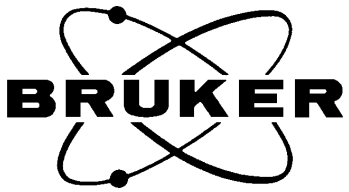

NMR CASE ™

Trouble Shooting Guide

BRUKER

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1. Sample Eject (Lift) Problems

1.1 Sample lift air flow

When ejecting the sample, it must come up with speed (within 10 seconds) and climb all the way to the top of the NMR Case. There must be enough airflow so that the top of the spinner is pressed against the sample stop head on top of the sample tray.

If the sample creeps up very slowly and barely reaches the sample stop, then the sample lift airflow must be increased. There is a dedicated method on how to adjust the sample lift airflow within the NMR console. It is done either by software or with the BSMS. Do not increase the console main air pressure. Read the corresponding manual on how to adjust the sample lift airflow (or ask Bruker for assistance).
In case the sample lift airflow needs to be increased fully to its maximum, then there is possible an air leak. Read and follow sections 1.3 to 1.8 to find the fault.

1.2 Sample holder tray slamming

If the sample holder tray slams when advancing, it may need more sample lift air than necessary. See section 5 for adjustments.

1.3 Light barrier

There is a light barrier built into the top part of the BST shim stack, It slows down the sample lift. Use the sample control modifier cable P/N B1428 to disengage the light barrier. Read the instruction sheet P/N B2300.

1.4 Seals

To avoid sample lift air leaks, the following four seals must be properly installed (see installation manual Figure 1, page 17):
1. Inside the adapter collar: one O-Ring.
2. On top of the adapter collar: one flat rubber seal.
3. Inside the large white round ring plate: one flat rubber seal.
4. One white or brown seal ring on top of the large white round ring plate.

1.5 Seating of the adapter collar

Check that the adapter collar is seated correctly on top of the BST shim stack. The lower end of the collar must be flush with the lower end of the top large portion of the BST.

1.6 Alignment of the adapter collar, seal ring and brown interface tube.

The adapter collar, seal ring and brown interface tube inside the collar must be aligned. Loosen the three screws of the collar and insert the gray safety ring through the seal ring into the brown interface tube. The safety ring serves as alignment tool. Tighten the three screws again and remove the safety ring.

1.7 Sample lift air bypass

There is a small pneumatic cylinder located inside aluminum housing underneath the NMR Case base plate (see Figure 2 and Figure 3). This cylinder opens and closes a sample lift air bypass exit hole, located in the adapter collar. Check for the correct closing of this bypass exit hole.
If the bypass exit hole is not closed completely, the sample will not eject to the top of the sample tray, but will sit on top of the BST instead.

1.8 Interface tube inside the adapter collar

Inside the adapter collar is a tube, which interfaces the adapter collar with the BST shim upper stack (see Figure 2 and 3 at the end of this manual and Figure 3 at the end of the installation manual). The correct seating of the adapter collar and the interface tube is critical for the reliability of the sample changer.

To check the seating, first remove the 3 screws and then remove the NMR Case base plate, leaving only the collar in place. Check that the bottom of the collar is flush with the BST. Check that the interface tube is flush with the top of the collar. Check that the five fingers of the interface tube are not bent inwards and block the inside diameter of the BST.

See figure 4 at the end of the installation manual for the correct seating. See figure 5 at the end of the installation manual for the incorrect seating.

If the collar cannot be seated correctly, then check the BST top head for parts sticking out (labels or covers).

If the O-ring does not engage onto the BST (it feels too tight), then apply some silicone grease onto the O-ring inside the collar.

If the interface tube is not flush with the top of the collar, then it may be an old version (made from brown plastic). Replace it with a new version made from black metal (Part number B3695).

If the inner diameter of the interface tube seems to be too small, then it may be an old version (made from brown plastic). Replace it with a new version made from black aluminum metal (Part number B3695).

2. Sample Insert (down) Problems

2.1 NMR Case or magnet not level

The shim stack must be vertical and the NMR Case horizontal aligned. Check it with the circular level (supplied with the tool kit). The bubble must be inside the innermost ring. Adjust the magnet stand and the telescopic front feet as necessary.

