



BLAXH2H300/100/150 E

Amplifier 200-600MHz Operating & Service Manual

Version 002



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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 BLAXH2H300/100/150 E is a linear broadband pulse power amplifier specifically designed for Nuclear Magnetic Resonance (NMR) applications for 4,7 to 14 Teslas Systems. It is commercialized under the BRUKER part number W1345096.

Operating linear class AB, it provides 300W peak power output over the frequency range 6-365MHz on the X channel output, 140W peak power output over the frequency range 220 to 564MHz (100W for 180 to 220MHz and at 600MHz) on the H channel output and 150W peak power output over the frequency range 30-92MHz on the 2H channel output.

The amplifier is realized by employing N-CHANNEL MOS BROADBAND RF POWER FETs of the latest generation. The unit can provide full power for any combination of pulse width / duty cycle up to 100ms / 25% for the H100 channel, 100ms / 10% for the X300 channel and 5ms / 10% for 2H150 channel.

Its built-in protection circuitry will allow lower power pulses for longer pulse widths and duty cycles, maintaining a 30W X channel, a 35W H channel and a 15W 2H channel average power.

An 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 ≥ 6)
- Thermal overload (overheat).
- The 2H channel is not protected against reflected RF power and excessive power output level.

The amplifier 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.

The supply is self protecting for overcurrent and overvoltage.

The entire unit is housed in a 19", 3U, 520mm rack cabinet.

General Information



The BLAXH2H300/100/150 E Amplifier 200-600MHz is in accordance with the standard 61010-1 safety Requirements for Electrical Equipments.

Labels

2.1

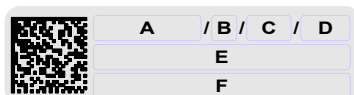
Labels are provided to alert operating and service personnel to conditions that may cause personal injury or damage to the equipment from misuse or abuse. Please read the labels and understand their meaning.

Identifying plate

2.1.1

The BLAXH2H300/100/150 E 200-600MHz can be identified by an identifying plate at the front panel of the unit that has following information.

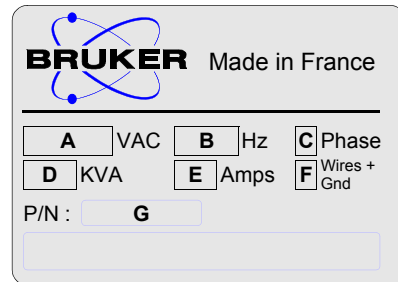
Figure 2.1. Identifying plate



- **(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.

The BLAXH2H300/100/150 E 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



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

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

- Electric shock on power supply.
- Contact burn with 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. 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."

Installation

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 (means 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 220-230 VAC \pm 15% range must be compatible with.
- An external blanking (gating) pulse must be applied to the amplifier in order for the unit to function. Ensure that this pulse has a proper level and logic polarity.
- The BLAXH2H300/100/150 E has a nominal input level of +4dBm. Ensure that the system drivers are operating at these levels.

Initial turn on procedure

3.4

The following list describes how to turn on the BLAXH2H300/100/150 E 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 amplifier to the AC line and turn the circuit breaker to ON.
2. Observe the indicators on the front panel :
 - 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

4.1

The BLAXH2H300/100/150 E front panel is provided with 2 x 13 indicators for status monitoring, 12 connectors and 2 interface connectors.

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.
Channel ON	Indicates when the RF Power is present on the H channel or X channel.
2H ON	Indicates when the RF Power is present on the 2H channel.
2H Error	Indicates when an error has occurred on the 2H channel. This could be a: - Duty cycle error, - Pulse width error. This Led is also coupled with the overheat error.

Table 4.2. Coaxial Connectors assignment

IN 1, IN 2, IN 3	RF inputs of the embedded router, SMA type connector (female). Default entries are : - IN 1 to channel H and allows the channel to deliver full power at nominal +4dBm drive. - IN 2 to channel X and allows the channel to deliver full power at nominal +4dBm drive.
FX IN	Connection from SGU auxiliary RF output. This is the input of the 2H amplifier.
FO IN	Connection from the L-TX 2H-TR. This is the 2H lock signal.
X OUT / H OUT	RF output N type connector (female).
2H OUT	Connection to the HPPR 2H-module. This is either the output of the 2H amplifier and the 2H lock signal.
BLNK X / BLNK H	Blanking signals of channel X or H, BNC type connector (female). TTL logic, 5V = blanking ON, 0V = blanking OFF. When BLANKING signal is at TTL level high (+5V), no gating is applied to the amplifier stages, and no RF Power is possible. When BLANKING signal is at TTL level low (0V), the amplifier stages are gated and RF Power is possible.
LTX BLNK	Connection to L-TX TX-BLNK. This signal, the same as SEL2HAMP, is used to blank the L-TX (ECL02 or higher) during Deuterium decoupling.
SEL 2H AMP	This signal is used to command the RF switch located on the 2H amplifier board. It is also used to blank the 2H amplifier (same polarity as a BLNK signal).

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

Table 4.3. RJ45 Pin assignment

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

Accessory Connector

4.1.4

Depending of the probe model, this connector makes it possible to connect the QNP accessory.

This accessory (BRUKER part number W1345201) is reconized by "cf" and allows automatic routing to the probe.

