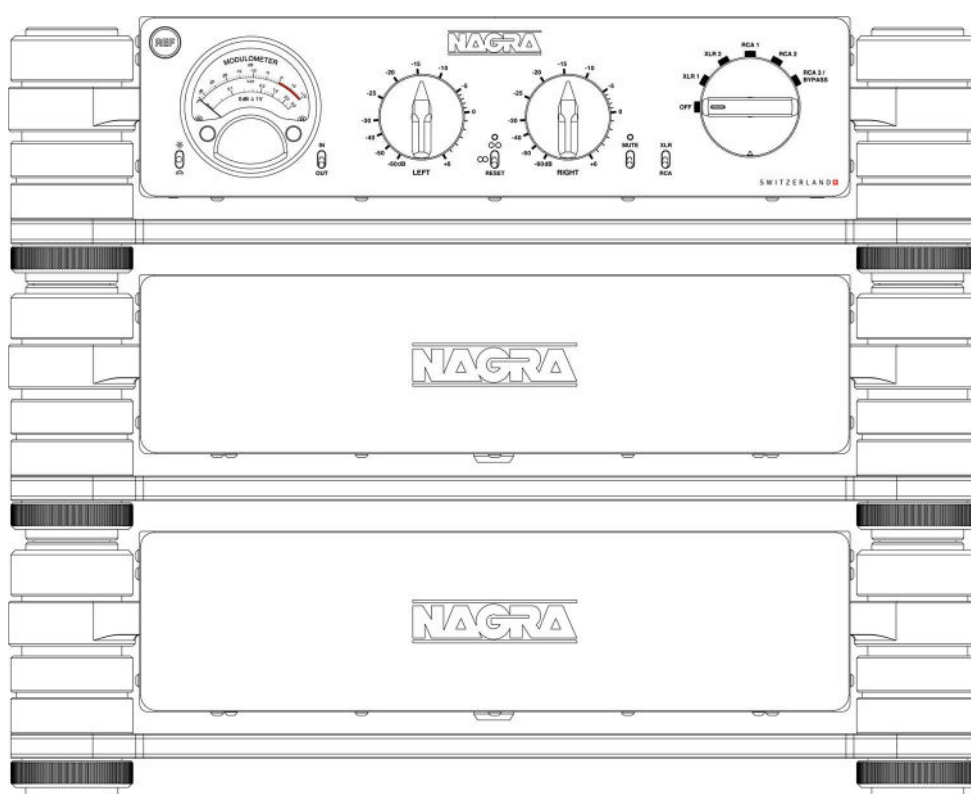




# Nagra REFERENCE PREAMP



## USER MANUAL

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## **Safety warnings**

- Read this manual carefully before operating the REFERENCE PREAMP.
- Should you have any questions on how to setup or use your REFERENCE PREAMP, please contact your Nagra dealer.
- Audio Technology Switzerland SA declines any responsibility in the event of an accident caused by the non-observance of these instructions or any other form of user negligence.
- The REFERENCE PREAMP has a specific power supply designed to operate correctly in your country. The power supply voltage can only be changed at the factory. Make sure you have the right operating voltage before switching your device ON.
- The REFERENCE PREAMP is CLASS I equipment. It is essential that it is connected to a MAINS socket outlet with a protective earthing connection.
- The REFERENCE PREAMP must not be exposed to dripping or splashing liquids and no objects filled with liquids, such as vases, should be placed on the machine.
- To prevent the risk of electric shock and burns, never try to open your REFERENCE PREAMP. Only Nagra dealers & skilled technicians are authorised to do this for maintenance and specific settings.

## **Warranty**

Please refer to the addendum enclosed in this User Manual.

## **Congratulations**

The REFERENCE PREAMP was created by an engineering team with more than 70 years of experience designing world-class products for the professional audio, national security and military industries.

Since its founding in 1951, Nagra has built products that continue to earn a reputation for delivering ultimate sonic performance. Numerous awards have been bestowed upon Nagra for its technical innovation, excellence in design and flawless construction including two Oscars® and two Emmys®.

The professional and Hi-Fi ranges are both designed by our Research and Development department. Nagra launched a Hi-Fi range to allow the wider public to benefit from technical advances that are often the sole privilege of professionals.

This technology exists in the service of music, your music. We wish you wonderful moments of listening pleasure with your REFERENCE PREAMP.

Thank you for your trust.

## **Important notice**

The Nagra REFERENCE PREAMP features a unique volume control. You should be aware of its operation to experience the full benefit of this very special piece of equipment.

The unit actually features two preamplifiers: one used to set the volume, using the front L and R potentiometers. The other uses a combination of multiple taps from Nagra-wound transformers.

Once you have set a certain listening level, the preamplifier switches the sound through a series of transformer windings. The advantages are: perfect left and right gain and the same left and right phase responses. Additionally, the signal is not altered by resistors or potentiometers. Thus, the REFERENCE PREAMP's output stage is balanced by design and we recommend using its XLR balanced outputs, especially when paired with the NAGRA REFERENCE AMP!

## **Package contents**

The package of your REFERENCE PREAMP includes the following parts:

- REFERENCE PREAMP audio device chassis
- REFERENCE PREAMP MAIN power supply chassis
- REFERENCE PREAMP SECOND power supply chassis, if it was ordered
- Eight ceramic balls
- Pair of microfiber gloves « Haute Horlogerie »
- One power cord\* (two with the SECOND power supply)
- Two umbilical cords with LEMO plugs (three with the SECOND power supply)
- One set of fuses (for 100-127 V~ or 230-240 V~, depending on your country)
- One remote control unit and its docking station with 3x AA-dry cell batteries
- One user manual

Please contact your Nagra dealer should anything be missing.

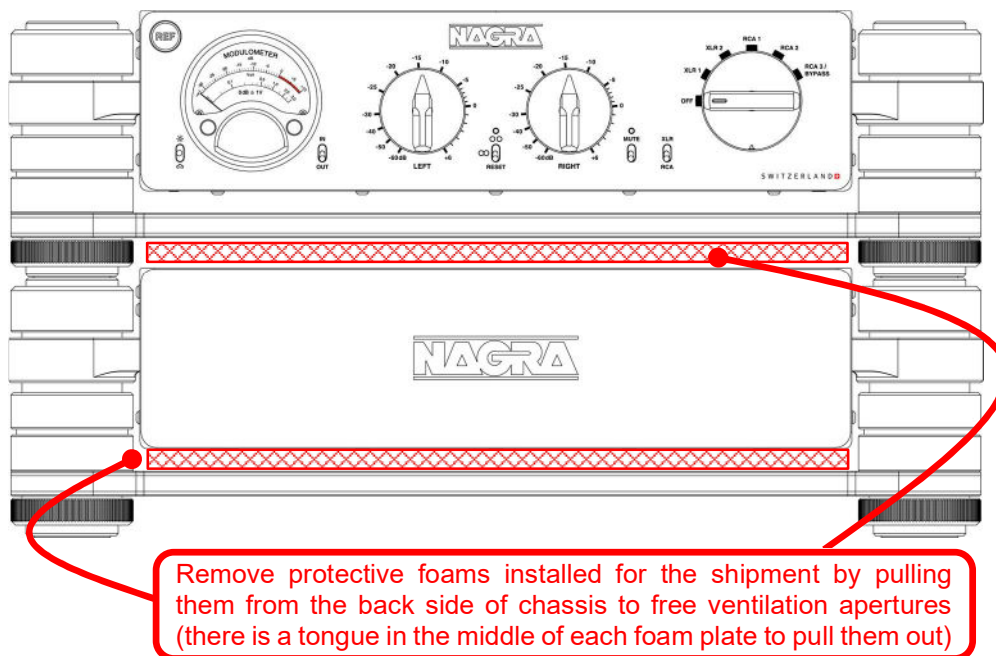
\* Depending on your country, the power cords feature either US, European or Swiss plugs.

## INSTALLATION OF YOUR REFERENCE PREAMP

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### Choosing a location

The REFERENCE PREAMP is designed exclusively for indoor use in a moderate climate.

