



NX241 DIGITAL TDcontroller

User Manual

Norms



This equipment has been tested and found to comply with the following European and international Standards for electromagnetic Compatibility and electrical Safety:

- Electrical safety CEI65
- Radiated emission EN55022
- Conduction emissions EN55022
- ESD tests: EN61000-4-2.
- Immunity to fast electrical transients (sense input, RS232 link and AC inlet) EN61000-4-4

Safety Warning

This unit is fitted with 3-pin IEC standard power socket. For safety reasons the earth should not be disconnected.

To prevent shock or fire hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not remove covers. Dangerous voltages exist inside. Refer servicing to qualified personnel only

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Quick Start

- This section contains a summary of most frequently asked questions by people who haven't read the manual. You may be able to use the NX241 TDcontroller quite quickly as it has been designed to be user friendly. However **please devote some attention to reading this manual. A better understanding of some specific features of the NX241 TDcontroller will help you to operate your system to its full potential.**
- Please ensure that the unit is set for the correct mains input voltage BEFORE use.
- **WARNING:** Information on the amplifiers used is MANDATORY. Before using your system you MUST configure "MENU 2.6 AMP GAIN" and "MENU 2.7 AMP POWER". Failure to do so or to properly connect the Sense Lines will invalidate the NEXO warranty on the attached NEXO loudspeakers.

RESET

You can reset the unit without powering off by simultaneously depressing buttons A, B & SWAP (◀▶) at the same time.

Selecting cabinet family

Simultaneously depressing A & B buttons at A/C power up or during device RESET accesses the system change menu. **Keep the A & B Buttons until all LEDs light off.** This will enable the selection of any cabinet in any family. Using the rotary encoder, scroll through the configurations and press 'enter' (◀▶) to load the required settings.

Select your cabinet set-up

In MENU 3.0 you will be able to choose among the different set-ups within the same cabinet family. (i.e. you don't have to modify the amplifier to cabinet wiring).

Navigating Menus

On the controller display screen, the number before the Function corresponds to the Menu Number. To change the first number (this is the Main menu label) button A must be pressed. To change the second number (this is the Submenu label) button B must be pressed. To select options, turn the encoder wheel, or press the swap button (◀▶). Changes are immediate (no validation is required unless clearly stated)

Back to default

In Menu 2.5 you have the possibility to put back all MENUS to the factory default (except the amplifier information that you have entered (MENU 2.6 & 2.7)

Auto save

The current set-up is saved in case of power failure every two minutes after the last change. At power up this set-up is restored

List of Supported presets (LOAD1_80)

At the time of printing, the following factory presets are supported by LOAD 1_80. Please refer to the release notes if the software loaded in your NX241 is not LOAD 1_80.

Alpha Family

ALPHATD B1+M3	Configured: Input A to drive a 3-Way Alpha System
ALPHATD S2+B1+M3 SubTD S2-63Hz	Configured: Input A to drive a 4-Way Alpha System
ALPHATD S2+B1+M3 SubTD S2-80Hz	Configured: Input A to drive a 4-Way Alpha System
ALPHATD S2+B1+M3 S2-63Hz AUX inB	Configures Input B (right) to drive the SUB channel independently
ALPHATD S2+B1+M3 S2-80Hz AUX inB	Configures Input B (right) to drive the SUB channel independently
4 S2 cabinets S2-63Hz	Configures all four channels to drive the S2 cabinet (crossover 63Hz)
4 S2 cabinets S2-80Hz	Configures all four channels to drive the S2 cabinet (crossover 80Hz)

Alpha E Family

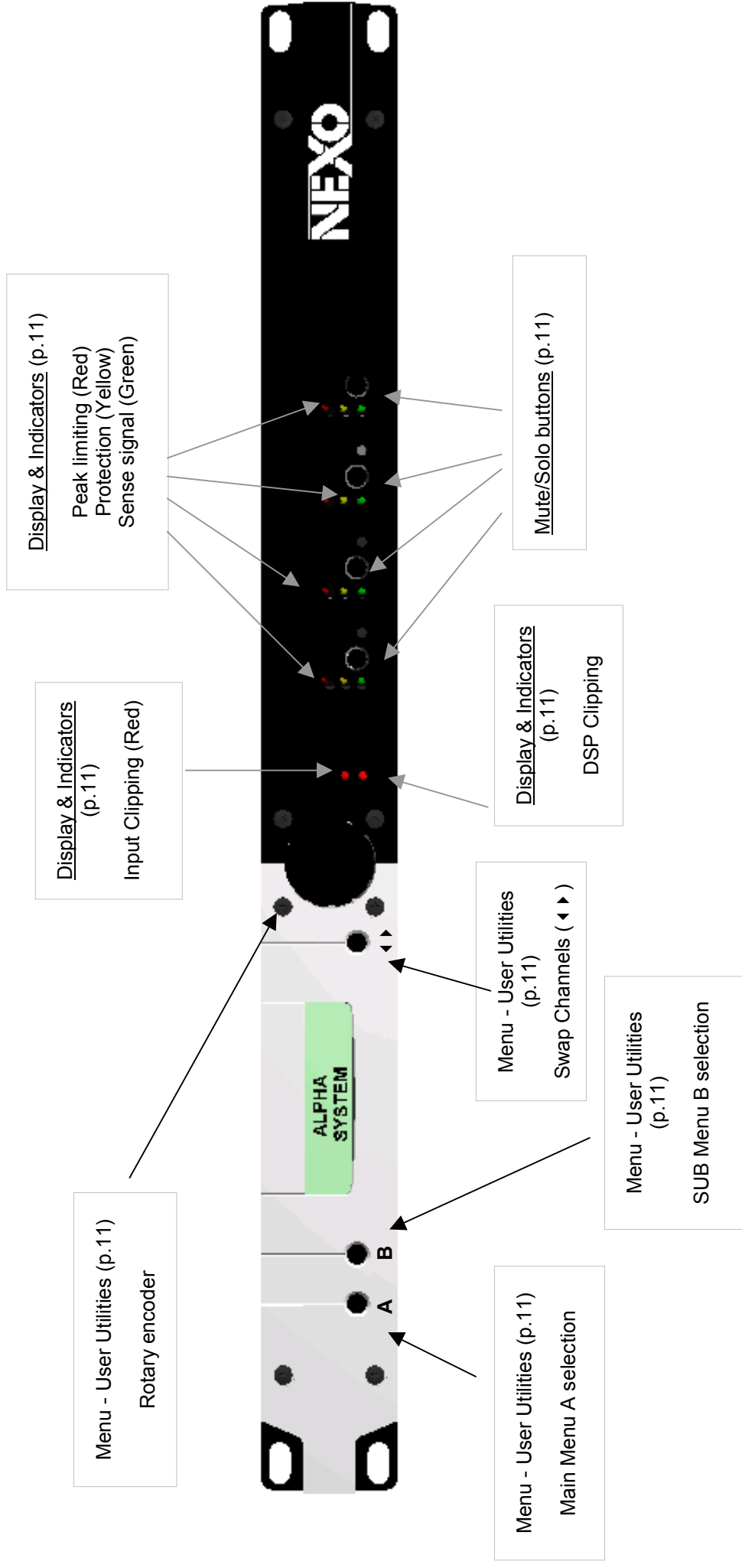
AlphaE STEREO	Configures 2 passive Alpha EM + 2 B1-18 (or 2 Alpha EF) in stereo
ALPHAE Mono AEM B1-18 S2-63	Configures one passive Alpha Em with one B1-18 bass and one S2 Sub (crossover 63Hz)
ALPHAE Mono AEM B1-18 S2-80	Configures one passive Alpha Em with one B1-18 bass and one S2 Sub (crossover 80Hz)

PS Family

PS8TD Wideband NO SUB	Configures PS8 cabinet in wideband position (without sub)
PS8TD Crossover With LS400	Configures PS8 cabinet in crossover position with LS400 sub
PS10TD Wideband NO SUB	Configures PS10 cabinet in wideband position (without sub)
PS10TD Crossover With LS500	Configures PS10 cabinet in crossover position with LS500 sub
PS15TD Overlap With LS1200	Configures PS15 passive cabinet in wideband position with LS1200 available.
PS15TD Crossover With LS1200	Configures PS15 passive cabinet in crossover position with LS1200 available.

