adt-audio

TV & Radio

Installation
+
Configuration

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Summary

Preface

This manual contains all necessary information to prepare and plan the installation of the mixing console and accessory components.

Please, read this manual carefully. We point out common mistakes and problems that are connected with the installation and provide suggestions to avoid such problems. You will save a lot of time and unnecessary start up problems by investing a couple of hours in the reading of this manual.

The first part of the manual contains everything about the power supply units and crossover devices that are necessary for fail safe power supply configurations, and the implementation of the mains connections. Part 2 is about the audio installation. Besides detailed information about basic principles of audio installation and the methods of grounding, this chapter contains all pinning diagrams, pictures and graphics of the locations of the connectors, and a detailed description of their functions.

Part 3 contains general information about the frame, the assembly of the console, environmental considerations, the recommended maintenance, and a couple of remarks about the operation of the console to ensure a long and problem free lifespan.

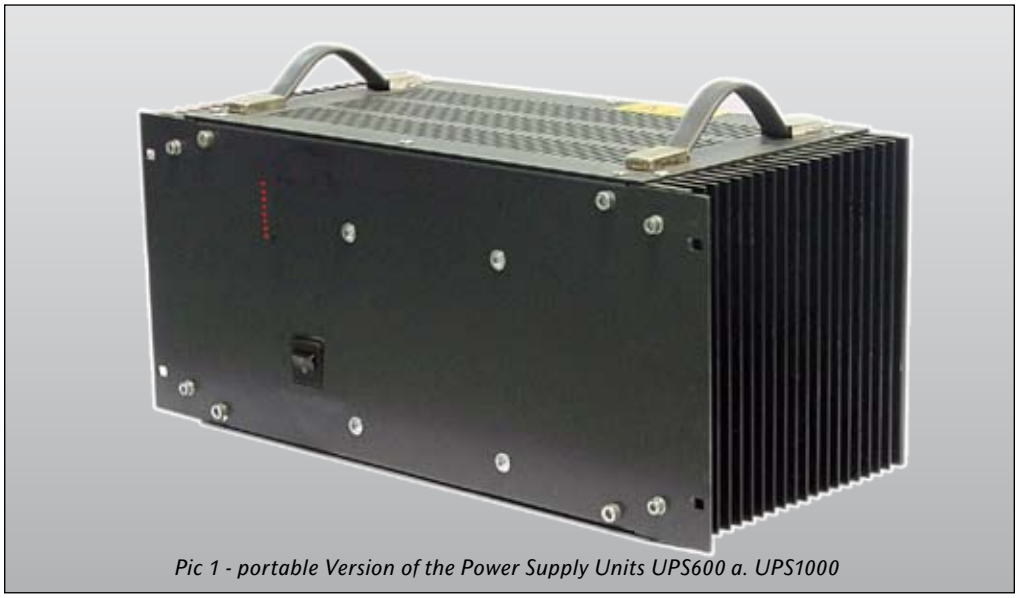
Important:

This manual concerns the stereo versions of the BC3 Broadcast Console, Revision 2.2 / 2007-2008

1. Power supply

1.1 Power supply units

BC3 Consoles up to 48 Channels use either the UPS600 ot the UPS1000 power supply units. While the UPS600 is used for mixers with up to 24 modules in total, the UPS1000 can be used with BC3 on-air mixers with up to 40 modules. For larger consoles, the power supply the UPS1500 is used. In addition, the UPS10 and UPS25 of the 5MT series of broadcast consoles can be adapted since all the required voltages are the same in both systems.



Pic 1 - portable Version of the Power Supply Units UPS600 a. UPS1000

The UPS600, UPS1000 and the UPS1500 differ in the current capacity of the main supply voltages for audio and relays. The total output power is 600 VA for the UPS600, 1000 VA for the UPS1000 and 1500 VA for the UPS1500. While the UPS600 and UPS1000 use the same housing and the same connectors, the UPS1500 is deeper and uses a different connector. Of course, a UPS1000 or UPS1500 can be used with a small size broadcast console as well. The actual power requirement of a particular mixing console depends not only on the number of channels but also on the channel and group module versions that are installed. It is obvious that modules with built in dynamic sections or other, additional features have a higher current consumption. The limits mentioned above are valid in good approximation. Of course, we determine the required power supply for every quotation and offer a device with sufficient spare capacity. We recommend, that you use a larger power supply version if the installation and/or the mains supply is critical to ensure trouble free operation.

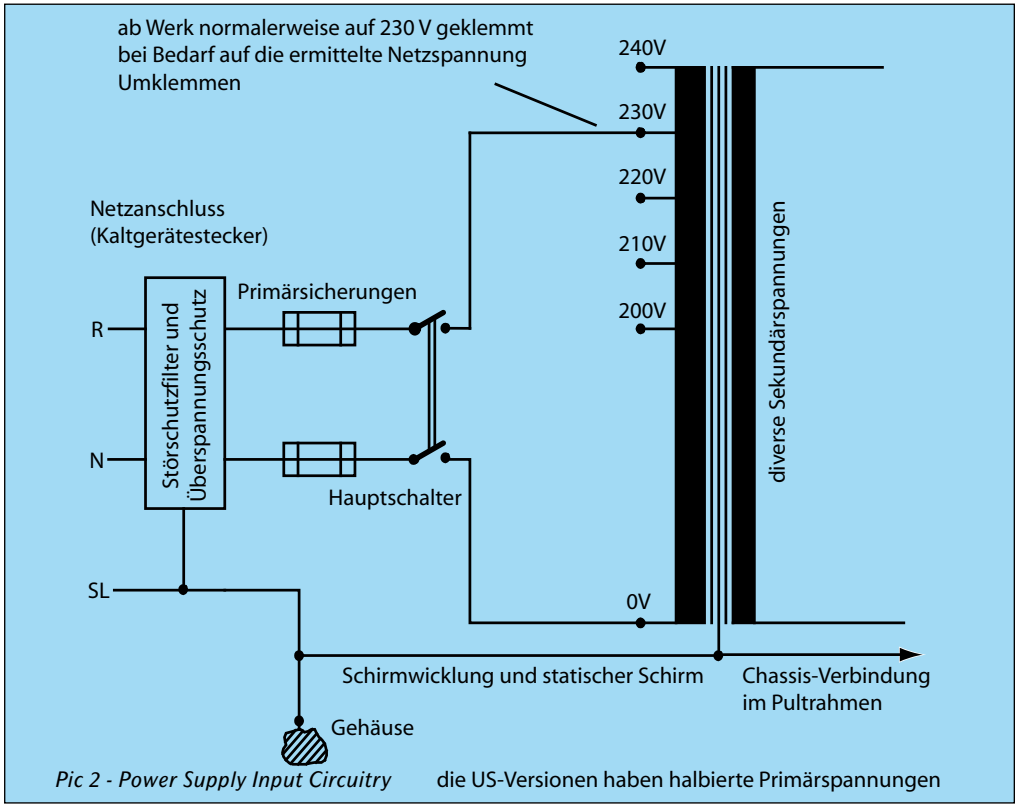
The power supply units can be rack-mounted if the rack is stable enough to carry the weight of approx. 15 kg (30 lb) for the UPS600 and 30 kg (60 lb) for the UPS1500. The total width of the front panel is 483 mm. The actual width behind the top plate is, 320 mm for both the UPS600 and UPS1000, Without attached connectors both power supply units are approx. 210 mm deep. The height of the unit is 210 mm in total. It fits into five rack spaces. The UPS1500 fits into seven rack spaces and the depth is 450 mm without attached connectors.

Not all power supply versions have forced ventilation (fans). The two large heat sinks on both sides of the housing will dissipate heat sufficiently if the device is correctly installed. If the unit is mounted in a closed rack, or if there are other circumstances that impede sufficient air supply, the

TYP	Power Consumption	Nominal Current of the Main Voltages	Usage with Consoles up to	Height & Depth
UPS600	600VA	3 A	24 in 4	220 x 210 mm
UPS1000	1000VA	5 A	40 in 8	220 x 210 mm
UPS1500	1500VA	10A	64 in 8	320 x 310 mm

capacity of the power supply unit will diminish. All housings are prepared for the installation of additional fans that can be added in situations like this to force the airflow across the heat sinks and improve the heat dissipation.

All connectors are mounted on the rear panel of the devices. The mains connector is a standard Euro outlet with built in mains fuses and interference trap for the UPS600/UPS1000, and a Neutrik, Power Con connector is used with the UPS15000. The output is a 20-pin 'Siemens' type female multipin connector, DIN41618/622 for the UPS600/1000 and a 26-pin version of the same series for the UPS1500. The 26 pin versions parallels the high current power lines to achieve higher cross section for the connector and the power cable to the console frame as well. Even though the units have different connector types, the voltages are not different. A UPS1000 can be used for a BC4 system with a special cable. The cable power supply - console is included with the scope of supply. The standard length of this cable is 8 m. Cables up to 12 m are available. If the situation at the location requires cables longer than 20 m, special high cross section cores have to be used; please ask.



Pic 2 - Power Supply Input Circuitry die US-Versionen haben halbierte Primärspannungen

All power supply units are available for any mains voltage that you specify. Standard versions for 230 V and 115 V are available from stock or at short notice. Any other voltage requires a custom made power transformer, which is possible within the normal lead time for the delivery of the console. The mains frequency can be 50 or 60 Hz with all versions. The power transformer has a tapped primary winding that makes it possible to adjust the power supply to the local mains voltage in steps of 10 V from 200 to 240 V with the 230 V version and in steps of 5 V from 100 to 120 V with the 115 V version. Special versions for a different nominal mains voltage are adapted. The minimum mains voltage depends on this settings. The tapped primary windings offer the choice to avoid unnecessary thermal stress, caused by a very high mains voltage. It is possible to find an appropriate compromise between regulation reserve and heat dissipation easily. If you need a selectable mains voltage 230/115 V, please ask.

For fail-safe operation a second, identical power supply and an additional crossover device are used. See the chapter below for details.

1.2 Power supply installation

Though the installation of the power supply devices of the BC3 Broadcast Console is not critical, some important issues have to be considered to prevent unnecessary problems and to ensure a problem free operation of the entire system.

Thermal Considerations

Since all power supply devices of the BC3 broadcast console do not necessarily need forced ventilation, special care must be taken in regards to the airflow with the installation of the units. The major part of the heat

exchange takes place at the heat sinks mounted on both sides of the power supply unit. It is crucial that cold air can pass along the heat sink unimpeded. Air inlets should be placed below the unit, underneath the heat sink, and corresponding air outlets have to be above the heat sinks. If the units are mounted in a rack, this might be a problem, even more if additional devices with high heat dissipation are mounted in the same rack. The best way to avoid problems due to inappropriate heat removal is to leave an appropriate free space of 2 or 3 rack spaces between the particular devices. In addition, no unit should be installed at the extreme bottom of the rack. To support proper distribution of cold air, it is good practice to leave 3 rack spaces free at the bottom of the rack.

If the power supply unit is not installed in a rack but used stand-alone on the floor, care must be taken, that there is at least 5 cm / 2” of free space between the bottom of the unit and the floor. If this space is to small or even not existing, air cannot pass thru the device from bottom to top. This causes limited heat dissipation and might reduce the capacity of the power supply unit considerably. Spacers are available for this purpose; a wooden slat of about 5 cm / 2” height is a sufficient solution as well. A higher distance to the ground is even better, of course.

If the unit is placed next to a wall or in a corner, we recommend, that the distance to any wall is at least 5 cm / 2”. This rule is either valid for an additional cover plate above the unit. We recommend that you use such a plate to prevent conductive parts, pieces of wires, aluminum foils or any other conductive material to fall into the device thru the slotted cover sheet of the unit. If you use a cover plate, make sure that the distance between the top of the unit and the additional cover plate is at least 5 cm. If the circumstances at the location do not allow applying the principles listed above, there are a couple of ways to ensure trouble free operation even though.

Rack-mounted Fan(s)
Installing and using rack-mounted fans is a good decision, if other devices with high heat emission are installed in the same rack as the power supply unit. One or two fan units can be used. If one unit is used, it should be mounted on top of the rack. The direction of the fans must transport hot air out of the rack. Adding a second fan would improve the airflow even more. This second unit should be installed on the bottom of the rack in a way, that it blows cold air into the rack. It is a good idea to use a fan unit with an integrated dust filter. The filter will decrease the dust pollution in the rack significantly. However, a filter requires continuous maintenance and reduces the efficiency of the fan, when not maintained permanentely. Like all fan-cooled systems, the reliability of the cooled devices depends on the reliability of the fans. If the fans fail, the entire system will fall. The best way to make sure that a fan cooled system is safe to operate, is to install at least twice the number of fans that are necessary for normal operation. This principle ensures that a failure of one or two fans will not cause total failure due to overheat of the power supply device.

Fans in the Power Supply Unit
Internal fans are possible for all power supply units of the BC3 Broadcast Consoles. If specified with the order, the power supply comes with fans installed. However, it is possible to upgrade the power supply units with fans at any time, since all units come with all necessary mounting holes. Power supply units with installed fans require free airflow at the rear side of the unit. If the installation does not cater for the free expulsion of the hot air, the fan is almost pointless. However, if free airflow is possible, the heat sink temperature will be reduced from 10 to 20 degrees. **The cooling effect of external, rack-mounted, fan units is a lot higher than internal fans. If at all possible, such units should be used.** Since any fan produces noise, installation of the power supply in the control room might make using fans imposssible.

High capacity Power Supply Unit
In principle, a power supply unit with higher capacity reduces the temperature of the heat sinks; however, the quantity of heat produced is eventually the same, as it depends not on the capacity of the power supply unit but the broadcast console. Therefore, there is no advantage in using a UPS1500 instead of a UPS1000. The cooling load is not different; therefore, a stronger power supply than necessary for the particular broadcast mixer will not substitute appropriate and sufficient ventilation but only the time that will pass before the overheat protection circuits react, if the airflow along the heatsinks is not sufficient.

Test of the Installation
A good method to test the installation of the power supply unit is to check the temperature after some hours of operation. **If the temperature exceeds 60°C, cooling is insufficient.** You can make a quick test just by touching the heat sinks with your hand. If the temperature is above 60°C, you will jerk back immediately. A temperature of 50°C, which is appropriate, gives you the feeling that it's rather warm but not hot.

Mains Voltage
The power supply units are available for a power voltage of 230 V or 115 V or any other voltage that you specify. The transformer of the unit has a tapped primary winding that makes it possible to adapt the unit to 200, 210, 220, 230, or 240 V mains voltage for the 230 V versions and to 100, 105, 110, 115, and 120V for the 115 V versions. It is possible to adjust the power supply exactly to the local situation. The terminator block is accessible after the cover sheet is removed.

FOR SAFETY REASONS YOU MUST DISCONNECT THE MAINS BEFORE OPENING THE UNIT.
PLEASE CONSIDER - HAZARDOUS VOLTAGES INSIDE THE POWER SUPPLY ARE A RISK FOR YOUR HEALTH AND YOUR LIFE.

MAKE SURE THAT ANYTHING THAT FALLS INTO THE UNIT (SCREWS OR OTHER METAL PARTS ETC.) IS REMOVED BEFORE THE UNIT IS RECONNECTED TO THE MAINS.

THE COVER SHEETS MAY HAVE SHARP EDGES, ACT CAREFULLY.

ONLY QUALIFIED PERSONNEL WITH KNOWLEDGE ABOUT ELECTRICAL SAFETY ARE ALLOWED TO MODIFY OR REPAIR THE POWER SUPPLY UNITS.

The terminals for the primary voltage settings are clearly marked inside the power supply unit either on the mains transformer for the UPS600/1000 versions or on a separate terminal block for the UPS1500. Make sure that you do not change any other wiring than the tapped primary winding.

Please consider:
Setting the mains voltage to a lower voltage tap of the transformer increases the output voltage of the transformer and therefore the regulation reserve. At the same time higher heat dissipation occurs. You should do this if there are problems with a mains voltage that is too low. In this case, remove the mains power from 230 V and connect it to 220 V or from 115 V to 110 V, respectively

Setting the mains voltage to a higher voltage tap of the transformer decreases the output voltage of the transformer and therefore the regulation reserve. At the same time LOWER heat dissipation occurs. You should do this if the mains voltage is very high all the time (240 V, for example) and the temperature of the power supply is very high. In this case, remove the mains power from 230V and connect it to 240 V or from 115V to 120 V respectively.

The better the primary setting of the power supply unit is adapted to the local situation, the lower is the heat dissipation. Depending on the stability of mains voltage it is possible to find an appropriate compromise between regulation reserve and heat dissipation.

In most cases, it is not necessary that you take care about the setting of the primary voltage. We deliver all power supply units with a default setting of 230 V or 115V respectively. This setting will result in a good compromise for most local situations. However, if the mains voltage is always very high or very low, or if there are large voltage swings in the mains power, it can be of advantage to check if another primary setting is the better choice. Two problems might arise because of an inappropriate setting of the primary voltage, very high heat dissipation and drop out failures.

If the line voltage is very high, the regulation reserve of the power supply that makes sure that the internal voltage regulators operate with low mains voltage too, is much too high. This results in a high voltage across the voltage regulator, therefore in a high power that causes higher heat dissipation.

If the line voltage is very low, the regulation reserve is not sufficient to

assure proper operation of the voltage regulators. The heat dissipation is very low, however, as soon as the mains voltage drops below the regulator's drop out point, a 100Hz or 120 Hz interference appears on the DC output voltage. This AC component will cause a hum noise of approximately – 50 dB in all master outputs of the broadcast console; the solution is to use a different setting for the primary voltage. It is best to test the mains voltage every couple of hours for several days before making any changes. Make a note of the values, and after a few days check for the highest and the lowest value. Then change the setting -

AFTER YOU HAVE DISCONNECTED THE MAINS – FOLLOW THE SAFETY RULES LISTED ABOVE!

- to a setting, that is the next lower value to the lowest value on your list. If your lowest value is 223 V, you are supposed to use transformer tap 220 V, for example. Now, check the highest value on your list. If it is lower than the lowest value + 10 V, you are done. If not, it is necessary to check the temperature of the power supply unit every once in a while for a couple of days. If the temperature exceeds 60°C for several hours, you should improve the ventilation of the power supply (outside the rack, some free rack spaces above and below the power supply, or a change of location).

1.3 Fail-safe Power Supply

The C1000 C1500 cross-over units are optionally available if failsafe operation is required for BC3 on-air consoles. This unit can be used with all the power supply units UPS600, UPS1000 and UPS1500. The failsafe device is a passive diode cross-over with an additional, active, failure response system. The C1000 and C1500 cross-over units are equipped with Shottky diodes with very low drop out voltage to keep voltage drop and power dissipation of the failsafe system as low as possible. A connector for a remote display that can be installed in the console's meter bridge is available.

The passive diode cross-over section of the C1000 and C1500 failsafe units can handle forward currents of up to 10 or 20 ampere per output voltage for the C1000 or C1500 version, therefore the operation with any of the standard power supply units of the BC3 broadcast consoles is possible.

The cross over unit is a 3U high rack-mountable device. The total width of the front panel 483 mm. The actual width behind the top plate is 320 mm. The only differences between the C1000 and C1500 version are the maximum current of the diodes and the type of connectors that are used. While the C1000 uses diodes for a current load of 10 amps and a 20-pin connector, the C1500 uses diodes for currents of 20 amps and a 26-pin connector. The pinning is same as it is used with the power supply units.

