



Bruker BioSpin


SampleXpress

Sample Changer
Service Manual

Version 001

think forward

NMR Spectroscopy



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1 About

1.1 This Manual

This manual is intended to be a reference guide for Bruker certified service engineers. It provides detailed information about the installation, maintenance and service and overall use of the Bruker device.

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

Carefully read all relevant chapters before working on the device!

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

1.2 Policy Statement

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

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

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

1.3 Symbols and Conventions

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

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



! DANGER

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



⚠ WARNING

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



⚠ CAUTION

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

NOTICE

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

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

2 Introduction

This service manual is intended to be used by trained Bruker service staff only. It contains the following information about the SampleXpress: installation, working principle and troubleshooting.

2.1 Concept

The new Bruker sample changer SampleXpress allows automatic measurement of NMR samples with Bruker NMR spectrometers. It is the successor of the B-ACS sample changer system. Its compact, exceptionally integrated design drastically reduces sample transfer distances, delivering exchange times of just a few seconds, making SampleXpress ideal for optimizing throughput in standard NMR service laboratories running 30-200 samples per day. In addition, efficiency is maximised thanks to exchangeable, easy-fill cassette modules that can be loaded off-system and in parallel with current experiments.

SampleXpress is controlled by TopSpin or ICON-NMR, Bruker's graphical user interface for fully-automated acquisition and processing.

The system is also equipped with integrated barcode reader registration, which is under control of SampleTrack, Bruker's information and data management software.

Refer to SampleXpress User Manual for a complete description of the design and function of SampleXpress.



Figure 2.1 SampleXpress

2.2 Limitation of liability

All specifications and instructions in this manual have been compiled taking account of applicable standards and regulations, the current state of technology and the experience and insights we have gained over the years.

The manufacturer accepts no liability for damage due to:

- Failure to observe this manual
- Improper use
- Deployment of untrained personnel
- Unauthorized modifications
- Technical modifications
- Use of unauthorized spare parts

The actual scope of supply may differ from the explanations and depictions in this manual in the case of special designs, take-up of additional ordering options, or as a result of the latest technical modifications.

The undertakings agreed in the supply contract as well as the manufacturer's Terms and Conditions and Terms of Delivery and the legal regulations applicable at the time of conclusion of the contract shall apply.

2.3 Before you begin

This service manual contains information and safety information that are necessary for the installation and servicing of the SampleXpress.

All maintenance and repairs are to be accomplished using the information in this manual. At the same time references over general maintenance and care from the User Manual are also to be followed.

Consider all safety references!

Be sure that no NMR measurement is in progress during the installation as it might be disturbed.

Information for ordering spare parts is available in the spare parts section from the Bruker Service Center (see ["Contact" on page 131](#)).

2.4 Minimum Qualifications for Service Personnel

| Type of Task | Personnel | Training and Experience |
|-----------------------------------|---|---|
| Transportation | No special requirements. | No special. |
| Installation | Bruker certified personnel only. | Technically skilled, with a good knowledge of the application field. |
| Routine Use | Appropriately certified and experienced personnel, familiar with use of computers and automation in general | Laboratory technicians or equivalent. Training is usually done in-house. Familiar with MS Windows® environment. |
| Daily Maintenance | | |
| Setup and optimization of program | Bruker certified personnel only. | Experienced laboratory technician. High degree of knowledge of the relevant application field. |
| Preventive Maintenance | Bruker certified personnel only. | Technically skilled with a basic understanding of the application. |
| Servicing | Bruker certified personnel only. | Background and experience in electronics/mechanics with computer knowledge. |

Table 2.1 Overview Installation and Operation Requirements for Personnel

2.5 The Bruker Service

Our customer service division is available to provide technical information. See ["Contact" on page 131](#) for contact details.

In addition, our employees are always interested in acquiring new information and experience gained from practical application; such information and experience may help improve our products.

2.6 Transport to Manufacturer

When the SampleXpress must be returned to the manufacturer for a major repair, use the original packaging for transportation.

Include a good description of the problem.

3 Safety

This section provides an overview of all the main safety aspects involved in ensuring optimal personnel protection and safe and smooth operation.

Non-compliance with the action guidelines and safety instructions contained in this manual may result in serious hazards.

Read the following safety instructions carefully before you start installation or working with the SampleXpress.

3.1 General

Before you start any repair inside of the SampleXpress, be aware of high voltages 230/115V. Even if these voltages are protected by security features to avoid any contact with your body, it is still possible that you unintentionally touch these voltages with a tool, e.g. screwdriver etc.

Therefore, always check if you really need the power supply to be switched on during your work. Otherwise turn the SampleXpress off and disconnect the power cable from the wall socket to the SampleXpress. Avoid that anyone can re-power the system without your notice.

3.2 Personnel Requirements

3.2.1 Qualifications

i Note: Only trained Bruker personnel are allowed to mount, retrofit, repair, adjust and dismantle the unit!

3.2.2 Unauthorized Persons



WARNING

Risk to life for unauthorized personnel due to hazards in the danger and working zone!

Unauthorized personnel who do not meet the requirements described in this manual will not be familiar with the dangers in the working zone. Therefore, unauthorized persons face the risk of serious injury or death.

- ▶ Unauthorized persons must be kept away from the danger and working zone.
- ▶ If in doubt, address the persons in question and ask them to leave the danger and working zone.
- ▶ Cease work while unauthorized persons are in the danger and working zone.

3.3 Personal Protective Equipment

Personal protective equipment is used to protect the personnel from dangers which could affect their safety or health while working.

The personnel must wear personal protective equipment while carrying out the different operations at and with the device.

This equipment will be defined by the head of laboratory. Always comply with the instructions governing personal protective equipment posted in the work area.

3.4 Basic Dangers

The following section specifies residual risks which may result from using the device and have been established by means of a risk assessment.

In order to minimize health hazards and avoid dangerous situations, follow the safety instructions specified here as well as in the following chapters of this manual.

3.4.1 General Workplace Dangers

Dirt and Scattered Objects



CAUTION

Danger of injury from tripping over dirt and scattered objects!

Dirt and scattered objects may cause people to slip or trip. A fall may result in injuries.

- ▶ Always keep the work area clean.
- ▶ Remove objects which are no longer required from the work area and particularly from the floor.
- ▶ Indicate unavoidable hazards using marking tape.

Working in Heights



CAUTION

Accident hazard from falling from ladder!

It is possible to fall from a ladder when it is used to reach the SampleXpress on some magnets.

- ▶ Do not use a ladder.
- ▶ Use an approved platform to reach the device on the magnet.
- ▶ Wear non-slip shoes.

Software Error

NOTICE

Material damage due to a software error!

Samples or SampleXpress may be damaged due to a software error causing malfunction of the control system. Users may also be shocked by abrupt malfunction or unexpected system start.

- ▶ Dummy samples must be used during installation and service.
- ▶ Personnel should be alerted to unexpected malfunctions.

Impacting Magnet

NOTICE

Material damage hazard due to impacting the magnet!

Impacting the magnet may result in a quench.

- ▶ Mount the SampleXpress carefully on the magnet.
- ▶ Avoid banging the magnet during installation and operation, e.g. when replacing the sample cassette.

Genuine Samples

NOTICE

Material damage due to the use of genuine samples during installation and maintenance!

Using genuine samples during installation and maintenance may result in material damage.

- ▶ Use only dummy samples during installation and maintenance.

3.4.2 Dangers from Electric Power

Stored Charges

DANGER



Danger to life from stored charges!

Electric charges may be stored in electrical components even after the system has been switched off and disconnected from the power supply. Contact with these components may result in serious or fatal injury.

- ▶ Before working on the specified components, ensure that they have been completely disconnected from the power supply. Allow 10 minutes to elapse in order to ensure that the internal capacitors have been fully discharged.

Electric Current

WARNING



Electrical hazard from electrical shock!

A life threatening shock may result when the housing is open during operation.

- ▶ Disconnect the device from the electrical power supply before opening the device. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.

Residual Electrostatic Potentials

WARNING



Danger to life from residual electrostatic potentials!

Friction between material being conveyed may result in significant development of electrostatic potential. Contact with parts immediately following the conveying operation may therefore be life-threatening.

- ▶ Therefore, potential equalisation must be ensured before making contact with parts, unless such equalisation is provided by the customer.

Electrostatic Discharge



Electrostatic discharge from friction may occur, resulting in an electric spark and loud bang. Use ESD flooring and wear ESD shoes.

3.4.3 Mechanical Dangers

Moving Parts



CAUTION

Accident hazard from movement of mechanical parts!

The fingers or hand may be pinched due to movement of mechanical parts.

- ▶ Shut off the device before accessing.

Falling Objects



CAUTION

Accident and material damage hazard from falling objects!

Equipment may fall down during assembly, retrofitting, or dismantling. This may result in personal injury or equipment damage.

- ▶ If necessary, assemble/disassemble the device in multiple parts.
- ▶ Use a platform with railings instead of a ladder to reach the assembly area.
- ▶ Avoid working over the head. When this can not be avoided, wear a protective hard hat.
- ▶ Follow the mounting instructions in the installation manual.

Chain Drive



CAUTION

Accident hazard from loose clothing or long hair becoming caught in magazine chain!

Wearing loose clothing or long hair around the magazine chain may result in the clothing or hair being pulled into the magazine chain causing injury.

- ▶ Do not wear loose clothing or jewelry in the vicinity of the magazine chain.
- ▶ Those who have long hair should stay well clear of the magazine chain.

3.4.4 Dangers from Gases Under Pressure

Pneumatics



WARNING

Danger of injury due to movements caused by stored pneumatic forces!

Pneumatically driven components may move unexpectedly due to stored residual forces, causing serious injuries.

- ▶ Work on the pneumatics system must only be carried out by trained pneumatics technicians.
- ▶ Before starting work on the pneumatics system, ensure that it has been completely depressurised. The pressure accumulator must be completely relieved.

Suffocation



WARNING

Accident hazard from asphyxiation!

A break in the pneumatic hose may result in the uncontrolled exit of nitrogen into the laboratory.

- ▶ An oxygen warning device should be present in the laboratory if the device is operated with nitrogen.
- ▶ Note that leakage from the main supply line cannot be stopped by the SampleXpress Lite!

3.4.5 Dangers from Radiation

Strong Magnetic Fields



WARNING

Danger to life from strong magnetic fields!

Strong magnetic fields may cause serious injuries or death and significant damage to property.

- ▶ Persons fitted with heart pacemakers must be kept away from the appliance. The functionality of the heart pacemaker could be compromised.
- ▶ Persons with metal implants must be kept away from the appliance. Implants may heat up or be subject to magnetic attraction.
- ▶ Ferromagnetic materials and electromagnets must be kept away from the magnetic source. Such materials could be subject to magnetic attraction and may fly around the room, injuring or killing people. Minimum distance 3 meters.
- ▶ Remove magnetic items (jewelry, watches, pens etc.) before carrying out maintenance work.
- ▶ Keep electronic equipment away from the magnetic source. Such equipment could be damaged.
- ▶ Keep storage media, credit cards etc. away from the magnetic source. Data could be erased.



Note: The magnetic field of the SampleXpress does not cause any personal injuries or property damage. For further information see the manual of the magnet used.

Bright LED Light



CAUTION

Accident hazard from bright LED light!

Peering into the lighting system of optical sensors, e.g. barcode reader, may result in temporary blinding of the eyes due to the bright light.

- ▶ Do not look into the ray of light.
- ▶ Switch off the equipment before maintenance work.

3.4.6 Dangers Due to High or Low Temperatures

Hot or Cold Air

CAUTION



Accident hazard from hot or cold air escaping out of the unit.

When the cassette is removed, hot or cold air may exit the unit or BST, which may result in serious burns.

- ▶ Ensure that personnel are aware of this risk.
- ▶ Refer to the unit manual for more information.

Hot or Cold Surfaces

CAUTION



Accident hazard from contact with hot or cold surfaces on the unit.

Contact with the hot or cold surfaces of the unit may result in serious burns.

- ▶ Do not touch device parts of cooled or heated units.
- ▶ Do not use damaged samples.
- ▶ After removing a sample or cassette allow it to cool or thaw before coming in contact.

Thermal Shock

NOTICE

Material damage hazard from overflow of cryogenics.

Material damage may result from the overflow of cryogenics.

- ▶ Turn off the device during magnet servicing.
- ▶ Cover the device with a protective cover, e.g. P/N 1804420 provided in the accessory case, to avoid contact with cold gases.
- ▶ Be sure to use sufficient transfer line and Teflon evacuation hose for nitrogen and helium refills based on recommendations in the magnet manual.
- ▶ After refilling cryogenics some parts of the magnet may be icy. Be sure to remove the ice to avoid its melting onto the device.

3.4.7 Danger from Chemical Substances

Glass Tube Breakage



DANGER

Danger of injury from glass tube breakage!

Broken glass tubes may cause minor injuries or material damage, but may also result in a life threatening situation if hazardous substances are used.

- ▶ If a glass tube breaks, refer to the corresponding precautions and cleaning/disinfection instructions.
- ▶ Wear protective equipment.
- ▶ Perform all tasks with the carousel and glass tubes carefully.
- ▶ Before carrying out any maintenance work, remove the samples and use dummy samples if necessary.
- ▶ Strictly observe the correct sample adjustment, i.e. the maximum sample height.
- ▶ Never turn the carousel upside down or on it's side.

The **laboratory supervisor** is responsible for:

- ▶ Establishing and enforcing standard sample handling and cleaning procedures.
- ▶ Establishing and enforcing the use of protective clothing and equipment.
- ▶ Training laboratory personnel.
- ▶ Preparing an emergency plan.

Vapor Formation



WARNING

Danger of injury from vapor formation!

During the work process, vapors may form which cause serious injury if inhaled.

- ▶ Only install the appliance in a well-ventilated room or ensure that an extractor is fitted.

NMR Solvents

NOTICE**Material damage hazard from material contact with NMR solvents!**

Material damage may result when the device comes in contact with NMR solvents.

- ▶ Follow instructions provided in the manual for correct handling of solvents.
- ▶ Follow the sensor cleaning procedures described in this manual.
- ▶ If surface damage should occur, contact Bruker for repair of damaged parts.

NOTICE**Material damage hazard from heavy samples!**

Samples may be damaged due to incorrect sample lift pressure adjustment.

- ▶ Adjustment is valid only for 1 sample configuration and weight.
- ▶ Personnel must be trained.

Safety Devices

⚠ WARNING**Danger to life from nonfunctional safety devices!**

If safety devices are not functioning or are disabled, there is a danger of serious injury or death.

- ▶ Check that all safety devices are fully functional and correctly installed before starting work.
- ▶ Never disable or bypass safety devices.
- ▶ Ensure that all safety devices are always accessible.

3.4.8 Position of the Safety Devices

EMERGENCY STOP Button

The position of the EMERGENCY STOP button is indicated in the illustration by an arrow.



Figure 3.1 Position of the Emergency Stop

3.4.9 Description of the Installed Safety Devices

EMERGENCY STOP Button

Pressing the EMERGENCY STOP button triggers an emergency stop. After an EMERGENCY STOP button has been pressed, it must be unlocked by rotating it in order to enable a restart.

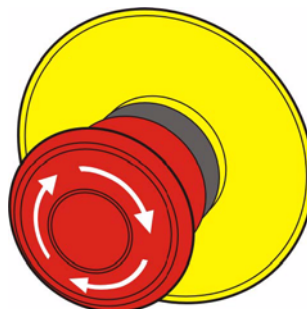


Figure 3.2 Emergency Stop Button

Protective Earth Conductor

WARNING



Danger to life from contact voltage!

Absent or faulty protective earth conductor may result in contact voltage. This may pose a risk of injury or death.

- ▶ Before the initial commissioning of the appliance, connect the main power supply to the socket and verify the complete functionality of the protective earth conductor.

Overpressure Valve

The high pressure system includes an overpressure valve which safely reduces the excess pressure in the event of inadmissible pressure conditions developing as a result of faulty operation, component failure or other irregular events.

3.5 Environmental Protection

NOTICE

Danger to the environment from incorrect handling of pollutants!

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- ▶ Always observe the instructions below regarding handling and disposal of pollutants.
- ▶ Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

The following pollutants are used:

| | |
|-------------------------|---|
| Helium inert gas | Helium inert gas may cause suffocation at high concentrations. Disposal of the empty gas cylinders must be performed by a specialist disposal company. |
| Nitrogen gas | Nitrogen gas may cause suffocation at high concentrations. Disposal of the empty gas cylinders must be performed by a specialist disposal company. |
| Coolants | When released, coolants develop decomposition products which are hazardous to the environment. Maximum care and caution are required when handling coolants. Always observe the safety data sheet issued by the manufacturer. Ensure that personnel handling coolants are regularly informed about potential dangers and are instructed in the safe handling of coolants. |
| Cleaning liquids | Cleaning liquids incorporating solvents contain toxic substances. They must not be allowed to escape into the environment. Disposal must be carried out by a specialist disposal company. |

3.6 Signage

The following symbols and information signs can be found in the work area. They refer to their immediate surroundings.

i Note: The identification and placement of warning labels are included in the manual. The laboratory supervisor is responsible for ensuring that all the warning labels are maintained in their proper place any time that the device is used.

Electrical Voltage



Only qualified electricians are permitted to work in a work room marked by this sign. unauthorized persons must not enter the workplaces thus marked and must not open the marked cabinet.

Danger Spot



Warning indicating a danger spot in work rooms.

Hand Injury



Keep hands away from areas bearing this warning sign. There is a danger that hands could be crushed, drawn in or otherwise injured.

Maximum Sample Height



There is a danger that the sample breaks, if the sample exceeds the maximum sample height.

3.7 Spare Parts

NOTICE

Material damage hazard from glass tube breakage or sample blockage in the BST.

Material damage from glass breakage or samples becoming stuck in the BST may result if non-OEM replacement parts are used.

- ▶ Replacement parts must meet OEM standards.



Loss of guarantee

If non-approved spare parts are used the manufacturer's guarantee is invalidated.

Purchase spare parts from authorised dealers or directly from the manufacturer. See "[Contact](#)" on page 131 for manufacturer's address.

4 Tool Requirements

All tools required for the installation are provided in the accessory case.

i Be sure to use non-magnetic tools, especially when working on unshielded magnets.

5 Installation

The SampleXpress is mounted directly on top of the BST. The installation consists of 7 major steps:

1. ["Before You Begin"](#)
2. ["Repositioning the Control Panel"](#)
3. ["Mounting the SampleXpress Components"](#)
4. ["External Cable Connections"](#)
5. ["Starting the device"](#)
6. ["Adjustments"](#)
7. ["Installation Acceptance"](#)

5.1 Before You Begin

Before you begin the installation be sure to:

- Verify the ["Site Planning Considerations"](#) on page 33.
- Read the ["Important Safety Information"](#) on page 35.
- Start filling out the Installation Acceptance Form (see ["SampleXpress Installation Acceptance Form"](#) on page 133).

5.1.1 Site Planning Considerations

There are several laboratory site considerations that must be met before installing the SampleXpress sample changer. The considerations that are specific for the SampleXpress are listed in this section. Note that the standard site considerations for Bruker Avance spectrometers must also be realized, unless otherwise noted in this section. Refer to the corresponding Avance Site Planning Manual for details.

Electrical Supply Specifications

Voltage: 208 - 230V AC 50/60Hz.

Normal Operation: 40 W/120VA.

Air Supply Specifications

Pressure: 5 to 7 bar.

Flow: More than 100 l/min .

Oil: Oil-free (below 0.005 ppm = 0.005 mg/m³).

Water Content: The air must be dry with a dew-point below 4°C. For cooling applications, the dew-point must be below -50 °C.

Particles: below 5 µm.

Environmental Specifications

| Data | Value | Unit |
|---|-------|------|
| Temperature range | 5-30 | °C |
| Relative humidity at 31 °C, maximum | < 80 | % |
| Decreasing linear till relative humidity < 50% at 40 °C, maximum. | < 50 | % |

Table 5.1 Operating Environment

For the appropriate temperature see also the Bruker site planning guides on the BASH CD (Bruker Advanced Service Handbook):

| Manual | Bruker Part Number |
|--|--------------------|
| Site Planning for AVANCE Systems 300-700 MHz (UM) | Z31276 |
| Site Planning for AVANCE Systems 750 -950 MHz (UM) | Z31686 |

Table 5.2 Bruker Site Planning Guides

NMR Magnet specifications

The SampleXpress can be mounted on the following NMR magnets:

- Unshielded <= 600 MHz
- Shielded (US, US2) <= 800 MHz

The minimum distance between the helium towers must be 228 mm.

The correct BST length corresponding to the magnet must be mounted. The BST upper level must be between 56 and 174 mm above the upper magnet flange level (see [Figure 5.2](#)).

IMPORTANT NOTE:

The SampleXpress can NOT be mounted on the new generation of re Fridgerated Magnets, i.e. dewar types D345, D346 and D355.

5.1.2 Important Safety Information

The magnet safety devices, especially the drop-off plate, must remain unobstructed when the SampleXpress is mounted. Be sure that all cables are secured as described in "Placing the Cables" on page 53.

5.1.2.1 Checking the Functionality of the Drop-Off Plate

To guarantee the functionality of the drop-off plate, ensure that no cables, hoses, etc. are blocking it, and that it can be opened up to at least a 45° angle to a horizontal line.

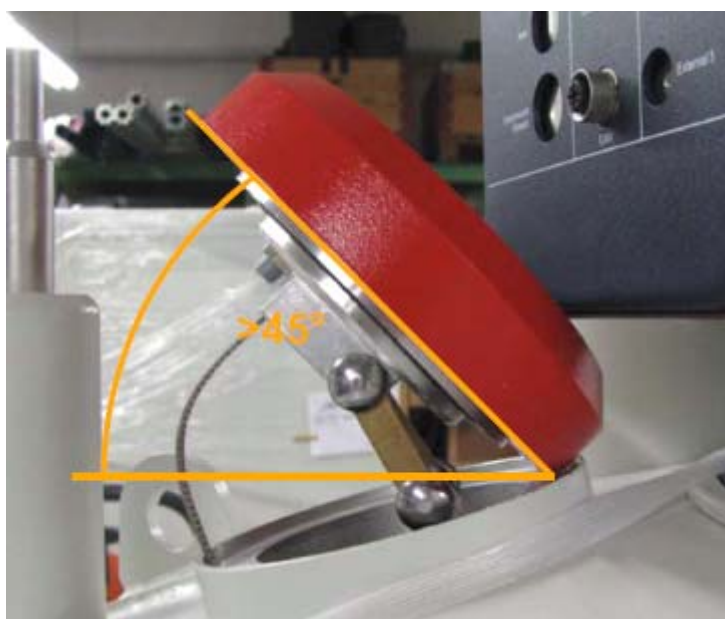


Figure 5.1 Drop-Off Plate in the Open Position

Some magnets have 2 drop-off plates, be sure to check both sides of the magnet!

To help identify a potential obstruction, measure the distance Z between the magnet upper level and the BST upper level (see the figure below).

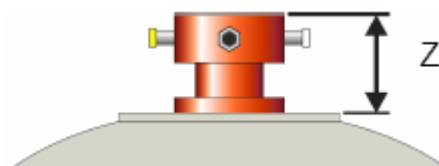


Figure 5.2 Measuring the Distance Z of the Magnet Dewar

If the distance Z is below 100 mm, it is especially important to verify whether an obstruction exists. Likewise, the following magnet dewar types should be checked:

D315 D325 D335 D345 D355 D365 D375

Refer to the magnet identification plate for the dewar type.

If you are uncertain whether the functionality of the drop-off plate is guaranteed, it is best to use the BST 50 mm elongation (P/N H121852).

To mount the BST 50 mm elongation, place it on top of the BST and rotate it until it is locked.

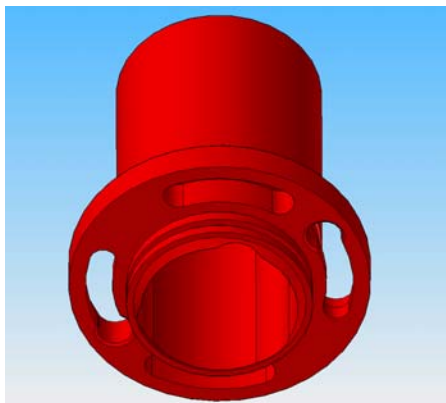


Figure 5.3 P/N H121852: BST 50 mm Elongation

5.1.3 Removing the Transportation Lock

Before mounting the SampleXpress, remove the transportation lock rod from the cassette:



Figure 5.4 Transportation Lock Rod

5.2 Repositioning the Control Panel

The control panel can be mounted on the left or right side of the SampleXpress, depending on which side the customer chooses to access the sample changer. Note that on some magnets (e.g. 800 MHz US+), the control panel can only be mounted on the left side due to a large helium tower.

