

adt-audio[®]

ToolMod Faderbox

**modulare Consoles
Installation Manual**



analoge + digitale Tonstudioteknik Karl Jüngling

Inh. Dipl.-Ing. Gerd Jüngling e. K.

4-6, Scholtwiese • Gladbeck • D45966 • Germany

Phone: 0049 2043 51061 • Fax: 0049 2043 56844

Email: sales@adt-audio.com

Web: www.adt-audio.com + www.adt-audio.de

Webstore: www.pro-audio-store.de

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ToolMod Faderbox modular Summing Mixer

General Information



Preface and Disclaimer

This manual contains general information on the adt-audio® modular summing mixer system ToolMod® Faderbox.

By no means does this information represent guaranteed particular characteristics or results of use. The information in this manual has been carefully compiled and verified.

Due to our policy of continuous product improvement, we reserve the right to make product changes without prior notice.

All specifications are subject to change without notice.

Copyright

This manual is copyright protected. Do not copy, distribute, or translate into other languages without permission in writing from adt-audio® Karl Juengling. All rights reserved.

Trade Marks

adt-audio® and ToolMod® are registered trademarks of analoge + digitale Tonstudioteknik Karl Juengling. All other trademarks are the property of their respective owners.

CE Declaration of Conformity

Manufacturer: Fa. Karl Juengling
Type of Equipment: Audio Signal Processor
Product: ToolMod Pro-Audio Module System,
consisting of:
Modules, Mounting Frames,
Power Supply Units and Accessories

Compliance Engineer: Gerd Juengling

Test Basis:

EN50081-1:1992, EN50082-1:1992, EN61000-3-3:1995,

EN60065:1993 Class1, EN61000-3-2:2000,

EN60065:2002, EN55013:2001, EN55020:2002,

73/23 EWG; 93/68 EWG

We hereby declare that the construction of the ToolMod system complies with the standards and regulations listed above.



Environmental Protection

This product can be recycled. Products bearing this symbol must not be thrown away with normal household waste. At the end of the product's



life, take it to a collection point designated for recycling of electrical and electronic devices. Find out more about return and collection points through your local authorities.

The European Waste Electrical and Electronic Equipment (WEEE) Directive was implemented to reduce the amount of waste going to landfills, thereby reducing the environmental impact on the planet and on human health. Please act responsibly by recycling used products. If this product is still useable, consider giving it away or selling it.

WEEE-Registration: DE 59049716

Important Safety Instructions

Please note and retain this information!

Read and follow all safety and operation instructions carefully before you start using the product!

Heed all warnings!

This manual provides general information on the ToolMod Faderbox. Extensive information on the entire ToolMod Faderbox system and files for download can be found on our website www.adt-audio.com.

Water and Humidity

Do not use the devices near water, near a bathtub, in a wet basement, near a swimming pool, and the like. Do not expose the devices to rain or moisture.

WARNING: RISK OF DEATH BY ELECTRIC SHOCK!



Insertion of Objects or Fluids

NEVER allow any kind of object to get into the devices through ventilation slots or other openings in the housing. You can easily come into contact with dangerous electric voltage or cause damaging short circuits. **NEVER** allow any kind of fluids to be spilled or sprayed on the devices. Such actions can cause damage, dangerous electric shocks, or fire.

WARNING: RISK OF DEATH BY ELECTRIC SHOCK!





In case an object or fluids got into a device, disconnect the power immediately and contact a qualified service technician!

Power Supply Units

Do not defeat the safety purpose of the grounding type Euro outlet. Use only power cables and wall outlets that provide protective ground connection to the power supply units. Grounding type cables and outlets have two contacts for the ac line and a third grounding contact. The third, grounding contact is provided for your safety. If the provided cable does not fit into your wall socket, consult an electrician for replacement.

Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the power supply unit.

Unplug the power supply units when unused or unattended for long periods.

Make sure that the voltage selector of the power supply is set to the correct voltage **BEFORE YOU CONNECT THE POWER SUPPLY.**

NEVER OPEN THE HOUSING OF A POWER SUPPLY UNIT BEFORE YOU DISCONNECT THE POWER CORD. Even if the unit is switched off, dangerous voltage is present inside the unit. In order to avoid exposure to any residual voltage, the units should be disconnected from any power source at least 5 minutes before opening!

Make sure that the voltage selector of the power supply is set to the correct voltage **BEFORE YOU CONNECT THE POWER SUPPLY.**

The power supply units must be located such that the rear AC socket and connected power cord are readily accessible. Avoid any kind of overload in connections to wall sockets, extension or splitter power cords. Overloads create serious risk of

FIRE HAZARDS and DEATH BY ELECTRIC SHOCK!
WARNING: RISK OF DEATH BY ELECTRIC SHOCK!



Do not use different fuses for replacement. **NEVER replace a fuse with another one with higher current values or different tripping behavior. Use on-**

ly fuses with the original values. Other fuses can cause damage, fire, and/or electric shocks.

WARNING: RISK OF DEATH BY ELECTRIC SHOCK!

Unplug the power supply units before lightning storms or when unused or unattended for long periods. This will prevent damage to the power supply units from lightning and power line surges.

**WARNING: DO NOT TOUCH OR DISCONNECT DEVICES
DURING A LIGHTNING STORM
RISK OF DEATH BY ELECTRIC SHOCK!**



Ventilation slots and/or openings prevent the devices from overheating. Do not block or cover ventilation openings. Never place the units on a soft surface (carpet, sofa, pillow, etc.). Make sure to provide enough space (4 to 5 cm / 2 inches) around the devices, when mounting into a rack or cabinet.

Do not attempt any alterations to the units without express written approval from adt-audio Karl Juengling! Unauthorized alterations void any warranty and liability!



Module Frames

It is not necessary to remove cover sheets when installing or removing modules. Modules can be removed and exchanged after unbolting the knurled screws that fix the modules in the frame. Additional modules can be installed after removing blind panels, where necessary.

Do not remove cover sheets of the frames and do not make any changes. The supply voltages of +/- 25 volts and 48 volts DC are accessible inside the frames. Although these voltages are low, there is still the risk of electric shocks.

Important Note:

In no event, open the housing of the power supply units before the power cord is disconnected. Wait at least 5 minutes after disconnecting the cord to avoid exposure to residual voltage. Otherwise, no liability will be assumed.



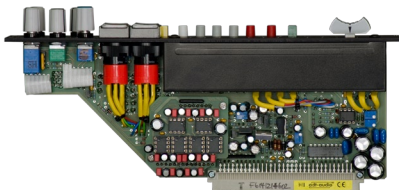
Installing and removing Modules

Before you begin, disconnect the devices from the power line, and wait 5 minutes until any residual voltage has discharged.

Before you reconnect the power and switch on, make sure that all modules fit into the mating plugs in the frame and that all modules are fixed.

Do not install any modules with visible damages.

Modules can have sharp corners and edges, sharp tips of screws, pointed wire ends and other dangerous parts. There is the risk of injury. Be careful, make sure that you do not hurt yourself, and take care where to touch the modules.



Never use control knobs as handle to remove the modules from the frame. The fixing screws are knurled neck collar screws.



After unbolting the modules from the frame, the screws fit into taps in the faceplates and can be used as handles for removing. Use a torx screwdriver size T8 for these screws. If you use low quality allen keys, the screws might be damaged so they can't be removed.

Pull out the modules always using the remover screws. Otherwise, there is the risk of damage for pots and other control elements.



Like computer add-on boards, the PCB's of the modules do not have cover sheets. Make sure that you act with appropriate caution and do not touch any components.

Qualified personnel should perform installing and removing. With respect to possible physical damage or injuries, any manipulation is at your own risk and we are not liable for any physical damage or injury.

Repairs

In case that:

- you think repairs are necessary
- objects or fluids have gotten into a device
- the device fell to the ground
- the device is otherwise mechanically damaged
- the device is not working properly
- the power cord is damaged
- the device was exposed to rain
- the device fell into water

Disconnect the power immediately and contact a qualified service technician.

Make sure to inform the service technician about anything that has happened to the device.

In case that the power cord is damaged, do not touch the cord or the device but switch off the main circuit breaker before disconnecting the power cord.

WARNING:
RISK OF DEATH BY ELECTRIC SHOCK!

Spare Parts

Make sure that only original parts are used for repair or replacement. Wrong spare parts may cause fire, electric shocks, subsequent damages, and other dangerous risks. Otherwise, the warranty is void and no liability will be assumed.

Safety Test

Insist that the service technician conducts a thorough safety test to ensure that the condition of the repaired device is safe and up to factory standards.

Factory Repair

If you intend to send defective devices to the factory, please get in touch with us by phone (0049 2043 51061) or by email (support (at) adt-audio.com) and let us know:

- Type and serial number of the defective device
- Date of purchase and name of the dealer,



ToolMod Faderbox modular Summing Mixer Power Supply



- if you have not purchased directly from the factory
- a brief description of the problem and of the history (fluids in the device, something that happened, etc.)

We will tell you how to proceed.

Cleaning

Before you begin to clean devices, disconnect the power cord. Clean only with a dry cloth and do not use any solvents or sprays! For removing stubborn contaminations, you may use a cloth soaked with isopropyl alcohol as cleaning agent. Isopropyl alcohol does not attack the powder coating and the plastic parts.

Make sure that the alcohol is entirely evaporated before you reconnect the unit to the power line. Otherwise, you risk fire and electrical shocks!

Power Supply

The ToolMod Faderbox uses the same power supply units, cables, and connectors as the ToolMod Pro-Audio module system, the ToolMix summing boxes, and the ToolKit channel strip. A range of linear power supply units is available for these devices. Using the same power supply unit for several different units is possible.

Mains Voltages and Frequencies

All power supply units are suited for 230 and 115 volts ac power lines with 50 or 60 Hz.

Output Voltages

All supply units deliver +/- 25 volts for the audio amplifiers of the ToolMod Faderbox and an additional 48 volts phantom power for condenser microphones.

Power Cables

6 core, high cross section control cables with 5-pin XLR connectors are used for the connection between the power supply units and the frames and between frames. The pin assignment of the 5-pin XLR connectors is compa-



tible with the ToolMix series of summing boxes, the ToolKit channel strip and the ToolMod Faderbox. The power supply units can be used with any combination of these devices without any disadvantage, if the capacity of the particular power supply unit is sufficient.

TM400 Series ToolMod Consoles come with a 5-pin XLR power output connector for all ToolMod, ToolMix, and ToolKit units. Using the power supply unit of a ToolMod console with sufficient capacity for these units is also possible.

Power Supply Rating

Type and number of modules and units determine the version of the required power supply unit. The three standard power supply units for the adt-audio Tool devices can be used with almost all existing system setups. Which power supply unit is suited for a particular setup is determined by the current consumption of the modules and units and, on rare occasions, by the operation level and the load on the outputs. The current consumption of the modules and other Tool devices is listed in the technical specifications of the particular device in the manuals and on the web pages (www.adt-audio.com). The operation level and the load is only important if the load on a considerable number of outputs is lower than 2 k Ω while the operation level is close to the headroom of + 30 dBu.

If you are in doubt which power supply is required for a particular setup, please ask by phone or email.

Power Supply Units

There are three standard power supply units with different capacities: ToolPwr-M, ToolPwr-S and ToolPwr-E

ToolPwr-M

The ToolPwr-M is a desk-top unit with a nominal output current of 1 amps and a peak output current of 1.5 amps. The ToolPwr-M comes with a single 5-pin XLR output connector. The nominal power is 100 watts.



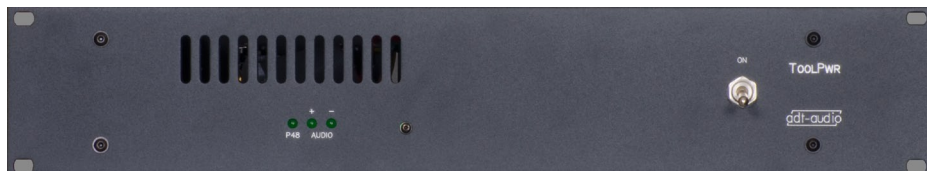


ToolMod Faderbox modular Summing Mixer Power Supply



ToolPwr-S

The ToolPwr-S is a 2U-high 19" unit with a nominal output current of 2,5 amps and a peak output current of 4 amps. The ToolPwr-S comes with two 5-pin XLR output connectors. The nominal power is 230 watts.



ToolPwr-E

Like the ToolPwr-S, the ToolPwr-E is a 2U-high 19" unit; however, the nominal output current is 5 amps and the peak output current is 7 amps. The ToolPwr-E comes with a bigger power transformer, a larger heat sink, high power voltage regulators and bigger load capacitors. Like the ToolPwr-S it has two 5-pin XLR output connectors. The nominal power is 450 watts.



Phantom Power

The considerations of the output current refers to the capacity of the audio supply voltages. The 48 volts phantom supply in each of the power supply units is designed to supply high current condenser microphones if the entire capacity of the audio supply is used for microphone amplifiers. Therefore, there is no need to consider the capacity of the phantom power supply.

Power Supply Outputs

Depending on the power supply unit, there are one or two 5-pin XLR output connectors. The picture shows the rear panel of a ToolPwr-S with 2 output connectors, wired in parallel.



Power Supply Connections between Power Supply Unit and Frame

6 core, high cross section control cables, fitted with 5-pin XLR plugs are used for the power cables. The cross section of each core is 0.75 mm² = AWG18. The

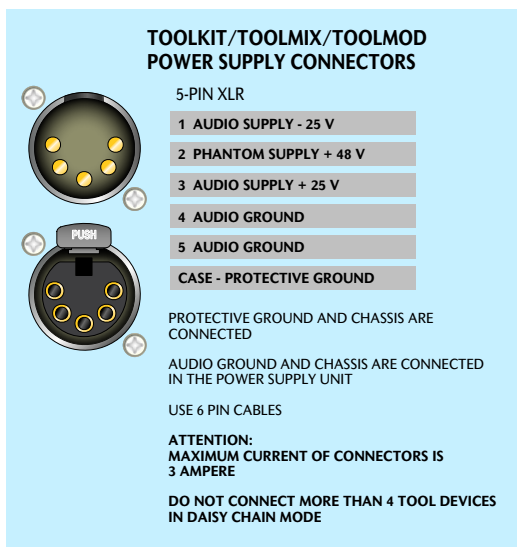
5-pin XLR connectors and the voltage drop along the cable determine the maximum current of 3 amps.

Power Supply Connections between Frames

All ToolMod Faderbox frames come with a 5-pin male XLR and a parallel 5-pin female XLR. Several frames can be connected in daisy chain mode, as long the total current is lower than 3 amps. All power cables are extension cords with a female and a male plug, therefore. The picture shows the rear panel of a 1U high ToolMod frame.

