MS-440 Main Station
and
RM-440 Remote Station

Operation Manual

Clear-Com
Intercom Systems

CLEAR-COM LIMITED WARRANTY

This Clear-Com product is warranted to be free from defects in materials and workmanship for a period of two years from the date of sale.

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, 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.

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.

For your own records fill in the information below:

Model No._____ Serial No._____

Date Purchased_____

Purchased from (dealer)_____

Address _____

City_____ State_____ZIP_____

Factory Service

All Equipment returned for repair must be accompanied by documentation stating your return address,
telephone number and date of purchase, along with a description of the problem.

Note: Do not ship any equipment to Clear-Com without first calling and obtaining a Return Authorization Number.

Send equipment to be repaired to:

**Customer Service Department
Clear-Com Intercom Systems
4065 Hollis Street
Emeryville, CA 94608-3505
Telephone: (510) 496-6666
Fax: (510) 496-6610
Web Site: www.clearcom.com**

Warranty Repairs - if in warranty, no charge will be made for the repairs. Equipment being returned for warranty repair must be sent prepaid and will be returned prepaid.

Non-Warranty Repair - Equipment that is not under warranty must be sent prepaid to Clear-Com. If requested, an estimate of repair costs will be issued prior to service. Once your approval for repair, and repair of equipment is completed, the equipment will be shipped freight collect from the factory to the customer.

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.

ABOUT THIS MANUAL . . .

To get the most out of the MS-440/RM-440 Stations, read this manual carefully. It will answer questions you might have about installation and operation. For service information you will need to order the MS/RM/SB-440 Service Manual from Clear-Com's Customer Service Department. The part number for the service manual is 810207.

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.

DESCRIPTION

This section discusses the Clear-Com concept of intercom systems, provides an overall description of the MS-440 and RM-440, and gives the technical specifications of the units.

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 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 (>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. Low-impedance mic input lines (200 Ohms) and specially designed circuitry make Clear-Com channels virtually immune to RFI and dimmer noise.

Clear-Com stations are interconnected with two-conductor, shielded microphone cable. Portable stations are connected with 2 conductor cables with 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 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.
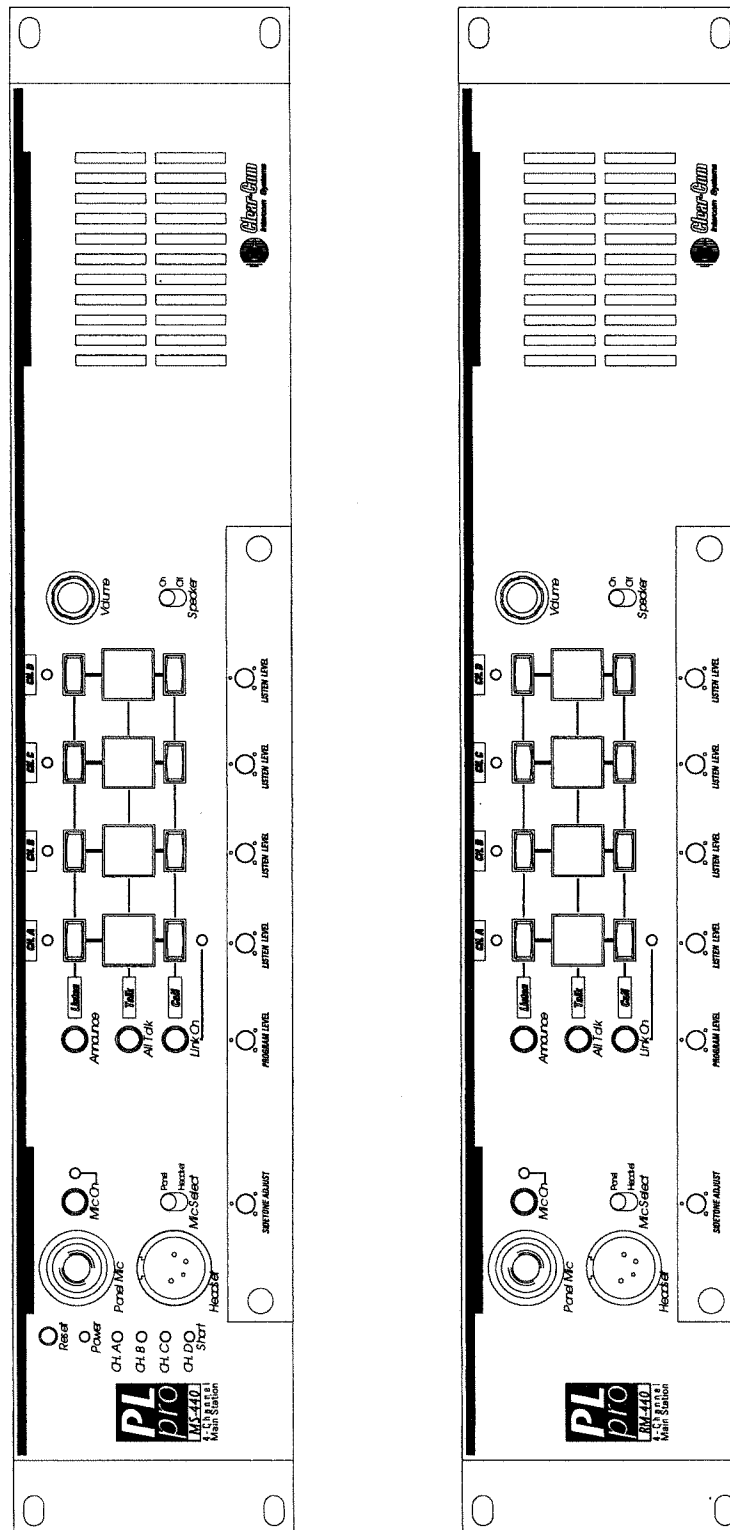
MS-440 and RM-440 Front Panels

