



CLEAR-COM ENCORE

SB-704 MAIN STATION

I N S T R U C T I O N M A N U A L

SB-704 Main Station Instruction Manual
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IMPORTANT SAFETY INSTRUCTIONS

Please read and follow these instructions before operating this product.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades, with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. **WARNING:** To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.

Please familiarize yourself with the safety symbols in Figure 1. When you see these symbols on this product, they warn you of the potential danger of electric shock if the main station is used improperly. They also refer you to important operating and maintenance instructions in the manual.



This symbol alerts you to the presence of uninsulated dangerous voltage within the product's enclosure that might be of sufficient magnitude to constitute a risk of electric shock. Do not open the product's case.



This symbol informs you that important operating and maintenance instructions are included in the literature accompanying this product.

Figure 1: Safety Symbols

EMC AND SAFETY

The SB-704 station meets all relevant CE, FCC, UL, and CSA specifications set out below:

EN55103-1 Electromagnetic compatibility. Product family standard for audio, video, audio-visual, and entertainment lighting control apparatus for professional use. Part 1: Emissions.

EN55103-2 Electromagnetic compatibility. Product family standard for audio, video, audio-visual, and entertainment lighting control apparatus for professional use. Part 2: Immunity.

UL 60065-7, CAN/CSA-C22.2 No.60065-3, IEC 60065-7 Safety requirements.

And thereby compliance with the requirement of Electromagnetic Compatibility Directive 2004/108/EC and Low Voltage Directive 2006/95/EC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.



OPERATION

INTRODUCTION

Congratulations on choosing this Clear-Com product. Clear-Com was established in 1968 and remains the market leader in providing intercoms for entertainment, educational, broadcast and industrial applications. The ruggedness and high build-quality of Clear-Com products defines the industry standard. In fact, many of our original belt packs and main stations are still in daily use around the world.

We recommend that you read through this manual completely to better understand the functions of the SB-704. If you encounter a situation or have a question that this manual does not address, contact your dealer or call Clear-Com directly. Our applications support and service people are standing by to assist you. (Refer to Chapter 5, “Warranty” for contact information.) Thank you for selecting Clear-Com for your communications needs.

THE CLEAR-COM CONCEPT

Clear-Com is a closed-circuit intercom system that consistently provides high-clarity communication in high-noise and low-noise environments. A basic system consists of a single- or multi-channel power supply or main station connected to various single- or multi-channel remote stations, such as belt packs and loudspeaker stations.

Clear-Com manufactures a wide variety of both portable and fixed-installation units. All are compatible with each other. Clear-Com intercom systems can also interface with other communication systems and devices.

Clear-Com is a distributed amplifier system; each main and remote station houses its own mic preamplifier, headset or speaker power amplifier, and signaling circuitry. Stations bridge the intercom line at a very high impedance and place a minimum load on the line. The audio level always remains constant, and does not fluctuate as stations leave and join the network. Low-impedance mic input lines and specially designed circuitry make Clear-Com channels virtually immune to RFI and dimmer noise.

Clear-Com stations are interconnected with two-conductor, shielded microphone cable. Portable stations are connected with two conductor cables with 3-pin XLR connectors. One wire carries the DC power from a main station or power supply to all remote stations, and the other wire carries 2-way (duplex) audio information. The shield acts as a common ground. One termination (per channel) is needed throughout the intercom network, and is usually located in the main station or power supply.

Clear-Com main stations, power supplies, and certain remote stations each have an auxiliary program input with its own volume control, which allows an external audio source to be fed to the intercom system.

Visual signal circuitry (*call lights*), a standard feature on all main and remote stations, allows the user to attract the attention of operators who have removed their headsets.

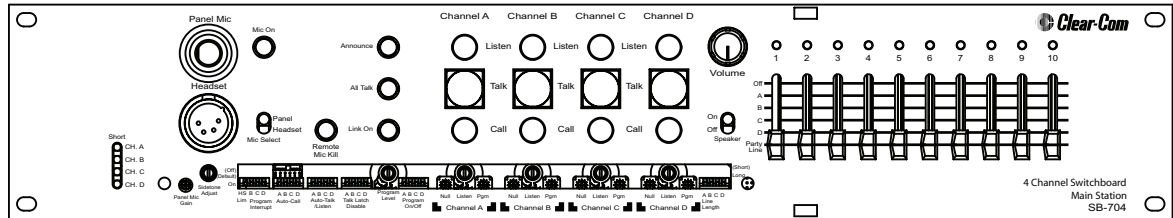


Figure I-1: SB-704 Front Panel

DESCRIPTION

The SB-704 main station is a four-channel microprocessor-controlled station intended to work with other Clear-Com party-line products. The SB-704 is designed for applications in which a person needs to communicate with up to four groups of people and be able to quickly assign a remote station to any of the four channels.

The station features a ten-position slide switch matrix that allows assignment of any of the ten intercom lines to any of the four intercom channels, to an isolated separate party line, or to an *off* position.

The following is a list of features found in the SB-704 intercom station:

- **MICROPROCESSOR CONTROL:** Most aspects of station operation are under microprocessor control.
- **REMOVABLE ACCESS PANEL:** A removable front panel allows access to most controls and option DIP switches.
- **INDIVIDUAL CHANNEL CONTROLS:** Each channel has individual *talk*, *listen*, and *call* push-buttons for each channel.
- **MOMENTARY/LATCHING TALK BUTTONS:** The *talk* buttons have a *momentary* and *latching* action depending on how the button is used. The latching function can be defeated with DIP switches.
- **INDIVIDUAL CHANNEL ADJUSTMENTS:** Each channel has individual *listen level* controls, *channel null* adjustments, and *program feed level* controls.
- **MULTIPLE PROGRAM INPUTS:** Multiple program inputs are provided for local station monitoring and program feed to intercom lines for local talent cuing (IFB).
- **INTERNAL IFB (IFB - Interrupt Foldback of program feeds):** Program feed can be fed to each channel and interrupted (IFB) when a *talk* function is active or when a *call* signal is received on that channel. An internal jumper determines whether the IFB function is talk- or call signal- activated.

- **ASSIGNMENT MATRIX:** Up to ten stations or groups of stations can be assigned to any one of the four intercom lines.
- **LINK FUNCTION:** The SB-704 has a *link* function that places all four channels into a common party line at the single push of a button.
- **ALL-TALK:** An *all-talk* button allows instant access to all channels.
- **ANNOUNCE FUNCTION:** An *announce* button allows external paging. A set of relay contacts is provided to control an external system.
- **PROGRAM FEED OVER STAGE ANNOUNCE:** An internal jumper allows the main program feed to be fed to the *stage announce* output. The program is automatically interrupted when the *announce* button is pressed.
- **MIC ON/OFF SWITCH:** A separate *mic on/off* push-button allows turning the microphone off without upsetting the setting of *talk* switches.
- **REMOTE MIC KILL SWITCH:** Front-panel switch allows you to turn off all latched talks on remote stations and beltacks.
- **EXTERNAL MIC ON/OFF INPUT:** An external logic input allows the *mic on/off* function to be switched remotely.
- **EXTERNAL IFB and HOT MIC OUTPUT:** A rear panel jack provides direct connection to Clear-Com's external IFB system such that the station's microphone can be used in the external IFB system. A buffered unswitched output of the selected microphone is also available.
- **EXTERNAL SPEAKER OUTPUT:** The SB-704 does not have a panel-mounted speaker; however, the speaker amplifier output is made available on the rear panel.
- **SPEAKER ON/OFF SWITCH:** The speaker output may be turned on and off with a front panel switch.
- **SPEAKER DIMMING:** Whenever a *talk* is active the *speaker* output is dimmed approximately 6 dB to prevent feedback.
- **PANEL MIC GAIN:** The preamplifier for the panel microphone has a *gain trim* adjustment to allow field trimming. Adjustment of the panel microphone gain also varies the frequency response of the preamplifier to compensate for feedback when the microphone is used up close.
- **POWER SUPPLY WITH SHORT CIRCUIT PROTECTION:** The SB-704 features redundant powering to remote stations by providing separate short-circuit-protected power sources to each of the four intercom lines. A short on one intercom line will not bring the whole system down. *Short-circuit* indicators are provided on the front panel for each channel.