2.2 BST shim stack with sharp edges

On top of the BST, where the samples are inserted, there are some cutouts located on the inside diameter. Some cutouts have sharp edges. If this is the case (check it with a finger), either replace the BST or remove the sharp edges with a file.

2.3 Sample lift air bypass

After changing a sample, the new sample should stays on top of the sample holder tray for a short moment, before it is rapidly inserted into the BST (within 2 seconds).
There is a small pneumatic cylinder located inside aluminum housing underneath the NMR Case base plate (see Figure 2 and Figure 3). This cylinder opens and closes a sample lift air bypass exit hole, located in the adapter collar. Check for the correct opening and closing of this bypass exit hole.
If the bypass exit hole is not open completely, the sample does not get inserted fast enough into the BST and may get stuck on top of the BST.
If the bypass exit hole is not closed completely, the sample will not eject to the top of the sample tray, but will sit on top of the BST instead.

2.4 Too much sample lift air flow

If the sample lift airflow is excessive large, then the sample is not inserted rapidly into the BST as described in 2.2 above, despite the open bypass exit hole. The samples may get stuck on top of the BST.
Reduce the sample lift airflow.

See section 1.1 of this manual on how to adjust the sample lift airflow for a good sample lift within 10 seconds.
If the sample lift airflow needs to be excessive large, then check section 1.2 and 1.4 for possible faults.

2.5 Sample holder tray does not advances firmly

The sample holder tray must advance with some speed and should be stopped firmly in the next position. If the sample holder tray just creeps forward slowly and hesitantly, then the next openings for the sample may not be aligned properly and the sample may get stuck. Although the NMR Case is factory adjusted, this specific adjustment is air pressure dependent and therefore may need some tweaking at the installation site.

Check that the bottom of the sample holder tray is clean and free of foreign debris like sticky tape, glue from tape or staplers.

Check that the 3 white round plates located on the NMR Case base plate are clean and free of foreign debris like sticky tape, glue from tape or staplers parts.

Switch off the motion controller and push the black pin on the side to the inside out of the way. Mount the sample holder tray and check for smooth rotation by hand. It should not go easy, but with a constant force and without steps.

If the sample holder tray rotates smooth, then increase the airflow for the pneumatic piston by adjusting flow reducers # 4. It is located underneath the NMR Case base plate, on a manifold (see Figure 3). Use a small screwdriver and turn the adjustment screws counter clockwise (CCW) out by quarter turn increments. Check for the firm advancement and turn further out if necessary. If there is no change in the sample holder tray advancement, then turn flow reducer # 3 out counter clockwise (CCW) by quarter turn increments as well.
However the airflow should not be increased too much or the sample holder tray will slam the sample tubes. See section 5 of this manual.

2.6 Alignment of the adapter collar, seal ring and brown interface tube.

Check the alignment according section 1.6 of this manual

2.7 Interface tube inside the adapter collar

Check it according section 1.8 of this manual.

3. The sample holder tray does not advance.

3.1.1 **Most common cause: a sample has been removed manually or the NMR Case has been used in manual mode**. **Press the RESET button while the sample lift is OFF** to clear the sample tracking memory.

3.1.2 Increase the airflow for the pneumatic pistons by adjusting the flow reducers # 1,2,3,4. They are located underneath the NMR Case base plate, on a manifold (see Figure 3). Use a small screwdriver and turn the adjustment screws counter clockwise out by one turn each.

3.1.3 Open the motion controller (see section 4.1.1). Observe the turn ON/OFF sequence of the green LED lights. The upper row of lights is marked I (Input), the lower row of lights is marked O (Out).