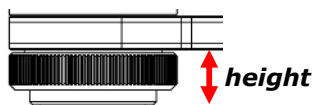


The REFERENCE PREAMP is contained in two or three chassis: one audio device and one / two power supplies. These chassis feature anti-vibration bases that allow either for putting one chassis on top of the other or one chassis next to the other, while remaining completely insensitive to vibration. They must be installed level on a suitable flat, firm and stable stand.

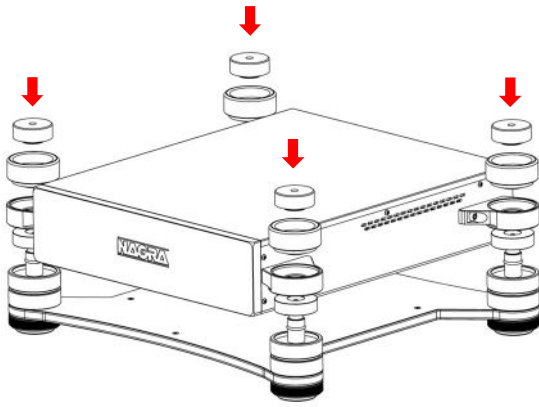
There must be enough space all around the chassis for adequate ventilation.

Ventilation should not be impeded by covering the ventilation openings with items such as newspapers, tablecloths, curtains, etc.

### Horizontal adjustment of the REFERENCE PREAMP / REFERENCE PSU



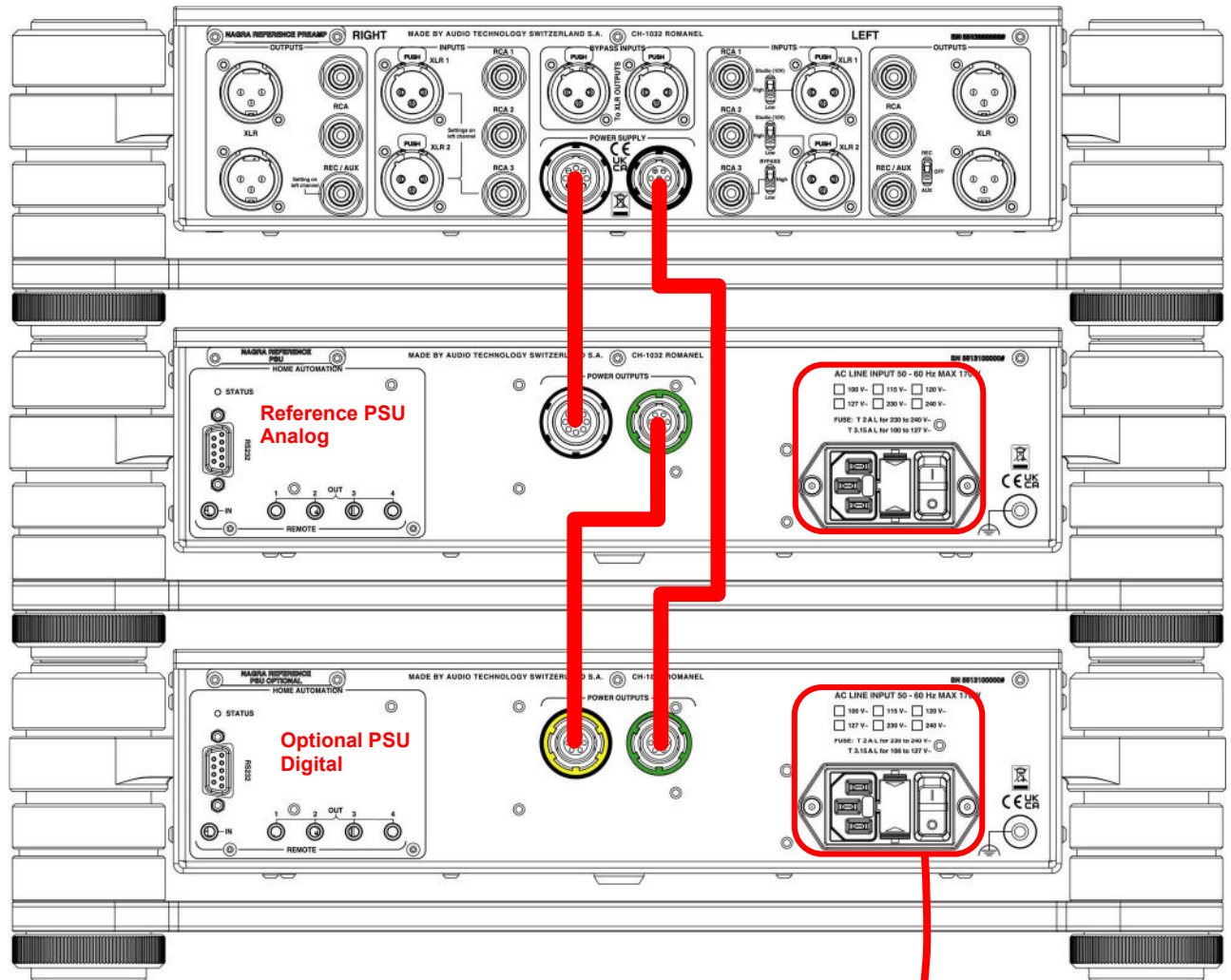
Each chassis has four decoupling feet whose height can be adjusted with a wheel (knurled part). Turning the wheel adjusts the height of the foot and thus the level of the chassis.



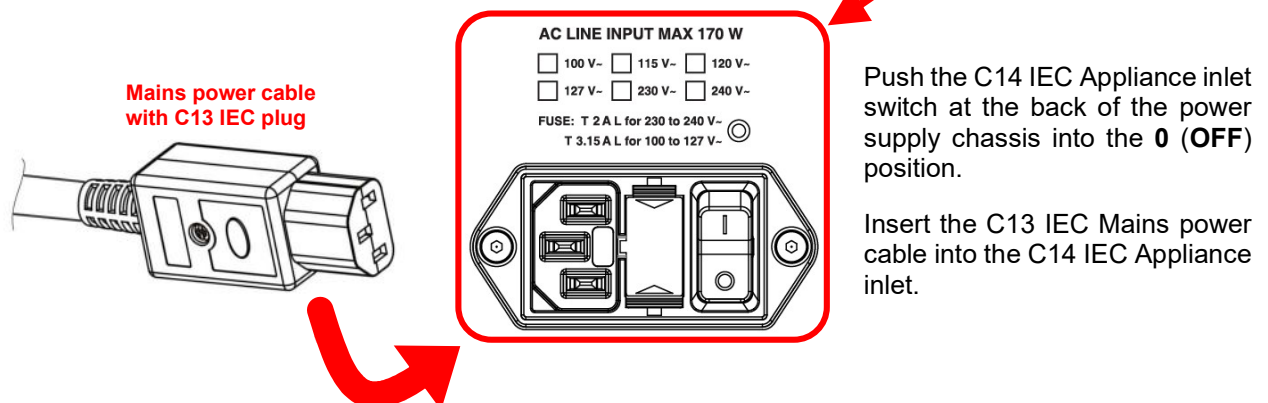
When the chassis are installed one on top of the other, the four feet of the upper chassis are in contact with the four feet of the lower chassis through four ceramic balls supplied with the REFERENCE PREAMP. The balls are seated in the small indentations on the top of each foot of the lower chassis (preferably the power supply chassis).

## Powering the REFERENCE PREAMP – two power supplies

The power cord of the REFERENCE PREAMP is connected to the rear panel of its power supply chassis. The power supply chassis converts the Mains supply into several different regulated voltages sent to the audio device chassis through three umbilical cords with LEMO plugs. These cords are supplied with the REFERENCE PREAMP.