Due to the low drop Shottky type power diodes, the power and heat dissipation of the C1000 cross-over unit is rather low, even under full load condition. Additional ventilation is not required and the installation is not critical as far as airflow is concerned.

All connectors are mounted on the rear panel of the device. The mains connector is a standard Euro outlet with build in mains fuses and interference trap. The output is a 20 pin or 26 pin 'Siemens' type female multipin connector. The device has two inputs for the two power supply units UPS1000, UPS600 or UP1500 respectively. The input connectors are 20 pin or 26 pin 'Siemens' type male multipin connectors. Two cables to connect the power supplies 1 and 2 to the cross-over unit belong to the scope of supply of the cross-over device. The standard length of these cables is 2 m. Longer cables are available.

Since the diode matrix is passive, mains supply is only required for the alert system. However, the alert system of the device requires a power supply. The power consumption of all versions is only 30 VA. The mains transformer can be used with 230 V and 115 V. Solder bridges inside the unit determine the mains voltage.

The failure alert system controls if all output voltages of both attached power supply units have a sufficient output voltage. LED's on the faceplate of the cross over unit indicate the output voltages. A minimum voltage can be adjusted for each voltage independently, using internal trim pots. If at least one output voltage drops below the minimum voltage, an alert LED displays failure condition. In addition, a beeper is activated. The beeper can be switched off on the faceplate of the device.

A Remote Panel that contains the 2 failure alert lamps, an alert beeper and a switch to disable the beeper but not the lamps is available. This panel can be installed in the meter bridge of the console to ensure permanent control of the power supply section if the power supply units are installed in a separate room. An additional control cable is needed for this remote section.

1.4 The Mains Power Supply of Audio Systems

ONLY QUALIFIED PERSONNEL SHOULD BE ALLOWED TO INSTALL AND/OR MODIFY HAZARDOUS VOLTAGE, ELECTRICAL SYSTEMS.

THE EXAMPLES WE GIVE ARE VERY GENERAL AND ARE TO BE TAKEN AS SUCH; IN ADDITION, SOME DETAILS MAY NOT APPLY IN YOUR LOCAL AREA BECAUSE OF SPECIFIC LOCAL LAWS AND/OR REGULATIONS.

WE ADVISES THAT YOU CONSULT A QUALIFIED ELECTRICIAN REGARDING THE INSTALLATION OF ANY NEW ELECTRICAL SUPPLY, OR THE MODIFICATION OF AN EXISTING SUPPLY. BY NO MEANS, WE WILL BE LIABLE FOR ANYTHING THAT YOU DO.

As far as the mains power supply of a professional audio system is concerned, it is possible to avoid many problems from the very beginning by correctly installing the studio system. Besides click noise by other electrical devices and other problems due to mutual interaction of two devices that share the same power supply, the grounding of the audio system is unavoidable connected to the power supply. A correct grounding of the entire system can only be accomplished if the safety grounding that is used at the location is properly integrated to cover all considerations. If this is neglected, the final installation will never be problem free.

Power supply wiring

The best base for an appropriate installation of the studio is that a separate three phase current line is available that is used only for the studio. This line should come directly from the main ground node of the building and it should have an appropriate cross-section of 4 x 10mm^2 or higher. This line should be available in a distribution in the studio. This principle avoids any kind of interference from other electric devices that share the same power and ground and might cause interference in the system. Typical examples are refrigerators, electric heater systems, or coffee machines with poor suppression filters that can infiltrate click noise, or Xerox machines that use switched mode heat regulators that scatter back RF noise. Even though the input filters of the console's power supply units and an additional, totally separated screen winding of the mains transformer will block these disturbances as far as the console's DC supply is concerned, the problem remains, since the only possible way to shunt these disturbances is the ground.

In addition, the separate line is the best way to control the audio grounding of the system. Usually, the mains line is carried out as a 4-conductor line with 3 phases and the neutral conductor. Even though there are different rules and uses from country to country, this is a commonly used principle that works fine as far as safety is concerned, but not for audio. Since the neutral conductor is not totally separated from the protection conductor that is used to maintain electrical safety in different ways in most countries, an unbalanced load of the three-phase conductor causes compensation currents in the neutral conductor. Of course, this current causes a voltage drop on the line that shifts the entire ground potential away from that potential that can be considered as ground node. In principle, the only 'real' ground node is the core of the planet; however, a real-world ground node is an electrical potential that is not different from the electrical potential of another place, independent of the distance between the two points. All these are limit considerations, of course. Let's get back to 'ground'. The point in a building that comes closest to this ground node, is the mains power entry, where the neutral connector is bridged to an earth plate, the concrete of the building's foundations, the main water pipes and/or other systems that are supposed to have a very good 'earth' connection. The closer (in the electrical meaning of this word) that you can come to this potential, the less are your grounding problems. It is therefore crucial to have this electrical potential transported to the main ground node of the entire studio.

If a conventional 4-line cable is used, the ground potential depends on the current in the neutral connector. There is no way to avoid this current, since almost no audio equipment uses a three-phase power supply. It is simply not possible to share all equipment between the three phases in a way that the resulting current in the neutral conductor is zero. The result of these considerations is that a separate, current free conductor must be used for ground. If the mains supply line is implemented as a five-line cable that uses an additional conductor only for the ground, you don't need to take care about this; it's already done. However; with a 4 line cable, it is very important to install an additional line that is current free and transports the ground node potential from the 'low impedance point', which is usually the mains distribution in the basement of the building. This line should have the highest possible cross section that can be installed. 10 mm^2 is a minimum, 16, 20 or even 32 mm^2 will do no harm but improve the stability of the system. We will see later that this line is actually not current free but has to shunt all interferences that are injected into the ground by the connected devices.

Let's get this clear. If the ground is connected thru a separate line from the basement that has a cross section of 10 mm^2, the resistance of this line is approx. 1.7 milliohms per meter. With a cable length of 50 m, there is a total resistance of 85 milliohms. If we use one phase of the three phase system for all the audio equipment and the second and third phases for 'dirty' electric stuff, like lamps, heaters and whatever else is installed, we can assume that we will have a final current in the neutral conductor of something in the range of several amperes. Let's start with the assumption that the compensation current is 5 amperes, which is a realistic value. Simply using 'Ohm's Law', it is obvious that this current causes a voltage drop of 5 amps * 0.085 ohms, which is approximately 0.4 Volts. As long as the complete studio system is completely isolated from the rest of the world, this is not a problem. However, if there is only ONE ground connection to another room or studio that has a different ground potential, a compensating current will flow thru this additional connection and cause problems. The voltage drop on the ground line is of course an alternating voltage with the frequency of the local mains voltage, 50 or 60 Hz. It therefore injects an audible hum into the system that changes as soon as the ground potential of one of the systems changes. This problem is well known as a 'ground loop'.

RF problems

Most of the modern devices use a switch mode power supply section that is more efficient than conventional linear power regulators. This principle allows easier control over the power dissipation but it produces high-level interferences at the switching frequency of the regulator, which is in the range between 40 kHz and 100 kHz with most devices. Since the switching regulator does not produce clean sine waves, many additional harmonics are produced as well. There are several different types of switch mode regulators that produce different sorts of interferences, but for our problem, this is not important. What is important is that each device has a built in RF filter whose job it is to avoid the reaction on the power line. Of course, the protective connector is used to leak the RF interference. This adds a considerable amount of RF current into any ground system that can cause many strange problems. While a 50 or 60 Hz voltage offset on the ground system will be shorted if all the units are ground connected using appropriate cross section lines, the RF signal can spread out much easier. The voltage drop depends not only on the real resistance of the ground connections but also on the inductive reactance of the wires that is proportional to the frequency. It is almost impossible to make realistic calculations. The only remedy is to increase the cross section of the ground cables that ground all parts of the audio system. The higher the cross section is the 'closer' is each device to ground and the lower is the probability that RF signals are injected into the ground system.

Neutral connector

In some countries, it is common to connect both the protective conductor and the neutral conductor in the power distribution panel. As far as safety considerations are concerned this works fine, as far as audio grounding is concerned, this method spoils the entire system described above. If there is a connection between the neutral conductor and the separate ground line, the ground line is ineffective, because it is just a parallel line to the neutral connector. Please, make sure that this is not the case with your installation.

Let's put this together:

The base of a problem free installation of the entire studio system is a solid, high cross section ground that is directly connected to a low impedance ground node, which is in most cases the mains power entry

in the basement of a building. This main audio ground should be used to connect the electric ground and protective ground of all devices in the studio with high cross section cable. Care must be taken that the ground connector is isolated from the neutral conductor.

ONLY QUALIFIED PERSONNEL SHOULD INSTALL OR MODIFY ANY ELECTRICAL SYSTEM. MISTAKES AND/OR NEGLIGENCE CAN CREATE LIFE THREATENING SAFETY HAZZARDS. UNDER NO CIRCUMSTANCE SHOULD UNQUALIFIED PERSONNEL TOUCH THESE CIRCUITS – LIFE IS IN DANGER IF SAFETY RULES ARE NOT FOLLOWED.

Assignment of phases
The assignment of the three phases of the mains power line should be carefully distributed to the different sorts of equipment in the studio. If this is left to chance, it is likely that you have to deal with many avoidable problems. There is one basic rule. Put all audio equipment on one phase and DON'T install any household appliance to this phase. Mark all sockets of the 'audio phase' carefully and take care that there are enough additional sockets that are connected to another phase. Of course, these sockets should also be marked. If you don't do so, you might have to deal with click noise, strange problems with noise or strange behavior of some systems every once in while. In a complex system, it is very difficult to figure out what the reason for a particular problem like this really is. Household appliance with temperature controls, switched power supply and ineffective filters, thermostats, relays and other components can cause this.

This principle gives another advantage. If you have to deal with a mains supply that is already 'dirty', since there are companies in the neighborhood that have huge power consumption and produce interference, you can single out the best phase for audio, just by rearranging the phases in your distribution panel –

AND AGAIN, THIS MUST BE DONE BY A QUALIFIED ELECTRICIAN AND IN ACCORDANCE WITH ALL SAFETY REGULATIONS IN YOUR LOCAL AREA.

Inrush current

Since the power supply units of the broadcast consoles have a very high inrush current, precautions are necessary that concern the mains fuses. The actual inrush of the transformer is not the most important part of the total current. The power regulator circuits and the entire audio electronic of the console is actually a very huge capacitor that must be charged when the unit is switched on. This means that the current in the first moment is a lot higher than the quiescent current. For the mains power the console power supply is not different from a shortage at the moment when it is powered. The best way to handle this effect is to use an appropriate, slow blown mains fuse. Using a conventional inrush current limiter, which is actually a relay in combination with a resistor, is not a good solution on our experience. If such systems are not 20 times oversized, it will become defective within the first two years. This is also the case with the electronic versions that uses a triac or thyristor. As far as the BC3 consoles are concerned, a standard 16 amp slow blow fuse works fine with all power supply units including the UPS 1500 as long as one fuse is used for one power supply only and no additional equipment with high inrush current is connected to the same fuse.

1.5 Power Supply Connections – Power Supply Unit – Console

Cables
High cross section control wires connect the power supply units to the console. The cables are standardized and use DIN41618/41622 'Siemens' high reliability, multipin connectors. All connectors are coded in a way that makes it impossible to install a connector incorrectly. The console's power supply connector is installed in the connector panel behind the master section.

Important:
Please, do not plug in the cable between power supply and console when

the power supply is already switched on. Nothing will become defective if you do so, but it is possible that protective circuitry in the power supply will sense an overload and drop down the voltage. If this happens, switch off the power supply, wait approximately 30 seconds and switch on again.

Cable length

The cables that are usually used are high cross section multicore cables with 18 or 26 cores and a cross section between 1 mm^2 and 1.5 mm^2, depending on the size of the console. While the UPS600 and UPS1000 power supply units use a 20-pin connector a 26-pin connector is used for the UPS1500. Two connector pins and two cable lines are used in parallel for the high current supply voltages, audio +, audio – and relay & lamps to keep the voltage drop on the power lines as low as possible.

Since the total current consumption of the audio supply in any case remains below 200 mA per module with standard mono input modules and mono group modules, unless all outputs are, loaded with 600 ohms and have full level, which is not a realistic assumption, a 56/8/master version has a total audio supply current of less than 14 Amps. The constant output current of the UPS1500 with appropriate cooling is 18 amperes; the peak current is in the range of 30 amperes for some hundred milliseconds. The cross section of each line is 3 mm^2 for the high current supplies, . This is equivalent to a resistance of 6 milliohms per meter. The total length of the cable must be multiplied by two, since the current must return to the power supply, a cable length of 12 meter is equivalent to a total resistance of 24 meter x 6 milliohms = 0.144 ohms. With a current of 14 ampere, the voltage drop on a 12 meter cable is approximately 2 Volts. This is the maximum voltage drop that should appear on the cable; therefore, the length is limited to 12 meter. If longer cables are required, there are three possible ways.

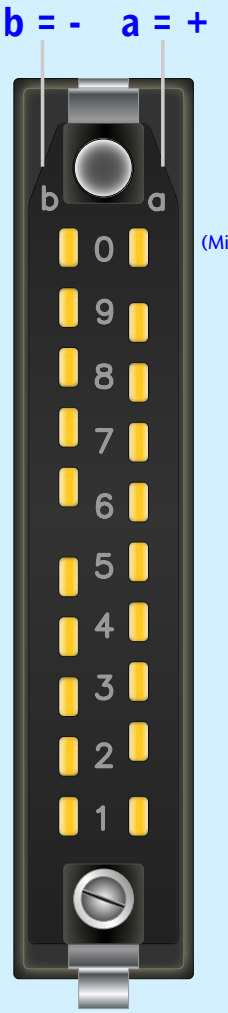
1. Using special cables with higher cross section. The problem with this solution is that appropriate cables are normally not available from stock, since they are not commonly used. A special order will have a very long lead-time and the minimum order quantity will be not reasonable.
2. Making a cable by using single wires of higher cross section for the 6 high current power lines and normal cross section for the low current lines. This is of course possible, however, all the single cables must be coated by an appropriate cable hose. In total, it is going to be very expensive.
3. If the cable length can be determined with the order, it is possible to install special power connectors with the power supply or the cross-over device and the console's frame. In this case, we use an additional connector for the two high current audio lines only. Using a 26 core / 1.5 mm^2 cable means that six 1.5 mm^2 lines can be used for the 4 high current audio lines in parallel. This results in a cross section of 10 mm^2 per line and in a total length of the cable with the 56/8/4 version of approximately 36 meters.

For several reasons, version 3 is the best choice, since the cost is much lower than version 2. In addition, there are no problems to put all the high cross section lines into the cable housings. On our experience, a length in that range is more than sufficient. Actually, it happened only twice in more than 25 years that a longer cable was needed. By the way, we solved this problem with a huge 64 channel 5MT Broadcast where the location of the main gear room with the power supplies was 55 meters away from the control room, by using 4 connectors in total instead of two. Of course, if the console is a 32-channel version, the current is much lower and the maximum cable length can be higher. You can determine the maximum cable length for a particular console easily. It is reciprocally proportional to the number of channels. In detail: a 56/8/4 has 70 units, master section included. A 40-channel console with 8 groups has 54 modules in total. 70 divided by 54 is 1.3; and 1.3 multiplied by 12 meters is 15.5 meters. This console can have a maximum cable length of 15.5 meter. Of course, a 'version 3', dual connector installation can have a length of 47 meters without problems.

1.6 The pinning of the power supply plugs.

The drawing shows the pinning of the power supply connector for almost all versions of the BC3 console frame. This pinning is identical to the pinning of the output connector of the UPS600 or UPS1000 power supply

units. Consoles with more than 40 input channels usually come with the UPS1500 power supply. In this case, the power connector is a 26-pin version, that parallels the high current power lines. Here is the pinning diagram of the UPS600 and UPS1000 power supply. The pinning of the



POWER CONNECTORS IN CONSOLE, POWER-SUPPLY AND CROSS-OVER UNITS

20 Pin DIN 41622 Connector

Female in Power Supply - Male in Console Frame

		VOLTAGE IN CONSOLE-FRAME MINIMUM (Minimum Voltage ist needed for Headroom + 26 dBu)	VOLTAGE IN CONSOLE-FRAME MAXIMUM (Voltage may not exceed Maximum)	MAXIMUM OUTPUT CURRENT IN UNIT UPS600	MAXIMUM OUTPUT CURRENT IN UNIT UPS1000
10	AUDIO +	24.0 V	25.5V	3 A	5A
9	AUDIO -	24.0 V	25.5V	3 A	5A
8	RELAIS	24.5 V	26.5V	3 A	5A
7	EXT-CTRL	23.5 V	24.5V	1 A	1 A
6	METER	23.5 V	25.5V	3 A	5 A
5	SPEAKER	18.0 V	20.0V	1.5 A	1.5 A
4	LOGIC	15.0 V	16.0V	3 A	5A
3	P48	47.5 V	48.5V	0.1 A	0.1 A
2	nc				
1	CHASSIS / SL				

ALL SUPPLY VOLTAGES ARE FULLY FLOATING IN THE POWER SUPPLY UNIT AND THE CROSSOVER UNIT!
ALL VOLTAGES ARE MEASURED IN CONSOLE-FRAME
THE VOLTAGES IN THE POWER UNIT DEPEND ON CABLE LENGTH AND CURRENT CONSUMPTION OF THE CONSOLE

POWER CONNECTORS IN CONSOLE, POWER-SUPPLY AND CROSS-OVER UNITS

26 Pin DIN 41618/41622 Connector

Female in Power Supply - Male in Console Frame

		VOLTAGE IN CONSOLE-FRAME MINIMUM (Minimum Voltage ist needed for Headroom + 26 dBu)	VOLTAGE IN CONSOLE-FRAME MAXIMUM (Voltage may not exceed Maximum)	
13	AUDIO +	24.5 V	25.5V	a || b = +
12	AUDIO +	24.5 V	25.5V	a || b = -
11	AUDIO -	24.5 V	25.5V	a || b = +
10	AUDIO -	24.5 V	25.5V	a || b = -
9	RELAIS	24.5 V	26.5V	a || b = +
8	RELAIS	24.5 V	26.5V	a || b = -
7	EXT-CTRL	23.5 V	24.5V	a=+ b=-
6	METER	23.5 V	25.5V	a=+ b=-
5	SPEAKER	18.0 V	20.0V	a=+ b=-
4	LOGIC	15.0 V	16.0V	a=+ b=-
3	P48	47.5 V	48.5V	a=+ b=-
2	nc			
1	CHASSIS / SL			

ALL SUPPLY VOLTAGES ARE FULLY FLOATING IN THE POWER SUPPLY UNIT AND THE CROSSOVER UNIT!
ALL VOLTAGES ARE MEASURED IN CONSOLE-FRAME
THE VOLTAGES IN THE POWER UNIT DEPEND ON CABLE LENGTH AND CURRENT CONSUMPTION OF THE CONSOLE

UPS1500 units, that are used for the BC4 consoles as well, is on the right side.

1. 7. Supply Voltages

All adt-audio broadcast consoles use 8 separate voltages in total. All output voltages are entirely independent. The ouputs of the voltages in the power supply unit are floating. Referencing the different supply voltages to ground takes place in the console frame.