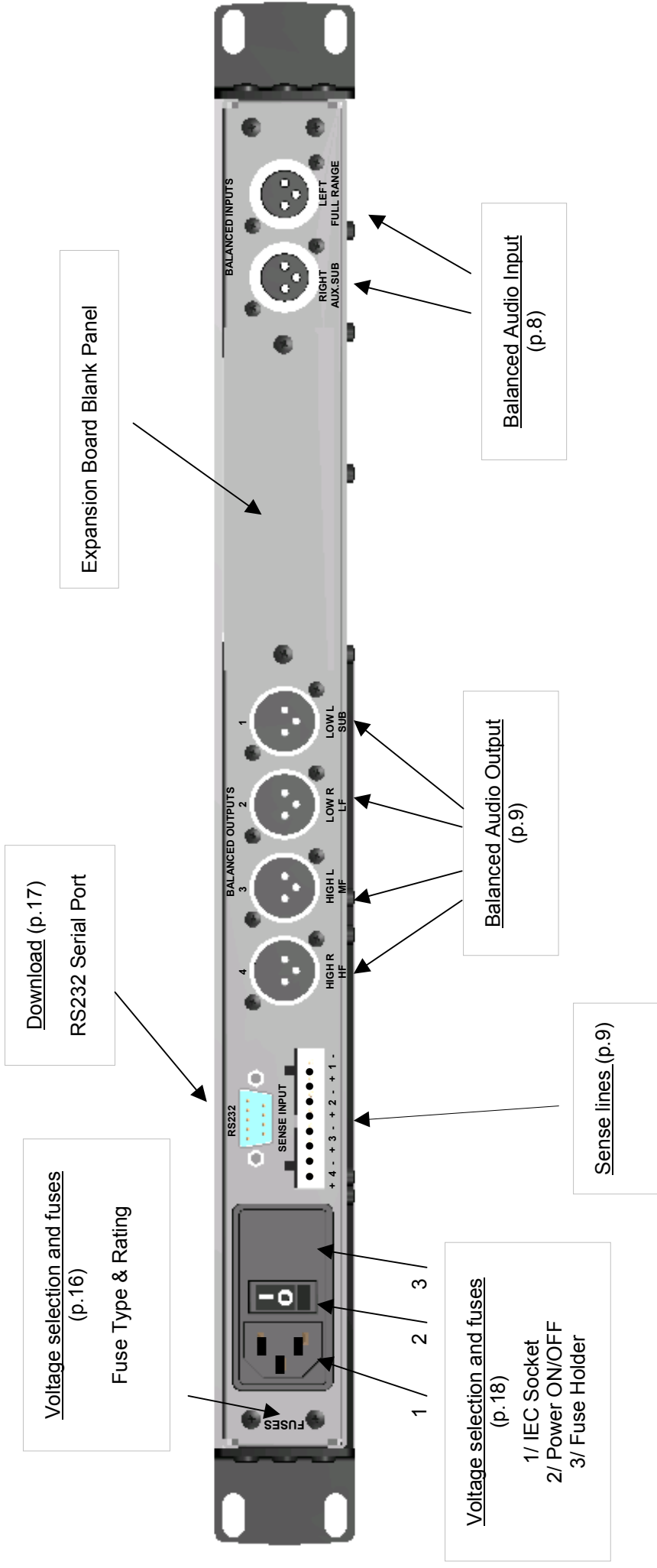
GENERAL DESCRIPTION

Front Panel



GENERAL DESCRIPTION

Rear Panel



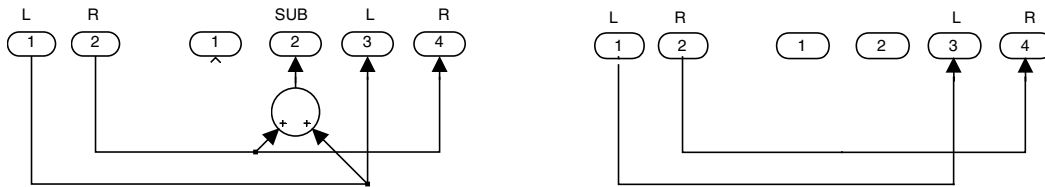
Configuration

Global architecture is based upon a full 24 bit audio path with 48-bit core calculator running at 100 Million Instructions per Second. Featuring:

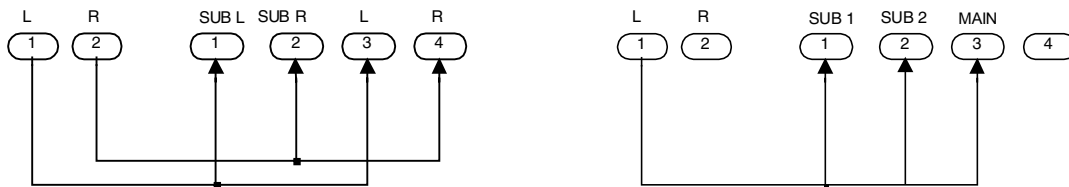
- 2 analogue inputs (balanced) 24 bit resolution ADC
- 4 analogue outputs (balanced) 24 bit resolution DAC
- 4 sense inputs (unbalanced) 18 bit resolution ADC

Set-up configurations possible:

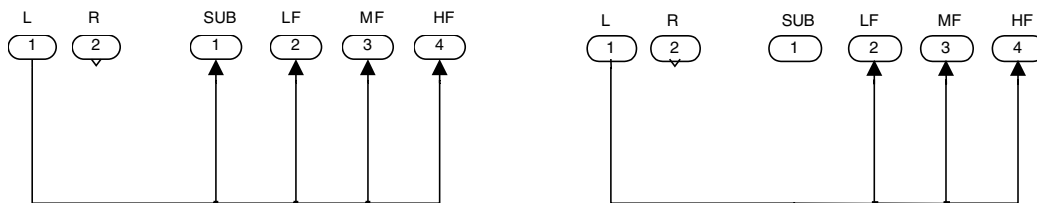
- STEREO PASSIVE MODE WITH (or Without) MONO SUB (2 independent passive cabinets)



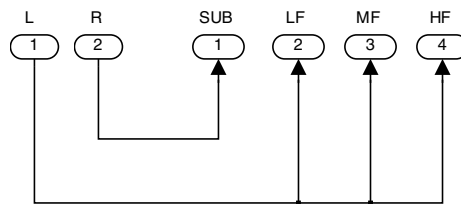
- STEREO PASSIVE MODE WITH STEREO SUB & MONO PASSIVE WITH 2 SUBS



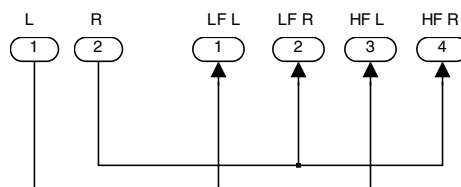
- ACTIVE 4 WAY & ACTIVE 3WAY (MONO)



- ACTIVE 3 WAY plus AUX SUB on INPUT B



- STEREO ACTIVE 2 WAY



Equalisation & Filtering

Subsonic and VHF filtering

Low and high-pass filters are used to filter out frequency components that could possibly degrade the performance of the TDcontroller and amplifiers. The filters are optimised to work in conjunction with overall system response.

The high pass filters are also extremely important as they optimise excursion at very low frequency which is a very important safety factor. (So do not use set-ups which are not designed for the cabinet you are using)

Equalising acoustical response

This equaliser section achieves the correction required to obtain a flat system response, as the cabinets are acoustically designed for maximum efficiency on the whole frequency range. Active rather than passive attenuation allows the lowering of amplifier voltages for a given output SPL and therefore increases the maximum SPL achievable with the same amplifier. Active equalisation also extends system bandpass especially at low frequencies where acoustical performance is limited by cabinet size.

Crossover section

Crossover between different bands is tuned for every set-up of every cabinet. The crossover is designed to ensure the best phase alignment possible over the crossover overlap.

User set-up, Array EQ

A basic Array EQ is currently implanted in the NX241. The cut off frequency of a Low-shelving filter is factory tuned for each cabinet setup. The user has access to the gain of this filter. Some more sophisticated User EQ is currently under development. They will require the use of the upcoming expansion board. Please read the readme.txt that comes along with every new software upgrade to track eventual changes.

Delay & Polarity inversion

Input to output delay without filtering is 1.4ms (due to the digital processing). This delay will prevent compatibility with analogue TDcontrollers. **ANALOGUE AND DIGITAL TDCONTROLLER SHOULD NOT BE MIXED IN THE SAME SYSTEM.**

Factory set-up

Note that each output may contain a small phase adjustment delay at the crossover point. Also, a polarity inversion may be performed. These adjustments are part of the factory set-ups and are necessary to time-align the corresponding cabinet that is selected.

User set-up

Following user delay adjustment is possible:

GLOBAL: Affecting all channels at the same time (delaying all the system for application as delay towers...)

MAIN: Affecting only CH3&4 for passive set-up and CH2, 3&4 for active channels (delaying the main system if Sub basses are located behind it)

SUB: Affecting only CH1&2 for passive set-up and CH1 for active setup (delaying the Sub-bass cabinet if main system are located behind it)

GLOBAL and MAIN/SUB delays are cumulative up to 150m per channel (about 450ms, 500 feet).

Audio Input/Output

Balanced Audio Input

The analogue inputs are on 3 pin female XLR connectors with positive and negative signal polarities on pins 2 and 3 respectively. Pin 1 is coupled at high frequencies to the chassis using a capacitor to limit screen currents, and to the analogue ground with a jumper link.

The input signal can be adjusted in MENU 1.1 HEADROOM in order to avoid clipping of the A/D converter. See corresponding paragraph (MENU section)

Balanced Audio Output

The analogue outputs are on 3-pin male XLR connectors with positive and negative signal polarities on pins 2 and 3 respectively. Pin 1 is coupled at high frequencies to the chassis using a capacitor to limit screen currents, and to the analogue ground with a jumper link. The output will deliver a full-scale output of +28dBu(balanced 600Ω / 1nF load.)

During A/C power up of the NX241, all outputs are muted by firmware-controlled relays (strapping pin 2 and pin 3 of each output).

Connecting the audio outputs

Output stages are able to drive several amplifiers in parallel; however it is not advised to work with loads of less than 600 Ohm. It is best to check with the impedance characteristics of the inputs - supplied by the manufacturer - to check if the number of amplifier channels is acceptable. Where precise information is not available (and taking 5 kΩ as the minimum expected value) then seven channels in parallel per output is a conservative maximum. In the case where input impedance is 20kΩ it puts this value up to 30 amps channels

General Functions

System Protections

The following protection functions are performed. See "Protection Information Notes" page 20 for a complete description. As the NX241 TDcontroller is common to all NEXO cabinets, see also the release notes corresponding to each software revision for an update of the following list.