Ask the customer if the control panel should be located on the right. Otherwise place it on the left hand side as described in the following section **before** you start mounting the SampleXpress onto the magnet.

The SampleXpress is delivered completely assembled, to switch the control panel to the other side:

1. Ensure that the SampleXpress is turned off.
2. If not already done, remove the transportation lock rod from the cassette and remove the cassette.

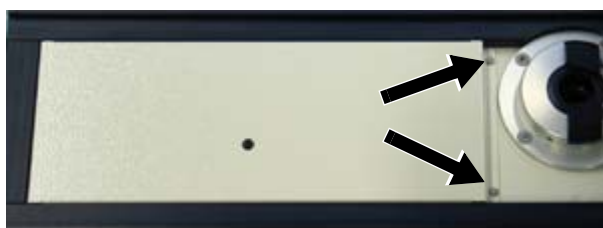


Figure 5.5 Location of Screws for the Base Unit Cassette Guide

3. Unscrew the two screws holding the base unit cassette guide and remove the guide.



Figure 5.6 Location of Screws for the Bottom Base Plate

4. Unscrew the two left screws holding the bottom side of the base plate.

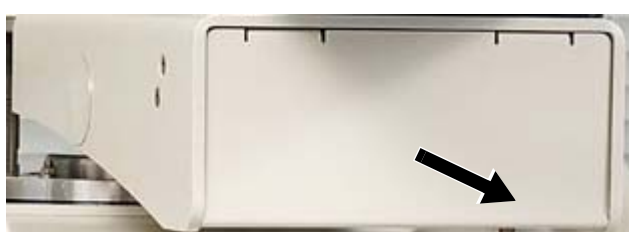


Figure 5.7 Bottom Side of Base Plate

5. Slide the base plate out of the SampleXpress unit.



Figure 5.8 Location of the Power and CAN Cables on the Base Unit Connector Panel

6. Disconnect the power control cable and the CAN cable from the base unit connector panel.

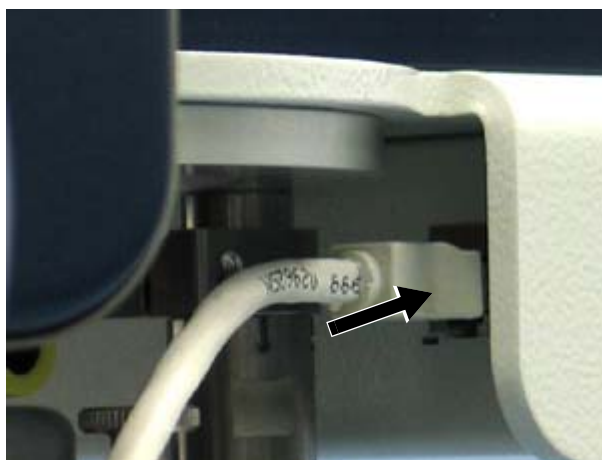


Figure 5.9 Location of the Ethernet Cable at the Back of the Base Plate

7. Pull the silver Ethernet connector out of the opening in the metal plate and disconnect the ethernet cable which was inside of the base plate reservoir from the silver connector.



Figure 5.10 Side of Control Panel Arm

8. Remove the two screws on the cover of the side of the arm.

9. Remove the screws attaching the arm to the base unit.

10. Carefully pull all the cables through the hole.



Figure 5.11 Location of the Control Panel Cover

11. Remove the metal control panel cover from around the control panel. It is not tightened with screws, only pushed onto the panel.



Figure 5.12 Rear of the Control Panel

12. Open the back of the control panel by unscrewing the 4 screws.



Figure 5.13 Rear of the Control Panel

13. Rotate the panel 180°, being careful not to disconnect any of the cables.
14. Reconnect the control panel to the back using the 4 screws removed previously.

15. Replace the metal control panel cover on the control panel. It is not tightened with screws, you only need to push it onto the panel (see [Figure 5.11](#)).



Figure 5.14 Cable Plug on Base Plate

16. Remove the plug on the other side of the base plate.

17. Carefully pull all the cables through the plug hole on the side of the base plate (see [step 10](#)).

18. Replace the screws attaching the arm to the base unit (see step 9.).
19. Replace the two screws on the cover of the side of the arm (see step 8.).
20. Reconnect the Ethernet cable to the socket in the back of the base plate (see step 7.).
21. Reconnect the power control cable and the CAN cable from the base unit connector panel (see step 6.).
22. Slide the base plate into of the SampleXpress unit and replace the 2 screws on top of the base plate (see steps 5. and 4.).
23. Replace the base unit cassette guide and secure it using the two screws removed in step 3.

IMPORTANT: Check the USB port supply polarity with the USB test dongle board H119290 provided in the accessory case. The green LED's **must light** when the test board is inserted into the USB port.

5.3 Mounting the SampleXpress Components

The following steps should be followed in sequential order:

1. ["Preparation"](#)
2. ["BST Clamping Ring with N2 Connector"](#)
3. ["Mounting the Height & Level Adjustment Kit"](#)
4. ["Mounting the SampleXpress on the Base Main Flange"](#)
5. ["Remounting the Base Unit"](#)

5.3.1 Preparation

Before mounting the SampleXpress components:

- Make sure that the BST inside the magnet is mounted, attached and configured correctly as described in the BST installation manual (P/N Z31123).
- Make sure that the NMR samples can be transported without obstruction through the BST and that the spectrometer is operating correctly.

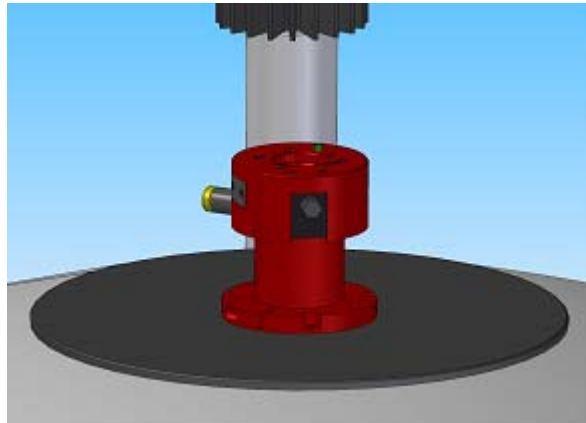


Figure 5.15 Connections on the Top of the BST

1. Disconnect the yellow cable from the top of the BST.
2. Disconnect the white and the yellow hoses from the top of the BST.
3. Remove the transportation lock rod (if present) from the cassette and remove the cassette (see "[Repositioning the Control Panel](#)" on page 37, step 2).

5.3.2 BST Clamping Ring with N2 Connector

If the BST clamping ring is equipped with a N2 connector, replace the straight connector with a 90° angular one, e.g. P/N 1804500 provided in the accessory case.

5.3.3 Mounting the Height & Level Adjustment Kit

Part Identification

Refer to the following figure for the location of the parts mentioned in this section.

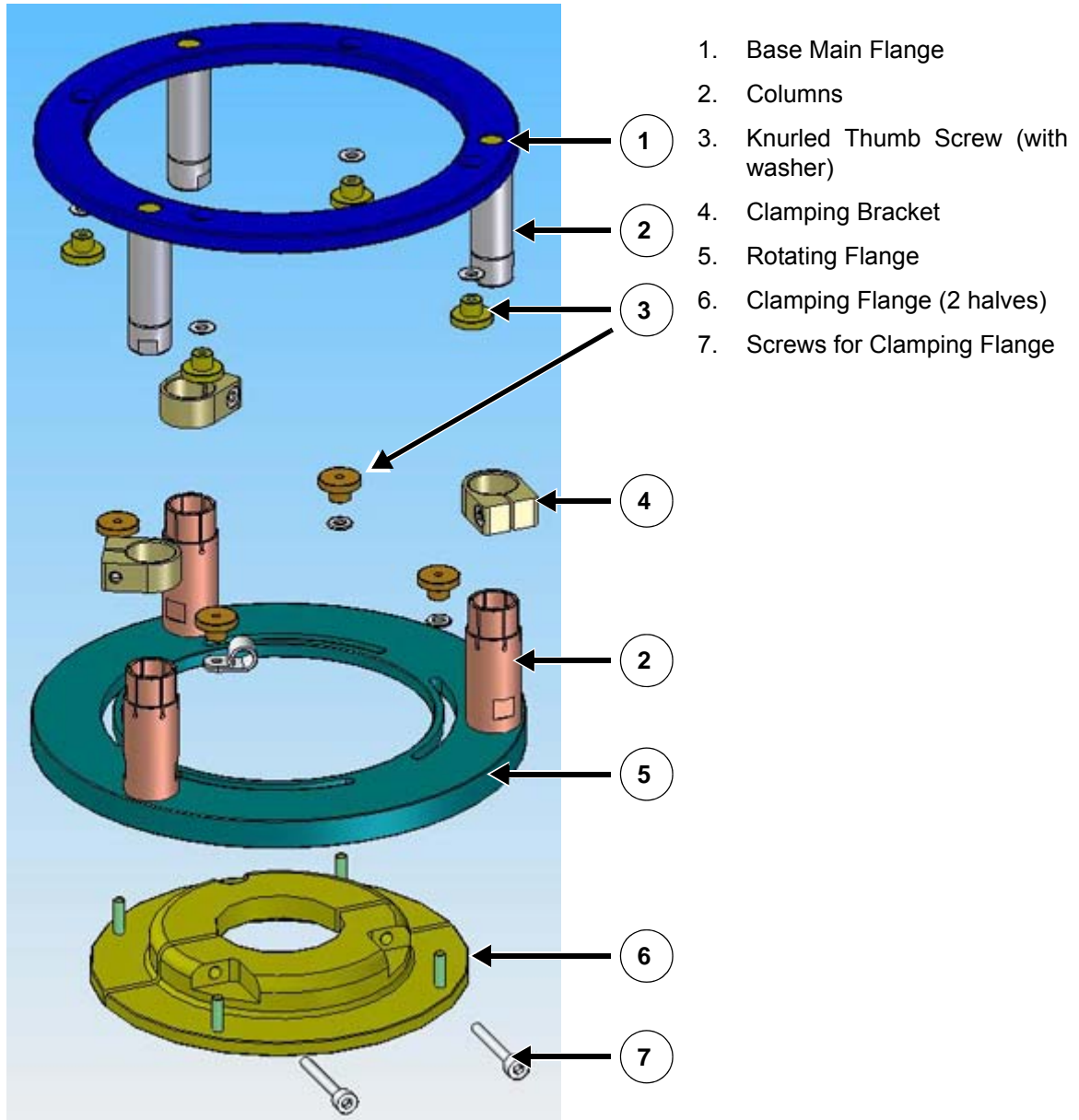


Figure 5.16 Height & Level Adjustment Kit Parts

1. Measure the distance Z from the magnet top level to the BST upper level, or if mounted, to the top of the BST 50 mm elongation (P/N H121852, see "[Checking the Functionality of the Drop-Off Plate](#)" on page 35).

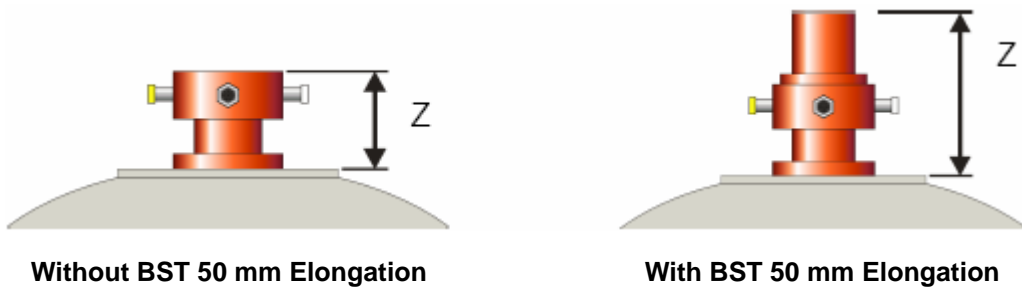
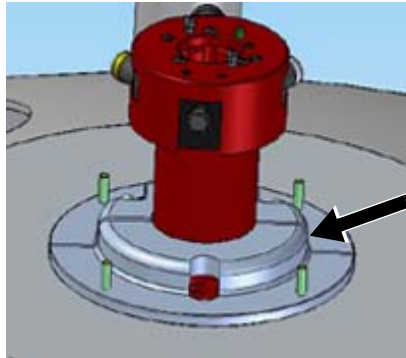


Figure 5.17 Measuring the Z-Distance for the Height & Level Adjustment Kit

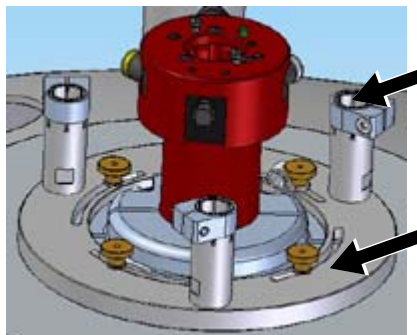
2. Select one of the following sets of height adjustment columns from the accessory case based on the Z distance obtained in the previous step:

Short: Z range 56-77 mm
Medium: Z range 74-112 mm
Long: Z range 106-174 mm

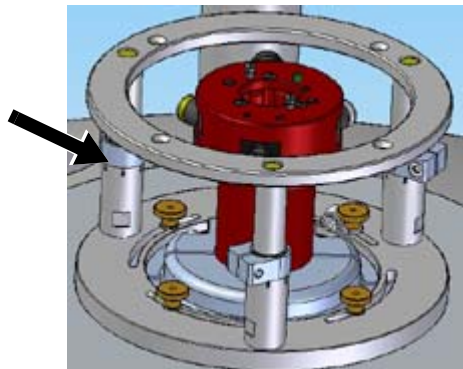
3. Mount the columns to the base main flange by screwing them onto the preset screws.



4. Place the clamping flange, which is split into two halves, onto the top of the magnet.
5. Tighten the 2 screws to clamp the flange.

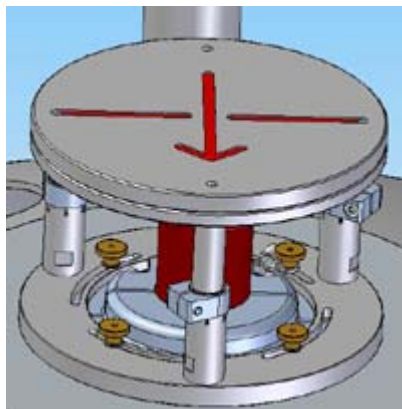


6. Place the rotating flange above the clamping flange. Insert the knurled thumb screws, but do not tighten them completely, to allow for rotation of the flange.
7. Place the 3 small clamping brackets onto the columns, but do not tighten them.



8. Insert the base main flange columns into the columns of the rotating flange.

Tighten the clamping brackets slightly to where the base main flange can still move up and down within the columns.



9. Place the level adjustment plate with arrow on the top of the base main flange and attach it using the 4 screws and nuts from the accessory case.

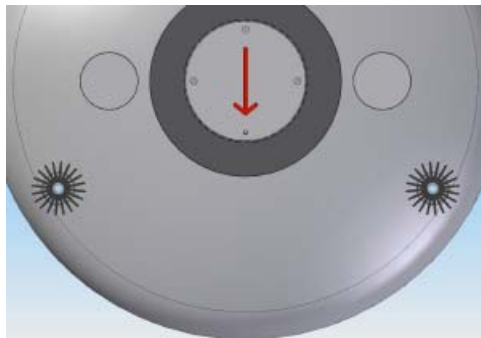
10. Rotate the whole unit in such a way that the arrow points toward the front of the magnet.

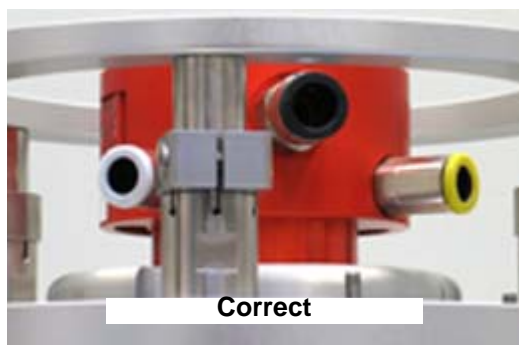
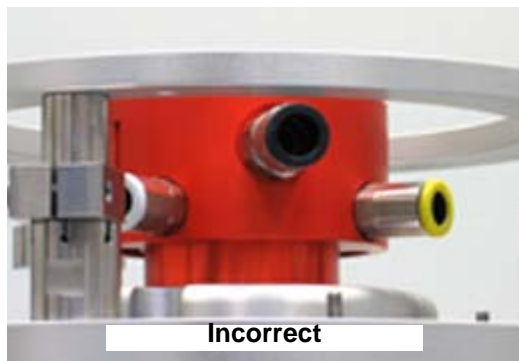
- Do not place a column of the rotating flange in front of a pneumatic or electrical connector of the BST.

11. Move the base main flange columns up or down until the level adjustment plate is perfectly level on the top of the BST. Use a level gauge to check for level.

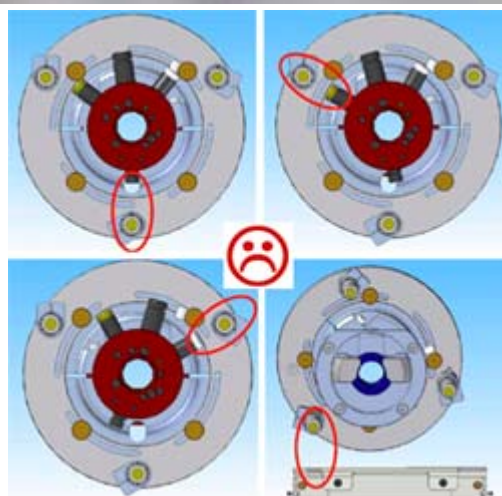
12. Tighten the clamping brackets on the columns.

13. Recheck the level and repeat step 12 if necessary.



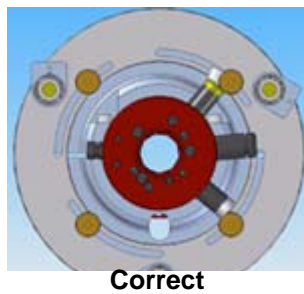


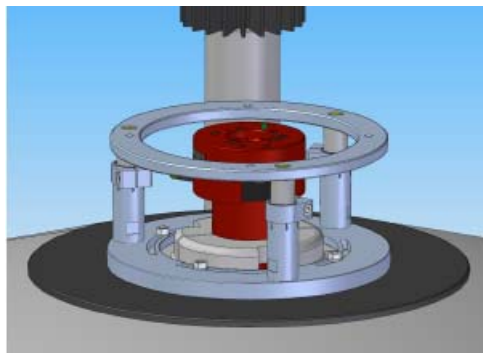
14. Align the rotating flange with the columns and base main flange so that no column is directly in front of the BST connectors or the Ethernet connector.
15. Tighten the 3 small clamping bracket screws and the 4 knurled thumb screws on the lower clamping flange.



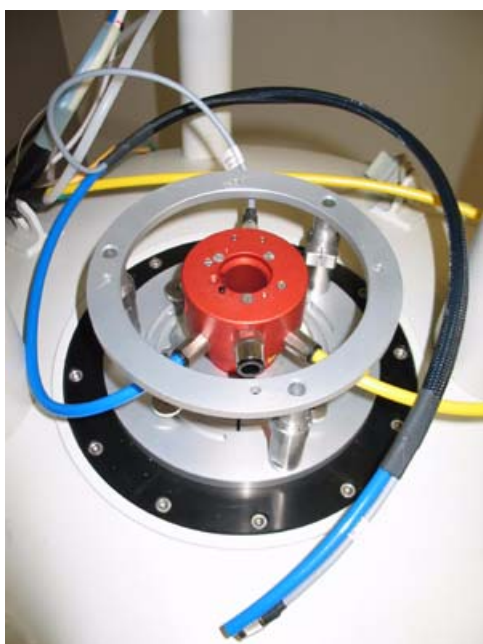
Note: If the knurled thumb screws collide with the columns, use the screw nuts provided in the accessory case (used for attaching the level adjustment plate temporarily) to attach the mounting kit.

At least 3 of the 4 screws on the bottom and on the top must be mounted to attach the device properly.





16. Remove the level adjustment plate with arrow from the top of the base main flange.
17. Recheck all the screws for the Height & Level Adjustment Kit to see if they are properly tightened.



18. Connect the blue BST Interface Cable (P/N HZ16836) to the BST.
 - The 8 pin male connector from the cable is connected to the 8 pin female connector of the BST.
 - The pneumatic hose is connected to the white lift air inlet of the BST.
19. Reconnect the yellow hose to the yellow spin air inlet of the BST. Use the 90° angle pneumatic connectors from the accessory case if necessary.

For details see "[External Cable Connections](#)" on page 52.

5.3.4 Mounting the SampleXpress on the Base Main Flange

The SampleXpress is delivered with the base plate and base unit completely assembled. however for some magnets, for example, those with a short distance between the helium towers, it might be necessary to remove the base unit from the base plate before the base plate can actually be mounted onto the magnet.

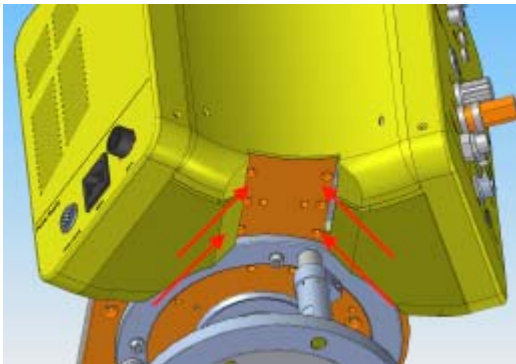
5.3.4.1 Testing for a Correct Fit

To test whether it is necessary to separate the base unit from the base plate:

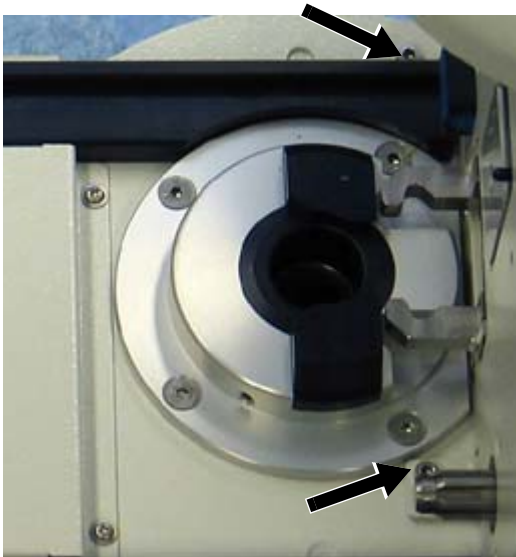
1. Place the base plate with the base unit attached on the base main flange over the BST.
 - If the four screw holes line up then you do not need to separate the base unit from the base plate, go directly to ["Mounting the Adjustable Columns on the Bottom of the Base Plate"](#) on page 49.

If the four screw holes do not line up, then you will need to remove the base unit from the base plate as described in the following section.

5.3.4.2 Removing the Base Unit from the Base Plate



1. Remove the 4 screws from the bottom of the base unit.



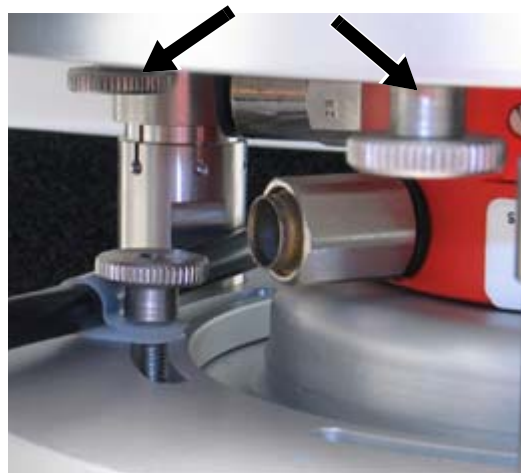
2. Remove the 2 screws from the top of the base plate.
3. Carefully remove the base unit from the base plate.
4. Proceed to the next section, ["Mounting the Adjustable Columns on the Bottom of the Base Plate"](#).

