Probe Installation Manual

Phoenix NMR HX Probe

PhoenixNMR
4/5/2019

Many of the operations described herein should be completed only by a skilled individual as damage to the equipment may occur if an inexperienced individual is left to explore without guidance. This manual provides general user specific information for the PhoenixNMR HX probe product. The information contained herein is meant as a guide and knowledge of Solid State NMR general practices and procedures is assumed.

1 Terminology and symbols used within this manual

The following symbols will be used within this manual to bring your attention to instructions, warnings and procedures which pose a risk to the user, the equipment being described or to other equipment, or to the validity of the NMR data collected. Whenever you see one of these symbols to the right of a section, figure, table or instruction extra care should be taken to fully understand the material being presented prior to proceeding any further.

This symbol will be used when the user could be placed at risk of injury if the instructions given are not followed.

This symbol indicates that damage to the probe or other system components could occur if the instructions given are not followed.

This symbol will be used if there is a risk of explosion or explosive discharge.

This symbol will be used when a task or process is being described that requires validation by the user.

Band Select Elements: The “Series Capacitor” and the “Shunt” are used to select the tuning band for each of the X frequency channel.

Series Capacitor: The small plug-in element used within the probe head to select the lowest frequency tuning band for the probe configuration. This plug-in consists of chip capacitors only and does not have a solenoid coil attached to it.

Shunt: The small plug-in element used within the probe head to select the X frequency tuning band for the probe configuration. This plug-in consists of either chip capacitors or a solenoid coil.

Short Circuit: A component with the same shape and use as a Series Capacitor, but it is an electrical short. May be used in place of a Shunt, Series Capacitor or both in some tuning configurations.

Tuning Band: The range of frequencies a Series Capacitor or Shunt band select element or a given configuration is effective over. Operation outside a recommend tuning band could result in damage to equipment.

Tuning Band Selection Switch: An electrical switch built into the RF circuit allowing the tuning for the three modes of operation; High band, low band and Low gamma.

Probe Head: The section of the probe located at the end of the long thin main body, opposite from the large base box. This component contains the sample spinning system as well as the Shunt and Series Capacitor used for tuning band selection.

Probe Body: The largest component of the probe, consisting of the base box containing the Radio Frequency, Variable Temperature and Spinning system connectors. As well as the main portion of the probe shaft, the long tubular section which enters the NMR magnet.

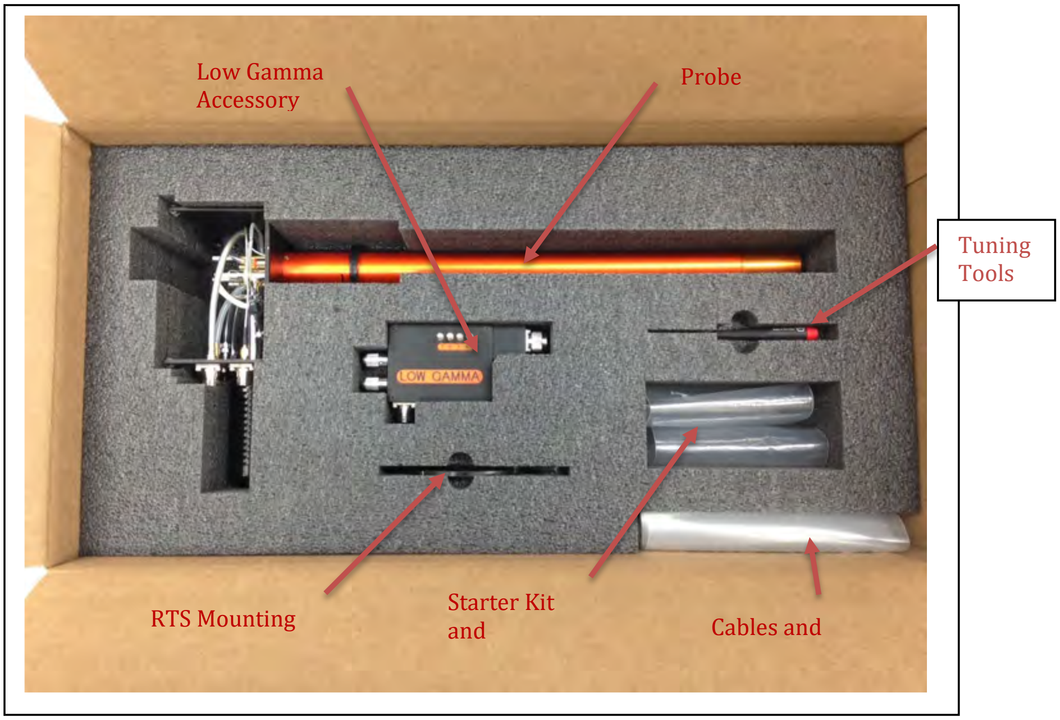
Sample Rotor: The ceramic sleeve which contains the user's sample.

Standard Sample Volume: This is the volume used for all NMR testing, shimming, pulse width, and sensitivity.

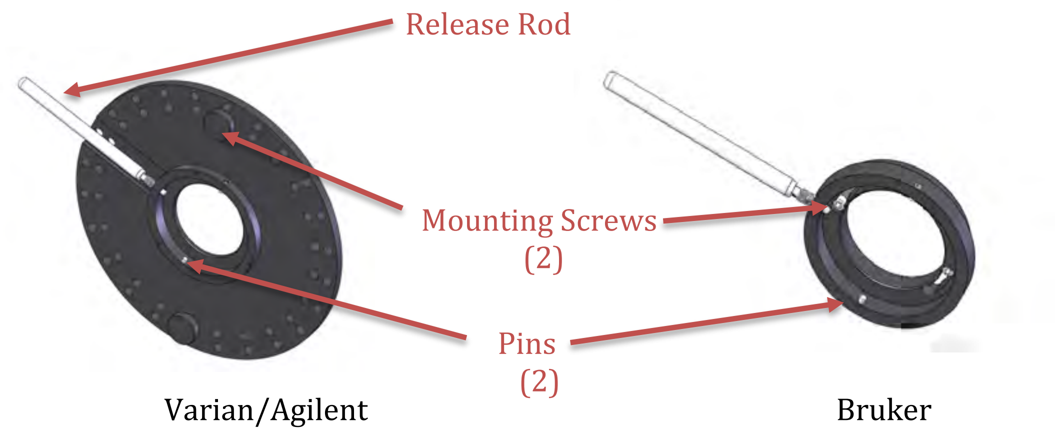
Low Gamma Box: This is the optional add on accessory which extends the low frequency channel, (X) down to ~15MHz.

