

Naim Preamp Block Diagram

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1. Overview

The internal configuration of classic Naim preamps has basically remained the same since the introduction of the NAC12. The design utilizes a “motherboard”, a large printed circuit board with copper traces, to link together smaller “plug-in” boards which contain some or all of the active electronic circuitry. The motherboard has all the wiring to the rear connectors and everything is housed in a rugged enclosure. Variations for the subsequent 32/32.5/42/52/62/72 and 82 preamps have generally included: adding additional inputs; changing the extent of modularity (including putting some/most of the active circuitry on the the motherboard itself); modifying the motherboard layout to allow for additional power supply rails; and adding remote control. Underlying all that, however, is a more-or-less constant circuit design. In fact, the underlying circuits and components themselves are virtually unchanged for over 40 years.

A simplified block diagram of one channel of a representative preamp is shown in Fig 1 and will be used as the basis for this discussion (mute, tape monitor, or remote control switching not shown).

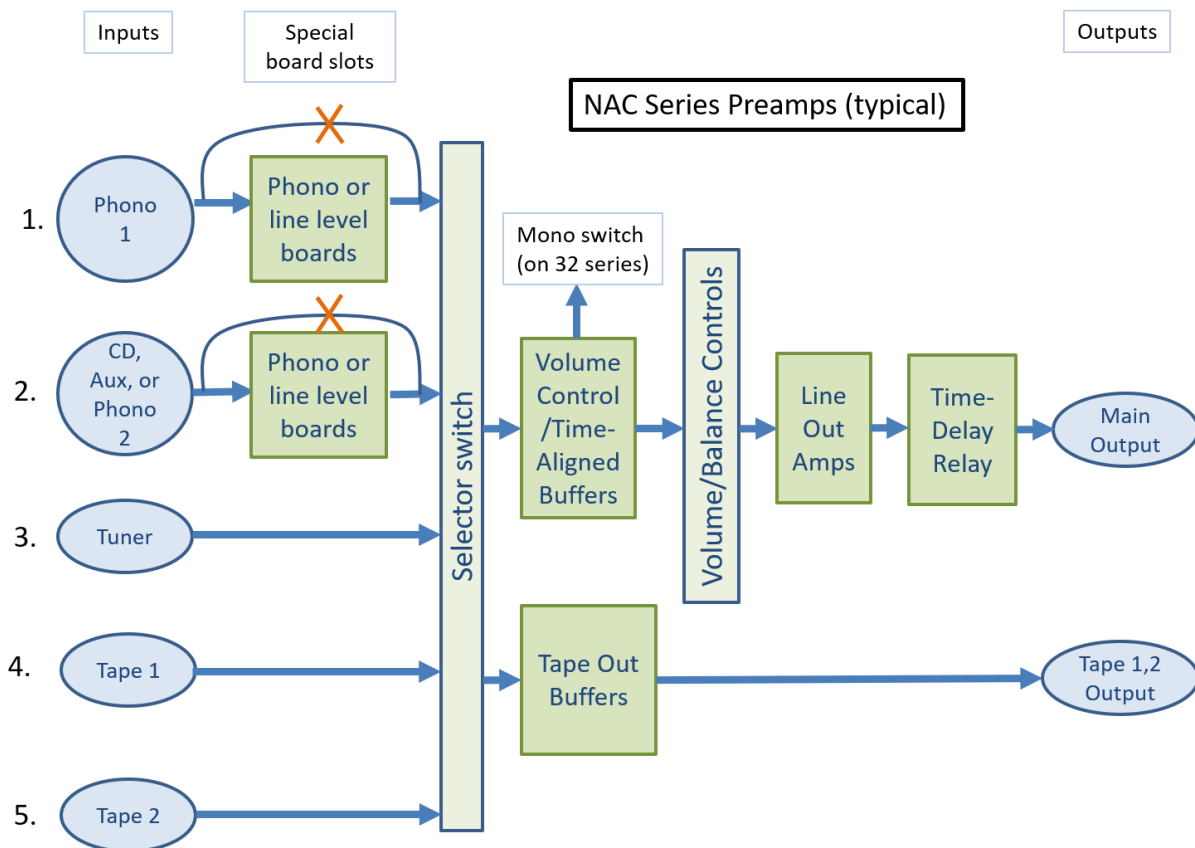


Fig. 1: Simplified Preamplifier Block Diagram

2. Inputs

Up to 7 input connections are provided in the NAC series including 1 or 2 suitable for phono. Most were “line level” expecting around 1 volt input, such as: CD player, DAC, tuner, or tape and went straight to the input selector switch. The phono input(s) allowed for another plug-in board to be inserted so that they could provide the additional gain and RIAA correction for turntables. Both MC (moving coil) and MM (moving magnet) boards are available but use different plug-in boards.