Device Design

4.1.5

Figure 4.1. BLAXH2H300/100/150 E Front Panel Design

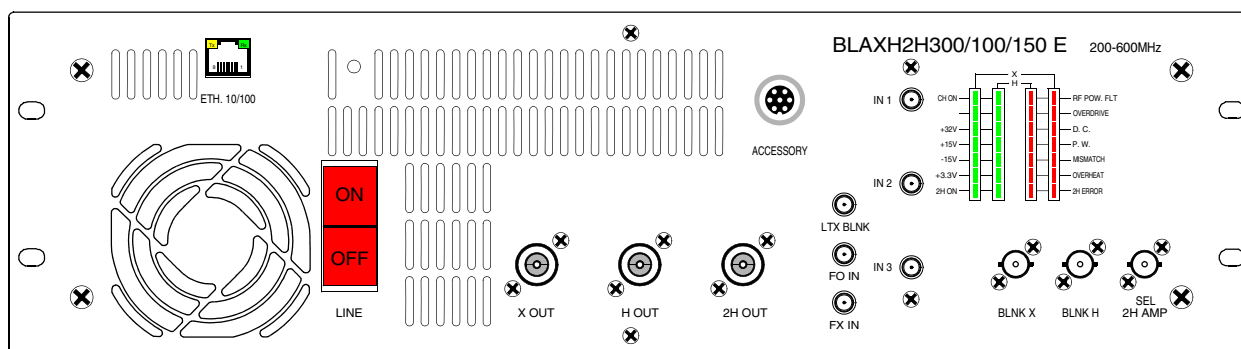
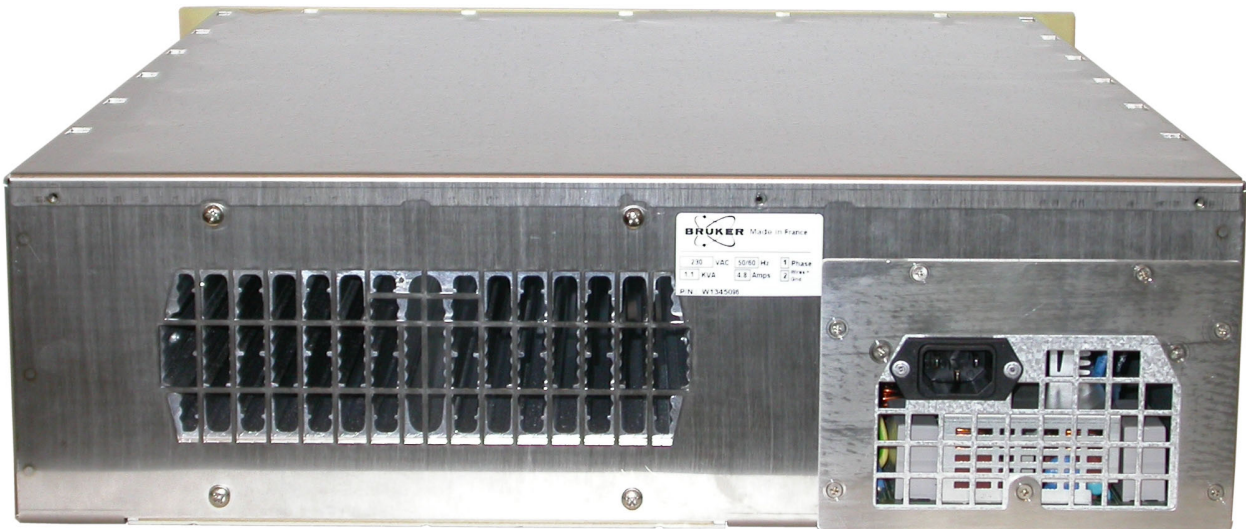


Figure 4.2. BLAXH2H300/100/150 E Front Panel View



The rear Panel of the BLAXH2H E Serie Amplifiers is free of elements in exception of the three pole (2P + E) line filter socket.

Figure 4.3. BLAXH2H300/100/150 E Rear Panel View



The BLAXH2H300/100/150 E amplifier provides :

- A RF Output of 300W on the X channel Output X OUT, over the full frequency range 6 to 365MHz.
- A RF Output of 140W on the H channel Output H OUT, over the full frequency range 200 to 564MHz (also 100W from 180 to 220MHz and at 600MHz).
- A RF Output of 150W on the 2H channel Output 2H OUT, over the full frequency range 30 to 92MHz.

The RF section of the system consists of an embedded router fixed on the front panel and a linear module BLMXH2H300/100/150-E, mounted around a single, self-contained Push fan assembly, heatsink.

The embedded router has three RF inputs and two outputs respectively wired to channel H and channel X located on the BLMXH2H300/100/150-E module. The 2H channel is not routed.

The linear module BLMXH2H300/100/150-E includes three class AB power amplifiers. The amplifiers for the H and 2H channels are located on the top side of the module, and the one for the X channel on the bottom side.

X and H channel outputs are connected to the front panel of the amplifier via a bi-directional high dynamic coupler. The 2H channel output is connected directly to the front panel.

The entire system is tied together by a Digital Signal Processing control board, processing information from the amplifier and blanking signal, providing protection to X and H channels from excessive peak power, duty cycle and pulse width for average power, maximum reflected power and heatsink overtemperature.

The DSP control board reads identification information of the amplifier (BIS). Monitoring of Fan status, Supply status & LED status is also performed by the control board.

Moreover, a 2H-E supervisor board is in relation with the DSP control board, to ensure protection of the 2H channel.

These are the following:

- Duty cycle and Pulse width (Average Power).
- Heatsink overtemperature.
- Fan assembly malfunction.

