



~~wijziging op blz 3-3~~

2x par. 4-11!

verwijzing op blz 4-2

hxwd → blz 10-1

wijzigingen op blz 6-1/2

pag. 1-2, 5-2

XLR-connect. plaatjes.

verbeterd  
per 28-9-'89

# Stage Accompany

## BLUE BOX

Computer Controlled  
Integrated Sound System

User Manual  
Software Version 4.8

BLUE BOX User Manual



Published by:

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Training & Documentation

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*Version*

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**Quick introduction**

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## 1 Quick Introduction to the Blue Box

If you have to get to work with the Blue Box straight away and do not have time to read the complete manual, make sure that you at least read the following:

- Ensure that you have a reliable power source. The required current for the Blue Box can be found in the table on page 3-2.
- Connect the Blue Box to your signal source via the <AUDIO IN> input. Connect this Blue Box to other units via the <AUDIO OUT> output using short signal leads.
- If desired, connect all Blue Boxes with each other via <SAnet-IN> and <SAnet-OUT>.
- Switch the Blue Box on using the <POWER ON/OFF> switch.
- Depending on the input signal, switch the Blue Box to either <BALANCED> or <UNBALANCED> using the <INPUT MODE>.
- Switch the phase with the <POLARITY> key to either <NORMAL> or <INVERTED> according to your wishes.
- Switch the Blue Box from "Standby" (green LED lit) to "Power amp on" (red LED lit) using the <SYSTEM MODE> key.
- Choose for the "Level" to be displayed using the <DISPLAY SELECT> key. The LED next to the word "Level" will light up; the display registers "OFF" (n.b. this is only true the first time the Blue Box is switched on or after a "reset": normally the last set value will be read from the memory).
- Press the <UP> key in and keep it depressed. The value in the display increases from OFF (-60 dB) to 0 dB (completely open). The level adjustment for the high and low amplifier of the Blue Box occurs independently.



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- With the <READOUT SELECT> key you can choose which amplifier you are operating. If you have just set the level of the "LOW" amplifier to 0 dB, select "HIGH" (the high amplifier) with the <READOUT SELECT> key. Now, with the aid of the <UP> key you can set the display to 0 again.
- Any earth rumble that may be present can be cured with the <SYSTEM GROUND> key, or (if connected) the <SA-NET GROUND> key.

The Blue Box is now ready for use.



## Introduction

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## 2 Introduction

The Stage Accompany Blue Box is a two-way, active loudspeaker system that comprises the following components:

- Cabinet
- Programmable monitor system PMS 5000
- Low frequency driver SA 1503
- High frequency driver SA 8525 JN
- Horn SA 2527
- Optional flight case (order no. 0220.4425SB)
- Optional flyer system (order no. 0310.4425)
- Optional personal computer control system (order no. 0810.3202)

The Programmable Monitor System (PMS 5000) comprises the following components:

- Balanced input stage
- Two-way 24 dB/octave Bessel crossover, takeover point 1 kHz
- Low frequency amplifier with digital volume control, 380 watts peak
- High frequency amplifier with digital volume control, 590 watts peak
- Microcomputer for control and protection of the system
- High speed interface (SAnet) for control via an IBM® (compatible) Personal Computer.

The functioning of the Blue Box is controlled and monitored by the built-in microcomputer. Via the SAnet interface, the system can be controlled remotely by an IBM (compatible) PC, or by a Blue Box that has been designated as the "Master" Blue Box (see paragraph 4.15). A maximum of 250 Blue Boxes can be controlled at distances of up to 500 meters.

Note: The Blue Box performs excellently without a PC and/or interconnection via SAnet. The SAnet interface is a standard provision that enables groupwise operation, but does not need to be used.



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The audio input and output are connected internally without electronics. This is done to prevent any loss of quality. With an input impedance of 22 kohms, it is possible to connect a maximum of 30 Blue Boxes with each other. If more than 30 systems need to be connected to each other, an (optional) signal driver must be used.

The Blue Box has a number of unique features, including:

AEC, Auto Energy Control

DDC, Dynamic Damping Control

SAnet interface.

### AEC

Auto Energy Control is a three-fold protection against clipping and overload at average power and at peak power, which maintains the complete dynamic range of the signal. The microprocessor continuously measures the output power of the amplifier and monitors both the average power and peak power. All levels are compared with the pre-programmed values of the AEC. As soon as an overload is detected, the volume is reduced in proportion to the amount of overloading.

As soon as the cause of the overload has disappeared, the volume is gradually returned to its original value. Attack and release times are independent of the type of overload and have been chosen in such a way that a virtually inaudible operation is guaranteed.

### DDC

Dynamic Damping Control is a special way of measuring the cone movement of a loudspeaker. The voltage induced in the voicecoil is sensed and fed back to the amplifier's feedback circuit. Hence, a virtually infinite damping is achieved, which results in an exceptionally tight sound reproduction.

### SAnet Interface

The SAnet Interface is a computer interface developed by Stage Accompany that can be used for monitoring and control of automated sound systems. Apparatus equipped with an SAnet Interface (such as the Blue Box, PPA 1200 Programmable Amplifier and PPE 2410 Programmable Parametric Equalizer) can be connected to a Personal Computer, allowing remote monitoring and control. All parameters of the individual units can be



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programmed and monitored from the PC. Furthermore, the apparatus (such as Blue Boxes) can be grouped as desired and then controlled groupwise. The maximum communication distance, using the correct cabling, is 500 meters.

SAnet is a genuine communication system: data transfer occurs bi-directionally along the same line. This is in contrast to (for example) MIDI. MIDI has separate in, out and thru provisions and cabling, restricting communication to only one direction. The transmission speed of MIDI is approximately 32 kB/s, that of SAnet is 375 kB/s, more than 10 times as fast!

SAnet and MIDI are not compatible!

For the application of SAnet, see paragraph 3.3 of this manual.



### 3 Connection of the Blue Box(es)

Because all the components of a Blue Box are contained in a single cabinet, connection is extremely simple. Only two connections need to be made; mains power and audio signal. An SAnet connection is not necessary for the functioning of the Blue Box.

#### 3.1 Mains Power

On page 3-2 and 3-3 of this manual, the current consumption of the Blue Box is tabulated. Always ensure that you use a good, well earthed power supply. If more than one Blue Box is to be used, it is advisable to connect each separately to the nearest mains supply instead of connecting several Blue Boxes using an adaptor block (see diagram). This prevents unnecessary power loss in the cabling. If circumstances do not allow this, it is advisable to connect the adaptor block directly to the power supply using a short cable and then connect the individual Blue Boxes to it using longer leads. Although this method is not ideal, it does limit power loss as much as possible.