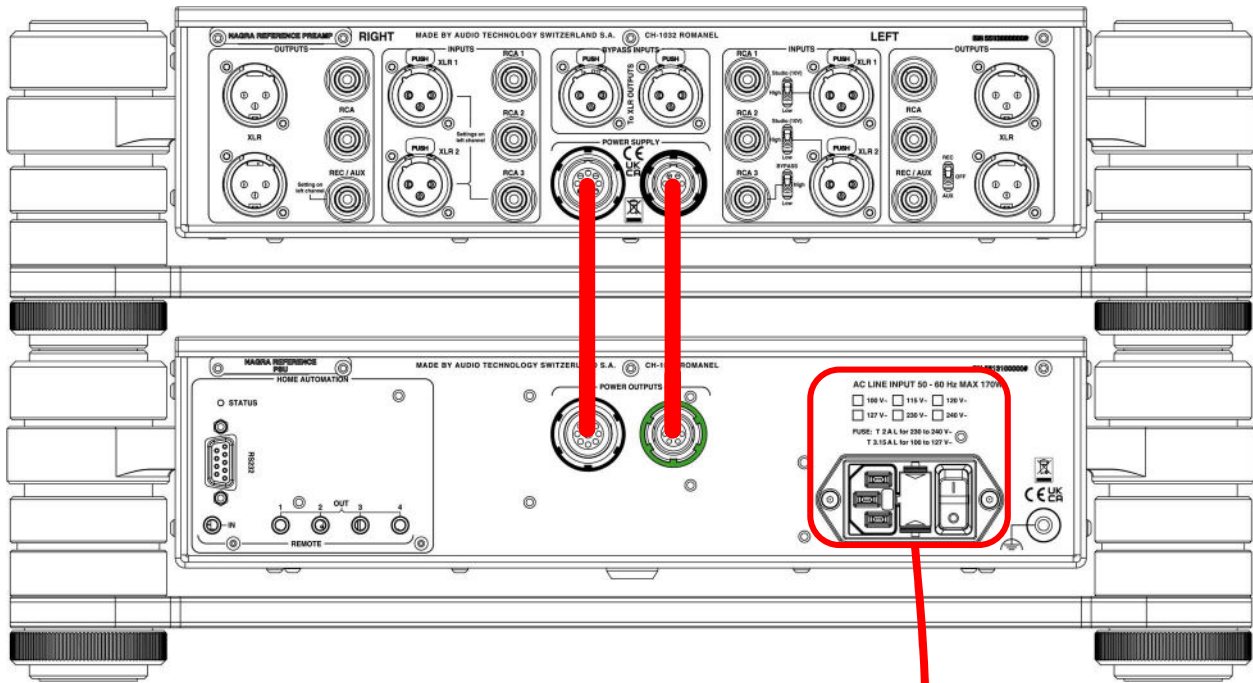


## Connection to the Mains

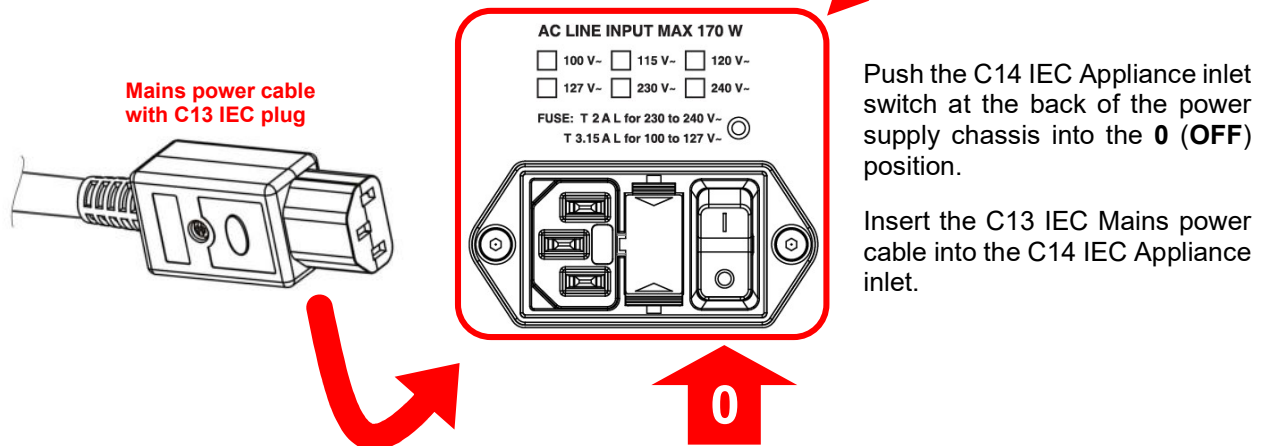


## Powering the REFERENCE PREAMP – one power supply

The power cord of the REFERENCE PREAMP is connected to the rear panel of its power supply chassis. The power supply chassis converts the Mains supply into several different regulated voltages sent to the audio device chassis through two umbilical cords with LEMO plugs. These cords are supplied with the REFERENCE PREAMP.



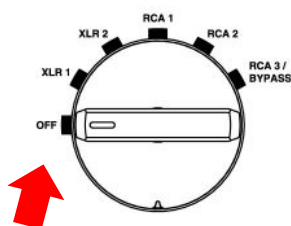
### Connection to the Mains



Please note that you can add a second power supply at a later stage to improve the performance of your REFERENCE PREAMP



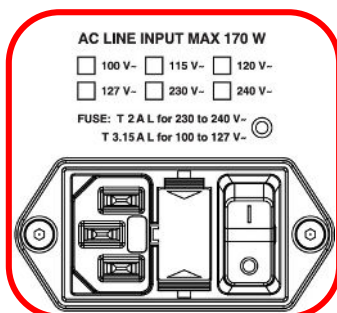
## Connection/Disconnection of LEMO cables



Turn the front rotary selector of the audio device chassis to the **OFF** position. Insert one LEMO plug of each umbilical cord into the matching LEMO socket at the back of the power supply chassis. Please note that the red dot on the LEMO plug must be facing up before trying to insert them into the chassis sockets. You will hear a click indicating that the plug is securely locked in.

To disconnect the plug, hold the knurled section of the plug and pull it backwards.

## Fuse replacement



The fuse holder located in the Mains appliance inlet, between the IEC connector and the switch, includes a replacement fuse.

The fuse type is: **FST 5x20 mm 250 V.**

***Should you need to replace it, use only the same fuse type and value.***

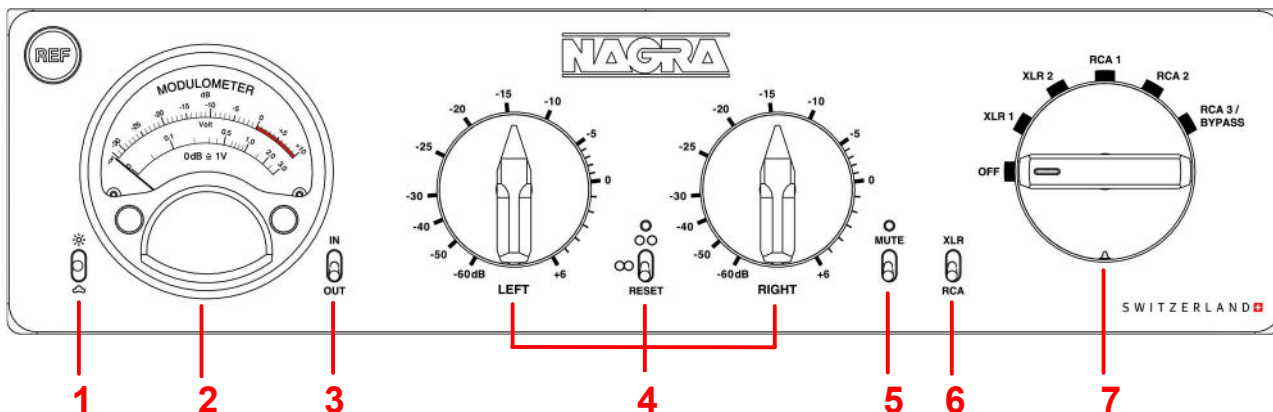
**T 3.15A L** for 100 V~ to 127 V~ versions.

