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MS-222

2-Channel Main Station

INSTRUCTION MANUAL

Clear-Com Intercom Systems

945 Camelia St. Berkeley, California 94710 510-527-6666

Clear-Com 810142

9/25/91 REV.A

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RMK OPERATION

References to the RMK function as they appear in the body of the manual text are to be disregarded.

500 Series Belt Packs have the feature of resetting microphone status to the off condition whenever the Remote Mic-Kill button is pressed. Momentarily pressing the Channel A Remote Mic-Kill button on a MS-222 or CS-222 station will interrupt +30 volt power to both Channel A and Channel B XLR receptacles. This will reset microphone staus to the off condition on all 500 series Belt Packs connected to that station.

Use of more than one power source is NOT recommended. If more than one Main Station or an auxiliary power source (i.e. battery or power supply) is used in conjunction with a Main Station the RMK function may not be used. In this situation operating RMK will short circuit any additional power sources causing system power disruption or damage to the Main Station.

Channel B RMK is available as a special order. Consult factory sales department for details.

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CLEAR-COM LIMITED WARRANTY

Clear-Com products are warranted to be free from defects in materials and workmanship for a period of one year from the date of sale.

Clear-Com's sole obligation during the warranty period is to provide, without charge, the parts and labor necessary to remedy covered defects appearing in products returned prepaid to Clear-Com, 945 Camelia St., Berkeley, Ca. 94710-1484, U.S.A.

This 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 improper associated equipment, attempts at modification and repair not authorized by Clear-Com, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

To obtain warranty service, follow the procedures described below in "Procedures for Returns" and "Shipping to Manufacturer for Repair or Adjustment."

This warranty is the sole and exclusive express warranty given with respect to Clear-Com products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability are limited to the duration of this express limited warranty. Neither Clear-Com nor the dealer who sells Clear-Com products is liable for incidental or consequential damages of any kind.

Return Shipping Instructions

Procedures for returns:

--If repair is necessary, contact the dealer where the unit was purchased.

--If repair through the dealer is not possible, contact the Clear-Com Customer Service Department, located at the factory, as directed below. They will issue a Return Authorization Number (RMA).

--Do not return any equipment to the factory without first obtaining a Return Authorization Number.

--Be prepared to provide your company's name, address, phone number, name of person to contact regarding the repair, type and quantity of the equipment, description of the defect, and the equipment serial number(s).

Questions regarding returns for repair should be directed to:

Customer Service Department
Clear-Com Intercom Systems
945 Camelia Street
Berkeley, California 94710-1484
Telephone: (510) 527-6666
Fax: (510) 527-6699

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Shipping to Manufacturer for Repair or Adjustment

All shipments of Clear-Com equipment must be prepaid via United Parcel Service or the best available shipper. The equipment should be shipped in the original packing container; however, if the original container is not available, use a suitable container that is rigid and of adequate size. If a substitute container is used, the equipment should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material. A detailed description of the problem or work to be done should be included. All shipments should be directed to the attention of the Customer Service Department and must include the Return Authorization Number.

Upon completion of repairs, equipment will be returned collect via United Parcel Service or other specified shipper.

NOTICE ABOUT SPECIFICATIONS

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.

BEFORE YOU BEGIN . . .

To get the most out of the MS-222 Main Station, read this manual carefully. It will answer questions you might have about the operation and service of the components in the system. Included is a Troubleshooting Section that provides causes and possible solutions to problems you might have with system and component operation. Clear-Com's Customer Service Department is available to answer questions not covered in this manual.

It is assumed you are familiar with the operation of basic intercom systems. If you are not, it is important to read the section titled "The Clear-Com Concept".

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SECTION 1
DESCRIPTION OF THE MS-222 2-CHANNEL INTERCOM STATION

THE CLEAR-COM CONCEPT

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

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

Clear-Com stations are interconnected with two-conductor, shielded microphone cable, using 3-pin XLR connectors. One wire carries the DC power (28-30 volts) from a main station or power supply to all remote stations, and the other wire carries 2-way (duplex) audio information. The shield acts as a common ground. One termination (per channel) is needed throughout the intercom network, and is usually located in the main station or power supply.

Clear-Com is a distributed amplifier system; each main and remote station houses its own mic preamplifier, headset or speaker power amplifier, and signaling circuitry. The Automatic Headset Detection circuit shuts off a station's mic pre-amp when the headset is disconnected, so background noise on the line is not increased by an unused yet on-line station. Low-impedance mic input lines (200 Ohms) and specially designed circuitry make Clear-Com channels virtually immune to RFI and dimmer noise.

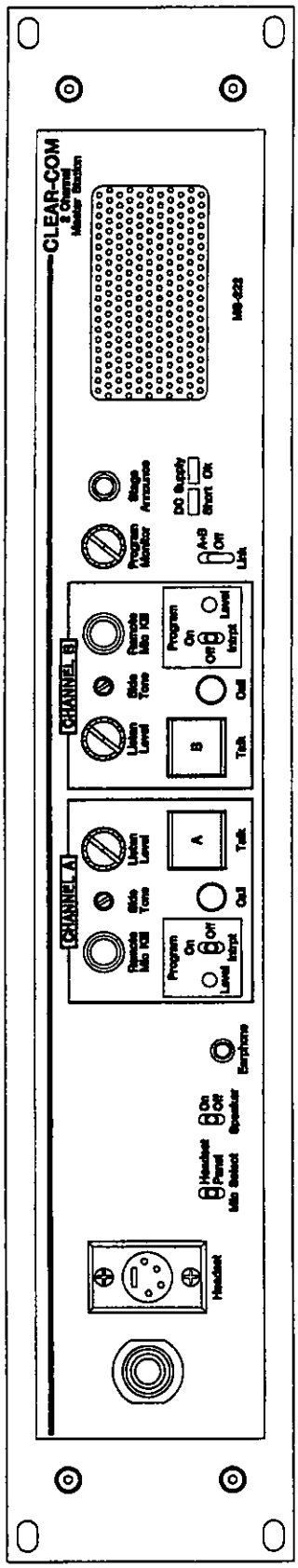
Clear-Com main stations, power supplies and certain remote stations each have an auxiliary program input with its own volume control, which allows an external audio source to be fed to the intercom system.

Visual Signal Circuitry (CALL Lights), a standard feature on most main and remote stations, allows the user to attract the attention of operators who have removed their headsets.

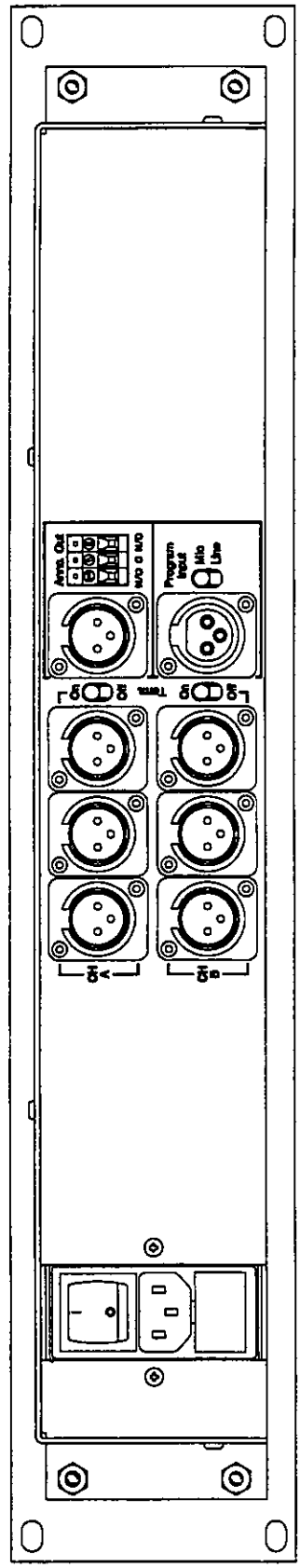
Depending upon the type of main and remote stations selected and assuming that enough DC power is available, a maximum number of remote stations from 10 (all speaker stations) to 30 (all headset stations) can be distributed along a mile of wire. Remote stations bridge the intercom line at a very high impedance (>10 KOhms), and place a minimum load on the line. The audio level always remains constant, and does not fluctuate as stations leave and join the network.

