made a mistake on the error recovery or you have a different error message to the first one.
- Go to the manual mode.
If you get the same error message over and over again the system has serious problems you can not handle without assistance from BRUKER. The system will go to the manual mode to enable at least manual insertion of samples.

Figure 5.21. The states of an error recovery

**Fast and Full error recovery:**

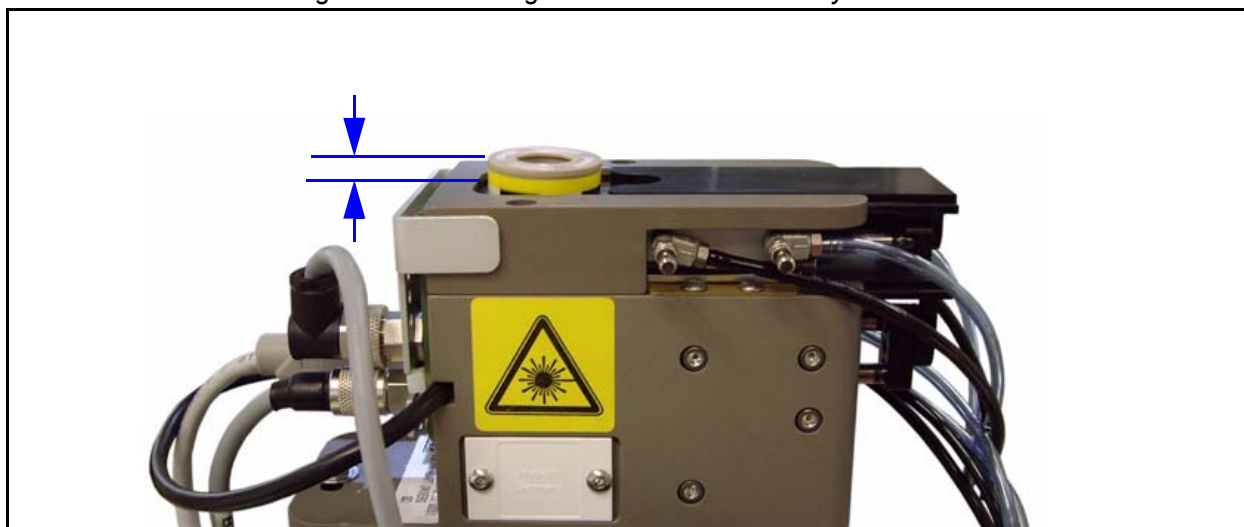
Depending on the Error the SampleJet chooses a fast or a full error recovery. A fast error recovery will be performed if:

- The error recovery was started from the display and not from the web interface.
- The BST is in a defined state (= lower BST adapter slider closed)



Starting a error recovery from the web interface will always choose the full error recovery.

Figure 5.22. Floating Shuttle in Error Recovery



Hint:

If a shuttle is towering the BST adapter as shown in **"Floating Shuttle in Error Recovery" on page 44** the action „Assure that BST is empty“ in the full error recovery can be skipped by just pressing the „Done“ button.

The system goes into the „Hardware Offline“ state, if an error occurs during application startup. These errors cannot be handled with the „Error Recovery“ sequence. There are 3 possible reasons for the „Hardware Offline“ state.

If no hardware or firmware was changed:

1. There is a defective hardware.

If firmware was changed:

2. The new firmware does not support the old hardware.

If hardware was changed (and hardware is not defective):

3. The „System Configuration“ has wrong values.



If you have a „Hardware Offline“ situation, contact your local BRUKER BIOSPIN representative. You cannot solve the problem on your own except after loading new Firmware. In this case try to load the old firmware again.



In the „Hardware Offline“ state the web interface is operational for functions which do not access the SAMPLEJET hardware (e.g loading firmware).

Emergency Stop

5.9

The red emergency button on top of the SAMPLEJET disconnects the power supply to all the drives. This will immediately stop any movement of the carousel and the gripper. The emergency button can also be used to restart the application.



If the emergency stop has been pressed, the application is restarted when the button is released. This will then lead to an error recovery in any case.

Important Things to Keep in Mind

5.10

- Never interrupt the „busy“ state of the SAMPLEJET. Just wait until the operation is finished and the state is „idle“ before sending commands to the SAMPLEJET from the display or the web interface.
- Never apply any force to the drives, axis or rotary tray of the SAMPLEJET. Applying force may lead to a misadjusted calibration which may result in a crash and / or sample destruction.

Operating Modes

6

Introduction

6.1

The operating modes, the installed hardware, the carriers, the caps and the tubes are all related in some way. This chapter describes all the relations, modes and parts.

SampleJet Operating Modes

6.2

The SAMPLEJET has the following different operating modes.

- 1mm Shuttle
- 1.7mm Shuttle
- 3mm Shuttle
- 5mm Shuttle
- Spinner
- Manual



The operating modes are named after the carrier (spinner / shuttle) they use.

In the „User Settings“ one can disable the unused operating modes to simplify the handling when changing the modes manually, and also protect the system from going into a wrong mode.

The „X.Xmm Shuttle“ Operating Mode

6.3

In the „shuttle“ operating mode of a specified diameter, the samples will be stored without a spinner in the rack (or the openshop ring). There will only be one shuttle remaining in the shim system for all the samples.

- The clampable shuttles (3mm and 5mm) clamp the tube that allows it to spin and adjust the insertion depth of the tube.
- The shuttles for the smaller diameters (1mm and 1.7mm) do not clamp the tubes. Therefore spinning is not possible and the insertion depth is defined by the probehead.

Table 6.1. Number of holders for tubes without spinners

Carousel	Part number	Holders
CAROUSEL TYPE PMMA 5 Racks	Z105513	5x96 (5 racks)
CAROUSEL 30/5 COOLING	Z112451	5x96 (5 racks)
CAROUSEL 99/5	Z110929	5x96 + 96 (5 racks + openshop ring)

The „Spinner“ Operating Mode

6.4

In the „spinner“ mode the long sample tubes will be stored with their spinner in the openshop ring. The user is responsible for adjusting the tube to the right insertion depth.
The number of spinner slots available for storage differs, depending on the hardware.

Table 6.2. Number of holders for spinners

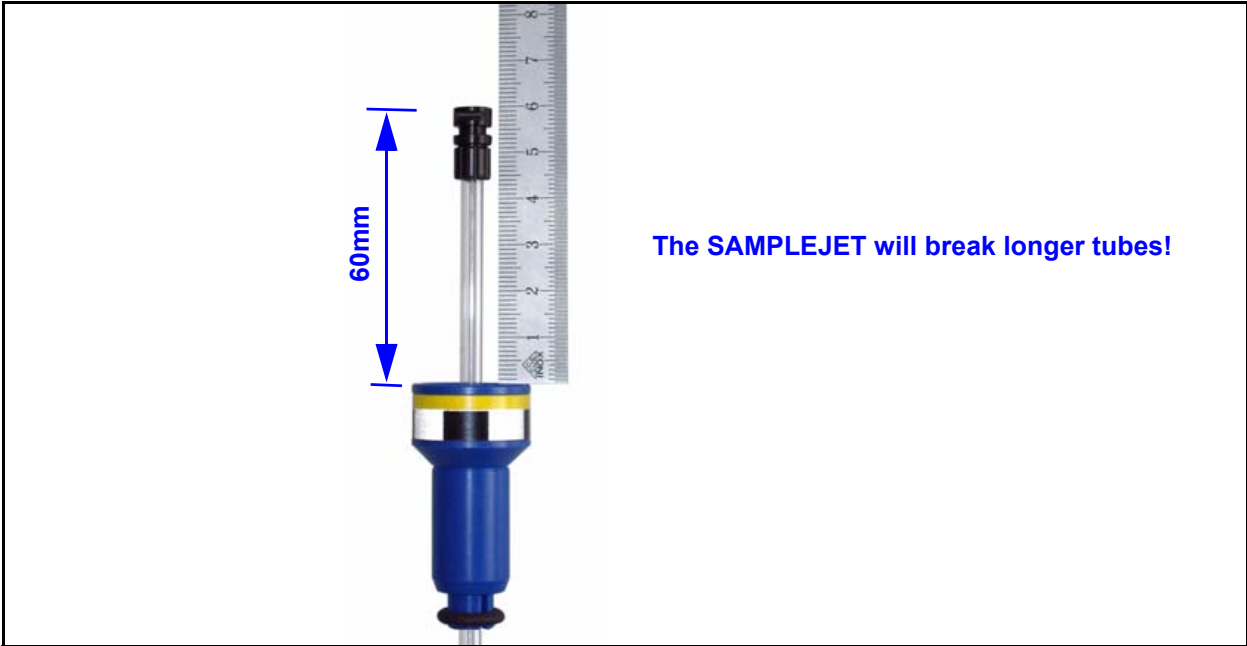
Carousel	Part number	Holders
CAROUSEL TYPE PMMA 5 Racks	Z105513	47
CAROUSEL 30/5 COOLING	Z112451	30
CAROUSEL 99/5	Z110929	3

Check the height of the tube in the spinner. If it is too high the SAMPLEJET could break the sample tube while moving above it. The black reference caps and non-BRUKER tubes are especially critical. If the SAMPLEJET detects a tube beyond limitation the system stops with an error.



For the „spinner“ mode the maximum allowed height of the upper tube and cap length is 60mm!

Figure 6.1. Limitation in the „spinner“ mode



The „Manual“ Operating Mode

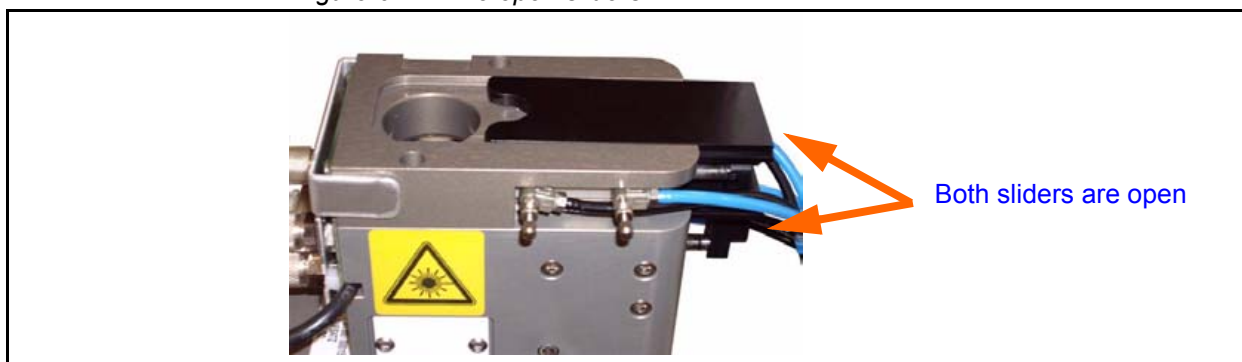
6.5

If you do not use the SAMPLEJET and work manually with the BSMS lift, use this mode (the BSMS lift is used if the „Lift“ button on the BSMS keyboard is pressed, „ej“ or „ij“ is entered in Topspin). All the sliders inside the SAMPLEJET BST ADAPTER UNIVERSAL are open and the gripper moves away from the BST.



Use the „Manual“ mode for working with a MAS or CryoFit system.

Figure 6.2. The open sliders



Open the door on the back of the cover to insert and remove samples. The door stays open if you slide it to the very top.

Figure 6.3. The door on the back



Changing the Mode

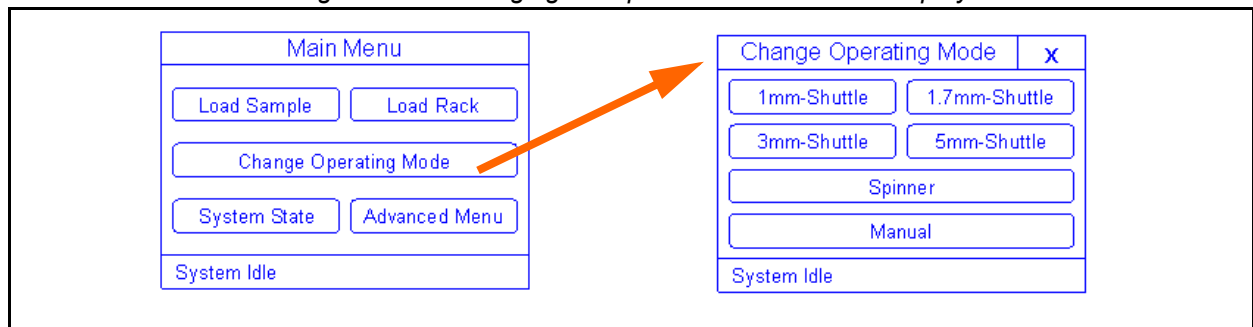
6.6

There are 2 different possibilities to change an operating mode. Depending on the setting in the „User Settings“ a manual or an automated change of the operating mode will be performed. Use the option „Let system change operating mode automatically“ and define the shuttle homes if you would like to change the mode automated.

- Manual change of operating mode.
This procedure can only be triggered from the display of the SAMPLEJET. Instructions are shown on the display to help change the mode.
- Automated change of operating mode
The SAMPLEJET will get the right shuttle or no shuttle for the operating mode. This procedure is automatically triggered depending on the „User Settings“ or on the VISION option (if available).
One can perform an automated change of the operating mode triggered manually from the „Basic Commands“ page of the web interface or on the display of the SAMPLEJET.

To change between the modes, press „Change Operating Mode“ on the main menu of the SAMPLEJET display. The list of available modes depends on the enabled operating modes in the „User Settings“ see chapter **„User Settings“ on page 53.**

Figure 6.4. Changing the operation mode on the display



User Settings

7

Introduction

7.1

There are several different ways in which a SAMPLEJET may be used in the lab. To adapt the SAMPLEJET to its environment a lot of settings can be set. All the values are on one „User Settings“ page of the web interface. Before you can access this page you have to log in as a „User“ with the password „bruker“. This prevents from the unintentional changing of a value. To access the page, do the following:

1. The system has to be in idle state.
2. Open a web browser and type „samplejet“ or „http://149.236.99.55“.
3. Log in to the web page as a user (password: „Bruker“).
4. Click on „User Settings“ in the „Basic Service“ menu.

If you change a value on the page you have to press the „Save Settings“ button at the bottom of the list.



You can only store a changed value on the „User Settings“ page when the SAMPLEJET is in the „Idle“ state and no sample tube is in the magnet.



Settings for optional hardware are shown only if that option is installed on your SAMPLEJET. These settings are labeled with „(option)“ in this chapter.

Sample Security for Racks

- Rack: Occupied position
<default: disabled>
If the content of a rack changes during the NMR experiment, a crash may result when returning a tube to the rack. With this option, the position in a rack is checked first before a sample is returned to it.
If there are door sensors indicating the doors were not opened between the inserting and removing of a sample into and from the magnet, the check will not be proceeded.
We recommend not to change the rack contents during NMR experiments.
- Deny user access to rack if sample of the rack is in magnet.
<default: enabled>
The SampleJet will not bring a rack to the front door if one of the tubes of that rack is in the magnet
- Check sample diameter with matrix code (option)
<default: disabled>
If you have the VISION option you can choose if the diameter of the tubes in the Racks corresponds with the preset diameter of the option **"Racks" on page 55**

Sample Security for OpenShop-Ring

- Occupied position / Free position check
<default: enabled / disabled>
If a lot of different people are inserting and removing samples in the openshop mode these safety options should be switched on. The SAMPLEJET will move to the openshop position and check if it is free before inserting the currently measured sample. If the position is occupied an error is displayed and the SAMPLEJET stops. If you do not want to stop the device choose the option of placing the sample into another storage number if one is free.
The SAMPLEJET will check for both, tube and spinner.
If there are door sensors indicating the doors were not opened between the inserting and removing of a sample into and from the magnet, the check will not be proceeded.
- Check sample diameter with matrix code (option)
<default: disabled>
If you have the VISION and the CAROUSEL 99/5 option you can choose if the diameter of the tubes in the slots 1 -96 correspond with the preset diameter of the option **"OpenShop-Ring" on page 55**

Shuttles

- Shuttle home positions + ECL's
<default: nothing defined>
If you want to use the automated change of operating modes you have to tell the system where the shuttles are stored when not in use. If your shuttle has no ECL on a label, set this value to „0.0“.
For shuttles you do not have, choose „none“ in the „Unit“ field.
- Sample insertion depth for samples in clampable shuttles
<default: 20mm>

You can set the insertion depth for every clampable shuttle. See **"Supplies and Accessories" on page 129** for the specifications of the shuttles.

- Vision calibration shuttle home position + ECL (option)
The SAMPLEJET needs to know where the vision calibration shuttle is located to perform the calibration.

Racks

- Rack Types
<default: Rack-96, short 1mm to 5mm-Samples mixed>
Preselect the allowed tube diameters in the rack. This will have an influence on the automated change of operating modes and of the sample security if you have the vision option.
If you choose the „Rack-96, short 1mm to 5mm-Samples mixed“ option without having the VISION option, the customer is responsible for selecting the right operating mode for the tubes being used. In this case there are no safety checks for the right diameter.
The „Rack-96, short 1mm to 5mm-Samples, waste for CAROUSEL 99/5“ is for removing short sample tubes, originally stored in the openshop ring, after the NMR measurement.
- Sample order in the rack
<default: Start with A1, B1 ... H1 and jump to A2>
Some laboratories may have a certain way of addressing a rack. 8 different possibilities can be chosen (See also **"Sample Holder Numbers" on page 40**). If you use an IconNMR version supporting the SAMPLEJET (IconNMR 4.2 and up) this value will be overwritten with the settings from IconNMR.
- Insertion test
<default: enabled>
If an untrained person inserts a rack they may forget to remove the cover or to check if the rack stands flatly. If you switch on this option, the gripper will check the rack every time a new rack is accessed.
- Sample insertion depth for samples in clampable shuttles
<default: 20mm>
With this value you can set the insertion depth rack wise. This is helpfully if your racks does not have the same filling height of the tubes.

OpenShop-Ring

- Sample type in slot 1-96
<default: 1mm to 5mm-Samples>
If your system is equipped with the CAROUSEL 99/5 option you can preselect the allowed tube diameters in the openshop ring. This will have an influence on the automated change of operating modes and of the sample security if you have the vision option.
If you choose the „1mm to 5mm-Samples“ option without having a VISION option the customer is responsible for selecting the right operating mode for the tubes being used. In this case there are no safety checks for the right diameter.
- Sample insertion depth for samples in clampable shuttles
<default: 20mm>
If your system is equipped with the CAROUSEL 99/5 option you can set the insertion depth for the openshop.

Probehead

- Probehead Sample Diameter
<default: Undefined>
If you choose your current probehead, the system will take care to allow only the valid operating modes
- Default Sample Insertion Depth
<default: 20mm>
This is the start value of the insertion depth that can be set either shuttle or rack dependent.

Operating Modes

- Enabled Operating Modes
<default: all enabled>
Choose the modes to work with from the list. This will affect the available operating modes on the SAMPLEJET display when using the function „Change Operating Mode“
- Let system decide to change operating mode automatically
<default: disabled>
If this option is set, the SAMPLEJET will change the operating modes automatically. This means the system has to know where the shuttles are stored when not used. Read ***"Shuttles" on page 54*** for the shuttles homes.
If the SAMPLEJET can not change the mode when needed for a sample „No sample in position xx“ is returned to TopSpin or IconNmr.

Table 7.1. Automatically mode change restrictions

Mode	Restriction
Manual mode	The SAMPLEJET will never leave the Manual Mode automatically. (for safety reason)
Spinner mode	The SAMPLEJET will not change from Spinner mode to a shuttle mode if the racks are defined as „mixed“. (for technical reason)

Touchscreen

- Touchscreen service code
<default: 0>
A numerical service code can be entered to override the default value to protect critical functions on the SampleJet. This service code will be requested when functions are chosen from the display. The service code will not be requested when it has the default value.
- Backlight brightness when dimmed
<default: 80%>
The lifetime of the touch screen backlight can be extended if it is dimmed when not used. You can choose the degree of dimming with this setting. The recommended value is 10%.

- Backlight brightness when not dimmed
<default: 10%>
The touchscreen backlight can be adjusted to suit the ambient light in the lab.

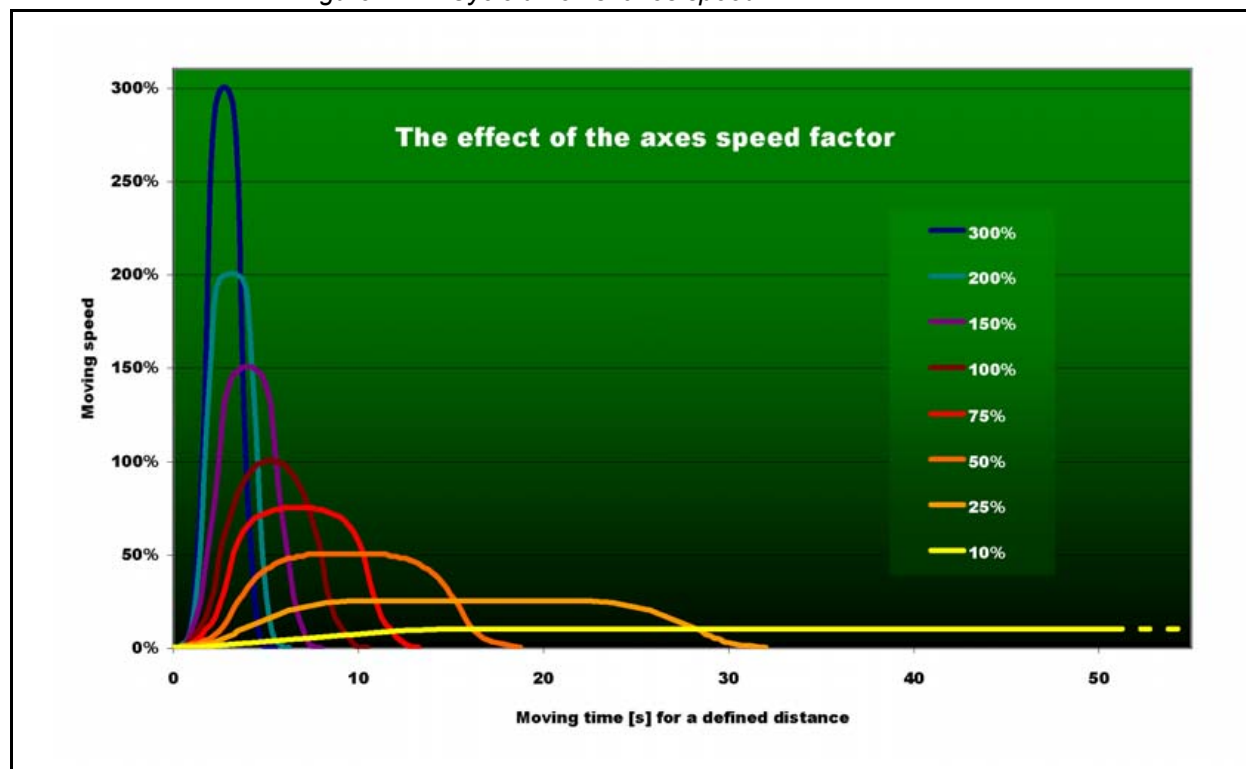
Light & Door Kit (option)

- Door mode
<default: Normal>
You can choose between two modes:
The light flashes in the „Normal“ door mode if a door is open and the device is working. This is a warning to prevent the user from grabbing a sample or rack when parts are moving.
In the „Service“ door mode there is no warning when parts are moving.
- Light mode
<default: Automatic>
The light blinks slowly in the case of an error and flashes in case of danger. There are four different modes for the light behavior: You can switch the light on and off, let the doors control the light automatically like the light in a refrigerator or choose the „observe“ mode to have light when the SAMPLEJET is working.

Axes

- Axes speed factor
<default: 100%>
If vibrations and sample losses are not a problem you can increase the speed of your SAMPLEJET. If trouble arises, decrease the axes speed factor for easier observation.
The axes speed is not proportional to the sample change cycle time, as the lift and communication will always take the same time.

Figure 7.1. Cycle time vs. axes speed



- Move slowly when a sample is in the magnet
<default: enabled>
Normally the SAMPLEJET will reduce the revolving speed of the carousel if there is a sample in the magnet. Otherwise a possible ongoing NMR acquisition may be disturbed. If you do not care about disturbances affecting the magnet you can switch off this speed reduction.
- Idle time until axes are switched off
<default: Never switch off>
Defines the time after the axes switch off their current if not being used, increasing their lifetime and saving energy.

About Vision

8.1

The VISION option is a special GRIPPER ARM with a camera and an integrated spot light. VISION is standard on newer systems and an upgrading option for previous SAMPLEJETS.

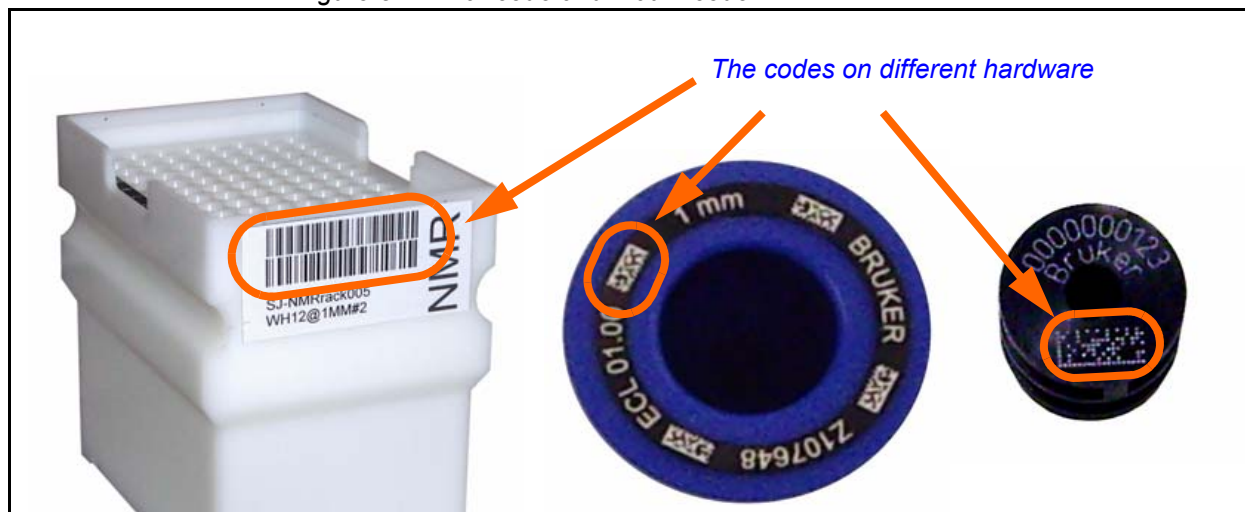
The camera can read:

1. Bar code labels on the racks.
2. Matrix codes on sample caps and shuttles.

Figure 8.1. The GRIPPER ARM / 2 for the VISION option



Figure 8.2. Bar code and matrix code



Using the VISION for Bar Codes

8.2

To enable the SAMPLEJET GRIPPER ARM / 2 (Z108928) to function, it has to be listed in the „System Configuration“. If it is listed, all of the coordinates and the camera need to be calibrated. If matrix codes are to be read, a software key and calibration is required.

