

AQS BLA2BB

Amplifier 200-400MHz Operating & Service Manual

Version 001



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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 AQS BLA2BB Amplifier 200-400MHz (P/N:W1345049) is a double broadband linear pulse amplifier specifically designed for Nuclear Magnetic Resonance (NMR) applications.

Each channel is a class AB linear amplifier and provides 130W in the frequency range of 20 to 162MHz and 50W in the frequency range of 180-400MHz.

There are 4 inputs available, where 3 can be mixed and switched to each amplifier.

Each channel has a programmable max. output level through I²C bus. The amount of attenuation may be -10dB max.

The channel 1 is used commonly for X NMR and the channel 2 is used for ¹H.

The amplifiers are gated with a blanking pulse. The output power level is numerised and available on the I²C bus.

RF pulsing is displayed on the front panel for each channel, default of power supplies +28V on amplifiers and overheat default is also displayed.

The thermal protection is double :

- Thermoswitch at 70°C which cuts +28V on both amplifiers.
- Thermal sense which cuts only blanking signal. Thermoswitch has priority over sense.

There is no pulse width or max. power limitation but see specifications for rating values.

The amplifier is powered by an external switched power supply assembly that provides the 28VDC for the power amplifiers.

The AQS BLA2BB Amplifier is housed in a rack 12TE x 6HE x 290mm.

Initial turn on procedure

1.2

Before introducing the unit in the AQS bay, verify the power supply is turned off.

After turning on power supply and if no default, the +28V display is on (green led).

Connect the input coaxial to I 1, I 1A, I 2, I 2A and the output cables to OUT 1 (X QNP) and OUT 2 (1H).

General Information

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.

Dangerous area

2.1.1

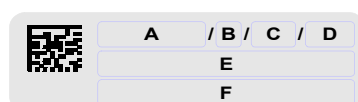
WARNING ! High Voltage.



Name plate

2.1.2

The AQS BLA2BB Amplifier can be identified by a name plate at the front panel of the unit which has following information:



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

- **(F) Information**

This field contains information about the mains input requirement of the product.

Front panel description

3.1

The AQS BLA2BB Amplifier front panel is provided with 4 indicators for status monitoring and 6 RF connectors.

Led's indicators

3.1.1

Table 3.1. LED's indicators assignment

PULSE1	Indicates that channel 1 is sending RF pulse
ERROR	Indicates a default of power supplies or thermal fault.
+28V	Indicates that power supply is ok on amplifiers
PULSE2	Indicates that channel 2 is sending RF pulse