Audio Supply
The AUDIO + and the AUDIO - output voltages are used for all audio circuits in the console. The total supply voltages is 50 volts. The center of the two voltages that are stacked in the console frame is connected to the audio ground.

Relay & Lamps
The separate RELAY supply is used for all circuits that can cause click noise or other side efffects that might affect the quality of the audio performance. The output voltage is also 25 V, since almost all relays and lamps are 24 volt versions.

External Control
This 24 V supply with a capacity of 1 amps can be used for external equipment, additional meters, customer's external relay interfaces, and other gear.

Meter
The 24 V supply is used for all versions of the console meters.

Speaker
The separate speaker supply voltages is used for the optional active PFL speakers that can be installed in the meter bridge.

Logic
Even though, almost all modules of the broadcast consoles do not use this additional voltage, it may be needed for several options and custom build systems.

P48
The phantom power is used with all microphone inputs of the modules.

POWER CONNECTORS IN CONSOLE, POWER-SUPPLY AND CROSS-OVER UNITS

20 Pin DIN 41622 Connector
Female in Power Supply - Male in Console Frame

		VOLTAGE IN CONSOLE-FRAME (Minimum Voltage ist needed for Headroom + 26 dBu Voltage may not exceed Maximum) MINIMUM	MAXIMUM	MAXIMUM OUTPUT CURRENT IN UNIT UPS600	UPS1000
10	AUDIO +	24.0 V	25.5V	3 A	5A
9	AUDIO -	24.0 V	25.5V	3 A	5A
8	RELAIS	24.5 V	26.5V	3 A	5A
7	EXT-CTRL	23.5 V	24.5V	1 A	1 A
6	METER	23.5 V	25.5V	3 A	5 A
5	SPEAKER	18.0 V	20.0V	1.5 A	1.5 A
4	LOGIC	15.0 V	16.0V	3 A	5A
3	P48	47.5 V	48.5V	0.1 A	0.1 A
2	nc				
1	CHASSIS / SL				

ALL SUPPLY VOLTAGES ARE FULLY FLOATING IN THE POWER SUPPLY UNIT AND THE CROSSOVER UNIT!
ALL VOLTAGES ARE MEASURED IN CONSOLE-FRAME
THE VOLTAGES IN THE POWER UNIT DEPEND ON CABLE LENGTH AND CURRENT CONSUMPTION OF THE CONSOLE

2. Audio Installation in the Studio

2.1 Grounding

As already mentioned with the ground connection of the mains supply, correct and clean grounding in the entire studio is crucial for a proper and noise free operation of the entire system. We can not repeat this often enough – almost all common problems with poor S/N, humming, RF interference, which means, 'I can hear the radio in my speaker, but where is the receiver', and what is commonly called 'Crosstalk', which means that there is an audio signal on a channel where it is not supposed to be, has to do with bad grounding of the entire system.

It is a good idea to be concerned about several problems that are inevitably connected with a complex audio installation before the installation begins. Trouble free operation of a studio is depending on the care that has been taken with the installation. In this regard, care does not only mean that the execution of the work has to be professional but also that the ground connections between the several parts of the entire system are appropriate and that the basic principle is carried out precisely in the complete installation.

To debate the entire topic will go beyond the scope of this manual. Therefore, we will focus on the essential parts.

The following basic principle is proven:

All cable screens are only connected at one end of a line. All screens are supposed to be connected to the screening pins of the console. All lines that are not directly connected to the console should have the screen connected to a central point that can be a patch bay or a distribution system.

This principle avoids ground loops from additional ground connections thru the screens. All screen pins of all the audio connectors of any adt-audio console are internally connected to a separate, isolated, ground network that we call the connector ground. This connector ground is bridged to the main ground in the console at a point, where an external ground loop causes the least possible problems. Of course, it is possible to use another basic principle, for instance, to connect the cable screens always at the input or the output of a device.

Connecting the screen to the inputs might cause problems; it only works properly, if there are no lines that connect one output to more than one input. If such lines exist, care must be taken, to insure that the second input has no screen connection.

This problem does not exist if only the outputs have the screen connected. In this case, the screen potential is distributed with the audio signal and as long as the screen is not connected to an input, the system is free of ground loops. However, it is not possible to carry out the complete installation in this way. As soon as this principle is used with a phantom powered microphone input line, it has to be altered. The phantom supply current must return thru the screen of the cable. If the screen at the input is not connected, phantom power will simply not work anymore. This is the greatest disadvantage of the 'output leads screen' principle. If lines are used for microphone signals and other signals alternatively, this system becomes confusing. There is no way to avoid this confusion, unless microphone lines and microphone patch bays and distributors and other lines are strictly separated or the console's phantom power system is replaced by local phantom power supply units that are installed next to each microphone. Actually, there is no real advantage using these two principles. The most transparent way is to connect all screens at the console.

By connecting the cable screens only on one end of the cable, it is possible to avoid ground loops in the entire system, as already mentioned above. However, this principle assumes that all devices are on the same ground potential. To accomplish this, it is necessary to add an additional grounding installation that connects all devices using high cross section cables to a central ground node in the studio. In most cases, the console is the best possible point for this ground node, since almost all audio lines in the studio are connected to the console. If this ground installation is carried out in a way, that each stand-alone device and each rack with several devices is connected with a cross section of 4 to 10 mm2 to this central ground node, the entire system is an excellent base for problem

free operation of the studio.

However, the problem with this principle is that electric safety has the highest priority. Since it is necessary to connect the protective conductor to every device that has a power line connection, there are actually two ground connections with almost every device, one thru the protective ground and the other one thru the additional, high cross section, ground cable.

Of course, this situation presents another risk for ground loops. At this point we have to get back to the considerations about the mains power installation to find a feasible solution since the modification of all the equipment in a studio, in a way that makes it possible to use the additional ground line as a protective conductor is impossible. In addition to the problems that occur with the necessary intrusion into the devices, and the connected legal problems, like warranty, etc., a modification like this also affects the safety of each device. Only the problem of finding an insurance company that will underwrite this risk leads us to the point that this principle cannot be used.

However, there is a way that is much easier and works properly. If the mains power installation is carried out in the way described above, we will already have a low impedance ground connection to the central ground node, which actually is the protective ground. We can leave everything unchanged, if we use this main ground line as not only audio ground node, but also as protective ground. Since the main ground conductor is part of the mains power installation it is not a problem to accomplish this system easily.

WE SHOULD MENTION THIS AGAIN...ONLY QUALIFIED PERSONNEL SHOULD BE ALLOWED TO INSTALL AND/OR MODIFY HAZARDOUS VOLTAGE, ELECTRICAL SYSTEMS.

THE EXAMPLES WE GIVE ARE VERY GENERAL AND ARE TO BE TAKEN AS SUCH; IN ADDITION, SOME DETAILS MAY NOT APPLY IN YOUR LOCAL AREA BECAUSE OF SPECIFIC LOCAL LAWS AND/OR REGULATIONS.

WE ADVISES THAT YOU CONSULT A QUALIFIED ELECTRICIAN REGARDING THE INSTALLATION OF ANY NEW ELECTRICAL SUPPLY, OR THE MODIFICATION OF AN EXISTING SUPPLY. BY NO MEANS, WILL WE BE LIABLE FOR ANYTHING THAT YOU DO.

Let's put this together. We use the high cross section ground line from the basement of the building not only as audio ground node but also as protective ground. If we now install additional, high cross section ground connections to the devices in the studio, we simply parallel the existing protective ground that already exists. If commonly used power cords and electric installation is used, we will have a cross section of the protective ground of 1.5 mm2 from the electric distribution box to the sockets and 0.75 mm2 to 1.5 mm2 from the sockets to the devices. This differs from country to country, but it's always in the range. This cross section is sufficient for electric safety. Our additional high cross section cable add another 4, 6 or even 10 mm2 just in parallel to the protective ground, which means, that the particular device is now connected to the ground node very well and that the protective ground is almost shorted by this additional ground line. However, if for any reason the additional ground is removed or fails, the original protective ground is still installed. Therefore, safety is not a problem. The only point of importance is that there may be no connection between the neutral conductor and the audio ground conductor, for the reasons already discussed in detail.

If, for any reason it is not possible to implement this system, there is another way to get the same result. However, this way is complicated and expensive. The entire mains power of the studio has to be separated from the mains power by a huge isolating transformer. When the isolation transformer is installed, the secondary circuit of the mains power is galvanically isolated from ground. The mains power has no ground reference anymore, which means, that we are free to apply any ground with a sufficient cross section as protective ground.

BEFORE USING THIS PRINCIPLE, MAKE SURE THAT YOUR LOCAL RULES ALLOW THIS PRINCIPLE. EVEN IF THIS WORKS, IT MIGHT NOT BE ALLOWED AT YOUR LOCATION.

For the realization, the main ground node, which in this case can be the central ground point of the building, or a separate earthing electrode, or a combination of both, has to be connected to the protective conductor at the studio installation that is driven by the secondary winding of the isolation transformer. As mentioned above, you must obey your local rules as far as the installation of isolation transformers are concerned. These rules are different from country to country. In some countries, it is only allowed to install one single device to an isolation transformer but not to install a system like this. **Gather all necessary information and make sure that an installation like this is in accordance with the local safety regulations. Even if such system works properly, it is under your responsibility to obey the local rules and you will be liable for any damage and harm that is caused by this installation. By no means, we will be liable for anything that you do.** We only describe possible ways of an audio installation, but we cannot tell if everything that is listed here is allowed at your location.

If your studio is installed in a room with an existing, old electrical installation, it is necessary to check this installation. Figure out, how the protective ground is wired and if it is connected to another electric circuit. Check if the cross section of the protective ground is appropriate and check how the different circuits and sockets are distributed among the fuses. If there is any connection of the protective ground to another room or sub distribution you will have serious problems. It is necessary to make sure, that the protective ground of the audio mains power is clean unless you risk many dubious problems. It might be necessary to replace cables, or add new protective conductors with sufficient cross section, replace sockets, rearrange the distribution, and add new fuses. You need to have a skilled, professional electrician for this task, who is familiar with the special problems of audio installation and grounding.

2.2 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 unbalanced, 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 any 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 (in the meaning of a low 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 normally 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 of the RJ45 and 10-BaseT types are grounded on both sides of the line. A computer network 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 with the network cables, which have high impedance. Since it is not important for the function of the networks, 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 audio protection ground. If there is no degration, you are lucky. Leave it as it is and make sure that you have a list of these devices ready. If at any time in the future you have noise in the system, disconnect all devices 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 these devices.

2.3 Cables

The selection of the cables that are used for the audio installation is very important for the proper operation of the entire system, for the sound performance and, last but least for the cost of the installation. Multicore cables are commonly used for most of the necessary lines. There is an overwhelming offer of multicore cables from many brands in a price range from almost nothing to amounts that are not reasonable anymore.

As far as the sound performance of a cable is concerned, be aware of the fact that a cable does not 'sound'. A cable is a passive electric component that has a resistance, an inductance and a capacity, nothing else. If a cable alters anything, it depends not only on the properties of the cable itself but also on the qualities of the audio output and input that are connected by the cable. Since the electric properties of a cable are proportional to its length, longer cables are more critical than shorter cables. Nothing else but resistance, inductance and capacity is important for audio signals. The skin effect and the impedance have no influence on audio signals, because these effects are not relevant in the audio frequency band. The skin effect for instance is the influence of the magnetic field that is caused by any current in a conductor that displaces the electrons to the boundaries of the cable. It is obvious that this effect is proportional to the frequency of the signal, since it is caused by the inductive reactance that increases with the frequency. The skin depth is the distance from the boundary of the cable to that point inside the cable where the current is reduced by 1/e, which is equivalent to 36.8 %. For audio signals at a frequency of 20 kHz, the skin depth is approx. 0.3 mm. With audio cables that usually have a diameter in the range of 0.2 to 0.4 mm this means, that there is simply no skin effect. As far as the impedance or wave resistance of a cable is concerned, there is also no effect in the audio band. The meaning of the wave resistance is not so easy to understand. The speed of an electrical signal is in principal the speed of light. However, in a cable, the real speed of an electron is impeded. The real speed is in the range of two thirds of the speed of light. If we imagine a generator that is connected to one end of a cable and an output signal that is a pulse that is as small as possible, a so called Dirac pulse, the pulse runs thru the cable at approx. 200000 km/sec. For a certain period of time the pulse is only existing in the cable until is arrives at the input that is connected to the other end of the cable. Depending on the qualities of the cable, the pulse will be send back to the output of the generator and produce reflexions of the original signal that run along the cable from one end to the other if the wave resistance of the cable does not match the impedance of the connected input and output. If we use a cable of 100 meters, and assume that the speed is 200000 km/s we can calculate, that the time that is needed for the cable length of 100 meters is 500 nano seconds. The wavelength of an audio signal of 20 kHz is 0.050 ms, which is 100 times longer than the delay that is caused by the 100 m cable. This means, that even if there would be a reflection on the cable, it will not alter the signal, since the amplitude of the signal has not changed during the time between the original signal and the reflection. Actually, the phase angle difference of the 20 kHz single during the 500 ns period is only 3 degrees.

The most important quality of a cable is the capacity. Since both lines and the screen are close together, the capacity of any cable cannot be neglected. We need to make a difference between the capacity core to core and core to screen. These two values have a different influence, depending on the type of audio connection. This means, that the core-to-core capacity is not that important with unbalanced signals. However,

the lower the total capacity, the lower the possible influence. The most critical source is a microphone, since its source impedance is usually 200 ohms while the source impedance of professional audio line level outputs is below 60 ohms. Let' make some calculations to determine a critical value for the cable capacity. Assuming that the source resistance of the microphone is not higher than 200 ohms up to frequencies of 20 kHz, and we use a good quality cable with a total capacity (between cores and core to screen) of only 100 pF, we have a total load capacity of 10000 pF with a cable length of 100 meters. This capacity has an impedance of a little less than 800 ohms, which results in a drop of level at 20 kHz of approximately 0.75 dB and an additional phase shift in the range of 20 degrees. In critical situations, this will be audible. However, if the cable is shorter, or if a low source resistance line output is connected instead of the microphone, the situation is not that problematic. Anyway, we are supposed to check for low capacity values of the cables. The lower the capacity, the less is it likely that there is any influence on the audio signal.

While the inductance of commonly used cables is not important in the audio band, let's check if the resistance can have another influence. We use the 100 m microphone cable for this check again. If we use a cable with a cross section of 0.2 mm^2, the total resistance per core and per meter is approximately 0.085 ohms. The total length of both cores of the 100 m cable is of course 200 m, which means that the total resistance of such cable is 17 ohms. This resistance is added to the 200 ohms source resistance of the microphone, which means, that as far as the cable resistance is concerned, the input impedance of the amplifier is the important factor. A commonly used professional microphone preamplifier will have an impedance that is higher than 1 kOhm in any case. The difference of the attenuation of the applied load of a 1 kiloohms input to a 200 ohm microphone can be easily calculated. Without cable, there is a voltage drop of 16 %, which is equivalent to approximately 1.3 dB. With the additional resistance of the cable the voltage drop is 16.4 % instead of 16 %. The difference is less than 0.1 dB, so we can forget about this, unless we use cables with a cross section that is much lower than 0.2 mm^2. This calculation also reveals, that the influence of silver plated cables is not existing. Even though the electrical conductance of silver is little better than the conductance of copper, the difference is not very high. Kappa, the electrical conductance of copper is 56.2 m/ohms*mm^2, while the conductance of silver is 62.5 m/ohms*mm^2. This makes a difference of 11.2 %. Since silver plated cables have only a very thin silver surface of less than 10 micrometers, the silver plating does not alter the total resistance of the cable at all. As we have already seen, also the skin effect, that would be able to make the silver-plating on the surface of the cable more important, will not have any effect in the audio band.

What is much more important than the material is that the cable is stable enough to withstand the mechanical treatment and that the isolation between the screen is sufficient to make sure, that there is no chance that the screens of the separate cores of a multicore are shorted. This is a big risk with multicore cables that use anodized aluminum foil without additional isolation for the single lines. It is very difficult to assemble these cables in a way that there is no risk for shorting the screens. If the multicore lines must be split to several single connectors, this type of cable is not a good selection at all. If the single lines are not carefully isolated with shrink tube or other appropriate material, a little scratch in the aluminum foil can create a very confusing problem when a screen makes electrical contact with the housing of a device. Don't use this kind of cable.

2.4 Planning of the installation

A good design and preparation of the installation will save a lot of time and trouble. Make sure to list all the equipment that is installed in the studio and make a list of all necessary connections. In most cases, the biggest part of the work is not the console. All connections from and to the console are actually predetermined by the connectors. The major part of this work is the external processing gear in the control room and the connections from and to the studio. You must take care that you have enough connector panels in the studio and that these panels are placed in a way that can handle any kind of recording or broadcasting with the existing lines. In addition, studio headphones and playback speakers must be installed. Another part of the work is the necessary control installation, red lights, speakers' tables and anything else that is necessary for the particular studio.

External processing gear in the control room is the most problematic

part of any installation. All devices are different, you have to deal with balanced and unbalanced lines, different connectors types and problems with screening and grounding. In addition, the units that have internal power supply sections can inject hum by the magnetic field of the power transformer into the devices that are mounted above or below in the rack. There are no standards for this kind of equipment, which means, that you have to figure out what works. In addition, there may be temperature problems in a rack, when several units with high operation temperature are mounted above each other. It is always a good idea to make some tests before you make the rack layout and the cables.

Here are some proven rules:

Use only balanced cables
Even if a particular device is unbalanced, use a balanced cable. This gives the opportunity to transport the ground potential of the particular, unbalanced device to the balanced input of the console or another device. This means, that the balanced input 'sees' the voltage differential between the unbalanced output and the ground of the device and not the output to the ground of the console. Any difference in the ground potential of the console and the external device will not cause problems using these principles. Otherwise, the voltage difference between the two grounds becomes a part of the audio signal.

The rules in brief
Connect all cable screens to the console and leave the other end open
If an external device is balanced, connect both lines to hot and cold.
If the external device is unbalanced, connect the hot / + phase to the unbalanced input or output and the cold/- phase to the ground of the external device.

Connect the screen to that end of the cable that is attached to the console only.

While you actually don't know what ground potential a particular screen pin of a connector of an external device has, you know that all screen pins of the console has a clean ground potential that can be used for screening without problems. If the cable is not attached to the console but to a patch bay or distribution panel, prepare a similar system for the cable screens in that patch-bay.