**T 2A L** for 230 V~ to 240 V~ versions.

***Should the fuse blow more than once, please contact your Nagra dealer for assistance.***

## REFERENCE PREAMP description

### Front panel (audio device chassis)



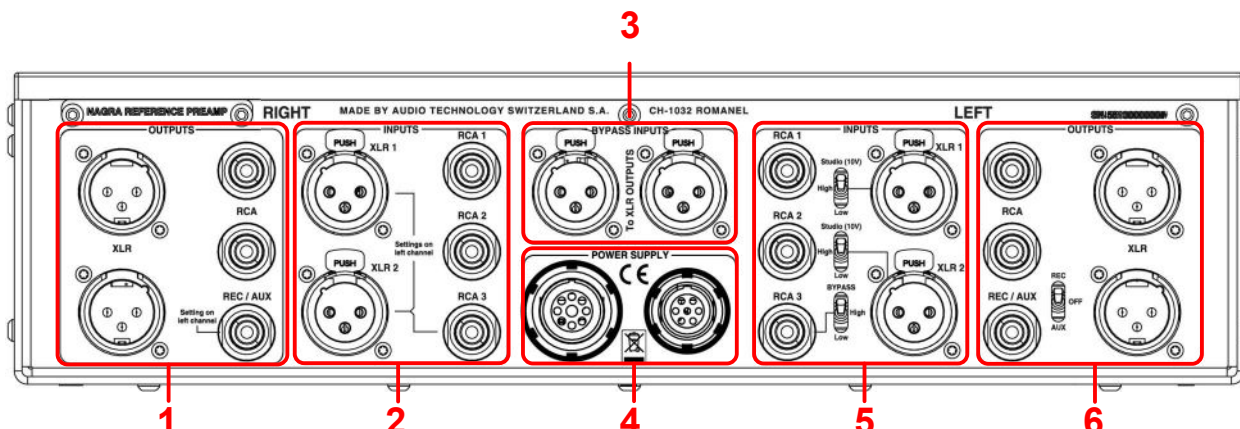
- 1 Modulometer & LEDs brightness switch. Push up for more intensity, push down for less. There are seven intensity levels.
- 2 Nagra Modulometer. Indicates level in dB with 0 dB = 1 V RMS as a reference.
- 3 IN / OUT switch to select input or output signal level shown on the Modulometer.
- 4 Motorized volume level controls LEFT & RIGHT with synchronization switch and warning LED for channels out of balance status (note: no sound passes through the potentiometer).
- 5 MUTE switch and LED, also used as reminder / preheating sequence indication.
- 6 RCA / XLR output selection switch.
- 7 Front rotary selector for ON / OFF and input selection.

When turned ON (a position other than OFF on its front rotary selector), the REFERENCE PREAMP enters a 3-minute preheating sequence in order to optimize tubes and warm up critical components. This will allow your REFERENCE PREAMP to offer excellent performance for years to come.

#### Note

*Should the REFERENCE PREAMP be switched OFF then ON again, the preheating sequence will start again from zero. During the preheating sequence, the MUTE LED flashes with a 1s period.*

## Rear panel (audio device chassis)



- 1 RIGHT OUTPUTS: XLR and RCA main, REC / AUX RCA.
- 2 RIGHT INPUTS: XLR and RCA.
- 3 BYPASS XLR inputs.
- 4 LEMO power supply inputs (Analog 9 pins + Digital 7 pins) with dedicated colour rings (**BLACK**).
- 5 LEFT INPUTS: XLR and RCA with sensitivity selectors for both channels.
- 6 LEFT OUTPUTS: XLR and RCA, REC / AUX RCA with selector.



### WARNING



***XLR and RCA inputs are unbalanced.  
Balancing transformers for XLR inputs are available as an option.***

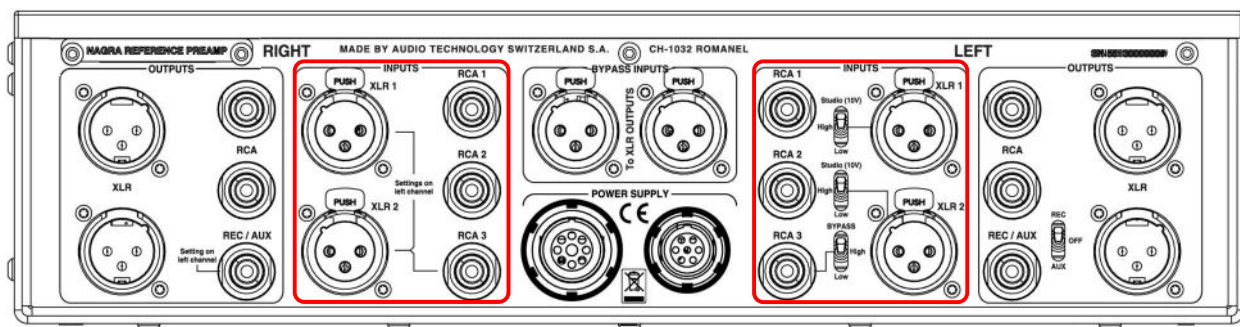
***XLR outputs are balanced.  
RCA outputs are unbalanced.***

***Please find more details in the following paragraphs.***

***Be careful, when cabling sources and amplifiers to your  
REFERENCE PREAMP, to properly connect them with the appropriate cables  
so as not to decrease audio signal quality!***

***Pay attention to the grounding to avoid any potential differences between  
equipment that could permanently damage your REFERENCE PREAMP!***

## Audio inputs



**RIGHT**

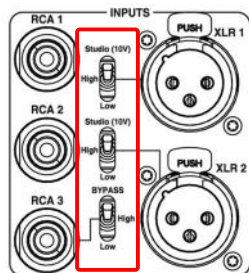
**LEFT**

The input is selected with the front rotary selector (see page 15).

On both channels, sensitivity of RCA 1 and RCA 2 inputs is fixed (1 V).

XLR 1, XLR 2 and RCA 3 inputs have adjustable sensitivity.

Three switches located next to the left channel inputs are dedicated to set sensitivity on both channels simultaneously:



XLR 1, XLR 2

Studio 10 V

High 2 V

Low 1 V recommended position for Nagra equipment

RCA 3

High 2 V

Low 1 V

### Note

When sensitivity is adjusted, you should switch the REFERENCE PREAMP OFF (front rotary selector to OFF), and the REFERENCE PSU OFF (Mains appliance inlet switch to 0), then switch them on again in order for the adjustments to be memorized.

XLR inputs are unbalanced. Balancing transformers are available as an option. All our transformers are designed and hand-wound on our premises in Romanel-sur-Lausanne, Switzerland. If you require balanced inputs, please contact your Nagra dealer who will supply and install the transformers.

Please note that this option is only necessary when balanced XLR inputs are required (this is an exceptional circumstance); if not required, we do not recommend adding transformers.

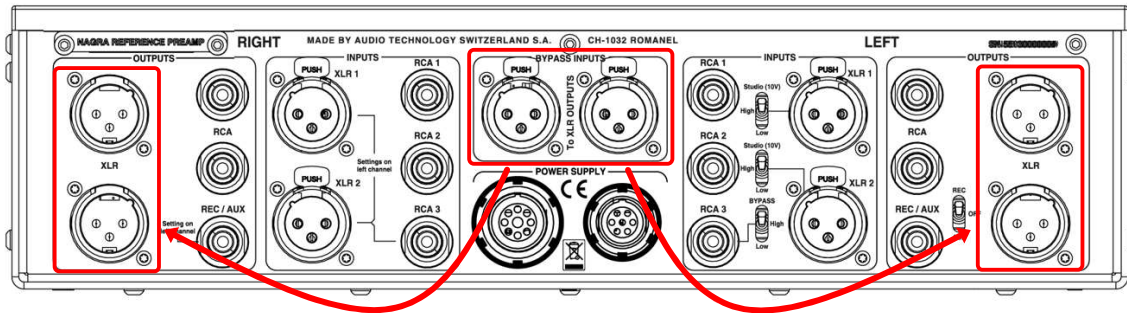
## BYPASS INPUTS

The BYPASS function can be handy in a few situations, notably for our demanding customers who use their main system as a front left and right source for their home cinema, for instance.

The BYPASS function has been designed to make home cinema integration easy and with no special calibration required.

Be aware that the REF PREAMP electronics will be totally bypassed so it is **mandatory to have a volume control on your home cinema source**, otherwise you might seriously damage your speakers.

## XLR BYPASS



BYPASS INPUTS should be connected to your home cinema controller “main front L” and “main front R” outputs.

