Bruker BioSpin

19F Lockswitch

200-600 MHz
Operating & Service Manual

Version 001

think forward

NMR Spectroscopy

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This manual describes the units as they are at the date of printing. On request, the manufacturer shall supply circuit diagrams, lists of components, descriptions, calibrating instructions and any other information for use by qualified personnel of the user, in charge of repairing the parts of the unit which have been stated by the manufacturer to be "repairable". Such supply shall in no event constitute permission to modify or repair the units or approval of the same.

This unit is not designed for any type of use which is not specifically described in this manual. Such use may be hazardous.

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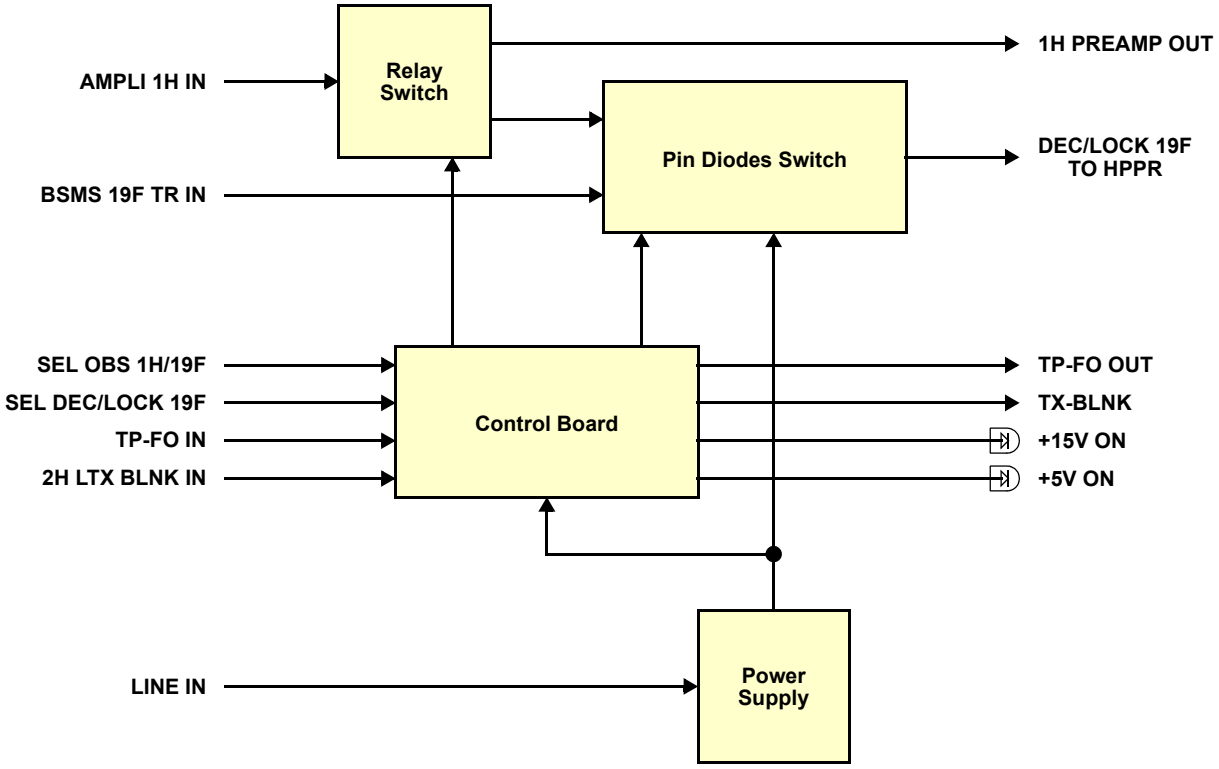
General Information 1

Introduction 1.1

The 19F Lockswitch allows to perform experiments with Lock and Fluorine decoupling, or just Fluorine observation. It is possible to switch from ^{1}H to the ^{19}F observation by using only one ^{1}H amplifier without doing any cable changes. This can be done thanks to the internal routing dispatching the source (^{1}H or ^{19}F) either on the "Fluorine" (DEC/LOCK 19F to HPPR) or on the " Proton " output (1H PREAMP OUT). This system also permits to perform "Fluorine Gradient Shimming".