MS-440/RM-440 OVERALL DESCRIPTION

The MS-440 and RM-440 Intercom stations are 4 channel microprocessor controlled stations intended to work with other Clear-Com Party-Line products. Both stations have a speaker, provisions for installing a panel microphone, and a headset connector.

The MS-440 is a 4 channel Main station that contains a 2 amp. no fail system power supply. The RM-440 is a 4 channel Remote station intended to be powered from the intercom line.

The following is a list of features found in the MS-440 and RM-440 intercom stations:

- **MICROPROCESSOR CONTROL:** Most aspects of station operation are under microprocessor control.

- **REMOVABLE ACCESS PANEL:** A removable access panel allows access to most controls and option dip switches.

- **REMOVABLE RACK MOUNTING BRACKETS:** Removable rack mounting brackets allows the units to be rack mounted or used 'stand-alone' as a table top unit.

- **INDIVIDUAL CHANNEL CONTROLS:** Each channel has individual Talk, Listen, and Call push-buttons for each channel.

- **MOMENTARY/LATCHING TALK BUTTONS:** The TALK buttons have a momentary and latching action depending on how the button is used. The latching function can be defeated with dip switches.

- **INDIVIDUAL CHANNEL ADJUSTMENTS:** Each channel has individual listen level controls, channel null adjustments, and program feed level controls.

- **MULTIPLE PROGRAM INPUTS:** Multiple program inputs are provided for local station monitoring and program feed to intercom lines for local talent cueing (IFB).

- **INTERNAL IFB (IFB - Interrupt Foldback of program feeds):** Program can be feed to each channel and interrupted (IFB) when a Talk function is active or when a Call signal is received on that channel. An internal jumper determines whether the IFB function is Talk or Call signal activated.

- **LINK FUNCTION (MS-440):** The MS-440 has a LINK function that places all channels into a common party-line at the single push of a button.

- **ALL-TALK:** An ALL-TALK button allows instant access to all channels.

- **ANNOUNCE FUNCTION:** An ANNOUNCE button allows external paging. A set of relay contacts is provided to control an external system.

- **PROGRAM FEED OVER STAGE ANNOUNCE:** An internal jumper allows the main program feed to be fed to the Stage Announce output. The program is automatically interrupted when the ANNOUNCE button is pressed.

- **MIC ON/OFF SWITCH:** A separate MIC ON/OFF push-button allows turning the microphone off without upsetting the setting of TALK switches.

- **EXTERNAL MIC ON/OFF INPUT:** An external logic input allows the MIC ON/OFF function to be switched remotely.

- **EXTERNAL IFB and HOT MIC OUTPUT:** A rear panel jack provides direct connection to Clear-Com's external IFB system such that the station's microphone can be used in the external IFB system. A buffered unswitched output of the selected microphone is also available.

- **SPEAKER ON/OFF SWITCH:** The speaker may be turned on and off with a front panel switch.

- **SPEAKER MUTING:** Whenever a TALK is active the Speaker output is muted approximately 6 dB to prevent feedback.

- **PANEL MIC GAIN:** The preamplifier for the Panel microphone has a gain trim adjustment to allow field trimming. Adjustment of the panel microphone gain also varies the frequency response of the preamplifier to compensate for feedback when the microphone is used up close.

- **2 AMP. POWER SUPPLY WITH SHORT CIRCUIT PROTECTION:** The SB-440 features redundant powering to remote stations by providing separate short circuit protected power sources to each of the four intercom lines. A short on one intercom line will not bring the whole system down. Short circuit indicators are provided on the front panel for each channel.

TECHNICAL SPECIFICATIONS:

CONTROL SYSTEM:

Microprocessor controlled logic and CMOS electronic switches.

HEADSET MICROPHONE PRE-AMP:

Dynamic Headset Input Impedance .... - 200 Ohms
Input Level .... - 55 dBv* nominal
Frequency Response: .... 150 Hz to 15 KHz, contoured
for intelligibility.
Gain from Headset to Intercom Line: ...... +41 dB

PANEL MICROPHONE PRE-AMP:

Input Level .... 45 dBv* nominal
Frequency Response: .... 150 Hz to 15 KHz, contoured
for intelligibility.
Gain from Panel Mic to Intercom Line: ..... +31 dB (adjustable)

SPEAKER AMPLIFIER:

Load Impedance: .... 8 - 50 Ohms
Output Level: .... 4 watts into 8 Ohms
Distortion: .... <0.5% THD at 1 KHz
Frequency Response: .... 200-15KHz +/-2dB

HEADPHONE AMPLIFIER:

Load Impedance: .... 50 - 2000 Ohms
Output Level: .... at least +20 dBv* across 600 Ohms
Distortion: .... <0.2% THD at 1 KHz
Frequency Response: .... 150-18KHz +/-2dB
Gain from Intercom Line: .... +37 dB