The 28-30 volts DC provided by main stations and power supply units enable remote stations to operate with minimal current (25 mA. quiescent for headset stations, 50 mA. quiescent for speaker stations) while generating extremely loud listen volumes (greater than 110 dB SPL using Clear-Com Headsets). The higher voltage and low current keep voltage losses to an absolute minimum in long lines. If the supply voltage drops due to the addition of great length of cable or many more stations, Clear-Com equipment will continue operating with less than 12 volts available.

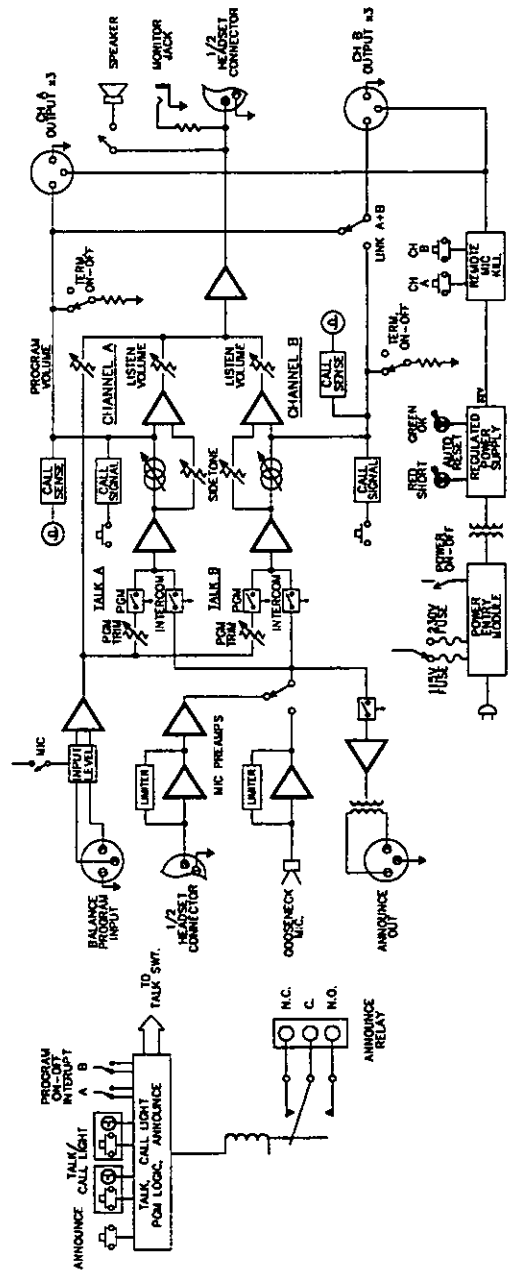
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MS-222 FRONT PANEL



MS-222 REAR PANEL



MS-222 BLOCK DIAGRAM

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1.1 MS-222 OVERALL DESCRIPTION

The MS-222 is a rack-mount, two-channel main station with a speaker, optional goose neck microphone (MS-222GM), regulated power supply and a versatile monitoring system. It features excellent speech intelligibility in all noise-levels.

The MS-222 contains two mic preamps with limiters for each microphone input. Each microphone preamp is optimized for the type of microphone used with it.

The MS-222's four-watt power amp can drive a standard Clear-Com headset to levels greater than 110 dB SPL.

The MS-222 provides DC voltage and the ability to talk & listen on two separate channels. It supports and monitors two intercom lines containing as many as 30 remote head-set or 6 remote speaker stations.

Monitoring System

The front panel of the MS-222 has one headset connector and a panel mounted speaker for use by the operator. The operator monitors the intercom channels turning up the appropriate "Listen Level" volume controls (one for Channel A, one for Channel B). Either channel may be monitored separately, or both simultaneously (without tying the two channels together). These volume controls are always active regardless of "Talk" channel selection on the station.

The speaker may be turned on and off with a separate front panel switch.

The jack marked "Earphone" is connected in parallel with the earphone circuit of the headset connector. It can be used for monitoring or recording.

Dual-Action "Talk" Buttons

Each channel has its own "Talk" button which can either "Latch" on, or operate momentarily.

Pressing the button quickly will "toggle" the "talk" function, alternately turning it on or off.

The "Talk" button will illuminate dimly when activated.

Stage Announce (Paging)

The "STAGE ANNOUNCE" button on the front panel sends the signal from the chosen microphone preamp to the balanced, line-level Stage Announce output on the back panel.

The Stage Announce button also mutes the operator's voice output to the intercom channels. This mute function can be defeated with an internal user selectable jumper.

The "STAGE ANNOUNCE" button also activates a SPDT from "C" relay when pressed. The 1 amp contacts can be used for any user desired control function (i.e. muting a local monitor speaker).

Sidetone

The "Sidetone Adjust" controls for each channel on the front panel allows adjustment of the operators own voice as heard in the headset.

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Call Signaling

Visual "Call" Signaling attracts the attention of people who have removed their headsets or turned off their speakers. The MS-222 front panel provides a "Call" button for each channel. Pressing the desired channel button turns on the "Call" lights at all stations on that channel. The "Call" is active regardless of talk status.

When a remote station sends a Call signal, the lamp in the "Talk" button associated with that station's channel lights brightly, whether or not the channel is selected.

Program Input

The MS-222 accepts a balanced, mic-level or line-level program input which can be monitored in the headset or speaker. Program volume for the operator's listening is adjustable with the "Program Monitor" knob on the front panel.

The external program is also assignable and adjustable in level to either or both channels, and mixes with the intercom signal. The program feed can be set to be interrupted by the "TALK" for a particular channel.

LINKing Channels Together

A front panel switch is provided that allows the operator to instantly connect channel A and channel B together for a combined intercom system consisting of both channels.

Remote Mic-Kill Function

The MS-222 provides the ability to turn off any open-mics on Series 500 belt-pack remote stations. Momentarily pressing the Channel A RMK button will remove the DC power from both channels, clearing the 'talk' function of all the belt-packs.

Power Supply Protection

The MS-222 power supply is regulated, current-limited, and provides 30 volts DC at 1 A from a 115V or 230V (selectable) AC mains supply. The MS-222 has an automatic short-circuit sensor to protect the system from miswired cable or shorts in the lines or general current overload. If a short occurs, the red LED on the front panel marked "Short" illuminates. Removing the short, will cause the power-supply to reset itself automatically within 5 seconds.

System Termination

The MS-222 provides individually selectable audio termination networks for both channels A and B.

Easy Interconnection

The MS-222 provides three 3-pin, male XLR outputs for Channel A (connectors are wired in parallel) and three for Channel B. Intercom signals are fed from the MS-222 with standard mic cable (see next section).

Easy System Expansion

The MS-222 can be ganged together with other MS-222's or other Clear-Com power-supplies for multiple two-channel systems and back-up power support.

