CLEAR-COM ENCORE

SYSTEM INSTALLATION

INSTRUCTION MANUAL

Encore System Installation Instruction Manual

Part Number 810229Z Rev. 4

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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 produces heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades, with one blade 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 speaker 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 Clear-Com Encore product line 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.

INTRODUCTION

Congratulations on choosing Clear-Com products. Clear-Com was established in 1968 and remains the market leader in providing intercom for entertainment, educational, broadcast and industrial applications. The ruggedness and high build-quality of Clear-Com products is the industry standard. In fact, many of our original beltpacks and Main Stations are still in daily use around the world.

We recommend that you read through this manual completely to better understand how to install your intercom system. Please pay particular attention to the section on system wiring, as improper wiring detracts from the performance of the system or causes system failure. If you encounter a situation or have a question that this manual does not address, contact your dealer or call Clear-Com direct at the factory. Our applications support and service people are standing by to assist you. 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 both 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 beltpacks and loudspeaker stations.

Clear-Com is a distributed amplifier system; each Main or Remote Station houses its own microphone 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 system. 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 (or individually shielded multi-pair cable as required). Portable stations are connected with 2 conductor cables with 3-pin XLR connectors. One wire, connected to pin 2, carries the DC power from a Main Station or Power Supply to all Remote Stations. The other wire, connected to pin 3, carries the 2-way (duplex) audio information. The shield, connected to pin 1, 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. Certain stations also have an audible Tone Alert feature which can be useful for this purpose.

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.

POWER DISTRIBUTION AND SHORT CIRCUIT PROTECTION

A Main Station or Power Supply is the heart of an intercom system. It has special features which are not found in traditional designs. It must supply low-noise DC current to multiple intercom lines. It must continue to operate 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.

Use the chart on this page to determine how many Speaker Stations and Beltpacks can be powered in varying combinations by a Main Station or Power Supply. Additional power supplies can be connected for additional power capability if required by the application. The current requirements of Clear-Com Remote Stations and Beltpacks vary with model and use. A station which is simply "'on" and not being used may draw only a small amount of current. Contact your dealer or Clear-Com if you require further assistance in determining the overall current requirements of your system.

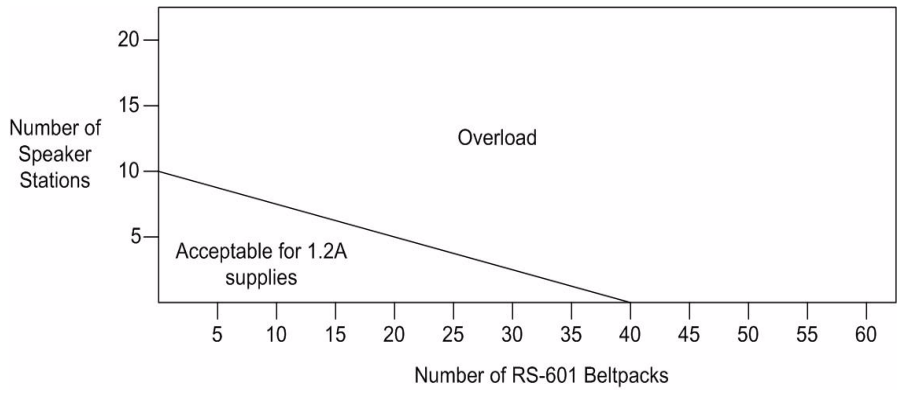

Figure 1-1: Power Supply Loading

For example, the MS-702 provides DC power to operate Clear-Com beltpacks and remote stations. The power is distributed between the two channels and will support up to 40 RS-601 beltpacks or 10 speaker stations or 12 headset stations.

Clear-Com's fail-safe design automatically shuts down the power to a channel when a short circuit or electronic overload is sensed on that channel. The other channel will continue to operate normally. Once the fault condition is removed, the MS-702's fail-safe circuit will restore power, even under full load conditions. LED indicators signal a short or overload on either channel.

The DC power output details are:

- 1.2A continuous output
- 2A peak output (not exceeding the 1.2A rating for more than 2 seconds per 1 minute period)

The station 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:

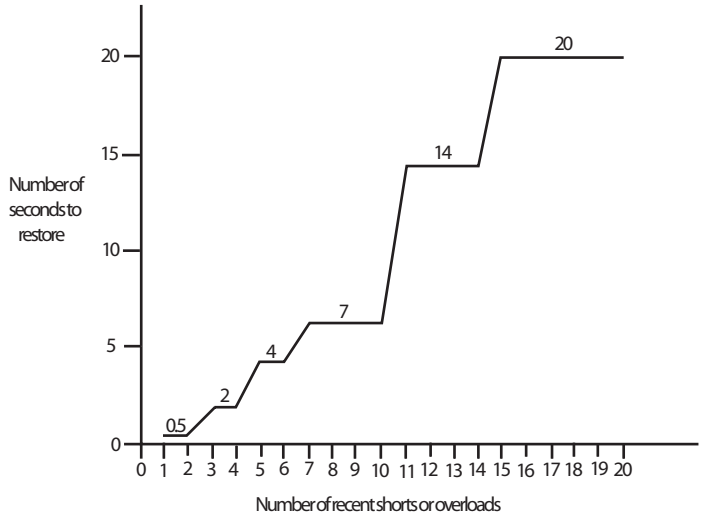

Figure 1-2: Automatic Power Restore Times

Shorts are generally caused by miswiring or damaged cables. Overloads are generally caused by connecting too many beltpacks and stations to a channel.

INSTALLING AN INTERCOM SYSTEM

When considering how to install and wire an intercom system, several factors must be taken into account. These include the number of stations, the length of the cable runs and whether single or multiple

channels are required. If multi-channel stations are connected with multi-pair cables, then crosstalk becomes an important issue. Crosstalk is not a factor with single-channel systems or multi-channel systems where each channel is run on its own individual cable to single-channel Remote Stations. While the physical considerations include ease of installation, type of cabling, station location, etc., the electrical considerations are concerned primarily with the capacitance between conductors on the intercom line, and the DC resistance in the ground return of the intercom line.

Note: PIN 1 and the shell of the XLR plug on the interconnect cables should NOT be connected together.

Excessive resistance in the conductors of the cable results in a loss of sidetone null at Remote Stations, and some overall loss of level. Excessive resistance in the ground conductor or shield greatly increases crosstalk between channels. This can significantly affect the performance of multi-channel systems.

SINGLE-CHANNEL SYSTEM

In a single-channel system, there are two general methods of wiring Remote Stations to the Power Supply. Any one method may be used exclusively in a small system, and both may used in various combinations for a larger system.

1. **Daisy Chain:** Remote stations are wired from one station to the next and so on along each line connected to a Main Station. This requires the least amount of cable, but may be impractical due to the system layout. Also, if a break occurs in the line, all stations down line of the break will be disconnected from the party line.

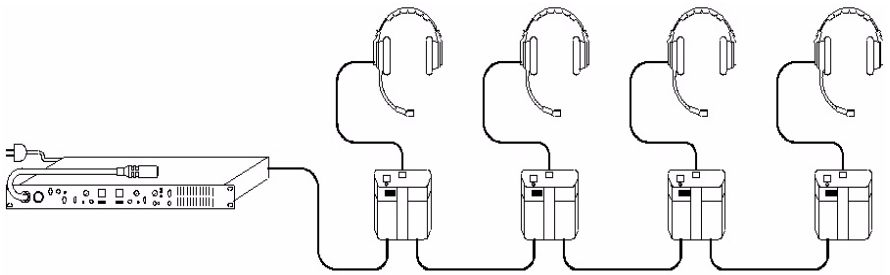

Figure 1-3: Party Line Daisy Chain

2. **Hub or Star:** Each Remote Station is wired directly back to a Main Station or to a split of a line wired directly to a Main Station.

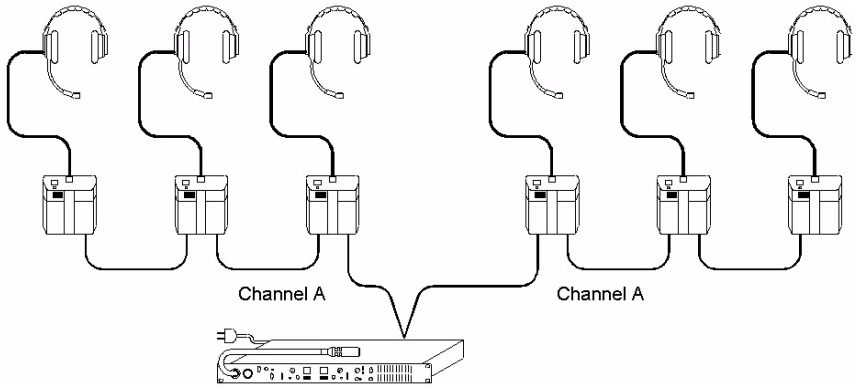

Figure 1-4: Party Line Hub Configuration

MULTI-CHANNEL SYSTEM

In a multi-channel system where each channel is run on its own cable and connected only to single channel Remote Stations as in the following diagram, there are no crosstalk issues because the channels do not share a common ground. Consult the table in the next section for cable recommendations.

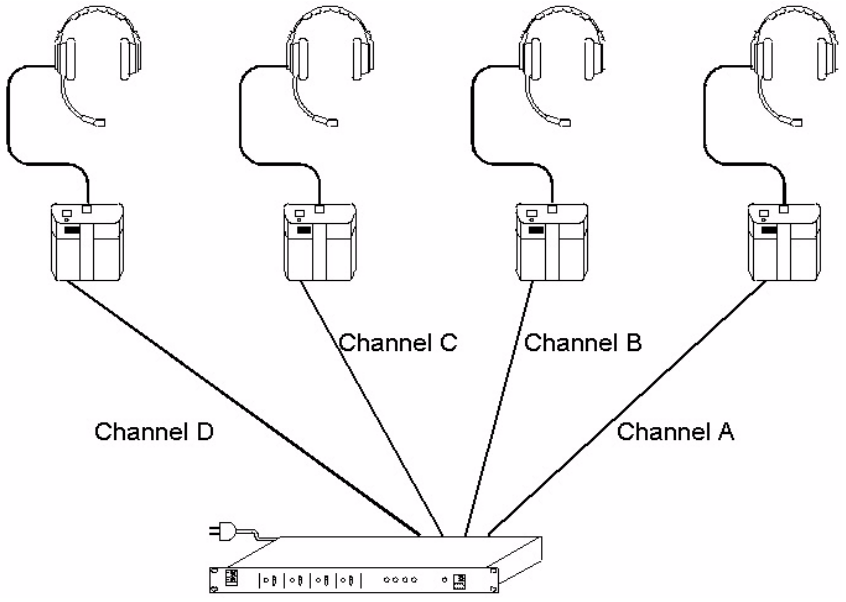

Figure 1-5: Multi-Channel Party Line

It is also important to centrally locate the multi-channel Main Station or Power Supply containing the termination. Crosstalk does not exist at the termination point, but can increase in proportion to the length of the wiring to multi-channel stations. If the termination is centrally located and the wiring length guidelines in the following section are adhered to, then crosstalk will be at a minimum.

