INSTRUCTION MANUAL

MTX-MONITOR V3b-4.2.1

STUDIO MONITOR CONTROLLER

FUNK TONSTUDIOTECHNIK

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IMPORTANT SAFETY PRECAUTIONS

The following applies to all versions of MTX-MONITOR.V3b-4.2.1 and MTX-Monitor.V3b-4.2.1 TV.

CAUTION ! :

Only use the voltage specified as correct for the device. The required voltage is printed on the back plate of the device. 230 Volt/50..60 Hz! (115 Volt/50..60 Hz also available!).
The device may only be operated on a grounded electrical outlet! To prevent fire and/or electric shock, the device can not be exposed to rain or moisture!

If the power cord or plug becomes frayed or damaged, or if there is a sudden loss of sound during use of the device, or if any unusual smells or smoke should appear to be caused by it, immediately turn off the power switch, disconnect the electric plug from the outlet, and have the device inspected by qualified Funk Tonstudiotechnik service personnel.

If this device should be dropped or damaged, immediately turn off the power switch, disconnect the electric plug from the outlet, and have the device inspected by qualified Funk Tonstudiotechnik service personnel.

Do not attempt to disassemble the internal parts or modify them in any way. If it should appear to be malfunctioning, discontinue use immediately and have it inspected by qualified Funk Tonstudiotechnik service personnel.

CAUTIONS ON INSTALLATION :
Do not install in the following types of places. Doing so could degrade the sound quality and/or cause malfunctions:

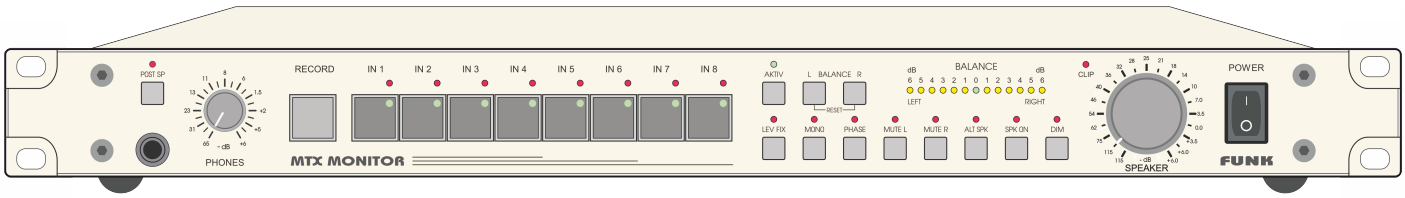
places with significant vibrations or that are otherwise unstable
near windows or other places exposed to direct sunlight
near heaters or other extremely hot places
extremely cold places
places with bad ventilation or high humidity
very dusty locations

BEWARE OF CONDENSATION :
In case of moving the device from a cold to a warm place, or used after a sudden temperature change, a vapor in the air could condense on the internal parts making correct operation impossible. To prevent this, or if this occurs let the unit sit for at least 1 hour at the new room temperature before using.

CLEANING :
To clean the unit, wipe gently with a soft cloth. This particularly applies to the version with gold or chrome plated front. Do not use any benzene, paint thinner, ethyl alcohol or other chemical agents to clean the unit as they could damage the metal surface, or plastic control knobs of the unit.

WARRANTY :
Warranty for parts and labor is granted for period of 3 years. Defects associated with the production or material defect, will be removed free of charge during this period. The warranty is void after unauthorized opening and/or interfering with the device by third parties!

MTX-MONITOR.V3b-4.2.1 MONITOR CONTROLLER



FRONT PANEL VIEW

MTX-MONITOR.V3b-4.2.1 is a professional preamplifier built to meet highest demands for sound quality and operation comfort. It was designed in order to choose which signal should be monitored as well as for copying audio material from one stereo source to another without any loss of quality in sound (television) studio such as CD, DAT or mixing desk Mix output. Using of „ultra-linear audio switching technology" in MTX Monitor guarantees exceptional impulse processing and frequency response far exceeding limits of audibility.

By using the device with digital editing stations there is no need to give up comfortable monitoring or copying. **MTX-MONITOR** can work both as independent device and it can replace/expand existing mixing console router. Various audio connections do not have to be led to mixing console, but can end at main device (1U 19" rack).

The device is equipped with 4 balanced sockets (XLR socket +6 dBu) and 4 unbalanced Cinch ports for stereo sound sources with working level of 0 or +6 dBu. For unbalanced inputs internal level alignment is possible. One or more of 8 signal sources can be chosen for recording (Record-Router). This stereo signal is fed to two pairs of Cinch sockets.

In audio path the audio matrix, balance and level circuit as well as most monitoring functions operate in contact-less electronic way. Thanks to that high level of reliability and stability of audio parameters are obtained. There are typical monitoring functions built in, like mute left, mute right, mono, left – right, -20 dB, phase reversal, balance, muting of speaker, etc.

On front panel a very high quality, powerful short- circuit resistant headphone amplifier is available. It's level can be controlled independent from monitor level or dependent on „speaker volume" (switchable).

For power amp connection or active monitors the device has two alternative stereo outputs. One output is balanced, preset to working level of +6 dBu, another one is unbalanced, set to 0 or +6 dBu. For unbalanced inputs internal level matching is possible. Optionally it is possible to turn on both monitor outputs. This option (M2) does not allow alternate monitor switching, but additionally turns on the second monitor. „Speaker-On" button turns on or off both monitor outputs simultaneously if both were previously selected.

For monitoring audio signals there is special stereo measurement output. This output serves as monitor signal control, it is switched together with signal source and it is unbalanced. Stereo control devices can be connected here, as stereo analog Peak-Level-Meter and so on. Alternatively, chosen monitor signal from this output can be used to feed another amplifier.

A red Clip-LED indicates danger of overloaded signal in monitored path.

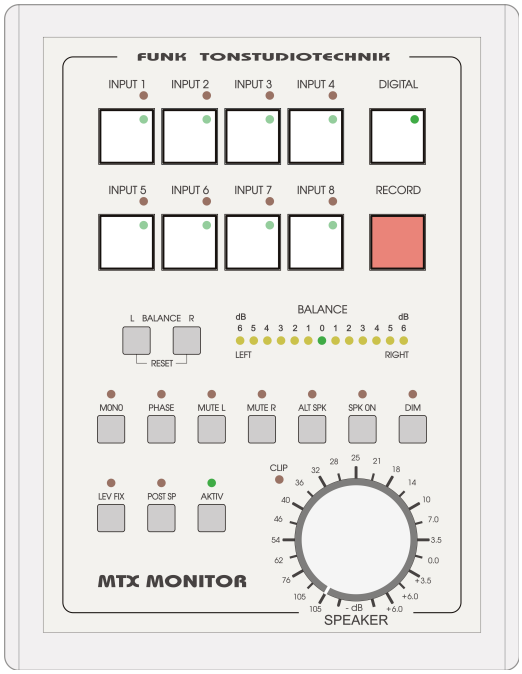
For monitor calibration it is possible to bypass balance and level circuit with button. Chosen signal will appear then on monitor out with gain of 0,0 dB.

MTX-MONITOR.V3b-4.2.1 has toroidal power transformers built in, which has very low emissions characteristics.

It is possible to remotely control all functions of the device. Remote control module is available as option. Remote control of nearly all the functions of the device is possible.

- 8 stereo inputs (4x balanced 4x unbalanced)
- 2 monitoring amplifiers to choose from (1x balanced. 1x unbalanced)
- Measurement output for stereo peak meter, or stereo visual fx device
- 2 record outputs
- various monitor functions
- high fidelity headphone amplifier
- integrated power supply
- optional remote control
- optional operation with digital router
- highest sound quality

Optional remote unit can be as far as 50 meters distant from main device (8 m in standard)



REMOTE CONTROL UNIT MTX-REMOTE.V3a

AUDIO TECHNOLOGY:

MTX-MONITOR.V3b-4.2.1 is controlled fully digitally. Input choice, balance and volume adjustment is performed in contact-less way. A very high level of precision and fault-free operation has been achieved that way. Typical differences of level between left and right channels in the whole signal path are less then 0,05 dB between left and right channels in whole monitor path of the MTX, down to -80 dB volume settings. Thanks to step operation of the knob ultra precise level recalling is obtained.

Dynamic range of 125 dB, marvelous frequency range (below 0,5 Hz to over 1 MHz) and phase response as well as extremely low non-linear distortion with typical value of 0,00006% (-125 dB) in important middle frequency range allows for neutral and totally objective evaluation of a chosen sound source. Because of quality issues we have fully abandoned voltage controlled amplifiers (VCA). Highly precise, analog level regulators are controlled digitally. Comparing to integrated, affordable fully digital level regulators, this allows for much less distorted operation when the signal level is very low. It is specially noticeable when working with 16 bit systems.

All analog input signals are fed to active matrix by input buffers. This expanded input circuitry ensures the benefit of constant load resistance for each signal, also in summing working regime. Thanks to that crosstalk in neighboring channels does not depend on chosen sound source's impedance (this applies to exceptionally high frequencies). Such solution is requirement for high channel separation of inputs for MTX.V3b-4.2.1, which typically equals 120 dB at 1 kHz. Thanks to switching method used in MTX Monitor small irregularities of level at multiple signal splitting, as it often happens in many passive matrices (one signal split to many paths), were also eliminated.

STABILITY AND SAFETY OF OPERATION :

The device is designed for users who highly care for stability of audio parameters throughout the whole period of device operation.

Fault-free operation of device is ensured by active switching matrix with use of additional buffering amps. Use of matrix with buffering amps increases it's reliability: in case of overloading one input, for example by exceedingly high input voltages the whole sum will not stop working. Only overloaded input amplifier will be affected by this. After switching to another input the device will be ready to work again.

In case of turning the device off or sudden power disruption the input choice and levels are memorized and restored at next power on of the unit. That function is also useful for users, who work with timer type power steering devices.

Like with majority of analog input amplifiers, there should be no higher level signals at balanced inputs when the device is turned off. This particularly applies to amplifiers with exceptionally low noise amplifiers, like MTX Monitor. Voltages at Cinch inputs higher then +16 dBu (circa 5V) when the device is turned off can damage asymmetrical input amplifier!

ANALOG MONITOR CHOICE:

The core of MTX.V3b-4.2.1 are two stereo routers (Monitor-Router and Record-Router). Signal demanded for monitoring will be chosen by **MONITOR'S ROUTER**. Simultaneous choice of multiple analog inputs is possible, without mutual influence (creating sum, eg. in order to cascade connection of outputs „MIX" of several consoles! Or in order to measurement or montage). This feature can be switched of.

ANALOG RECORD CHOICE:

A source signal for recording can be chosen with **RECORD Router**, and the choice is independent from monitor signal choice. Further processing or gain change is not provided here. The signal appears on Cinch RECORD-1 OUT and RECORD-2 OUT and enables analog copying also without patch box.

DIGITAL SOURCE CHOICE:

Optional devices like „AMS-2-DAR" or „PAS-8" MTX-Monitor offer particular function allows for choice of one of 8 digital sound sources (AES/EBU) and passing it on without further processing for monitoring on two outputs. Outboard digital-analog converters or measuring-control devices can be connected here. In conjunction with outboard digital-analog converter, direct switching and comparison between analog and digital signal source is possible using one button.

Regardless of this active digital router can choose another signal from 8 input signals (eg. As digital signal for record). This signal is also available on two galvanic separated outputs. Depending on operation mode copies of digital signals onto analog devices can be made.

DIGITAL SIGNAL SPLITTING USING OPTIONAL DDA-12:

If, for example, a digital record signal should be redirected to several receivers, the digital signal splitter **DDA-12** is helpful in such situation. The device has 2 XLR inputs and 2x 6 outputs. Using buttons both outputs can be freely assigned to both interior, 6-fold splitting amplifiers, which means that using one button 1 to 12 division is possible. Also it is possible to control this function with external contacts.

ANALOG MEASUREMENT OUTPUTS:

Asymmetric stereo measurement output „METER/DIRECT OUT" allows for control of currently monitored signal source before processing in monitoring system (eg. For stereo control-measuring devices or stereo visual devices).

This output is also suitable for redirecting monitored signal without gain change. Monitoring of signal source is directly after monitor matrix. Switching various monitoring functions and level and balance changes in MTX MONITOR have no influence on this output.

ANALOG FUNCTIONS OF MONITORING:

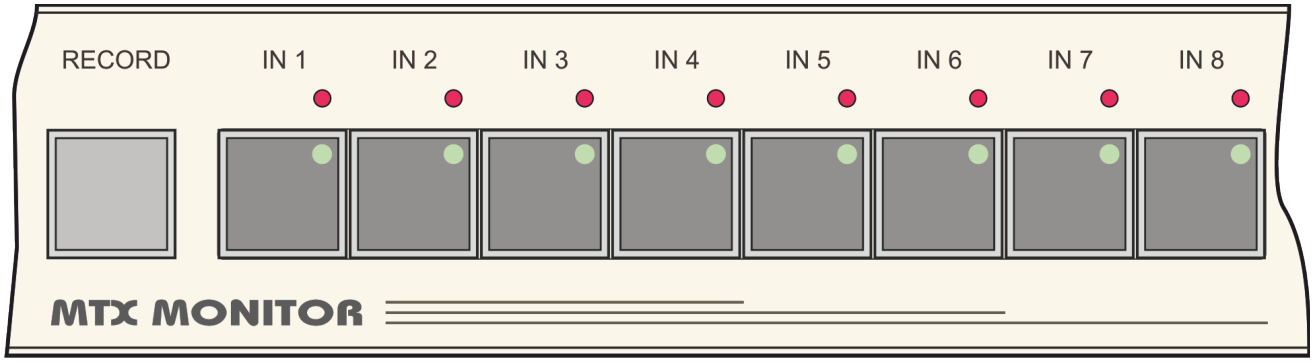
mute left, mute right, mute speakers only, mono, -20 dB, phase change 180° (mono + phase simultaneously giving > left - right) and balance +/- 6 dB in 1 dB steps.

Besides monitor matrix's working mode (summing + alternative or only alternative choice of analog inputs) all work modes of MTX MONITOR can be activated in the device itself or remotely. Fast and reliable operation is ensured by ergonomic design of front panel and optical display of all connection states using LED diodes.

In order to make gain alignment there is bypass button for level regulator and balance regulator (with 2 seconds blockade). Thanks to that chosen input signal appears on monitor output with exactly 0 dB gain.

Digital control gives the benefit of recalling once preset volume and balance parameters with tolerance of +/- 0.25 dB. Step of adjustment is set to 1 dB. Each of 13 steps is indicated by LED diodes stripe.

SWITCHING SUM AND ANALOG INPUTS

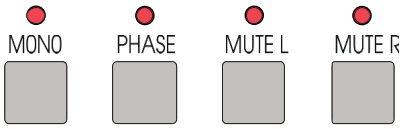


Analog signal for monitoring is chosen by depressing one of buttons **INPUT 1..8**. Former choice is replaced by new one. If one of the buttons is depressed and held and additionally other buttons will be depressed in that row, all chosen in this way inputs will be monitored at the same time. The buttons are now summed. It is also possible to internally turn off this special function. All chosen sound sources will be indicated by green LEDs placed in buttons (white or blue ones optional).

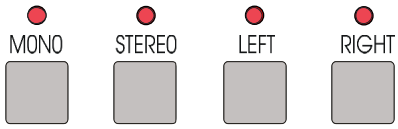
MTX-MONITOR besides analog monitor matrix has also another, analog record matrix. Thanks to that one of signals fed on input 1..8 can be chosen and used as signal source for connected recording device. This happens independent from currently monitored signal. By depressing red button „RECORD" and simultaneous choice of analog source (1..8) that **RECORD MATRIX** will be active and it switches chosen signal onto both record outputs. As option, also Record Matrix can sum many inputs. Chosen record source is indicated by red LED diode above the button (blue or white one optional).

Description field of buttons is protected by plexiglass cover. Included to MTX-MONITOR are labels for user markings of input buttons or included to remote control module.

MONITOR FUNCTIONS



MTX-MONITOR.V3b-4.2.1



MTX-MONITOR.V3b-4.2.1 **TV**

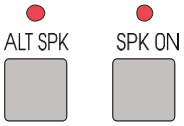
MUTE buttons switch left channel (MUTE L) or right channel (MUTE R) or both channels simultaneously.

MONO button sums left and right channel when depressed. Each channel appears then on both outputs attenuated by 6 dB, so summed signal at Mono function activated is again available with 0 dB attenuation.

PHASE button reverses phase in left channel exactly by 180°.

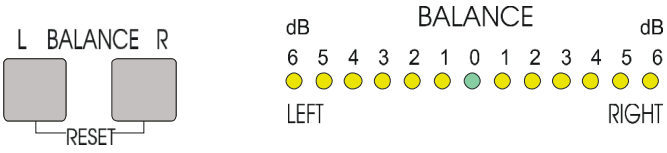
PHASE and MONO functions activated simultaneously give difference between left and right channels (L-R). This way, at equal left and right channels levels part of the signal that has same phase is removed. Thanks to this function, high level and phase accordance of MTX.V3b-4.2.1 monitor enables exact control of relative phase and output level without additional measuring devices of signal source, as long as both channels modulation is identical! Simultaneously, basing on gain differences of chosen signal sources and linearity of frequency characteristics, attenuation depth informs about relative course of phase characteristic. „**TV**-Version" does not have this test-allowing function !

SPEAKER SELECTION



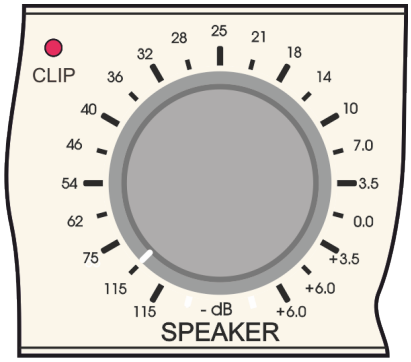
By use of „ALT SPK" (alternative speaker) button another monitor device is turned on. Normally choice is possible only alternatively. „**2M**" option allows for simultaneous use of both groups of speakers. Asymmetric"ALT-SPK" can then be connected or disconnected from symmetric output. „SPK ON" button mutes currently selected monitor devices, however the choice is preserved. The selection remains consist. See also "CONFIGURATION CHANGE".

BALANCE



Buttons „L" i „R" regulate balance, moving it by 1 dB at each press in appropriate direction. If any button will be held for longer time balance automatically moves to chosen direction. During balance adjustments both channels are affected is such way, that volume remains the same at all settings. Yellow LED diodes indicate chosen balance correction. By simultaneous pressing both buttons the balance will be immediately restored to 0 dB position (green LED diode is lit). If no balance correction was chosen, the green diode goes off after about 10 seconds. Maximum balance shift is ± 6 dB.