- Temperature Protection
- Displacement protection
- Peak limiting
- Interchannel regulation
- Physiologic Dynamic Control

Sense lines

Recommendations for sense line wiring

The Input impedance of the TDcontroller's Sense inputs is very high, current is thus very low although voltages are high. It is therefore not necessary to use a special type of cable. If the processor is placed in the amp rack an unshielded cable can be used.

Amplifier gain evaluation

This is used to determine the actual gain of the amp, and adjust for possible temperature drift, amplifier input potentiometer adjustment or failure of this amp. This value is then compared to the user-supplied nominal value and used for the displacement and temperature protection.

Remote sense

Line input (-18dB less than the amplifier gain) is possible and allows performing remote sense. At this time these functions need additional accessories currently under development.

Reset

Holding down the three menu buttons (A, B, ◀ ▶) simultaneously will reset the unit. Reset has the same effect as powering on and off the unit. The unit will mute (hardware) for 5 seconds with all LED's on. The unit will then return to the last set-up automatically saved (every 2 minutes).

Resetting the unit from the front panel is useful to change the cabinet family without powering off and on (Press the three buttons to reset then let go of the swap button to enter into MENU 0). In that case you will have to keep the A & B Buttons until all LEDs light off. Note that to execute a download you will have to physically turn the unit off and then back on. (See "Download" page 17.)

Mute/Solo buttons

Front panel, direct access. The Mute (or Solo) mode is selected in the user menu. Please note that these MUTES are soft mute and are therefore not operating output relays.

Display & Indicators

User control of all settings is via two menu scroll pushbuttons, an additional assignable pushbutton, an assignable rotary encoder and a backlit 16*2 character display.

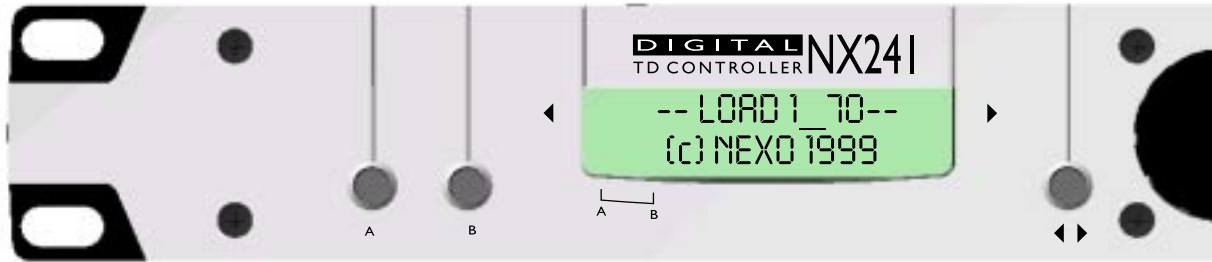
Three LED's per channel for sense (green), peak limit (red) protects (yellow). Four dedicated LED's are situated alongside the associated MUTE/SOLO button.

Two LED's to indicate input overload and signal clipping into the DSP.

Default screen will pop up after 2 minutes and display the current set-up.

Serial link / Downloader

The unit can be RS232 linked to any PC in order to download new versions of software using a DOS compatible Downloader program. (See "Download" page 17.)



Menu - User Utilities

On the controller display screen, the number before the Function corresponds to the Menu Number. To change the first number (this is the Main menu label) button A must be pressed. To change the second number (this is the Submenu label) button B must be pressed. To select options, turn the encoder wheel, or press the swap button (◀ ▶). Changes are immediate (no validation is required unless clearly stated).

Please refer to the release notes issued with each new download to track eventual menu changes.

Main Family Selection



Changing Cabinet Family

In order to prevent end-user changing between different NEXO system set-ups during use, the following procedure is obligatory. This procedure has been purposely designed to avoid any mistake. It is nevertheless very easy to change set-up among the same family (see menu 3)

Simultaneously depressing A & B buttons at A/C power up or a device reset accesses the system change menu. You can reset the unit without powering off by simultaneously depressing buttons A, B & SWAP (◀ ▶) at the same time.

Note: Selecting a new family will set all parameters to factory default settings.

User settings



1.1 HEADROOM

Allows the user to adjust the headroom (4 steps -6, 0, +6, +12) before the A/D converter without changing the overall gain of the processor. Factory default is set to maximum headroom (and so, maximum noise). This can be adjusted if you feel the processor is too noisy for lower level applications. Adjust the Headroom while the unit is operating making sure that the red Input Clip and DSP Clip LED's never flash. The operation is sonically transparent and will not generate glitches while you are doing so.



1.2 DELAYS [Sub / Main / Global]

Each output channel can be delayed by up to a maximum (global + individual delay) of 450ms (150m). See page 8

The unit can display in [FEET / METRES / SECONDS] as required.

Delay is adjustable in 10cm (0.3ms) increments. The control pot will accelerate through the adjustments faster according to the speed of use.



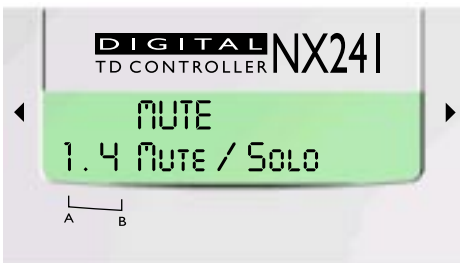
1.3 OUT Levels

[global / HF / MF / LF / SUB]]

Adjust overall & separate TDcontroller gain with this menu.

These gain controls are provided to adjust the tonal balance of the system by acting on separate channels. You can also compensate for gain differences between different amplifiers. (Although the use of differing gain structure amplifiers in the same set-up is possible it is not recommended).

Each of the individual or global gain is +/- 6dB. (Step 0.5dB)



1.4 Mute/Solo

Allows the user to switch the function of the front panel channel buttons between Mute and solo mode



1.5 SAVE Set-up

It is possible to store and recall up to 10 user set-ups (including EARTH LIFT) but **excluding MUTE**.

Additionally the current set-up is saved in case of power failure every two minutes after the last change. At power up this set-up is restored.

Set-ups are numbered from 1 to 10. When saving your set-up you can choose a reference name up to 6 characters for identification purposes.

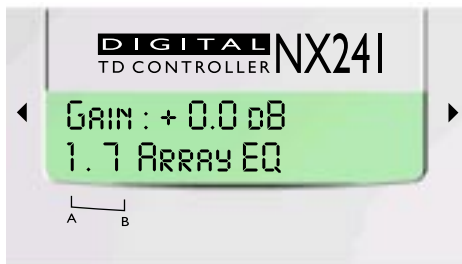
NOTE: ALL SAVED SETUPS WILL BE ERASED WHEN DOWNLOADING A NEW VERSION OF THE SOFTWARE.



1.6 RECALL Set-up

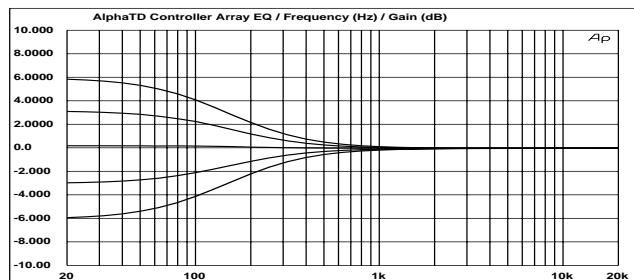
Recalling a user set-up is forbidden if the family of cabinet is not the same.

When recalling a set-up, the unit will stay in the recall menu allowing another selection for comparison. Switching from a set-up to another is glitch-free and instantaneous (no muting takes place).



1.7 Array EQ

One array EQ gain control of +/- 6dB (0.5dB step) is included. This filter frequency is factory tuned.

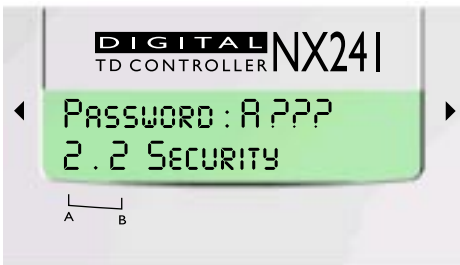


System settings



2.1 Revision [soft & hard rev]

Displays the revision number of the LOAD; DSP SOFTWARE; FLASH BOOT; HARDWARE. Turn the encoder to access to the different revision screens.



2.2 Security [password]

The user password facility allows switching between "free access", "unit locked" and "Change password. The factory default password is NEXO.

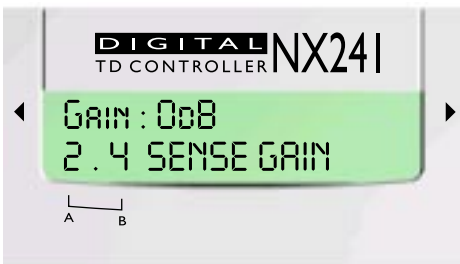
This allows you also to get into an INSTALLER menu. Please contact your NEXO dealer if access required.



