CLEAR-COM ENCORE

PS-704   FOUR-CHANNEL POWER SUPPLY

INSTRUCTION MANUAL

PS-704 Four-Channel Power Supply Instruction Manual

Part Number 810494Z Rev. 3

Legal Disclaimers

Clear-Com Offices are located in California, USA; Cambridge, UK; Montreal, Canada; and Beijing, China. Specific addresses and contact information can be found on Clear-Com's corporate website:

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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.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
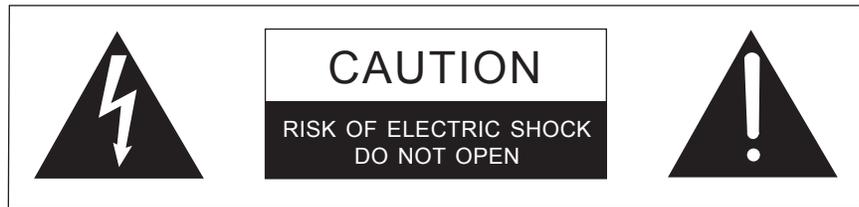
This symbol alerts you to the presence of uninsulated dangerous voltage within the product's enclosure that might be of sufficient magnitude to constitute a risk of electric shock. Do not open the product's case.

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 PS-704 power supply 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.

1 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 beltpacks and main stations are still in daily use around the world.

The PS-704 power supply is a powerful, yet user-friendly unit that can serve as the heart of a Clear-Com system. We recommend that you read through this manual completely to better understand the function of the PS-704 and how to optimize your system setup. 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 directly at the factory. Our applications support and service people are standing by to assist you. (Refer to Chapter 6: "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 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 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 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 two 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 two-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.

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.

DESCRIPTION

The Clear-Com PS-704 is a single rack space, one- to four-channel intercom power supply which can provide up to 1.2 amperes per channel to operate Clear-Com beltpacks and remote stations. This power is supplied to any or all of four channels, and will support up to 40 beltpacks or 10 speaker stations. Clear-Com's new 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 channels continue to operate normally. Once the fault condition is removed, the PS-704's fail-safe circuit will bring the power back up, even under full load conditions. LED indicators signal a fault on any channel. A line-level program input offers a master input level. Individual program selects, each with its own send level, are provided for each channel. Use of a switching power supply allows the PS-704 to operate with any AC line voltage from 100 volts to 240 volts AC at 50 Hz or 60 Hz. The metal chassis and extra-thick front panel with integral rack ears maintains legendary Clear-Com ruggedness.

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 PS-704's power supply:

• **AUTOMATIC SHORT CIRCUIT PROTECTION:** The PS-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 PS-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 PS-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:
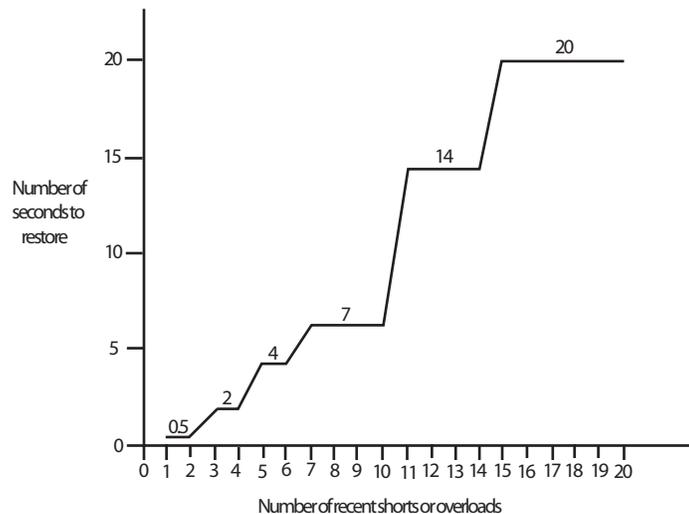
Figure 1-1: Automatic Power Restore Times

- **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.

- **FRONT PANEL INDICATIONS:** There are four *overload* indicators on the front panel (one for each channel) and a *power* indicator for the power supply. The *overload* indicators light steady 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 PS-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.

- **MULTI-CHANNEL REMOTE STATIONS MAINTAIN THE POWER LINE ISOLATION:** The RM-704, RM-702 and KB-702 as well as any two or four channel remote station or beltpacks are designed

to use the isolated power provided by the PS-704. Refer to Chapter 2, "Installation."

• **LOW NOISE CIRCUITRY:** The direct current outputs of the PS-704 contain very little hum and noise. The PS-704 does not contribute to audible noise in the remote stations and beltpacks.