5.3.4.3 Mounting the Adjustable Columns on the Bottom of the Base Plate

There are 3 sets of adjustable columns available to hold the base plate on the top of the magnet. If you used the longest columns of the Height & Level Adjustment Kit, you also need the longest columns here. As a rule try using the longest possible columns first!



1. Insert the adjustable columns onto the base plate and rotate them until they are completely in.



2. Place the base plate (with base unit if attached) onto the top of the base main flange.
3. Secure the base plate using the knurled thumb screws from the bottom side of the upper ring of the adjustment pillar unit.



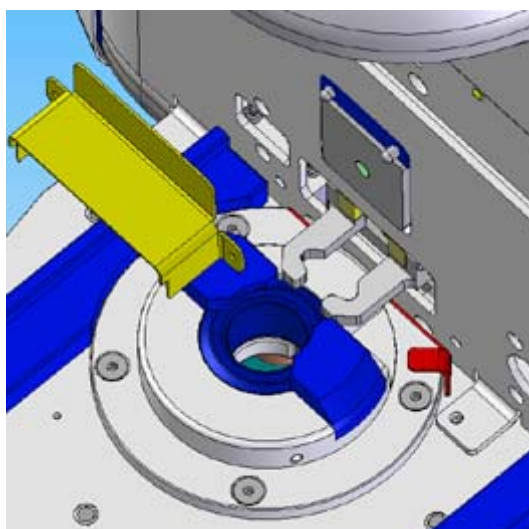
4. Adjust the 2 base plate adjustable columns so they are resting on the magnet housing.
5. Secure this position with the nuts on the thread by moving them upwards until they reach the metal plate.
6. Using a level gauge, screw the adjustable columns up or down until the base plate is level in all directions.



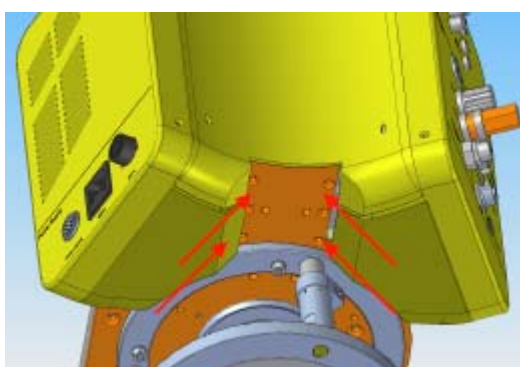
7. If not already done so, mount the control panel support arm on the left or right hand side of the base plate (see ["Repositioning the Control Panel"](#) on page 37).
8. The height of the control panel can be adjusted in increments using the holes on the side of the arm.

5.3.4.4 Remounting the Base Unit

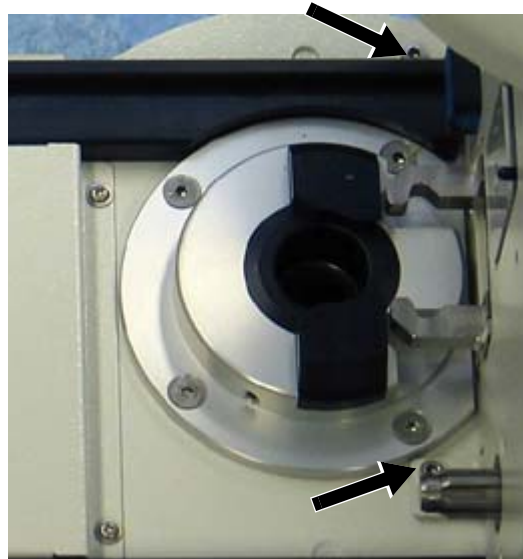
When the base unit was removed previously, as described in ["Removing the Base Unit from the Base Plate"](#) on page 48, then it will need to be remounted as described in this section.



1. Place the base unit on the back of the base plate.
 - The base unit must be aligned in parallel with the BST flange.
2. Remove the protection plate (yellow in figure) from above the cassette gripper.
3. Place the adjustment plate (P/N H122671, provided in the accessory case) between the flange and the base unit (red in the figure).



4. Attach the base unit using the 4 screws on the bottom of the base unit.



5. Attach base unit to the base plate with the 2 screws on the top of the base plate.
6. Remove the adjustment plate and remount the protection plate.

5.4 External Cable Connections

The SampleXpress consists of the following cable connections:

- Power Supply Cable
- Pneumatic Supply Hose
- Ethernet Cable
- RS232 cable
- BST Interface Cable
- Pneumatic BST Connection

The power supply cable, the ethernet cable and the pneumatic supply hose are delivered in one cable supply set, with two variations:

- P/N HZ16796 (length 7 meters), or,
- P/N HZ16797 (length 15 meters).

The length is the distance (vertical + horizontal) from the SampleXpress to the console. The actual cable length is about 3-4 meters longer, which provides adequate length for the installation.

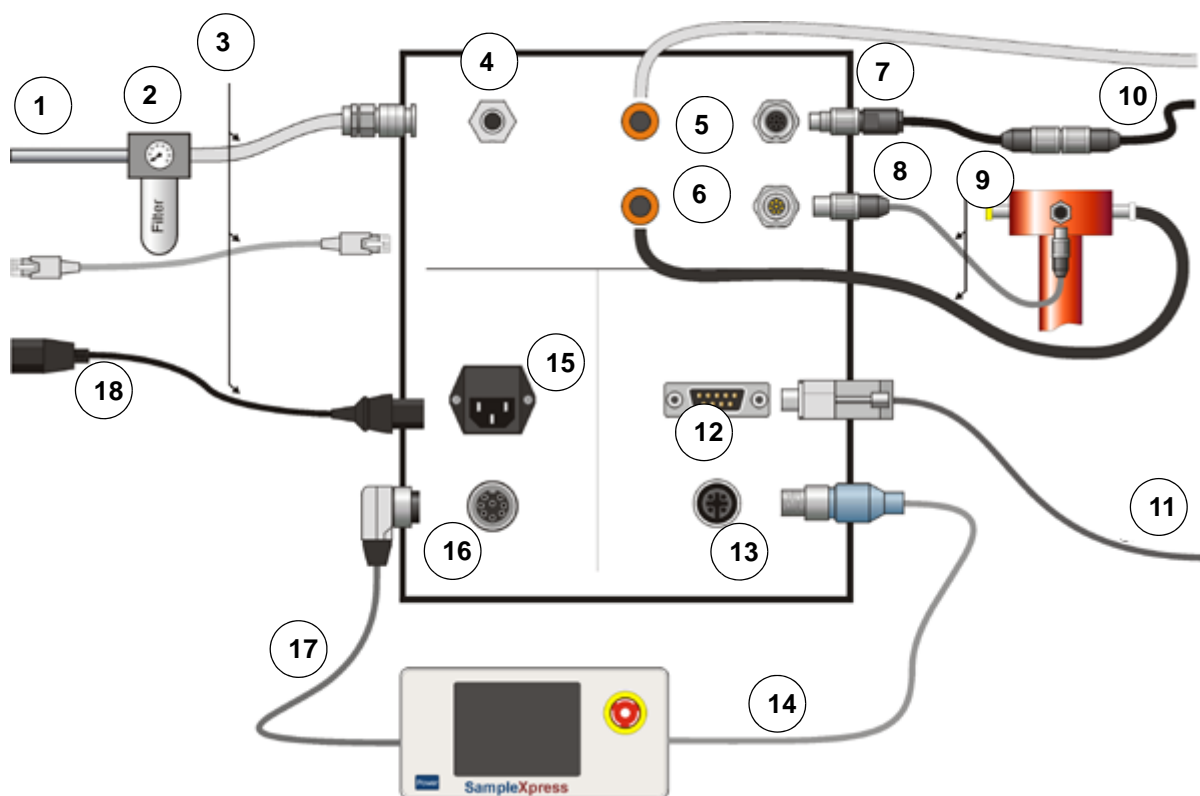
- The power supply cable must be connected to the power outlet of the console to avoid grounding short circuiting which might lead to reduced spectra sensitivity.
- The pneumatic supply can be connected to a wall armature or taken from the console supply using the T-piece at the end of the pneumatic supply hose.

Installation

The SampleXpress is connected to a free RS232 interface on the spectrometer. This provides 100% backwards compatible to the B-ACS.

The BST interface cable allows the SampleXpress to directly detect the signals at the BST.

The pneumatic BST connection is used for the activation of the sample eject function in the BST.



- | | |
|---|---------------------------------|
| 1. Compressed Air / N2 | 10. To/from Spectrometer |
| 2. Wall Armature | 11. Spectrometer CCU: TTY08 |
| 3. Supply Set 7m HZ16795 Supply Set 15 m HZ1Z16797 | 12. Communication Console RS232 |
| 4. Air Supply Inlet | 13. Communication CAN |
| 5. Lift & BST from SLCB, BSMS | 14. HZ16204 |
| 6. Lift & BST to BST | 15. Power Supply Mains |
| 7. 1803542 | 16. Power Supply Power Control |
| 8. BST Interface Set HZ16836 | 17. HZ16206 |
| 9. BST Interface Set HZ16836 | 18. To Console Outlet |

Figure 5.18 External Cable Connections

The Ethernet connector is hidden:



Figure 5.19 Location of the Ethernet Cable

Placing the Cables

1. Be sure that all cables are attached properly, e.g. with a cable tie.
2. To avoid obstruction, be sure that the cables are not placed above the Drop-Off plate.
3. Be sure that the power supply cable is attached using the clamp as shown in the picture below



Figure 5.20 Attaching the Power Cable

5.5 Installation of the External Control Panel Accessory

1. Open the base plate cable reservoir as described in "Repositioning the Control Panel" on page 37, steps 1 to 7.
2. Demount the control panel support arm as described in "Repositioning the Control Panel" on page 37, steps 8 to 10.
3. Mount the support arm on the external control panel vertical stand.
4. Pull all the cables through the vertical stand and connect them to the elongation cables delivered with the external stand:



Figure 5.21 Cables for the External Control Panel Accessory

5. Connect the power control cable to the rear right side of the SampleXpress.
6. Connect the CAN cable to the SampleXpress rear left side.
7. Connect the Ethernet cable to the silver Ethernet plug (pull it out of the metal plate).
8. Close the cable outlet in the SampleXpress base plate with the metal plate provided with the external control panel stand (Figure 5.14).
9. Close the base plate cable reservoir as described in "Repositioning the Control Panel" on page 37, steps 22 and 23.

Note: As a result of the installation of the control panel accessory, the Ethernet connection is connected from the external control panel to the SampleXpress and from there to the spectrometer (as already installed without the external control panel).

5.6 Starting the device

To start the SampleXpress, press the "POWER" button on the control panel. The SampleXpress will start initialisation after a few seconds.

5.7 Adjustments

After the SampleXpress is operational, several adjustments must be made.

- "BACS Lift Configuration"
- "Sample Down Detection"
- "Control Panel Pivot"
- "Sample Lift"
- "Sample at NMR Access Position Present"

5.7.1 BACS Lift Configuration

The spectrometer software doesn't recognize that a SampleXpress is mounted above the BST, thus ejecting a sample may cause it to break when the cassette is positioned directly above the BST (the NMR access position) and the position is already occupied.

Likewise, configuring the lift control by the BSMS will create an error message when starting an ICON-NMR run.

To avoid this, the sample changer must control the lift operation:

1. Execute the spectrometer software **cf** command and answer the question "Should the Sample Changer control the lift" with "Yes".
 - This will set the lift control to "BACS lift" and as a result the SampleXpress will simulate a mounted overpressure cap on top of the BST. This avoids starting the eject air at the BSMS and triggers the error message "Lid is closed".

5.7.2 Sample Down Detection

The SampleXpress is equipped with an internal sample down detection mechanism, that must be activated:

1. Go to the Service Page "Misc" and select "Auto".

5.7.3 Control Panel Pivot

The pivot of the control panel can be adjusted using an optional lever (P/N 89196), available in the accessory case.

To install the lever, replace the screw with the lever.

Note: Be aware that changing the pivot might affect the shim fine tuning.

5.7.4 Sample Lift

The sample lift is adjusted using the lift adjustment screw on the left rear side of the SampleXpress base unit. This adjustment screw opens/closes a needle valve inside the base unit and reduces the air flow to the BST.

When a sample is lifted, the “Sample Hovering Sensor” (see ["Sample Hovering Sensor" on page 72](#)) should find the sample hovering slightly lifted above the top of the cassette chain link. If this is not the case, open the valve until the sample is lifted as described.

Check the lift adjustment by ejecting a sample. It should rise with a moderate speed, and not shoot out of the BST and brake hard at the sample stop fork above the cassette chain link.

Important: The lift adjustment is only valid for a single sample weight!

When using different spinners (plastic & ceramic) or samples (7 inch tubes, heavy tubes with polymers inside, long samples i.e. with J.Young valve) you may need to make a new adjustment for each sample weight.

5.7.4.1 How to Perform the Sample Lift Adjustment

1. On the control panel, click “Add / Remove”, “Select and Goto” and select position 17.
2. Insert a dummy sample (see accessory case) into the cassette at position 17.
3. Click “Add / Remove”, “Select and Goto” and select position 1. Do not insert a sample! Click on “back”. The Sample at position 17 should now be above the BST.
4. Enter the Service Area by clicking “Settings”, “Service”
5. Click “Sample Guide: Close”.
6. Click “Lift air: on”.
7. Click “Sample Release: activate”.
8. Adjust the lift air using the needle valve (named “lift adjust”) on the rear of the base unit, until the sample hovering sensor LED is orange.
9. Click “Lift air: off” and wait until the sample is down.
10. Click “Lift air: on”. The sample must come up with moderate speed and hover in such a fashion that the orange LED at the sample hovering sensor is continuously lit.

5.7.5 Sample at NMR Access Position Present

Normally, this sensor is adjusted at the factory. Change the adjustment only if necessary, e.g. samples are not detected even if they are present (or vice versa). The orange LED at the sensor should only be active when a sample is available in the cassette magazine position directly beneath the sensor.



Figure 5.22 Reflex Sensor at the NMR Access Position

Adjusting the pivot of the sensor.

1. Loosen the 2 screws slightly that hold the sensor in place.
2. Rotate the sensor down to the end of the long hole.
3. Rotate the sensor upwards and observe the display.
4. Rotate it up until the display shows 999 (or the maximum value that can be achieved).
5. Tighten the 2 sensor screws in this position.

Adjusting the light intensity threshold

To adjust the threshold, the white plastic spinners (KELF spinners, P/N H00177) are ideally suited.

When a white plastic spinner is available:

1. Without a sample in place, press the "SET" button.
2. With a sample in the magazine, press the "SET" button once again. The threshold will blink in the display 3 times. It should show a value above 700.

If you do not have a white plastic spinner:

1. Set the threshold to a value of approximately 100 below the value displayed without a spinner, by using the up/down arrows at the sensor.

Checking the adjustment

1. When no sample is present in the magazine, the green LED must be active and the orange LED must be off.
2. With a sample is present in the magazine, both the green and orange LED must be active.

5.8 Installation Acceptance

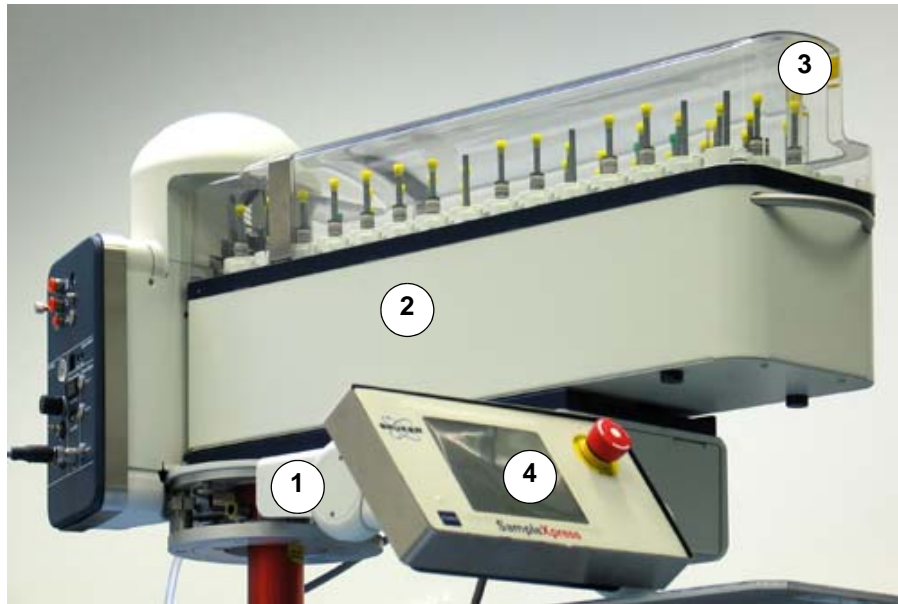
After completeing the installation and adjustment fill out the rest of the Installation Acceptance Form and sign it together with the customer.

The Installation Acceptance Form is available in the Appendix "[SampleXpress Installation Acceptance Form](#)" on page 133.

6 Principles of Operation

6.1 Main Components

The main components of the SampleXpress consist of:



1. Base Plate
2. Base Unit
3. Cassette
4. Control Panel

Figure 6.1 SampleXpress Main Components

6.1.1 Base Plate

The base plate is mounted on top of the magnet and holds all the other components. During installation it is important that the plate is horizontally aligned. This can be done by adjusting the 3 feet around the BST and the 2 feet in the front of the plate.

6.1.2 Base Unit

The base unit contains all of the actuators and most of the sensors. It is placed on top of the base plate and fixed with 4 screws from the bottom side and 2 screws from the top side of the base plate. The mechanical tolerances are fixed, there is no need to adjust anything between the base plate and the base unit.

6.1.3 Cassette

The cassette holds all the samples for acquisition. The samples are transported in a conveyor chain, where each position has a small lever to hold the sample in place. The cassette can be removed after acquisition and re-populated with new samples away from the magnet.

6.1.4 Control Panel

Interactions with the SampleXpress take place at the control panel. It can be mounted on the left or on the right hand side of the SampleXpress base plate. As an option, the pivot of the control panel can be adjusted. It is possible that changing the pivot affects the magnet shim.

6.2 Actuators

The actuators are located within the base unit.

The SampleXpress uses an electric DC motor for moving the sample conveyor chain, all the other actuators are pneumatic cylinders. When working with high frequency magnets, it is recommended that the the motor be placed outside the 5 Gauss line.



Figure 6.2 The Base Unit

6.2.1 Cassette Clamp Mechanism

When inserting a cassette into the SampleXpress, it is fixed by a clamping mechanism. This is a special kind of gripper adapted to a pneumatic gripper cylinder.



Figure 6.3 Cassette Clamp Open

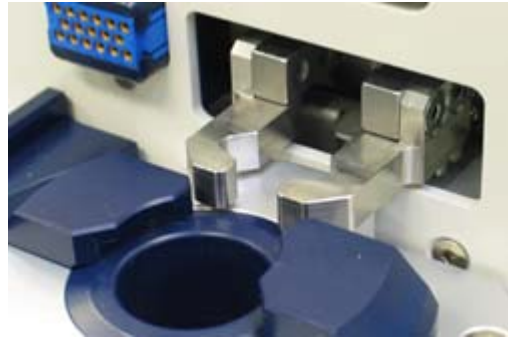


Figure 6.4 Cassette Clamp Closed



Figure 6.5 Cassette Clamp in Cassette



Figure 6.6 Detailed View

The gripper is placed behind a metal shield to avoid personal injury. Do not put your fingers into the small opening behind which the gripper is located!

6.2.2 Conveyor Chain Motor

A DC motor is used to move the sample conveyor chain inside the cassette. This motor is mounted with special vibration damping parts to reduce NMR artefacts to a minimum.



Figure 6.7 Conveyor Chain Motor

6.2.3 Sample Guide

The sample guide consists of two parts, a half-shell that is fixed and a movable half-shell that is mounted inside the cassette. When the sample guide is activated, the two parts come together and form a round tube that allows the samples to drop down through the BST into the magnet.

The pneumatic cylinder named “Sample Guide” placed on the base unit activates the sample guide via an opening on the rear side of the cassette.



Figure 6.8 Guide Cylinder Inactive



Figure 6.9 Guide Cylinder Active

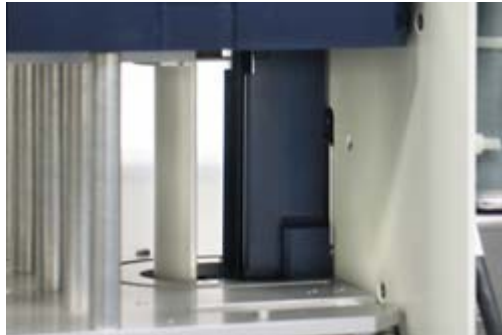


Figure 6.10 Guide Inactive (open)

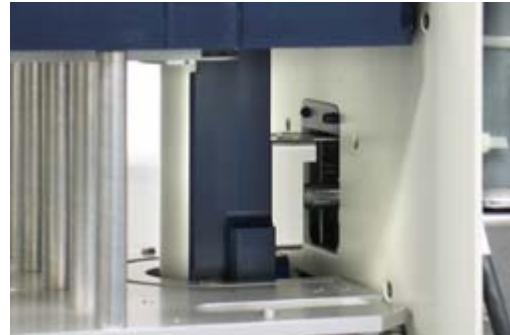


Figure 6.11 Guide Active (closed)



Figure 6.12 Guide Inactive - Top View



Figure 6.13 Guide Partially Active - Top View

The sample guide also fixes the conveyor chain in place to avoid any motion and also works as a conveyor chain block.

The chain links have a lot of play when a conveyor chain link is almost over the correct position above the BST. This was done intentionally to avoid precise positioning mechanisms that may cause samples to break.

When a conveyor chain link is almost over the correct position above the BST, the cassette guide is activated and clasps the lower part of the conveyor chain link and fixes it precisely above the BST.

6.2.4 Sample Release Lever

Each conveyor chain link has a small lever to hold a sample in place. The lever is pressed into its home position by a spring contained in each link. Each link also contains a small hole, into which another lever can be inserted, pressing the sample release lever into its working position. Through this action the sample falls down through the conveyor chain into the magnet.



Figure 6.14 Release Inactive – Sample is Held



Figure 6.15 Release Active – Sample Will Fall

6.2.5 Sample Stopping Fork

When a sample is ejected from the magnet it is lifted out by an air stream which can be adjusted using the lift control needle valve. If this valve is not adjusted correctly, the sample may shoot out of the magnet and crash into the status light dome.

To avoid any damage to the sample, a sample stopping fork is activated, together with the sample release lever:



Figure 6.16 Sample Stopping Fork

6.2.6 Additional Information on the Pneumatic Cylinders

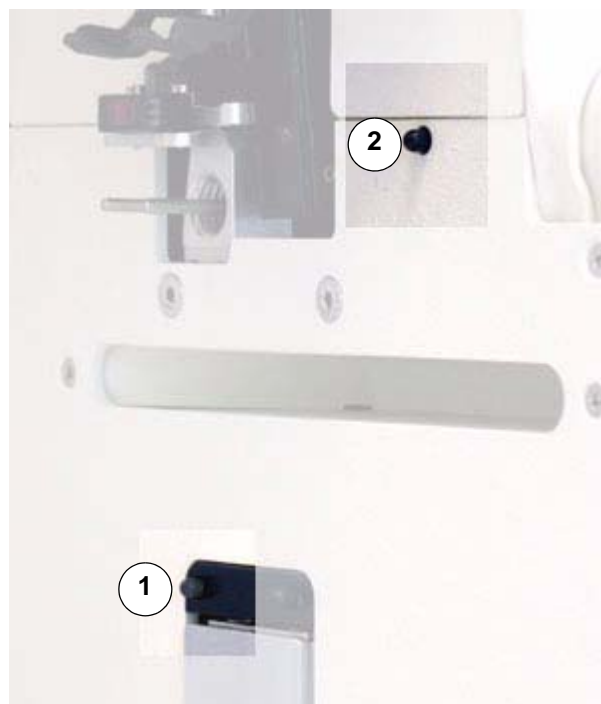
All cylinders are single acting, which means, they will return to their home position when no electrical power is present or the air supply is insufficient. The home position for each pneumatic cylinder component is different:

- **Cassette clamp mechanism:** The cassette is released and not fixed.
- **Sample guide:** Open, it is not possible for a sample to fall into the magnet.
- **Sample release lever:** Closed. The sample release lever in the conveyor chain link is not activated, it is pressed to its home position by the internal spring.