NORMAL OPERATION

Once installed and operational, the SB-704 is easy to operate. The following sections describe normal operation of the unit, use of controls available under the access panel, and abnormal operation of the power distribution system.

Normal operation of the SB-704 requires access only to the front-panel controls. The following is a brief description of how to use the front-panel controls in day-to-day operation.

There are option DIP switches and adjustment controls behind the access panel on the lower portion of the front panel. To gain access to the switches and controls, pull on the two latches on either end of the access panel and remove it.

This section discusses the following subjects:

- Intercom power status lights
- Selecting microphones and enabling the speaker
- Listening to intercom channels
- Monitoring main program
- Talking on intercom channels
- The all-talk function
- Sending and receiving *call* signals
- Linking intercom channels together
- The announce function
- Channel assignments using the slide switch matrix

Intercom Power Status Lights

The four red short lights are failure indicators for each of the four intercom lines. These lights will assist in locating a shorted or overloaded channel. Within as little as ½ second of automatically cutting off power to an overloaded intercom line, the SB-704 will attempt to turn power on again. This allows momentary short or overload conditions to clear automatically. Shorts are normally caused by miswiring or damaged cables. Overloads are generally caused by connecting too many belt packs and stations to an intercom line.

Clear-Com's advanced fail-safe design can sense the difference between a short or an overload to optimally protect itself. Power is restored in as quickly as ½ second, depending upon whether there was a single or multiple short or overload. The other channels continue to operate normally. The SB-704's advanced fail-safe circuit will bring the power back up even under full load conditions. Front-panel lights indicate a fault on any of the four channels. When the station is first turned on, all four short lights are normally off.

Selecting Microphones and Enabling the Speaker

To select between the gooseneck mic and the headset mic, move the *microphone select* switch to the appropriate position.

The *mic on/off* pushbutton toggles the microphone *on* and *off*. The *mic* button lights blue when the mic is active.

The microphone will be turned on automatically whenever a *talk* function is activated as it is assumed that you wish to talk. If one or more *talks* are active, you may turn the microphone off without unlatching the active talks.

The speaker may be turned *on* and *off* with the *speaker* switch.

Listening to Intercom Channels

To listen to an intercom channel, press the *listen* button for the desired channel. The listen button lights green to indicate that the listen function is on.

The *listen level* control (below the *call* button) for that channel is usually set to full on position and the listening volume is set by the *intercom volume* control to the left of the speaker.

If several channels are being listened to at the same time, it might be desirable to adjust the individual listen levels of each channel for the desired mix.

Talking on Intercom Channels

To talk on an intercom channel, press the desired *talk* button. Pressing and holding the button will cause the function to be active only while the button is held (*momentary*). Pressing and releasing the button quickly will cause the function to latch on if it was off or turn off if it was on (*latching*).

The latching function can be defeated on an individual channel with an option DIP switch beneath the access panel (*latch disable* DIP switch).

The button will be illuminated blue when the talk function is off and amber when the talk function is on.

Another option allows the automatic setting of a *listen* function whenever a talk is active (*auto-listen* DIP switch) for each channel.

The All-Talk Function

Pressing the button marked *all talk* sends the selected microphone to all channels while the button is pressed (*momentary* only). This button lights amber when pressed.

Monitoring Main Program

The *main program* input is the one on the XLR connector on the rear panel. To listen to the main program in the speaker or headphone, adjust the *program level* control just below the *link* and *all talk* pushbuttons.

Sending and Receiving Call Signals

To send a *call* signal on an intercom channel press the *call* button for that channel. This is a *momentary* function.

If the *auto-call* option is selected for that channel, activating a *talk* button will also send a *call* to that channel.

Receiving a *call* signal is indicated by a flashing red *call* button.

Linking Intercom Channels Together

A pushbutton allows the connecting of intercom channels B, C, and D to channel A. The *link* pushbutton is latching in action. The *link* button illuminates amber when all channels are linked together. In the latched position, the entire station operates as one party line.

Talk and *listen* buttons are non-functional on channels B, C, and D when they are linked to channel A.

The Announce Function

A single pushbutton sends the active microphone's audio to the *announce* output on the rear panel. Any active talks are disabled while the announce button is held. The announce button illuminates amber when held. *Talk* and *listen* latches are not reset, but the microphone's audio does not go to the intercom line while the announce function is active. A set of relay contacts are activated to control some external device.

There is an option which allows program audio to be fed to the *announce* output. If this option is enabled, the announce pushbutton interrupts this audio when it is pressed. Program audio feed to the announce output is selected by setting jumper *J11* on the *main* board to the *on* position.

Channel Assignments Using the Slide Switch Matrix

The ten *assignment* switches let you assign the switchboard destinations (#1 - #10 on the rear panel) to any of the four main intercom channels (*A*, *B*, *C*, or *D*), an isolated off channel, or a separate common party line just for these inputs.

When the switchboard destinations are assigned to the *off* position, they are isolated from all other switchboard destinations and isolated from the four main intercom channels. Stations on one of these lines can only talk to each other. A call signal on one of these lines will be indicated by the *amber* LED above the particular matrix switch. Pressing the *all talk* button on the station will send the microphone to the channel in the *off* position.

When the switchboard destinations are assigned to the party-line position, all destinations that are placed in the party-line position will be connected into a common party line isolated from the rest of the station. Pressing the *all talk* button on the station will send the microphone to all channels in the party-line position.

Remote Mic Kill Function

When you press the *remote mic kill* pushbutton, the *talk* function shuts off for every belt-pack on all four channels. If the talk functions of a large number of belt-packs have inadvertently been left activated, incidental noise and talking can make it difficult or impossible to communicate on the party line intercom. The remote mic kill button can be pressed to quiet the line in this situation. Those needing to communicate can then set their *talk* functions to *on* as needed.

Note: The remote mic kill button only functions if the SB-704 main station is powering all of the stations in the system. Pressing the button momentarily interrupts power to the other beltpacks and stations in the system. If there are other power supplies or main stations in the system, then the remote mic kill switch cannot interrupt power and therefore cannot work.

HIDDEN FRONT PANEL OPTIONS AND ADJUSTMENTS

This section describes the option DIP switches and various adjustment controls behind the access panel on the front panel. These option switches and controls are usually set and not used in daily operation of the unit.

To gain access to these controls, pull on the two latches on either end of the access panel and remove it.

DIP Switch Options

The unit is shipped with all DIP switches, except the Headset Audio Limiter switch, in their default positions (*up*). The Headset Audio Limiter switch is shipped in the *down* (on) position.

The following functions are enabled with DIP switches:

- **HEADSET AUDIO LIMITER:** The HS dip switch turns the headset audio limiter on or off. Unless an especially high volume is needed, this switch should be left in the on position to protect the hearing of the user.
- **INTERRUPT ENABLE:** Three DIP switches enable the *program interrupt* function on channels *B*, *C*, and *D*. Program interrupt is not available on channel *A*.
- **AUTO-CALL:** Four DIP switches (one for each channel) enable automatically sending a *call* signal whenever a *talk* is active on the enabled channel.
- **AUTO-TALK/LISTEN:** Four DIP switches (one for each channel) enable automatically setting the *listen* function whenever a talk is active on the enabled channel.
- **TALK LATCH DISABLE:** Four DIP switches (one for each channel) disable the *latching* action of the selected channel.
- **PROGRAM ON/OFF:** Four DIP switches (one for each channel) enable feeding the *main program* input to the selected intercom channel. The *main program* input is the one on the XLR-3F on the rear panel.

The other four program inputs in the auxiliary connector feed their respective intercom channels all of the time. The only way to turn off the auxiliary feed to a channel is to turn its individual control *off*.

- **LINE LENGTH:** Four DIP switches (one for each channel) allow the optimization of the nulling circuitry for each channel. The default (*up* position) is for lines less than 400 ft. (122 m). The *down* position is for lines greater than 400 ft. (122 m).