Events	LED sequence	
Sample goes up (eject)	ON	I - 1, 3, 2, 0
Sample holder tray rotates	ON	O - 1, 0
Sample goes down (insert)	OFF	I - 0, 2, 3, 1
Rotating mechanism resets	OFF	O - 1, 0
Air ON (always ON)	ON	O - 2
Next sample is inserted	ON	O - 3
No sample is inserted	OFF	O - 3
Reset button depressed	ON OFF	I – 4 O - 3

3.1.4 Check that I - 0 is turned ON when the sample is on top of the sample holder tray. The sample holder (spinner) must be pressed up firmly against the sample stop head of the tray by the sample lift air. This turns on I –0. If there is a gap between the spinner and the stop head, then I – 0 is not turned ON and the motion controller does not rotate the sample holder tray. Increase the sample lift airflow according section 1.1.

3.1.5 Check that I-3 is ON **before** I-0 is ON when ejecting the sample. If I-3 is ON after I-0 or does not come ON at all, then the motion controller does not rotate the sample holder tray. The reason is that the sample lift airflow is too high and the sample shoots up too fast. Slow down the sample lift by lowering the sample lift airflow according section 2.4 or activating the light barrier (section 1.3).

4. The motion controller does not work

4.1.1 The controller contains electrical valves, which do not work in a magnetic field. Make sure that the controller is at least 2 meters (6 feet) away from the magnet dewar cryostat.

4.1.2 Open the motion controller. First loosen the four screws of the cover by two turns counter clockwise each. Now lift up the cover up as far it goes (the cover may stick to the case, just pull on it). Finally loosen the screws all the way and pull the cover off.

4.1.3 Switch the motion controller off and on. Observe all LED lights. For the first two seconds, the LED's are:

green	red	**I**	green	green	green	green	green	green
RUN	**ERR**		**0**	**1**	**2**	**3**	**4**	**5**
Orange	red	**O**	green	green	green	green		
COM	**I/O**		**0**	**1**	**2**	**3**		

4.1.4 Two seconds after switching on:

Green		**I**						
RUN	**ERR**		**0**	**1**	**2**	**3**	**4**	**5**
		O	green		green			
COM	**I/O**		**0**	**1**	**2**	**3**		

Section 1.6

4.1.5 Four seconds after switching on:

Green		**I**						
RUN	**ERR**		**0**	**1**	**2**	**3**	**4**	**5**
		O			green	????		
COM	**I/O**		**0**	**1**	**2**	**3**		

4.1.6 If the LED O - 3 is green, then press the RESET switch. The O-3 LED should go off.

4.1.7 If there are no lights, check the power cord and the fuse. There is a spare fuse inside the fuse holder, 250V-3A slow-blow.

4.1.8 If during the first two seconds some lights are missing, or a red light is still on after two seconds, then the motion controller unit needs to be replaced.

4.1.9 To check input 0, 1, 2 and 3, blow into the corresponding sensor inputs with a short piece of Ø 4 mm hose (supplied). I-1 should come on before I-3. To check input 4, press the reset switch.

Row	LED	Input	Status	Hardware
I	I-0	SENSOR 1	Sample up, on top	Pressure sensor 1.5 " H2O PSF 100 A – 1.5
I	I-1	SL-SENSE	Sample lift air on ,low pressure	Pressure sensor 4" H2O PSF 200A dual 4/15
I	I-2	SENSOR 2	Adapter collar pressure on	Pressure sensor 0.5 " H2O PSF 100 A – 0.5
I	I-3	SL-SENSE	Sample lift air on, high pressure	Pressure sensor 15" H2O PSF 200A dual 4/15
I	I-4	RESET	Reset sample insertion memory	RESET switch at the side of motion controller

4.1.10 switching the controller on and off. During the first 2 seconds, no air comes out. After two seconds, air comes out at CYL A L-IN and CYL B RET. After four seconds, air comes out at CYL A L-OUT and CYL B RET.

Row	LED	Output	Action	Hardware
O	O-0	CYL A	Latch in	MAC valve for CYL A L – IN / L – OUT
		Connector	Indicates tray advanced	Test connector pin 7 = + 24 V / Ground = pin 5
O	O-1	CYL B	Latch extend (rotate tray)	MAC valve for CYL B EXT / RET
O	O-2	MAIN AIR	Main air on	MAC main air valve
O	O-3	Connector	Indicates sample changed	Test connector pin 3 = + 24 V / Ground = pin 5

5. The sample holder tray slams samples when advancing.

If the sample holder tray is slamming into the next position so hard that the sample tubes are shaking dangerously, then the airflow for the pneumatic piston needs to be decreased. This is done by adjusting the air flow reducer # 4, located underneath the NMR Case base plate on a manifold (see Installation manual Figure 3). Use a small screwdriver and turn the adjustment screw clockwise (CW) in by quarter turn increments. Check for slamming and turn further in if necessary.