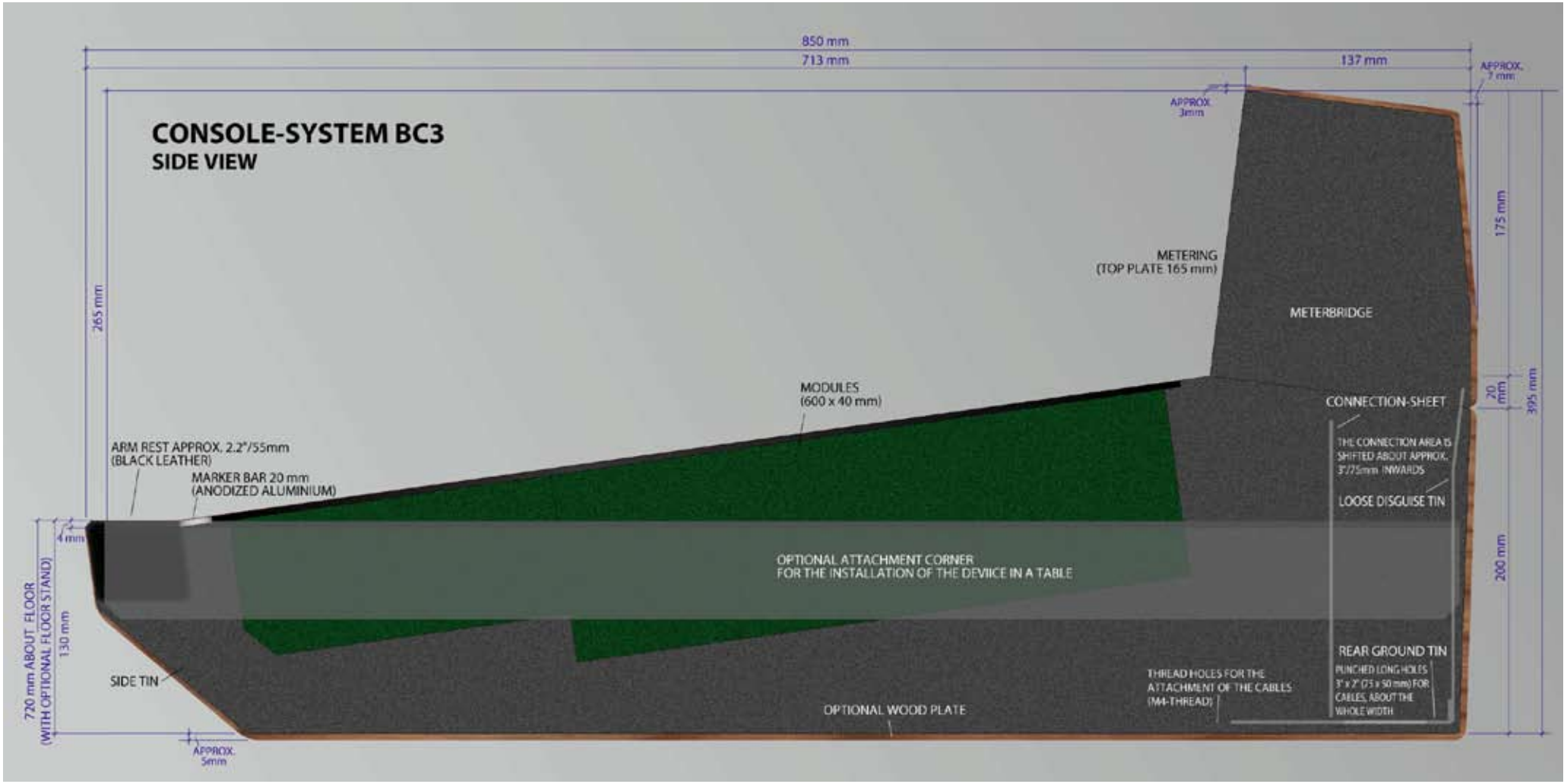
Carrying out the installation

Most of the work is cable assembly, which has to be made carefully. Care must be taken not only about the soldering and the isolation but also of an appropriate pull relief and the mechanical stability of the cables and the connectors. Every cable should be carefully tested before it is installed.

3. Frames

3.1 General information

Many different frame versions for BC3 broadcast consoles are available. The width of a particular frame depends on the number of module compartments. All frames are available as desktop versions, build-in version and stand-alone version together with a floorstand.



3.2 Dimensions

3.2.1 Side View
The side view shows are all dimensions of the different frames. The height of the fader bank of the stand-alone version is determined by the height of the floor-stands and can be increased by adapters between the floor-stands and the frame up to 50 mm / 2".

3.2.2 Width
The width of the frames depends on the number of module compartments. The module grid of the BC3 series consoles is 40mm/1.575". The frames are organized in a grid of 4 module slots = 160 mm/6.3". A particular frame can be combined by any number of 4 module blocks. Frames are available in each width that can be divided through 4 * 40= 160mm. The smallest frame for 4 input channels and the master section has an inner width of 320 mm/6.3". Single frames are possible up to an inner width of 3040 mm / 119.68" with 76 module compartments (64 inputs, 8 groups, 4 master modules). Larger consoles can be arranged by a combination of two or more frames on a common floorstand.

3.2.3 Modules and Accessories

3.2.3.1 Master Section
The master section is mandatory for each BC3 broadcast console. At least, the program master module PM3 or PM4 and the control room module CTR3 must be installed. The playback module STU3 and the talkback/oscillator/on-air control module TBO3 can be left out if the functions are not necessary for the particular application. Apart from the special 19"-rack-mounted frame versions that has a 3 slot master section, all BC3 frames come with a 4 slot master section, wired for the 4 master modules. The master section can be installed between any block of 4 modules in the frame. The position must be specified with the order. It is not possible to move the master block once the frame is wired.

3.2.3.2 Groups
4, 8, 12 or 16 module compartments can be used for groups modules. Of course, groups can be left out completely as well. Mono and stereo group modules are available. The standard versions of all input modules come with a group routing section for 8 mono or 4 stereo groups modules. Special versions of the input modules with 16 bus routing sections are available. The maximum number of groups in a BC3 system is 16.

Mixed installation of mono and stereo group modules in a frame is possible. The group module compartments are assigned to the bus rails on the wiring pcbs in the frame by solder pins that are installed in the frame. This configuration takes place in the factory but can be modified at location.

The only limitation is that a section for groups must fit into the 4 slot / 160 mm grid. The location of the groups in the frame is up to you. Any position between a block of 4 modules is possible. It is also possible to place one block for the groups 1 to 4 away from a second block with the groups 5 to 8. The position of the groups in the frame must be specified with the order, since groups require different wiring pcbs and connector panels. It is not possible to change the position of the groups once the frame is wired. Actually, this can be done in the factory; however, the cost is not appropriate.

3.2.3.3 Input modules
All module compartments for input modules are compatible with all input module versions. It is not necessary to specify the module type for a particular compartment. Input modules can be rearranged in the frame at any time.

3.2.3.4 Blindpanels, Producers Tables, Writing Areas, Integration of external Equiment.
WProducers tables or writing areas can be installed between any block of 4 input or group modules anywhere in the console. The limitation to the 4-channel grid is valid also for these ares. It is therefore possible to installe sections with 160 mm, 320 mm, 480 mm or 640 mm. The face-plates for these areas can be single slot blind panles as well as 4-, 8-, 12- or 16-channel plates. The surface can be black anodized like the module face-plates or powder coated. Wooden panels are possible as well, please ask. Compartments of 320 mm, 480 mm, or 640 mm can be carried out parallel to ground alternatively. The compartments can be prewired for later installation of modules. The integration of external equipment, re-

motes, keyboards, etc. is possible within the limits of the available space in the frame. Please aks for details.

3.2.4 Versions

Three versions of the BC3 frame are available, the desktop version, the built-in version for integrating the console into an existing control room desk, and the stand-alone version with floor stands.

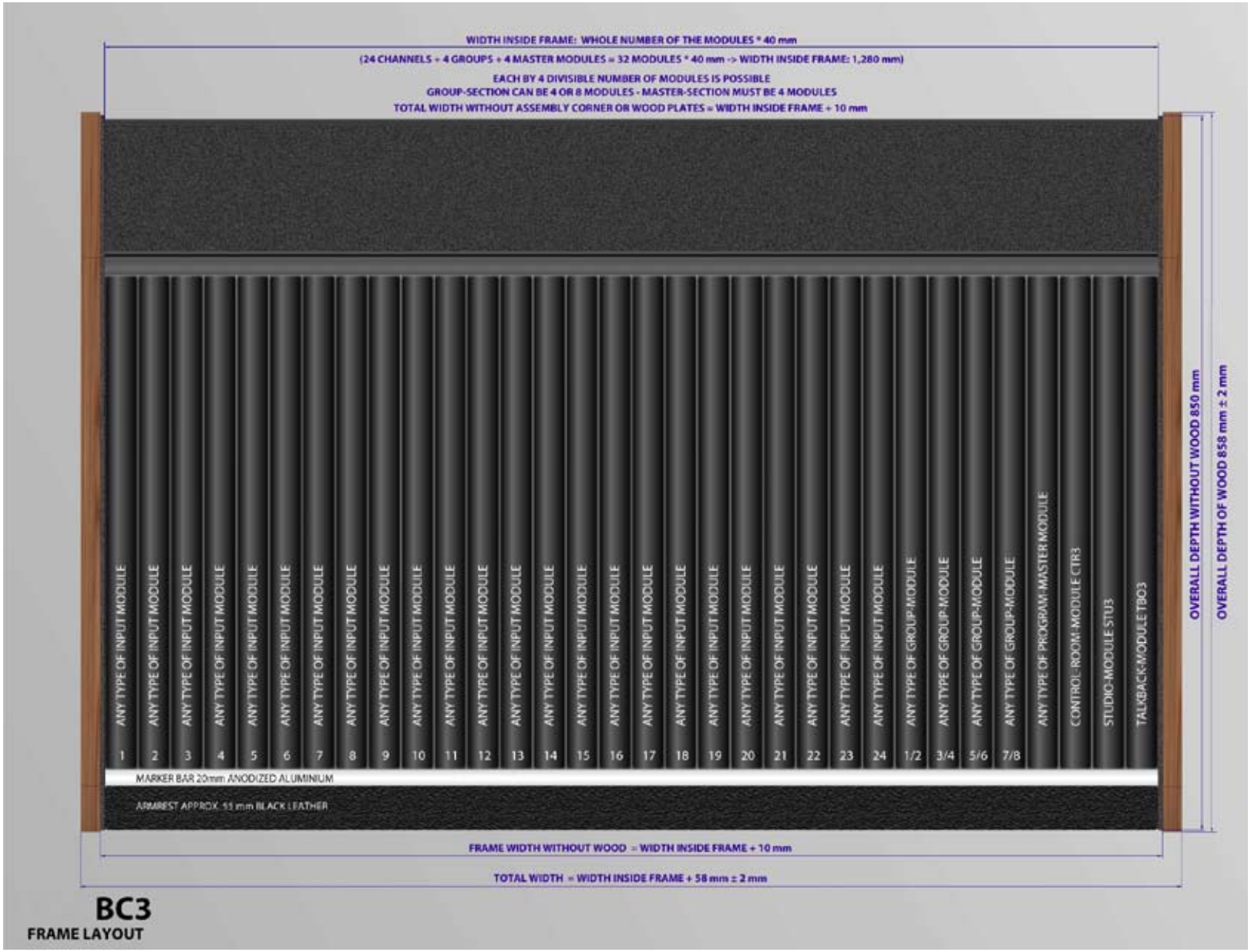
All frames come with all necessary holes and threads to convert one version into another one. The build-in version, for example can be converted into a desktop version just by replacing the mounting brackets and the wooden side panels.

3.2.4.1 Desktop Versions

This version comes with wooden side panels and rubber pads. The console can be placed on any table that is stable enough to withstand the weight.

3.2.4.2 Stand alone Versions

Two floorstands can be bolted to the bottom side bars of the console frame. Different wooden panels that cover the



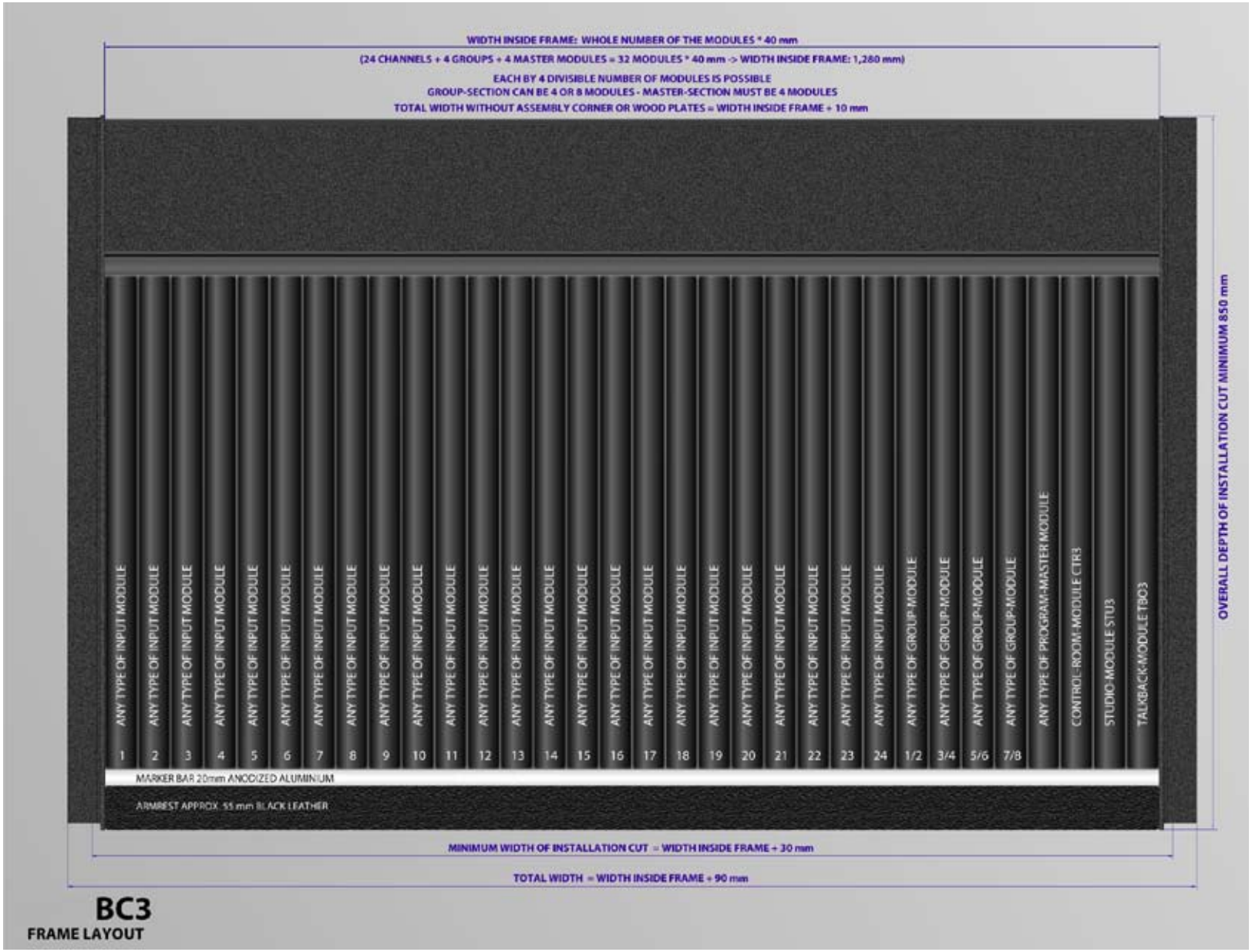
top of the floorstand come with this version as well. The standard height of the floorstands puts the fader bay to a height of 720 mm / 28.35" above the floor. Special spacer bar can alter the height up to 50 mm / 2".

3.2.4.3 Built-in Version

Two mounting brackets 40 by 60 mm, made of stable alumium profile can be bolted to the side panels of the frame. The console can be installed in a cut out of an existing table-plate. Different mounting positions of the brackets make possible to fix the console from the top or bottom into the table plate. It is also possible to maintain the original pitch of 7 ° or install the module surface plain with the table. The version is completed by different, smaller wooden side panels on top of the mounting brackeds.

3.2.4.4 19" frame

The special 19" frame can be used for installing a console in a standard 19" rack. The 19" version has 11 module solts; the innder width is 440 mm. the overall width without rack-ears is 448 mm. The total width is 483 mm and the distance between the fixing ho-



les is 465 mm, according to the 19" standards.

This version comes with a special wiring for 8 input modules or 6 input- and two group modules. The ramaining 3 compartments are used for the program master, the control room module and the talkback/oscillator/on-air module. The installation of the studio module is not possible.

3.3 Meterbridge

All frames for the BC3 series come with a meter-bridge. The bridge can be used for the installation of different meter versions, speakers, and dynamics-section. In addition to adt-audio VU- and PPM meters, plasma bar graph meters, brand RTW (www.rtw.de) can be installed. While the standard module version of the plasma bar graphs fit horizontally, the series 1000 meters can be mounted vertically as well. In addition, most of the LCD/TFT combined meters of RTW fit as well.

3.3.1 Meters

VU meters, LED-PPM's and plasma bar graphs can be mixed in any way. The only limitation is the available space in the meter bridge.

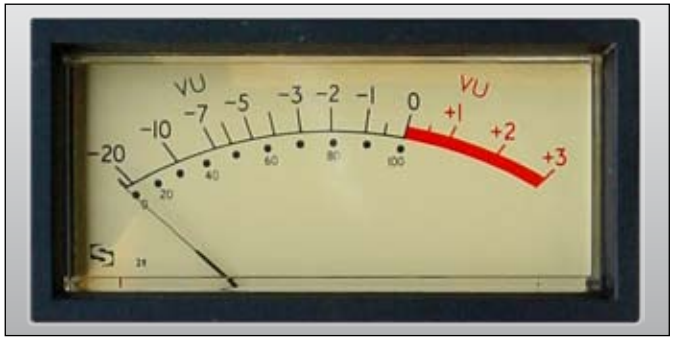
3.3.1.1 Meter Source Signals

Even though a usual broadcast console won't have meters installed on all input module, there are jumper configurable meter sends in all modules. The jumpers make possible to meter calibrated input signals, or the signal pre or post fader. Stereo modules have two meter sends and can be used together with a stereo meter. An additional meter matrixallows using mono meters as well.

The master modules can drive meters for the program master and the aux- and cue masters. In addition, the control room source and the calibrated stereo PFL master are also available or metering.

All connections to the meters are flat cables from the wiring pcbs in the main frame. The power supply voltage for all meters is 24 V. It is connected from meter to meter in daisy chain mode. The meter supply voltage is a separate, floating voltage that comes directly from the the power supply unit. It is always installed in a BC3 broadcast console. All meter versions can be combined in any way. Upgrade with additional meters is possible at any time.

3.3.2 Versions



3.3.2.1 VU-Meter

The VU meters for the BC3 console are active meters with the standard attack and release time of 300 ms. Level and lead are adjustable and default to and adjustment to 0 dB VU @ 0 dBV (+ 4 dBV with 4 dB lead) equivalent to ~ + 2 dBu. The adjustment range covers all commonly used settings. The VU meters are available in panels with 2 or 4 meters. Two meters are 80 mm / 2 module compartments wide.

3.3.2.1 Peak Program Meters

High resolution peak program meters adt-audio TK-PS/TK-PM can be installed alternatively. These meters use a led-bar with 40 led's as display. TK-PS is the stereo version, TK-PM the mono version. The modules are installed vertically in the meter bridge. The width of the modules is 40 mm, just like the modules of the BC3 system. The attack time is either 10 ms or less than 1 ms for a display of -1 dB with a 5 kHz burst of 10 ms or 1 ms duration. It can be selected by a jumper. The release time is linear and adjusted to 1.5 sec for 20 dB. Two different display ranges are available. The standard broadcast versions comes with a range from - 40 dB to + 10 dB; -40 dB to + 15 dB are available as an alternative. The resolution in the upper 25 dB is 1 dB. The rectifier circuit operates according to DIN45405, quasi peak, with a polarity error of less than 0.5 dB. Zjr 0 dB level defaults to + 6 dBu ~ + 4 dBV and be adjusted in a wide range. Due to the availability of mono and stereo modules in the same channel grid as the input, group and master modules, it is possible to install the meters directly above the input or group modules.