Hidden Adjustment Controls

Various adjustments are available beneath the front access panel.

- **PANEL MIC GAIN:** This control trims the panel microphone preamplifier gain to compensate for different uses of the station.

The unit is shipped from the factory in the minimum gain position (fully counter-clockwise). This level matches the headset microphone level when the panel microphone is worked up close. Raising the gain from the factory setting should be done carefully as too much gain will increase the background noise in the intercom making it unusable.

- **CHANNEL NULL ADJUST:** The screwdriver-adjustable control beneath each *talk* push-button marked *null* allows nulling of the hybrid circuitry associated with each listen channel.

The amount of null in the listen circuitry varies with the length of the intercom line. Adding or removing stations and intercom cable will change the null. For optimum performance, the *null* control will need to be adjusted each time there is some change in the intercom line wiring.

If a panel microphone and speaker is being used, the setting of the *null* control is critical to prevent feedback.

To adjust the *null* control on a given channel:

1. Turn the *sidetone adjust* control just below the *headset* connector to minimum.
2. Set a talk to the channel to be adjusted or send some program to the channel and adjust the *null* control for the channel for minimum level in the headphone. If the headset microphone is being used, hum or gently scratch it for a continuous signal source to null on. If a good null is not attainable, switch the *long/short* DIP switch for the channel (to the far right of the hidden adjustments) to its opposite setting. Use the setting that produces the best results.
3. Repeat the adjustment for all four channels on the station.
4. Adjust the *sidetone adjust* control for the desired amount of sidetone in the headset.

- **CHANNEL PROGRAM FEED LEVEL:** Beside the *null* control for each channel there is a control marked *PGM* which adjusts the amount of program being sent to that channel.

Each channel has two program sources:

1. The main program that is input from the rear-panel *XLR* connector may be enabled for a given channel with the *program on/off* DIP switches for the channel.

2. The *auxiliary input* connector has four individual program inputs for each channel. These inputs cannot be disabled with front-panel DIP switches.

REAR PANEL OPTIONS

This section describes the switches on the rear panel. These switches and controls are usually set and not used in daily operation of the unit.

Intercom Line Termination

The SB-704 has switch-selectable intercom-line termination networks. If more than one SB-704 (or any other Master Station) is installed on the same intercom lines then all of the terminations in all of the stations except one must be disabled.

Note: If the link function is to be used on an SB-704 and there is more than one main station in the system, it can only be used on the unit that provides termination.

The terminations are *enabled* or *disabled* with switches on the rear panel. Each channel is marked clearly on the panel. Set the switches to the *off* position to disable the terminations in the station. **The SB-704 is shipped from the factory with all four lines terminated.**

SHORT-CIRCUIT AND OVERLOAD CONDITIONS

If a short-circuit condition appears on any of the four intercom lines, the sense circuitry for that line will disconnect the DC power to that line only and the *red* “short” light for that channel will be *on*. After approximately 0.5 seconds, the SB-704 will attempt to turn power on again. This allows momentary short or overload conditions to clear automatically.

If the *red* “short” light remains after repeated automatic or manual attempts to restore power, then there is either a short on that intercom line or too many intercom stations have been connected to that intercom line. In this case, unplug the intercom line connected to the affected channel and its *red* “short” light should go out. This indicates that there is short in that line. Follow that intercom line and break it apart in several places while it is plugged into the station to isolate the section of line that is shorted.

SUMMARY OF MAIN FRONT-PANEL KEYS, LIGHTS, AND CONTROLS

Table 1 summarizes the meaning of various front-panel keys, lights, and controls.

| Function | “On” State | “Off” State | Momentary or Latching |
|--|---|---|--|
| Microphone Key (activates selected microphone, either panel or headset) | Blue | Off | Latching only (activates automatically when other keys such as Talk, Announce, All Talk are pressed) |
| Listen Key (press to listen to a channel) | Green | Off | Latching only (can be set to activate automatically with “talk”) |
| Talk /Power-On Key (press to talk on a channel) | Amber | Blue (indicates that the station is receiving power, but the “talk” feature is off) | Both |
| Call Key (press to send a call signal on a channel) | Red (flashing) when receiving or sending call signal) | Off | Momentary only |
| Announce Key (press to send microphone’s audio to “announce” output, i.e. PA system) | Amber | Off | Momentary only |
| All-Talk Key (press to send microphone’s audio to all channels) | Amber | Off | Momentary only |
| Link-On Key (press to link all channels together so that station operates as one party line) | Amber | Off | Latching only |
| Remote Microphone Kill Key (press to clear all latched talks on connected remote stations/beltpacks on all channels) | Amber | Off | Momentary only |
| Short/Overload Light (lights when there is a short or overload on the associated channel) | Red | Off | Neither |
| Mic Select Switch (to select to activate either the panel or headset microphone) | n/a | n/a | n/a |

| Function (Continued) | “On” State | “Off” State | Momentary or Latching |
|---|-------------------|--------------------|------------------------------|
| Speaker On/Off Switch (to switch station speaker on or off) | n/a | n/a | n/a |
| Volume Knob (adjusts overall incoming volume on all channels) | n/a | n/a | n/a |
| Listen Level Knob (adjusts incoming volume to selected channel only) | n/a | n/a | n/a |
| Channel Slide Switch (assigns each of 10 individual stations to one of four channels) | n/a | n/a | n/a |
| Channel Light (shows if there is a call signal on a channel) | amber | off | n/a |

Note: To “latch” (or “lock”) a button to “on,” quickly press it once. The button is “locked” to “on” for hands-free use. Pressing the button again releases the latch. Otherwise when you press and hold a button the feature switches on, and when you release the button the feature switches off. This is called “momentary” use.

2 INSTALLATION

This chapter describes installation of the SB-704 in an intercom system.

INSTALLATION OVERVIEW

This section describes the Clear-Com concept in intercom line interconnection under the following topics:

- Intercom Line Connection
- Line Termination
- Station Powering
- Cable Considerations

INTERCOM LINE CONNECTION

The SB-704 provides one male XLR-3 connector for each main intercom line and ten male XLR-3 connectors for the separate assignable intercom channels.

LINE TERMINATION

The fundamental concept of the Clear-Com party-line intercom is that all stations provide high impedance into a single system termination.

Note: An intercom line must be terminated. Care must be taken not to “double” terminate a line. All unused intercom inputs must be terminated to keep the line drive circuits stable.

The SB-704 provides switchable terminations of the intercom lines. Clear-Com main stations and power supplies provide switch-selectable termination networks on all intercom output lines. It is up to the user to determine where the termination will be provided. An unterminated line will cause excessive levels, possible oscillation of line drivers, and severe imbalance of hybrid null networks. A double- or multiple-terminated line will cause low levels and severe imbalance of hybrid null circuits.

Switching of the termination *on* and *off* on the SB-704 is with back-panel switches. The SB-704 is shipped from the factory with all four lines terminated.

USING THE LINK FUNCTION

The *link* function in the SB-704 uses relays to connect the four party lines together. In doing so, it also removes the terminations from channels *B*, *C*, and *D* such that the new party line on channel *A* has only one termination when link is activated. If there is more than one SB-704 or MS-704 in a system, the *link* function can only be used at the station where the terminations are set *on*.