VOLUME REGULATOR

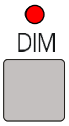


Electronic precise level regulator has 41 positions and works in +6 dB...-115 dB range. Intermediate positions have high resolution (resolution of 0.5 dB, internal resolution 0.125 dB). At each change of level regulator's position it momentarily passes though all switching levels, from initial to demanded level. Thanks to this technique and especially exact switching steps so called „Zipper Noise" is drastically reduced. Throughout working level precision of recalled gain/attenuation level is typically 0,25 dB. Scale precision in +6...-50 dB range is typically < 1 dB. Level regulator in MTX-Monitor.V3b-4.2.1 and level regulator of MTX-Remote Control module have the same parameters.

OVERLOAD INDICATOR :

LED **CLIP** diode besides volume regulator is a reliable indicator of level override risk. All the amplifier stages in chosen monitor path are controlled. Even the shortest signal impulses are recognized. If Clip indicator is lit it means either signal already over-driven or reserve is less than 0,5 dB. Switching threshold for this indicator is set at internal working level of + 23,5 dBu. Overloading the headphone amplifier, a currently active current limiting, also indicated reliable.

DIM-FUNCTION



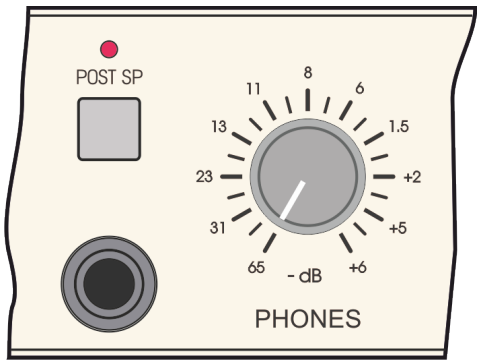
„DIM" button lowers monitor level for speakers and headphones by exactly 20 dB, independent from current volume setting.

This function can be also operated by means of external no-voltage contact (EXT.DIM option). Whenever this contact is jumped MTX-Monitor mutes monitor signal by 20 dB. When the contact is open, the Dim function is turned off immediately.

SPECIAL LEVEL REGULATOR FUNCTION

„GAIN 0dB" button sets gain for level regulator precisely at 0,0 dB and any different then center balance position is set back to initial value. Thanks to that signal path measurements and monitor calibrations are possible without disconnecting wires or MTX MONITOR bridges. Second pressing the button will restore previous volume potentiometer level setting. The balance remains at 0 dB. To prevent accidental turning on this function it activates after 2 seconds delay.

HEADPHONES



The integrated headphone amplifier is compared to older MTX-versions significantly more powerful and works both with high and low impedance headphones with stereo 6,3 mm plug. Headphone signal is available on front panel in stereo headphone socket.

Headphone level adjustment is independent from speakers signal level. Range od adjustment is between +6..-65 dB (+6..-75 dB set internally by means of soldered jumper). Main level regulator and balance setting usually does not have influence on headphone signal path.

In case of special application and working with remote control unit, a need for adjusting headphones level by digital level regulator can arise (speaker level). It is possible by turning on **„POST SP"** function. This button is placed right over headphones socket. After turning on this function, headphones level regulator receives it's signal from speakers level regulator's output along with possibly set balance correction. Just like before, initial volume setting for headphones can be performed by headphones level regulator. If speakers level is now changed, the headphones level will be changed in the same degree. Same situation occures with speakers turned off. In this working mode balance setting influences headphone amplifier. LED diode „POST SP" indicates the working mode.

Attention ! Depending on impedance, headphone amplifier can deliver sufficient power to almost all types of passive headphones. To avoid hearing loss, especially with hi efficiency headphones before switching to unknown signal source turning down volume level is recommended.

Max. output power, depending on impedance of connected headphones is approx. 1300 mW per channel. Maximum available power depending on headphones impedance and signal level is specified in table below (output power at THD less then 0,1%)

600 Ω	300 Ω	200 Ω	150 Ω	100 Ω	70 Ω	47 Ω	32 Ω	22 Ω	16 Ω
2x 260 mW	2x 485 mW	2x 680 mW	2x 845 mW	2x1100 mW	2x1330 mW	2x1220 mW	2x 900 mW	2x 640 mW	2x 465 mW

AKTIV-FUNCTION

On demand MTX-MONITOR can be operated by remote control module. **„AKTIV"** button activates Remote function on remote control module. At the same time main unit controls cease to operate. Control can executed only from MTX-MONITOR or remote control unit. Device that is inactive at the time indicates its state, however, by LED diodes use.

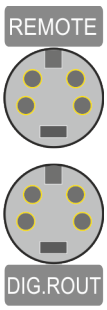
ANALOG OUTPUT ROUTER WORKING MODE

Analog Monitor/Record Matrix's working mode can be chosen either *only alternatively* or *alternatively and summing* (initial settings). This function can be switched inside the device on the main board labeled „INPUT STATUS" (refer also to chapter „Level matching").

If the switch is in „ALTERNATIV" position only alternative signal choice is possible. At simultaneous depressing multiple buttons only the one which is held the longest time will be respected.

If the switch is in „SUMMING" position, it is possible to switch signal both in summing and alternative way.

ADDITIONAL DEVICES CONNECTORS



Optional digital audio router „**AMS-2 DAR**" or **„PAS-8"** is to be connected to **„DIG.ROUT"** socket. Only 4–pin Mini-Din connecting cable (included) can be used. Power supply is provided from the MTX-Monitor . Selection will be done on the remote control. PAS-8 can be additionally controlled with own buttons situated of front panel.

Upper 4-pin **REMOTE** Mini-Din socket is used for connecting eg. Remote control unit.

SPECIAL VERSION - „EXT.DIM"

This Option „additionally external controllable Dim function" will be activated with help of Cinch socket labeled **„EXT.DIM"**. For this purpose internal and external contacts of this Cinch socket will be connected. The active function is not indicated on the front panel.

Lower Cinch socket is non functional at this and record output 2 is excluded.

SPECIAL VERSION - „MTX.V3b-4.2.1 MONITOR TV"

„MTX.V3b-4.2.1 MONITOR TV" version allows for choice of the following monitor modes with a single keystroke:

1. left channel on both sides (-6 dB),
2. right channel on both sides (-6 dB),
3. mono signal on both sides (summed left + right),
4. Stereo / Mono

„Phase 180°" is not supported. All inputs and outputs are set for gain level of +6 dBu and input matrix is preset in alternative work regime.

MARKING, DESIGNATION PLATE, SERIAL NUMBER

Exact MTX Monitor version can be verified on the bottom of device close to back panel. Designation plate also informs about firmware version of the device. Serial number is placed on the back panel below power socket, looking from the front on right side.

INPUTS-OUTPUTS :

Inputs :

4 stereo symmetric analog inputs (XLR sockets). Working level +6 dBu
Impedance : 20 kΩ

4 stereo analog asymmetric inputs (Cinch sockets). Working level 0 (+6*) dBu
Impedance : 2 MΩ
If more than 4 symmetric stereo inputs are needed, additional differential amplifier can be used, such as SAM-1Bs/SAM-1C or versions 19" SAM-2B/SAM-2C.

Outputs :

Monitor output 1 (monitor out) for speaker systems with XLR sockets for power amplifiers or active speakers. Working level +6 dBu.

Alternative monitor output 2 for speaker systems with Cinch socket for power amplifiers. Working level 0 (+6*) dBu.

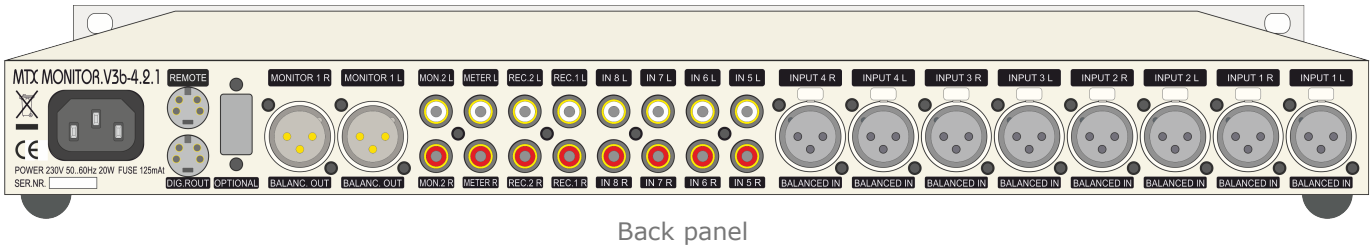
Two record outputs Record 1 and Record 2 on Cinch socket for recording common analog source. Working level 0 (+6*) dBu.

Measurement outputs (Direct Out) on Cinch socket, for connecting controlling instruments or stereo visualization devices. The output supplies chosen monitor signal, however neither monitor functions nor level setting has influence on that signal. Independent from MTX Monitor, this output can be used for feeding currently chosen signal into another monitoring devices equipped with own level adjustment.

Working level +6 dBu. * Means: internally adjustable

Headphone output :

MTX-Monitor.V3b-4.2.1 contains a powerful High-End stereo headphone amplifier for passive headphones with stereo 6,3 mm plug. Impedance between 16 Ω ... 10 kΩ are suitable. Headphone output is placed on the front panel.



Back panel

Signal level at the sockets :

Symmetric inputs, symmetric output "Monitor 1" and asymmetric Cinch sockets METER/DIRECT OUT have working level in all versions set to + 6 dBu.

All other asymmetric inputs and outputs work in standard version with working level of 0 dBu.

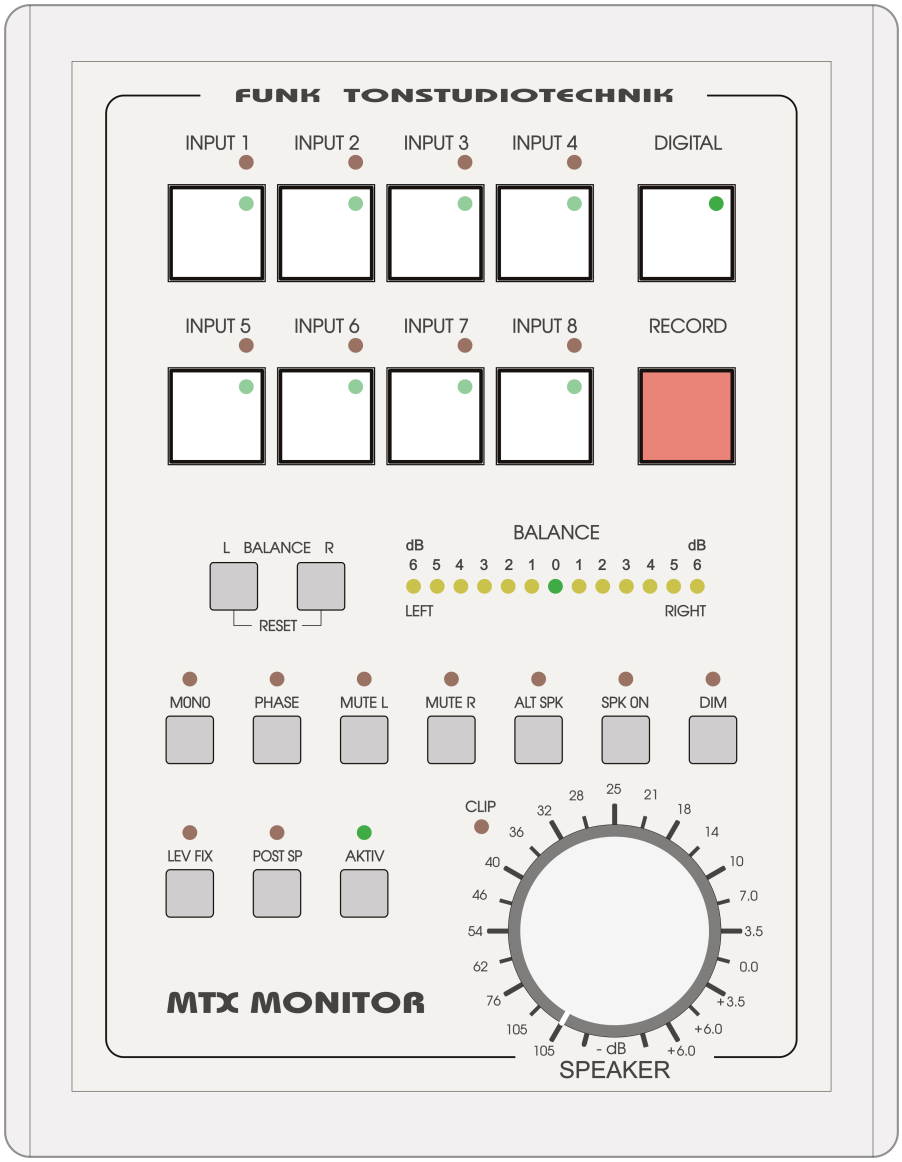
*MTX-Monitor is also available with +6 dBu working level preset on all **inputs and outputs**, just like in **MTX-Monitor.V3b-4.2.1 TV**. For individual possibilities of level adjustments refer also to chapter „Matching levels".

LED brightness intensity :

LED diodes in MTX version are controlled with optimum efficiency by modern control circuit with impulse width adjustment. Internally, continuous change of brightness of all LED diodes is possible with small screwdriver. Controlling is from front button plate of the MTX Monitor.

Brightness change: in order to change settings cover of the device must be removed by unscrewing 10 screws (Philips screwdriver size 1). Access to brightness trimmer is through 20 mm hole on left back side of board (flat screwdriver 2-2.5 mm). Turning it clockwise increases brightness and turning it counter-clockwise decreases the brightness to complete turning of the LED.

Remote control unit is delivered in chassis for use on table top. It allows for choice of 8 analog, and in conjunction with digital router (for AES/EBU signals eg. AMS-2 DAR or PAS-8) simultaneous choice from 8 digital sources. Monitor and record sources can be chosen each time in independent way.



When digital monitoring source is chosen the source switches analog monitoring router to input 1 as long as **„DIGITAL"** function is active. If output of D/A converter is connected then digital signal source can be monitored. It does not influence the analog RECORD-Router.

„DIGITAL" button can be activated only when digital router is connected!

Just like in analog domain also with digital router the monitor and record signals can be chosen simultaneously and independent of each other.

Remote control unit is available in white finish (RAL7035) or Nextel dark gray with black anodized front panel.

4-wire shielded control cable for remote control unit can be delivered at increased length of 50 m (standard length is 8 m). Cable is connected to socket located on the back panel of remote control unit.

By factory standard MTX-Monitor.V3b-4.2.1 features connectors for remote control unit on the back panel and also connectors for controlling digital router.

Remote control unit dimensions: 150 mm x 195 mm x 50 mm.

Digital format :

8 digital inputs for both digital, active matrices in AMS-2 DAR router and PAS-8 are configured for **AES/EBU** (or AES-3) format. SPDIF signals can also be fed as long as typical level (400...500 mV) will be maintained. Chosen signal source will be redirected to output (eg. to external D/A converter) and parallel to it buffered available on second output (eg. for digital peak meter). This is valid both for record matrix and for monitoring.

Signal format fed on input is present on output in identical form. Further processing of the signal is not provided. Additionally, PAS-8 offers digital Insert, which can be turned on by pressing a button even into monitor path or record path (further processing like format change, signal splitting, sampling frequency conversion in AES/EBU- or SPDIF formats is offered by **DAS-SRC**).

The devices are fully transparent for all the data in serial data stream. Automatic correction „DUTY-CYCLE" maintains constant sampling proportions also at various input levels. Jitter added to signal is exceptionally small and equals < 500 pS_{eff} ! All typical sampling frequencies can be processed (also 96 kHz and 24 Bits resolution).

Digital router **AMS-2 DAR** and **PAS-8** indicate presence of „Clock" signal for currently chosen input at the front panel and in case of a need they make easier fast tracking the signal. Monitor and Record paths have separate clock indicators.

Connectors :

All the digital router's inputs and outputs are symmetric, no mass and are equipped with transformer. For each input additional input impedance setting is possible, by use of jumper. At open jumper input impedance is >1 kΩ, at closed jumper 110 Ω. Thanks to that eg. signal splitting for two receivers is facilitated. At factory input impedance is set to 110 Ω.

If signal is to be directed not only to digital switch but further, to another digital receiver, then jumper for appropriate input will be open in router. The signal will then be led from source first to AMS-2 DAR or PAS-8 and then further to second receiver. Therefore in many application digital signal splitter may be not necessary.

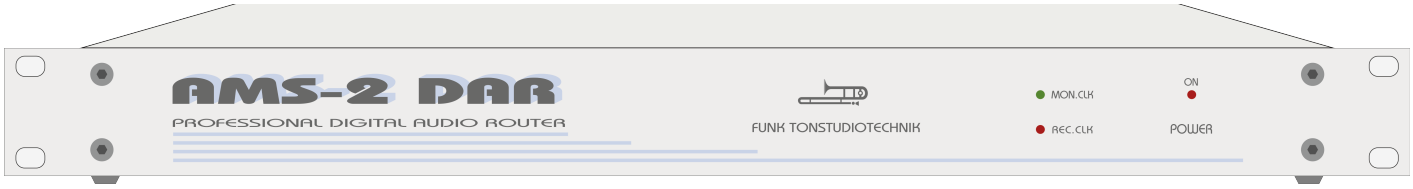
MTX-MONITOR automatically recognizes presence of digital AMS-2 DAR or PAS-8 router and allows the remote device for digital signal choice.

Digital router do not need power supply from the mains. Control and powering is provided by MTX-MONITOR via 4-pin Mini-DIN cable (included). AMS-2 DAR needs remote control unit for input choice, PAS-8 can be used also with no remote device.

Synchronization:

AMS-2 DAR and PAS-8 do not need any external synchronization. If router is used as a signal switch in peripheral synchronized device, then at identical modulation of both signal sources taking part or at digital signal = 0 digital signal switching will be inaudible. The same applies to signal split to two matrix's inputs and switching between those signals.

In case of sound signals of different modulation during switching there will be audible click proportional to difference of both signal levels during switching. Fundamentally such switching clicks appear in fast switching matrices both in digital and digital domain. Switching speed between turning off the currently monitored signal and turning on a newly chosen signal is in range of nanoseconds (10^{-8}...10^{-9} sec.).



FRONT DIGITAL ROUTER AMS-2 DAR

BACK PANEL DIGITAL ROUTER AMS-2 DAR

Monitor choice :

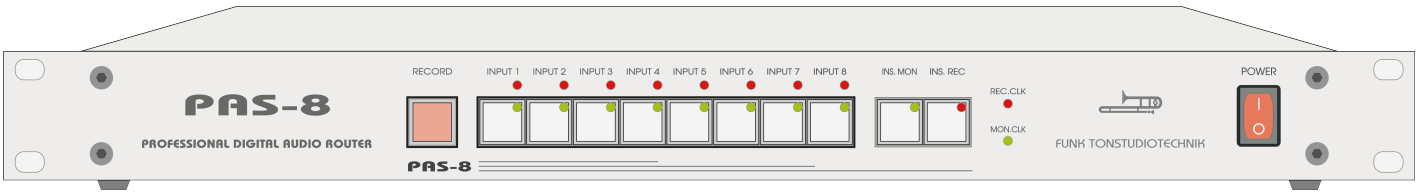
Core of **PAS-8** are like in AMS-2 DAR two symmetric stereo routers (Monitor-Router and Record-Router). Signal demanded for monitoring is chosen by **MONITOR ROUTER**.