Power Supply Pin Assignment

The pin assignment of the power supply unit and the ToolMod Faderbox frame matches the pin assignment of all other adt-audio Tool devices. Any combination of these devices can be connected to any power supply and any other Tool unit, as long as the capacity of the power supply unit is sufficient.



Standard Power Cables and custom Cables

The following standard power cables are available from stock:

10 ft./3m, 5 ft./1.5 m, 3 ft./1 m, 2 ft./60 cm, and 1 ft./30 cm.

Custom cables, up to 6 meters are available at short notice. The 10 ft./3 m versions are usually used for connecting the power supply unit to the first frame. The shorter cables are used to connect several frames in daisy chain mode.

IMPORTANT HINT:

The maximum current per cable must not exceed 3 amps.

The XLR connectors are not designed for higher currents than 3 amps. In addition,



ToolMod Faderbox modular Summing Mixer Power Supply



tion to a higher failure probability of the connectors, higher current results in higher voltage drop along the cable and therefore a lower supply voltage of the modules. This may result in a reduction of the headroom and degraded transient performance.

To make sure that the maximum current will not exceed 3 amps with a reasonable safety margin, connect not more than a single 4U high frame, two 2U high frames, or four 1U-high frames to a single power supply output.

Of course this is only a rule of thumb. The exact current consumption results from the addition of the current consumption of the modules, and the load resistance combined with the operation level, as explained in detail above.

Grounding and Protective Ground

As factory standard, the protective ground from the Euro inlet of the power supply unit is connected via the power supply cable to the chassis of the frame, the audio ground, and the screen pins of all connectors. This principle ensures that all accessible parts are connected to the protective ground. However, the connections between the different grounds are not part of the basic design of the ToolMod Faderbox series. The three ground circuits protective ground = chassis, audio ground = 0 volts of the power supply, and screen-ground = all screening pins of the audio connectors, are fully isolated from each other and connected only at one point inside each frame. If ground loops show up due to the connection of the protective ground to the audio ground and/or screen ground, it is possible to isolate the ground circuits. For safety reasons, it is not possible to isolate the protective ground from the chassis. In any case it is necessary to ensure that the safety of the system is ensured if the ground connections are removed. **Contact us before you change anything!**

IMPORTANT HINT:

Do not power on the system before the power cables are installed!

If you unplug or plug in a power cable while the system is under power by accident, there is no risk that a module or the power supply unit becomes defective. If the load on the power supply unit is low, the system will keep working. However, if the load of the power supply unit is high, the inrush current when you plug in a power cable is very high, since the oversized load capacitors in all modules have to be loaded. In this case it might happen that one of the protection circuits in the power supply unit is triggered and shuts down one or both audio supply voltages. This results in very high background noise and a reduced intensity of the control LED of the particular supply voltage on the faceplate of the power supply unit. If this happens, switch off, wait about 1 minute, and switch on again.

Placement/Installation of the Power Supply Units.

Do not place or install the power supply unit directly below, above, or next to a ToolMod frame.

The most important reason for external power supply units is the electro magnetic field of the toroidal power transformer that can only be effectively screened by MU-metal at very high cost. Even though the magnetic field of a high quality toroidal transformer is a lot lower than the field of a cheap standard transformer, it is still existing and may induce hum into sensitive devices, especially those with input and output transformer and/or inductors that are not sufficiently screened and/or with high gain and high input impedance. Since the intensity of an electro magnetic field is reciprocally proportional to the second power of the distance, any disturbance caused by magnetic fields is reduced to a quarter is the distance is doubled. If you install a power supply next to an audio device with sensitive circuitry, you reduce the advantage of the external power unit significantly. With a proper placement of the power supply unit, about 1 m away from any audio gear, you can install any module in any module compartment without hum or other disturbances from electro magnetic fields. If you have to deal with such problems and no improvement can be achieved when moving the power supply unit away, please check for other devices that produce magnetic fields. In addition to power amplifiers, big power supply units, very often small plug power supplies with under designed transformers are the reason for such problems. Check for these devices and try to move them away. If the reason for the hum is an electro magnetic field, you will notice a difference as soon as you start changing the position.

Overloading Power Supply Units

When you upgrade your system with more modules and/or additional frames it might happen that the capacity of the power supply unit is not sufficient anymore. We strongly advice that you consider the capacity of your power supply if you add more modules. If you are not sure if your supply unit is sufficient for the new setup, just ask for advice.

Overload Effects of Power Supply Units

You will notice if a power supply units is overloaded if one of the following effects occur:

Very high Temperature of the Heat Sink and the Housing

With increasing output current, the amount of heat that has to be dissipated by the heat sink increases significantly. The total power loss is not only determined by the output current but also by the local mains voltage. High mains voltage causes higher heat dissipation; low mains voltage reduces the heat dis-



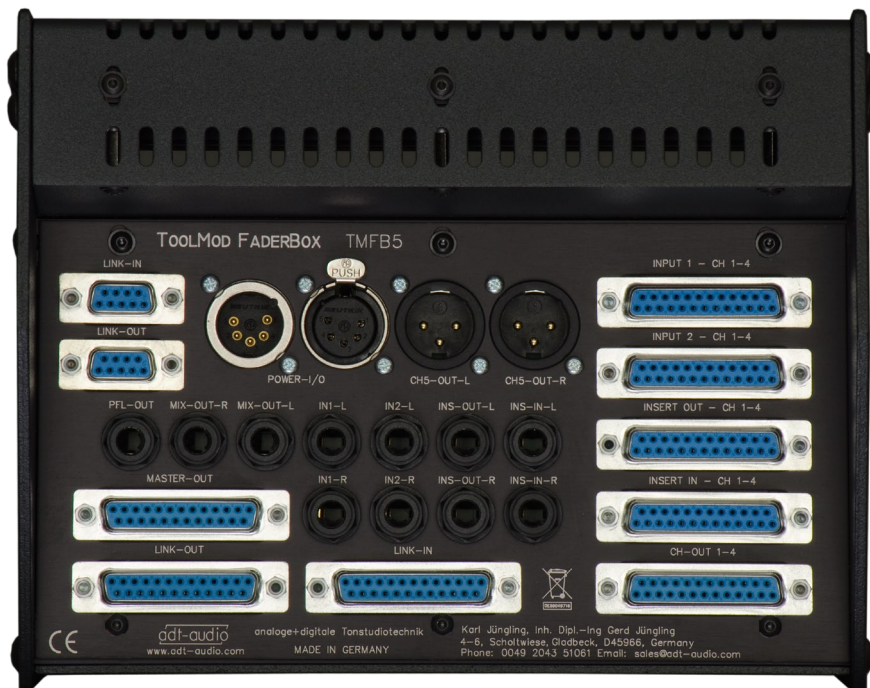
sipation but may result in a reduced capacity of the power supply unit. Since all ToolMod power supply units work without internal fans, the temperature of the heat sink at a certain combination of output current and mains voltage depends also on the installation of the unit. If you notice that the temperature of the heat sink is very high, please check if the airflow along the heat sink is sufficient. Fresh air should pass along the heat sink from the bottom and there must be a free pass for heated air to the top. If the installation or the placement of the power supply unit does not impede the airflow, the prove for an overload is that the overheat protection circuitry shuts down the output voltages after a certain time. If this happens, there is a very high background noise, almost no headroom, and the intensity of the control LEDs on the faceplate of the power supply unit is a lot lower than normal. In this case switch off, wait some time to allow the unit to cool down, and switch on again. Please take into account that the power supply unit will shut down again when the temperature raises above the threshold of the protection circuitry. In the long run you will need to get another power supply unit with higher capacity or a second unit, if you have more than 1 frame an are able to use several power supply units for the different frames. To keep working until the problem is solved, you can remove the power supply from the rack and place a fan directly next to the heat sink. This will improve the heat flow and the time before the temperature control shuts down again will be considerably longer.

Hum

With standard to high mains voltage, the heat dissipation is the most important problem of a power supply overload. Hum will only occur if the mains voltage is low. With low mains voltage the safety margin of the voltage regulators is also low. If the load current is high, the output voltage of the power transformer drops down. In addition to the reduced voltage by the low mains voltage, the input voltage of the regulators may be below the necessary value for proper operation of the regulators. The output voltages are not constant anymore and a saw tooth ripple voltage with the frequency of 100 Hz (with 50 Hz mains frequency) or 120 Hz (with 60 Hz mains frequency) is added to the DC output voltages. This ripple voltage may appear in the audio path of modules, mostly with high gain modules and bus amps. One of the characteristics of this kind of disturbance is that the ripple noise changes with small variations of the mains voltage, and, if the mains voltage raises, the ripple may completely disappears for some time. This kind of hum is not caused by an electro magnetic field, where the position of the power supply affects the hum.

Faderbox Frames

Three versions of the ToolMod Faderbox frames for 5, 11 and 20 modules are available. The master amplifiers and the link input and output amplifiers



are installed in the frame. There are several versions of the master amplifier. By using a particular master amplifier pcb, a Faderbox frame can be configured as stand-alone, master, slave, or daisy chain unit.

Due to the integration of the master amplifiers in the frame, all module compartments can be used for input modules, if no master faders or subgroup modules are required for a particular application. If master and/or group modules are necessary, any mono or stereo input module can be used for this purpose by feeding one of the two inputs of the module with the output(s) of the internal master or group output(s). Details on using input modules as master can be found in the ToolMod Faderbox Handbook.



XLR, TRS, and 25-pin d-sub connectors are used for all audio inputs and outputs of the Faderbox.

XLR

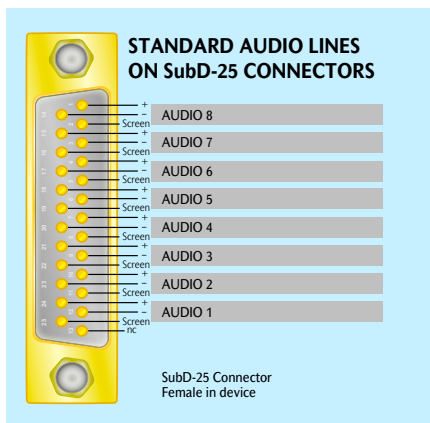
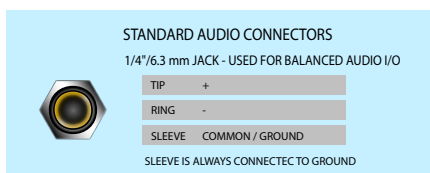
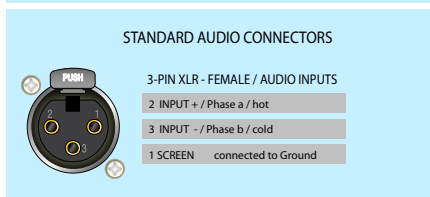
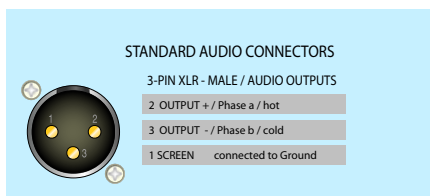
The pin assignment of the XLR connectors meets the international standard with Pin 1 = Screen (grounded), Pin 2 = + / hot, and Pin 3 = - / cold.

TRS

All TRS connectors are used for balanced audio lines. The only exception is the headphone output on the faceplate of the TM612 control room monitor module. The pin assignment of the TRS jacks (TRS = Tip - Ring - Sleeve = 1/4" Stereo jack) for balanced audio lines also matches the international standard with Tip = + / hot, Ring = - / cold, and Sleeve = screen (grounded).

25-Pin D-Sub Connectors

The pin out of all 25-pin d-sub connectors matches the so-called 'Tascam' standard for 8 analog audio lines on one connector. The diagram shows the basic pin configuration for this standard. The pin outs of all connectors are described in detail on the following pages.



Connector Panels

The connectors for the power supply, the link inputs and outputs, and the master outputs are identical in all versions of the ToolMod Faderbox frame. The picture on the next page shows the connector panel of a 5-channel Faderbox frame as an example.



Power Supply Connectors

The power supply section on the connector panel uses a male 5-pin XLR connector and a female connector that is wired in parallel for easy daisy chaining of the power supply. Any ToolMod, ToolMix, or ToolKit device can be supplied from a single power supply with sufficient capacity. The pin out of the 5-pin XLRs are shown on page 12. These connectors are installed in all versions of the Faderbox frame.

Master Outputs

The outputs of the stereo master amplifier and the six group master amplifiers that are installed in the frame are available on the 25-pin d-sub connector MASTER OUTPUTS. This connector is installed in all versions of the Faderbox. The pin out is shown here. Please note that the master outputs are not functional in a slave-version or a daisy chain version of the Faderbox. Please check page 34 and the ToolMod Faderbox Handbook for details on the different versions of the master pcb and the frames.

In all versions, the outputs of the stereo

ToolMod Faderbox MASTER OUTPUTS	
13	nc
12	Screen
11	Screen
10	Screen
9	Screen
8	Screen
7	Screen
6	Screen
5	Screen
4	Screen
3	Screen
2	Screen
1	Screen
LINE	
1	GROUP 6 OUTPUT
2	GROUP 5 OUTPUT
3	GROUP 4 OUTPUT
4	GROUP 3 OUTPUT
5	GROUP 2 OUTPUT
6	GROUP 1 OUTPUT
7	MIX-OUTPUT RIGHT
8	MIX-OUTPUT LEFT

SubD-25 Connector
Female in Console Frame



master MIX are also available on two TRS jacks in parallel to the d-sub. In the 19"- and the 20-channel version, there are additional TRS jacks for the groups 5 and 6.

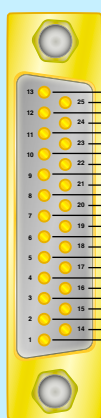
Connectors for the Link System

Like the power supply and the master output connectors, the inputs and outputs of the link system are installed in all versions of the Faderbox; however, if these connectors are functional or not depends on the version of the master pcb that is installed in the particular frame. Please check page 34 and the ToolMod Faderbox Handbook for details.

Two 25-pin d-subs are used for the link audio inputs and outputs. The two additional 9-pin d-sub are used for the inputs and outputs of the link control system.


The pin assignments of the 25-pin d-sub connectors match the 'Tascam' standard like all other 25-pin d-sub. The link inputs and outputs are electronically balanced; the operation level is identical to the level of the master outputs. Standard 8-core analog audio multicores can be used for the link system.