CROSSTALK CONSIDERATIONS IN A MULTI-CHANNEL SYSTEM

In a multi-channel system where multiple channels are run from a Main Station to a Remote Station as in the following diagram, crosstalk can be an issue. This is because the channels will share a common ground at both ends of the cable run.

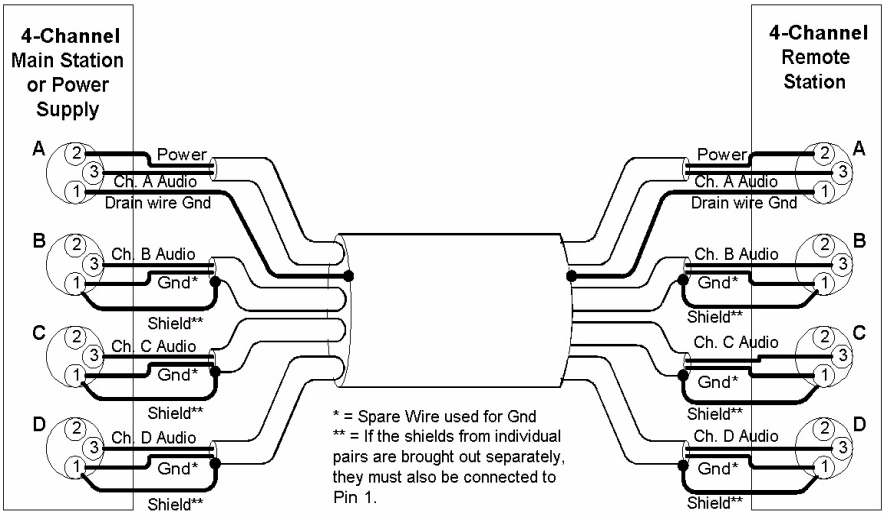

Figure 1-6: Party Line Multi-Channel Configuration

When multiple channels are fed to Remote Stations, the amount of crosstalk between channels is proportional to the DC resistance of the ground return path back to the channel terminations. To minimize this crosstalk between channels when running more than one channel in a multi-pair cable, keep the DC resistance of the ground return as low as possible. Ideally, this should be less than 2 Ohms. This can be achieved as follows:

- Keep cable runs under 500 feet. If a longer cable run is unavoidable and approaches 1000 feet or more, make sure the appropriate lone line option switches or jumpers are set in the stations. Refer to the individual station manuals for further information.
- Use a cable whose common shield has a low DC resistance.
- Connect unused cable wires of a multi-pair cable to the Pin 1 shield.

Note: All multi-pair cables must have individually shielded pairs.

Clear-Com recommends the Belden 1800 Series of multi-pair cables. They offer a common shield with a low DC resistance in addition to individual shields on each pair.

The performance of a Clear-Com system depends upon the use of Clear-Com or Clear-Com approved compatible headsets. Use of headsets other than these can induce crosstalk into a multi-channel system through the headset cable. Clear-Com also recommends against the use of headset extension cables or headset "Y" cables, as they will increase crosstalk into a multi-channel system.

INTERCOM CABLE CONSIDERATIONS

The Clear-Com intercom line is intended to run on one shielded cable pair per intercom channel. One conductor carries audio, and the other conductor carries the DC power for Remote Stations. The shield serves as the ground return for the audio and power conductors. When choosing interconnect cable, keep the following considerations in mind:

- **Keep cable runs under 500 feet.** The DC resistance of the ground or common conductor affects crosstalk. For permanent installation runs longer than 500 feet, do not use wire smaller than 20 gauge. The capacitance of the interconnect cable affects system frequency response and sidetone stability. Total capacitance should not be greater than 0.25 uF.
- **Ground Isolation:** The Pin 1 ground connection of each XLR connector must be isolated from the chassis. Pin 1 should not be connected to the shell of the XLR connector.
- **Multi-pair Cable:** Individually shielded multi-pair cable is acceptable for use in multi-channel systems. For crosstalk considerations the shields must be tied together on both ends of the cable to produce the lowest possible DC resistance path for the ground return.
- **Suggested Cable Types:** The following chart lists the specifications of various BELDEN cables:

BELDEN SHIELDED CABLES

Trade #	# of Pairs	AWG & Stranding	Nom. O.D. (inch)	Nom. Cap. (pF/ft)	Shield Nom. D.C.R. (Ohms)	Max.* Cable Run (ft)	Recommended Application
8412.000	1.000	20 (26x34)	0.268	30.000		5000.000	Portable
8762.000	1.000	20 (7x28)	0.196	27.000		5000.000	Permanent (short)
8760.000	1.000	18 (16x30)	0.222	24.000		5000.000	Permanent (long)
1814A	2.000	22 (7x30)	0.319	31.000	3.9 Ω/M'	1500.000	Permanent
1815A	4.000	22 (7x30)	0.384	31.000	3.9 Ω/M'	1500.000	Permanent
1817A	8.000	22 (7x30)	0.503	31.000	3.6 Ω/M'	1500.000	Permanent
1818A	12.000	22 (7x30)	0.889	31.000	3.4 Ω/M'	1500.000	Permanent

Table 1-1: Belden Shielded Cables

Note: For better than 50 dB channel crosstalk

- **Portable Installation Cable:** Practical cable for portable system interconnections is flexible, two-conductor, shielded microphone cable. We suggest using BELDEN #8413 (24 Gauge). For runs longer than 500 feet use a 20 gauge cable or larger (BELDEN #8412).
- **Permanent Installation Cable:** Vinyl-jacketed shielded pair is the cable of choice for permanent installations. Placing the cable in conduit is recommended but not necessary.

INSTALLING THE STATIONS

First, choose the location for the Main Station or Power Supply. These units require access to AC power. They should be located away from other equipment that generates excessive amounts of heat. Also, choose locations for each Remote Station and Speaker Station. Choose general locations and areas of use for the beltpacks. Determine the locations for other Clear-Com equipment which will connect to the intercom lines. The choice of location will depend upon and often define the wiring scheme. It is very helpful to create a drawing showing where each component will be located as well as where the wiring will run.

CONNECTIONS

The following sections describe the connections provided on the intercom stations:

- **Intercom Line Connection:** The rear panel of Main Stations, Power Supplies, Remote Stations, and other stations contain between one and three 3-pin male XLR connectors for each

intercom line. These connectors are wired in parallel. Any single-channel station or channel of a multi-channel station connected on a line plugged into Channel A of the a Main Station will be "party-lined" with all the other stations on that channel. In a multi-channel system, the goal is to assign specific people to the correct group, i.e. the other people they need to be in contact with the most. This is particularly important when the party line users are on a single-channel beltpack or station; less so if they are on multi-channel stations. The pinout of the intercom connectors is as follows:

- Pin 1 --- Ground (Shield)
- Pin 2 --- Power
- Pin 3 --- Audio

- **Line Termination:** The fundamental concept of Clear-Com Party-Line intercom is that all channels are terminated in one location, preferably at a Main Station or Power Supply.

Note: All intercom lines must be terminated. Care must be taken not to '"double-terminate" a line. All unused intercom lines must also be terminated.

Switching of the channel terminations ON and OFF is done with switches or jumpers on the Main Station. In most systems, the terminations should be in the ON position (default setting). Clear-Com Power Supplies also provide switch-selectable termination networks on all intercom lines. Refer to the User manual for the specific Main Station or Power Supply for the exact location. It is up to the user to ensure that the terminations are set correctly. An unterminated line will cause excessive levels, possible oscillation of line drivers, and squealing in the headsets. An intercom line with double or multiple terminations will cause low levels and the inability to null the headsets.
The termination switches on a Main Station should be set to the OFF position only if the channel is terminated by another Main Station or Power Supply in the system. **If there are no other Main Stations or Power Supplies terminating the line, the termination switch on each channel of the Main Station should be switched to ON.**

- **Headset Connector:** The headset connector is located on the front panel of all stations. Clear-Com headsets are recommended, but others can be used if they meet the following requirements:
  - Mic Type --- Dynamic; 150 to 250 ohms impedance; -55 dB output level
  - Headphone --- Dynamic; 50 to 2000 ohms impedance

The wiring of the headset is to be as follows:

- Pin 1 --- Mic common

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

The mic and headphone wiring in the headset cord must be individually shielded. **Do not connect Pins 1 and 3 together.** Headset extension cords or headset "Y" cables are not recommended because they will increase crosstalk between channels.

- **Panel Mic Connector:** Clear-Com recommends the GM-9 and GM-18 plug-in panel microphones for use with all stations having a panel mic connector. The GM-9 is 9 inches long and the GM-18 is 18 inches long. The microphone is an electret type. The 1/4 inch phone jack on the microphone mates with the Panel Mic receptacle on the front panel.

To install a GM-9 or GM-18 microphone, use the following steps:

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. Set the set screw on top of the bushing to lock the microphone in place.

- **Hot Mic Out / IFB System:** Some Main and Remote Stations have an interface to the External Line In jack on Clear-Com's IFB System. This connection is a 1/4 inch phone jack on the rear panel. It provides a 0 dBu output signal from the selected headset or panel microphone on the station. It connects using a standard 2-wire and shield stereo 1/4 inch plug-to-plug cable such as the Clear-Com P/N 73016501 (18 inch) or P/N 73016502 (5 foot). It allows the station's microphone to be used to cue talent through the IFB System. A control signal sent into this connector from the IFB System can optionally disconnect the station's microphone from the intercom line(s). The jack is wired as follows:
  - Ring --- Ext. IFB Control Signal Input
  - Tip --- Hot Mic Audio Output
  - Sleeve --- Ground (Shield)
- **Stage Announce Output:** Some Main and Remote Stations have a 3-pin XLR male connector on the rear panel to feed into a studio PA. Pressing the Announce button on the front panel places the audio from the selected headset or panel microphone on the rear panel connector. Optionally, pressing the Announce button can also disconnect the selected headset or panel microphone from the intercom line(s). This option is controlled by the Interrupt Announce option switch. 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 a jumper on the Main board to the ON position. The pinout of the Announce Out connector is as follows:

- Pin 1 --- Ground (Shield)
- Pin 2 --- - Signal
- Pin 3 --- + Signal

The audio output is balanced and transformer isolated. It has a 600 ohm impedance and a nominal output level of 0 dBu. A shielded twisted pair cable should be used in the cable wired to this connector.