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

PS-704 OVERALL DESCRIPTION

A brief description of the connectors and controls follows. (Refer to Figure 1-2.)
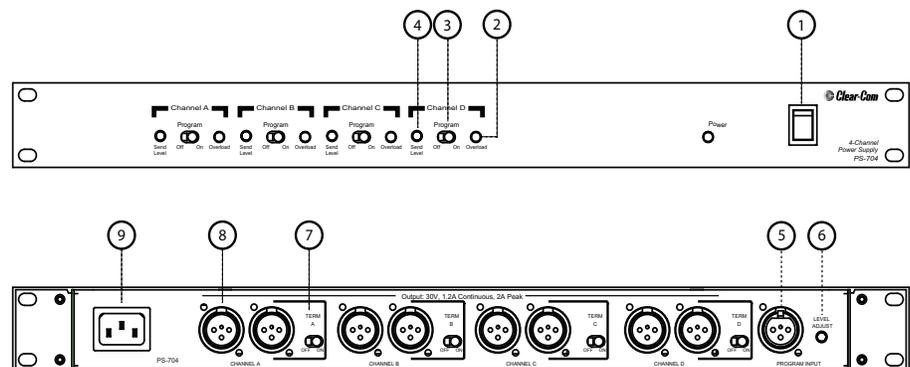
Figure 1-2: Front and Back Panels of PS-704

FRONT PANEL

1. **POWER SWITCH:** Switches the AC power to the PS-704 on and off. The adjacent *green* LED will illuminate when the power is *on*.
2. **OVERLOAD INDICATORS:** The respective *red* LED for each channel (*A, B, C, D*) will illuminate if the PS-704 senses a short or overload on that channel. When the fault is removed, the PS-704 will automatically reset and the LED will go out.
3. **PROGRAM SEND:** Slide switch on each channel (*A, B, C, D*) selects that channel to receive the program input coming into the PS-704. All channels receive the same signal from the rear panel *program* input.
4. **PROGRAM SEND LEVEL:** Trimpot adjusts the audio level of the program sent to its respective channel.

REAR PANEL

5. **PROGRAM INPUT:** Female 3-pin XLR jack accepts a balanced or unbalanced line-level input.
6. **PROGRAM INPUT LEVEL:** Adjusts the program level coming into the PS-704. Used with the *program send level* controls to achieve desired system program levels.

7. **TERM. ON/OFF:** Slide switch (one per channel) selects whether the PS-704 will provide termination for that channel. The default position is *on*.

8. **INTERCOM LINE CONNECTOR:** There are two 3-pin male XLR connectors per channel, wired in parallel or "looped-through."

9. **AC POWER SUPPLY INPUT:** Connects to AC with an IEC cable. The PS-704's power supply will accept any line voltage between 100 volts and 240 volts AC @ 50 Hz - 60 Hz. It will automatically adjust to the line voltage. There is no need for a selector switch or an external fuse.

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

POWER DISTRIBUTION AND SHORT CIRCUIT PROTECTION

Depending upon how many shorts or overloads a channel has experienced recently, the PS-704 will attempt to turn power on again within 0.5 to 20 seconds of automatically cutting off power to an overloaded channel. This allows momentary short or overload conditions to clear automatically. If the PS-704 cuts power off to one or more channels, it will indicate which channel is affected by blinking the red *overload* light(s) corresponding to these channel(s). This light will assist in locating the shorted or overloaded channel. Shorts are generally caused by miswiring or damaged cables. Overloads are generally caused by connecting too many beltpacks and stations to a channel.

The current requirements of Clear-Com remote stations and beltpacks vary with model and use. A station that is simply *on* and idling in the circuit may draw only a small amount of current.

The PS-704 provides DC power to operate Clear-Com beltpacks and remote stations.   The power is distributed between the four channels and will support up to 40 1-Channel Beltpacks or 10 speaker stations or 12 headset stations.

OPERATION

Because the PS-704 is a power supply, its actual operation is very straightforward. Some forethought as to system layout, station selection, and cabling schemes is worthwhile, especially if the system encompasses multiple channels, a large number of stations, long cable runs or any combination of these. The only actual user-initiated operation of the PS-704 once it is connected to the system is to switch the power *on,* check and set the terminations, select the program sends, and adjust the levels. Any time the system is initially powered up, it is a good idea to verify that none of the *overload indicator* LEDs are lit.

FRONT AND REAR PANEL CONTROLS

In the following descriptions, the numbers in the left column refer to Figure 1-2 on page 1-4.