ToolMod Faderbox
LINK OUTPUTS (AUDIO)
(requires Master-PCB with Link-Outputs installed)

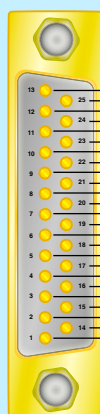
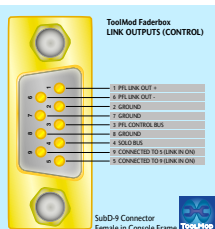
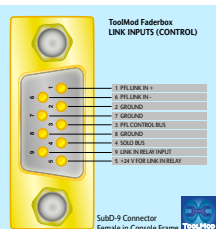


LINE	Output
1	GROUP 6 LINK OUTPUT
2	GROUP 5 LINK OUTPUT
3	GROUP 4 LINK OUTPUT
4	GROUP 3 LINK OUTPUT
5	GROUP 2 LINK OUTPUT
6	GROUP 1 LINK OUTPUT
7	MIX LINK OUTPUT RIGHT
8	MIX LINK OUTPUT LEFT

SubD-25 Connector
Female in Console Frame



The 9-pin d-sub connectors are used to control the link system. If a cable between two Faderbox frames is installed, the master Faderbox enables the link inputs automatically. In addition, the PFL and Solo control system is linked with these cables. Common computer cables can be used for these connections.



ToolMod Faderbox LINK INPUTS (AUDIO)
(requires Master-PCB with Link-Inputs installed)

LINE	
1	GROUP 6 LINK INPUT
2	GROUP 5 LINK INPUT
3	GROUP 4 LINK INPUT
4	GROUP 3 LINK INPUT
5	GROUP 2 LINK INPUT
6	GROUP 1 LINK INPUT
7	MIX LINK INPUTRIGHT
8	MIX LINK INPUTLEFT

SubD-25 Connector
Female in Console Frame



Connectors in the 5 Channel Frame

The 5-channel / 10" frame uses five 25-pin d-sub connectors for the inputs and outputs of the first four module compartment and TRS jacks and XLRs for the fifth compartment. The pin outs of the TRS and XLR connectors can be found on page 17.





ToolMod Faderbox modular Summing Mixer

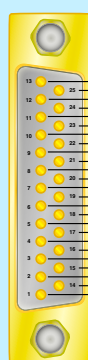
Audio Connectors



Connectors for the Module Compartments 1 to 4.

All inputs and outputs for the first four module compartments are wired to five 25-pin d-sub connectors, 'INPUT 1', 'INPUT 2', 'INSERT OUT', 'INSERT IN' and 'CHANNEL OUT'.

Die pin configuration of these d-sub, which match the 'Tascam' standard, are designed for stereo modules. With mono modules, only the left channels inputs and outputs are used. Special multicores for your setup are available. The pin outs of all connectors are shown on this page.

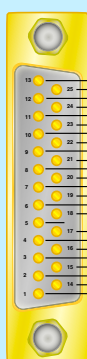


ToolMod Faderbox - 5CH-Frame INPUT 1 - CH 1 - 4

USE INPUT LEFT / MONO WITH MONO MODULES

LINE	
1	CH1 INPUT 1 LEFT / MONO
2	CH1 INPUT 1 RIGHT
3	CH2 INPUT 1 LEFT / MONO
4	CH2 INPUT 1 RIGHT
5	CH3 INPUT 1 LEFT / MONO
6	CH3 INPUT 1 RIGHT
7	CH4 INPUT 1 LEFT / MONO
8	CH4 INPUT 1 RIGHT

SubD-25 Connector
Female in Console Frame

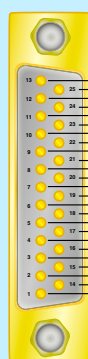


ToolMod Faderbox - 5CH-Frame INPUT 2 - CH 1 - 4

USE INPUT LEFT / MONO WITH MONO MODULES

LINE	
1	CH1 INPUT 2 LEFT / MONO
2	CH1 INPUT 2 RIGHT
3	CH2 INPUT 2 LEFT / MONO
4	CH2 INPUT 2 RIGHT
5	CH3 INPUT 2 LEFT / MONO
6	CH3 INPUT 2 RIGHT
7	CH4 INPUT 2 LEFT / MONO
8	CH4 INPUT 2 RIGHT

SubD-25 Connector
Female in Console Frame



ToolMod Faderbox - 5CH-Frame INSERT OUTPUT - CH 1 - 4

USE OUTPUT LEFT / MONO WITH MONO MODULES

LINE	
1	CH1 INSERT OUTPUT LEFT / MONO
2	CH1 INSERT OUTPUT RIGHT
3	CH2 INSERT OUTPUT LEFT / MONO
4	CH2 INSERT OUTPUT RIGHT
5	CH3 INSERT OUTPUT LEFT / MONO
6	CH3 INSERT OUTPUT RIGHT
7	CH4 INSERT OUTPUT LEFT / MONO
8	CH4 INSERT OUTPUT RIGHT

SubD-25 Connector
Female in Console Frame



ToolMod Faderbox - 5CH-Frame INSERT INPUT - CH 1 - 4

USE INPUT LEFT / MONO WITH MONO MODULES

LINE	
1	CH1 INSERT INPUT LEFT / MONO
2	CH1 INSERT INPUT RIGHT
3	CH2 INSERT INPUT LEFT / MONO
4	CH2 INSERT INPUT RIGHT
5	CH3 INSERT INPUT LEFT / MONO
6	CH3 INSERT INPUT RIGHT
7	CH4 INSERT INPUT LEFT / MONO
8	CH4 INSERT INPUT RIGHT

SubD-25 Connector
Female in Console Frame



ToolMod Faderbox - 5CH-Frame CHANNEL OUTPUT - CH 1 - 4

USE OUTPUT LEFT / MONO WITH MONO MODULES

LINE	
1	CH1 CHANNEL OUTPUT LEFT/MONO
2	CH1 CHANNEL OUTPUT RIGHT
3	CH2 CHANNEL OUTPUT LEFT/MONO
4	CH2 CHANNEL OUTPUT RIGHT
5	CH3 CHANNEL OUTPUT LEFT/MONO
6	CH3 CHANNEL OUTPUT RIGHT
7	CH4 CHANNEL OUTPUT LEFT/MONO
8	CH4 CHANNEL OUTPUT RIGHT

SubD-25 Connector
Female in Console Frame



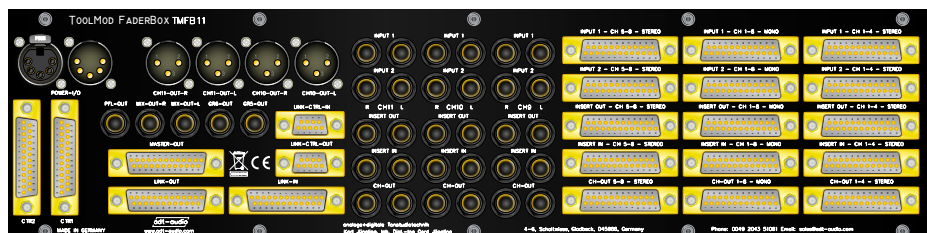
Connectors for the fifth Module Compartment

TRS jacks are used for the inputs and the insert inputs and outputs of the fifth module compartment. The outputs of the fifth module are available on xlr connectors.

This combination makes possible to configure a stereo master using a stereo input module installed in the last slot using standard TRS patch cords. The configuration of master and group faders is explained in detail on page 40 and in the ToolMod Faderbox Handbook.

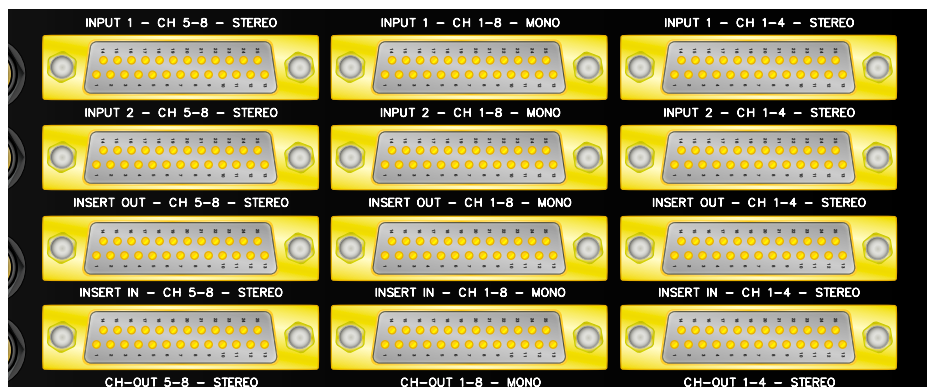
Connectors in 19" Frames

15 25-pin d-sub connectors are used for the inputs and outputs of the module compartment 1 to 8 in the 19"-frame. The inputs and outputs of the remaining module compartments 9 to 11 are available on TRS jacks and XLR connectors in parallel for the outputs of the compartments 10 and 11. The pin outs of the TRS and XLR connectors can be found on page 17.



Connectors for the Module Compartments 1 to 8

All inputs and outputs of the first 8 module compartments are wired to the 15





ToolMod Faderbox modular Summing Mixer Audio Connectors



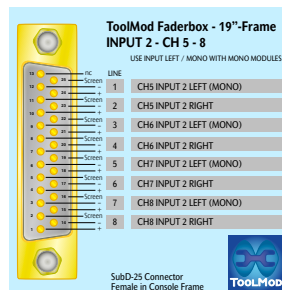
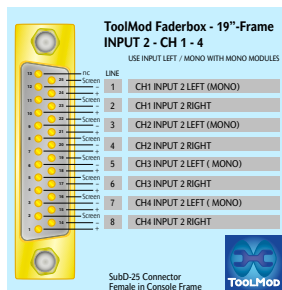
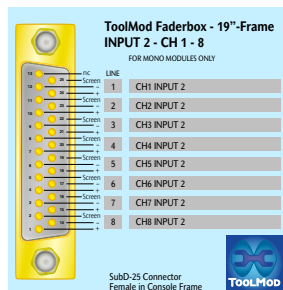
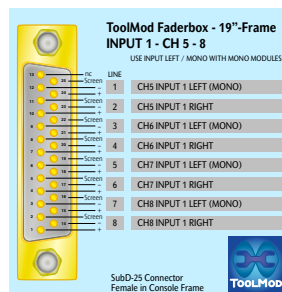
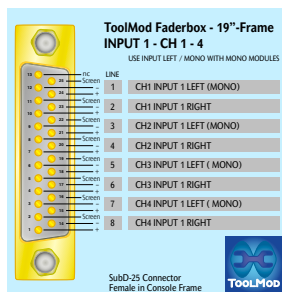
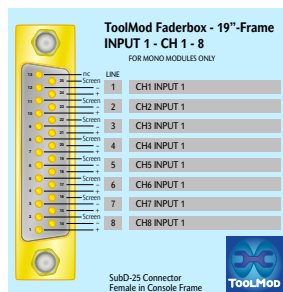
25-pin d-sub connectors 'INPUT 1', 'INPUT 2', 'INSERT OUT', 'INSERT IN' und 'CHANNEL OUT'.

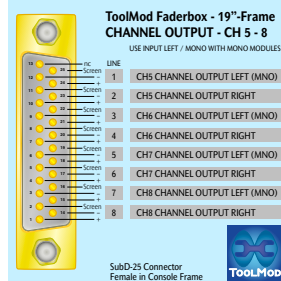
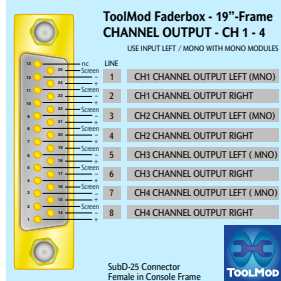
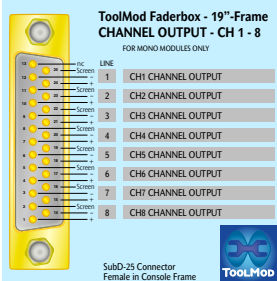
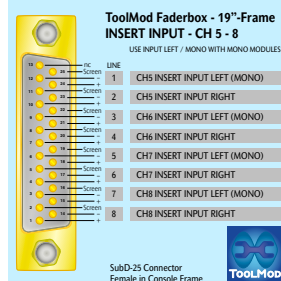
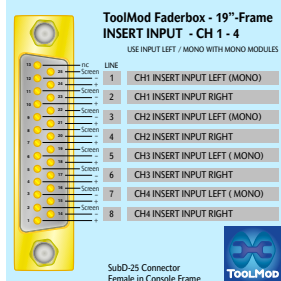
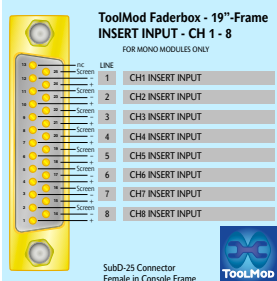
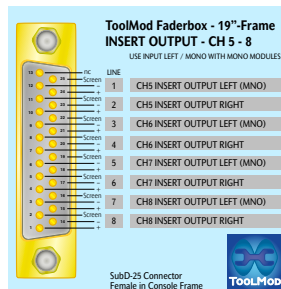
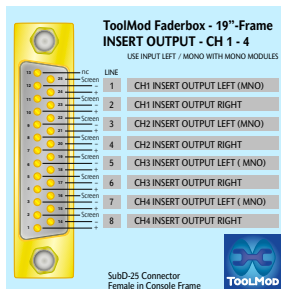
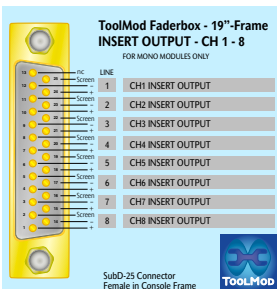
In order to use standard analog multicore cables with 25-pin d-sub's if 8 mono or 8 stereo input modules are installed in the compartments 1 to 8, there are three connectors for each input and output. The connectors '1-4 STEREO' and '5-8 STEREO' are used with stereo modules. These are wired in a way that eight DAW tracks feed the inputs and outputs of 4 stereo channels in ascending order (track 1 - input 1 left, track 2 - input 1 right, track 3 - input 2 left, and so on till track 8 - input 4 right).

The connectors 'CH 1-8 - MONO' are wired in parallel but for 8 channels in ascending order. The inputs and outputs for the left channels are wired to all connectors while the right channels are only wired to the STEREO connectors.

Unless mono and stereo modules are installed in random order, standard multicore cables can be used. Custom cables for special configurations that are not covered by the parallel connectors are available according to your specifications at short notice.

Here are the pin outs of all connectors for the module slots 1 to 8:





Connectors for the Module Compartments 9, 10, and 11

TRS jacks are used for all inputs and outputs of the compartments 9 to 11. Stereo input modules can be installed; if mono modules are installed only the jacks for the left channels are used. The outputs of the compartments 10 and 11 are also wired to XLR connectors.

In addition to the TRS jacks for the outputs of the internal stereo master, the outputs of the groups 5 and 6 are also wired to TRS jacks in parallel to the sub connector MASTER OUT. These jacks allow easy configuration of master



and group faders using common TRS patch cords. Details on the configuration of master and group fader can be found on page 40.

The d-sub connectors CTR1 and CTR2 are only used if a TM612 stereo control room module is installed on the 11th compartment of the frame. Please go to page 30 for details.