Figure 1.1. 19F Lockswitch Wiring Diagram



This accessory is housed in a 19", 1U, 280mm rack cabinet.

Safety 2

The 19F Lockswitch 200-600MHz is in accordance with the standard 61010-1 safety Requirements for Electrical Equipments.

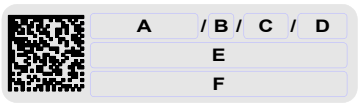
Labels 2.1

Labels are provided to alert operating and service personnel to conditions that may cause personal injury or damage to the equipment from misuse or abuse. Please read the labels and understand their meaning.

Identifying plate 2.1.1

The 19F Lockswitch 200-600MHz can be identified by an identifying plate at the front panel of the unit that has following information.

Figure 2.1. Identifying plate

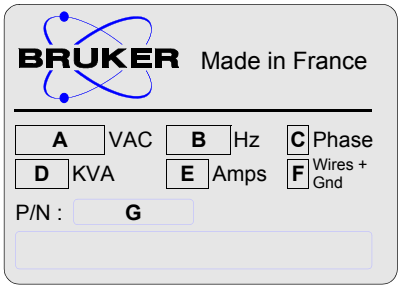


- **(A) Part Number**
  This field indicates the part number of the product.
- **(B) Variant**
  This field indicates the variant number that identifies the production category of the product. The default variant is 00.
- **(C) ECL**
  This field indicates the revision number that identifies the product configuration. The initial revision is 0.00.
- **(D) Serial Number**
  This field indicates the serial number of the product.
- **(E) Type**
  This field contains the designation of the product.
- **(F) Information**
  This field contains additional information about the product.

Manufacturer's nameplate *2.1.2*

The 19F Lockswitch 200-600MHz can be identified by a manufacturer's nameplate at the back panel of the unit that has following information:

Figure 2.2. Manufacturer's nameplate



- **(A) Voltage**
  This field indicates the input mains voltage of the product.
- **(B) Frequency**
  This field indicates the input mains frequency of the product.
- **(C) Phases**
  This field indicates the number of phases of the mains.
- **(D) Power**
  This field indicates the absorbed power of the product.
- **(E) Current**
  This field indicates the absorbed current of the product.
- **(F) Wires**
  This field indicates number of wires with the ground in the mains cord.
- **(G) Part Number**
  This field indicates the assembly number that identifies the part number of the product.

Safety labels and symbols 2.2

Warning signs 2.2.1

WARNING! *Risk of electrical shocks*

Figure 2.3. General hazard symbol

Please disconnect line cord before opening or prevent potential hazards such as :

- Electric schock on power supply,
- Contact burn with the RF module and heatsink,
- Finger scratch due to the fan assembly on the RF module.

Figure 2.4. Electrical hazard symbol

Please disconnect line cord before opening :

- Take care Don’t touch electric parts.

Installation 3

The installation of the device must be done only by an authorized and qualified technician, in total accordance with the running standards. Every breakdown due to a non-respect of the following instructions will not be attributable to Bruker and will not be covered by the guarantee clauses.

Initial inspection 3.1

Mechanical check 3.1.1

If damage of the shipping carton is evident, request the carrier's agent to be present when the instrument is unpacked. Check the equipment for damage and inspect the cabinet and panel surfaces for dents and scratches.

Claim for damage 3.1.2

If the unit is mechanically damaged or fails to meet specifications upon receipt, notify BRUKER or our representative immediately. Retain the shipping carton and packing material for the carriers inspection as well as for subsequent use in returning the unit if necessary.

Reshipment and repackaging requirements 3.1.3

Whenever possible, the original carton and packing material should be used for reshipment. If the original packing material is not available, wrap the instrument in heavy paper or plastic. Use a strong shipping container. If a cardboard is used, it should be at least 200 lbs. test material.