- **Relay Out:** On Main and Remote Stations with an Announce button, a dry set of relay contacts is provided through a 1/4 inch jack or screw terminals on the rear panel. These contacts can activate an external device such as a PA amplifier to another room. The contacts are rated for 2.0 Amps at 24 VDC. If screw terminals are provided on the Main Station, their connections are labeled N/C, C and N/O. The 1/4 inch jack is wired as follows:
  - Ring --- Normally Closed Contact --- N/C
  - Tip --- Common Contact --- C
  - Sleeve --- Normally Open Contact --- N/O
- **Program Input:** A 3-pin XLR female connector on most Main Stations and Power Supplies provides the program input to the intercom system. The Program Input accepts a balanced or unbalanced line-level audio signal from -20 dBu to +10 dBu. There is an option to feed program audio to the Announce Output. This is selected by setting a jumper on the Main board to the ON position. When this option is selected, a 0 dBu signal on the Program Input will produce a 0dBu signal on the Announce Output.

The pinout of the Program Input connector is as follows:

- Pin 1 --- Ground (Shield)
- Pin 2 --- + Signal
- Pin 3 --- - Signal

- **External Speaker:** Some Main Stations provide an 8 ohm external speaker output through a 1/4 inch jack.
- **Auxiliary Connector:** Some Main Stations provide a DB-15 type Auxiliary connector on the rear panel. This allows connection to a variety of devices, depending upon the capabilities and features of that particular Main Station. Refer to the Main Station User Manual for further details on the connections provided.

- **AC Power Connection:** An IEC type 320 connector is provided on most Main Stations and Power Supplies to interface to the appropriate AC power cord to be used. Refer to the chart on the inside back cover of this manual. Main Stations and Power Supplies can either be switched between 115 or 230 VAC operation or will automatically adjust to voltages from 100 to 240 VAC at 50 or 60 Hz. Consult the User Manual for information on the particular unit.

CONFIGURING CLEAR-COM PRODUCTS TO WORK TOGETHER

Clear-Com Intercom Systems are designed to integrate with many other Clear-Com products. The following sections describe some frequently used configurations. Most of these configurations involve the use of Clear-Com's versatile Call signal. This signal travels silently through the intercom wiring and is often used to get the attention of operators who have removed their headsets. However, as the following descriptions show, it can also be used to control a variety of functions.

TW-40/TW-47 Two-Way Radio Interface

The TW-40 is an earlier version of the TW-47 product but both product have the same functionality.

It is often important to link walkie-talkies into an intercom system to extend communication to remote persons. The TW-47 Two-Way Radio Interface connects between an intercom line and a variety of walkie-talkies, using one walkie-talkie as a base station. Refer to the TW-47 Instruction Manual for details describing the connection of the TW-47. To interface with the TW-47, the option switches of the Main or Remote Station must be set as follows:

- Enable the Momentary Talk option switch or jumper on the appropriate channel of the Main or Remote Station. Refer to the User Manual for the Main or Remote Station to locate this switch or jumper. This will cause the Talk button to have a momentary only action and not latch.
- Enable the Call on Talk option switch or jumper on the appropriate channel of the Main or Remote Station. Again, refer to the User Manual for the Main to locate this switch or jumper. This will cause the Call signal to be activated whenever the Talk button is held down.

When the Talk button is depressed, the Call signal will be activated, causing the transmitter connected to the TW-47 to be keyed. Audio on the intercom line will then be transmitted over the two-way radio. When the Talk button is released, the Call signal will disappear and audio from the receiver of the two-way radio will appear on the intercom line, allowing a reply.

KB-112/KB-212/KB-701 Speaker Station

KB-112, KB-212 and KB-701 stations are all sucessive models of single channel speaker stations with similar functionality. In the following description the current model KB-701 is cited but the functionality is similar or identical on the earlier stations.

The KB-701 Speaker Station provides intercom communication capability in places where wearing a headset is not feasible. It can be optioned for several remote control functions. Refer to the appropriate Instruction Manual for details on setting the option switches.

A Main or Remote Station can control the microphone on a KB-701 set to Remote Listen operating mode, allowing the KB-701 operator to talk "hands free." When the option switches of the KB-701 are set to this mode, depressing the Call button on the Main or Remote Station will turn on the microphone of the KB-701. Care must be taken in the design of the intercom system to make sure that the call signal will not be needed for other functions on the same channel. For example, it would not be possible to interface *both* the TW-47 and a KB-701 in Remote Listen mode on the *same* intercom channel. In this case, separate intercom channels should be used for each interface.

The KB-701 also has Remote Page and Remote Listen-Page modes. In these modes, the speaker of the KB-701 can be turned on by a Call signal from the Main Station. The flexibility of Clear-Com Main and Remote Stations allows the following variations on these modes:

- A Main or Remote Station can be used to talk to other intercom stations, and enable the KB-701 speaker only when necessary. To talk to all intercom stations *except* the KB-701, press the Main or Remote Station Talk button. To talk to the KB-701 as well, press *both* the Call and Talk buttons.
- A Main or Remote Station can enable the KB-701 speaker *whenever* the operator is talking to other intercom stations. Set the Call on Talk option switch or jumper for the channel the KB-701 is on. This will cause the Call signal to be activated whenever the Talk button is held down. This will have the effect of turning on the KB-701 speaker whenever the Talk button is pressed. If it is preferable to prevent the Talk button from latching, set the Momentary Talk option switch or jumper for that channel to the ON position. This will cause the Talk button to have a momentary only action and not latch.

RM-220/RM-702 Remote Station

RM-220 and RM-702 stations are sucessive models of two channel remote stations with similar functionality. In the following description the current model RM-702 is cited but the functionality is similar or identical on the earlier station.

A Main Station, such as the MS-232 or MS-702can be configured to provide program audio on a channel but allow this audio to be interrupted whenever the Talk button for that channel is pressed. If a Remote Station, such as the RM-220 or RM-702 is used along with the Main Station in this configuration, it can be important to have the program audio interrupted by the operator of either station. To do this, the Main or Remote Stations must be set up as follows:

- Enable the Momentary Talk option switch or jumper on the appropriate channel of the Main and Remote Stations. Refer to the User Manual for to locate this switch or jumper. This will cause the Talk button to have a momentary only action and not latch.
- Enable the Call on Talk option switch or jumper on the appropriate channel of the Main and Remote Stations. Again, refer to the User Manual for these stations to locate this switch or jumper. This will cause the Call signal to be activated whenever the Talk button is held down.
- Feed the program audio into the Program Audio connector *on the Remote Station*.

With this setup, any Call signal on this intercom channel, including Call signals from beltpacks, will cause the program audio to be interrupted.

TYPICAL APPLICATIONS

CABLE OR SCHOOL TELEVISION STUDIO

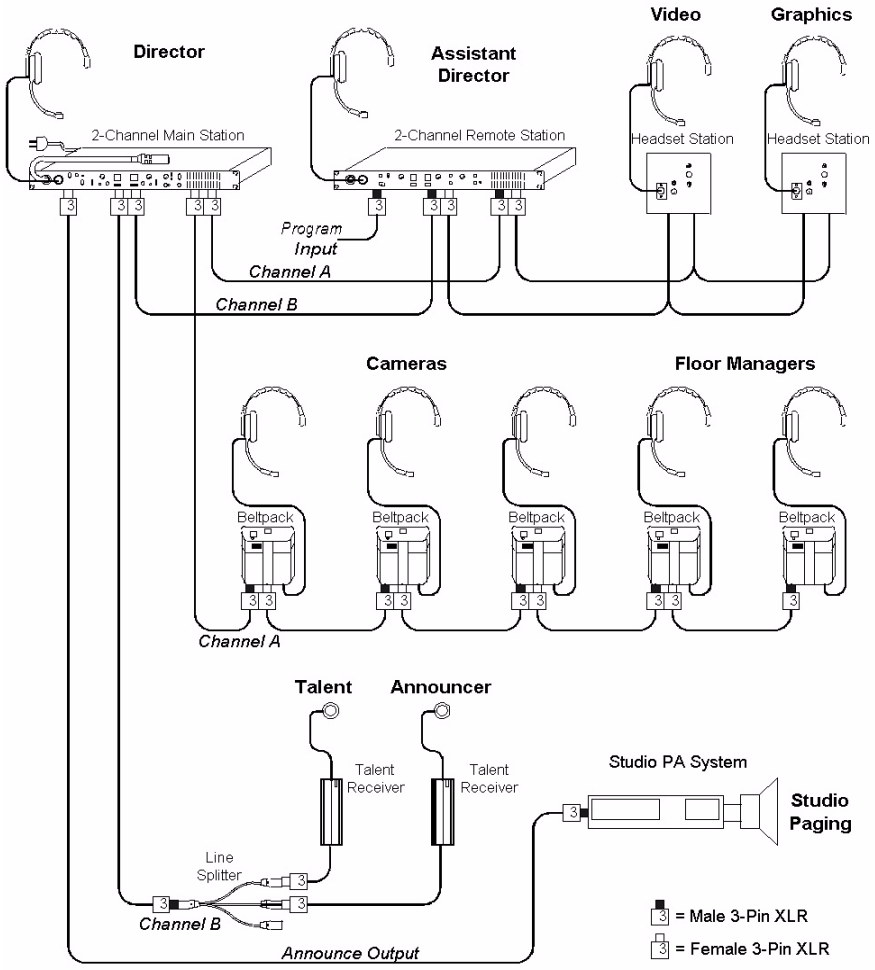

Figure 1-7: Party Line Studio Application

The typical Cable or School Television Studio installation shown in the preceding diagram is centered around a two-channel Main Station, which also powers the system. The Director operates this station and an Assistant Director operates a two-channel Remote Station. A line of single-channel beltpacks is connected to Channel A. The beltpacks are used by camera operators and floor managers. Communication between these people and the Director and Assistant Director is on Channel A. Two-channel Headset Stations are wired to both channels A and B and are used by the video and graphics people. This allows them the flexibility of communicating on either Channel A or Channel B.

Program feed audio is connected to the Remote Station so it can be heard by the Director as well as the Talent and Announcers. A Call

signal can interrupt the program audio that feeds into the Remote Station. Talent and Announcers use Talent Receivers which are connected to Channel B. The Director and Assistant Director must be able to interrupt this program audio to cue the Talent and Announcers, so Channel B would be programmed as follows:

- The Momentary Talk B option switch on the Main and Remote Stations must be set to the ON (down) position. This will cause the Channel B Talk button to have a momentary only action and not latch. Refer to the appropriate User Manuals for the location of these settings.
- The Call on Talk B option switch on the Main and Remote Stations must be set to the ON (down) position. This will cause the Channel B Talk button to activate the Call signal.
- The Channel B On-Off-Interrupt switch on the Remote Station must be set to the INTERRUPT position. The Channel A On-Off-Interrupt switch must be set to the OFF position, assuming that program audio should *not* be heard on this channel.
- The Channel B Program Level trimpot on the Remote Station should be adjusted so that the program feed is at a comfortable level for the Talent and Announcer.

If desired, the Director could turn on the Party Line Link (A+B) switch on the Main Station during rehearsals to combine the communication between everyone on both channels.

The Main or Remote Station speaker can be turned on whenever necessary, when others in the area need to hear. If it is turned on, it will automatically dip in level whenever the panel or headset microphone is on.