Technical description

Figure 5.1. BLAXH2H300/100/150 E System Block Diagram

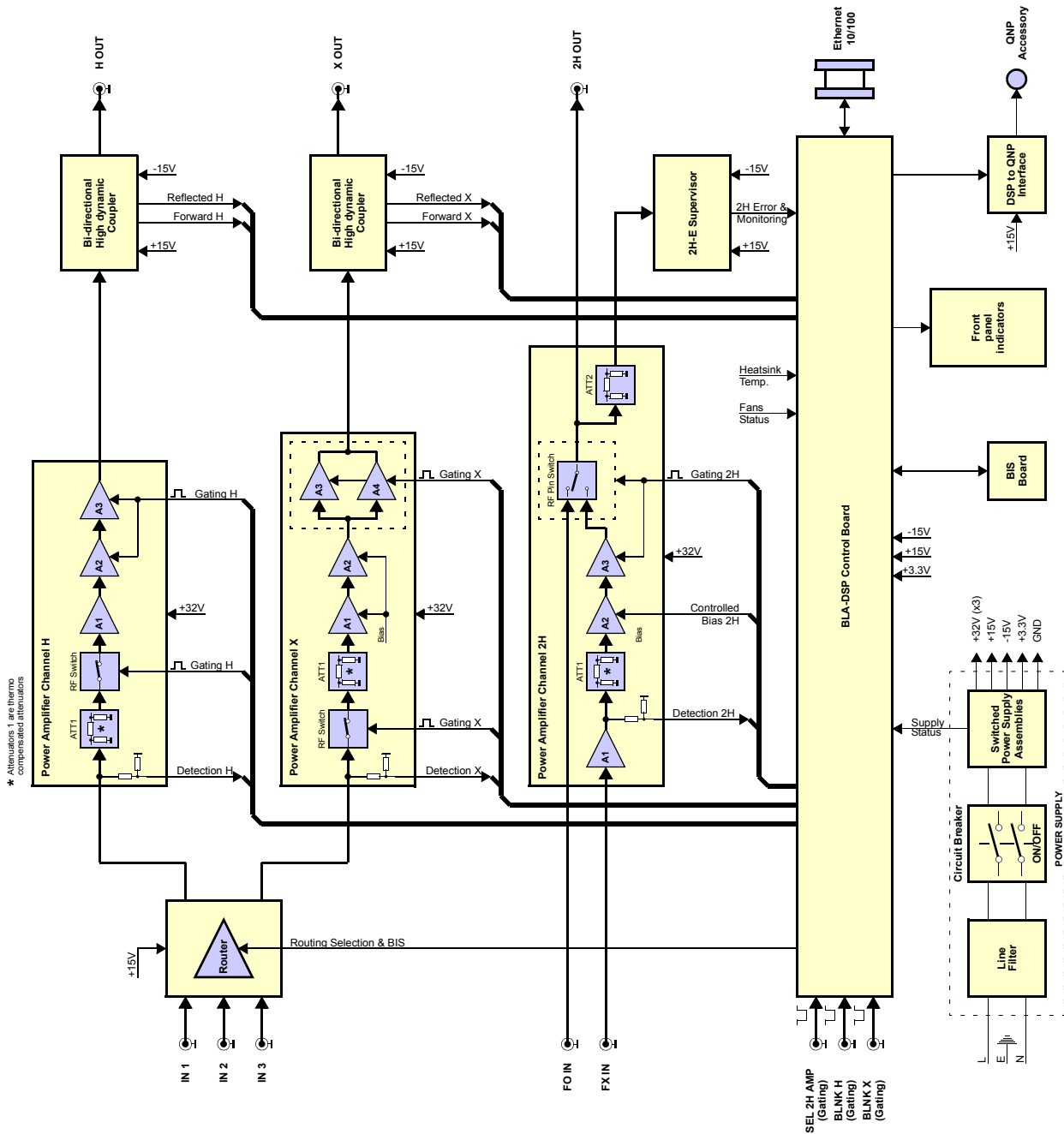
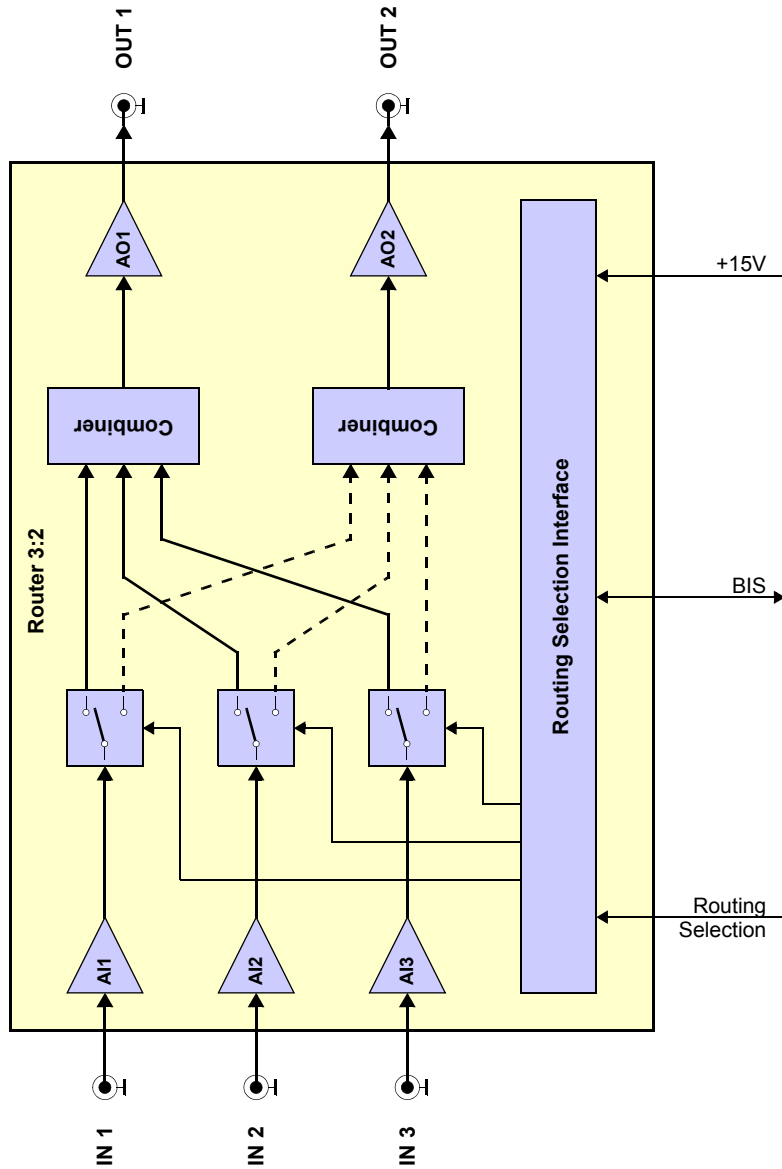


Figure 5.2. Embedded Router Block Diagram



The BLAXH2H300/100/150 E amplifier (P/N: W1345096) consists of a 3 inputs embedded router and three Class AB power amplifiers.

A nominal input power level of +4dBm produces a nominal output peak power of :

- 300W for 10% duty cycle at 100ms pulse width maximum on the X channel output.
- 140W for 25% duty cycle at 100ms pulse width maximum on the H channel output.
- 150W for 10% duty cycle at 5ms pulse width maximum on the 2H channel output.

The unit is also capable of longer pulses for lower average power.