However the airflow should not be decreased too much, or the sample holder tray will no longer advancing firmly. See section 2.5 of this manual.

6. The adapter collar cannot be removed from the BST upper stack.

The adapter collar should sit tight on the top of the BST shim stack. There is an O-ring inside the collar, which causes the tight fit. There are no screws that attach the collar to the BST shim stack. Normally the collar can be pulled off by hand, using a little force.

The BST shim stack has a serial number label glued to the outside of the cylindrical top part. The glue of this label can be the reason for a very tight fit of the collar. In this case, use a piece of wood to lever off the collar from the shim stack.

Warning: Do not use metallic tools (screwdriver). Beware of the very strong magnetic field.

To avoid this problem in the future, remove the label carefully from the shim stack and reattach it again to the lower, narrower part of the shim stack, and apply some silicon grease to the O-ring.

7. The adapter collar does not fit to the shim stack

One adapter collar for a shim upper stack type BST is included with every NMR Case.
For shim stacks other than of type BST, different adapter collars can be ordered and mounted to the NMR Case base.
Read and follow the NMR Case system requirement manual P/N B2928, section 6.

8. The NMR Case does not fit.

Read and follow the NMR Case system requirement manual P/N B2928, section 10.

9. The sample spin rate goes up to 150 Hz

Check the following to see if the problem goes away:

9.1.1 Unplug the spin rate cable connector at the BST shim stack. Check it and plug it back in.

9.1.2 Remove the BSMS sample control modifier cable B1428 (see instruction sheet B2300).

9.1.3 Check the spin rate settings.

10. Intermittent problems

The following 4 items need to be properly adjusted for a reliable long-term operation of the NMR Case.

Item	Necessary adjustments	Trouble Shooting Guide
1	NMR Case or magnet not leveled	Section 2.1
2	Sample lift air flow	Section 1.1 and 2.4
3	Sample holder tray movement	Section 2.5 or 5
4	Seating of collar and adapter tube	Section 1.8

11. Sample lift (eject) : sometimes hangs on top of the BST and does NOT go up into the NMR Case

Item	Check out	Trouble Shooting Guide
1	correct closing of the sample lift air bypass	Section 1.7
2	Seating of collar and adapter tube	Section 1.8
3	sample lift airflow	Section 1.1
4	Alignment of collar, ring, brown tube	Section 1.6
5	sample lift airflow	Section 1.1

12. Sample lift (eject) : always hangs on top of the BST and does NOT go up into the NMR Case

Item	Check out	Trouble Shooting Guide
1	sample lift airflow	Section 1.1
2	correct closing of the sample lift air bypass	Section 1.7
3	Motion controller has no power	Section 4
4	Motion controller has no air pressure	Section 4

13. Sample insert (down): sometimes hangs on top of the sample holder tray

Item	Check out	Trouble Shooting Guide
1	sample holder tray advances firmly	Section 2.5
2	correct opening of the sample lift air bypass	Section 2.3
3	too much sample lift air flow	Section 2.4

14. Sample insert (down): sometimes hangs at the white ring on top of the adapter collar

Item	Check out	Trouble Shooting Guide
1	sample holder tray advances firmly	Section 2.5
2	Alignment of collar and white ring	Section 1.6
3	Seating of collar and adapter tube	Section 1.8
4	BST shim with sharp edges	Section 2.2
5	NMR Case or magnet not leveled	Section 1.8

15. The sample holder tray does not advance away from position 0.

Cause: a sample has been removed manually or the NMR Case has been used in manual mode.