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1.2 TECHNICAL SPECIFICATIONS:

HEADSET MICROPHONE PRE-AMP:
--Dynamic Headset Input: ---------- Input Impedance - 1 KOhms
--Input Level ---------- 55 dBv* nominal
--Frequency Response: ---------- 250 Hz to 12 KHz, contoured for intelligibility.
--Gain from Headset to Intercom Line: --------- +41 dB

PANEL MICROPHONE PRE-AMP:
--Input Level ---------- 45 dBv* nominal
--Frequency Response: ---------- 250 Hz to 12 KHz, contoured for intelligibility.
--Gain from Headset to Intercom Line: --------- +31 dB

HEADPHONE/SPEAKER AMPLIFIER:
--Load Impedance: ---------- 8 Ohms
--Output Level: ---------- at least +20 dBv* across 600 ohm
--Distortion: ---------- <0.2% THD at 1 KHz
--Frequency Response: ---------- 200-18KHz +/-2dB
--Gain from Intercom Line: ---------- +37 dB

PROGRAM INPUT:
--Input Level Ref.: ---------- -65 dBv* (mic) -15 dBv* (line)
--Input Impedance: ---------- >1 KOhms (mic) >100 KOhms (line)
--Frequency Response: ---------- 150 Hz to 18 KHz

INTERCOM LINE DRIVE/RECEIVE CIRCUITS:
--Impedance, Output Load: ---------- > 10 KOhms (200Hz - 10 KHz)
--Level, Line (200 ohm load): ---------- -9 dBv* (nominal) +5dBv (max before clip)
--Sidetone Null Capability: ---------- > 25 dB (200Hz - 10 KHz)
--Crosstalk, Station Induced Ch. to Ch.: ------- >60 dB
--Noise, SN Ratio in Listen Channels: ---------- >60 dB

INTERCOM SYSTEM SPECIFICATIONS (STANDARD CLEAR-COM):
Usable Line Quality: ---------- > 100 Stations
Total Line Length on One Channel ---------- > 5000 feet

POWER SUPPLY:
--Output Voltage: ---------- +30 Volts
--Output Ripple: ---------- < 1 mili volt AC RMS
--Output Noise: ---------- < -70 dBv AC RMS
--Current limit: ---------- 1.0 A

CONNECTORS:
--Intercom: ---------- 6 XLR-3 (3-CH A, 3-CH B)
--Program: ---------- XLR-3F
--SA: ---------- XLR-3M

AC POWER REQUIREMENTS: ---------- 105-125/210-250 VAC, 50 to 60 Hz, 60 VA

PHYSICAL SPECIFICATIONS:
--Dimensions: ---------- 19"W x 3.5"H x 10.0D (483mm x 89mm x 254mm)
--Weight: ---------- 7.4 lbs (3.4 Kg)
--Operating Temperature Range: - 32-122° F (0-50° C)

* - 0dBv = 0.775 volts RMS. (Specifications subject to change without notice.)

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SECTION 2
INSTALLATION OF THE MS-222 2-CHANNEL MAIN STATION

2.1 INSTALLATION OVERVIEW

The MS-222 is a combination of a very versatile intercom station and a system power supply. Installations can vary depending on what features are used.

The fundamental concept of Clear-Com Party-Line intercom is that all stations provide high impedance current sourced signals into a single common system termination. The line drivers in a station have a source impedance greater than 10 KOhms.

The termination of an intercom line (or channel) is a 220 Ohm resistor in series with a 4.7 KOhm that is paralleled with a 10 uF capacitor. The impedance of the network at audio frequencies is 220 Ohms. The DC resistance of the network is 5 KOhms. The high DC resistance allows a CALL voltage to be placed on the line without drawing too much current. A CALL signal is a DC voltage greater than 10 volts on the line. The DC source for this CALL signal is also a current source there by providing a high impedance and not affecting the audio signal.

The receive or "listen" section of stations contain a 'hybrid null' circuit that attempts to reject (null) any "talk" signal being sent by that station on that channel. The 'hybrid null' circuit depends on a known impedance on the intercom line to accomplish this. Variations in impedance on the line upset the 'null'.

Clear-Com main and some remote stations provide switch selectable termination networks on all intercom output lines. It is up to the user to determine where the termination will be provided. An unterminated line will cause excessive levels, possible oscillation of line drivers, and sever unbalance of hybrid null networks. A double or multiple terminated line will cause low levels and sever unbalance of hybrid null circuits.

CAUTION: All Clear-Com Intercom lines must be terminated. **Care must be taken not to fail to terminate or to 'double' terminate a line.** All unused intercom inputs must be terminated to keep the line drive circuits stable.

CLEAR-COM STATION TYPES:
Clear-Com party-line intercom stations all fall into one of four distinct catagories that relate to system powering and termination. The four types are as follows:

A. MAIN STATION:------- Supplies system power for external stations.
------- Provides switch selectable terminations.

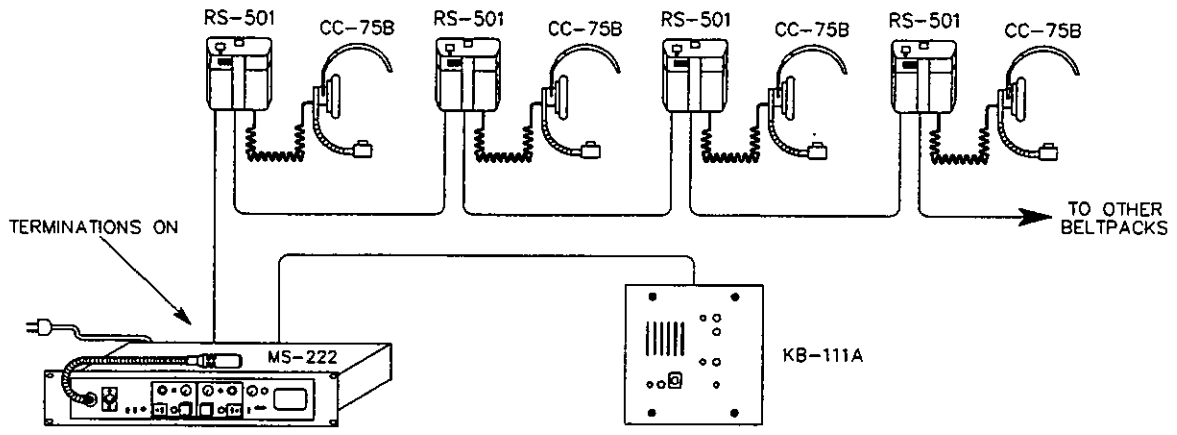
B. MASTER STATION: - Contains a power supply just for itself.
- Provides switch selectable line terminations.