PROGRAM INPUT:

Input Level Ref.: .... 0 dBv*
Input Impedance: .... >10 KOhms
Frequency Response: .... 150 Hz to 15 KHz

INTERCOM LINE DRIVE/RECEIVE CIRCUITS:

Impedance, Bridging: .... >10 KOhms
Level, Line (200 ohm load): .... -14 dBv* (nominal) +5dBv
(max before clip)
Sidetone Null Capability: .... >25 dB (200Hz - 10 KHz)
Crosstalk, Station Induced Ch. to Ch.: ...... >60 dB
Noise, S/N Ratio in Listen Channels: .... >60 dB

LINE LEVEL OUTPUTS:
SA (Announce)
>   Type .... Balanced
>   Impedance .... 600 ohms
>   Level .... 0 dBv

IFB/Hot Mic:
>   Type .... Unbalanced
>   Impedance .... 600 Ohms
>   Level .... 0 dBv

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

CONNECTORS:
Intercom: (MS-440) 8 XLR-3M
Intercom: (RM-440) .... 4 XLR-3M and 4 XLR-3F
Announce Output: XLR-3M
Program Input (Main) XLR-3F
Accessory DB-15F
>   Auxiliary Program Inputs (4)
>   Foot Switch Logic Input
>   Line Level Output (Signal being sent to speaker amp.)
>   Announce Relay Output

IFB/Hot Mic. .... 1/4 inch Phone Jack

POWER REQUIREMENTS and OUTPUT:
MS-440 Source .... AC Power Line
>   Voltage .... 90 - 240 VAC 50-60 Hz
>   Power In .... 80 VA Max.
>   30 VDC Intercom Power Out ...... 2.0 Amp Continuous short circuit
>   protected, 1 3/4 Amp. each channel

RM-440 Source .... Intercom Line
>   Voltage .... 20 - 30 VDC
>   Current .... 90 mA idle, 150 mA average

PHYSICAL SPECIFICATIONS:
Dimensions: .... 19"W x 3.5"H x 10.5"D
>   (483mm x 88mm x 267mm)

Weight (MS-440): .... 7.4 lbs (3.4 Kg)
Weight (RM-440): .... 5.9 lbs (2.7 Kg)
Operating Temperature Range: .... 32-122° F (0-50° C)

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

INSTALLATION

This section discusses the installation of the MS-440 and RM-440 in an intercom system. The following sections describe how to install and adjust the stations for initial use; Installation overview, Physical installation, Description of Connectors, and Internal option jumpers.

INSTALLATION OVERVIEW

This section describes the Clear-Com concept in intercom line interconnection. The following subjects are discussed:

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

INTERCOM LINE CONNECTION:

The MS-440 provides two male XLR-3 connectors for each intercom line that are "looped through".

The RM-440 provides a male and female XLR-3 connector for each intercom line that are "looped through".

LINE TERMINATION:

The fundamental concept of Clear-Com Party-Line intercom is that all stations provide high impedance into a single 200 ohm system termination.

CAUTION: An Intercom line must be terminated. Care must be taken not to 'double' terminate a line. All unused intercom inputs must be terminated to keep the line drive circuits stable.

The MS-440 provides switchable terminations of the intercom lines. Clear-Com main stations and power supplies provide switch selectable termination networks on all intercom output lines. It is up to the user to determine where the termination will be provided. An unterminated line will cause excessive levels, possible oscillation of line drivers, and severe unbalance of hybrid null networks. A double or multiple terminated line will cause low levels and severe unbalance of hybrid null circuits.

Switching of the termination on and off on the MS-440 is with back panel switches. The MS-440 is shipped from the factory with all four lines terminated.

USING THE LINK FUNCTION: The LINK function in the MS-440 uses relays to connect the four party-lines together. In doing so, it also removes the terminations from channels B, C, and D such that the new party line on channel A has only one termination when LINK is activated. If there is more than one MS-440 in a system, the LINK function can only be used at the station where the terminations are set on.

NO FAIL REDUNDANT POWER SCHEME

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 MS-440 power supply:

- **SMART ELECTRONIC CIRCUIT BREAKER:** A smart electronic circuit breaker senses the difference between short term and long term overload conditions. A momentary short on the power will not cause the circuit to activate. The circuit breakers automatically reset approximately 7 seconds after the short is removed.

- **INDIVIDUAL CHANNEL SHORT CIRCUIT PROTECTION:** Each individual channel is separately short circuit protected. Each individual channel may draw as much as 1.75 Amps. yet the total to all four channels is limited to 2.0 Amps. A short on one intercom line will not bring the whole system down.

- **FRONT PANEL INDICATION AND RESET:** On the front panel of the MS-440 there four failure indicators for each of the four intercom power lines, a power on indicator for the power supply, and a common reset button for all four overload circuits.

- **AC LINE VOLTAGE IMMUNITY:** The MS-440 is specified to operate at any AC line voltage from 90 to 240 VAC without manual switching, assuring that steady, low-noise power will always be delivered to the intercom system.

- **PARALLELING MULTIPLE POWER SUPPLIES:** Multiple power supplies can be paralleled to increase system capacity.