Rack Identification

8.2.1

The barcode reading can be used to identify racks to the BRUKER IconNMR software. This creates the possibility of setting up your IconNMR runs from the BRUKER SAMPLETRACK software to a specific rack. This feature needs at least firmware 5.

Since the SAMPLEJET requires more commands for communication with the IconNMR, older IconNMR versions cannot be used.



To use the VISION you need at least TOPSPIN 2.1 to be installed (containing IconNMR 4.2).

Bar Code Reading Behavior

8.2.2

SAMPLEJET LIGHT AND DOOR SWITCHES are recommended for a SAMPLEJET equipped with the VISION option. The device can detect if a rack has been changed. Therefore all of the racks are read only as long as the doors are closed. If one door is opened, all racks, tubes and shuttles are flagged as „ID not reliable“ and every rack, tube and shuttle accessed has to be verified again. If the door stays open, the continuous verification of the racks slows down the working speed.



Always close the doors when using the VISION option to make more efficient work possible.

If a bar code could not be read the first time SAMPLEJET tries to read it again.



Stray light from outside the SAMPLEJET can disturb a reading. Closing the doors prevents this problem.

Bar Code Specifications

8.2.3

Bruker specifies the bar codes for all automation devices in a separate manual.



Please refer to „Barcodes for BRUKER Automation User Manual“ (Z31588) for bar code specifications .

Using the VISION for Matrix Codes

8.3

Tube Diameter Safety

8.3.1

The matrix code reading can be used to verify if the diameter of the tube and the shuttle correlates with the chosen operating mode. The SAMPLEJET is able to change the operating mode on its own if it is not correlating.

Requirements for matrix code reading

8.3.2

The SampleJet with a VISION gripper needs the following to read the codes:

- A key is required in order to activate the code reading.
- A calibration for the matrix codes is needed. This calibration is described in **"Vision Calibration" on page 127**

Matrix Code Definitions

8.3.3

All matrix codes on caps and shuttles are labeled by BRUKER. Therefore no specification is available on matrix codes. Some definitions of the content of the codes are described below.

Caps

- The whole information from the code is also labeled in ten digits.
- The first two digits define the diameter of the tube.
- The remaining eight digits are a unique serial number of the cap.

Shuttles

- The whole information from the code is also labeled in characters. This includes the diameter (x.xmm), the part number (Zxxxxxx) and the version (ECLxx.xx).

Figure 8.3. A picture captured by the VISION



Known reasons for unreadable codes

If the SAMPLEJET is not able to read a code, there could be various reasons why.

- The bar code does not match the specifications.
- The bar code label was not stuck on the right place or is aslope.
- The matrix code may be destroyed, covered or overwritten
- The camera is not properly calibrated for bar codes or matrix codes.
- Light sources from outside the SAMPLEJET disturb the reading. Assure the cover is complete and the doors are closed.

Check what the camera reads.

All the codes the SAMPLEJET reads will be shown on the „System Database“ web page. For matrix codes feedback information about the readability will be shown there.

1. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
2. Choose „System Database“ in the „Device Information“ menu.

Downloading unreadable code pictures

The last 10 unreadable codes are stored as a picture and can be downloaded to give an idea of the problem. The pictures get lost if the SAMPLEJET is switched off.

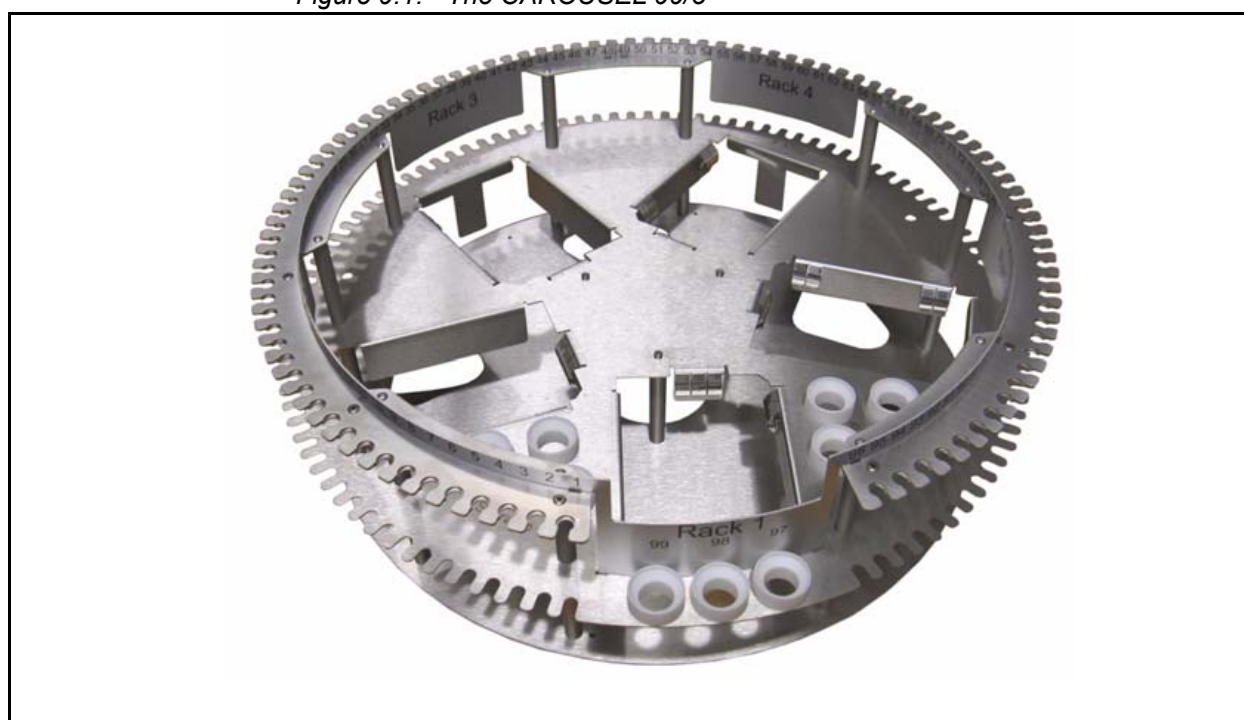
1. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
2. Log in to the web page as a user (password: „bruker“).
3. Choose „Download Images“ in the „Basic Service“ menu.
4. Unreadable codes will be shown as images and can be downloaded.

What is the Carousel 99/5?

9.1

This option can be mounted instead of the standard storage. The CAROUSEL 99/5 storage leads to new possibilities when working without the racks. This option requires at least firmware 6.

Figure 9.1. The CAROUSEL 99/5

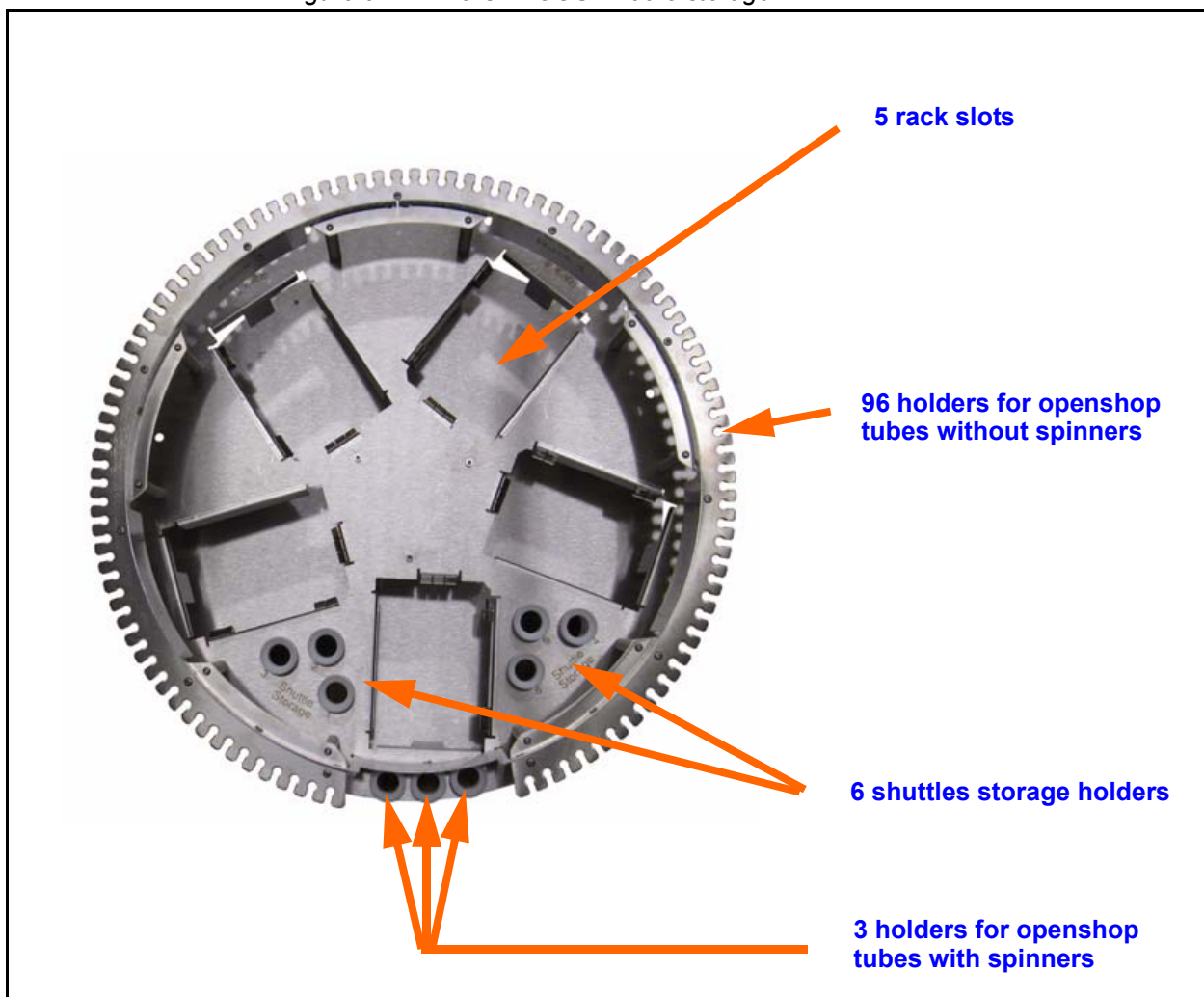


- High capacity on openshop ring
This storage has 96 slots for short or long sample tubes in the openshop ring and 3 additional slots for tubes with spinners.
- No spinners needed on openshop ring
The 96 tubes on the openshop ring will use one single SAMPLEJET shuttle for each diameter. There is no need to store the tubes with a spinner anymore.
- Capable of handling different tubes
The 96 tubes in the openshop ring can accommodate the following diameters: 1mm, 1,7mm, 3mm and 5mm.
- Defined insertion depth
The SAMPLEJET is responsible for adjusting the tubes in clampable shuttles

to the right insertion depth. This value can be set in the „User Settings“ within a certain range.

- **5 racks**
5 racks can be placed in the middle of the storage. The inserting and removing of racks is very soft, preventing the magnet from shaking.
- **Separate storage for 6 shuttles**
Special holders on the trays will hold the shuttles when not in use. Shuttles will therefore no longer occupy any holders for tubes.
- **Waste Rack**
Being able to put measured short tubes from the openshop ring into a rack leads to very easy unloading of the openshop. You just have to remove one single rack instead of searching and removing measured tubes from the openshop ring one by one.

Figure 9.2. The CAROUSEL 99/5 storage



Using the Carousel 99/5

9.2

The firmware will recognize the CAROUSEL 99/5 option, if it is set in the „System Configuration“. The new storage requires a new storage calibration. Depending on what tube diameter you work with, the setting can be changed in the **"User Settings" on page 53** to suit the diameter of the openshop ring. The SAMPLEJET will make sure the system is in the right operating mode when using tubes from the ring.

Table 9.1. The CAROUSEL 99/5 holder numbers

Holder numbers	Number of slots	Used for
1 - 96	96	Short or long samples without a spinner in the open-shop ring.
97 - 99	3	Long samples (sealed reference tubes) with a spinner in the openshop ring.
101 - 196	96	For short samples in rack 1 (or used as a waste rack).
201 - 296	96	For short samples in rack 2 (or used as a waste rack).
301 - 396	96	For short samples in rack 3 (or used as a waste rack).
401 - 496	96	For short samples in rack 4 (or used as a waste rack).
501 - 596	96	For short samples in rack 5 (or used as a waste rack).

The Shuttle Storage

9.2.1

In the **"User Settings" on page 53** you can define the home position of each shuttle in the „Shuttle Storage“. Whenever the SAMPLEJET will change the operating mode, the shuttle will be picked up from one of these 6 holders.

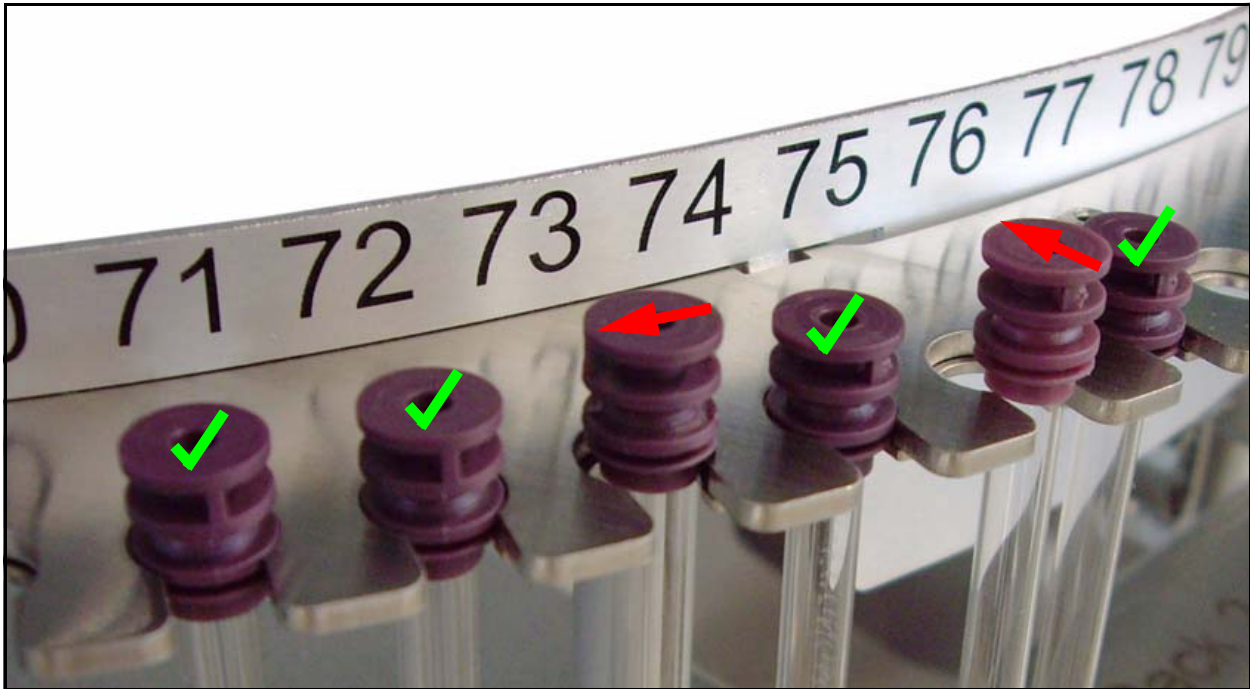
Figure 9.3. A 1mm shuttle in the Shuttle Storage



Correct Placing of the Tubes on the Grate**9.2.2**

Take care to hang the tubes correctly into their holders. The caps are guided by the holder and in most cases the caps will fall into the right position when inserting the tubes. If a tube is not hanging correctly, the gripper will try two times to grab the cap because the first attempt to grab will often push the cap down in the holder. The second attempt has then no problem to grab the cap correctly.

Figure 9.4. Hanging tubes on their caps into the grate



Working with a Waste Rack

9.3

Up to 5 racks can be defined as waste racks in the **"User Settings" on page 53**. Short sample tubes from the openshop ring will be placed there after the NMR measurement. It is easier to remove a rack with many measured openshop samples than to pick them from the openshop one by one. Long samples will always be moved back to the openshop ring.

With new IconNMR software (**"SAMPLEJET Together with IconNMR" on page 80**) you can choose for each tube if it should go to the waste rack or not.

Read **"Racks" on page 55** to set up a rack slot as a waste rack.

The waste racks will be filled in a predefined order. The SAMPLEJET starts filling a rack at position 1 and remembers the last used position. After reaching position 96 in a rack it goes back to position 1.

If more than one waste rack is defined, the SAMPLEJET will give them priorities according to their slot numbers. The lowest slot number has the highest priority and therefore will be filled first.



The SAMPLEJET will not search for a free position in a rack. Always empty a waste rack completely before inserting it. If position 1 is occupied, a rack will be recognized as full.



If there are no free positions in the waste racks, the sample tubes will be returned to their original position in the openshop ring.



A rack defined as a waste rack can not be accessed by the user. Once a sample is in the waste rack the SAMPLEJET will not bring it to the magnet again.

Cooling (option)

10

What is the Cooling?

10.1

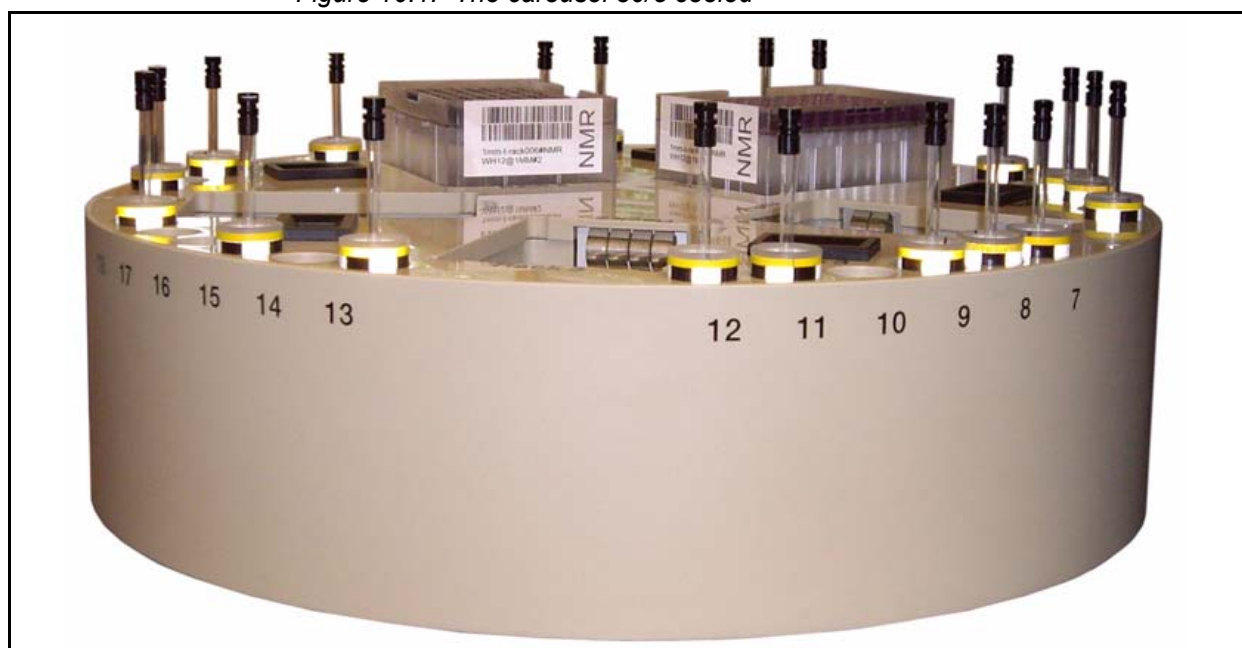
The cooling option for the SAMPLEJET stores the tubes in the carousel at a reduced temperature. Temperature sensitive samples will not be destroyed when waiting for the NMR measurement. 5 standard racks fits into the special carousel and can be cooled, beside them 30 not cooled tubes with spinner can be placed .



The cooling keeps the tubes in the racks at 279 K when stored in the SAMPLEJET.

- Carousel 30/5 cooled
- Cooling basic set
- Preheating unit
See **"Extension (Option)" on page 83.**

Figure 10.1. The carousel 30/5 cooled



Connect the nitrogen separator to compressed air when ever possible. This will guaranty a normal oxygen level in the lab. If the separator or the cooling is connected to nitrogen the room needs a proper ventilation and an alarm system indicating low oxygen concentration.



If the separator or the cooling is connected to nitrogen the concentration of oxygen in the air may drop to a critical value.

Cooled tubes may get wet from the ambient humidity. When ever installing a cooling make sure the SAMPLEJET is equipped with a SAMPLEJET preheating unit. Otherwise the wet tubes will bring water into your probe head and may destroy it or disturb the NMR measurement.



Never operate a cooled SAMPLEJET without a SAMPLEJET preheating unit.

The temperatures in the preheating and the cooled carousel can be read out any time. In case of a system failure, these temperatures can exceed the specified range and destroy sensitive liquids in the tubes.



Check the temperature of the rack slots periodically. Tubes are submitted for cooling at owners risk.

*The carousel 30/5 cooled***10.3**

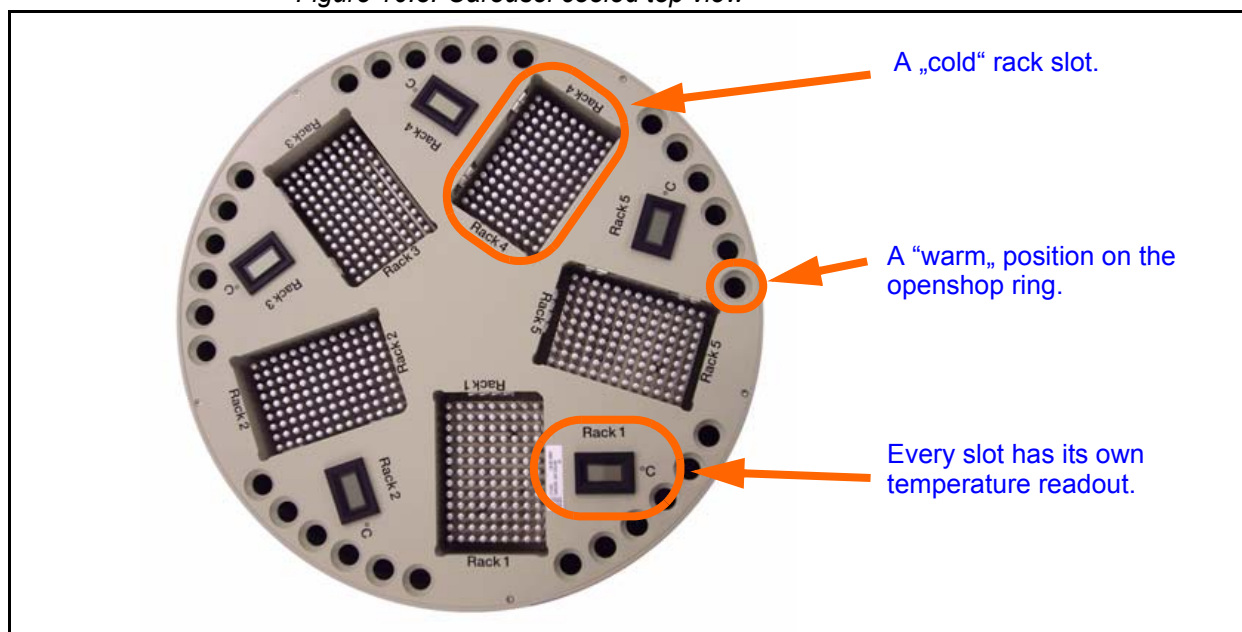
This carousel has a insulation keeping the 5 standard racks cold. The finger plate in every rack slot is a perfect heat exchanger and guaranties the same temperature for all of the 96 tubes in a rack. For every rack the actual temperature is controlled separately and can be read out.

Figure 10.2. The heat exchanger



Since the heat exchanger has a much bigger mass than the rack with the tubes, the temperature stays constant when inserting and removing racks. The rack slots do not need to be covered when not in use.

Figure 10.3. Carousel cooled top view



Using the Cooling

10.4

There aren't any settings for the cooling, but the system needs to have the cooled carousel in the system configuration. This is because of the different geometry of the carousel.

Since cold tubes getting wet on ambient temperature, the tubes need to be warmed and dried in the pre-heating unit. See **"Extension (Option)" on page 83.**



Operating the SAMPLEJET with and without the cooling has only one difference: Cooled tubes must be dried first in the pre-heating unit before measuring them.

Switching on and off the cooling

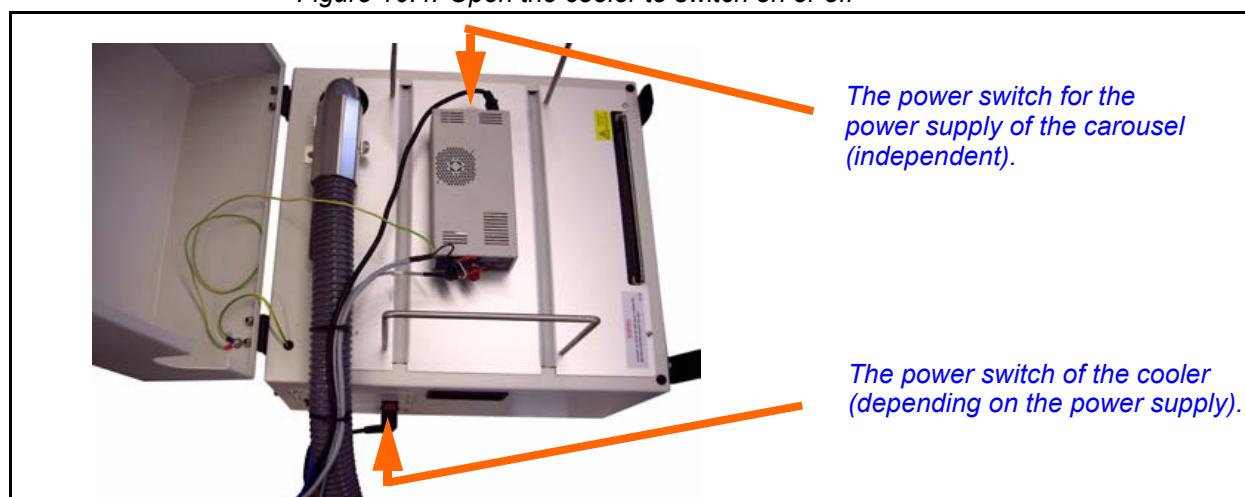
10.5

The cooler and the temperature control inside the carousel are connected together.



You can not switch on the cooler when the power supply for the carousel is switched off. This is to protect the system from under cooling and getting clogged.

