

Bruker BioSpin

# BLAH2000-I E C ●

Amplifier 300MHz  
Operating & Service Manual

Version 001

think forward

Preclinical MRI

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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.

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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 BLAH2000-I E C Amplifier 300MHz is a narrowband linear pulse power amplifier specifically designed for Magnetic Resonance Imaging (MRI) applications up to 7 Tesla systems.

It is commercialized under the BRUKER BIOSPIN part number W1345551.

It is operated in AB linear class and provides 2000W and more peak RF power at 300MHz frequency.

The amplifier is equipped with **N-Channel MOS Broadband RF Power FETs** transistors of the latest generation. The unit can provide full power for any combination of pulse width and duty cycle up to 10ms and 5% for 2000W RF output Power.

Its built-in protection circuitry will allow lower power pulses for longer pulse widths and duty-cycles, maintaining up to 100W average power on the 2000W RF output.

The electronic protection circuitry has been designed to protect against:

- Excessive power output level (overdrive)
- Excessive pulse repetition rate (over duty-cycle protection)
- Excessive pulse duration (over pulse-width)
- More than 50% reflected RF power (mismatch when  $VSWR \geq 6$ )
- Thermal protection (overheat)

The amplifier is also equipped with a CAN interface for the Siemens MAGNETOM electronic platform and can be used in combination with the Siemens *syngo* software.

Internal monitoring provides detailed status information which is transferred over the CAN bus to the syngo MR error logger.

The supply is self protected for overcurrent and overvoltage.

The amplifier is housed in a 19", 4U, 520mm deep rack cabinet and is powered by an internal switched power supply assembly that provides the +32VDC for the power amplifiers, in addition to all low level voltages for the system.





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The BLAH2000-I E C is in accordance with the standard 61010-1 and with the UL 61010-1 / CSA C22.2 No.61010-1-04 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 BLAH2000-I E C can be identified by an identifying plate at the front panel of the unit that contains the following information :

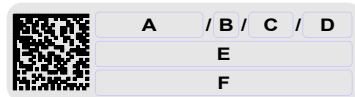


Figure 2.1. Identifying Plate

- **(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.

The BLAH2000-I E C can be identified by a manufacturer's name plate at the back panel of the unit that contains the following information :

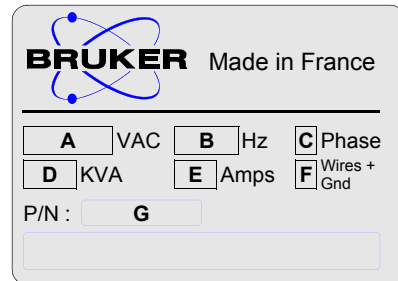


Figure 2.2. Manufacturer's Name Plate

- **(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.



#### *Risk of Danger*



#### **DANGER! Risk of electrical shocks**

Throughout this manual, this symbol indicates the possibility of severe personal injury, loss of life or equipment damage if the instructions are not followed.

On the equipment, the symbol also implies a danger and alerts the user.

#### ***Operating Instruction***

Operating personal should not remove RF output cable without turn off the power supply because the RF output can cause serious burns before the "Mismatch" protection is active.

Please disconnect the mains supply before opening to prevent potential hazard such as :

- Electrical shock from power supply
- Contact burns from the RF module and heatsink
- Finger scratch due to the fan assembly on the RF module.



# Installation

# 3

The installation of the device must be done only by an authorized and qualified technician, in total accordance with the running standards.

BRUKER BIOSPIN assumes no liability for the customer's failure to comply with these requirements and is therefore not responsible or liable for any injury or damage that occurs as a consequence of non-approved installation.

## ***Initial Inspection***

**3.1**

---

### ***Mechanical Check***

**3.1.1**

---

If damage of the shipping cardboard 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 cardboard 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 cardboard 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 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 movement from inside the container wall on each side. Protect the front panel by means of cardboard spacers inserted between the front panel and the shipping cardboard. Make sure that the instrument cannot move in the container during shipping. Seal the cardboard box with a good grade of shipping tape and mark the container :

**"FRAGILE ELECTRONIC INSTRUMENT"**

### **Environment Requirements**

**3.1.4**

This amplifier is built for inside use only on a maximum elevation of 2000m above sea level (6600 feet).

No specific cooling or ventilation is required.

Be sure that the amplifier has enough area around it so that the free air flow into and out of the amplifier is not obstructed.

It should, however, be in an environment which conforms to the 5°C - 45°C (41°F - 113°F) thermal specifications, a 80% maximum relative humidity of air and a contamination level of two (means a normal 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 has a class II installation category.

### **Bench Operation**

**3.2.1**

The unit can be placed onto a secure flat surface.

### **Power Requirements**

**3.3**

The BLAH2000-I E C Amplifier 300MHz has a build-in switched power supply. The mains line connector on the rear panel is a CEI 10A.

#### **One Phase Line requirements :**

AC input voltage :	208-230VAC
Input current max :	5.5A
Frequency :	50/60Hz

### **System Check**

**3.4**

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

- The AC input voltage 208-230 VAC  $\pm$  10% range must be compatible with the power supply.
- AC line is connected.
- CAN interface is connected.
- Power forward and reflected are connected.
- The BLAH2000-I E C Amplifier 300MHz has a nominal input level of 0dBm. Ensure that the system drivers are operating at these levels.
- Output RF loads are connected.

The following list describes how to turn on the BLAH2000-I E C Amplifier 300MHz and what should be seen as this occurs.

Before starting this procedure, make sure that you have properly followed the instructions in section **"System Check" on page 12.**

1. Connect the amplifier to the AC line and turn the line switch to ON.
2. Observe the indicators on the front panel of the amplifier :
  - The +32V ON LED's will illuminate,
  - The +15V, -15V and +3,3V ON LED's will illuminate.
3. System is now fully operational.



# Operation

# 4

## Front Panel Description

4.1

The BLAH2000-I E C Amplifier 300MHz front panel is provided with 11 indicators for status monitoring, 5 RF connectors, 1 interface connector, 6 optocoupled connectors and 1 line switch.

## Indicators

4.1.1

Normal operation is indicated when following LED's are ON.

Table 4.1. Indicators Assignment

+32V	Indicates that the +32V supply is applied.
+15V	Indicates that the +15V supply is applied.
-15V	Indicates that the -15V supply is applied.
+3,3V	Indicates that the +3,3V supply is applied.
Overdrive	Indicates when the peak power limit has been reached.
Duty Cycle (D.C.)	Indicates when the duty cycle limit has been reached.
Pulse Width (P.W.)	Indicates when the pulse width limit has been reached.
Mismatch	Indicates when the max. reflected power limit has been reached.
RF POW. FLT	Indicates when one of the above limits has been reached.
Overheat	Indicates that the thermistor located on the RF module heatsink has sensed excessive heatsink temperature. The amplifier is blanked until an acceptable temperature is reached. The function is self-resetting and no maintenance is needed. Indicates also that a fan on the assembly stops turning. The amplifier is blanked until fans are changed.
2000	Indicates when the RF Power is present on the 2000W output.