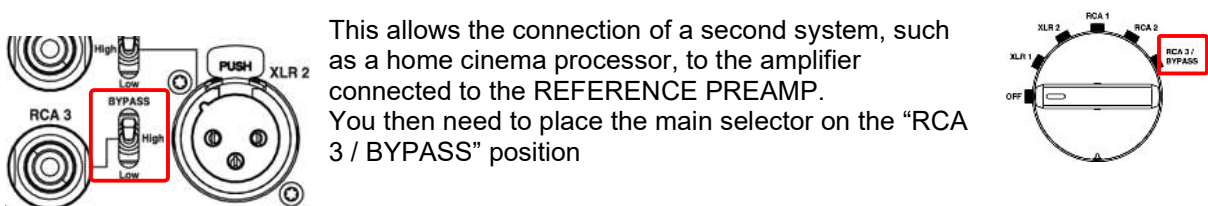
When you turn the REFERENCE PREAMP **OFF**, BYPASS INPUT XLR connectors are directly connected to the XLR. It is almost as if you connected the home cinema output directly to the amplifiers.

The advantages are: no calibration needed; your preamplifier is off so you don't wear tubes down.

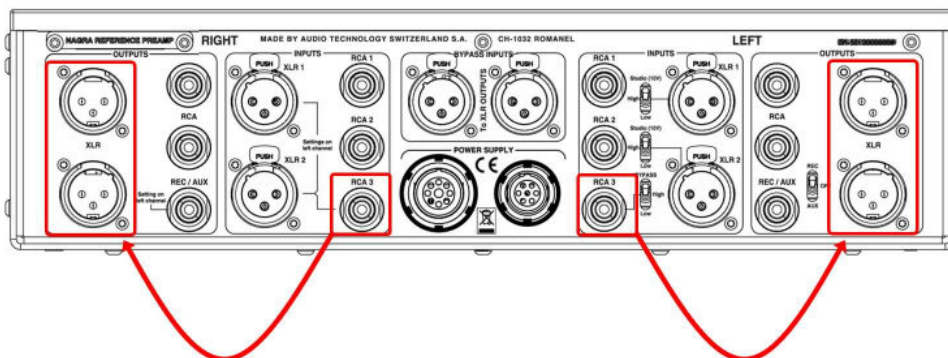
Should you wish to connect a second set-up or if you want your Reference PREAMP to stay ON while you watch a movie so that you can enjoy some music later on, then you can use RCA 3 as a BYPASS input.

### Bypass on RCA 3 input

Adjust the RCA3 selector switch to BYPASS. Please be aware that the preamplifier should be OFF (front and back selectors) before you change this setting.

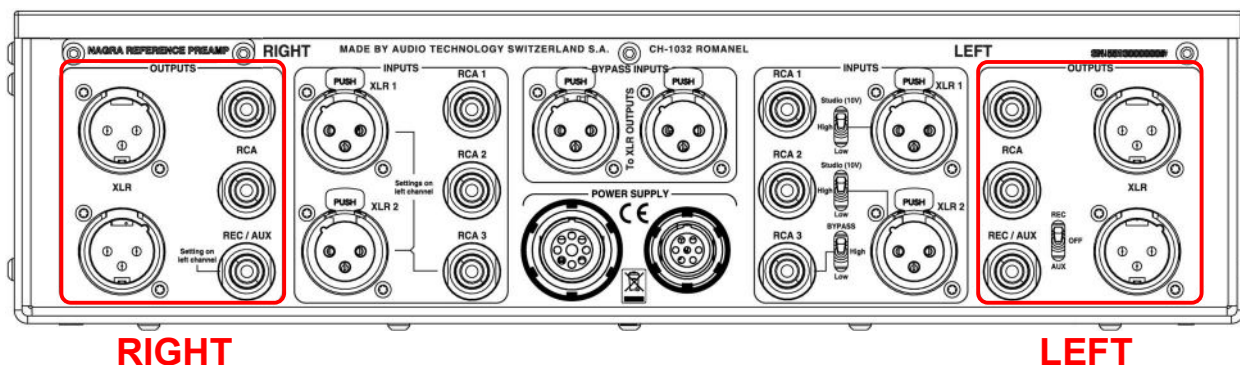


This allows the connection of a second system, such as a home cinema processor, to the amplifier connected to the REFERENCE PREAMP. You then need to place the main selector on the “RCA 3 / BYPASS” position





## Audio outputs



Your Reference PREAMP features two sets of outputs.

Simply select XLR or RCA on the front panel switch (see position 6 page 16). The use of XLR balanced outputs is recommended because it offers a complete galvanic isolation that limits possible ground loops.

### XLR

The audio ground (pin 1 of XLR) is routed to the Mains earth (preamplifier chassis). Signal is between pin 2 (+) and 3 (-).

### RCA

The ring of the RCA connectors is connected to the audio ground. The tip is connected to the (+) signal. This is the standard way to use RCA connectors.

### REC / AUX

This set of outputs allows you to connect a recorder for instance (REC position, fixed level) or a subwoofer using (AUX position, variable volume).

**REC** Fixed output level whatever the volume control position.

**OFF** REC / AUX output is disabled (recommended position if this output is not used).

**AUX** Variable output level according to the volume control position, for a subwoofer for instance.



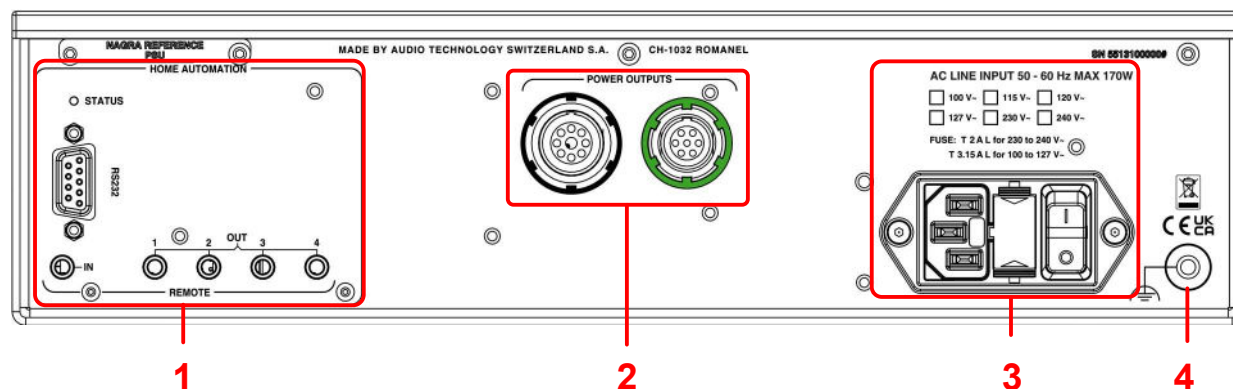
## WARNING

**Please be sure not to have any potential difference between the REFERENCE PREAMP chassis and other audio equipment (correct grounding). Otherwise, there is a risk of REFERENCE PREAMP damage when adjusting the volume level.**

**Since the main output uses transformers, the problem might arise when you change volume. If you hear a buzz or some clicks when you change volume, make sure to use grounding cables between the preamplifier and the amplifiers to prevent damage.**

**Cable manufacturers offer many options for ground cables, we highly recommend grounding the components together for optimal sound performance.**

## Rear panel (power supply chassis)



- 1 STATUS LED for software upgrade & detection of wrong audio device chassis  
SUB-D9 for Home Automation  
REMOTE IN (1x) to be driven by a MAIN device - 3.5 mm (1/8") stereo Jack  
REMOTE OUT (4x) to drive CONTROLLED devices - 3.5 mm (1/8") stereo Jack
- 2 LEMO power supply outputs - Analog (black) 9 pins, Digital (green) 7 pins
- 3 C14 IEC Appliance inlet with switch and fuse + voltage version & fuse value information
- 4 Ground post

### About the ground post

Use of this feature is recommended throughout your system. Your Nagra dealer will assist you on when and how to use this connector, see page 13.