2 Unpacking your probe

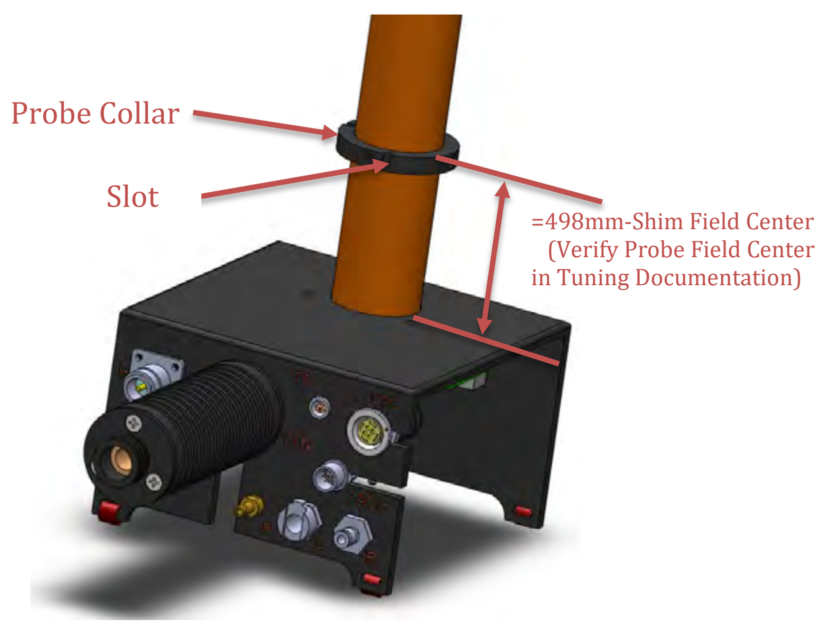
Your PhoenixNMR probe has been delivered in a custom designed box to provide proper protection during shipping. This is the ONLY approved container if your probe is returned to the factory. This box MUST be used box for shipment back to us. The crate alone is NOT sufficient for shipping protection. Please protect your investment by packing it properly as indicated in the chapter entitled "Returning your probe for repair" when transporting the probe or returning it for repair. Below is a picture of a PhoenixNMR probe storage box, your probe delivery may not contain all of the components shown below depending on the options and accessories you may have chosen.



1. The probe mounting plate is attached to the bottom of the room temperature shim using the mounting screws (2). The mounting plate comes in two versions for Bruker and Varian/Agilent room temperature shims.



2. Pull the release rod out to allow the probe collar to slide into the mounting plate. Pulling and then rotating the release rod 90 degrees will keep the release open for mounting the probe.
3. Align the slots in the probe collar while raising the probe up to the mounting plate. Rotate the probe 15degrees after insertion to engage the pins with the collar.
4. Once the probe has been engaged into the mounting plate, rotate the release rod 90 degrees to lock the probe into place.

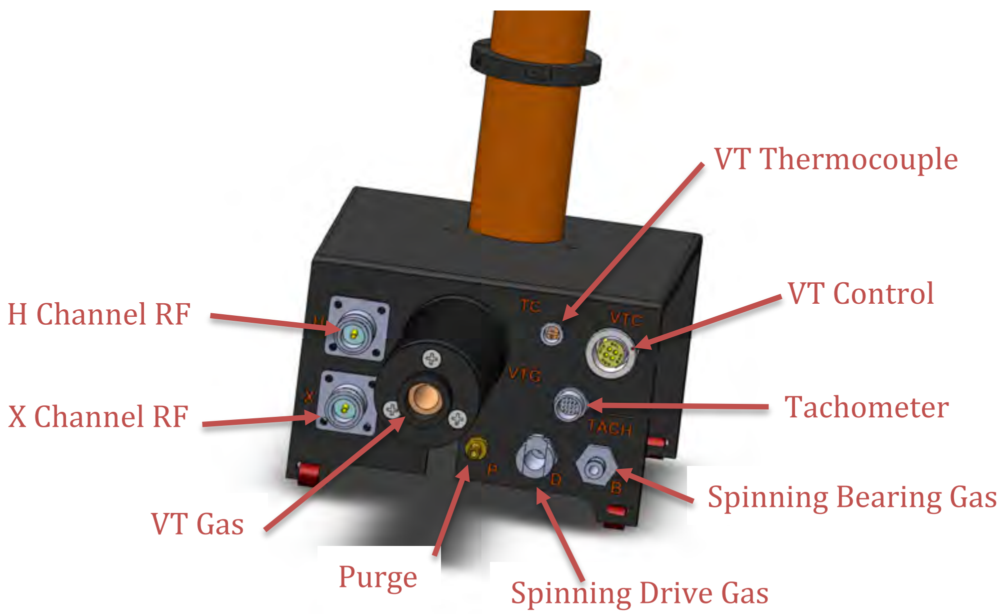


Caution *: Never place the Probe in a prone or lying down position on a bench top. This will cause damage to the top deck of the Probe and will compromise the Radio Frequency shielding as well as prevent the top cap from mounting properly to the probe.*