Table 4.2. Coaxial Connectors Assignment

<b>RF IN</b>	RF input, SMA type connector (female). Allows to the BLAH2000-I E C to deliver full power at nominal +0dBm drive.
<b>2000W</b>	RF output, N type connector (female). Power output 2000W @ 300MHz.
<b>BLNK</b>	Blanking input, BNC type connector (female), for test only. TTL logic, 0V = blanking ON, +5V = blanking OFF. When BLANKING signal is at TTL level low (0V), no gating is applied to the amplifier stages, and no RF Power is possible. When BLANKING signal is at TTL level high (+5V), the amplifier stages are gated and RF Power is possible.
<b>POWER FORWARD</b>	Image of Forward signal output, SMA type connector (female). Nominal coupling -67dB.
<b>POWER REFLECTED</b>	Image of Reflected signal output, SMA type connector (female). Nominal coupling -67dB.

The RJ45 connector for the Ethernet 10/100 Mbps link is mounted directly on the BLA Control Board.

Table 4.3. RJ45 Pin Assignment

<b>Pin 1</b>	Transmit + (Tx+)
<b>Pin 2</b>	Transmit - (Tx-)
<b>Pin 3</b>	Receive + (Rx+)
<b>Pin 4</b>	N/A
<b>Pin 5</b>	N/A
<b>Pin 6</b>	Receive - (Rx-)
<b>Pin 7</b>	N/A
<b>Pin 8</b>	N/A



CAN Bus Interface Connectors

4.1.4

Table 4.4. CAN Bus Connectors Assignment

U2	Optocoupled output TX1
U3	Optocoupled input RX1
U4	Optocoupled output TX2
U5	Optocoupled input RX2
ENABLE	Optocoupled enable input
UNBLK	Optocoupled input blanking

Device Front View

4.1.5

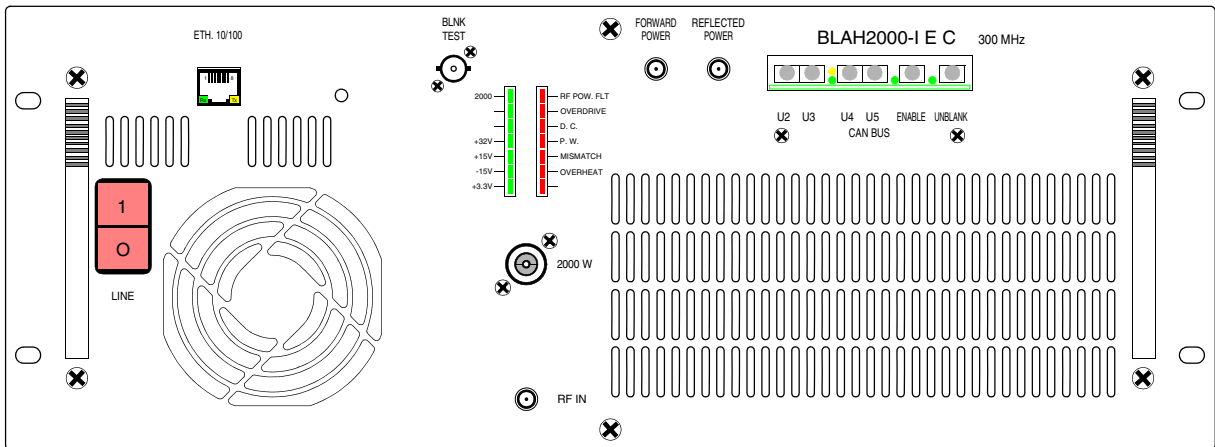
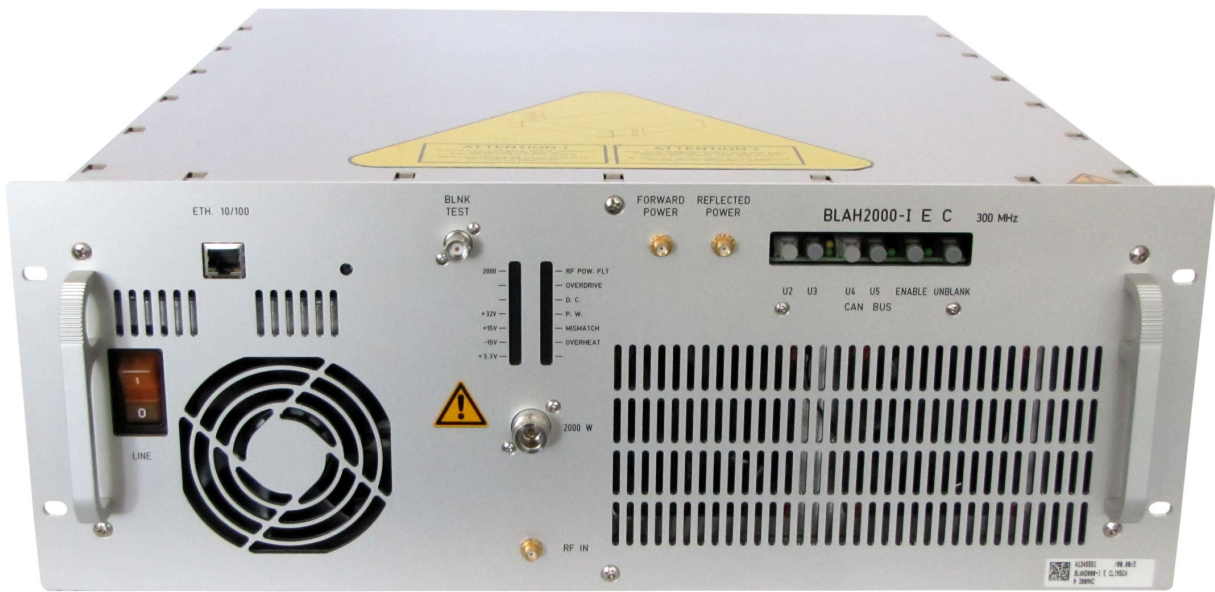


Figure 4.1. BLAH2000-I E C Amplifier 300MHz Front Panel Design



BLAH2000-I E C Amplifier 300MHz *Front Panel View*

**Rear Panel Description**

**4.2**

The BLAH2000-I E C Amplifier 300MHz rear panel is free of elements in exception of the 3 poles (2P+E) line filter socket.