## OPERATION OF YOUR REFERENCE PREAMP

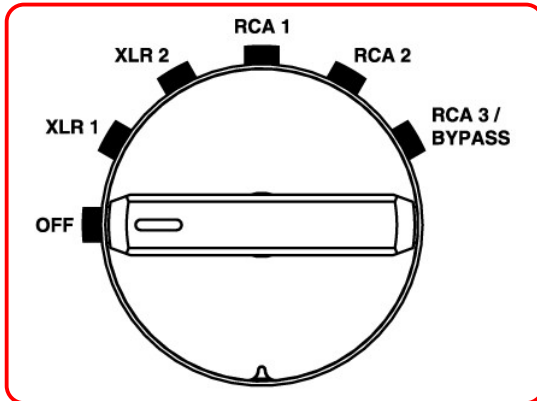
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Only proceed if you have completed the installation steps as described in the previous chapter.

### Power ON & input selection

To use your REFERENCE PREAMP, first you must push the Mains power switch to position **1 (ON)**. The Mains power switch is located on the rear panel of power supply chassis.

The front rotary selector offers 6 positions to select the desired input or to switch your REFERENCE PREAMP OFF:



**OFF** Similar to a STANDBY mode, the unit is still powered but the consumption remains very low

**XLR 1** Selection of XLR 1 input

**XLR 2** Selection of XLR 2 input

**RCA 1** Selection of RCA 1 input

**RCA 2** Selection of RCA 2 input

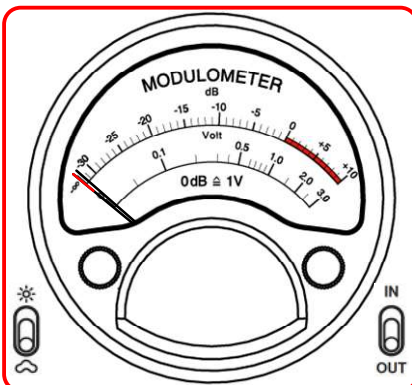
**RCA 3 / BYPASS** Selection of RCA 3 / BYPASS input

### Audio output selection



Connect the REFERENCE PREAMP output to your amplifier(s) by using either the XLR or RCA connectors according to the XLR / RCA switch position on the audio device chassis front panel.

### Nagra modulometer



The Nagra modulometer is inherited from the second recorder developed by Nagra back in 1952, the Nagra II. The Modulometer is a typical Nagra precision instrument that displays the necessary information to achieve the best possible audio level setting. In the case of the REFERENCE PREAMP, the modulometer displays either the input level or the output level.

Reference 0 dB = 1 V<sub>RMS</sub>.

Left channel – black needle

Right channel – red needle

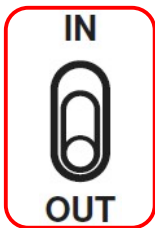


### Light intensity adjustment



This two-way toggle switch allows you to adjust the Modulometer & displays backlight intensities. Pushing the toggle up will increase the brightness, pushing it down will lower the brightness all the way to no illumination. There are 7 different intensity levels.

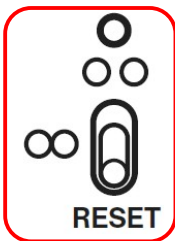
### Modulometer IN/OUT



Selection of audio signal displayed by the modulometer.

**IN** needles will display the level of the signal at the input of the REF PREAMP  
**OUT** needles will display the level of the signal at the output of the REF PREAMP

### Volume control synchronization & warning LED



#### Warning LED

ON when preheating is ended and volume controls are desynchronized.  
OFF when preheating is ended and volume controls are synchronized.



Desynchronization of both volume controls. They can be moved separately.

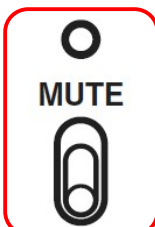


Synchronization of both volume controls. They move simultaneously. A given level difference, if any, will be kept when this setting is chosen.

#### RESET

When pushing switch on RESET, both volume controls calculate an average between their positions and move to this average position (useful for resynchronizing volume controls).

### Mute



The outputs of the REFERENCE PREAMP can be muted. Pulling up the switch will activate the muting (no more sound) and light the yellow LED. Pulling down the switch will deactivate the muting and turn the yellow LED off. The REFERENCE PREAMP outputs will be working again.

**Note** The MUTE LED flashes during the preheating sequence with a 1s period.

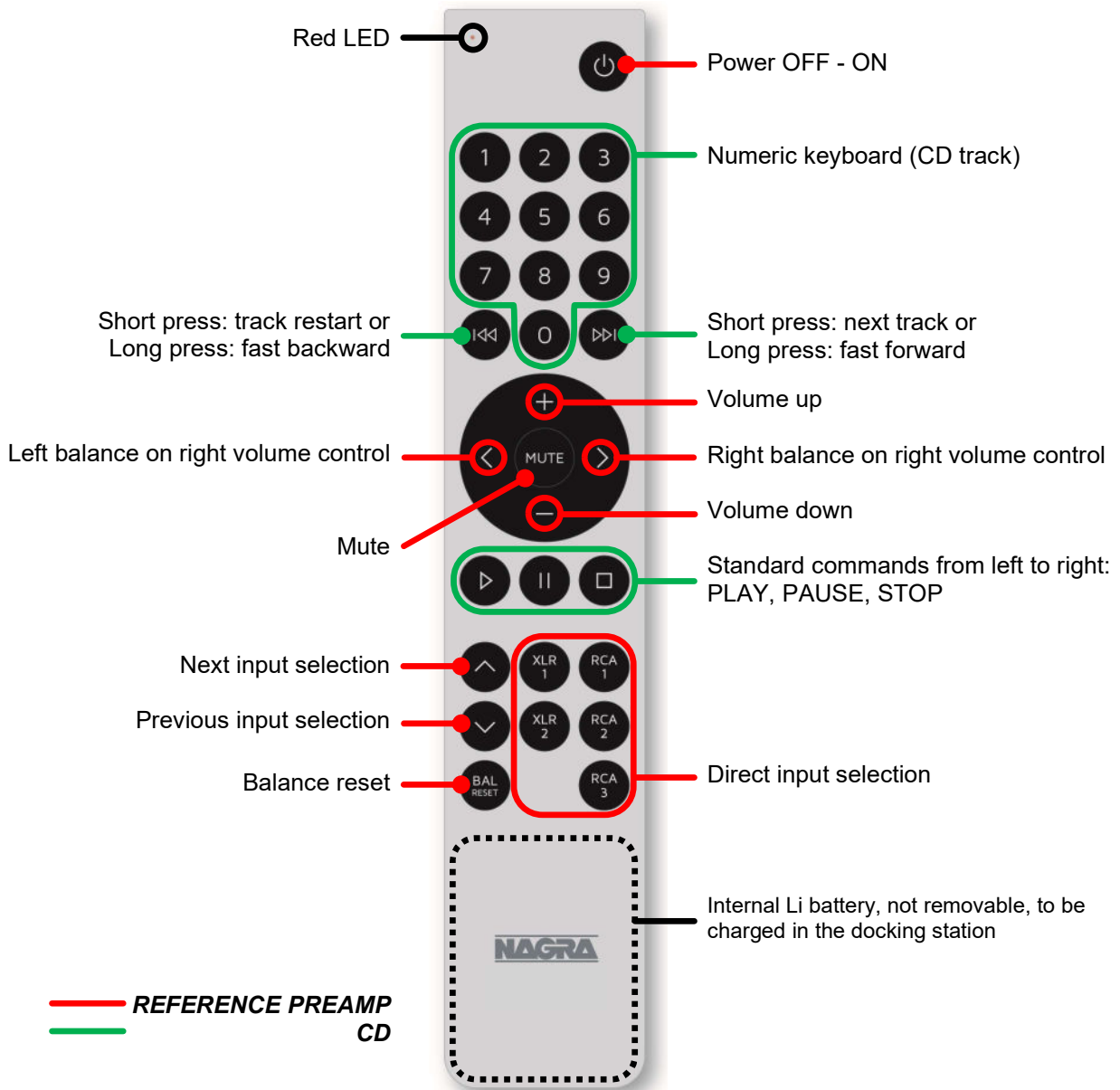
## IR Remote Control Unit



The Remote Control Unit, with battery installed, must not be exposed to excessive heat such as sunshine, fire or similar.