Figure 10.4. Open the cooler to switch on or off



Cleaning the Heat Exchanger

10.6

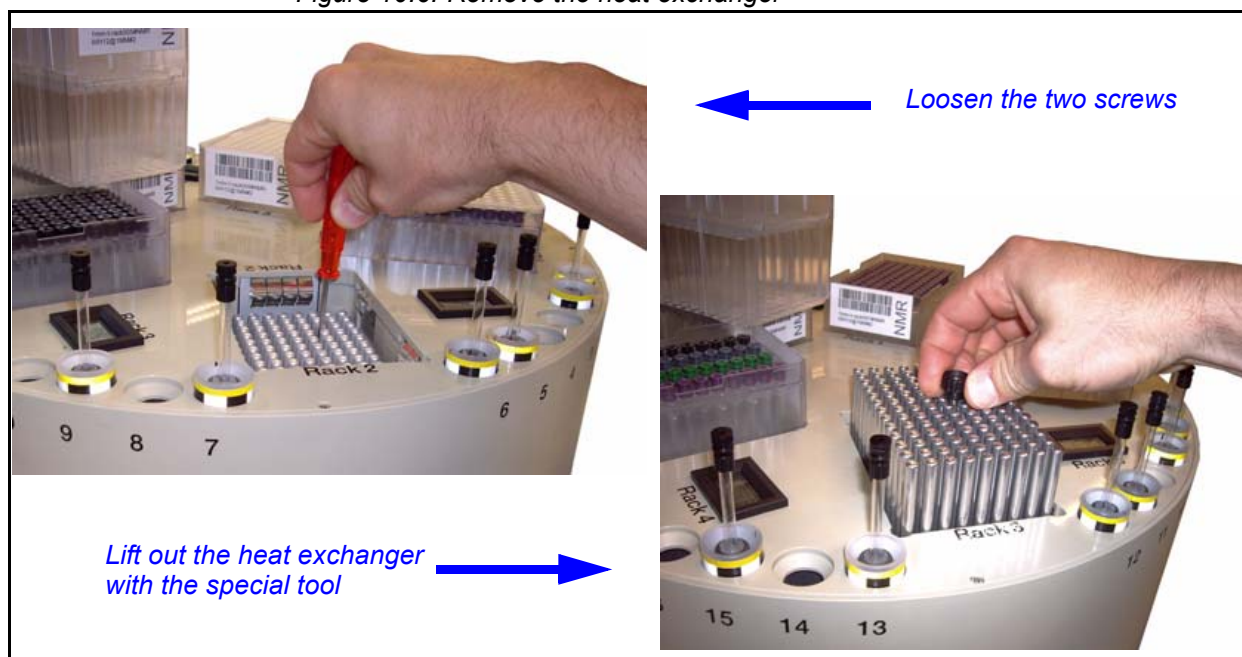
If a tube in a rack breaks the liquid and broken glass will fall down in to the heat exchanger. In this case you have to take out the heat exchanger in order to clean it.

Figure 10.5. The special tool



1. Loosen two screws with the allen key 2.5 found in the SAMPLEJET tool kit.
2. Lift out the Heat exchanger with the special tool coming with the cooling.
3. Clean the heat exchanger and the rack slot.
4. Put it back again and screw it to the carousel.

Figure 10.6. Remove the heat exchanger



Carousel 47/5

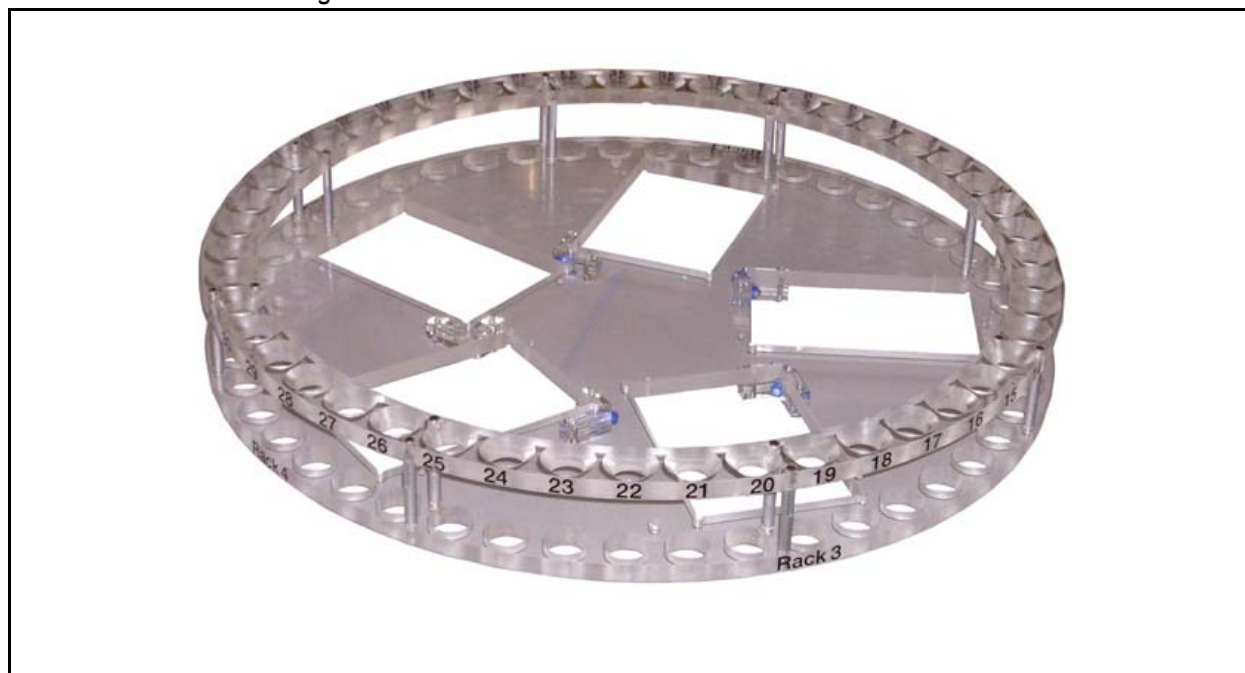
11

What is the Carousel 47/5?

11.1

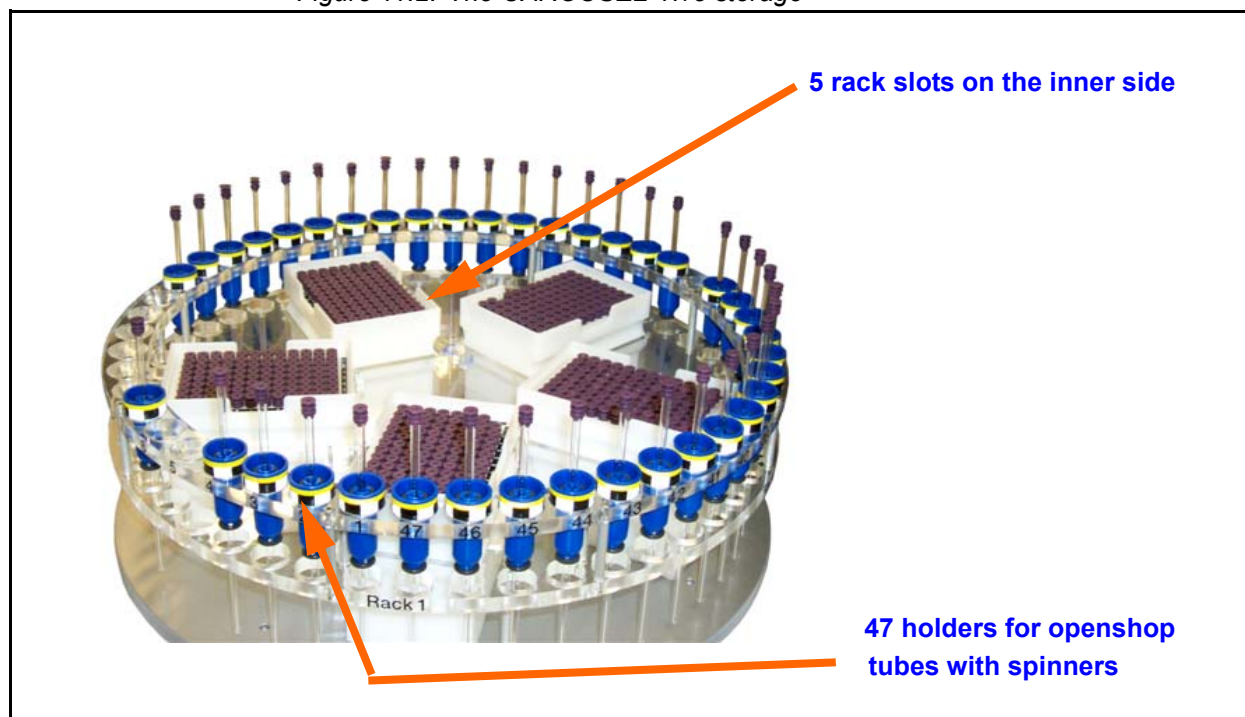
This carousel was the first of all the carousel and delivered as the standard version until 2009.

Figure 11.1. The CAROUSEL 47/5



- 47 tubes on the openshop ring
On the outer openshop ring 47long 7" tubes with spinners can be placed.
- 5 racks
5 racks can be placed in the middle of the storage.

Figure 11.2. The CAROUSEL 47/5 storage



Using the Carousel 47/5

11.2

The firmware will recognize the CAROUSEL 99/5 option, if it is set in the „System Configuration“. The new storage requires a new storage calibration. Depending on what tube diameter you work with, the setting can be changed in the **"User Settings" on page 53** to suit the diameter of the openshop ring. The SAMPLEJET will make sure the system is in the right operating mode when using tubes from the ring.

Table 11.1. The holder numbers for a standard carousel

Previous IconNMR sx commands	Newer IconNMR	Number of slots	Used for
1 - 47	1-47	47	Long samples with a spinner in the openshop ring.
101 - 196	1A1-1H12	96	For short samples in the rack 1
201 - 296	2A1-2H12	96	For short samples in the rack 2
301 - 396	3A1-3H12	96	For short samples in the rack 3
401 - 496	4A1-4H12	96	For short samples in the rack 4
501 - 596	5A1-5H12	96	For short samples in the rack 5

Using Bruker NMR Software

12

Introduction

12.1

The SAMPLEJET can perform some basic actions on its own, but is normally controlled by the TOPSPIN or IconNMR software. This chapter describes the interaction of those NMR software with the SAMPLEJET.

SAMPLEJET Together with TOPSPIN

12.2

You can insert and remove any probe in the SAMPLEJET trough commands on the command line.

Use the „sx“ command followed by a number to empty the magnet and insert the probe with the given holder number. If you just want to remove the probe use the „sx ej“ command.

If the SAMPLEJET user settings were correct, the SAMPLEJET will perform a change of the operating mode if needed. If the operating mode cannot be changed to the desired mode, the system will abort with the „No sample in position“ message.

Table 12.1. TOPSPIN Commands

Command	TOPSPIN	Description
sx 123	All versions	Remove the current sample if there is one in the magnet. Then insert the sample in position 123.
sx ej	All versions	Eject the sample from the magnet and place it back in storage.
ha	From 3.0	Shows a link to the SampleJet web page.

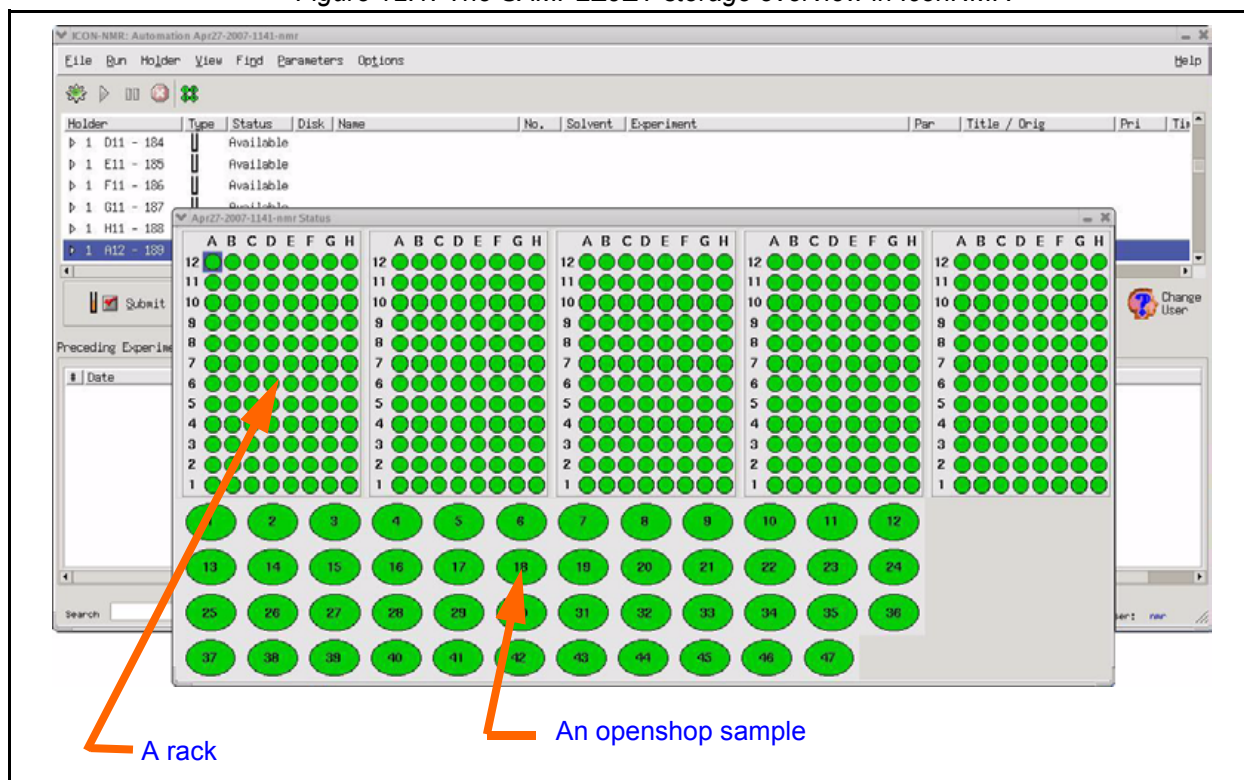
Table 12.2. IconNMR Features for SAMPLEJET

Feature	IconNMR (in TOPSPIN)	Description
Basic communication	All Versions	IconNMR can be configured as working with a BACS.
Storage Overview	4.2 (2.1)	An overview of the storage can be obtained. In this overview the state of every sample is displayed with different colors.
Supporting Vision	4.2 (2.1)	The expanded protocol for the communication between SAMPLEJET and IconNMR enables faster work and support for the SAMPLEJET VISION option.
Rack Identification	4.2 (2.1)	One can choose between working with tube positions or working with rack identifications (when using Bruker SampleTrack software).
Sample Order in Rack	4.2 (2.1)	IconNMR can change the sample order in the racks that was made in the „User Settings“ of the SampleJet.
Different Storages	4.2 (2.1)	IconNMR can display different SAMPLEJET carousels by choosing the number of holders (0, 30, 47 or 99) of the open shop.
Waste Rack and Status	4.3 (3.0)	IconNMR can decide if a tube is finished or if other jobs on this tube are submitted. The customer can choose if a specific tube should be returned to waste rack when measurement on a tube is finished.
Preheating Controlling	4.3 (3.0)	IconNMR is submitting information about subsequent tubes in queue to be put in the preheating. In addition IconNMR can overwrite the conditioning time set in the „Heater Commands“.



BRUKER IconNMR software recognizes the SAMPLEJET from version 4.2, included in TOPSPIN 2.1. From this IconNMR version the SAMPLEJET can be defined as a SAMPLEJET or a BACS. See ["Setting up IconNMR" on page 116](#) for details.

Figure 12.1. The SAMPLEJET storage overview in IconNMR



For detailed information about the IconNMR please refer to the IconNMR documentation.

Extension (Option)

13

What is an Extension?

13.1

There is some free space between the rotary tray and the BST Adapter in the SAMPLEJET. Different extensions can be mounted in this gap to the existing SAMPLEJET hardware.

- A PARKING UNIT, parking only (Z109175)
- A PRE-HEATING UNIT, parking with preheating (Z109174)
(comes with an installation kit)

Figure 13.1. The PREHEATING UNIT



What is the Parking Unit used for?

13.2

The parking section is designed for carriers which should remain permanently in the SAMPLEJET. The best way to store the SAMPLEJET shuttles is in these parking slots. They do not occupy storage slots, but the SAMPLEJET can use them to perform an automated change of the operating mode.

What is the Preheating Unit used for?

13.3

If the SAMPLEJET is equipped with a cooling system the cold tube needs to be dried and warmed before it is inserted into the magnet.

- The temperature of the samples is controlled with a heater and a fan to a configurable target temperature. The warming up of a sample takes place just before the measurement. If you measure more than one probe, the preheating will warm the second probe while the first is in the magnet. This leads to very little loss of time.
- Cold samples would immediately fog up due to the wet ambient air. To avoid the water coming into the NMR System a little gas flow streams around the sample tubes and dries them.

Using the Parking

13.4

To use the parking as shuttle storage you have to set the shuttles in the „User Settings“ to the according slot.

Figure 13.2. Shuttles in the parking

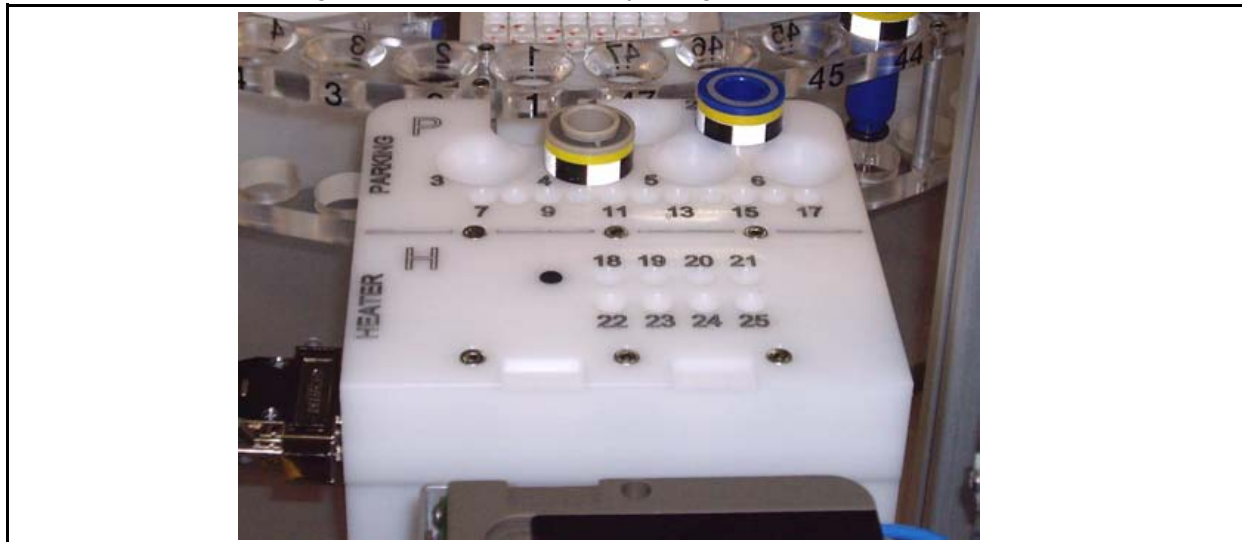


Figure 13.3. Setting the shuttles in the parking

1mm shuttle in parking slot 3

Shuttles				
Shuttle Home Positions + Shuttle ECL's (Automatic operating mode change only works for shuttles with defined home position.)	1mm-Shuttle (Z107648)	Unit: Parking	Slot: 3	Shuttle ECL: 0.0
	1.7mm-Shuttle (Z106558)	Unit: OpenShop-Ring	Slot: 97	Shuttle ECL: 0.0
	3mm-Shuttle (Z105909)	Unit: none	Slot: 3	Shuttle ECL: 0.0
	5mm-Shuttle (Z105515)	Unit: OpenShop-Ring	Slot: 99	Shuttle ECL: 0.0

As soon as the preheating station is set in the „System Configuration“ list you can configure and switch on the heater to a target temperature on the „Heater Commands“ page or on the display in the „Advanced“ menu in the „Heater“ window.

Figure 13.4. The „Heater Commands“

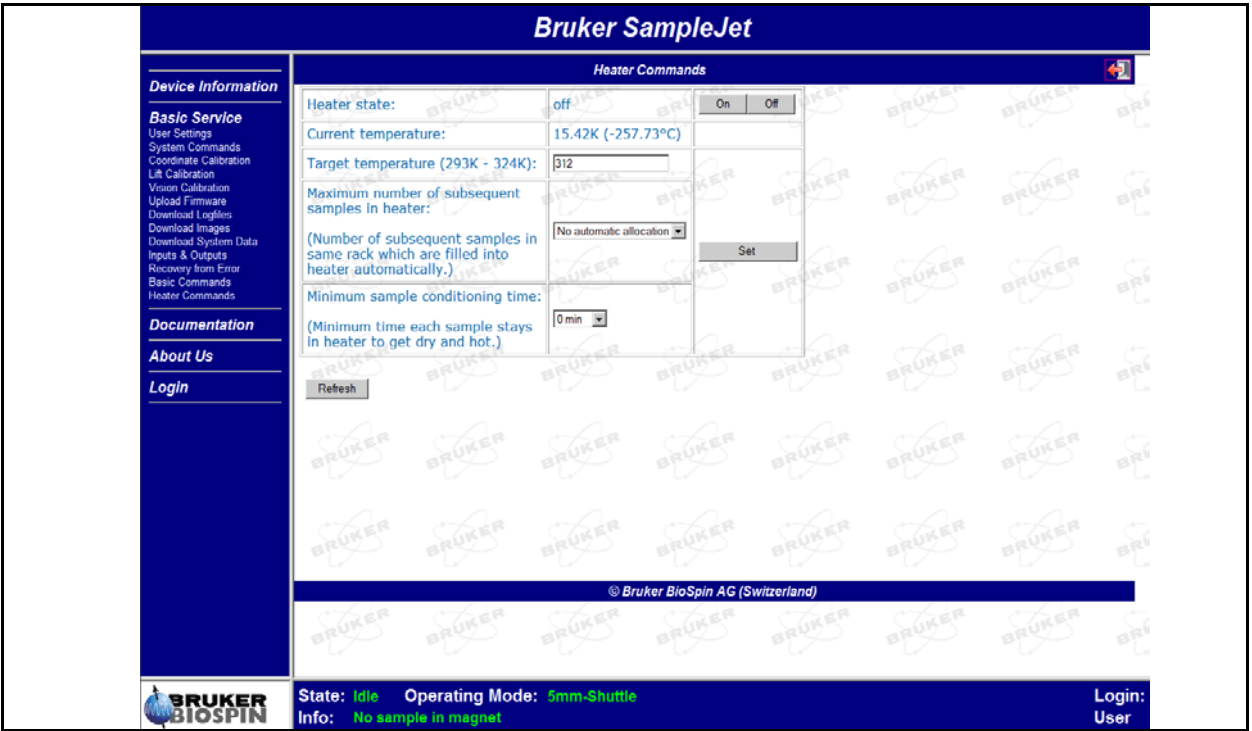
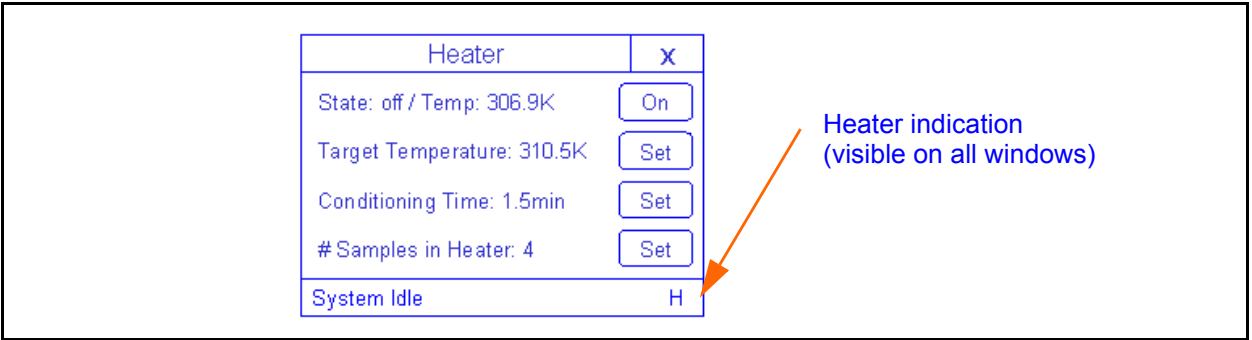


Figure 13.5. Heater window on the display

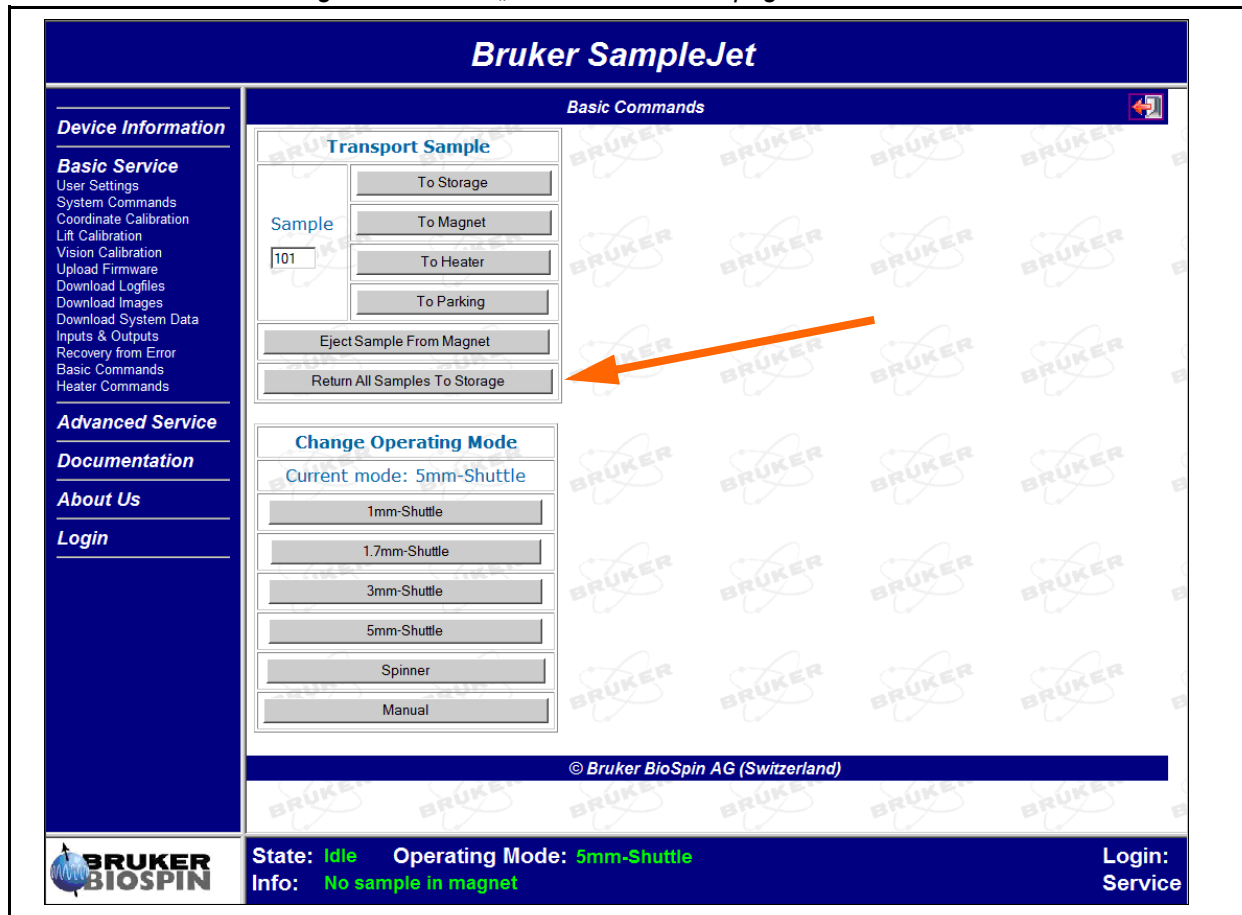


The state of the heater will be indicated in the status bar of the display.
Table 13.1. Heater indication

Indication	Meaning
„H“ not visible	Heater is off.
„H“ blinking	Heater is on, temperature not stable.
„H“ stable	Heater is on, temperature is stable.