Embedded Router

The embedded Router consists of a Class A RF amplifier IC's and RF switches, manufactured on a Gallium Arsenide process.

It is built on a five independent cells architecture with three RF input cells and two RF output cells. The RF input cell ensures function of amplification and routing, the RF output cell ensures the function of combining, RF amplitude thermo-stability and amplification.

The three RF inputs could be routed alone or combined to the first or the second RF output by selecting the wished RF path through the BLA controller board. The same RF input cannot be routed at the same time towards the two RF outputs.

Each entire RF path has a nominal 15dB of gain and operates at +15V DC.

Also, the router is equipped with a EEPROM for BIS information.

RF Power amplifier Channel X300

In the first section of this power amplifier, the RF input signal crosses the RF detection path. Then it is conveyed via an AsGa RF Switch to a thermo compensated attenuator and two class A drivers to build a nominal 25dB to 29dB gain block.

In this section, only the RF switch requires a control board conditioned gating signal to control the operation of the switching element.

The second section of the PA includes two 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 in order to control the bias gate voltage on the gates of the FETs.

The input-output gain of this section is at nominal 13dB.

The RF power amplifier has a 38dB nominal gain and operates at +32VDC. With the embedded router gain, the entire RF path has a 53dB nominal gain.

RF Power Amplifier Channel H100

In the first section of this power amplifier, the RF input signal crosses the RF detection path. Then it is conveyed to a thermo compensated attenuator, a RF switch and two class A drivers to build a nominal 26dB gain block.

In this section, the RF switch and the second class A transistor requires a control board conditioned gating signal to improve better anti-droop behavior.

The second section of the PA includes one FET transistor.

The circuitry around the transistor 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 in order to control the bias gate voltage on the gates of the FET.

The input-output gain of this section is at nominal 10dB.

The RF power amplifier has a 36dB nominal gain and operates at +32VDC. With the embedded router gain, the entire RF path has a 51dB nominal gain.

RF Power Amplifier Channel 2H150

In the first section of this power amplifier, the input RF signal is fed directly to a hybrid amplifier followed by the RF detection path and a thermo compensated attenuator. Then the RF signal is amplified by a class A driver to build a nominal 38dB gain block.

The second section of the PA includes a FET transistor.

The circuitry around consists of complementary input and output transformers and baluns. This transistor requires a control board conditioned gating signal in order to control the bias gate voltage. The input-output nominal gain value of this section is 13dB.

The entire RF power amplifier has a 51dB nominal gain and operates at +32VDC.

2H RF Power Switch

The output of the 2H150W power amplifier is connected directly to an RF Power switch, located on the same board. This switch is used to select either the 2H amplifier or the lock transmitter.

It is composed of PIN diodes and provides a 60dB isolation between the 2H OUTPUT and the FO IN input when the 2H amplifier is selected. PIN diodes also have 0.4dB insertion between FO IN and 2H OUTPUT when the 2H amplifier is not selected. In this mode, the LTX signal can feed through.

RF Coupler H and X

The bi-directional high dynamic couplers on the front panel provide an approximate 1V peak DC signal for full output power and also a peak DC signal for reflected power on channel H and X.

Both signals, forward and reflected, are analyzed by the BLA Control board for monitoring and protection setting.

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 high dynamic couplers.
- Condition the input blanking (BLNK) signal. The board delivers it to the above mentioned RF Paths.
- Allow Ethernet communication with the workstation.

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.

2H-E Supervisor Board

5.2.3

The 2H RF output power is coupled via resistive coupling to the 2H-E Supervisor board. This board is in relation with the BLA Control board and ensures basics functions of :

- 2H RF output power monitoring,
- Protection against Duty cycle and Pulse width overstresses (average power),
- Indication of 2H RF output power presence.

BLA Extension Board

5.2.4

This board gives the information to the control board of RF detection.

Status Led Board

5.2.5

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 13 and "**BLA Control Board**".

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



Technical help : please contact your local representative.

Servicing the BLA

6

Diagnosis and servicing access to the BLA amplifier relies on HTTP, allowing service access with any web browser.

Accessing the BLA amplifier

6.1

The BLAXH2H300/100/150 E Amplifier 200-600MHz 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 be lit.

To access the BLAXH2H300/100/150 E Amplifier 200-600MHz, type "ha" in TOPSPIN 2.xx 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.

Servicing the BLA

Figure 6.1. Device Information

BRUKER BLA Service Web

Bruker Linear Amplifier
Device Information

Amplifier information

- Amplifier status
- Amplifier limitations
- Routing information
- Self test & Software reset
- BIS content
- Firmware update

Device Information

Name: BLAXH2H300/100/150 E 200-600MHZ
 Part number: W1345096
 Serial number: 0112
 Ecl: 1
 Manufacturing location: BFR
 Manufacturing date: 2/21/07
 BIS type: BLA

Software versions

Boot version: 20051018
 Kernel version: Windows CE 5.0
 Application version: 20060727

Channel Information

Ch.	Type	Nom. power	Min freq.	Max freq.	Limits				Output num.	Input num.
					Duty cycle	Pulse width	Mismatch	Forw. peak		
1	H	100 W	180 MHz	600 MHz	25 %	100 ms	50 W (50 %)	200 W (200 %)	1	Via router
2	X	300 W	6 MHz	365 MHz	10 %	100 ms	150 W (50 %)	600 W (200 %)	2	Via router
3	D	150 W	30 MHz	92 MHz	10 %	5 ms	75 W (50 %)	300 W (200 %)	3	4

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The left panel is the navigation menu. It can be used to navigate through the service pages.