2.3 Earth Lift

[CHASSIS LINKED / CHASSIS LIFTED]

Earth Lift information is stored in the "user set-up" and "automatic save set-up". It will keep the same state when powering the unit on or off (also in the event of mains failure)



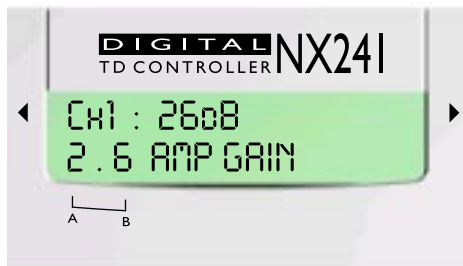
2.4 SENSE GAIN

Allows switching between line level sense lines and amplifier level sense lines. (0 or 18dB gain on the sense line)



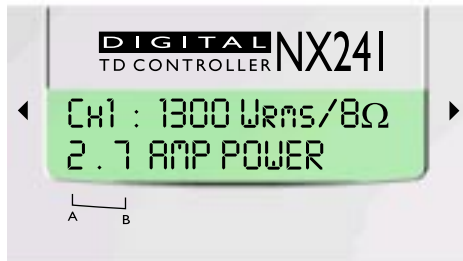
2.5 DEFAULT VALS

Restores the factory defaults. System related values like the AMP GAIN and AMP Power will not change.



2.6 AMP GAIN

Adjustable from 20dB to 40dB nominal Amp Gain in 0.5dB steps for each channel.



2.7 AMP POWER

Allows you to enter a Nominal Amp RMS power into 8ohms. Adjustable from 200 Watts to 5000 Watts in 50W steps for each channel. Warning: this power is specified into an 8-Ohm load and does not represent the maximum power of the Amp.

Configuration select.



3.1 System Config.

Changing a set of parameters within the same family is made immediately and is barely audible.

Voltage selection and fuses

Precautions

Please ensure that the unit is set for the correct voltage for your local supply BEFORE use. Operating voltage is indicated in the window of the main socket at the rear of the unit.

Power connection

Connection is made by means of an IEC standard power socket. The unit will operate with AC main voltage between 90Vac and 125Vac 50-60Hz in 115v mode and 180Vac to 264Vac 50-60Hz in 230v mode.

Please note that each mode requires a different fuse. Before connecting to the main AC supply, ensure that the fuse fitted is the correct type (time-lag T, slow blow) and rating (115V/T400mA or 230V/T200mA), as indicated on the rear panel, adjacent to the fuse holder.

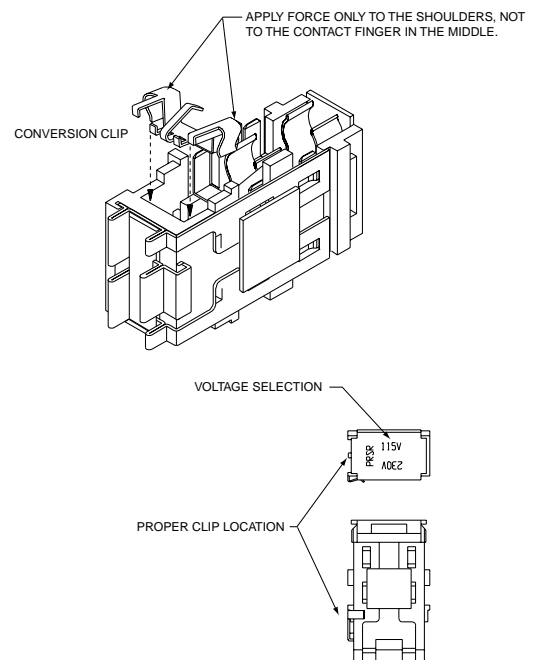


115/230 Switching

Voltage Selection Change requires no special tooling and can be performed in the field by qualified service people.

DISCONNECT MAINS POWER TO THE UNIT, then follow these instructions:

- Open the fuse holder window in the power entry module located on the rear of the unit. (External access)
- Remove the red fuse holder and insert the corresponding fuse (115V/T400mA - 230V/T200mA) for the voltage required into the opposite side of the holder.
- For safety reasons, when the fuse holder is flipped around for voltage changing, the conversion clip (small metal contact) should be re-installed to the other side of the fuse holder. Otherwise the fuse holder will not go back into the housing completely and the power entry module will not function. The proper location of the conversion clip can be checked in the following way. It should be located to the left-hand side of the voltage number selected, i.e., with the voltage label upright. See diagrams opposite.
- Re-insert the red fuse holder, the required voltage figure can now be seen in the fuseholder window.
- The unit is now ready for use.



Download

Information concerning downloading in this manual are general instructions. Please read the specific instructions that come with each new LOAD (readme.txt) file.

Warning

The latest version of the downloader program (NXLoad.exe) provided with each upgrade set of files must ALWAYS be used.

A "NULL MODEM" or "LAPLINK" cable is required to connect your PC RS232 serial port to the NX241 RS232 serial port.

Connection from NX241 RS232 9-Pin Serial Port to PC's COM port

NX241 RS232 serial port		PC COM port
1	Don't care	1
2 RXD	←-----Receive-----	3
3 TXD	-----Transmit-----→	2
4	Don't care	6
5 SGND	Signal ground	5
6	Don't care	4
7	Don't care	8
8	Don't care	7
9	Don't care	9

The NEXO download software is DOS compatible and has been tested on the following operating systems:

- Microsoft MSDOS (V5.0 and above)
- DOS shell of Microsoft Windows 3.x
- DOS shell of Microsoft Windows 95
- DOS shell of Microsoft Windows 98
- Macintosh DOS compatible shell.

Note:

Due to the way Microsoft Windows NT addresses serial ports, the software does not currently run on any version of Windows NT DOS shell. If you wish to use a machine that is running NT you will have to make a bootable DOS disk, copy the downloader (NXLOAD.EXE) and the corresponding

DOWNLOAD

LOAD (*.DLD) files to the disk and restart your machine in true DOS using this disk. [If you have true DOS, to create a bootable disk under true DOS type the following "Format a: /s"]

Instruction

The files needed to execute your download will be provided as a *.ZIP file. You will have to extract the content of this ZIP in a temporary directory using programs as Pkunzip or WINZIP (not provided by NEXO). Once extracted you should have access to the following files:

- Two download (.DLD) files: the last official release version and the newly released version. If you experience any problems with the new version, simply load back the old .DLD program to return the unit to the previous version.
- A README.TXT that will contain download instruction
- WHATSNEW.TXT, which will inform you with all new features of the new LOAD.
- The downloader program NXLOAD.EXE

Execute the following procedure to load the new software into the NX241 Flash EPROM.

- 1) Connect the serial cable to both computer and NX241.
- 2) Execute your DOS shell (or start your machine from DOS).
- 3) At the DOS prompt, type the start command for the loader in the directory containing the files. The correct syntax is as follows:

NXLOAD filename -COMport_number. <ENTER>

(e.g. NXLOAD LOAD1_80.DLD -1)

The downloader works with Com Ports 1 and 2 only. Com 3 and 4 cannot be used.

- 4) When you press <Enter> to invoke the command the following message appears on the computer screen:

"Loading file...Waiting for NX241..."

Note: If the message is followed by a string of strange characters it is possible you have entered the incorrect Com Port number. Hit ESCAPE to abort the procedure and start again. If nothing happens, make sure that the cable is correctly wired and your computer COM port actually DOES work before trying again. You can also try re-booting your machine.

- 5) Now to complete the procedure, you must set the NX241 to "Download" mode to make it ready to accept the program.

DOWNLOAD

Power the TDcontroller OFF and then back on whilst holding down the MUTE button of channel 1 (leftmost mute). The controller will now enter "Download " mode and the download will start. The address of the code being loaded will be displayed on both the computer screen and the NX241 whilst the process is in operation. The download procedure is complete when the unit resets (all LED's on).

6) The NX241 now HAS to be reset AGAIN to enter the configuration menu.

Turn the unit OFF, wait 5 seconds and then power back ON or hold down simultaneously the three menu buttons (A, B, ◀ ▶).

Hold down the two menu buttons (A, B) to enter into the Configuration Menu to choose your cabinet.

The unit is now ready for use.

Protection Information Notes

Protection

VCA's and VCEQs

Each channel has its own simulation and protection process.

Each audio channel contains a combination of controlled gain stages (let's call them VCA's as in our analogue circuitry). These VCA's are embedded into complex composite structures in order to change their basic operation into frequency selective attenuation. This operation is similar to that of a voltage controlled dynamic equaliser (VCEQ).

Each VCEQ and VCA is controlled by the synthesis of several signals issued from the various detection sections. That synthesis is in fact the envelope of those signals, with an optimised release and attack time for each VCEQ and VCA (depending on its frequency range and the cabinet selected).

Displacement control

The Sense input signal is sent to a shaping filter producing a signal whose instantaneous amplitude is proportional to the voice coil excursion. This signal, after rectification, is compared to a preset threshold matching the maximum usable value, as determined from laboratory measurements. Any part of the signal exceeding the threshold is sent to the VCEQ control buffer while the VCEQ acts as an instantaneous limiter (very short attack time) to prevent displacement from overriding the maximum permissible value.

Temperature control

Each sense signal is fed into a shaping filter (one per transducer), each one producing a signal proportional to the instantaneous current flowing into the voice coil of the transducer. After rectification, this signal is integrated with attack and release time constants equivalent to the thermal time constants of the voice coil and chassis, producing a voltage, which is representative of the instantaneous temperature of the voice coil.