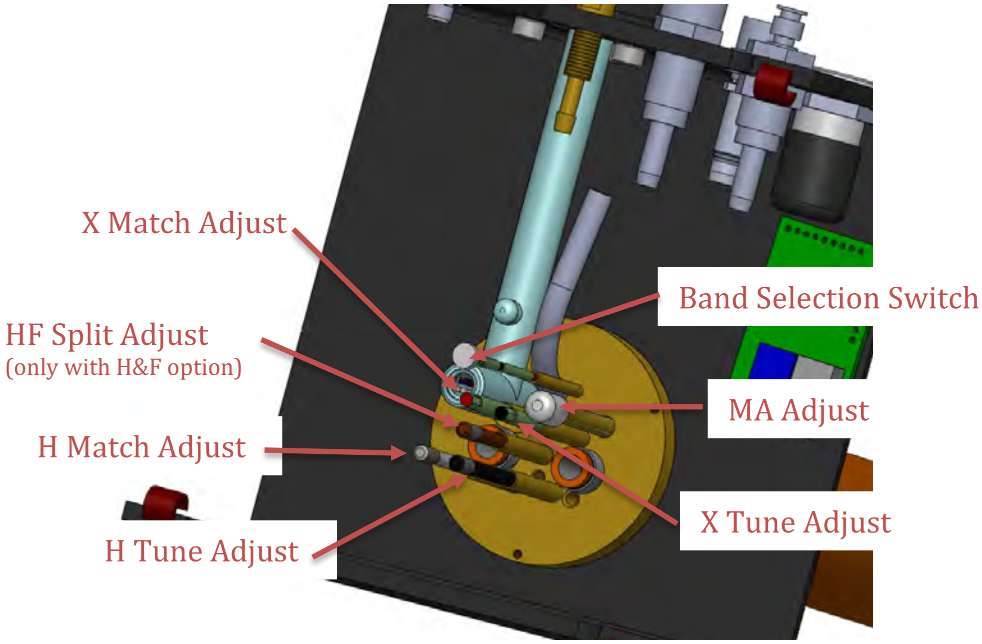
3 Let's take a tour of your new Phoenix NMR probe

3.1 Probe Base

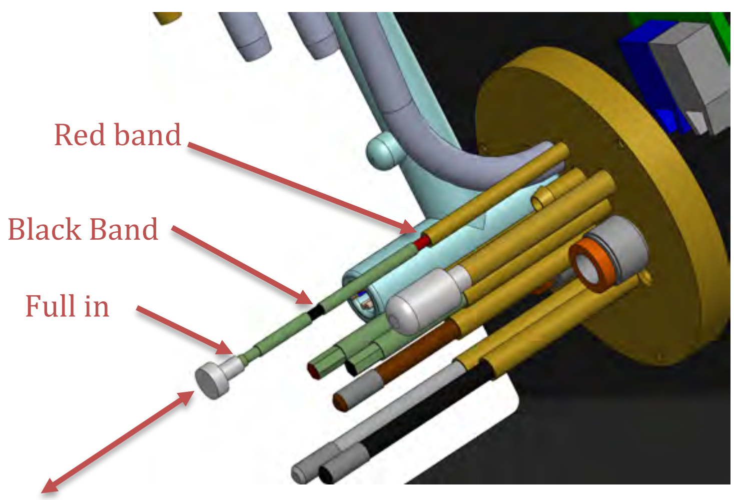
1. Shown below is a figure with the connections of your probe base.



2. The figure below illustrates the various tune/match knobs, magic angle adjust. There is a tuning band selection switch used to change the probe configuration from high, low, and low gamma tuning. The actual colors of the knobs/shafts may vary from figure below, however their relative positions will not. The hoses and wires have been deleted for clarity.

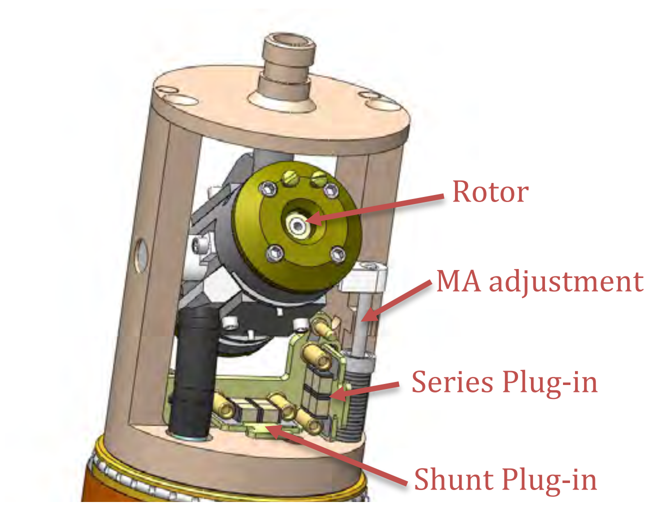


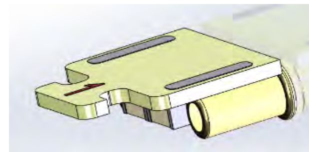
3. The band selection switch is used to select the tuning band of the probe. Pulling the switch rod out to show the "red" band is used for tuning in high band mode (above 11B), The Black Band is used for Low-Gamma tuning with the low gamma accessory and pushing the rod fully in is used to tune from 11B down to 15N. *Please refer to the tuning chart because some probes do not use all three settings.*



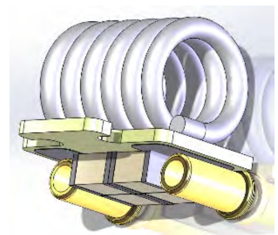
3.2 Probe Head

Shown below are several figures with annotation describing the Probe Head. When handling the probe head **DO NOT** touch the areas that interface to the Plug-ins, these areas are gold plated electrical contacts and need to be clean for good electrical connection. There are two types of plug-ins for this probe; capacitive and inductive.





Capacitive Plug-in



Inductive Plug-in

3.3 Probe adapter kits

3.3.1 PhoenixNMR to Agilent/Varian

The Agilent/Varian to PhoenixNMR adapter cable kit included with your Probe Body contains the following cables.

- Tachometer cable
- Variable temperature control cable
- Purge Gas Line

3.3.2 PhoenixNMR to Bruker

The Bruker to PhoenixNMR adapter cable kit included with your Probe Body contains the following cables.

- Tachometer cable
- Variable temperature control cable
- Purge gas line
- Drive and Bearing gas lines
- Variable temperature gas line

4 Setting the probe up for its first use

4.1 Removing the top cap

The top cap is removed by pressing the tab to release the top cap from the probe, then lifting the cap off the probe. **Do not rotate the cap**, this will remove the surface plating on the inside and reduce the effective grounding to the probe body.