Record choice :

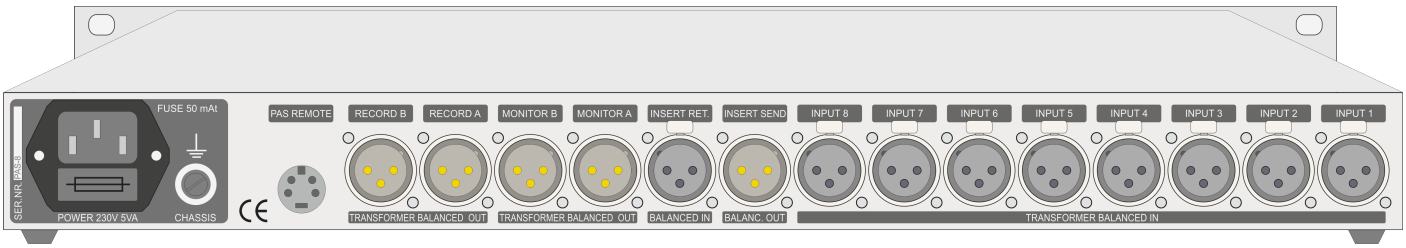
RECORD ROUTER, independently from monitor signal choice, enables choice of signal for recording.

Digital Insert :

By use of button an external digital sound processing device can be included into monitor or record signal path of PAS-8.



FRONT DIGITAL ROUTER PAS-8



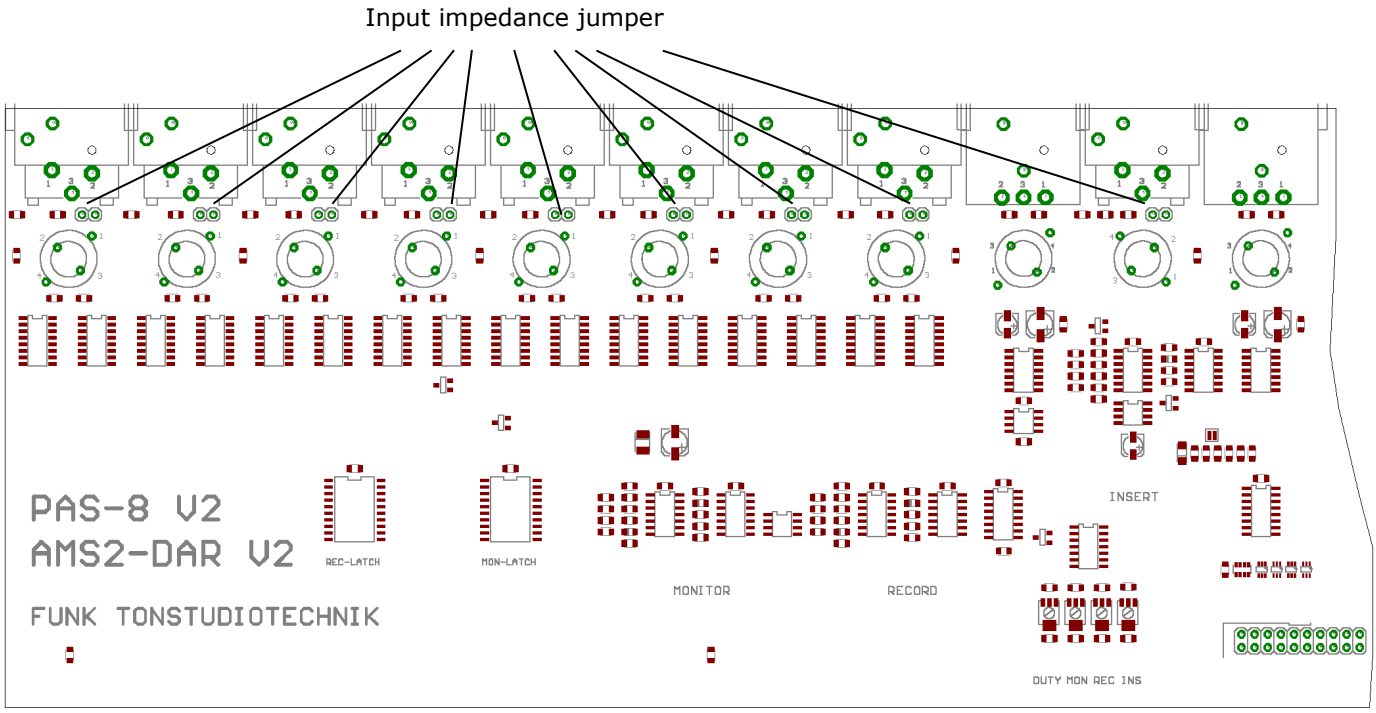
BACK PANEL DIGITAL ROUTER PAS-8

In case of power supply failure or turning off the device current configuration will be stored automatically in non-volatile memory. As soon as the powering voltage is restored, the router loads up preserved configuration. Thanks to that **AMS-2 DAR** and **PAS-8** devices can work in timer controlled working mode.

If PAS-8 is to work together with MTX-MONITOR, digital router powering will be taken from MTX Monitor system. In such configuration power switch of PAS-8 should be turned off to enable central „Reset" through Monitor's system.

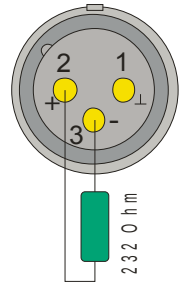
Change of input impedance :

After removing of device cover access to input impedance jumpers is provided. If a jumper is put onto 2 contacts, input impedance is 110 Ω. If jumper is put only on one contact, input impedance is >1 kΩ. AMS-2 DAR has 8 jumpers, PAS-8 additionally has one more for digital Insert input.



SPDIF SIGNALS TO SYMMETRIC INPUTS AES-EBU

XLR-STECKER



If SPDIF signal is fed from XLR inputs, in appropriate XLR plug impedance should be aligned by parallel 232 Ω resistor between pins 2 and 3. Thanks to that, the input will be matched to wave impedance of 75 Ω, which is typical for SPDIF signals. On the connected cable, „hot" wire will be join of XLR plug Pin 2. The drawing shows soldering side of XLR plug.

Ready adapter cable with impedance matched is available in various lengths, as **CASA** or **CASA-T** cable for Cinch to XLR connections or **BASA** or **BASA-T** cable from BNC to XLR. The CASA-T and BASA-T versions are equipped with additional puls-transformer to prevent ground loops.

For from AES/EBU to Cinch (BNC) connections **UAS** cable is available, equipped always with pulse transformer.

Special features of level circuit in MTX-Monitor.V3b-4.2.1

Precision analog level regulators are digitally controlled. In comparison to relatively easy in construction, fully digital, affordable and integrated level regulators, our version allows for noticeably less distorted signal processing, especially at very low signal levels. This is especially true for 16-Bit systems.

Digital level regulator

Purely digital level regulators can be recommended only in limited range of applications, especially in case of high signal quality demands. At low level monitor settings and 16- Bit formats their flows are showing off. Depending on program content, at gain level set around -20 dB an average level of the signal will lie at about -30..-40 dB in relation to full gain. Basic level of noise remains more or less the same, however, independent from gain setting. It concludes that dynamics falls almost in proportion to level drop. In case of typical today's signal sources of common 16 Bit resolution the dynamics lowers in our example from 98 dB (in best case) to about 58..68 dB.

The real problem lies in non linear distortion, however (THD = total harmonic distortion), which due to resolution grow strongly when signal is digitally lowered. In our example the distortion typically grow by a factor of 10. For example in quiet places of a CD record, or a DAT recording at level of about -20 dB distortion growth is once again repeated by the factor of 10. Digital-analog converter with THD of around 0,005% at full gain, reaches then typical THD value of around 0,2..0,5 %. The distortion is occurring also at upper THD components (upper harmonics k3..k9) still very clear and interfering. Due to this, music playback at high quality is excluded! At higher resolution of digital recording like 24 Bit or use of dithering, the problem is drastically less significant.

Why analog level regulator

Basically analog level regulators do not have that problem. Even at the lowest listening levels, like in our example, theoretically it is not possible to distinguish any significant limiting of resolution. It depends, however, to decisive degree on circuit of gain path behind level adjusting potentiometer. Also the potentiometer itself can be source of distortion. There are potentiometers, which total interior resistance does not exhibit purely ohm nature. It is capacity and inductance factors, which often cause measurable non-linearities. A big problem is insufficient linearity regarding frequency response in stereo potentiometers. The non-linearities of 2-3 db values are not uncommon, especially at lower level settings. Higher quality pots ensure typical error of 0,5..1 dB (Tracking). After longer periods of operation large problem is caused by quality of connections inside the potentiometer. After years transitional resistances arising in the potentiometer are not linear but depending on level, besides total signal drop-outs additional distortion in 3-rd harmonic can be observed here, mainly k3 distortion (distortion with predominant 3-rd harmonic). The same problem is existing in motor driven potentiometers, which are often used for remotely operated devices.

High quality electronic regulators, which are used in amplifiers controlled by voltage VCA (Voltage-Controled-Amplifier) have in case of careful design usually do not have problems with reliability, even after years of use. Their main flaw is dynamic range limit and, comparing to highest quality electronic components, relatively high level of distortion. The distortion is occurring mainly at large level differences, between input and output of level regulator and with predominant 2-nd and 3-rd harmonic, depending from circuit technique used.

Level regulators with electronically controlled integrated circuits usually also do not have reliability problems. In simple circuits however, distortion containing 2-nd harmonic often arises, in addition to limited dynamics and reduced level resolution.

Level regulator used in MTX-Monitor.V3b-4.2.1

MTX MONITOR contains highest quality switching components for analog level adjustment available today. In signal path they work in purely analog way, however, they are digitally controlled by separate microprocessor. Besides the level, balance adjustment is realized in the same amplification stages. In order to optimize resolution of level regulator for each channel 4 switching circuits are used, working in cascade mode. Not only internal resolution was improved to 0,125 dB for each level stage, but also dynamics is almost doubled comparing to similar circuits.

The 300° Volume Potentiometer for setting gain works as DC voltage with 40 steps potentiometer. At the end, DC voltage obtained here will be converted to digital format in A/D converter and recalculated by main processor to appropriate level value for each channel. Digital window comparator prevents uncontrolled switching between two level values, if the level regulator is exactly between two digital level values. The data will be sent then either directly to MTX-MONITOR main board or through remote control connector to level processor. Here follows required control of analog switching circuits. Simultaneously, in case of sudden turn of regulator there will be no sudden level jump in amplifier. Processor will be performing many small steps from current to demanded level (some milliseconds), preventing so called „zippernoise" clicks this way.

In order to control level setting, incremental turn encoders were purposely dropped from design, because they do not give good adjustment feel and can not provide any straightforward information about set level. Technique used in the MTX MONITOR improves access time to defined amplification level in comparison to incremental turn encoders or values input from keyboard. Very fast realization of exact volume settings is possible, similarly to amplifiers equipped with passive potentiometers.

Cons of switching technique used in MTX Monitor are :

1. space requirements
2. high switching expenditures
3. expensive components
4. need for more power
5. complex control by a separate microprocessor

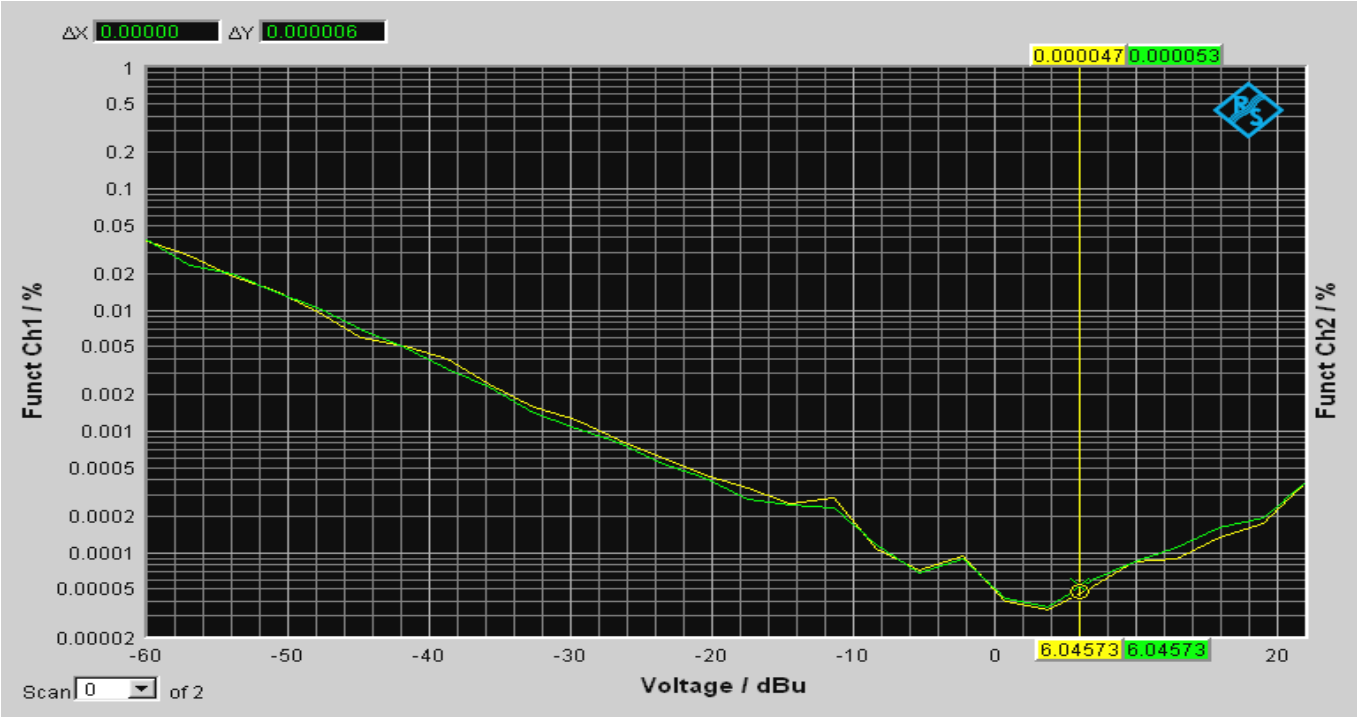
Pros of this technique are :

1. very low distortion
2. high dynamics
3. excellent sound uniformity
4. highest reliability also after many years of operation
5. excellent feel of regulators
6. straightforward information about set gain
7. lack of noises during adjustments
8. almost any unrestricted characteristics defined by firmware
9. Possibility of balance adjustment integration without expansion of analog circuit
10. Possibility of remote controlling of level and balance

Additional advantage of electronic level regulator is exact conformance between both audio channels. In typical regulation range of +6...- 60 dB deviations of level are only about < 0,05 dB. Even at very low level settings of -80 dB excellent deviation values of typ. 0,1 dB are still obtained. Dynamic range of level regulator at uniform gain (input level = output level) is in excess of 130 dB (20 Hz...20 kHz eff. unweighted).

This diagram shows exceptionally small non-linearities, separately for each channel, at uniform gain [0 dB] at different input levels from -60...+22 dBu of MTX-Monitor.V3b-4.2.1.

Lower scale shows level, right scale shows corresponding THD distortion levels calculated from harmonic k2..k9 in %. In gain range of -8...+10 dBu THD values of both channels lie below 0.0001%! Even at signals as low as -60 dBu, which correspond to the quietest, almost inaudible passages of symphonic orchestra, total THD distortion equals only 0,04%. Minimum lies at input signals within level range of 0...+6,0 dBu (circa 1,55 Volt), marked with cursor, of values 0.00005%. In digital audio devices such values are unreachable up to this day. In most amplifiers used for Hi Fi such test show distortion 10 to 100 times greater. Even UPV Rhode & Schwarz audio analyzer used for the test and which belongs to the best measuring devices used for such measurements, almost reaches limits of it's resolution here. Steps on diagram curve were created due to automatic analyzer switching to another range and are not caused by MTX-Monitor.



Mass concept in MTX-Monitor.V3b-4.2.1

Main requirement for exceptional input channels separation of MTX MONITOR reaching over 120 dB at 1 kHz is unique conception of extraordinary mass concept (ground) of the device. In other designs interference currents and unused inputs are most often shorted to ground. Such interference signals are left on circuit boards even if the thickest tracks and largest shielding surfaces are used. The result is partially audible crosstalk and additional distortion components.

In MTX-Monitor we have entered the entirely new way to defeat this problem in significant degree. Interfering currents and parts of signal from sources that were not chosen are not shorted to ground, but are led to separate, virtual „Dummy-Mass", which has no ohm connection to audio ground. Even relatively large currents, signal currents in headphone amplifier are not led, as usually it happens, to audio ground. Those currents are caught by active, virtual ground and by backset voltage disposed by power supply. Without such switching technique so high channel separation obtained on small area is difficult. Improvement in comparison to typical designs is about by 10 times.

Additionally significant effort was put into power supply of the device to prevent those small interferences from entering the audio ground of the device. Integrated power supply produces exceptionally stable and clean power voltage (hum and noises of power voltage are equal to 30 µV at full load!). Digital control units have own power supply and own ground. „Ultra-Low-Drop" circuits for all power voltages cause only very low energy emission in the device. Despite high level of technical advancement and digital level control MTX-MONITOR has only 13 Watt of power consumption. It is environment friendly and has positive influence on longevity of the device.

Phase purity in MTX-Monitor

MTX-Monitor has several functions, that are just not met in typical „High-End" amplifiers, which are however essential in sound editing or recording studio. Such a function is eg. phase reversal. Theoretically the signal will be attenuated when it is mixed with another identical signal with same level, but reversed by 180°.

In MTX-Monitor that function is executable by simultaneous pressing Mono button and phase reversal button. In case of mono signal level will drop then by around typ. 60 dB (depending on uniformity of level in both channels of signal source's). Besides in such conception of sound test, relative phase characteristics of both channels have influence on sound frequency characteristic.

