BRYSTON

BAX-1 Active DSP Crossover

Owner's Manual

Important Safety Instructions

The lightning flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage " within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. Do not open. NO USER SERVICEABLE PARTS INSIDE

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.
DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, ARE PLACED ON THE EQUIPMENT.
TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE.
THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERABLE.

BRYSTON LIMITED WARRANTY

Bryston analog audio products are warranted to be free from manufacturing defects for twenty (20) years from the original date of manufacture. The warranty includes parts and labour. Bryston digital products and cables are warranted for five years from the original date of manufacture. The warranty includes parts and labour.

Bryston products having motorized moving parts, excluding motorized volume controls, are warranted for three years from the original date of manufacture. The warranty includes parts and labour.

Bryston will remedy the problem by repair or replacement, as we deem necessary, to restore the product to full performance. Bryston will pay return shipping only for the full length of the specific product's warranty.

In the event of a defect or malfunction, contact Bryston's repair centers for return authorization. Products must be returned using original packaging material only. Packing material may be purchased from Bryston if necessary. This warranty is considered void if the defect, malfunction or failure of the product or any component part was caused by damage (not resulting from a defect or malfunction) or abuse while in the possession of the customer. Tampering by persons other than factory authorized service personnel or failure to fully comply with Bryston operating instructions voids the warranty. This warranty gives you specific legal rights and you may also have other rights which may vary from province to province and country to country. As of 2006-02-22 Bryston will only warranty Bryston products purchased through authorized Bryston dealers. Bryston products with a date code of 0608 or higher (date code format is "yyww", where "yy" is the two least significant digits of the year and "ww" is the week of the year) must be accompanied by a copy of the bill-of-sale from a Bryston authorized dealer to qualify for warranty service. The warranty is transferable from the original owner to a subsequent owner as long as a copy of the bill-of-sale from the original authorized Bryston dealer accompanies the re-sale. The copy of the bill of sale to any subsequent owner need ONLY include the Name of the Bryston Authorized Dealer and the Model and Serial number of the Bryston product The warranty will only be honored in the country of the original purchase unless otherwise pre-authorized by Bryston.

BRYSTON SERVICE in CANADA:

Postal address:	P.O. BOX 2170, Stn. Main
	PETERBOROUGH, ONTARIO
	CANADA K9J 7Y4
Courier address:	677 NEAL DRIVE
	PETERBOROUGH, ONTARIO
	CANADA K9J 6X7
PHONE:	705-742-5325
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BRYSTON SERVICE in the USA:

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NEWPORT, VERMONT
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PHONE:	802-334-1201
FAX:	802-334-6658
E-mail:	usaser@bryston.com

BRYSTON SERVICE outside Canada and the USA:

contact your local distributor or

CHECK OUR WEB SITE:	www.bryston.com
E-MAIL BRYSTON DIRECTLY:	cdnser@bryston.com
FAX BRYSTON DIRECTLY:	01-705-742-0882
PHONE BRYSTON DIRECTLY:	01-705-742-5325

Table of Contents

General

Welcome

Thank you for your purchase of a Bryston Active Loudspeaker System! Our class leading loudspeakers and ultra high performance DSP crossover platform combine with your choice of Bryston amplification to form a unique high performance playback system through which you can hear details you never thought possible. We welcome your feedback and hope you enjoy your new Bryston Active Loudspeakers for many years to come.

Description

Fully active loudspeakers dispense with passive crossovers that are built into conventional loudspeakers in favor of crossovers inserted before amplification is applied. The benefits are many including increased flexibility with filter shapes, the ability to make fine-grained adjustments which result in improved on and off axis response (these are often competing objectives in passive loudspeakers), direct coupling of the loudspeaker to the driver which avoids losses inherent in passive crossovers and more. Bryston Active Loudspeakers combine decades of research into acoustics, electronics, amplification as well as state of the art components to recreate your recordings with stunning realism. The BAX-1 Active DSP Crossover is a core component of this system.

The BAX-1 is a state of the art DSP crossover that has been specially programmed at the factory for compatibility with your specific model of Bryston Active Loudspeakers. It is comprised of two channels of analog to digital conversion which convert incoming full range analog audio from your preamplifier to an equivalent digital audio signal sampled at 96kHz and decimated to 24 bits. This signal passes to a high powered DSP core which performs the 3-way crossover function for each channel and any user selected filters desired for altering the bass response of the loudspeakers in the room. Three bands of audio per channel are then passed to 6 digital to analog converters

followed by fully discrete balanced analog outputs which in turn feed 3 amplifier channels per loudspeaker. The BAX-1 only accepts balanced input and provides balanced output. No single ended audio connections are available. If you require single ended connections, XLR to RCA adapters can be used.