3.3.2.2 RTW-Peakmeter

Plasma bar-graph meters, brand RTW (www.rtw.de) are available in two different formats. The 190 x 40 mm standard ‚cassette' houses fits into the BC3 meter bridge horizontally. These meters are available in different

versions and different scalings. Combinations of level and phase correlation meters are available as well.

The series 1000 uses cassettes with dimension 144 x 40mm (type 1001-40). These devices can be installed vertically, directly above the channels.

3.3.3 Speakers

Active speakers for use with PFL and incoming talkback are available for installation in the meter bridge. The 130 mm wide-band coaxial speakers are combined with 8 Watt power amplifiers. The units have two balanced inputs. The control room module BC-CTR3 can drive one speaker in mono mode or a pair of speakers in stereo mode as well. All necessary controls for the operation of the speaker(s) are included. For use as PFL and talkback loudspeaker there are active loudspeakers for the installation into the over bridge available. The monitoring module CTR3 consists a select and control unit for this system. A separate supply voltage for the speaker amplifiers with sufficient capacity for a stereo pair is included with each power supply unit.

3.3.4 Additional devices

For additional devices there are different front panels and adapters available. Please ask for details. An additional 24 volt / 1 amp power supply is available for external devices.

4. Technical data

The characteristic data of all audio inputs and outputs of the modules are identical. Here is a listing of the basic data of the different types.

Level
The nominal level of the BC3 system is determined by the customer. It is only fixed by the adjustment of the system meters that can be set to any level between 0 dBu and +10 dBu. If no nominal level is specified by the customer, it will be set to + 6 dBu = 1.55 V RMS ~ + 4 dBV.

Headroom
The maximum level of a particular signal chain always refers to an overall gain of 0 dB. With positive gain values, the maximum value is equivalent to the output value, with negative gain settings, the maximum value is equivalent to the input level. The design of the internal circuitry can handle the maximum level in each stage of the signal chain; however, if the internal chain adds gain stages and attenuation stages as well, the maximum level is the level of the circuit of the highest level in the chain.

Transmission Band
The entire system is designed for the transmission of audio frequencies between 40 Hz and 15 kHz in accordance to German IRT rulebook 3/5. Variations of the amplitude vs frequency (frequency response) are in accordance with this rulebook.

The worst case value for any line level signal chain is > +/- 0.5 dB

RF- and Subsonic Filters
The suppression of subsonic and RF frequencies depends on the execution of the internal filters. The default filters are adjusted for edge frequencies (- 3 dB) of < 10 Hz and > 80 kHz. Other values in accordance to customers requirements are possible.

The suppression of subsonic and RF frequencies for microphone preamplifiers defaults to edge frequencies (- 3 dB) of < 15 Hz and > 40 kHz. Other values in accordance to customers requirements are possible.

Inputs

Microphone inputs
All microphone inputs are transformer balanced and floating. The input impedance is > 1kOhm in the transmission band without input pad and | > 2 kOhms with pad. CMRR in accordance to IRT standards is > 70dB at frequencies <=15 kHz.

Line inputs
Line Inputs can be implemented electronically balanced or transformer balanced and floating as an option. All insert inputs, control room source select inputs, and other line level inputs are electronically balanced unless otherwise ordered.

Electronically balanced line level inputs
Nominal level +6dB (or custom level, respectively)
Maximum level in the transmission band >= +28.5 dBu.
Input impedance in transmission band > 10 kOhm.
CMRR corresponding to IRT rulebook measurement method
> 50dB, in the transmission band

Transformer balanced and floating line level inputs
(optionally available for line inputs of input channels)
Nominal level +6dB (or custom level, respectively)
Maximum level in the transmission band >= + 26 dBu,
(limited by core saturation of input transformers at 40 Hz)
Input impedance in the transmission band > 10 kOhm.
CMRR corresponding to IRT rulebook measurement method 60dB, in the transmission band

Outputs
All outputs are electronically balanced. Some outputs can be implemented transformer balanced and floating on special order. Most of the optional output transformers are mounted in the console frame, because the size of a transformer that is capable of handling levels of more than + 26 dBu @ 40 Hz does not fit into most of the modules.

All electronically balanced outputs have a drive capacity of at least + 26 dBu into the nominal load of 600 Ohms between 40 Hz and 15 kHz (worst case condition).

Comment:
The entire system can handle line levels of + 30 dBu. The maximum output level into a load of more 1.2 kOhm is typically + 30 dBu. In a real-world situation, no load lower than 2 kOhm is applied to any output. However, the maximum level is limited by the power dissipation of the output drivers, that reduces the headroom to >+26 dBu into 600 Ohms, steady state. This does not affect the internal headroom, of course.

Nominal level +6dB (or custom level, respectively)
Source impedance < 60 Ohms
CMRR/IEC > 34 dB, typical value 46 dB

Transformer balanced outputs:
If transformer balanced outputs are ordered, the low frequency headroom is limited by the core saturation level of the transformer itself. The minimum value is + 26 dBu into 600 Ohms at 40 Hz.

Nominal level +6dB (or custom level, respectively)
Source impedance < 60 Ohms
CMRR/IEC > 34 dB, typical value 46 dB
CMRR/IRT > 60 dB up to 15 kHz

5. Connectors

5.1 Connector Types

Four versions of the connector panel
The connections for each module type of series BC3 consoles are standardized. There are 3 types of connector panels.
Version 1 is used for mono, stereo, and telco input modules
Version 2 is used for group modules
Version 3 is used for the master section.

The master panel also contains the power supply connector. One of these panels is part of every BC3 console.

5.1.1 Location of the connector panels

The connector panels are mounted right behind the belonging input, group or master modules at the rear side of the frame. The connector panels are inside the frame and can be covered by additional rear sheets. The base panel of this section has a row of 75 x 50 mm oblongs that can be used as cable outlets. A row of metric 4 mm threads allows the installation of cable clips at the rear bottom of the console frame. These clips can be used to hold the cable tree. The connector panels are mounted approximately 75 mm inside the frame.

5.1.2 Group and master assignment

The assignment of the group rails to the module slots is part of the frame installation. It can be changed by the rearrangement of bridges on the frame boards. See the drawings of the frame boards for details about this configuration. This configuration determines which group is in which module slot.

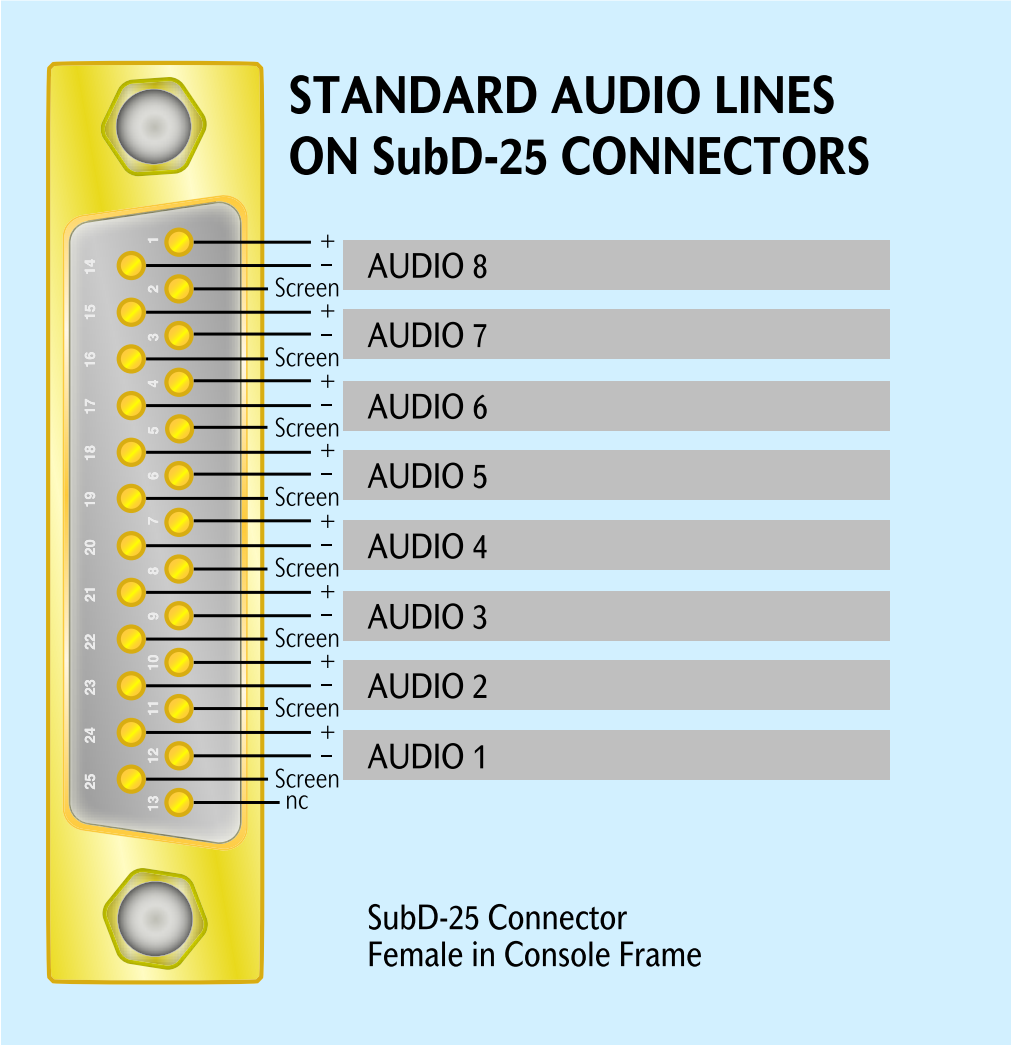
The module slots for the program master modules, the control room module, the playback module and the talkback module are fixed.

5.1.3 Pinning

Only 3-Pin XLR connectors and female 25-pin D-Sub connectors are used for all audio connections of the entire console. The only exception is the ¼" TRS jack for the control room headphones. If a patch-bay is installed in a particular console, the type of jacks that are used depends on customers specification.

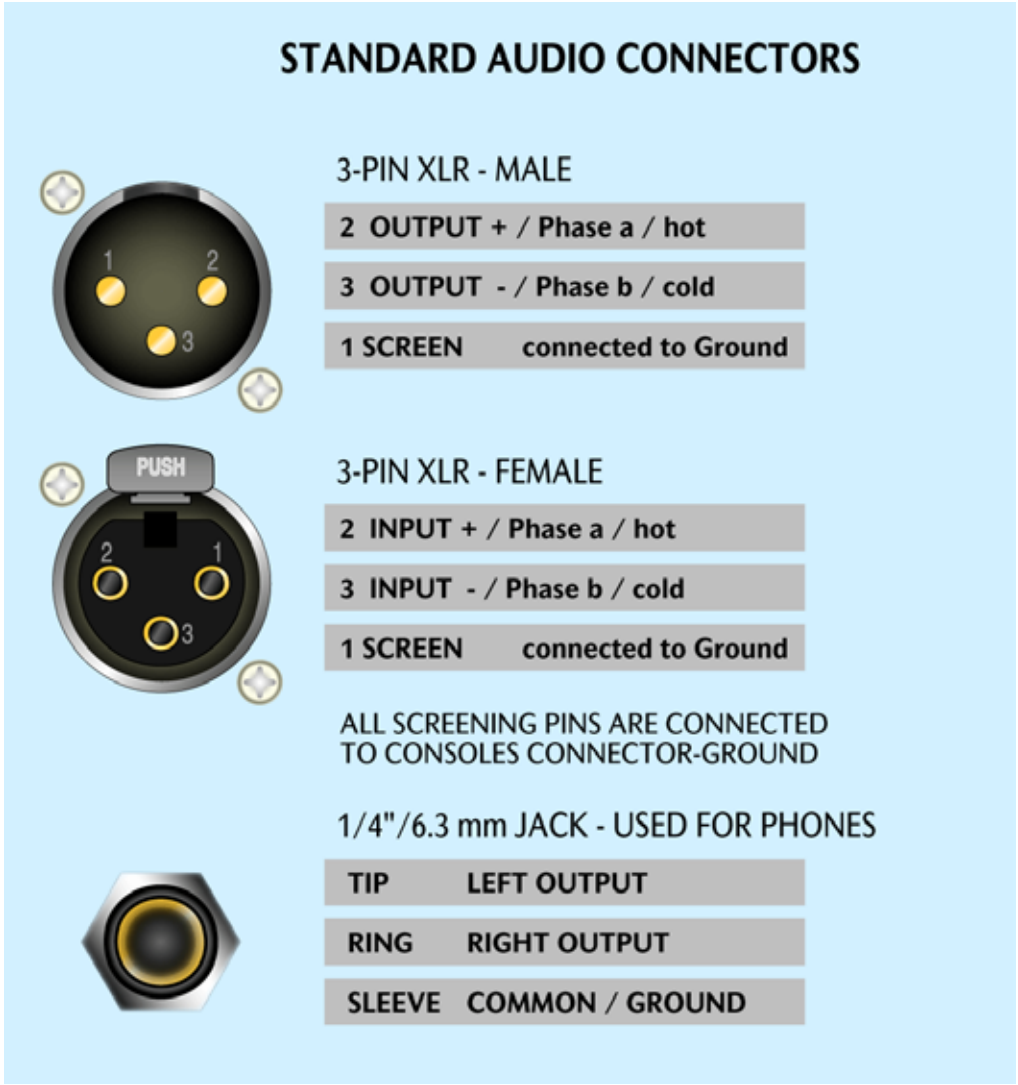
XLR 3-Pin connectors use the standard connection scheme with + on 2, - on 3 and screen on 1. The 25-pin D-Sub connectors use the common "Tascam" pinning with 8 balanced audio lines. See the drawing on the right side of this page and on the next page for details. The different pinnings of the D-Sub connectors are descibed in detail below.

All D-Sub connectors use UNC4-40 fixing nuts.



5.1.4 Screening

All screen contacts of all audio connectors are internally connected to ground. This means that each pin 1 of an XLR and the 8 screen pins of a 25-pin D-Sub are connected to a console internal ground network, that



is bridged to audio ground. Read the chapter about the audio installation about our recommendations, what principles of wiring should be used.

As mentioned in this chapter, all screen pins form an additional ground network, the 'Connector-Ground', which is bridged to audio ground at one point in the console's frame. If the console has to be installed in a very 'dirty' electric environment, it is possible to float the entire connector ground network and connect to audio ground via a low ohm resistor of approximately 1 to 5 ohms. This will avoid any ground loop current, since the 'dirty' ground lines will short and compensate in the connector ground network and not cause any current in the main audio ground, which is the reference ground for all the mix-busses. However, **call us for advice before you do so**.

With this principle, the **microphone input screens** are also connected to this separated connector ground. Depending on the ground loop situation, these contacts might be polluted by compensating current. Since these contacs are used for the return of the phantom power which might reduce the signal to noise ratio of a microphone in certain cases. It is not very likely that things like this happen, since such a disturbance that can cause these effects will have other effects as well that cannot be tolerated. However, it is possible to change the potential of the microphone input screening pins from connector ground to the audio ground of the particular channel by a jumper on the local channel PCB. Setting the screen to the ground of the local channels has the risk that different ground potentials attached to different mic inputs will compensate thru the main audio ground of the console, which is also the reference for all mix busses. Be aware that this setting should only be changed in particular channels if there is no other way to bring the system to work properly. The best choice is always to take care about a clean ground, before such compensation techniques are used. Please, asks for advice (0049 2043 51061 – support@adt-audio.com) before you change the default setting.

Special Terms:

**** Connector-ground:***
separate ground netword that connects all the screen contacts of the audio lines
***** Audio-ground:***
the internal electrical audio reference ground of the console

5.2 Connector Panels

5.2.1 Three versions of the connector panel

The connector panels of the BC3 broadcast consoles are standardized. Three different connector panels for input modules, group modules and the master section are existing. In addition there is a special master connector panel that is only used with the 19"-frame.

5.2.2 Location of the Connector Panels

Since the entire BC3 console system is based on a 4 channel grid, the size of the particular connector panels fits into this standard. The connector panels are installed right behind the modules on the rear side of the frame. The panels are mounted approx. 75 mm/3" inside the frame. The rear panel can be covered with powder coated panels that belong to the scope of supply of the console. Large oblong in the bottom cover can be used as cable outlets.

5.2.3 Connector Panels Versions

5.2.3.1 Input Channels

The connector panels for input modules can be used with all input module versions. The use of the particular connector with the different modules is printed on the connector panels and listed below.

5.2.3.2 Group channels

Like the input connector panels, the group connector panels are compatible with all types of group modules. The stereo modules use all available connectors, while the mono groups use only the left channel connectors for the mono signal.

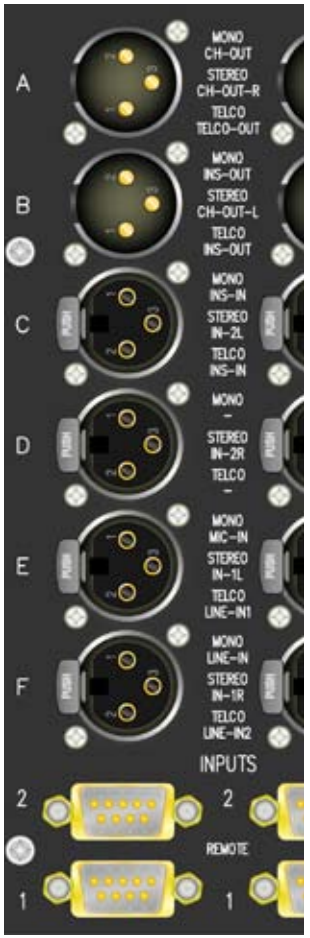
5.2.3.3 Master section

The master connector panel combines all connectors for the program master output, the master insert, the monitor- and auxiliary outputs, talkback outputs and everything else that is exisiting only once in a console. In addition, the power connector is located on this panel.

The corresponding module compartments in the master section are fixed for the master modules in this way (from left to right):

PGM – CTR – STU – TBO

The first compartment of the master section can be used with the BC-PM3 or the BC-PM4 master module. Compartment no. 2 is always used for the control room module BC-CTR3. These two modules are mandatory for the operation of the console. Compartment no. 3 is used for one of the optional playback modules BC-STU3a, b, or c and compartment no. 4 holds the talkback/oscillator/on-air control module BC-TBO3a, b, or c, which is also not mandatory. While standard broadcasting application will require these two modules, consoles used for an edit suite or DJ consoles won't usually need the additional functions.

