

Bruker BioSpin

# BLA1000 E C ●

Amplifier 15-300MHz  
Operating and 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.

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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 BLA1000 E C Amplifier 15-300MHz is a broadband 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 W1345506.

The class AB linear amplifier provides 1000W and more peak RF power over the frequency range 15-300MHz.

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 100ms and 5%.

Its built-in protection circuitry will allow lower power pulses for longer pulse widths and duty-cycles up to 50W average power on the 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  $\geq 6$ )
- 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", 3U, 520mm deep rack cabinet and is powered by an external switched power supply assembly housed in a 19", 2U, 480mm deep rack cabinet.

The amplifier and its power supply are available under the BRUKER BIOSPIN part number W1304087.





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The BLA1000 E C Amplifier 15-300MHz 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.

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## 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 BLA1000 E C Amplifier 15-300MHz can be identified by an identifying plate at the front panel of the unit that contains the following information :

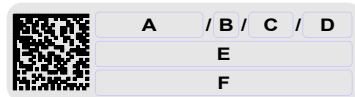


Figure 2.1. Identifying Plate

- **(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.

### Manufacturer's Name Plate

2.1.2

The BLA1000 E C Amplifier 15-300MHz can be identified by a manufacturer's name plate at the back panel of the unit that contains the country of origin of manufacture.

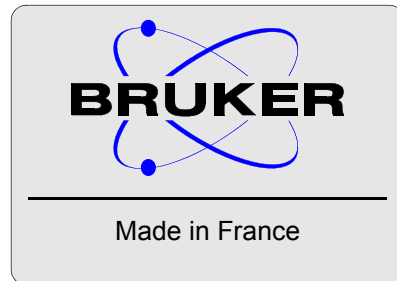


Figure 2.2. Manufacturer's Name Plate

### Safety Labels and Symbols

2.1.3

### Warning Signs

2.1.4

#### 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.

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## ***Initial Inspection*** **3.1**

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### ***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.

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### ***Claim for Damage*** **3.1.2**

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

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### ***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 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 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 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 BLA1000 E C Amplifier 15-300MHz is designed to be powered by an additional external switched power supply (P/N:W1304007).

The connection to this power supply is realized via an 1100mm cable fitted with a 15 pins DIN 41612-ERNI female connector and coming out from the rear panel of the amplifier.

It provides all the voltages necessary to the BLA1000 E C Amplifier 15-300MHz to work. See **"External Power Supply" on page 17.**

### **System Check**

**3.4**

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

- The AC input voltage 208-230VAC  $\pm$  10% range must be compatible with the power supply.
- AC line is connected.
- CAN interface is connected.
- Power forward and reflected are connected.
- The BLA1000 E C Amplifier 15-300MHz 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 BLA1000 E C Amplifier 15-300MHz and what should be seen as this occurs.

Before starting this procedure, make sure that you have properly followed the instructions in the section **"System Check" on page 10**.

1. Connect together the amplifier and the external power supply, connect it 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 BLA1000 E C front panel is provided with 11 indicators for status monitoring, 5 RF connectors, 1 interface connector and 6 optocoupled connectors.

## Indicators

4.1.1

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

Table 4.1. Amplifier Indicators Assignment

|                           |   |
|---------------------------|---|
| <b>+32V</b>               | Indicates that the 5 x +32V supplies are applied.   |
| <b>+15V</b>               | Indicates that the +15V supply is applied.  |
| <b>-15V</b>               | Indicates that the -15V supply is applied.  |
| <b>+3.3V</b>              | Indicates that the +3.3V supply is applied.   |
| <b>Overdrive</b>          | Indicates when the peak RF power limit has been reached.  |
| <b>Duty Cycle (D.C.)</b>  | Indicates when the duty cycle limit has been reached.   |
| <b>Pulse Width (P.W.)</b> | Indicates when the pulse width limit has been reached.  |
| <b>Mismatch</b>           | Indicates when the max. reflected RF power limit has been reached.  |
| <b>RF POW. FLT</b>        | Indicates when one of the above limits has been reached.  |
| <b>Overheat</b>           | 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.<br>Indicates also that a fan on the assembly stops turning. The amplifier is blanked until fans are changed. |
| <b>1000 ON</b>            | Indicates when the RF Power is present on the 1000W output.   |

Table 4.2. Coaxial Connectors Assignment

|                        |  |
|------------------------|--|
| <b>RF IN</b>           | RF input, SMA type connector (female).<br>Nominal input +0dBm.   |
| <b>1000 W</b>          | RF output, N type connector (female).<br>Pnominal 1000W (15-300MHz)  |
| <b>BLNK TEST</b>       | Blanking Test input, BNC type connector (female), for test only.<br>TTL logic, 0V = blanking on, +5V = blanking off.<br>When BLANKING signal is at TTL level low (0V), no gating is applied to the amplifier stages, and no RF Power is possible.<br>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).<br>Nominal coupling -67dB.  |
| <b>POWER REFLECTED</b> | Image of Reflected signal output, SMA type connector (female).<br>Nominal coupling -67dB and -20dB directivity.  |

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              |

Table 4.4. CAN Bus Connectors Assignment

|               |                            |
|---------------|----------------------------|
| <b>U2</b>     | Optocoupled output TX1     |
| <b>U3</b>     | Optocoupled input RX1      |
| <b>U4</b>     | Optocoupled output TX2     |
| <b>U5</b>     | Optocoupled input RX2      |
| <b>ENABLE</b> | Optocoupled enable input   |
| <b>UNBLK</b>  | Optocoupled input blanking |

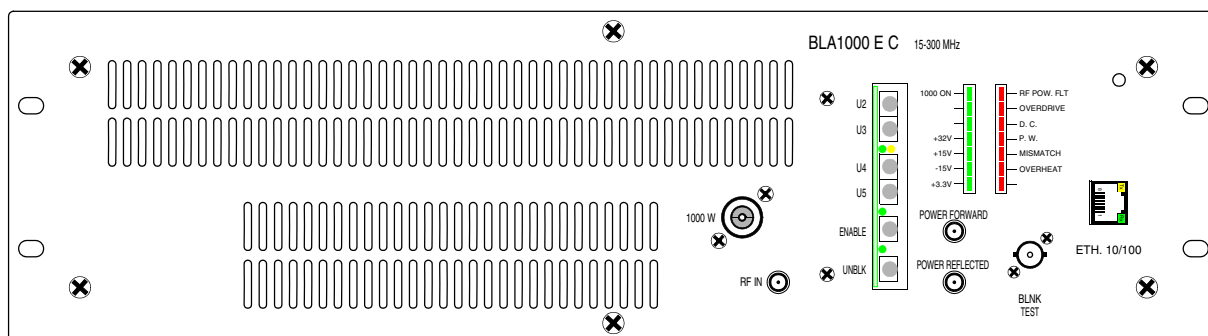


Figure 4.1. BLA1000 E C Front Panel Design



Figure 4.2. BLA1000 E C Front Panel View

**Rear Panel Description**

**4.2**

The rear panel of the BLA1000 E C Amplifier 15-300MHz has a 1100mm cable fitted with a 15 pin DIN 41612-ERNI female connector, coming out of the rear panel of the amplifier.