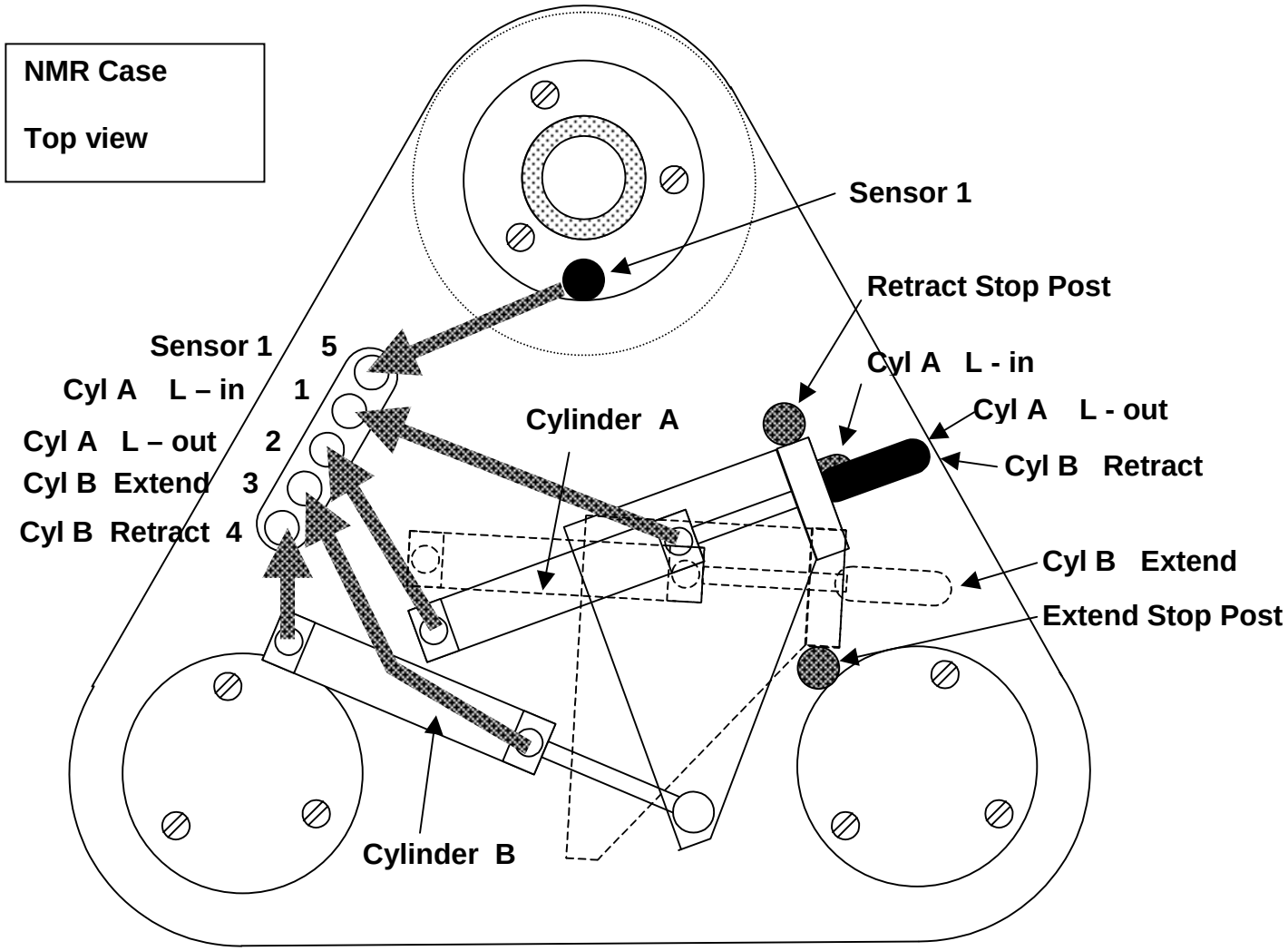
Solution: Press the RESET button (on the side of the controller) while the sample lift is OFF to clear the sample tracking memory.

Note: pressing the RESET button while the sample lift is ON does not work.