The system can be user controlled through a simple and intuitive web-application for setup. Network connection is required for those who desire to tailor the bass response of the loudspeaker to the room and for firmware updates but is not otherwise necessary.

Features

Bryston BAX-1 includes the following features:
- 6 DACs and 2 ADCs by AKM
- Audio sensing auto-power on
- Network connectivity for control and firmware updates
- Balanced XLR input and output
- Three position gain switch
- Available in either 17 inch or 19 inch wide C-Series dress panel in silver-toned (clear anodized) or black anodized aluminum.

Shipping Box and Packing Material

Please keep the original shipping box and all packing material. This will ensure the BAX-1 is protected in future transport. In the unlikely event you have a problem and must return it for service, you must use the proper packing material. Ship the BAX-1 only in the original packing material as the unit is not insurable by carriers otherwise. Replacement packing materials consisting of a shipping carton with plastic foam inserts is available from Bryston for a small fee.

Installation

Ventilation

The BAX-1 is a cool-running line level component. It generates far less heat than amplifiers and many other components. It can be safely placed inside furniture or an equipment rack. However, it should

not be tightly enclosed. Some airflow is desired.

Connecting to A/C Power

Please check the Data Plate on the right rear of the crossover to verify power requirements agree with your location. Plug the IEC-320 C14 end of the power cord into the BAX-1, then plug the other end into an approved and grounded A/C receptacle.

Connecting to an Audio System

Though the BAX-1 is a DSP driven digital audio component, all audio connections are analog only. This is to accommodate a broad range of pre-amps and front-ends while operating the digital circuitry at optimum conditions. Contrary to some beliefs, converting analog to digital inside the crossover does not create a compromised sonic experience.

From your stereo preamplifier, connect the left and right outputs to the BAX-1 left and right inputs using good quality balanced XLR cable. The left and right channels each have 3 outputs marked low mid and high. The low output for each channel goes to the amplifier designated to drive the bass section, mid should drive the midrange, and high drives the tweeters of your speakers.

Connection Diagram

The connection diagram below shows one channel connected of a Bryston BP-26 Preamplifier → BAX-1 Crossover → 21B^3 Amplifier → Model T Active Loudspeaker.

Choosing Amplification

Bryston Active Loudspeakers have been optimized for use with Bryston amplifiers however other brand amplifiers may be suitable as well. Each amplifier used must have the same gain as there is currently no provision to compensate for mis-matched amplifiers within the DSP.

Connect to Network

Connect the BAX-1 to your network router using a CAT-5 or better ethernet cable.