**Power Supply Connector**

**4.2.1**

Table 4.5. DIN 41612-ERNI Pin Assignment

|                |       |                |               |
|----------------|-------|----------------|---------------|
| <b>Pin z4</b>  | +3,3V | <b>Pin d6</b>  | not connected |
| <b>Pin z8</b>  | +15V  | <b>Pin d10</b> | DGND          |
| <b>Pin z12</b> | -15V  | <b>Pin d14</b> | PGND          |
| <b>Pin z16</b> | +32V  | <b>Pin d18</b> | PGND          |
| <b>Pin z20</b> | +32V  | <b>Pin d22</b> | PGND          |
| <b>Pin z24</b> | +32V  | <b>Pin d26</b> | PGND          |
| <b>Pin z28</b> | +32V  | <b>Pin d30</b> | PGND          |
| <b>Pin z32</b> | +32V  |                |               |



*DGND = Digital Ground for ±15V and +3,3V*  
*PGND = Power Ground for 5 x +32V*

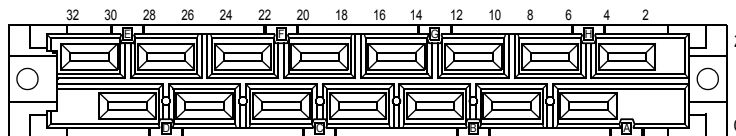


Figure 4.3. DIN 41612-ERNI Connector Design



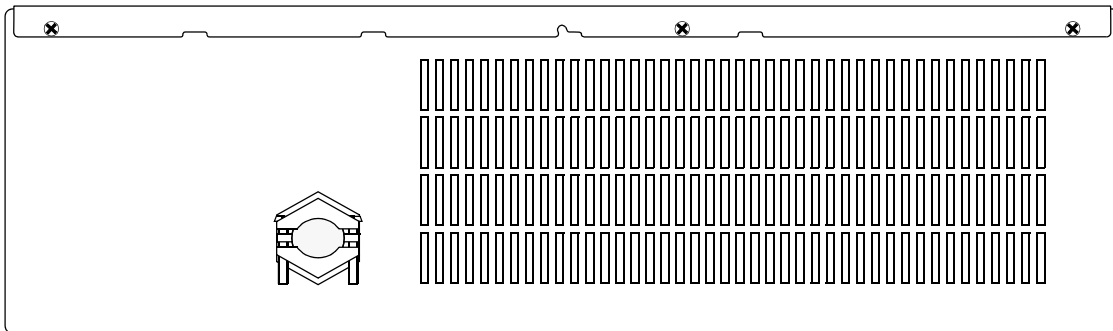


Figure 4.4. BLA1000 E C Amplifier 15-300MHz Rear Panel Design

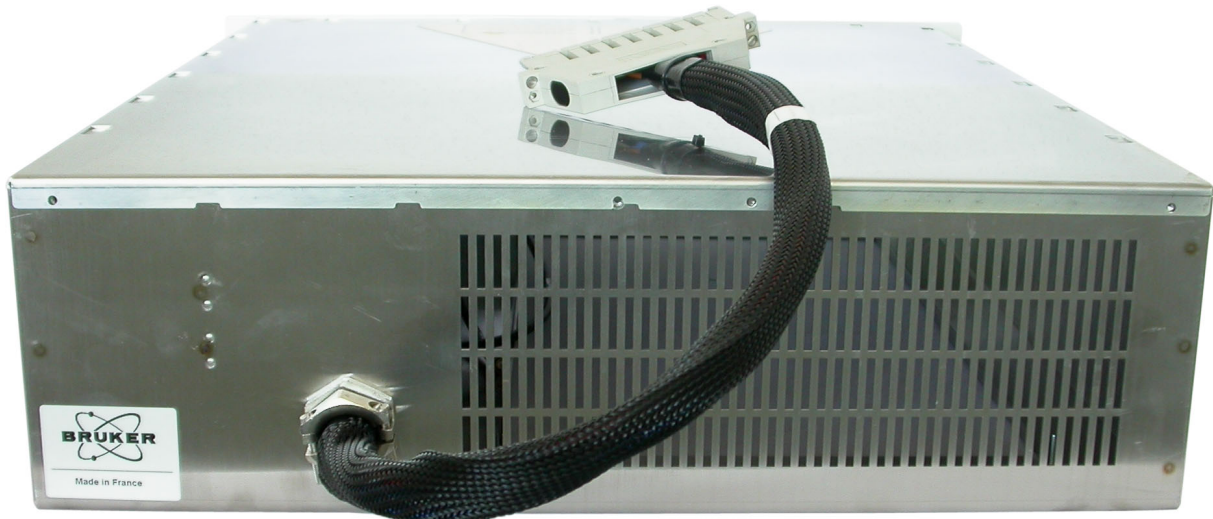


Figure 4.5. BLA1000 E C Rear Panel View

## External Power Supply

## 4.3

The external power supply has the Bruker Part Number P/N:W1304007.

This part number has been established for identification of use by internal jumper settings.

It provides a first output voltage channel of +32Vdc, 50A maximum with a current peak of 175A maximum for 100ms pulse width and 5% duty cycle and also a second output voltage channel of +32Vdc, 18A maximum with a current peak of 45A maximum for 100ms pulse width and 10% duty cycle.

This unit provides also auxiliaries supplies of +15Vdc; 2A, -15Vdc; 0.5A and +3.3Vdc; 4A.