Use shock absorbing material around all sides of the instrument to provide a firm cushion and to prevent from movements inside the container wall on each side. Protect the front panel by means of cardboard spacers inserted between the front panel and the shipping carton. Make sure that the instrument cannot move in the container during shipping. Seal the carton with a good grade of shipping tape and mark the container :

" FRAGILE ELECTRONIC INSTRUMENT."

Environment requirements *3.1.4*

This amplifier is build for inside use only on a maximum high level of 2000m above sea level (6600 feet).
No specific cooling or ventilation is required.
Be sure that the amplifier has enough area around so that the free air flow into and out of the amplifier is not obstruct.
It should, however, be in an environment which conforms, the 5°C - 45°C (41°F - 113°F) thermal specifications, a 80% maximum relative humidity of air and a contamination level of 2 (mince a normal, only non conductive contamination, temporary conductivity due to condensation is possible).

Installation requirements *3.2*

No special precautions are necessary. Mount the equipment in an area which is relatively free of vibration, and has sufficient room for cable connections.
The amplifier is a class II of installation category.

Bench operation *3.2.1*

The unit can be placed onto a secure flat surface.

System check *3.3*

Before applying power for the first time the following items should be checked:

- The AC input voltage 230 VAC -40% to +15% range must be compatible with.

Initial turn on procedure *3.4*

The following list describes how to turn on the 19F Lockswitch and what should be seen as this occurs.

Before starting this procedure, make sure that you have properly followed instructions in the section ***"System check"***.

1. Connect the device to the AC line and turn the circuit breaker to "1".
2. Observe the indicators on the front panel :
   - The ON/OFF Switch will illuminate,
   - The +5V ON and +15V ON LED's will illuminate.
3. System is now fully operational.

Operation 4

Front Panel 4.1

The 19F Lockswitch front panel is provided with 2 leds for Supply indication and 10 coaxial connectors.

Indicators 4.1.1

Normal operation is indicated when following LED's are on :

Table 4.1. Indicators

+15V ON	Indicates that the +15V supply is applied.
+5V ON	Indicates that the +5V supply is applied.

Connectors 4.2

Table 4.2. Connectors

BSMS 19F TR IN	SMA type connector (female). 19F Lock input coming from BSMS LTX.
AMPLI 1H IN	N type connector (female). RF Power input coming from Proton amplifier output.
1H PREAMP OUT	N type connector (female). 1H Power output connected to 1H PREAMP.
DEC/LOCK 19F to HPPR	SMA type connector (female). 19F output connected to 19F HPPR.
SEL OBS 1H/19F	SMA type connector (female). Selection between ^{1}H or ^{19}F mode.
SEL DEC/LOCK 19F	SMA type connector (female). Selection between 19F Lock and 19F RF Pulse.
TP-FO IN	SMA type connector (female). Lock Protection Pulse Input coming from BSMS LTX.
TP-FO OUT	SMA type connector (female). Lock Protection Pulse connected to HPPR.

2H LTX BLNK IN	SMA type connector (female). Coming from BLAXH2H (or BSMS 2H-TX) LTX BLNK.
TX-BLNK OUT	SMA type connector (female). Connected to BSMS LTX. This signal is used to blank the LTX.

Figure 4.1. 19F Lockswitch Front Panel Design

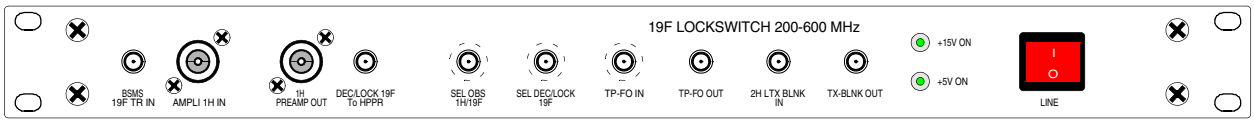


Figure 4.2. 19F Lockswitch Front Panel View

Rear panel *4.3*

The rear Panel of the 19F Lockswitch is free of elements in exception of the three pole (2P + E) line filter socket.