**Device Rear View**

**4.2.1**

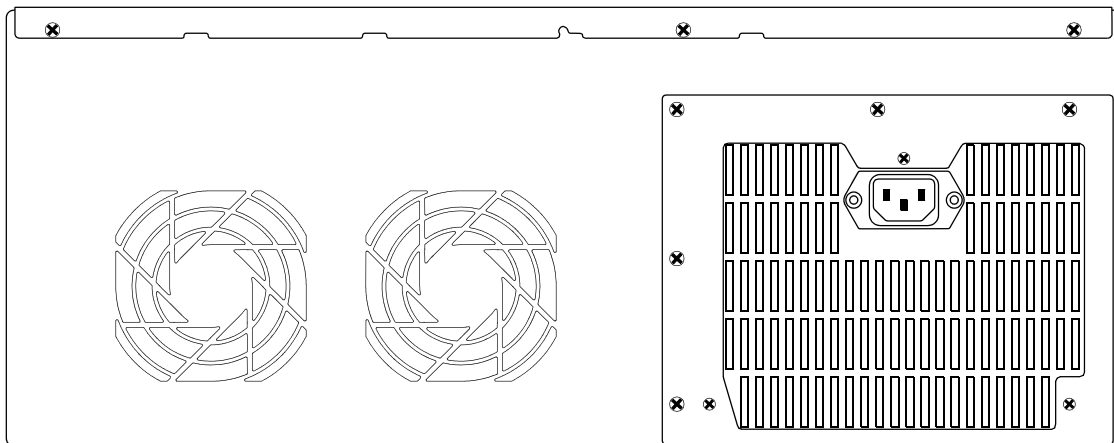


Figure 4.2. BLAH2000-I E C Amplifier 300MHz *Rear Panel Design*



Figure 4.3. BLAH2000-I E C Amplifier 300MHz Rear Panel View



# Technical Description

# 5

## System Overview

## 5.1

The BLAH2000-I E C Amplifier 300MHz provides :

- A RF Output of 2000W on the Output 2000W and more at 0dBm input over the frequency range 300MHz.

The RF section of the system consists of a linear module BLM2000 mounted around a single self-contained Push and Pull fan assembly heatsink.

A linear class A / AB driver using switches and bias voltage gatings, delivers the RF input power to the four power amplifiers through a 4 ways in-phase splitter. This driver is located on the bottom of the heatsink assembly.

The four class AB power amplifiers are located on the top of the heatsink assembly and are combined by the means of 4 ways in-phase combiner.

The output of the combiner is connected to a bi-directional coupler mounted in the BLM2000 module.

The entire system is controlled by a Digital Signal Processing control board, processing information from the amplifier and blanking signal, providing protection from excessive peak power, duty cycle and pulse width for average power, maximum reflected power and heatsink over-temperature.

The DSP control board reads the identification information of the amplifier (BIS).

Monitoring of fan status, supply status and LED's status is also performed by the control board.

Circuits such as Fan Status board located on the RF module, Status LED's board, and a CAN Bus interface complete the amplifier assembly.