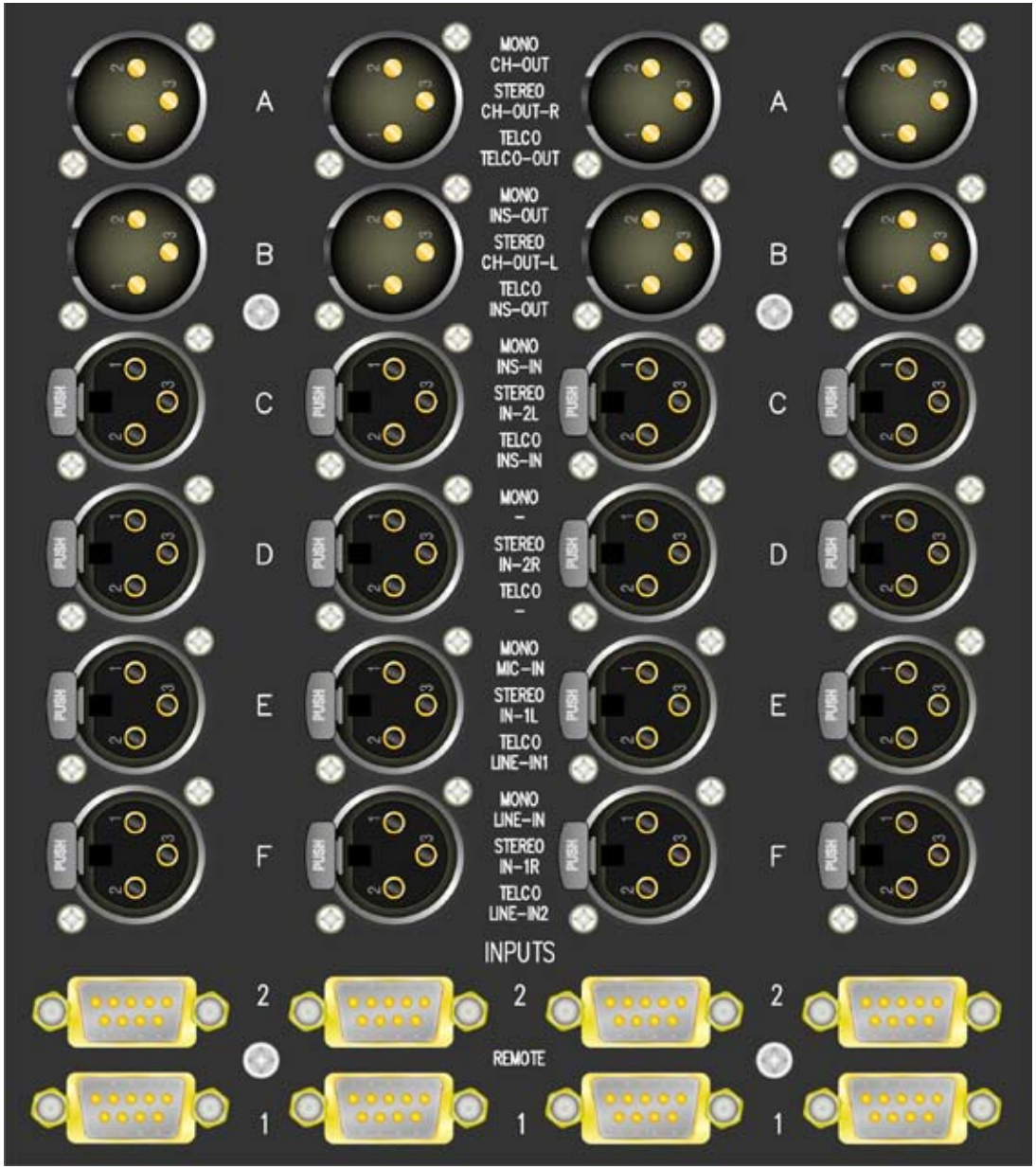


IMPORTANT

It is self evident that the connectors of the input module slots and the group- and master module slots are different. Even though no damage will occur when installing wrong modules in a particular compartment, the console will not function properly. It is also necessary to assign the group bus rails correctly to the compartments of the group module. This takes place by soldered pins in the frame pcb's of the group compartments. When altering the groups, please make sure that all necessary modifications are considered.

5.3 Connector Pinnings

All audio connectors are either 3-pin XLR versions or 25-pin d-subs, wired according to the so called ‚Tascam' standard. The headphone connectors are standard TRS connectors.



5.3.1 Connector Panels for Input Modules

The connector panels for input module contain 4 female XLR's, 2 male XLR's, and 2 female 9-pin D-subs per channel.

The XLR connectors are labeled from A to F. The function of a particular connector change with the type of input module that is installed in the corresponding frame compartment. The following describes the functions for mono, stereo, and telco channels in detail.

5.3.1.1 Input Modules

5.3.1.1.1 Mono Input Modules with Mic and Line Input IM3(s) or IM4(s)

Connector A – CH-OUT
XLR, male, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the version of the module, the channel output is electronically balanced or transformer balanced. The nominal output level is +6dBu. The electronically balanced versions can be also used unbalanced. In this case, one of the cores has to be connector to ground directly at the output connector.

Connector B – INS-OUT
XLR, male, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the version of the module, the channel output is electronically balanced or transformer balanced. The nominal output level is +6dBu. The electronically balanced versions can be also used unbalanced. In this case, one of the cores has to be connector to ground directly at the output connector.

The output is buffered – shorting the output will not affect the function of the module. The signal at the insert output is always available.

Connector C – INS-IN
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

The insert input (INS-IN) can be implemented electronically balanced or transformer balanced. The norminal input level is + 6 dBu.

Connector D – not used

Connector E - MICROPHONE INPUT
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

The microphone input is always transformer balanced. The input impedance is > 1 k Ohm without and > 2 k Ohm with input pad. Phantom power can be applied to the microphone inputs.

Connector F – LINE-IN
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the module version, the line input is either electronically balanced or transformer balanced.

The input select switch of the module determines whether the microphone or the lines input is active. This switch selects also the remote control interface that is active.

5.3.1.1.2 Stereo Input Modules with 2 Stereo Line Inputs, IS3(s) or IS4(s)

Reference:
Stereo input modules with AES-EBU inputs and outputs are described in detail in the technical manual.

Connector A – CH-OUT-R
XLR, male, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector B – CH-OUT-L
XLR, male, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the version of the module, the channel outputs are electronically balanced or transformer balanced. The nominal output level is +6dBu. The electronically balanced versions can be also used unbalanced. In this case, one of the cores has to be connector to ground directly at the output connector.

Connector C – LINE-IN 2 L
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector D – LINE-IN 2 R
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector E – LINE-IN 1 L
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector F – LINE-IN 1 R
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the module version, the stereo line inputs are either electronically balanced or transformer balanced.

The input select switch of the module determines which inputs are active. This switch selects also the remote control interface that is active.

5.3.1.1.3 Mono Telco Module with 2 Line Inputs,
IT3(s) or IT4(s)

Connector A – TELCO-OUT
XLR, male, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the version of the module, the output for the telephone hybrid are electronically balanced or transformer balanced. The nominal output level is +6dBu. The electronically balanced versions can be also used unbalanced. In this case, one of the cores has to be connector to ground directly at the output connector.

Connector B – INS-OUT
XLR, male, standard pinning1 = screen, 2 = core a / +, 3 = core b / -

Depending on the version of the module, the channel output is electronically balanced or transformer balanced. The nominal output level is +6dBu. The electronically balanced versions can be also used unbalanced. In this case, one of the cores has to be connector to ground directly at the output connector.

The output is buffered – shorting the output will not affect the function of the module. The signal at the insert output is always available.

Connector C – INS-IN
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

The insert input (INS-IN) can be implemented electronically balanced or transformer balanced. The norminal input level is + 6 dBu.

Connector D – not used

Connector E – LINE-IN 1
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector F – LINE-IN 2
XLR, female, standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Depending on the module version, the line inputs are either electronically balanced or transformer balanced.

The input select switch of the module determines which inputs are active. This switch selects also the remote control interface that is active.

5.3.1.2 Remote control ports
Each module has 2 remote control ports. Depending on the module version that is installed in the particular slot, these ports have different functions. With mono input channels, port 1 controls the microphone and port 2 is a remote port for external devices that is active when the line input is selected. All other modules that only have line inputs use the two ports as remote control connectors. The selection of the active port is coupled with the input selector of the module.

The female 9-Pin D-sub connectors have a different pinning for microphone control and remote control. Both version provide a 24 V supply voltage with a current capacity of 100 mA for external relays, lamps, and switches. This current is internally limited by a semiconductor fuse that resets if a shortage or overlaod is removed.

Most of the functions of the remote controls are determined by jumpers on the module. It is also possible to disable the entire port of a particular module.

5.3.1.2.1 Control ports for microphones
With microphone inputs port 1 is used. See the pinning diagram on the next page for details. The interface has two outputs that are both active when the microphone channel is open. The condition for ‚open‘ is determined by the jumper configuration of the module. It is possible to use only the channel on switch, or the channel-on switch and the fader switch to control this output. Output 1 is a relay that connects pin 4 and pin 6 when the microphone is open and pin 4 and pin 2 when it is off. Output 2 is an open collector output that can sink up to 100 mA to Relay Ground. It is active when the microphone is open. This output is available

between pin 5 (+) and pin 9 (switched -). In addition, there are two, active low inputs for external switches. Both inputs are pulled to +24V. The switch current is less than 1mA. The inputs are protected against overvoltage. Both inputs are active when connected to Relay Ground.

To avoid ground loops, please use floating relay or switches for control.

The Cough input mutes the microphone preamplifier remotely when active. The Talkback input routes the output signal of the microphone preamplifier to the console‘s ‚Listen-Bus‘. This function makes it possible to use the microphone for incoming talkback. A jumper can block this functions with fader open or in general. In addition, it is possible to mute the main signal chain automatically with talkback.

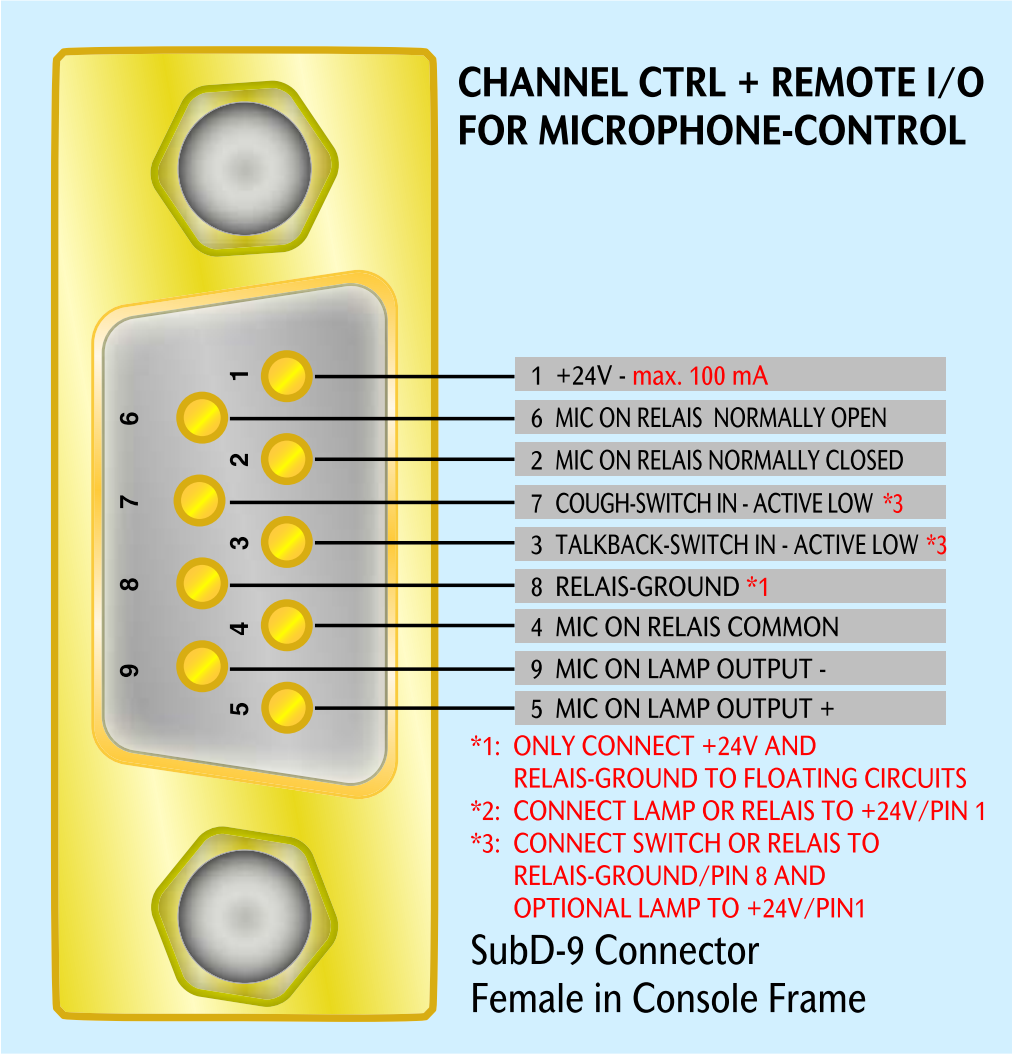
5.3.1.2.2 Remote Control and Telephone
This type of control port is installed with all line level inputs of mono, stereo and telephone inputs modules.

The remote control interface has two relays and an control input. The operation of the relays depends on the configuration of the particular module. Both relays are fully floating, can handle voltages of 30 V and current of up to 50 mA.

The port can be set to pulsed or static operation by jumpers. In addition, it is possible to disable a paritcular port. With both modes the port can be controlled by the channel-on switch alone or in combination with the fader switch. With static mode, The stop relay is normally closed and the start relay is in off position. Pins 4 and 2 are connected. When the module is in start mode (fader open, channel on, start switch pressed), the stop relay opens and the start relays connects pin 4 and pin 6.

With pulsed mode, both relays are off unless start is activated. When start is activated, the start relay connects pin 4 and pin 6 for approximately 100 ms. When the module changes from start to stop mode, the stop relay closes for 100 ms. The time is determined by internal capacitors.

The START switch of the module can toggle the state of the start/stop



control all the time to make possible that an external device can be started before the fader is opened and stopped without closing the fader. This functions can be disabled as well.

The ‚Lamp In‘ input can be used to remote control the start LED of the

module by the external device. It is implemented as an opto coupler and can be used with an input voltage in the range from approx. 10 to 30 Volts. With 5 Volts a resistor has to be changed.

Another jumper determines, if the internal start logic or the lamp input is used to drive the start LED.

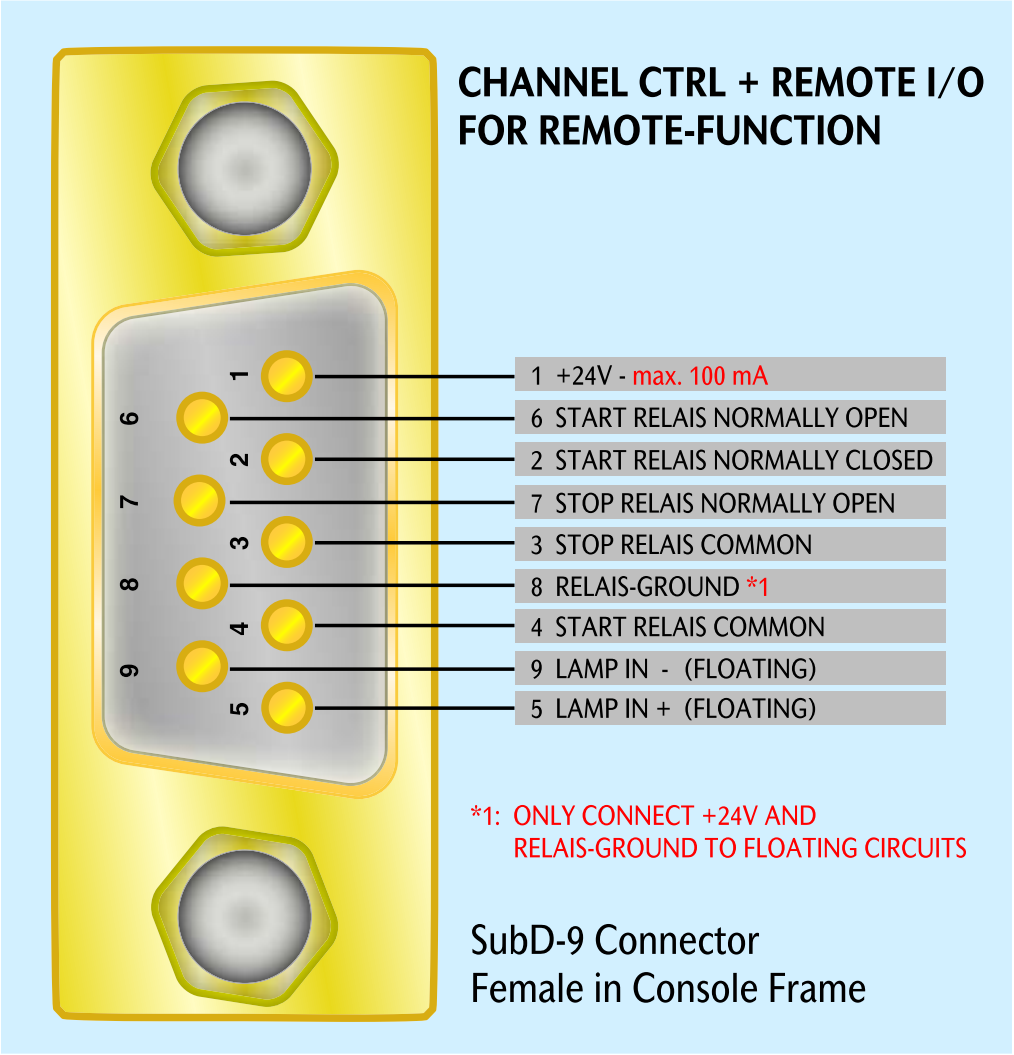
5.3.1.3 Interferences on the remote port
The design of the remote ports considers all common problems with the control of external devices to avoid any trouble that can be caused by the connection of the external device. However, there are some ‚don't do's', that should be mentioned:

Ground Loops:
Please, make shure that you do not connect the ground of the external device to the ‚Relay-Ground' of the remote port galvanically. There is no reason to do this. All relay outputs of the remote port are floating and the input of the lamp control is a floating optocoupler. If you need to use the internal 24 V supply, make sure that you use a relay or an optocoupler to separate the grounds.

High Voltages:
Case that very high voltages of more than 30 Volts are necessary to control the external device, please, use separate relays for the high voltage circuitry. Such voltages might cause click noise or other interferences in the audio path of the module.

AC Voltage:
Please to not connect AC voltage to the relays of the remote section. High AC voltages can cause hum and other intereferences.

Bouncing:
All inputs are protected against bouncing appropriately. However, if very old switches or relays are used in the external devices, it might happen that you need to add additional time delay to suppress bouncing. Call us or email us about such problem.



5.3.2 Group Connector Panel

The group panel combines all connectors for four group channels. There are 4 male and 3 female XLR connector for each group. This panels operates with all mono and stereo group modules of the BC3 system. All audio signals are balanced. Inputs and outputs can be either electronically balanced or transformer balanced, depending on the options installed in the particular module. With the mono group modules BC-MG3 and BC-MG4 only one channel is active while the stereo group modules BC-SG3 and BC-SG4 use all connectors. The additional connector G is reserved for custom functions.