When this voltage reaches the threshold value corresponding to the maximum safe operation temperature, the VCA becomes active to reduce the Audio signal level and limit the effective temperature to fall under the maximum usable value.

In order to avoid detrimental effects induced by very long release time constants coming from the temperature detection signal (level being reduced for an extended period, « pumping » effects...), the detection signal is modulated by another voltage integrated with faster time constants matching the sound level subjective perception. This allows the controller to reduce the effective operation duration of the temperature limiter and make it sound more natural, while the efficiency of protection is fully preserved and operation thresholds are unaffected (kept as high as possible).

Physiologic Dynamic Control

The so-called Physiologic Dynamic Control is intended to avoid unwanted effects as a result of a too long attack time constant. By anticipating the operation of the temperature limiter, it prevents a high level Audio signal appearing suddenly then being kept up for a period, which is long enough to trigger the temperature limiter. Without this, a rough and delayed gain variation would result which would be quite noticeable and unnatural.

The Physio control voltage acts independently on the VCA with its operation threshold slightly above (3 dB) that of the temperature limiter and a low compression ratio; its optimised attack time constant allows it to start operating without any subjectively unpleasant transient effects.

Interchannel regulation

As described before, each transducer is individually servo-controlled for temperature.

This means in practice that, in case of a potential risk detected, protective operation would only affect the concerned driver. Your driver will be protected but the overall system tonal balance could be altered if the different channels are not heating at the same time. In addition, triggering a temperature protection means that the loudspeaker has already lost some efficiency (power compression up to 3dB in extreme cases)

The purpose of interchannel regulation is to cancel that effect by linking VCAs together. When the protection is activated on one channel and reaches a predetermined threshold, the regulation section begins to correct the balance between the different channels (HF, MF, and LF) by acting on the concerned VCA.

Peak limiter

The peak limiter primary function is to avoid massive clipping of the amp, which can have some very audible artefacts and in some cases may be dangerous for the Cabinets. (Modulation of the amplifier's rails can create very low frequencies not filtered at all by the NX241 or some harmonics at high frequency and level...)

The threshold of the peak limiter is determined by the user to match its amplifier. (3 MENU AMP POWER and AMP GAIN).

The second function of the peak limiter is to avoid huge amounts of power being sent to a driver. Each driver is protected in temperature and displacement but there could be other factors of destruction that cannot be predicted by simulation (especially mechanical damage to the cone...). Each driver is specified for a certain power handling and a factory set peak limiter threshold is tuned to avoid any abuse.

Some words on Amplifiers

Power

NEXO recommends high power amplifiers in all cases. Budget constraints are the only reason to select lower power amplifiers. If an incident occurs on an installation without protection the fact that amps only generating half their rated output power (-3dB) are used will not change anything in respect of possible damage. This is due to the fact that the RMS power handling of the weakest component in the system is always 6 to 10 dB lower than the amps' ratings.

Current rating

It is very important that the amplifier behaves correctly under low load conditions. A speaker system is reactive by nature, on transient signals like music it will require much higher instantaneous current than its nominal impedance would indicate (four to ten times more). Amplifiers are always specified by continuous RMS power into resistive loads (which is irrelevant); the only useful information in that respect is the specification into a 2 ohms load. It is possible to make an amplifier listening test by loading them with twice the number of cabinets considered for the application (2 speakers per channel instead of one, 4 instead of 2...) and modulating at high level (onset of clipping). If the signal does not noticeably deteriorate the amplifier is well adapted (overheating after approximately ten minutes is normal but thermal protection must not operate too quickly after starting this test).

Amplifier gains

As you already read in the Quick Start section Information on the amplifiers used is MANDATORY. This value is the key of a correct setting. It is very important to know the gain of all amplifiers present in your set-up. The tolerance shall be about $\pm 0,5$ dB. In practice this can be difficult to achieve:

- Some amplifier brands have an identical input sensitivity for models of different power rating (this means DIFFERENT GAIN for each model). This problematic practice, inherited from non-professional applications, is easily detected when the manufacturer specifies the same input sensitivity for all its range (like 775mV/0dBm or 1.55V/+6dBm). This translates to very high gain values on higher power models.
- Other brands do offer constant gain but only within a given product range (like higher gain on all semi-professional amps).
- Even if a manufacturer is conscious of this problem and applies the constant gain rule to all its models, the value he chooses is not necessarily the same as other manufacturers.
- Some manufacturers can deliver products where manufacturing tolerance on the same model is ± 1 dB or more. Worse, he can agree to modify this gain at the customer's request without clear and visible identification on the device. Some amps feature internal gain switches and it is sometimes impossible to know the amp gain without measuring or opening it.

In cases where you don't know the gain of your amplifier (or want to check it) please read the following instructions.

1. Unplug any cabinet from the amp
2. With a signal generator feed a sine wave (freq. within the audio range, 1000Hz for example) Amplitude Vin is not important (1V is rather convenient). Unless if you use 0.7V sensitivity where you will overflow the amp input!
3. Measure the Amplitude Volt at the output of the amp.
4. $Gain = 20 * LOG_{10}(V_{out}/V_{in})$
5. Some examples:

Vin	Gain	20dB	26dB	32dB	37dB (1.4V sensitivity / 1350Wrms)
0.1V		1V	2V	4V	7.1V
0.5V		5V	10V	20V	35.4V
1V		10V	20V	40V	70.8V

Remember that constant sensitivity settings will give you different gain value when the amp Power is different.

Gain value

NEXO recommends low gain amplifiers: +26dB is recommended, as it is at the same time adequately low and quite common. This considerably improves signal to noise ratio and allows all preceding electronic gear, including the TDcontroller, to operate at optimum level. Remember that using a high gain amplifier will proportionally raise the noise floor level by the same amount.

Advanced protections

Some high-end amplifiers may have some advanced functions like those found in the NX241 TDcontroller ("loudspeaker offset integration", "limiter", "compressor"...). These functions are not well adapted to specific system requirements and may interfere with existing protection within the TDcontroller. NEXO do not recommend using these functions with the NX241 TDcontroller

TECHNICAL SPECIFICATIONS

SPECIFICATIONS	NX241 Digital TDcontroller
Output Level	+28 dBu Max. into 600 Ohms load
Dynamic Range	Channels 1 & 2 = 99 dBu Channel 3 & 4 = typical 107 dBu. (Flat without gain scaling: 101dBu)
THD + Noise	< 0.02% flat setup (max0.04% for Output 27.5dBu)
Latency time	1.4ms on a flat setup
Power Supply	115/230 Volts 50/60 Hz (operating range 90-125V & 180-264V)
FEATURES	
Audio Inputs	2 Audio Inputs 24 bit converters Electronically Balanced, 36 k Ohms. 2 XLR-3F Connectors.
Sense Inputs	4 Amplifier Sense Inputs (LF mono, MF/HF L&R) Floating 150 kΩ. 18 bit converters 8 Pole Removable Strip Terminal.
Audio Outputs	4 Audio Outputs. 24 bit converters Electronically balanced, 50 Ohms 4 XLR-3M connectors
Processing	24 bit data with 48-bit accumulator. 100MIPS Optional Expansion Board 300MIPS
Front Panel	Menu A and Menu B buttons 16 characters by 2 lines display Select Wheel & Enter button (◀ ▶) IN Clip – DSP Clip red LED's Speaker Protection yellow LED for each channel Individual Mute/Solo buttons and red LED for each channel Amp. Sense & Peak (green & red) LED's for each channel
FLASH EPROM	Upgrade for software improvement, new cabinet set-ups available on NEXO web site.
Rear Panel	115/230 V switch Fuse holder RS232 connector for serial com. Empty slot for extension card (communication & processing power)
Dimensions & Weight	1U 19" Rack - 230 mm (9") Depth. 4 kg



Update to NX241 Manual

GEO setups

NX windows Loader

Recommended installation practices



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GEO setups

This chapter describes the GEO setups released with the LOAD1_92. Keep in mind that you shall reset the NX241 and hold on A & B button to switch from one family to the other. (Refer to page 10 of the NX241 User Manual)

Geo Line Arrays

S805 4-8 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Ouput 3 (left) and 4 (right). No signal on output 1 &2.

Configure GEO S805 Wideband for 4-8 boxes

S805 9-16 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Ouput 3 (left) and 4 (right). No signal on output 1 &2.

Configure GEO S805 Wideband for 9-12 boxes

S805 4-8 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Ouput 3 (GEO), no signal on Ouput 4.

Configure GEO S805 (4-8 boxes) with CD12

S805 9-6 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Ouput 3 (GEO), no signal on Ouput 4.

Configure GEO S805 (9-16 boxes) with CD12

S805 4-8 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Ouput 3 (GEO), no signal on Ouput 4.