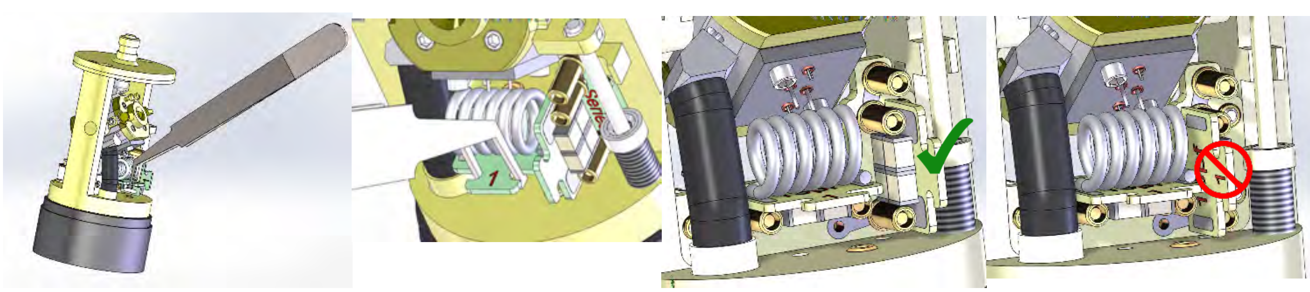
The installation of a PhoenixNMR probe head tuning plug-ins should be carried out by experienced users and should not be left to untrained or inexperienced individuals. While we have made every effort to ensure a robust and reliable interface between the Probe Head and Plug-ins. The complexity of this interface means that damage can occur if improper processes or handling are used when joining them.

4.2 Installing the proper Series and Shunt Tuning Elements

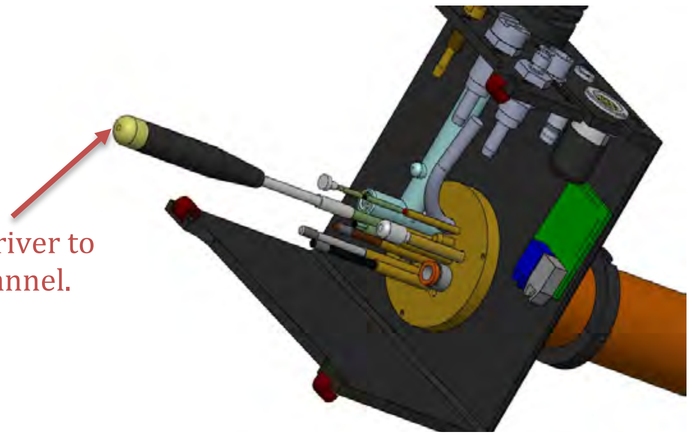
Refer to the probe tune chart supplied with your probe for the proper selection of the series and shunt, plug-ins for your desired probe configuration.

I. Using the supplied tweezers or your fingers, gently grasp the series insert by the finger tabs and slip it onto the series pins in the probe head. Push the series capacitor all the way onto the pins until it stops. Be sure that the small ceramic capacitors are facing the shunt location and not the green circuit board material.

II. If required for your desired configuration insert the shunt plug-in into the probe head using the same techniques as the series capacitor.



Set the Band selection switch to the proper setting. Refer to section 3.1 step 3. X will not tune when the switch is set to the incorrect setting. Adjust the X- channel tunning using the Hex wrench delivered with your probe. The hex is an 1/8" if you need to replace the wrench.



The 1H tune and macth knobs are knurled for adjusting with your fingers. Refer to section 3.1 step 2 for adjust knob locations.

4.3 Mounting the probe to the magnet

4.3.1 Attach the mounting plate to the room temperature shim set using the 2 screws provided. Pull out the lock pin to allow the probe collar to insert into the plate. Raise the probe into the magnet aligning the slots in the collar with the pins in the mounting plate. Insert the probe collar into the mounting plate and rotating 15 degrees. The probe should be engaged in the plate and remain in place. Release the locking mechanism. Refer to section 2 for additional information.

4.4 Connecting the probe to the console

Your PhoenixNMR probe was delivered with all the adaptor cables you should need to connect to your system to the probe (refer to section 3.3). Please contact us for assistance if you have acquired new equipment and need a different set of cables.

Warning: You must use nitrogen or a dry gas source if you plan to operate your probe below ambient temperature. Phoenix NMR can recommend gas dryers for your system if you do not have dry house gas. It is VERY important that the dew point of the gas is well below the VT temperature you plan to run at. This includes the variable temperature, purge and spinning gasses. Failure to use dry gas will damage you probe.

4.5 Tuning your probe

When tuning your Phoenix probe for the first time after unpacking it or after re-configuring to a new HX mode, you will find it easier to use the swept tuning function of your system (WOBB or MTUNE). Always start with the X channel, then tune the 1H channel. Always adjust the tune first until the resonance is identified, then adjust match. The match and tune adjustment can be difficult to turn by hand, to assist you is a hex driver. This will allow the match and tune to be adjusted very easily.

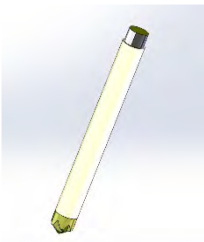
4.6 Identifying and addressing parasites in your system/probe configuration

The PhoenixNMR probe has the most versatile RF tuning configurations in the market, and while this makes the probe a true research powerhouse, it does have its occasional drawback. One of this is the occasional parasite. Parasites are a non-desired RF resonance within the probe/system configuration that when they occur in close proximity to one of your desired probe tuning frequencies, then that channels performance will be compromised. Parasites are much more common on the 1H channel of the probe and are almost always a result of a cable length/filter combination on the X channel. Thankfully these are very easy to disrupt but can be difficult to identify. In some cases, the parasite is clearly visible as a second tuning resonance on the swept tuning function of your console (MTUNE, WOBB). However not all are clearly visible and can only be detected by observing that the probe is requiring an unusual amount of power to reach pulse-width specification. When a parasite is identified or suspected the easiest way to verify the presence and remove it is to increase the length of the cable between the probe and the filter on the X channel. The Addition a type-N elbow between the X probe connector and the cable may be all that is needed to remove a 1H channel parasite.

4.7 Configuring the speed controller to function with an PhoenixNMR probe

4.7.1 Rotor Tachometer Marking

Be sure that the rotor has been properly marked to enable the tachometer system to detect the spin rate of the rotor properly. The rotor should be marked approximately 180 degrees in black sharpie marker (supplied). The 1.6 and smaller rotors should have the other 180 degrees marked with silver sharpie (supplied). See illustrations below.