Ultimately, it is possible to place the adaptor block near a Blue Box, but if a great deal of power is required from the system, the final current provided is far from optimum: loss of current leads to unrecoverable loss of sound pressure.

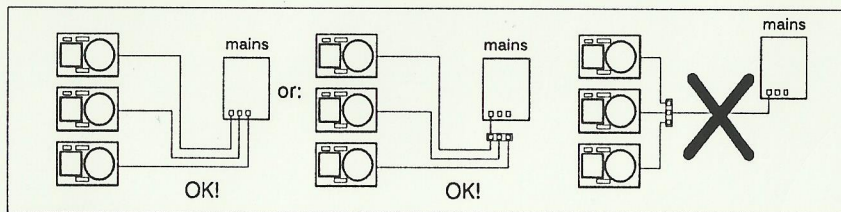


Figure 3-1. Connection to the mains supply.



#### Current Table (mains voltage: 220V)

No. boxes	Power Required (VA)	current drawn (A)	No. boxes	Power Required (VA)	current drawn (A)
1	660	3	34	22440	102
2	1320	6	35	23100	105
3	1980	9	36	23760	108
4	2640	12	37	24420	111
5	3300	15	38	25080	114
6	3960	18	39	25740	117
7	4620	21	40	26400	120
8	5280	24	41	27060	123
9	5940	27	42	27720	126
10	6600	30	43	28380	129
11	7260	33	44	29040	132
12	7920	36	45	29700	135
13	8580	39	46	30360	138
14	9240	42	47	31020	141
15	9900	45	48	31680	144
16	10560	48	49	32340	147
17	11220	51	50	33000	150
18	11880	54	51	33660	153
19	12540	57	52	34320	156
20	13200	60	53	34980	159
21	13860	63	54	35640	162
22	14520	66	55	36300	165
23	15180	69	56	36960	168
24	15840	72	57	37620	171
25	16500	75	58	38280	174
26	17160	78	59	38940	177
27	17820	81	60	39600	180
28	18480	84	61	40260	183
29	19140	87	62	40920	186
30	19800	90	63	41580	189
31	20460	93	64	42240	192
32	21120	96	65	42900	195
33	21780	99	66	43560	198



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## Current Table (Continued, mains voltage: 220V)

No. boxes	Power Required (VA)	current drawn (A)	No. boxes	Power Required (VA)	current drawn (A)
67	44220	201	84	55440	252
68	44880	204	85	56100	255
69	45540	207	86	56760	258
70	46200	210	87	57420	261
71	46860	213	88	58080	264
72	47520	216	89	58740	267
73	48180	219	90	59400	270
74	48840	222	91	60060	273
75	49500	225	92	60720	276
76	50160	228	93	61380	279
77	50820	231	94	62040	282
78	51480	234	95	62700	285
79	52140	237	96	63360	288
80	52800	240	97	64020	291
81	53460	243	98	64680	294
82	54120	246	99	65340	297
83	54780	249	100	66000	300

## Warning

The peak at power-up can be up to four times the magnitude of the nominal required current! Therefore, never switch on multiple Blue Boxes simultaneously. Use the <POWER ON DELAY> feature (see paragraph 4.12 of this manual).

*4.12*  
*look ahead*  
*4.11*



## Connections

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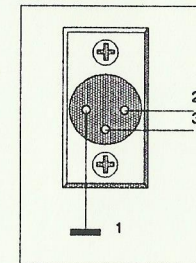
## 3.2 Audio Connections

The XLR connectors (audio in and audio out) of the Blue Box are wired as follows:

Pin 1 = ground

Pin 2 = in phase (+ or "hot")

Pin 3 = out phase (- or "cold")



Always use high quality XLR connectors and screened signal cables.

The audio connections should be made as shown in the diagram below. Up to 30 Blue Boxes can be interconnected without problem. If more than 30 need to be interconnected, an (optional) signal driver should be used.

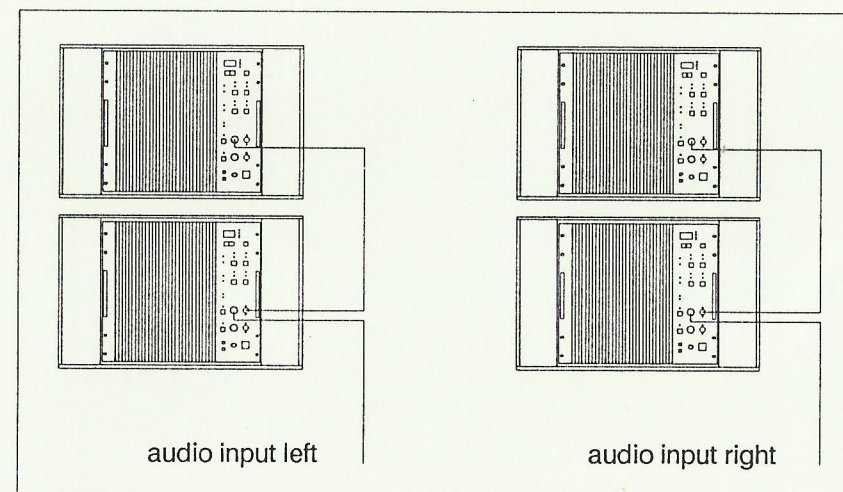


Figure 3-2. How to interconnect several Blue Boxes.



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### 3.3 SAnet Connections

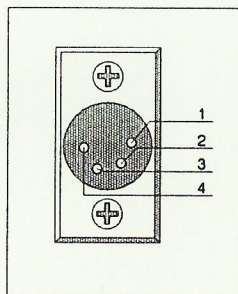
SAnet uses a symmetrical, two-wire connection. The advantage of a symmetrical connection is that "common mode" interference (= external interference such as power-up peaks from other equipment, radio interference and interference from light dimmers) has less influence on the signal.

You are advised to use two-wire coaxial cable (known as "twinax") as the connecting cable. If the system is not going to be used under extreme circumstances, well screened microphone cable may suffice. The maximum cable length is approximately 500 m when using twinax and 250 m when using screened microphone cable.

The required connector is of the 4-pole XLR type, such as the Neutrik NC-4-FC (female) or NC-4-FRC (female / angled) and the NC-4-MC (male) or NC-4-MRC (male / angled). These connectors are mechanically very robust, currently popular and readily available at your local suppliers.

The XLR connectors (SAnet in and SAnet out) of the Blue Box are wired as follows:

- Pin 1 = ground (screening)
- Pin 2 = +5 V for future use of remote control
- Pin 3 = SAnet in phase (+ or "hot")
- Pin 4 = SAnet out phase (- or "cold")



A maximum of 250 units (Blue Boxes and/or other equipment with an SAnet interface) can be connected simultaneously to SAnet.