If you have to stop an IconNMR run for any reason you can return all the samples in the heater to their original positions with the „Return All Samples To Storage“ button on the „Basic Commands“ page of the web interface.

Figure 13.6. The „Basic Commands“ page



Preheating Settings

13.6

The PRE-HEATING UNIT has four settings which are described in the next chapter. Two examples can be found in the chapter after next.



Always keep in mind that the „Minimum conditioning time“ has the higher priority than the „Automatic heater allocation“ setting.

The four preheating settings

13.6.1

- **Heater state**

If the preheating is not required, you can switch it off. These are the 4 heater states.

Table 13.2. Heater states

State
on
off
error
not connected



If the heater is switched off the SAMPLEJET will go to „ERROR“ state as soon as it should put a tube into the preheating.



To disable preheating completely switch off the heater. Set the automatic allocation to „No automatic allocation“ and the conditioning time to „0“.

- **Target temperature**

You can choose a target temperature in a given range. See the table in **"Extension Specifications" on page 169** for the limitations.



The preheating will never get colder than the ambient temperature.

- **Maximum number of subsequent samples in heater**

You can choose the number of samples you want to have preheating (at the same time). This value depends on your experiment duration, your target temperature and the tube diameter. Even if it is set at zero the samples will be inserted into the preheating when the „Minimum conditioning time“ is not zero.

- **Minimum sample conditioning time**

You can set a minimum time for a sample to stay in the PREHEATING option. This will make sure your sample will reach the target temperature and completely dries. Set the time to a start value of 3 minutes and optimize it if required.



If you set the „Minimum conditioning time“ too short, water from wet tubes may get into your probehead.

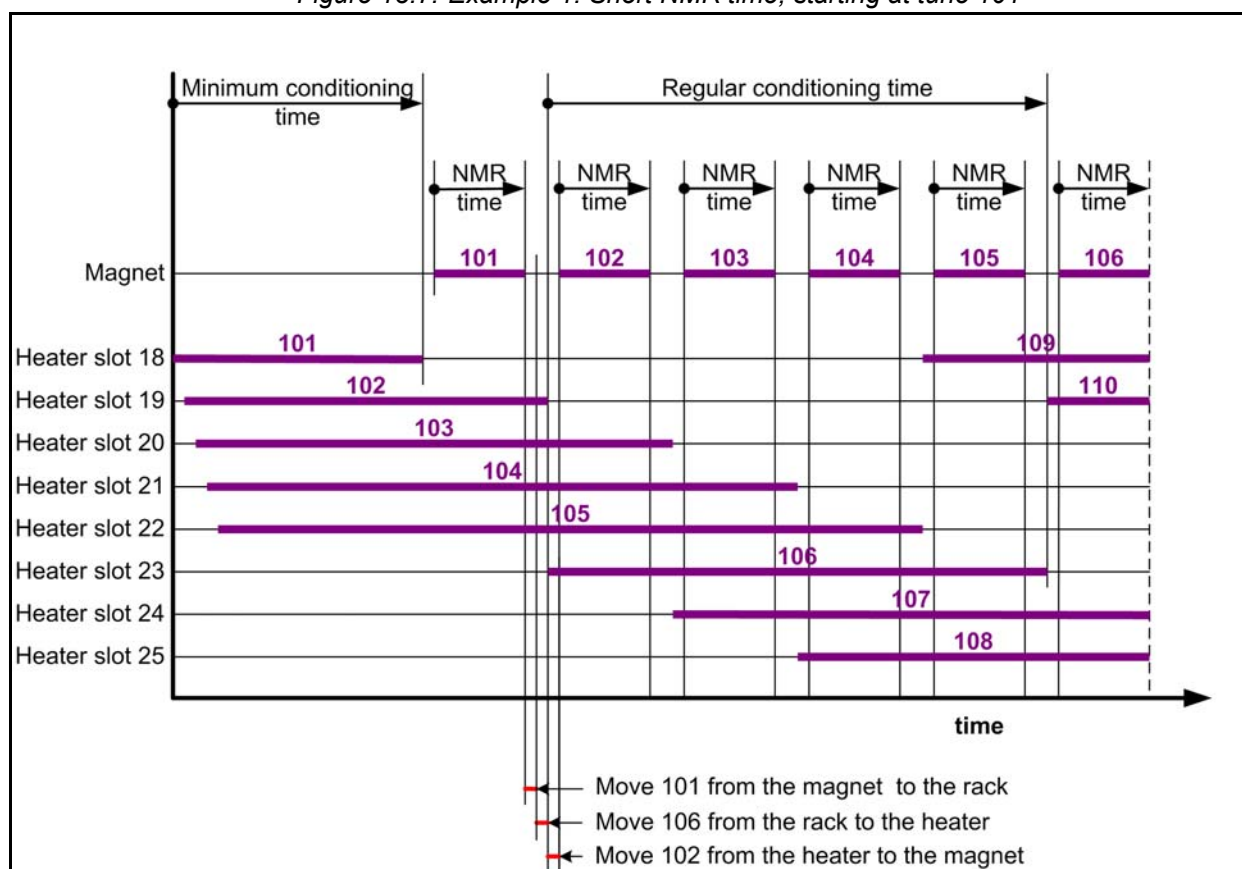
Example 1: Short NMR time

The first example shows a set up with a short NMR time. 4 sample tubes were automatically allocated into the heater slots for at least 3 minutes. After the first samples, the conditioning time is defined as four times the NNR time. The time between following tubes in the magnet is very short.

Table 13.3. Heater settings for example 1

Setting	Value
Heater allocation	4 tubes
Minimum conditioning time	3 min.

Figure 13.7. Example 1: Short NMR time, starting at tune 101



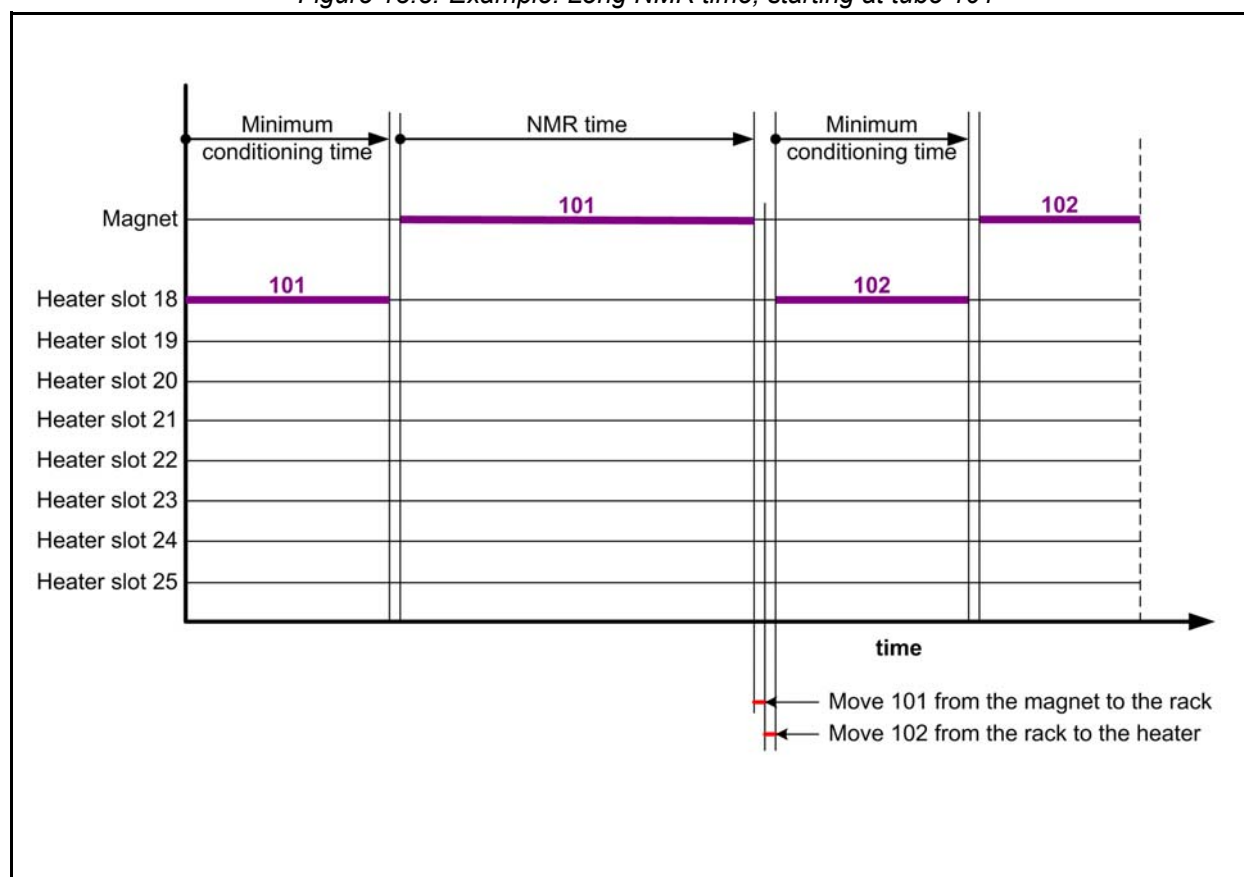
Example 2: Long NMR time

The second example shows a set with long NMR times. No sample tubes were automatically allocated into the heater slots. But because of the 3 minute conditioning time every tube will go to the heater before going into the magnet. The time between following tubes in the magnet is longer than in the first example, but short in comparison to the NMR time. This setup will not put any tube into the heater during the long NMR time.

Table 13.4. Heater settings for example 2

Setting	Value
Heater allocation	0 tubes
Minimum conditioning time	3 min.

Figure 13.8. Example: Long NMR time, starting at tube 101



Preheating on a Power Failure**13.7**

The SAMPLEJET recognizes all the sample tubes in the preheating slots as long as the SAMPLEJET is turned on. The „Emergency Stop“ button makes the application restart. The system remains the information about the samples in the heater at that time because the SAMPLEJET did not lose current .



If the SAMPLEJET ever loses its power supply, you have to empty the preheating slots before starting up the system again.

Since there is a fixed order of placing the tubes in the preheating slots one can find out what tube is in which slot in case of a power failure.

Figure 13.9. .Order of putting next tubes in the slots

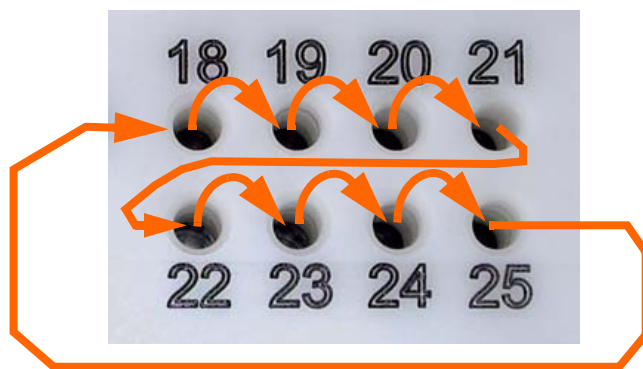
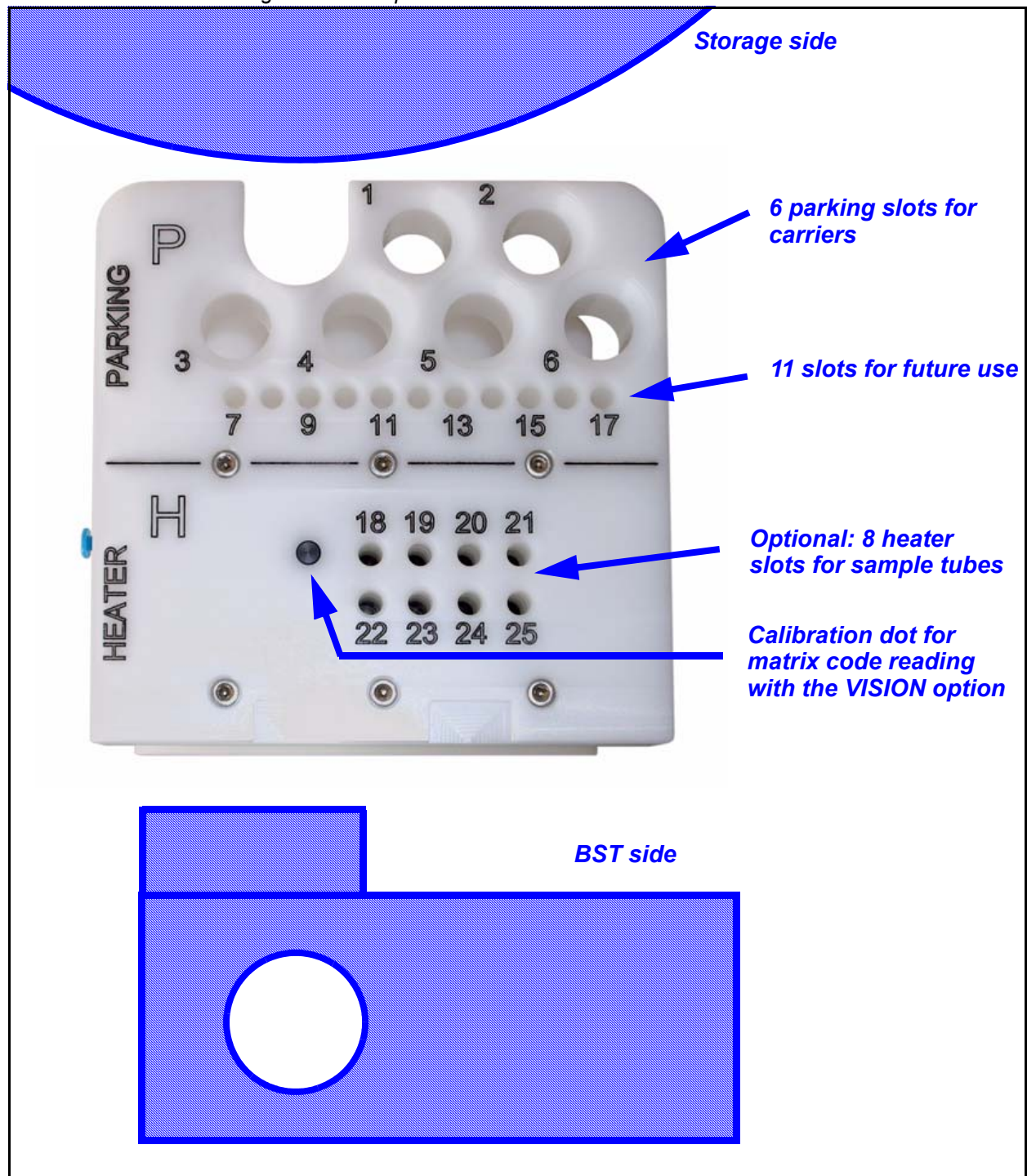


Figure 13.10. Top view on the extension



Remote Control (Option)

14

What is the Remote Control used for?

14.1

The REMOTE CONTROL allows the changing of openshop samples without disturbing a running NMR measurement.

Furthermore, the exchanging of a rack or an openshop sample is very easy. Only two buttons are used, the users do not have to know the menu on the display. This is useful if many users are placing racks and samples in the SAMPLEJET.

A minimum of SAMPLEJET firmware version 4 is used to operate the REMOTE CONTROL.



It is not possible to harm the SAMPLEJET by uncontrolled pressing of the buttons on the REMOTE CONTROL.

Figure 14.1. The REMOTE CONTROL



How to Install the Remote Control

14.2

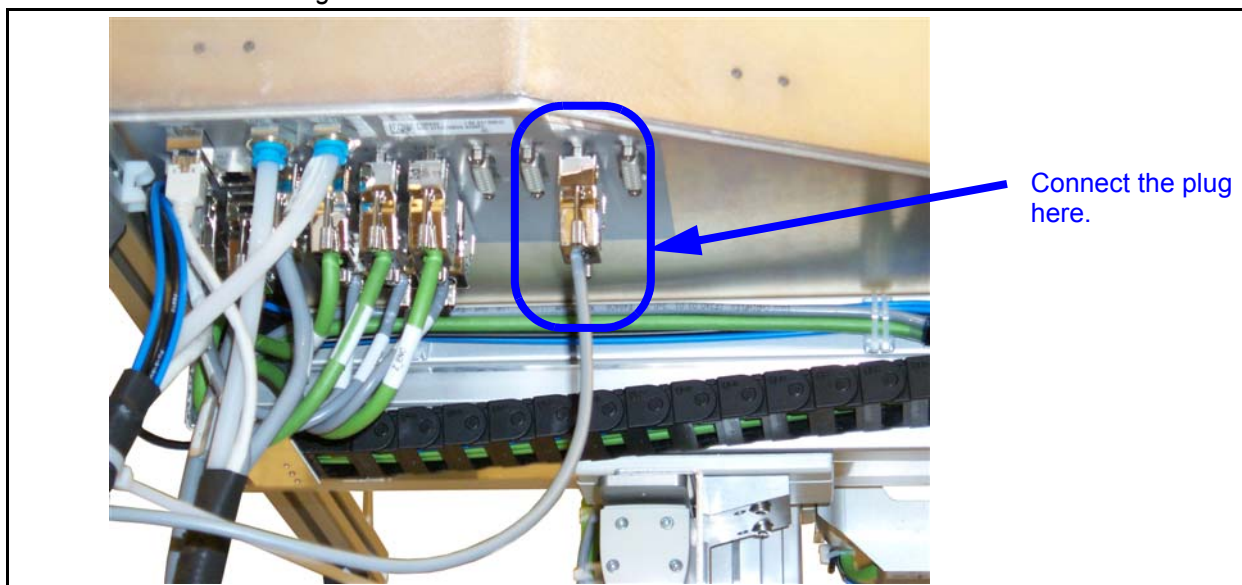
The installation of the REMOTE CONTROL is simple and can be easily carried out by the customer, if the REMOTE CONTROL is ordered after the installation of the SAMPLEJET.

1. The SAMPLEJET has to be in idle state.
2. Remove the cover on the right side.
--> Angled allen key 2.5
3. Feed the plug through the hole in the bottom of the frame.
4. Connect the plug to the control box on top of the SAMPLEJET (position RES1) and fix the cable with lacing cord.
--> Screw driver 2



There are several similar plugs! Use the „RES1“ to connect the REMOTE CONTROL.

Figure 14.2. Where to connect the REMOTE CONTROL



5. Remount the cover on the right side.
--> Angled allen key 2.5

6. If a SAMPLEJET STAIR 4 STEPS is used, the REMOTE CONTROL can be mounted to the hand rail.
--> Angled allen key 2.5
If not, attach it to a ladder with the pads or place it on a table.

Figure 14.3. The pads



How to use the Remote Control

14.3

Just press the + or - button to turn the rotary tray step wise to the left or the right.
One step is half a rack or 5 samples.

If a sample is in the magnet the tray will move slower in order to not disturb a running measurement.

Figure 14.4. Using the REMOTE CONTROL

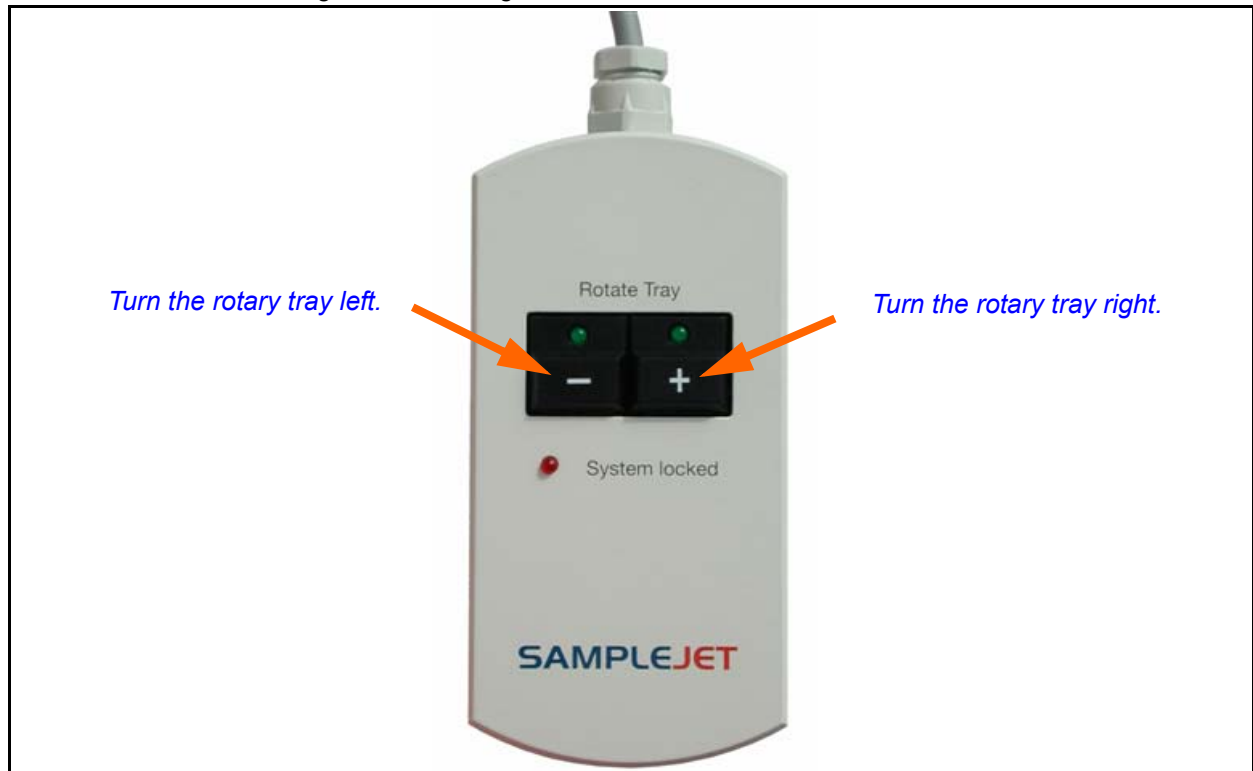


Table 14.1. The REMOTE CONTROL LEDs

LED „System locked“ 	LED's „Rotate Tray“ 	Meaning
Off	Off	System locked by another process.
Off	On	The System is idle.
On	On	The System is locked for the user of the REMOTE CONTROL, commands from the work station are buffered.
On	Blinking	The rotary tray is turning in the direction indicated by the LED.
Blinking	On	REMOTE CONTROL is loosing the „locked“ status.
Blinking	Blinking	SAMPLEJET is in error state.



If the „System locked“ LED starts blinking, the SAMPLEJET will shortly accept commands from IconNMR and may start moving.

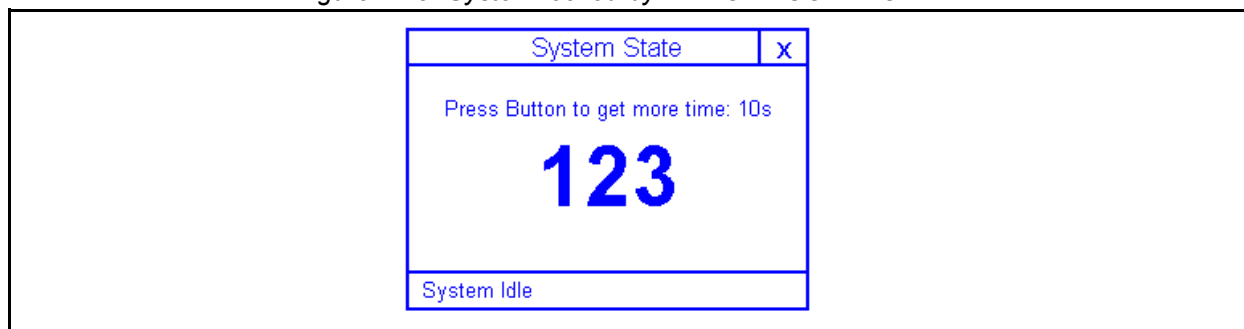


If the „System locked“ LED is blinking you gain more time by pressing one of the buttons. In this case, the tray will not move if the button is only pressed shortly.



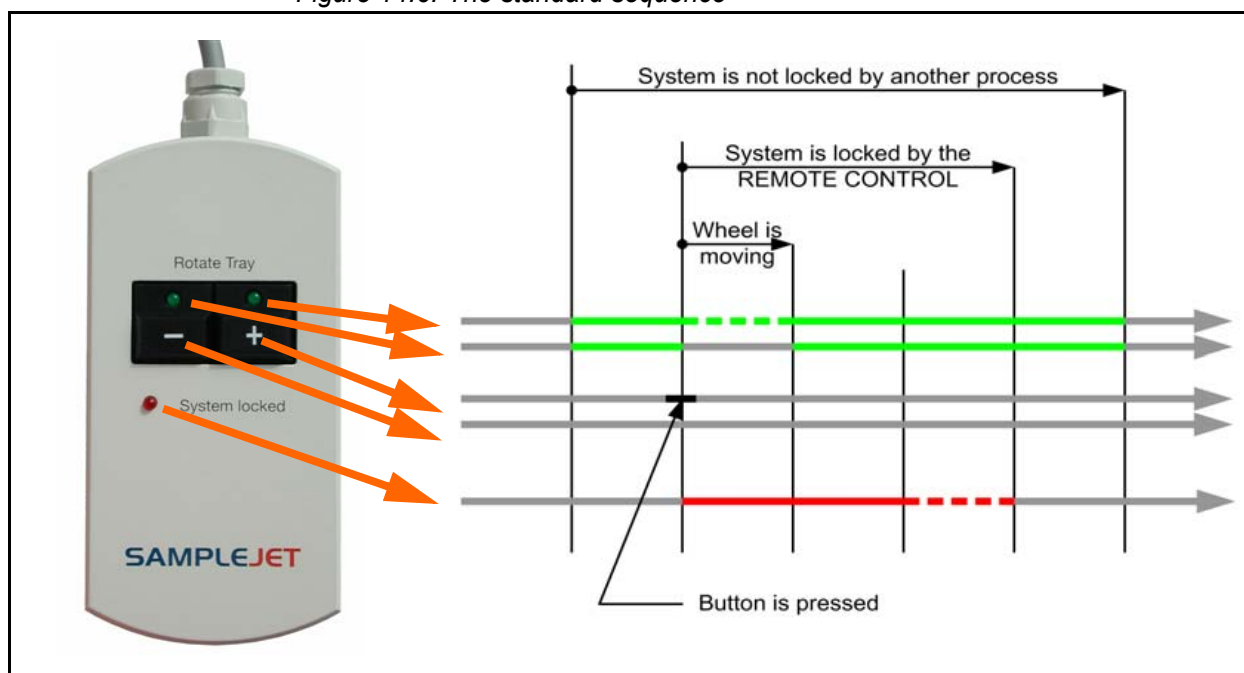
Pressing both buttons for more than 15 seconds will restart the application.