A PA amplifier can be connected to the Announce Output of the Main Station, allowing the Director to make announcements to everyone in the studio. The Relay Out connection can be used to switch the PA amplifier if necessary. Depending upon the situation, these announcements may tend to interfere with communication on the intercom line. If this is a problem, set the Interrupt Announce Option Switch on the Main Station to the ON position. This will prevent announcements from being heard on the intercom line.

Although this application was illustrated using 2-channel Main and Remote Stations, it could have been implemented using 4-channel (or more) stations. Doing so could further split the functional areas and allow more individual conversations to occur at once.

THEATRE 1

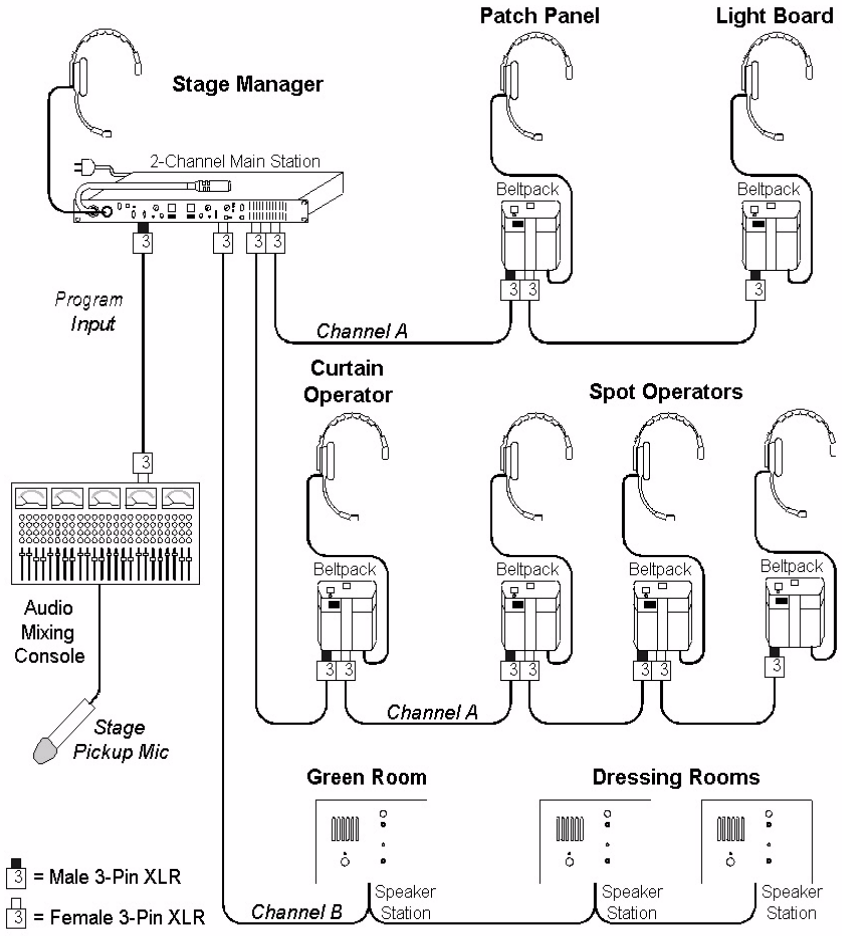

Figure 1-8: Party Line Theatre Application Example 1

In the preceding diagram of a typical Theatre installation, the Stage Manager operates a two-channel Main Station, which also powers the system. Several single-channel beltpacks are connected to Channel A. The beltpacks are used by curtain, spot, patch panel, and light board operators. Communication between these people and the Stage Manager is on Channel A.

Some Main Stations contain a Tone Alert function. This will audibly signal the Stage Manager if the stage personnel press the Call buttons on their beltpacks. If needed, the Tone Alert function can be enabled using the button on the front panel. The volume of this signal can be set using the Tone Alert Volume control.

An audio mixing console output from the stage pickup microphones is connected to the Program Input of the Main Station. If desired, this audio can be placed at a low (or any) level on Channel A. The level can be adjusted using the Channel A Program Level trimpot. If this

audio is to be interrupted by communication from the Stage Manager, then the Channel A On-Off-Interrupt switch should be set to the INTERRUPT position. If stage microphone audio should be heard on Channel A at all times, the On-Off-Interrupt switch should be set to the ON position. If it is not desirable to have audio from the stage microphones on this intercom channel, the On-Off-Interrupt switch should be set to the OFF position.

The Program Level control can be used to adjust the stage microphone audio level the Stage Manager hears. If or whenever the Stage Manager does not need to monitor this, the Program Level control can be turned fully counter-clockwise.

Channel B is connected to Speaker Stations such as the Clear-Com KB-112/KB-212/KB-701 which are installed in the green room and in dressing rooms. These Speaker stations should be optioned for Normal operation, which enables the speaker and allows a push-to-talk function for replying to the Stage Manager. Channel B on the Main Station would typically be programmed as follows:

- The Momentary Talk B option switch must be set to the ON position. This will cause the Channel B Talk button to have a momentary only action and not latch. The Stage Manager could then only be heard by the actors and actresses in the Green Room and Dressing Rooms when the Channel B Talk button is held down.
- The Channel B On-Off-Interrupt switch must be set to the INTERRUPT position. This causes the Channel B Talk button to interrupt the audio from the stage microphone.
- The Channel B Program Level trimpot should be adjusted to a comfortable level in the Speaker Stations.

The stage microphone audio can then be heard by the actors and actresses in the green room and dressing rooms. The stage microphone audio heard by the waiting actors and actresses will be interrupted whenever the Stage Manager talks to them.

Because of the two-channel capability, communication between the Stage Manager and stage equipment operators cannot be heard by the actors and actresses, and vice-versa. This eliminates confusion and miscommunication. If desired, the Stage Manager can turn on the Party Line Link (A+B) switch on the Main Station during rehearsals to combine the communication between everyone on both channels.

THEATRE 2

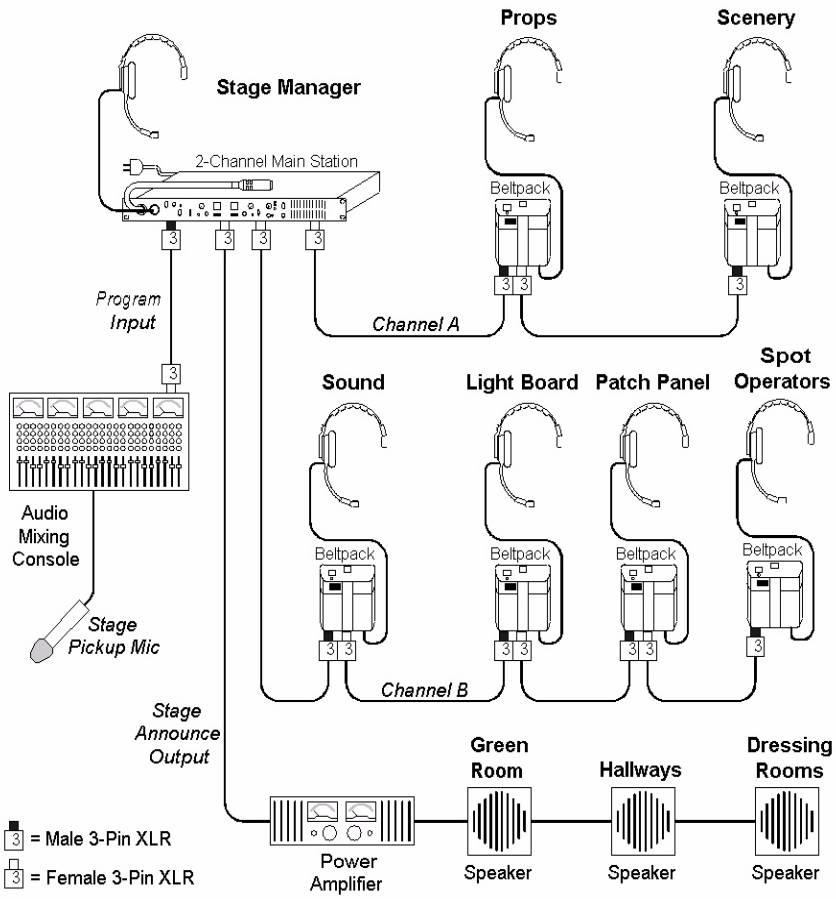

Figure 1-9: Party Line Theatre Application Example 2

In this example of another typical Theatre installation, the Stage Manager operates a two-channel Main Station, which also powers the system. Several single-channel beltpacks are connected to Channel A. The beltpacks are used by props and scenery people. Communication between these people and the Stage Manager is on Channel A.

Several single-channel beltpacks are also connected to Channel B. The beltpacks are used by sound, light board, patch panel, and spot operators. Communication between these people and the Stage Manager is on Channel B.

A mixing board audio output from the stage pickup microphones is connected to the Program Input of the Main Station. Using the Program Audio to Stage Announce option, this audio is routed out the Stage Announce output of the Main Station and into an external power amplifier. This amplifier drives speakers in the Green Room, Hallways, and Dressing Rooms. The people in these rooms will then be able to hear sound from the stage. The Stage Manager presses the

Announce button on the Main Station to communicate with the people in these rooms. When this happens, the audio from the stage is interrupted automatically. As long as the Stage Manager does not have a Talk set, the announcement is heard only by the people in the Green Room, Hallways, and Dressing Rooms, but not by the people on intercom Channels A or B.

To adjust the stage announce and program levels, use the following steps:

1. Press the Announce button and adjust the program audio power amplifier for the correct level from the speakers connected to it. The Stage Announce output will provide a 0 dBu signal to the stage announce amplifier.
2. With the Announce button released, adjust the Mixing Console so that the Program level is correct as heard through the speakers connected to the stage announce amplifier. The output from the Mixing Console will likely be 0 dBu or less.
3. If the Program Audio is to be heard on the intercom channels, adjust the Program Level controls for the channels accordingly. Refer to the MS-232, MS-702, MS-440, RM-440, MS-704/RM-704, SB-440 or SB-704 Station manual to locate these controls.
4. If the Stage Manager is to hear the Program Audio, adjust the Program Level control on the MS-232, MS-702, MS-440, MS-704, RM-440, RM-704, SB-440 or SB-704 Station. If or whenever the Stage Manager does not need to monitor this, the Program Level control can be turned fully counter-clockwise.

If the program audio on the intercom channel(s) is to be interrupted when the Stage Manager presses the Talk button, then the On-Off-Interrupt switch for that channel should be set to the INTERRUPT position. If stage microphone audio should be heard on a channel at all times, its On-Off-Interrupt switch should be set to the ON position. If it is not desirable to have audio from the stage microphones on an intercom channel, its On-Off-Interrupt switch should be set to the OFF position.

Because of the multiple-channel capability, the Stage Manager can communicate individually to three separate areas: Props and Scenery, Sound and Lighting, and Costuming, Makeup, and Talent. This eliminates confusion and miscommunication. If desired, the Stage Manager can turn on the Party Line Link (A+B) switch on the Main Station during rehearsals to combine the communication between the Props and Scenery channel and the Sound and Lighting channel.