- **MULTI-CHANNEL REMOTE STATIONS MAINTAIN THE POWER LINE ISOLATION:** The RM-440 is designed to use the isolated power provided by the MS-440. Power coming into any one of the four intercom lines will operate the station..
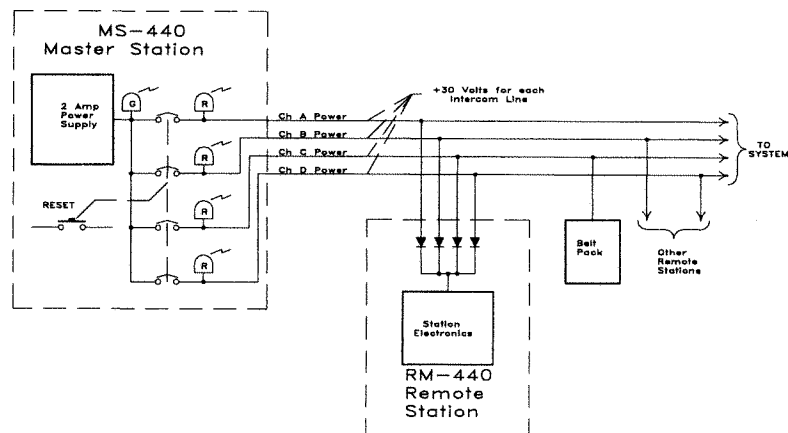
FAIL SAFE POWER DISTRIBUTION SCHEME
WITH SINGLE—CHANNEL REMOTE STATIONS
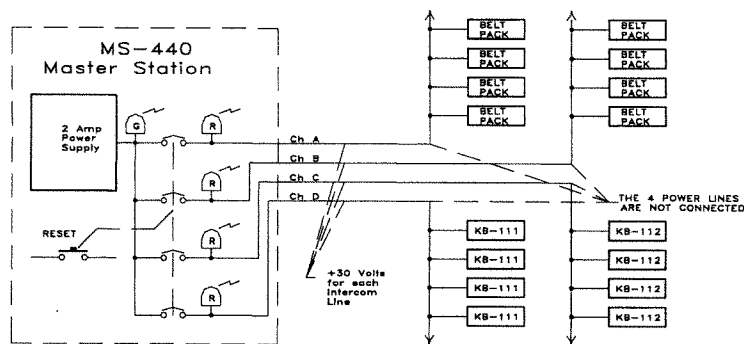
The illustration above shows the proper power wiring of a system powered by a single MS-440. The remote stations connected to each channel are powered from the intercom cable for that channel. In the case above, a short on any one line will only take that channel down.

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

FAIL SAFE POWER DISTRIBUTION SCHEME
WITH MULTI—CHANNEL REMOTE STATIONS

The illustration above shows the power wiring of a system powered by a single MS-440. An RM-440 is connected to all four power lines through the intercom line connections, however the blocking diodes in the RM-440 prevent a short circuit on one line affecting the others. Other single channel remote stations are also connected to individual channels.

Rev. C

IMPLEMENTING A NO FAIL POWER SCHEME IN AN EXISTING INSTALLATION:
The MS-440 and SB-440 are the first products to implement the NO FAIL power supply
scheme. The MS-440 will work with older Clear-Com party line products. Using a MS-440 in a
pre-installed system with older product to implement the NO FAIL power scheme is possible
but it is beyond the scope of this manual to describe all of the possible variations and possible
modifications necessary to older equipment to make it work. Call the Clear-Com service
department for assistance if needed.

CONNECTION TO AC MAINS: The MS-440 is powered from the AC power line and
connects with an IEC cable. It will accept any line voltage between 90 and 240 VAC at 50-60
Hz. It will automatically adjust to the line voltage. There is no need for a voltage selector switch
or an external fuse. The unit draws a maximum of 80 VA of power from the AC line.
Clear-Com power supplies can be paralleled to increase the number of REMOTE STATIONS
that can be operated in a system.

INTERCOM CABLE CONSIDERATIONS:

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

1   DC resistance of the ground or common conductor affects crosstalk. For runs longer than 500 feet do not use wire smaller than 20 gauge.

2   The capacitance of the interconnect cable affects system frequency response and sidetone stability. Total capacitance should not be greater than 0.25 uF.

PORTABLE INSTALLATION CABLE: Practical cable for portable system interconnections is flexible, two-conductor, shielded microphone cable. We suggest you use BELDEN #8413 (24 Gauge). For runs longer than 500 feet use a 20 gauge cable or larger (BELDEN #8412).

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

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

SUGGESTED CABLE TYPES AND WIRING DIAGRAMS: The next page contains a chart with specifications of various BELDEN cables. A wiring diagram is shown for connecting two stations together with individual cables.