Figure 14.5. System locked by REMOTE CONTROL



To learn more about the system locked state of the SAMPLEJET read **"System Locked by User" on page 34.**

Figure 14.6. The standard sequence



Basic Service carried out by the Operator

15.1

There are some simple service operations the user may perform.

- Calibrating the device
- Changing the O-ring
- Changing the pincer
- Cleaning the SAMPLEJET
- Storing the system data
- Storing the log files
- Loading new firmware

Calibrating the Device

15.2

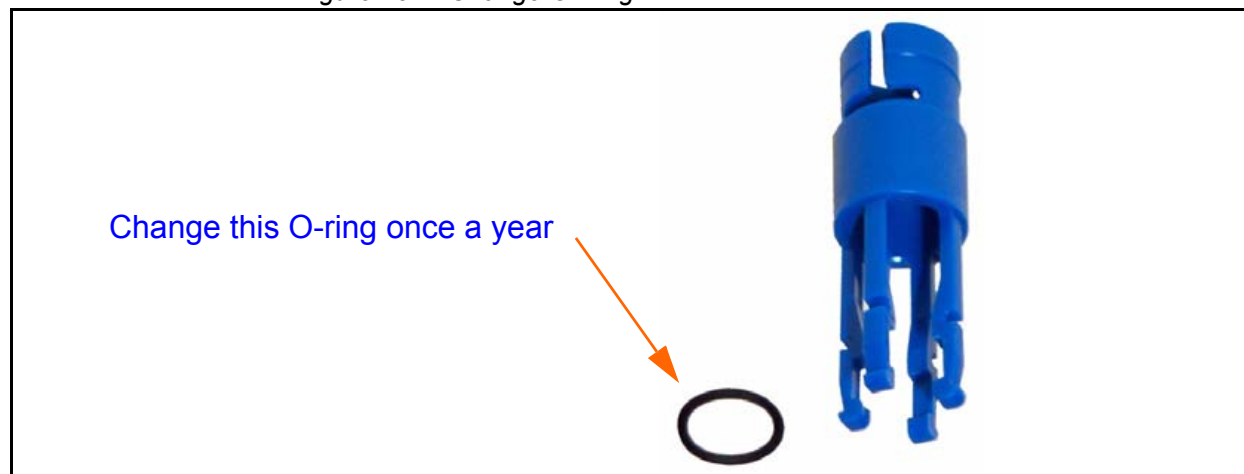
The calibrating is described in chapter "Calibration" on page 121.

Changing the O-Ring

15.3

The O-ring on the Gripper should be changed once a year. If the rubber loses its elasticity, caps can not be held anymore. Spare O-rings can be found in the SPARE PARTS KIT.

Figure 15.1. Change O-Ring



Replacing the Pincer

15.4

If the SAMPLEJET should crash for any reason the pincer is the weakest point and should break first to prevent the system from serious damage. Once a pincer loses one or more of its four legs it has to be replaced.

Even an undamaged pincer should be replaced after 3 years.

The drives have to be switched off for this procedure.

Switching off the drives

1. The system has to be in the idle state.
2. Press the red emergency button.
3. You can now move the gripper arm manually.

Open the Cover

4. Remove the back cover to access the gripper arm.

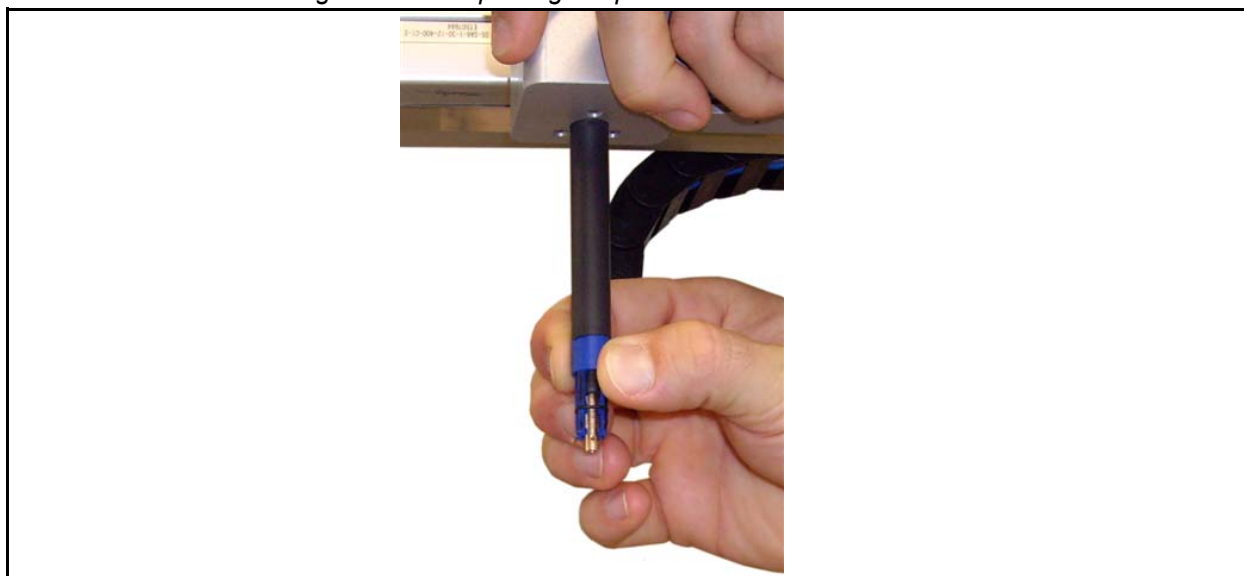
Removing the broken pincer.

5. Try to remove the pincer with your fingers. Pull the blue pincer down firmly while holding the gripper arm with the other hand.



The older design pincer could not be removed by hand. Use gripping pliers and be careful of the magnetic field!

Figure 15.2. Replacing the pincer



Mounting a new pincer.

6. Insert the new pincer until a „click“ sound can be heard



Make sure the orientation of the pincer is correct. There is no gap between the pincer and the black pen.

Figure 15.3. Inserting the pincer



Close the Cover

7. Remount the back cover,

Restarting the system.

8. Release the emergency button by turning it clock wise. The application will be restarted.

Cleaning the SAMPLEJET

15.5

If a sample tube is broken, all the glass has to be removed from the SAMPLEJET, otherwise the racks will not stand properly on the rotary tray.



Stop the SAMPLEJET operating before you start cleaning the device. Don't forget to stop the submitted jobs in IconNMR.



Pay special attention to the toothing of the rotating tray. If it is not clean the drive cogwheel may be damaged.

If proper cleaning is not possible through the front door, remove one of the side covers (--> Angled allen key 2.5).

If the gripper arm disturbs the cleaning it can be moved away. Choose the „Load Rack“ or „Load Sample“ function from the display.

Storing the System Data and Log Files**15.6**

If troubleshooting an unknown error, BRUKER BIOSPIN may ask you to send the log files and system data. BRUKER BIOSPIN can acquire additional debugging information from these files.



These files do not contain any information about your company, samples or spectra. BRUKER BIOSPIN will not give any information to a third party.



The easiest way to send all the required data is to create a pack of the latest log files on the web page. All the system data will be included automatically.

Log Files**15.6.1**

The SAMPLEJET stores a large amount of data in two different log files. These textfiles may not make sense to users and service engineers. They are intended to be used by the development team.

Table 15.1. The different types of logfiles

Log file	Content	Description
Details	All data	All information is stored in detail.
Summary	Overview	Contains an abstract of the information in the details file and give an overview.

Log file conventions

The SAMPLEJET firmware handles all the files automatically. If needed the permanent files are compressed and stored and a new file will be generated. The file-names of archived logfiles contain the date and time of the last log entry in YYYYMMDD-HHMM format.

Downloading Logfiles

There is a simple way to download more than one file by creating a compressed package of files. This is described on the web page.

1. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
2. Log in to the web page as a user (password: „bruker“).
3. Click on „Download Logfiles“ on the „Basic Service“ menu.
4. Follow the instructions shown on the webpage.

System Data

15.6.2

Information about the software, the hardware and the user settings are stored in the system files. The files are textfiles, containing data in xml (Extensible Markup Language) structure. Three files are stored:

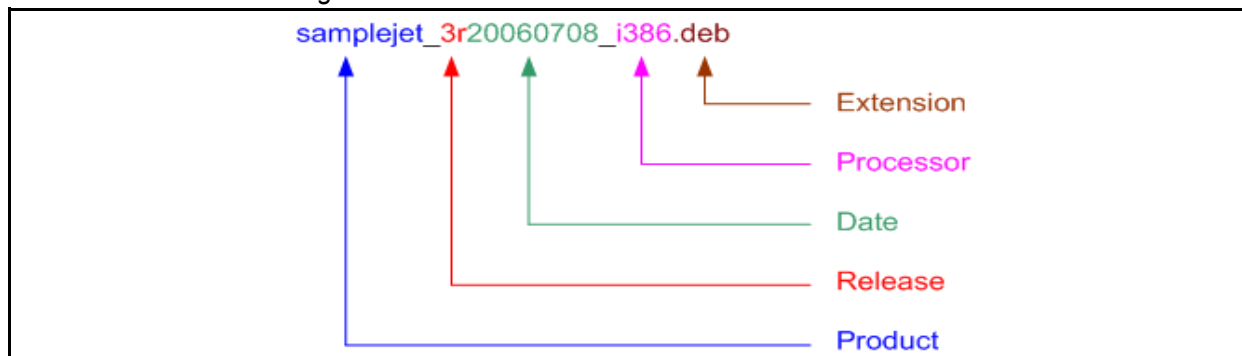
- BIS.xml
Contains information about the SAMPLEJET hardware.
- Base.xml
Contains default settings and software data and will be replaced with every firmware upload.
- User.xml
Contains the user settings, the statistics and the calibration.
- Patch.xml
This optional file can be used for customer specific hot fixes or special tests.
- icDMatrixDSLlinux.dat
The matrix code library registration file is used if you want to read matrix codes with the VISION option.
- dmesg.txt
This file contains the operating system log messages.

The files can be downloaded through the web interface.

1. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
2. Log in to the web page as a user (password: „bruker“).
3. Click on „Download System Data“ on the „Basic Service“ menu.
4. Follow the instructions shown on the webpage.

A SAMPLEJET firmware has a „deb“ extension and is an archive file. The filename contains some information about the software package.

Figure 15.4. Filename nomenclature



Acquiring new firmware

The current firmware can be downloaded from the BRUKER ftp server:
`„ftp://ftp.bruker.ch/pub/NMR/download/SAMPLEJET/“`



Remove all samples from the magnet and PRE-HEATING UNIT before loading a new firmware.

To check the installed firmware

1. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
2. Log in to the web page as a user (password: „bruker“).
3. Click on „Firmware“ on the „Device Information“ menu.

To load new firmware

1. The system has to be in idle state.
2. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
3. Log in to the web page as a user (password: „bruker“).
4. Click on „Upload Firmware“ on the „Basic Service“ menu.
5. Follow the instructions shown on the webpage.
 (The web site layout depends on the installed firmware).

Initial Configurations

16

Introduction

16.1

This chapter will lead you through the configuration, fine adjustment procedures, pneumatic settings, and final setup of the SAMPLEJET. These adjustments should be made after the SAMPLEJET has been mounted in accordance with the mounting instructions.



The initial configuration should only be carried out by a BRUKER service engineer.



***Do not start the SAMPLEJET with „sx“ commands or IconNMR jobs unless the SAMPLEJET is calibrated correctly!
This is described in "Calibrating the SampleJet" on page 121***

Starting the SAMPLEJET

1. Make sure the emergency button is released.
2. Switch on the 24 V power supply of the SampleJet, which is located in the console.
3. Wait until the touch screen on the front of the SampleJet starts up. This may take up to 30 seconds.

4. Follow the startup procedure. Note: read the advice given on the display carefully.



If the starting sequence leads into the error state again and again, some cabling/hoses may be incorrectly installed. Check the installation and try again.

Readjusting the BSMS Lift

16.2

The SAMPLEJET controls the BST lift itself except in the SAMPLEJET manual mode. After installing a SAMPLEJET, the BST lift (controlled by the BSMS) has to be set up again in the service mode of the BSMS. This lift mode is used if the SAMPLEJET is operated in manual mode.

5. Change the SAMPLEJET operation mode to „manual“.
6. Switch on the BSMS lift.
7. Insert a long sample with the heaviest carrier the customer is using.
8. Adjust the BSMS lift to a value which brings the sample to the top.

Setting up the Service Access with a Web Browser

16.3

A web server on the SAMPLEJET provides a simple way of managing the SAMPLEJET. Access is gained via any common web browser located on the spectrometer computer.



An administrator or super user password is required to configure the „hosts“ file. If you can not change the „hosts“ file, the IP has to be used. In this case a short cut has to be created on the web browser to this IP. The shortcut should be named „SampleJet“.

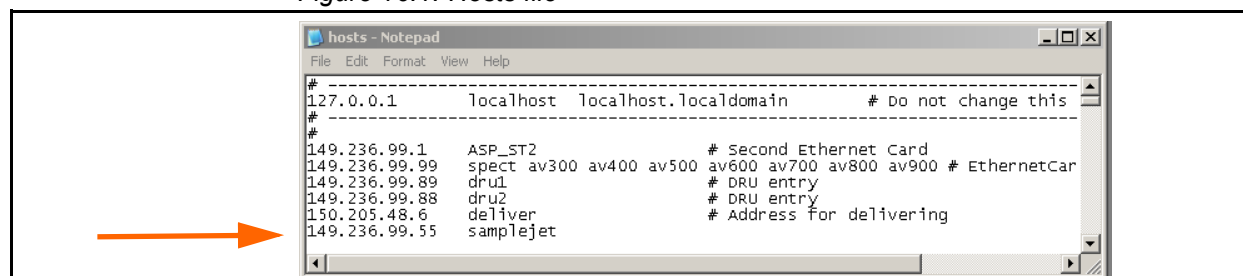
9. Check if the „hosts“ file contains an entry for the SampleJet. The SAMPLEJET uses the fixed IP address: 149.236.99.55. This IP address is only valid in the

spectrometer network.

Table 16.1. Where the hosts file are located

Operating System	Path to the hosts files
Windows	C:\WINDOWS\system32\drivers\etc\hosts
Linux	/etc/hosts

Figure 16.1. Hosts file



- Just type „samplejet“ in any Web browser to get access to the service web if the hostfile is modified correctly.

The Main Window

16.3.1

Figure 16.2. Web server start up window

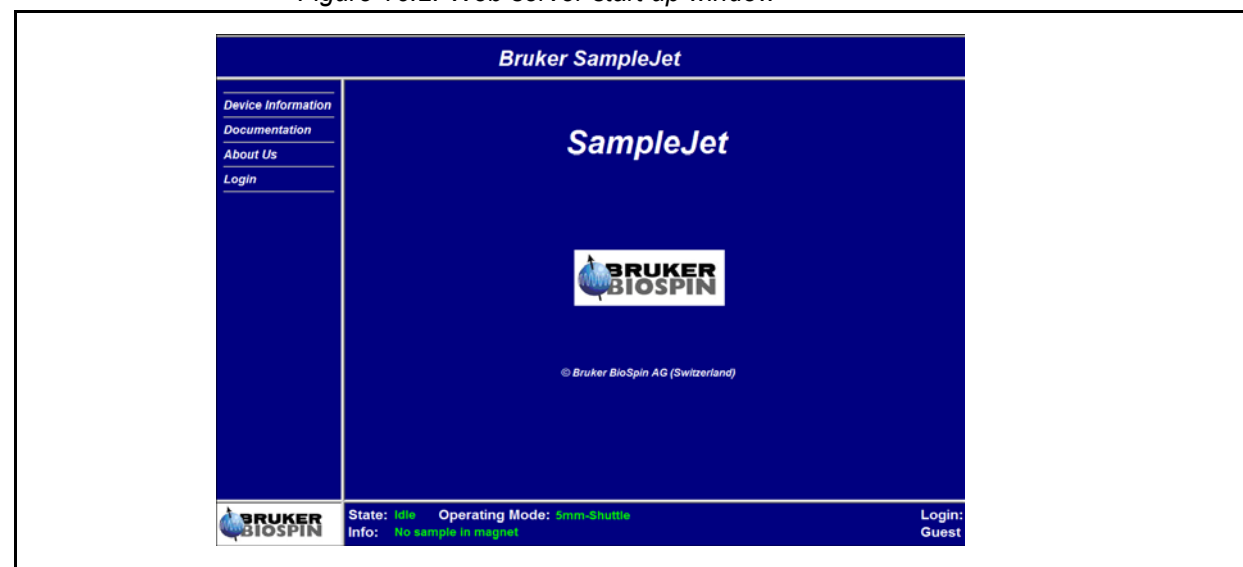


Figure 16.3. Log in web server window

Select the user „Service“ for setting up the SAMPELET (contact BRUKER BIOSPIN if you don't know the password). For more information about the users, please read **"Access from the Web Interface" on page 27.**

The functionality of the SampleJet depends on the firmware version that is installed. The installed version can be seen on the web page:

11. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
12. In „Device Information“ see the „System Configuration“.

Figure 16.4. Installed firmware version

Component	Production ID	ECI	Serial Number	Comment
Entire System	Z109954	0.0	005	USC SAMPLEJET STANDARD
Basic Kit	Z105514	0.0	0	
Base Plate	Z104529	0.0	0	
Carousel Drive	Z73868	0.0	0	
Carousel	Z110929	1.0	0	OpenShop-99 / 5 Racks
Axes System	Z104678	0.0	0	
Gripper	Z108928	0.0	0	Vision
Control Unit	Z105243	1.0	0	
Casing	Z105443	0.0	0	
BST Adapter	Z105516	2.0	0	BST2
Light + Door Switches	Z108935	0.0	0	
Heater / Parking	Z109174	0.0	0	Heater + Parking

Setting up the System Settings**16.4**

Currently there is only one setting that can be changed. This concerns the shim system, it will affect the lift air.

13. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
14. Log in to the web page as service, contact BRUKER BIOSPIN if you do not know the password. The password is for BRUKER service engineers only.
15. Choose „System Settings“ in the „Advanced Service“ menu.
16. Select the BST type installed on your system. The Z-number can be looked up on the label on the top of the BST.

Setting up the Time and Date**16.5**

The system time is important when solving logged problems. The user may refer to a problem at a certain time.

17. Open a web browser and type in „samplejet“ or „http://149.236.99.55“.
18. Log in to the web page as „user“ with the „bruker“ password.
19. Choose „Date & Time“ in the „Basic Service“ menu.
20. Set the time to the local „winter“ time.

Setting up TopSpin**16.6**

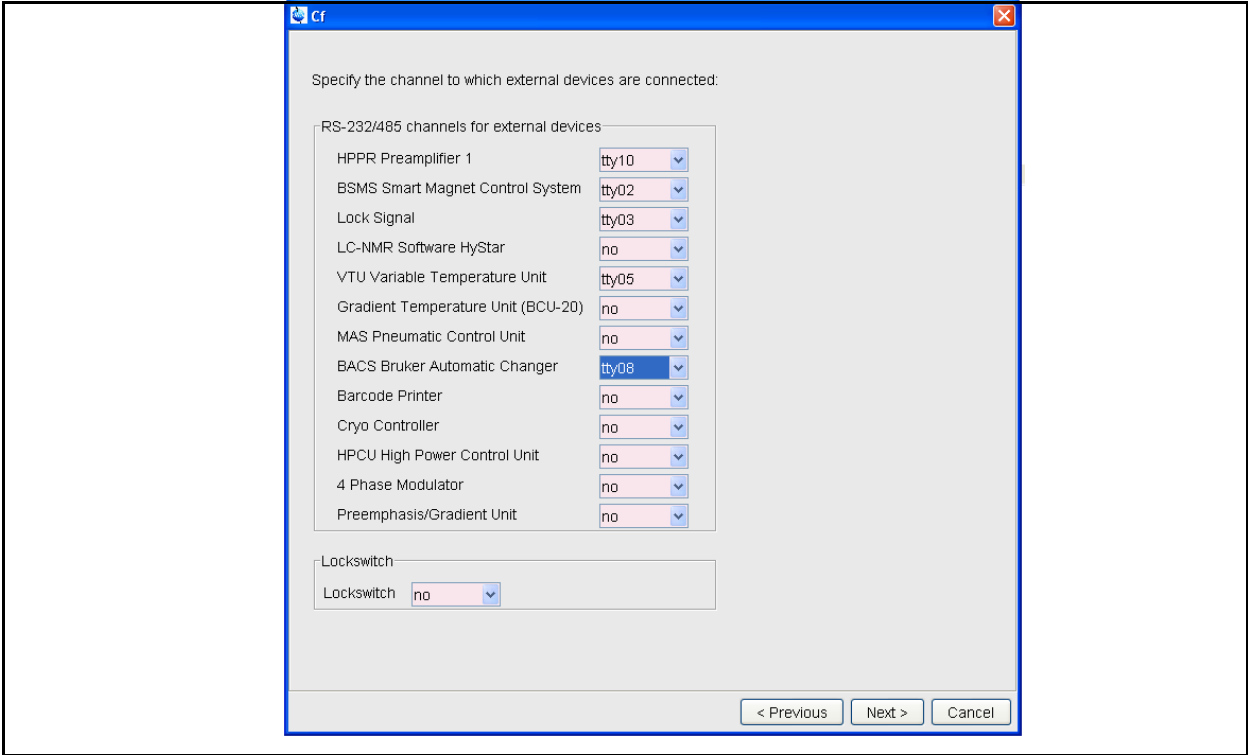
This chapter describes the setup for TopSpin 1.3, 2.1 or 3.0 (carry out the setting up of where a XwinNMR 3.5 is installed analogical to the description).



The SampleJet must be turned on and connected to the console via tty.

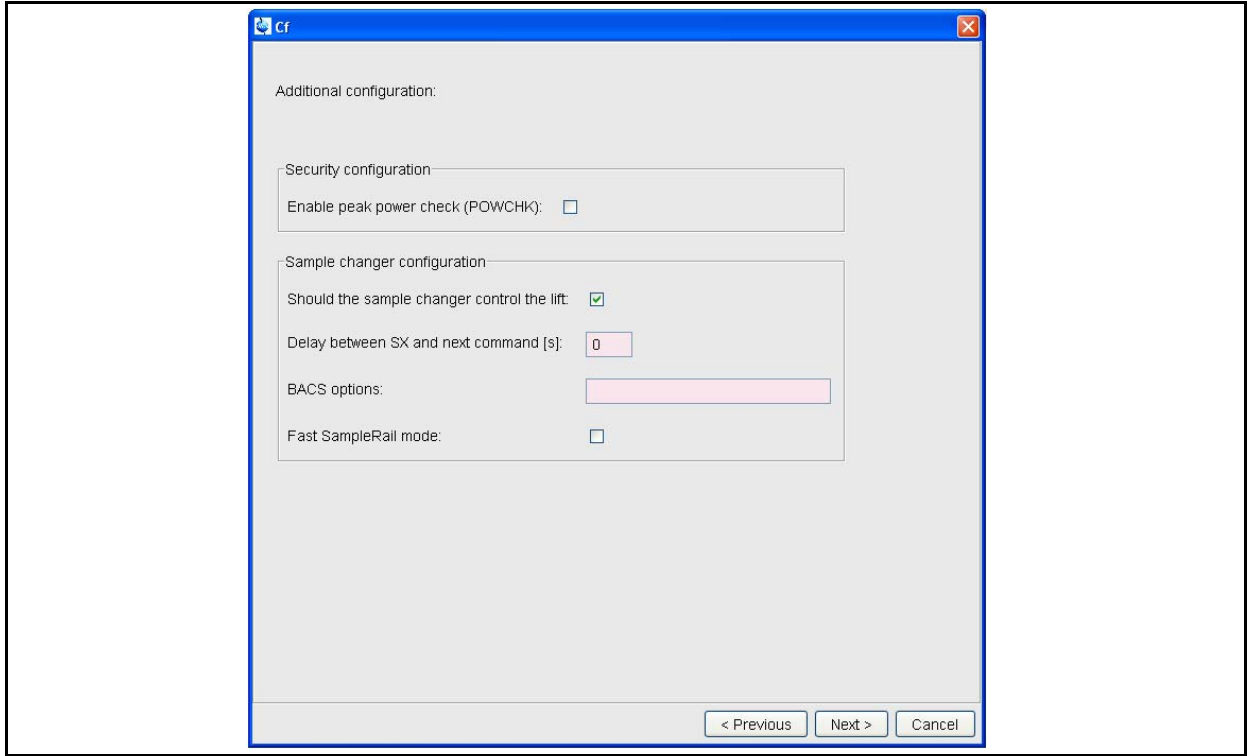
21. Do „cf“ in TopSpin or XwinNMR.
22. Enter the tty channel which the SampleJet is connected to.

Figure 16.5. TopSpin TTY window



- 23. Tick the box „Should the sample changer control the lift.“
- 24. Enter 0 in „Delay between SX and next command[s].“

Figure 16.6. TopSpin BACS window



25. A summary of all the hardware installed (called „Configuration Information“) is supplied at the end of the „cf“. If the SAMPLEJET has been recognized by „cf“ it can be found in this file.

Figure 16.7. Configuration Information after „cf“

```
BACS Sample Changer: device connected to 149.236.99.243:/dev/tty04
- Capacity: 596 holders
- Firmware: 970111
- use BACS air = yes
- BACS sx delay = 0 s
- Sample Rail fast changer mode = no
```

Table 16.2. Supported SX commands

Command	Remark
sx <holder number>	Removes the previously inserted sample automatically. Inserts the chosen sample from the holder into the magnet
sx ej	Removes sample from the magnet and puts it back to its origin.

Setting up IconNMR

16.7

This chapter describes the setting up of a IconNMR version 4. The setting up should be done analogical to the description like with other versions .