Amplifier status

6.1.1

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

Figure 6.2. Amplifier status

BRUKER BLA Service Web

Bruker Linear Amplifier
Amplifier status

Name:	BLAXH2H300/100/150 E 200-600MHZ		
Part number:	W1345096		
Serial number:	0112		
Ecl:	1		

	Channel 1	Channel 2	Channel 3
Type :	H	X	D
Nominal power :	100 W	300 W	150 W
Forward peak power :	0.00 %	0.00 %	2.00 %
Forward average power :	0.00 %	0.00 %	2.00 %
Reflected power :	0 %	0 %	0 %
Overdrive :	OK	OK	OK
Pulse width :	OK	OK	OK
Duty cycle :	OK	OK	OK
Mismatch :	OK	OK	OK
General gating fault :	OK	OK	OK
Supply :	OK	OK	OK
Thermal :	OK	OK	OK
Blanking signal state :	inactive	inactive	inactive
Input power :	none	none	none
Output power :	none	none	none
High resolution state :	inactive	inactive	inactive
Switchbox position :	0xFF	0xFF	0xFF

This page is automatically refreshed every 10 seconds

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Leads you to a page giving several, default and current limits, from the both channels of the amplifier. The 2H channel is not displayed because his limits are fixed.

Figure 6.3. Amplifier limitations

The screenshot shows the 'Bruker Linear Amplifier Amplifier limitations' page. It includes a sidebar with navigation options like 'Amplifier information', 'Amplifier status', 'Amplifier limitations', 'Routing information', 'Self test & Software reset', 'BIS content', and 'Firmware update'. The main content area displays the amplifier's name, part number, serial number, and Ecl. Below this, it provides 'Channel Information' for two channels, Channel 1 and Channel 2, each with a table of technical specifications and limits.

Amplifier Information:
 Name: BLAXH2H300/100/150 E 200-600MHZ
 Part number: W1345096
 Serial number: 0112
 Ecl: 1

Channel Information

Channel 1				Limits				Output num.	Input num.
Type	Nom. power	Min freq.	Max freq.	Duty cycle	Pulse width	Mismatch	Forw. peak		
H	100 W	180 MHz	600 MHz	25 %	100 ms	50 W (50 %)	200 W (200 %)	1	Via router
Current limits :				25 %	100 ms	50 W	200 W	Change limits	

Channel 2				Limits				Output num.	Input num.
Type	Nom. power	Min freq.	Max freq.	Duty cycle	Pulse width	Mismatch	Forw. peak		
X	300 W	6 MHz	365 MHz	10 %	100 ms	150 W (50 %)	600 W (200 %)	2	Via router
Current limits :				10 %	100 ms	150 W	600 W	Change limits	

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If you want, for any reasons, to change the current limits from one or both channels of the amplifier, press **Change limits**.

Figure 6.4. Change limits

BRUKER BLA Service Web

Bruker Linear Amplifier
Channel limitations

Amplifier information
Amplifier status
Amplifier limitations
Routing information
Self test & Software reset
BIS content
Firmware update

Name: BLAXH2H300/100/150 E 200-600MHZ
Part number: W1345096
Serial number: 0112
Ecl: 1

Channel 1 limitations

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

Type :	H			
Nominal power :	100 W			
Min. frequency :	180 MHz			
Max. frequency :	600 MHz			
	Default	Current	New	Maximum
Duty cycle limit :	25 %	25 %	<input type="text" value="25"/> %	25 %
Pulse width limit :	100 ms	100 ms	<input type="text" value="100"/> ms	100 ms
Mismatch limit :	50 W (50 %)	50 W	<input type="text" value="50"/> W	100 W
Forward peak limit :	200 W (200 %)	200 W	<input type="text" value="200"/> W	200 W
			<input type="button" value="Apply"/>	
Output number :	1			
Input number :	Via router			

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BRUKER BLA Service Web

Bruker Linear Amplifier
Channel limitations

Amplifier information
Amplifier status
Amplifier limitations
Routing information
Self test & Software reset
BIS content
Firmware update

Name: BLAXH2H300/100/150 E 200-600MHZ
Part number: W1345096
Serial number: 0112
Ecl: 1

Channel 2 limitations

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

Type :	X			
Nominal power :	300 W			
Min. frequency :	6 MHz			
Max. frequency :	365 MHz			
	Default	Current	New	Maximum
Duty cycle limit :	10 %	10 %	<input type="text" value="10"/> %	10 %
Pulse width limit :	100 ms	100 ms	<input type="text" value="100"/> ms	100 ms
Mismatch limit :	150 W (50 %)	150 W	<input type="text" value="150"/> W	300 W
Forward peak limit :	600 W (200 %)	600 W	<input type="text" value="600"/> W	600 W
			<input type="button" value="Apply"/>	
Output number :	2			
Input number :	Via router			

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

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

Default RF path is INPUT1 to CHANNEL1 and INPUT2 to CHANNEL2.
2H RF path is fixed route.

Figure 6.5. Routing information

The screenshot shows the 'Bruker Linear Amplifier Routing Information & Setting' web page. On the left is a navigation menu with options: Amplifier information, Amplifier status, Amplifier limitations, Routing information (highlighted), Self test & Software reset, BIS content, and Firmware update. The main content area displays the amplifier's name, part number, serial number, and Ecl. Below this is a warning message: 'Warning : Changing these settings will overwrite the routes defined with the spectrometer software. Please use this page for test purposes only.' A table follows, showing routing configurations for four input numbers. Each row includes the input number, current channel, possible channels, and a 'New route' section with a dropdown menu and a 'set new route' button.