1 **POWER SWITCH:** Switches the AC power to the PS-704 *on* and *off*. When in the *on* position, the LED indicator to the left of the switch should illuminate. Check the short indicators for evidence of system malfunctions.

3 **PROGRAM SEND ON/OFF:** These toggle switches, one for each channel, connect program audio to that channel. The number of active sends will not affect the overall send level to any channel.

4 **PROGRAM SEND LEVEL:** These potentiometers, or trim pots (one for each channel), adjust the level of program heard in that channel. The *program* switch must be *on* for the control to function on that channel. (The level controls work in conjunction with the *program in* [6] level control on the rear panel.) For a higher program level, turn the control clockwise. For less program level, turn the control counter-clockwise. If the control is all the way up on a channel and the program level in the line is not loud enough, increase the input level with the *program in* control on the rear panel. Conversely, if there is still program heard on a channel when its level is all the way down, decrease the program in level. Any change in the *program in* level control on the rear panel to adjust for one channel will necessitate adjustment on the other channels to compensate.

6 **PROGRAM INPUT LEVEL ADJUSTMENT (rear panel):** Use this trim pot to adjust the overall input level of the external program. Turn the control clockwise to increase the gain and counter-clockwise to reduce it.

Note: *Do not force the trim pots past their stop points as this will damage them.*

7 **TERM ON/OFF:** These toggle switches activate the termination for their respective channel when switched to *on*. These should always be on unless there are other power supplies or terminated main stations in the system. If there are other possible terminations in the system, it must be decided where each channel's single termination will be.

REAR PANEL CONNECTORS

5 **PROGRAM INPUT:** This 3-pin female XLR jack accepts a balanced or unbalanced line-level signal. This is typically a feed from an audio board, an air feed from a studio to remote site over a phone line, or an audio cue track. Send levels to the individual channels are controlled with a combination of the *program in* level and the *program send* levels on the channels.

8 **INTERCOM LINE CONNECTOR:** There are two 3-pin male XLR jacks per channel, wired in parallel, or looped through. All the stations in the system are ultimately connected to the station through these jacks. Because intercom audio is two-way, they are neither inputs nor outputs, but may be thought of as "ports." Pin #1 is connected to the shield and carries the signal ground. Pin #2 carries the DC voltage that runs the remote stations. Pin #3 carries two-way audio and call signals.

FRONT PANEL INDICATORS

2 **OVERLOAD INDICATORS:** 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* LED for that channel will be on. If a *red* LED is illuminated, the fault on that channel must be located and removed. The *overload* LED will go out and the PS-704's automatic short reset circuitry will automatically bring the power back up on that channel when the fault is removed. If there are no shorts, but the LED stays on, an overload exists, possibly due to too many intercom stations connected on that intercom line.

If the failure continues, unplug the intercom line connected to the affected channel. Its red *short* LED should go out. This indicates a short in that line. Follow that intercom line connecting and disconnecting cables along the line until the fault is isolated.

TO CHECK BEFORE POWERING SYSTEM

Before you turn on the power:

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:

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 KΩ. A very high channel resistance means the channel is not terminated. Channel resistance of 2 KΩ indicates a double-termination. If a double-termination is indicated, locate the other power supply or main station and set its termination to *off*.

   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 inside the unit. Consult the unit's manual for the location.*

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 10Ω. A high reading (over 100Ω) indicates that the 10Ω 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 10Ω (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.

Caution: 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 2Ω. 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 4Ω is ideal.

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 to 30 volts.

2. Test for proper operation of call signaling. Activate the call signal on any belt pack or station. The *call* lights on all other stations on that channel should illuminate and then go out when the *call* button is released.

3. Adjust the sidetone null on all stations. (Refer to the manual for each specific unit for instructions.)

2 INSTALLATION

QUICK START

1. Unpack the unit and inspect for any damage that may have occurred during shipping.
2. Connect the proper AC mains cable.
3. Install the PS-704.
4. Connect the AC to the mains circuit. Connect the intercom lines and program input as required.
5. Set the four termination switches on the rear panel to *on*.
6. Switch power *on*. The green *power* light should be *on* and the four red *short* lights should be *off*.
7. Select program sends and set program levels as required using *program input level* adjust and *program send level.* Program level controls on unused channels should be set to the fully counterclockwise position.
8. Set levels and sidetone nulls at remote stations.
9. The intercom system should now be operating properly.
10. Read the rest of this manual for further information.

INSTALLATION

Choose the location of the PS-704. The unit requires access to AC power. It should be located away from other equipment that generates excessive amounts of heat. The choice of location will also depend upon the wiring scheme (refer to the section "Wiring").