The REFERENCE PREAMP currently comes with the new IR Remote Control Unit with Philips RC-5 format encoding. You may also use a Nagra RCU or RCU-II IR Remote Control Unit. As they require a different communication protocol (RECS-80), please contact your Nagra dealer for assistance.



**NOTE** To protect the Li battery during transport, the Remote Control Unit keys have been locked. To unlock them, press **MUTE** for 5 seconds until the red LED blinks twice.

### Red LED on Remote Control Unit

The red LED lights ON when pressing any key on the Remote Control Unit. If not, it means either the Remote Control Unit keyboard is locked (please refer to the previous page for unlocking it) or the Remote Control Unit Li battery is empty. Insert the unit into the docking station to charge the Li battery.

### Power OFF - ON key

Toggle key to switch the REFERENCE PREAMP ON and OFF. When switching ON, the preamplifier automatically turns the front selector to the input selected before last power OFF.

**Note:** *This key is not operative when a REMOTE AUTOMATION jack cable is connected to the REMOTE IN socket of the power supply chassis!*

### “+” and “-” volume keys

To move both left and right volume controls simultaneously, either up or down, press on key briefly for a  $\pm 0.5\text{dB}$  change, or longer for bigger volume differences. The volume controls can be set to work either in synchronized mode or in desynchronised mode.

### “<” and “>” keys

With synchronized volume controls = No effect

With desynchronized volume controls = step of  $\pm 0.5\text{dB}$ , only on right volume control

### “BAL RESET” key

With synchronized volume controls = No effect

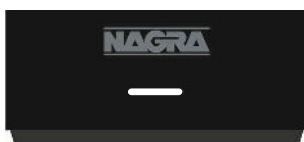
With desynchronized volume controls = both volume controls calculate an average between their positions and move to this average position (useful for resynchronizing volume controls)

### Docking station usage

To charge the Remote Control Unit Li battery, insert the unit into the docking station (unit keyboard towards docking station front). Fully charged, the Remote Control Unit will work for around 2-3 months, depending on usage. The 3x AA-dry cells in the docking station will be able to charge the Li battery for about 2 years.

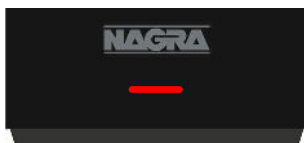
### Docking station LED indicator

The LED on the front indicates the condition of the Remote Control Unit Li battery when the unit is inserted into the docking station:



#### WHITE blinking

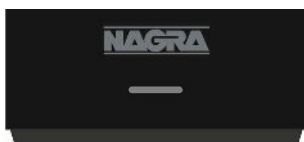
The Li Battery in Remote Control Unit is charging.



#### RED blinking

**A.** The 3x AA-dry cells are almost exhausted and deliver a voltage too low to load the Li Battery in the Remote Control Unit. They should be exchanged.

**B.** The Remote Control Unit is defective. Please contact your Nagra dealer.



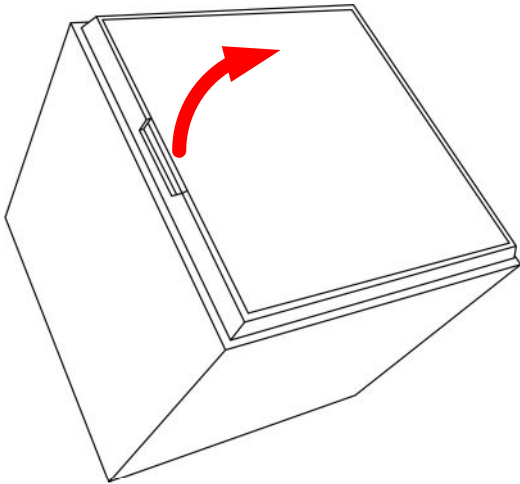
#### Permanently OFF

The Li Battery in the Remote Control Unit is fully charged or the Remote Control Unit is not properly inserted into the docking station. Remove and reinsert the unit into the docking station. If the LED blinks white everything is OK, if not, the 3x AA-dry cells are exhausted and must be exchanged.

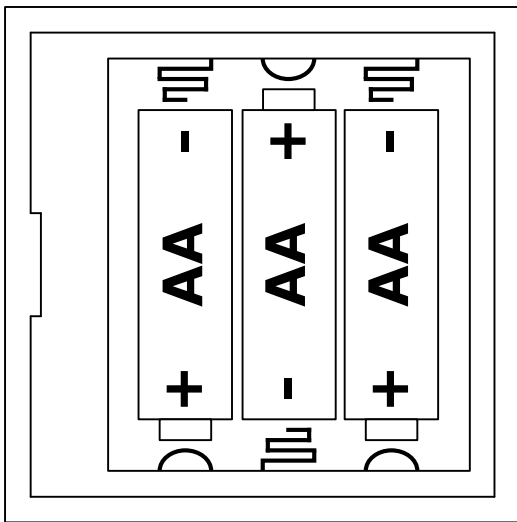
#### NOTE

When the Li Battery in the Remote Control Unit is fully charged, the docking station only uses a small amount of current to maintain the full charge. There is no risk of overload even if the Remote Control Unit is inserted in the docking station for a long time.

## Battery installation/exchange in docking station



Open the battery box by inserting your thumb nail into the groove and lift the bottom panel up (magnetic lock).



Replace empty batteries with 3x new AA-dry cell batteries.

4

### **Warning**

Do not use any mechanical tool to open the docking station battery box.  
You could damage the body or the panel of the unit.



By ensuring battery is disposed of correctly, you will help prevent potential negative consequences for the environment and human health. The recycling of materials will help to conserve natural resources. For more detailed information about recycling of battery, please contact your local authority, your household waste disposal service or the shop where you purchased the battery.

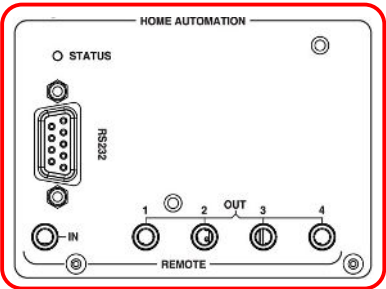
### Use of a universal IR Remote Control Unit

The REFERENCE PREAMP responds to IR (Infra Red) signals encoded in Philips RC-5 format. A default **code 16** has been allocated to the unit.

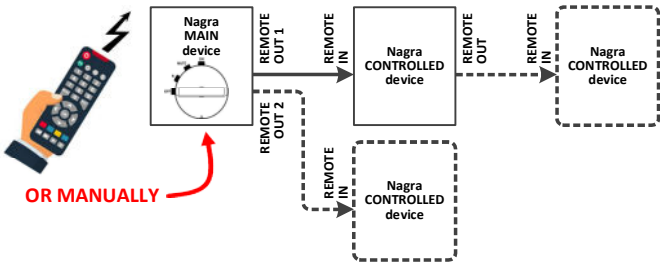
Should you wish to program your universal remote control, please use the following table:

Code	Device group number	Key
REFERENCE PREAMP		
1	16	XLR 1
2	16	XLR 2
3	16	RCA 1
4	16	RCA 2
5	16	RCA 3
12	16	Power ON /OFF
13	16	Mute
16	16	+ (Volume up)
17	16	- (Volume down)
20	16	Balance reset
26	16	> (Right balance)
27	16	< (Left balance)
32	16	^ (Input change, step-up)
33	16	v (Input change, step-down)
CD		
0	20	0
1	20	1
2	20	2
3	20	3
4	20	4
5	20	5
6	20	6
7	20	7
8	20	8
9	20	9
32	20	>>  (Short press: next track)
33	20	<< (Short press: track restart)
48	20	(Pause)
50	20	<< (Long press: fast backward)
52	20	>>  (Long press: fast forward)
53	20	▷(Play)
54	20	□(Stop)

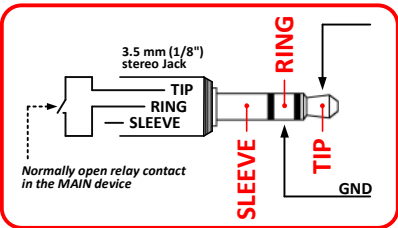
Remote automation



It allows you to switch a complete configuration of Nagra devices ON / OFF by using one unit to control the other, through the MAIN device manually or with an IR Remote Control Unit if available:



Starting the REFERENCE PREAMP using the REMOTE IN trigger input



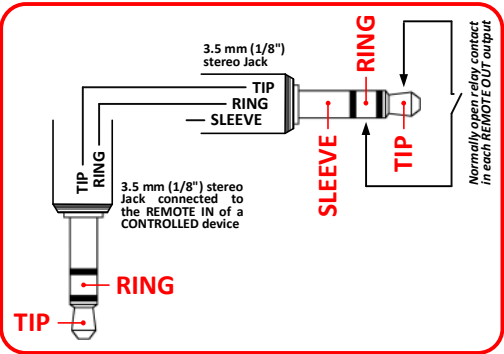
Please note that the RING contact of the 3.5 mm (1/8'') stereo Jack inserted in the **REMOTE IN** input is connected to the ground in the power supply chassis.