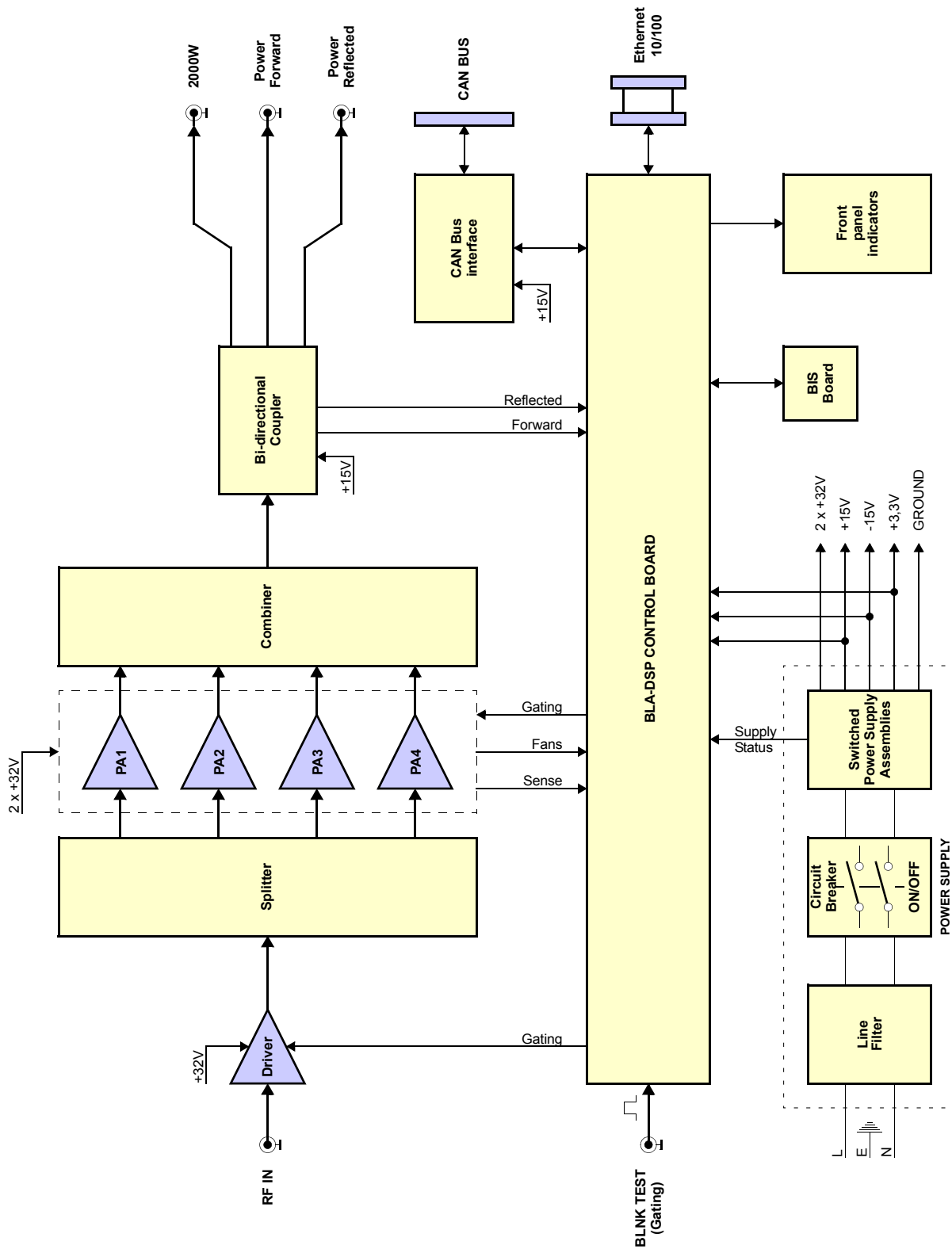


Figure 5.1. BLAH2000-I E C System Block Diagram

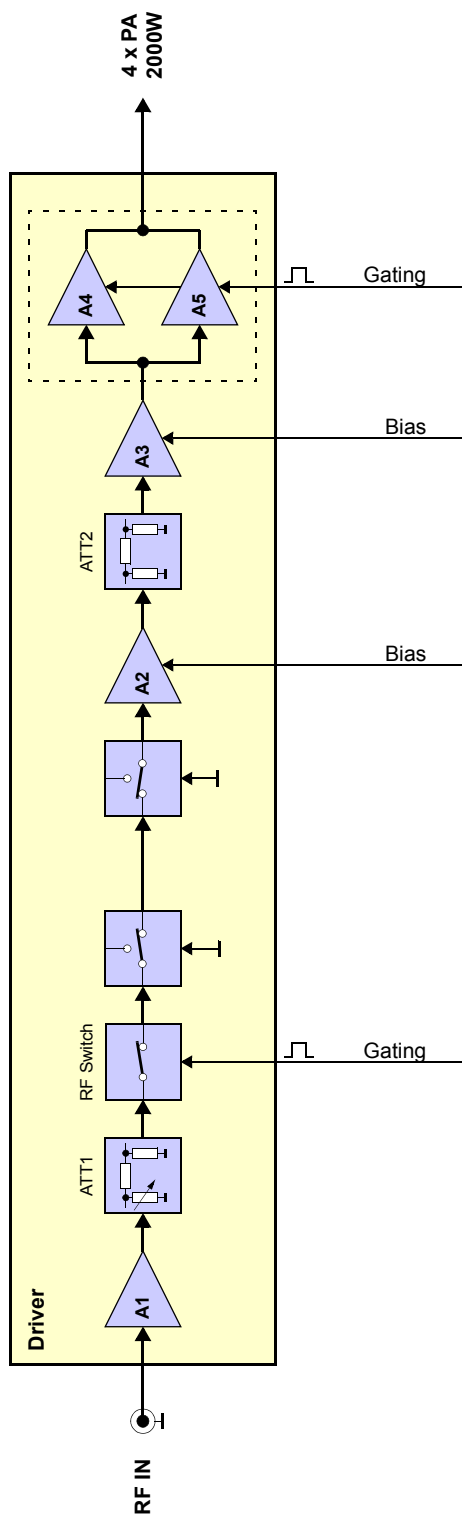


Figure 5.2. Driver Block Diagram

The BLAH2000-I E C Amplifier 300MHz (P/N: W1345551) consists of a class A / AB driver amplifier and a class AB power amplifier.

A nominal input power level of 0dBm produces a rated linear output power of :

- 2000W peak power for 5% duty cycle at 10ms pulse width maximum on the 2000W front panel output connector. The unit is also capable of longer pulses for lower average power, up to 100W CW power on the 2000W output.

#### **RF Driver**

In the first section of the driver, the RF input signal is preamplified with a low noise stage amplifier and followed by a variable attenuator.

Then, the RF signal get through a gating GaAs RF switch.

Next, there is a two stage class A amplifier to build a nominal 40dB gain block.

The second section of the driver includes two power MOSFET transistors. The circuits around the transistors consist of complementary input and output transformers and baluns which operate the devices in push-pull mode.

This section requires a control board conditioned gating signal to control the bias voltage on the gates of the FETs. The gain of this section is around 13dB.

The entire RF driver has around 53dB nominal gain, operates at +32VDC and able to provide more than 250W linear power.

#### **RF 4 ways Splitter**

The RF in-phase splitter distributes with minimal power losses the RF output from the driver towards the four power amplifier circuits.

#### **RF Power Amplifier**

The power amplifier is divided in four identical cells constituted by two RF MOSFET transistors each. The circuits around the transistors consist of complementary transformers and baluns which operate the devices in push-pull mode. Each amplifier cell requires a control board conditioned gating signal to control the bias voltage on the gates of the FETs.

The entire RF power amplifier operates at +32V DC and are followed by an in-phase combiner.

#### **RF 4 ways Combiner**

The RF in-phase combiner is the same structure that the 4 ways splitter. It combines the outputs from the four power amplifier cells in one output which feed a bi-directional coupler.



**RF Coupler**

The bi-directional coupler provides an approximate 1V peak DC signal for full 2000W forward power and also a peak DC signal for reflected power level.

Forward and reflected signals are analyzed by the BLA control board for monitoring and protection of the RF power output.

The coupler provides also two RF signals which are the image of the forward and reflected RF power.

These signals can achieve -4dBm for full 2000W power and are wired to the front panel on POWER FORWARD and POWER REFLECTED connectors.

**BLA Control Board****5.2.2**

The BLA Control Board has 3 main functions:

1. Conditions the input gating (BLNK TEST) signal and delivers it to the above mentioned RF Paths.
2. Allows Ethernet communication with the workstation.
3. Monitor the output characteristics of the amplifier thanks to the DC peak detection of the bi-directional coupler.




---

**Only for amplifier test** : The Ethernet Controller can read all the information given by the control board as described before, read information about forward and reflected power, information of identifications of the amplifier (Bruker Identification System = BIS). It also can minimize absolute ratings for pulse width, duty cycle and peak power limitations.

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**Warning** : the operating of the Ethernet Link requires a Spectrometer Management Software such as TOPSPIN.

---

Configuration, diagnosis and servicing access to the amplifier relies on http. See more information in "**Servicing the BLA**" on page 27.

The monitoring circuitry is also useful to process the detection information and protect the amplifier from overstress in peak power, average power versus duty cycle and pulse width, so as excess of reflected power.

The control board also monitors the RF Path heatsink temperature to protect against thermal overstress.

Information from supplies and fan status board are also analyzed by the control board.

If one of the above overstresses, faults on power supplies or fans appears, the gating signal is disabled, and the status led board on the front panel displays the fault.

The CAN Bus interface control the pulse generation for gating the amplifier and the security of the system.

In Siemens electronics based MR-systems, the optocoupled CAN Bus interface has control of the amplifier :

#### **CAN 1 In (RX U3) / Out (TX U2)**

The normal on/off switching of the amplifier as well as supplying status and error information to the Siemens electronics takes place over this serial communication bus. Via signal RFPA\_OFF, the RFPA is switched off. It can be switched on afterward by a CAN-command only. Activity on the CAN bus is visualized by the LEDs.

#### **CAN 2 In (RX U5) / Out (TX U4)**

A feed-through to other components in the CAN chain.

#### **Enable**

The enable signal allows the Siemens electronics to shut the amplifier down independent from the CAN Bus controller. If the signal is missing (light out), the amplifier shuts down.

#### **Unblank**

To reduce noise and loss of the MR echo during reception, the amplifier is blanked during the receive cycle. This is accomplished with the fiber optic signal UNBLANK. When signal is active (light on), the amplifier is activated.

The status led board, on the front panel of the amplifier, displays overstress functions, supplies status, and so on, as described in **"Indicators" on page 15** and **"BLA Control Board" on page 25**.