Front Panel & Indicators Description

4.3.1

The external Power Supply front panel is provided with 5 indicators for status monitoring.

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

Table 4.6. Power Supply Indicators Assignment

|                             |   |
|-----------------------------|---|
| <b>+28/30/32V A ON 175A</b> | Indicates that the +32V first voltage output channel supply is active. Internal setting.  |
| <b>+28/30/32V B ON 45A</b>  | Indicates that the +32V second voltage output channel supply is active. Internal setting. |
| <b>+12/+15V ON</b>          | Indicates that the +15V supply is active. Internal setting.                               |
| <b>-15V ON</b>              | Indicates that the -15V supply is active.   |
| <b>+3,3V/+5V ON</b>         | Indicates that the +3,3V supply is active. Internal setting.                              |

Device Front View

4.3.2

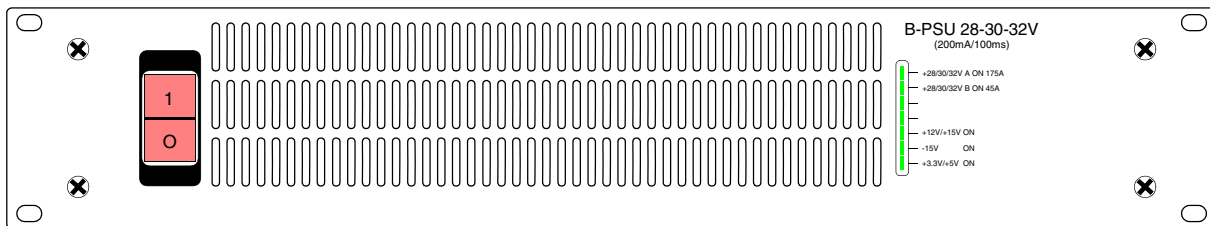


Figure 4.6. Power Supply Front Panel Design

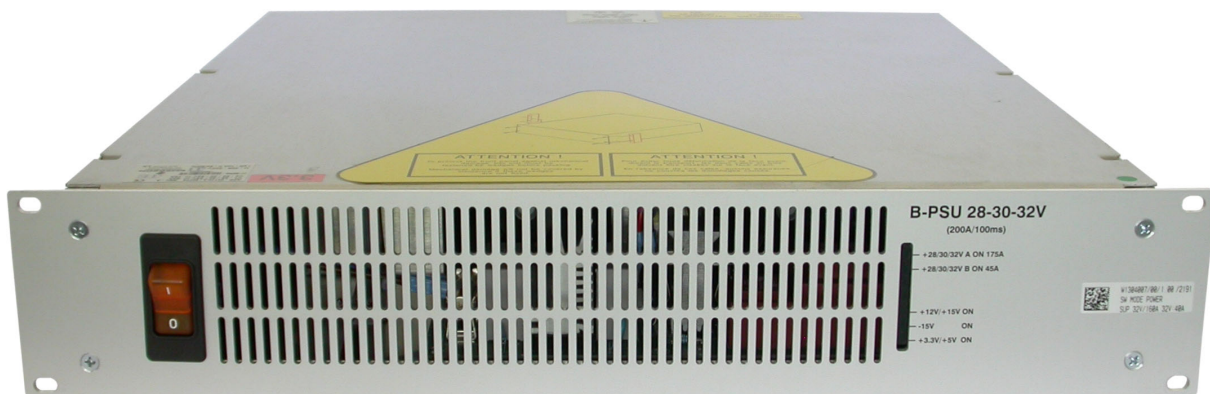


Figure 4.7. Power Supply Front Panel View

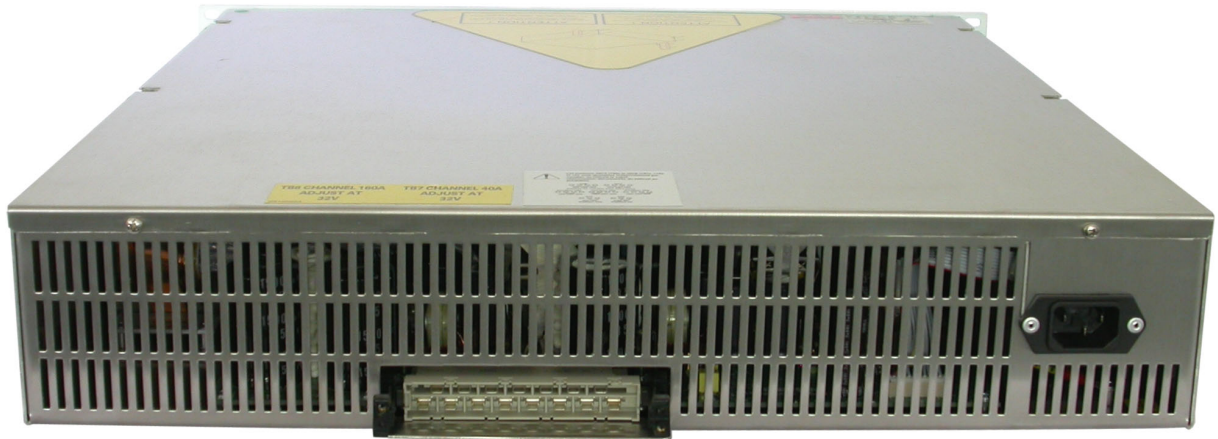
### ***Rear Panel Description***

**4.3.3**

The rear panel of the external power supply is provided with a 15 pin DIN 41612-ERNI male connector.

### ***Device Rear View***

**4.3.4**



*Figure 4.8. Power Supply Rear Panel View*



## System Overview

## 5.1

The BLA1000 E C Amplifier 15-300MHz requires the additional Bruker Biospin Power Supply to provide :

- A RF Output of 1000W on the Output 1000W and more at 0dBm input over the frequency range 15-300MHz.

The RF section of the system consists of a linear module BLM1000 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.

Four class AB power amplifiers, located on the top of the heatsink are combined by mean of a 4 ways in-phase combiner.

The output of the combiner is connected to a bi-directional coupler mounted on the bottom of the heatsink assembly.

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 identification information of the amplifier (BIS).

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

## CAN BUS Interface

## 5.1.1

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 suppling 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.