C. REMOTE STATION: - No power supply. Derives power from the intercom line.
- May or may not have terminations.

D. POWER SUPPLY: --- Supplies system fower for external stations.
--- Provides switch selectable terminations.

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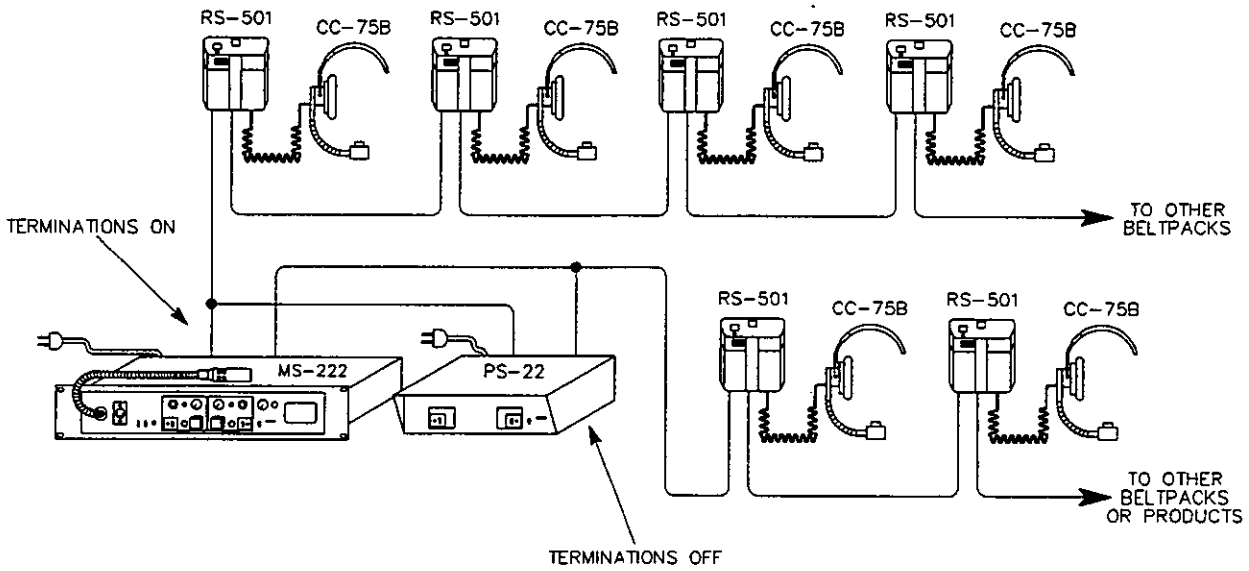
SYSTEM POWERING: Typical Clear-Com systems consist of a MAIN STATION and multiple REMOTE STATIONS. The REMOTE STATIONS are powered from the MAIN STATION through the intercom cable.



Typical Single Power Source System

Clear-Com power supplies can be paralleled to increase the number of REMOTE STATIONS that can be operated in a system. The MS-222, CS-222, and the PS-22 will provide 1 A of current.

By simply connecting a PS-22 or another MS-222 in parallel with an existing MS-222 the current capacity of the system is raised to 2 A. The termination switches in the second power source would need to be in the OFF position. **NOTE:** The RMK function will not work on a system that has two or more power supplies.



System With Multiple Power Sources

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2.2 CABLE CONSIDERATIONS:

The Clear-Com intercom line is intended to run on a shielded twisted pair of cable per channel of intercom. One conductor carries full duplex ("two-way") audio, the other conductor carries the DC power for remote stations. The shield is used for ground return for audio and power. When choosing interconnect cable, keep the following considerations in mind:

1. DC resistance of the ground or common conductor affects crosstalk. For runs longer than 100 feet do not use wire smaller than 20 gauge. The total resistance of the ground return (the combined parallel sum of all shields to a location) to any point in the system should be under 1.5 ohms.

2. The capacitance of the interconnect cable affects system frequency response and side-tone stability. Total capacitance should not be greater than 0.25 uF (capacitance between conductor and shield) equivalent to an intercom system containing 5000 feet of cable at 50 pF per foot.

PORTABLE INSTALLATION CABLE

Typical cable for portable system interconnections is flexible, two-conductor, shielded microphone cable. For runs less than 500 feet a cable made of 24 gauge wire is acceptable. For runs longer than 500 feet use a 20 gauge cable or larger.

Portable remote stations such as belt-packs have a pair of input and output connectors; when installing a system that includes these, they can be "daisy-chained" or "loop-thru" connected along one interconnect path. Clear-Com provides a one input by three output Line-Splitter (QP-100) that can also simplify wiring. Daisy-Chaining and Line-Splitting decreases the amount of cable required and simplifies the installation.

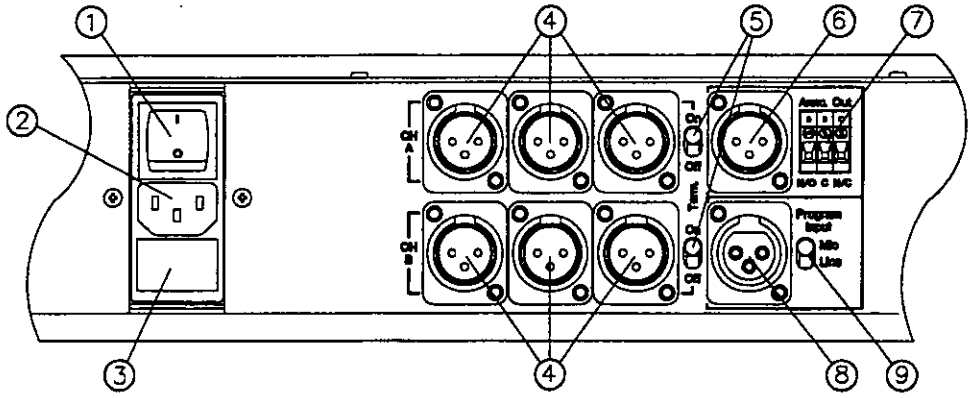
PERMANENT INSTALLATION CABLE

Vinyl-jacketed shielded pair is the cable of choice for permanent installations. Use a low-capacitance 20 gauge wire for short runs (under 500 feet) and 18 gauge cable for runs greater than 500 feet. Placing the cable in conduit is recommended but not necessary.

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

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2.3 REAR PANEL DESCRIPTION



MS-222 Rear Panel

1. **Power Switch**
   The AC "Power Switch" is located on the top left corner of the rear panel. The switch is a rocker switch with a "1" mark for on and "0" for off.

2. **Power Connector**
   Just below the power switch is an EIA power receptacle for either 115 or 230 VAC power input.

3. **Power Voltage Select and Fuse Block**
   Just below the EIA receptacle is a plug-in fuse block. By placing a flat blade screwdriver in the slot between the connector and the block and twisting slightly the fuse block will release from the connector.

   Complete removal of the block will give access to both fuses. Both fuses are identical in value regardless of the AC voltage applied.

   By turning the block over when replacing it in the receptacle will convert the input voltage range. The voltage range that is read right side up on the bottom of the block is the one selected.

4. **Intercom Line Connectors**
   There are two sets of three XLR-3M intercom connectors for both channel outputs.

   Standard Clear-Com wiring is as follows: Pin 1 -- Ground
   Pin 2 -- +30 VDC
   Pin 3 -- Intercom Audio

5. **Termination Switches**
   Each intercom channel is provided with a "Termination" switch allowing easy termination of the intercom line. The switch is provided in case there are multiple MAIN stations connected to the inter-com line.

   CAUTION: FOR PROPER OPERATION IT IS IMPERATIVE THAT ONE AND ONLY ONE TERMINATION BE PRESENT ON A CLEAR-COM INTERCOM LINE. CLEAR-COM LINE DRIVERS DEPEND ON A KNOWN LOAD VALUE FOR PROPER OPERATION.

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6. **Announce Output Connector**
The "Announce" output is a XLR-3M. The output is transformer isolated, 600 ohms output impedance, and has an output level of approximately 0 dBv.

Wiring is as follows: Pin 1 -- Ground
Pin 2 -- -Audio
Pin 3 -- +Audio

7. **Announce Relay Contact Terminals**
The "Announce" relay contacts are available on a screw terminal block. The relay contacts are "Form C" (break before make). The contact description is as follows:

Left most ---- N/O --- Normally Open Contact
Center ------- C --- Wiper
Right most -- N/C --- Normally Closed Contact

8. **Program Input Connector**
The "Program" input is a XLR-3F. It is an electronically balanced (differential) input.