If another line level input is desired instead of a phono input, a jumper board can be used. On later NAC72's, a wire jumper was inserted at the factory to allow immediate use of the phono input as a line level input without the need for jumper boards. These are shown with an X in the diagram and need to be cut in order to be able to use phono boards. This is easily done with small wire cutters from the top of the motherboard. The output voltage of a phono board is approximately at line level.

3. Selector switch

This switch operates at line level voltages either from a phono board output or directly from a line level input.

4. Buffers

Buffers are used to drive the volume/balance controls and also to separately drive the Tape Out function. They are unity gain and their function is primarily to present a high impedance to the preamp inputs while having a low output impedance to drive the two outputs just mentioned. Naim's original design is a simple amp with no filtering (NA324). Later on, with the NAC72, they introduced a low pass filter function to those boards (NA729) with a cut off around 53kHz. No reason was given for this change but it is suspected that they wanted to minimize chances for TIM (transient intermodulation distortion) in the power amplifier. The improved designs needed to avoid TIM were not introduced until sometime later. Today's power amplifiers don't actually need this filtering but it doesn't hurt the sound so it's still a good safety measure.

5. Volume and Balance Controls

The 20k ohm volume and 10k ohm balance controls benefit from the buffer drive by keeping the response flat and the transients tight. Some people recommend bypassing the buffers and putting inputs straight to the volume control but we find this audibly reduces the music dynamics and strongly suggest keeping them in the circuit.

6. Output Amps

All of the gain for the line level signals, is provided by this output amp stage. To allow for a wide range of input levels, including some very low output MC cartridges, the gain was set at x13 on the Naim boards. For some very high level inputs, such as modern CD players, this makes adjusting the volume at low levels very constrained, often using less than ¼ of the entire volume control rotation to go from zero to very loud. There are a couple of ways to solve this problem including reducing the level of that specific input, by using an attenuated jumper board, or reducing the output level for all

inputs by changing the gain of this stage. In any event, the output amps heavily influence the sound quality because of their large gain.

7. Time-Delay Relay

Due primarily to the one-sided power supply (+24v positive and ground only), there is an inherent large voltage swing at the output of the preamp at turn-on and turn-off. The purpose of the relay is to disconnect the preamp circuitry from the output connector until that voltage swing has stabilized. This typically takes about 5 seconds using Naim's relay board. To prevent the turn-on thump, the output amp is simply not connected to the output until that time has passed. It is also designed such that it will quickly disconnect the output as soon as the power supply voltage drops below 22v. This prevents the turn-off thump.

8. Differences Among Classic Naim Preamps

There are quite a few "classic" Naim preamps, each with slightly different properties, so it's easy to get confused about what's inside yours without taking the cover off. This table summarizes all the models covered by RSL plug-ins and which aspects of them can be upgraded.

Naim NAC Preamp Model	# Total Inputs	# Phono Inputs	Replaceable Phono?	Replaceable buffers?	Replaceable output amp?	Replaceable relay?
12 (later model)	3	1	✓	✓	✓	✓
32	5	2	✓	✓	✓	✓
32.5	5	2	✓	✓	✓	✓
42	3	1	✓			
52	7	1	✓(*)			
62	4	1	✓			
72	5	2	✓	✓	✓	✓
82	7	1	✓(*)			
102	7	1	✓(*)			
Nait3	5	1	✓(*)			
(*) = uses horizontal phono plug-in boards						

9. Naim Board Numbers

The listing below may help in identifying what you have in your preamp (taken from on-line sources):

NAC12/32/32.5/42/62 (as applicable):

NA323 K/S Phono MC

NA323N Phono - early MM dropped in favor of NA322.

NA323E Phono for high output MC (1mv)

NA322 MM Phono

NA326 Fixed Line Input (link board)
NA328 Variable Level Line input with some HF filtering
NA324 Tape Output and pre potentiometer Buffer boards
NA321 Main Gain, Output Drive
NA325 Switch on relay

NAC 72:

323 K/S Phono MC
322 Phono MM

324/7 (tape out buffer)
328/1 (Variable Level Line input with some HF filtering)
729/1 Time-Aligned input buffer boards
321/5 Main Gain, Output Drive
325/7 X 1 Switch on relay

NAC 52/82/102/Nait3:

523/1 MC phono
522 MM phono