SAnet and other communication systems such as MIDI are NOT compatible. Therefore, never make a connection between SAnet and MIDI equipment. If you do, it can result in damage to your equipment.



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For the sake of clarity: ALL Blue Boxes that are part of a sound system can be connected with each other via SAnet, without differentiation between "left" and "right" in a stereo set-up. SAnet is a communication network that is separate from the audio signal route and therefore has no influence on the sound and/or stereo image.

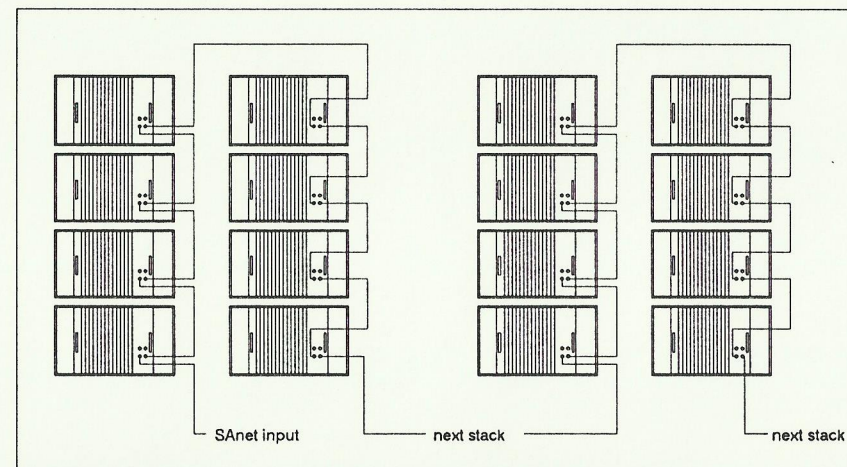


Figure 3-3 How to interconnect several Blue Boxes with SAnet.





## 4 Operation

After connection to the correct mains voltage, the Blue Box is switched on using the <POWER> switch. The first time, or after for example the software has been updated, the system will start up in <STAND BY> mode.

The various functions of the system will now be described one after one. It is advisable to practise the various functions and operations described in this manual with one or two Blue Boxes.

### 4.1 Display Select

This key is used to make a choice from four different readouts:

- Input sensitivity of the system amplifiers in dB <LEVEL>
- Temperature of the power amplifiers in °C <TEMPERATURE>
- Average power delivered in watts <AVERAGE POWER>
- Peak power delivered in watts <PEAK POWER>

### 4.2 Readout Select

This key allows the common display to be switched as desired to read the "low" or "high" region of the system.

### 4.3 Up/Down

The <UP/DOWN> keys can be used to adjust the input sensitivities of both amplifiers independently. The range is from OFF (-60 dB) to 0 dBm, in increments of 1 dB. If you keep an <UP> or <DOWN> key depressed, the value increases or decreases respectively with increasing speed.

With the <READOUT SELECT> key, you select whether the "low" or "high" amplifier is adjusted. When you touch an <UP/DOWN> key, the display automatically jumps to <LEVEL>. If you depress both <UP/DOWN> keys simultaneously, the level of both amplifiers is set to <OFF>. This works as an "emergency stop".

For optimum functioning of the system, both the high and low amplifier should be adjusted to the same level, although you can deviate from this if desired.



The <UP/DOWN> keys are also used with other functions: further details are provided later.

### 4.4 System Mode

The Blue Box starts up in <STAND BY> mode the first time it is used, with the green LED on. Using the <SYSTEM MODE> key, both amplifiers are switched on simultaneously, whereby the red LED for <POWER AMP ON> comes on.

After switching the system on, it waits five seconds before connecting loudspeakers to the amplifiers. Both amplifiers require this period to stabilize. Subsequently, the signal is gradually fed to the amplifiers using an automatic "fade in".

The Blue Box starts up automatically in the <POWER AMP ON> mode if it was switched off the previous time while in the <POWER AMP ON> mode: The system "remembers" the last mode. After switching the system on, an adjustable delay (variable from 2 to 100 seconds) is counted down. Subsequently, it automatically switches to <POWER AMP ON> mode. The signal is fed to the amplifiers five seconds after switching to the <POWER AMP ON> mode.

Even after a power failure, the Blue Box starts up in the way described above.

The Blue Box is protected against power failures and fast switching on and off: It is not necessary to set the level of the amplifiers to "OFF" before switching the system off, as the system is protected against signal spikes.

The adjustment of the power on delay is described in paragraph 4.10 of this manual.

### 4.5 Input Mode

The <INPUT MODE> key can be used to set the input stage to balanced or unbalanced (see <POLARITY> below).

### 4.6 Polarity

The XLR connectors (audio in and audio out) of the Blue Box are wired as follows:

Pin 1 = ground

Pin 2 = in phase (+ or "hot")

Pin 3 = out phase (- or "cold")



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**Balanced:**

If a balanced (symmetrical) audio signal is presented, you should set the <INPUT MODE> to <BALANCED> and the <POLARITY> to <NORMAL>.

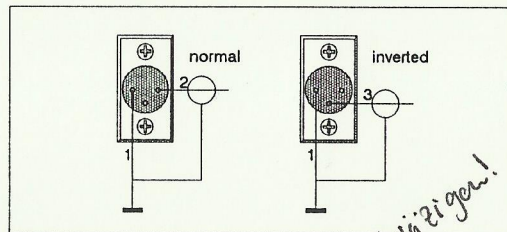
In addition, you can use the <POLARITY> key to inverse the phase ("invert"), in which case pin 3 becomes in phase ("hot") and pin 2 becomes out of phase ("cold"). This is effected by switching <PHASE> from <NORMAL> to <INVERTED>.

Beware: You switch the Blue Box(es) concerned out of phase. Unless you want to achieve special effects (such as the Bessel effect: see Chapter 8), you should ensure that ALL Blue Boxes in the system have either normal polarity or inverted polarity. If not, there will be a considerable loss of sound pressure.

Note: Consult the documentation of any other equipment you use to check which connections other manufacturers use. The connection of pin 2 or pin 3 "in phase" is not standardized. As a result, you run the risk that the phase can be inverted more than once within your sound system. If required, adjust the wiring in your system.

**Unbalanced:**

If an unbalanced signal is presented, you should ALWAYS set the <INPUT MODE> to <UNBALANCED>. In this case, you can use the <PHASE> key to choose which pin is "hot". In the <NORMAL> position, this is pin 2, in the <INVERTED> position, it is pin 3.



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**4.7 System Ground Lift**

If a rumble or other strange sound is audible after switching on a Blue Box, the cause may be incorrect earthing of your sound system.