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

GROUND ISOLATION: The PIN 1 ground connection of each XLR connector must also be isolated from the chassis. PIN 1 should not be connected to the shell of the XLR connector.
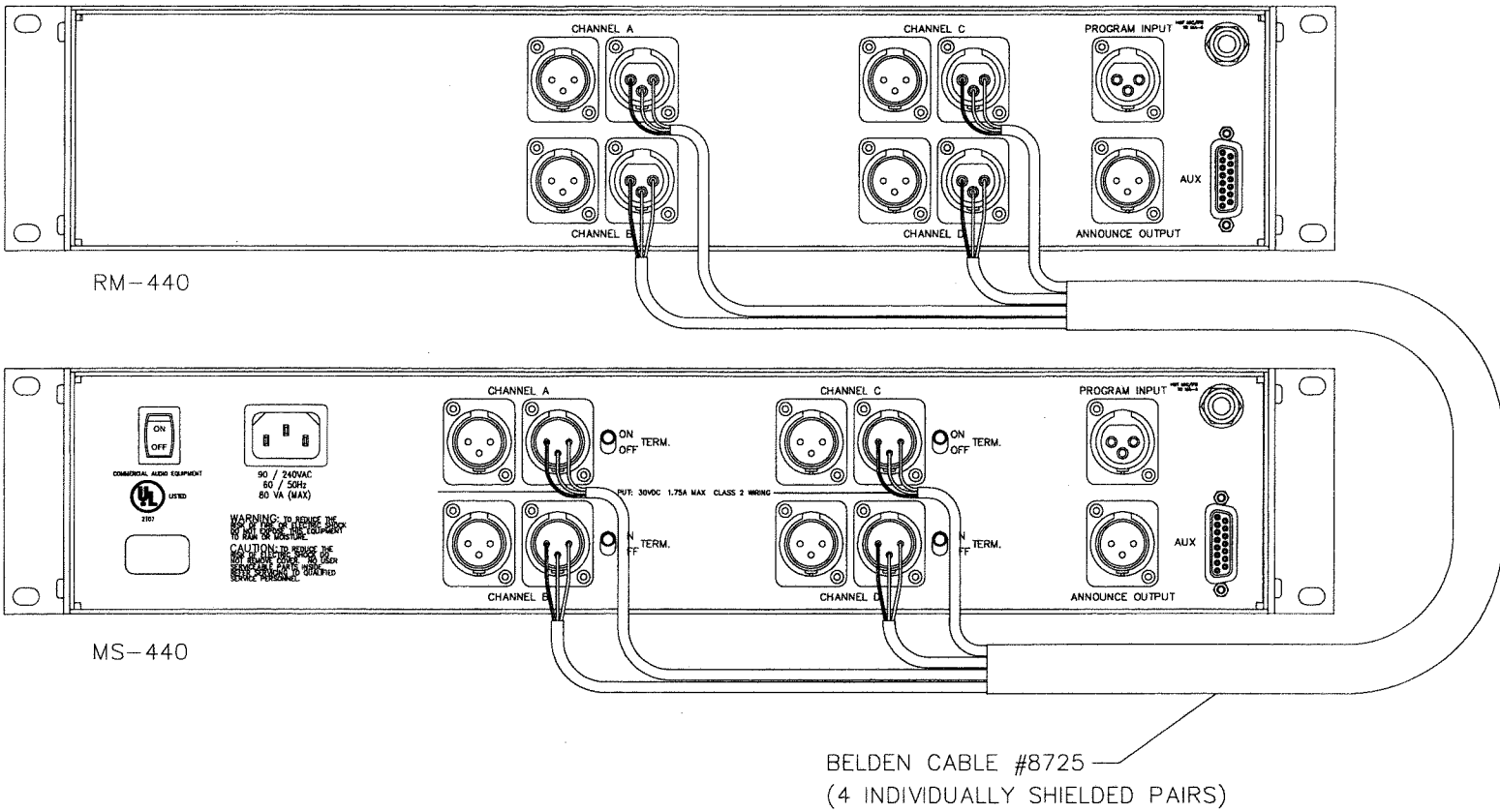
BELDEN SHIELDED CABLES

TRADE #	# OF Cond.	AWG & Stranding	Insulation Thickness (Inch)	Jacket Thickness (Inch)	Nom. O.D. (Inch)	% Shield Coverage	Sug. Working Voltage	Nom. Cap. * (pf/ft)	Nom. Cap. ** (pf/ft)
8413	2	24 (45x40)	0.019	0.025	0.19	100	300	30	55
8412	2	20 (26x34)	0.02	0.043	0.268	84	600	30	55
8762	2	20 (7x28)	0.014	0.028	0.196	100	350	27	49
8760	2	18 (16x30)	0.018	0.028	0.222	100	450	24	44
8725	8	20 (7x28)	0.015	0.03	0.36	100	400	27	49
8723	4	22 (7x30)	0.008	0.019	0.165	100	400	35	62

*   Capacitance between conductors
**   Capacitance between 1 conductor and other conductor connected to shield