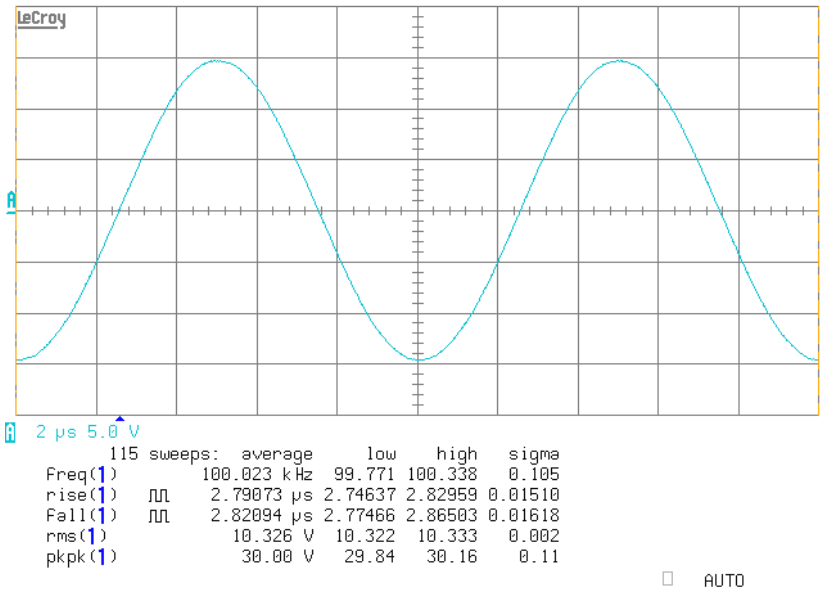
With help of this function level irregularities of signal source can be quickly recognized (the bigger attenuation the better channels uniformity) and the less sound difference between this test function and normal working mode, the cleaner is relative phase characteristic of sound source. If sending device generates level differences between left and right channels and outputs of this device can be aligned using this function, it is possible to align levels without any special measuring devices only by monitoring using this function (set to minimum level in this function!

Exceptionally small phase reversal of the MTX-Monitor, below 0,5° between left and right channels and exquisite level compliance between left and right channels as well with typical value of 0,01..0,02 dB allow for those amazing tests of connected audio devices.

Frequency response of MTX-Monitor.V3b-4.2.1

The MTX-Monitor has typical frequency response from 1 Hz...500 kHz +/- 1 dB. Therefore even exceptionally short transients with very high amplitude will be purely reproduced and will not exceed amplifier's capabilities. Thanks to very fast amplifier stages transient intermodulation distortion (DIM) are practically non-existent.

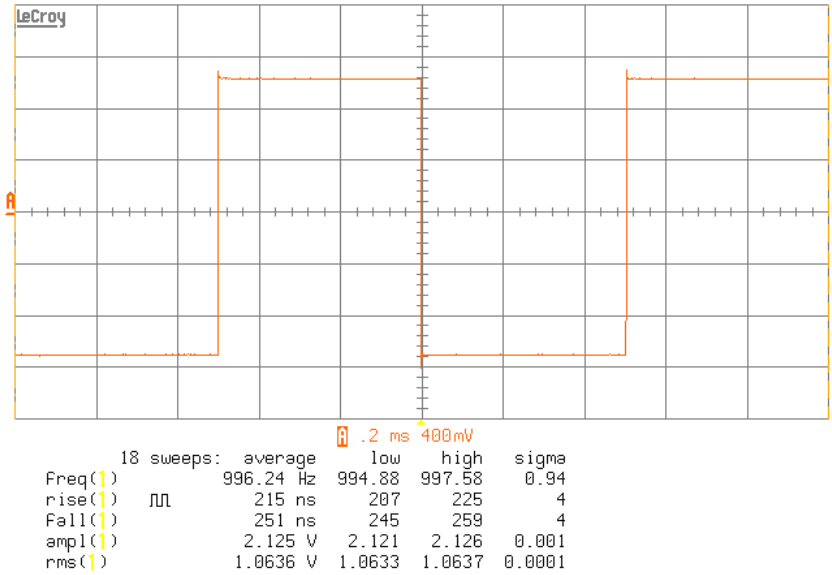
Test signal diagram 1: High-signal frequency response of MTX-Monitor. Sinusoidal signal 100 kHz about 10 V RMS or 30 Vpp (corresponds to about +22 dBu signal level). Even sound signals of highest levels and highest frequencies much above human hearing possibilities are reproduced by amplifier with unchanged shape. This diagram shows, that preamplifier is absolutely compatible with the analog output of newest digital signal sources, equipped with sampling frequencies of up to 192 kHz.



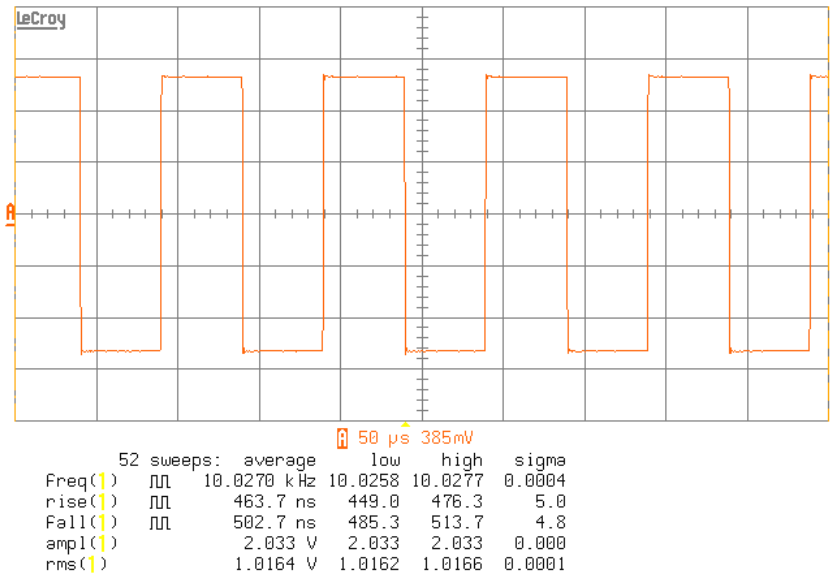
AMPLIFIER PATHS :

The device is equipped with very wide range amplification paths, that ensure exceptional and uniform phases of signal response. This is clearly proved by measurement results showed below. MTX-Monitor was fed by square wave produced by impulse generator at 0 dB gain (input level = output level).

Test signal diagram 1: 1 kHz at about 2 V level (between top to bottom) using typical load resistance of 10 kΩ. On basis of almost invisible slope wide frequency response and clean phase characteristic in bass area can be recognized.

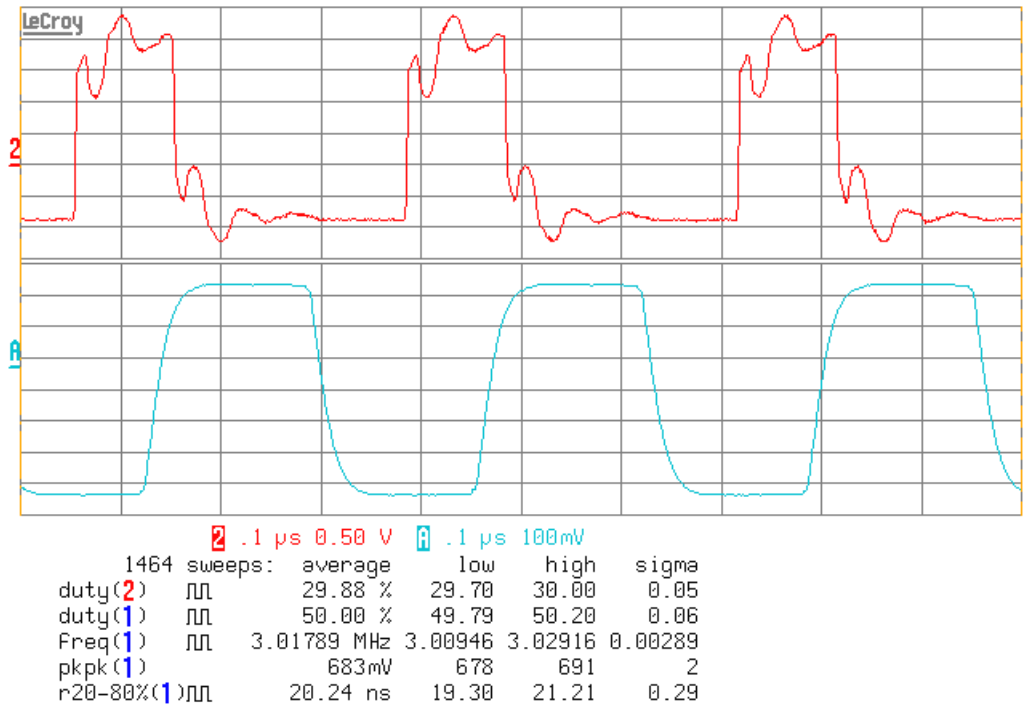


Test signal diagram 2: 10 kHz at about 2 V level, between top to bottom. Oscilloscope load resistance in this measurement 50 Ω. Very gentle slopes indicate wide frequency range and very small phase reversal of MTX-Monitor.V3b-4.2.1 in high frequency range. Even fastest impulses will be exactly reproduced!



INPUT AND OUTPUT AMPLIFIER :

AMS-2 DAR and **PAS-8** are designed not only as record signal switches but first of all as high quality Monitor Matrix working in conjunction with external D/A converter. To ensure required high sound quality all the outputs of this router work with automatic "Duty-Cycle" regulation (positive and negative impulse areas will be equal). Thanks to that constant bit width (sampling ratio) will be maintained, also in case of very different input levels and different attack and decay times of signal fed on input. This applies also to Insert path in PAS-8.



Above diagram illustrates the way „Duty-Cycle" regulation is working in. Upper red curve shows definitely wrongly matched input signal with additionally sampling proportions shifted in 30/70 ratio, (top row of the measured values). Signal level is about 3,5 Vss. Lower blue curve shows clean output signal corrected by PAS-8 (AMS-2 DAR), with sampling proportions (Duty-Cycle symmetry) of typical value of 50 % (2. row of the measured values) !

Clearly visible are well defined, free of oscillation attack and decay times as well as latency time between input and output. Latency time for monitor path from input directly to the output equals about 60 ns (nanoseconds) and about 70 ns for record path. At Insert in PAS-8 activated another 30 ns is added. Thanks to those exceptionally short latencies operation with synchronized network studio devices is possible.

All the amplification paths are optimized for modest jitter.

CREATING INSERT FUNCTION :

MTX-Monitor does not have INSERT PATH for external devices for temporary inserting into monitor path.

Such function, however, can be created with small limitation as long as only 7 inputs will be needed and record path will not be necessary, or necessary briefly.

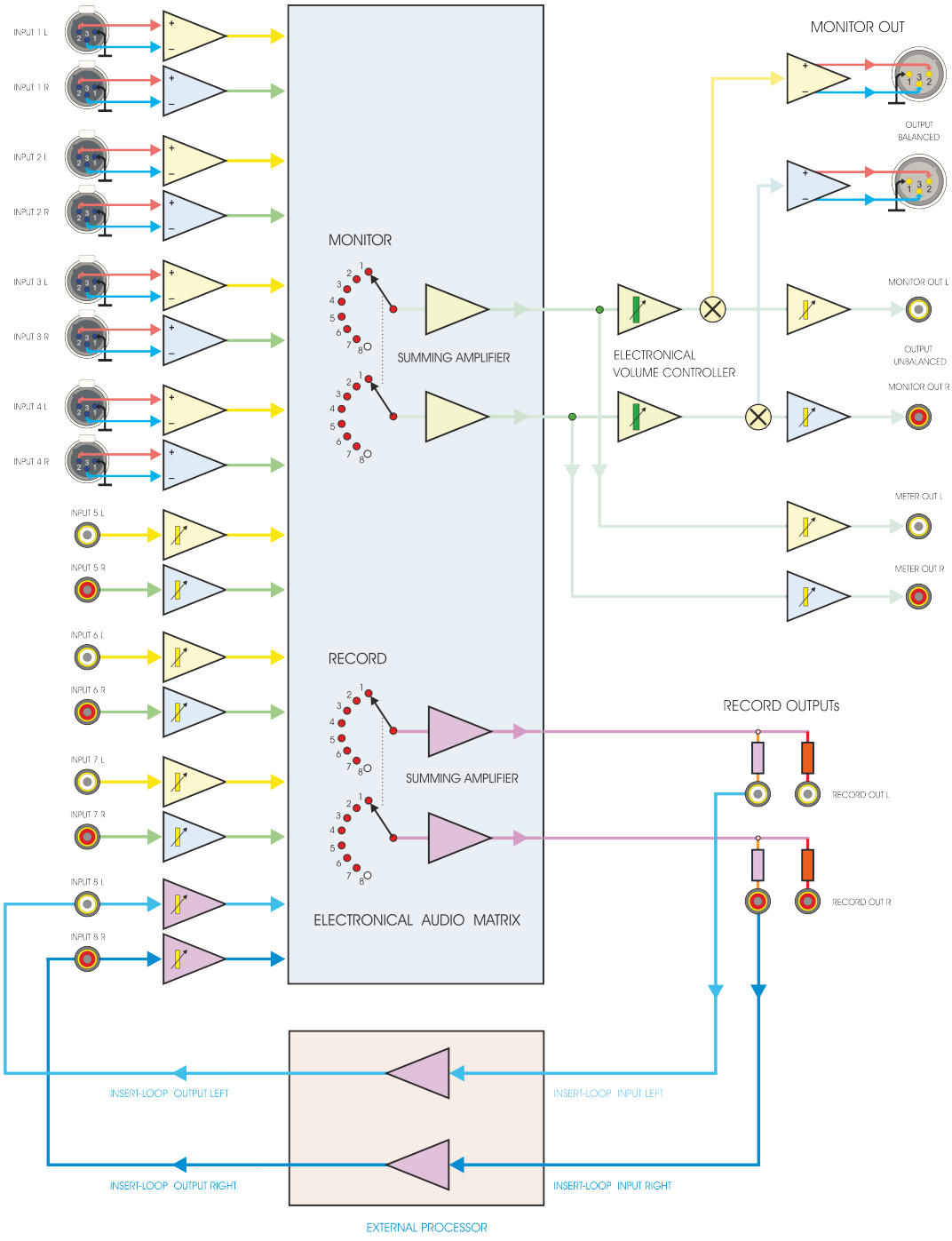
Below picture shows example of connecting external sound processor. Inputs 1...7 will be used normally as inputs for 7 devices. The 8-th input will be fed with output signal of the device included in loop (sound processor in this case). Input of this external device is connected to any record output (Record-Out) of MTX-Monitor, like it is illustrated on picture below. Signal path for external sound processor is shown in blue or violet. Now input 8 is not allowed to be used in record path!

WORKING MODE :

To choose signal for sound processor depress Record and chosen input buttons simultaneously. Each signal that is to be processed by sound processor will be monitored by monitor input 8.

Example: if a CD player's signal connected to input 2 of MTX-Monitor is to be monitored unchanged and also processed by external sound processor, then for Record path input button 2 should be depressed. This way the signal from CD player will be fed to sound processor's input. Then, the signal changed by sound processor can be monitored by switching MTX Monitor's monitor path from input button 2 to button 8. Switching to button 2 again brings back the CD player to direct signal path without sound processor.

SIMPLIFIED BLOCK DIAGRAM



NOISE LOOPS :

Hum and noise are often generated not only as result of interference with electrical or magnetic fields. Differences in ground potentials between connected devices e.g. due to double ground connection, create „noise loops". They can cause significant interference currents, especially when low impedance shields are used for connecting the devices. Those currents depending on system configuration generate noise voltages which adds to already distorted audio signals. This can be remedied by using symmetrical connections.

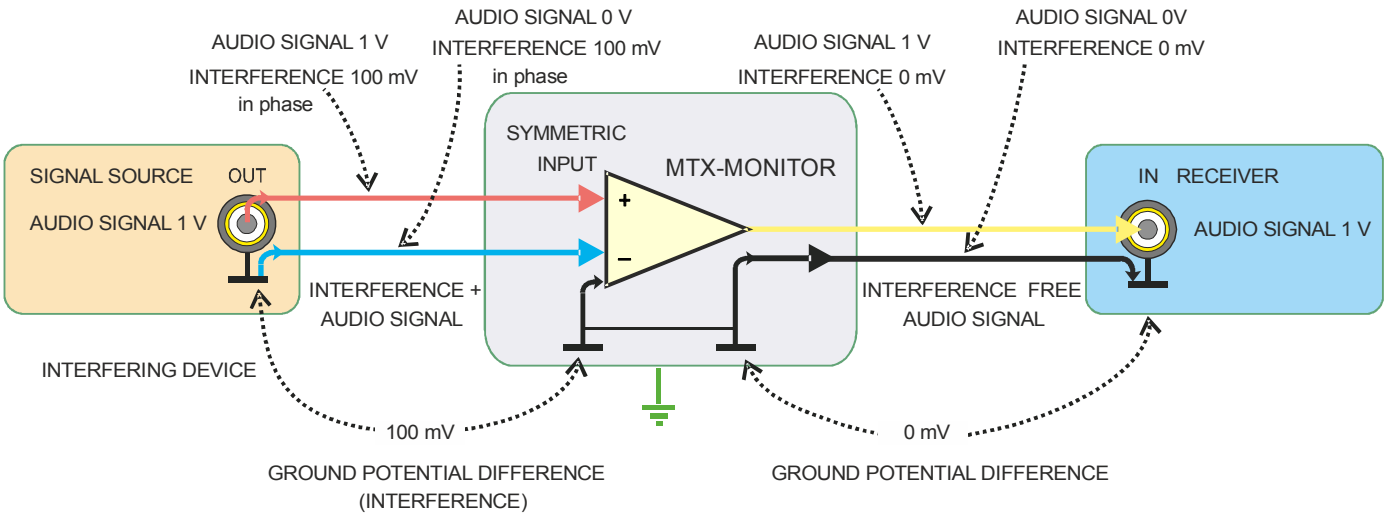
Noise loops in asymmetric switching circuits:

Real problem solution lies only in splitting this ground connection loop and use of audio transformer or special differential amplifier.

On diagram below influence of separation within the noise loop asymmetric intermediate wiring is shown by connecting symmetric intermediate amplifier input (differential amplifier input 1..4 of MTX-Monitor or, for example differential amplifiers SAM-1Bs/SAM-1C or SAM-2B/SAM-2C).

Differential amplifier or hi-ohm „instrumentation amplifier" ideally take into account only the difference between the two inputs. If both inputs are connected to each other and then time modulated, no signal will arise in this way at the output. If only input's minus - will be connected to ground or to shield of sending (feeding) device and then input's plus + to hot input of the signal output, both symmetrical inputs of receiving device will be modulated common phase with interfering signal 100 mV. Input signal, however will remain equal to 0 Volt, because there is no electric potential difference between input's + and -.