Technical Description

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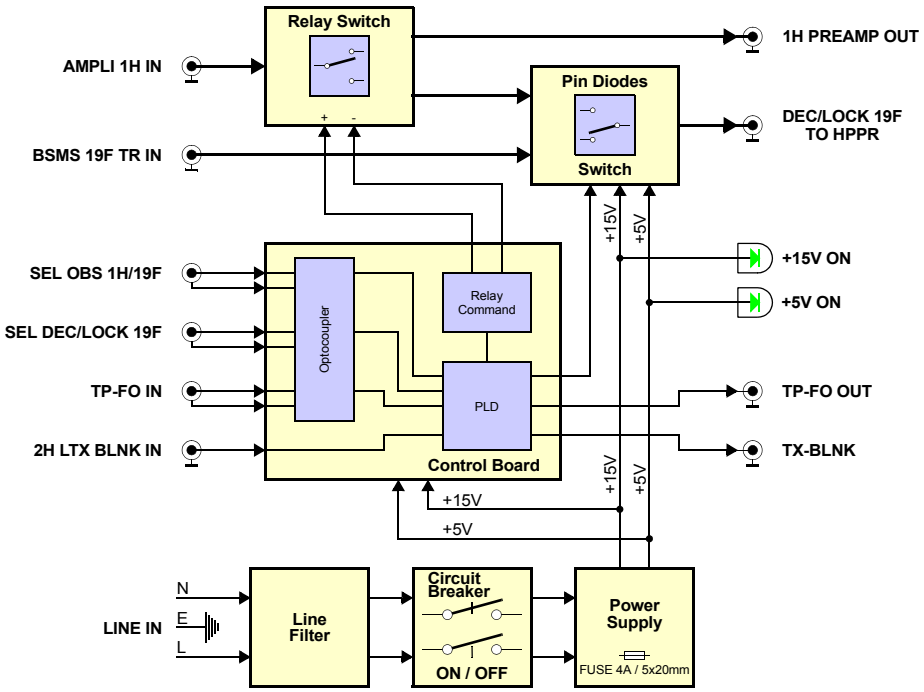
System Overview 5.1

The 19F Lockswitch is composed of different sub-assemblies :

- **Switched power supply**
  Protected by a 4A 250V 5x20mm fuse, it delivers the +15V and the +5V to the entire system.
- **Control board**
  It dispatchs the logic signals to the other components, according to the inputs such as SEL OBS 1H/19F, SEL DEC/LOCK19F, TP-FO IN or 2H LTX BLNK IN. It also displays, using leds on front panel, the presence of the +15V and the +5V.
- **Relay switch**
  This component allows to switch the RF power to the 1H Preamplifier of the spectrometer (1H Mode) or to the internal PIN diodes switch (19F Mode).
- **PIN Diodes switch**
  It permits to route to the 19F HPPR, either the 19F Lock or, via the electromechanical relay, the 19F RF power.

Figure 5.1. 19F Lockswitch System Block Diagram



Theory of operation 5.2

RF Path 5.2.1

The 19F Lockswitch consists of :

- An electromechanical relay,
- A PIN diodes switch.

Electromechanical relay

The relay is used to route the RF power to the 1H Preamplifier of the spectrometer (1H Mode) or to the internal PIN diodes switch (19F Mode).

This is done with the signal SEL OBS 1H/19F on the front panel, according to the truth table below.