4-PAIR CABLE - Belden 8725 or equivalent

INTERCONNECT CABLE DETAIL
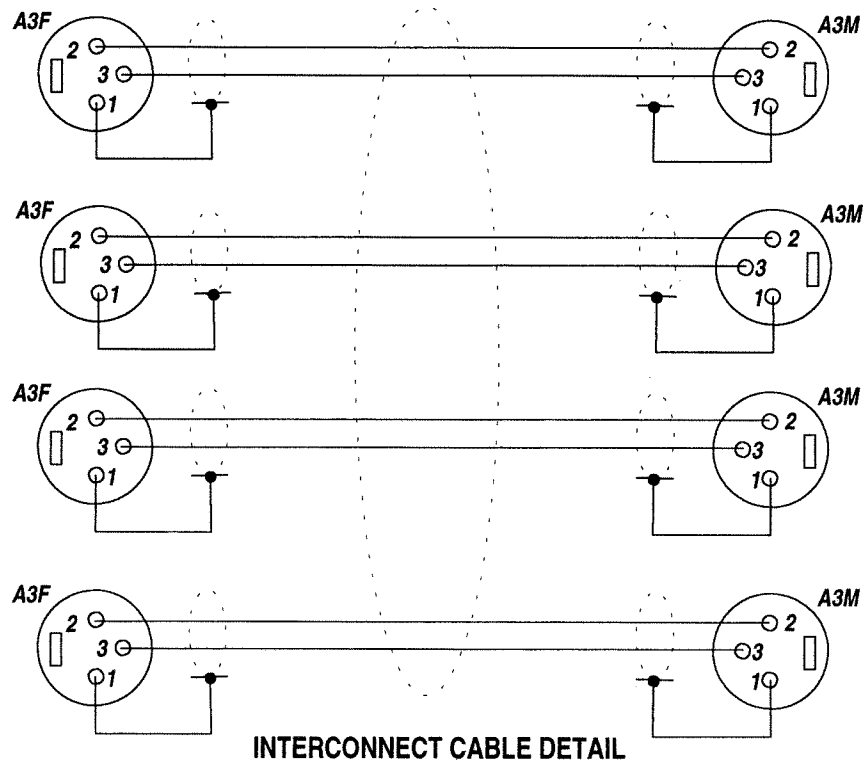
PIN 1: Common
PIN 2: +VDC
PIN 3: Intercom Audio

RM-440

MS-440

BELDEN CABLE #8725
(4 INDIVIDUALLY SHIELDED PAIRS)

PHYSICAL INSTALLATION

The MS-440 and RM-440 can be rack mounted or set alone on a table top. The units are shipped with removable rack mounting brackets and rubber feet to accommodate both situations. This section describes Rack Mounting and Table Top Mounting.

RACK MOUNT INSTALLATION

The unit requires 3 1/2 inches (2RU) of rack space. The station is 10 1/2 inches in depth and requires at least 2 1/2 inches clearance in the rear to clear connectors and cables.

The unit is shipped from the factory with the two rack mounting brackets not installed. The brackets have large slots to allow mounting in such a manner to allow various depths between the front panel and the mounting surface.

To install the brackets; remove the two screws on each side toward the top and front. Use these screws and the screws provided with the brackets. Refer to the illustration below.

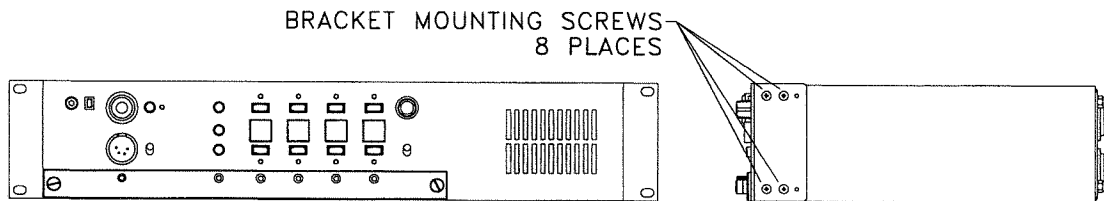BRACKET MOUNTING SCREWS
8 PLACES

TABLE TOP INSTALLATION

The MS-440 and RM-440 can be used as standalone units sitting on a table or desk. To use the units as table top units apply the adhesive mounted rubber feet supplied with the unit to the bottom of the chassis. Place the feet approximately 1/2 inch from a side and front or back on all four corners of the unit.

1/2"

1/2"

RUBBER FOOT
5 PLACES

© Clear-Com 1998
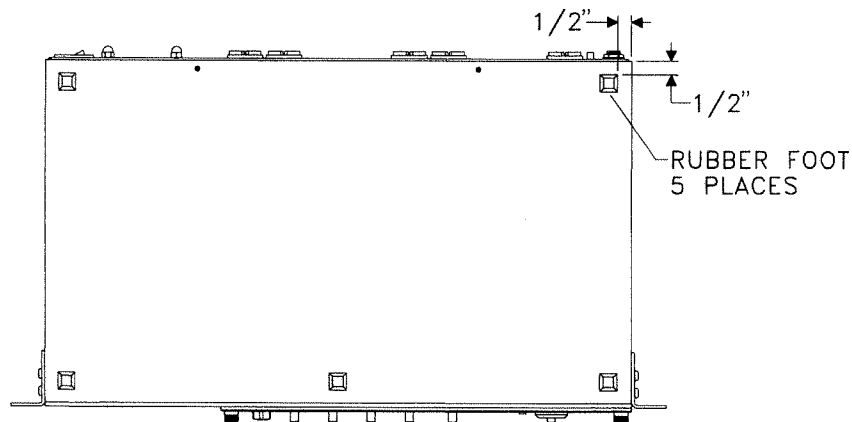
DESCRIPTION OF CONNECTORS

HEADSET CONNECTOR (Front Panel)

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

Mic Type ----- Dynamic	Wiring:	Pin 1 -- mic common
Impedance --- 150-250 Ohms		Pin 2 -- mic hot
Output -------- -55dB		Pin 3 -- headphone common
Headphone --- Dynamic		Pin 4 -- headphone hot
Impedance --- 50-2000 Ohms		

Caution: Do not tie pin 1 and pin 3 together.