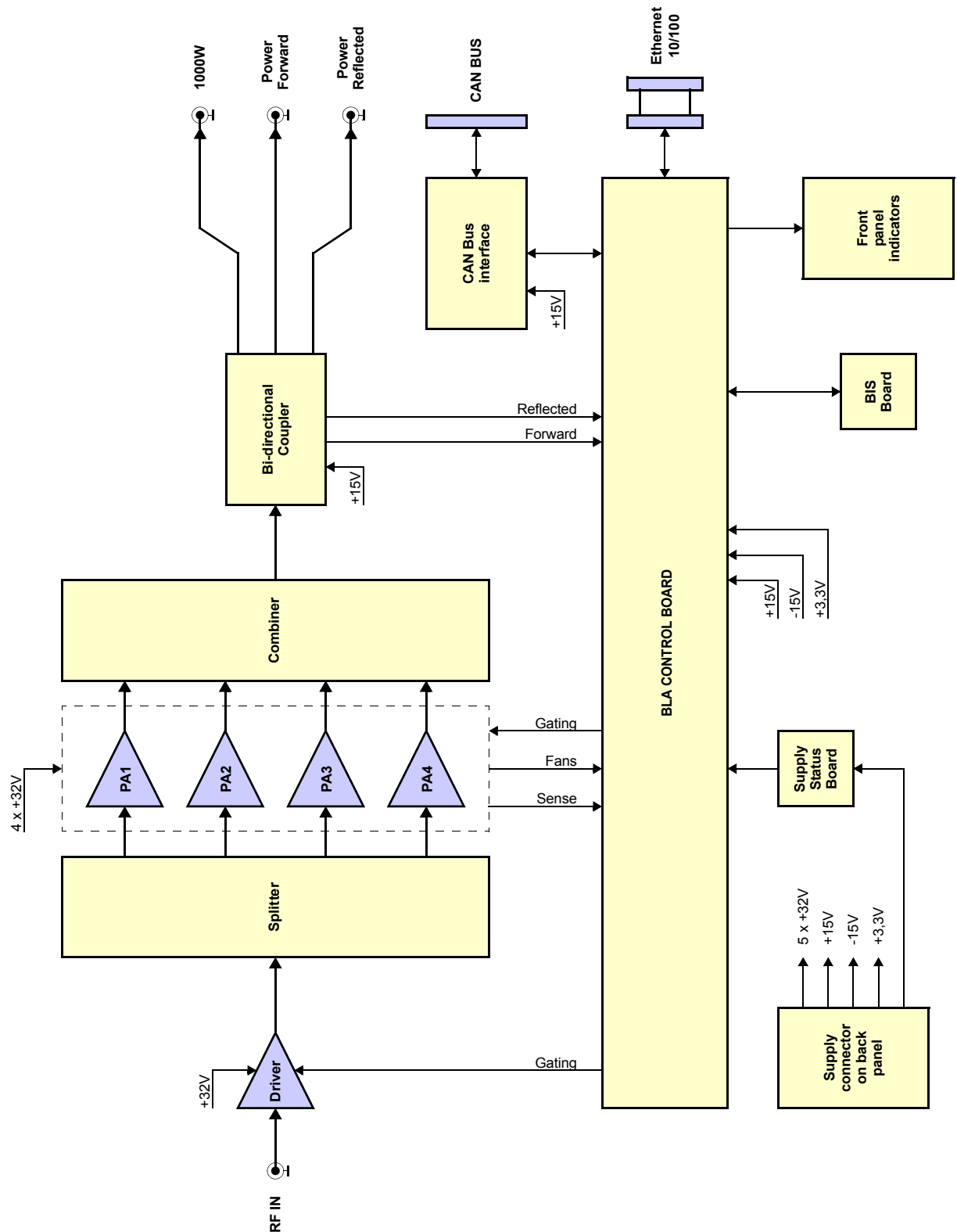


Figure 5.1. System Block Diagram

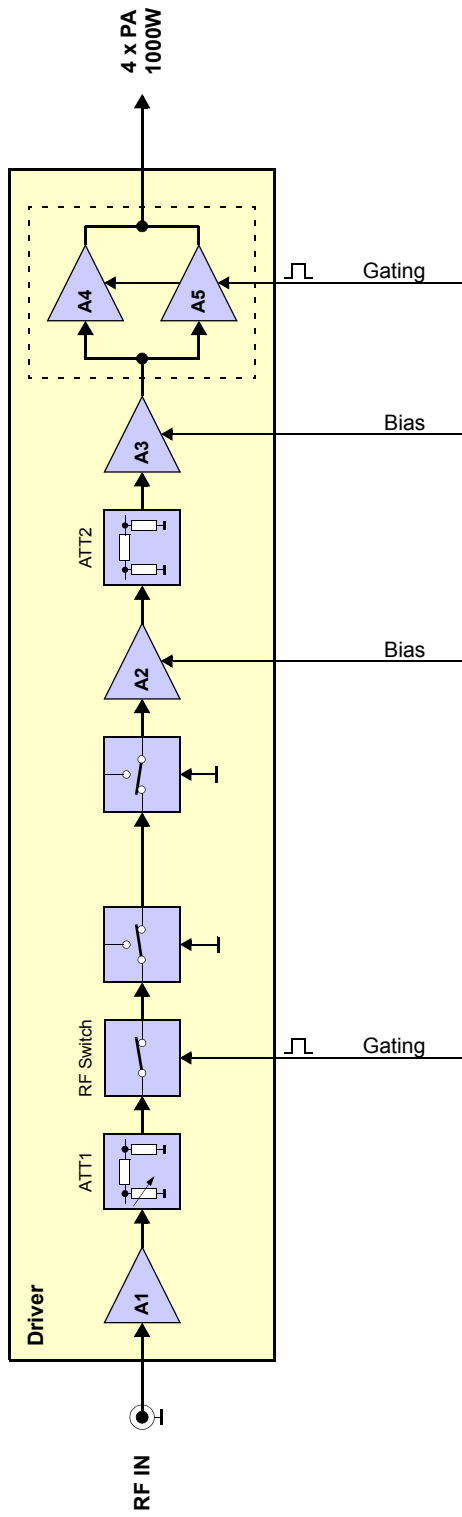


Figure 5.2. Driver Block Diagram



The BLA1000 E C Amplifier 15-300MHz (P/N : W1345506) consists of a class A / AB driver and a Class AB power amplifier.