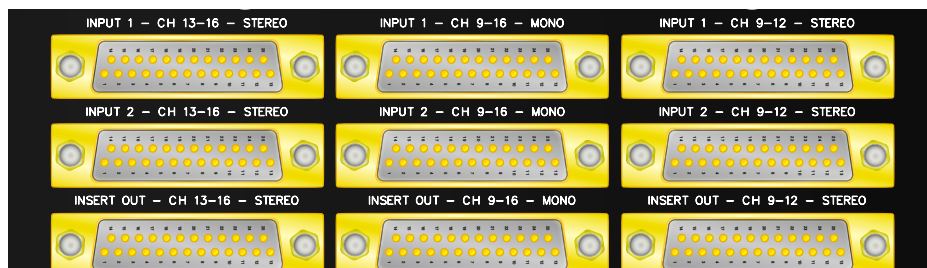
Connectors in the 20 Channel Frame



The image shows the connector panel of the 20-channel version of the Faderbox, which is almost identical to the 19" version apart from the connectors for the additional nine module compartments. There are 30 25-pin d-sub connectors in total for the inputs and output of the module compartments 1 to 16. The layout of the connectors for the slots 1 to 8 and 9 to 16 are identical to the layout of the connectors for the slots 1 to 8 of the 19" Faderbox.

Connectors for the Module Compartments 1 to 8 and 9 to 16

All inputs and outputs of the first 16 module compartments are wired to the 30 25-pin d-sub connectors 'INPUT 1', 'INPUT 2', 'INSERT OUT', 'INSERT IN' and



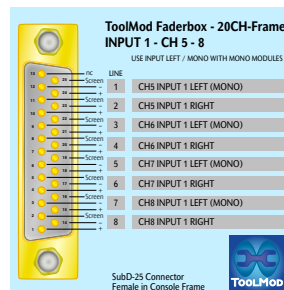
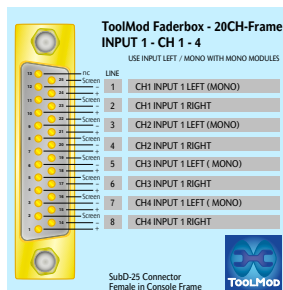
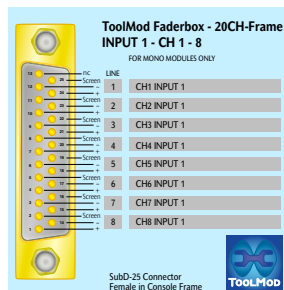
'CHANNEL OUT'.

In order to use standard analog multicore cables with 25-pin d-sub's if 8 mono or 8 stereo input modules are installed in the compartments 1 to 8 or 9 to 16, there are three connectors for each input and output. The connectors '1-4 STEREO' and '5-8 STEREO' are used with stereo modules. These are wired in a way that eight DAW tracks feed the inputs and outputs of 4 stereo channels in ascending order (track 1 - input 1 left, track 2 - input 1 right, track 3 - input 2 left, and so on till track 8 - input 4 right). All other connectors are based on the same principle.

The connectors 'CH 1-8 - MONO' and 'CH 9-16 - MONO' are wired in parallel but for 8 channels in ascending order. The inputs and outputs for the left channels are wired to all connectors while the right channels are only wired to the STEREO connectors.

Unless mono and stereo modules are installed in random order, standard multicore cables can be used. Custom cables for special configurations that are not covered by the parallel connectors are available according to your specifications at short notice.

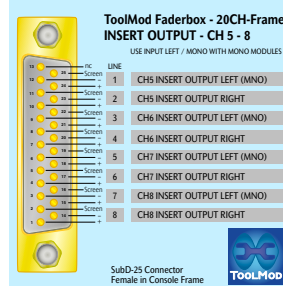
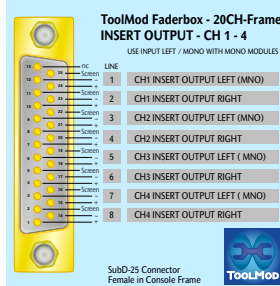
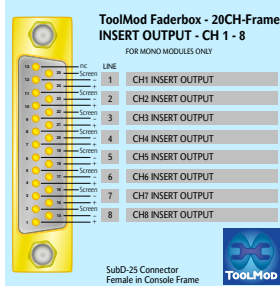
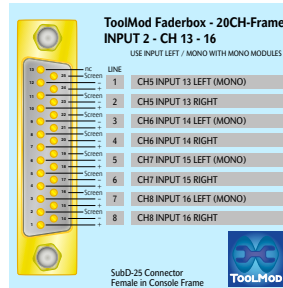
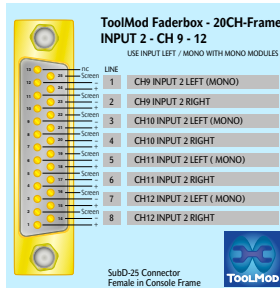
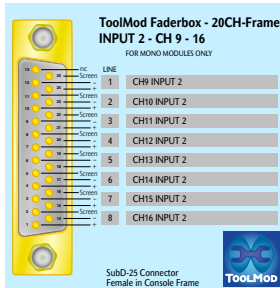
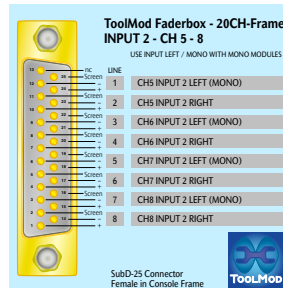
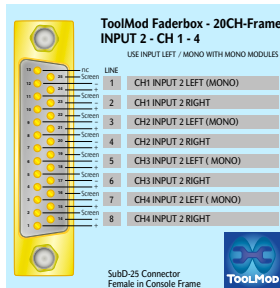
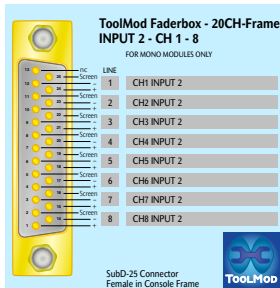
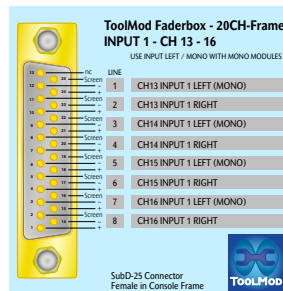
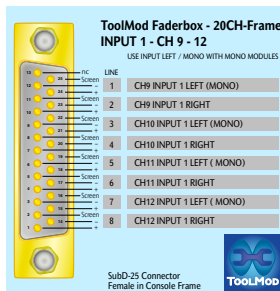
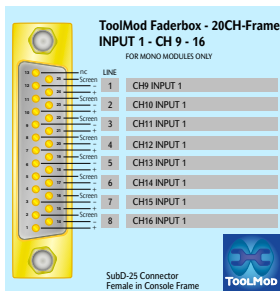
Here are the pin outs of all connectors for the module slots 1 to 16:

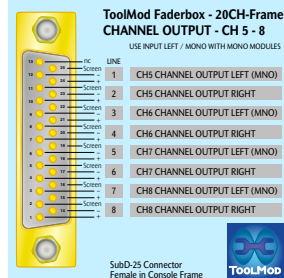
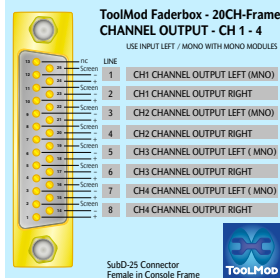
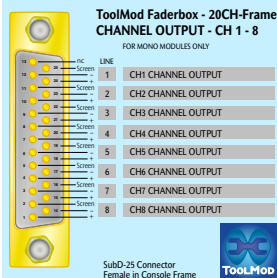
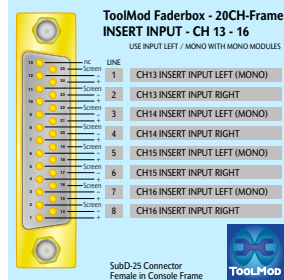
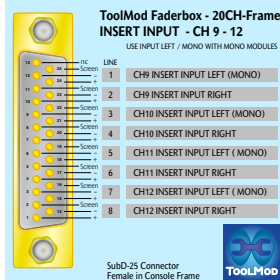
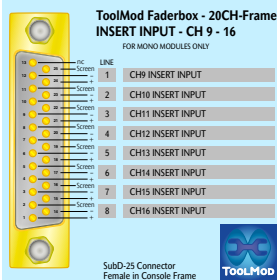
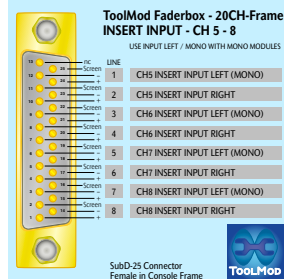
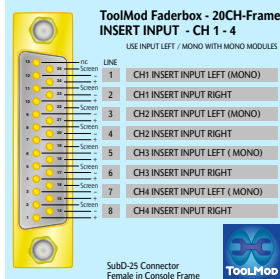
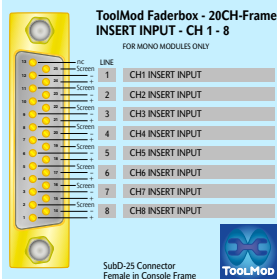
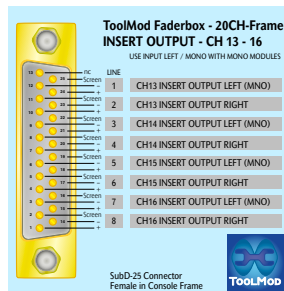
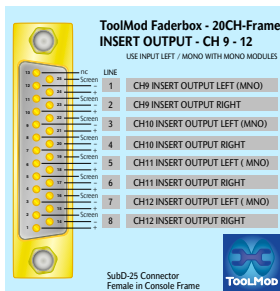
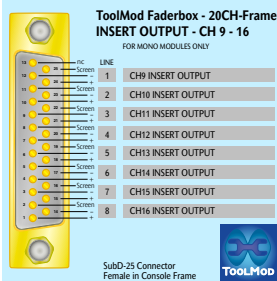




ToolMod Faderbox modular Summing Mixer

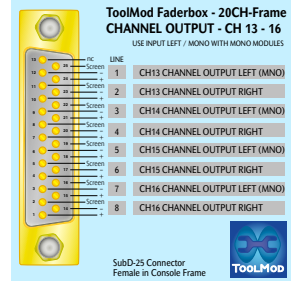
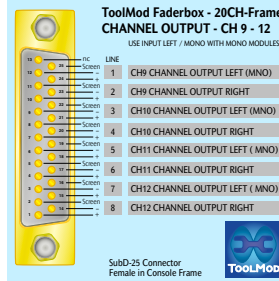
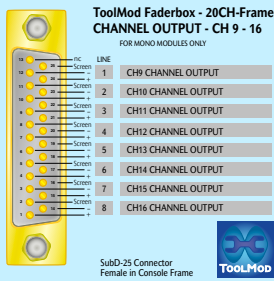
Audio Connectors







ToolMod Faderbox modular Summing Mixer Audio Connectors

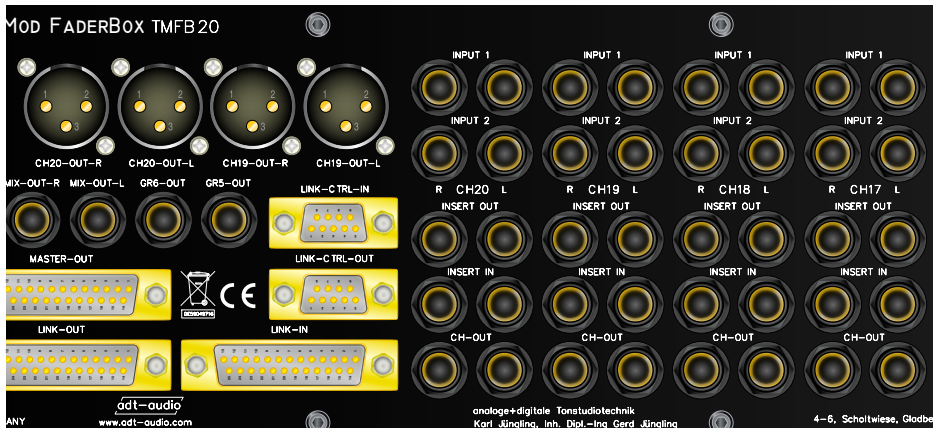


Connectors for the Compartments 17 to 20

TRS jacks are used for all inputs and outputs of the compartments 17 to 20. Stereo input modules can be installed; if mono modules are installed only the jacks for the left channels are used. The outputs of the compartments 19 and 20 are also wired to XLR connectors.

In addition to the TRS jacks for the outputs of the internal stereo master, the outputs of the groups 5 and 6 are also wired to TRS jacks in parallel to the d-sub connector MASTER OUT. These jacks allow easy configuration of master and group faders using common TRS patch cords. Details on the configuration of master and group fader can be found on page 40.

The d-sub connectors CTR1 and CTR2 are only used if a TM612 stereo control room module is installed on the 20th compartment of the frame. The next chapter describes the details of the installation of a TM612 module.



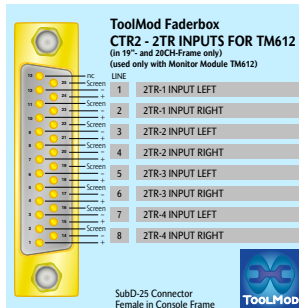
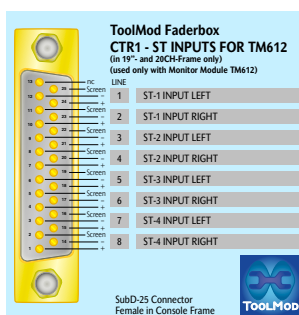
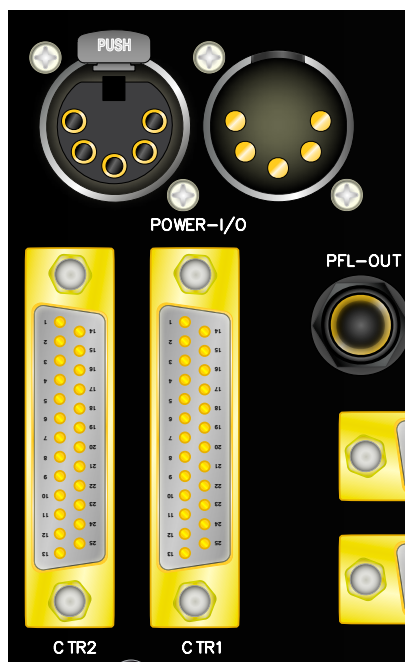
Connectors for the TM612 Control Room Module

The compartments 11 in the 19" frame and 20 in the 20-channel frame are designed for the installation of the stereo control room module TM612. This module can be installed in other compartments; however, all features are only available when the TM612 is installed in these compartments.