FAIL-SAFE POWER

An intercom power supply has special needs that are not met by traditionally designed power supplies. An intercom power supply must work in adverse conditions such as low AC line voltage, momentary shorts on the DC power lines to the stations, and excessive peak loads during “power-on” conditions. The following features are incorporated into the SB-704’s power supply:

- **AUTOMATIC SHORT CIRCUIT PROTECTION:** The SB-704’s internal power supply checks each channel for a short or current overload. If it detects a short the power supply will shut down that channel. A short duration short circuit will not cause the power supply to interrupt power.
- **AUTOMATIC OVERLOAD PROTECTION:** The SB-704’s internal power supply senses the difference between shorts and overloads. If an overload is detected the power supply will shut down that channel. An overload lasting a short period will not cause the power supply to interrupt power.
- **AUTOMATIC POWER RESTORE:** The SB-704’s internal power supply senses the difference between short-term and long-term shorts and overload conditions. After the first few times a short or overload occurs, the power supply will try to restore power after only 0.5 seconds. If the short or overload persists or occurs repeatedly, the power supply will take progressively longer (to a maximum of 20 seconds) to try to restore power. This protects the power supply from damage due to overheating. Once the short is removed, the channel will recover, even under a full load condition. The automatic power restore times are shown in the following chart:

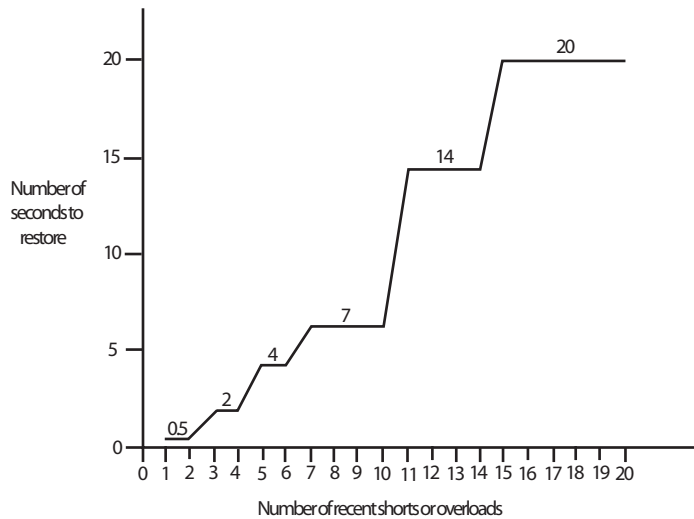


Figure 2-2: Automatic Power Restore Times

- **INDIVIDUAL CHANNEL SHORT CIRCUIT PROTECTION:** Each individual channel is separately overload and short circuit protected and may draw as much as 1.2 amperes, though the total to both channels is limited to

2 amperes. A short on any one intercom line will not bring the whole system down.

Note: Power supply lines connected together at remote stations will disable the individual channel short circuit protection feature.

- **FRONT PANEL “SHORT” LIGHTS:** There are four *short* lights on the front panel (one for each channel). The *short* lights illuminate steadily when an overload or short condition is detected. They blink if power to a channel has been shut off as a result of an overload or short.
- **PARALLELING MULTIPLE POWER SUPPLIES:** Multiple power supplies can be paralleled to increase system capacity. The SB-704’s internal power supply will automatically detect the actions of other power supplies during overloads and short circuits to restore power as quickly as possible.
- **LOW NOISE CIRCUITRY:** The direct current outputs of the SB-704’s internal power supply contain very little hum and noise. The power supply does not contribute to audible noise in the remote stations and beltpacks.
- **CONNECTION TO AC MAINS:** The AC power line supplies power to the SB-704’s internal power supply. The power supply will accept any line voltage between 100 and 240 VAC at 50-60 Hz. It will automatically adjust to the line voltage. There is no need for a voltage selector switch or an external fuse. The unit draws a maximum of 60 VA of power from the AC line. Clear-Com power supplies can be paralleled to increase the number of remote stations that can be operated in a system.

FAIL SAFE POWER DISTRIBUTION SCHEME
WITH MULTI-CHANNEL REMOTE STATIONS

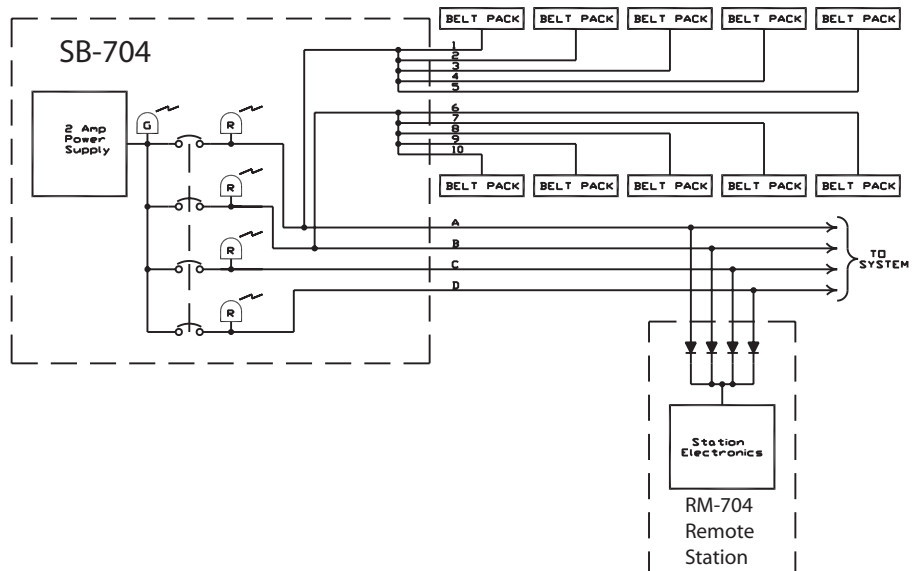


Figure 2-3: Fail Safe Power Distribution

The illustration above shows the proper power wiring of a system powered by a single SB-704. The single-channel remote stations are connected to the ten

switched intercom connectors. These connectors derive their DC power internally from the SB-704. The station comes set from the factory with the power on the assigned lines #1 - #5 connected to channel *A*'s power. The power for channels #6 - #10 is sourced from channel *B*. Multiple-channel remote stations are connected to the four intercom channels. In the case above, a short on any one line will only take that channel down.

It is assumed that none of the power lines are interconnected in the external system wiring. However, if a multiple-channel remote station that has not been equipped for power line isolation is connected, those channels would now have their power lines connected. The system will still work except that a short circuit on any of the interconnected channels will cause both to fail thus taking more of the system down with a single short circuit.

INTERCOM CABLE CONSIDERATIONS

The Clear-Com intercom line is intended to run on shielded-pair cable. One conductor carries audio, the other conductor carries the DC power for remote stations. The shield is used for ground return for audio and power. When choosing interconnect cable, keep the following considerations in mind:

1. DC resistance of the ground or common conductor affects crosstalk. For runs longer than 500 ft. (152.5 m) do not use wire smaller than 20 gauge.
2. The capacitance of the interconnect cable affects system frequency response and sidetone stability. Total capacitance should not be greater than 0.25 uF.

Portable Installation Cable

Practical cable for portable system interconnections is flexible, two-conductor, shielded microphone cable. We suggest you use Belden #1800F (24 gauge). For runs longer than 500 ft. (152.5 m) use a 20 gauge cable or larger (Belden #8412).

Permanent Installation Cable

Vinyl-jacketed shielded pair is the cable of choice for permanent installations. Use a low-capacitance 20 gauge wire for runs under 500 ft. (152.5 m). We suggest you use Belden #8762. For runs longer than 500 ft. (152.5 m) use an 18 gauge cable (Belden #8760). Placing the cable in conduit is recommended but not necessary.

Multi-pair cable that is individually shielded is acceptable for use in multi-channel systems. For cross-talk considerations, the shields must be tied together on both ends of the cable to produce the lowest possible DC path for ground return.

WIRING DIAGRAM

The diagram shows using a multi-pair cable to connect two stations. Note that the power and shield wires of each channel are not connected together.

GROUND ISOLATION

The pin #1 ground connection of each XLR connector must also be isolated from the chassis. Pin #1 should not be connected to the shell of the XLR connector.