The 3-Pin XLR plugs are marked from A to G.
Connector A – Group output left

Connector B – Group output right or group output mono
XLR-plug (male), standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

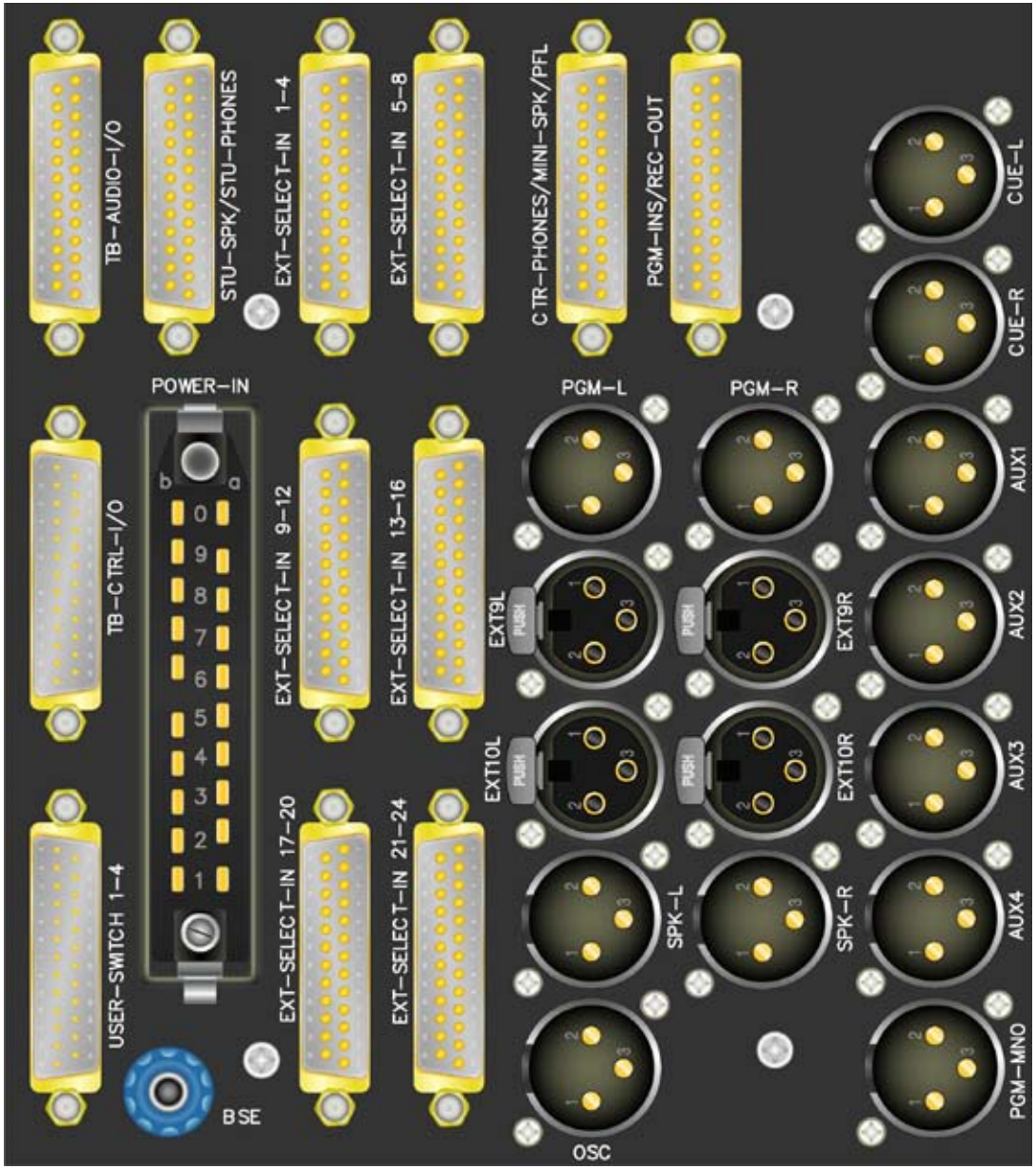
Connector C – Insert out left or insert out mono
XLR-plug (male) standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector D – Insert out right (not used with mono groups)
XLR-plug (male), standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector E – Insert input right (not used with mono groups)
XLR-plug (female), standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector F – Insert input left or insert input mono
XLR-plug (female), standard pinning
1 = screen, 2 = core a / +, 3 = core b / -

Connector G – not used
XLR-plug (male), standard pinning
1 = screen, 2 = core a / +, 3 = core b / -



5.3.3 Master section

The connector panel of the master section also includes the power connector. It combines 3-Pin XLR connectors for the main inputs and outputs and all 25-pin D-sub connectors that are required for the operation of the entire console. The different connectors are described in detail below.

5.3.3.1 XLR connectors

The most important inputs and outputs of the master section are installed on 3-pin XLR connectors. These are the outputs of the program master, the additional mono output of the program master, the outputs of all auxiliary sends and the stereo cue sends, the main control room speaker outputs, the extension select I/O's 9 and 10 and the output of the test tone oscillator.

All XLR connectors use the standard pinning with:
1 = screen, 2 = core a/+, 3 = core b / -

While there is nothing special with most of these inputs and outputs, it is necessary to point out some details about these connectors:

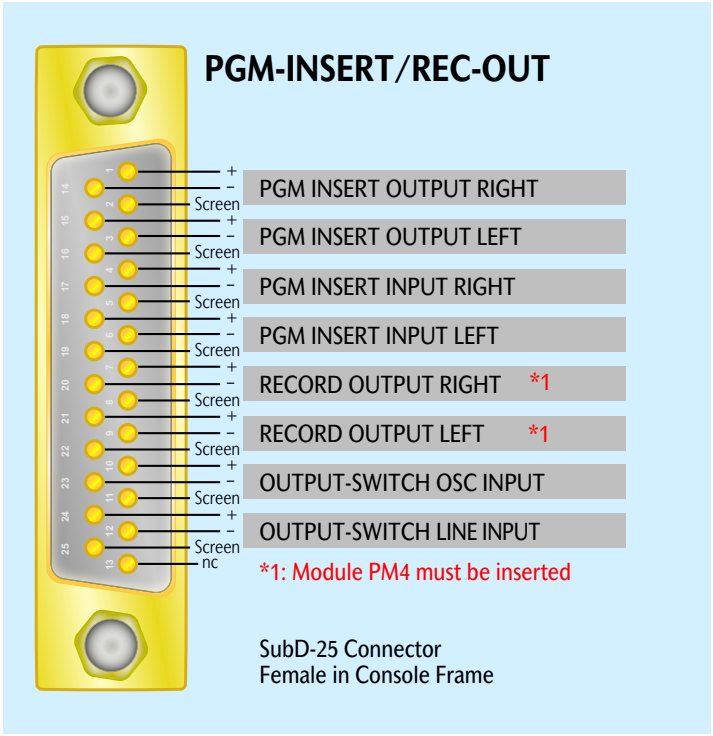
OSC
The test tone oscillator is always available on this connector when it is switched on. It is simply the direct, electronically balanced output of the oscialltor.

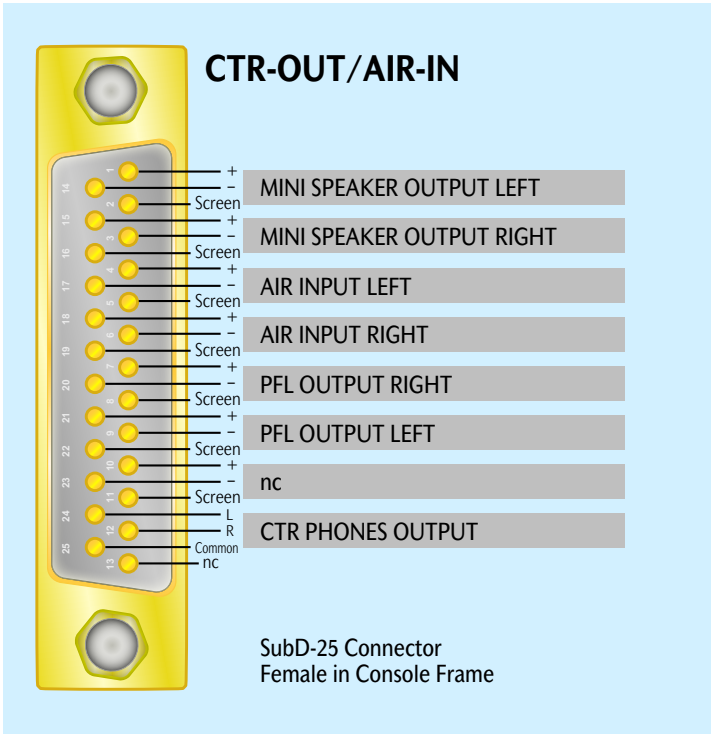
SEL2-L, SEL2-R, SEL3-L, SEL3-R
These 4 connectors are the outputs of the extension connectors ‚Select 2' and Select 3' that are installed in the BC-STU3b playback module and the BC-TBO3b talkback module. Depending on internal bridges on the consoles frame board they can be used to access the output of these switchblocks or to drive the SEL2 and SEL3 inputs of the selector block installed in the control room module. Using the connectors as output makes it possible to use the particular switch block for another function than control room select extension.

5.3.3.2 D-Sub connectors for audio signals

There are 10 25-pin D-sub connectors in total. All connectors are female. The connectors combine inputs and outputs of a particular signal group. The pinning of these connectors is shown on the next pages.

Apart from the headphone outputs of the playback module and the parallel ouput of the control room headphone, all inputs and outputs are electronically balanced, or transformer balanced if such an option was ordered.





5.3.3.2.1 Power Connector

The power connector, a 20-Pin, DIN41618/41622 ‚Siemens' version in installed in this panel as well. This connector is described in detail in the part I of this manual.

5.3.3.2.2 BSE

This is a high cross-section connection to the console's internal ground node. It shoud be used for potential equalizsation of the console. Connect this terminal with a high cross-section wire to your central ground node to make sure that the console has a solid ground.

5.3.3.2.3 PGM-INS

These connectors house the stereo insert inputs and outputs of the program master module. In addition there are the ‚Record-Outputs' that are only available if the BC-PM4 program master module is installed. In addition, the inputs of the output switch in the program master module for the positions OSC (oscillator) and LINE (external source) are available here. Please note that there is NO internal connection from the output of the internal oscillator to the oscillator position of the output switch. If you are using a central level oscillator you can just install the output to the output switch input. When using the internal oscillator, a cable from the oscialltor output jack has to be installed.

5.3.3.2.4 CTR-PHONES/MINI-SPK/PFL

Apart from the main speaker outputs that are available on XLR connectors, this connector combines all outputs and inputs of the control room monitor section.

Mini Speakers

The outputs of the mini speakers left and right are wired to the meter bridge of the frame. Thess optional speakers are normally used for PFL and incoming talkback. However, if no internal speakers are installed, external, active speakers can be used for this purpose. It is also possible to use these outputs as ‚alternates', since the input selection of the mini speaker section includes the output control room source selector. It de-

pends on the setting of the control room module, if both outputs are active are only the left or right one. Jumpers make it possible to use this system in mono or stereo, with one or two speakers.

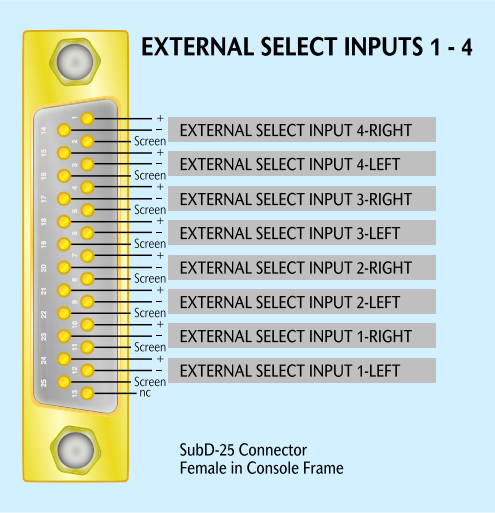
CTR Headphones
The output is unbalanced for the direct connection of a headphone. It is in parallel to the console‘s internal headphone jack. Please, observe the special pinning of this output.

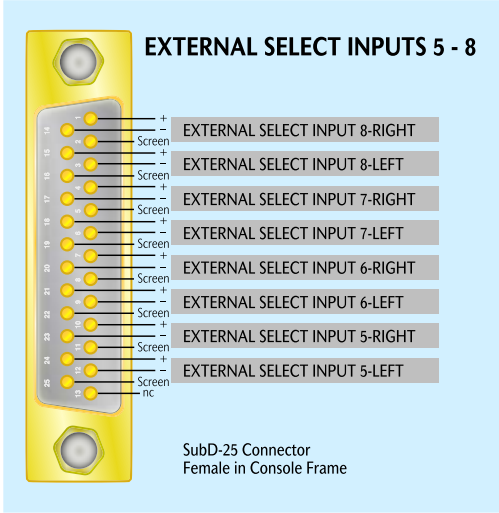
AIR-IN
The AIR-INPUTS are used for ‚post transmitter‘ control with live broadcasting.

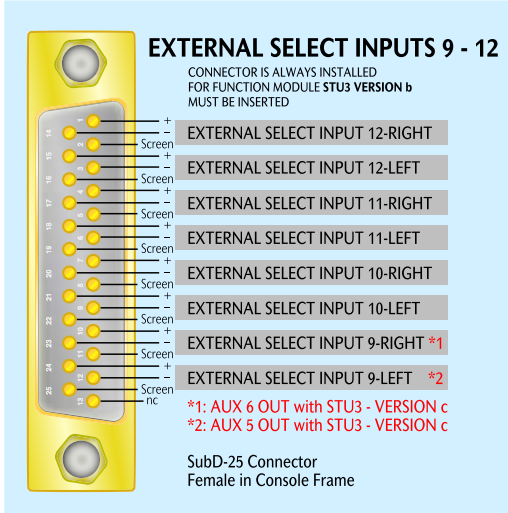
PFL
This is the direct, calibrated, electonically balanced output of the stereo PFL bus for external use.

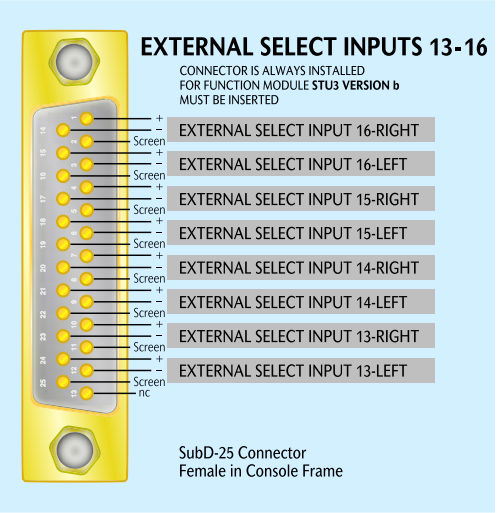
5.3.3.2.5 EXT-SELECT-IN 1-4, 5-8, 9-12, 13-16, 17-20, and 21-24

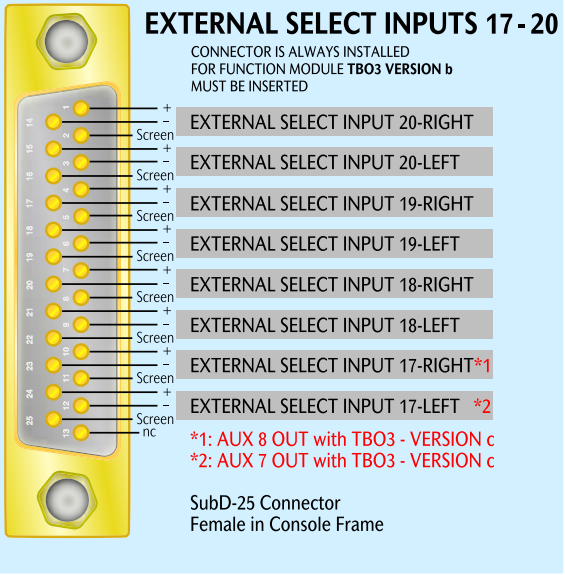
The 24 stereo inputs of the extension source selector of the control room monitor section are available on 6 female 25-Pin D-Sub connectors in groups of 4 stereo sources each. The connectors EXT-SEL 1-4 and EXT-SEL 5-8 access the switch block that is installed in the control room module. EXT-SEL 9-12 and EXT-SEL 13-16 connect the octal switch block of the selector in the playback module BC-STU3b while EXT-SEL 17-20 and EXT-SEL 21-24 are used for the switch block in the talkback module BC-TBO3b. It is self evidend that these additional octal blocks are only available if the modules are installed. All connections are balanced. The entire select system is passive. The switches have a break before make delay. All switches are implemented

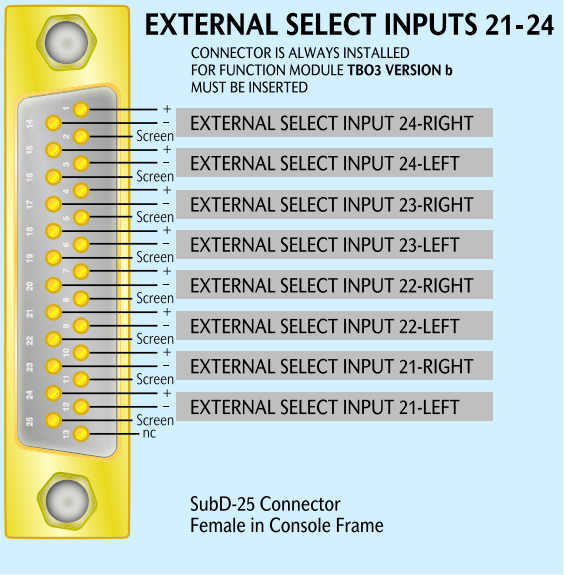












with electrical, mutual locking to avoid that several outputs can be connected inadvertently.

The outputs of the switch blocks 2 and 3 in the playback and the talkback module are separately available on the XLR connectors SEL2 and SEL 3 , left and right.

The default wiring of these switch blocks connect the outputs of the block 9 to 16 with the SEL2 input and the outputs of the block 17 to 24 with the SEL3 input on the master wiring pcb in the console frame.

5.3.3.2.6 TB-AUDIO-I/O

This connector combines all inputs and outputs of the talkback, listen and oscillator section of the console. See the pinning diagram for details.

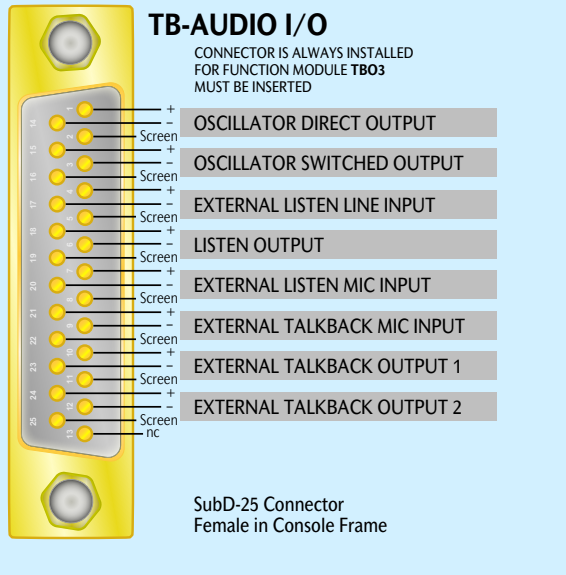
The ‚Oscillator Direct Output' is in parallel to the XLR connector ‚OSC-OUT'. An additional output, ‚OSC SWITCHED OUTPUT' is only active when the OSC to Group output is enabled.