INTERCOM LINE CONNECTION

The PS-704 provides two rear-panel 3-pin male XLR connectors for each intercom line. These connectors are wired in parallel and intended for loop-through connection. Any single-channel station or channel of a multi-channel station connected on a line plugged into Channel A of the PS-704 will be "party-lined" with all the other stations on that same channel. In a multi-channel system, the goal is to assign specific people to the correct group (i.e. the other people with whom they need to be in contact 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 (REAR PANEL)

Switching of the channels' terminations *on* and *off* are done with the rear-panel toggle switches. In most systems, all terminations on the PS-704 should be in the *on* position (default setting). The fundamental concept of Clear-Com party-line intercom is that all channels are terminated in one location, preferably at the power supply.

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

The PS-704 provides terminations for each of its four channels. Clear-Com main stations and power supplies provide switch-selectable termination networks on all intercom lines. 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 severe imbalance of hybrid null networks. A line with double or multiple terminations will cause low levels and severe imbalance of hybrid null circuits.

If the PS-704 is the only power supply in the system (no other power supplies or powered main stations are in the system) the termination switch on each channel of the PS-704 should be switched to *on*. Simply toggle the rear-panel switch labeled *term* to the *on* position. The termination switch should be set to the *off* position **only** if the channel is terminated at another station.

PROGRAM INPUT (REAR PANEL)

A 3-pin XLR female connector provides the main program input to the station. This input level is controlled by the rear-panel *program level* control adjacent to the *program in* connector. This control sets the overall level for all the channels. The input accepts a balanced or unbalanced line-level audio signal. The program can be fed to any or all of the intercom lines by using the front-panel toggle switches labeled *program on/off*. There is one of these switches for each channel.

The pinout of the program input connector is as follows:

> Pin #1 --- Ground (shield)
>
> Pin #2 --- + Signal
>
> Pin #3 --- - Signal

RACK MOUNTING

The unit requires 1.75 in. (44 mm or 1RU) of rack space. It requires no additional free rack space above or below it for ventilation. The station is 7.5 in. (165 mm) in depth and requires at least 2.5 in. (64 mm) clearance in the rear for connectors and cables. The single-piece front panel has integral "rack ears." This adds stability and strength.

WIRING

When considering how to 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 preferred. 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.

Caution: 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 connector or shield greatly increases crosstalk between channels. This can greatly 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 be 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 the power supply. 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 downline of the break will be disconnected from the party line.
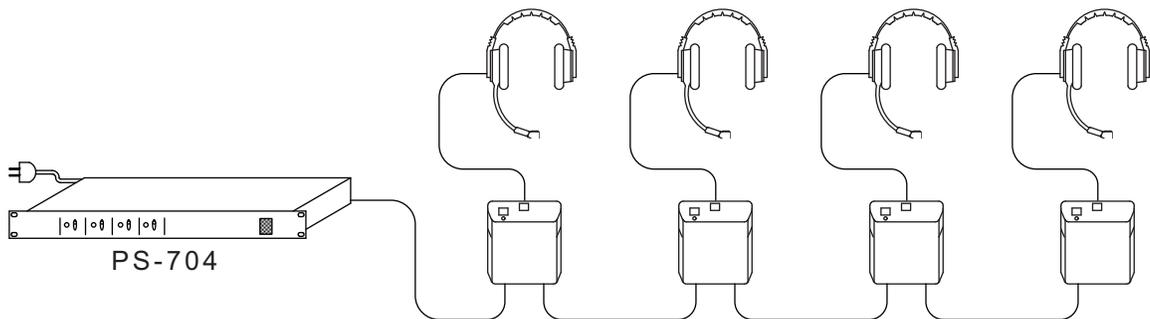

Figure 2-1: Daisy Chain

2. **Hub or Star:** Each remote station is wired directly back to the power supply or to a split line wired directly to the power supply.