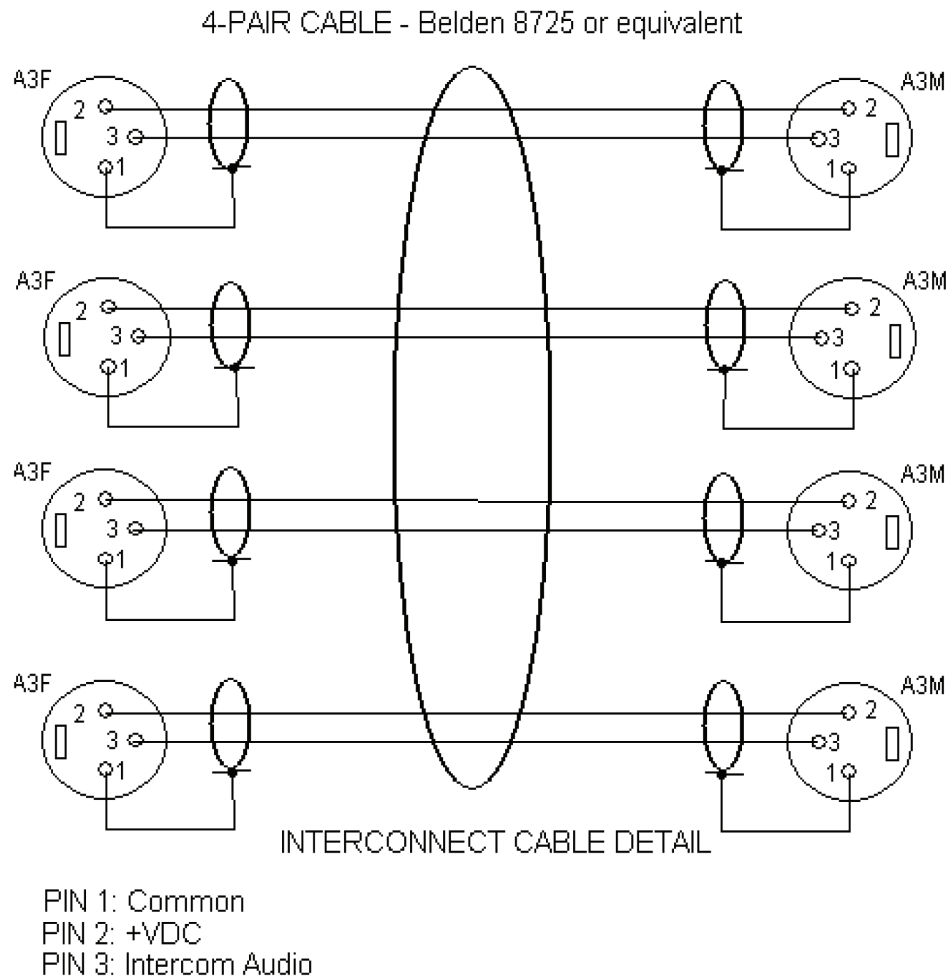


Figure 2-4: Interconnect Cable Detail

Note: The remote stations connected to each channel are powered from the intercom cable for that channel. In the case above, a short on any one line will only take that channel down.

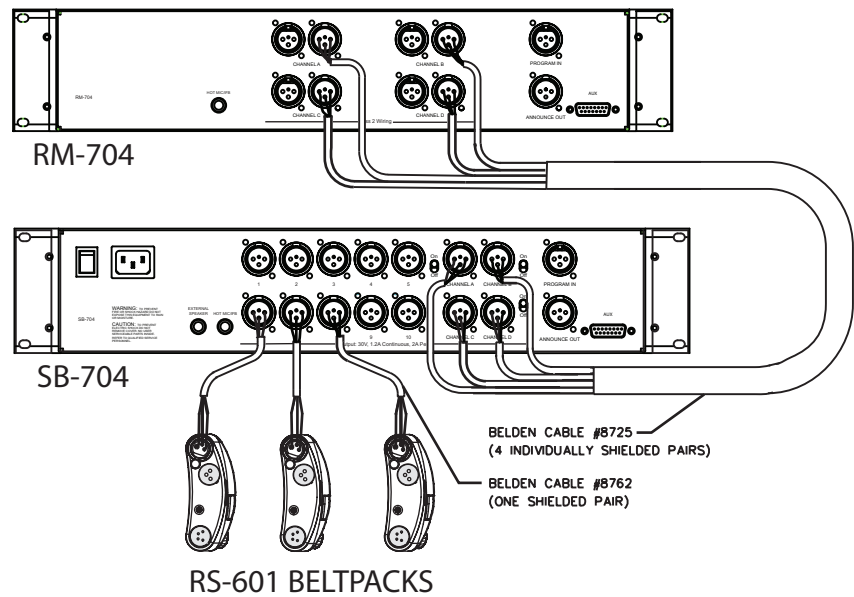


Figure 2-5: Typical Mixed System Wiring

PHYSICAL INSTALLATION

You can install the SB-704 in a standard equipment rack, or you can use it as stand-alone unit sitting on a table or desk. For installing in an equipment rack, the unit requires 3.5 in. (8.89 cm or 2RU) of rack space. The stations are 10.5 in. (26.67 cm) in depth and require at least 2.5 in. (6.35 cm) clearance in the rear to clear connectors and cables.

DESCRIPTION OF CONNECTORS

HEADSET CONNECTOR (FRONT PANEL)

Note: The following is a description of a recommended headset.

Mic Type --- Dynamic, see technical specifications for details

Wiring:

- Pin 1 --- Mic common
- Pin 2 --- Mic hot
- Pin 3 --- Headphone common
- Pin 4 --- Headphone hot

Note: Do not tie pin #1 and pin #3 together.

PANEL MIC CONNECTOR (FRONT PANEL)

Two plug-in panel microphones are available for use on the SB-704. The GM-9 is 9 in. (23.04 cm) long and GM-18 is 18 in. (46.08 cm) long. The microphone

is of the electret type. The microphone has a built-in 0.25-in. (0.64 cm) phone jack for a connector. A proprietary mating receptacle is mounted on the station.

To install a GM-9 or GM-18 panel mount microphone:

1. Check the set screw in the mic mounting flange to make sure it is clear of the threads in the bushing.
2. Screw the microphone into the bushing hand tight.
3. If desired, set the set screw on top of the bushing to lock the mic in place.

INTERCOM LINE CONNECTORS (REAR PANEL)

The SB-704 has a single male XLR-3 connector for each intercom line. The ten switched intercom lines also have male XLR-3 connectors. The pinout of the intercom connectors is as follows:

Pin 1 --- Ground (Shield)

Pin 2 --- Power

Pin 3 --- Audio

PROGRAM INPUT (REAR PANEL)

A XLR-3F connector provides the main program input to the station. This input is fed to the front panel *program level* control for listening in the headphones or speaker and optionally it can be fed to each of the intercom lines with the option DIP switches marked *program select A-D*. Another option is to feed program audio to the *announce* output. This is selected by setting jumper *J11* on the main board to the *on* position.

Separate program inputs are also available for each channel via the *accessory DB-15* connector. Refer to the section on that connector for details. The pinout of the *program input* connector is as follows:

Pin 1 --- Ground (Shield)

Pin 2 --- - Signal

Pin 3 --- + Signal

ANNOUNCE OUTPUT (REAR PANEL)

A XLR-3M connector provides the *announce* output from the station. Whenever the *announce* button on the front panel is pressed, the selected microphone is sent to the announce output and the announce relay is activated. Simultaneously, if the program audio feed to the announce output is enabled, it is interrupted by the announcement. Program audio feed to the announce output is selected by setting jumper *J11* on the main board to the *on* position. Refer to the section on the *accessory* connector for instructions on connecting to the relay contacts.

The pinout of the *announce* output connector is as follows:

Pin 1 --- Ground (Shield)

Pin 2 --- - Signal

Pin 3 --- + Signal

The signal level is 0 dBu and transformer isolated.

IFB/HOT MIC (REAR PANEL, 1/4-INCH PHONE JACK)

A ¼ in. (0.64 cm) phone jack marked *IFB/hot Mic* provides an output signal from the selected microphone. This output is also intended to work with Clear-Com's IFB system. Consult the factory for installation instructions.