6.3 Sensors

Every actor has at least one sensor to detect the state of the actor.

6.3.1 Detecting the Cassette and the Cover



1. Cassette Available
2. Cover

Figure 6.17 Sensors for Detecting the Cassette and the Cover

6.3.2 Pneumatic Cylinders End Position Microswitches

6.3.2.1 General Information

All pneumatic cylinders have microswitches on both end positions:

- One for an inactive position (without air supply or without electrical supply), and,
- One for the active position (with air and electrical supply).

Using these microswitches, the current state of all pneumatic actors can be monitored.



Figure 6.18 Pneumatic Cylinder End Position Microswitches

The switch on the left side of a pneumatic cylinder is for the „active“ state, the switch on the right side is for the “inactive” state.

The state of each of the end position microswitches are indicated on the base main board by an LED next to each connector. If the sensors recognizes an active actor state, the green LED lights; if the sensors recognizes an inactive actor state, the blue LED lights.

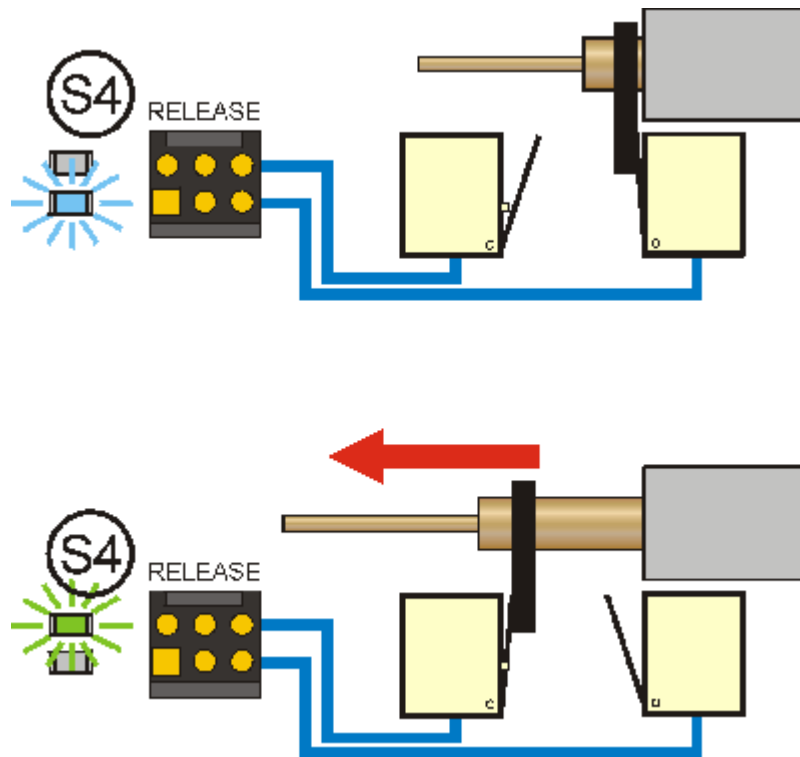


Figure 6.19 Microswitch Actor States

By using these 2 microswitches the following 4 states can be indicated through the software:

| Left Switch | Right Switch | LED | State | Remark |
|-------------|--------------|---------------------------|--------------|---|
| Pressed | Not pressed | Top LED: Green | Active/On | Control valve is on |
| Not pressed | Not pressed | None | Undefined | Cylinder is moving |
| Not pressed | Pressed | Bottom LED: Blue or Green | Inactive/Off | Control valve is off |
| Pressed | Pressed | Both | Error | mechanically not possible damage has occurred! |

Table 6.1 Microswitch States

The state of each pair of microswitches is also display on the service pages.

6.3.2.2 Sample Guide Detection Mechanism

Normally, the sensors detect the state of the pneumatic cylinder, however the sample guide detection mechanism works slightly different.

The inactive state (sample guide is open, sample cannot fall into the magnet) is detected by a plunger which detects if the movable guide half-shell (located in the cassette) has moved to its inactive (open) position. It is essential because it is possible that the pneumatic cylinder reaches its inactive position even though the movable guide half shell doesn't (e.g. when it gets stuck).



Figure 6.20 Sample Guide Detection Mechanism

6.3.3 Conveyor Chain Fine Positioning Sensors

In the double bottom of the cassette are two fork light barriers which point to a disc containing a long hole.



Figure 6.21 Conveyor Chain Fine Positioning Sensors

When the conveyor chain moves, these 2 sensors create the following signals which can be observed on 2 LEDs mounted on the electronic board inside the cassette:

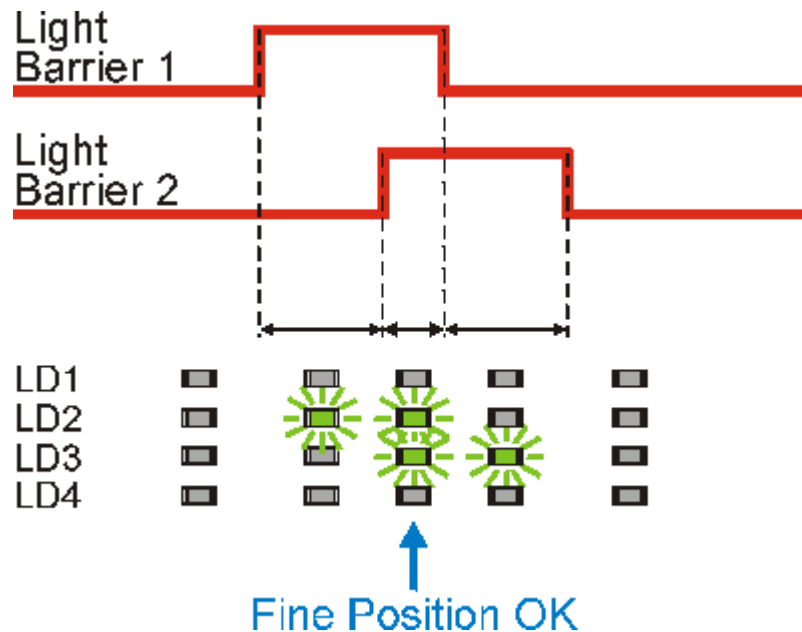


Figure 6.22 Signals Created During Conveyor Chain Motion

If both sensor signals see the hole in the disc, a conveyor chain link is positioned near the NMR access position with a tolerance of about ± 2 mm. This position is then close enough enough for the movable guide half shell to pull the chain link directly above the BST.

6.3.4 Conveyor Chain Position Identification

Each conveyor chain link has a barcode pattern lasered onto the plastic. This barcode pattern contains the 2 digit position of the link on the conveyor chain, and is read by a barcode reader:

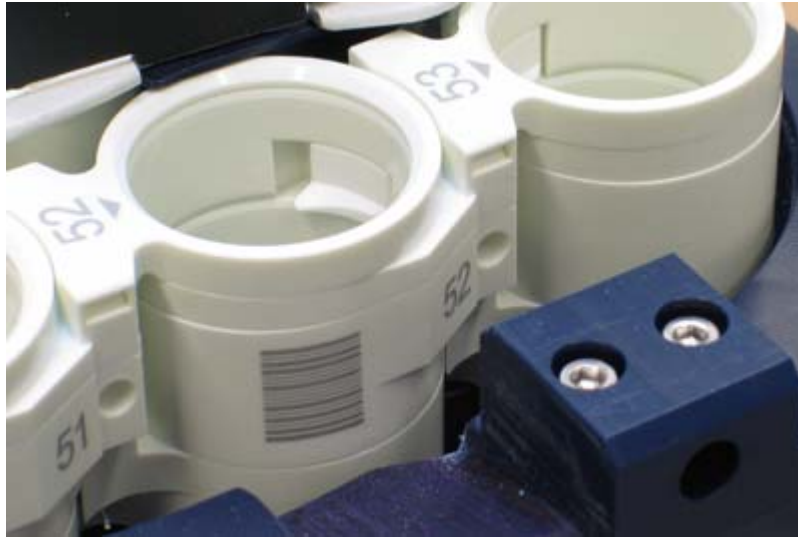


Figure 6.23 Conveyor Chain Position Identification

6.3.5 Tube ID Identification

The barcode reader which reads the current conveyor chain position is also used to read the Tube ID of a sample.

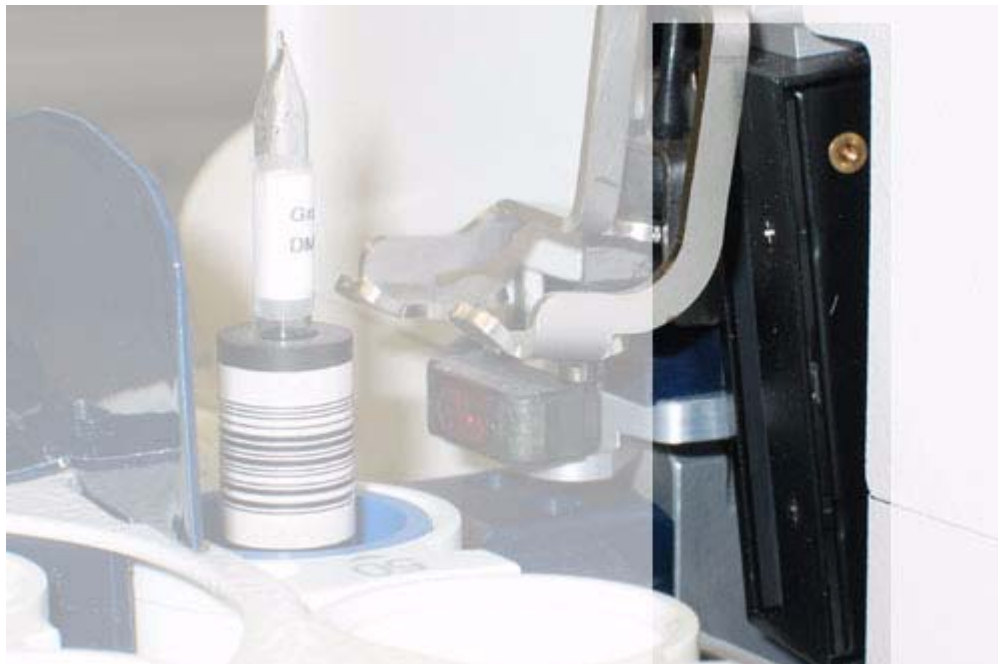


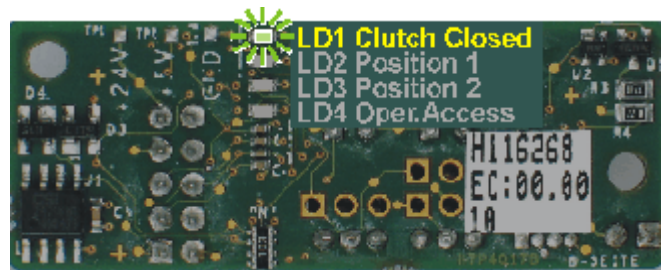
Figure 6.24 Tube ID Identification

6.3.6 Clutch Detection Sensor

When a cassette is placed on the base unit, SampleXpress first verifies that it is indeed a cassette and then adapts it to the base unit. The mechanical connection of the drive shaft from the base unit to the cassette is accomplished through a clutch. The rotational energy for the cassette is provided through this clutch.

The clutch connects the base unit motor axis, which has an external tooth system, to the drive shaft of the cassette, which consists of a movable round hollow shaft with internal toothing. When the teeth from the base unit align with those on the cassette, the clutch completes the connection.

The state of the connection is monitored by a clutch sensor, which is a microswitch that is released when there is no connection between the two shafts. In this case the motor will rotate slowly until the microswitch is pressed. The state of the clutch sensor can be observed by an LED on the electronic board on the cassette.



6.3.7 Loading State of Operator Access Position

In the cassette a optosensor senses if the Operator Access Position is filled or empty.

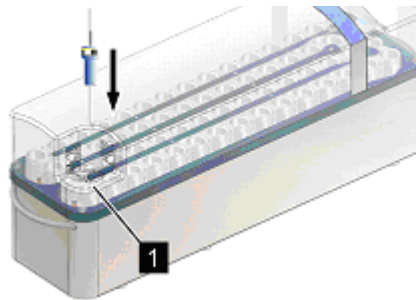
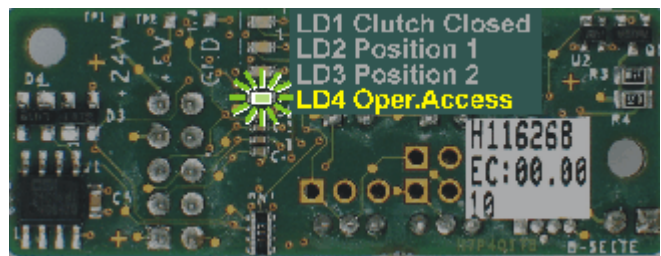


Figure 6.25 Operator Access Position

6.3.8 Loading State of NMR Access Position

The NMR Access Position is the position above the BST where samples can be inserted into the magnet. The loading state of this position is monitored by an optical reflective sensor. The sensor output can be observed through an LED on the base main board.



Figure 6.26 Reflex Sensor

6.3.9 Sample Hovering Sensor

Whenever a sample is ejected from the magnet, it must be detected by the sample hovering sensor before the sample release cylinder is deactivated (this avoids unintended blockage of the sample on its way up back into the conveyor chain link).



Figure 6.27 Sample Hovering Sensor

6.4 Pneumatics

The pneumatics are placed on the left of the base unit. They contain an overpressure valve which will be activated to prevent the pneumatic valves from being damaged if the incoming air supply pressure is above 7 bar.

A pressure regulator establishes the main supply air pressure for the SampleXpress and the current pressure level is indicated on a pressure gauge.

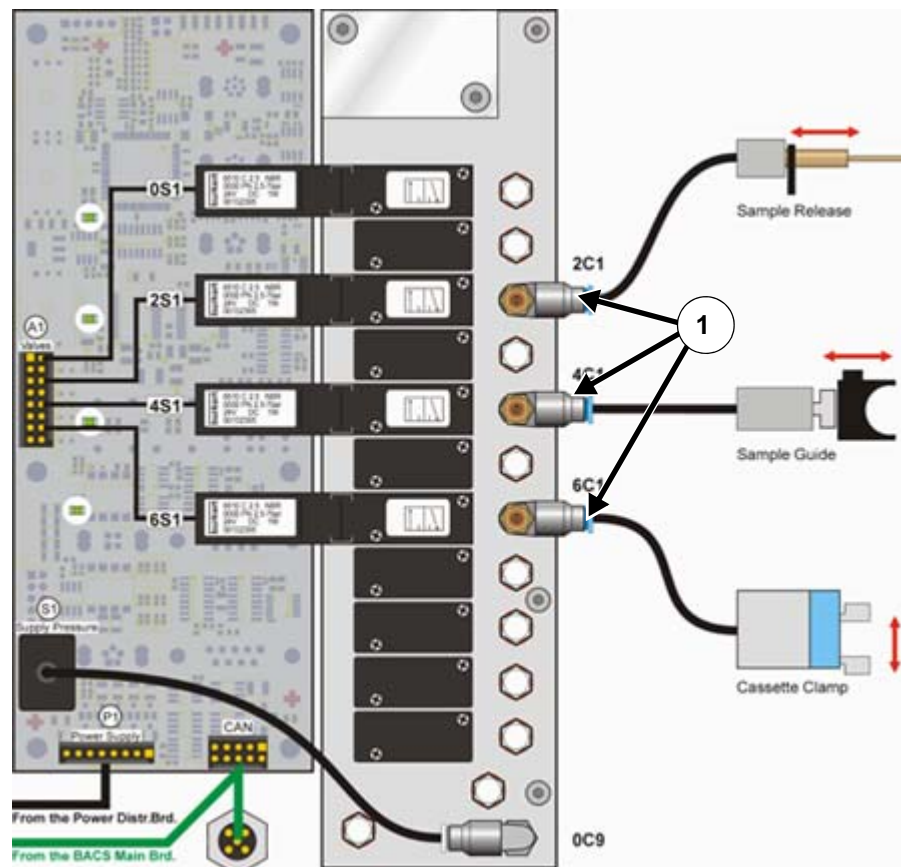
The SampleXpress uses 4 electro-pneumatic valves:

- Lift Control
- Sample Release Lever
- Sample Guide
- Cassette Clamp Mechanism.

All pneumatic parts are located on a so called pneumatic chip, which can be found on the rear on the left side of the SampleXpress base unit. This is a highly integrated pneumatic circuit.

The 4 electro-pneumatic valves will be discussed in detail in the following sections.

The following is a wiring diagram of the pneumatic chip with its environmental pneumatic cylinders:



1. Needle valves for adjusting the motion speed.

Figure 6.28 Wiring Diagram of the Pneumatic Chip



Figure 6.29 Pneumatic Chip (top)



Figure 6.30 Pneumatic Chip (bottom)

As a future option for high frequency magnet systems with strong magnetic fields, the electropneumatic valves may be replaced with piezo valves, which are not affected by magnetic fields.

6.4.1 Lift Control

The sample lift in the BST can be controlled either by the SampleXpress or the SLCB/BSMS unit. For lift control, the air supply supplied by the main air supply line is unlimited, i.e. is not reduced by a pressure limiter. An internal needle valve is used to limit the air supply for adjusting the speed for ejecting sample from the magnet.

The lift air of the SampleXpress is logically “OR”ed with the lift air of the SLCB. Thus, it must be configured which of these units controls the sample lift (see ["BACS Lift Configuration" on page 55](#)).

The spectrometer software does not recognize that a SampleXpress is mounted above the BST, thus ejecting a sample may cause it to break when placed in the cassette position directly above the BST.

Likewise, configuring the lift control by the BSMS will create an error message when starting an ICON-NMR run.

To avoid this the sample changer should control the lift operation:

1. Execute the spectrometer software **cf** command and answer the question “Should the Sample Changer control the lift” with **“Yes”**.
 - This will set the lift control to “BACS lift” and as a result the SampleXpress will simulate a mounted overpressure cap on top of the BST. This avoids starting the eject air at the BSMS and triggers the error message “Lid is closed”.

To adjust the lift air needle valve, see ["Sample Lift" on page 56](#).

6.4.2 Pressure Adjustment

The pneumatic chip contains a pressure limiter and a corresponding pressure gauge. The normal adjustment is 4 bar, which is the nominal pressure where all cylinders should work correctly. Do not change this adjustment unnecessarily!

6.4.3 Sample Release Lever

This valve's working output is connected directly to the single-acting pneumatic cylinder for activating the sample release lever.

The motion speed of the cylinder can be adjusted by a small needle valve on the pneumatic chip.

6.4.4 Sample Guide

This valve's working output is connected via a pressure regulator to the single-acting pneumatic cylinder for activating the sample guide. The pressure regulator limits the maximum force of the sample guide to avoid any damage to the conveyor chain links. The normal setting is 3.0 bar, **do not** change this factory-set default configuration unnecessarily!

The motion speed of the cylinder can be adjusted by a small needle valve on the pneumatic chip.

6.4.5 Cassette Clamp

This valve's working output is connected directly to the single-acting pneumatic cylinder for activating the cassette clamp gripper.

The motion speed of the cylinder can be adjusted by a small needle valve on the pneumatic chip.

6.5 Electronic Boards & Controller

6.5.1 Electronic Boards

The SampleXpress uses 7 electronic boards:

- The Power Distribution and Motor Control Board
- The Standby Board
- WinCE Main Controller
- The Interface Board
- The Base Main Board
- The Cassette Board
- The Status Light Board

Principles of Operation

6.5.1.1 Power Distribution and Motor Control Board

This electronic board is located next to the main power supply unit. It creates the standby voltage, controls the standby mode, enables the main power supply unit and controls the conveyor chain motor speed and torque.



Figure 6.31 Power Distribution and Motor Control Board

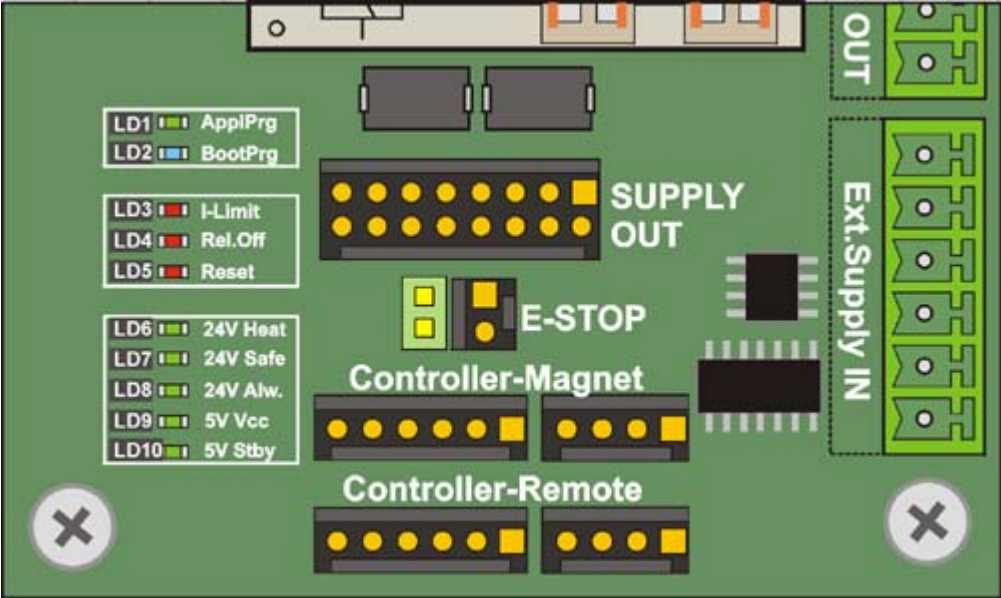




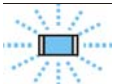



















Figure 6.32 Power Distribution and Motor Control Board LED Status

The normal operation status is displayed in **BOLD**.

| | | |
|-----------------|---|--|
| LD1 Appl.Prg |  | Application program started. |
| |  | Application program didn't start. |
| LD2 Boot Prg |  | Illuminates: Boot program is running. |
| |  | Slowly blinks: Application program is running, CAN Bus is OK. |
| |  | Quickly blinks (twice a second): CAN error. |
| |  | Boot program is not running. |
| LD3 I-Limit |  | Motor current is limited. |
| |  | Motor current is not limited (OK). |
| LD4 Rel.Off |  | Safety relay OFF: Emergency STOP pushed or 24V power supply not present (in standby mode). |
| |  | Safety relay ON or no power supply. |
| LD5 Reset |  | Reset ($V_{cc} < 4.5V$, $V_{Core} < 2.4V$). |
| |  | No reset or no power supply. |
| LD6 24V Heat |  | 24V for heating / cooling (switched) ON. |
| |  | 24V for heating / cooling (switched) OFF or not present. |
| LD7 24V Safe |  | 24V safe ON. |
| |  | 24V safe OFF. |
| LD8 24V Alw. |  | 24V always ON. |
| |  | 24V always OFF. |

| | | |
|-----------------|---|--|
| LD9 5V Vcc |  | Microcontrollers' Vcc power supply 5V ON. |
| |  | Microcontrollers' Vcc power supply 5V OFF. |
| LD10 5V Stby |  | 5V standby power supply ON. |
| |  | 5V standby power supply OFF. |

6.5.1.2 STANDBY Board

This board is located inside the control panel. It is connected to the power distribution board via a "Power Control" cable which is connected to the rear right side of the base unit.

The standby board detects the "power" button on the front used to power on or shut down the SampleXpress to standby mode. In standby mode, only 1 single power supply is connected to the mains plug, which detects when someone presses the "power" button. After this button is pressed, the power distribution board turns on all the other power supplies necessary to operate the SampleXpress. The software can shut down the SampleXpress to standby mode via a connection cable to the WinCE controller.

In addition, this board monitors the state of the Emergency Stop button and submits this information to the WinCE controller board.