Table 5.1. Electromechanical relay RF routing truth table

Spectrometer	SEL OBS 1H/19F	RF routing
AMX / ARX	Logical level "low" (0V)	AMPLI 1H IN to 1H PREAMP OUT
	Logical level "high" (+5V)	AMPLI 1H IN to internal PIN diodes switch
AVANCE	Logical level "low" (0V)	AMPLI 1H IN to internal PIN diodes switch
	Logical level "high" (+5V)	AMPLI 1H IN to 1H PREAMP OUT

PIN diodes switch

The PIN diodes switch is used to route either the 19F Lock or a 19F RF Pulse to the output DEC/LOCK 19F to HPPR. This is done with the signal SEL DEC/LOCK 19F on the front panel, according to the truth table below :

Table 5.2. PIN diodes switch RF routing truth table

Spectrometer	SEL OBS 1H/19F	RF routing
AMX / ARX	Logical level "low" (0V)	19F Lock routed to output
	Logical level "high" (+5V)	19F Lock is isolated. Allows 19F RF Pulse to output
AVANCE	Logical level "low" (0V)	19F Lock is isolated. Allows 19F RF Pulse to output
	Logical level "high" (+5V)	19F Lock routed to output

Control Board *5.2.2*

A Programmable Logique Device (PLD) processes the logical inputs SEL OBS 1H/19F and SEL DEC/LOCK 19F in order to command the 2 switching components of the system.

- SEL OBS 1H/19F is for the relay switch,
- SEL DEC/LOCK 19F is for the PIN diodes switch.

Delay between control signal and RF Power *5.2.3*

SEL OBS or SEL DEC/LOCK logical inputs are fed to the PLD through an optocoupler having a pretty "long" switching time. That's why you must ensure that you send the RF Power **at least 12µs after** the logical level "low" on SEL DEC/LOCK.

Because of the Electromechanical Relay Switch, this delay is increased to 10 ms for SEL OBS.

Specifications 6

General specifications 6.1

Table 6.1. 19F Lockswitch General specifications

RF SPECIFICATIONS	
Frequency range	188 to 600MHz
INSERTION LOSS	
1H Preamp Out vs Obs 19F In	0.1dB typ. full range
Dec/Lock 19F to HPPR vs Obs 19F In	0.3dB typ. @ 188MHz - 1dB typ. @ 564MHz
Dec/Lock 19F to HPPR vs 19F TR In	0.5dB typ. @ 188MHz - 0.9dB typ. @ 564MHz
ISOLATION	
Ampli 1H In routed to 1H PREAMP Out & BSMS 19F TR In routed to DEC/LOCK 19F to HPPR	
Dec/Lock 19F to HPPR vs Obs 19F In	> 100dB typ. full range
Ampli 1H In routed to DEC/LOCK 19F to HPPR	
1H Preamp Out vs Obs 19F In	> 80dB typ. full range
Dec/Lock 19F to HPPR vs 19F TR In	> 70dB typ. full range
RF POWER HANDLING CAPABILITIES	
1H Mode	Max. 150W PW 100ms DC 25% / Max. 35W CW
19F Mode	Max. 150W PW 5ms DC 25% / Max. 35W CW
DC TRANSIENTS	
BSMS 19F TR In	±500mV & < 1µs typ.
Dec/Lock 19F to HPPR	±500mV & < 1µs typ.
SWITCHING TIME	
Delay between the commutation signal SEL & the RF Power	
Sel Obs 1H/19F	Min. 10ms due to the electromechanical relay
Sel Dec/Lock 19F	Min. 12µs due to the optocoupler

SUPPLY	
Power supply	230VAC -40% to +15% single phase 50-60Hz
Fuse (On internal supply)	4A 250V 5x20mm

Common characteristics *6.2*

Table 6.2. 19F Lockswitch Common characteristics

RF Input Connector BSMS 19F TR IN	SMA female coaxial connector
RF Output Connector Dec/Lock 19F to HPPR	SMA female coaxial connector
RF Input Connector Ampli 1H In	N female coaxial connector
RF Output Connector 1H Preamp Out	N female coaxial connector
Logical I/O Connector	SMA female coaxial connector
Rear Panel Interface	AC Line in socket
Size	19" Rack Cabinet, 1U height, 280mm depth
Weight	4kgs

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