1.6mm and smaller rotors with end cap marked ½ black and

3.2mm rotor with end cap marked ½ black.

4.0mm rotor with sleeve marked ½ black.

Danger: The probe head shield should always be in place and a face shield worn when spinning a sample in the probe. Small shards of the rotor material and sample will be ejected forcefully and may cause injury.

4.7.1.1 Agilent/Varian

The PhoenixNMR probe will work directly with the Varian/Agilent speed controller.

4.7.1.2 MAS 1 or 2

The PhoenixNMR probe will work directly with the Bruker MAS-2 speed controller in manual mode only. We are currently working to gather information to complete this section. If you have a MAS1 or 2 system and need assistance please contact us, we may have an update to this manual available or provide you with more information to assist you.

4.7.1.3 MAS 3

The PhoenixNMR probe will work directly with the Bruker MAS-3 speed controller in manual mode only. We are currently working to gather information to complete this section. If you have a MAS1 or 2 system and need assistance please contact us, we may have an update to this manual available or provide you with more information to assist you.

4.7.2 Techmag

We are currently working to gather information to complete this section. If you have a Techmag system and need assistance please contact us, we may have an update to this manual available or may be able to provide "hot off the press" information to assist you.

4.7.3

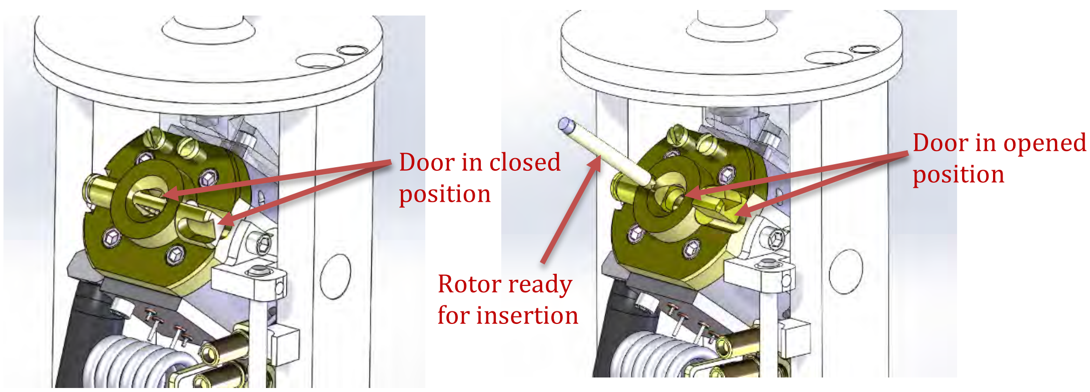
5 Sample Rotor Insertion/Removal

5.1 1.2mm, 1.6mm and 3.2mm rotors

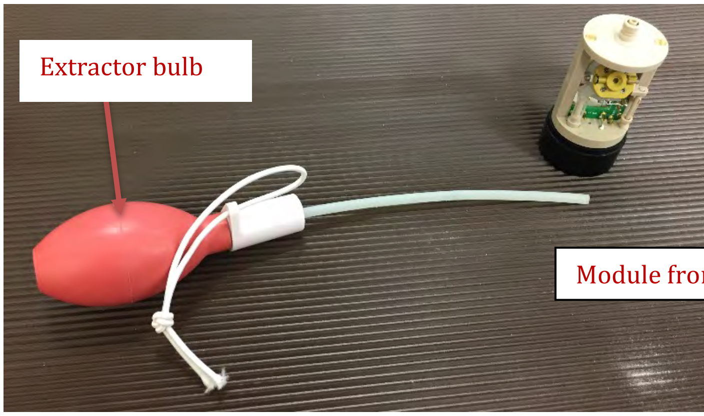
The 1.2mm, 1.6, and 3.2mm spinning modules have a rotating door to prevent the rotor from being ejected from the module during spin start-up and stopping. This door is opened by rotating the lever clockwise (see figures below).

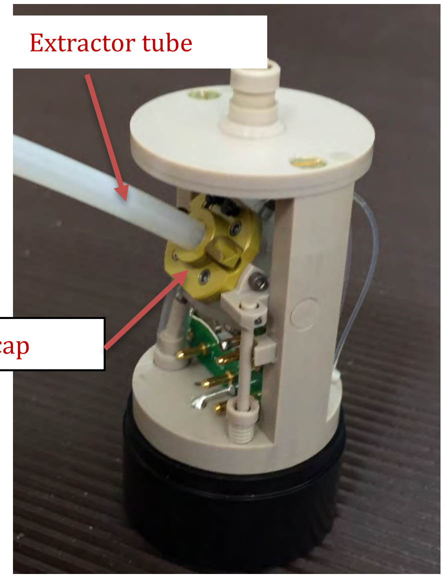
Insertion: Once the door is opened the rotor can be inserted drive tip first into the module gently sliding it in until you can no see the end cap in the door region. If the rotor does not slide fully into the module (the door will not rotate closed), extract the rotor and try again. Once the rotor is in place rotate the door to the closed position before spinning.

Caution: Contaminants such as oils or other materials from your fingers when handling the rotor can cause problems with insertion, spinning as well as causing spurious NMR signals to appear. The rotor should be gently wiped with a Chem-wipe or similar particulate free soft paper product just before insertion into the probe.



Removal: Rotate door to the open position, then apply the end of the sample extraction tube to the front of the module. Be sure to center the tube to the front of the module and close any gap between the tube and module. Do not press hard against the module as you may disrupt the magic angle setting. Squeeze the red bulb and release quickly to create a vacuum to extract the rotor from the module. The rotor may stop in the tube or in the bulb, so be careful how you handle the extractor until you know where the rotor is located.





5.2 4mm, 5mm and 6mm rotors

The 4mm, 5mm and 6mm spin modules do not require a rotating door to keep the rotor in the spin module during start-up and stopping.

Insertion: Insert the rotor drive tip first, gently sliding in into the module until the end cap is just below the front cap of the spin module. If the rotor does not slide fully into the module, extract it and try again.