Figure 6.33 Standby Board

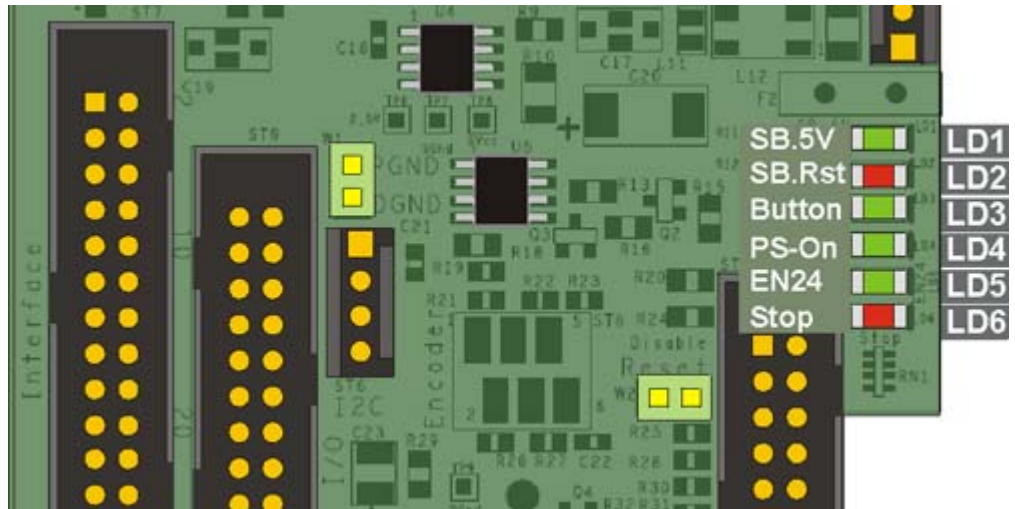




Figure 6.34 Standby Board LED Status

The normal operation status is displayed in **BOLD**.

| | | |
|---------------|--|--|
| LD1 SB.5V | | Standby power supply 5V present. |
| | | Standby power supply 5V absence. |
| LD2 SB.Rst | | Standby electronic reset (5V standby failed, PWR_OFF* Lo). |
| | | Standby power supply 5V: OK. |
| LD3 Button | | Button POWER pushed. |
| | | Button POWER not pushed. |
| LD4 PS-On | | Power supply ON (solid state relay On). |
| | | Power supply OFF (solid state relay Off). |
| LD5 EN24 | | 24V safe enabled. |
| | | 24V safe disabled. |

| | | |
|-------------|---|---|
| LD6 Stop |  | Disable 24V safe: Emergency stop pushed, RST* Lo, RST* Z. |
| |  | 24V safe not blocked. |

6.5.1.3 WinCE Main Controller

This is the brain of the SampleXpress. This controller is placed in the control panel and controls and monitors all the actions the SampleXpress is carrying out.



Figure 6.35 WinCE Main Controller

6.5.1.4 Interface Board

This electronic board is placed on the left hand side of the SampleXpress. It controls all external signals, e.g. RS232 to spectrometer, BST interface, low level debug interface, etc. Furthermore, it controls all the pneumatic valves which are placed on the pneumatic chip next to the interface board.

This board also has a pressure sensor for the main supply pressure after the pressure limiter.

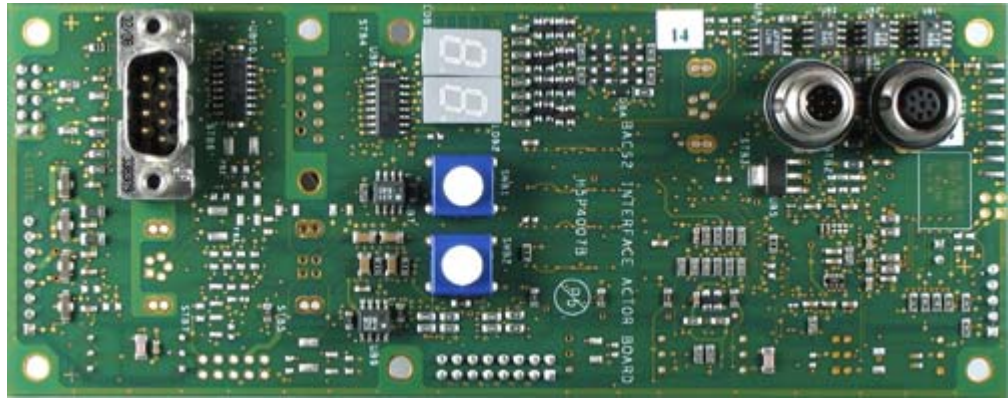


Figure 6.36 Interface Board (back)



Figure 6.37 Interface Board (front)

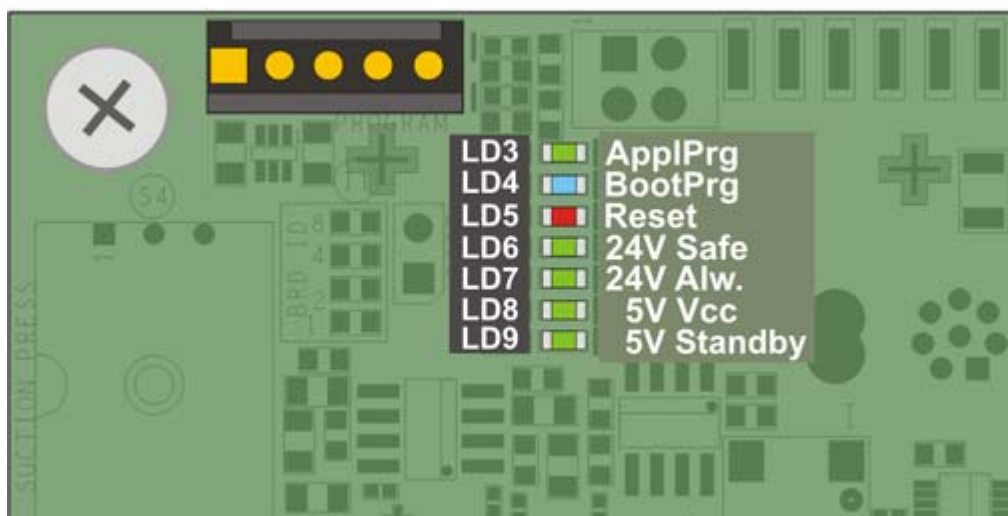


















Figure 6.38 Interface Board LED Status

Principles of Operation

The normal operation status is displayed in **BOLD**.

| | | |
|-----------------|---|--|
| LD3 Appl.Prg |  | Application program started. |
| |  | Application program didn't start. |
| LD4 Boot Prg |  | Illuminates: Boot program is running. |
| |  | Slowly blinks: Application program is running, CAN bus is OK. |
| |  | Quickly blinks (twice a second): CAN error. |
| |  | Boot program is not running. |
| LD5 Reset |  | Reset ($V_{CC} < 4.5V$, $V_{Core} < 2.4V$). |
| |  | No reset or no power supply. |
| LD6 24V Safe |  | 24V safe ON. |
| |  | 24V safe OFF. |
| LD7 24V Alw. |  | 24V always ON. |
| |  | 24V always OFF. |
| LD8 5V Vcc |  | Microcontrollers' Vcc power supply 5V ON. |
| |  | Microcontrollers' Vcc power supply 5V OFF. |
| LD9 5V Stby |  | 5V standby power supply ON. |
| |  | 5V standby power supply OFF. |

6.5.1.5 Base Main Board

The base main board provides connectors for all pneumatic cylinder end position micro-switches and all other optical sensors. It provides electronic connection to the cassette and contains power switches to enable the power supply to the cassette.

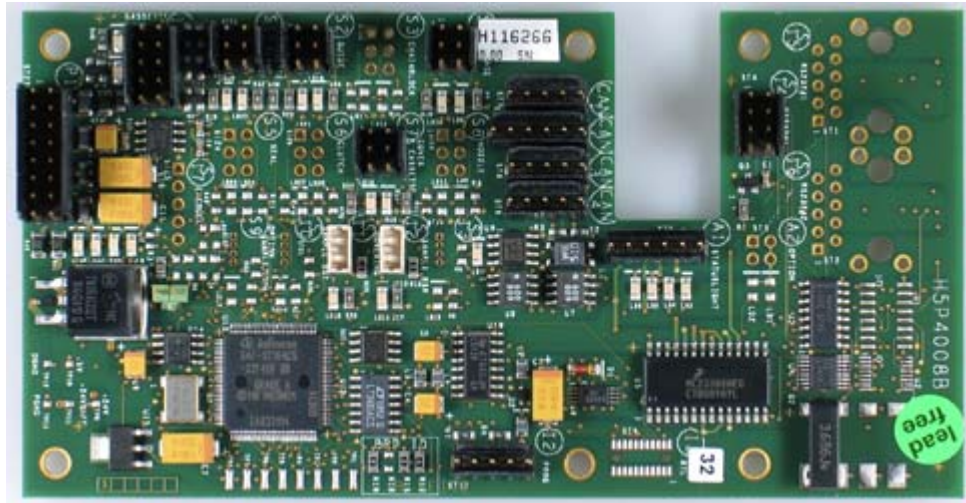


Figure 6.39 Base Main Board

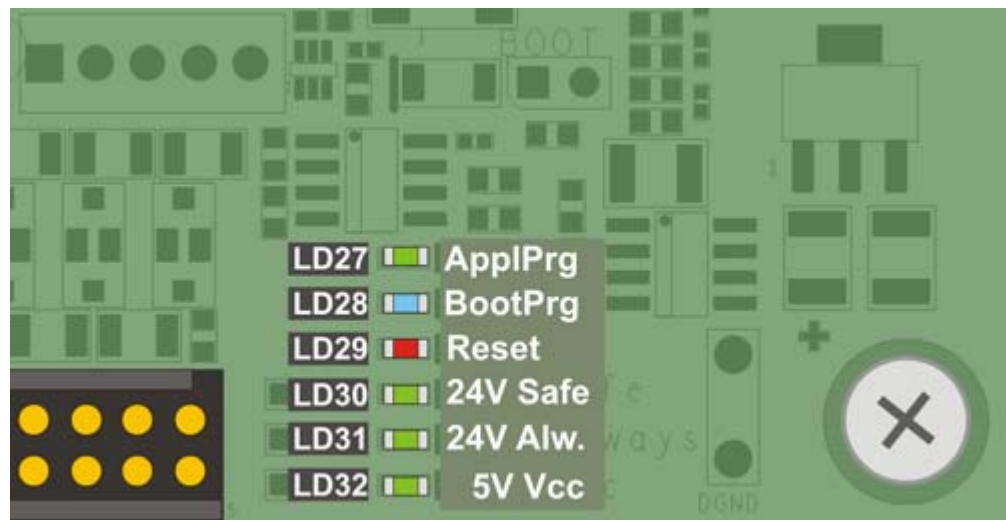
















Figure 6.40 Base Main Board LED Status

The normal operation status is displayed in **BOLD**.

Principles of Operation

| | | |
|------------------|---|--|
| LD27 Appl.Prg |  | Application program started. |
| |  | Application program didn't start. |
| LD28 Boot Prg |  | Illuminates: Boot program is running. |
| |  | Slowly blinks: Application program is running, CAN bus is OK. |
| |  | Quickly blinks (twice a second): CAN error. |
| |  | Boot program is not running. |
| LD29 Reset |  | Reset ($V_{CC} < 4.5V$, $V_{Core} < 2.4V$). |
| |  | No reset or no power supply. |
| LD30 24V Safe |  | 24V safe ON. |
| |  | 24V safe OFF. |
| LD31 24V Alw. |  | 24V always ON. |
| |  | 24V always OFF. |
| LD32 5V Vcc |  | Microcontrollers' Vcc power supply 5V ON. |
| |  | Microcontrollers' Vcc power supply 5V OFF. |

6.5.1.6 Cassette Board

This board does not have a microcontroller, rather has some fork light barriers and provides connectors to the clutch sensor and to the loading state sensor of the operator access position. It is designed as a “slave” board to the base main board.

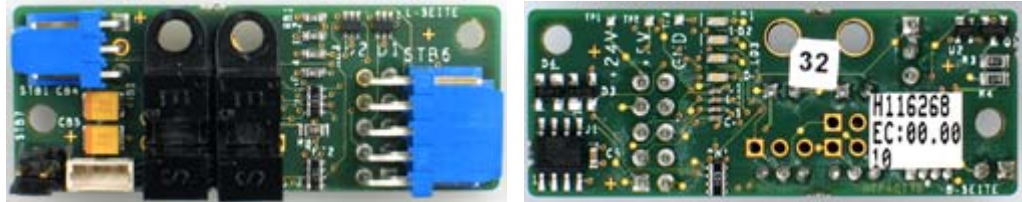


Figure 6.41 Cassette Board

6.5.1.7 Status Light Board

This is also a “slave” board to the base main board. It consists of rows of LEDs with 4 different colors: red, green, white and blue. Using these 4 colors, all necessary status light information can be displayed.

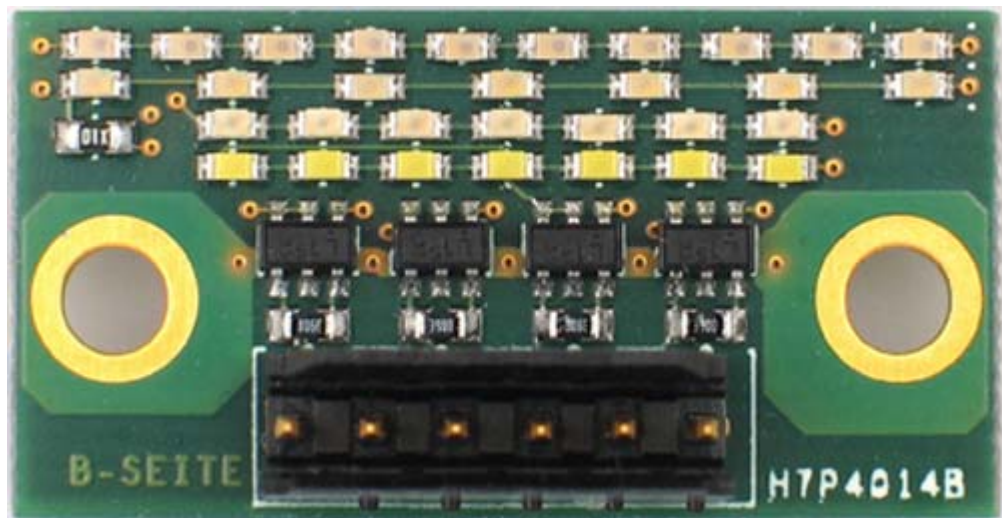


Figure 6.42 Status Light Board

6.5.2 Information Exchange

For information exchange a Controller Area Network (CAN) consisting of the following boards is used:

- WinCE Main Controller
- Power Distribution & Motor Control Board
- Interface Board
- Base Main Board

Within this network, information is exchanged using the CANopen protocol. For service work the details of the network and the way information is exchanged is not relevant.

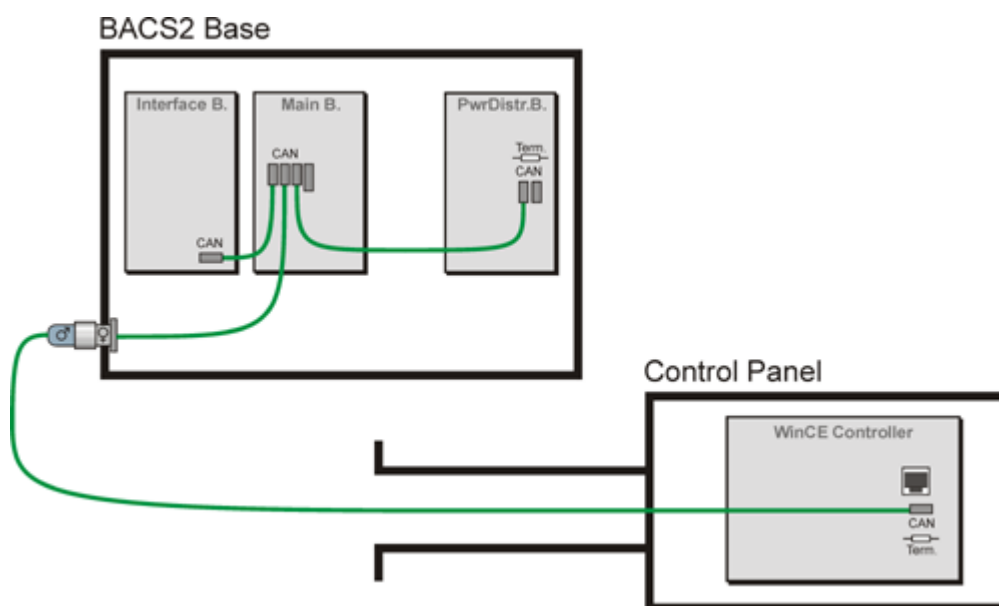


Figure 6.43 CAN Network

6.6 Standby, Power Supply & Emergency Stop

The SampleXpress is supplied by a 230/115V supply from a wall socket. A main supply switch routes the energy to the power distribution board, where the following power supplies are generated.

- Standby Voltage
- Board Supply
- 24 V Always/24 V Safe
- Emergency Stop Button

6.6.1 Standby Voltage

The +5V standby voltage supply powers a simple circuit which turns on the yellow standby LED at the user front panel and monitors the power switch at the user front panel.

When the power button is pressed, a flip flop is toggled enabling power to be supplied to all other internal components. The standby circuit was implemented to reduce power consumption when the unit is not needed, and to avoid a main switch which might be difficult to access, e.g. on large magnets.

When the power button is pressed after the initial power on, the circuit will prohibit shutting down the system. Instead, a signal is transferred to the WinCE main computer indicating the user wants to shut down the SampleXpress into standby mode.

The WinCE will then determine if it is safe to shut the system down, e.g. if a sample is in route, and will send display a message requesting confirmation, e.g. by pressing the power button again, to whether the system shutdown should continue.

When the power button is pressed more than about 5 seconds without any interruption, the SampleXpress will shut down immediately into the standby mode.

The +5V standby supply voltage is galvanically isolated from all other +5V supplies (see "[Board Supply](#)"), so is also used for powering circuits which are connected to the spectrometer, including the galvanically isolated RS232 to the spectrometer CCU and the sample down detection circuit on the interface board.

6.6.2 Board Supply

All electronic boards in the base unit need a +5V supply, e.g. for the microcontroller and other integrated circuits on the boards. This +5V supply is only used inside the SampleXpress, not externally. Every supply voltage leading outside the SampleXpress is galvanically isolated from this supply to reduce electromagnetic interference (EMI).

6.6.3 24V always / 24V safe

The SampleXpress uses two 24 V supply lines internally: "24 V always" and "24 V safe", both derived from the same 24 V power supply.

The "24 V always" is available directly after power on (standby off). It is used for the status light LEDs and the WinCE main computer wide range input supply.

The "24 V safe" is used for the emergency stop button. When this is pressed, a safety relay is released and the 24 V safe voltage shuts down to 0 V immediately. This disables all possible dangerous parts, e.g. pneumatic cylinders and the conveyor chain driving motor.

6.6.4 Emergency Stop Button

When the emergency stop button on the control panel is pressed, all actors (motor and pneumatic cylinders) are automatically powered off due to loss of the +24 V safe voltage.

This means that all pneumatic cylinders will move to their home position. See "[Additional Information on the Pneumatic Cylinders](#)" on page 65 for information about home positions.