CTR 1 and CTR2 in 19" and 20-Channel Frames

The 25-pin d-sub connectors CTR1 and CTR2 are only installed in the 19" frame and the 20-channel frame. These connectors are used for eight of the nine inputs of the TM612 control room module. All details on the installation of the TM612 can be found in the ToolMod Faderbox Handbook. Each of the two connectors is used for four stereo inputs that feed the corresponding switches of the input selector.

The standard connectors of the last compartment are used for the ninth input, DAW, as well as all outputs of the control room module as follows:



INPUT 1 L	=	DAW-IN L
INPUT 1 R	=	DAW-IN R
INPUT 2 L	=	METER-SEND L *)
INPUT 2 R	=	METER-SEND-R *)
INSERT-OUT L	=	ALTERNATE SPEAKER OUT L
INSERT-OUT R	=	ALTERNATE SPEAKER OUT R
INSERT-IN L	=	MINI-SPEAKER OUT L
INSERT-IN R	=	MINI-SPEAKER OUT R
CHANNEL-OUT L	=	MAIN-SPEAKER OUT L
CHANNEL-OUT R	=	MAIN-SPEAKER OUT R

*) The INPUT 2 L and INPUT 2 R jacks that are used for the direct outputs for external meters can be used for the 2TR-1 inputs alternatively. The configuration takes place by jumpers. The block diagram of the TM612 can be found on the next page.



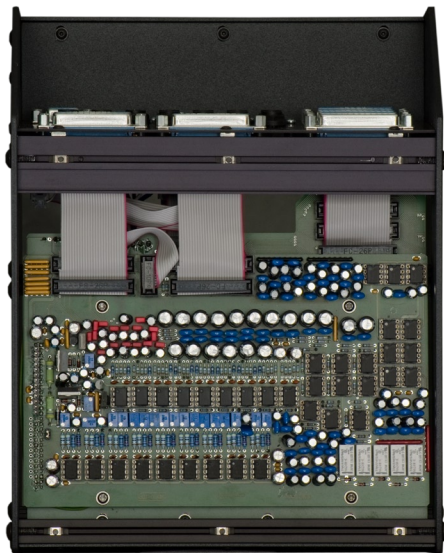




Master Amplifiers and Link Interface

The master amplifiers of the Faderbox are located on a plug-in board that is installed below the motherboard in the frame. Several versions of this pcb that also contains the link interface are available.

The picture on the right side shows a master pcb with master amplifiers and link input and output amplifiers in a 5-channel frame. The picture below shows a master pcb version with master outputs but no link inputs and outputs installed, which is used for stand-alone versions of the Faderbox. Replacing the master pcb with another version is possible at any time. After removing the bottom cover sheet and the screws that hold the pcb in the frame, you can unplug all cables, pull out the pcb and replaced it with another version. Adding link features to a stand-alone frame is therefore possible at any time without soldering. The cables for all versions are always installed in the frame.

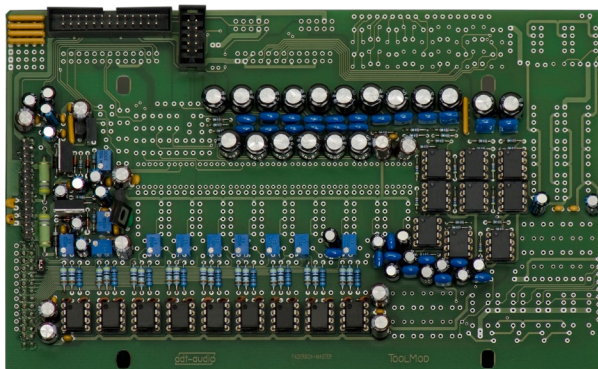


Master-Pcb Versions

Using the link system to couple several Faderboxes postulates that the suitable versions of the master pcb are installed in all frames!

All versions of the master pcb contain the bus-amps for the stereo master, the six groups, and the PFL system.

All necessary cables for the master outputs and the link inputs and outputs are installed in all Faderbox frames. Adding link features is therefore possible just by replacing the master pcb.



The following versions of the master pcb are available:

For 'stand-alone' operation:

Master Only Master amplifiers installed,
link inputs and outputs not installed

For a master frame in combination with a slave frame:

Master + Link In Master amplifiers and link inputs installed,
link outputs not installed

For a slave frame in combination with a master frame:

Slave 1 only link outputs installed,
link inputs and master amplifiers not installed

For a slave frame in combination with a master frame:

With this version, another slave frame can be added to the first slave frame in daisy chain mode:

Slave 2 Link inputs and link outputs installed,
master amplifiers not installed

For a frame with master amplifiers and link inputs to couple a slave frame, which is used as slave of another master frame:

Master + Link In + Master amplifiers, link inputs and
Link Out link outputs installed

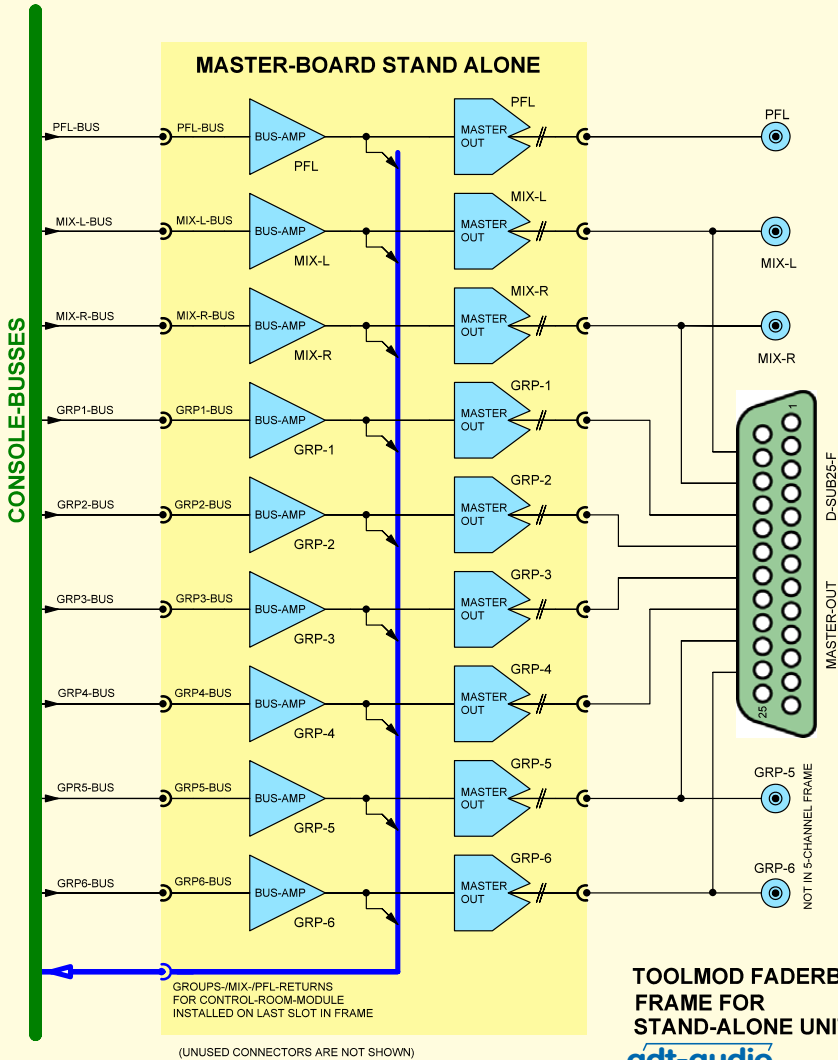
The block diagrams of the different versions can be found on the next pages.

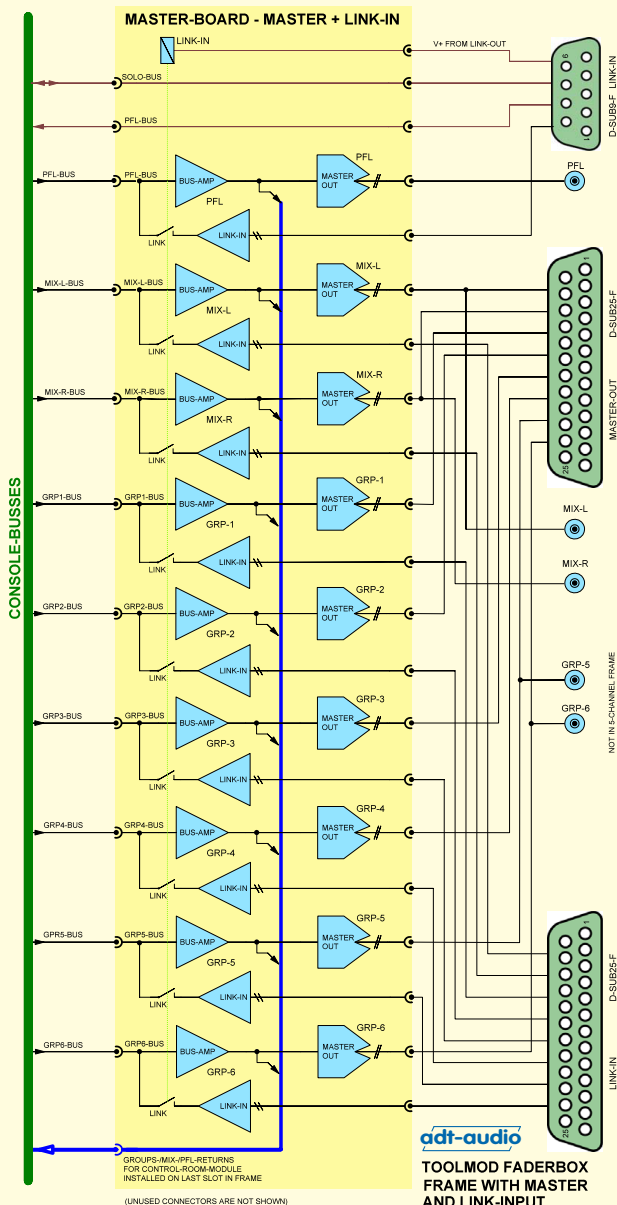
Link Inputs and Outputs

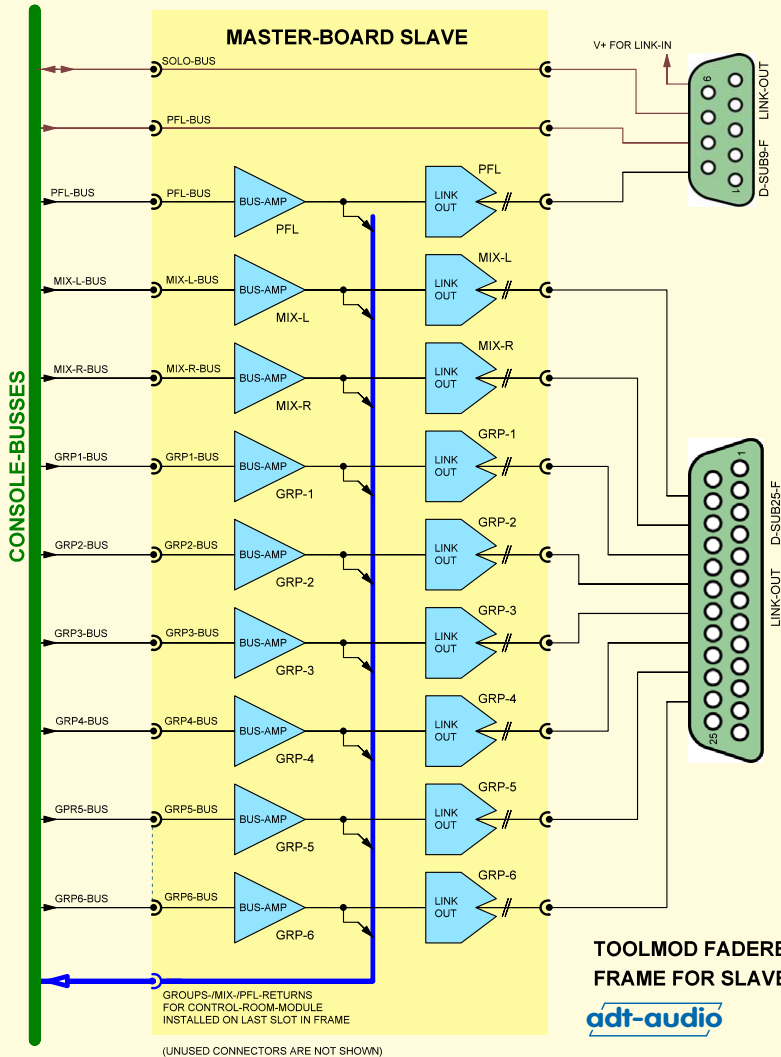
All link inputs and outputs are electronically balanced. Trouble free linking of any number of Faderbox frames using long cables and/or different power supply units for the frames is possible. The pin assignments of the link connectors can be found on pages 19 and 20. Common 8-core audio multicores with 25-pin d-sub connectors are used for the audio link. The additional 9-pin d-sub connectors connect the control busses of solo and PFL and unlock the link inputs of a master frame automatically. Common computer cables with 9-pin male d-sub connectors can be used for these connections. To enable the link it is only necessary to connect the link audio input and output and the 9-pin link control input and output of the frames.

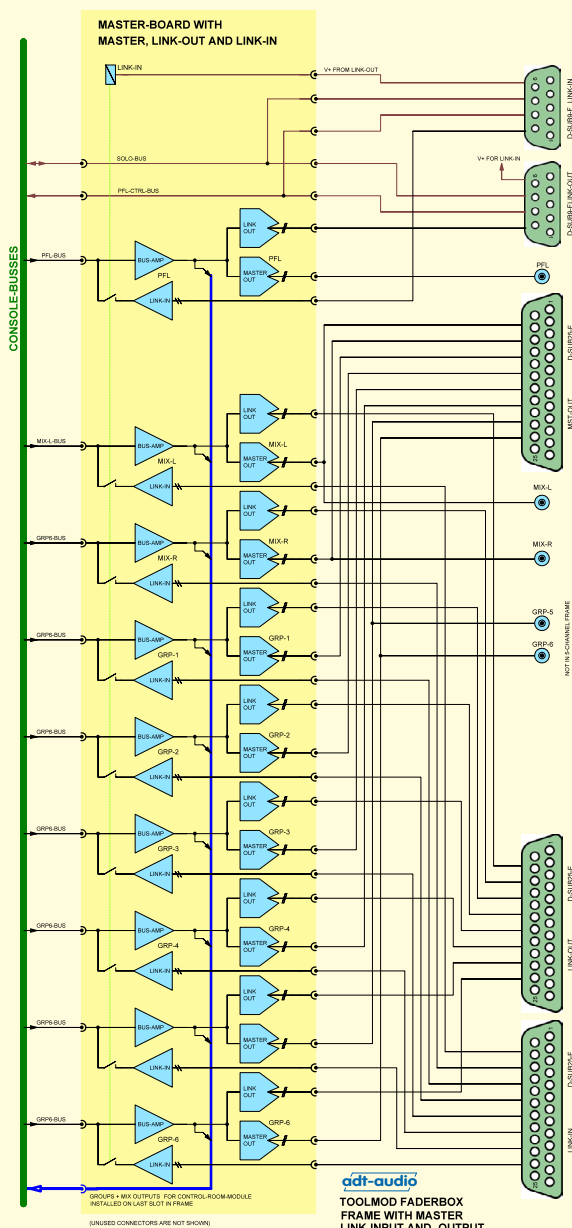


ToolMod Faderbox modular Summing Mixer Master Amplifiers / Link-Interface











Frames without Master-PCB

If no master-pcb is installed in a ToolMod Faderbox frame, all module inputs and outputs work; however, mixing is not possible.