The universal BIS board is located on the amplifier case and contains identifications of the amplifier.



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[Technical help : please contact your local representative.](#)

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# *Servicing the BLA*

# 6

The BLAH2000-I E C Amplifier 300MHz provides diagnosis and servicing web pages relies on HTTP, allowing service access with any web browser.

## *Accessing the BLA Amplifier*

**6.1**

The BLAH2000-I E C Amplifier 300MHz is accessible via the BLA control board with its IP address.

The IP address is given during "cf" by using TOPSPIN 2.xx software on the workstation.

In case of problems :

- Check the RJ45 cabling between amplifier, Ethernet switch and workstation.
- Check the Ethernet switch power.
- Check if the green LED on the amplifier RJ45 connector lights up.
- Check the front panel of the amplifier, LED's indicators +32V, +15V, -15V and +3.3V ON must have lit.

To access the BLAH2000-I E C Amplifier 300MHz, type "**ha**" in TOPSPIN 2.xx or better and choose the BLA that should be accessed or start your favourite web browser and type the given IP address as URL.

You should get the following start screen.

**think forward**

Channel Information						Limits				
Ch.	Type	Nom. power	Min freq.	Max freq.	Duty cycle	Pulse width	Mismatch	Forw. peak	Output num.	Input num.
1	H	2000 W	280 MHz	320 MHz	5 %	10 ms	1000 W (50 %)	4000 W (200 %)	1	1

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Figure 6.1. Device Information

This page gives you general information about the amplifier (default page).

In the main toolbar, we can see that a BLA is displayed.

The left panel is the navigation menu. It can be used to navigate through the service pages or choose another tab in the sub toolbar.

Leads you to a page giving information about the current status of the amplifier.

**Bruker Linear Amplifiers**

**BLA**

Information    Advanced Operations    Maintenance

**Amplifier status**

Name: BLAH2000-1 E C  
 Part number: W1345551  
 Serial number: 0001  
 Ecl: 0

	Channel 1
Type:	H
Nominal power:	2000 W
Forward peak power:	0.04 %
Forward average power:	0.01 %
Reflected power:	0 %
Overdrive:	OK
Pulse width:	OK
Duty cycle:	OK
Mismatch:	OK
General gating fault:	OK
Supply:	OK
Thermal:	OK
Blanking signal state:	inactive
Input power:	none
Output power:	none
High resolution state:	inactive
Switchbox position:	0xFF

This page is automatically refreshed every 10 seconds

think forward

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Figure 6.2. Amplifier Status

You should get the following start screen.

**think forward**

**BRUKER**

**Bruker Linear Amplifiers**

**BLA**

Information **Advanced Operations** Maintenance

**Advanced Operations**

- Amplifier limitations
- Routing information & setting

**Device Information**

Name: BLAH2000-I E C  
 Part number: W1345551  
 Serial number: 0001  
 Ecl: 0  
 Manufacturing location: BFR  
 Manufacturing date: 7/2/09  
 BIS type: BLA

**Software Versions**

Boot version: 20051018  
 Kernel version: Windows CE 5.0  
 Application version: BLAC6\_20090311

**Channel Information**

Ch.	Type	Nom. power	Min freq.	Max freq.	Limits				Output num.	Input num.
					Duty cycle	Pulse width	Mismatch	Forw. peak		
1	H	2000 W	280 MHz	320 MHz	5 %	10 ms	1000 W (50 %)	4000 W (200 %)	1	1

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Figure 6.3. Device Information

This page gives you general information about the amplifier.

The left panel is the navigation menu. It can be used to navigate through the service pages or choose another tab in the sub toolbar.

Leads you to a page giving several default and current limits of the amplifier.

If you want, for any reasons, to change the current limits of the amplifier, press **Change limits**.

**Bruker Linear Amplifiers**

BLA

Information **Advanced Operations** Maintenance

**Amplifier limitations**

Name: BLAH2000-1 E C  
 Part number: W1345551  
 Serial number: 0001  
 Ed: 0

Channel Information

Channel 1				Limits					
Type	Nom. power	Min freq.	Max freq.	Duty cycle	Pulse width	Mismatch	Forw. peak	Output num.	Input num.
H	2000 W	280 MHz	320 MHz	5 %	100 ms	1000 W (50 %)	4000 W (200 %)	1	1
Current limits :				5 %	100 ms	1000 W	4000 W	<a href="#">Change limits</a>	

think forward

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Figure 6.4. Amplifier Limitations

Read the warnings, change limit parameters and press **Apply** if you are sure of that.



**Bruker Linear Amplifiers**

BLA

Information   **Advanced Operations**   Maintenance

**Advanced Operations**


Amplifier limitations

Routing information & setting

**Channel limitations**

Name: BLAH2000-1 E C  
 Part number: W1345551  
 Serial number: 0001  
 Ecl: 0

**Channel 1 limitations**

 Changing these settings will overwrite the limitations defined with the spectrometer software. Please use this page for test purposes only.

Type :	H			
Nominal power :	2000 W			
Min. frequency :	280 MHz			
Max. frequency :	320 MHz			
	Default	Current	New	Maximum
Duty cycle limit :	5 %	5 %	<input type="text" value="5"/> %	5 %
Pulse width limit :	100 ms	100 ms	<input type="text" value="100"/> ms	100 ms
Mismatch limit :	1000 W (50 %)	1000 W	<input type="text" value="1000"/> W	2000 W
Forward peak limit :	4000 W (200 %)	4000 W	<input type="text" value="4000"/> W	4000 W
	<input type="button" value="Apply"/>			
Output number :	1			
Input number :	1			

think forward

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Figure 6.5. Change Limits



Leads you to a page giving information about the current routed RF path at the amplifier inputs.

Default RF path is INPUT 1 to CHANNEL 1.

**think forward**

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Figure 6.6. Routing Information and Setting

Because of fixed route, it is not possible to change anything.

You should get the following start screen.

The screenshot shows the Bruker Linear Amplifiers web interface. At the top right is the Bruker logo. Below it is a navigation bar with tabs for 'Information', 'Advanced Operations', and 'Maintenance'. The 'Maintenance' tab is selected. On the left is a blue navigation menu with options: 'Maintenance', 'Self test & Software reset', 'Firmware update', and 'BIS content'. The main content area is titled 'Device Information' and contains three sections: 'Device Information' (with fields for Name, Part number, Serial number, Ecl, Manufacturing location, Manufacturing date, and BIS type), 'Software Versions' (with fields for Boot version, Kernel version, and Application version), and 'Channel Information' (a table with columns for Ch., Type, Nom. power, Min freq., Max freq., Duty cycle, Pulse width, Mismatch, Forw. peak, Output num., and Input num.). Below the screenshot is the text 'think forward'.