Position of the Emergency Stop

7 Internal Connections

7.1 Overview

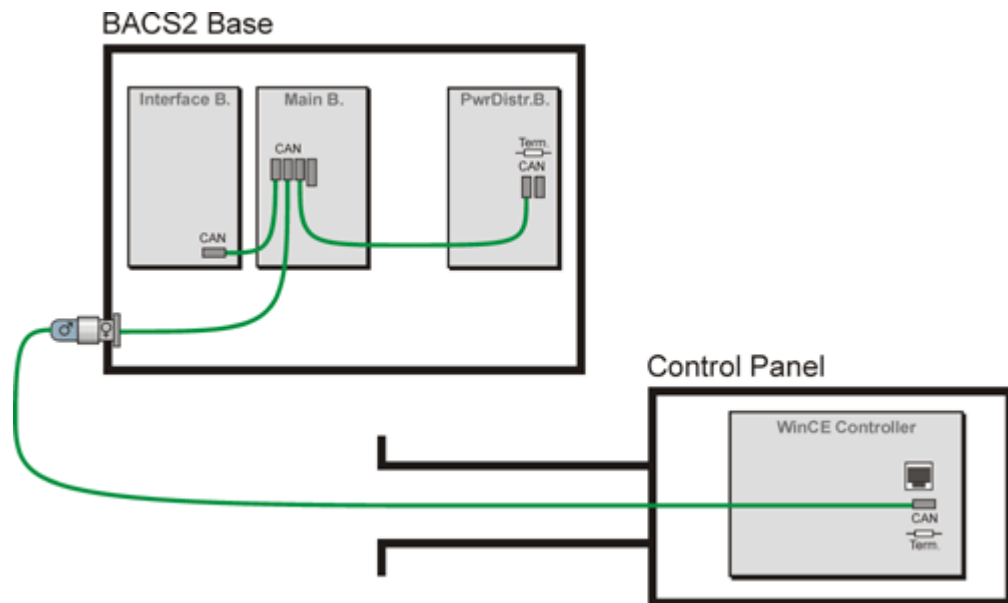


Figure 7.1 CAN Network

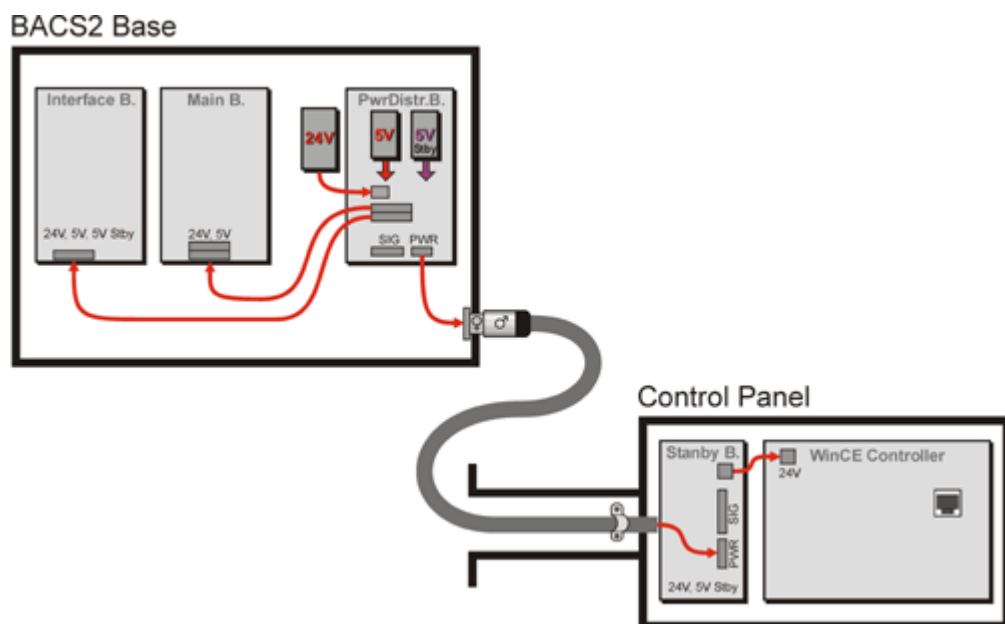


Figure 7.2 Power Supply

Internal Connections

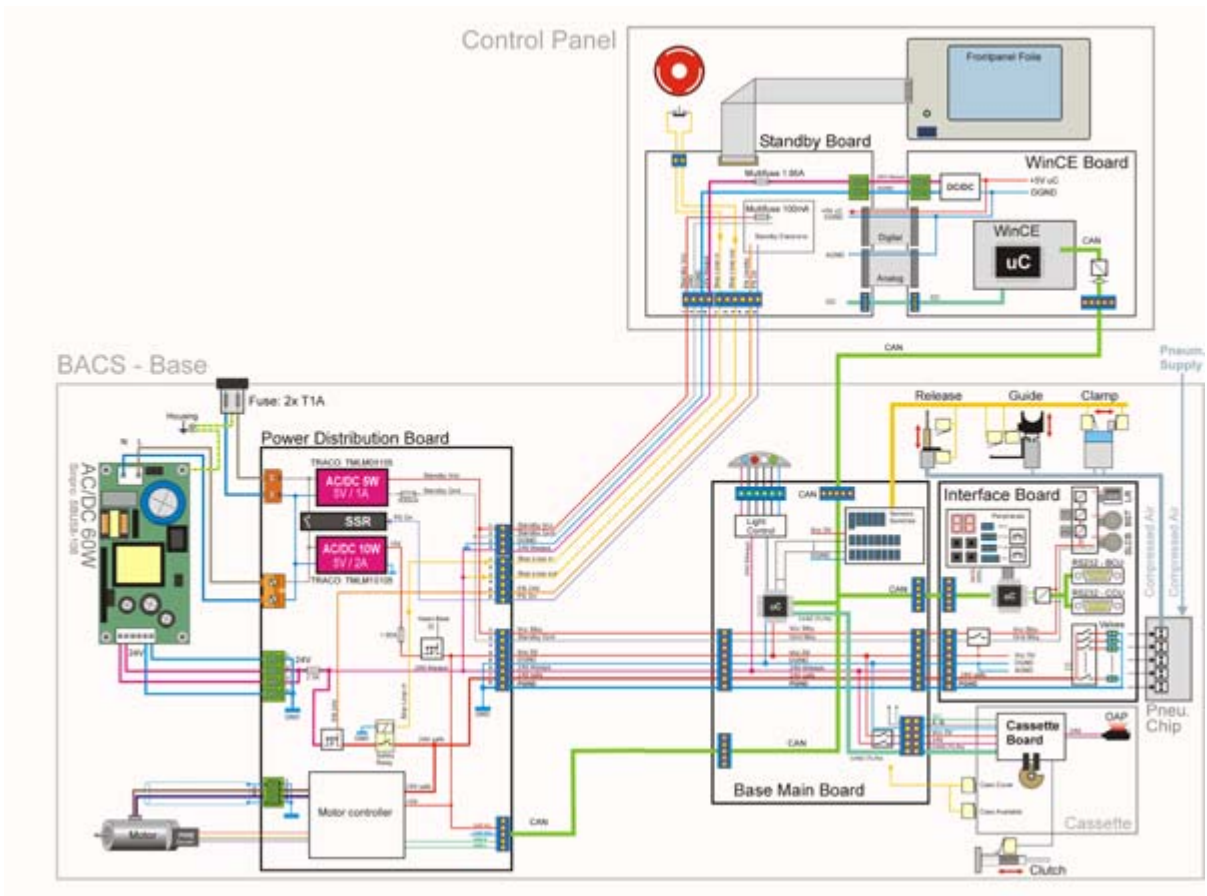


Figure 7.3 Connection Overview

7.2 Pneumatic Cylinder to the Pneumatic Chip Wiring

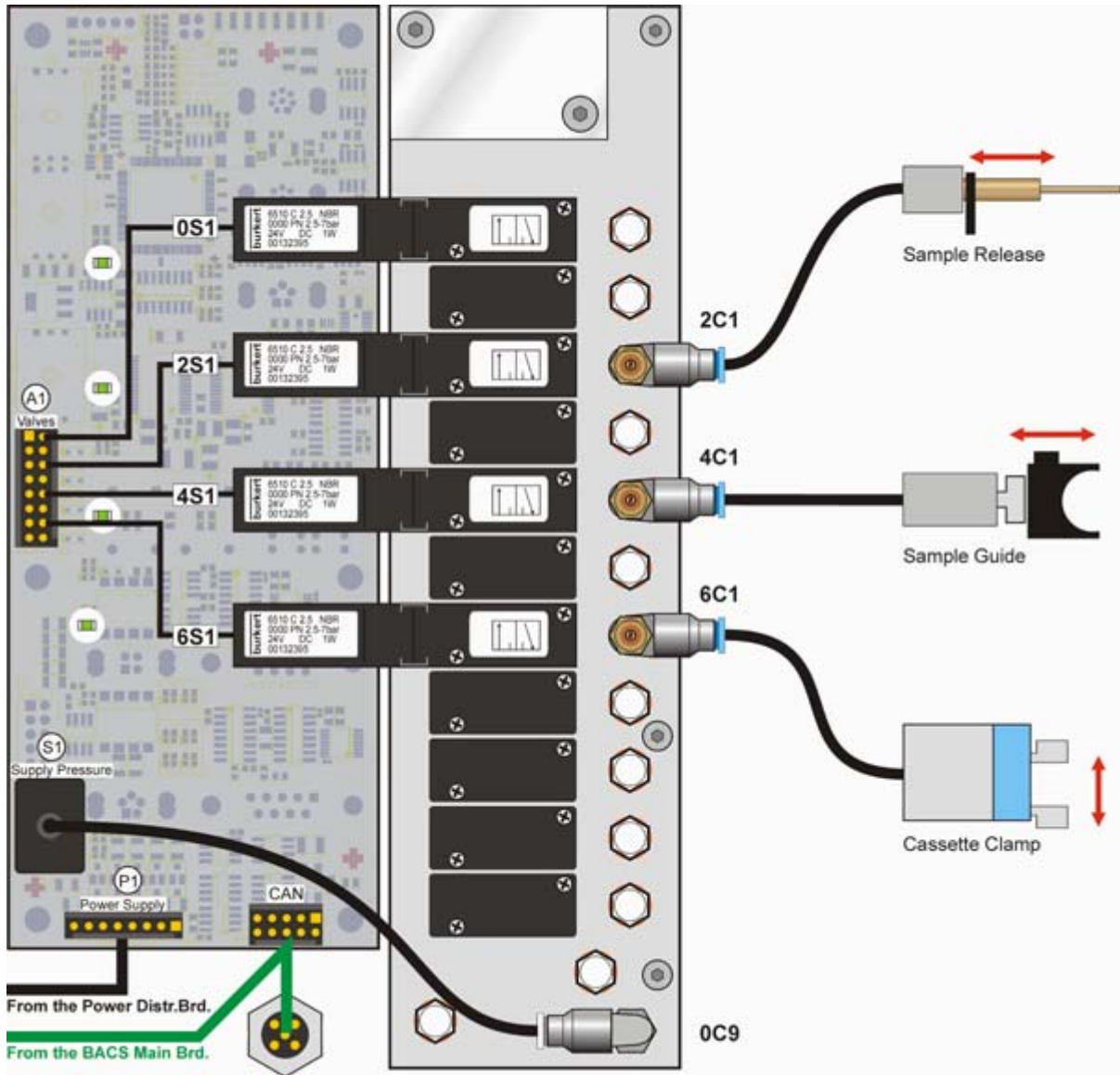


Figure 7.4 Wiring from the Pneumatic Cylinders to the Pneumatic Chip

7.3 Sensor Wiring on the Base Main Board

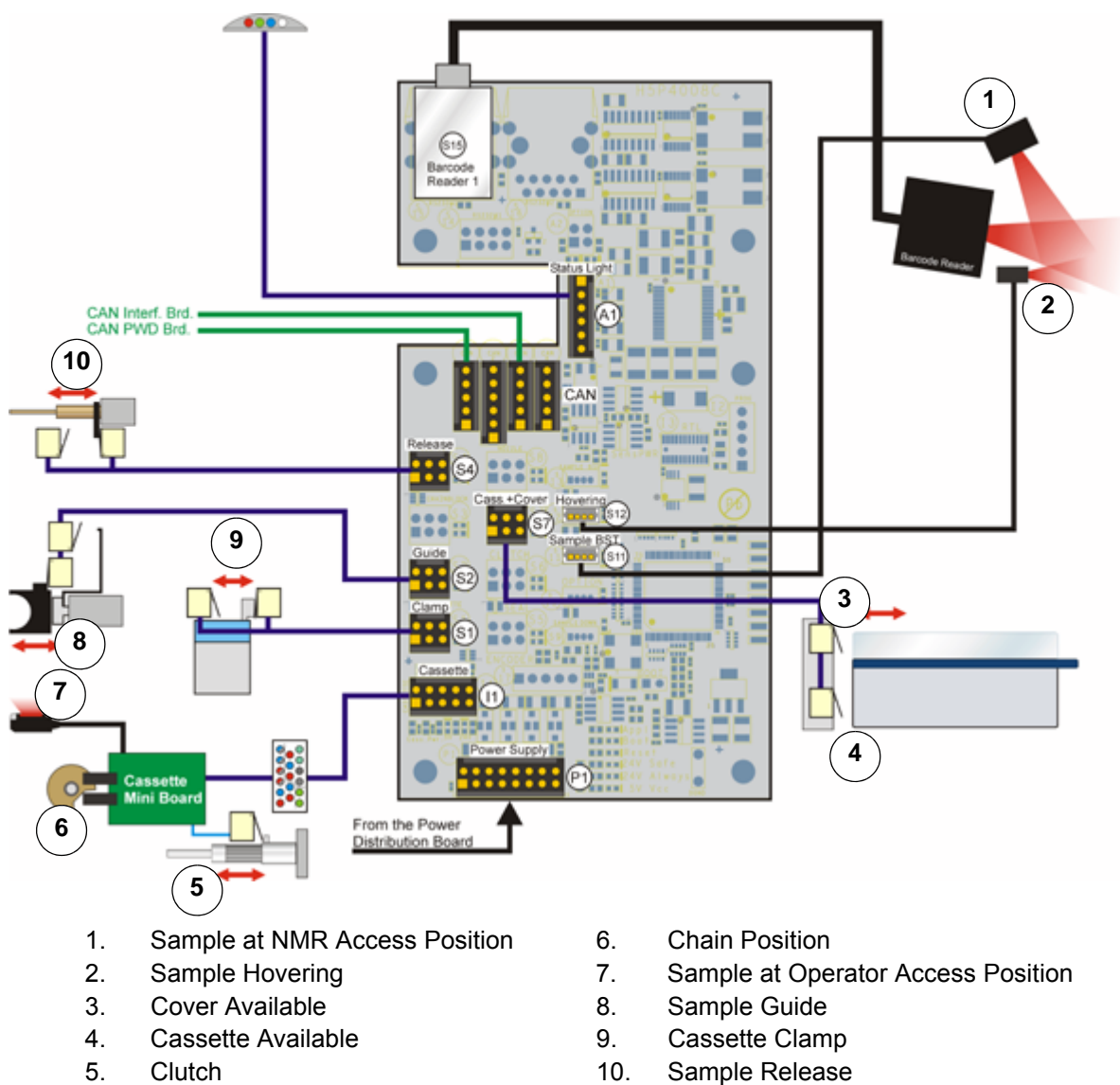


Figure 7.5 Sensor Wiring on the Base Main Board

7.4 Cassette Board Wiring

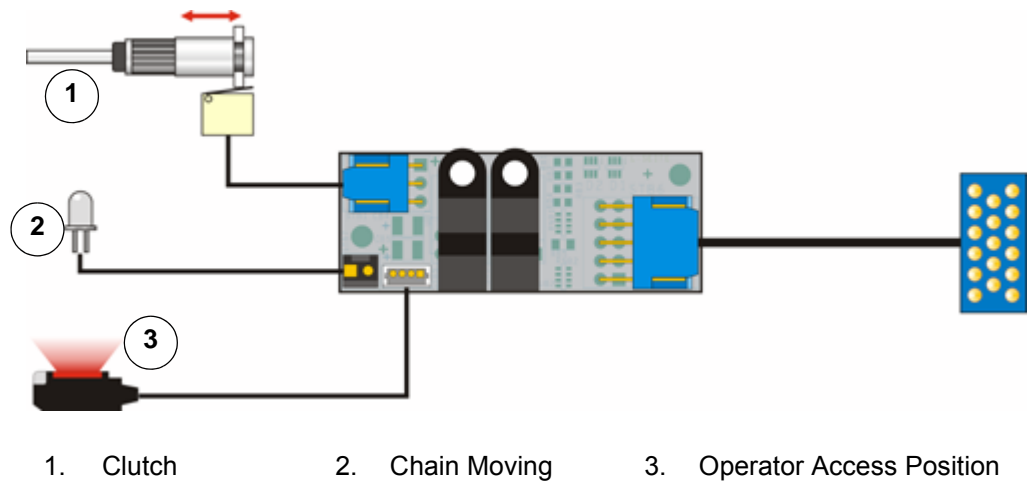


Figure 7.6 Cassette Board Wiring

7.5 Status Light Board Wiring

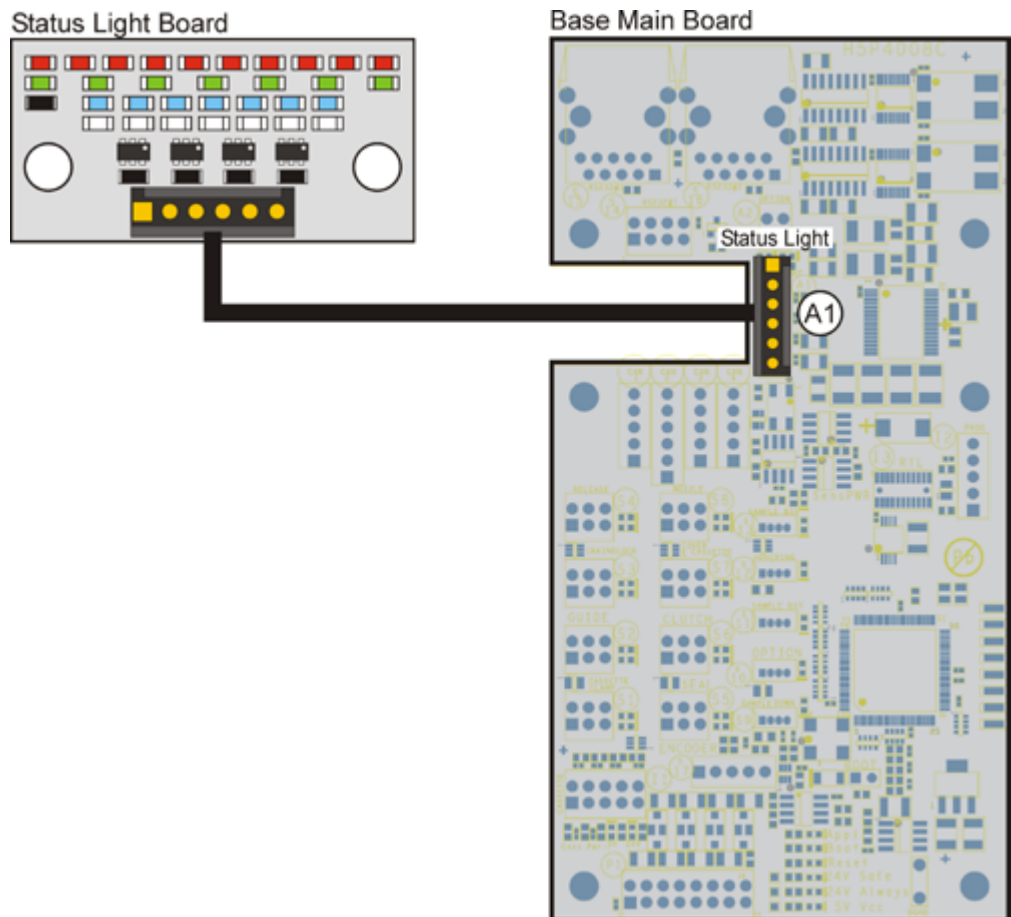
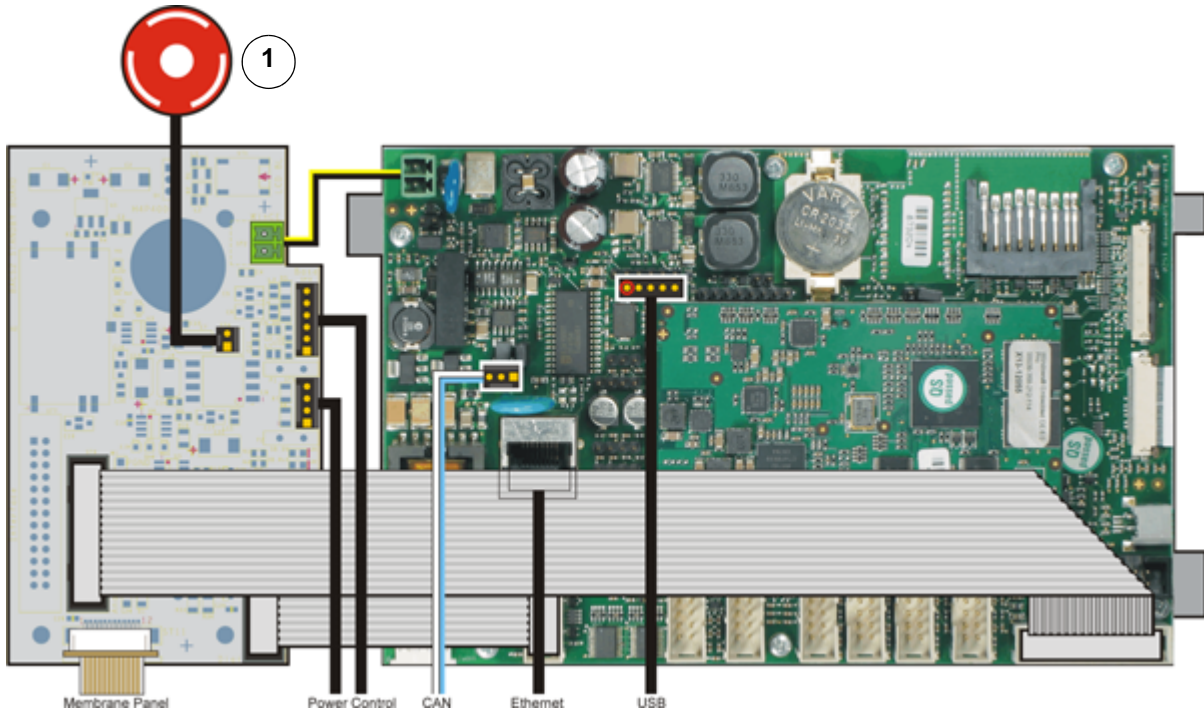


Figure 7.7 Status Light Board Wiring

7.6 Standby Board Wiring



1. Emergency Stop Button

Figure 7.8 Standby Board Wiring

8 Interfaces

All air and electrical supplies, as well as all electrical interfaces, are arranged on the rear left hand side of the SampleXpress base unit. These interfaces are described in the following sections.



Figure 8.1 Base Unit Left Side Electrical Connections

8.1 Electrical Supply

The electrical mains supply of the SampleXpress is clearly marked with the text “Mains”.

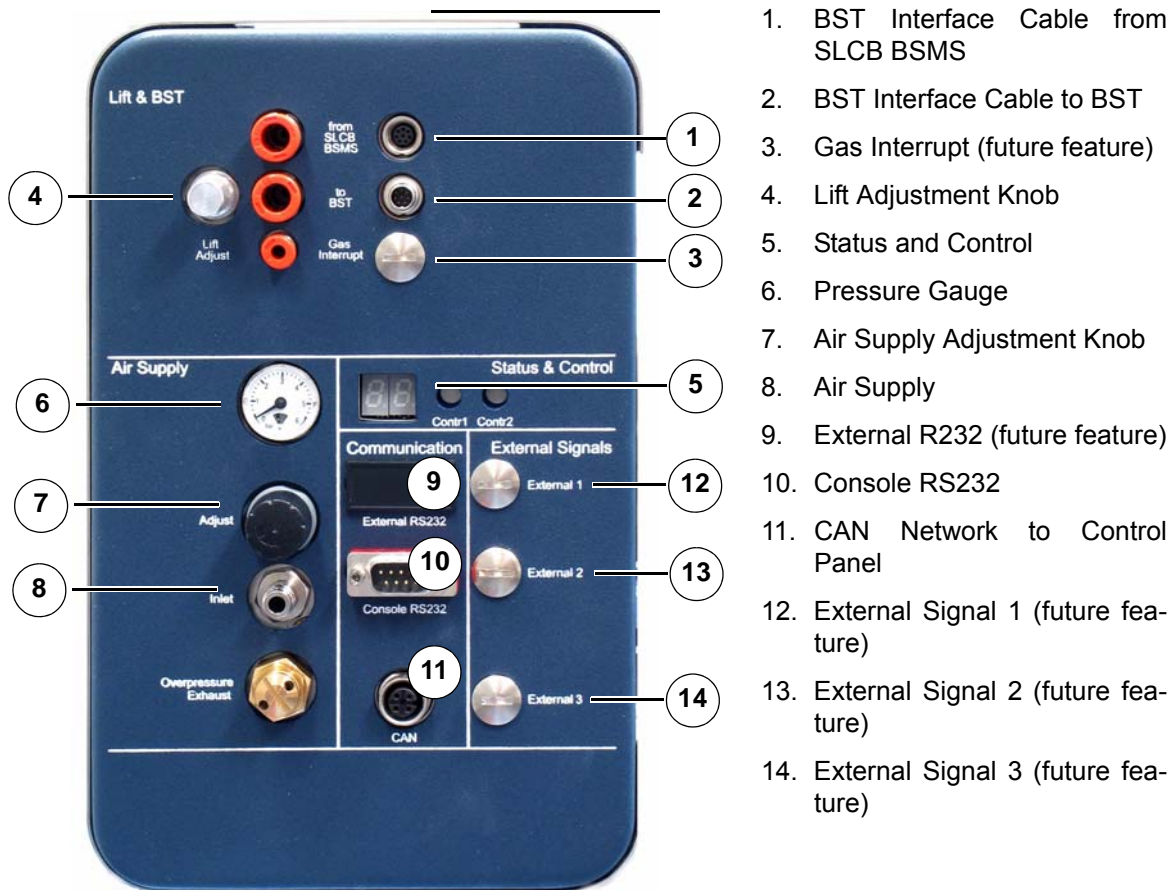


Figure 8.2 Base Unit Right Side Connections

8.2 Air Supply

The connector “Inlet” supplies the SampleXpress with compressed air or nitrogen. If too much pressure is supplied it will be exhausted via the overpressure protection valve named “Overpressure Exhaust”.

The working pressure can be adjusted at the pressure regulator; current setting is displayed at the pressure gauge.

8.3 Communication Interface

Ethernet link

The Ethernet link cable is included in the SampleXpress supply cable set and is available in two different lengths:

- P/N: HZ16796 (length 7 m), or,
- P/N HZ16797 (length 15 m)

RS232

A crossover cable is used to connect the SampleXpress to the CCU TTY08. With this cable, the SampleXpress behaves like the old B-ACS sample changer. The following are examples of cables that can be used:

- P/N: HZ15425 (length = 5 m)
- P/N HZ10019 (length = 9.5 m)
- P/N HZ10034 (length = 10m)
- P/N HZ12674 (length = 15 m)

CAN

The CAN communication cable from the control panel is connected to the CAN interface connector "CAN".

8.4 Lift Interface

The SampleXpress is able to control the lift, just as the old B-ACS did. However, it is necessary to disconnect the pneumatic hose from the SLCB to the BST, and to reroute it to the lift input of the SampleXpress. A short pneumatic hose must then be routed from the SampleXpress lift output to the BST.

This hose is included in the cable set P/N HZ16836 for the BST. Adjusting the air flow to the BST is done using the throttle valve named "Lift Adjust".

8.5 BST interface

The cable connection between the SLCB and BST must be rerouted to the SampleXpress BST input. A short cable is used to connect the SampleXpress BST output connector to the BST.

With this connection, the SampleXpress can detect if a sample has moved down into the magnet.