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

- 1000W peak for 5% duty-cycle at 100ms pulse width maximum on the output 1000W.

The unit is also capable of longer pulses for lower average power, up to 50W CW Power on the output 1000W.

### **RF Driver**

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

Then follows a gating switch.

Next is a two stage class A/AB amplifier to built a nominal 40dB gain block. The second section of the driver includes power MOS FET Transistors.

The circuitry around the transistors consists of complementary input and output transformers and baluns and operates the devices in push-pull.

This section requires a control board conditioned gating signal to control the bias voltage on the gates of the FETs.

The entire RF driver has a nominal 53dB gain, able to develop more than 200W linear power and operates at +32V DC.

### **RF Splitter**

The RF Splitter acts as a 4 ways in-phase splitter between the output of the RF driver and the inputs of the 4 power amplifiers PA.

### **RF Power Amplifier**

Each of the four PA includes two FET transistors pairs mounted on a single flange. The circuitry around each transistor pair consists of complementary input and output transformers and baluns and operates the devices in push-pull. The four PA requires a control board conditioned gating signal in order to control the bias gate voltage on the gates of the FETs.

The four PA operates at +32V DC and are followed by an in-phase combiner.

### **RF Combiner**

The RF Combiner acts as an 4 ways in-phase combiner between the outputs of the four PA and the input of the bi-directional coupler.

### **RF Coupler**

The bi-directional coupler provides an approximate 1V peak DC signal and an approximate +4dBm RF signal for full 1000W power output, same as a peak DC signal and a RF signal for reflected power.

Both peak DC signals, forward and reflected, are analyzed by the BLA Control Board for monitoring and protection on 1000W output.

Both peak RF signals are wired to the front panel on POWER FORWARD and POWER REFLECTED.

### **BLA Control Board**

**5.2.2**

The BLA Control Board has 3 functions:

- Monitor the output characteristics of the amplifier. This is done thanks to the DC peak detections of the bi-directional coupler.
- Condition the input gating (BLNK) signal. The board delivers it to the above mentioned RF Paths.
- Allow Ethernet communication with the workstation.



---

**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.

---



---

**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 29.

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.

### **CAN Board Controller**

**5.2.3**

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

### **Status Led Board**

---

5.2.4

The Status Led Board, on the front panel of the amplifier, displays overrun functions, supplies status, and so on, as described in **"Indicators" on page 13** and **"BLA Control Board" on page 26**.

### **BIS Board**

---

5.2.5

The Universal BIS board is located on the amplifier case and contains identification information of the amplifier.

### **Supply Status Board**

---

5.2.6

This board serves for monitoring the external power supplies and to signalize a default to the control board. In this case, the gating signal is disabled while the default is visualized on the front panel LED's display.



---

**Technical help** : please contact your local representative.

---



# *Servicing the BLA*

# 6

The BLA1000 E C Amplifier 15-300MHz provides diagnosis and servicing Web pages relies on HTTP, allowing service access with any web browser.

## ***Accessing the BLA amplifier***

## **6.1**

The BLA1000 E C Amplifier 15-300MHz 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 BLA1000 E C Amplifier 15-300MHz, type "**ha**" in TOPSPIN 2.xx or better and choose the amplifier to 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                   | BB   | 1000 W     | 15 MHz    | 300 MHz   | 5 %        | 100 ms      | 500 W (50 %) | 2000 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: BLA1000 E C 1S-300MHZ  
 Part number: W1345506  
 Serial number: 0001  
 Ecl: 0

|                        | Channel 1 |
|------------------------|-----------|
| Type:                  | BB        |
| Nominal power:         | 1000 W    |
| Forward peak power:    | 0.00 %    |
| Forward average power: | 0.00 %    |
| 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      |

think forward

This page is automatically refreshed every 10 seconds

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Figure 6.2. Amplifier Status

You should get the following start screen.

**think forward**

**Device Information**

Name: BLA1000 E C 15-300MHZ  
 Part number: W1345506  
 Serial number: 0001  
 Ecl: 0  
 Manufacturing location: BFR  
 Manufacturing date: 4/17/09  
 BIS type: BLA

**Software Versions**

Boot version: 20051018  
 Kernel version: Windows CE 5.0  
 Application version: BLAC6\_20081006

**Channel Information**

| Ch. | Type | Nom. power | Min freq. | Max freq. | Limits     |             |              |                | Output num. | Input num. |
|-----|------|------------|-----------|-----------|------------|-------------|--------------|----------------|-------------|------------|
|     |      |            |           |           | Duty cycle | Pulse width | Mismatch     | Forw. peak     |             |            |
| 1   | BB   | 1000 W     | 15 MHz    | 300 MHz   | 5 %        | 100 ms      | 500 W (50 %) | 2000 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

**Advanced Operations**

Amplifier limitations

Routing information & setting

**Amplifier limitations**

Name: BLA1000 E C 15-300MHZ  
 Part number: W1345506  
 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. |
| BB               | 1000 W     | 15 MHz    | 300 MHz   | 5 %        | 100 ms      | 500 W (50 %) | 2000 W (200 %) | 1                             | 1          |
| Current limits : |            |           |           | 5 %        | 100 ms      | 500 W        | 2000 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: BLA1000 E C 15-300MHZ  
 Part number: W1345506  
 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 :               | BB                                   |         |                                     |         |
| Nominal power :      | 1000 W                               |         |                                     |         |
| Min. frequency :     | 15 MHz                               |         |                                     |         |
| Max. frequency :     | 300 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 :     | 500 W<br>(50 %)                      | 500 W   | <input type="text" value="500"/> W  | 1000 W  |
| Forward peak limit : | 2000 W<br>(200 %)                    | 2000 W  | <input type="text" value="2000"/> W | 2000 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.

**Bruker Linear Amplifiers**

BLA

Information | **Advanced Operations** | Maintenance

**Routing Information & Setting**

Name: BLA1000 E C 15-300MHZ  
 Part number: W1345506  
 Serial number: 0001  
 Ed: 0

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

**Input routing**

| Input number | Current channel | Possible channels | New route   |
|--------------|-----------------|-------------------|-------------|
| 1            | 1               | 1                 | Fixed route |

**Output routing**

| Output number | Current channel | Possible channels | New route   |
|---------------|-----------------|-------------------|-------------|
| 1             | 1               | 1                 | Fixed route |

think forward

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Figure 6.6. Routing Information

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.).