IconNMR version 4.2 or later supports SAMPLEJET specific functions.

Depending on the IconNMR version, different automation modes are available.

Table 16.3. Selecting the Automation Mode

IconNMR Version	Automation Mode	Description
< 4.2	„Standard BACS“	Working by referring to positions.
>= 4.2	„Sample Jet“	Working by referring to positions
	„Sample Track (Sample Jet)“	If a SampleTrack is installed you can work by referring to bar code ID's on the racks. (Only with the „VISION“ option)

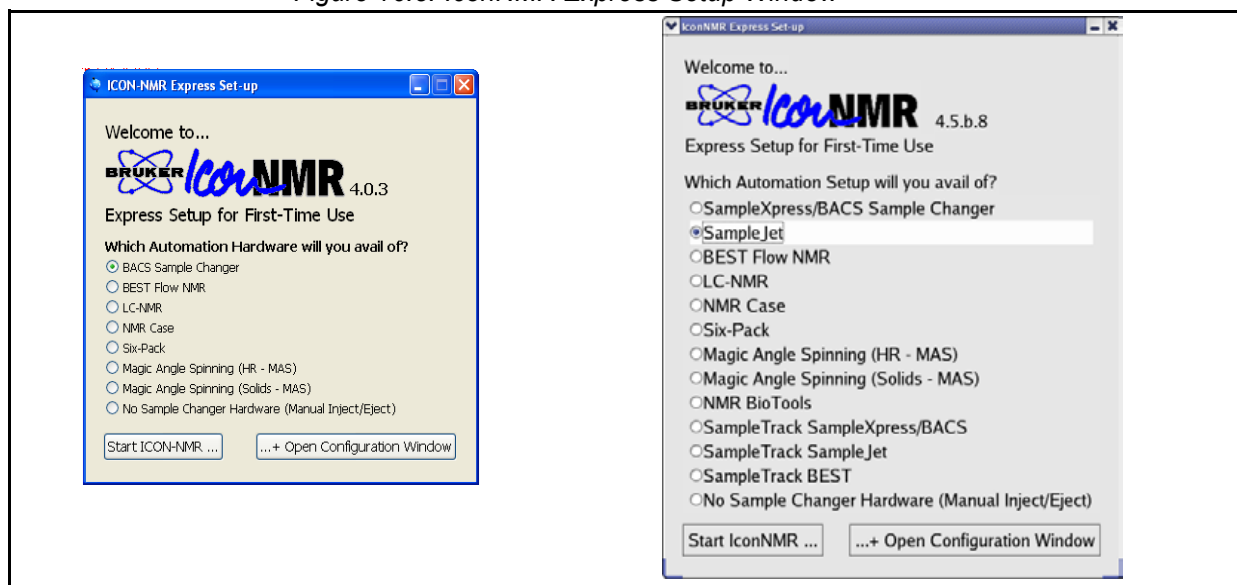
If the customer is using IconNMR for the first time the setup is slightly different than if IconNMR is already in use. If IconNMR is in use, continue with **“Setting up the IconNMR if already in use” on page 117**

Setting up IconNMR for First-Time Use

16.7.1

26. Enter „IconNMR“ in TopSpin.
27. Select the automation mode in „Express Setup for First-Time Use“. See **“Selecting the Automation Mode” on page 116**

Figure 16.8. IconNMR Express Setup Window



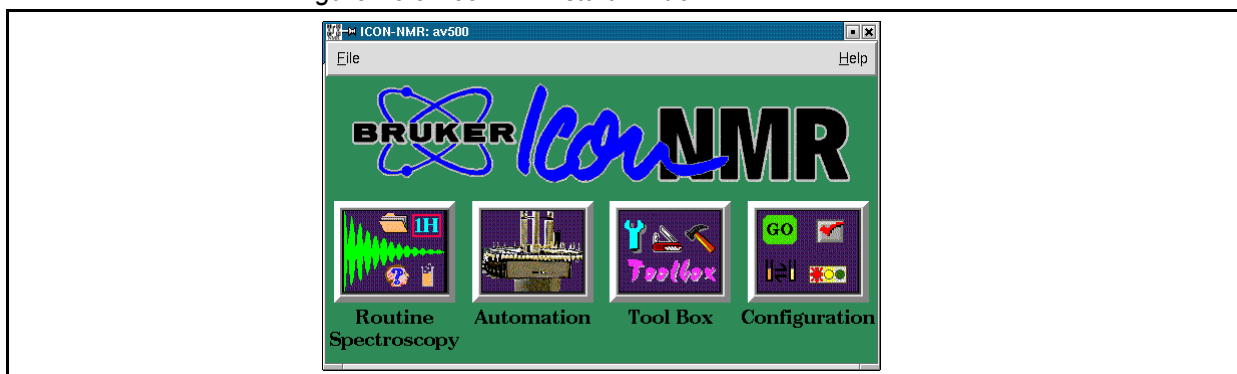
28. Change the „Default Number of Sample Holders“ to „596“ in the „Automation Window“ menu. See **"The number of sample holders" on page 119**

Setting up the IconNMR if already in use

16.8

29. Enter „IconNMR“ in TopSpin.
30. Select „Configuration“ in the IconNMR start window.

Figure 16.9. IconNMR start window



31. Select the „Automation Configuration“ menu (or „Master Switches“) to change the „Default Automation Mode“ to the desired automation mode. See **"Selecting the Automation Mode" on page 116**

Figure 16.10. Selecting the automation device

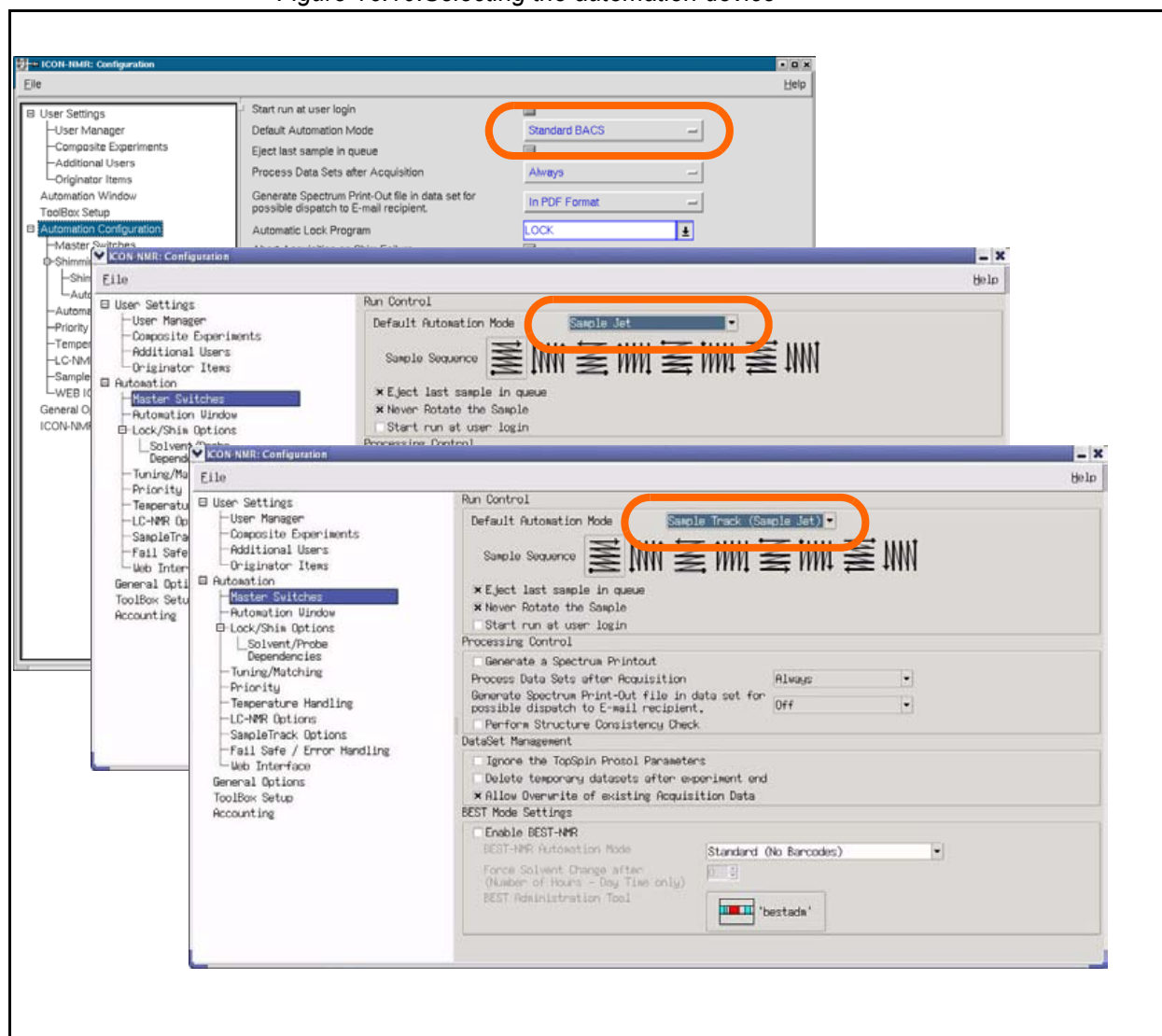
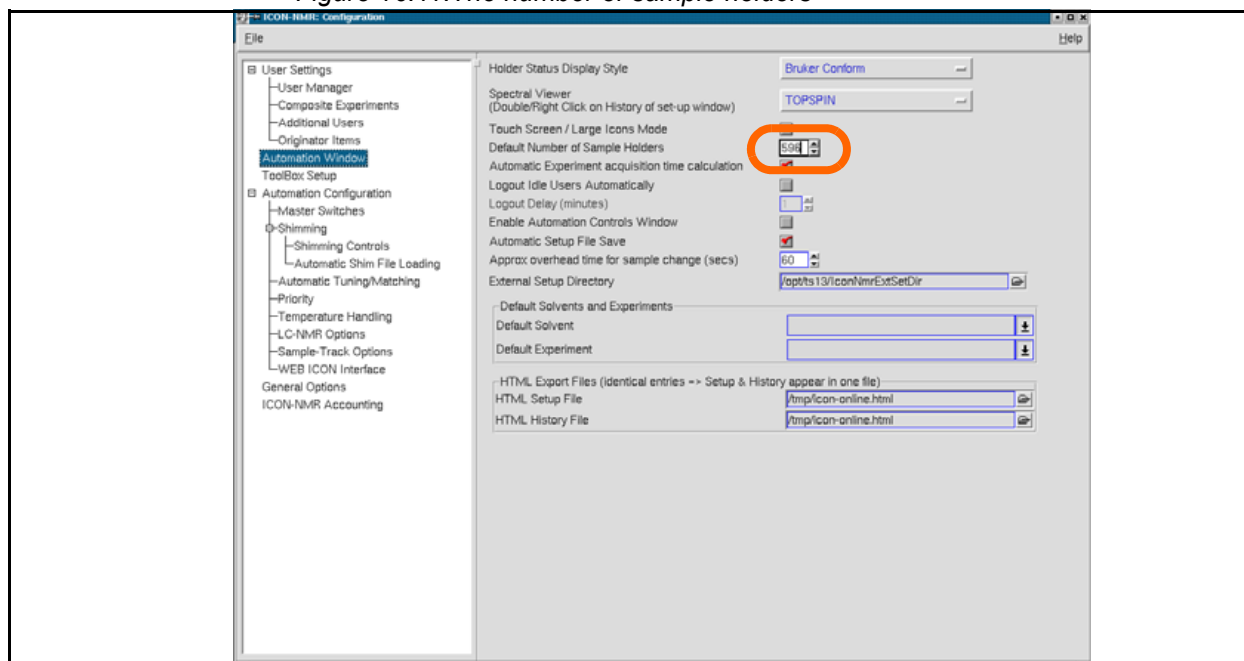


Figure 16.11. The number of sample holders



32. Change the „Default Number of Sample Holders“ to „596“ in the „Automation Window“ menu.

Calibrating the SampleJet

17.1

The drives and the lift have to be calibrated after the initial installation and starting up of the SAMPLEJET. Every calibration is stored with its date.

The following calibrations have to be carried out in the given order. They are described on the next pages.

1. Coordinate Calibration
Calibrates all the hardware positions.
2. Lift Calibration
Calibration of the lift for each shuttle or spinner type
3. Vision Calibration
If the system is equipped with a camera, the camera also needs to be calibrated.



The coordinates of the system have to be recalibrated when updating to firmware version 6.



The SAMPLEJET will refuse any work until it is calibrated. This behavior protects the device from damaging itself by moving into wrong positions.



If the SAMPLEJET is miscalibrated for any reason, the calibration procedure has to be repeated.



If the SAMPLEJET is moved in any way from the SAMPLEJET BASE PLATE, the BST coordinates have to be recalibrated.

One can calibrate the coordinates of the entire system or a specific part of it. The calibration routine can be started from the display or the web interface.

Calibrations

- **Calibrate Entire System**
This routine will calibrate the sample storage, the BST and Extension if present. All calibrations will be saved and dated. It takes about 18 minutes to calibrate everything.
- **Calibrate Storage**
The length of the storage calibration depends on the installed carousel. Check if all the racks are inserted correctly before starting the calibration.
- **Calibrate BST**
The SAMPLEJET will automatically find the calibration notch on the SAMPLE-JET BST ADAPTER UNIVERSAL and calibrate it in about 3 minutes.
- **Calibrate Extension.**
SAMPLEJET will calibrate the parking and preheating positions. The calibration is only available if the hardware is listed in the „System Configuration“,

Calibrating from the display

1. The system has to be in idle state.
2. Choose the „Advanced Menu“ in the „Main Menu“.
3. Choose „Service“ in the „Advanced Menu“.
4. If there is a service code set in the „System Settings“ of the web interface, type in the number.
5. Click on „Calibration“ and then „Coordinate Calibration“.
6. Choose a calibration routine and follow the instructions on the display.

Calibrating from the web interface

1. The system has to be in idle state.
2. Open a web browser and type in „samplejet“ or „http://149.236.99.55“ on the spectrometer control computer.
3. Log in to the web page as a user (password: „bruker“).
4. Choose „Coordinate Calibration“ in the „Basic Menu“.
5. Choose a calibration routine and follow the instructions.

Given the fact that each type of shuttle or spinner has a different weight and a diameter tolerance, the SAMPLEJET needs to calibrate each one of them. With some iterations the SAMPLEJET tries to find the fastest set up of the air flow without hitting the sample too hard on the bottom or on the top. Some carriers are calibrated with a sample tube, others without. The thicker tubes carriers need the tubes to acquire the normal amount of weight and airflow.

The lift calibration routine can only be started from the SAMPLEJET display.



Never operate a carrier that was not calibrated correctly.



Only the „Enabled Operating Modes“ in the „User Settings“ are available for calibration (except the „Manual mode“).

The calibration of the lift has two layers:

1. The lift presetting
2. The lift calibration

The Presetting for the Lift

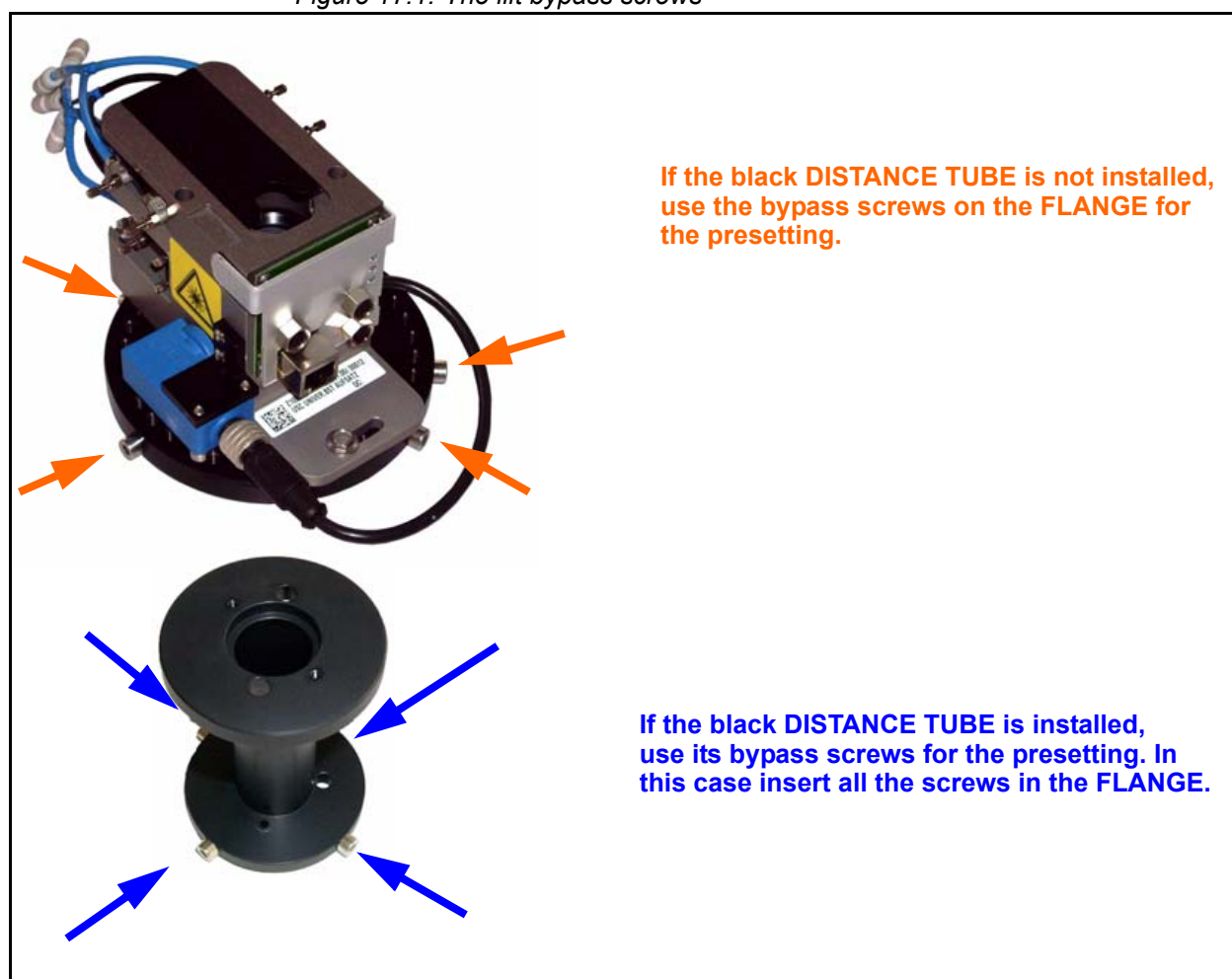
17.4.1

The gas used to blow out a carrier needs to exhaust at the top end of the shim system to decelerate the carrier. Therefore the SAMPLEJET hardware has some bypass holes in it. But if the gas supply is not strong enough those holes need to be closed with screws to have enough gas to blow the carrier up. Those inserted screws in the bypass holes serve as a presetting for the lift calibration. If the setting of the screws does not match the existing gas supply the lift calibration will fail or the carrier will not be handled smoothly.



The lift presetting with the bypass screws is important to get a correct lift calibration

Figure 17.1. The lift bypass screws



Calibrate from display

1. The system has to be in idle state.
2. Choose the „Advanced Menu“ from „Main Menu“
3. Choose „Service“ in the „Advanced Menu“.
4. If there is a service code set in the „System Settings“ of the web interface type in the number.
5. Click on „Calibration“ and then „Lift Calibration“
6. Choose a calibration routine and follow the instructions on the display.

Calibrate from the web interface

- The lift calibration is currently not available in the web interface.



Check the quality of the lift calibration with the lift calibration feedback on the web interface.

Table 17.1. Basic Lift Analysis

Behaviour	Reason	Instruction
Lift failed error (during calibration)	Most probably the gas supply is too weak for your lift presetting.	Change the lift presetting by closing some bypass holes with screws or enhance the gas supply to the SAMPLEJET. Then repeat the calibration
Calibration feedback over 80%		
Carrier hitting the sliders on top of the shim stack hard.	Too many bypass screws closed.	Change the lift presetting by opening some bypass holes with screws. Then repeat the calibration.
Carrier hitting the turbine on the bottom of the shim stack hard.	Corrupt lift calibration or unstable gas supply	Repeat the lift calibration.

Systems which are equipped with a camera require this calibration. The calibration is available when the appropriate gripper arm is listed in the „System Configuration“. The calibration routine can be started from the display or the web interface. To start a vision calibration do the following.

Calibrations

- Gripper camera for bar codes
This procedure calibrates the position of a bar code on a rack. This will take around thirty seconds.
- Gripper camera for matrix codes
This will calibrate the matrix code reading. For this calibration the „vision calibration shuttle“ is needed and has to be set in the „User Settings“. This calibration will take around thirty seconds.



For the matrix code calibration you need to have the vision calibration shuttle and the matrix code library registration file to activate the matrix code reading. If one of both is missing, please contact BRUKER.

Calibrating from the display

1. The system has to be in idle state.
2. Choose the „Advanced Menu“ from „Main Menu“.
3. Choose „Service“ in the „Advanced Menu“.
4. If there is a service code set in the „System Settings“ of the web interface type in the number.
5. Click on „Calibration“ and then „Vision Calibration“.
6. Choose the required calibration.
7. Follow the instructions on the display.

Calibrating from the web interface

1. The system has to be in idle state.
2. Open a web browser and type in „samplejet“ or „http://149.236.99.55“ on the spectrometer control computer.
3. Log in to the web page as a user (password: „bruker“).
4. Choose „Coordinate Calibration“ in the „Basic Menu“.
5. Choose the required calibration and follow the instructions.

Supplies and Accessories

18

SAMPLEJET on Workload

18.1

Once a SAMPLEJET is installed, high amounts of various tubes can be measured. BRUKER provides different hardware to meet your needs.

General statements

18.2

- Short tubes are approximately 4" long (and the cap), long tubes are 7" long.
- The standard package size is 96pcs. for short tubes with caps in a rack and 100 pcs. for tubes with loose caps or loose caps without glass.
- BRUKER sells also caps without glass. Customers may buy their own glass that mandatory needs to fulfill the diameter specification of the caps.
- Mounting caps on small glass diameter (1mm and 1.7mm) is delicate and will be done and testes by BRUKER only. Therefore we do not sell loose caps of this diameter.
- The premounted caps on the tubes in a rack do always have a hole to allow filling them without removing the cap.
- Not premounted caps do never have a hole because the tubes are filled before the cap are mounted.
- The SAMPLEJET will never work with long tubes together with the racks because tubes are centered in the racks on the caps.
- Besides the market prices short tubes are easier to produce and therefore cheaper than long tubes in the same quality.
- BRUKER gives a progressive quantity discount on consumables.

What is to consider

18.3

- **Short tubes?**

Short tubes are cheaper, do not need a separate spinner for each tube and can be transported and stored in the racks. When using the CAROUSEL 99/5 you can even use them for open shop applications with single tube submission.

- **Caps with codes?**

Labeled caps are a gain in convenience even for systems without a code reader. Since the caps have an unique number, you will never mix them up. For systems with a camera for code reading the advantage is even bigger: Tube diameter check and tube identification is performed by the SAMPLEJET firmware.

Where to get consumables

18.4

Please contact your local BRUKER representative to get consumables or check the BRUKER web store.



Check the BRUKER store for shuttles, tubes and caps:
www.store.bruker-biospin.com

Table 18.1. Remarks on Hardware

Topic	Remark
Pictures	The pictures shows the hardware at the date of release of this manual. Older or newer Hardware may look different.
	Everything labelled with this sign has a matrix code on it and can be read with the camera of the SAMPLEJET.
	Tubes labelled with a rack are delivered in these racks.
1)	This indicates operating modes, that can only be used with the CAROUSEL 99/5.
2)	This is the guaranteed insertion depth. Depending on tolerances the range could be wider. Try to exceed the range and check for warnings on the web interface.
ECL	The ECL (engineering change level) indicates the version of a hardware.