Channel A   Channel A

PS-704
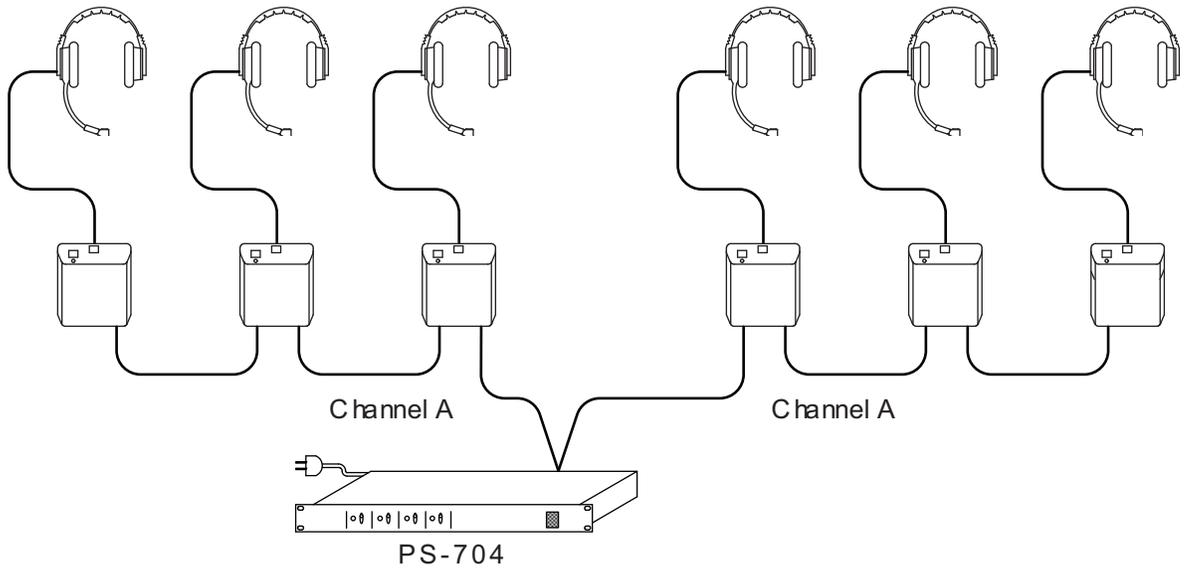
Figure 2-2: Hub or Star

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 "Belden Shielded Cables" in the next section for cable recommendations.

Figure 2-3: Multi-channel System

In a multi-channel system where multiple channels are run from the PS-704 to multiple channel stations 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. If this kind of connection will be used, refer to the section "Crosstalk Considerations."

Figure 2-4: Multi-channel to multi-channel

CROSSTALK CONSIDERATIONS

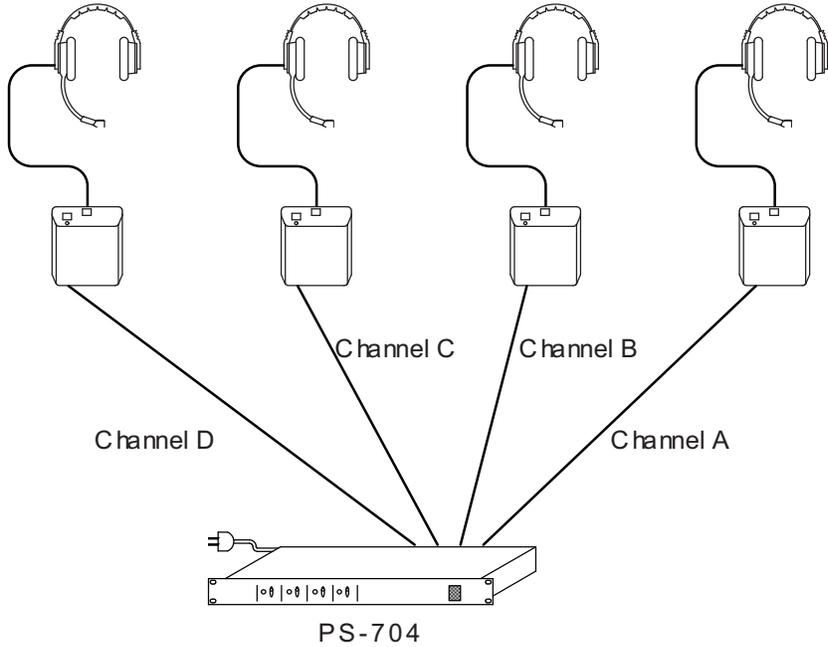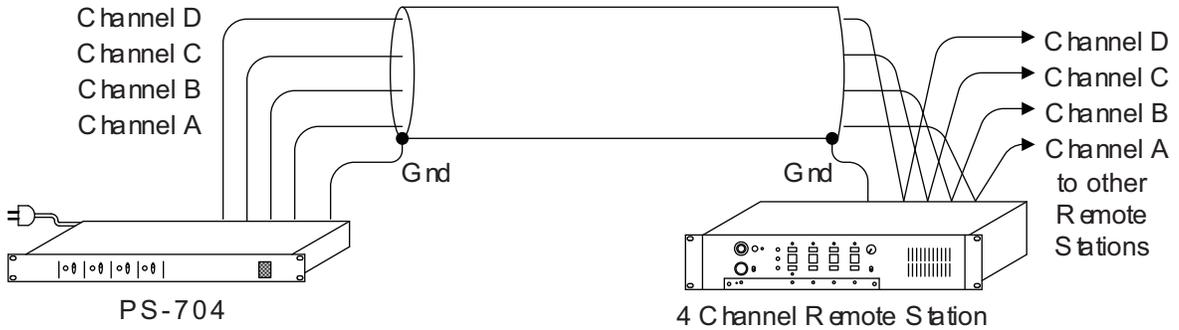When multiple channels are fed to remote stations, the amount of crosstalk between channels is proportional to the DC resistance of the ground return path back to the channel terminations. To minimize this crosstalk between channels when running more than one channel in a multi-pair cable, keep the DC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