The drawback of the Program Audio to Stage Announce option is that the people in the Green Room, Hallways, and Dressing rooms cannot communicate back to the Stage Manager. This may not be drawback in all cases. The benefit of this option is that it adds an additional channel of communication from the Stage Manager.

ENG/EFP TRUCK

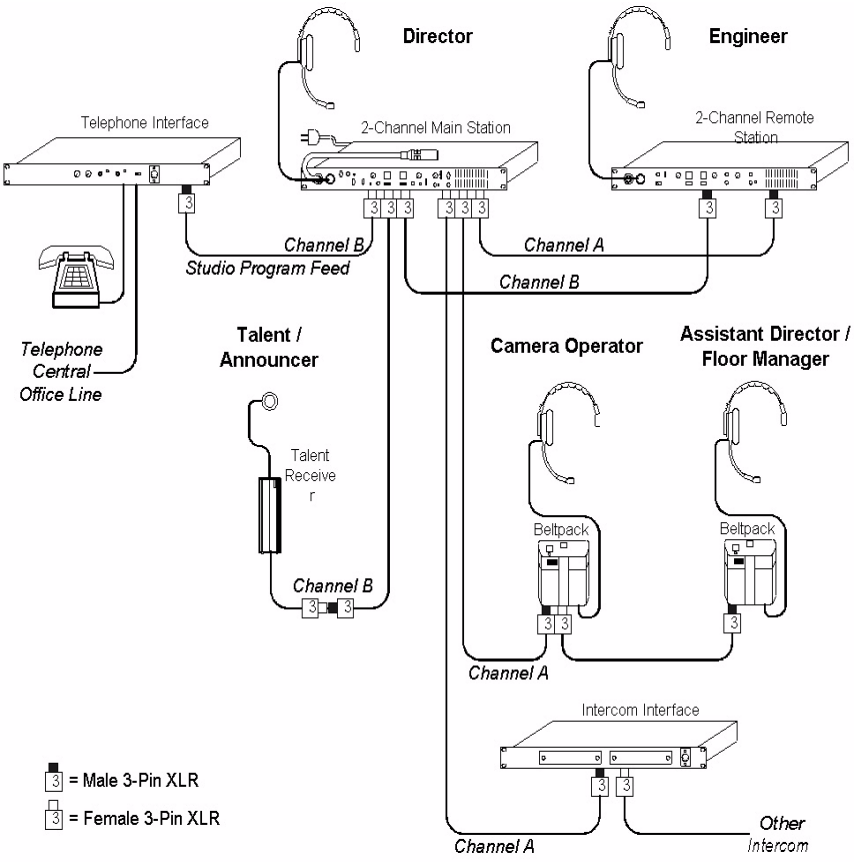

Figure 1-10: Party Line Eng/EFT Truck Application

In the preceding diagram of a typical ENG/EFP Truck installation, a 2-Channel Main Station powers the intercom system. The Director operates the Main Station, and an Engineer operates the Remote Station. A line of single-channel beltpacks is connected to Channel A and are used by camera operators and floor managers. Communication between these people and the Director is on Channel A. If 4-channel (or more) stations were used in this application, the functional areas of communications could be further split to allow more individual conversations to occur at once.

A System Interface such as the Clear-Com TW-12C can be used to interconnect with another intercom system which may be on site, whether or not it is a Clear-Com system. It isolates the intercom audio and compensates for level and impedance differences. It also isolates and translates call signals. A Clear-Com Telephone Interface can be used to provide a studio feed over a dial-up telephone line. The Telephone Interface should be optioned to insert program on Channel B, and interrupt the program when a Call signal is present on Channel B. Because the program audio is fed into the intercom line and not the

Program Input jack, the Program Level controls on the Main Station have no effect.

Channel B is connected to a Talent Receiver for Talent or an Announcer. Program feed audio from the studio feed can be heard by the Director and Engineer, as well as the Talent or Announcer. The Call on Talk B and Momentary Talk B options switches on the Main and Remote Stations would be set to the ON (down) position . This would cause the program audio heard by the Talent and Announcer to be interrupted whenever the Director talks to them, but only while the Director is holding the Talk button.

SYSTEM CHECKOUT

Before you turn on the power, perform the following tests:

CHECK TERMINATION

There should be one and only one termination for each channel in the system. This termination is usually set to ON at the Main Station or Power Supply. To ascertain that only one termination is present on the channel, perform the following test:

Note: The location of the termination switch varies with model. On some products, the termination switches are on the rear panel; on others they are jumpers inside the unit. Consult the unit's manual for the location.

1. Using a multimeter, measure the resistance between pins 1 and 3 on one of the Channel A XLR connectors at the rear of the unit.
2. If the channel is terminated properly, then the resistance should measure approximately 4,000 Ohms. A very high channel resistance means the channel is not terminated. Channel resistance of 2,000 Ohms indicates a double-termination. If a double-termination is indicated, locate the other terminated Power Supply or Main Station and set its termination to OFF.
3. Repeat for the other channels.
4. Check resistance between Chassis Ground and pin 1. Using an Ohmmeter, measure the resistance from pin 1 on the Main Station or Power Supply to chassis ground. The measurement should read 10 Ohms. A high reading (over 100 Ohms) indicates that the 10 Ohm resistor in the unit has failed and requires replacement. Failure to perform the replacement will result in an audible "buzz" in the system. A reading of less than 10 Ohms (or a short) typically indicates that the shell and pin 1 of one of the interconnect cables are shorted together. Test the individual cables until the culprit is located and repair or replace the cable.

Note: Pin 1 and the shell of the XLR plug on the interconnect cables should NOT be connected together.

CHECK INTERCOM CABLE RESISTANCE

For minimal crosstalk, the ground resistance of the intercom cables should be as low as possible, preferably less than 2 Ohms. Disconnect an intercom line from the Main Station or Power Supply. At the point in the intercom line furthest from the unit, connect a clip lead jumper between pins 1 and 2. Back at the "powered" end, use an Ohmmeter to measure the resistance between pins 1 and 2. A value of less than 4 Ohms is ideal, but a value of 4 to 10 Ohms is acceptable.

FINAL TESTS

After you turn the power ON:

1. Check for proper voltage on pin 2 of any intercom line or jack in a channel. It should read 26-30 Volts.

2. Test for proper operation of Call Signaling. Activate the Call Signal on any beltpack or station. The call light on the Main Station should illuminate and then go out when the call button is released. If enabled, the Tone Alert should sound. Activate the Call Signal on the Main Station. The call lights on any beltpacks or stations should illuminate and then go out when the call button is released.

3. Adjust the sidetone on this and all stations. (Refer to the manual for each specific unit for instructions.) Using the headset or panel mic, make sure that the Main Station can communicate with attached beltpacks or stations. Check that other stations can be heard through the panel speaker.

4. If connected, check that Program Input, Announce Output and Hot Mic Output / IFB System jacks are functional. Verify the operation of the controls that affect the function of these inputs and outputs. Refer to the User Manual of the particular Main Station.

TROUBLESHOOTING

PROBLEM:	**System does not operate. No power to Main Station or Power Supply. Green POWER LED is not illuminated and no SHORT LED's are illuminated**
Cause 1:	No AC power to the Main Station or Power Supply.
Solution 1:	Make sure the power switch on the rear panel is turned ON. Check AC connection and cable. Plug into dependable AC source.
Cause 2:	Main Station or Power Supply has an internal Power Supply failure.
Solution 2:	Unit requires servicing.
PROBLEM:	**Problem:Red SHORT LED illuminated**
Cause 1:	Short or overload on that channel due to a shorted or miswired cable.
Solution 1:	Remove cables one at a time from system until the faulty line is located. (The red Short LED will then turn off.) Check for shorts between pins 1 and 2 or improper cable wiring. Once the short is removed, the Main Station or Power Supply will reset automatically and the power will come back up within several seconds.
Cause 2:	Defective Remote Station.
Solution 2:	Check Remote Station and replace if necessary.
PROBLEM:	**Both red SHORT LEDs are illuminated**
Cause 1:	System is overloaded.
Solution 1:	Remove cables, one at a time from system to help determine where the excess current requirements lie. Re-evaluate system current needs.
Cause 2:	Short in multipair cable.
Solution 2:	Remove cables, one at a time from system until the faulty line is located. Check for shorts between pins 1 and 2 or improper cable wiring.
PROBLEM:	**Hum or buzz in system**
Cause 1:	Inductive pickup caused by close proximity of this Main Station or connected Remote Stations to power lines or transformers.
Solution 1:	Relocate offending unit.
Cause 2	10 Ohm chassis ground resistor is open.
Solution 2:	Check the DC resistance for 10 Ohms between the chassis and pin 1 of any intercom connector.

If this condition happens, it is because the system ground came into contact with something that was "HOT" with respect to the Power Supply earth ground. If this occurs, carefully check the system ground and AC distribution in the area.

Warning: *This is a potentially dangerous situation. A shock hazard may exist between the metal boom of a Remote Station headset and ground.*

PROBLEM:	**System feedback (Acoustical)**
Cause 1:	Listen Level control at this station or a Remote Station is set too high.
Solution 1:	Adjust.
Cause 2:	Sidetone Null control at this station or a Remote Station is not adjusted correctly.
Solution 2:	Adjust. Refer to the procedure in the Front Panel Controls section of this manual.
Cause 3:	Channel unterminated.
Solution 3:	Set the Main Station or Power Supply termination switch for that channel to the ON position.
Cause 4:	A headset extension cord was used.
Solution 4:	Headset extension cords are not recommended.
PROBLEM:	**Excessive crosstalk**
Cause 1:	High DC resistance in ground return.
Solution 1:	Use heavier cable; add additional conductor(s) to ground return.
Cause 2:	MULTI-CHANNEL cable pairs are not individually shielded.
Solution 2:	Replace cable with individually shield pairs.
Cause 3:	Headset cables are not wired properly or shielded properly.
Solution 3:	Correct wiring. Use headsets with properly shielded wiring.
PROBLEM:	**Program signal sounds distorted.**
Cause:	Overload of Program Input circuit.
Solution:	Reduce Program Input level or reduce the gain of the program signal at the source, such as an audio mixer.
PROBLEM:	**Call signals do not function.**
Cause 1:	Excessive DC loading of intercom line.
Solution 1:	Remove any audio transformers or other equipment which may be connected across the intercom line. If equipment other than Clear-Com intercom equipment must be connected to the intercom line, please contact Clear-Com application or service personnel for advice.
Cause 2:	Far too many terminations on the intercom line.
Solution 2:	Check all Main Stations and Power Supplies to make sure each intercom channel is terminated at only one point .

GLOSSARY

Some of the terms used when discussing critical communications for television or theatre may be new to you as they are unique to intercom applications. Although many of the terms are common to other audio applications, to be certain you understand their meanings we offer the following definitions:

All Call: Ability to push one button from the Main Station and talk to all channels at once on a multiple channel system.