Table 18.2. 1mm Parts for the SAMPLEJET

Part	Attribute	Value
1mm Shuttle	Part Number	Z107648
	Label color	Black (none for ECL < 01.00)
	Diameter	1mm
	Clamping the tube	No
	Rotatable	No
	Transportable	Yes (no for ECL < 01.00)
	Max. temperature	150°C (80° for ECL < 01.00)
	For operating modes	1mm Shuttle / Manual
	For probehead diameter	1mm only
	Insertion depth (short tubes)	Defined by the probehead
1mm Tubes with Caps	Part Number	107503 (96 pcs. in a rack)
	Diameter	1mm
	Insertion depth	Probe defined
	Tube length	appr. 4"
	Cap color	Black
	Cap removable from tube	No
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	1mm Shuttle / Manual

Table 18.2. 1mm Parts for the SAMPLEJET

Part	Attribute	Value
Tubes with Caps	Part Number	107504 (96 pcs. in a rack)
	Diameter	1mm
	Insertion depth	Probe defined
	Tube length	appr. 4"
	Cap color	Black
	Cap removable from tube	No
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	1mm Shuttle / Manual

Table 18.3. 1.7mm Parts for the SAMPLEJET

Part	Attribute	Value
1.7mm Shuttle 	Part Number	Z106558
	Label color	Gray
	Diameter	1.7mm
	Clamping the tube	No
	Rotatable	No
	Transportable	Yes
	Max. temperature	150°C (80° for ECL < 01.00)
	For operating modes	1.7mm Shuttle / Manual
	For probehead diameter	1,7mm only
	Insertion depth (short tubes)	Defined by the probehead
1.7mm Tubes with Caps 	Part Number	Z106463 (96 pcs. in a rack)
	Diameter	1.7mm
	Insertion depth	Probe defined
	Tube length	appr. 4"
	Cap color	Gray
	Cap removable from tube	No
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	1.7mm Shuttle / Manual

Table 18.3. 1.7mm Parts for the SAMPLEJET

Part	Attribute	Value
1.7mm Tubes with Caps	Part Number	Z106462 (96 pcs. in a rack)
	Diameter	1.7mm
	Insertion depth	Probe defined
	Tube length	appr. 4"
	Cap color	Gray
	Cap removable from tube	No
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For Operating Modes	1.7mm Shuttle / Manual

Table 18.4. 3mm Parts for the SAMPLEJET

Part	Attribute	Value
 	Part Number	Z105909
	Label color	Green (none for ECL < 01.00)
	Diameter	3mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	Yes
	Max. temperature	150°C (50°C for ECL < 02.00)
	For operating modes	3mm Shuttle / Manual
	For probehead diameter	>= 3mm
	Insertion depth (short tubes)	11 to 20mm ²⁾
	Part Number	Z112271 (96 pcs. in a rack)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	3mm Shuttle / Manual

Table 18.4. 3mm Parts for the SAMPLEJET

Part	Attribute	Value
3mm Tubes with Caps	Part Number	Z112272 (96 pcs. in a rack)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	3mm Shuttle / Manual
3mm Tubes and Caps	Part Number	Z117723 (100 pcs. each)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	3mm Shuttle / Manual
3mm Tubes and Caps	Part Number	Z117724 (100 pcs. each)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	3mm Shuttle / Manual

Table 18.4. 3mm Parts for the SAMPLEJET

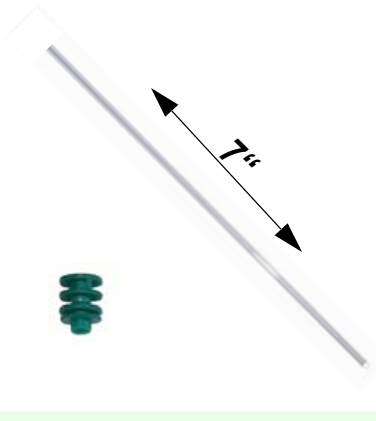
Part	Attribute	Value
3mm Tubes and Caps	Part Number	Z116388 (100 pcs. each)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	7"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	3mm Shuttle ¹⁾ / Spinner / Manual
3mm Tubes and Caps	Part Number	Z117559 (100 pcs. each)
	Diameter	3mm
	Insertion depth	5 to 20.6mm
	Tube length	7"
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	3mm Shuttle ¹⁾ / Spinner / Manual
3mm Caps	Part Number	Z107474 (100 pcs.)
	Glass diameter	3mm ^{+0.05} / _{-0.05}
	Used for	Standard 7" tubes
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	None
	For operating modes	3mm Shuttle / Spinner / Manual

Table 18.4. 3mm Parts for the SAMPLEJET

Part	Attribute	Value
3mm Caps	Part Number	Z107163 (100 pcs.)
	Glass diameter	3mm $^{+0.05}_{-0.05}$
	Used for	Standard 7" tubes
	Cap color	Green
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	Matrix code and number
	For operating modes	3mm Shuttle / Spinner / Manual
3mm Spinner	Part Number	Z45665
	Label color	-
	Diameter	3mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	No
	Max. temperature	80°C
	For operating modes	Spinner / Manual

Table 18.5. 5mm Parts for the SAMPLEJET

Part	Attribute	Value
5mm Shuttle 	Part Number	Z105515
	Label color	Violet (none for ECL < 01.00)
	Diameter	5mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	Yes
	Max. temperature	150°C (50°C for ECL < 02.00)
	For operating modes	5mm Shuttle / Manual
	For probehead diameter	>= 5mm
	Insertion depth (short tubes)	11 to 20mm ²⁾
5mm Tubes with Caps 	Part Number	Z105684 (96 pcs. in a rack)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	5mm Shuttle / Manual

Table 18.5. 5mm Parts for the SAMPLEJET

Part	Attribute	Value
5mm Tubes with Caps	Part Number	Z112273 (96 pcs. in a rack)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	5mm Shuttle / Manual
5mm Tubes and Caps	Part Number	Z114254 (100 pcs. each)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	None
	For operating modes	5mm Shuttle / Manual
5mm Tubes and Caps	Part Number	Z117777 (100 pcs. each)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	appr. 4"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	Yes
	Cap label	Matrix code and number
	For operating modes	5mm Shuttle / Manual

Table 18.5. 5mm Parts for the SAMPLEJET

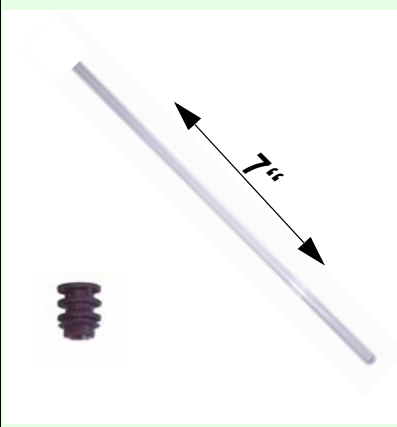
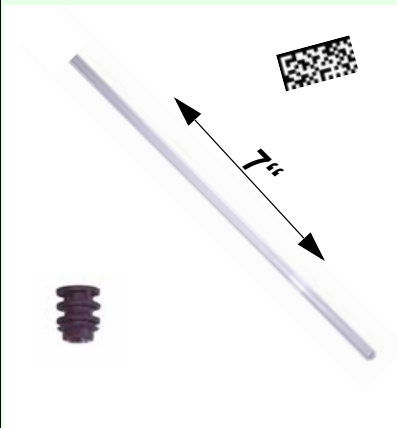
Part	Attribute	Value
5mm Tubes and Caps	Part Number	Z107374 (100 pcs. each)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	7"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	None
	For operating modes	5mm Shuttle ¹⁾ / Spinner / Manual
5mm Tubes and Caps	Part Number	Z107373 (100 pcs. each)
	Diameter	5mm
	Insertion depth	5 to 20.6mm
	Tube length	7"
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	Matrix code and number
	For operating modes	5mm Shuttle ¹⁾ / Spinner / Manual
5mm Caps	Part Number	Z105683 (100 pcs.)
	Glass diameter	5mm ^{+0.05} / _{-0.15}
	Used for	Standard 7" tubes
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	None
	For operating modes	5mm Shuttle / Spinner / Manual

Table 18.5. 5mm Parts for the SAMPLEJET

Part	Attribute	Value
5mm Caps	Part Number	Z106779 (100 pcs.)
	Glass diameter	5mm $^{+0.05}_{-0.15}$
	Used for	Standard 7" tubes
	Cap color	Violet
	Cap removable from tube	Yes
	Cap reusable	No
	Cap with hole	No
	Cap label	Matrix code and number
	For operating modes	5mm Shuttle / Spinner / Manual
Reference Tubes Cap	Part Number	Z106764 and Z106770
	Glass diameter	5mm
	Used for	Sealed reference samples
	Cap color	Black
	Cap removable from tube	Yes
	Cap reusable	Yes
	Cap with hole	Yes
	For operating modes	5mm Shuttle / Spinner / Manual
5mm Spinner	Part Number	Z42516
	Label color	-
	Diameter	5mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	No
	Max. temperature	80°C
	For operating modes	Spinner / Manual

Table 18.5. 5mm Parts for the SAMPLEJET

Part	Attribute	Value
5mm Spinner	Part Number	H00177
	Label color	-
	Diameter	5mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	No
	Max. temperature	120°C
	For operating modes	Spinner / Manual
5mm Spinner	Part Number	H00804
	Label color	-
	Diameter	5mm
	Clamping the tube	Yes
	Rotatable	Yes
	Transportable	No
	Max. temperature	177°C
	For operating modes	Spinner / Manual

Limitations

18.10

Table 18.6. Limitations on the SAMPLEJET

Part	Attribute	Value
Standard Caps	Limitation !	Manual mode only.
	Description	These are not SAMPLEJET caps. Only the SAMPLEJET caps have the right geometry to guarantee successful sample transport with the SAMPLEJET.
	For Operating Mode	Manual
1mm Shuttle for BACS	Limitation !	Manual mode only.
	Description	This is a 1mm carrier designed for the BACS sample changer. You can not use them as a 1mm shuttle for the SMAPLEJET.
	For Operating Mode	Manual
Match System	Limitation !	Manual mode only.
	Description	Match spinners and samples should not be used in the „spinner“ mode of the SAMPLEJET.
	For Operating Mode	Manual

Table 18.6. Limitations on the SAMPLEJET

Part	Attribute	Value
Older Spinners	Limitation !	Manual mode only. Not recommended.
	Description	Older spinners without a yellow mark must not be used in the „spinner“ mode of the SAMPLEJET. It is possible to use them in the „manual“ mode but not recommended.
	For Operating Mode	Manual

Printout Section

19

What is this Chapter about?

19.1

The next pages contain drawings, forms and guidance for the daily usage of a SAMPLEJET. Print or copy these pages and place them in a noticeable spot in your lab if required. There is a page per topic.

Diameter Setup**19.2**

These are the settings from the „User Settings“ page on the web interface for shuttle homes and diameters.

Shuttle homes

If a shuttle is not used, it will be stored in its home position

Table 19.1. The home positions of the shuttles

Shuttle	Openshop-Ring	Parking	Slot number
1mm Shuttle	☐	☐	
1.7mm Shuttle	☐	☐	
3mm Shuttle	☐	☐	
5mm Shuttle	☐	☐	

Diameters

These are the chosen diameters for each of the storages.

Table 19.2. The diameter setup of the storage

Storage	Rack-96, short 1mm to 5mm-Samples mixed	Rack-96, short 1mm-Samples only	Rack-96, short 1.7mm-Samples only	Rack-96, short 3mm-Samples only	Rack-96, short 5mm-Samples only	Rack-96, waste for CAROUSEL 99/5	1mm to 5mm-Samples mixed	1mm-Samples only	1.7mm-Samples only	3mm-Samples only	5mm-Samples only
Rack 1	☐	☐	☐	☐	☐	☐					
Rack 2	☐	☐	☐	☐	☐	☐					
Rack 3	☐	☐	☐	☐	☐	☐					
Rack 4	☐	☐	☐	☐	☐	☐					
Rack 5	☐	☐	☐	☐	☐	☐					
Openshop-Ring							☐	☐	☐	☐	☐

Figure 19.1. A1,B1...H1 and Jump to A2

	1	2	3	4	5	6	7	8	9	10	11	12
A	.01	.09	.17	.25	.33	.41	.49	.57	.65	.73	.81	.89
B	.02	.10	.18	.26	.34	.42	.50	.58	.66	.74	.82	.90
C	.03	.11	.19	.27	.35	.43	.51	.59	.67	.75	.83	.91
D	.04	.12	.20	.28	.36	.44	.52	.60	.68	.76	.84	.92
E	.05	.13	.21	.29	.37	.45	.53	.61	.69	.77	.85	.93
F	.06	.14	.22	.30	.38	.46	.54	.62	.70	.78	.86	.94
G	.07	.15	.23	.31	.39	.47	.55	.63	.71	.79	.87	.95
H	.08	.16	.24	.32	.40	.48	.56	.64	.72	.80	.88	.96

Figure 19.2. A1,A2...A12 and Jump to B1

	1	2	3	4	5	6	7	8	9	10	11	12
A	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10	.11	.12
B	.13	.14	.15	.16	.17	.18	.19	.20	.21	.22	.23	.24
C	.25	.26	.27	.28	.29	.30	.31	.32	.33	.34	.35	.36
D	.37	.38	.39	.40	.41	.42	.43	.44	.45	.46	.47	.48
E	.49	.50	.51	.52	.53	.54	.55	.56	.57	.58	.59	.60
F	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70	.71	.72
G	.73	.74	.75	.76	.77	.78	.79	.80	.81	.82	.83	.84
H	.85	.86	.87	.88	.89	.90	.91	.92	.93	.94	.95	.96

The leading dots are wildcard characters for the number of the rack.

Figure 19.3. H1,G1...A1 and Jump to H2

	1	2	3	4	5	6	7	8	9	10	11	12
A	.08	.16	.24	.32	.40	.48	.56	.64	.72	.80	.88	.96
B	.07	.15	.23	.31	.39	.47	.55	.63	.71	.79	.87	.95
C	.06	.14	.22	.30	.38	.46	.54	.62	.70	.78	.86	.94
D	.05	.13	.21	.29	.37	.45	.53	.61	.69	.77	.85	.93
E	.04	.12	.20	.28	.36	.44	.52	.60	.68	.76	.84	.92
F	.03	.11	.19	.27	.35	.43	.51	.59	.67	.75	.83	.91
G	.02	.10	.18	.26	.34	.42	.50	.58	.66	.74	.82	.90
H	.01	.09	.17	.25	.33	.41	.49	.57	.65	.73	.81	.89

Figure 19.4. H1,H2...H12 and Jump to G1

	1	2	3	4	5	6	7	8	9	10	11	12
A	.85	.86	.87	.88	.89	.90	.91	.92	.93	.94	.95	.96
B	.73	.74	.75	.76	.77	.78	.79	.80	.81	.82	.83	.84
C	.61	.62	.63	.64	.65	.66	.67	.68	.69	.70	.71	.72
D	.49	.50	.51	.52	.53	.54	.55	.56	.57	.58	.59	.60
E	.37	.38	.39	.40	.41	.42	.43	.44	.45	.46	.47	.48
F	.25	.26	.27	.28	.29	.30	.31	.32	.33	.34	.35	.36
G	.13	.14	.15	.16	.17	.18	.19	.20	.21	.22	.23	.24
H	.01	.02	.03	.04	.05	.06	.07	.08	.09	.10	.11	.12

The leading dots are wildcard characters for the number of the rack.

Figure 19.5. A12,B12...H12 and Jump to A11

	1	2	3	4	5	6	7	8	9	10	11	12
A	.89	.81	.73	.65	.57	.49	.41	.33	.25	.17	.09	.01
B	.90	.82	.74	.66	.58	.50	.42	.34	.26	.18	.10	.02
C	.91	.83	.75	.67	.59	.51	.43	.35	.27	.19	.11	.03
D	.92	.84	.76	.68	.60	.52	.44	.36	.28	.20	.12	.04
E	.93	.85	.77	.69	.61	.53	.45	.37	.29	.21	.13	.05
F	.94	.86	.78	.70	.62	.54	.46	.38	.30	.22	.14	.06
G	.95	.87	.79	.71	.63	.55	.47	.39	.31	.23	.15	.07
H	.96	.88	.80	.72	.64	.56	.48	.40	.32	.24	.16	.08

Figure 19.6. A12,A11...A1 and Jump to B12

	1	2	3	4	5	6	7	8	9	10	11	12
A	.89	.81	.73	.65	.57	.49	.41	.33	.25	.17	.09	.01
B	.90	.82	.74	.66	.58	.50	.42	.34	.26	.18	.10	.02
C	.91	.83	.75	.67	.59	.51	.43	.35	.27	.19	.11	.03
D	.92	.84	.76	.68	.60	.52	.44	.36	.28	.20	.12	.04
E	.93	.85	.77	.69	.61	.53	.45	.37	.29	.21	.13	.05
F	.94	.86	.78	.70	.62	.54	.46	.38	.30	.22	.14	.06
G	.95	.87	.79	.71	.63	.55	.47	.39	.31	.23	.15	.07
H	.96	.88	.80	.72	.64	.56	.48	.40	.32	.24	.16	.08

The leading dots are wildcard characters for the number of the rack.

Figure 19.7. H12,G12...A1 and Jump to H11

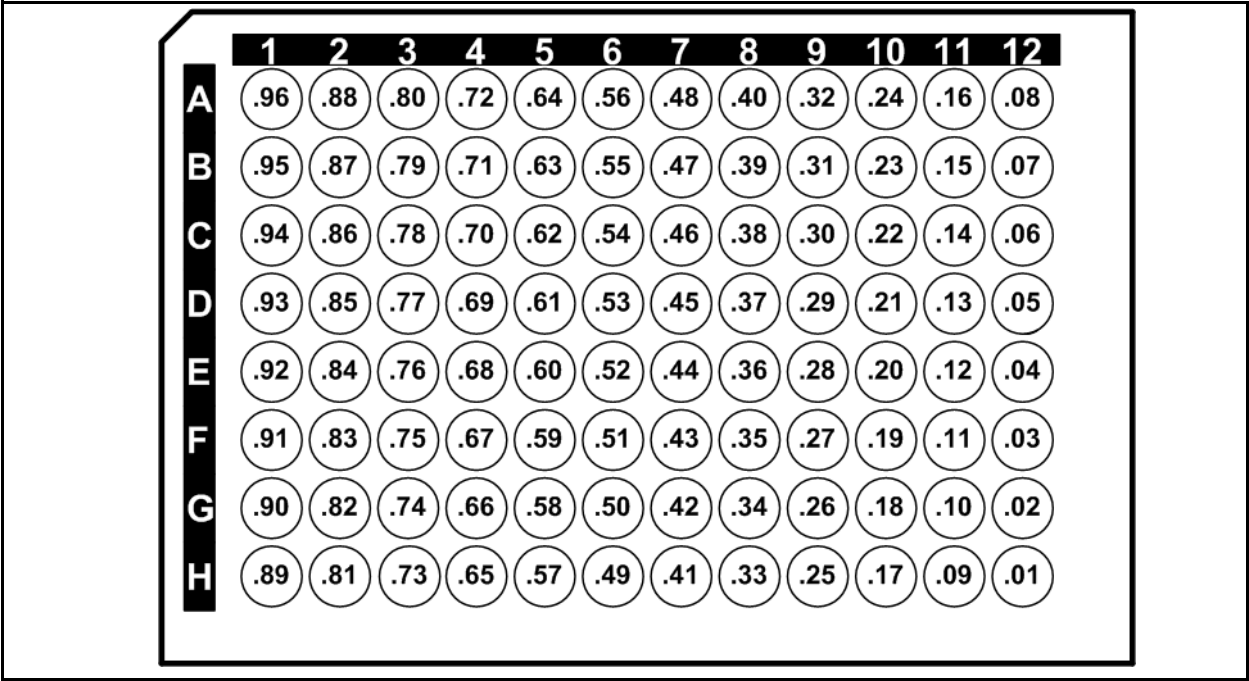
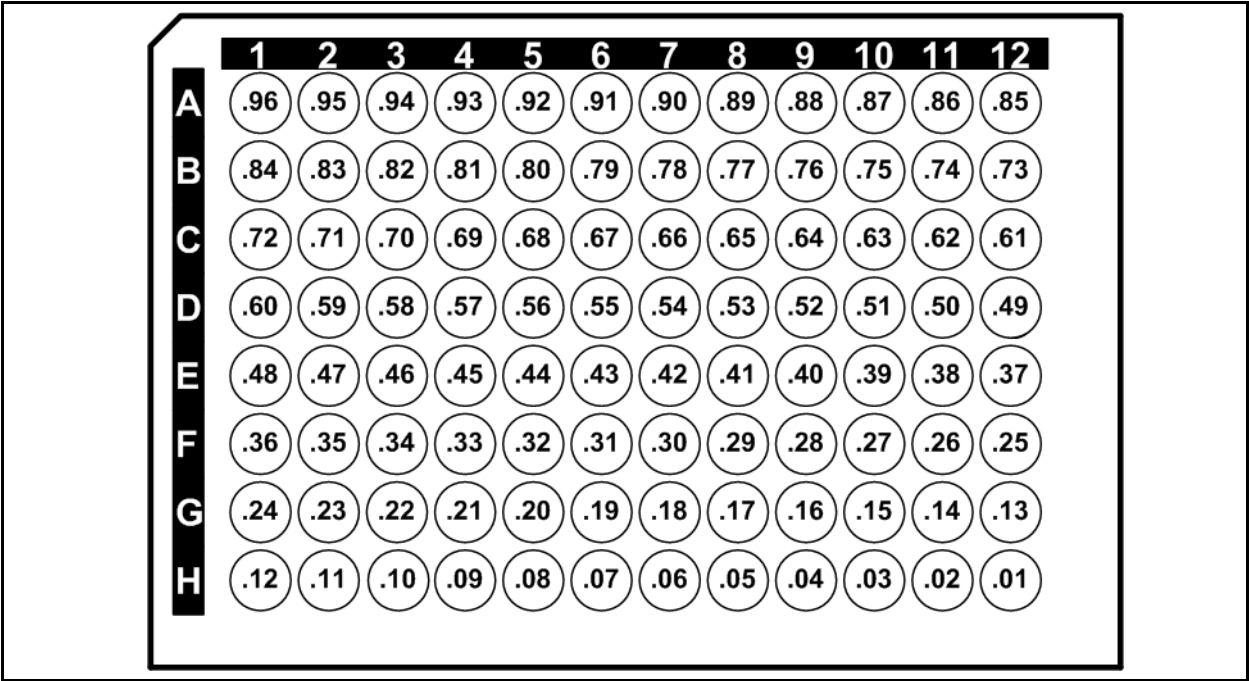


Figure 19.8. H12,H11...H1 and Jump to G12



The leading dots are wildcard characters for the number of the rack.

Content of a Rack**19.4***Table 19.3. General information*

Rack no.: (1) (2) (3) (4) (5)	Date:	Who:
Rack id.:		
Sample diameter:(1) (1.7) (3) (5)		

Table 19.4. Samples in the rack

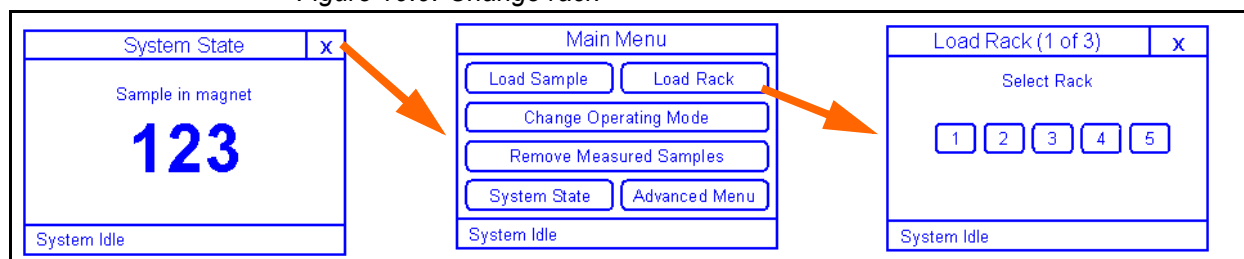
No.	SAMPLE	No.	SAMPLE	No.	SAMPLE
1		33		65	
2		34		66	
3		35		67	
4		36		68	
5		37		69	
6		38		70	
7		39		71	
8		40		72	
9		41		73	
10		42		74	
11		43		75	
12		44		76	
13		45		77	
14		46		78	
15		47		79	
16		48		80	
17		49		81	
18		50		82	
19		51		83	
20		52		84	
21		53		85	
22		54		86	
23		55		87	
24		56		88	
25		57		89	
26		58		90	
27		59		91	
28		60		92	
29		61		93	
30		62		94	
31		63		95	
32		64		96	

Loading a Rack Using the Display

19.5

1. Navigate to the main menu and press the „Load Rack“ button.
2. Select the rack to be exchanged, it will then move to the front.

Figure 19.9. Change rack



3. Open the front door and remove the old rack (if there is one).
4. Insert the new rack and close the front door. (The rack will only fit in one direction.)
5. Press „Done“

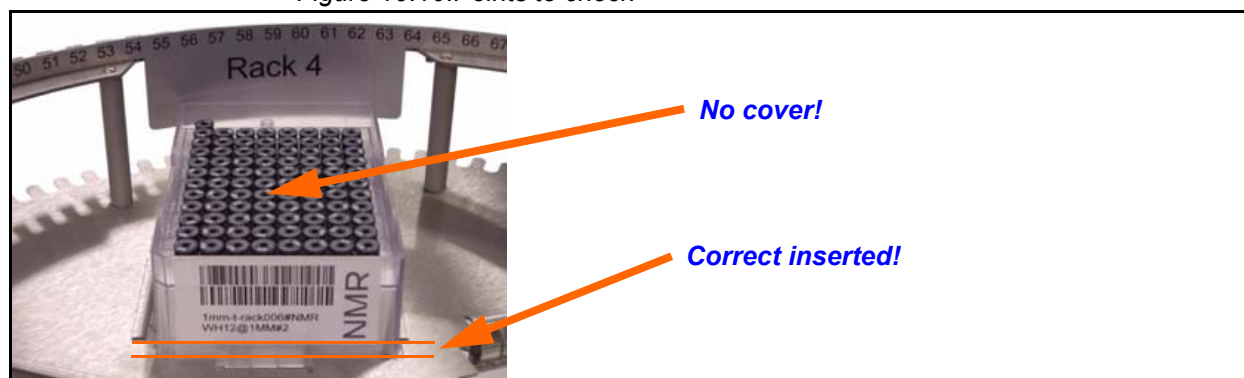


The SAMPLEJET may start moving after 60 seconds inactivity.



Check that the rack is not covered and that it stands flatly on the rotary tray.

Figure 19.10. Points to check



Loading a Rack Using the Remote Control

19.6

1. Open the front door.
2. Press a button on the REMOTE CONTROL to rotate the rack to the front.

Figure 19.11. The REMOTE CONTROL



3. Remove the old rack (if there is one).
4. Insert the new rack. (The rack will only fit in one direction.)
5. Close the front door.

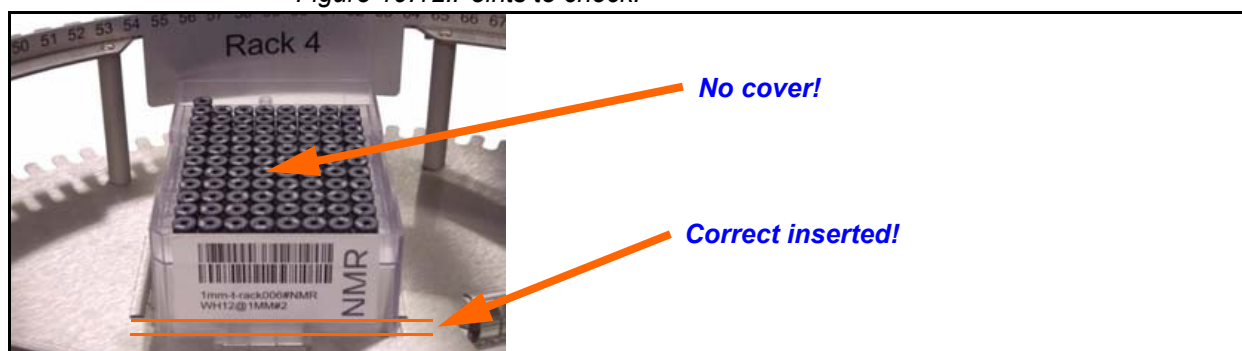


The SAMPLEJET may start moving after 60 seconds inactivity.



Check that the rack is not covered and that it stands flatly on the rotary tray.

Figure 19.12. Points to check.

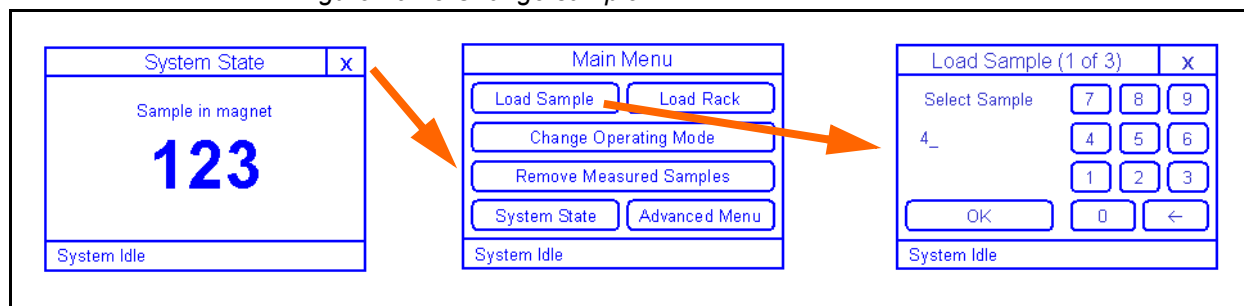


Loading a Sample Using the Display

19.7

1. Navigate to the main menu and press the „Load Sample“ button.
2. Select the sample to be exchanged, it will then move to the front.