First Run

Upon first run, the BAX-1 has not yet been programmed for your model loudspeaker and the power LED will blink green. You must program the BAX-1 for your model by connecting to the web interface. From your web browser, navigate to http://my.bryston.com. The website will scan your network for connected Bryston equipment and
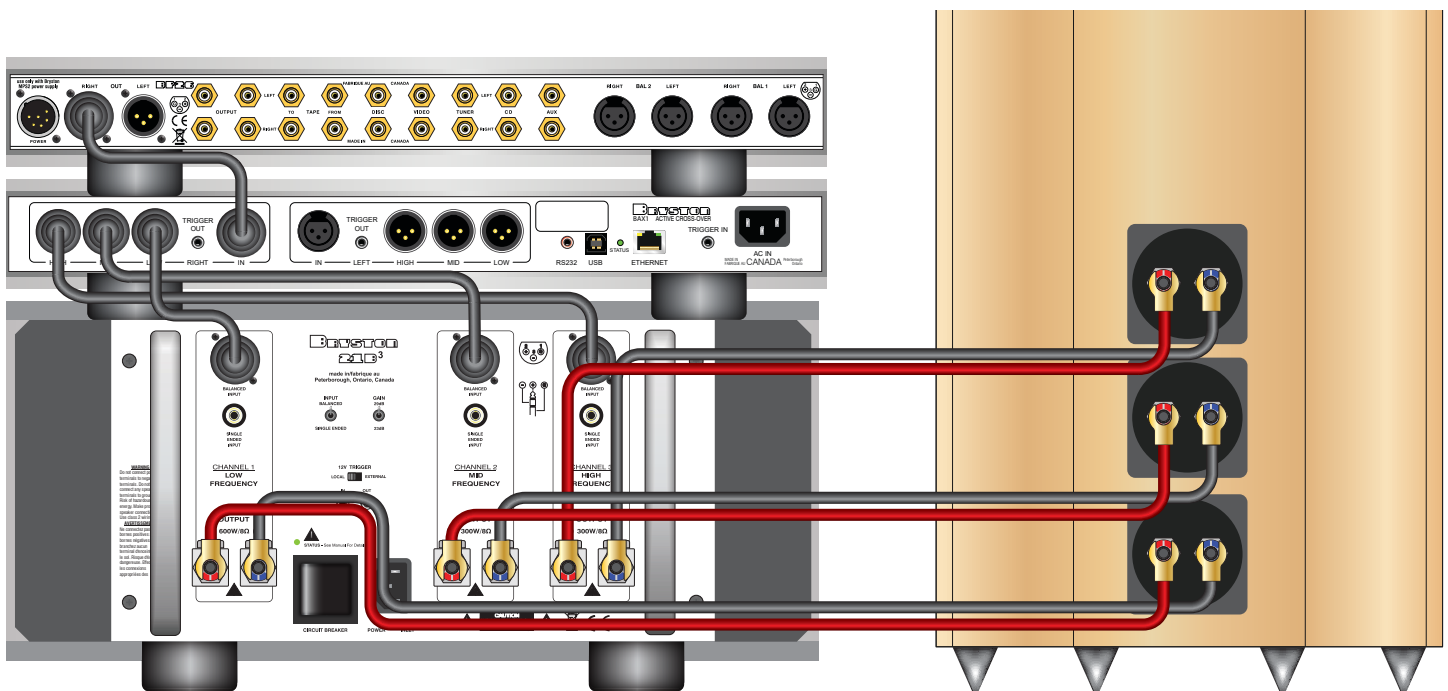
generate a link to your BAX-1. Click that link.
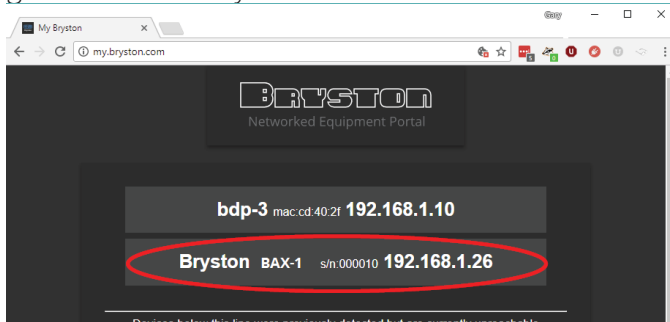
Click the **Terminal** button. Enter the text below and click CMD.
`%2370INIT222.`
The BAX-1 will respond **#70INITUnlocked.**

Depending on which model speaker you are pairing with the BAX-1, enter the following:

`%2370APPS_ModelT.`   For Model T
`%2370APPS_MiddleT.`   For Middle T
`%2370APPS_MiniT.`   For Mini T
`%2370APP_TRex.`   For T Rex

The BAX-1 will restart and be ready for operation.

Bass Adjustment

A Word About Room Tuning

The BAX-1 permits some degree of loudspeaker tuning below approximately 150Hz. Many competing systems provide full bandwidth adjustments, or attempt to automatically tune loudspeaker response based on measurements taken by microphone. Bryston certainly advocates tuning loudspeaker performance based on measurements, but electrically altering loudspeaker response is a last step, not a first step. DSP application is most certainly not a replacement for proper loudspeaker placement, well informed gear choices, proper room construction and wise room treatment. In other words, take care to choose upstream equipment and cables wisely, and position your speakers carefully in the room before attempting corrections with the BAX-1. It is for this reason we limit the adjustment window to 9dB per band.

Further, narrow bandwidth anomalies are less audible than wide bandwidth anomalies. Your focus should be correcting broadband deviations from zero before attempting to correct narrow band issues.

Finally, do not obsess over getting absolute flat response!