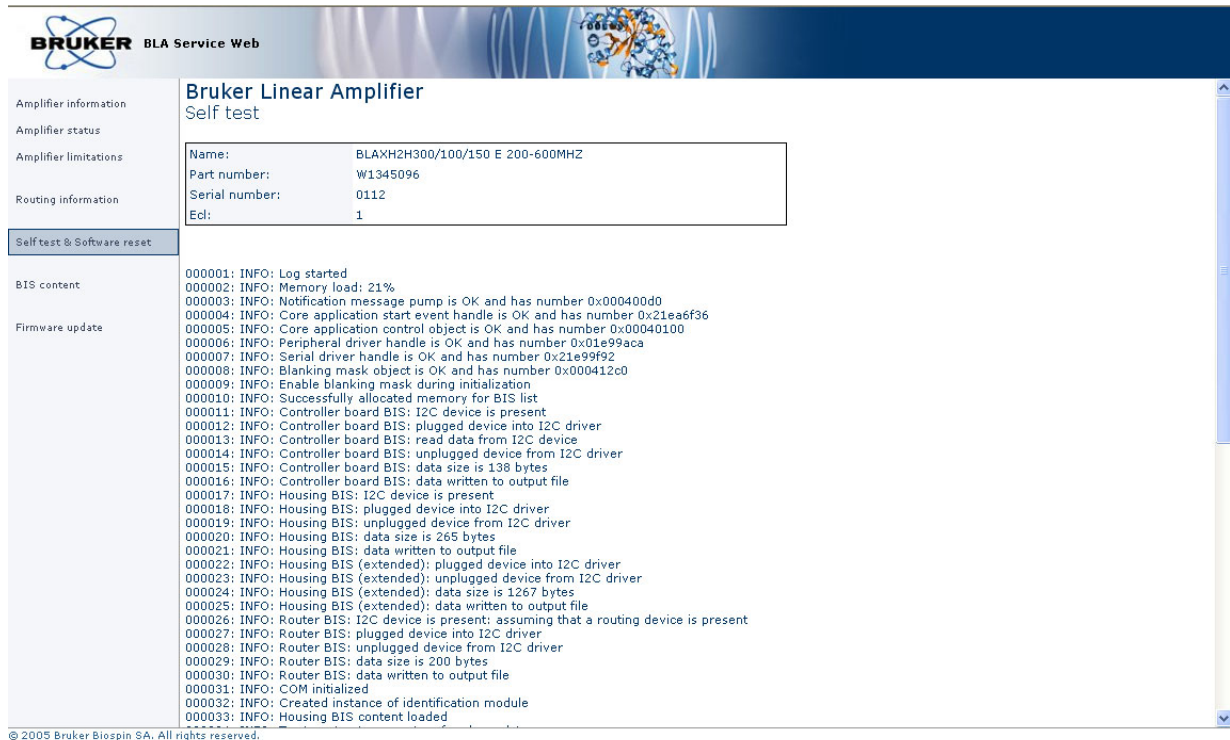
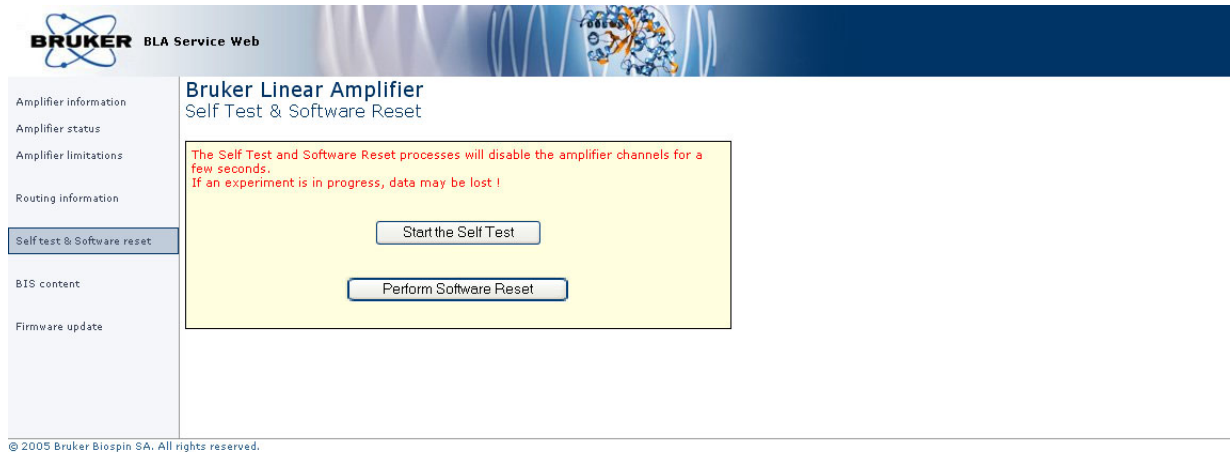
Input number	Current channel	Possible channels	New route
1	1	1, 2	Channel 1 <input type="button" value="set new route"/>
2	2	1, 2	Channel 2 <input type="button" value="set new route"/>
3	0	1, 2	no route <input type="button" value="set new route"/>
4	3	3	Fixed route

Read the warnings, it is allowed to change routing configuration (ex: new route INPUT2 to CHANNEL1 and INPUT3 to CHANNEL2), press **Set new route** if you are sure of that.

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.

Figure 6.6. Self-test, software reset and report



Read the warnings, press **Start the self-test**.

You should have only blue lines in the report .