Signal on the TIP	REFERENCE PREAMP
Loop closed between TIP and RING (MAIN device ON) or TIP connected to the GND in the MAIN device	ON
Loop open between TIP and RING (MAIN device OFF) or TIP connected to max +12V $\pm$ in the MAIN device	OFF

If a 3.5 mm (1/8'') stereo Jack connector is inserted into the **REMOTE IN** input, this control gains priority over the IR Remote Control Unit and RS232 commands (ON-OFF key switch on IR Remote Control Unit no longer works).

As soon as the REFERENCE PREAMP is switched ON, the front rotary selector turns itself to the selected input before it was last switched off. If you manually turn the front rotary selector to the OFF position when TIP and RING are shorted (loop closed), it will turn itself back to the last selected input.

Using the REMOTE OUT trigger outputs

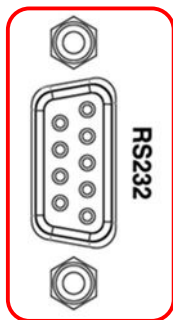


REFERENCE PREAMP	TIP & RING contacts
REMOTE OUT activated (REFERENCE PREAMP ON)	Loop closed between TIP and RING when the REFERENCE PREAMP or the MAIN device connected on the REMOTE IN are switched ON
REMOTE OUT not activated (REFERENCE PREAMP OFF)	Loop open between TIP and RING when the REFERENCE PREAMP or the MAIN device connected on the REMOTE IN are switched OFF

The relay contact activation is done at the beginning of the start-up sequence when turning the REFERENCE PREAMP ON.

**Note** Use standard straight cable to connect the different devices except for the **REM** (REMOTE IN) input of a CONTROLLED Nagra MPS. For more information, please ask your Nagra dealer who will provide you with a specific document on the topic: Nagra Remote automation - User+service instruction - 2055000159 - How does it work.

## Home automation



All commands are sent / received on the SUB-D9 connector located on the rear panel of the power supply chassis. The serial settings are: 115200 bits per second, 8 data bits, no parity, 1 stop bit.

All commands are executed after sending the command itself and terminating with a <CR> (carriage return).

Command	Description
BALLEFT	Step balance left
BALRESET	Reset balance
BALRIGHT	Step balance right
BLUP	Increase backlight intensity
BLDOWN	Decrease backlight intensity
MUOFF	Mute OFF
MUON	Mute ON
MVDOWN	Decrease volume
MVUP	Increase volume
PWON	Power on the device
PWSTANDBY	Set device to standby (or power off)
SILEFT	Previous input
SIRIGHT	Next input
SI1	Select input 1
SI2	Select input 2
SI3	Select input 3
SI4	Select input 4
SI5	Select input 5

## Tube ageing

Nagra selects the REFERENCE PREAMP tubes according to exacting criteria. Their theoretical minimum useful life is 5'000 hours. In fact, some tubes operate consistently for more than 10'000 hours.

Thus, the useful life of the tubes is somewhat unpredictable. Rather than replacing the tubes arbitrarily after 5'000 hours, we suggest that you identify the signs of ageing:

- Distortion gently increases to an audible level
- Presence of clicks (dry, brief noises, like dead wood snapping)
- Presence of pops, brief noises in the low frequencies
- Presence of hiss, higher background noise
- Reduction of spaciousness, loss of naturalness

As soon as one of these signs appears, please contact your Nagra dealer to order a REFERENCE PREAMP replacement tube kit (see Accessories chapter for reference).

## Case cleaning

Clean the REFERENCE PREAMP chassis, the IR Remote Control Unit and its docking station by using a soft, lint-free, slightly damp cloth. Do not use any cleaning products that could have a corrosive effect.



## TECHNICAL SPECIFICATIONS

<b>Input impedance</b>	> 50 k $\Omega$	
<b>Output impedance</b>	< 0.2 $\Omega$ < 40 $\Omega$	Volume @ -15 dB Volume @ 0 dB
<b>Frequency response</b>	10 Hz - 100 kHz 10 Hz - 200 kHz	+0.1 dB / -0.1 dB +1.5 dB / -0.2 dB
<b>Dynamic range</b>	> 150 dB	Volume @ -15 dB
<b>Input level to reach 0 dB on modulometer</b>		Volume @ 0 dB
Sensitivity LOW	1 V <sub>RMS</sub>	
Sensitivity HIGH	2 V <sub>RMS</sub>	
Sensitivity STUDIO	10 V <sub>RMS</sub>	
<b>Harmonic levels</b>		@ 1 kHz, 1 V out, no load
h2	< -70 dB	
h3	< -120 dB	
h5 & h7	< -150 dB	
<b>Crosstalk</b>	> 130 dB > 110 dB	@ 1 kHz, 1 V RMS @ 20 kHz, 1 V RMS
<b>Remote automation</b>		
Input	1x 3.5 mm (1/8") stereo Jack socket	Input command
Output	4x 3.5 mm (1/8") stereo Jack socket	Output switching by relay
<b>Home automation</b>	1x SUB-D9 connector	RS232 115200 bits/s, 8 data bits, no parity, 1 stop bit
<b>Mains power</b>	100 V~, 115 V~, 120 V~, 127 V~, 230 V~ or 240 V~ NOT ADJUSTABLE	±10 %, 50-60 Hz
<b>Power consumption</b>	170 W max	
<b>Mains fuse</b>		
230 V~ to 240 V~	T 2A L	FST 5x20 mm 250 V
100 V~ to 127 V~	T 3.15A L	FST 5x20 mm 250 V
<b>Operating temperature</b>	+15 °C to +35 °C +59 °F to +95 °F	Moderate climate
<b>Operating environment</b>	Indoor only	IP30
<b>Overall dimensions with VFP</b>		
LxWxH		
Power supply chassis (REF PSU)	439 x 438 x 121-130 mm	17.3 x 17.3 x 4.8-5.1 in
Audio device chassis	439 x 438 x 121-130 mm	17.3 x 17.3 x 4.8-5.1 in
<b>Weight with VFP (net)</b>		
Power supply chassis (REF PSU)	16.5 kg	36.4 lb
Audio device chassis	13.5 kg	29.8 lb

*Specifications may change without notice*

## ACCESSORIES

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ATS ref	Part description	Comment
4181311200	FST 5x20 mm T 2A L / 250 V fuse cartridge	For 230 V~ to 240 V~ versions
4181311315	FST 5x20 mm T 3.15A L / 250 V fuse cartridge	For 100 V~ to 127 V~ versions
7055130022	REFERENCE PREAMP input transformer kit	
7055130030	REFERENCE PREAMP spare tube kit	2x 12AX7-type selected by Nagra Lab
7055428000	REFERENCE PREAMP remote control	Including charging station



Disposal of old electrical & electronic equipment (applicable in the European Union and other European countries with separate collection systems).

This symbol on the product or on its packaging indicates that it should be handed over to the applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product, please contact your local authority, your household waste disposal service or the shop where you purchased the product.

Applicable to the following devices:  
REFERENCE PREAMP and all the package contents