Measuring In Room Loudspeaker Response

Though you can attempt to equalize the response of your loudspeakers by ear, it is strongly advised to measure the response in your room instead. There are numerous inexpensive measurement microphones and free software available to accomplish this. For those unaccustomed to measuring loudspeakers, Bryston recommends that your dealer do the setup and calibration for you.

Enter the DSP menu of the BAX-1. Select Pink Noise, set the level in -dB (entering 40 results in output 40dB below full scale). Press the button "Click to Update Source" and both loudspeakers will be playing pink noise.

Use your measurement system of choice to measure frequency response. It may be useful to limit your measurement band to 20-160Hz. Note the center frequency, magnitude and width of any peaks or dips.

Using the 10 band parametric equalizer, enable the filters with the center frequency nearest to those you wish to correct. Note that each EQ band can accommodate the following adjustments: Center Frequency can be adjusted up to 10Hz above nominal for each band, magnitude can be -10 to +3dB, and Q can be set between 1 and 5 where 1 is broad and 10 is narrow. Filter changes are reflected in real time. You should both hear the changes and see them reflected in your measurements.

Monitor the graph near the bottom of the page to see your changes. Also note that an aggregate maximum gain of 3dB is permitted.

DSP Filter Setup

Bass equalization can be access through the web user interface by clicking the DSP tab. This can be done from the listening position from most modern web enabled devices. See "Network Connection" on page 10 for details on how to connect the BAX-1 to your network.
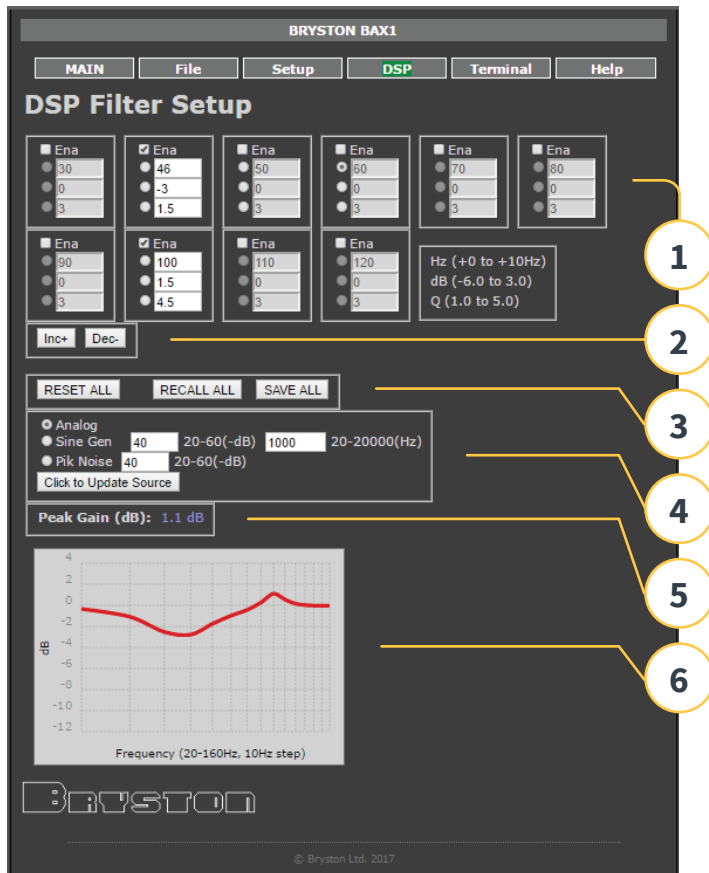
1. 10 Band Parametric EQ

For each band you would like to edit, enter desired center frequency, boost or cut in dB, and width. Center frequency can be the preset value or raised by up to 10Hz. Boost cut range is -10.0 to +3.0 dB, and Q is 1.0 to 5.0 where 1 is the widest and 10 is narrowest.

2. Increase / Decrease

Especially useful when making adjustments from a touchscreen device, these buttons will increase or decrease the selected value by the

precision shown with each button press or tap.

3. Memory

Store a preset by creating a correction curve, then pressing SAVE ALL. Reset all filters to flat by pressing RESET ALL. Recall a saved preset by pressing RECALL ALL.

4. Audio Output

Normal function of the BAX-1 is to pass audio received at the input jacks on the back of the unit. You can also engage a built in sine single tone generator and pink noise generator for testing. Press the desired audio source then press 'Click to Update Source' to engage the desired audio source.