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

Figure 6.7. BIS content

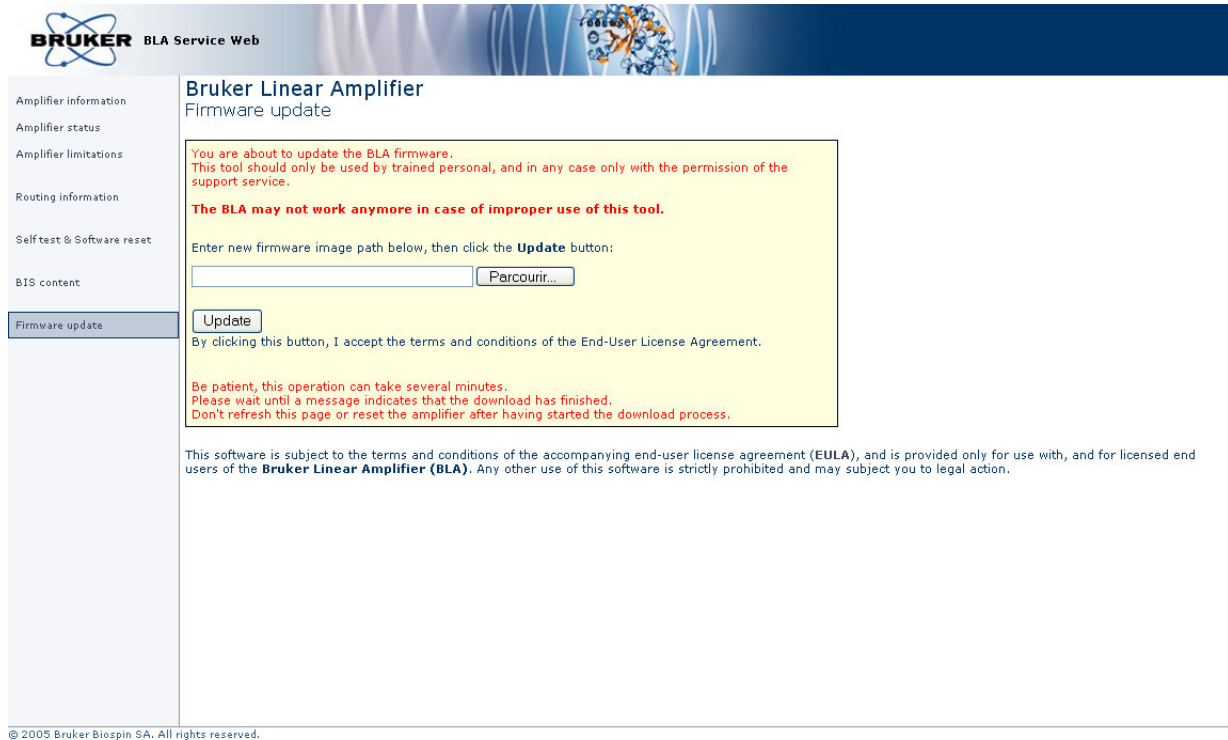
Bruker Linear Amplifier
BIS Content

Amplifier information	BIS Id: 1 BIS description: BLA Controller BIS type: BLAC BIS content: \$Bis,1,20070214,2048,BLAC,1# \$Prd,W1522050,0049,1,,BDE,20070214# \$Nam,BLA CONTROL BOARD 6 2V H-USB# \$CtrlVers,1.0,6.0# \$EndBis,b1,3c#
Amplifier status	
Amplifier limitations	
Routing information	
Self test & Software reset	
BIS content	
Firmware update	BIS Id: 2 BIS description: BLA Housing BIS type: BLA BIS content: \$Bis,1,20070221,2048,BLA,3# \$Prd,W1345096,0112,1,,BFR,20070221# \$Nam,BLAXH2H300/100/150 E 200-600MHZ# \$Amp,1.1,1,H,100,F8,25,100,180,600,1,0,50,200,200,# \$Amp,1.1,2,X,300,F8,10,100,6,365,2,0,50,200,200,# \$Amp,1.1,3,D,150,58,10,5,30,92,3,4,50,200,200,0# \$EndBis,27,94#
	BIS Id: 3 BIS description: Mini-Router BIS type: BLAROUTER BIS content: \$Bis,1,20070221,2048,BLAROUTER,1# \$Prd,W1345204,0178,0,,BFR,20070221# \$Nam,BLMR32 RF AMPLIFIER MODULE# \$RtInChar,1.0,10,1000,15# \$RtInPath,1.0,1,3,1# \$RtInPath,1.0,2,3,2# \$RtInPath,1.0,3,3,# \$EndBis,2d,f8#

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

Figure 6.8. 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

Specifications

7

General specifications

7.1

Table 7.1. BLAXH2H300/100/150 E Common Specifications

Constant Internal Protection	Supplies & Fans faults & Over temperature Forward Power for X and H channels: Peak & CW Power Pulse Width Duty Cycle Reflected Power : Peak & CW Power Pulse Width and Duty Cycle for 2H channel
Front Panel Indicators	Amplifier Status Led Board
Front Panel Interfaces	1 x I/O 8 pins RJ45 connector, 1 x 7 pins female connector for QNP Accessory
Front Panel controls	AC Line ON / OFF
Front Panel connectors	5 x RF input, 3 x RF output, 3 x gating input, 1 x gating output
Rear Panel Interface	AC Line in socket
Cooling System	Forced air cooling (from front to rear)
Size	19" rack cabinet x 3U height x 520mm depth
Weight	23kg
Power requirements	220-230VAC \pm 15%, single phase 50-60Hz Bruker part number W1304006 Power consumption max. 0,8kVA

Specifications

Table 7.2. BLAXH2H300/100/150 E channel X300 specifications

Frequency range	6 to 365MHz
Linear Gain	53dB \pm 1dB typical
Gain Flatness	\pm 1dB max.
Minimum Pulsed Output Power (@ nominal input +4dBm)	300W min. full range
CW Output Power (internal limitation)	30W max.
Linear Output Power	300W typical @ 1dB compression
Linearity	\pm 1dB to 300W typical
Amplifier biasing	Class AB Operation
Blanking Delay Time	1 μ s min.
RF Rise Time	< 100ns
RF Fall Time	< 50ns
DC Ringing	\pm 500mV typical (due to blanking signal)
Input Noise Figure	9dB typical
Output Noise Power (Unblanked)	-112dBm @ 1Hz
Output Noise Power (Blanked)	< 25dB over Thermal noise
IN / OUT Impedance	50 Ω
Input V.S.W.R. Route OFF	1,2 max.
Input V.S.W.R. Route On	1,3 max. (100 to 365MHz) (up to 1,9 max. @ 20MHz)
Output Harmonics (2fc ; 3fc)	-30dBc ; -10dBc max. @ 300W
Pulse Width (internal limitation)	100ms @ 300W (up to CW @ 30W)
Duty Cycle (internal limitation)	10% @ 300W (up to 100% @ 30W)
Droop & Pulse Flatness	\pm 4% typical @ 300W for 20ms Pulse Width \pm 1,5% typical @ 300W for 1ms Pulse Width
Amplitude stability versus temperature	\pm 0,1% / $^{\circ}$ C max.