- Keep cable runs under 500 ft. (152.5 m).

- 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.

If shielded multi-pair cables are used to connect multiple channels between the PS-704 and remote stations, the cables should be wired to maximize the number of ground connectors to minimize crosstalk. In the following cable wiring diagram, note that it is not necessary to run redundant power connectors on each channel to the remote station. The spare wires which would normally conduct power are instead used to augment the drain wire ground connection.
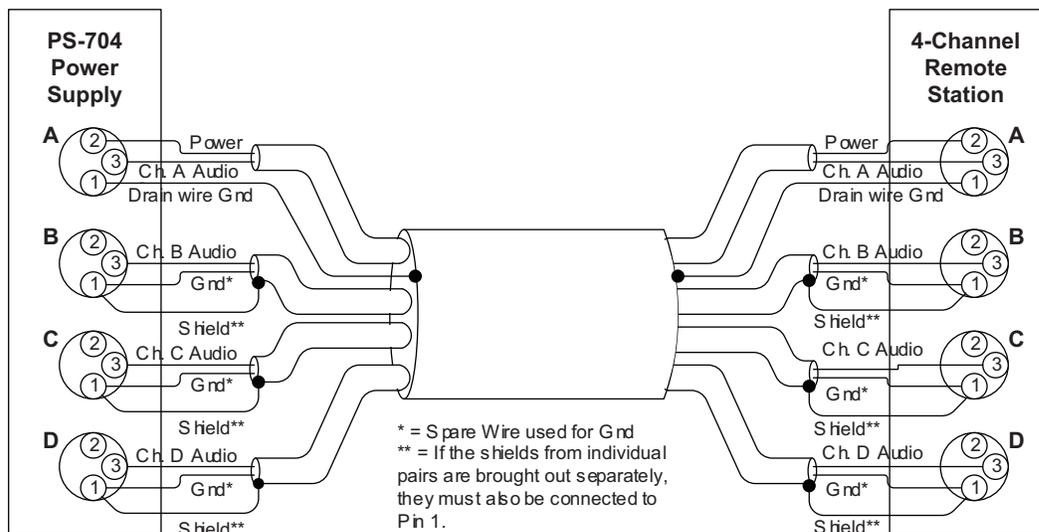
Figure 2-5: PS-704 to 4-Channel Remote Station

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.

Typical system performance for a Clear-Com system is contingent on 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 does not recommend 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, the other conductor carries the DC power for remote stations. The shield serves as the ground return of the audio and power conductors. When choosing interconnect cable, keep the following considerations in mind:

• **Keep cable runs under 500 ft. (152.5 m).** The DC resistance of the ground or common conductor affects crosstalk. For permanent installation runs longer than 500 ft. (152.5 m), 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 then 0.25 uF.

• **Portable installation cable:** Practical cable for portable system interconnections is flexible, two-conductor, shielded microphone cable. We suggest using Belden #1800. 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. Placing the cable in conduit is recommended, but not necessary.

• **Multi-pair cable:** Individually shielded multi-pair cable 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 resistance path for the ground return.

• **Grounded installation:** 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.

• **Suggested cable types:** The following chart lists the specifications of various BELDEN cables:

Table 2-1: Belden Cable Types

Trade No.	No. of Pairs	AWG & Stranding	Insulation Thickness (inch)	Jacket Thickness (inch)	Nom. O.D. (Inch)	Nom Cap($_p$F/ft)	Shield Nom D.C.R. (Ohms)
8413	1	24 (45x40)	0.019	0.025	0.019	30	
8412	1	20 (26x34)	0.02	0.043	0.268	30	
8762	1	20 (7x28)	0.014	0.028	0.196	27	
8760	1	18 (16x30)	0.018	0.028	0.222	24	
1408B	4	24 (7x32)	0.04	0.037	0.346	31	4.8Ω/M
1814A	2	22 (7x30)	0.05	0.025	0.319	31	3.9Ω/M