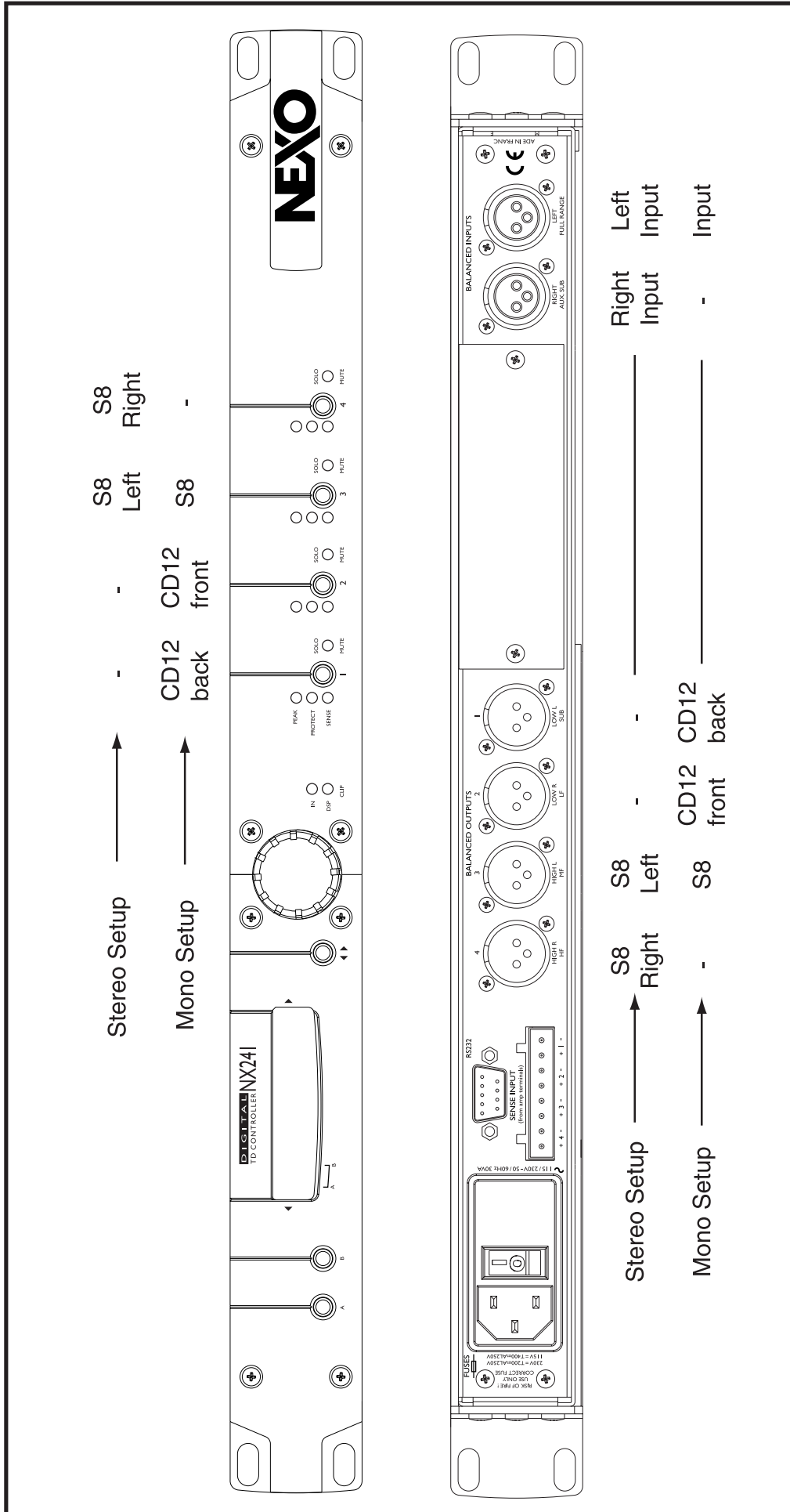
Configure GEO S805 (4-8 boxes) with CD12 flown

S805 9-16 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Ouput 3 (GEO), no signal on Ouput 4.

Configure GEO S805 (9-16 boxes)with CD12 flown

GEO SETUPS



Geo Horizontal Arrays

S830 3 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Output 3 (left) and 4 (right). No signal on output 1 & 2.

Configure three GEO S830 Wideband

S830 3 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure three GEO S830 with a CD12 flown

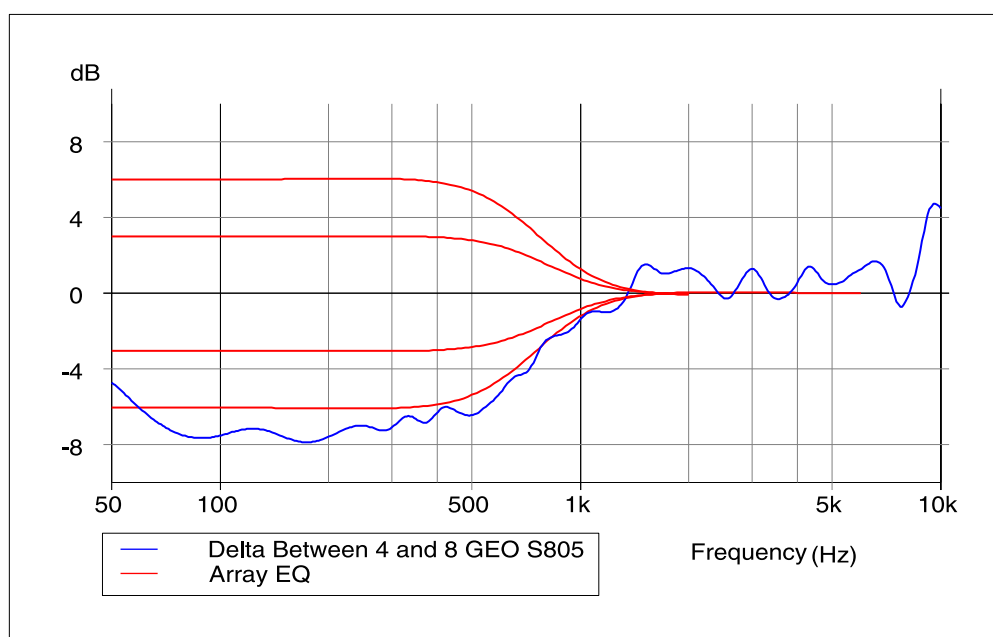
S830 3 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure three GEO S830 with a CD12 ground

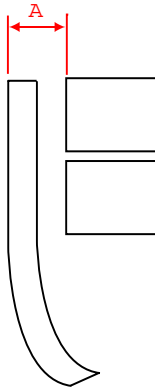
User Array EQ

The User Array EQ (MENU 1.7) has been tuned in order to reproduce the coupling effect of the Geo in the Low Frequencies. It will help you to fine tune your system according to the number of cabinets and personal taste. Note however that the two GEO setup (4-8 & 9-16) should allow you to deal with most of the cases without touching to this adjustment.



Delays & System alignment

The NX241 internal time adjustments (factory presets) have been optimised to provide the best crossover possible between MAIN and SUB system. **The reference point for this adjustment is the front side of each cabinet.** (That means that the internal delays are set for a S8 cabinet standing close to the CD12 both front sides being aligned)



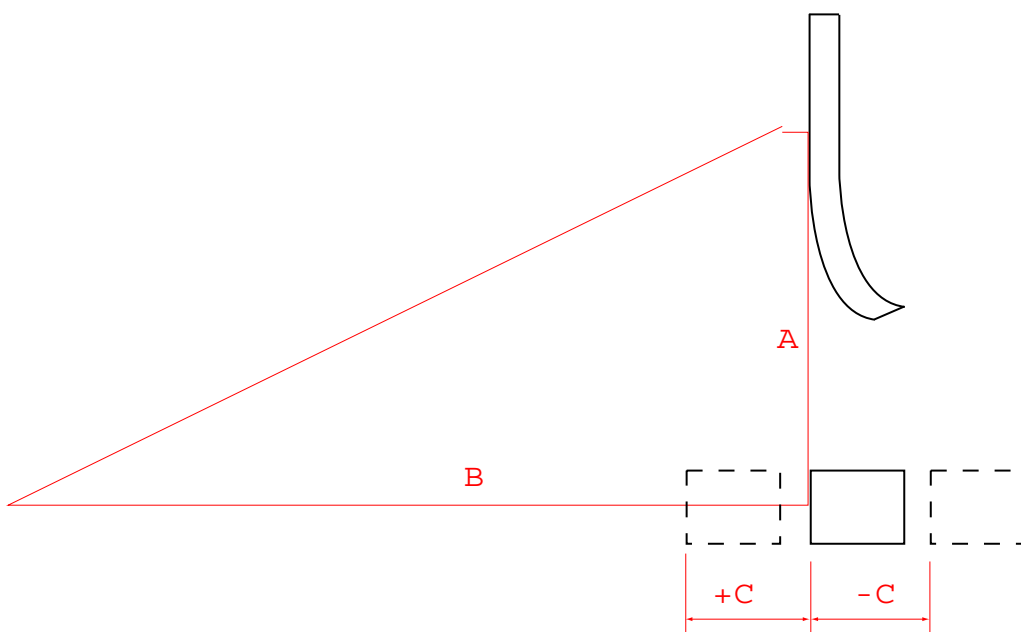
Should you rig your CD12 behind the S8, you will have to delay **A** the MAIN system (in MENU 1.2) from the according distance. (Setting the unit as meter or feet will be more convenient).

Should you leave your CD12 on the ground you will have to adjust the delay on the CD12 (menu 1.2) according to the average path difference between the flown GEO and the ground stacked CD12.

In the following case where A is the average height, B the average listening point and C the difference between front sides of both systems

$$\text{CD12 Delay} = \sqrt{A^2 + B^2} - B \pm C$$

If this formula gives a negative result the delay shall be implemented on the MAIN channel.