Caution: Contaminants such as oils or other materials from your fingers when handling the rotor can cause problems with insertion, spinning as well as causing spurious NMR signals to appear. The rotor should be gently wiped with a Chem-wipe or similar particulate free soft paper product just before insertion into the probe.

Removal: Apply the end of the sample extraction tube to the front of the module. Be sure to center the tube to the front of the module and close any gap between the tube and module. Do not press hard against the module as you may disrupt the magic angle setting. Squeeze the red bulb and release quickly to create a vacuum to extract the rotor from the module. The rotor may stop in the tube or in the bulb, so be careful how you handle the extractor until you know where the rotor is located.

6 Calibrating the probe

6.1 Overview of calibration procedures and sample selection

While the probe has been fully bench tested and NMR tested at our manufacturing facilities it will need to have the Magic Angle adjusted to account for variations in magnet alignment. In addition, the power levels required to reach the RF field strength specification for the probe must be found for your system.

Caution: Due to the experimental requirements of Solid State NMR the power level at which your probe will fail, causing damage, is only 10-20% above the probe specifications. Care must be taken whenever testing or running the probe at or near its specification limits.

The following table provides a list of recommended test samples for your probe, the associated experiments, and the parameters to be set. These are not the only samples that could be used to set the parameters, but these are the ones we recommend when testing the probes ability to meet specification.

Sample	Experiment	Parameters
KBr	Br79 Simple one pulse	Magic Angle by observing Br79 free induction decay
Adamantane	1H Simple one pulse	1H RF field strength, pw90
Adamantane	13C Simple one pulse with 1H decoupling	13C RF field strength, pw90
Adamantane	Simple one pulse with 1H decoupling	13C lineshape
Hexamethylbenzene	1H/13C Cross Polarization, with 1H Decoupling	13C Signal to Noise, 3.2mm rotors and larger
Glycine	1H/13C Cross Polarization, with 1H decoupling	13C Signal to Noise, 1.6mm rotors and smaller
15N labeled Glycine or 15N labeled Urea	15N Simple one pulse with 1H decoupling	15N RF field strength, pw90
Sodium-hexafluorophosphate	31P Simple one pulse	31P RF field strength, pw90

6.2 Generic calibration procedures

Typical probe installation workflow –

A. Set Magic Angle using a full rotor of KBr spinning at 5-10kHz. Use a spectral width of 500ppm and an acquisition time of 50ms. Observe the on resonance free induction decay with the fid phasing adjusted to observe a maximum in the real channel. Optimize the number of rotor echo's visible. Alternatively, observe the spectrum and adjust the Magic Angle to optimize the 1st or 2nd spinning sideband intensity. Use a spectral width of ~2kHz and an acquisition time of 20ms. In the case of very small rotors it can be useful to place the sideband on resonance and use a very narrow spectral width to limit the spectrum to include only the one sideband, this improves the overall S/N. (Note: This is only possible on a digital receiver where the digital filters have adequately sharp cutoff to avoid folding in the other spinning sidebands.)

B. Set the 1H pw90 using a full rotor of Adamantane spinning at ~5kHz. Use a spectral width of 125ppm, and an acquisition time of 20ms. Beginning at a very low power (<20 Watts) with the 1H line on resonance, find the pw90 time. We define the pw90 as the difference between the 360 null and 180 null divided by two. Slowly advance the power until the pw90 measured meets the probe specification. This is the MAXIMUM allowable power into the probe for 1H, do not exceed this value.

C. Set the 13C pw90 using a full rotor of Admanatane spinning at ~5kHz. Use a spectral width of 500ppm and an acquisition time of 100ms. Use a 1H decoupling strength of ½ the field strength found in step B, this is equivalent to ¼ the power. Begin at low power (<20 Watts) for the 13C channel and slowly work up to the specification pw90. This is the MAXIMUM allowable power into the probe for 13C, do not exceed this value. (Note: It may be required to roughly shim to get a 13C line narrow enough to provide sufficient S/N for setting the pw90.)

D. Shim the probe using a full rotor of Adamantane spinning at 5kHz. Use a spectral width of 2kHz, centered about the left 13C line in the spectrum, set ~500Hz off resonance. If you do not have a digital receiver, then you will need to use a ~10kHz spectral width centered ~ between the 13C lines in the spectrum. Adjust the acquisition time to 250ms, and be sure that the 1H decoupling field strength is ½ the value found in step B.

⚠ *Warning: Decoupling for periods > 100ms at anything higher than 50% of the probe specification WILL cause damage to the probe. Extreme care must be exercised when extending the acquisition time with decoupling present beyond 100ms.*

We have found it useful to follow the procedures found in the paper "Magic Shimming: Gradient shimming with magic angle sample spinning, JMR 216: pg197-200" when shimming the probe. It is also useful to align the probe with one of the shim axis, this reduces the number of active shims. (i.e. if the rotor axis is aligned along the x axis of the shims, then the shims y, yz, y2z, …. Will have no effect and can be neglected.) It is also useful to begin shimming from a known good set of shims from a liquids probe if available.

The final line-shape should be acquired with an acquisition time of 400ms and 32 transients. Again, use only ½ the 1H field strength found in step B.

E. Signal to Noise is measured using a full rotor, 22ul, of hexamethylbenzene for 3.2mm and larger rotors. The spectral width should be 500ppm and the acquisition time should be 20ms. Exponential line broadening should be used match to the natural linewidth of the sample (typically ~150Hz). Use the full specification 13C field strength (as found in step C) for the cross polarization level on 13C and a cross polarization time of 15ms. Use the full specification 1H decoupling field strength as found in step B. Array the 1H cross polarization level from the full specification down to below the field strength for 13C. The resulting array will show clear peaks with non-zero amplitude valleys between. The peaks correspond to the cross polarization match at +/- n rotor frequency offsets. The most intense two correspond to +/- 1 rotor frequency offset and the +1 (meaning higher 1H field strength should be the most intense and is where the CP match will be set. The final step prior to measuring the S/N is to use a ramp on the 1H channel that corresponds to ~3-5% of the 1H cross polarization field intensity. This ramp should be centered about the CP match value. The final signal to noise measurements are acquired with 4 transients each with a delay of 10s between each scan. A total of ten repeated measurements are made and the average value is used for the specification. The S/N is measured in a spectrum using a 100ppm wide best noise region.