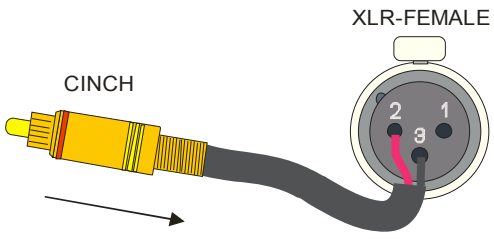
If then sending device's output with amplitude of 1V will be modulated, difference of 1V will still exist on symmetrical input of SAM-1C/SAM-2B, but without hum voltage. This rule also applies when the two cores (blue and red) will be exchanged with each other. Only phase of electric outlet signal would be changed by 180°. Thus equalizing of phase reversal is possible.

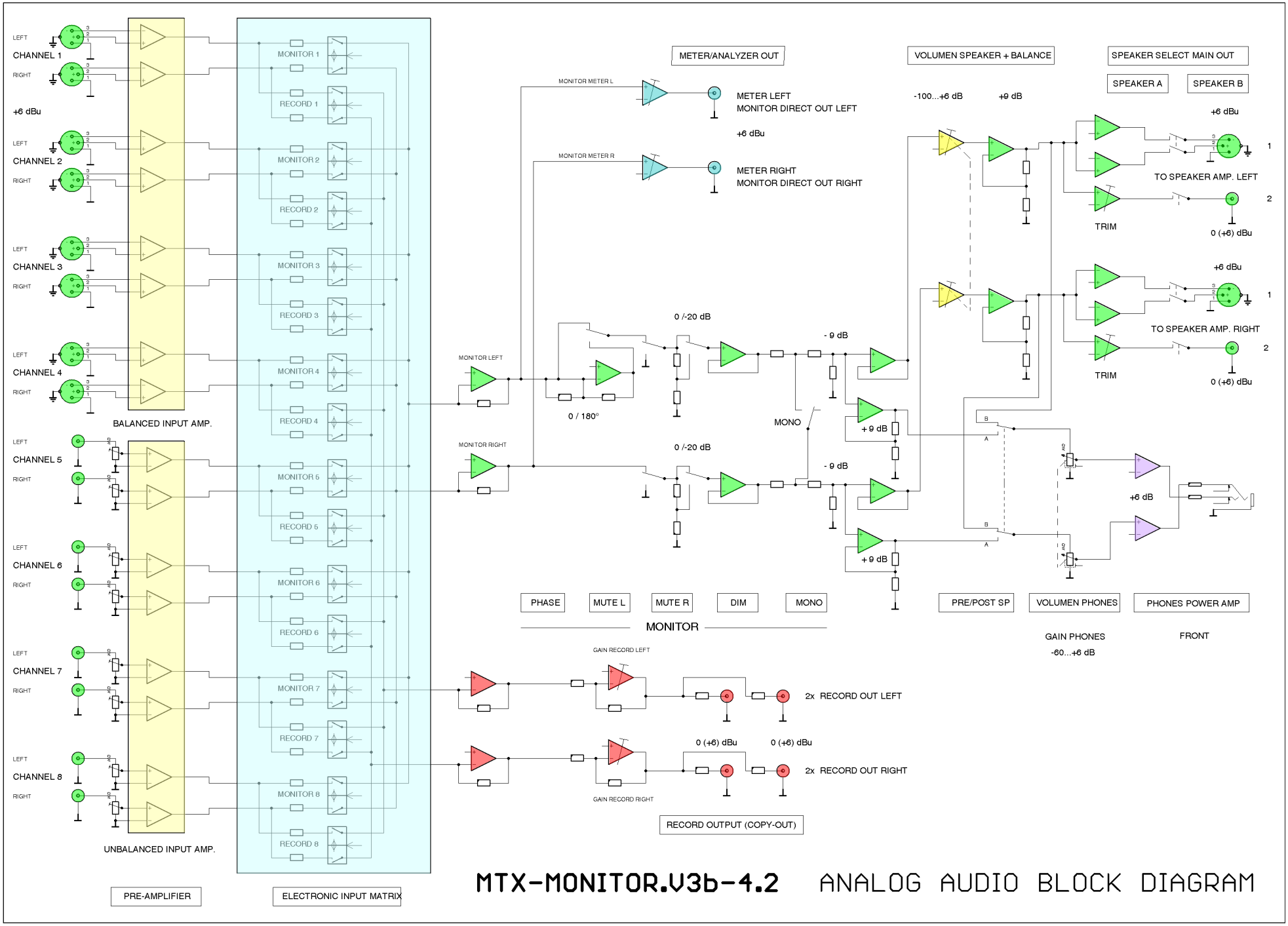


No differential amplifier works ideally. Typical circuits reach about 1/1000...1/10 000 (60..80 dB) of interference signal muting. Interfering signal given in our example will be reduced from 100 mV to 0,1...0,01 mV.

In MTX-Monitor case (grounding or earth wire potential) and zero of the audio circuit ground are separated from each other and do not additionally cause risk of arising noise loops.

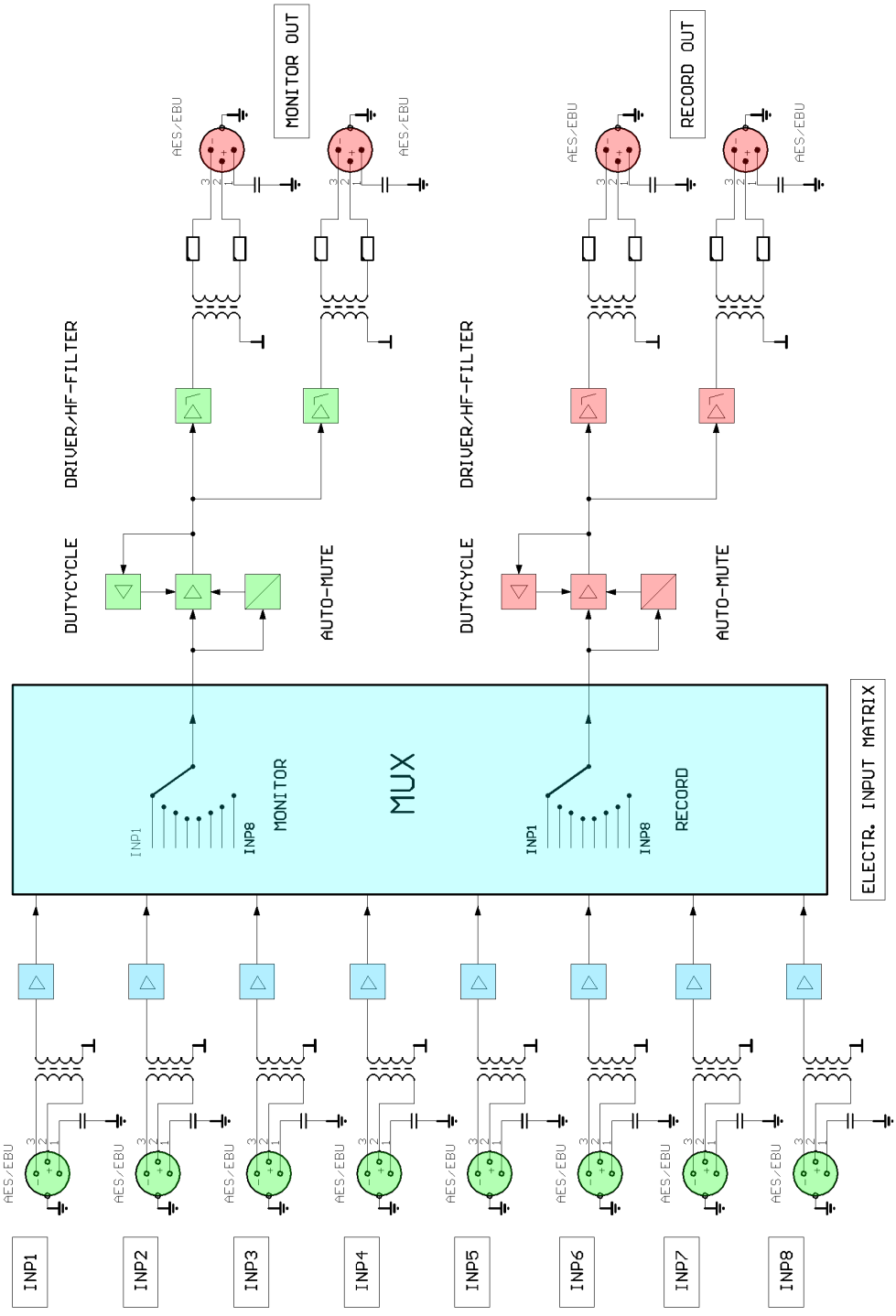
Picture besides explains practical way of connecting interfering asymmetric signal sources with symmetric MTX-Monitor's input. Pin 1 remains open here and pin 3 is connected to shield.

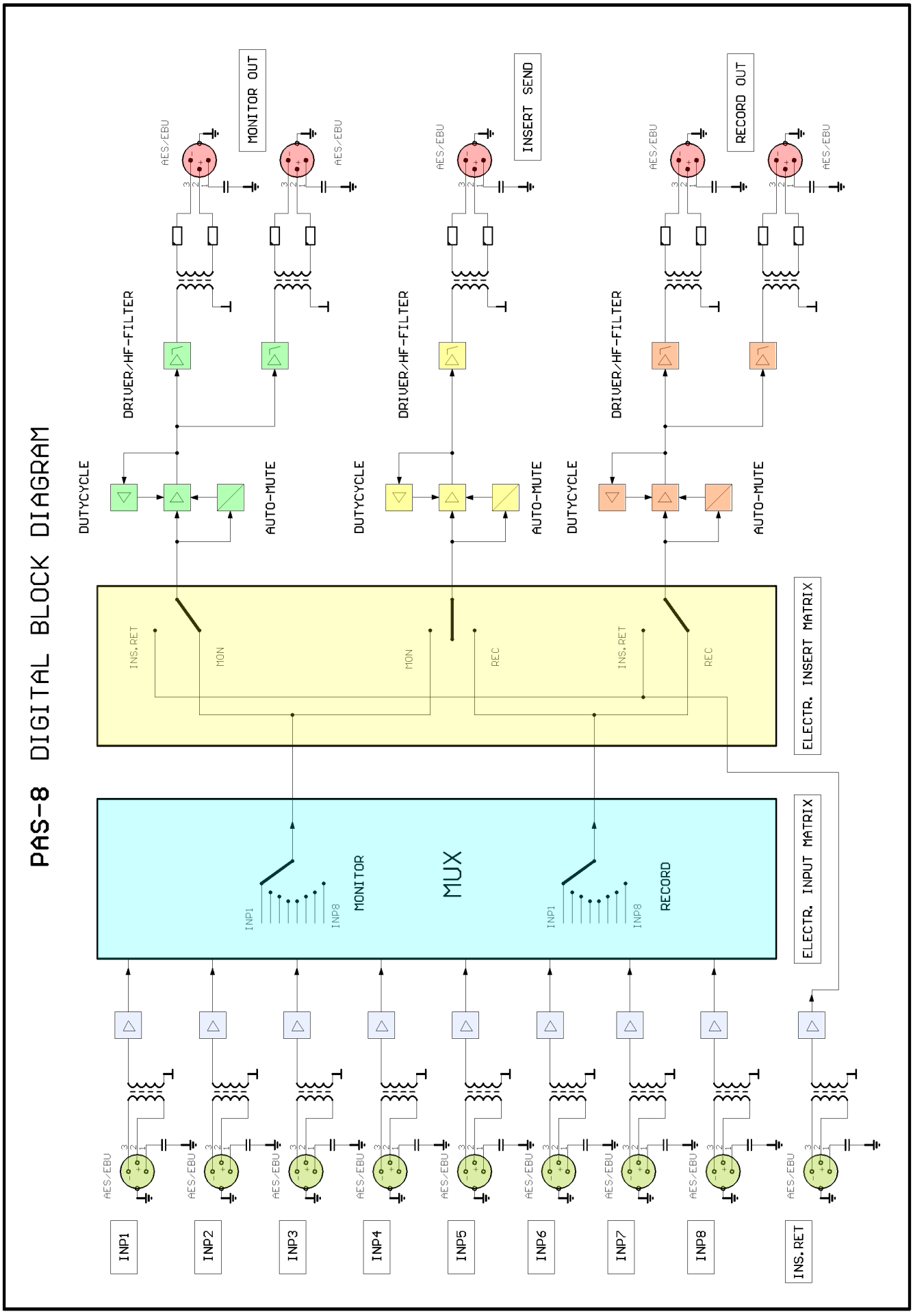




MTX-MONITOR.V3b-4.2 ANALOG AUDIO BLOCK DIAGRAM

AMS-2 DAR DIGITAL BLOCK DIAGRAM



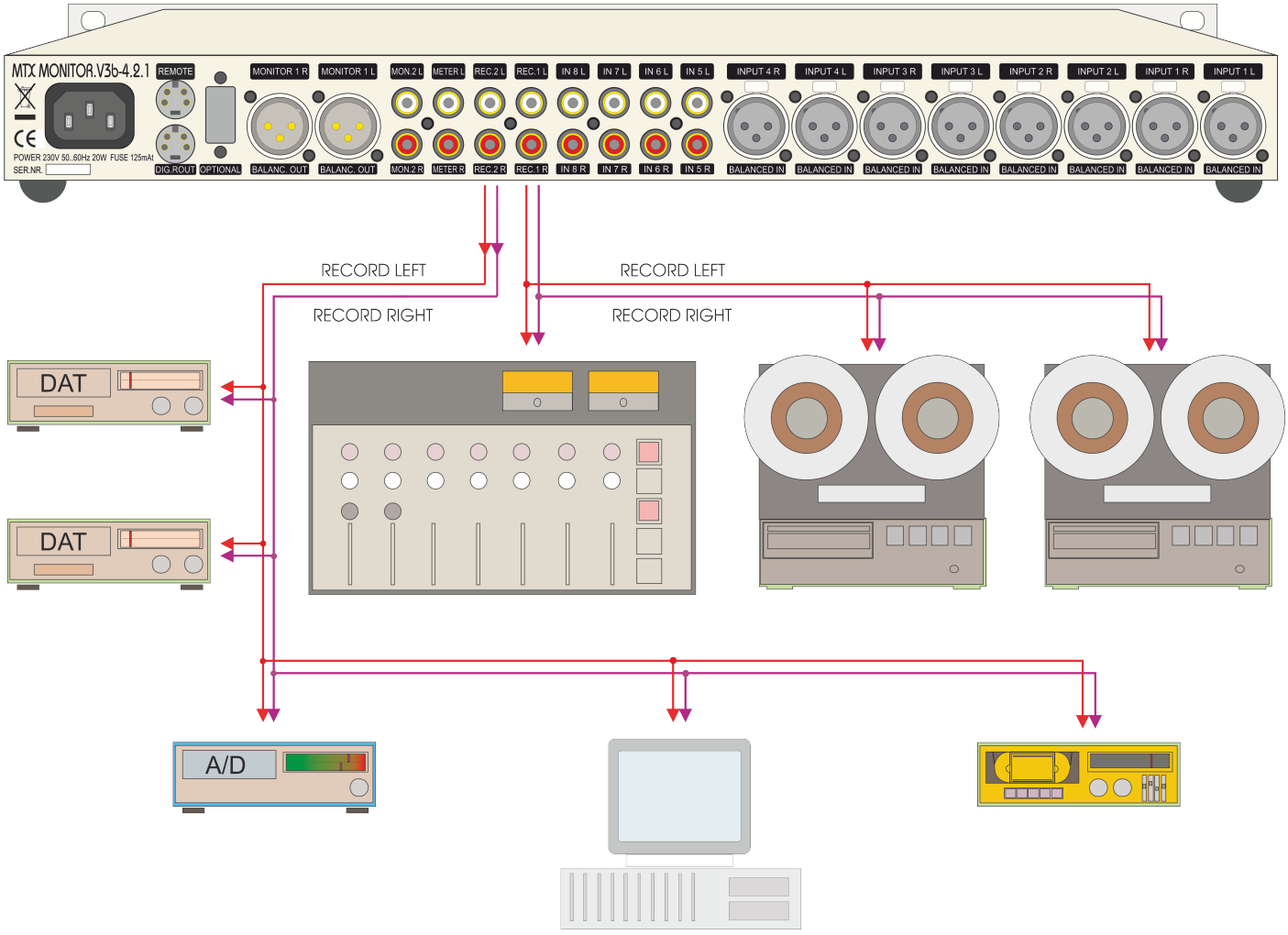

PAS-8 DIGITAL BLOCK DIAGRAM
INP1
INP2
INP3
INP4
INP5
INP6
INP7
INP8
INS.RET
AES/EBU
MUX
MONITOR
RECORD
INP1
INP8
ELECTR. INPUT MATRIX
ELECTR. INSERT MATRIX
INS.RET
MON
REC
DUTYCYCLE
AUTO-MUTE
DRIVER/HF-FILTER
MONITOR OUT
INSERT SEND
RECORD OUT

ANALOG RECORD PATHS WIRING SUGGESTION

Picture below shows a proposition of simple connection for analog copying (Record-Matrix). Inputs of connected device can be connected with record outputs 1 and 2 of MTX MONITOR using Y cable. Buffering amplifiers are not necessary when short connections are used and proper ground wiring.

In such configuration it is possible to make copies from each source on every receiver. Expansion of signal for copying can also be done by external patch panel with splitting plug. Various recordings are then simultaneously possible. In large installations active splitting amplifiers are recommended, such as SAM-2B/SAM-2C or SAM-1Bs/SAM-1C.