**Device Information**

Name: BLA1000 E C 15-300MHZ  
 Part number: W1345506  
 Serial number: 0001  
 Ecl: 0  
 Manufacturing location: BFR  
 Manufacturing date: 4/17/09  
 BIS type: BLA

**Software Versions**

Boot version: 20051018  
 Kernel version: Windows CE 5.0  
 Application version: BLAC6\_20081006

**Channel Information**

| Ch. | Type | Nom. power | Min freq. | Max freq. | Limits     |             |              | Forw. peak     | Output num. | Input num. |
|-----|------|------------|-----------|-----------|------------|-------------|--------------|----------------|-------------|------------|
|     |      |            |           |           | Duty cycle | Pulse width | Mismatch     |                |             |            |
| 1   | BB   | 1000 W     | 15 MHz    | 300 MHz   | 5 %        | 100 ms      | 500 W (50 %) | 2000 W (200 %) | 1           | 1          |

think forward

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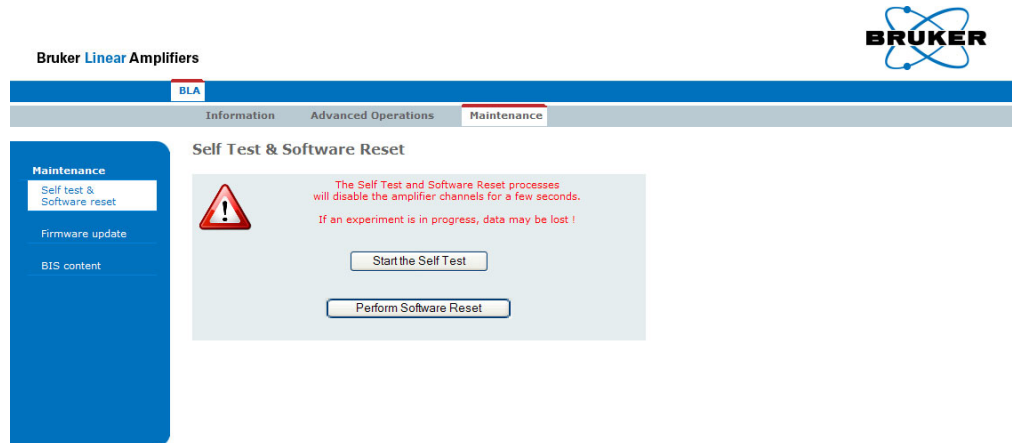
Figure 6.7. Device Information

This page gives you general information about the amplifier

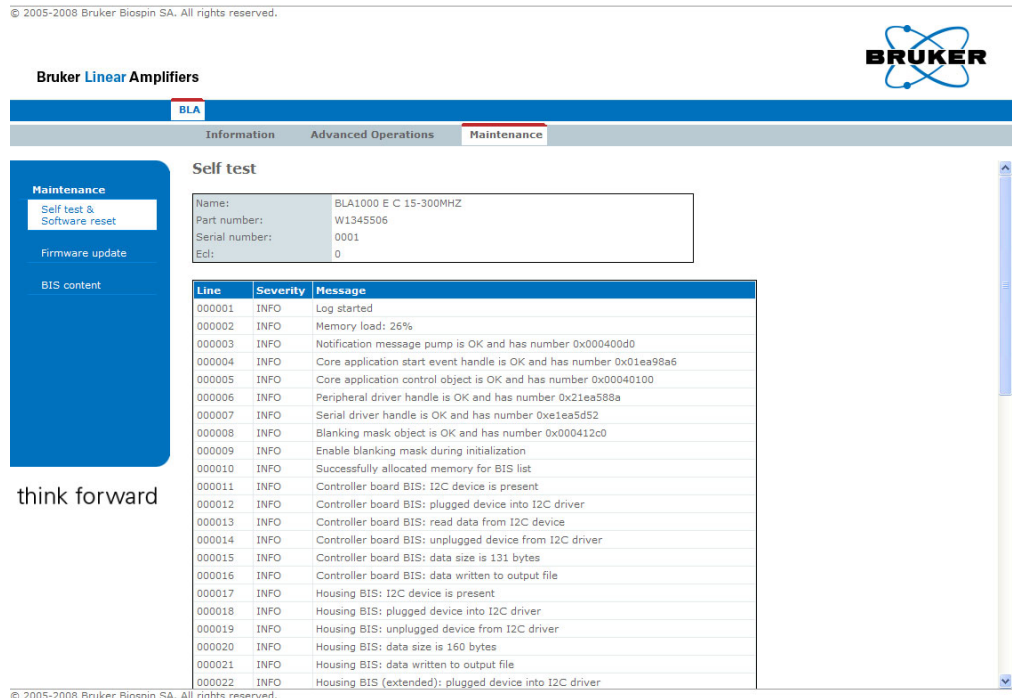
The left panel is the navigation menu. It can be used to navigate through the service pages or choose another tab in the sub toolbar.