F. Signal to Noise is measured using a full rotor of Glycine spinning at 10kHz for 1.6mm and smaller rotors. We do not remove the sample spacers and fill beyond the active region of the rotor to artificially enhance the available S/N of the probe. The spectral width should be 500ppm and the acquisition time should be 30ms. Exponential line broadening should be used matched to the natural linewidth of the sample (typically ~50Hz). Use the full specification 13C field strength (as found in step C) for the cross polarization level on 13C and a cross polarization time of 1.5ms. Use the full specification 1H decoupling field strength as found in step B. Array the 1H cross polarization level from the full specification down to below the field strength for 13C, using 4 scans per increment. The resulting array will show a clear maximum peak. Array the contact time at the 1H CP value found to give the maximum S/N in the previous array in the following steps, 250us, 500us, 1ms, 2ms, 3ms, 4ms, 5ms. Choose the maximum signal strength peak, interpolating between values if needed. Then run a set of 10 repetitions, 32 transients each at this maximum value. The average of these 10 repetitions, (dropping the maximum and minimum value) is the signal to noise for the probe. The S/N is measured using a 100ppm wide best noise region.

G. Set the 15N pw90 using a full rotor of 15N labeled Glycine spinning at ~5kHz(8kHz for 1.6mm). Use a spectral width of 300ppm and an acquisition time of 100ms. Use a 1H decoupling strength of ½ the field strength found in step B, this is equivalent to ¼ the power. Begin at low power (<20 Watts) for the 15N channel and slowly work up to the specification pw90. This is the MAXIMUM allowable power into the probe for 15N, do not exceed this value.

H. Set the 31P pw90 using a full rotor of hexafluorophosphate spinning at ~5kHz, (8kHz for 1.2mm, 1.6mm). Use a spectral width of 300ppm and an acquisition time of 30ms. Use a 1H decoupling strength of ½ the field strength found in step B, this is equivalent to ¼ the power. Begin at low power (<20 Watts) for the 31P channel and slowly work up to the specification pw90. This is the MAXIMUM allowable power into the probe for 31P, do not exceed this value.

7 Variable Temperature Operation

Please refer to the probe specification sheet, a paper copy was delivered with your probe and there is a digital copy available on the USB data storage on the probe. Depending on the spinning module materials chosen (usually based on background) the variable temperature range will differ between probes.

Warning: Operation of your PhoenixNMR probe outside of the specified variable temperature range, or without sufficient purge gas flow can damage your probe, the magnet and/or the system shim set. Operation without the supplied Variable Temperature Chimney (guides hot/cold exhaust gas up and out the top of the magnet) can also cause damage to these components.

When running variable temperature experiments it is recommended that you add an inline mass flow meter before the cold gas accessory. It is known that the "floating ball" style flow meters delivered on Varian/Agilent systems greatly misread the actual gas mass flowrate. In many cases the actual gas flow is twice the indicated flow, this error is backpressure dependent and can lead to difficulties in stably spinning your sample.

Warning: If you plan to operate your probe below ambient temperature you must be sure to use a dry gas source. PhoenixNMR can recommend gas driers for your system if you do not have dry house gas. It is VERY important that the dew point of the gas is well below the temperature you plan to run at. This includes the variable temperature gas, the probe purge gas and the spinning gas. Failure to use dry gas will damage your probe.

Please refer to the table below for recommended gas flow rates when operating your probe above or below ambient temperature. The purge flows recommended are for ambient to maximum temperature deviation from ambient.

Spinning/Rotor Module Size	Probe Purge Flow	VT Mass Flow
1.2mm	25-50 lpm	<20 lpm
1.6mm	25-50 lpm	<30 lpm
3.2mm	25-50 lpm	<35 lpm
4.0-6.0mm	25-50 lpm	<40 lpm

7.1 7.1 Variable temperature exhaust chimney

The exhaust chimney routs all probe exhaust gasses from the probe to the top of the magnet. Proper installation is important to ensure that the gasses do not leak into the magnet bore. The chimney is lowered from the top of the magnet until it rests on the upper barrel (if installed). When the probe is loaded from the bottom of the magnet it will interface to the chimney at the top of the probe inside the magnet bore. The mounting plate is mounted to either the magnet top plate or liquids upper barrel and the insulated tubes (U-shaped) rout the gasses away from the magnet centerline.

Installation instructions:

I. Check that the liquids upper barrel and magnet bore are both clear of obstructions, especially liquids samples, before loading the exhaust chimney into the magnet.

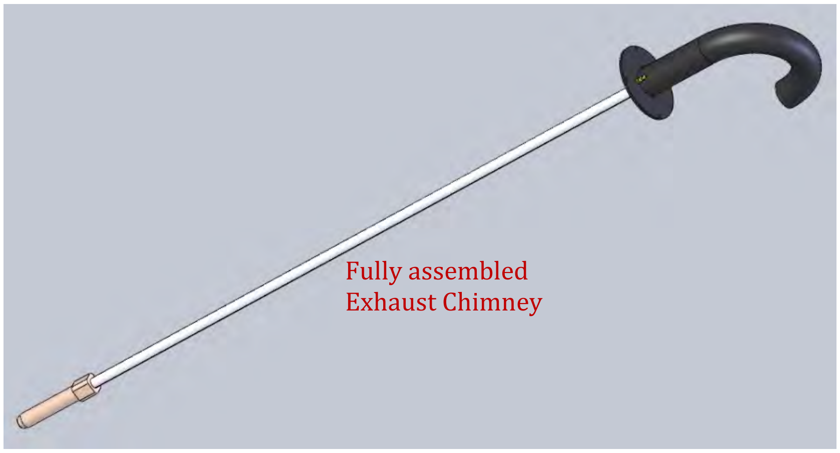
III. Load the exhaust chimney from the top of the magnet bore nose first. It will pass through the liquids upper barrel and rest on the liquids upper barrel turbine.