NEXO Windows Loader

Information concerning downloading in this manual are general instructions. Please read the specific instructions that come with each new LOAD (readme.txt) file.

Warning

The latest version of the downloader program (NXwin.exe) provided with each upgrade set of files must ALWAYS be used. A "NULL MODEM" or "LAPLINK" cable is required to connect your PC RS232 serial port to the NX241 RS232 serial port.

Connection from NX241 RS232 9-Pin Serial Port to PC's COM port

NX241 RS232 serial port		PC COM port
1	Don't care	1
2 RXD	←-----Receive-----	3
3 TXD	-----Transmit-----→	2
4	Don't care	6
5 SGND	Signal ground	5
6	Don't care	4
7	Don't care	8
8	Don't care	7
9	Don't care	9

The NEXO download software is win32 compatible and has been tested on the following operating systems :

- Microsoft Windows 95
- Microsoft Windows 98
- Microsoft Windows 2000

Instruction

The files needed to execute your download will be provided as a *.ZIP file. You will have to extract the content of this ZIP in a temporary directory using programs as WINZIP (not provided by NEXO). Once extracted you should have access to the following files:

- Two download (.DLD) files: the last official release version and the newly released version. If you experience any problems with the new version, simply load back the old .DLD program to return the unit to the previous version.
- A README.TXT that will contain download instruction

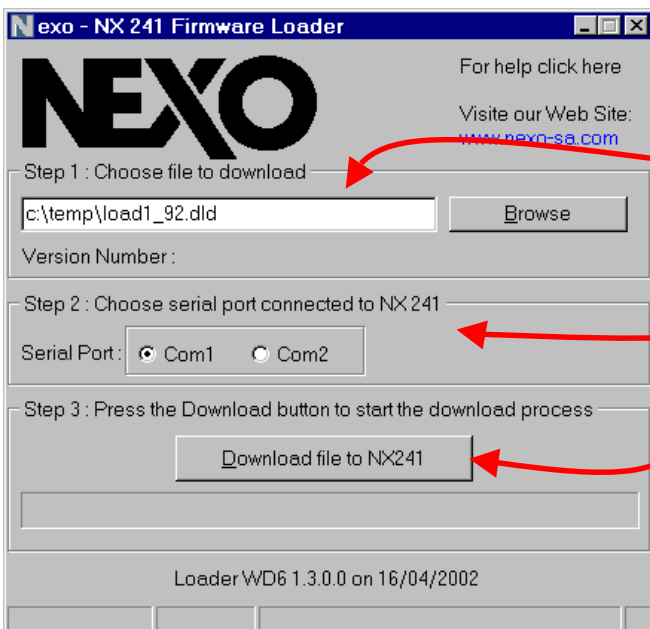
NEXO WINDOWS LOADER

- WHATSNEW.TXT, which will inform you with all new features of the new LOAD.
- The downloader programs NXWIN.EXE and former DOS loader NXLOAD.EXE

To use the former DOS loader please see instructions in the NX241 User Manual (also provided in the readme.txt file)

Execute the following procedure to load the new software into the NX241 Flash EPROM.

- 1) Connect the serial cable to both computer and NX241. The downloader works with Com Ports 1 and 2 only. Com 3 and 4 cannot be used.
- 2) Start your Windows OS.
- 3) Launch the loader.

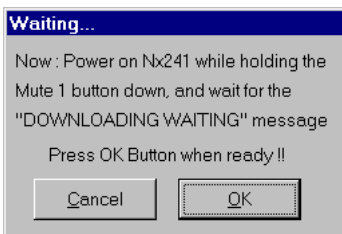


4) Follow the 3 steps shown in the loader window.

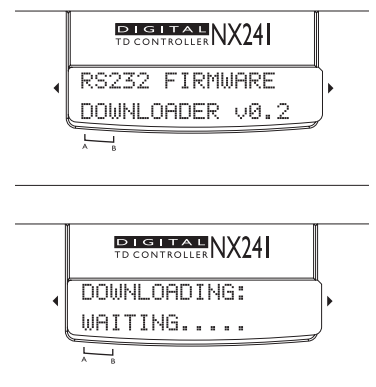
- Browse for your .dld file to download
- Choose your serial port connected to the NX241. The downloader works with Com Ports 1 and 2 only. Com 3 and 4 cannot be used
- Press "Download file to NX241" button.

5) Now to complete the procedure, you must set the NX241 to "Download" mode to make it ready to accept the program.

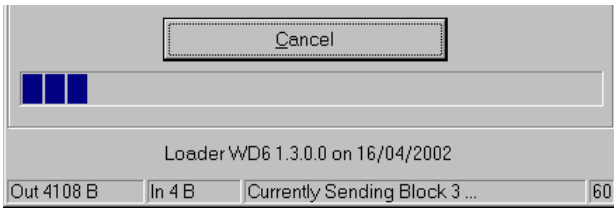
Power the TDcontroller OFF and then back on whilst holding down the MUTE button of channel 1 (leftmost mute). The controller will now enter "Download " mode. First screen displays the revision number of the RS232 Firmware.



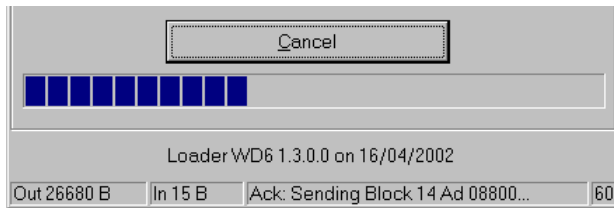
As soon as the message "DOWNLOADING: WAITING" appears, you can press the "OK" button



NEXO WINDOWS LOADER



Have a look to the status bar to follow the downloading process. The Loader sends the first block of code to the NX241.



The NX241 acknowledge the reception both on the computer and in the NX241 screen.

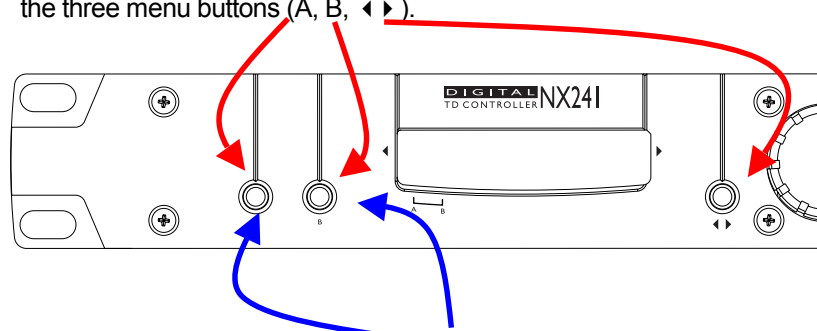
The downloading continues until the progression bar reaches its left most position.

The number in the lower left corner (60) is a timeout. A countdown begins when the transmission is broken (wrong com port, plus disconnected...) when it reaches zero a fault is generated.

The download procedure is complete when the unit resets (all LED's on).

6) The NX241 now HAS to be reset AGAIN to enter the configuration menu.

Turn the unit OFF, wait 5 seconds and then power back ON or hold down simultaneously the three menu buttons (A, B, < >).



Hold down the two menu buttons (A, B) to enter into the Configuration Menu to choose your cabinet.

The unit is now ready for use.

Recommended installation practices

Purpose of the recommended installation practices

Nexo is a supplier of high performance professional loudspeakers and TDcontrollers. Competent audio engineers are aware that the performance of an audio system depends on the installation (cabling, choice of hardware).

We are, however, aware that there are different cabling techniques in use in pro-audio systems. At the present time, we have not found a standard which covers the different installation issues which need special attention. To this end, we feel it is necessary to provide a "recommended installation practice" which covers the electrical installation of the TDcontroller and of other units to which the TDcontroller is connected.

At Nexo, we give special attention to issues such as input/output compatibility (type of signals, levels, connectors) for wanted signals, and electromagnetic compatibility (EMC) for unwanted phenomena (emission of disturbance and immunity to disturbance).

With regard to input/output compatibility, we have to face the problem of insufficient standardization of: input signals, output signals, grounding, cables and the choice of connectors. Insufficient standardization means that there are a wide range of possible system configurations in the field, many of which are unsuitable for a good installation.

Regarding EMC, Nexo's TDcontrollers comply with applicable regulatory requirements (e.g the technical requirements expressed in the EMC standards for the implementation of the 89/336/EEC directive i.e the EMC directive, in Europe).

Nexo also has applied additional requirements relevant for its products, as a result of a review of relevant electromagnetic environments, installation practices, and the possible effects of interference in the field.

However, TDcontrollers will provide the best performance in terms of signal-to-noise ratio in the "normal" system configuration and electromagnetic environment recommended by Nexo.

Suggested installation rules

Electromagnetic environments

The emission (this word describes all types of noise generation by the equipment) requirements which have been applied to Nexo's TDcontrollers are the stringent requirements of the "Commercial and light industrial environment" of the product family EMC standard [T1] for emission.

The immunity (this word describes the ability to cope with electromagnetic disturbance generated by other items and natural phenomena) requirements that we have considered exceeds those applicable to the "Commercial and light industrial environment" of the product family EMC standard [T2] for immunity. However, we recommend that you do not subject the TDcontrollers to electromagnetic disturbances having a level exceeding half of the limits found in this standard, when they are being

used (in order to introduce some safety margin).

These two EMC standards are those applicable to pro-audio equipment for the implementation of the "EMC directive".