The <SYSTEM GROUND> key can be used to "lift" the connection between the signal/system earth and the mains earth. (The incoming signal earth is, however, ALWAYS connected to the system earth). This action alone is often sufficient to eliminate the undesired noise caused by a "dirty supply". If you activate the <SYSTEM GROUND>, the yellow LED by <LIFTED> will light.

If the rumble does not disappear after lifting, you should search for the cause elsewhere in the sound system. In this case, systematically check all other components being used, such as effect racks, mixing panel, etc. Moreover, to aid in preventing such interference it is advisable to keep signal cables well away from power cables and cables from, for example, lighting installations.

**4.8 SAnet Ground Lift**

The connection between the incoming SAnet earth and the system earth can also be lifted using the <SA-NET GROUND> key. In this case, the yellow LED by <LIFTED> will light.

**4.9 Lock/Unlock**

To prevent unauthorized or undesired changes to system settings, the Blue Box is provided with a <LOCK> facility in the form of a "lock code" comprising 1 to 3 numbers.

**Lock**

To "lock" the system, do as follows:

Depress the <DISPLAY SELECT/"LOCK"> key during one second, until a dot appears in the display furthest right. This will also display an initiated lock code with a value of "1".

The desired numeric code can now be programmed using the <UP/DOWN> keys. Any value between "1" and "999" can be selected. From "1" you can jump directly to "999" and lower numbers using the <DOWN> key.



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Now, press the <DISPLAY SELECT/"LOCK"> key again: the Blue Box is now locked. No parameters can be changed. It is, however, possible to call up various readings in the display using the <DISPLAY SELECT> and the <READOUT SELECT> key.

### Unlock

To "unlock" the Blue Box, proceed as follows:

Depress the <DISPLAY SELECT/"LOCK"> key for one second, till a point appears in the display furthest right. This will also display the initiated lock code with a value of "1".

Now, use the <UP/DOWN> keys to set the correct lock code (i.e. the value entered previously in the "locking" procedure). From "1" you can jump directly to "999" and lower numbers using the <DOWN> key.

After setting the correct value, press the <DISPLAY SELECT/"LOCK"> key again: the Blue Box is now unlocked.

If an incorrect lock code is entered, the Blue Box remains locked and the figure "1" will appear in the display again, indicating that your entry was incorrect. The unlocking procedure can then be repeated.

### 4.10 Resetting the <LOCK> and <LOCK CODE>

This confidential information is printed in chapter 11.1. Chapter 11 may be omitted in this manual for safety reasons.

Beware: The lock function is a protection against unauthorized use and is consequently a very effective deterrent against theft. If the lock code is not known or has been forgotten, the system can only be unlocked by Stage Accompany or one of the Stage Accompany dealers. Therefore, always remember your lock code: it will save you the visit of a service engineer.

### 4.11 Power On Delay

The automatic switching to <POWER AMP ON> described earlier occurs after a programmable time delay. The aim of this function is to allow a number of Blue Boxes to automatically switch to <POWER AMP ON> mode one after another with a time interval so that the power supply is not overburdened.



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If a number of Blue Boxes are switched on simultaneously without using the mains power switch (for example placing the plug in the socket or when power returns after a power failure) this feature prevents melting of the fuses, which would otherwise occur because of the high peak burden.

The switch-on current of the high power supply of the Blue Box can be more than 10 amps. It is easy to imagine what will happen if, for example, four Blue Boxes are switched on simultaneously. The <POWER ON DELAY> removes the need, after for example a power failure, of switching (switching off and then again on) all the mains switches of the Blue Boxes.

The <POWER ON DELAY> is set as follows:

Depress the <READOUT SELECT/"POWER ON DELAY"> key for one second, until the delay, displayed in seconds, appears in the display. The default value for the delay is two seconds.

Using the <UP/DOWN> keys, the value can be set between 2 and 99.9 seconds, in increments of 0.1 second. From "2" you can jump directly to "99.9" and lower values using the <DOWN> key.

Pressing the <READOUT SELECT/"POWER ON DELAY"> again returns the display to its readout function.

In a permanent installation, such as in a discotheque, etc., this feature makes it possible to centralize the power supply of the Blue Boxes so that it is not required to switch each unit on and off individually.

### 4.1<sup>12</sup> Software Version

As a result of Stage Accompany's policy of continuous development and improvement, the software of the Blue Box is regularly updated. To check which software version your Blue Box is provided with, act as follows:

Switch off the power using the <POWER ON/OFF> switch. Press the <DOWN> key while you turn the power on again with the <POWER ON/OFF> switch. The software version installed in your Blue Box appears in the display, for example 4.8.



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After switching the Blue Box off and on again using the <POWER ON/OFF> switch, the system is ready for use. It is preferable not to perform this act on a Blue Box that is in use since the system does not function while displaying the software version.

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## X 4.12 ID Code

Each Blue Box has its own, unique identity code. This code is important when using a Blue Box in combination with a Personal Computer, because the computer "recognizes" the Blue Box by its ID code. However, the ID code is also very important for you. After hiring out or lending a Blue Box, you can check whether the Blue Box returned is the correct one. Furthermore, the unique ID code, in addition to the "lock" function, provides extra protection against theft.

If you note the ID codes of your Blue Boxes and report them to Stage Accompany in the event of theft, the ID codes concerned will be circulated worldwide throughout the Stage Accompany dealer network. This prevents trading of stolen Blue Boxes since the ID code cannot be changed.

## Reading the ID Code

Switch off the power supply using the <POWER ON/OFF> switch. Depress the <UP> key while you switch the power on again with the <POWER ON/OFF> switch. Assume the ID code of the Blue Box concerned is: 01677593. Because the complete code comprises eight figures, it is impossible to display it all at once. The display will show the first figure of the unique code, reading:

1 - 0.

This indicates that the first figure is "0". Using the <UP> key, you can display each figure successively: the first figure in the display indicates which figure of the ID code is being displayed. In this example you would see in turn:

1 - 0  
2 - 1  
3 - 6  
4 - 7  
5 - 7  
6 - 5  
7 - 9  
8 - 3.



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You can use the <DOWN> key to step backwards through the series to the first figure to check the number you have noted. The ID code can be neither changed nor erased.

While reading the ID code, the Blue Box does not function. After checking the code, the Blue Box is ready for use again after switching it off and on using the <POWER ON/OFF> switch.

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## X 4.13 Master Function

From software version 4.7 and upwards, the Blue Box can be connected to SAnet. Systems of up to 250 Blue Boxes can be controlled and monitored simultaneously using a Personal Computer. In this case the PC functions as the so-called "Master": the connected Blue Boxes (or other equipment connected via SAnet) function as "slaves".