The TALKBACK EXTENSION input can be used to couple the internal talkback microphone with an external talkback mic or use the external mic alternatively. It is also possible to link the console's talkback system to an external talkback system, since this input is implemented as a balanced zero-ohm input. With an external microphone, 2 470 ohms resistors should be used. If line level sources are connected to the input, 2 100k resistors should be used per input. Of course, it is possible to change these values to increase or decrease the overall gain.

The Talkback Extension input has its own rotary level control and can be enabled by a local switch or a remote control input. See the ‚Talkback Control Connector' for details.

There are 2 external inputs for the extension of the LISTEN system that handles incoming talkback signals. The EXTERNAL LISTEN MIC INPUT is identical to the external talkback input and uses the same zero ohm technique. See the description above for details. The input EXTERNAL LISTEN LINE INPUT is a standard electronically balanced, high level input. This input can be used in steady mode or the integrated gate function can be used to activate the input. The function is active when the DETECT switch on the faceplate of the BC-TBO3 module is pressed.

With this function, an input signal above threshold releases the listen signal than can feed the PFL system, the mini speakers, the control room headphone and/or the external listen output.

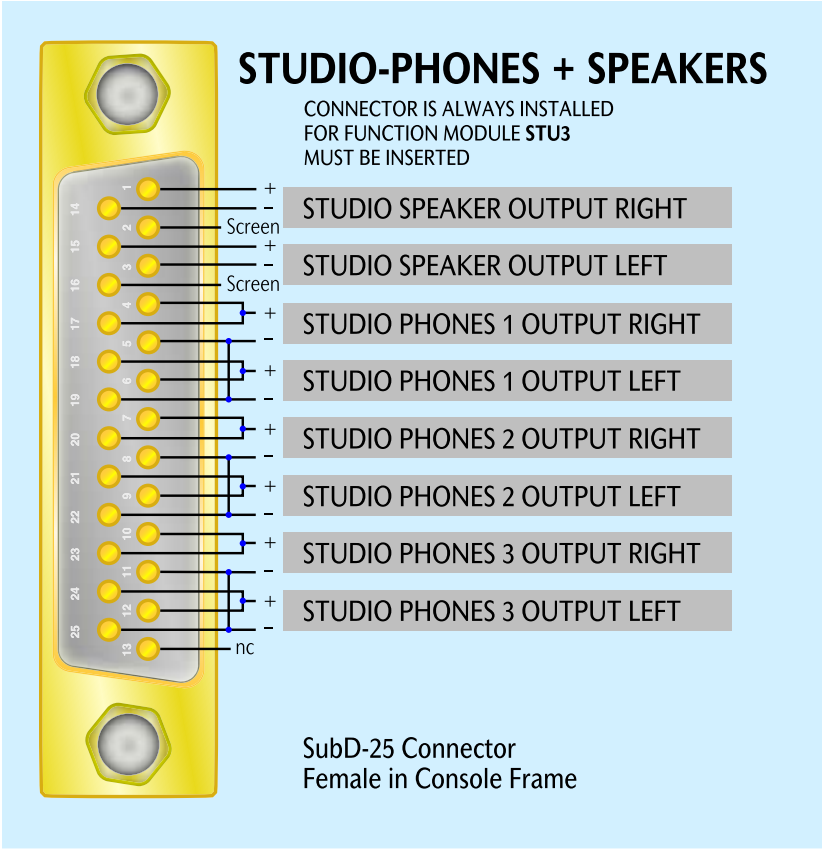


The LISTEN OUTPUT is electronically balanced. It can be used to drive external speakers.

The two outputs, EXTERNAL TALKBACK OUTPUT 1 and EXTERNAL TALKBACK OUTPUT 2 are electronically balanced, line level outputs. They are activated by the corresponding talkback switches in the BC-TBO4 module. It is possible that one of these lines is used internally for talkback to the program master bus. This option can be installed on customers request. Please check, if such an option was ordered before you use these outputs.

5.3.3.2.7 STU-SPK/STU-HEADPHONES

This connector combines the 3 playback headphone outputs and the studio speakers outputs of the playback module BC-STU4b. While the studio speakers outputs are standard, electronically balanced, line level outputs, the headphone outputs are unbalanced to drive headphones directly. Each output can drive approx. 3 headphones in parallel. Please, make sure that headphone that are attached to the same driver have the same impedance. Otherwise, different volume differences are possible. Please note the special pinning of these headphone outputs.



5.3.3.3 25-Pin D-Sub Control Connectors

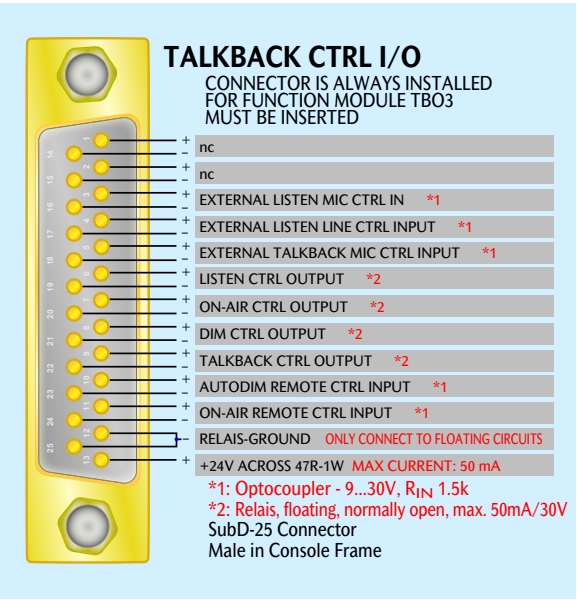
There are two, male 25-pin D-Sub connectors for talkback, listen and on-air control connections. The secon connector holds floating connection to 4 ‚User' switches that can be used for special application by the customer.

5.3.3.3.1 TB-CTRL-I/O

The connections on this plug are used to remote control the console's logic functions and external equipment. All control inputs and outputs are floating. All outputs are relay contacts, all inputs are opto couplers that can be used with a voltage between approx. 9 V and 30 V. The input resistance is 1,5 k Ohm. If 5 volt control in necessary, an internal resistor per input can be changed which shifts the control voltage range down to 3 volts. The output relays can handle currents up to 50 mA and voltages of 30 V. Please, use only ‚clean' DC voltages, no AC voltages and **BY NO MEANS MAINS VOLTAGE OF 115V OR 230V.**

EXTERNAL LISTEN CTRL INPUT
Remotes controls the external listen line input that can also be controlled by the level detector circuit,

EXTERNAL LISTEN MIC CTRL INPUT
Remote control of the zero ohms external listen input.



EXTERNAL TALKBACK MIC CTRL INPUT
This input remote controls the zero ohm input for external talkback sources.

AUTODIM REMOTE CTRL INPUT
This input makes it possible to activate the Autodim Bus by an exernal voltage. The Autodim bus can be accessed by the control room speakers and the studio speakers.

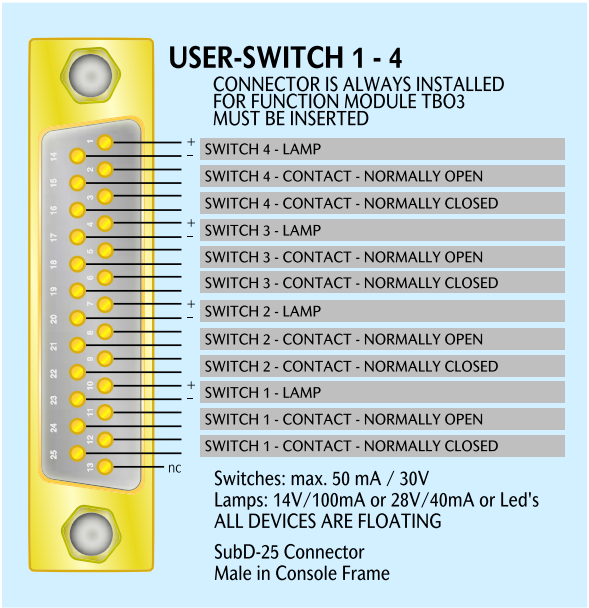
ON-AIR REMOTE CTRL INPUT
This input sets the console in ON-AIR mode when active. Actually it drives the ON-AIR Bus 1 / Mic; however the configuration of this input takes place on the BC-TBO3 module‘s pcb.

The LISTEN-CTRL-OUTPUT is active, when the listen-system of the console is active.

The DIM-CTRL-OUTPUT is active, when the AutoDim function of the console is activated.

The ON-AIR-CTRL-OUTPUT is active when the console is in On-Air mode.

The TALKBACK-CTRL-OUTUT is active, when at least one of the talkback buttons is pressed. It is possible to isolate particular TB switches from this function.



Please consder, that almost all inputs and outputs on this connector can be used differently on customers demand. Please check your order information if there are any changes that concerns these functions. We will inform you in a special bulletin about any custom configuration and changes in the functions of a particular signal. The default connections and functions are depending on jumper settings on the BC-TBO3 pcb below the talkback switches. Please refer to the pcb drawing in the technical reference manual for details.

5.3.3.3.2 USER-SWITCH 1-4

4 switches are installed in the BC-TBO3 talkback modules that can be used for customers remote controls or other local functions. With the standrad configuration, 2 of the switches are non-locking versions while the other two are locking versions. This assignment can be changed by special order. The entire connector is fully floating. Each contact and the lamp can be accessed. Each switch has ‚NO‘, normally open, and an ‚NC‘ normally closed contact. The ‚Lamp‘ is a multi-LED that operates with 2V or 24V DC. The color and the engraved lettering of the caps and the color of the LED‘s can be fixed with order. The contacts can handle voltages of 30 V and DC currents of 50 mA.

Only “clean” direct voltages may be used. If there are AC voltages or ‚dirty‘ DC connected, interferences in

the audio system are possible.

Special configuration of the ON-AIR system or other control sections ot the console may use these switches for internal functions. Please check your order if something like this is installed with your console, before using these switches. Many console use the lamps to display the state of the different On-Air control busses and the switches to activate the particular on-air bus manually.

Only “clean” direct voltages may be used. If there are switched alternating voltages or direct voltages with strong humming noises or HF-superimpositions, there can be interferences in the audio system. (See also remote control connections of the input modules – interferences).

6. Installation of the console

This chapter is only of importance if the unit is not delivered and installed by adt-audio or one of its representatives. In this case, the console system is delivered by a forwarding agency. You will one or more wooden boxes that contain the console, the floor stand, the power supply units, and the accessories. To keep the total weight of the main box as low as possible, the main box contains only the main frame of the console, everything else is usually packed in additional boxes. Since the total weight of the console frame box is considerable, it might be a problem to unload the main case. As soon as we have shipped the console system, we will inform you about the details of shipment. Please get in touch with the local office of the forwarding agency to clear up all details about the unloading of the boxes. The total weight of the entire system depends on the size of the frame and on the versions of modules. In any case, the total weight of a BC3 broadcast console system with 24 channels will be above 100 kg/220 lbs, while a 48 channel stand-alone console is in the range of 300 kg/660 lbs. Two persons can easily handle the power supply, accessories and other boxes.

6.1 Unpacking and set-up

Make sure that you have the following tools at hand:

A set of screwdrivers for Philips head screws, torx head screws and metric Allen keys 1.5 to 4 mm
A set of metric spanners, from 10 to 19 mm

Please unpack all the other boxes before unpacking the main box. If your console has a floor stand, you will need the floor stand to assemble the frame. In addition, a cardboard box with screws and other small parts that are necessary for the assembly of the frame are either packed in the main box or the floor stand box. Open the main box with the console and remove the lid and all end walls. The console frame is usually bolted to the base plate of the box with 4 screws. You can reach these screws from the bottom of the box. Remove the screws to free the main frame.

Check carefully to verify that the console was not damaged during transit. If there is damage, inform the forwarder before you continue. Do not alter anything and make sure to take some pictures of the damage. In most cases, transport insurance will cover any damage; this however, depends on the details of the purchase. In any case, you are supposed to inform the forwarding agency and us immediately.

Depending on the size and the weight of the frame you might need up to 6 persons for the next step, the installation of the floor stand. There are two separate floor stands, one for each side of the frame. They are fixed with 2 screws thru the upper tube of each stand to the flange plate on the left and right bottom of the main frame. It is the same point that was used to fix the main frame into the transport box.

Do not use the meter bridge as a handle or lifting point when lifting and/or moving the console.

Use the flange plates and the side panels.

The easiest way to install the floor stand is to place the console frame on its connector panel with the fader bank up (in the air). Depending on the weight of the frame, 4 or 6 persons will be required to lift the frame. For safety, two persons, (one on either end of the console) should securely hold the console in place at all times when it is in this position. The bottom of the frame can now be accessed easily. Attach the two floor stands to the flange plates and fix them in place with the special screws that are located in the small cardboard box. After this part is accomplished, you can carefully tilt the entire frame up into the normal operating position. Make sure that there are enough persons to safely handle the weight of the console.

To avoid damage, the wooden side panels are packed separately. After the installation of the floor stand, place the console into the final position and unpack the side panels. The panels contain threaded inserts. They are fixed to the side panels by a couple of screws. You can easily locate the position of the screws by placing the wood to the side panels. The screw heads in the side panles fit into holes in the boards and leave some clearance for the fixing screws. To fix the wood, two modules all to the left and all to the right must be removed. Use the screws in the cardboard and

fix the wooden panels.

In most cases, the small wooden panels for the meter bridge are already mounted. If this is not the case with your console, remove the rear cover sheets on both sides of the meter bridge and fix the wooden panels.

Remove the protective foil covering the armrest.

You are now ready to install the power supply. Read the first chapter of the manual that contains important information on the installation of the power supply. Mount the power supply, make sure that it is switched off, and connect the power cord to the mains wall outlet. If you have a failsafe power supply, you can use one of the two power supply units for a first check. Of course, you can also install the complete power supply system right away. Mount both power supply units and the crossover unit into a rack or put it into its permanent location. Make sure that everything is switched off and connect all units to the mains supply.

Important note:
Make sure that you install the two power supply units to two different fuses. If you do not do so, a problem in any device that is supplied from this fuse might disable the failsafe system. The best way is to use two different circuits with separate fuses for each power supply unit. The crossover unit itself is passive and will work even if it is not powered. However, the alert system requires power. If want to keep the alert system operational in any case, it is best to use a third electrical circuit for the crossover unit.

Switch all units on and check if all control LED's come on. Switch everything off again and install the included cables. With a normal cable, you will have only one cable to connect the power supply and the console. With a failsafe unit, there are 2 additional cables to connect the two power supply units to the crossover device. The console must be connected to the crossover device.

After you have installed all connections, double check for any transport damage. Make sure that all modules are properly installed in the frame. If you are sure that everything is okay, switch the system on and check if all control LED's of the power supply are on. It is a good idea to install the speaker system in the next step and make a quick test if all channels work.

It is a good practice to repeat the final complete test we are making at the factory before the console is packed right after the installation, just to make sure that nothing has been damaged and the console is fully operational.

7. Operating conditions

7.1 Environments

The environmental conditions have great influence on the long-term stability and reliability of the entire console.

7.2 Temperature

The recommended operating temperature range is from 10 °C to 45 °C. The console will also operate at temperatures above and below this limit of course. However, operating at temperatures outside this range for long periods will reduce the lifespan of the console.

Under normal conditions, we recommend that you power down the console if it is not in use. The console is ready for use within a minute. It will reach a steady operating temperature within the first hour of operation. There is no reason to leave the system switched on constantly.

For some reasons it can be of advantage as far as the lifespan of the console is concerned to leave the system powered on if, for example, the temperature is not stable, and drops down far below 10 degrees at night. In this case, it will take a longer period to reach its steady operating state.

Within the first weeks of operation, the console should NOT run in continuous operation. If there is any early failure of an IC, an electrolytic or another component happens, it is most likely that this occurs during the first 4 weeks of operation. To acoid collateral damage from such a failure, the console should not be powered over night, when nobody is there.

7.3 Soiling

The console and all its connectors should be kept as dust and dirt free as possible. If drinks or other liquids are accidentally spilled onto the console, the concerned modules must be immediately removed and a cleaned. We recommend the use of Isopropyl alcohol for cleaning the console. Isopropyl alcohol will not damage the components of the console. The sooner the remains of any spilled liquid is cleaned, is the less risk there is for damage.

8. Maintainance

A BC3 console requires no regular maintenance. Service is only required, if there is a failure that makes repair necessary. 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.

8.1 Console use

All electromechanical components of the console, such as potentiometers, switches, faders, and relays are self-cleaning. However, self-cleaning only occurs when the particular component is in use. 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 work 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 a long period. 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 one time per 6 months to keep the self cleaning process running. If you don’t do so, you will reduce the problem-free lifespan of the console.

8.2 Testing the console

From time to time, (we recommend at least one time per year) all functions of the mixer should be tested. Check every function, all the inputs and outputs and all controls and switches of the entire console. 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 consoles, 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 with the console, it is good idea to make a quick note which includes all the details of the problems 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 mistakes 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 fixed.

8.3 Cleaning

Only non-corrosive cleaners such Isopropyl alcohol or cleaning foam should be used for cleaning the console and its components. Isopropyl alcohol is he 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 were exposed to the thinner.

8.4 Potentiometers and push buttons

Depending on the environmental situation at the location, the grease inside the switches, rotary pots and slider faders begins to harden within a period between approximately 6 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 also has a huge influence on this condition as well.

It is very easy to prevent these effects just by following these simple maintenance steps. We recommend the following to be done after 6 six to 10 years of operation.

8.5 Rotary pots and slider faders
When the grease between bushing and shaft begins to harden, the pot will run tight. Apply a small drop of penetrating oil between the shaft and the bushing and turn the pot 5 to 10 times. Doing this will keep the pots in good shape for many years.

8.6 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 and it depends on the environmental conditions and the frequency of use. The best way to maintain pushbutton switches is the use of a special lubricant, type CRC3-36, brand CRC, Belgium. If you cannot get this oil, you can order it from the factory.

This cleaner contains a non-aggressive, non-permanent solvent that dissolves hardened fat and grease effectively. The second component is a high quality, non-hardening, penetrating oil that protects the cleaned surface for a long time. CRC3-36 comes as aerosols that make it easy to apply the agent.

Using CRC3-36 with pushbutton switches is very easy. Remove a module and put it on a table so that you can see the topside of the switches. Press the knob of the aerosol tin carefully while you put the end of the little tube that comes the tin next to the locker block at the top of the switch. By pressing the knob carefully, you can produce oil foam. Apply approximately 1 cubic cm of this foam to each switch that has to be cleaned. Wait some minutes before you operate each switch 10 to 20 times. With this procedure, you can keep all the switches in a good shape for an almost unlimited period. However, as mentioned before, all electromechanic components will remain in a good shape as long they are in constant use.

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 conventional contact spray to a module, you have to use this repeatedly. There is no way to remove the spray out of switches or faders unless these components are replaced. Some technicians use Vaseline as a protection against corrosion. The biggest problem with Vaseline is that it starts to melt when the temperature is higher than 40 °C. If vaseline is used for the cleaning of switches, you have to deal with the problem that after the temperature exceeds 40 ° C, the entire contact area of the switch will be covered with 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.

8.7 Screws

After a period of about 4 years, the power supply unit should be opened and all screws of the transformer and the prints should be re-tightened. The thermal situation in a power supply makes it likely that screws in terminator blocks will loose their contact pressure for the high temperature difference between the on and off state.