The jack connections are as follows:

Tip --- Hot mic output

Ring --- Control signal in

Sleeve --- Ground

EXTERNAL SPEAKER (REAR PANEL, 1/4-INCH PHONE JACK)

A ¼ in. (0.64 cm) phone jack marked *external speaker* provides the power amplifier output of the station intended for driving an external speaker. The jack connections are as follows:

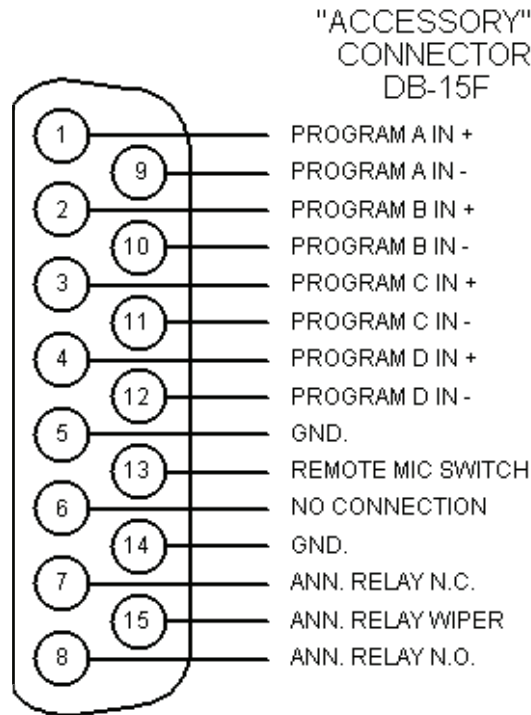
Tip --- Speaker amplifier output

Ring --- No connection

Sleeve --- Ground

ACCESSORY (REAR PANEL, DB-15F)

The *accessory DB-15F* connector on the rear panel provides auxiliary program inputs for each channel, *remote mic on/off* input, *line level* output, and *announce relay* contacts. The pin assignments of the connector are as follows:



Viewed from the rear of the connector

Figure 2-6: Accessory Connector DB-15F - Rear View

Auxiliary Program Inputs

Four different program inputs, one for each channel, are provided. These auxiliary program inputs can only be fed directly to their associated intercom line. The only controls that affect these inputs are the *PGM level* controls associated with each channel and the internal *program interrupt* switch which is active if the function has been activated with an option DIP switch and a talk is active on that channel.

Refer to the illustration for connection of the program inputs. Pins #5 or #14 can be used for connecting shields.

Remote Mic On/Off Switch

An external *momentary* pushbutton switch connected to pins #5 and #13 will duplicate the action of the front panel *mic on/off* switch.

Announce Relay Contacts

A relay is provided that activates when the *announce* button is pressed and its contacts are available on the *accessory* connector. The relay contacts are rated for 2.0 amps of DC current at 24 VDC and are electrically isolated from the rest of the station.

INTERNAL OPTION JUMPERS

There are several jumper options inside the chassis of the SB-704. To access these options remove the top cover of the unit.

Note: Remove AC power from the unit before removing the top cover.

Note: This adjustment should only be carried out by qualified service personnel.

The following options are available:

- IFB Operation Mode Select
- Run/Test Mode Jumper
- Power source selection for switchable intercom lines
- Program Audio Feed to Announce Output

IFB MODE

The SB-704 supports two different modes of operation for the internally generated IFB function. J10 on the main PC board (in the lower left hand corner of the board just behind the DIP switches) selects this mode. If an interrupt enable DIP switch is enabled for a channel, the operation will be as follows:

- **LOCAL (Talk Function Activated):** Jumper between Pins #1 and #2, factory default. When a talk is active on the channel on which the interrupt has been enabled, the program will be interrupted for the duration of the talk.
- **REMOTE (Call Signal Activated):** Jumper between pins #2 and #3. When a call is received on the channel on which the interrupt has been enabled, the program will be interrupted for the duration of the call signal on that channel. To cause an interrupt of the program from this station a call signal must be sent by pressing the call button or enabling the auto-call DIP switch option for that channel and activating a talk on that channel.

RUN/TEST MODE JUMPER

The J2 jumper on the main printed circuit board allow a factory test mode to be invoked and should never be used for normal intercom operation.

CAUTION: Do not move these jumpers. Moving these test jumpers may cause the SB-704 not to operate. Possible damage to the product may result.

PROGRAM AUDIO FEED TO ANNOUNCE OUTPUT JUMPER

J11 on the main board allows program audio to be fed to the announce output. This is selected by setting jumper J11 to the *on* position. In this mode, pressing the *announce* pushbutton turns off the program audio feed to the announce output and replaces it with audio from the selected panel or headset microphone.

The factory default position for J11 is in the *off* position, blocking program audio feed from the announce output.

POWER SOURCE SELECTION FOR SWITCHABLE INTERCOM LINES

The power pins (pin #2) of the ten switchable intercom connectors are connected together in two groups of five. Internal jumpers on the rear-panel PCB board allow the selection of the source of power for each of these groups. Either of the groups can be powered from channels *A*, *B*, *C*, or *D*'s power feed to the main intercom lines.

As shipped from the factory, the first five (channels #1 - #5) are powered from channel *A*'s power and the second five (channels #6 - #10) are powered from channel *B*'s power.

A jumper field in the middle upper portion of the rear panel printed wiring board has been provided for changing the power source of the switchable intercom lines.

To change the factory default setting, refer to the illustration below.

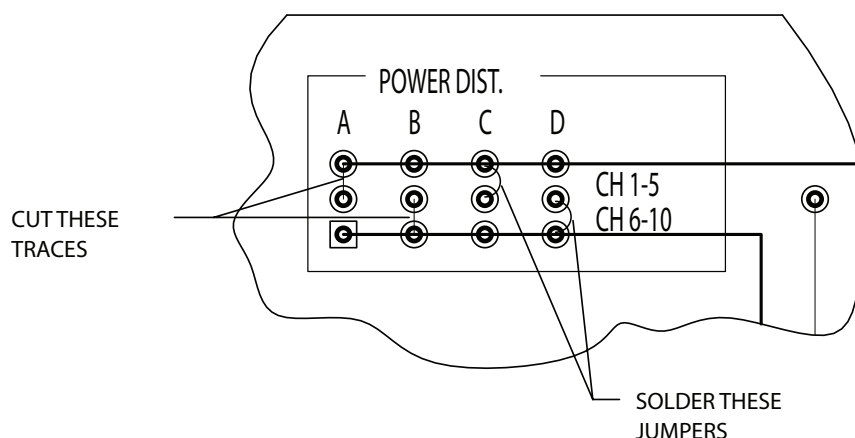


Figure 2-7: Jumper Fields

If the first bank (channels #1 - #5) are to be changed, cut the PCB trace (between the top pad marked *A* and the center pad just below it) with a knife or scraping tool, then solder a wire jumper between one of the top pads marked *A*, *B*, *C*, or *D* to the pad just below it (depending on which channel the power is to come from).

If the second bank (channels #6 - #10) are to be changed, cut the PCB trace (between the bottom pad marked *B* and the center pad just above it) with a knife or scraping tool, then solder a wire jumper between one of the bottom pads marked *A*, *B*, *C*, or *D* to the pad just above it (depending on which channel the power is to come from).

3 MAINTENANCE

INTRODUCTION

This chapter provides maintenance information, including a block diagram and troubleshooting tips.