Instead of a PC, any of the Blue Boxes can be used as the 'Master'. The settings for this Master Blue Box will then be transmitted to all the other Blue Boxes via SAnet, allowing parallel operation or multi-tracking. If use is made of this multi-tracking function, the Blue Boxes do not need to be programmed individually, which saves a great deal of time. Multi-tracking allows the Blue Boxes to take only the same settings as the Master Blue Box. Individual setting, which is possible using a PC, is not possible.

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## X 4.14 Activating the Master Function

Switch off the Blue Box designated as the Master using the <POWER ON/OFF> switch. Then depress the <SYSTEM GROUND/"MASTER"> key while you switch the power back on. The <DISPLAY SELECT> level LED will now flash, indicating that the Blue Box concerned is in Master mode.

All other Blue Boxes connected via the SAnet will now function as slaves. If desired, more than one Blue Box can be designated as Master within the same sound system, offering operation of the complete sound system from various positions. Every Blue Box will react to the commands from any of the Masters.

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## X 4.15 Deactivating the Master Function

Turn the Master Blue Box off using the <POWER ON/OFF> switch. Press the <SYSTEM GROUND/"MASTER"> key and hold it in while you turn the power back on. Now, the Blue Box is no longer in Master mode.

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**WARNING**

Before you switch the <SYSTEM MODE> of a Master Blue Box from <STAND BY> to <POWER AMP ON>, check that all other Blue Boxes connected have a different <POWER AMP ON DELAY> set.

If not, set different delay times for each Blue Box before switching to <POWER AMP ON>. This prevents melting the fuses. The <POWER AMP ON DELAY> function cannot be adjusted for the individual Blue Boxes from the Master.

The <LOCK> function, however, can be set, activated and deactivated for all Blue Boxes from the Master Blue Box.

**Indicators**

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**5 Indicators**

A number of indicators are provided on the front and rear of the Blue Box.

Rear:	indicator
• Signal present indicator	< SIGNAL PRESENT >
• Input overload indicator	< INPUT OVERLOAD >
• DC protection of the "low" amplifier	< DC LOW >
• DC protection of the "high" amplifier	< DC HIGH >
• Temperature of the "low" amplifier too high	< HIGH TEMP LOW >
• Temperature of the "high" amplifier too high	< HIGH TEMP HIGH >
Front:	
• Clipping of the "low" amplifier	< CLIP LOW >
• Clipping of the "high" amplifier	< CLIP HIGH >
• Power limit of the "low" amplifier	< POWER LIMIT LOW >
• Power limit of the "high" amplifier	< POWER LIMIT HIGH >

Explanation of the indicators on the rear of the Blue Box:

**5.1 Signal Present**

The < SIGNAL PRESENT > indicator is active whenever a signal greater than -20 dBm is present at the input stage.

**5.2 Input Overload**

The < INPUT OVERLOAD > indicator is active whenever a signal greater than +20 dBm is present at the input stage.

**5.3 DC High**

The < DC HIGH > indicator is active whenever a direct current that would be dangerous for the "high frequency" loudspeaker is present at the output of the amplifier. The DC protection disconnects the loudspeaker from the amplifier, while the signal to the amplifier is switched off.

**Indicators**

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After five seconds, the amplifier is switched on again and the connection to the loudspeaker is reactivated. The audio signal is also supplied again.

In case of permanent DC, the total high power supply of the system is switched off. The Blue Box does not switch to <POWER AMP ON> mode again until the problem has been solved. Examination and repair by an official Stage Accompany dealer is necessary in this case.

**5.4 DC Low**

See <DC HIGH>. The protection is active if damaging low frequency oscillations (of less than 10 Hz) are present. The loudspeaker is also reactivated after a period of five seconds and the signal is supplied again.

**5.5 High Temp High**

The <HIGH TEMP HIGH> indicator is active whenever the temperature of the "high" amplifier reaches more than 85° celsius (85°C). The processor switches the signal of the amplifier off at this temperature, allowing it to cool. The signal is switched on again after the temperature has dropped below 80°C.

If, after switching off the signal, the temperature continues to increase, the high power supply is switched off after a temperature of more than 90°C has been reached. The power supply is switched on again after the temperature has dropped below 80°C.

**5.6 High Temp Low**

Functions in the same manner as <HIGH TEMP HIGH> (see above), but this time for the "low" amplifier.

Explanation of the indicators on the front of the Blue Box:

**5.7 Stand By Mode**

The green LED lights when the system is in <STAND BY> mode.

**5.8 Power Amp On Mode**

The red LED lights when the system is in <POWER AMP ON> mode.

**Indicators**

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**5.9 Clip High**

The <CLIP HIGH> indicator is active for at least 0.3 seconds if the output voltage of the amplifier clips against the supply voltage. In general, this will only occur when the amplifier delivers the peak power of 590 watts.

**5.10 Clip Low**

As for <CLIP HIGH>, except it occurs with peak powers of 380 watts instead of 590 watts.

**5.11 Power Limit High**

The input signal for the main amplifiers is adjusted by the processor so that the average power delivered to the "high" loudspeaker does not exceed a certain limit. Large signal peaks can be withstood by the loudspeaker and are transmitted without hindrance. Thus the signal remains "fast", "tight" and "transparent".

The protection needs to react quickly in unexpected situations, for example in case of feedback. However, this is not a guarantee that the speaker cannot be damaged!

It is therefore important that the system is not used for too long at <POWER LIMIT> conditions: the activation of the <POWER LIMIT> protection indicates a serious degree of overload.

**5.12 Power Limit Low**

See <POWER LIMIT HIGH>.

**Recommendations**

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## 6 Recommendations for Optimum Use

- Ensure that the mains supply is of a good enough quality and that it can supply the required peak values. In addition, a good earthing is necessary to prevent noise, rumble and safety problems. If rumble does occur, it can almost always be cured using the <SYSTEM GROUND> key.  
*rumble = < 10 Hz*
- All programmed settings of a Blue Box are automatically saved in memory. Therefore, any changes you may make do not have to be saved separately. When a Blue Box is switched on (after first use), all parameters will be adjusted to the last programmed values. As a result, Blue Boxes used as part of a fixed set-up only need to be programmed once.  
*HVM = 50g*  
*100 Hz*
- NOTE: After a software update all settings are erased and the Blue Box concerned has to be reprogrammed.
- The Blue Box has passive cooling, which means that it must NOT be built into a space with insufficient circulation of fresh air. A temperature that is constantly too high leads to switching on and off of the protection and considerably reduces lifetime of the system.  
*xx*  
*Y the*
- The power limit function (<POWER LIMIT>) is executed by the processor, which measures the exact amount of power delivered to the loudspeaker. If the <POWER LIMIT> protection is activated, slightly reducing the input level will usually be sufficient to cure the problem. In this way, the sound level is not noticeably reduced, whereas a <POWER LIMIT> protection that is activated now and then takes "chunks" out of the signal, which is less acceptable to the human ear.
- As noted earlier, the <POWER LIMIT> function is a sort of emergency measure. Considering that the processor is much faster than the user, the system can react appropriately and quickly to unexpected situations. It is recommended that you trace the source of overload and remedy it as soon as possible. Just to reiterate: the