Trade No.	No. of Pairs	AWG & Stranding	Insulation Thickness (inch)	Jacket Thickness (inch)	Nom. O.D. (Inch)	Nom Cap($_p$F/ft)	Shield Nom D.C.R. (Ohms)
1815A	4	22 (7x30)	0.05	0.03	0.384	31	3.9Ω/M

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.*

PS-704 BLOCK DIAGRAM

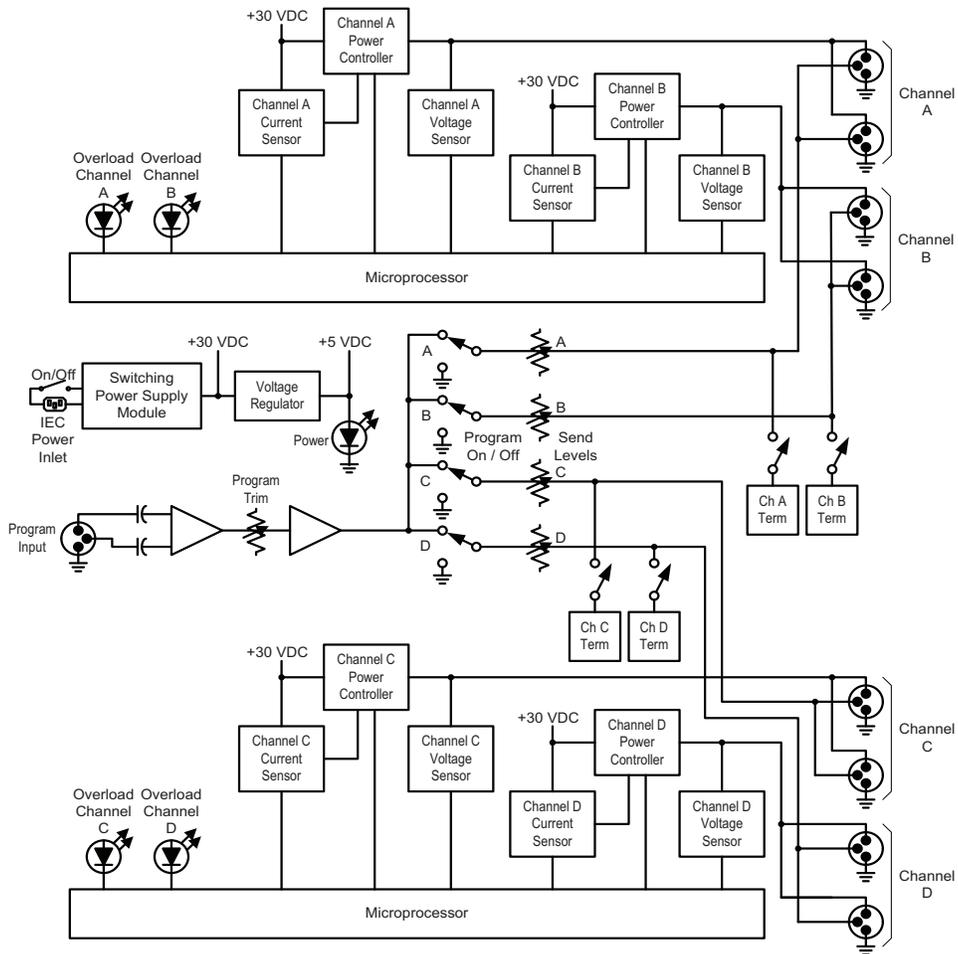The following is a block diagram of the PS-704:

PS-704

Figure 3-1: PS-704 Block Diagram

TROUBLESHOOTING TIPS

SYMPTOM	CAUSE	SOLUTION
System does not operate. No power to the PS-704. Green *power* LED is not illuminated and no *short* LEDs are illuminated.	No AC power to the PS-704.	Check AC connection and cable. Plug into dependable AC source.
	PS-704 has an internal power supply failure.	Unit requires servicing.
Red *short* LED illuminated.	Short or overload on that channel due to a shorted or miswired cable.	Remove cables (one at a time) from system until the faulty line is located. Check for shorts between pins #1 and #2. Once the short is removed, the PS-704 will reset automatically and the power will come back up within a few seconds.
	Defective remote station.	Check remote station and replace if necessary.
All red *short* LEDs are illuminated.	System is overloaded.	Remove cables (one at a time) from system to help determine where the excess current requirements lie. Re-evaluate system current needs.
	Short in multipair cable.	Remove cables (one at a time) from system until the faulty line is located. Check for shorts between pins #1 and #2.
Hum or buzz in system.	Inductive pickup caused by close proximity of main or remote stations to power lines or transformers.	Relocate offending unit.
	10Ω chassis ground resistor is open.	Check the DC resistance for 10Ω between the chassis and pin #1 of any intercom connector.
If this condition occurs, 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.*		
System feedback (acoustical).	Volume control at the remote station is set too high.	Adjust.