Channel Information						Limits				
Ch.	Type	Nom. power	Min freq.	Max freq.	Duty cycle	Pulse width	Mismatch	Forw. peak	Output num.	Input num.
1	H	2000 W	280 MHz	320 MHz	5 %	10 ms	1000 W (50 %)	4000 W (200 %)	1	1

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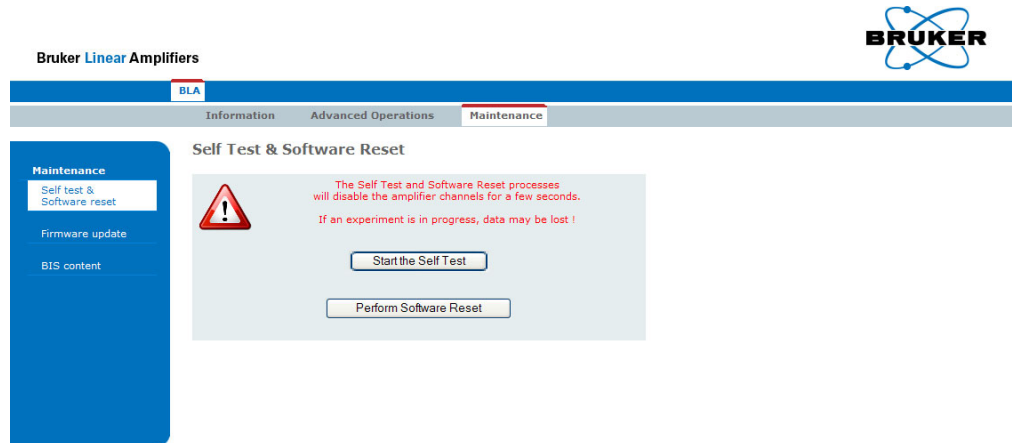
Figure 6.7. Device Information

This page gives you general information about the amplifier.

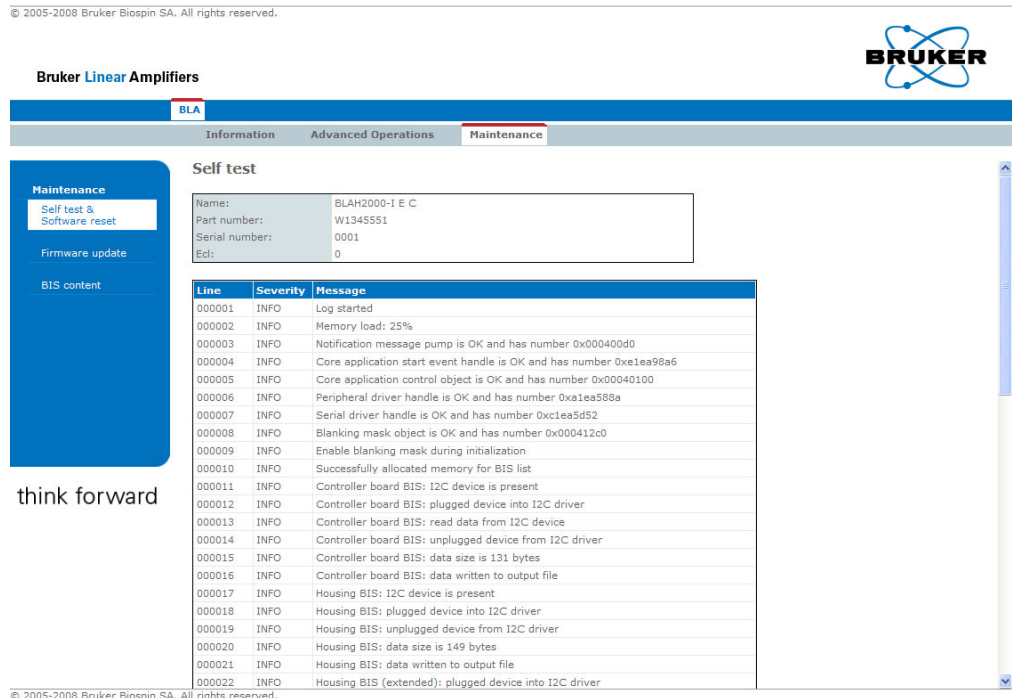
The left panel is the navigation menu. It can be used to navigate through the service pages or choose another tab in the sub toolbar.

Leads you to a page allowing you to do a self-test on the BLA control board (Hardware test) and to do a software reset.

Both operations can be done if the amplifier doesn't work correctly.



think forward

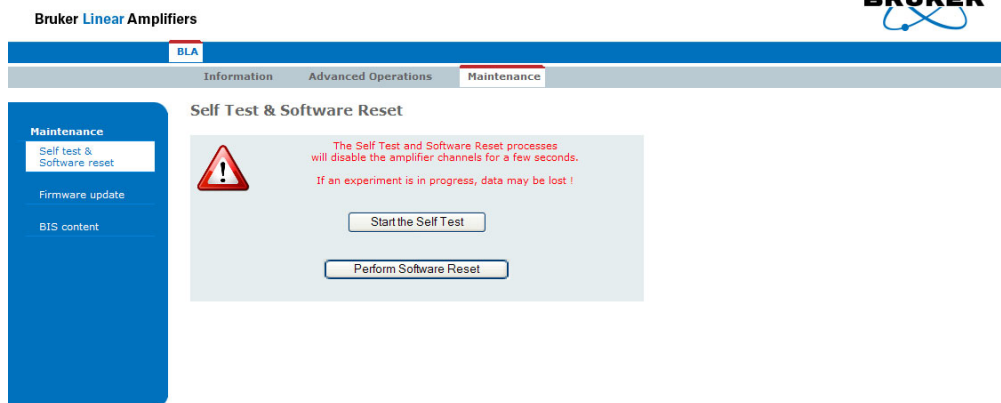


think forward

Figure 6.8. Perform Self Test and Report

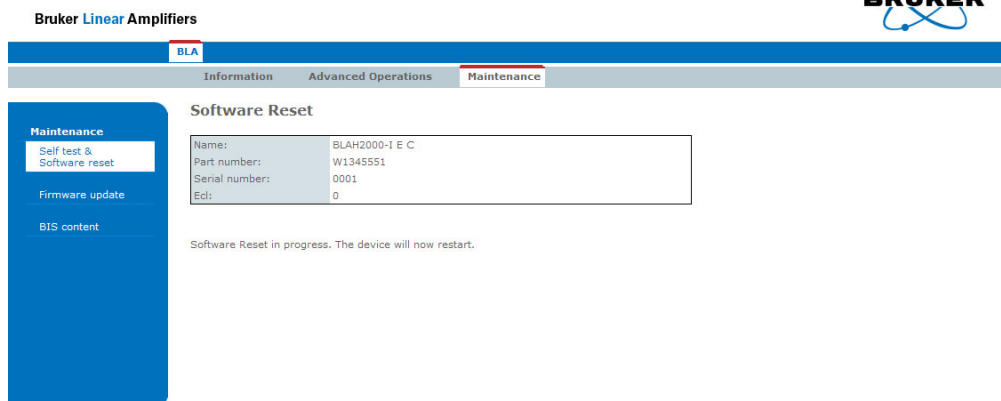
Read the warnings, press **Start the Self Test**.