**Recommendations**

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- <POWER LIMIT> function does not offer a 100% guarantee against damaging the loudspeakers. It is, however, an excellent aid in preventing problems such as distortion.
- The excellent sound reproduction of the Blue Box greatly depends on the correct adjustment of the various system parameters. You are therefore advised to "lock" the Blue Box as soon as possible after setting the desired parameters so that it cannot be interfered with by unauthorized personnel. Of course, it is just as important that you remember the "lock code" you entered.
- Human hearing incorrectly interprets distortion as an increase in volume. It is also well-known that compression drivers at full load exhibit a distortion index that varies between 25% and 40%, which makes it sound as if these drivers produce a high sound pressure. This explains why a small sound system often seems very loud, whereas specifications and measurements show that this impression is not substantiated. The Blue Box, however, features extremely low distortion values as a result of the application of the latest techniques. The combination of an SA Compact Driver, SA 1503 loudspeaker and PMS 5000 offers a unique sound image, in which a maximum sound pressure of 130 dB per unit can be obtained. Because the Blue Box offers completely faithful sound reproduction, without disturbing, irritating distortion, the impression may be gained that the system does not sound really "loud". Don't be misled into continually increasing the sound level: a sound pressure of 130 dB causes permanent damage to the human ear!
- A faulty fuse must ALWAYS be replaced with a new one of the same value. A fuse of a different value can cause permanent damage to the microcomputer.
- Repairs to the Blue Box should only be carried out by an authorized Stage Accompany dealer. Never dismantle the Blue Box yourself, because you risk damaging vital components: moreover, the guarantee becomes irrevocably invalidated.
- Read this manual carefully. As you go, try out the various functions described in this manual: in this way you will soon become familiar with the many possibilities that the system offers.

**Recommendations**

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- It is just as important that your colleagues who will use the Blue Box also read the manual!
- With a good knowledge of the working of the Blue Box, it is possible to fully utilize its superior sound quality in every situation.

**SUCCESS!****Sound Pressure**

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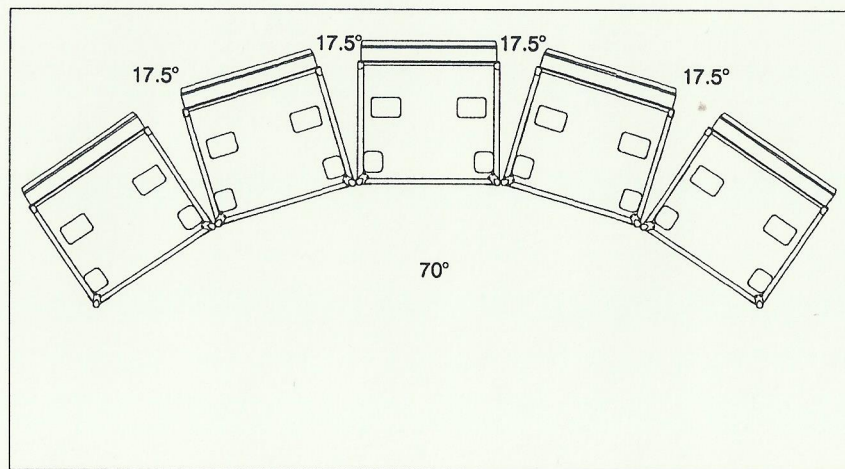
**7 Obtainable Continuous Sound Pressure**

Given that: All systems are in phase and arranged for a 70° dispersion (see figure 7-1 on the next page).

Ver- ti- cal	Hori- zon- tal	To- tal	10	15	20	30	50	75	100	150	200	300	500	m
2	1	2	106	102	100	96	92							dB
3	1	3	110	106	104	100	96	92	90					dB
4	1	4	112	109	106	102	98	95	92					dB
5	1	5	114	110	108	104	101	96	94	90				dB
4	2	8	115	112	109	106	103	98	95	92				dB
5	2	10	117	113	111	107	103	99	97	93	91			dB
5	3	15	119	115	113	109	105	101	99	95	93			dB
5	4	20	120	116	114	110	106	102	100	96	94	90		dB
5	5	25	121	117	115	111	107	103	101	97	95	91		dB
5	7	35	122	119	116	113	108	105	102	99	96	93		dB
5	10	50	124	120	118	114	110	106	104	100	98	94	90	dB
5	15	75	126	122	120	116	112	108	106	102	100	96	92	dB
5	20	100	127	123	121	117	113	109	107	103	101	97	93	dB

Note: The values indicated represent the continuous sound pressure: peak values are 10 dB higher.





**Figure 7-1** Five Blue Boxes are used to obtain a 70° dispersion angle.



## 8 Directivity / Dispersion Control

It is well known that when a number of speakers reproducing the same signal are combined, the directivity of the combined speakers differs from that of the individual speakers. The change in dispersion depends on the combined level and polarity relationships, as well as the combined physical positioning and direction, and the frequency of the signal being reproduced.

This effect is applied for example in conventional loudspeaker columns, which display a strongly frequency dependent vertical beaming and wide horizontal dispersion. More advanced applications include directional microphones, etc.

The least easily achievable, but sometimes preferred situation in a combination of sound systems is one in which the same directional behavior is displayed as in a single sound system.

If Blue Boxes are used, such a spreading behavior can be realized relatively simply. It is achieved by setting the "level" (volume) and "polarity" (phase) of the various loudspeaker systems according to the so called "Bessel configuration".

A Bessel configuration is created as follows: For a combination of five loudspeakers (horizontally arranged), the levels should be adjusted as follows for the Blue Boxes: -6 dB, 0 dB, 0 dB, 0- dB (polarity inverted), -6 dB (ratio: 1 : 2 : 2 : 1).

For the Blue Box indicated as 0- dB (out of phase), the polarity must be adjusted to "inverted": the other Blue Boxes are simply in phase.

The HIGH and LOW amplifiers of each Blue Box should be adjusted to be the same (i.e. -6 dB or 0 dB).

Note well: These mutual relationships must be maintained exactly.