PANEL MIC CONNECTOR (Front Panel)

Two plug-in panel microphones are available for use on the MS-440 and RM-440. The GM-9 is 9 inches long and GM-18 is 18 inches long. The microphone is of the electret type. The microphone has a built-in 1/4 inch phone jack for a connector. A proprietary mating receptacle is mounted on the station.

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

1   Check the set screw in the mic mounting flange to make sure it is clear of the threads in the bushing.

2   Screw the microphone into the bushing hand tight.

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

INTERCOM LINE CONNECTORS (Rear Panel)

The MS-440 has a pair of male XLR-3 connectors for each intercom line. The male-male pair of connectors are wired parallel and intended for loop-through connection.

The RM-440 has a male and female pair of XLR-3 connectors for each intercom line. The male-female pair of connectors are wired parallel and intended for loop-through connection.

The pinout of the Intercom Connectors is as follows:

- Pin 1 --- Ground (Shield)
- Pin 2 --- Power (+20 to +30 VDC)
- Pin 3 --- Audio

PROGRAM INPUT (Rear Panel)

A XLR-3F connector provides the main program input to the station. This input is fed to the front panel PROGRAM LEVEL control for listening in the headphones or speaker and optionally it can be fed to each of the intercom lines with the option dip switches marked PROGRAM SELECT A-D. Another option is to feed program audio to the Announce Output. This is selected by setting jumper J11 on the Main board to the ON position.

Separate program inputs are also available for each channel via the Accessory DB-15 connector. Refer to the section on that connector for details.

The pinout of the Program Input Connector is as follows:

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

The signal level should be a nominal 0 dBV. The input impedance is greater than 10 KOhms.

ANNOUNCE Output (Rear Panel)

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

The pinout of the Announce Output Connector is as follows:

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

The signal level is 0 dBV and transformer isolated. The output impedance is intended to drive 600 ohms.
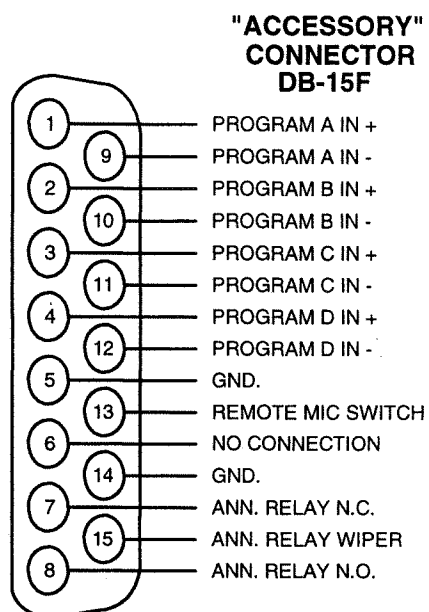
IFB/HOT Mic (Rear panel, 1/4 inch Phone Jack)

A 1/4 inch phone jack marked IFB/HOT Mic provides a 0 dB output signal from the selected microphone. This output is also intended to work with Clear-Com's IFB system. Consult the factory for installation instructions.

The jack connections are as follows:

- Tip   --- Hot Mic Output
- Ring --- Control Signal In (>4 volts DC)
- Sleeve --- Ground

ACCESSORY (Rear Panel, DB-15F)

The Accessory DB-15F connector on the rear panel provides Auxiliary Program Inputs for each channel, Remote Mic ON/OFF input, Line Level Output, and Announce Relay Contacts. The pin assignments of the connector are as follows:

"ACCESSORY" CONNECTOR DB-15F

Pin	Signal
1	PROGRAM A IN +
9	PROGRAM A IN -
2	PROGRAM B IN +
10	PROGRAM B IN -
3	PROGRAM C IN +
11	PROGRAM C IN -
4	PROGRAM D IN +
12	PROGRAM D IN -
5	GND.
13	REMOTE MIC SWITCH
6	NO CONNECTION
14	GND.
7	ANN. RELAY N.C.
15	ANN. RELAY WIPER
8	ANN. RELAY N.O.

Viewed from the rear of the connector

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

These inputs are electronically balanced with an input impedance greater than 10 KOhms. The signal level should be a nominal 0 dBV. Refer to the illustration above for connection of the program inputs. Pins 5 or 14 can be used for connecting shields.

REMOTE MIC ON/OFF SWITCH: An external momentary push-button switch connected to pins 5 and 13 will duplicate the action of the front panel MIC ON/OFF switch.

ANNOUNCE RELAY CONTACTS: A relay is provided that activates when the ANNOUNCE button is pressed and its contacts are available on the ACCESSORY connector. The relay contacts are rated for 2.0 Amps. of DC current at 24 VDC and are electrically isolated from the rest of the station.

INTERNAL OPTION JUMPERS

There are several jumper options inside the chassis of the MS-440 and RM-440. To access these options remove the top cover by removing the top cover of the unit.

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

The following options are available:

- IFB Operation Mode Select
- Run/Test Mode Jumper
- Program Audio Feed to Announce Output

IFB MODE

The MS-440 and RM-440 support two different modes of operation for the internally generated IFB function. J10 on the main PC board (in the lower left hand corner of the board just behind the dip switches) selects this mode. If an INTERRUPT ENABLE dip switch is enabled for a channel the operation will be as follows:

LOCAL (Talk Function Activated): (Jumper between Pins 1-2) (Factory Default) When a TALK is active on the channel that interrupt has been enabled the program will be interrupted for the duration of the TALK.