5. Peak Gain Indicator

A maximum aggregate gain of 3dB can be achieved by the system. If two filters with overlapping bands are engaged and maximum gain would exceed 3dB, the 2nd filter is restricted to a figure that maintains no more than 3dB peak gain. Peak gain is limited to ensure internal electronics are not creating distortion.

6. Correction Curve

The result of your applied filters is indicated in graphical form here. Ideally, this will be the opposite of your measurements before compensation is applied. Note that this graph is 20-160 Hz and shows -12 to +4dB
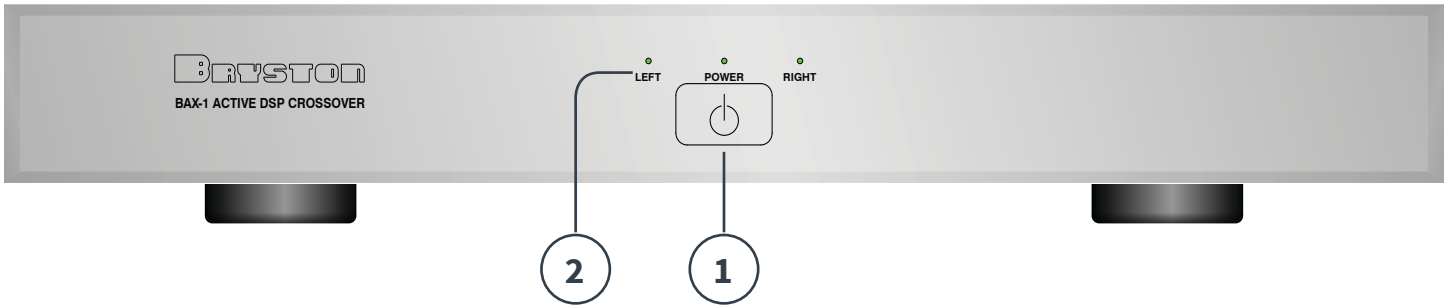
Front Panel

1. Power Button
Press this button to toggle the BAX-1 on or into standby mode.

Unlit	BAX-1 is not receiving power. Plug unit into AC mains power.
Red	Plugged into AC Mains but in standby mode.
Green or Blue	BAX-1 is on and operational.
Blinking Red	Secondary power supply failure. Contact Bryston technical support.

2. Audio Channel Indicators
The left and right channels both feature LEDs which indicate the incoming audio status of each channel.

Unlit	BAX-1 is not receiving audio to the indicated channel
Green or Blue	BAX-1 is receiving audio at the indicated channel
Blinking Orange	Audio received is too loud to be processed without distortion. Reduce preamplifier volume.

Rear Panel

3. Channel Input Output
The BAX-1 includes Left and Right channel input and output. Analog audio is received through a balanced audio interconnect from a stereo preamplifier to the left and right channel inputs respectively. The internal DSP divides and processes that signal into 3 bands - low, mid and high to drive the bass, midrange, and high frequency amplifier channels respectively.

Preamplifiers and amplifiers that do not feature balanced audio connections can be connected to the BAX-1 by using commonly available XLR to RCA adapters.

Each channel also includes a trigger out jack on a 'mono' 3.5mm jack which can be used to trigger the power state of compatible downstream amplifiers. The tip is +12V and sleeve is GND. When the BAX-1 is powered on either by actuating the front power button or through the trigger input, voltage is applied to the trigger outputs.

4. RS232 Input
The BAX-1 can be controlled via two-way RS232 using a connector terminated by a 3.5mm TRS 'stereo mini plug'. Terminate the plug as follows:
Tip: Transmit
Ring: Receive
Sleeve: Ground

5. USB Control Input
USB is provided for diagnostic information by Bryston technicians.

6. Status LED
LED lights to indicate the following status:
Red: Standby   Green: On
Amber: Starting up   Blinking Amber: Updating firmware
Blue: Self programing. Do not power off