Ambient Noise: Those background sounds which are not part of the specific communication but are picked up by the microphone. Selection of a good "noise-canceling" mic will reduce ambient noise.

Belt Pack: A portable electronics package worn on the belt or mounted on a wall or other convenient location. Interconnects to system with mic cable and is powered by a central Power Supply or Main Station.

Bridging, High Impedance (hi-Z): A method of connecting to an audio line (such as Clear-Com) without loading or taking appreciable power from that line. Simply stated, as you add more and more stations to the line, the volume remains constant.

Call Signaling: This feature is included with the majority of Clear-Com products. It is a visual indicator on a station (a lamp or LED) used to attract the attention of an operator who has removed the headset.

Channel: A channel is the line that connects parties together within a party line - it is a two-way talk path. For example, if you have six people who need to hear one director, you have a seven-station single-channel need. If the same director needs to speak privately to any one of the six, add a second channel. You now have a seven-station, two-channel system.

Closed-Circuit: Any intercom which is connected via cable (also called hard-wired). The other type would be Wireless. . .we make those too. However, if you want privacy and versatility, you probably want a closed-circuit system or a combination of both.

Cross Talk: Leakage of audio transmissions from one channel to another.

Dry Pair: A telephone term is used to describe a pair of wires (2 conductors) that carry audio but no voltage. Contrast this with a "Wet Pair" that carries both audio and voltage.

Duplex: Duplex refers to bi-directional communications. Normal communication between individuals talking face to face is "full duplex" -- in other words you can talk and listen simultaneously. The alternative is "half-duplex" such as a push-to-talk situation where one station at a time can talk while others listen. A walkie-talkie is a good example of half-duplex communication.

EFP: Electronic Field Production. An EFP truck contains the necessary audio, video, intercom, and other equipment to create these productions.

ENG: Electronic News Gathering. An ENG truck contains the necessary audio, video, intercom, communications, and other equipment to effectively support gathering news and transmitting news reports back to a studio.

IFB: The term means "Interrupt Fold Back." A Fold-Back is a monitor system that allows, for example, talent to hear their voices or musicians to hear their voices and instruments on stage. IFB (program interrupt) disconnects the audio source while the talk button on the Main Station is pushed.

ISO: A private conversation path. An ISO channel allows one to simply push a button and transfer themselves and the person they wish to speak with to an isolated channel.

Linking: Linking ties separate channels into one single party line.

Main Station: This is a product that includes both the ability to communicate with multiple channels without connecting them together, and to power all the stations connected to these channels.

Master Station: A Remote Station which requires AC power to operate, and cannot power other stations

Multi-Channel: More than one channel

Party Line (P.L.): Intercom system where all people talking on the system can talk or listen to each other simultaneously. Also called conferencing.

Point to Point: One path to one person.

Program: Audio source that is fed into the intercom channels.

Program Interrupt: Disconnects the audio source while the talk button on the Main Station is pushed. (IFB)

Remote Mic Kill (RMK): The ability for certain Main Stations to shut off all microphones on beltpacks in a system.

Remote Station: Like the belt pack, this would be any of the products connected to the intercom line that allow duplex or half-duplex conversation, but do not contain a Power Supply.

Sidetone: This is your own voice heard in your earphone as you are speaking.

Stage Announce (SA): Redirects output of the Main Station's microphone to an external destination (such as a PA system).

Station: A station is connected to one or more channels. For example, if you have six people who need to hear one director, you have a seven-station single-channel need. If the same director needs

to speak privately to any one of the six, add a second channel. You now have a seven-station, two-channel system.

Termination: Passive network that is connected in each channel, usually on the Power Supply or Main Station.

2 CONFIGURATION OPTIONS

PARTY LINE PRODUCTS

The following table provides information on Party Line products indicating which model numbers have similar functionality to assist in upgrading existing systems where the current products are no longer available. As the functionality of the equivalent products may be slightly different the user should check the product manuals for details.

DESCRIPTION	ENCORE PRODUCT	PARTY LINE PRODUCT
2-Channel Main Station	MS-702	MS-232, MS-222, MS-200
2-Channel Remote Station	RM-702	RM-220
2-Channel Portable Station	CS-702	CS-222
4-Channel Main Station	MS-704	MS-440, MS-400A
4-Channel Remote Station	RM-704	RM-440
4-Channel Switchboard Main Station	SB-704	SB-440, SB-412A
12-Channel Programmable Main Station	MS-812A	MS-812A
12-Channel Source Assignment Panel	RCS-2700	RCS-2000
Amplified Monitor Speaker	AMS-1027	AMS-1025
Single Channel Wall Mount Speaker Station	KB-701	KB-212, KB112
2-Channel Wall Mount Speaker Station	KB-702 KB-702GM	KB-211 KB-211GM

DESCRIPTION	ENCORE PRODUCT	PARTY LINE PRODUCT
2-Channel Wall Mount Headset Station	HB-702	MR-202
4-Channel Wall Mount Headset Station	HB-704	MR-704
2-Channel Power Supply	PS-702	PS-232
4-Channel Power Supply	PS-704	PS464
Program Interrupt Controller	PIC-4704	PIC-4000
System Interface	TWC-12C	TWC-12B
4-Wire Interface	IF4W4	IF4B-2 IF4B-4
2-Channel Intercom Adapter	TWC-701	
4-Channel Intercom Adapter	TWC-704	
2-Way Radio Interface	TW-47	TW-40
Party Line to 4-Wire Interface	EF-701M	EF-1M
Telephone and 2-Wire Interface	AC-701	AC-10H
Call Signal Flasher	FL-7	FL-1
Lightweight Power Supply	PK-7	PK-5
IFB Control Panel	AX-704	AX-4
IFB Control Panel with Mic Connector	MA-704	MA-4
Talent Receiver	TR-50	TR-50
Announcer’s Console	AB-700	AB-100
Beltpacks	RS-601/RS-602 /RS-622/RS-60 3/RS-603R/RS-623/RS-623R	RS-501, RS-502, RS-522

Table 2-1: Party Line Product Equivalences

PROGRAM AUDIO TO ANNOUNCE OUTPUT OPTION

The MS-232, MS-440, RM-440, and SB-440 products include the Program Audio to Stage Announce Output option. This option allows audio from the main Program Audio input to be routed through the Stage Announce output. Pressing the Announce button interrupts this audio and instead routes audio from the selected panel or headset microphone through the Stage Announce output.

This facility is also available as standard on the MS-702, MS-704, RM-704 and SB-704 products.

THEATRE APPLICATION

One application of the Stage Announce option is illustrated in the following diagram:

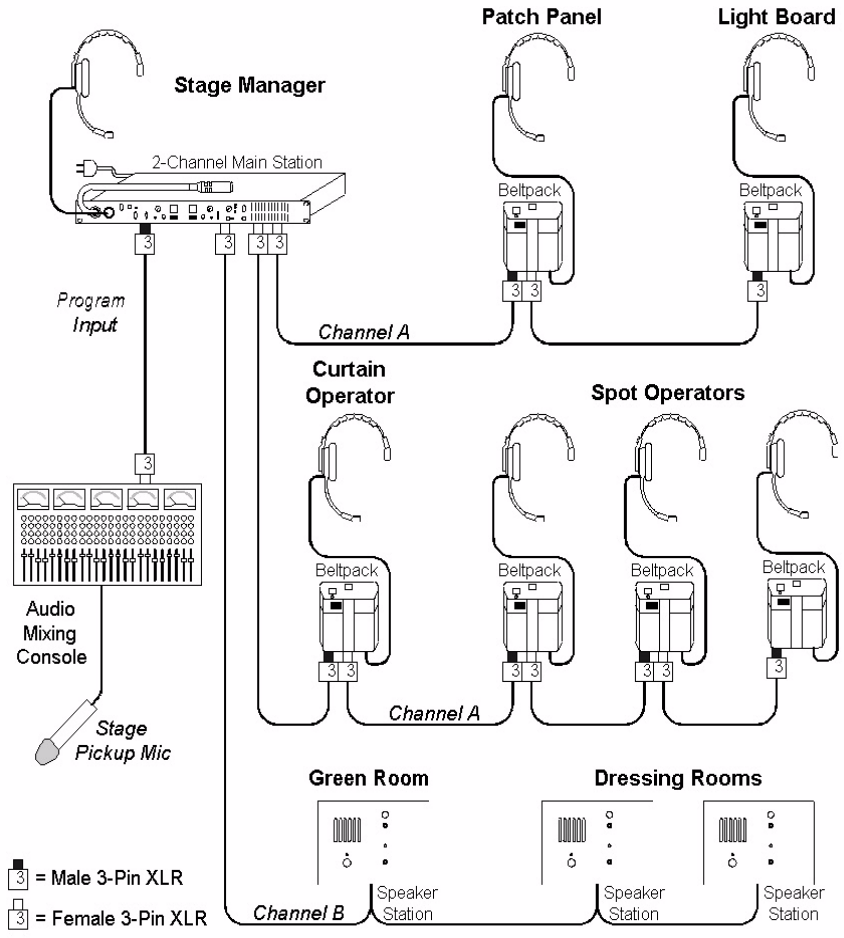

Figure 2-1: Party Line Theatre Application

In the preceding diagram of a typical Theatre installation, the Stage Manager operates a two-channel Main Station, which also powers the system. Several single-channel beltpacks are connected to Channel A. The beltpacks are used by props and scenery people. Communication between these people and the Stage Manager is on Channel A.

Several single-channel beltpacks are also connected to Channel B. The beltpacks are used by sound, light board, patch panel, and spot operators. Communication between these people and the Stage Manager is on Channel B.

A mixing board audio output from the stage pickup microphones is connected to the Program Input of the Main Station. Using the Program Audio to Stage Announce option, this audio is routed out the Stage Announce output of the Main Station and into an external power amplifier. This amplifier drives speakers in the Green Room, Hallways, and Dressing Rooms. The people in these rooms will then be able to hear sound from the stage. The Stage Manager presses the Announce button on the Main Station to communicate with the people in these rooms. When this happens, the audio from the stage is interrupted automatically. As long as the Stage Manager does not have a Talk set, the announcement is heard only by the people in the Green Room, Hallways, and Dressing Rooms, but not by the people on intercom Channels A or B.

If desired, the stage audio can be placed at a low (or any) level on Channel A and/or Channel B. The level can be adjusted using the Program Level trimpots for each channel. If this audio is to be interrupted whenever the Stage Manager presses the Talk button, then the On-Off-Interrupt switch for that channel should be set to the INTERRUPT position. If stage microphone audio should be heard on a channel at all times, its On-Off-Interrupt switch should be set to the ON position. If it is not desirable to have audio from the stage microphones on an intercom channel, its On-Off-Interrupt switch should be set to the OFF position.