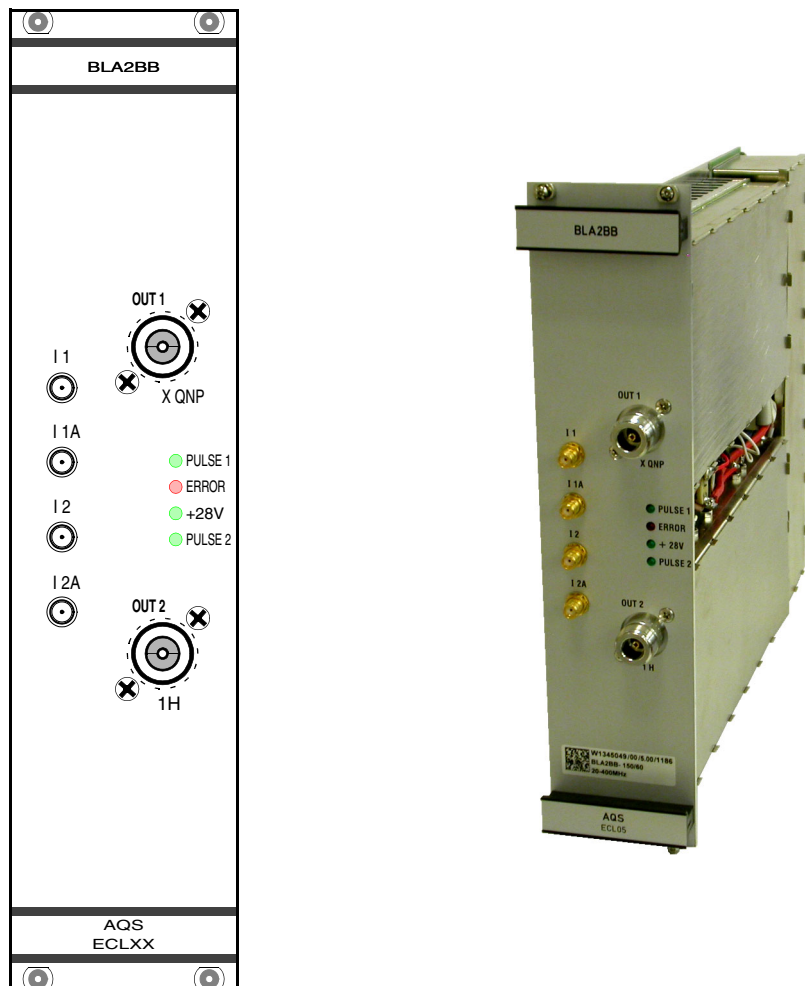
RF connectors

3.1.2

Table 3.2. RF Connectors assignment

I 1	RF in SMA Connector (female) Nominal input +4dBm
I 1A	RF in SMA Connector (female) Nominal input +4dBm
I 2	RF in SMA Connector (female) Nominal input +4dBm
I 2A	RF in SMA Connector (female) Nominal input +4dBm
OUT 1 (X QNP)	RF out N Connector (female) Output 130W (20-162MHz)
OUT 2 (1H)	RF out N Connector (female) Output 50W (200-400MHz)

Figure 3.1. AQS BLA2BB Amplifier designs



Rear panel

3.2

The rear Panel of the AQS BLA2BB Amplifier is free of elements in exception of two ERNI female connectors.

Supply connector

3.2.1

Table 3.3. ERNI 044581 Power supply connector Pin assignment

Pin 1	PGND Power Ground
Pin 2	+28V
Pin 3	free

Table 3.4. ERNI 064558 interface connector Pin assignment

Pin A7	BLNK3
Pin A15	I ² C address A2
Pin A21	+5V
Pin B6	GND
Pin B8	GND
Pin B15	I ² C address A1
Pin B16	GND
Pin B18	GND
Pin B20	GND
Pin C15	I ² C address A0
Pin C16	I ² C SDA
Pin C17	I ² C SCL
Pin D15	GND
Pin D17	GND
Pin D19	GND
Pin E20	GND
Pin E21	+9V
Pin E22	-9V
Pin E23	+12V
Pin E24	+12V
Pin E25	+12V
Pin F1	GND
Pin F3	GND
Pin F5	GND
Pin F7	GND
Pin F9	GND
Pin F11	GND
Pin F13	GND
Pin F15	GND
Pin F17	GND
Pin F19	GND
Pin F21	GND
Pin F23	GND
Pin F25	GND

The inputs I 1, I 1A, I 2 and I 2A may be combined as following so the output power is available on OUT 1 and OUT 2

Table 3.5. Router combinations

I2C	OUT 1 (X QNP)	OUT 2 (1H)
00	I 1 + I 2A	I 1A + I 2
01	I 1 + I 1A + I 2A	I 2
02	I 1	I 1A + I 2 + I 2A
03	I 1 + I 1A	I 2 + I 2A

Technical description

4

Amplifiers

4.1

The AQS BLA2BB Amplifier 200-400MHz (P/N:W1345049), provides 2 high power outputs at nominal 130W in the frequency range of 20-162MHz and 50W in the frequency range of 200-400MHz.

It can provide a CW power of 10W max.

The linear amplifiers are class AB with all the stages blanked at BLK high signal on the transistor gates.

In order to have a good output power stability there is a thermal compensation which allow a amplitude stability of about 0.2%°C.

The linear gain is about 51dB @ 400MHz.

Interface and router

4.2

The AQS BLA2BB Amplifier has a input router for mixing or selecting of 4 inputs signals of +4dBm max. to be amplified in the power amplifiers.

The selection is made by the bus I²C.

The forward power detection level is numerised and send to the bus I²C, and the defaults indications too.

In order to control the max output power for ¹H a programmable attenuator up to 10dB can be set by the I²C bus.