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

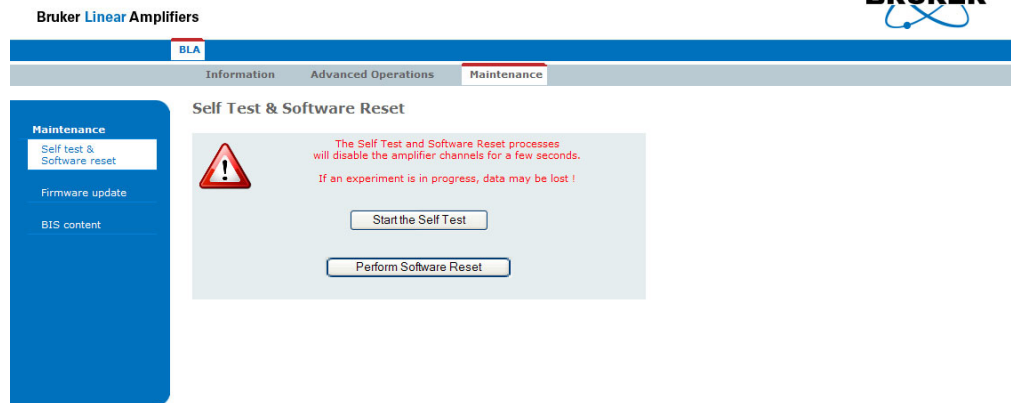


think forward

Figure 6.8. Perform Self Test and Report

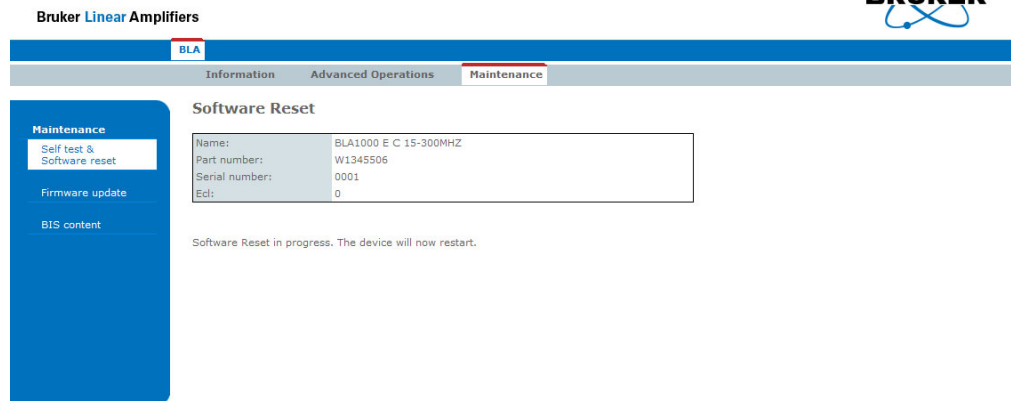
Read the warnings, press **Start the Self Test**.

You should have only gray lines in the report.



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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.

**Bruker Linear Amplifiers**

BLA

Information Advanced Operations Maintenance

**Maintenance**

Self test & Software reset

Firmware update

BIS content

**Firmware update**

You are about to update the BLA firmware. This tool should only be used by trained personnel, and in any case only with the permission of the support service.

**The BLA may not work anymore in case of improper use of this tool.**

Enter new firmware image path below, then click the **Update** button:

By clicking this button, I accept the terms and conditions of the End-User License Agreement.

Be patient, this operation can take several minutes. Please wait until a message indicates that the download has finished. Don't refresh this page or reset the amplifier after having started the download process.

This software is subject to the terms and conditions of the accompanying end-user license agreement (EULA), and is provided only for use with, and for licensed end users of the **Bruker Linear Amplifier (BLA)**. Any other use of this software is strictly prohibited and may subject you to legal action.

think forward

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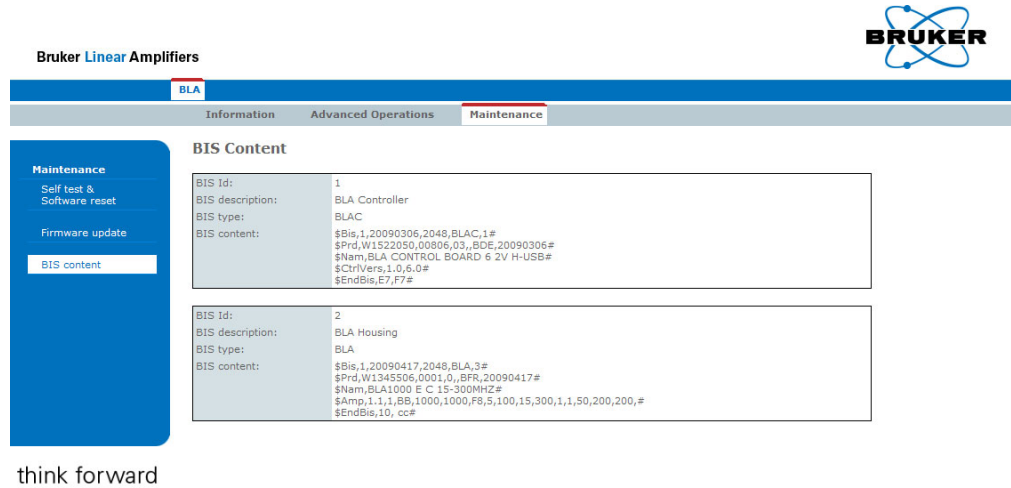
Figure 6.10. Firmware Update

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,1,20090306,2048,BLAC,1#<br/>\$Prd,W1522050,00806,03,\$BDE,20090306#<br/>\$Nam,BLA CONTROL BOARD 6 2V H-USB#<br/>\$CtrlVers,1,0,6,0#<br/>\$EndBis,E7,F7#</code>                              |
| BIS Id:          | 2   |
| BIS description: | BLA Housing   |
| BIS type:        | BLA   |
| BIS content:     | <code>\$Bis,1,20090417,2048,BLA,3#<br/>\$Prd,W1345506,0001,0,\$BFR,20090417#<br/>\$Nam,BLA1000 E C 15-300MHZ#<br/>\$Amp,1,1,1,BB,1000,1000,F8,5,100,15,300,1,1,50,200,200,#<br/>\$EndBis,10, cc#</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.<br>Forward Power : peak & CW power, pulse width and duty cycle.<br>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,<br>1 x I/O optocoupled CAN Bus.  |
| <b>Front Panel Controls</b>         | 1 x Power Forward output,<br>1 x Power Reflected output,<br>1 x Blanking Test.  |
| <b>Front Panel Connectors</b>       | 1 x RF input,<br>1 x RF output.   |
| <b>Rear Panel Connectors</b>        | 15 pins DIN 41612-H ERNI female connector (power supply connection).  |
| <b>Cooling System</b>               | Forced-air cooling (from front to rear).  |
| <b>Size</b>                         | 19" rack cabinet x 3U height x 520mm depth.   |
| <b>Weight</b>                       | 21kg  |
| <b>Power Requirements</b>           | Additional 208-230 VAC $\pm$ 10% single phase 50-60Hz switched power supply, Bruker Biospin part number W1304007.<br>A front panel circuit breaker turns the AC Line ON/OFF.<br>A status led board, on the front panel, indicates the power supplies condition.<br>Size : 19" rack cabinet x 2U height x 480mm depth.<br>Weight : 14kg. |