You should have only gray lines in the report.



think forward

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think forward

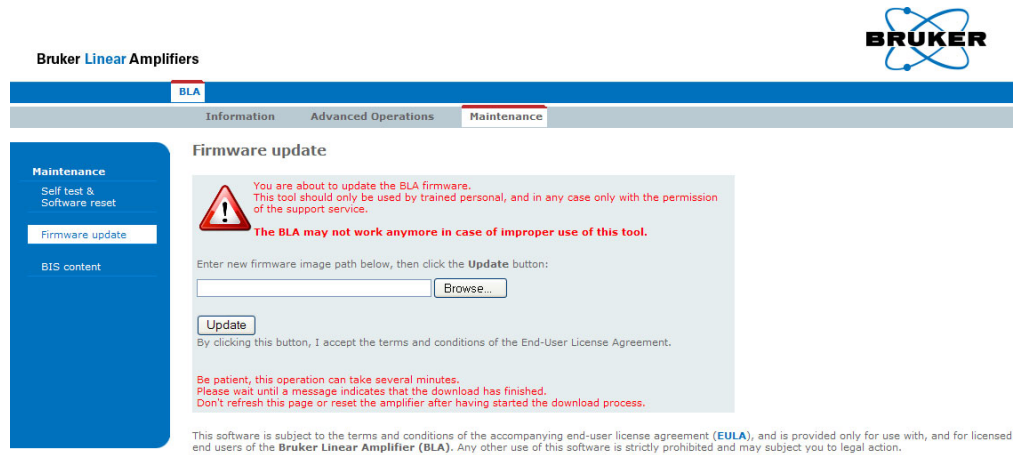
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Figure 6.9. Perform Software Reset and Report

Read the warnings, press **Perform Software Reset**.

You should have the following screen.

Leads you to a page allowing you to download new firmware.



think forward

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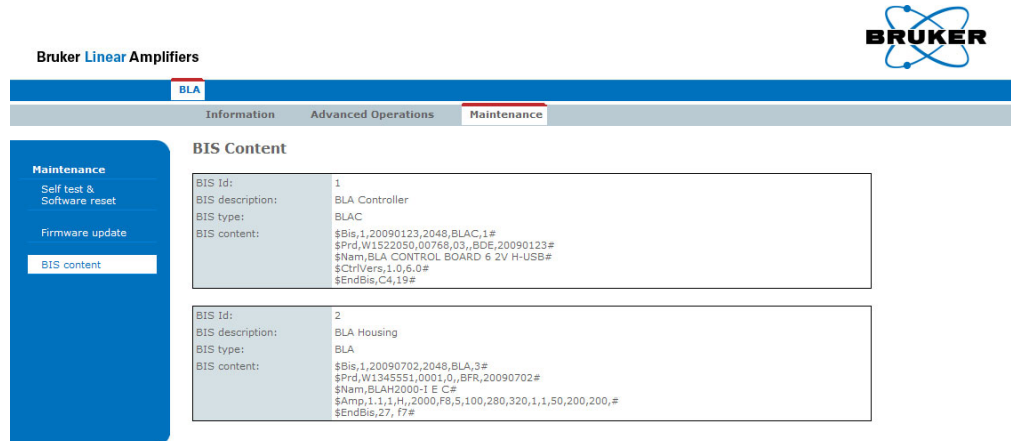
Figure 6.10. Firmware Update

Read the warnings, press the **Browse** button for selecting the new firmware file to download and press **Update**. Download the new firmware will take a few minutes.



**NOTE :** This button caption depends on your operating system language settings.

Leads you to a page giving information about the current BIS programmed on the amplifier.



**Bruker Linear Amplifiers**

**BLA**

Information   Advanced Operations   Maintenance

**Maintenance**

- Self test & Software reset
- Firmware update
- BIS content**

### BIS Content

BIS Id:	1
BIS description:	BLA Controller
BIS type:	BLAC
BIS content:	<code>\$Bis,1,20090123,2048,BLAC,1# \$Prd,W1522050,00768,03,BDE,20090123# \$Nam,BLA CONTROL BOARD 6 2V H-USB# \$CtrlVers,1,0,6,0# \$EndBis,C4,19#</code>
BIS Id:	2
BIS description:	BLA Housing
BIS type:	BLA
BIS content:	<code>\$Bis,1,20090702,2048,BLA,3# \$Prd,W1345551,0001,0,,BFR,20090702# \$Nam,BLAH2000-1 E-C# \$Amp,1.1,1,H,,2000,F8,5,100,280,320,1,1,50,200,200,# \$EndBis,27, f7#</code>

think forward

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Figure 6.11. BIS Content

# Specifications

# 7

## Common Characteristics

## 7.1

Table 7.1. Amplifier Common Characteristics

<b>Constant Internal Protection</b>	Supplies, fans faults and over temperature. Forward Power : peak & CW power, pulse width and duty cycle. Reflected Power : peak & CW power, self resetting protection shuts the amplifier off if the load VSWR is excessive.
<b>Front Panel Indicators</b>	Amplifier Status Led Board.
<b>Front Panel Interfaces</b>	1 x I/O 8 pins RJ45 connector, 1 x I/O octocoupled CAN bus.
<b>Front Panel Controls</b>	1 x AC line ON/OFF switch, 1 x power forward output, 1 x power reflected output, 1 x blanking test.
<b>Front Panel Connectors</b>	1 x RF input, 1 x RF output.
<b>Rear Panel Connectors</b>	1 x AC line in socket.
<b>Cooling System</b>	Forced-air cooling (from front to rear).
<b>Size</b>	19" rack cabinet x 4U height x 520mm depth.
<b>Weight</b>	30kg
<b>Power Requirements</b>	208-230 VAC $\pm$ 10% single phase 50-60Hz. Bruker Biospin part number 50776. Consumption max. 1.10kVA.