7. Ethernet Input
Ethernet connectivity is provided for user access to a web based interface which is useful for firmware updates and control over the internal DSP. Discrete commands can also be sent by custom integration systems.
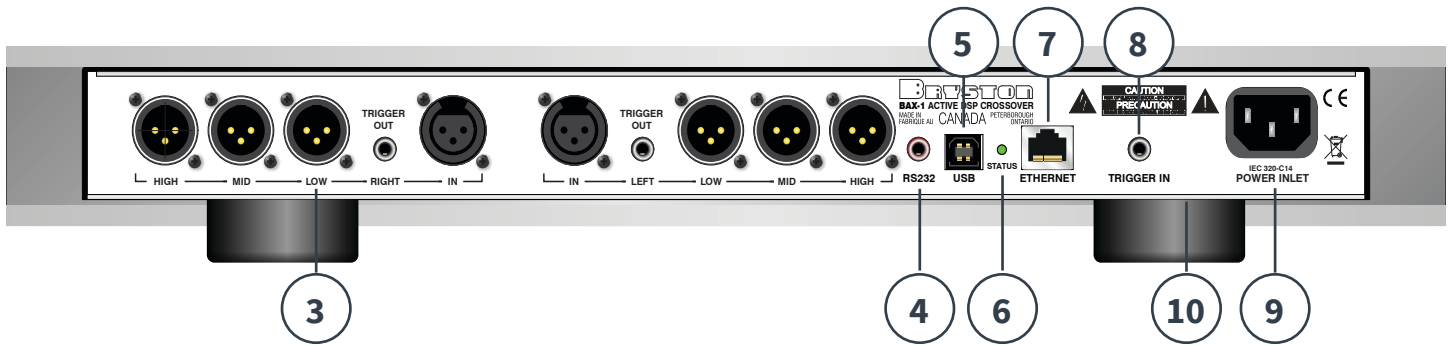
partial documentation or the HELP tab from the BAX-1 web interface for full documentation.

8. Trigger Input

Power/Standby can be toggled from a master component such as a preamp using this input. The connector is a standard 3.5mm tip sleeve commonly referred to as a "mono mini plug". Signal should be AC or DC between 3 and 12 volts. When voltage is present at the tip, the BAX-1 will remain powered on. The BAX-1 powers off when voltage is removed.

9. IEC Power Inlet:

The IEC -320 C14 power inlet accepts IEC-320 C13 equipped power cords such as the unit provided. Use only appropriate power cords that have been approved for your region.

10. Data Plate

The data plate is located on the bottom of the unit. It indicates hardware version, serial number, and A/C mains voltage of your unit.

Specifications and Dimensions

Max Voltage	Input:	4.0V
	Output:	5.6V (+3dB)*
Frequency Response	20Hz - 20kHz:	± 0.1dB
Noise	Balanced Out:	-140dB
	Single Ended Out:	-140dB
IMD	≤0.0003%	
THD + Noise	20Hz-20kHz :	≤0.0009%
Weight	4.7kg | 10.3 lbs	
Dimensions	Inches: 17 or 19 W x 2.75 H x 11.11 D	
	Cm: 43. or 48.3 W x 7 H x 28.2 D	
Power Consumption at 120V/60Hz	Standby:	0.4W
	On:	22W

System operates at unity gain and only boosts or attenuates bands as set by the user in DSP.

Network Connection

You may connect your BAX-1 to your local area network using CAT5 or better cable to facilitate use of the built in web-based user interface or to control and monitor the unit using an automation system. Once connected to the network, you may access the web user interface with a web browser by entering the host name into the address bar. The host name is formatted like so where the last 6 digits are the serial number of your unit:

http://bax1-000000

Some web browsers and networks ignore NetBIOS names such as above. In this case, you will need to use the numerical IP address of your unit to access the web user interface. You can find the IP address by logging into your network router or with popular network information apps on iOS and Android such as Fing.


Firmware Update

As with many other Bryston products, the BAX-1 may receive occasional firmware updates to ensure reliable operation and add new features. Check your installed version and for any new updates by using the File menu on the BAX-1 web user interface. Internet connection must be available to show correct information.
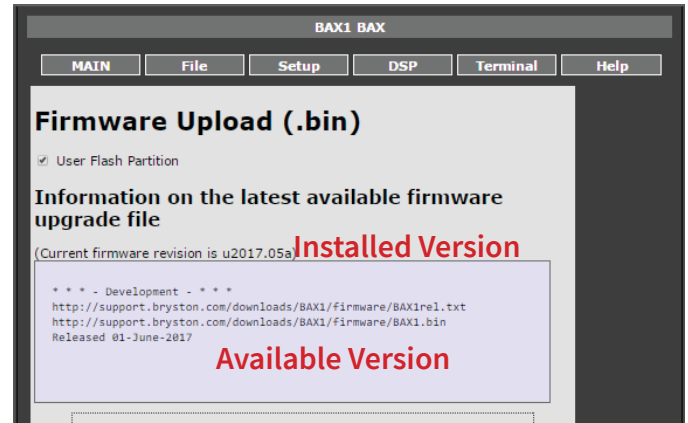
To update the firmware:

1. Download the firmware file by clicking the "Download Internet File..." button. Save the file in an easy to remember location.
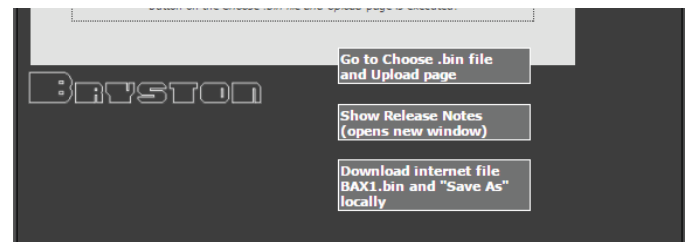
2. Click "Go to Choose .bin..." button. You will be taken to a mostly blank page.

3. Click "Choose File" or "Browse". Navigate to the location to which you downloaded the BAX1.bin file in step 1. This is most likely your Downloads folder. Click the file and press "Open" or "OK" You will be returned to the upload page. Press the Upload button to initiate firmware upgrade.

4. Uploading takes up to 5 minutes. The power LED will turn off during the update.

5. Do not power off. The BAX-1 will reboot itself. You may check the web user interface to verify that the new firmware version agrees with the version you just downloaded. You may need to force refresh your browser window to see any changes.

Remote Control

The BAX-1 can be controlled and monitored through a variety of mechanisms including TCP/IP when connected to your local area network, USB, RS232, and DC trigger.

Serial Protocol

The BAX-1 can receive commands and can send responses to each command. It can also (optionally) broadcast automatic responses to certain system events such as front panel button presses. Commands can be sent over RS232, RS485 (with an RS232 to RS485 interface) and TCP/IP using HTTP cmd.cgi.

The RS232 input is a 3.5mm mini-jack configured as:

Tip	*Ring*	*Sleeve*
Transmit	*Receive*	*Ground*

Command Format

RS232	#	7	D2	C1	C2	C3	C4	P1	P2	...	CR
TCP/IP	%23	7	D2	C1	C2	C3	C4	P1	P2	...	.

The command format always begins with a command start character.

The next two digits are the Device ID. The first of which is always "7" for BAX-1s, and the second will be "0" except when using RS232/RS485 in a multi-drop configuration.

Next are C1 through C4 which comprise the command name. These are typically uppercase ASCII letters.

Following the command name are the arguments or parameters for that command. These are two or more ASCII characters.

The command is always terminated with a carriage return character. For RS232, this is ASCII code 13. TCP/IP commands are terminated with a period (.)

Example:

#70MPWRQS<CR> command: query power status

Responses are returned in the same format as commands. Note that responses may contain up to 320 characters. All characters preceding the **#** or **%23** and following **<CR>** or **.** are ignored. Do not insert **#**, spaces, **<LF>**, **<TAB>** or other non-ASCII characters inside the command string.

The following are selected commands most pertinent to initial setup and everyday operation. Find complete documentation by accessing the BAX-1 web UI or by contacting Bryston.

Comm.	Param.	Description
SDSP		Set DSP Parameters
	QS or ?	Display list of all FILT command options
	FILTnnfffsggqq	select filter number nn(01...10), set frequency ff (030...120Hz), set filter gain or reduction, s=1 +, s=0 for - set filter gain gg (00...30, 0.1dB) set filter Q factor qq (10...50, 0.1) *ex: #70FILT0305002530. for filter 3=50Hz, -2.5dB, Q 3.0*
	FILTQS	Displays last settings as above
	FILTSAVE FILTRECALL	Save filter values to EEPROM Recall saved filter values from EEPROM
	DSRCxx	Set DSP source xx=00 for analog inputs, 02 for sine, 04 for pink noise
MPWR		Switch between On and Standby
	00	Off (standby)
	01	On
	02	Toggle On/Standby
	QS	Query Status
INIT		Re-initialize parameters
	00	Re-initialize all but TCP/IP
	01	Re-initialize all inclding TCP/IP