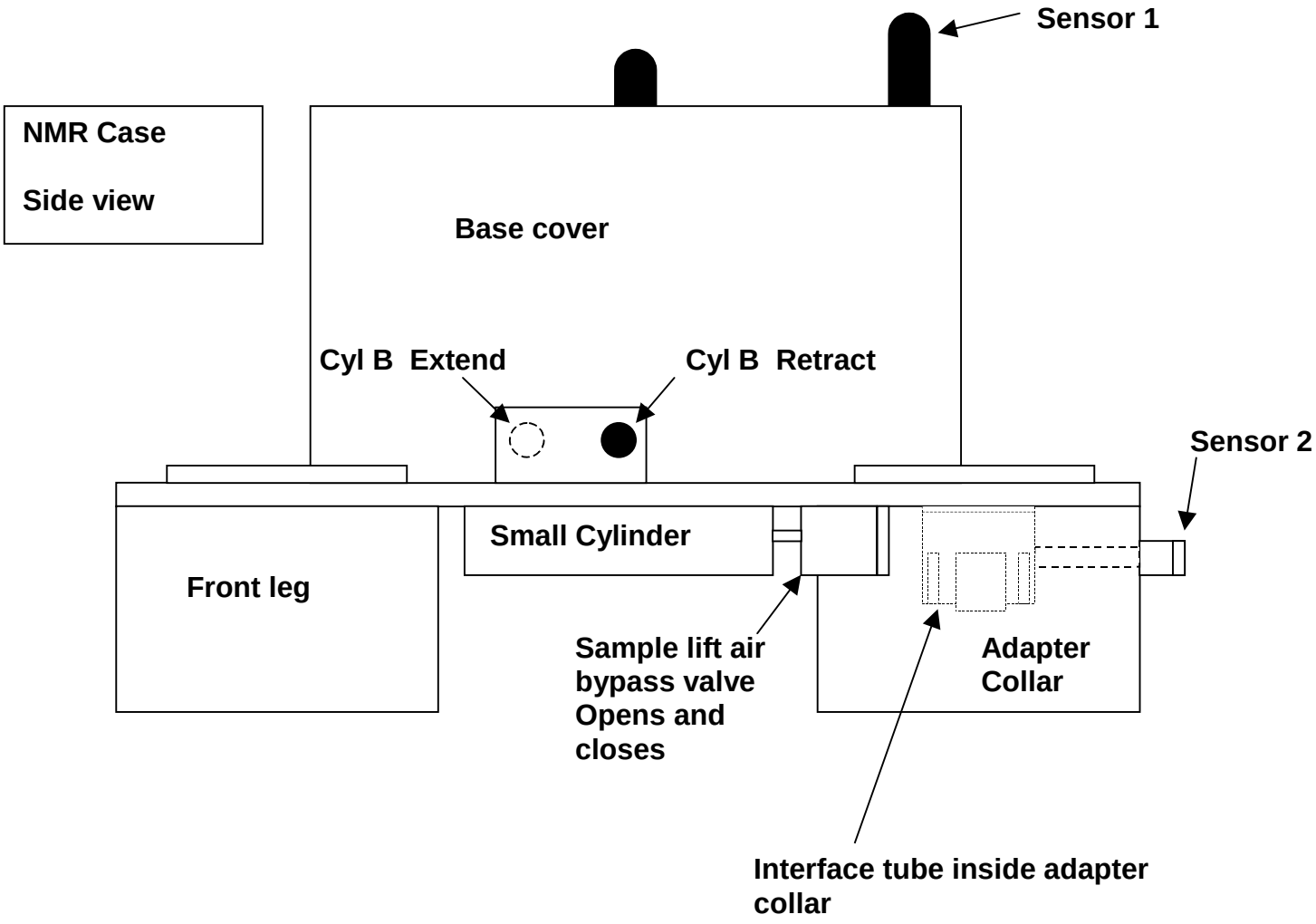
16. The black lever on the side of the NMR Case feels loose and does not move at all

Item	Check out	Trouble Shooting Guide
1	Motion controller has no power	Section 4
2	Fuse is blown	Section 4
3	Motion controller has no air pressure	Section 4

17. Figure 1: NMR Case Top View



18. Figure 2: NMR Case Side View



19. Figure 3: NMR Case bottom view