Wiring is as follows: Pin 1 -- Ground
Pin 2 -- -Audio
Pin 3 -- +Audio

9. **Program Gain Switch**
The "Program Input Gain Switch" is located next to the "Program Input" connector.

In the "Mic" position the input will accept a 'low' impedance dynamic microphone and produce a usable level from a -65 dBv input signal for monitor and intercom line feed uses.

In the "Line" position the input presents a balanced high impedance and a -15 dBv input signal will produce a nominal intercom level on an intercom line.

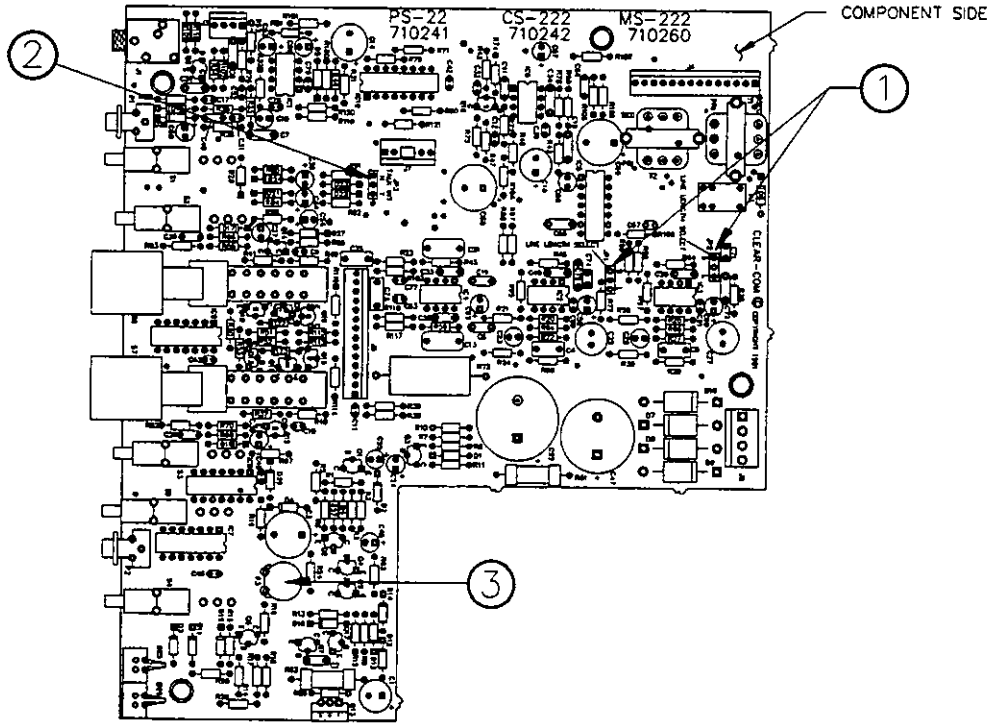
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"CAUTION - These servicing instructions are for use by qualified service personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so."

2.4 INTERNAL OPTIONS AND ADJUSTMENTS

ACCESS TO INTERNAL OPTIONS AND ADJUSTMENTS:

To access the internal options and adjustments the cover of the unit must be removed. Remove the two screws on either side of the station. Remove the four screws on the top of the station. Remove the cover.



Location of Jumpers and Adjustments on PCB

1. **JP-1 and JP-2 Line Length Selection Jumpers**
   Jumpers JP-1 and JP-2 allow the optimization of the hybrid null circuitry for excessive intercom cable lengths. JP-1 is for channel A and JP-2 is for channel B.

   The "S" position of the jumpers is for 'short' lines (200 - 500 feet). The "L" position is for lines in excess of 500 feet. The MS-222 is shipped from the factory with the jumpers in the "L" position. For very short total line lengths (less than 200 ft) remove the jumper completely.

2. **JP-3 Interrupt Enable/Disable Jumper**
   Jumper JP-3 allows the user to enable the "Stage Announce" mute function of active "Talks". Position "Y" is for yes to muting and "N" for no. The MS-222 is shipped from the factory with JP-3 in the "Y" position.

3. **Power Supply Voltage Adjustment**
   Potentiometer P3 is provided for trim adjustment of the +30 volt power supply. If power supplies are intended to be paralleled on the same line their outputs should be as close as possible to each other for proper sharing of current.

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2.5 INTERCONNECTION SETUP

After determining system configuration and channel assignment, pick a location for the MS-222; it can be anywhere as long as it is provided with a source of AC power. Check the Power Block on the rear panel for the proper AC voltage range. See section 2.3 on the page 12 if it needs changing.

1. Use standard shielded mic cable (see section 2.2). ALWAYS AVOID SHARP BENDS IN THE CABLING; ALLOW AT LEAST 3 inches behind rack-mount units for cable extending from rear panels.

2. Route all cables from the Main Station to the Remote Stations. Pin assignments on ALL 3-pin intercom connectors are:
   Pin 1 -- Common
   Pin 2 -- +30 Volts DC
   Pin 3 -- Intercom Audio

3. Route cables away from heavy AC power sources, such as lighting panels, electric motors, or power transformers.

4. In permanent installations, **BE SURE TO INSTALL THE SYSTEM IN ACCORDANCE WITH APPROVED LOCAL BUILDING CODE.**

5. If program monitoring is required, connect the external signal to the Program Input (3-pin female) connector on the MS-222 rear panel. The station operator can hear the program in the headset mixed with intercom activity or the program can be sent to either intercom line. The program pre-amp's gain is switch-selectable (on the rear panel) for either mic level (-65 dBv nominal input signal) or line-level (-15 dBv nominal). The input is balanced and the impedance is 100K Ohms in the line position, 600 Ohms nominal in the mic position.

6. If the Stage Announce function is to be used, connect to the Announce Output (3-pin male XLR) connector on the MS-222 rear panel. This output is transformer balanced, 600 Ohms impedance, and an output level of 0 dBv. If the output is to be used as an unbalanced source connect one side to common (pin-2 to pin-1).

   If the SA relay is to be used, connect to the appropriate screw lug terminals (NO or NC) depending on what action is needed for the external equipment to be controlled. The relay is a form C, Break before Make, contact. **NOTE: the contact rating of the relays are 1A resistive at 24 VDC or 1/2A resistive at 120 VAC.**

7. Turn on power switch on the rear panel. The GREEN Power led on the front panel should illuminate. Plug in a headset, and set intercom, Program, and Sidetone levels as desired.