8.6 Two Digit 7 Segment Display

This display is used to show the operational state of the entire system. The status of this display helps the Bruker service desk to identify the reason for the fault or error.

| Display | | Meaning |
|---------|-------|---|
| Left | Right | |
| Off | Off | SampleXpress is powered down (and thus the interface board). |
| Off | 1 | Interface board started boot program. |
| Off | 2 | Interface board initializes CAN bus. |
| Off | 3 | Interface board valid application program detected, switching to application program now. |
| Off | 4 | Interface board boot jumper is set. See "Interface Board" on page 80 for the location of the boot jumper. |
| Off | 5 - 8 | Interface board prepared for download of new firmware. |
| Off | 9 | No application program available on interface board. |
| 1 | 0 | Download data programming error. |
| 2 | 1 | Interface board started application program. |
| 2 | 2 | Interface board started software initialization procedure part 1. |
| 2 | 3 | Sending CAN wakeup message. |
| 2 | 4 | Interface board started software initialization procedure part 2. |
| 2 | 5 | Interface board initialization completed. At this point the interface board is waiting until the WinCE controller takes control over the CAN bus. |

Table 8.1 Interface Board Bootup

| Display | | Meaning |
|---------|-------|--|
| Left | Right | |
| 3 | 0 | Windows application program finished initialization and is waiting in idle loop. |
| 7 | 0 | Initializing the power distribution board. |
| 7 | 1 | Initializing the base main board. |
| 7 | 7 | Reading BIS from the interface board. |
| 7 | 8 | Reading BIS from the power distribution board. |
| 7 | 9 | Reading BIS from the base main board. |

Table 8.2 Windows Application Bootup

| Display | | Meaning |
|---------|-------|---------------------------------------|
| Left | Right | |
| A | 1 | Cassette Clamp: open/close |
| A | 2 | Release Sample: activate / deactivate |
| A | 3 | Sample Guide: open/close |
| A | 4 | Lift: on/off |

Table 8.3 Actions Started; Activation / Deactivation of Pneumatic Actuators

| Display | | Meaning |
|---------|-------|----------------------|
| Left | Right | |
| B | 1 | BST sample present. |
| B | 2 | BST sample hovering. |
| B | 3 | OAP sample present. |

Table 8.4 Sensor Plausibility Checks

| Display | | Meaning |
|---------|-------|---|
| Left | Right | |
| C | 1 | Cassette motion: Closing clutch. |
| C | 2 | Cassette motion: Fine positioning. |
| C | 3 | Cassette motion: Go to destination position. |
| C | 4 | Cassette motion: Searching. |
| C | 5 | Cassette motion: Scan all positions. |
| C | 6 | Cassette motion: Other motion. |
| C | 7 | Cassette motion: Continuous, initiated by user. |

Table 8.5 Cassette Motion

| Display | | Meaning |
|---------|-------|--|
| Left | Right | |
| E | 0 | No CAN bus available on the interface board. |
| E | 1 | Sample not present but expected (in cassette). |
| E | 2 | Sample present but not expected (in cassette). |
| E | 3 | Sample hovering but not expected. |
| E | 4 | Sample not hovering but expected. |
| E | 5 | Sample not down but expected. |
| E | 6 | Emergency stop active. |
| E | 7 | Sample down but not expected. |
| E | F | Device failure. |
| A | P | Insufficient air pressure. |

Table 8.6 Errors

| Display | | Meaning |
|---------|-------|---------------------------|
| Left | Right | |
| U | b | Working on the USB stick. |
| S | E | Service mode active. |

Table 8.7 Others

Patterns displayed during a firmware download:

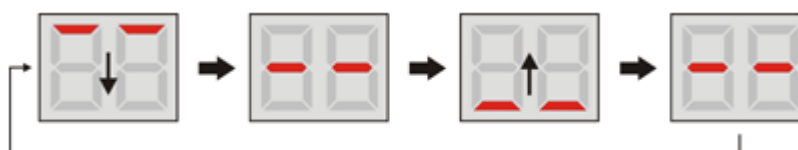


Figure 8.3 Firmware Download Pattern Part 1

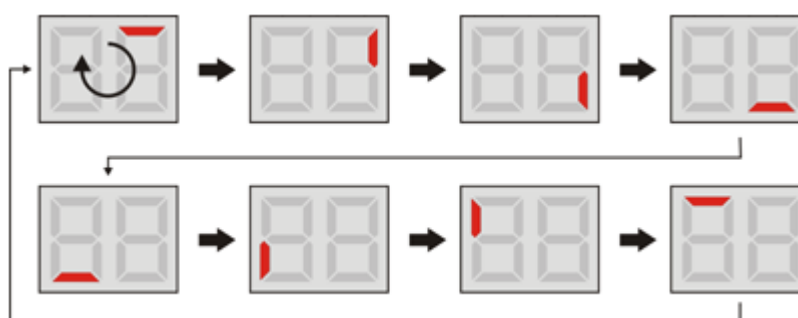


Figure 8.4 Firmware Download Pattern Part 2

8.7 Options

All the other connectors are reserved for future options and are currently not populated.

9 Service Page Interface

The service pages can be accessed by pressing the buttons [SETTINGS], then [BRUKER (Service)] and then “Enter Service Area”.

This area is password protected to avoid unintended user access.

The password is “service”.

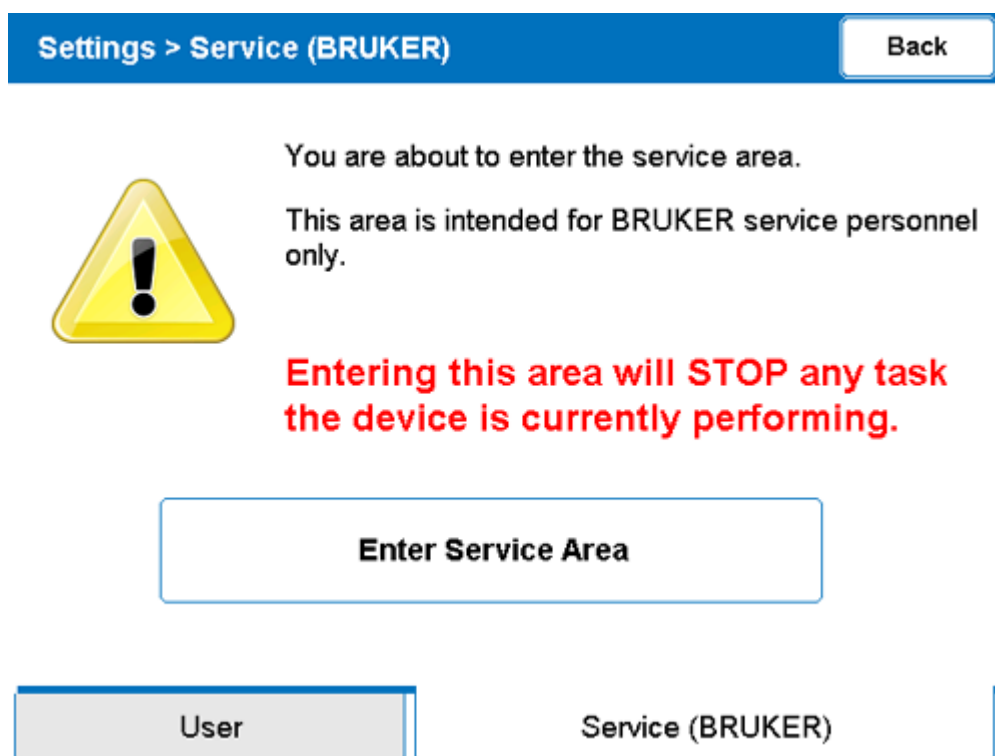


Figure 9.1 Service Page Tab

ATTENTION: You can start any actor or action from the SampleXpress, even if it should be avoided (e.g. insert a second sample into the BST). There are no software precautions taken to avoid such unallowed calls, thus service is able debug the system without restriction.

IMPORTANT: Use only dummy samples when adjusting the system or if you are working within these service pages!

9.1 Main Screen

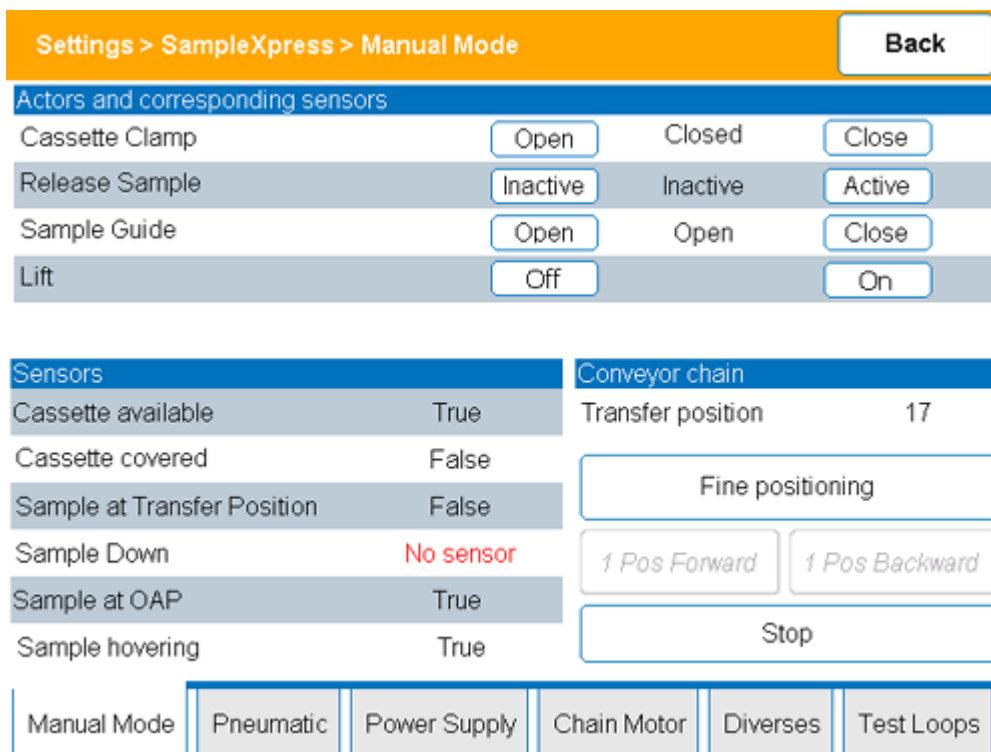


Figure 9.2 Service Page: Main Screen

From the main screen most actions can be started.

In the upper part of the screen, you will find the pneumatic actors and the corresponding sensors.

In the lower left part of the screen you will find additional sensor information. In the lower right part of the screen are buttons to start the chain motor.

9.2 Pneumatic

The screenshot shows the 'Pneumatic' settings page. At the top, there is a breadcrumb trail 'Settings > SampleXpress > Pneumatic' and a 'Back' button. Below this is a table for 'Pressures' with columns for 'Current (bar)' and 'Expected (bar)'. The 'Main Supply Pressure' is shown as 4.63 bar, with an expected value of 4 bar. Underneath is a 'Valves' section with four rows, each containing a valve name and two buttons: 'Open' and 'Close'. The valves are Lift Valve, Cassette Clamp Valve, Release Sample Valve, and Sample Guide Valve. At the bottom of the interface is a navigation bar with six buttons: 'Manual Mode', 'Pneumatic', 'Power Supply', 'Chain Motor', 'Diverses', and 'Test Loops'. The 'Pneumatic' button is currently selected and highlighted.

| Settings > SampleXpress > Pneumatic | | |
|-------------------------------------|-------------------------------------|--------------------------------------|
| Back | | |
| Pressures | Current (bar) | Expected (bar) |
| Main Supply Pressure | 4.63 | 4 |
| Valves | | |
| Lift Valve | <input type="button" value="Open"/> | <input type="button" value="Close"/> |
| Cassette Clamp Valve | <input type="button" value="Open"/> | <input type="button" value="Close"/> |
| Release Sample Valve | <input type="button" value="Open"/> | <input type="button" value="Close"/> |
| Sample Guide Valve | <input type="button" value="Open"/> | <input type="button" value="Close"/> |

| | | | | | |
|-------------|------------------|--------------|-------------|----------|------------|
| Manual Mode | Pneumatic | Power Supply | Chain Motor | Diverses | Test Loops |
|-------------|------------------|--------------|-------------|----------|------------|

Figure 9.3 Service Page: Pneumatic

The pneumatic window displays the pneumatic supply pressure level. The pneumatic valves can be activated from this window.

9.3 Power Supply

Settings > SampleXpress > Power Supply
Back

| Board / Voltage | 5V | 2.5V μ C | 24V always | 24V safe |
|--------------------------|------|--------------|------------|----------|
| Base Main Board | 4.83 | 2.48 | 23.74 | 23.74 |
| Power Distribution Board | 4.94 | 2.46 | 23.63 | 23.74 |
| Interface Board | 4.87 | 2.54 | 24.13 | 24.24 |

Cassette Supply

| | | | |
|--------------|-----------------------------------|-------|------------------------------------|
| 5V (and CAN) | <input type="button" value="On"/> | False | <input type="button" value="Off"/> |
| 24V | <input type="button" value="On"/> | True | <input type="button" value="Off"/> |

Diverses

| | | | |
|-------------|-----------------------------------|------|------------------------------------|
| 24V Safe | <input type="button" value="On"/> | True | <input type="button" value="Off"/> |
| Optosensors | <input type="button" value="On"/> | True | <input type="button" value="Off"/> |

Manual Mode

Pneumatic

Power Supply

Chain Motor

Diverses

Test Loops

Figure 9.4 Service Page: Power Supply

In this window information about the power supply for each board is displayed. You can check whether the emergency button is activated (watch the 24 V safe voltage) and you can reactivate the 24 V safe after the emergency button has been released.

9.4 Chain Motor

Settings > SampleXpress > Chain Motor
Back

Motor Control

| | | | |
|-------------------|----------|---------|---------|
| Current direction | Backward | Forward | Forward |
| Current speed | - | Stopped | + |
| Current torque | - | 1500 | + |
| Stop | | Off | |

Chain positioning

Scan all
Fine positioning

Look for position

Where BST OAP What Emotv Full

Direction Backward Full

Search

Manual Mode
Pneumatic
Power Supply
Chain Motor
Diverses
Test Loops

Figure 9.5 Service Page: Chain Motor

The Chain Motor window is used for starting and stopping the chain motor. The torque level adjustment currently is not implemented.

9.5 Misc (Miscellaneous)

The screenshot shows the 'Diverses' settings page. At the top, there is a breadcrumb trail 'Settings > SampleXpress > Diverses' and a 'Back' button. Below this is a 'Status Light' section with four rows: Red, Blue, White, and Green. Each row has 'On' and 'Off' buttons. The 'On' buttons for Red, Blue, and White are active. Below the status lights is a 'Sample Down Detection' section. It includes a 'Detection mode' dropdown menu set to 'None', a 'BST Supply (V)' field showing '0.00', a 'Sample Down Value (V)' field showing '0.269', and a 'Sample Down Threshold (V)' field showing '0.000' with a 'Calibrate' button. A red error message with a crossed-out circle icon reads: 'No sample down detection possible because BST supply is too low.' At the bottom, there is a navigation bar with buttons for 'Manual Mode', 'Pneumatic', 'Power Supply', 'Chain Motor', 'Diverses' (which is highlighted), and 'Test Loops'.


| Settings > SampleXpress > Diverses | | | Back | | |
|--|------------------------------------|--|------|--|--|
| Status Light | | | | | |
| Red | <input type="button" value="On"/> | <input type="button" value="Off"/> | | | |
| Blue | <input type="button" value="On"/> | <input type="button" value="Off"/> | | | |
| White | <input type="button" value="On"/> | <input type="button" value="Off"/> | | | |
| Green | <input type="button" value="On"/> | <input type="button" value="Off"/> | | | |
| Sample Down Detection | | | | | |
| Detection mode | <input type="text" value="None"/> | | | | |
| BST Supply (V) | 0.00 | | | | |
| Sample Down Value (V) | 0.269 | | | | |
| Sample Down Threshold (V) | <input type="text" value="0.000"/> | <input type="button" value="Calibrate"/> | | | |
|  No sample down detection possible because BST supply is too low. | | | | | |
| Manual Mode Pneumatic Power Supply Chain Motor Diverses Test Loops | | | | | |

Figure 9.6 Service Page: Diverses

From this window you can set the status light colors. Do not activate more than 2 colors at the same time, as the LEDs on the electronic board might get too warm and their life will decrease.

This window also displays information about the sample down detection voltage.

9.6 Test Loops

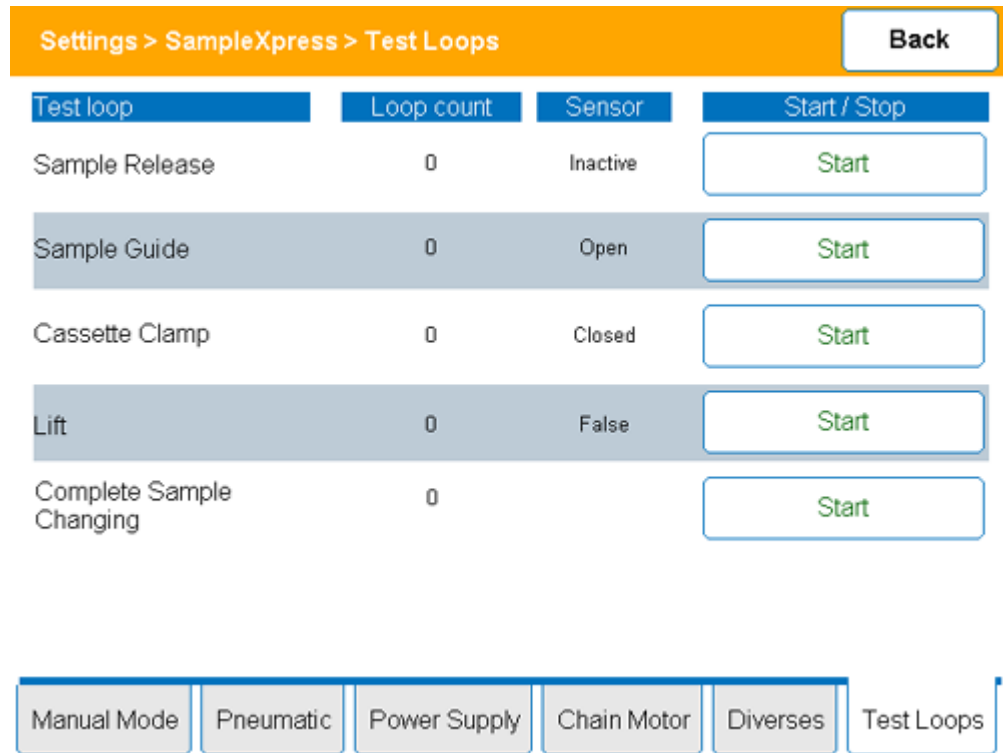


Figure 9.7 Service Page: Test Loops

The Test Loops window allows different test loops to be started, e.g. to adjust the pneumatic throttle valves. Be sure that the following requirements for each test loop are met:

| Test Loop | Requirements |
|--------------------------|--|
| Sample Release | The cassette must be removed or in place, and <ul style="list-style-type: none"> • Locked by the cassette clamp. • Chain fine position, OK. • No sample in the chain link above BST, or a sample in the chain link above BST, and, <ul style="list-style-type: none"> - no sample down in the magnet, and - sample guide closed. |
| Sample Guide | Cassette in place, and <ul style="list-style-type: none"> • Locked by cassette clamp. • Chain fine position OK. |
| Cassette Clamp | Sample guide inactive. |
| Lift | <ul style="list-style-type: none"> • Cassette in place and locked by cassette clamp. • Chain fine position OK. • Sample in the chain link above BST. • No sample down in the magnet. • Sample guide closed. • Optosensors are turned on. |
| Complete Sample Changing | <ul style="list-style-type: none"> • Cassette in place and locked by cassette clamp. • At least 1 sample in the cassette and at least 1 empty position in the cassette. • Optosensors are turned on. |

Table 9.1 Test Loop Requirements

10 List of Errors

This chapter explains the errors that may occur during operation. This list contains only the most common errors and is not complete. Many other errors exist, but normally only occur during development.

If an error occurs, note the complete error code. It consists of 3 x 3 digits, separated by dots. This helps the Bruker help desk to identify the error and solve the problem.

If you are in doubt of the error number, save the log files on a USB stick as written in ["Service and Maintenance" on page 113](#).

In addition to the errors written in the User Manual, the following errors can also occur:

| Error Code | Description |
|-------------|----------------------------|
| 122.310.001 | BIS informations not found |
| 101.410.148 | Missing BIS |

- The device could not read it's BIS (Board Information System) information successfully. System halted as this information is essential.

| Error Code | Description |
|-------------|--|
| 101.310.015 | Bad BIS contents, missing \$BIS. |
| 101.310.016 | Bad BIS contents, missing \$PRD or \$PRODUCTION. |
| 101.310.017 | Bad BIS contents, missing \$NAM or \$NAME. |
| 101.310.143 | Bad BIS contents, missing \$UPG or \$UPGRADE. |
| 101.310.409 | Bad BIS contents, missing \$REP or \$REPAIR. |

- BIS content is not valid, essential entries are missing The device cannot be used any more because some of its components could not be identified correctly.

| Error Code | Description |
|-------------|-------------------------|
| 101.310.403 | Invalid BIS identifier. |
| 101.310.404 | Invalid BIS data. |

- BIS information is corrupt. The device cannot be used any more because some of its components cannot be identified correctly.

| Error Code | Description |
|-------------|--|
| 101.310.028 | The firmware file you have downloaded has internal errors or is corrupt. Get another copy of the firmware and try again. |

| Error Code | Description |
|-------------|--|
| 101.410.146 | Firmware is not compatible with Part No. XX. |

- The firmware found on the device is not compatible with this device part number. Device has been halted.
 1. Download correct firmware to this device.
 2. Check if the device BIS information is correct.

| Error Code | Description |
|-------------|--|
| 101.310.018 | Devices running on Windows Desktop (2000, XP, Vista...) cannot be updated with the firmware updater. |
| 101.310.407 | Firmware update is not supported on desktop systems. |

- Firmware update not possible. Devices running on Windows Desktop (2000, XP, Vista...) cannot be updated in this way.

| Error Code | Description |
|-------------|---|
| 101.310.147 | Cannot communicate with sub device <NAME>. |
| 101.310.227 | CAN open protocol timeout. |
| 101.310.299 | CAN open protocol timeout. |
| 101.310.179 | CAN open protocol timeout. |
| 101.310.181 | CAN open protocol timeout by upload. |
| 101.310.182 | CAN open protocol timeout by upload. |
| 101.310.184 | Invalid SCS. |
| 101.310.185 | Toggle bit not alternated. |
| 101.310.186 | SDO protocol timed out. |
| 101.310.214 | CAN open protocol timeout. |
| 101.310.216 | CAN open protocol timeout. |
| 101.310.218 | CAN open protocol timeout. |
| 101.310.220 | CAN open protocol timeout. |
| 101.310.222 | CAN open protocol timeout. |
| 101.310.224 | CAN open protocol timeout. |
| 101.310.414 | Cannot communicate with sub device <NAME> after pre-operational firmware upgrade. |
| 101.410.044 | General protocol or communication error. |

- A sub-component (e.g. slave board) did not answer a request from the master in the accepted time or answer was erroneous.
 1. Check internal communication cable connections to the sub-device.
 2. Check if the sub-device is active.
 3. Send the log file to the Bruker help desk and restart device.

| Error Code | Description |
|-------------|----------------------------------|
| 101.310.474 | Touch screen calibration failed. |

► The touch screen calibration could not be terminated successfully.

1. Try again.

| Error Code | Description |
|-------------|--------------------------------|
| 101.310.600 | General Firmware Update Error. |

► An unknown error occurred during the firmware update.

1. Do not restart.
2. Try firmware update again.
3. Otherwise, reprogram using service tools or exchange CPU module.

11 Service and Maintenance

11.1 Software

Information exchange is accomplished via a USB memory stick which has sufficient free space and is FAT32 formatted.

11.1.1 Device Report File

The SampleXpress creates many log files automatically. By placing a USB stick into the USB port at the back of the control panel, these log files can be copied to the USB stick so they can be sent to the Bruker help desk.

1. Stop all automatic actions.
2. Plug the USB memory stick into the USB port on the rear left side of the device.
 - The 7-segment display will show "UB"
 - The application software searches for service files on the USB memory stick. This may take several minutes. Normally there is no service file available (see ["Service File" on page 114](#)).