Figure 19.13.Change sample



3. Open the front door.
4. Insert the new sample.
5. Close the front door.
6. Press „Done“



The SAMPLEJET may start moving after 60 seconds inactivity.

Loading a Sample Using the Remote Control**19.8**

1. Open the front door.
2. Press a button on the REMOTE CONTROL to rotate the sample to the front.

Figure 19.14. The REMOTE CONTROL



3. Insert the sample
4. Close the front door.



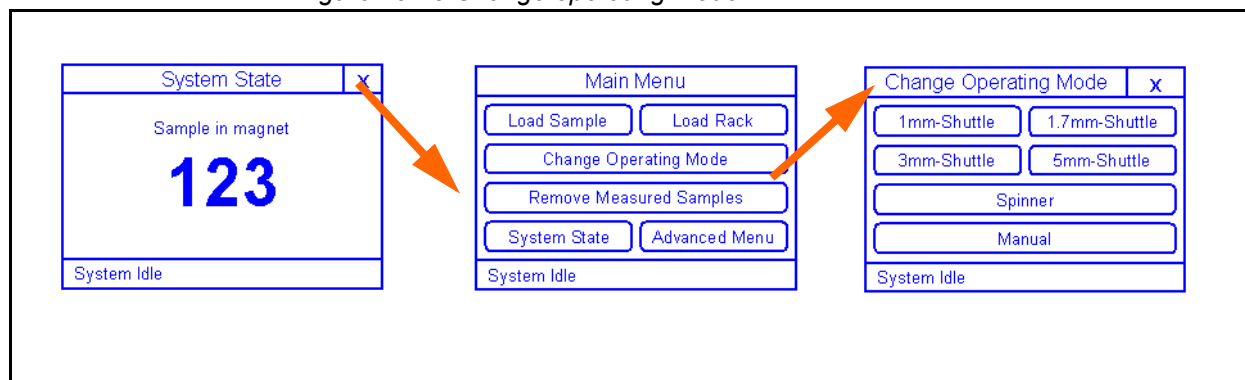
The SAMPLEJET may start moving after 60 seconds inactivity.

Changing the Operation Mode

19.9

1. Navigate to the main menu and press the „Change Operating Mode“ button.

Figure 19.15.Change operating mode



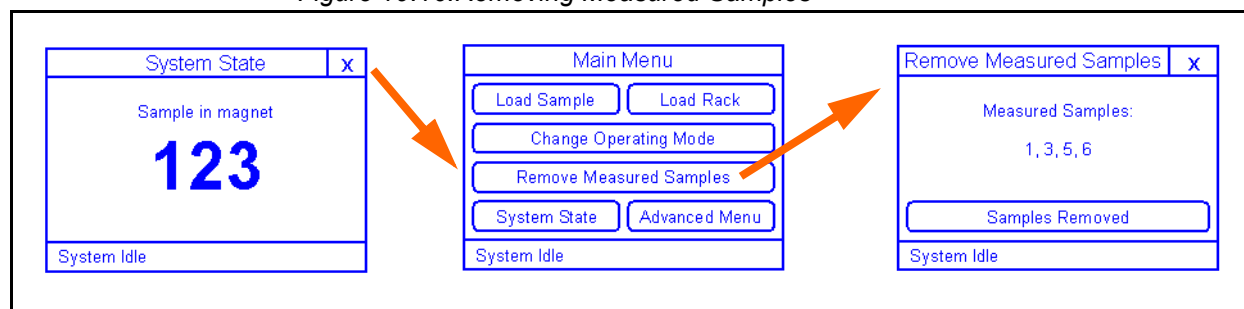
2. Select the desired mode.
3. Follow the instructions on the Display

Removing Measured Samples

19.10

1. Navigate to the main menu and press the „Remove Measured Samples“ button.
2. Open the front door.
3. Remove the samples as displayed. They will be moved to the front door.

Figure 19.16. Removing Measured Samples



4. Close the front door.
5. Press „Samples Removed“
6. If other samples needs to be removed repeat from step 2.
7. Press „Done“



The SAMPLEJET may start moving after 60 seconds inactivity.

If a SAMPLEJET ever has to be sent to BRUKER BIOSPIN for repairs or a BRUKER BIOSPIN engineer has to do any service work on the device please take note of the following.



*The customer has to accept and sign a photocopy of the "Safety and Repair Declaration *" form on page 162 or a newer version of the BRUKER form ZFQS0083, before any service work can be carried out on the SAMPLEJET.*

Safety and Repair Declaration *

20.2

This safety and repair declaration is applicable for:

- NMR probes
- Shim systems
- Sample handling systems

Bruker's analytical instruments may be exposed to hazardous substances when used by customers. Whenever a customer returns a system or its components to Bruker, e.g. for repair, upgrade, loan returns, exchange, etc., **the customer accepts the following obligation:**

It is the explicit responsibility of the customer to make sure that the returned products are absolutely free of any hazardous substances. In case of omission to do so, Bruker will hold the customer liable for any resulting personal injuries and/or damages, caused to Bruker employees and/or to other persons exposed to the hazardous substances. The customer is liable for all damage caused to Bruker, e.g. with the cleaning up of hazardous substances, decontamination, security measures, etc. The customer is also liable for any other (direct and/or indirect) damages that may be caused to Bruker by the hazardous substances.

☐ I ACCEPT THIS OBLIGATION

The completed and signed form has to be attached to the returned product. Otherwise, customer returns for the above mentioned products cannot be processed.

The safety & repair declaration form has to be signed by a Bruker service engineer if the system was never operated by the customer (e.g. prior to completion of the installation).

PRODUCT PART NO.	:	_____	SERIAL NO.	:	_____
FAULT DESCRIPTION (reason for return)	:	_____ _____			
DATE FAILURE OCCURED	:	_____			
SYSTEM ORDER NO. / DISPATCH NO.	:	_____			

The customer/signatory confirms that the returned product is absolutely free of any hazardous substances (e.g. toxic, corrosive, explosive, biologically dangerous or radioactive).

Signature:	COMPANY/INSTITUTE	:	_____
X _____	NAME	:	_____
	MAILING ADDRESS	:	_____
Date:	CITY/POSTAL CODE	:	_____
	COUNTRY	:	_____
	PHONE NO.	:	_____

* (This form is a corrected copy of the original ZFQS0083 form, version 02)

Technical Data

21

Shipping

21.1

The SAMPLEJET is packed in a single cardboard box on a standard euro-pallet. Tilt and impact indicator stickers can be located on the sides of the box.

Table 21.1. Shipping

Data	Value	Unit
Length	120	cm
Width	80	cm
Height	120	cm
Weight (standard delivery)	approx. 100	kg

Supply on Operation

21.2

The SAMPLEJET requires electricity and compressed air or nitrogen.

Table 21.2. Supply on operation

Data	Value	Unit
Electrical power active	approx. 50	W
Pressure	6-8	bar
Minimum gas flow	100	l/min ^{1), 2)}
Gas consumption 1mm and 1.7mm Rack Mode	approx. 4.4	l/cycle ¹⁾
Gas consumption 3mm and 5mm Rack Mode	approx. 4.8	l/cycle ¹⁾
Gas consumption Openshop Mode	approx. 21.4	l/cycle ¹⁾

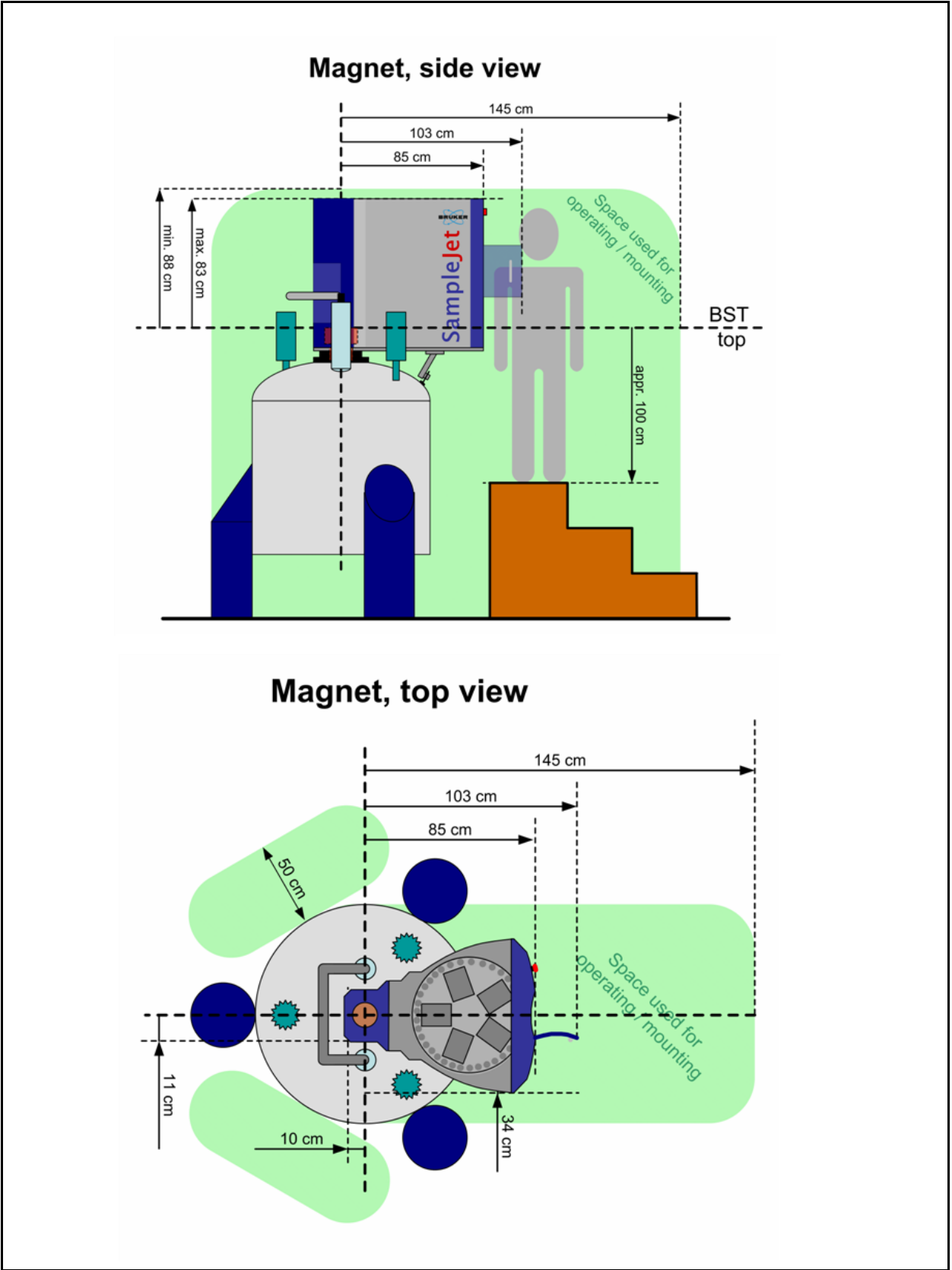
1) Standard conditions for gas: 20°C, 101.3kPa, 65%rH

(ANR norm liters after ISO R558 2.3 and ISO R554 2.2)

2) Work pressure = supply pressure -1bar

(Gas flow at work pressure after ISO 1217)

Figure 21.1. SAMPLEJET dimensions



Display**21.4**

There is a touchscreen on the front of the SAMPLEJET.

Table 21.3. The display

Data	Value	Unit
colors	white on blue	-
Dimension	61 x 96	mm
Resolution	128 x 240	pixels

Cycle Times**21.5**

The time needed to exchange a Sample in the magnet depends on the operating mode, the magnet and the selected safety checks. These are the minimum cycle times at 100% axes speed.

Table 21.4. Cycle times

Operating Mode	Value	Unit
1mm and 1.7mm Rack Mode	approx. 30	s
3mm and 5mm Rack Mode	approx. 35	s
Openshop Mode	approx. 40	s

Temperature Limitations**21.6**

Do not exceed these temperature limits.

Table 21.5. Temperature limitations

Data	Value	Unit
Ambient temperature.	Read the limitations in „Site Planning for AVANCE Systems, 300-700 MHz, Z31276“	-
Max. temperature for shuttles.	See <u>“Supplies and Accessories” on page 129</u>	-
Max .temperature for standard spinners. (OpenShop and Manual Mode)	Read the limitations in „Probes, User Manual, Z31339“	-
Max. temperature of sample tubes.	Limitations given by the shuttles / spinners	-

Table 21.6. Insertion Depth

Data	Value	Unit
Absolute insertion depth tolerance	+/-1	mm
Relative insertion depth tolerance	+/- 0.2	mm
Insertion depth for tubes in unclamped shuttles	Defined by probehead	-
Min. insertion depth for tubes in clamped shuttles	Default from Probehead -15	mm ^{1) 2)}
Max. insertion depth for tubes in clamped shuttles	Default from Probehead +2	mm ^{1) 2)}
Additional insertion depth limits for short tubes in clamped shuttles.	See shuttle specification in chapter <u>"Supplies and Accessories" on page 129</u>	-

1) Below magnetic centre of system.

2) If range is not smaller specified for short tubes given by the shuttle.

Moving**21.8**

The axis have the following parameters.

Table 21.7. Moving parts on the SAMPLEJET

Data	Value	Unit
General absolute precision	<0.5	mm
Max. moving speed X, Y and Z axes.	0.6	m/s
Max. rotating speed rotating tray.	1.2	rad/s
Max. acceleration X, Y und Z axes.	0.4	m/s ²
Max. acceleration rotating tray.	0.6	rad/s ²
Nominal force X axis.	19.6	N
Nominal force Y axis.	24.2	N
Nominal force Z axis.	39.2	N
Nominal force rotating tray (biggest radius)	30	N
Force of moving part in gripper	approx. 30	N
Force of sliders in BST ADAPTER UNIVERSAL	approx. 50	N
Nominal power X axis.	20	W
Nominal power Y axis.	30	W
Nominal power Z axis.	20	W
Nominal power rotating tray	6	W

Safety**21.9**

These are the relevant safety specifications.

Table 21.8. Safety specifications

Data	Value	Unit
Min. strain on the SampleJet before magnet tilt.	80	kg
Axes behaviour on exception.	Axes position and current are permanently monitored.	-
Behaviour on broken sample tube.	Sample tubes checked on inserting and removing from magnet.	-
Reaction time on emergency stop	<100	ms

Weight of components

21.10

These are the weights of the SAMPLEJET components.

Table 21.9. weight of components

Data	Value	Unit
Premounted main part	approx. 40	kg
Mounting hardware	approx. 9	kg
CONTROL UNIT	6.2	kg
USC CASING	approx. 13	kg
BST ADAPTER UNIVERSAL	1.2	kg

Cooling Specifications

21.11

This are the specifications for the cooling with the carousel 30/5 cooled.

Table 21.10. Cooling specifications

Data	Value	Unit
Nominal temperature	279	K
Maximum temperature tolerance	+/- 1	K
Read-out accuracy	0.1	K
Temperature control	Each rack separately	-
Temperature read-out	Each rack separately	-
Maximum power consumption carousel	100	W
Maximum power consumption cooler	450	W
Compressed air consumption	50	l/min. ¹⁾ , ²⁾
Minimum compressed air pressure	6-8	Bar
Maximum temperature of compressed air dew point	233	K

1) Standard conditions for gas: 20°C, 101.3kPa, 65%rH

(ANR norm liters after ISO R558 2.3 and ISO R554 2.2)

2) Work pressure = supply pressure -1bar

(Gas flow at work pressure after ISO 1217)

Extension Specifications**21.12**

This are the specifications for the parking section of the extension unit.

Table 21.11. Parking specifications

Description	Value	Unit
Parking slots for long tubes with spinners or empty shuttles	6	Slots
Parking slots for future use	11	Slots

This are the specifications for the heating section of the extension unit.

Table 21.12. Heater specifications

Description	Value	Unit
Heating slots for short sample tubes with a diameter of 1 to 5 mm	8	Slots
Configurable target temperature	293 to 324	K
Effective temperature	Room to 324	K
Absolute temperature tolerance	Max. +/- 1	K
Relative temperature tolerance	Max. +/- 0.25	K
Read-out accuracy	0.07	K
Automatic overheating protection	343 +/- 3	K
Temperature indicated as stable, „H“ on display not blinking.	Temp. offset < = 0.5	K
Tubes automatically allocated in the preheating (configurable)	0 - 8	Tubes
Minimum conditioning time (configurable)	0 - 5	min.

Bruker Biospin Contact

22

General Questions

22.1

Submit your inquiries regarding SAMPLEJET sales and service to your local BRUKER BIOSPIN representative. Use the following address to acquire further information.

Contact for Sales Information

22.2

For further technical assistance, please do not hesitate to contact us directly at:

BRUKER BIOSPIN AG
SAMPLEJET Info
Industriestrasse 26
8117 Fällanden
Switzerland

Phone:[+41] 44 825 98 80

E-mail: samplejet-info@bruker.ch

Contact for Additional Technical Assistance

22.3

For further technical assistance, please do not hesitate to contact us directly at:

BRUKER BIOSPIN AG
SAMPLEJET Service
Industriestrasse 26
8117 Fällanden
Switzerland

Phone:[+41] 44 825 98 90

E-mail: samplejet-service@bruker.ch

FTP: <ftp://ftp.bruker.ch/pub/NMR/download/SampleJet/>

Figures

1	Introduction	9
Figure 1.1.	SAMPLEJET System	9
Figure 1.2.	SAMPLEJET front view with closed casing	11
Figure 1.3.	An inside view of the SAMPLEJET with the casing partly removed	11
Figure 1.4.	SAMPLEJET Hardware	11
Figure 1.5.	Different Carousels for the SAMPLEJET	12
2	Safety	13
Figure 2.1.	Warning hazardous area	13
Figure 2.2.	Warning LASER hazard	14
3	Firmware Hints	17
4	First Steps	21
5	Using the SAMPLEJET	23
Figure 5.1.	The simplified states as a diagram	23
Figure 5.2.	Navigating through the menu	24
Figure 5.3.	The „System State“ window	24
Figure 5.4.	The display menu tree	26
Figure 5.5.	The SAMPLEJET web page	27
Figure 5.6.	The web page menu tree	29
Figure 5.7.	Transporting a shuttle	32
Figure 5.8.	Racks and openshop ring	33
Figure 5.9.	The countdowns before unlock	34
Figure 5.10.	System Locked by User	34
Figure 5.11.	The hidden buttons	35
Figure 5.12.	Loading samples	36
Figure 5.13.	Bring the desired tube to the door	36
Figure 5.14.	Removing Samples	37
Figure 5.15.	Loading Racks	38
Figure 5.16.	Bring the desired rack to the door	38
Figure 5.17.	Remove the cover of the rack.	39
Figure 5.18.	How to insert a rack correctly	39
Figure 5.19.	The enumeration of the rack	41
Figure 5.20.	An error message	42
Figure 5.21.	The states of an error recovery	43
Figure 5.22.	Floating Shuttle in Error Recovery	44
6	Operating Modes	47
Figure 6.1.	Limitation in the „spinner“ mode	49

Figure 6.2. The open sliders	50
Figure 6.3. The door on the back	50
Figure 6.4. Changing the operation mode on the display	51
7 User Settings	53
Figure 7.1. Cycle time vs. axes speed	57
8 Vision	59
Figure 8.1. The GRIPPER ARM / 2 for the VISION option	59
Figure 8.2. Bar code and matrix code	59
Figure 8.3. A picture captured by the VISION	62
9 Carousel 99/5	65
Figure 9.1. The CAROUSEL 99/5	65
Figure 9.2. The CAROUSEL 99/5 storage	66
Figure 9.3. A 1mm shuttle in the Shuttle Storage	67
Figure 9.4. Hanging tubes on their caps into the grate	68
10 Cooling (option)	71
Figure 10.1. The carousel 30/5 cooled	71
Figure 10.2. The heat exchanger	73
Figure 10.3. Carousel cooled top view	73
Figure 10.4. Open the cooler to switch on or off	74
Figure 10.5. The special tool	75
Figure 10.6. Remove the heat exchanger	75
11 Carousel 47/5	77
Figure 11.1. The CAROUSEL 47/5	77
Figure 11.2. The CAROUSEL 47/5 storage	78
12 Using Bruker NMR Software	79
Figure 12.1. The SAMPLEJET storage overview in IconNMR	81
13 Extension (Option)	83
Figure 13.1. The PREHEATING UNIT	83
Figure 13.2. Shuttles in the parking	85
Figure 13.3. Setting the shuttles in the parking	85
Figure 13.4. The „Heater Commands“	86
Figure 13.5. Heater window on the display	86
Figure 13.6. The „Basic Commands“ page	87
Figure 13.7. Example 1: Short NMR time, starting at tune 101	90
Figure 13.8. Example: Long NMR time, starting at tube 101	91
Figure 13.9. .Order of putting next tubes in the slots	92
Figure 13.10. Top view on the extension	93
14 Remote Control (Option)	95
Figure 14.1. The REMOTE CONTROL	95
Figure 14.2. Where to connect the REMOTE CONTROL	96

Figure 14.3. The pads	97
Figure 14.4. Using the REMOTE CONTROL	97
Figure 14.5. System locked by REMOTE CONTROL	99
Figure 14.6. The standard sequence	99

15 Basic Service 101

Figure 15.1. Change O-Ring	101
Figure 15.2. Replacing the pincer	102
Figure 15.3. Inserting the pincer	103
Figure 15.4. Filename nomenclature	107

16 Initial

Configurations 109

Figure 16.1. Hosts file	111
Figure 16.2. Web server start up window	111
Figure 16.3. Log in web server window	112
Figure 16.4. Installed firmware version	112
Figure 16.5. TopSpin TTY window	114
Figure 16.6. TopSpin BACS window	114
Figure 16.7. Configuration Information after „cf“	115
Figure 16.8. IconNMR Express Setup Window	117
Figure 16.9. IconNMR start window	117
Figure 16.10. Selecting the automation device	118
Figure 16.11. The number of sample holders	119

17 Calibration 121

Figure 17.1. The lift bypass screws	125
---	-----

18 Supplies and Accessories 129

19 Printout Section 147

Figure 19.1. A1,B1...H1 and Jump to A2	149
Figure 19.2. A1,A2...A12 and Jump to B1	149
Figure 19.3. H1,G1...A1 and Jump to H2	150
Figure 19.4. H1,H2...H12 and Jump to G1	150
Figure 19.5. A12,B12...H12 and Jump to A11	151
Figure 19.6. A12,A11...A1 and Jump to B12	151
Figure 19.7. H12,G12...A1 and Jump to H11	152
Figure 19.8. H12,H11...H1 and Jump to G12	152
Figure 19.9. Change rack	154
Figure 19.10. Points to check	154
Figure 19.11. The REMOTE CONTROL	155
Figure 19.12. Points to check.	155
Figure 19.13. Change sample	156
Figure 19.14. The REMOTE CONTROL	157
Figure 19.15. Change operating mode	158
Figure 19.16. Removing Measured Samples	159

20 Repair procedure 161

21 Technical Data 163

Figure 21.1. SAMPLEJET dimensions 164

22 Bruker Biospin Contact 171

Index

C

Calibration	121
Carriers	30
Cleaning	104

D

Display	24
---------------	----

E

Emergency Stop.....	45
Error	42

F

Firmware, loading.....	107
------------------------	-----

H

Hardware Offline	45
------------------------	----

M

Manual Mode	48 – 49
-------------------	---------

N

Numbers.....	40
--------------	----

O

Overview	11
----------------	----

P

Passwords.....	28
----------------	----

R

Remote Control	59, 65, 77, 83, 95
----------------------	--------------------

S

Safety 13

Sales Information 171

T

Technical Assistance 171

W

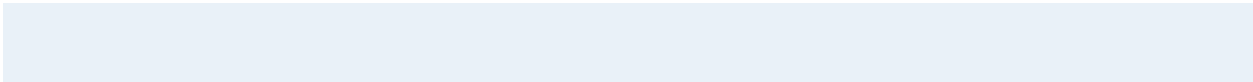
Web Interface 27

Tables

1	Introduction	9
2	Safety	13
3	Firmware Hints	17
4	First Steps	21
5	Using the SAMPLEJET	23
Table 5.1.	Login table	28
Table 5.2.	The defined colors	30
Table 5.3.	The holder numbers	40
6	Operating Modes	47
Table 6.1.	Number of holders for tubes without spinners	48
Table 6.2.	Number of holders for spinners	49
7	User Settings	53
Table 7.1.	Automatically mode change restrictions	56
8	Vision	59
9	Carousel 99/5	65
Table 9.1.	The CAROUSEL 99/5 holder numbers	67
10	Cooling (option)	71
11	Carousel 47/5	77
Table 11.1.	The holder numbers for a standard carousel	78
12	Using Bruker NMR Software	79
Table 12.1.	TOPSPIN Commands	79
Table 12.2.	IconNMR Features for SAMPLEJET	80
13	Extension (Option)	83
Table 13.1.	Heater indication	86
Table 13.2.	Heater states	88
Table 13.3.	Heater settings for example 1	90

Table 13.4.	Heater settings for example 2	91
14 Remote Control (Option)		95
Table 14.1.	The REMOTE CONTROL LEDs	98
15 Basic Service		101
Table 15.1.	The different types of logfiles	105
16 Initial Configurations		109
Table 16.1.	Where the hosts file are located	111
Table 16.2.	Supported SX commands	115
Table 16.3.	Selecting the Automation Mode	116
17 Calibration		121
Table 17.1.	Basic Lift Analysis	126
18 Supplies and Accessories		129
Table 18.1.	Remarks on Hardware	131
Table 18.2.	1mm Parts for the SAMPLEJET	132
Table 18.3.	1.7mm Parts for the SAMPLEJET	134
Table 18.4.	3mm Parts for the SAMPLEJET	136
Table 18.5.	5mm Parts for the SAMPLEJET	140
Table 18.6.	Limitations on the SAMPLEJET	145
19 Printout Section		147
Table 19.1.	The home positions of the shuttles	148
Table 19.2.	The diameter setup of the storage	148
Table 19.3.	General information	153
Table 19.4.	Samples in the rack	153
20 Repair procedure		161
21 Technical Data		163
Table 21.1.	Shipping	163
Table 21.2.	Supply on operation	163
Table 21.3.	The display	165
Table 21.4.	Cycle times	165
Table 21.5.	Temperature limitations	165
Table 21.6.	Insertion Depth	166
Table 21.7.	Moving parts on the SAMPLEJET	167
Table 21.8.	Safety specifications	167
Table 21.9.	weight of components	168
Table 21.10.	Cooling specifications	168
Table 21.11.	Parking specifications	169
Table 21.12.	Heater specifications	169

22 *Bruker Biospin Contact***171**



Notes:

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Our solution-oriented approach enables us to work closely with you to further establish your specific needs and determine the relevant solution package from our comprehensive range, or even collaborate with you on new developments.



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