The Program Level control can be used to adjust the program audio level the Stage Manager hears. If or whenever the Stage Manager does not need to monitor this, the Program Level control can be turned fully counter-clockwise.

Because of the multiple-channel capability, the Stage Manager can communicate individually to three separate areas: Props and Scenery, Sound and Lighting, and Costuming, Makeup, and Talent. This eliminates confusion and miscommunication. If desired, the Stage Manager can turn on the Party Line Link (A+B) switch on the Main Station during rehearsals to combine the communication between the Props and Scenery channel and the Sound and Lighting channel.

The drawback of the Program Audio to Stage Announce option is that the people in the Green Room, Hallways, and Dressing rooms cannot communicate back to the Stage Manager. This may not be drawback

in all cases. The benefit of this option is that it adds an additional channel of communication from the Stage Manager.

SETTING THE OPTION

The setting for the Program Audio to Stage Announce option is an internal jumper which may be positioned in either an ON or an OFF position. Products containing this option are shipped from the factory with the option turned OFF. To turn the option on, remove the top cover of the product and locate the option jumper as follows:

- In the MS-232 station the jumper is located at the left rear of the main circuit board as shown in Figure 2-2. JP2 should be set to ON to enable the option or OFF to disable it.

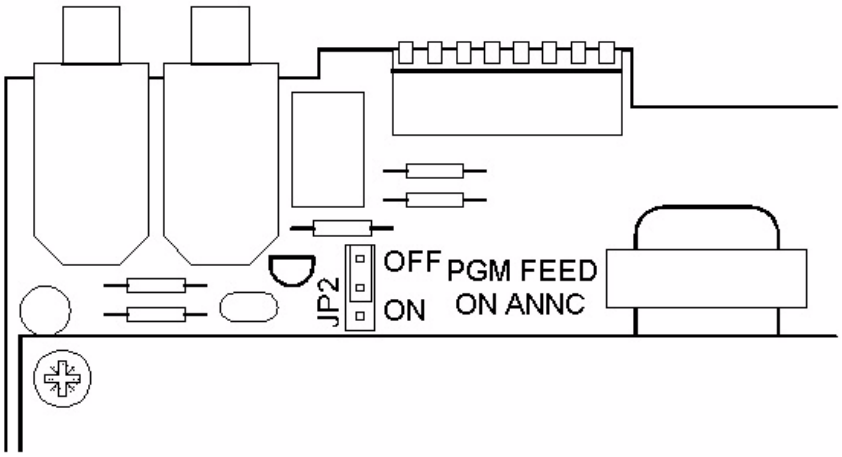

Figure 2-2: MS-232 Jumper

- In the MS-702 station the jumper is located towards the front of the main PCB as shown in Figure 2-3.

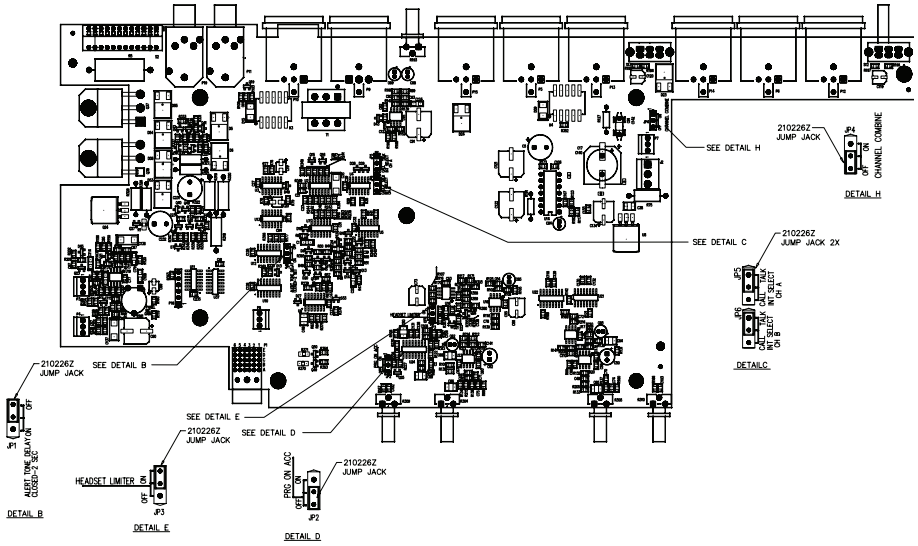

Figure 2-3: MS-702 Jumpers

- In the MS-440, MS-704, RM-440, RM-704, SB-440 and SB-704 stations, the jumper is located near the middle of the main circuit board. J11 should be set to ON to enable the option or OFF to disable it.

SYSTEM SETUP

After connecting the MS-232, MS-702, MS-440, MS-704, RM-440, RM-704, SB-440 or SB-704 Station, perform the following steps to assure that the audio level will be correct at each listening point:

1. Press the Announce button and adjust the stage announce power amplifier for the correct level from the speakers connected to it. The Stage Announce output will provide a 0 dBu signal to the stage announce amplifier.
2. With the Announce button released, adjust the Mixing Console so that the Program level is correct as heard through the speakers connected to the stage announce amplifier. The output from the Mixing Console will likely be 0 dBu or less.
3. If the Program Audio is to be heard on the intercom channels, adjust the Program Level controls for the channels accordingly. Refer to the MS-232, MS-702, MS-440, MS-704, RM-440, RM-704, SB-440 or SB-704 Station manual to locate these controls.
4. Lastly, if the Stage Manager is to hear the Program Audio, adjust this level on the MS-232, MS-702, MS-440, MS-704, RM-440, RM-704, SB-440 or SB-704 Station.

3 ADDENDUM: POWER CORDS

For proper selection of power supply cord, depending upon country of destination, see the figure below.

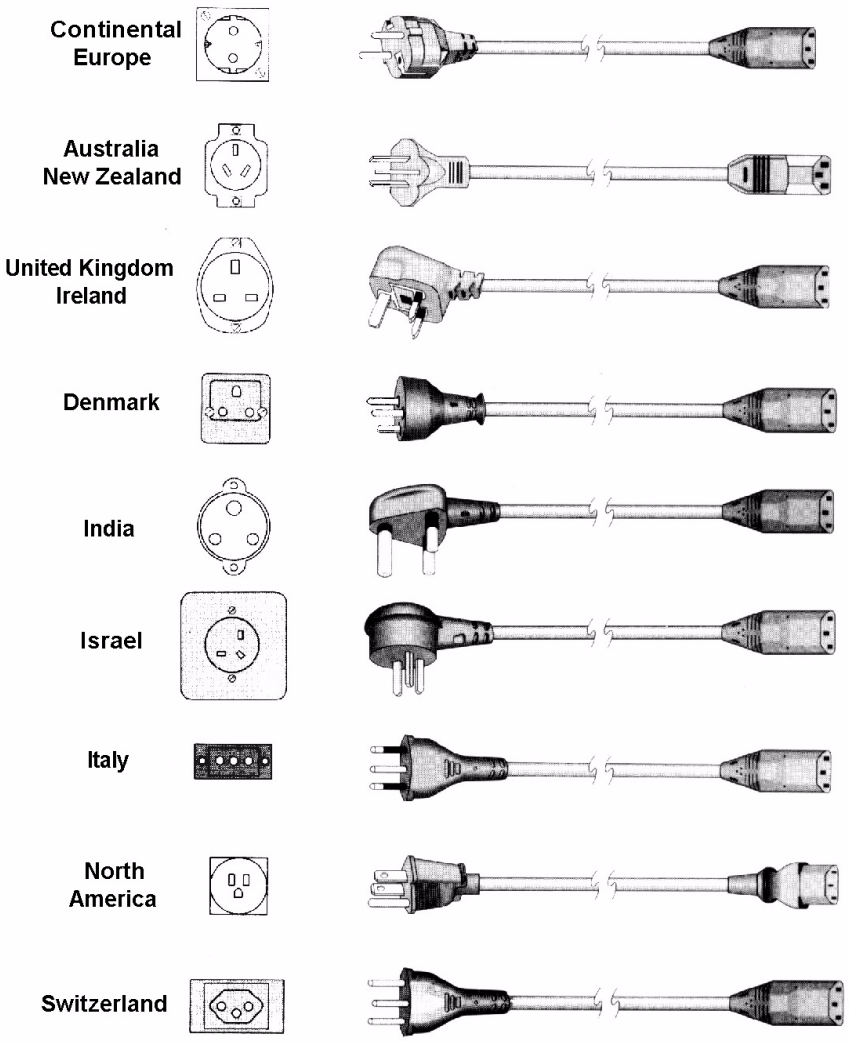

Figure 3-1: Power Cords

LIMITED WARRANTY

This document details the Clear-Com Standard Limited Warranty for all new products for sale within all regions with the exception of Military, Aerospace, and Government (MAG).

EXCEPT AS SET FORTH HEREIN ("LIMITED WARRANTY"), CLEAR-COM MAKES NO OTHER WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT OF THIRD PARTY RIGHTS, OR FITNESS FOR A PARTICULAR PURPOSE, ALL OF WHICH ARE EXPRESSLY DISCLAIMED.

1. **Standard Limited Warranty.** Clear-Com Communication Systems ("Clear-Com") warrants its products, including supplied accessories, against defects in material or workmanship for the time periods as set forth below provided it was purchased from an authorized Clear-Com dealer or distributor.

   a) Pursuant to this Limited Warranty, Clear-Com will, at its option:

      i) repair the product using new or refurbished parts, or;

      ii) replace the product with a new or refurbished product.

   b) Remedies: In the event of a defect, the rights detailed in 1 (a) are your exclusive remedies. For purposes of this Limited Warranty, "refurbished" means a product or part that has been returned to its original specifications.

   c) Standard Warranty Period (by Product):

      i) All Clear-Com brand systems and products, including belt packs, have a Limited Warranty of two years, with the exception of;

         (1) Cables, accessories, components & consumable items have a Limited Warranty of 90 days.

         (2) Any Clear-Com product that has been classified as obsolete at the time of sale has a Limited Warranty of 90 days from sales and will be replaced with the same product or a sales credit will be issued, at the sole discretion of Clear-Com.

         (3) Headsets, handsets, microphones, and associated spare parts, as well as UHF wireless IFB products, have a Limited Warranty of one year.

         (4) UHF WBS Analog wireless intercom systems have a Limited Warranty of three years.

(5) All software products, including Concert (Client and Server), ECS, Production Maestro and Logic Maestro are warranted for one year and shall substantially conform to published specifications. The media on which the Software is furnished is warranted to be free of defects in material and workmanship (under normal use) for a period of one year.