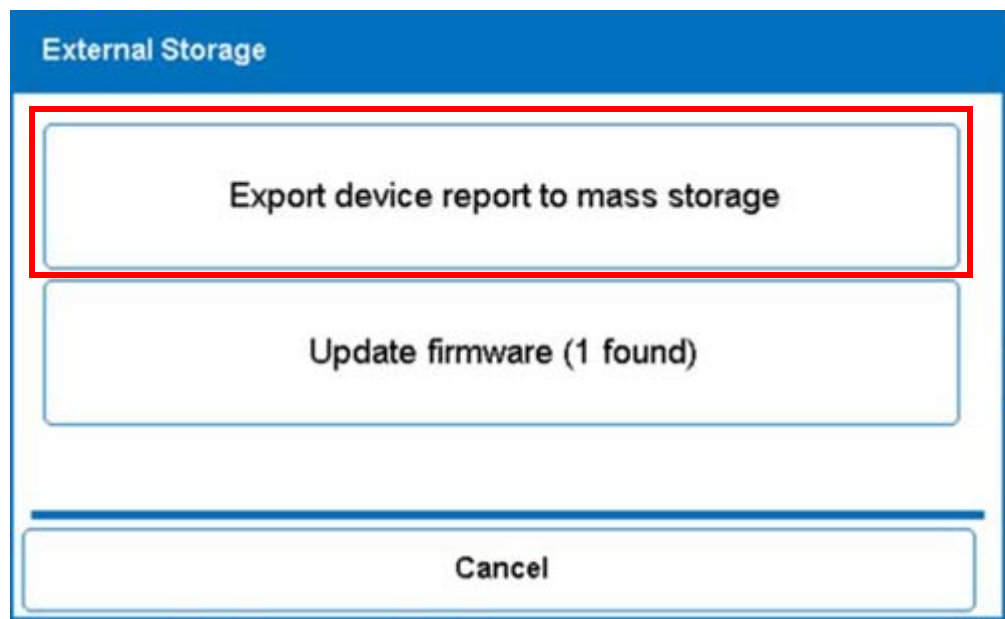


Figure 11.1 External Storage Display

3. Select „Export device report to mass storage“.
 - A window will appear which shows that the Device Report File has been copied to the memory stick.
 - When the device is ready, the indicator lamp switches to green or blue and the 7 segment display will show "30".
4. Disconnect the USB memory stick from the device.
5. Send the memory stick containing the service file to Bruker customer service.

i The file is saved in the directory \Bruker\Automation\logs\ on the USB stick. The file name consists of device name, model number, serial number, date (YYYYMMDD) and time (hhmmss),

e.g. X:\Bruker\Automation\logs\SampleXpress_modelno_serialno_YYYYMMDD_hhmmss.log.

The file name contains the serial number XXXX and the the internal date and time from the SampleXpress.

i The log file is written only if no service file (see "Service File" on page 114) is available for this device on the USB memory stick.

11.1.2 Service File

Bruker customer service can send a service file to carry out maintenance automatically. The service file is valid only once for a specific device (based on the P/N and serial number). You can download a new service file for this SampleXpress from our FTP server:

<ftp://ftp.bruker.de/pub/nmr/AUTOMATION/SampleXpress/>

1. Stop all automatic actions.
2. Plug the USB memory stick into the USB port on the rear left side of the device.
 - The 7-segment display will show "UB".
 - The application software searches the service files on the USB memory stick. This may take several minutes.
 - The indicator lamp switches to "yellow". The processes written in the service file will be executed. Be patient, this may take some time, do NOT disconnect the USB memory stick.
 - When the device is ready, the indicator lamp switches to green or blue and the 7 segment display will show "30".
3. Disconnect the USB memory stick from the device.

11.1.3 Firmware Upgrade

You can download new SampleXpress firmware versions from our FTP server:

<ftp://ftp.bruker.de/pub/nmr/AUTOMATION/SampleXpress/>

Copy the firmware file to a USB stick and insert the USB stick into the USB port on the back of the control panel. The stick will be recognized and will be searched for new firmware data. After you have selected the corresponding firmware file you want to download, please be patient. The download procedure might take up to 5 minutes.

Note: Make sure that the power supply is not cut off during the entire procedure.

The firmware update can be done using a service file, as described in the following section, or manually as described in "Upgrading Firmware Manually" on page 116.

11.1.3.1 Upgrading Firmware Using a Service File

1. Stop all automatic actions.
2. Plug the USB memory stick in the USB port on the rear left side of the device.
 - The 7-segment display will show "UB".
 - The application software searches the service files on the USB memory stick. This may take several minutes.
 - The indicator lamp switches to "yellow". Be patient, the download sequence may take some time, do NOT disconnect the USB memory stick.
 - While the firmware is being downloaded, the following patterns will occur on the 7-segment display:

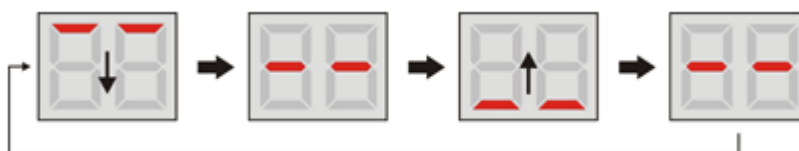


Figure 11.2 Firmware Download Pattern Part 1

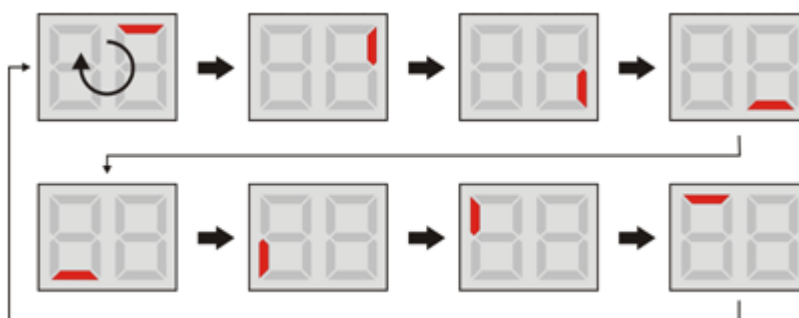
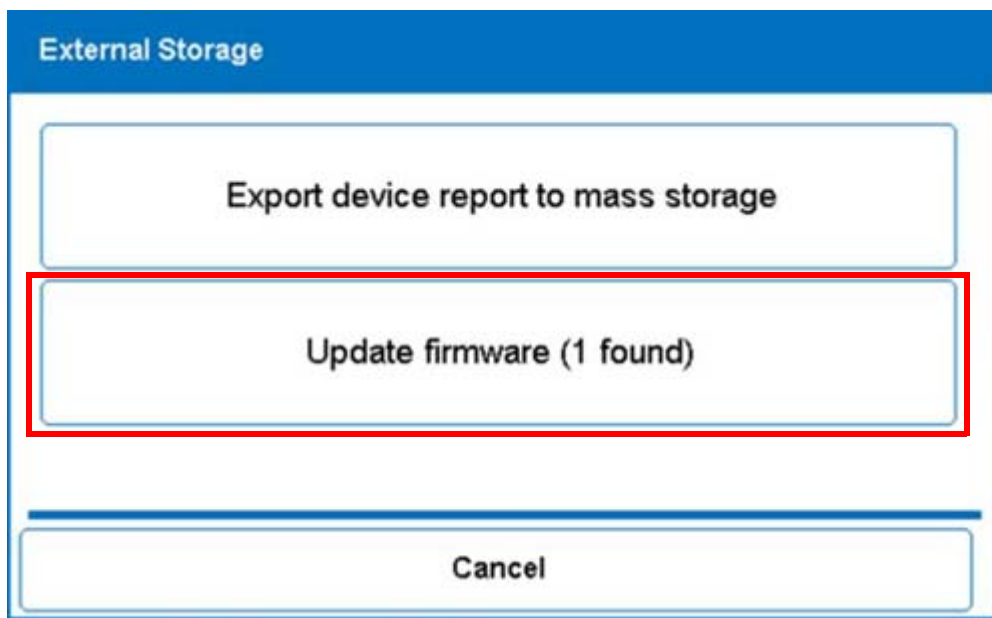


Figure 11.3 Firmware Download Pattern Part 2

- ▶ When the device is ready, the indicator lamp switches to green or blue and the 7-segment display will show "30".
- 3. Disconnect the USB memory stick from the device.

11.1.3.2 Upgrading Firmware Manually

1. Stop all automatic actions.
2. Plug the USB memory stick in the USB port on the rear left side of the device.
 - ▶ The 7-segment display will show "UB".
 - ▶ The application software searches the service files on the USB memory stick. This may take several minutes. Be sure that there is NO service file for this SampleX-press available on the memory stick.
 - ▶ The following window will appear:



3. If there is at least one firmware file found on your memory stick, the button „Update,,,“ will be enabled. Press this button.
 - ▶ A new window will appear.
4. Select the firmware file you want to download.
 - ▶ The download procedure will begin.
 - ▶ The indicator lamp switches to "yellow". Be patient, the download sequence may take some time, do NOT disconnect the USB memory stick.
 - ▶ While the firmware is being downloaded, the following patterns will occur on the 7-segment display:

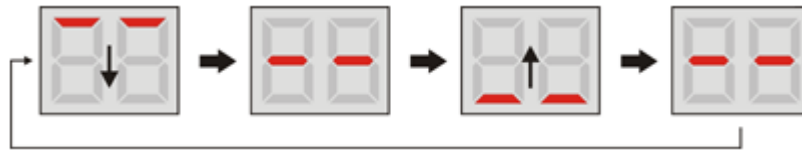


Figure 11.4 Firmware Download Pattern Part 1

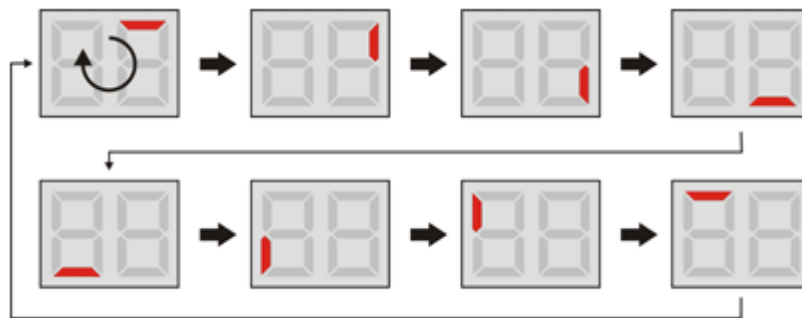


Figure 11.5 Firmware Download Pattern Part 2

- When the device is ready, the indicator lamp switches to green or blue and the 7-segment display will show "30".
5. Disconnect the USB memory stick from the device.

i **Note:** NEVER interrupt the power supply during download, even if you have selected an incorrect file. Wait until the download has completed and then start a new download. Interrupting the power supply during download can set the system into a state where only the production department can re-program the SampleXpress. In this case you have to remove the control panel and send it back for repair.

11.2 Hardware Service

Here is a list of possibly defective parts with their corresponding part numbers.

Information

Please check if there is any other part number written on the defective part itself. It is possible that this manual does not reflect the newest development state!

A service engineer in the field should only exchange the following units. It is not recommended to open these units and exchange sub-parts of them.

| Part Number | Description |
|----------------------------------|--|
| HZ16017 | Height & Level Adjustment Kit. |
| H15020 | Control Panel. |
| H15030 | Control Panel Support Arm. |
| H15010 | Base Plate with Control Panel and Support Arm. |
| H15040 | Base Unit. |
| H15050 | Cassette (without cover). |
| HZ16216 | Cassette Cover. |
| HZ16796 (7m) or HZ16797 (15m) | Power Supply Cable Set. |
| HZ16836 | BST Interface Cable Set. |

Only the following parts in the base unit should be exchanged as a complete block by a service engineer

| Part Number | Description |
|-------------|--------------------------------|
| H14216 | Status Light Board. |
| H15044 | Motor Unit including Gear Box. |
| H15048 | Pneumatik Chip. |

11.2.1 Exchanging the Complete Base Unit

The base unit contains the SampleXpress "Rating Plate" with the serial number of the whole device. Please do not exchange the blue plastic cover, so that the repaired device will hold its "old" serial number.

11.2.2 Exchanging the Complete Control Panel

The Control Panel contains the BIS with the serial number information of the device. After you have exchanged it, reprogram the correct serial number into the Control Panel. The correct serial number can be read from the type label at the mains connector of the base unit.

12 Technical Data

12.1 General Information

| Data | Value | Unit |
|---|-------|------|
| Weight without cassette | 17 | kg |
| Weight with 60s cassette (without any sample) | 25 | kg |
| Length | 85 | cm |
| Width | 65 | cm |
| Height | 50 | cm |

Table 12.1 Technical Data: General Information

12.2 Operating Conditions

Environment

| Data | Value | Unit |
|--|-------|------|
| Temperature range | 5-30 | °C |
| Relative humidity at 31 °C, maximum | < 80 | % |
| Decreasing linear till relative humidity < 50% at 40 °C, maximum | < 50 | % |

Table 12.2 Operating Environment

For the appropriate temperature see also the Bruker site planning guides on the BASH CD (Bruker Advanced Service Handbook):

| Manual | Bruker Part Number |
|--|--------------------|
| Site Planning for AVANCE Systems 300-700 MHz (UM) | Z31276 |
| Site Planning for AVANCE Systems 750 -950 MHz (UM) | Z31686 |

Table 12.3 Bruker Site Planning Guides

12.3 Connection Values

Electrical

| Data | Value | Unit |
|-------------------------------------|----------------------|------|
| Voltage | 208 - 230 | V C |
| Apparent power consumption, maximum | 120 | VA |
| Circuit protection | 2 x 1.0 Slow Blow | A |
| Frequency | 50/60 | Hz |

Table 12.4 Electrical Connection Values

Pneumatic

| Data | Value | Unit |
|-------------------------------------|-------|-------------------|
| Operating pressure | 4-7 | bar |
| Compressed air requirement, minimum | > 100 | l/min. |
| Oiling, maximum | 0.005 | mg/m ³ |

Table 12.5 Pneumatic Connection Values



Pressure supply above 7 bar will be repressed to avoid damage to the SampleXpress.

12.4 Rating Plate

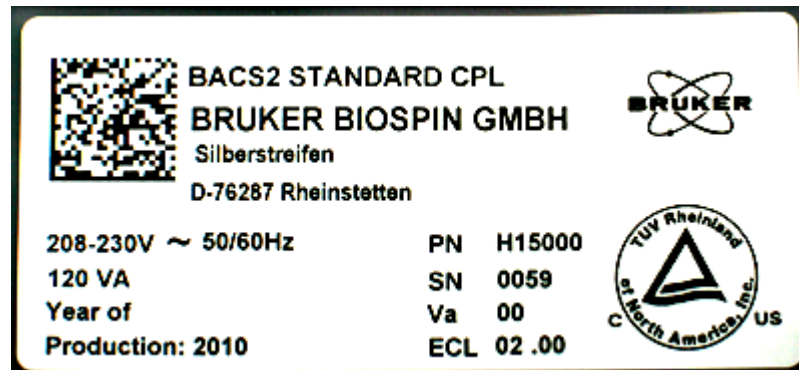


Figure 12.1 Rating Plate

The rating plate is located at the power input and includes the following information:

- Manufacturer
- Type
- Voltage
- Frequency
- Apparent power consumption, maximum
- Year of Production
- PN: Part Number
- SN: Serial Number
- Va: Variant
- ECL: Engineering Change Level

12.5 Sample Usage

SampleXpress can handle any type of sample with standard spinner geometry:

- Standard NMR tubes (3-10 mm).
- Melted reference samples.
- Match spinner (1, 1.7, 2, 2.5, 3, 4, 4.25, and 5 mm).
- Shuttle POM for sample tubes 1-1.7 mm.
- Dummy samples.



Figure 12.2 Samples Allowed: Maximum 7" (180 mm)

Samples with or without horizontal barcode labels can be used.

The maximum allowed sample height is 7" (180 mm).

The sample is handled at the spinner only!

The long probe (exceeding 180 mm) shown in the following figure can not be used in the SampleXpress!:



Figure 12.3 Example of a Sample That Cannot be Used in SampleXpress

13 Parts List

13.1 Replacement Parts

| Part Number | Description |
|-------------|-------------------------------------|
| H15040 | BACS2 Main Unit Standard Complete |
| H15020 | BACS2 Control Panel Complete |
| H15050 | BACS2 Cassette 60 Standard Complete |
| HZ16216 | BACS2 Cassette Top Cover |

Table 13.1 Bruker Replacement Parts

Replacement parts must be exchanged by Bruker service staff! The only exception is the cassette.

Only original parts from Bruker are to be used for the SampleXpress. Use of any parts other than from Bruker invalidates all warranty.

Parts which are returned to Bruker for repair or disposal must be accompanied by a repair declaration (refer to the user manual for the correct form).

14 Cleaning and Disposal

14.1 Cleaning

14.1.1 Before Cleaning

Personnel: Laboratory personnel

1. Stop the submitted jobs in the IconNMR automation mode.
2. Stop the SampleExpress from doing any actions.
3. Switch power off (see "[Switching Off the Device](#)" on page 59).
4. Disconnect the power supply ([Figure 14.1/3](#)).



Figure 14.1 Base Unit Left Side Electrical Connections

14.1.2 Outside of the SampleXpress Chassis and Units

Do not use any detergent or other cleaning solvents. Only use water or neutral cleaning fluids. Usage of volatile cleaners like thinner or benzene may damage the surface of the unit.

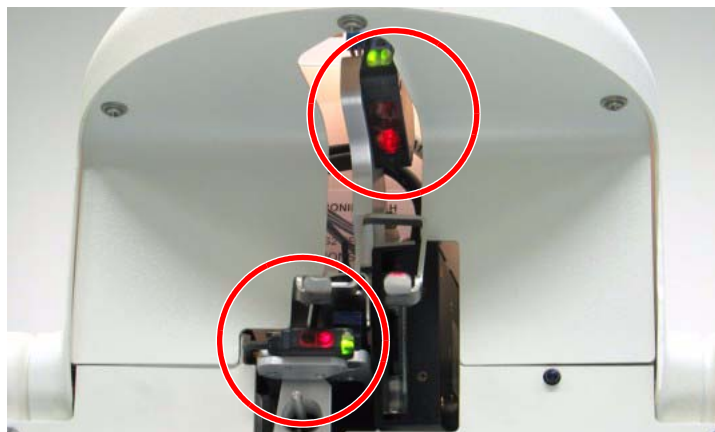
- Clean the outside of the SampleXpress chassis and units with a soft, lint-free cloth dampened in water.

i Wait until the unit is completely dry before you reconnect the line plug.

14.1.3 Outer Shell of the Device

- Do not use acetone for cleaning.
- Use only water as a cleaning fluid.
- Do not disassemble the device for cleaning. Do not use acetone for cleaning.
- Clean only the outer shell of the device with a lint-free cloth dampened in water.

14.1.4 Magazine Light Barrier



Clean the magazine light barrier with warm water and a damp lint-free cotton cloth or towel.

Figure 14.2 Magazine Light Barriers

i Excessive dust or dirt at the lens surface of the optics reduces the optics recognition performance.

- Keep these surfaces clean.

14.1.5 Cassette

1. Remove the cassette.
 2. Lift the cassette cover.
 3. Clean the magazine with warm water and a damp lint-free cotton cloth or towel.
-

i Let the cassette dry before using.

14.1.6 Other Cleaning Operations

For all other cleaning operations contact your authorized Bruker service station for advice and support. It may be necessary to send in the device for a cleaning service.

No special precautions have been taken in SampleXpress to avoid contamination from a leaking sample tube. Bruker accepts no responsibility for any damage which may occur when samples are used containing radioactive or other hazardous materials.

In case of an accident with toxic, radioactive, explosive, or biologically active substances, the device and associated equipment must be cleaned in such a way that no danger emanates from the device and associated equipment, especially for all uninformed personnel. If a device has to be cleaned of all remains of a substance for safety reasons, contact your authorised service station for advice and support.

Note that in serious cases it may be necessary for the owner to properly dispose of the device and replace it with a new one.

Repair Declaration Form

Use the Repair Declaration Form, whenever a device might be exposed to hazardous substances by customers, when it is to be returned to Bruker.

14.2 Disposal

Following the end of its useful life, the device must be dismantled and disposed of in accordance with the environmental regulations.

i Installation, initial commissioning, retrofitting, repairs, adjustments or dismantling of the device must only be carried out by employees of the manufacturer or persons authorised by the manufacturer.

14.3 Safety

Electrical System



WARNING

Electrical hazard from electrical shock!

A life threatening shock may result when the housing is open during operation.

- ▶ Disconnect the device from the electrical power supply before opening the device. Use a voltmeter to verify that the device is not under power!
- ▶ Be sure that the power supply cannot be reconnected without notice.

Improper Dismantling



WARNING

Danger of injury due to improper dismantling!

Stored residual energy, angular components, points and edges on and in the device or on the tools needed can cause injuries.

- ▶ Ensure sufficient space before starting work.
- ▶ Handle exposed, sharp-edged components with care.
- ▶ Dismantle the components properly.
- ▶ Secure components so that they cannot fall down or topple over.
- ▶ Consult the manufacturer if in doubt.

14.4 Dismantling

Before starting dismantling:

- Shut down the device and secure to prevent restarting.
- Physically disconnect the power supply from the device; discharge stored residual energy.
- Remove consumables, auxiliary materials and other processing materials and dispose of in accordance with the environmental regulations.
- Dismantle the device by following the installation instructions in reverse.

Clean assemblies and parts properly and dismantle in compliance with applicable local occupational safety and environmental protection regulations.

14.5 Disposal Instructions

If no return or disposal agreement has been made, send the dismantled components for recycling.

- Scrap metals.
- Send plastic elements for recycling.
- Sort and dispose of other components in accordance with their material composition.

NOTICE

Danger to the environment from incorrect handling of pollutants!

Incorrect handling of pollutants, particularly incorrect waste disposal, may cause serious damage to the environment.

- ▶ Always observe the instructions below regarding handling and disposal of pollutants.
- ▶ Take the appropriate actions immediately if pollutants escape accidentally into the environment. If in doubt, inform the responsible municipal authorities about the damage and ask about the appropriate actions to be taken.

15 Contact

Manufacturer:

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

NMR Hotlines

Contact our NMR service centers.

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

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

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

SampleXpress Installation Acceptance Form

Fill out this form completely and sign it together with the customer!

Spectrometer Order Number: _____

Magnet Type (e.g. 600 MHz unshielded): _____

Dewar Type (e.g. D345): _____

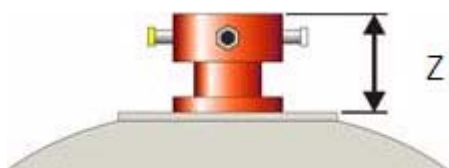
Does the magnet have a Drop-Off Plate on top? Yes No

BST Part Number (e.g. Z9234) _____

BST Serial Number: _____

BST ECL: _____

Distance Z from the BST upper level to the magnet upper level (mm): _____



If the magnet has a Drop-Off Plate in the area of the SampleXpress, make sure that this Drop-Off Plate can open up to at least 45° to a horizontal line. If you are unsure, use the 50 mm level extension column between the SampleXpress and the BST.

50 mm level extension column P/N: H121852 installed? Yes No

Can the Drop-Off Plate open at least up to 45° to a horizontal line? Yes No
If no, the installation must be aborted and the SampleXpress must be demounted. Take some photos and contact Bruker Germany for further help!

Lift adjusted for smooth sample transport? Yes No

User Manual P/N Z31900 given to the customer? Yes No
Note: The user manual contains important safety information about running the SampleXpress in your lab!

Control Panel pivot adjustment lever installed? Yes No
Note: Changing the pivot might change the shim.

- Functionality check: OK Not OK
- Adding samples to the cassette: OK Not OK
- Inserting a sample into the magnet using command "sx": OK Not OK
- Replacing a sample in the magnet using command "sx": OK Not OK
- Ejecting a sample from the NMR magnet using command "sx ej": OK Not OK
- Removing samples from the cassette: OK Not OK
- The installation is complete and the SampleXpress is running well: Yes No

Lines for remarks:

Signatures:

Installation Engineer Name: _____ Date: _____ Signature: _____
 Customer name: _____ Date: _____ Signature: _____

Appendix A

A.1 Warning Signs

C

Caution

| | |
|--|----|
| Accident and material damage hazard from falling objects. | 20 |
| Accident hazard from bright LED light. | 22 |
| Accident hazard from contact with hot or cold surfaces on the unit. | 23 |
| Accident hazard from falling from ladder. | 17 |
| Accident hazard from hot or cold air escaping out of the unit. | 23 |
| Accident hazard from loose clothing caught in magazine chain. | 20 |
| Accident hazard from movement of mechanical parts. | 20 |

D

Danger

| | |
|---|----|
| Danger of injury from glass tube breakage! | 24 |
|---|----|

N

Note

| | |
|---|----|
| Only trained Bruker personnel are allowed to mount, retrofit, repair, adjust and disassemble the unit! | 15 |
| The identification and placement of warning labels should be included in the manual. | 28 |

Notice

| | |
|---|----|
| Material damage due to a software error. | 17 |
| Material damage due to the use of genuine samples during installation and maintenance! | 18 |
| Material damage hazard due to impacting the magnet. | 18 |
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W

Warning

| | |
|---|---------|
| Accident hazard from asphyxiation. | 21 |
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A.4 Glossary

| | |
|-------------|------------------------------------|
| BSMS | Bruker Smart Magnet Control System |
| BST | Bruker Sample Transport |
| NMR | Nuclear Magnetic Resonance |
| SLCB | Sample Level Control Board |

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