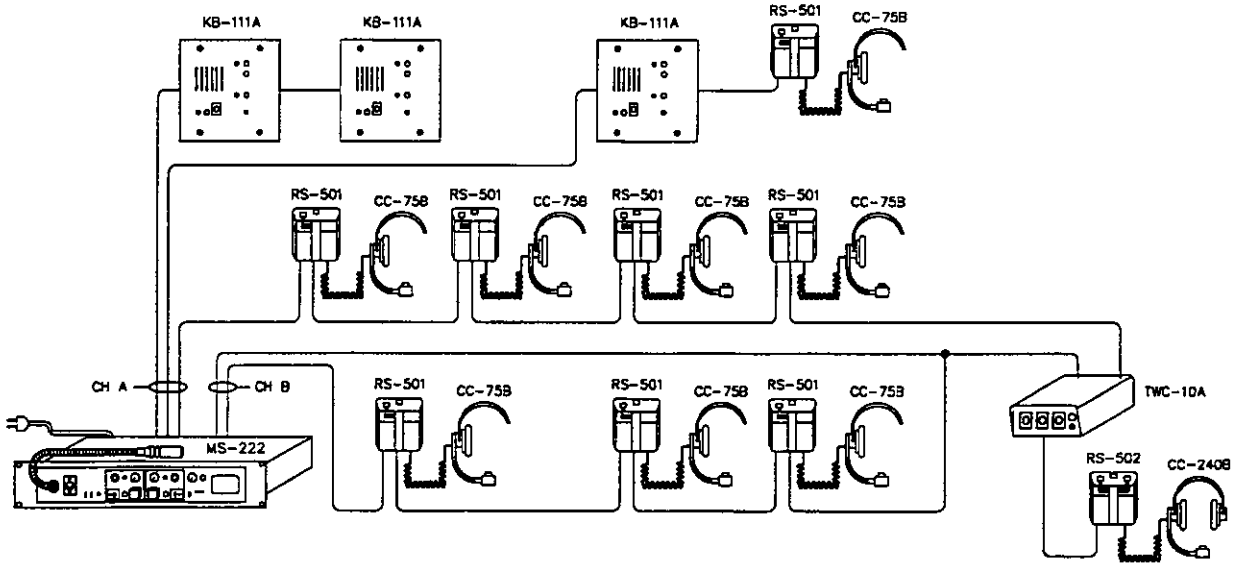
NOTE ABOUT HEADSETS: The following is a description of a recommended headset.

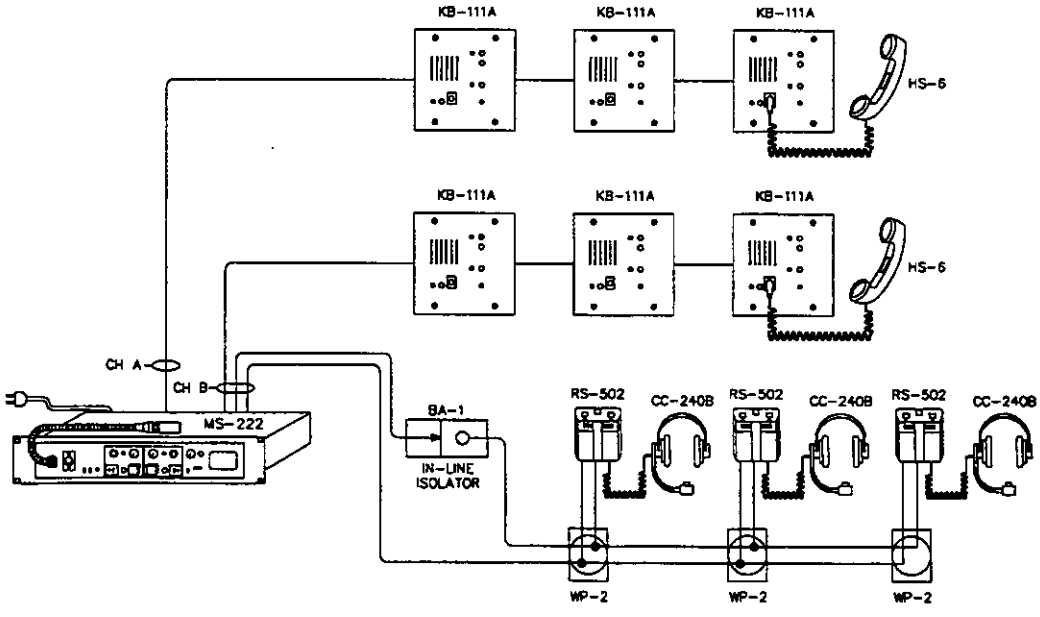
Mic Type ----- Dynamic
Impedance -- 150-250 Ohms
Output -------- -55dB
Headphone -- Dynamic
Impedance --- 50-2000 Ohms

Wiring: Pin 1 -- mic common
Pin 2 -- mic hot
Pin 3 -- headphone common
Pin 4 -- headphone hot

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TYPICAL MS-222 SYSTEMS:

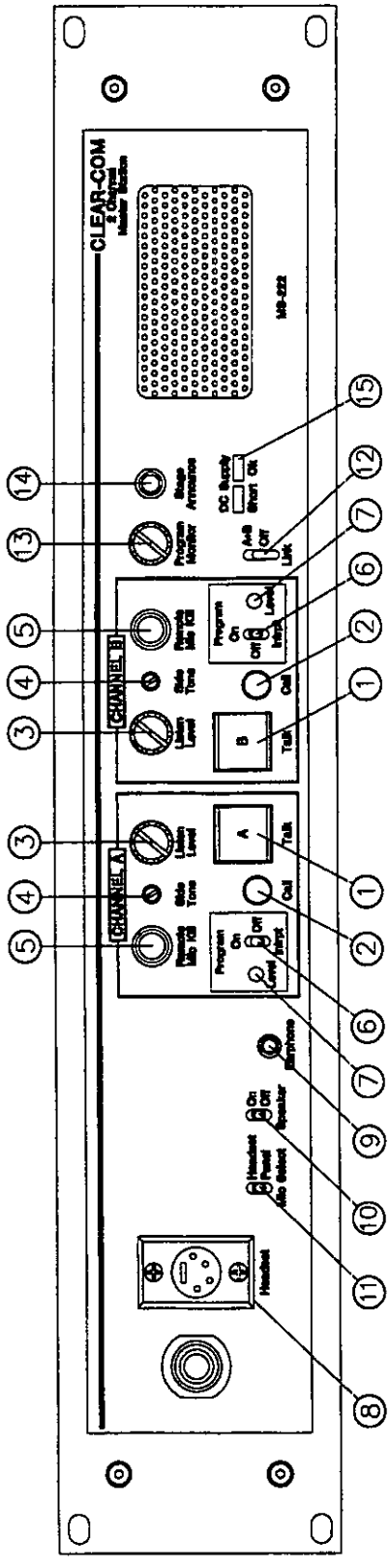




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SECTION 3 / OPERATION OF THE MS-222 2-CHANNEL INTERCOM STATION

Normal operation of the MS-222 only requires access to the front panel controls. For intercom operation set the Listen Level controls for each channel to desired level and press the Talk switches when talking. The rest of this section is a detailed description of each control.



MS-222 FRONT PANEL

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3.1 FRONT PANEL DESCRIPTION

1. **Talk Buttons**
   Each channel has its own illuminated "Talk" button for activating the microphone feed to a given channel. Mechanically the pushbutton is momentary in action, however electrically the button has dual action (momentary or latching) depending on how the button is pressed.

   LATCHING: Pressing the button quickly will "toggle" the "talk" function, alternately turning it on or off.

   MOMENTARY: Pressing the button for longer than 1/4 second will turn the button press into a momentary function such that when the button is released the "Talk" function will turn off. In any case the "Talk" function is activated all of the time the button is pressed.

   TALK INDICATION: The "Talk" button will illuminate dimly indicating when a "Talk" is activated.

   CALL INDICATION: The "Talk" button will illuminate brightly when a "Call" signal is received on that channel.

2. **Call Buttons**
   Each channel has its own "Call" button. Pressing the "Call" button at any time will send a "Call" signal on that channel regardless of the activation of the "Talk" circuit for that channel.

   The "Talk" button for that channel will illuminate brightly while the "Call" button is pressed indicating the presence of a "Call" signal on the line.