Technical description

Figure 4.1. AQS BLA2BB Amplifier 200-400MHz Block Diagram

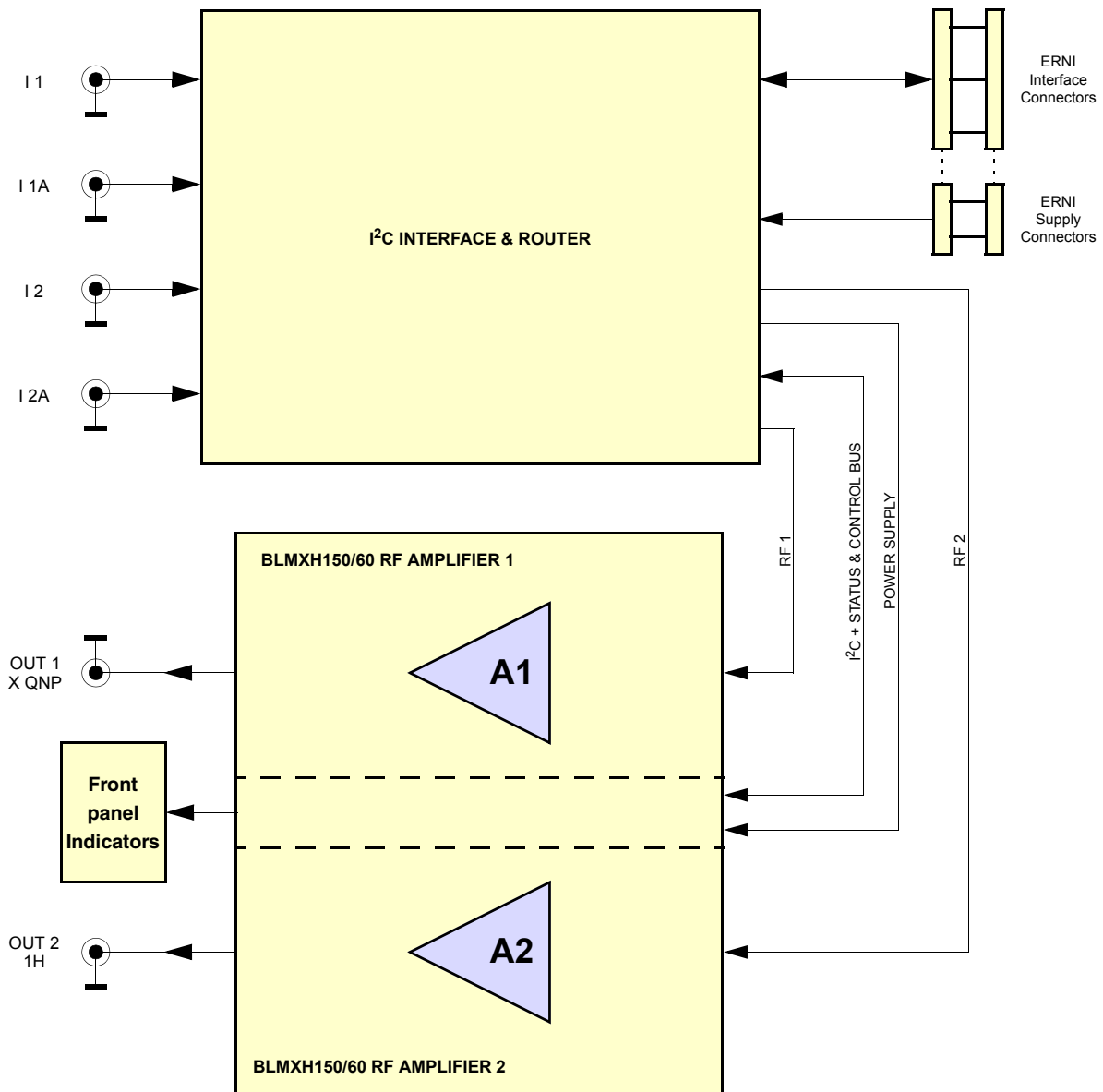
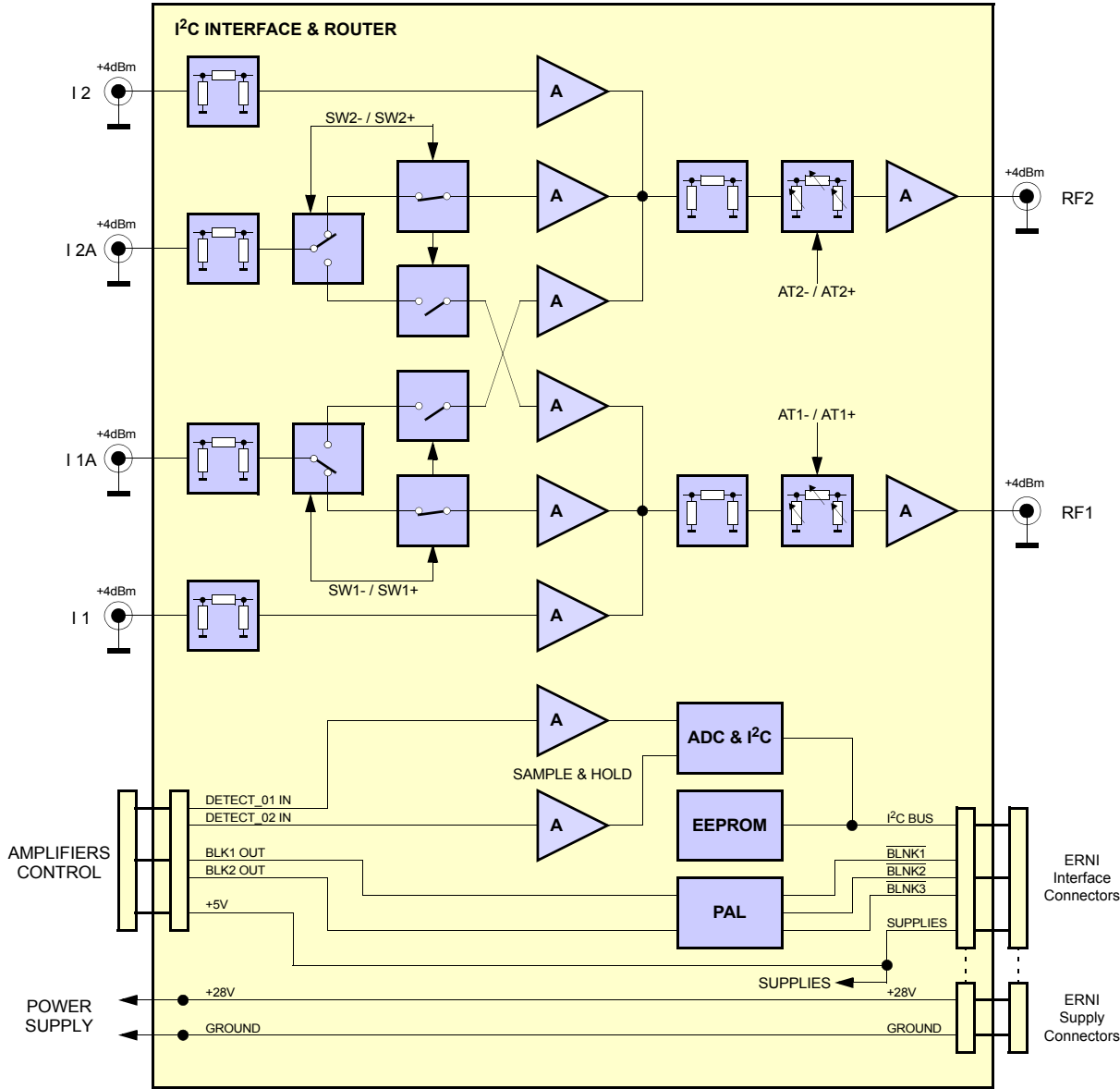