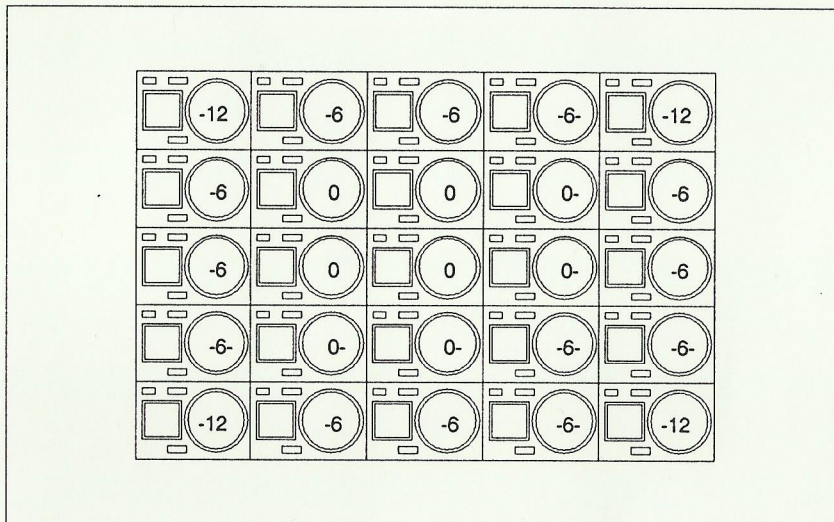
Remember when applying the Bessel configuration that the soundpressure produced ON axis of the system is less than it would be if the same sound system was used the "normal" way.

**Bessel Configuration**

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Off axis, however, the sound pressure is higher than normal. The difference in radiation is very noticeable: the sound is clearer and more transparent, while the dispersion angle is much greater.

In a large sound system comprising 2 x 25 Blue Boxes, the configuration for each set of 25 Boxes is as follows:



**Figure 8-1.** The Bessel configuration.

## Explanation:

-12	:level -12 dB,	normal polarity
-6	:level -6 dB,	normal polarity
-6-	:level -6 dB,	inverted polarity
0	:level 0 dB,	normal polarity
0-	:level 0 dB,	inverted polarity

**Options**

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## 9 Options

The following options are available for the Blue Box:

Flightcase	(order no. 0220.4425SB)
Flying system	(order no. 0310.4425)
Stand	(order no. 0310.0097)
Adaptor	(order no. 0320.0097)

### 9.1 Flightcase

The flightcase is indispensable for "on the road" use of the Blue Box. The Blue Box is fixed to the flightcase by means of four bolts. Provisions for these bolts are standard in the Blue Box and flightcase.

**Mounting:**

Remove the cover of the flightcase. Place the Blue Box with its front on the floor and slide the flightcase over the Blue Box: fit the flyer plates first if necessary (see paragraph 9.3). Tighten the four bolts at the indicated places in the socket of the handles.

After fitting the cover, the Blue Box is ready for transportation. On the backside of the flightcase (= top if the case is standing on its castors) are four sockets. During transportation, 3 cases can be placed on top of each other: the castors of the second unit fit exactly into these sockets. However, make sure that all four castors are securely in the sockets.

**Note:** Because the Blue Box is cooled passively, the back panel of the flightcase must ALWAYS be removed before use. Also ensure that the ventilation sockets of the flightcase are not obstructed when the Blue Box is packed for transportation.

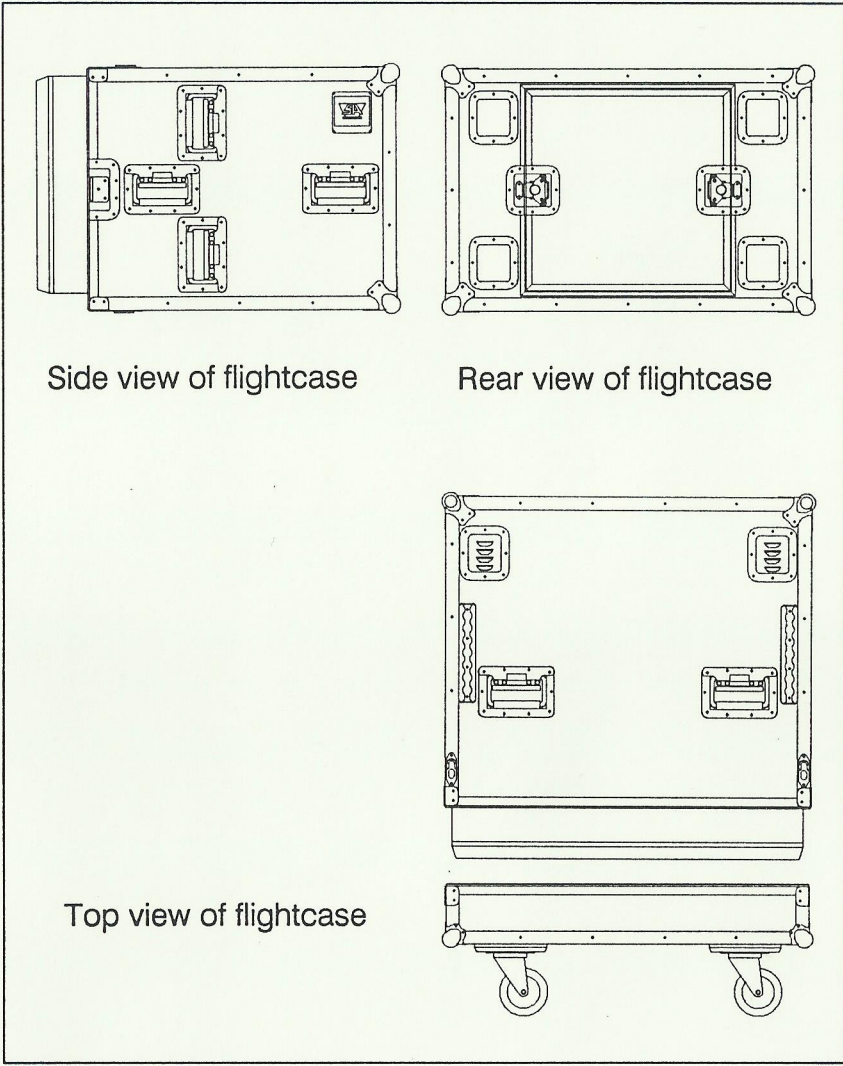


Figure 9-1 The optional flightcase.



### 9.2 Flying System

The Blue Box, when installed in its matching flightcase, can be used in a flying system. The flying system comprises four plates and two shackles for hanging the system. The plates are placed at the corners, inside the flightcase. The Blue Box must first be removed from its flightcase so that the plates can be mounted. Then the Blue Box is replaced in the case and retains the plates in position. A number of Blue Boxes can easily be hung under each other using a double hanging shackle (see figure 9-2 below). The maximum load of a flying system, installed in its flightcase, is 1,000 kg.