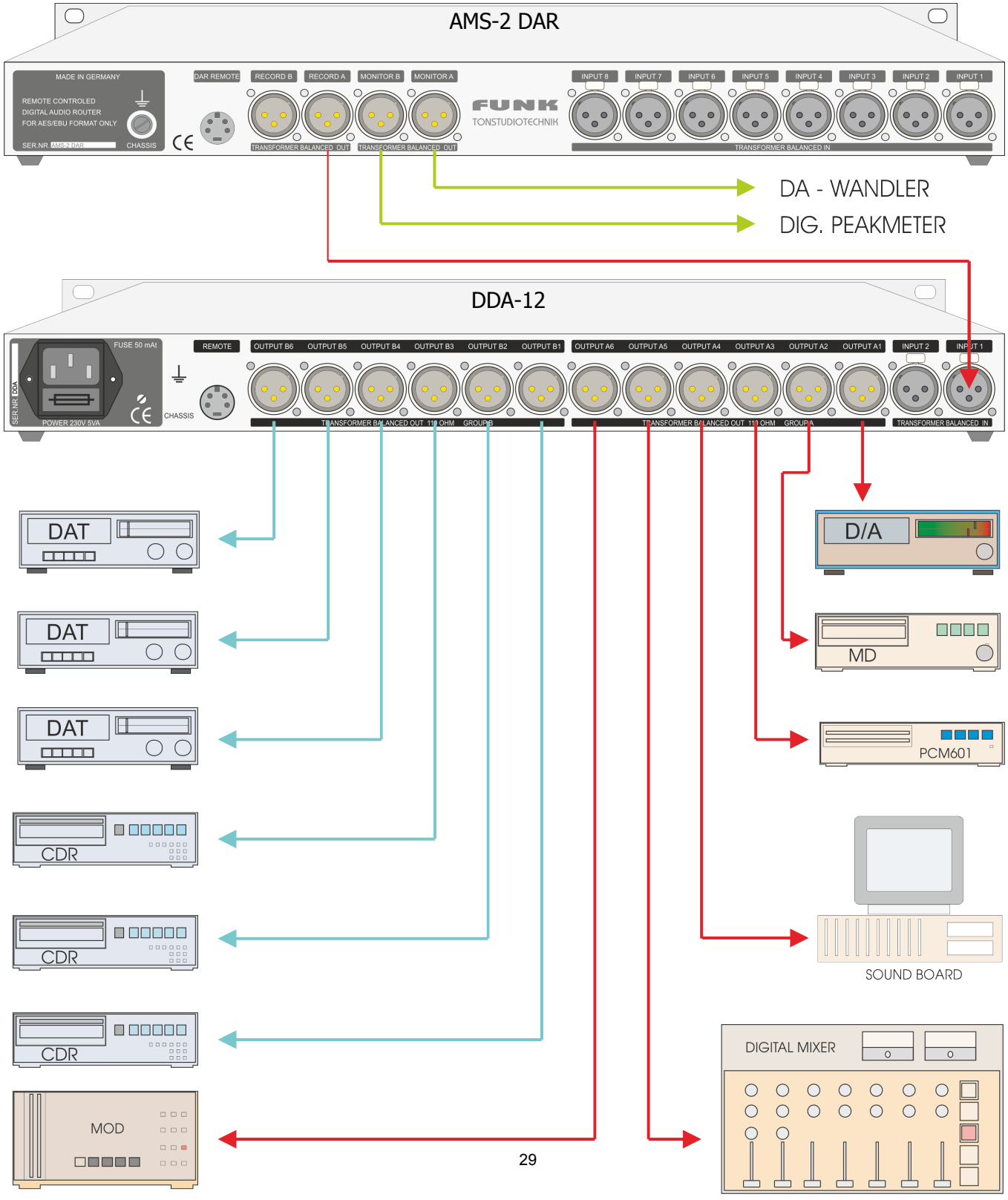
If wiring for copying should be symmetric, various versions of symmetric amplifier can be used, SAM-1C or SAM-2C. By including in path the SAM-2C/10v0, for example, 5 symmetric stereo record outputs are available, which can work with different output levels, if needed.



DIGITAL RECORD PATHS WIRING SUGGESTION

Picture below shows simple wiring proposition for copying (Record-Matrix). Because AES/EBU (AES-3) signals can not be simply divided in parallel to different receivers, in case of more then 4 digital receivers using AES/EBU dividing amplifier is recommended. As example on picture below, DDA-12 dividing amplifier is used in conjunction with AMS-2 DAR router.

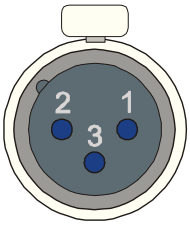
In such configuration copying from each source to each receiver is possible. Thanks to switching possibilities of DDA-12 as one possibility signal can be fed to input 2 of DDA-12 instead of to D/A converter or digital peak level meter. This way digital monitor or record signal can serve as record source. Simultaneous copying to various receivers from chosen digital monitor or record signal will be possible then.



CONNECTION ASSIGNMENT

SYMMETRIC ANALOG INPUTS

XLR-FEMALE

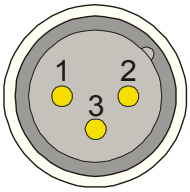


All the symmetric inputs are equipped with NEUTRIK-**XLR-FEMALE** sockets with gold-plated contacts. Wiring is typical for professional application. (refer to picture).

Protective earth connection (case) and audio working ground in MTX-MONITOR are separated from each other. To avoid noise and hum loops by switching zero wire (pin 1), shield should be connected to housing of XLR plug only. Otherwise, interfering currents present in pin 1 can cause voltage leakage on internal audio boards, which in adverse circumstances can be heard as hum.

SYMMETRIC ANALOG OUTPUTS

XLR-MALE

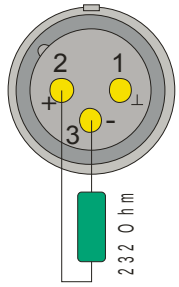


All the symmetric outputs are equipped with NEUTRIK-**XLR-MALE** sockets with gold-plated contacts. Wiring is typical for professional application. (refer to picture).

Protective earth connection (case) and audio working ground in MTX-MONITOR are separated from each other. To avoid noise and hum loops by switching zero wire (pin 1), shield should be connected to housing of XLR plug only. Otherwise, interfering currents present in pin 1 can cause voltage leakage on internal audio boards, which in adverse circumstances can be heard as hum.

SPDIF SIGNALS FED ON SYMMETRICAL AES-EBU INPUTS

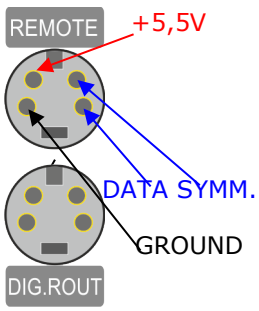
XLR-STECKER



If SPDIF signal is led to XLR AMS-2-DAR or PAS-8 inputs, impedance should be aligned by including parallel 232 Ω resistor between pin 2 and pin 3 in corresponding XLR plug. Thanks to this the input will be matched to wave impedance of 75 Ω. „Hot" wire from incoming cable will be connected with pin 2 and shield with pin 3 and 1 of XLR plug. Accompanying picture shows soldering side of XLR plug.

Ready cable adapter with matched impedance is available in various lengths: as **CASA** cable – for Cinch to XLR-male connections or **BASA** cable from BNC to XLR-male. **CASA-T** and **BASA-T** has the same function but with integrated puls transformer to avoid hum loops (for transformerless inputs).

MINI-DIN - SOCKET WIRING

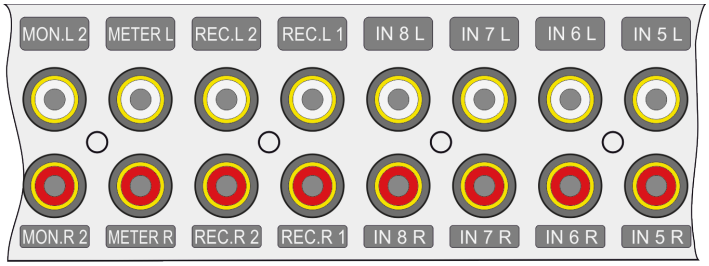


Wiring of remote control unit's socket and power socket for external AMS-2 DAR or PAS-8 signal switch is the same. Picture on the left shows plug's view from soldering side. Common shield is connected to pluck housing.

As cable width 0,14 mm^2 is adequate for each wire. At lengths above 15 m powering wire width (ground and +5,0 V) should be increased to 0,22 mm^2 . Lengths up to 50 m are available.

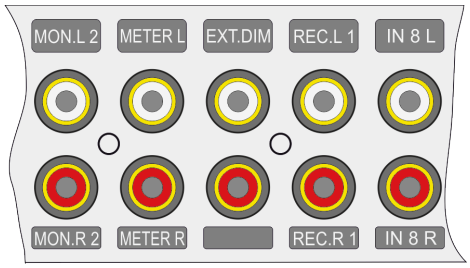
CONNECTION ASSIGNMENT

ASYMMETRIC ANALOG INPUTS/OUTPUTS



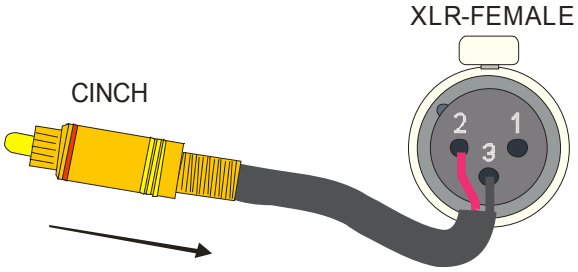
In MTX Monitor's inputs and outputs wiring shields of signal wire have to be soldered to Cinch plug housing. Besides, attention should be payed in order to avoid possible noise loops caused by another existing wiring or caused by connecting various devices housings (ground loops). It recommended to disable unused inputs by plugs with internal bridge between signal and ground wires. Our AS-75 connector with integrated 75-Ω resistor are ideal for this.

OPTION „EXTERN DIM"_

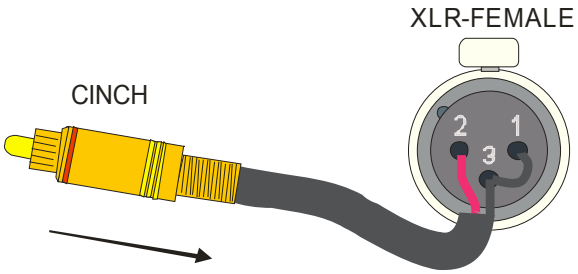


„EXT-DIM" Option allows for activation of internal Dim function of MTX Monitor by eg. external controlling device. Output Record 2 is excluded then. Upper Cinch socket, (with white marking ring) serves for controlling this function. Lower Cinch socket (red ring) is not connected. It is possible to use both shielded and non-shielded cables, because this connector is used only for controlling function.

ASSYMETRICAL SIGNAL SOURCES



If any devices with asymmetric Cinch outputs are to be connected to symmetric inputs of MTX Monitor, optimal way of connecting is showed on picture beside (shield to pin 3). If between sending device and MTX Monitor there is ground connection already, then little ground potential differences will be aligned by symmetric input of MTX. No ground loop arises, which often could lead to hum problems.

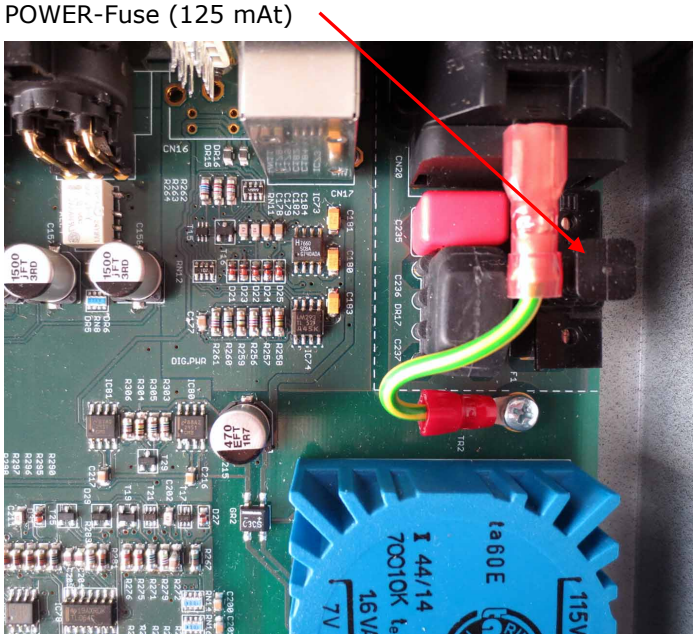


If there is no ground connection between sending device and MTX Monitor then usually best is another connection technique showed on picture. Thanks to connection between pin 1 and pin 3 sending device gets constant ground reference to monitoring device.

In extreme cases including in path symmetric amplifier could be favorable. In such case we recommend the SAM-1C or SAM-2C, which are available in many versions.

POWER SUPPLY :

POWER-Fuse (125 mAt)



Housing and zero potential of audio circuit of MTX-Monitor.V3b-4.2.1 are separated from each other. Interfering currents from 19-inch rack or protecting wire do not reach the electronic audio circuit of the device. Thanks to that it is possible to use the device with various ground use solutions.

Zero potential of audio circuit and housing of the device are internally interconnected with each other by 0,1 µF capacitor, parallel with 1,1 kΩ resistor. For high frequencies low ohm connection is created as shield for high frequencies. From other hand, no ground loop caused by electric outlet frequencies and their harmonics arise.

The device works with no problem also within high fluctuations of power voltage between 195..245 Volt AC current.

The commercial fusion power fuse is located close the unit after the power input jack on the right side. The fuse holder can be removed with bare hands up and replaced in case of damage. In case of replacement use only 125 mAt / 250V (time delay) 5x20mm fuse.

All the stabilized voltages of integrated power supply are short circuit-resistant and work with electronic fuse.

EMBODIMENTS MTX-MONITOR.V3b-4.2.1 and ACCESSORIES:

MTX-Monitor.V3b-4.2.1 is available as well with +6 dBu level on all the inputs and outputs.

Configuration „2M" allows for simultaneous monitoring through both speaker groups. Asymmetric „ALT-SPK" can be then connected or disconnected from symmetric output ("2M" is internally adjustable).

As „MONITOR MTX.V3b-4.2.1 **TV**" the device is available with changed monitor functions and working level of +6 dBu on all the inputs and outputs (refer to „Special Functions" and Technical Parameters" chapters). This version of **TV** is available with 19" front panel only, finished in white (RAL7035) or black (optional).

As normal 19" version the device is available with front panel finished in white, black and silver anodized, as well as HiFi version finished in black and silver.

All the MTX Monitor versions are also available with additional, externally controlled **Dim function**.

MTX-Monitor.V3b-4.2.1 is available in two power supply versions: 230V/50 Hz or 115V/50..60Hz. Switching to alternate voltage can be done only at factory.

DIGITAL ROUTER:

MTX MONITOR can be interconnected with **AMS-2 DAR** or **PAS-8** digital router. PAS-8 contain additional INSERT function (only be switched on PAS-8) and allows for simultaneous input choice both from Remote unit and PAS-8. The Routers are configured only for AES/EBU formats. Inputs and outputs are realized on XLR sockets and equipped with impulse transformers. Thanks to it's integrated self-sufficient construction, the PAS-8 can be also used as stand-alone unit.

REMOTE CONTROL:

Remote control unit is available in two finish versions.

1. MTX-REMOTE.V3a: White housing, white front panel (RAL7035), special thin 2,8 mm remote control cable.

2. MTX-REMOTE.V3a/SE: Nextel – covered housing in dark-gray, black front panel, special thin 2,8 mm remote control cable.

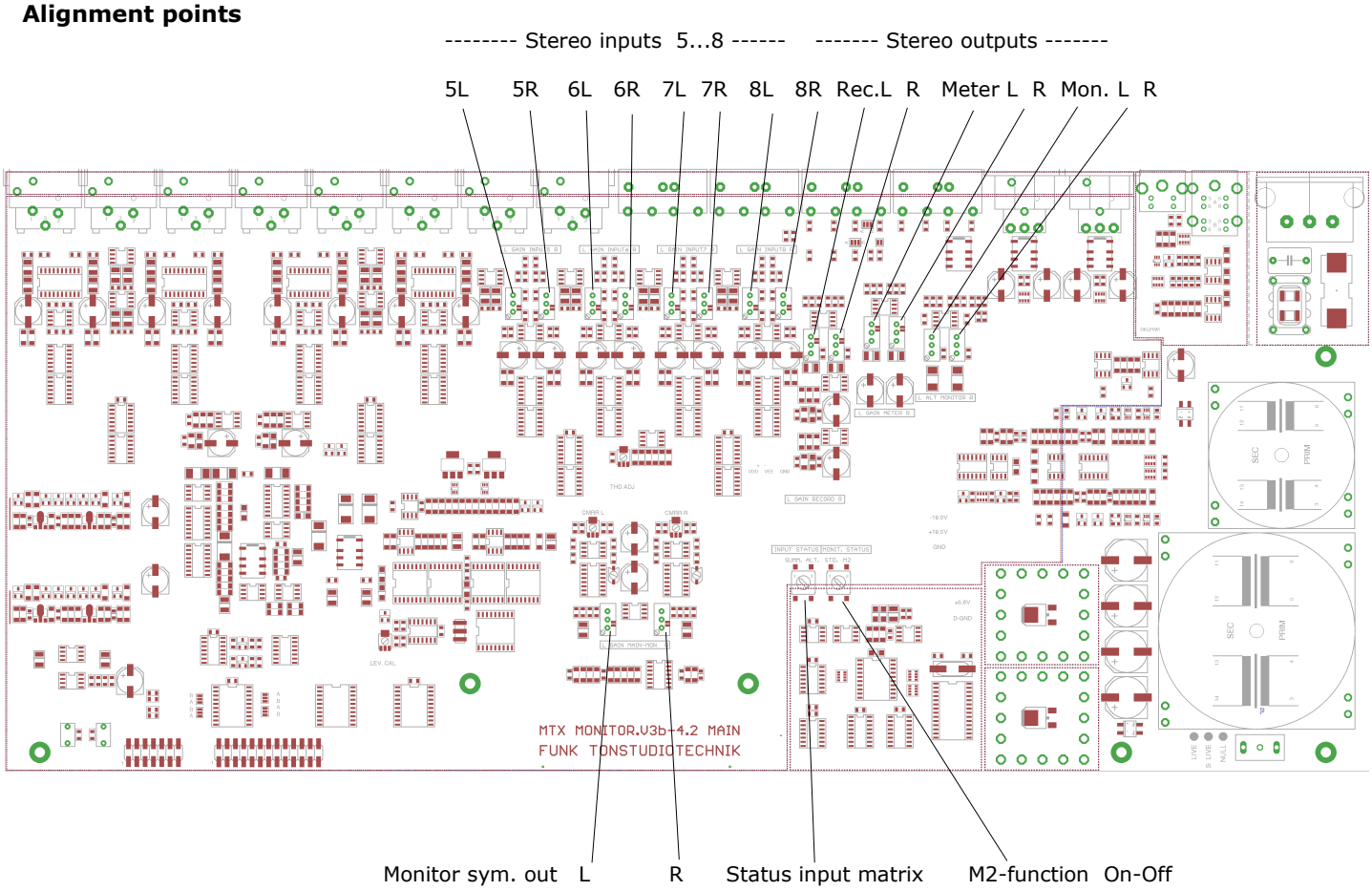
Standard remote cable length is 8,0 m. As option, lengths of up to 50 m are available.

INPUT/OUTPUT LEVEL

If another than factory preset working levels are needed on asymmetric Cinch sockets, they can be changed by 25-gear trimmer placed on main board.

After unscrewing 10 upper Philips size 1 screws the cover can be removed from housing.

Alignment points



working range inputs 5..8 :	-6 ...+9 dB	relative to initial setting
alignment range outputs RECORD 1 and 2 :	-40 ...+6 dB	relative to initial setting
alignment range METER/DIREKT OUT :	-40 ...+0 dB	relative to initial setting
alignment range MONITOR 2 asym. :	-24 ...+6 dB	relative to initial setting
alignment range MONITOR 1 asym. :	-0,2..+1.8 dB	relative to initial setting

Levels for inputs and outputs are adjusted by gray multi-turn trimmers. Turning them clockwise gain for corresponding input/output is increased. All values are for standard version. Level alignment should be done only by qualified personnel with use of precise voltage meter for audio frequencies.