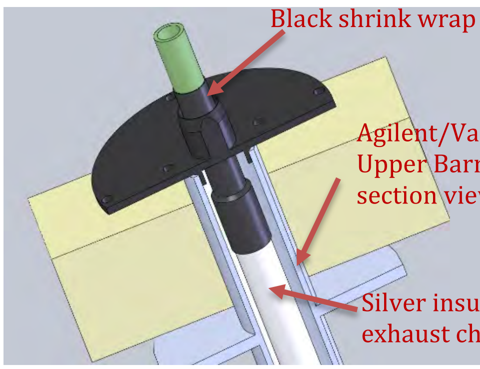
Warning: Check that the silver insulation ends approximately 1" below the top of the magnet bore / liquids upper barrel and that the black shrink wrap (above the insulation) extends approximately ½" beyond the magnet bore / liquids upper barrel. This ensures that the chimney is able to freely move up and down to allow proper mating to the probe top as it is raised inside the magnet bore. A sticking/binding chimney will allow VT gasses to enter the magnet bore cooling/heating the bore. This can be checked by having someone observe the exhaust stack moving up and down as the probe is raised/lowered in the bore. Movement will only occur in the last ~1/2" of probe movement as it reaches field center.

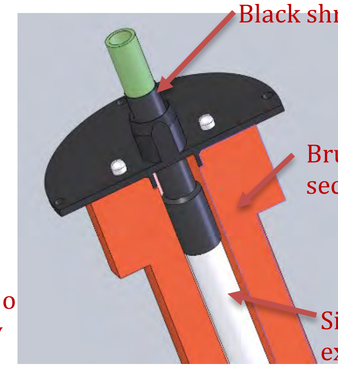
IV. Slide the mounting plate over the end of the exhaust tube and mount it to the magnet or liquids upper barrel.

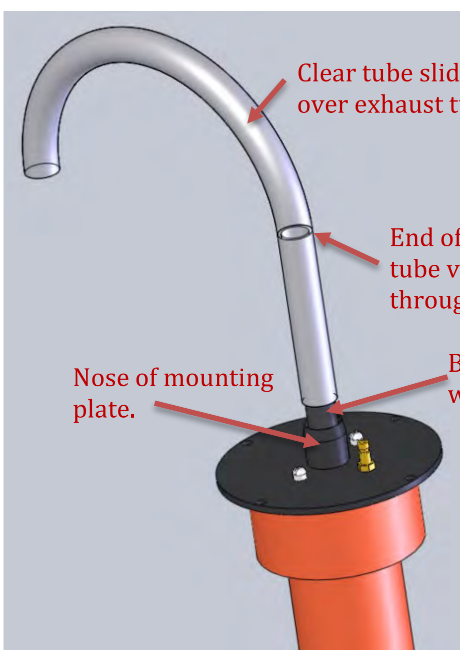
V. Slide the clear tube over the exhaust tube until it butts up to the black shrink wrap.

VI. Slide the black foam insulation tube over the clear tube and nose of mounting plate.


Fully assembled
Exhaust Chimney


Black shrink wrap
Agilent/Varian
Upper Barrel
section view.
Silver insulation o
exhaust chimney


Black shrink wrap
Bruker Upper Barrel
section view
Silver insulation on
exhaust chimney

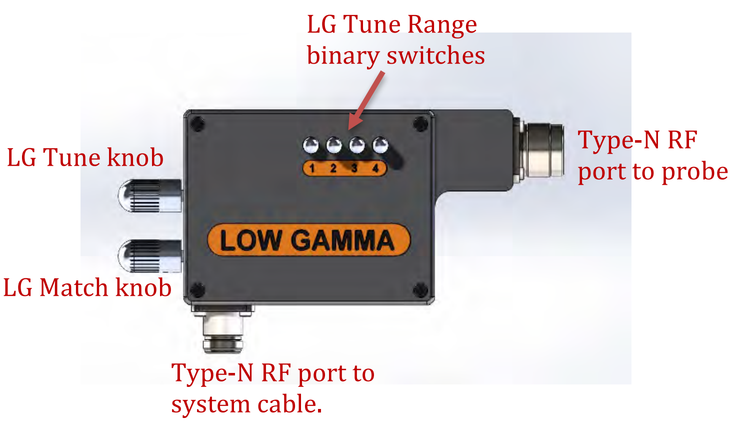

Clear tube slid
over exhaust tube.
End of exhaust
tube visible
through clear tube.
Nose of mounting
plate.
Black shrink
wrap


Black foam
insulation tube
covering the
clear tube and
the nose of the
mounting plate.

8 Low Gamma Accessory

The optional low gamma accessory allows the probe to be tuned in H-LG mode, where the LG channel will reach in a continuous fashion from 14N to ~10MHz. The lowest frequency achievable depends on the spinning module size and magnet frequency.

To set up the probe for low gamma tuning begin by setting the band selection switch to the low-Gamma position (black band visible). Refer to section 3.1. Install the S.C plug-in into the series position. Attach the Low Gamma box to the X connector of the probe. The probe tuning is done using the Low Gamma box "match", "tune" adjustments and switch settings 1-4. Refer to the probe tuning chart for the switch setting configuration for the desired frequency.



9 Returning your probe for repair

9.1 Does my probe need to be returned for repair?

Please be sure to examine and validate the probe configuration and your system configuration before preparing to ship your probe back for repair. It is our experience that some failures are assumed to be the probe when in fact there is a simple configuration error or a system failure. We also recommend that you contact us via email or phone and describe the failure as we may be able to help you identify if the problem is the probe or something else. If your probe does need to be returned we will make every effort to repair it and return it to you in a timely fashion. Please be aware that we provide repair estimates upon receipt of the probe and will not proceed with the repair until approval is given. When returning your probe please follow the procedures below to help prevent any shipping damage or delay upon its receipt at our offices.

9.2 How to request an RMA (Return Material Authorization) number?

Please contact PhoenixNMR either by phone – (970)-776-9658 (United States) or by Email info@phoenixnmr.com. We will respond within 24hrs during weekdays or by Tuesday morning if the request is made over the weekend. You will be required to fill out a brief questionnaire regarding the cause for a need to return the probe, the conditions under which the probe failed and any possible contaminations due to sample spills that we would need to be aware of. Please be as detailed as possible when filling out the questionnaire, as this will help us to return your probe in the timeliest manner possible.

9.3 What should I include when returning my equipment for repair?

Please return the Probe Body in the original packaging with the complete set of tuning plug-ins.