## Specifications

### General Specifications

7.2

### Channel 1000W Output

7.2.1

Table 7.2. Channel 1000W Output Specifications

|   |   |
|---|---|
| <b>Frequency range</b>  | 15 to 300MHz                                    |
| <b>Linear Gain</b>  | 61dB ± 1dB typical                              |
| <b>Gain Flatness</b>  | ± 2dB max.                                      |
| <b>Minimum Pulsed Output Power</b><br>(@ nominal Input +0dBm) | 1000W full range                                |
| <b>CW Output Power</b> (internal limitation)                  | 50W max.  |
| <b>Linear Output Power</b>                                    | 1000W @ 300MHz                                  |
| <b>Amplifier Biasing</b>                                      | Class AB Operation                              |
| <b>Blanking Delay Time</b>                                    | < 1.5µs typical "ON" & "OFF"                    |
| <b>RF Rise Time</b>   | < 100ns   |
| <b>RF Fall Time</b>   | < 70ns  |
| <b>DC Ringing</b>   | ± 500mV typical (due to blanking signal)        |
| <b>Input Noise Figure</b>                                     | 5dB max.  |
| <b>Output Noise Power</b> (Unblanked)                         | -108dBm @ 1Hz                                   |
| <b>Output Noise Power</b> (Blanked)                           | Thermal Noise                                   |
| <b>Input/output Impedance</b>                                 | 50Ω   |
| <b>Input V.S.W.R.</b>   | 1.3 : 1 max.                                    |
| <b>Output Harmonics 2nd order</b>                             | -30dBc or better                                |
| <b>Output Harmonics 3rd order</b>                             | -10dBc to -60dBc @ 1000W                        |
| <b>Pulse Width</b> (internal limitation)                      | 100ms @ 1000W (up to CW @ 50W)                  |
| <b>Duty Cycle</b> (internal limitation)                       | 5% @ 1000W (up to 100% @ 50W)                   |
| <b>Droop &amp; Pulse Flatness</b>                             | 6% @ 1000W for 20ms PW<br>4% @ 1000W for 1ms PW |
| <b>Amplitude Stability vs. Temperature</b>                    | ± 0,2% / °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 an easily extractible PUSH and PULL FAN Assembly.

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

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

To prevent such a malfunction, a preventive maintenance should 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 BIOSPEC / 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 from the Status Connections Board on the RF Amplifier Module.

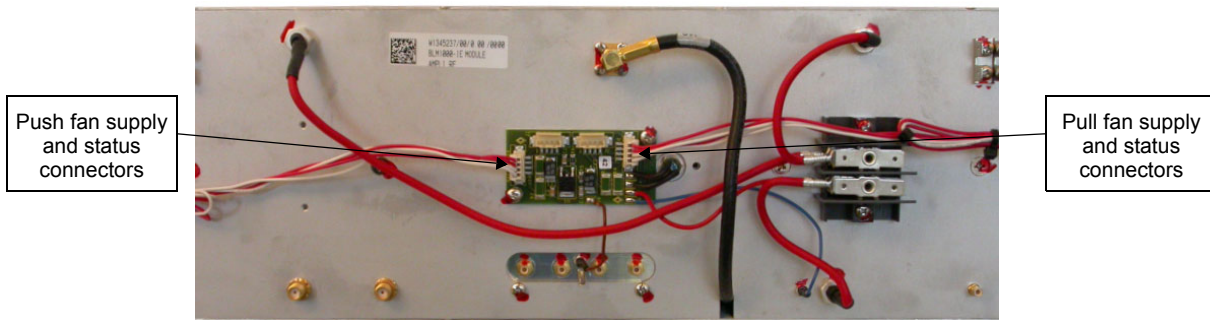


Figure 8.1. Fans Supplies and Status Connections

4. Unscrew only the 2 screws on the top of the Push and Pull fan assemblies on both side of the RF module.

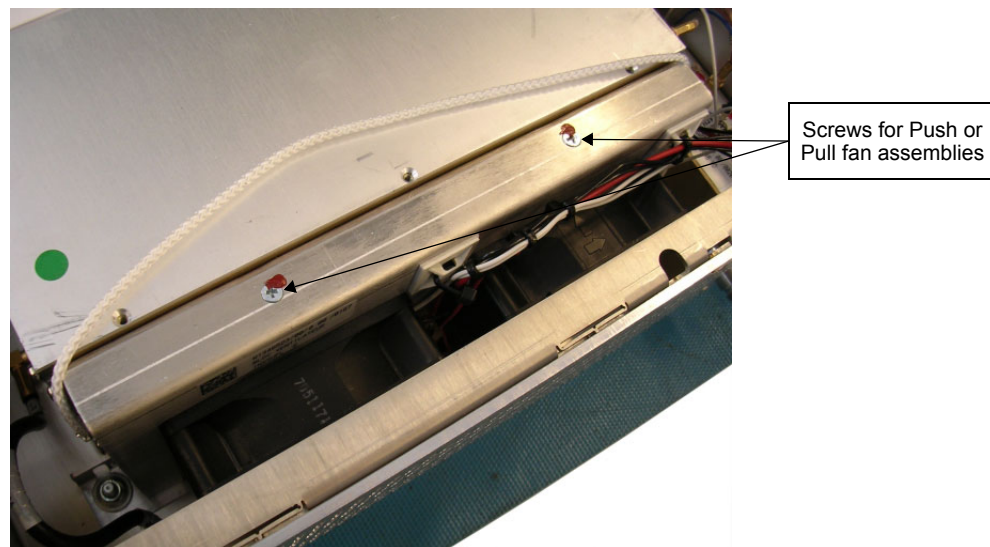


Figure 8.2. Push and Pull Fan Assembly

5. Remove the Push and the Pull fan assembly.
6. Place correctly the 2 new fan assemblies in the holes on the bottom of the RF module and screw it on the top.
7. Connect the 2 connectors J3 and J4 from the fan assemblies to the Status Connections Board.
8. Connect supply cable from amplifier to external power supply and turn on the amplifier. Note that the fans are turning and no OVERHEAT status led appears on front panel.
9. Put the coverage plate on the amplifier and screw it.
10. Put the amplifier in the BIOSPEC / CLINSCAN console, connect all cables on the front panel and the supply connector on the rear panel of the external power supply.

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**End of Document**

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