Die angegebenen Einstellbereiche gelten nur für die Normal-Versionen. Attention ! The TV versions have different adjustment ranges.

Attention !

4 small SMD trimmers (4x4 mm) can not be re-adjusted under any circumstance. They are aligned exclusively with use of precision measuring devices of very high resolution and they have no influence on levels in the unit!

OPERATING MODE ANALOG INPUT ROUTER

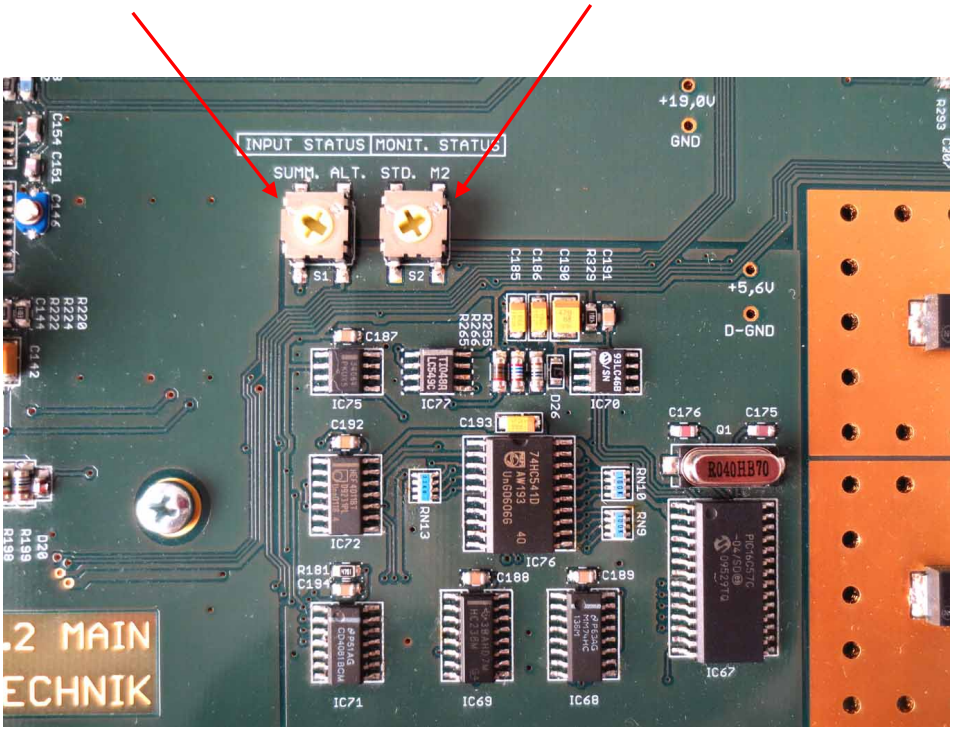
The operating mode of the analog monitor / dubbing matrix can either be selected only alternatively or alternatively and cumulatively (default). This function can be switched inside the device. The provided rotary switch located in front on the motherboard and is lettered "INPUT STATUS" (see also section "adjustment"). The position of this rotary switch can be selected with a small slotted screwdriver with a 2.5 mm wide blade.

Warning: before using this switch, MTX must be switched off.

When the switch position is "ALT." only alternative signal selection is possible. Now for actuation of several keys simultaneously is considered only the longest-held pressed.

If the rotary switch position is "SUMM." cumulative and alternative signal switching is possible simultaneously.

S1 Input routing **S2** Speaker switch mode



CHANGE OPERATING MODE "INPUT SELECTION" (switch S1)

Changes to this function are possible by switching the rotary switch S1 "**INPUT STATUS**". The position "**SUMM.**" allowed the alternative as well as the summing mode. The position "**ALT.**" allows only alternative input selection. These settings also apply to the "Record Matrix" (recording signal selection).

CHANGE OPERATING MODE SPEAKER SELECT "M2" (switch S2)

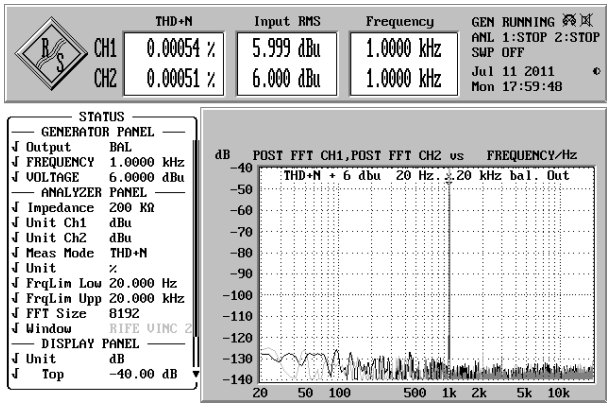
By pressing "**ALT SPK**" on the front (alternative speaker) monitor signal is switched to a second monitoring system. A speaker selection is usually only possible alternative (S2 position: **STD.**). The configuration "M2" also allows simultaneous activation both speaker groups (S2 position: **M2**). The asymmetric "ALT-SPK" is then parallel to the balanced output connected or disconnected. The "SPK ON" button on the front switches the currently selected monitoring system on or off, the selection remains consist.

These switches can be switched with a small slotted screwdriver with a 2.5 mm wide blade.

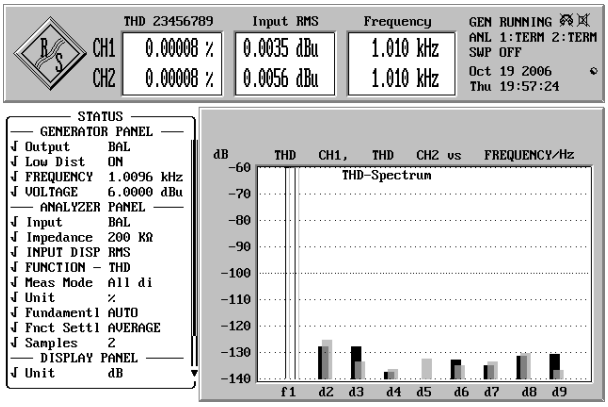
Warning: prior configuration of these switches MTX-Monitor must be switched off.

Upon delivery of the MTX-Monitor as a rule at the 19 "versions, the M2 option is turned off. Versions with "HiFi"-front (435 mm) configuration M2 is activated.

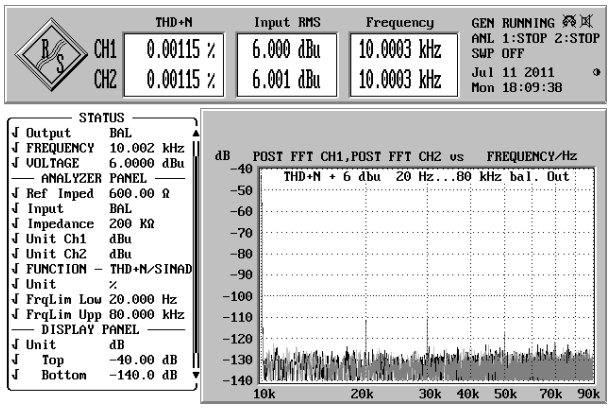
Typical values below are measured using serial MONITOR MTX.V3b-4.2.1 on symmetric monitor output with typical resistance load of 10 kΩ at signal level +6 dBu and 0 dB gain, unless otherwise stated. Signal supply by symmetric XLR socket input 1. The exact configuration of the analyzer is given in each case in the left block.



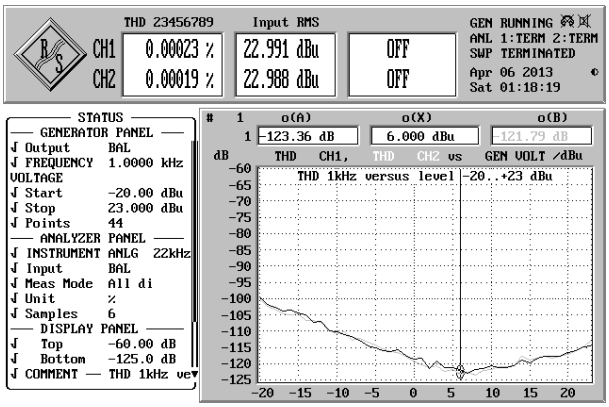
THD+N Spectrum Monitor, sym. input > sym. output at 1 kHz



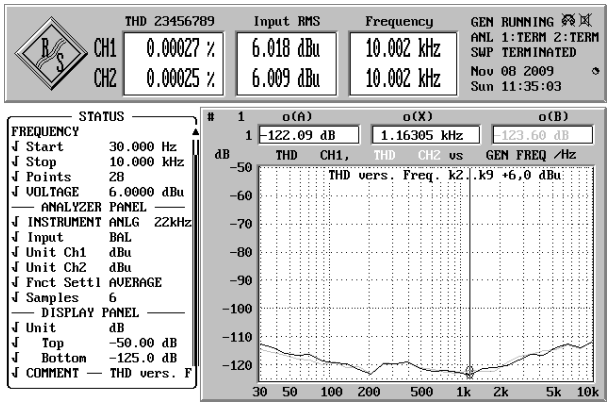
THD at 1 kHz sym. input > Record Out (k2..k9 weighted)



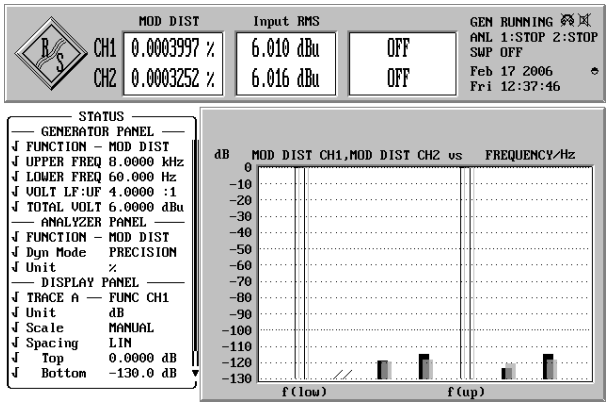
THD+N Spectrum Monitor 10 kHz (weighted 20 Hz...80 kHz)



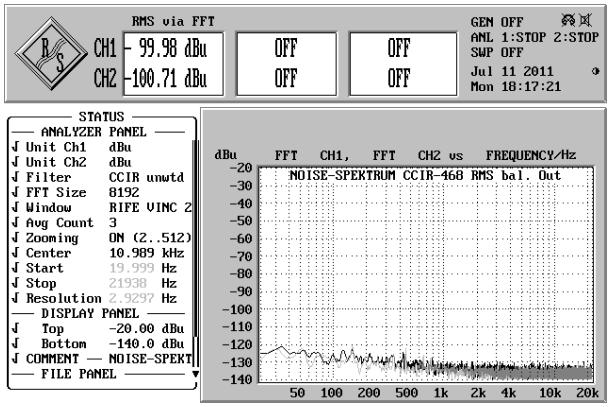
THD über Pegel bei 1 kHz von -20..+23 dBu (k2..k9 bewertet)



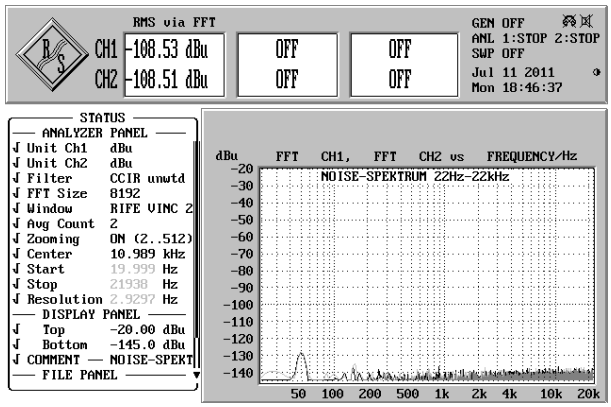
THD versus frequency at level +6 dBu sym. In > sym. Out



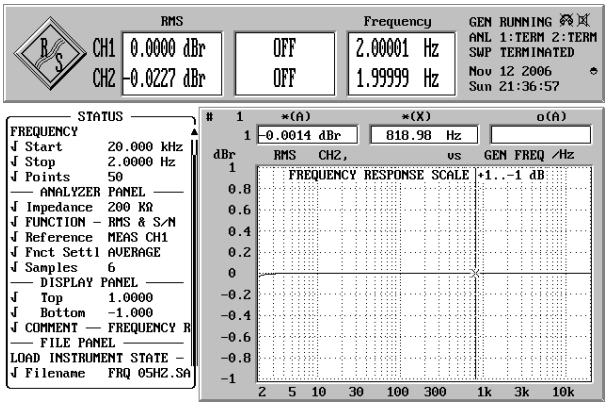
Intermodulation distortion 8kHz/60Hz 4:1



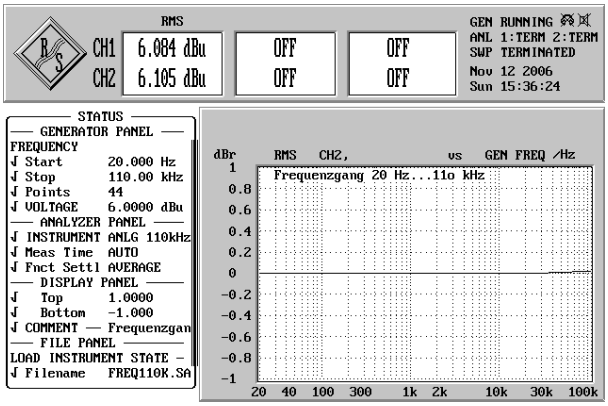
„Noise"-spectrum symmetric Monitor out (gain 0,0 dB)



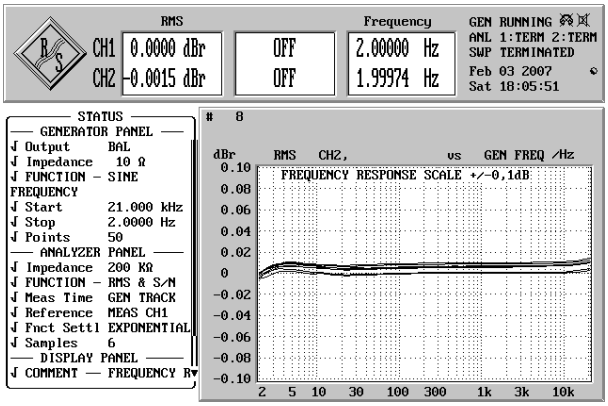
„Noise"-spectrum Record out (Cinch)



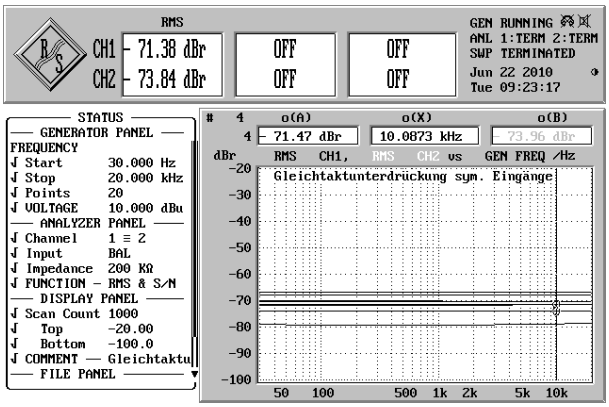
Monitor frequency sweep 2 Hz...20 kHz Scale : +/- 1dB



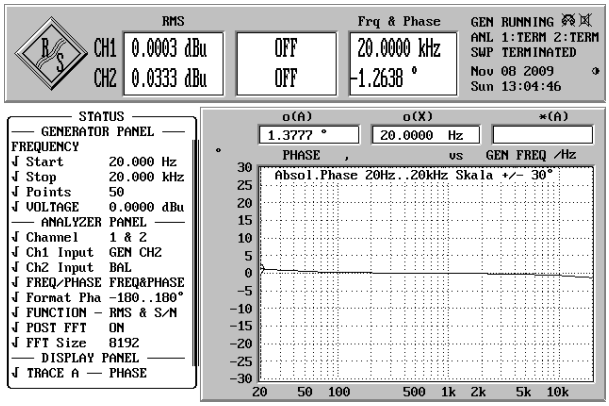
Monitor frequency sweep 20 Hz...110 kHz Scale : +/- 1dB



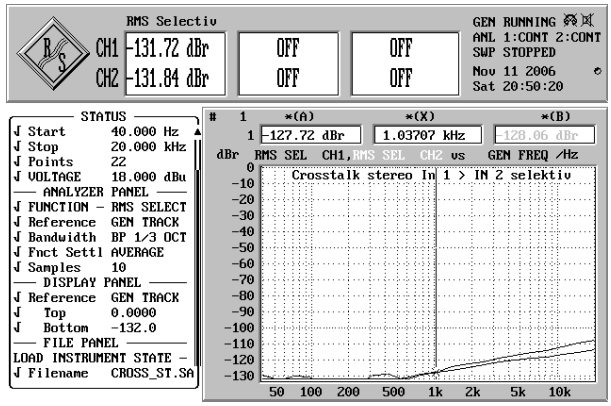
Level difference all 4 sym. Stereo inputs versus frequency



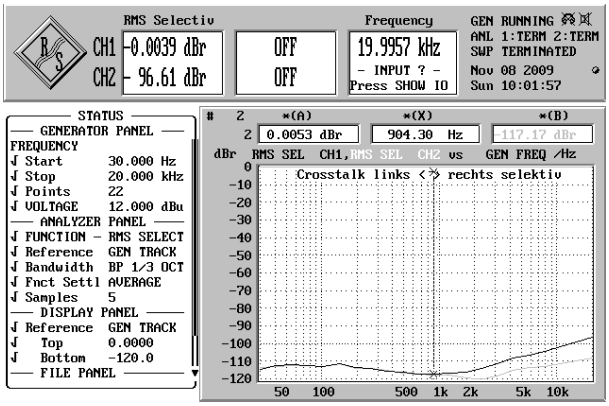
Commen mode reaction ratio all 4 stereo inputs versus frequency



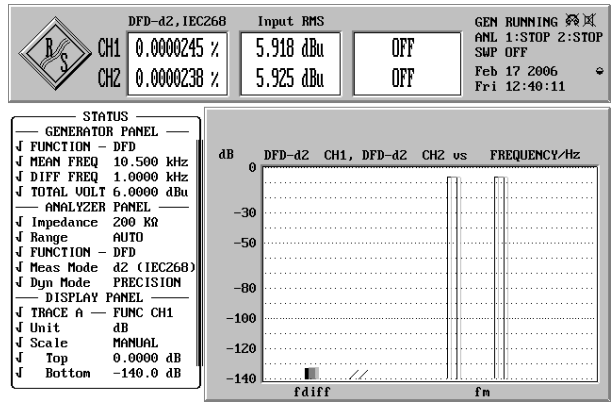
absolute phase deviation versus frequency 20 Hz...20 kHz



crosstalk input 1 L+R to input 2 (terminated with 47 Ω)



Crosstalk left > right and right > left versus 30 Hz...20 kHz



differencel frequency distortion at +6 dBu level

JITTER ANALYSIS :

During digital audio data transmission quality of sound decreases mainly due to short time shifts (jitter) of single blocks. In order to obtain high quality transmission jitter should be possibly the smallest.