Caution: These servicing instructions are for use by qualified personnel only. To reduce the risk of electrical shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

SB-704 BLOCK DIAGRAM

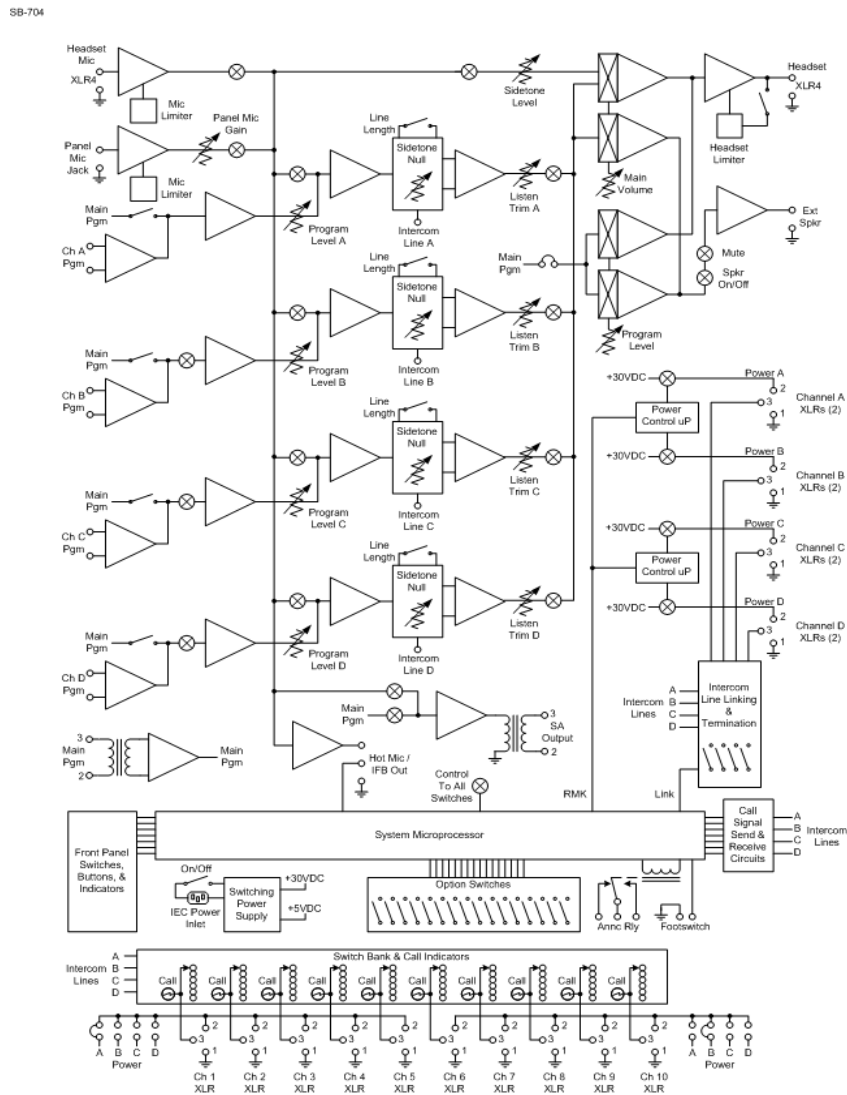


Figure 3-8: SB-704 Block Diagram

4

TECHNICAL SPECIFICATIONS

SB-704 MAIN STATION

dBu is an absolute measurement. 0 dBu is referenced to 0.775 volts RMS

Panel Microphone Input

| | |
|-----------------------|-----------------|
| Input Type | Electret |
| Input Impedance | $\geq 2K\Omega$ |
| Mic Limiter Threshold | 0dBu \pm 3dB |
| Mic Limiter Range | ≥ 15 dB |

Headset Microphone Input

| | |
|-----------------------|-----------------|
| Input Type | Dynamic |
| Input Impedance | $\geq 1K\Omega$ |
| Mic Limiter Threshold | 0dBu \pm 3dB |
| Mic Limiter Range | ≥ 15 dB |

Program Line Input

| | |
|-------------------------------|-----------------|
| Maximum Level before Clipping | ≥ 20 dBu |
| Input Impedance | $\geq 5K\Omega$ |

Headset Output

| | |
|--|-----------------|
| Load Impedance | $\geq 8\Omega$ |
| Output Impedance | $\leq 25\Omega$ |
| Output Limiter Threshold | +5dBu \pm 3dB |
| Maximum Output Level before Distortion | ≥ 17 dBu |

Speaker Output

| | |
|---------------------------------------|------------------|
| Load Impedance | $\geq 4\Omega$ |
| Max Output Level before 1% Distortion | 20dBu \pm 2dBu |

Party Line Output

| | |
|------------------|---------------|
| Off Noise | < -74 dBu |
| Output Impedance | $> 10K\Omega$ |

Party Line Input

| | |
|---------------------------|---------------|
| Crosstalk | < -60 dB |
| Max level before Clipping | ≥ 12 dBu |
| Sidetone Null Capability | > 25 dB |

Stage Announce/Balanced Line Out

| | |
|------------------|------------------|
| Type | Balanced |
| Output Impedance | $\geq 200\Omega$ |
| Load Impedance | $\geq 600\Omega$ |

IFB/Hot Mic

| | |
|------------------|---------------------|
| Type | Unbalanced |
| Output Impedance | 150 Ω |
| Load Impedance | \geq 600 Ω |

Frequency Response

| | |
|-----------------------------|-----------------------|
| Panel Mic - Party Line | 600 - 10KHz \pm 3dB |
| Headset Mic - Party Line | 200 - 12KHz \pm 3dB |
| Headset Mic - Line Out | 200 - 12KHz \pm 3dB |
| Program Input - Party Line | 100 - 17KHz \pm 3dB |
| Program Input - Headset Out | 200 - 10KHz \pm 3dB |
| Program Input - Speaker Out | 300 - 10KHz \pm 3dB |
| Party Line - Headset Out | 200 - 10KHz \pm 3dB |
| Party Line - Speaker Out | 300 - 10KHz \pm 3dB |

Max Distortion

| | |
|-----------------------------|-------------|
| Panel Mic - Party Line | \leq 0.5% |
| Headset Mic - Party Line | \leq 0.5% |
| Headset Mic - Line Out | \leq 0.5% |
| Program Input - Party Line | \leq 0.2% |
| Program Input - Headset Out | \leq 0.2% |
| Program Input - Speaker Out | \leq 0.5% |
| Party Line - Headset Out | \leq 0.2% |
| Party Line - Speaker Out | \leq 0.5% |

Noise

| | |
|-----------------------------|------------|
| Panel Mic - Party Line | $<$ -65dBu |
| Headset Mic - Party Line | $<$ -70dBu |
| Headset Mic - Line Out | $<$ -55dBu |
| Program Input - Party Line | $<$ -85dBu |
| Program Input - Headset Out | $<$ -60dBu |
| Program Input - Speaker Out | $<$ -60dBu |
| Party Line - Headset Out | $<$ -50dBu |
| Party Line - Speaker Out | $<$ -50dBu |

Max Gain

| | |
|-----------------------------|----------------|
| Panel Mic - Party Line | \geq 37dB |
| Headset Mic - Party Line | 41dB \pm 2dB |
| Headset Mic - Hot Mic Out | 55dB \pm 3dB |
| Headset Mic - Announce Out | 55dB \pm 3dB |
| Program Input - Party Line | \geq -16dB |
| Program Input - Headset Out | \geq 18dB |
| Program Input - Speaker Out | \geq 24dB |
| Party Line - Headset Out | \geq 34dB |
| Party Line - Speaker Out | \geq 40dB |

Min Gain

| | |
|------------------------|-------------|
| Panel Mic - Party Line | \leq 25dB |
|------------------------|-------------|

Mains Power

| | |
|--|---|
| Input Voltage Range | 100 - 240 VAC |
| Input Frequency Range | 50 - 60 Hz |
| Input Power | <= 60 VAC |
| Output Voltage | 30 VDC \pm 0.5V |
| Output Current per Channel (Continuous) | 1.2 A |
| Output Current per Channel (Peak) | 2 A (Do not exceed the 1.2A rating for more than 2 seconds per 1 minute period) |
| Short Circuit Recovery Time (1st short) | <= 0.5 sec |
| Short Circuit Recovery Time \geq 20 shorts in 20sec) | <= 20 sec |

Station Capacity

Up to 40 RS-601 beltpacks or 10 speaker stations or 12 headset stations distributed over all channels

Rear Panel Connectors

| | |
|--------------------------|----------------------------------|
| Switched Intercom: | (10) XLR-3M (1 per channel) |
| Intercom | (4) XLR-3M (1 per channel) |
| Announce Out: | (1) XLR-3M (audio) |
| Program: In | (1) XLR-3F |
| Hot Mic / IFB Interface: | (1) 1/4 in. (0.64 cm) phone jack |
| External Speaker | (1) 1/4 in. (0.64 cm) phone jack |
| Accessory | (1) DB-15F |
| AC Power: | IEC 320 connector |