Analogue signal cables

Analogue signal cables and connectors for input and output ports of the TDcontroller should be shielded twisted pair or quad cable fitted with XLR connectors on the TDcontroller side. We recommend the use of low transfer impedance cables with a braided shield and a transfer impedance below 10 mΩ/m.

For the sense inputs, the noise requirements are not as stringent, and any kind of twisted pair cable will be appropriate. For the digital TDcontrollers having a serial connector for loading upgraded firmware, it is best to use a cable shorter than 2 m, and to remove the serial link when the TDcontroller is in use .

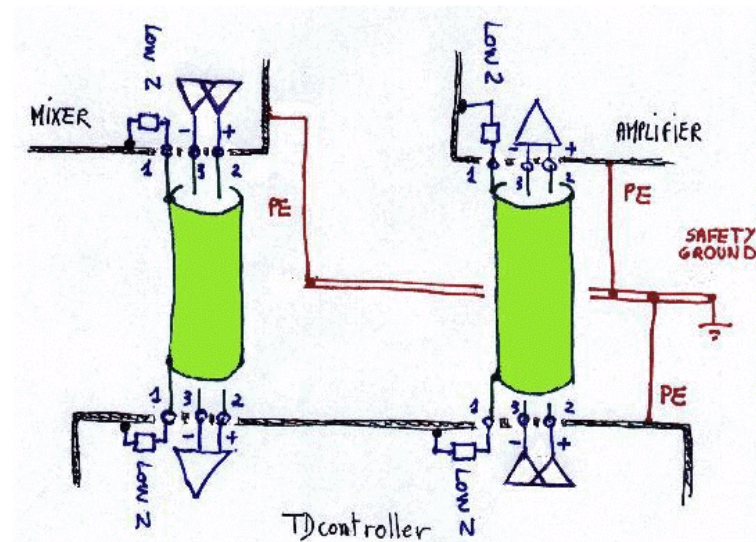


Fig. 1: connecting symmetrical sources and loads to a TDcontroller

The TDcontroller is intended to be used with symmetrical (balanced) sources (for instance a mixer) and symmetrical loads (for instance a power amplifier), as shown in Fig 1 above. You can see that the TDcontroller provides a low impedance path between pin 1 of its XLR connectors and its chassis (assuming the ground lift option, when available, is not activated). The TDcontroller can sustain high current in pin 1 without degradation of output noise. We recommend that the sources and loads you use have the same desirable characteristics.

It is sometimes claimed that connecting cable shield at both ends creates ground loops, and that the current flowing in such loops will produce noise. As explained in Section 4, this is not the case for most professional audio equipment. In short, there are two kinds of loops in which voltages are present: the loops formed by signal wires, and the loops formed by grounded conductors, among which are protective earth conductors (PE) and signal cable shields.

When a cable shield is grounded at both ends, a loop is closed, and the resulting current

RECOMMENDED INSTALLATION PRACTICES

causes a reduction of the voltage induced on signal lines. This effect is desirable: this is what the cable shield is intended for, and this is how it protects your signal from magnetic fields.

If you are using an asymmetrical source, it is best to use a shielded twisted pair and to connect wire 3 of the cable to the shield at the source output end, as shown in Fig. 2. This technique prevents noise currents flowing on the return path of the signal. If you are using an amplifier with an asymmetrical (unbalanced) input, it is best to use a shielded twisted pair, and to connect wire 3 at the TDcontroller end only, as shown in Fig. 2. This keeps a good capacitance balance for the signal, however noise currents flow on the return path of the signal (Note that this is only acceptable for a short cable).

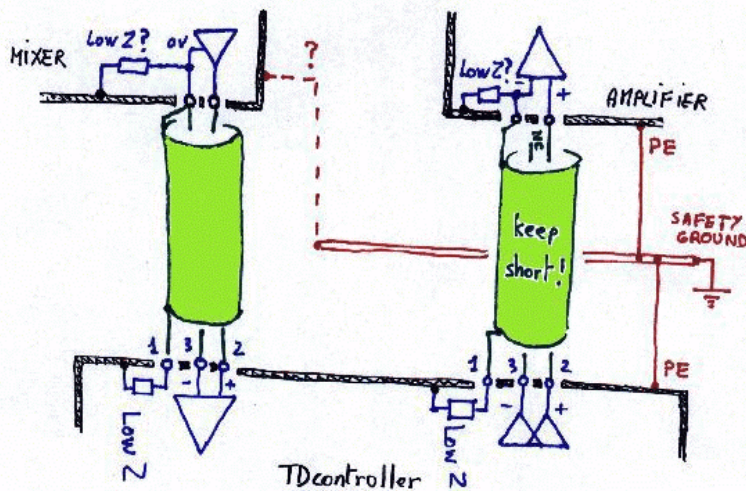


Fig. 2: Connecting asymmetrical sources and loads to a TDcontroller

If you are using a symmetrical source or amplifier which is prone to become noisy when a current of less than 100 mA at the mains frequency (50 Hz or 60 Hz) is sourced into pin 1 of its XLR connectors, you might consider opening the ground loops.

Grounding, shielding and mounting the TDcontroller in a rack

The primary reason for grounding is safety. The conformance to the applicable requirements of the authorities having jurisdiction is of course mandatory. However, grounding also has an impact on electromagnetic compatibility. From the EMC point of view, it is desirable to have a low impedance ground network as a current flowing in the ground network will then produce low voltage in the network. A low impedance network can be obtained using a multipoint ground scheme, for which the engineer would wish to implement as many closed ground loops as is economically possible.

In practice the TDcontroller is intended for rack-mounting. The rack is a free grounding and shielding structure, and it provides extra shielding. Therefore, it is desirable that the screws used to fix the TDcontroller in the frame or rack provide an electrical contact between the chassis of the TDcontroller and the rack.

Rationale on interconnection rules

Wording of the basic interconnection rules

There are conflicting opinions as to the best way of interconnecting audio equipment. In fact, different authors and "authorities" offer their own recipe, based on many years of experience. Such recipes of course conflict with the tips of other experts. We wish to explain our view, which is based on EMC analysis and experiments.

In fact there is a good reason for the co-existence of diverging views on the best audio interconnect techniques: the type of cable assembly (this designates the cable with the connectors attached) which will give the best result depends on the characteristics of the equipment at each end of the cable assembly, and of other characteristics of the whole system. However, there is only one solution for the best interconnection technique between two normally designed professional audio items (for instance between a mixer and a Nexo TDcontroller), that is to say equipment which :

- has a conductive enclosure (i.e. chassis) and an internal design which makes them insensitive to disturbances such as currents injected into the shield connection of signal cables and returning on their protection earth connection(s),
- uses balanced shielded pairs (or properly connected quad) with a high common mode rejection ratio for signal lines.

The practical design of equipment that is intended to be insensitive to injected currents will implement a low impedance between the cable shield terminal of input connectors and the equipment enclosure (otherwise a significant disturbance voltage will develop). The best method is a direct bonding of this terminal to the enclosure (but this is the manufacturer's business).

Let us focus on how to use equipment.

In this case, as we will show below, the best interconnection technique consists of:

- using shielded pair cables with a low transfer impedance shield (well below 10 mΩ/m),
- providing a low impedance between cable shields and the cable shield terminal of input connectors (and therefore a low impedance to the enclosure),
- having a ground connection which interconnects the equipment enclosure (chassis ground) as close as possible to the signal cables (this is the icing on the cake).

In practice, using XLR connectors:

- means that the cable shields must be connected to the pin 1 at each end of the cable, in line with the IEC 60268-12 international standard [T3], and also to the shell contact of the connector when this contact is available,

RECOMMENDED INSTALLATION PRACTICES

- means that the equipment must provide or be configured to provide a low impedance connection between each pin 1 and the equipment casing,
- implies that all power cables (which contain the protective earth connection for the casing) should preferably be connected to mains sockets with short wiring connecting their protective earth terminal.

These are the basic interconnection rules for professional equipment. Other additional rules could also be mentioned, for instance concerning cable layout and routing, but is not our purpose to write a textbook, and we will not review them here. We only want to put an end to the practice of "disconnecting pin 1" on cables.

Beware! : if you are using equipment which does not fulfill our assumptions, our interconnection rules may not apply. In fact, there is still equipment which suffers from the "pin 1 problem" defined in [T4]: pin 1 is not connected with a low enough impedance to the chassis (often, it is only connected to the "signal ground" or 0V of the internal circuitry - a really bad choice), and the noise level of the equipment can be degraded by a low current in this terminal. At Nexo, we consider that pro audio equipment should be capable of withstanding 100 mA in pin 1 of line inputs and outputs at the power frequency (50 Hz or 60 Hz), without noise degradation.

If your installation contains equipment which does not meet this requirement, or if you have really high leakage currents flowing on your signal cables when you ground them at both ends (this should not be the case!), the "one end only" practice may provide better results at the power frequency, but it brings disadvantages at higher frequencies, as explained in Section 5.3. This is why the NX241 TDcontroller provides a "ground lift" option through a menu.

References

[T1] EN 55103-1:1996 Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use B Part 1: Emission.

[T2] EN 55103-2:1996 Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use B Part 2: Immunity.

[T3] IEC 60268-12:1987 + IEC 60268-12:1987/A1:1991 + IEC 60268-12:1987/A2:1994 Sound system equipment - Part 12: Application of connectors for broadcast and similar use.

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