3. **Listen Level Controls**
   Each channel has a separate "Listen Level" control. Listening is always on and is not controlled by any logic. To listen to a channel, turn up the appropriate control. To not listen to a channel, turn the control completely off.

4. **Side Tone Controls**
   Each channel has a "Side Tone" null control. This control is used to set the amount of the microphone that is heard in the earphone from that channel.

   This control is a true hybrid null control and therefore is sensitive to changes in line loading. For headphone use it is best to find the 'null' for a given channel and then rotate the control clockwise to obtain the desired side tone level.

   If the speaker and panel microphone are used together providing a possible acoustic feedback path it will be necessary to use an almost complete 'null' of the side tone control.

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5. **Remote Mic Kill Button**
   It sometimes becomes desirable in an intercom system to turn off all open microphones in a system. Clear-Com Series 500 beltpacks have the feature that if the DC power to the pack is removed momentarily, the microphone "Talk" circuits will be turned off.

   Pressing and holding the RMK button for several seconds will reset all open microphones at all Series 500 beltpacks.

   CAUTION: RMK **CANNOT** be used if power for a channel is derived from some place other than the local station. The RMK action momentarily shorts the power line of the affected channel. **RMK only works from a single MAIN station system.**

6. **Program Enable Switches**
   The MS-222 has the ability to feed an external program signal to either of the two channels independently. The "Program Enable Switch" allows the program to be turned ON, OFF, or ON with INTERRUPT.

   In the ON position the program is fed to the channel under all conditions.

   In the OFF position the program is not fed to the channel.

   In the INT position the program is fed except when a "Talk" is activated to the channel. This "Program Interrupt" or "IFB" function can be used for talent cueing and dressing room show monitor applications.

7. **Program Send Level Controls**
   Each channel has a "Program Send Level" control that sets the amount of program being sent to that channel when the program is activated.

8. **Headset Connector**
   The "Headset" connector is a XLR-4M wired for standard Clear-Com headsets.

   MICROPHONE: The MS-222 is intended to work with a dynamic microphone of about 200 ohms.

   HEADPHONE: The MS-222 is designed to drive a 50 to 1000 ohm headphone. Clear-Com headsets are 400 ohms for the single muff and 200 ohms for the dual muff.

9. **Earphone Jack**
   The jack marked "Earphone" provides an output intended to drive an extra earphone. This output is capable of driving an 8 ohm headphone or loudspeaker.

10. **Speaker ON/OFF Switch**
    The switch marked Speaker ON/OFF is used to turn the speaker on and off.

11. **Mic Select Switch**
    The Mic Select Switch enables the operator to select which microphone is active.

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12. Link Switch

The switch marked "Link" on the right side of the unit allows the operator to "combine" channels A and B so that all stations can talk to each other. (Normally channels A and B are totally isolated and stations on one channel cannot talk to stations on the other channel.) When in the "A+B Link" operating mode, only the channel A controls operate. The channel B controls have no effect.

NOTE: When the switch is in the "A+B" position the channels do not actually 'combine'. What really happens is the three B channel connectors are simply internally disconnected from the B circuitry and connected to the A channel circuitry, putting all stations on the channel A party-line. This maintains all the correct line and station terminations.

CAUTION: The LINK function will work properly at the main station that is providing the "line terminations" for the system. If there is more than one Main Station in the system equipped with a "LINK" switch, **DO NOT ATTEMPT TO USE THE LINK SWITCH ON THE STATIONS THAT ARE NOT PROVIDING THE LINE TERMINATION.** Both double line termination and station un-termination will result, causing significant sidetone mis-adjustments and possible feedback and oscillation.

13. Program Monitor Control

The "Program Monitor" volume control sets the amount of the program signal heard directly in the headphone or speaker. This control only affects what is heard in the headphone or speaker and does not affect "Program" feed to the intercom lines.

14. Stage Announce Button

The "Stage Announce" (SA) button allows the operator to instantly use the microphone input to directly talk to a system external to the intercom such as a paging speaker/amplifier in another room. A dry set of relay contacts on the rear panel is also available that can be used to activate external switching as needed when the "SA" button is pressed.

Pressing the SA button momentarily disables any active "Talks". Active "Talk" circuits will be restored when the button is released. The "Talk" muting action can be defeated if desired by moving an internal jumper. (see section on internal options and adjustments)

15. Power Supply LEDs

There are two power supply status LEDs in the lower right hand corner of the front panel.

NORMAL OPERATION: The GREEN LED is on by itself.

OVERLOAD CONDITION: If the RED LED is on and the GREED LED pulses on shortly about every five seconds, the load is in excess of 1 ampere but there is not a direct short on the line.

SHORT CONDITION: If the RED LED is on and the GREEN LED does not pulse on, the power line has a direct short on it.

Lowering an excess load or removing a short will allow the automatic reset circuit to attempt to reset the power supply about once every four seconds, to restore normal operation to the power supply without operator intervention.

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SECTION 4 / TROUBLESHOOTING THE MS-222 2-CHANNEL INTERCOM STATION

Symptom #1: System is non-operable: GREEN power led is not illuminated and the RED short led is not illuminated.

CAUSE: Loss of AC power.
REMEDY: Plug unit into dependable AC source.

CAUSE: Fuses could be blown.
REMEDY: Replace fuse(s); If it blows repeatedly, probably the powersupply has internal component failure.

Symptom #2: The RED short led stays illuminated without the GREEN led pulsing on periodically.

CAUSE: Shorted or mis-wired intercom cable.
REMEDY: Remove cables, one at a time, from Main Station until faulty line is located. Check for shorts between pins 1 and 2. When removing a possible short wait for several seconds to see if the automatic reset will clear itself.

CAUSE: Defective Remote Station.
REMEDY: Check Remote unit.

Symptom #3: Excessive back-ground noise pick-up by microphone.

CAUSE: Distance from mic to mouth is too far.
REMEDY: Move closer to mic.

CAUSE: Too many mics on in entire system.
REMEDY: Turn off all unused mics. RMK can be used to kill all Series 500 belt-pack open mics.

CAUSE: Volume too high.
REMEDY: Lower headset volume.

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Symptom #4: Hum or buzz in system.

CAUSE: Inductive pickup caused by close proximity of Main or Remote station to power lines or transformers.
REMEDY: Relocate offending unit.

CAUSE: 10 Ohm chassis ground resistor (R224) is open.
REMEDY: Check the DC resistance for 10 Ohms between the chassis and pin-1 of any intercom connector. R224 is located on the Rear Panel Connector Printed Wiring Board. **If this condition happens it is because the system ground came in contact with something "HOT" with respect to the Main Station Earth ground. Should this occur, we recommend you carefully check the system ground and AC distribution in the area.**

NOTE: THIS IS A POTENTIALLY DANGEROUS SITUATION; IF IT OCCURS, A SHOCK HAZARD MAY EXIST BETWEEN THE METAL BOOM OF A HEADSET AND GROUND.

CAUSE: Inductive pick-up by headset mic; check by switching mic on and off.
REMEDY: Move mic away from "hum field".

Symptom #5: System feedback.

CAUSE: Acoustical.
REMEDY: Volume too high at one station.
REMEDY: Two or more speaker stations have mics on simultaneously.
REMEDY: Headset mis-wired. Rewire headset connector.
REMEDY: Headset laying on table and microphone on. Turn mic off.
REMEDY: Headset quality. Some headsets have poor isolation between the microphone and earphone. Adjust sidetone.