SYMPTOM	CAUSE	SOLUTION
	Channel unterminated.	Set the PS-704 *termination* switch for that channel to the *on* position.
	A headset extension cord was used.	Headset extension cords are not recommended.
Excessive crosstalk.	High DC resistance in ground return.	Use heavier cable; add additional conductor(s) to ground return.
	Multi-channel cable pairs are not individually shielded.	Replace cable with individually shielded pairs.
	Headset cables are not wired properly or shielded properly.	Correct wiring. Use headsets with properly shielded wiring.
Program signal sounds distorted.	Overload of *program in* circuit.	Reduce *program in* level or reduce the gain of the program signal at the source, such as an audio mixer.

Table 3-1: Troubleshooting Tips

4 TECHNICAL SPECIFICATIONS

PS-704 FOUR-CHANNEL POWER SUPPLY

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

Program Line Input
Maximum Level before Clipping	>= 20dBu
Input Impedance	>= 5KΩ

Frequency Response
Program Input - Party Line	200 - 20KHz ± 3dB

Max Distortion
Program Input - Party Line	<= 0.2%

Noise
Program Mic Input - Party Line	< -70dBu

Max Gain
Program Input - Party Line	>= -16dB

Min Gain
Program Input - Party Line	<= -20dB

Mains Power
Input Voltage Range	100 - 240 VAC
Input Frequency Range	50 - 60 Hz
Input Power	<= 60 VAC
Output Voltage	30 VDC ± 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 >= 20 shorts in 20sec)<= 20 sec	

Station Capacity

Up to 40 1-Channel Beltpacks, 10 speaker stations or 12 headset stations distributed over both channels

Rear Panel Connectors

Intercom:	(8) XLR-3M (2 per channel)
Program:	(1) XLR-3F
AC Power:	IEC 320 connector

Rear Panel Controls

(4) Termination On-Off switches
(1) Volume control

Front Panel Controls & Indicators

(4) Program switch
(4) Send level controls
(4) Overload LEDs
(1) Power indicator LED
(1) Power switch

Environmental

32 - 122° F (0 - 50° C)

Dimensions

19 in. W *x* 1.75 in. H *x* 7.5 in. D
(483 mm *x* 44 mm *x* 190 mm)

Weight

6.16 lbs. (2.80 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.

5 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 that are not part of the specific communication but are picked up by the microphone. Selection of a good "noise-cancelling" mic will reduce ambient noise.

Beltpack: 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 (red light) used to attract the attention of an operator who has removed the headset.

Channel vs. Station: 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).

Crosstalk: Leakage of audio transmissions from one channel to another.

Dry Pair: A telephone term is used to describe a pair of wires (two 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 other 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.

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 needs AC power to operate.

Multi-Channel: More than one channel.

Party Line (P.L.): Intercom system in which 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 beltpack, 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.

LIMITED WARRANTY

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

Clear-Com 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 beltpacks, 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, Clear-Com'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 Clear-Com'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 Clear-Com's User Support Centers are given below.

Americas and Asia-Pacific Headquarters California, United States Tel: +1.510.337.6600 Email: CustomerServicesUS@clearcom.com

Europe, Middle East, and Africa Headquarters Cambridge, United Kingdom Tel: +44 1223 815000 Email: SalesSupportEMEA@clearcom.com

Canada Office Quebec, Canada Tel: +1 (450) 653-9669

China Office Beijing Representative Office Beijing, P.R.China Tel: +8610 65811360 / 65815577

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). Clear-Com 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 Clear-Com's expense.

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

Americas and Asia-Pacific Headquarters California, United States Tel: +1.510.337.6600 Email: CustomerServicesUS@clearcom.com

Europe, Middle East, and Africa Headquarters Cambridge, United Kingdom Tel: +44 1223 815000 Email: SalesSupportEMEA@clearcom.com

Canada Office Quebec, Canada Tel: +1 (450) 653-9669

China Office Beijing Representative Office Beijing, P.R.China Tel: +8610 65811360 / 65815577

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

SERVICE CONTRACT

Clear-Com 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 CLEAR-COM'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, CLEAR-COM'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 Clear-Com warranty does not cover any defect, malfunction, or failure caused beyond the control of Clear-Com, 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 Clear-Com, 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 Clear-Com), 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 Clear-Com 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.