Switching technique used in AMS-2 DAR and PAS-8 ensures small jitter and therefore is perfectly suitable for use before D/A converter. In effect of additional correction DUTY-CYCLE independent from signal level and sampling ratio (average value of time ratio of „positive" and „negative" bit) of chosen source a signal with no constant voltage will be created and a possibility of jitter arising will be decreased due to low pass characteristics of used connection. Below measurement curves made by jitter analyzer show signal processing with exceptionally small jitter content.

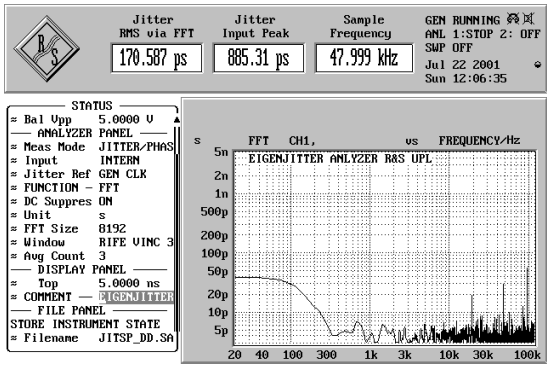


Diagram 1 :
On measurement diagram on the left is jitter spectrum of the measuring device itself (Rhode & Schwarz UPL). Scale of all the measurements is the same. Measurement range from single Hz to 120 kHz is used.

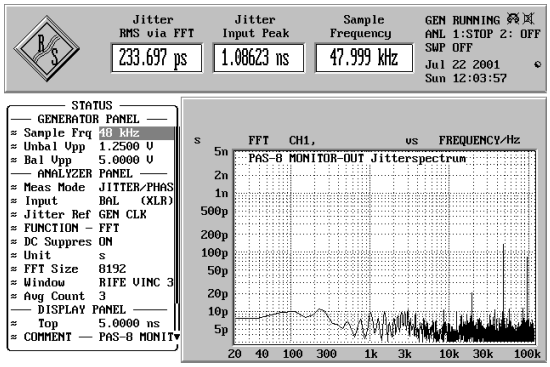


Diagram 2 :
Measurements on PAS-8 monitor output. In spite of very high resolution of measuring device jitter increase in spectrum is almost invisible. Measurement results lie just on the border of measurig device's possibilities. Peak jitter value is in the vicinity of 1 nanosecond and effective jitter is below 300 pS (10^{-12} of a secund!). Signal is led through input 1.

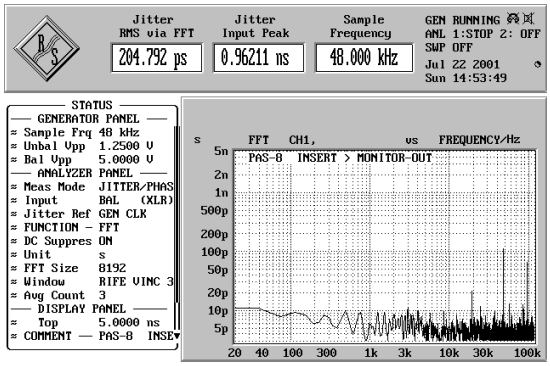


Diagram 3 :
Measurements on PAS-8 monitor output. Signal is led by Insert return. In spite of very high resolution of measuring device jitter increase in spectrum is almost invisible. Also in this case RMS jitter is less than 300 pS ! Peak jitter value equals about 1 nanosecond (10^{-12} second!).

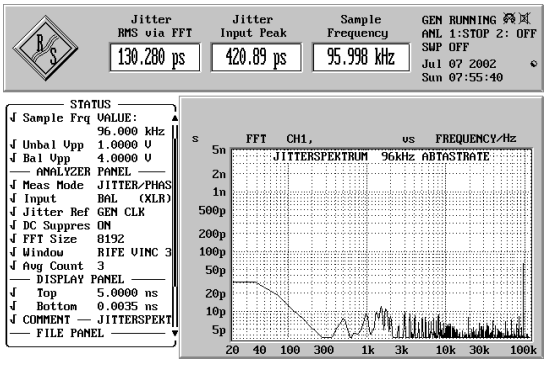


Diagram 4 :
Measurements on PAS-8 monitor output. Signal is led through input 1 with sampling frequency of 96 kHz and level about 4Vss. All used AES/EBU cables of about 2 meters in legth. RMS jiter is less then 150 pS ! Peak jitter value is about 420 ps.

MTX-MONITOR.V3b-4.2.1 TECHNICAL DATA

If not stated otherwise sym. Monitor output measured at 10 kΩ load, gain 0 dB and + 6 dBu working level on sym. input, values in brackets ( ) at +18 dBu (+12 dBu at RCA inputs) ,Power supply voltage: 230 V≈ . All measurements were made with Audioanalyzer APx555 + AP2722 + R&S UPV

max. input level (THD < 0.1%):	+24,0 dBu bal. , +18,0 dBu unbal. (max. +24,0 dBu adjustable**)		
Input impedance :	20 kΩ balanced (XLR) 2 MΩ unbalanced (RCA)		
CMRR commen mode rejection ratio: 1 kHz/10 kHz **:**	> 62 dB/62 dB (typ. > 70 dB), IEC: > 58 dB/58 dB (typ. > 60 dB/60 dB)		
max. output level balanced out and meter out:	+ 24,5 dBu at 10 kΩ bal. out +24,0 dBu at 10 kΩ unbalanced meter out		
max. output level unbalanced out:	+ 18,5 dBu at 10 kΩ [max. +24,0 dBu adjustable**]		
Output impedance balanced Monitor 1 (XLR):	< 25 Ω		
Output impedance unbalanced Monitor 2 and meter out:	< 1 Ω		
Output voltage symmetry :	≥ 75 dB/1 kHz ≥ 70 dB/10 kHz		
Output impedance symmetry (Ref. 600 Ω) **:**	≥ 75 dB/1 kHz ≥ 70 dB/10 kHz		
max. load on sym. and asymmetric monitor outputs:	600 Ω at +24 dBu / 300 Ω at + 21,5 dBu		
Frequency response :	3 Hz...60 kHz ± 0,01 dB 1,5 Hz...500 kHz ± 0,1 dB 0,3 Hz...1,4 MHz ± 3 dB		
Large signal bandwith (+22 dBu) **:**	1 Hz...100 kHz < ± 0,2 dB		
Phase deviation absolut:	20 Hz 20 kHz < ± 1,5°		
Phase deviation relativ left < > right **:**	20 Hz ...20 kHz < ± 0,1°		
THD nonliner harmonic distortion:	1 kHz < 0,00006 % (1 kHz < 0,00008 %), 10 kHz : < 0,00015 % (0,0006 %)		
THD+N nonliner harmonic distortion + noise:	1 kHz 0,00048 %* 10 kHz < 0,0009 %* (1 kHz < 0,00018 % 10 kHz < 0,0007 %)*		
DFD d2+d3 (ITU-R) **difference frequency distortion:**	10,5 kHz, diff. frequency 1 kHz : < 0,00003 % (< 0,00005 %)		
IMD (SMPTE) **Intermodulation** 60 Hz/7 kHz 4:1 **:**	< 0,0006 % (< 0,0010 %)		
DIM 30 Transient Intermodulation 3,15kHz sq /15kHz sin.**:**	< 0,00025 % (< 0,0012 %)		
Crosstalk input / input:	1 kHz > 125 dB 10 kHz > 110 dB		
Crosstalk left < > right :	1 kHz > 110 dB 10 kHz > 100 dB		
max. gain input > output :	+ 6 dB (additional +6 dB by asymmetrical input on balanced out)		
Gain deviation left input / right input :	< ± 0,01 dB		
Gain deviation outpu/output typ:	< ± 0,02 dB		
Balance adjustment range:	± 6 dB (13 levels)		
Balance step size:	1,0 dB ± < 0,2 dB (typ. ± 0,05 dB)		
Volume regulator range :	+ 6 dB ...- 115 dB		
Uniformity of volume regulator left < > right (+6..-80 dB).	< ± 0,1 dB typ. < ± 0,05 dB		
Volume regulator resolution working range (+6..-40 dB):	0,5 dB (internally 0,125 dB)		
Output noise **MONITOR-OUT XLR sym. :**	-100,5 dBu ± 0,2 dB BW 20 Hz..22 kHz eff.unweighted	from RCA input	-102,5 dBu
	-102,5 dBu ± 0,2 dB A-eff. weighted	from RCA input	-105,0 dBu
	- 89,5 dBu ± 0,5 dB CCIR 468-3 qp weighted	from RCA input	- 91,5 dBu
Output noise **MONITOR OUT-2 RCA asym. :**	-100,5 dBu 20 Hz..22 kHz eff. unweighted	from RCA input	-102,5 dBu
	-103,0 dBu A-eff. weighted	from RCA input	-104,5 dBu
	- 89,5 dBu CCIR 468-3 qp weighted	from RCA input	- 91,0 dBu
Output noise **RECORD OUT RCA :**	-109,0 dBu 20 Hz..22 kHz eff. unweighted	from RCA input	- 111,5 dBu
	-111.5 dBu A-eff. weighted	from RCA input	- 114,0dBu
	-98,0 dBu CCIR 468-3 qp weighted	from RCA input	- 100,5 dBu
Output noise **METER OUT/DIREKT OUT RCA :**	-104,0 dBu 20 Hz..22 kHz eff. unweighted	from RCA input	-105,0 dBu
	-93,0 dBu CCIR 468 qp weighted	from RCA input	- 97,5 dBu
Dynamik Ref. +24 dBu… **MONITOR OUT XLR sym.** :	124,5 dB CCIR eff. unweighted	from RCA input	127,0 dB
	127,0 dB A-eff. weighted	from RCA input	128,5 dB
Dynamik Ref. +24 dBu… **MONITOR OUT-2 RCA asym.** :	124,5 dB CCIR eff. unweighted	from RCA input	126,0 dB
	127,0 dB A eff. weighted	from RCA input	128,5 dB
Dynamik Ref. +24 dBu… **RECORD OUT RCA** :	127,0 dB CCIR eff. unweighted	from RCA input	129,5 dB
	129,5 dB A-eff. weighted.	from RCA input	132,0 dB
Clip indicator trigger level in monitor path :	+ 23,5 dBu sym. Ein- und Ausgänge +17,5 (23,5**) dBu asym. Eingänge		

HEADPHONE AMPLIFIER:

max. output power 1 kHz :	2 x 1300 mW at 70 Ω (THD+N < 0,00025% or < -112 dB)
max. output power versus impedance:	2 x 260 mW/600 Ω, 2x 485 mW/300 Ω, 2x 1100 mW/100 Ω, 2x 900 mW/32 Ω
Output impedance:	< 2 Ω
max. capacitive load:	47 nF
THD+N nonliner harmonic distortion + noise:	2x 1000 mW at 100 Ω 1 kHz < 0,00018 % (-115 dB)* 10 kHz < 0,0008 % (-102 dB)*
Frequency response :	20 Hz ...20 kHz < ± 0,03 dB (R_L= 2x 32 Ω)
Output noise CCIR 468 qp weighted (Gain = 0,0 dB) **:**	< - 90,0 dBu (with +6 dB Gain, Phones Volume full clockwise -86,0 dBu)
Output noise A-eff. weighted (Gain = 0,0 dB) **:**	< -103,5 dBu (with +6 dB Gain, Phones Volume full clockwise -99,0 dBu)
Output noise 20 Hz..20 kHz eff. (Gain = 0,0 dB) **:**	< -101,5 dBu (with +6 dB Gain, Phones Volume full clockwise -97,0 dBu)

MTX MONITOR.V3b-4.2.1 Power supply :	230V / 50..60 Hz (115V / 60 Hz briefly available)
Power consumtion typ.:	13 W
Power consumtion max.:	22 W incl. Remote, full audio power, additional digital Router AMS-2 DAR or PAS-8
Safety class:	1
Dimensions main unit:	19 inch/1HE 483 x 44 x 250 mm weight: 3,7 kg color Case/Front : RAL7035 or black
Dimensions remote:	150 x 195 x 50 mm weightt: 0,6 kg ABS-plasic, color : RAL 7035 (opt. dark gray)
Guarantee:	3 Years time and materials

* Measurement bandwith THD+N at 1 kHz frequency : 20 Hz..22 kHz, at 10 kHz frequency : 20 Hz..80 kHz (unless otherwise stated)

** when calibrating the asymmetric inputs and outputs for line level of +6 dBu.

All inputs and outputs can also be operated asymmetrically without affecting the technical data. Unlike many conventional amplifier circuits, the headroom is not changed by it! The difference in the output level between symmetrical and unbalanced connection is: < 0.1 dB. All outputs are short-circuit protected.

Number of inputs :	8x input
Number of outputs :	2x Monitor 2x Record (electrically isolated from each other)
Insert :	1x Send and 1x Return (only PAS-8)
Input connector :	XLR female gold-plated
Output connector :	XLR male gold-plated
Digital forrmat :	AES/EBU / AES3 (transparent for all biphase formats)
supported word length :	8..24 bits
supported clock frequency :	24...105 kHz
permissible input level :	300 mV...5V pp (max. 10V pp)
Input impedance :	110 Ω (optional 1 kΩ via internal jumper) transformer balanced floating
allowable input common mode voltage max.:	± 60V
Output level :	4,5 V pp at 110 Ω
Output impedance :	110 Ω transformer balanced floating
allowable output common mode voltage max. :	± 60V
Output rise time :	15...20 ns
Delay input to output :	60...80 ns
cumulative jitter (100 Hz..110 kHz) :	< 500 pS RMS at Ue 500mV...5Vpp (typ. < 300 pS RMS at Ue 2...5 Vpp)
Synchronization :	external synchronization is not required
remote controlled :	serial interface similar symmetrical RS422
Power Supply AMS-2 DAR :	5,5V DC powered by MTX-MONITOR
Power Supply PAS-8 :	5,5V DC powered by MTX-MONITOR or 230V/50Hz mains
Power consumtion :	3 VA
Fuse :	electronic current limiting (PAS-8 additional fuse)
Safety class :	1 (in connection with MTX-MONITOR)
Case design :	sheet steel coated RAL 7035 or 7040, front light gray RAL 7035
Dimensions AMS-2 DAR :	483 mm x 250 mm x 44 mm (Breite x Tiefe x Höhe) weightt: 2,6 kg
Abmessungen PAS-8 :	483 mm x 250 mm x 44 mm (Breite x Tiefe x Höhe) weight : 3,0 kg
Guarantee :	3 Years time and materials

INTERFERENCE EMISSION AND INTERFERENCE IMMUNITY

The device conforms to safety regulations regarding Electromagnetic Compatibility, which are defined inter alias in directives 89/336/EWG and FCC, Part 15 :

Electromagnetic radiation emitted by the device is limited in degree sufficient to using another electronic equipment as intended along with MTX-Monitor

The device has sufficient immunity to electromagnetic interference, so it's operation will not be disrupted by it.

The device has been tested and conforms to following regulations :

Safety : Protection class 1 according to EN60950; 1992 + A1/A2; 1993 (UL1950)

Electromagnetic Compatibility : Audio, video and audio-video installations, as well as for studio lighting controlling units for professional use.

Interference emission : EN55103-1
Interference immunity : EN55103-2

The inclusion of this standard provides with a specified probability of both environmental protection and reasonable resistance to interference. However, this does not give an absolute guarantee that during the operation of the equipment no electromagnetic interaction will arise.

To significantly reduce the likelihood of such influence, follow these rules:

When installing the unit, follow the instructions in the Owner's Manual

Shielded cables should be used for all audio paths. Special attention should be payed to proper, not corroded and large surfaced connection Cable shield connected only at one end can act as receiving/ transmitting antenna.

In the system and the environment in which the device is used, use only the components (systems, equipment), which also meet the requirements stated above.

To avoid creating a noise loop (loop current) or adverse effects, reduction of the surfaces (no unnecessarily long connections) should be used and a reduction of current flowing through them by e.g. using a transformer or difference amplifier.

The concept for grounding of a system should be provided that respects both the safety requirements as well as of electromagnetic compatibility.

When choosing between the grounding in a star configuration, or a surface or mixed ones, the advantages and disadvantages in relation to each of the two solutions should be considered.

In typical case ground in star configuration in Hi-Fi installations is justified. In case of existing noise loops between interconnected devices, we recommend including symmetrical or differential amplifier (such as SAM-1Bs or SAM-2B).

Noise loops arise also by connecting antenna's ground cable of tuner, computer or receiver, which are electrically connected to audio installation. By including filter into the antenna's circuit (suppressor) those problems can be avoided.

SAFETY

All repairs, maintenance and other actions on opened device can be performed only by qualified personnel with respect to existing regulations.

Before removing cover the device must be turned off and power cable disconnected from electric outlet.

During maintenance work on the open unit, which is under mains voltage,bare circuit parts and metal semiconductor packages are not touched directly by a non-isolated tool.

Only specific parts and components that conform to manufacturer's specifications can be used for maintenance and repair that are related to safety.

Electrostatic discharge (ESD)

Integrated circuits and other semiconductors are sensitive to electrostatic discharge (ESD). Incorrect components handling during maintenance and repair containing such elements can cause change of their features, influence their longevity or lead to permanent damage.

During contact with elements sensitive to electrostatic discharge the following rules should be obeyed :

The parts should be stored and transported only in special and specifically signed wrappings.

Unpacked elements that are sensitive to electrostatic discharge can be handled only in special environment (EPA, e.g. Authorized Service) and can be handled only by qualified service personnel. They should be connected to ground at service station. Device that is maintained or serviced as well as tools, service aids, electrostatic (conducting) working and floor mats must not be connected to metal surfaces (danger or electric shock).

To prevent temporary overloading of components and possible damage due to inappropriate voltage or balancing currents, electric connections can be performed only when device is turned off and after discharge of accumulated voltage in capacitors.

CE DECLARATION OF CONFORMITY

FUNK TONSTUDIOTECHNIK
10997 Berlin

declares in own responsibility that the product

MTX-MONITOR.V3b-4.2.1

according to directives of UE and their supplements

conforms to following norms :

Safety :
Class of protection 1, EN60950; 1992 + A1/A2; 1993
EMV :
EN55103-1 EN55103-2

Evaluation criterion B of the electromagnetic environment assessment E4

Berlin, 2015-07-09

Th. Funk, President