Input modules in a frame without master pcb operate stand-alone. The inputs, insert sends and returns, and the channel outputs will work as well as the internal 'aux to channel out' features. The pan-pot or the balanced control respectively, the routing switches, the PFL system, and all link features are inoperable since these features require the master-pcb. However, the solo system is fully functional.

Since the price of a frame without master-pcb is a lot lower, such frames make sense if just single faders for mono or stereo signals are required for a particular application.



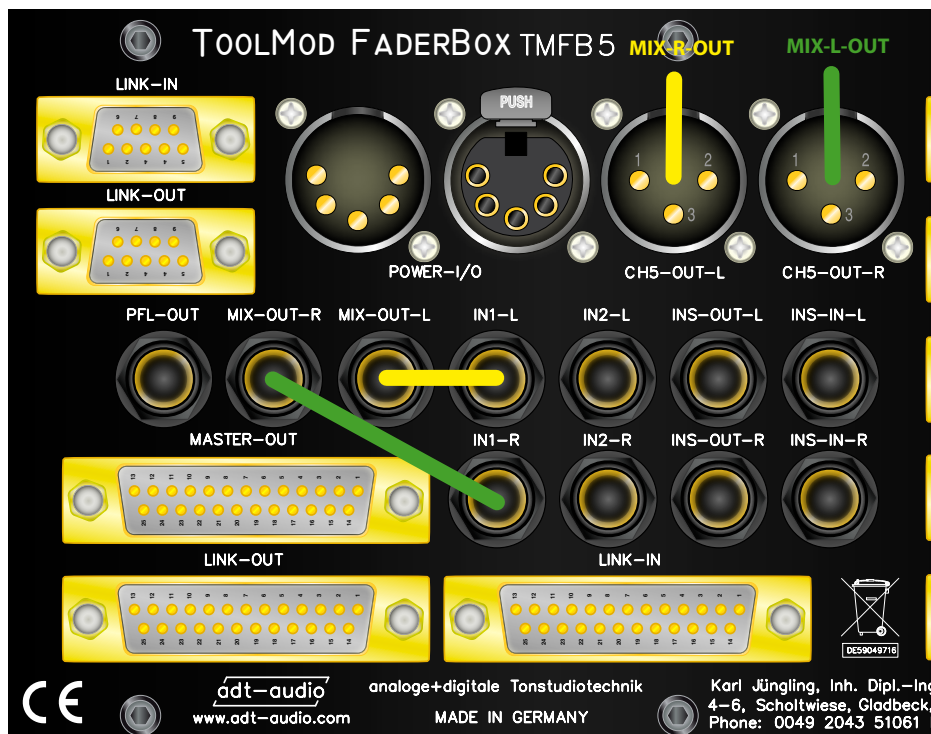
Master and Group Faders

If no master and/or group faders are required, input modules can be installed in all compartments. Any mix of mono and stereo module is possible, since all compartments are suited for all input module versions.

Master Fader

If a master fader for the main stereo master MIX is required, a stereo input module TM602 or TM603 can be used for this purpose by connecting the master outputs of the internal master amplifiers to one of the two stereo inputs of the stereo input module. In this case, the outputs of the stereo module become the master outputs of the console.

The image below shows a section of the connector panel of a 5-channel Faderbox. To use a stereo module in the fifth module compartment as stereo master, it is only necessary to connect the MIX-OUT-L and MIX-OUT-R outputs of the internal master pcb to the IN1-L and IN1-R inputs of the stereo module.





ToolMod Faderbox modular Summing Mixer Master and Group Faders



le using two short TRS patch cords. Using the second inputs IN2-L and IN2-R instead is possible as well. The outputs of the stereo channel that become the stereo master outputs are available on the male XLR connectors CH5-OUT-L and CH5-OUT-R.

Sub Group Master Faders

Using mono or stereo inputs as group masters for any number of the 6 groups of the Faderbox is possible in the same way. Depending on the use of mono or stereo input modules, just connect one of the inputs of the group master to the group outputs of the internal master pcb. Since all input modules come with two inputs, group master modules can still be used as standard input modules alternatively without any need for altering the cabling. In any case all features of the input modules, like insert, routing, and aux features, are available for the group master as well. A group master can be routed not only into the main stereo master MIX but also into another group, which can be used as master-group for other groups. Therefore, the groups are not limited to a single level but can be arranged in many different ways. The aux feature makes possible to feed effect gear from group masters.

The image below shows the necessary cabling with short TRS patch cords when using module compartment 11 as main stereo master and compartment 10 as stereo group master for the groups 5 and 6 in a 19" Faderbox. Since the groups 5 and 6 are used for recording if the Faderbox operates in inline mode, the group master works as 'record master' while recording and as sub group master or input channel when mixing.



Dimensions

The ToolMod Faderbox with a total height of 266 mm / 10.5" fits into 6U when mounted in a rack. The maximum depth of the frame is 150 mm / 6". The image on the next page shows the side view and cross section. The table below shows the different dimensions and the necessary size of a cut-out if the Faderbox is installed in a console or table.

Frame Version	inner Width	Width Desktop Version	Width Rack Version
-	-	incl. Screw Heads	incl. Brackets
5 Channel Frame	200 mm / 7.875"	210 mm / 8.25"	254 mm/10"- 241.5 mm/9.5" *)
19" Frame	440 mm / 17.332"	448 mm / 17.635"	483 mm / 19"
20 Channel Frame	800 mm / 31.375"	810 mm / 31.9"	835 mm / 32.87"
* 254 mm for 10" Rack (Standard), 241.5 mm for 9.5-Zoll / 0.5 * 19" Racks by different Brackets			
Frame Version	Width build-in Version incl. Brackets	Cut-Out Size flush fitting	Cut-Out Size ascending 8°
5 Channel Frame	260 mm / 10.24"	212 x 268 mm 8.35 x 10.55"	212 x 274 mm 8.35 x 10.78"
19" Frame	489 mm / 19.25"	450 x 268 mm 17.72 x 10.55"	450 x 274 mm 17.72 x 10.78"
20 Channel Frame	851 mm / 33.5"	812 x 268 mm 32 x 10.55"	812 x 274 mm 32 x 10.78"
		(W * H)	

Some Remarks

The column 'Width Desktop Version' refers to the overall width including screw heads.

A none-standard version of the rack brackets is needed if a 5-channel Faderbox is installed in a 9.5" (1/2 * 19") rack. With the standard brackets, the 5-channel-box fits into a 10" / 254 mm rack. Since some computer equipment uses this size, 10" racks are available at reasonable prices.

Installing the Faderbox in a Desk or a Console

To install a Faderbox in a cutout of a desk or console, just check the necessary size of the cutout in the table. It is possible to fix the console from the top or the bottom, flush with the table surface or at an angle of 8 degrees.

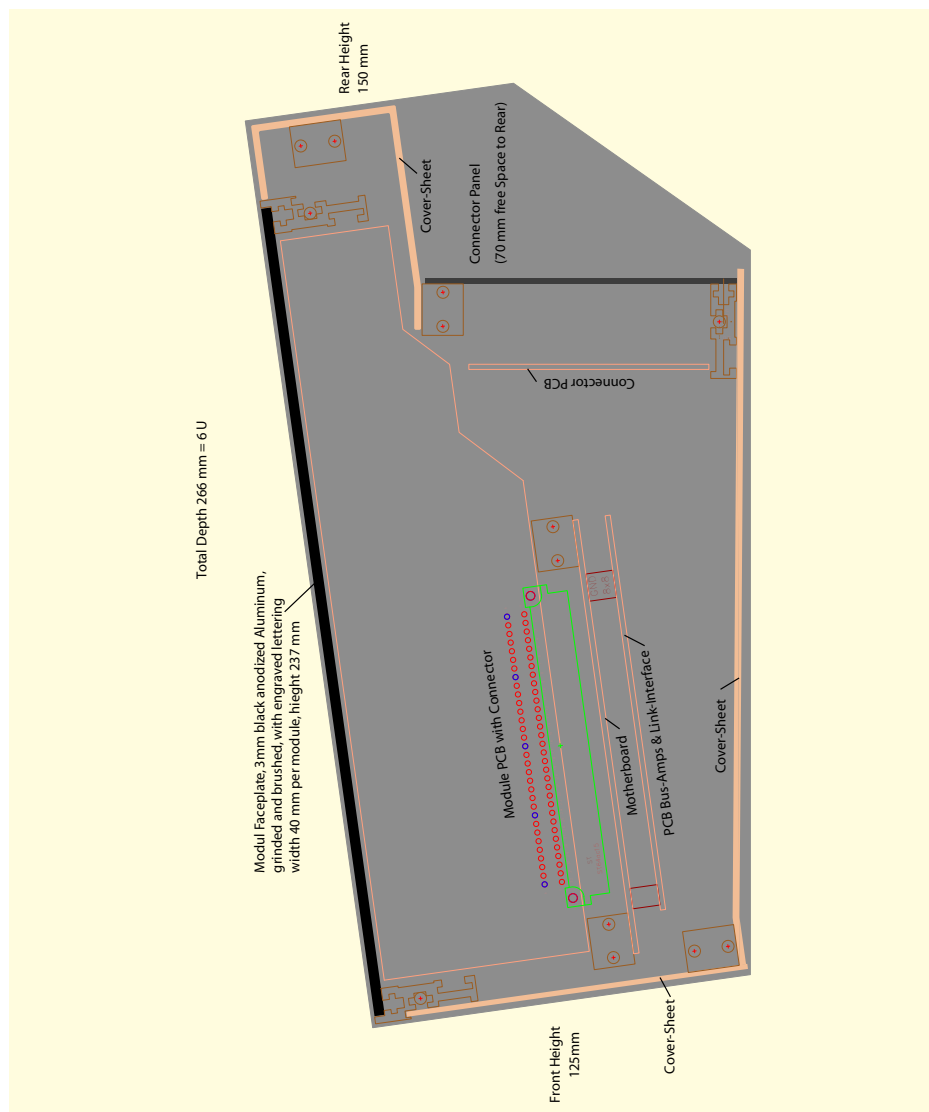


ToolMod Faderbox modular Summing Mixer

Faderbox Frames



Different cutout sizes are necessary for these versions; all are listed in the table. Threads in the side panel allow installing the rack brackets in four ways. Adjusting to different thicknesses of the table plate is possible by slotted holes in the rack brackets. See 'Frame Options' on page 44 for details.



Frame Options

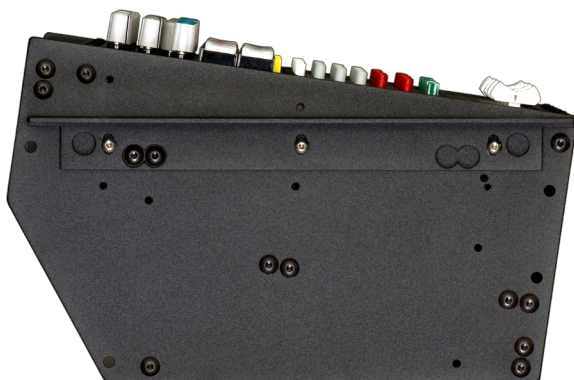
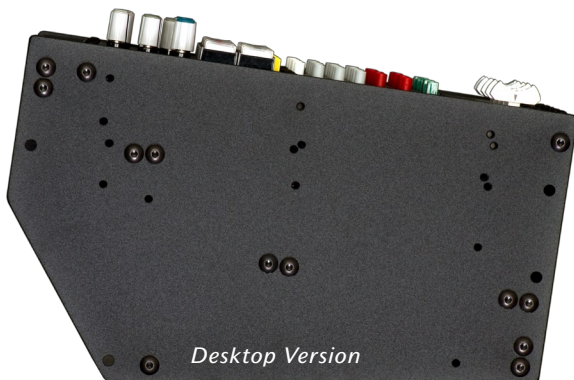
All versions of the ToolMod Faderbox can be used as desktop, 'lunchbox', or rack-mounted version. Installation in a desk or console is possible as well. The frame is identical for all versions. By adding rubber feet, handles, or brackets the frame can be adapted in the desired way. The pictures show these options. The standard side panels contain the necessary threads and fixing holes for all versions.

Desktop and Lunchbox Version

The picture on top of this page shows the side view of a desktop Faderbox. Wooden side panels to cover the screw heads in the side panels are available. Rubber feet are installed in the bottom sheet. Handles can be installed on one or both sides of the frame (see picture to the right, 'Lunchbox' style).

Rack mounting and Installation in a Desk or Console

The standard rack brackets for the ToolMod Faderbox can be used for rack mounting or the installation in a cutout in a desk. It is possible to install the brackets in four different ways. The pictures





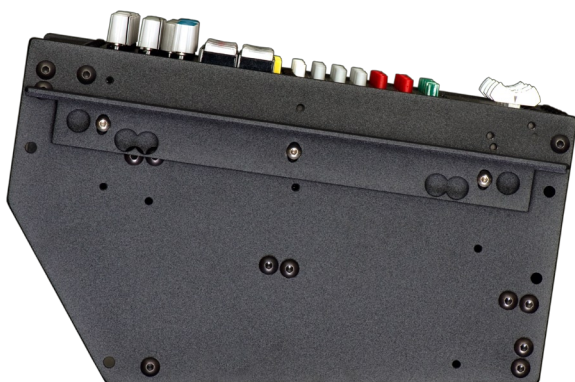
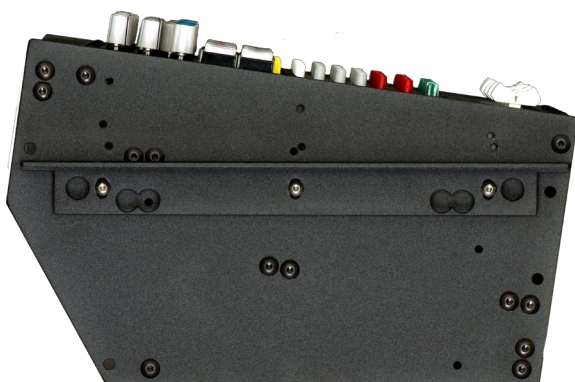
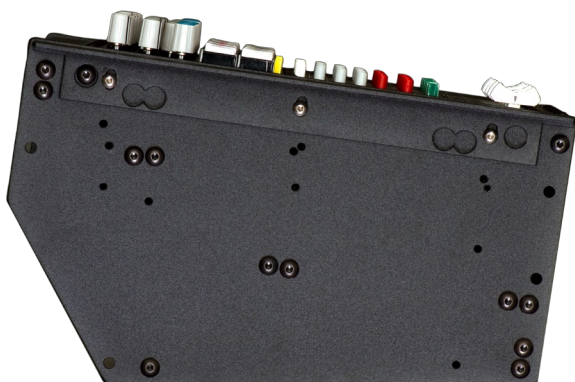
ToolMod Faderbox modular Summing Mixer

Faderbox Frames



on the bottom of the last and on top of this page show the brackets installed for rack mounting with flush fitting in parallel to the rack or ascending at an angle of 8 degrees. Installation in a desk with fixing from top is also possible with the brackets mounted like this.