(6) Any Clear-Com products that are listed within the last time buy period have the same Limited Warranty for their type 1.i 1 - 1.i.5 as above.

d) Any Clear-Com product that is repaired or supplied as a replacement under the terms of this Limited Warranty shall inherit the remaining warranty period from the original product.

e) Standard Warranty Period Start Date

i) Dealer / Distributor Sales: In view of Dealer or Distributor stocking practices, the Standard Warranty Period for products sold through Dealers or Distributors will commence from the Clear-Com invoice date and will include an automatic extension of three months. Any valid warranty claim within the Standard Warranty Period as determined by the Clear-Com invoice date will be covered without further supporting evidence. All warranty claims after this date must be supported by the Customer's proof of purchase that demonstrates the product is still within the Standard Warranty Period (as detailed in Section 1.c.i above, plus the automatic three month extension) from their purchase date.

ii) Direct Sales: The Standard Warranty Period will commence from the date the product was shipped from Clear-Com to the Customer. The Standard Warranty Period start date for contracts that include commissioning will be the date of the Site Acceptance Test (SAT) or one month from conclusion of the commissioning project, whichever is earlier.

f) Invalidation of Warranty

i) This Limited Warranty shall be invalidated if the product's outer case has been opened and internal modifications have been made or damage has occurred, or upon the occurrence of other damage or failure not attributable to normal wear and tear. Authorized modifications with Clear-Com's express written permission will not invalidate the warranty.

g) Software Updates

i) Software Updates are released periodically to correct discovered program bugs. During the Warranty Period, software updates are available to Customers free of charge.

h) Software Upgrades

i) Software Upgrades include new Features and/or Functional Enhancements and are not included as part of the Standard Warranty but may be purchased at the published rates.

ii) Note: In the absence of a Software Update containing a program correction and no available workaround to mitigate the problem, at the discretion of Service, Sales, Engineering, or Product Management, the Customer may be provided a Software Upgrade under warranty.

2. **Exclusions.** Services do not cover damage or failure caused by any occurrence beyond Clear-Com's reasonable control, including without limitation acts of God, fire, flooding, earthquake, lightning, failure of electric power or air conditioning, neglect, misuse, improper operation, war, government regulations, supply shortages, riots, sabotage, terrorism, unauthorized modifications or repair, strikes, labor disputes or any product failure that Clear-Com determines is not a result of failure in the Services provided by Clear-Com. Further Services excluded from this Agreement include: services required due to errors or omissions in Customer purchase orders; installation or maintenance of wiring, circuits, electrical conduits or devices external to the products; replacement or reconditioning of products which, in Clear-Com's opinion cannot be reliably maintained or properly serviced due to excessive wear or deterioration; Customer's failure to maintain the installation site in accordance with the environmental specifications of the products; or service on products removed from the location originally specified by Customer and/or reinstalled without the prior written approval of Clear-Com. Customer will pay Clear-Com's then current published charges to restore such Covered Products to a condition eligible for further service under this Agreement. Clear-Com shall be excused from and shall not be liable for any failure or delay in performance under this Agreement due to the foregoing or any causes beyond its reasonable control.

3. **Limitation of Liability. IN NO EVENT WILL CLEAR-COM BE LIABLE UNDER THIS AGREEMENT FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOST PROFITS), REGARDLESS OF THE FORM OF ACTION, EVEN IF ADVISED IN ADVANCE OF THE POSSIBILITY OF SUCH DAMAGES.**

4. **Assignment.** Neither party may assign this Agreement or any portion thereof without the prior written consent of the other, except in the event of a merger, sale of all or substantially all of the assets or other corporate reorganization.

5. **Ownership of replaced parts or product.** All replaced parts or products become the property of Clear-Com.

6. **Entire Agreement.** This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof, and supersedes all prior or contemporaneous proposals, oral or written, and all other communications between them relating to the subject matter of this Agreement.

TECHNICAL SUPPORT & REPAIR POLICY

NOVEMBER 1, 2008

In order to ensure that your experience with Clear-Com and our World Class products is as beneficial, effective and efficient as possible, we would like to define the policies and share some "best practices" that can accelerate any problem solving processes which we may find necessary and to enhance your customer service experience. Our Technical Support, Return Material Authorization, and Repair Policies are set forth below. These Policies are subject to revision and constantly evolve in order to address our Customers' and the Market's needs. Accordingly these are provided by way of guidance and for information only and may be changed at anytime with or without Notice.

TECHNICAL SUPPORT POLICY

a) Telephone, online, and e-mail technical support will be provided by the Customer Service Center free of charge during the Warranty Period.

b) Technical support will be provided free of charge for all software products under the following conditions:

i) The application, operating, and embedded software is installed on a product covered by Clear-Com's Limited Warranty, and:

(1) The software is at the current release level; or,

(2) The software is one (1) version removed from current.

ii) Older versions of software will receive "best-effort" support, but will not be updated to correct reported bugs or add requested functionality.

c) For Technical Support:

i) North and South America, (inc. Canada, Mexico, and the Caribbean) & US Military:

Hours:	0800 - 1700 Pacific Time
Days:	Monday - Friday
Tel:	+1 510 337 6600
Email:	CustomerServicesUS@vitecgroup.com

ii) Europe, the Middle East and Africa:

Hours:	0800 - midnight Central European Time

Days: Monday - Friday
Tel: +49 40 853 999 700
Email: TechnicalSupportEMEA@vitecgroup.com

iii) Asia-Pacific:
Hours: 0800 - 1700 Pacific Time
Days: Monday - Friday
Tel: +1 510 337 6600
Email: CustomerServicesAPAC@vitecgroup.com

d) Email Technical Support is available for all Clear-Com branded products free of charge for the life of the product, or two years after a product has been classified as obsolete, whichever comes first.

e) Support for Distributor and Dealer Sales

i) Distributors and Dealers may utilize the Customer Service Centers once a system has been installed and commissioned. Clear-Com Systems and Applications Engineers will provide support to the Distributor from the pre-sales stage through to satisfactory installation for new system purchases. Customers will be encouraged to contact their Dealer or Distributor with their installation and technical support enquires rather than using the Customer Service Centers directly.

f) Support for Direct Sales

i) Customers may utilize the Customer Service Centers once a system has been installed and commissioned by Clear-Com Systems and Applications Engineers, or in the case of project installations, once the Project Team has completed the hand-over to the Support Centers.

RETURN MATERIAL AUTHORIZATION POLICY

a) Authorizations: All products returned to Clear-Com or a Clear-Com Authorized Service Partner must be identified by a Return Material Authorization (RMA) number.

b) The Customer will be provided with an RMA number upon contacting Clear-Com Sales Support as instructed below.

c) The RMA number must be obtained from Clear-Com via phone or email prior to returning product to the Service Center. Product received by the Service Center without a proper RMA number is subject to return to the Customer at the Customer's expense.

d) Damaged equipment will be repaired at the Customer's expense.

e) Returns are subject to a 15% restocking fee.

f) Advance Warranty Replacements (AWRs);

i) *During the first 30 days of the Standard Warranty Period:* Once the equipment fault has been verified by Clear-Com or its authorized representative, Clear-Com will ship a new replacement product. The Customer will be provided with an RMA number and be required to return the faulty equipment within 14 days of receipt of the replacement or will be invoiced for the list price of a new product.

ii) *During days 31-90 of the Standard Warranty Period:* Once the equipment fault has been verified by Clear-Com or its authorized representative, Clear-Com will ship a like-new, fully refurbished replacement product. The Customer will be provided with an RMA number and be required to return the faulty equipment within 14 days of receipt of the replacement or will be invoiced for the list price of a new product.

iii) To obtain an RMA number or request an AWR:

(1) North and South America, Asia-Pacific, and US Military:

Hours:	0800 - 1700 Pacific Time
Days:	Monday - Friday
Tel:	+1 510 337 6600
Email:	SalesSupportUS@vitecgroup.com

(2) Europe, the Middle East and Africa:

Hours:	0800 - 1700 GMT + 1
Days:	Monday - Friday
Tel:	+ 44 1223 815000
Email:	SalesSupportEMEA@vitecgroup.com

iv) Note: AWRs are not available for UHF WBS Analog wireless intercom systems. UHF WBS Analog wireless intercom systems out-of-box failures must be returned to Alameda for repair.

v) Note: Out-of-box failures returned after 90 days will be repaired and not replaced unless approved by Clear-Com Management.

vi) Note: AWRs are not available after 90 days of receipt of product unless an AWR Warranty Extension is purchased at the time of product purchase.

vii) Note: Shipping charges, including duties, taxes, and insurance (optional), to Clear-Com's factory is the responsibility of the Customer. Shipping AWRs from Clear-Com is at Clear-Com's expense (normal ground or international economy delivery). Requests for expedited shipping (E.g. "Next-Day Air") and insurance are the responsibility of the Customer.

REPAIR POLICY

a) Repair Authorizations: All products sent to Clear-Com or a Clear-Com Authorized Service Partner for repair must be identified by a Repair Authorization (RA) number (see above).

b) The Customer will be provided with an RA number upon contacting Clear-Com Customer Services as instructed below.

c) The RA number must be obtained from Clear-Com via phone or email prior to returning product to the Service Center. Product received by the Service Center without a proper RA number is subject to return to the Customer at the Customer's expense.

d) Return for Repair

i) Customers are required to ship equipment at their own cost (including transportation, packing, transit, insurance, taxes and duties) to Clear-Com's designated location for repair.

(1) Clear-Com will pay for the equipment to be returned to the Customer when it is repaired under warranty.

(2) Shipping from Clear-Com is normal ground delivery or international economy. Requests for expedited shipping (E.g. "Next-Day Air") and insurance are the responsibility of the Customer.

ii) **Clear-Com does not provide temporary replacement equipment ("loaner") during the period the product is at the factory for repair.** Customers should consider a potential prolonged outage during the repair cycle, and if required for continuous operations purchase minimum spare equipment required or purchase an AWR Warranty Extension.

iii) No individual parts or subassemblies will be provided under warranty, and warranty repairs will be completed only by Clear-Com or its Authorized Service Partners.

iv) Customers requesting a non-warranty repair will be provided an estimate of the total repair cost prior to the return of the equipment. In the event that Clear-Com is unable to estimate

the cost of repair, the Customer may elect to return the product to the factory for an estimate. The Customer is responsible for shipping costs both to and from the factory in the event they choose not to accept the estimate.

v) The Customer must provide either a purchase order for the repair work, or will be required to make an advance payment (as a debit against the Dealer's line of credit, or credit card) prior to the repaired product being returned to the Customer.

vi) For requesting a Repair Authorization number:

(1) North and South America, Asia-Pacific, and US Military:

Hours:	0800 - 1700 Pacific Time
Days:	Monday - Friday
Tel:	+1 510 337 6600
Email:	CustomerServicesUS@vitecgroup.com

(2) Europe, the Middle East and Africa:

Hours:	0800 - midnight Central European Time
Days:	Monday - Friday
Tel:	+49 40 853 999 700
Email:	TechnicalSupportEMEA@vitecgroup.com

vii) Note: Clear-Com's Limited Warranty does not cover normal wear and tear. The Customer will be charged the full cost of the repair if their equipment has been tampered with by non-approved personnel, or has been subject to damage through electrical failure, liquid damage or mishandling. The Customer Service Center will provide the Customer with a cost estimate for any such repairs prior to undertaking the work.