## Specifications

### General Specifications

7.2

#### Channel 2000W Output

7.2.1

Table 7.2. Channel 2000W Output Specifications

<b>Frequency Range</b>	280 to 320MHz
<b>Linear Gain</b>	68dB $\pm$ 1dB typical
<b>Gain Flatness</b>	$\pm$ 1dB max.
<b>Minimum Pulsed Output Power</b> (@ nominal Input +0dBm)	2000W min. @ 300MHz
<b>CW Output Power</b> (Internal Limitation)	100W max.
<b>Linear Output Power</b>	1500W typical @ 1dB compression
<b>Linearity</b>	$\pm$ 1dB to 1500W typical @ 300MHz
<b>Amplifier Biasing</b>	Class AB operation
<b>Blanking Delay Time</b>	1.5 $\mu$ s min.
<b>RF Rise Time</b>	< 100ns
<b>RF Fall Time</b>	< 70ns
<b>DC Ringing</b>	$\pm$ 500mV typical (due to blanking signal)
<b>Input Noise Figure</b>	5dB typical
<b>Output Noise Power</b> (Unblanked)	-101dBm @ 1Hz
<b>Output Noise Power</b> (Blanked)	Thermal Noise
<b>Input/Output Impedance</b>	50 $\Omega$
<b>Input V.S.W.R.</b>	1.3 : 1 max.
<b>Output Harmonics</b> (2fc ; 3fc) @ 300MHz	-30dBc ; -20dBc min. @ 2000W
<b>Pulse Width</b> (Internal Limitation)	10ms @ 2000W (up to CW @ 100W)
<b>Duty Cycle</b> (Internal Limitation)	5% @ 2000W (up to 100% @ 100W)
<b>Droop &amp; Pulse Flatness</b>	$\pm$ 4% typical @ 2000W for 10ms Pulse Width
<b>Amplitude Stability vs. Temperature</b>	$\pm$ 0.15% / $^{\circ}$ C max.



# Service Information and Maintenance

# 8

Every intervention on the device must be carried out by an authorized and qualified person. Any failure due to a non-respect of the following instructions will not be attributable to BRUKER BIOSPIN and will not be covered by the guarantee clauses.

## ***Preventive Maintenance of the RF Module on BLA-Type Amplifiers***

**8.1**

The RF module inside BLA's Amplifiers is equipped with a easily extractible PUSH and PULL FAN Assemblies.

Fan's on assembly have a high reliability and manufacturer gives a expected live time of 70000 hours (8 years) at 25°C and 5 years at 60°C.

Replacement of the assembly could be done in the field when a misfonction of fans is detected by lightning from the OVERHEAT Status Led.

To prevent such a misfonction, a preventive maintenance could be done every 4 years.

These assemblies can be ordered on the manufactory BBIO-FR by P/N:

- **W1346530** «PUSH FAN ASSEMBLY BLA1000/300».
- **W1346531** «PULL FAN ASSEMBLY BLA1000/300».

## ***Operation***

**8.1.1**

1. Disconnect all cables from the front panel and the supply connector on the rear panel. Remove the amplifier from the CLINSCAN console and place it on a secure flat surface.
2. Unscrew and remove the coverage plate from the amplifier.
3. Disconnect the 2 connectors J3 and J4 (two red/white wires) from the left side of the RF module.

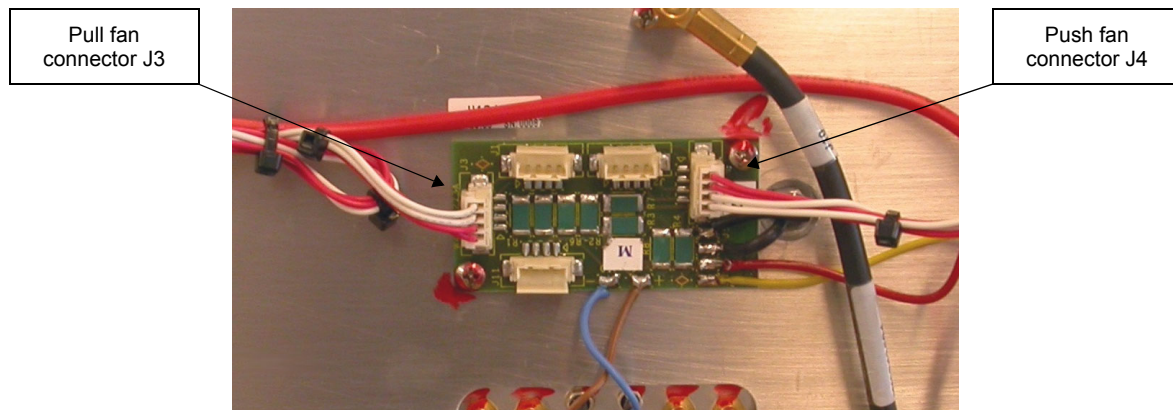


Figure 8.1. Fan Supplies and Status Connections

4. Unscrew only the 4 screws from the top of the Push and Pull fan assemblies on the both sides of the RF module.

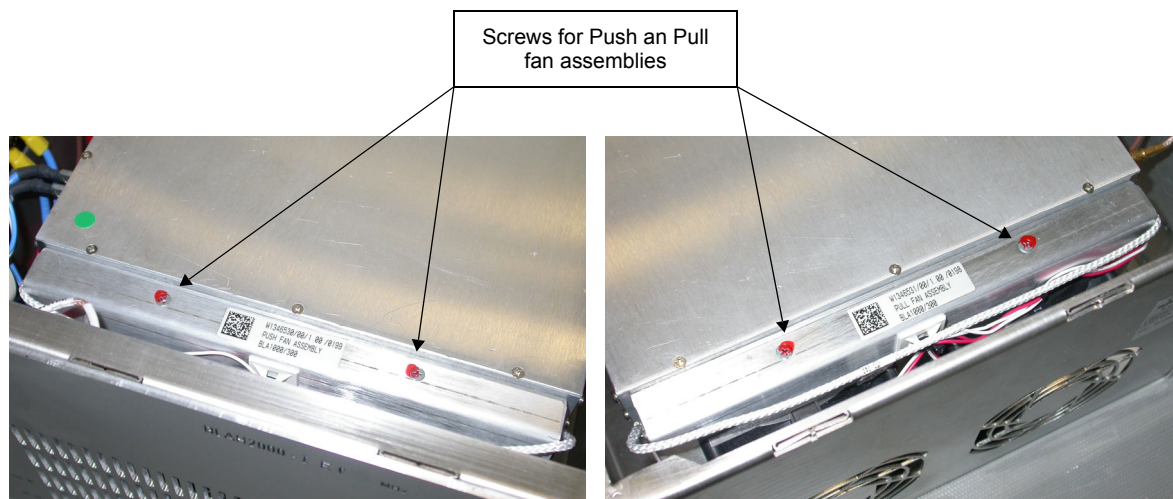


Figure 8.2. Push Fan Assembly

5. Remove the Push and Pull fan assemblies.
6. Place correctly the new fan assembly sets in the bottom holes of the RF module and screw it on the top.
7. Connect the 2 red/white wires on the left side of the RF module (J3 and J4).
8. Connect line cord and turn on the amplifier. Note that the fans are turning and no OVERHEAT status led appears on front panel.
9. Turn off the amplifier and disconnect the line cord.
10. Put the coverage plate on the amplifier and screw it.
11. Put the amplifier in the CLINSCAN console, connect all cables on the front panel and the line cord on the rear panel.

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**End of Document**

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