Table 7.3. BLAXH2H300/100/150 E channel H100 specifications

Frequency range	180 to 600MHz
Linear Gain	51dB \pm 1dB typical
Gain Flatness	\pm 1dB max.
Minimum Pulsed Output Power (@ nominal input +4dBm)	140W min. from 220 to 564MHz 100W min. from 180 to 220MHz and @ 600MHz
CW Output Power (internal limitation)	35W max.
Linear Output Power	80W typical @ 1dB compression
Linearity	\pm 1dB to 80W typical
Amplifier biasing	Class AB Operation
Blanking Delay Time	1 μ s min.
RF Rise Time	< 100ns
RF Fall Time	< 50ns
DC Ringing	\pm 200mV typical (due to blanking signal)
Input Noise Figure	8dB typical
Output Noise Power (Unblanked)	-115dBm @ 1Hz
Output Noise Power (Blanked)	Thermal noise
IN / OUT Impedance	50 Ω
Input V.S.W.R. Route OFF	1,2 max.
Input V.S.W.R. Route On	1,3 max.
Output Harmonics (2fc ; 3fc)	-40dBc ; -16dBc max. @ 100W
Pulse Width (internal limitation)	100ms @ 140W (up to CW @ 35W)
Duty Cycle (internal limitation)	25% @ 140W (up to 100% @ 35W)
Droop & Pulse Flatness	\pm 2% typical @ 140W for 100ms Pulse Width
Amplitude stability versus temperature	\pm 0,15% / $^{\circ}$ C max.

Specifications

Table 7.4. BLAXH2H300/100/150 E channel 2H150 specifications

Frequency range	30 to 92MHz
Linear Gain	50dB \pm 1dB typical
Gain Flatness	\pm 1dB max.
Minimum Pulsed Output Power (@ nominal input +4dBm)	150W min. full range
CW Output Power (internal limitation)	15W max.
Linear Output Power	150W typical @ 1dB compression
Linearity	\pm 1dB to 150W typical
Amplifier biasing	Class AB Operation
Blanking Delay Time	3 μ s min. (due to PIN diodes switch commutation)
RF Rise Time	< 500ns (due to PIN diodes switch commutation)
RF Fall Time	< 50ns
DC Ringing	N/A
Input Noise Figure	4,5dB typical
Output Noise Power (Unblanked)	-120dBm @ 1Hz
Output Noise Power (Blanked)	Thermal noise
IN / OUT Impedance	50 Ω
Input V.S.W.R.	1,3 Max. (No Router)
Output Harmonics (2fc ; 3fc)	-25dBc ; -11dBc max. @ 150W
Pulse Width (internal limitation)	5ms @ 150W (up to CW @ 15W)
Duty Cycle (internal limitation)	10% @ 150W (up to 100% @ 15W)
Droop & Pulse Flatness	\pm 2% typical @ 150W for 5ms Pulse Width
Amplitude stability versus temperature	\pm 0,15% / $^{\circ}$ C max.

Table 7.5. Channel 2H150 Pin diode switching specification

Insertion FO_IN vs 2HOUT	0,4dB typical
Isolation 2HOUT vs FO_IN	> 60dB full range

Service information and maintenance

8

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

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.

This assembly can be ordered on the manufactory BBIO-FR by P/N:

- **W1346523** «PUSH FAN ASSEMBLY 6».

Operation

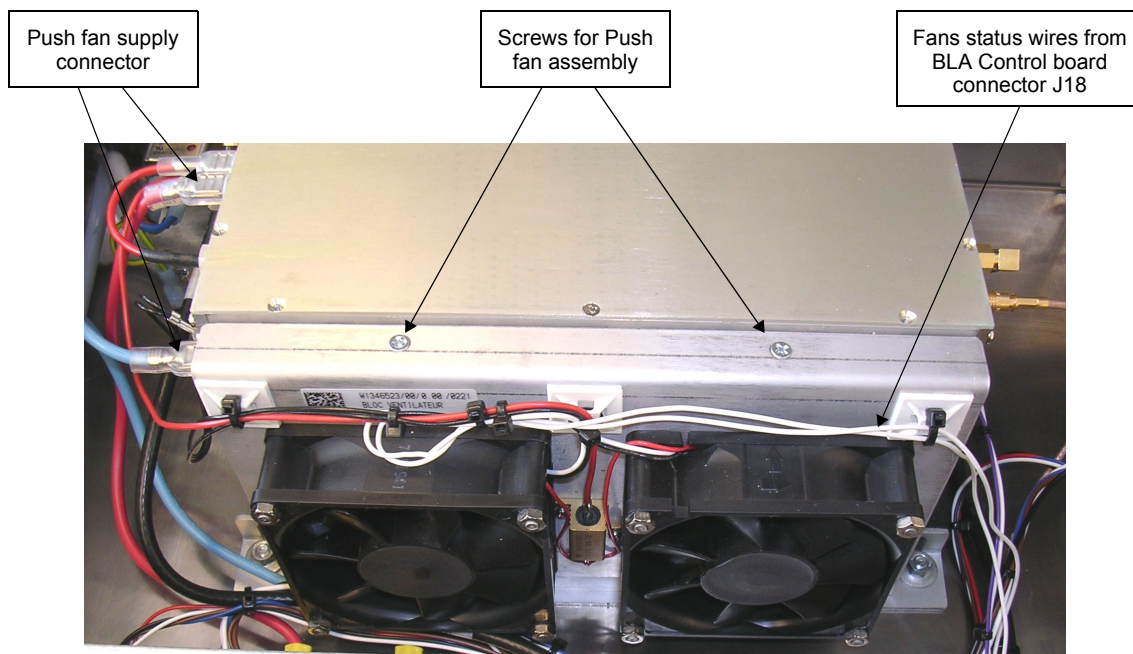
8.1.1



Read below or see SIH0292.

1. Disconnect all cables from the front panel and the supply connector on the rear panel. Remove the amplifier from the NMR console and place it on a secure flat surface.
2. Unscrew and remove the coverage plate from the amplifier.
3. Disconnect the 2 wires (red +32V / black GND) from the RF module dispatch supply connectors and disconnect the fan status wires (white) from BLA Control board connector J18.

Figure 8.1. Push Fan Assembly



4. Unscrew the 2 screws from the top of the push fan assembly.
5. Remove the push fan assembly.
6. Place correctly the new fan assembly in the bottom holes from the RF module and screw it.
7. Connect all wires (status and supply).
8. Connect line cord and turn on the BLA amplifier. Note that the fans are turning and no OVERHEAT status led appears on front panel.
9. Put the coverage plate on the BLA amplifier and screw it.
10. Put the amplifier in the NMR console, connect all cables on the front panel and the line cord on the rear panel.

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