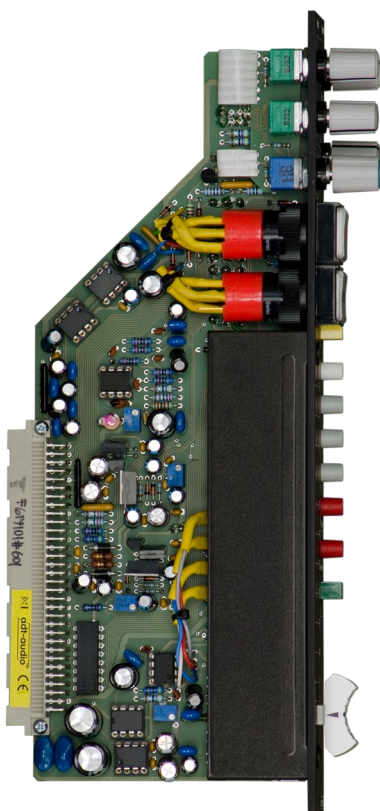
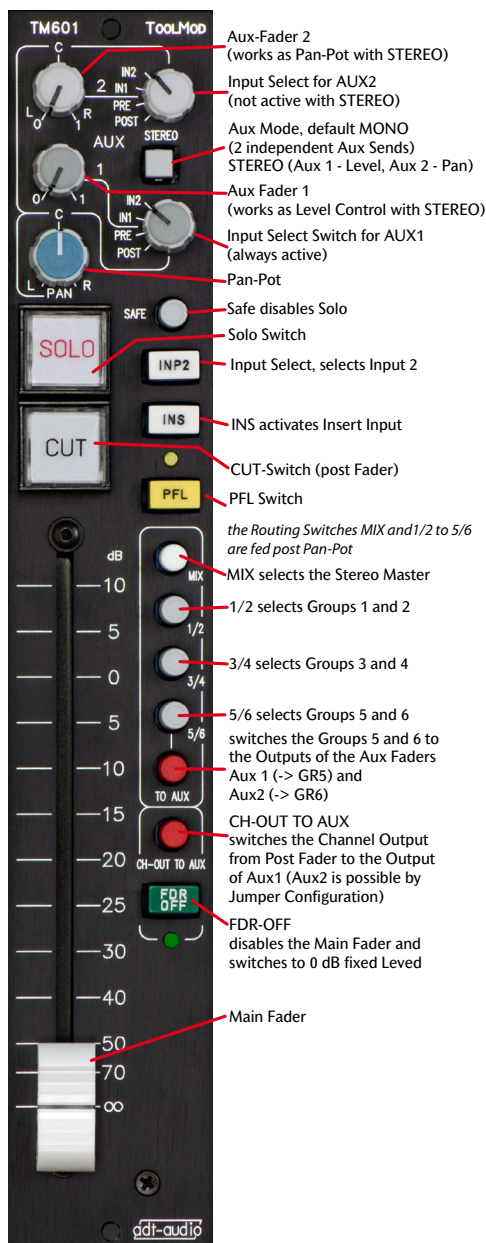
The two other pictures show the installation of the brackets for installation in a cut-out of a desk with fixing from the bottom. Slotted holes make possible to adjust the brackets to different table plates. Standard brackets can be used for all these versions; however, if the 5-channel frame is installed in a 9.5"-rack instead of a 10" rack, a special version of the brackets is necessary.

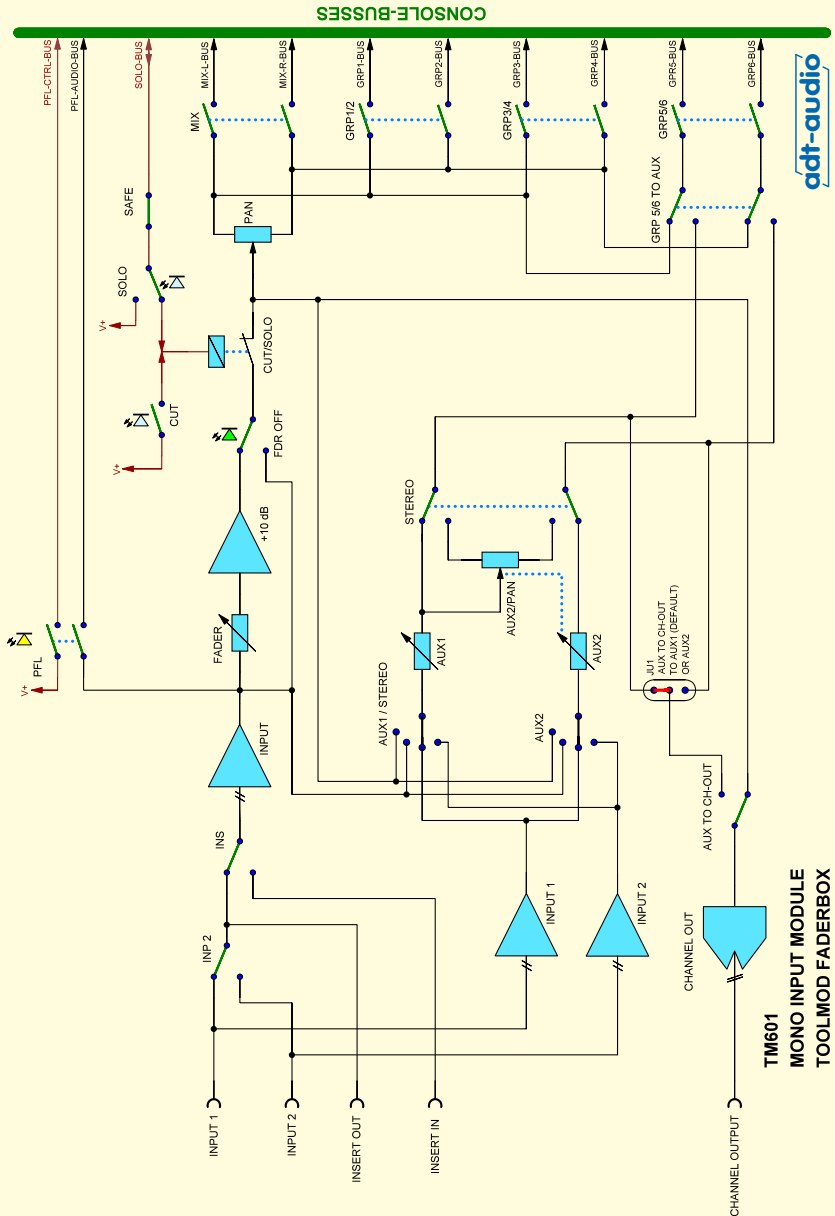


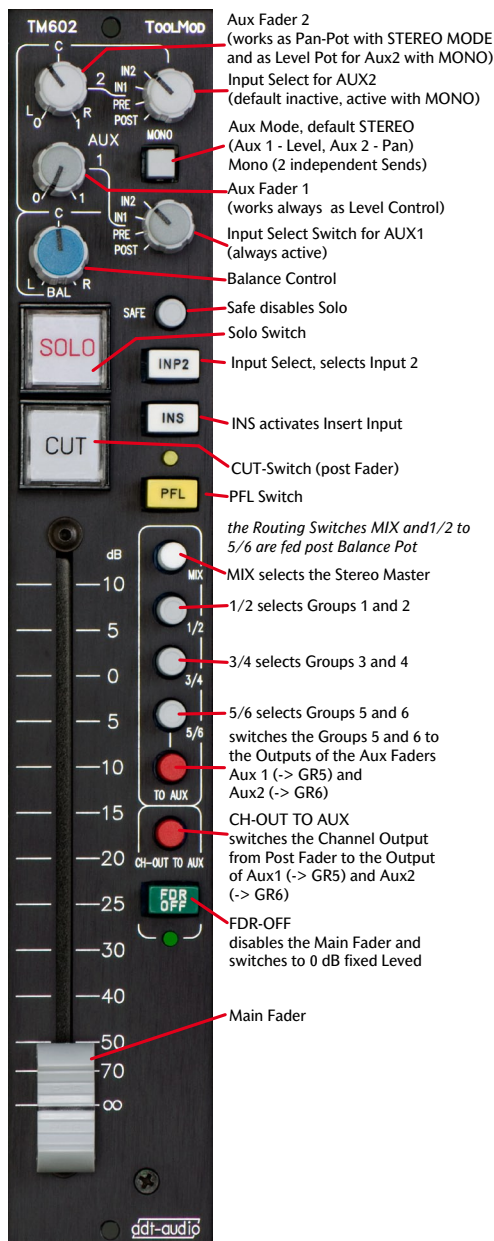
TM601 Mono Input Module

All details on the TM601 mono input module can be found in the ToolMod Faderbox Handbook.

Configuration Options:
CH-OUT TO AUX:
default from AUX1
alternatively from AUX2



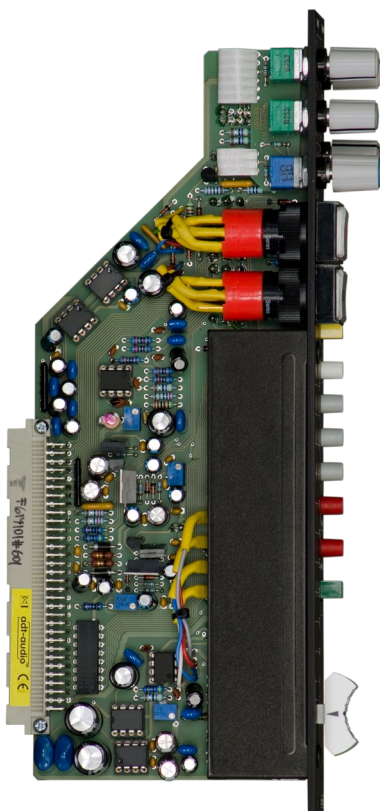




TM602 Stereo Input Module

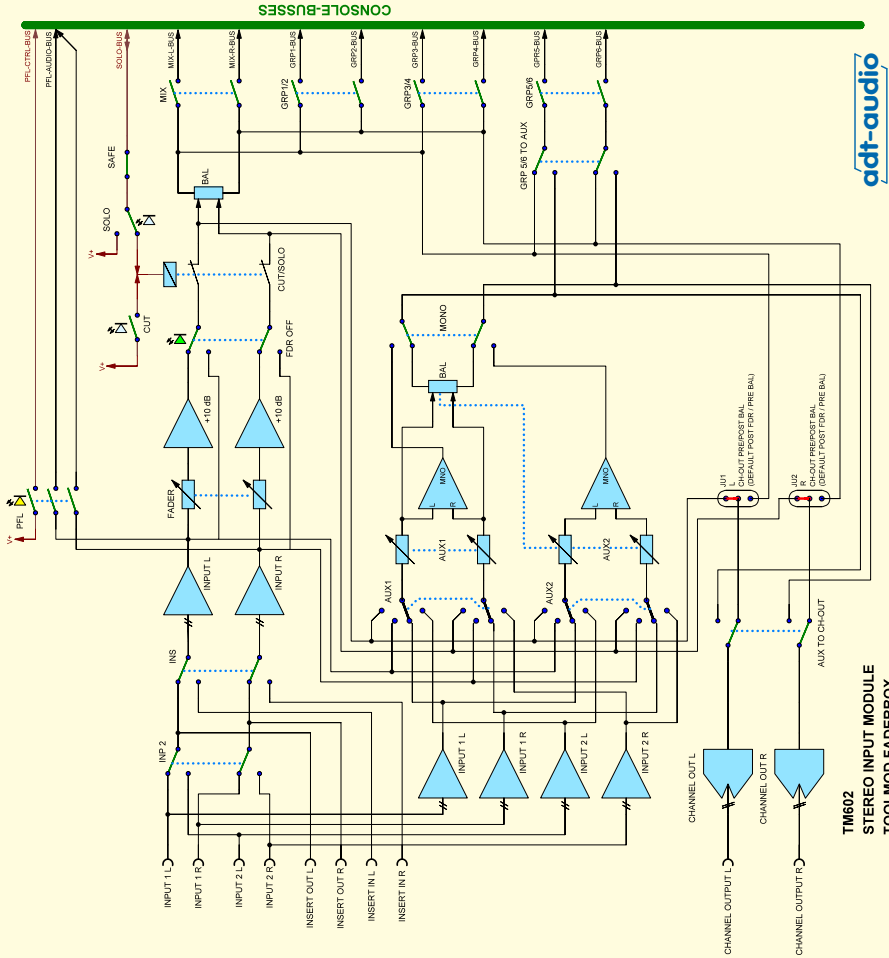
All details on the TM602 stereo input module can be found in the ToolMod Faderbox Handbook.