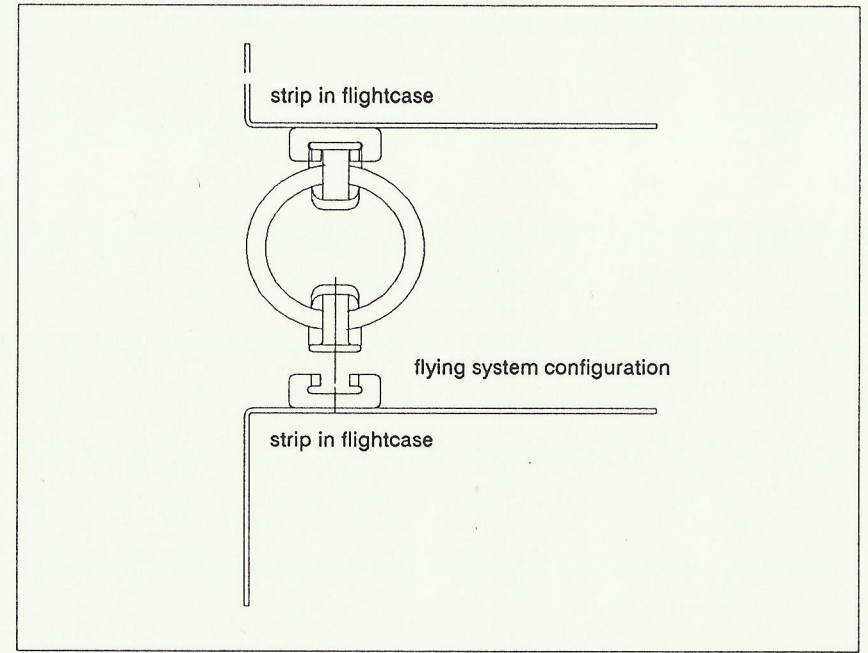


Figure 9-2 The flying system.



### 9.3 Stands

If two to four Blue Boxes are to be used as a compact PA or vocal system, mounting the Blue Boxes on stands is the preferred method to achieve a good and stable set-up. A special, heavy duty stand is available for this purpose. The stand has a load capacity of approximately 200 kg, allowing two Blue Boxes to be mounted on one stand.

Requirements are:

- 1 stand
- 1 adaptor plate
- 2 flyer plates.

The flyer plates are placed underneath the Blue Box, in the flightcase. The adaptor plate is fixed outside the flightcase to the flyer plates. The ridges of the adaptor plate fall in the indents of the flyer plate, after which both plates are fixed with the knob.

The adaptor plate has been made adjustable in order to distribute the weight of one or two Blue Boxes evenly. Once fixed to the Blue Box, the plate can be left there permanently.

After mounting the plate with Blue Box(es) on the stand, the height of the system can be adjusted by raising or lowering the stand to the desired height using the handle supplied. For optimum results, you are advised to place stands with single Blue Boxes just above head height of the audience and stands with pairs of Blue Boxes with the bottom Blue Box just at ear height. The Blue Boxes can be rotated with respect to the stand so that they can be directed for a correct sound distribution.

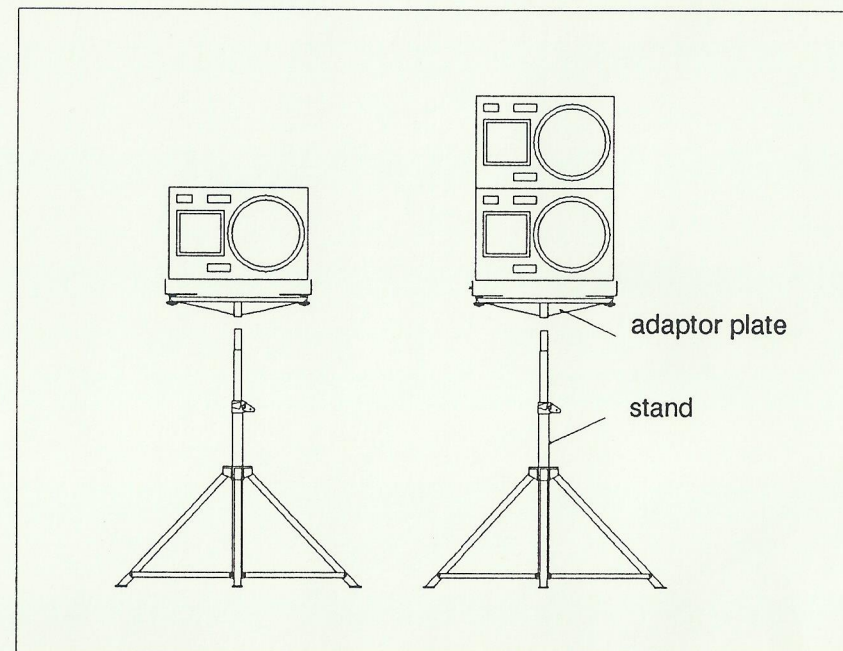


Figure 9-3 Blue Boxes on stands.



## Specifications

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## 10 Blue Box Specifications

### Total system

Frequency range:	30 Hz - 30 kHz; -3dB
Max output level:	120 dB continuous, 130 dB peak
Noise output:	< 5 dBA PWL
Nominal angle of spread:	70° horizontal, 40° vertical
Dim. (h x <del>w</del> x d, mm):	470 x 730 x 730, without flightcase 510 x 780 x 920, in flightcase, with lid
Weight:	84 kg without flightcase 110 kg in flightcase, with lid

### Amplifier

Input:	+6 dBm (1.55 V), ref. 0 dBm = 0.775 V
Max. input level:	+20 dBm
Impedance balanced:	30 kOhm
Impedance unbalanced:	25 kOhm
Crossover:	Crossover frequency 1 kHz, 24 dB/oct., Bessel

### Power delivered

Low frequency:	150 W average/380 W peak
High frequency:	60 W average/590 W peak
Continuous power consumption:	Standby: 75 W, max. output: 660 W

### Distortion

THD:	At every output level < 0.01% (20 Hz - 20 kHz)
IMD:	< 0.01%

### Slew rate:

60 V/us

### Damping (with DDC):

> 10,000, 1 kHz in 8 *ohms*

## Confidential Information

stage accompany Release date: 28-03-89

## 11 Security Function

This Chapter contains the information of one security function. You may remove this Chapter from the manual for safety reasons.

### 11.1 Resetting the <LOCK> and <LOCKCODE>

This function allows you to unlock the Blue Box if you forget the locking code. To do this depress the <SANET GROUND> key while switching on the Blue Box. The Blue Box will then be unlocked and the locking code set to 1.



stage accompany

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him for the information<sub>o</sub> you need.  
or her