CAUSE: Electrical.
REMEDY: Check Termination.
REMEDY: Check sidetone levels.
REMEDY: A headset extension cord was used. Headset extension cords must be used with great care and are not recommended.

Symptom #6: Audio sounds low and distorted and the Call light stays on.

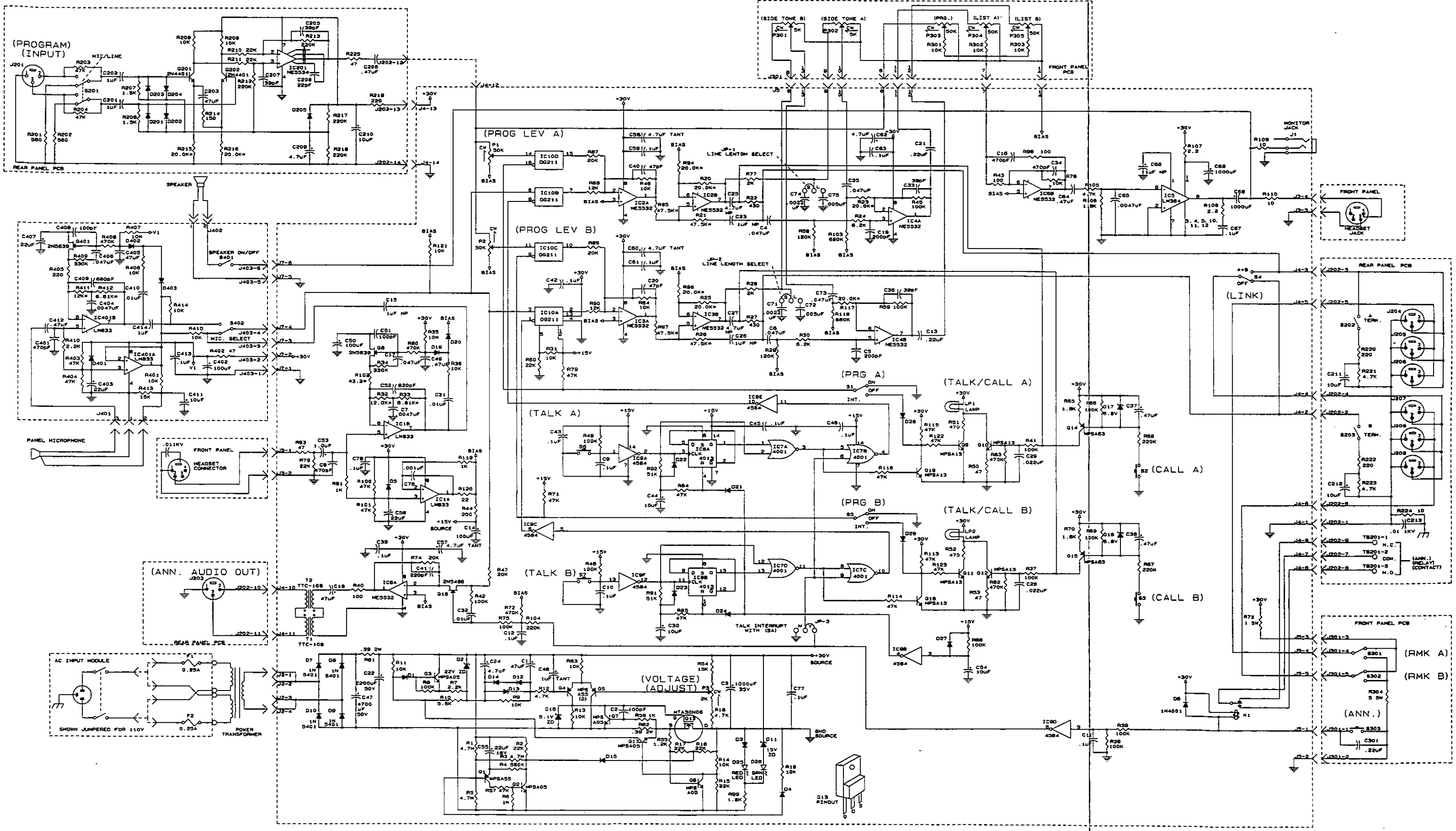
CAUSE: An ultrasonic oscillation is present.
REMEDY: Headset mis-wired. Rewire headset connector.
REMEDY: A headset extension cord was used. Headset extension cords must be used with great care and are not recommended.

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SECTION 5 / Parts List for MS-222 2-CHANNEL INTERCOM STATION

CC Part #	Description	Qty.
240039	Bracket, Hardware for Handle	2
210233	Connector, Power Entry Module	1
610022	Cord, Power	1
480090	CMOS IC, MC14584B Hex Schmitt Trigger	1
480092	CMOS IC, DG211CJ Quad Analog Switch	1
480112	CMOS IC, 4001 Quad 2 Input NOR Gate	1
480171	CMOS IC, 4013 Dual D Type Flip-Flop	1
480000	Diode, 1N4148, Signal	22
480001	Diode, 1N4001, Rect. 1A 50V PIV	1
480005	Diode, 1N5401, Rect. 3A 100V PIV	4
480026	Diode, Zener, 1N957B 6.8V 5% .4W	2
480038	Diode, Zener, 1N5231B 5.1V .5W	1
480053	Diode, Zener, 1N5245B 15V .5W	1
480172	Diode, Zener, 1N5251B 22V 5% .5W	1
520035	Fuse, 1/4A SLO-BLO 20MM	2
240015	Knob, Volume with 1/8" shaft	3
240038	Handle, Black	1
390005	Lamp, Incandescent EL3522 (Talk SW)	2
390038	LED, Red Square (Short LED)	1
390039	LED, Green Square (Power Good)	1
810142	Manual, Instruction	1
730164	Microphone, Panel Mount Assembly	1
480012	OP-AMP, LM384 Power	1
480175	OP-AMP, LM833A Dual Low Noise	1
480070	OP-AMP, NE5532 Dual Low Noise	4
480021	OP-AMP, NE5534A Low Noise	1
470019	POT, 50K Trim Vert. PC Mount (Prog Lev.)	2
470029	POT, 2K Trim Horz. PC Mount (Volt Adj.)	1
470061	POT, 50 PC Mount (Volume)	3
470063	POT, 5K Trim Horz. PC Mount (Sidetone)	2
450004	Relay, SPDT 24VDC	1
240010	Rubber Foot	4
240058	Shaft, Trimpot (Sidetone)	2
500103	Speaker, 2 1/2" 8 Ohm	1
510028	Switch, SPDT Pushbutton (Stage Announce)	1
510043	Switch, SPDT Pushbutton (Call)	2
510095	Switch, SPDT Pushbutton 6A (RMK)	2
510094	Switch, SPDT Toggle (Link)	1
510096	Switch, SP3T Toggle (Program)	2
510090	Switch, DPDT Slide (Term. & Prog Gain)	3
510093	Switch, 4PDT Illuminated Pushbutton (Talk)	2
560015	Transformer, Audio (Stage Announce)	1
560016	Transformer, Power	1
480047	Transistor, 2N4401	2
480061	Transistor, 2N5486 N Channel JFET	1
480069	Transistor, 2N5639 N Channel JFET	1
480052	Transistor, MPS-A05	5
480004	Transistor, MPS-A13	6
480050	Transistor, MPS-A55	3
480008	Transistor, MPS-A63	2
480173	Transistor, MTA30N06EL Power MOSFET 60V 30A	1

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MS-222 Schematic

11/90 Rev. 1.0

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