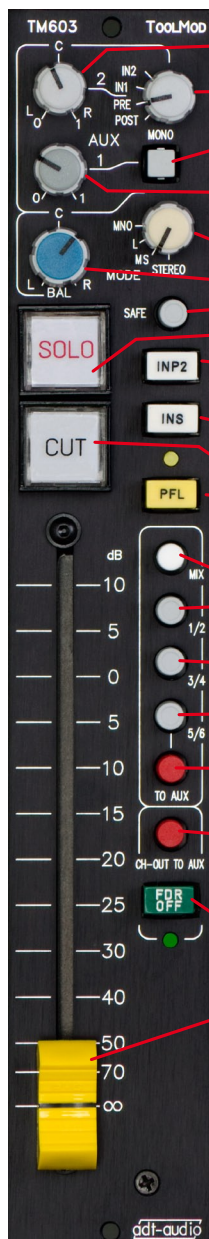
Configuration Options:
CHANNEL OUT:
default post Fader
alternativ post Balance Pot





ToolMod Faderbox modular Summing Mixer Stereo Input Module TM602





Aux Fader 2
(works as Pan-Pot with STEREO MODE
and as Level Pot for Aux2 with MONO)

Input Select for AUX 1 and 2
(always active)

Aux Mode, default STEREO
(Aux 1 - Level, Aux 2 - Pan)
Mono (2 independent Sends)

Aux-Fader 1
(works always as Level Control)

Operation Mode for the selected Input
Mono, Left only, MS and Stereo L & R

Balance Control

Safe disables Solo

Solo Switch

INP2 Input Select, selects Input 2

INS activates Insert Input

CUT-Switch (post Fader)

PFL Switch

*the Routing Switches MIX and 1/2 to
5/6 are fed post Balance Pot*

MIX selects the Stereo Master

1/2 selects Groups 1 and 2

3/4 selects Groups 3 and 4

5/6 selects Groups 5 and 6
switches the Groups 5 and 6 to
the Outputs of the Aux Faders
Aux 1 (-> GR5) and
Aux2 (-> GR6)

CH-OUT TO AUX
switches the Channel Output
from Post Fader to the Output
of Aux1 (-> GR5) and Aux2
(-> GR6)

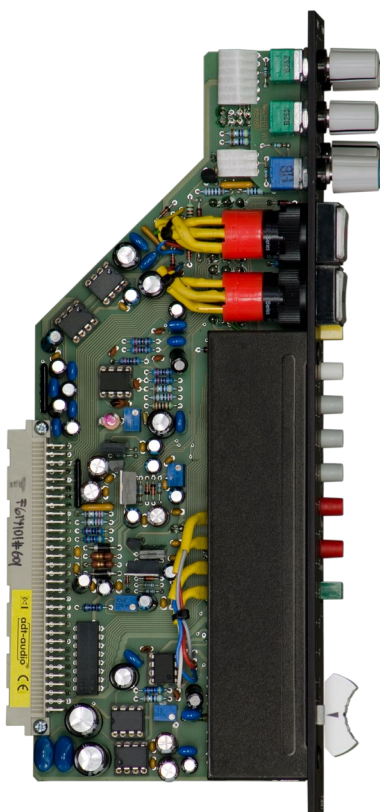
FDR-OFF
disables the Main Fader and
switches to 0 dB fixed Level

Main Fader

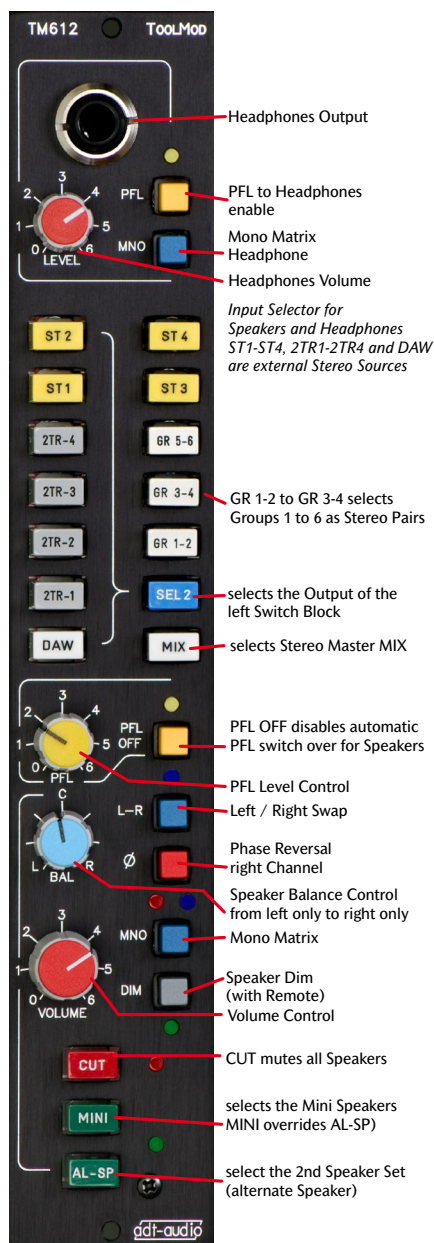
TM603 M/S Stereo Input Module

All details on the TM602 m/s stereo input module can be found in the ToolMod Faderbox Handbook.

Configuration Options:
CHANNEL OUT:
default post Fader
alternativ post Balance Pot







TM612

Stereo Control Room Module

All details on the TM612 stereo control room module can be found in the ToolMod Faderbox Handbook.

Configuration Options:

METER-SEND CONNECTORS:
default used for Meter Send
alternatively used for 2TR-1 IN

MONO SPEAKER:
default switched to both channels
alternatively switch to left or right channel only

MONO HEADPHONES:
default switched to both channels
alternatively switch to left or right channel only

PFL SPEAKER:
default switched to both channels
alternatively switch to left or right channel only

PFL HEADPHONES:
default switched to both channels
alternatively switch to left or right channel only

HEADPHONES:
default independent of Phase Reversal, L-R Swap and Balance-Pot (Φ , L-R, BAL)
alternatively post Phase Reversal, L-R Swap and Balance-Pot



Audio Installation

Ground

A proper working audio installation always begins with a solid grounding system. Don't underestimate the importance of correct grounding, which not only affects hum but also random noise, rf noise and transient performance.

If there are no ground connections with sufficient cross section between all parts of an audio system, there is a high probability of compensating currents in the screen cores of the audio cables that cause hum and other disturbances. To avoid compensating currents, the difference of the ground potential of the different units of the audio system must be kept as low as even possible.

Since in almost all existing devices, the ground is directly connected to the protective ground of the mains power line, the best way to minimize the ground potential difference between the devices - and therefore the reason for ground loops - is to keep the protective grounds of all devices as close together as possible.

This can be done by some simple measures:

If even possible, connect everything to a single wall outlet

if not, use two outlets of the same phase, as close to another as possible. Have an electrician increase the cross section between the two outlets considerably

Use only good quality (= expensive) multiple power sockets

Do not daisy chain multiple power sockets!

Use a single power strip with a sufficient number of outlets for the connection to the wall outlet. Distribute the power to all devices using additional multiple power sockets that are connected to outlets of the main power strip.

Common grounding problems

Even if the principle of the ground installation is perfect, some common situations should be considered.

Video

This is the basic problem of any TV studio. Since all video connections are un-



balanced, it is a hard job to maintain a clean audio ground situation with all the video equipment. You will need many audio transformers to make sure that your ground system is not polluted by the video signal. In many real-world situations, only pragmatism works, since you will not be able to make sure that an appropriate ground system can be installed. If this is the case, use the highest possible cross-section for all ground cable that is possible. If you cannot control the current in the different ground lines, the only possible way is to make the entire ground system as strong (as low a resistance) as possible.

Antennas

If a receiver or any other device is part of the system that requires a roof antenna, you can be sure that the antenna will inject a different ground potential into the system. An antenna must be grounded just for lightning protection and you can under normal circumstances not control the ground potential of this antenna. Make sure that this will not affect your studio ground. If necessary, install audio transformers and isolate the entire device from the rest of the studio.

Computer Network Connections

Like video, the commonly used computer network connections and connections from computer to computer and computer to peripheral devices use RJ45, 10-BaseT, and USB types that are grounded on both sides of the line. A computer installation is always a ground disaster, since all the computer devices, workstations, monitors, printers, network hubs, switches and repeaters may or may not be connected to a protective conductor, depending on the power supply of the particular device. In any case, all components are ground connected thru the computer cables, which have pretty high impedance as far as the ground is concerned. Since it is not important for the function of the computer system, no one takes care about the implementation of this ground connections at all. This is another way to spoil a good audio ground system.

Telephone Lines and Modems.

Any kind of telephone line or modem can create the same problem. In most cases, only audio transformers can be used to keep the ground system clean.

There is only one possible way to deal with these problems. After the installation is ready, tested and clean, check if there is any degradation when one of these devices is connected to the system. If this happens, install audio transformers on the inputs and outputs of the device and use separate power lines to avoid pollution of the protective ground. If there is no degradation, you are lucky. Leave it as it is and make sure that you make a list of the devices that are working without problems. If at any time in the future you have noise in the

system, disconnect all devices that are not on the list before you start to disassemble the entire studio installation. There is always a very good chance that something that is not under your control has changed with one or more of the devices that have been added later.

Unbalanced Inputs and Outputs

If you need to connect balanced ToolMod inputs or outputs to outputs or inputs of unbalanced devices, proceed as follows:

Unbalanced Output -> balanced ToolMod Input:

Use a balanced cable with a standard XLR or TRS pinning for the balanced input. Connect the + (hot) phase of the input with the unbalanced output (usually the tip of a mono jack) and connect the - (cold) phase to the ground of the unbalanced output, (usually the sleeve of a mono jack). Do not connect the screen for the moment but don't cut it away. Check if it works without hum or other problems. If this is the case, connect the screen to the ground of the unbalanced unit and to the - (cold) phase. If both ways don't work properly, the ground potential between the units is very high and the cross section of the screen core is not sufficient to short this ground difference voltage. In this case, try to connect the mains of the unbalanced unit to an outlet as close as possible to the outlet of the ToolMod power supply unit. If this also won't kill the disturbance and you don't want to go into a complete redesign of the grounding of your audio installation, you need either a balancing amplifier, DI-box or an audio transformer.

Balanced ToolMod Output -> unbalanced Input:

Use a balanced cable with standard XLR or TRS pin out for the balanced output. Connect the + (hot) phase with the unbalanced input, usually the tip of a mono plug and connect the - (cold) phase to the ground of the unbalanced unit. Now check if there is any hum or other problem. If this is not the case, cut away the screen core. If you get a problem, connect the screen core with the - (cold) phase **ON THE SIDE OF THE BALANCED OUTPUT!** This will prevent the self adjusting output amplifiers, that adjusts its output configuration to the input automatically, from oscillating, which might occur if there is a big difference between the ground potential of both units. If nothing works well, proceed like described in the last chapter.

4. Maintenance

A ToolMod Faderbox requires no regular maintenance. Service is only necessary if there is a problem that needs to be fixed. Almost all problems can be fixed by exchanging a defective module.



Following our recommended procedures for the use and care of the console will result in an extended lifespan of the console.

Use the Faderbox regularly

All electromechanical components of the Faderbox, such as potentiometers, switches, faders, and relays are self-cleaning. However, self-cleaning only occurs if the particular components are used on a regular basis. The electrical and mechanical lifespan of these components exceeds the useful life of the system in any case. A rotary pot, for instance, that has a lifespan of 50000 rotation, will work properly for a period of more than 30 years if it is used one time in an hour for 8 hours a day and 200 days per year. Long-term reliability is directly connected to continuous operation. Fine dust and hardened grease will be a problem for components that remain unused for years. If it is not possible to use all the components of a console constantly, we recommend that you actuate all pots and switches at least every 6 months 3 to 6 times to keep the self cleaning process running. Since such problems are also caused by fine dust, it is a good idea to cover the top of the Faderbox with a plastic foil when it is not in use for a longer period.

Testing

From time to time, (we recommend at least one time per year), all functions of a Faderbox should be tested. Check every function, all the inputs and outputs and all controls and switches of the entire system. If you are not able to make any necessary repairs immediately, make a note of all problems that were found for future repairs. With large, complex systems, it is a good idea to maintain a logbook at hand that is used to note all problems in the studio. Since it is likely that most of the problems will be discovered while working, it is good idea to make a quick note which includes all the details of the problem such as; the particular channel, the source signal and any special setting that caused the problem. This helps a service technician to locate problems. Many problems that come up in a particular setting only, may not be easily reconstructed after the end of a session. The more precise the notation in the logbook, the more likely it is that problems that are caused by a bad cable or anything else that is not a problem of a function of the console itself, can be found and repaired very fast.

Cleaning

Only non-corrosive cleaners such isopropyl alcohol should be used for cleaning the console and its components. Isopropyl alcohol is the best choice for all parts, including the plastic knobs and caps and the pushbutton knobs, all electric components and the top plates. More aggressive cleaners can cause problems because they might corrode mechanical or electrical components. **Do not use any kind of thinner** – you will have to replace all plastic parts that we-

re exposed to the thinner.

Potentiometers and Push Buttons

Depending on the environmental situation at the location, the grease in the switches, rotary pots, and slider faders begins to harden within a period between approximately 10 years and 15 years. It is not possible to determine an exact time when this occurs, since the environmental influence is different from location to location and the frequency of use of the different components has an influence on this condition as well.

If you follow the advice on the last page about using all the pots and switches regularly such problems will not show up.

In case that you didn't follow the advice, proceed as follows:

Rotary Pots and Slider Faders:

When the grease between bushing and shaft of rotary pots and on guardrails of slider faders begins to harden, the pot or the slider fader will run tight. Apply a small drop of penetrating oil between the shaft and the bushing and turn the pot 5 to 10 times. Apply a small drop of penetrating oil to the guardrails of faders and move the knob over the entire stroke a couple of times. Doing this will keep the pots in good shape for many years.

Pushbutton Switches

The grease in the pushbutton switches will also begin to harden. Since it is the same process, this will usually happen at the same time but it depends on the environmental conditions and the frequency of use. The pushbutton switches that are used in the ToolMod Faderbox are sealed and have 4 contacts per switch, therefore, fine-dust is usually no problem and the self-cleaning is very effective. If there is a problem with switches, don't use any kind of contact spray. Get a spray can with isopropanol and spray thru the faceplate next to the knob directly into the switch. You don't need to remove the module but

**MAKE SURE THAT YOU SWITCH OFF and DON'T SWITCH ON AGAIN
BEFORE ALL THE ALCOHOL HAS EVAPORATED.**

After spraying, use the switch 20 to 30 times. This will remove the problem. Make sure that you use these switches a lot during the next weeks to improve the cleaning effect.

**DO NOT USE ANY KIND OF CONTACT SPRAYS!
DO NOT USE VASELINE OR SIMILAR GREASE!**



DO NOT DIP AN ENTIRE MODULE INTO A CLEANING BATH!

Please follow these rules to avoid trouble. Once you have applied commonly available contact spray to a module, you have to use this repeatedly. There is no way to remove the spray out of switches or faders; you will need to replace these components. Some technicians use Vaseline as a protection against corrosion. The biggest problem with Vaseline is that it starts to melt when the temperature gets higher than 40°C. If Vaseline is used for cleaning or protecting switches and/or pots, you have to deal with the problem that after the temperature exceeds 40 ° C, the entire contact area of the switch or pot will be covered in Vaseline. As soon as the temperature drops down below 40 degrees, the fat hardens again. This causes considerable contact problems.

If you put an entire module into a cleaning bath, for instance of an ultrasonic cleaner, the only effect is that you distribute all the dirt equally to the entire module. This means that the dirt will be inside pots, switches, and everything else. Modules that were treated in this way, will never work properly again.



analoge + digitale Tonstudioteknik Karl Jüngling

Inh. Dipl.-Ing. Gerd Jüngling e. K.

4-6, Scholtwiese • Gladbeck • D45966 • Germany

Phone: 0049 2043 51061 • Fax: 0049 2043 56844

Email: sales@adt-audio.com

Web: www.adt-audio.com + www.adt-audio.de

Webstore: www.pro-audio-store.de

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