Rear Panel Controls

- (1) Power switch
- (4) Intercom On/Off Switches

Front Panel Connectors

| | |
|------------|---|
| Panel Mic: | (1) 1/4 in. (0.64 cm) panel mounting jack |
| Headset: | (1) XLR-4M |

Front Panel Controls & Indicators

- (1) Panel / headset mic switch
- (1) Mic on button
- (1) All talk button
- (1) Announce button
- (1) Party line link button
- (4) Program ON-OFF-INTERRUPT DIP switches
- (1) Program level control
- (4) Listen adjust controls
- (4) Channel null adjust controls

- (4) Channel program feed adjust controls
- (4) Talk buttons
- (4) Call buttons
- (4) Listen buttons
- (1) RMK button
- (1) Speaker ON-OFF switch
- (1) Speaker volume control
- (4) Short LEDs
- (1) Panel mic gain control
- (1) Sidetone adjust control
- (1) Headset audio limiter DIP switch
- (3) Interrupt enable DIP switches
- (4) Auto-call DIP switches
- (4) Auto-talk/listen DIP switches
- (4) Talk latch disable DIP switches
- (4) Line length DIP switches
- (10) Channel Assignment Slide switches

Environmental

32 - 122° F (0 - 50° C)

Dimensions

19 in. W x 3.5 in. H x 10.5 in. D
(483 mm x 88 mm x 267 mm)

Weight

10.93 lbs. (4.97 kg)

Notice About Specifications

While Clear-Com makes every attempt to maintain the accuracy of the information contained in its product manuals, that information is subject to change without notice. Performance specifications included in this manual are design-center specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

LIMITED WARRANTY

Vitec Group Communications (VGC) warrants that at the time of purchase, the equipment supplied complies with any specification in the order confirmation when used under normal conditions, and is free from defects in workmanship and materials during the warranty period.

During the warranty period VGC, or any service company authorized by VGC, will in a commercially reasonable time remedy defects in materials, design, and workmanship free of charge by repairing, or should VGC in its discretion deem it necessary, replacing the product in accordance with this limited warranty. In no event will VGC be responsible for incidental, consequential, or special loss or damage, however caused.

VGC offers 24 x 7 customer support if you have an Extended Warranty or Service Contract.

Return Material Authorization (RMA) numbers are required for all returns.

Both warranty and non-warranty repairs are available.

WARRANTY PERIOD

The product may consist of several parts, each covered by a different warranty period. The warranty periods are:

- Cables, accessories, components, and consumable items have a limited warranty of 90 days.
- Headsets, handsets, microphones, and spare parts have a limited warranty of one year.
- UHF wireless IFB products have a limited warranty of one year.
- UHF wireless intercom systems have a limited warranty of three years.
- All other Clear-Com and Drake brand systems and products, including belt packs, have a limited warranty of two years.

The warranty starts at the time of the product's original purchase. The warranty start date for contracts which include installation and commissioning will commence from the earlier of date of the Site Acceptance Test or three months from purchase.

TECHNICAL SUPPORT

To ensure complete and timely support to its customers, VGC's User Support Center is staffed by qualified technical personnel. Telephone and email technical support is offered worldwide by the User Support Center.

The User Support Center is available to VGC's customers during the full course of their warranty period. Telephone support during the warranty period will be offered at no charge between 09:00 and 17:00 according to the customer's local time zone.

In addition, for customers who purchase an Extended Warranty or Service Contract, 24-hour customer support is offered immediately upon purchase of

such agreement. For more information, contact your authorized dealer, distributor, or sales representative.

Instructions for reaching VGC's User Support Centers are given below.

Telephone for Europe, Middle East and Africa: +49 40 6688 4040

Telephone for the Americas and Asia: +1 510 337 6600

Email: vitec.support@AVC.de

Once the standard warranty period has expired, the User Support Center will continue to provide telephone support if you have purchased an Extended Warranty or Service Contract. In these cases, you will have access to telephone support 24 hours per day, 7 days per week.

WARRANTY REPAIRS AND RETURNS

Before returning equipment for repair, contact a User Support Center to obtain a Return Material Authorization (RMA). VGC representatives will give you instructions and addresses for returning your equipment. You must ship the equipment at your expense, and the support center will return the equipment at VGC's expense.

For out-of-box failures, use the following contact information:

Europe, Middle East and Africa

Tel: +44 1223 815000 Email: customerservicesEMEA@vitecgroup.com

North America, Canada, Mexico, Caribbean & US Military

Tel: +1 510 337 6600 Email: customerservicesUS@vitecgroup.com

Asia Pacific & South America

Tel: +1 510 337 6600 Email: customerservicesAPAC@vitecgroup.com

VGC has the right to inspect the equipment and/or installation or relevant packaging.

NON-WARRANTY REPAIRS AND RETURNS

For items not under warranty, you must obtain an RMA by contacting the User Support Center. VGC representatives will give you instructions and addresses for returning your equipment.

You must pay all charges to have the equipment shipped to the support center and returned to you, in addition to the costs of the repair.

EXTENDED WARRANTY

If you purchase an Extended Warranty, you are also given access free of charge to the User Support Center 24 hours a day, 7 days a week.

You can purchase an extended warranty at any time during the first two years of ownership of the product. The purchase of an extended warranty extends to five

years the warranty of any product offered with a standard two-year warranty. The total warranty period will not extend beyond five years. Any purchase of an extended warranty provides 24 x 7 customer support in addition to the warranty immediately upon purchase of the warranty extension.

Note: VGC does not offer warranty extensions on UHF wireless intercom systems, or on any product with a 1-year or 90-day warranty.

SERVICE CONTRACT

VGC also offers service contracts that provide 24 x 7 telephone support, advance replacements, training, proactive maintenance, on-site visits, and no charge for repair or replacement of equipment. For more information, contact your authorized dealer, distributor, or sales representative.

LIABILITY

THE FOREGOING WARRANTY IS VGC'S SOLE AND EXCLUSIVE WARRANTY. THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY OTHER REQUIRED IMPLIED WARRANTY SHALL EXPIRE AT THE END OF THE WARRANTY PERIOD. THERE ARE NO OTHER WARRANTIES (INCLUDING WITHOUT LIMITATION WARRANTIES FOR CONSUMABLES AND OTHER SUPPLIES) OF ANY NATURE WHATSOEVER, WHETHER ARISING IN CONTRACT, TORT, NEGLIGENCE OF ANY DEGREE, STRICT LIABILITY OR OTHERWISE, WITH RESPECT TO THE PRODUCTS OR ANY PART THEREOF DELIVERED HEREUNDER, OR FOR ANY DAMAGES AND/OR LOSSES (INCLUDING LOSS OF USE, REVENUE, AND/OR PROFITS). SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES OR THE LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. IN ANY EVENT, TO THE MAXIMUM EXTENT PERMITTED UNDER APPLICABLE LAW, VGC'S LIABILITY TO CUSTOMER HEREUNDER SHALL NOT UNDER ANY CIRCUMSTANCES EXCEED THE COST OF REPAIRING OR REPLACING ANY PART(S) FOUND TO BE DEFECTIVE WITHIN THE WARRANTY PERIOD AS AFORESAID.

This warranty does not cover any damage to a product resulting from cause other than part defect and malfunction. The VGC warranty does not cover any defect, malfunction, or failure caused beyond the control of VGC, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the manual, defective or improperly associated equipment, attempts at modification and repair not approved by VGC, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

This warranty does not include defects arising from installation (when not performed by VGC), lightning, power outages and fluctuations, air conditioning failure, improper integration with non-approved components, defects or failures

of customer furnished components resulting in damage to VGC provided product.

This limited warranty is not transferable and cannot be enforced by anyone other than the original consumer purchaser.

This warranty gives you specific legal rights and you may have other rights which vary from country to country.