Figure 4.2. I²C Interface & Router Block Diagram



Specifications

5

General specifications

5.1

Table 5.1. RF specifications

RF SPECIFICATIONS	CHANNEL X	CHANNEL H
Frequency range	14 to 162MHz	180 to 400MHz
Linear Gain at input for -30dBm	57dB @ 100MHZ	51dB @ 300MHZ
Gain Flatness	±2dB max.	±2dB max.
Minimum Pulsed Output Power (at nominal input +4dBm)	120W (14-162MHz) 135W (50-100MHz) - ¹³ C 130W (20-40MHz) - ¹⁵ N 90W (9-18MHz) - ¹⁰⁹ Ag	50W (400MHz) 70W (300MHz) 110W (200MHz)
CW Output Power	5W typ.	5W typ.
Linear Output Power at 1dB compression	10W typ. @ 100MHz (Input typ. -16dBm)	40W typ. @ 300MHz (Input typ. -1dBm)
Programmable attenuation	0-10dB	0-10dB
Amplifier Biasing	Class AB Operation	Class AB Operation
Blanking Delay	< 1.5µs typ.	< 1.5µs typ.
RF Rise Time & RF Fall Time	< 100ns	< 100ns
DC Ringing	±200mV typ. (blanking signal)	±200mV typ. (blanking signal)
Input Noise Figure	7dB max.	7dB max.
Output Noise Power (Unblanked)	< -110dBm @ 1Hz	< -116dBm @ 1Hz
Output Noise Power (Blanked)	Thermal noise +15dBm @ 1Hz	Thermal noise +15dBm @ 1Hz
Isolation Channel X / Channel H	> 90dB	> 90dB
IN / OUT Impedance	50Ω	50Ω
Input V.S.W.R.	1,5 max.	1,5 max.
Output Harmonics H2	-30dBc max. @ 130W	-30dBc max. @ 50W
Output Harmonics H3	-10dBc max. @ 130W	-10dBc max. @ 50W
Output Harmonics H4	-30dBc max. @ 130W	-30dBc max. @ 50W
Pulse Width max.	10ms @130W	10ms @ 50W
Duty Cycle	10% @ 130W	10% @ 50W
Amplitude Droop	< 10% @ 130W for 1ms Pulse Width	< 10% @ 50W for 1ms Pulse Width
Amplitude stability / Temperature	< 0.2% / °C	< 0.2% / °C

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