REMOTE (Call Signal Activated): (Jumper between pins 2-3) When a CALL is received on the channel that the interrupt has been enabled the program will be interrupted for the duration of the CALL signal on that channel. To cause an interrupt of the program from this station a CALL signal must be sent by pressing the CALL button or enabling the AUTO-CALL dip switch option for that channel and activating a TALK on that channel.

RUN/TEST MODE JUMPER

J2 on the main printed circuit board allows a factory test mode to be invoked and should never be used for normal intercom operation. The jump jack should be between pins 1-2.

CAUTION: **Do not move this jumper.** The MS-440 and RM-440 will not operate with the test jumper in the wrong position.

PROGRAM AUDIO FEED TO ANNOUNCE OUTPUT JUMPER

J11 on the Main board allows program audio to be fed the Announce Output. This is selected by setting jumper J11 to the ON position. In this mode, pressing the Announce push-button turns off the program audio feed to the Announce Output and replaces it with audio from the selected panel or headset microphone.

The factory default position for J11 is in the OFF position, blocking program audio feed from the Announce Output.
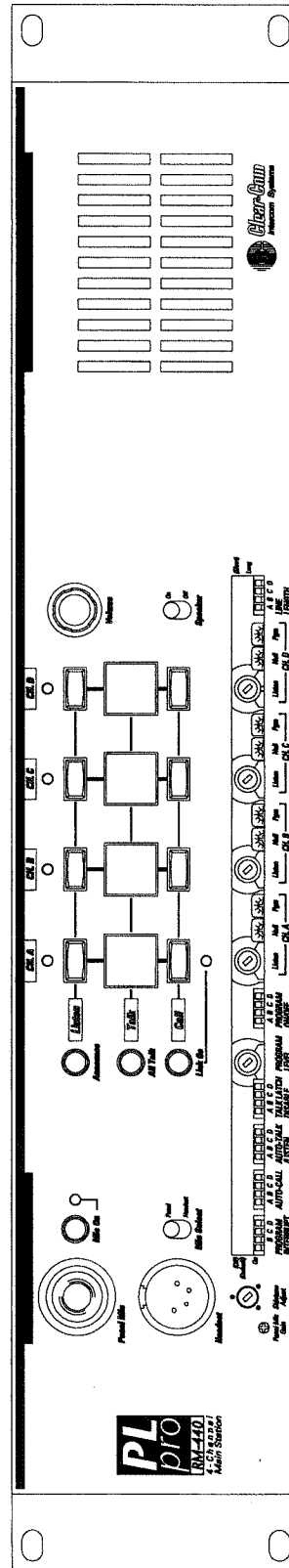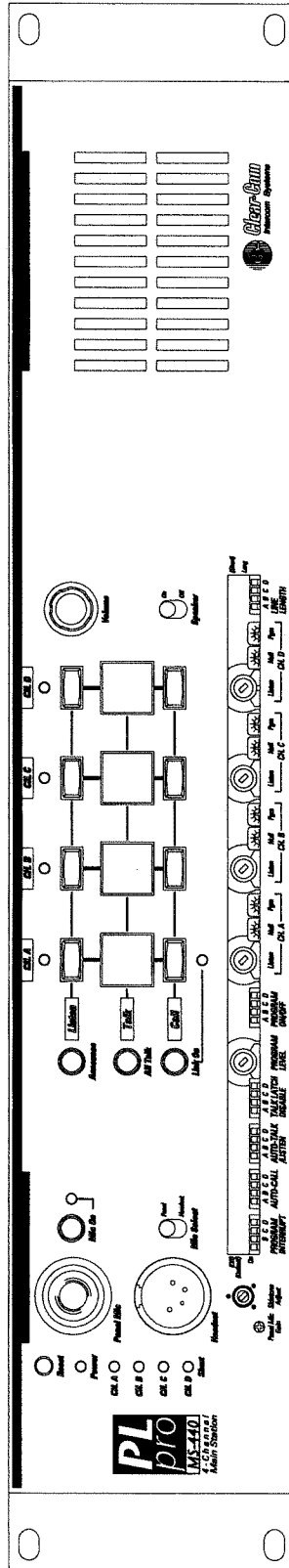
MS-440 and RM-440 Front Panels

OPERATION

Once installed and operational the MS-440 and RM-440 are easy to operate. The following sections describe normal operation of the unit, use of controls available under the Access Panel, and abnormal operation of power distribution system.

Some of the following functions are exclusive to the MS-440 and are marked as such.

NORMAL OPERATION

Normal operation of the MS-440 and RM-440 only requires access to the front panel controls. The following is a brief description of how to use the front panel controls in day-to-day operation.

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

This section discusses the following subjects:

- Intercom Power Distribution Indicators and Reset Button (MS-440)
- Selecting Microphones and Enabling The Speaker
- Listening To Intercom Channels
- Monitoring Main Program
- Talking On Intercom Channels
- The All Talk Function
- Sending And Receiving Call Signals
- Linking Intercom Channels Together (MS-440)
- The Announce Function

INTERCOM POWER DISTRIBUTION INDICATORS AND RESET BUTTON (MS-440)

The green led indicates that the local power supply in the MS-440 is on. The four red LEDs are failure indicators for each of the four intercom lines. These indications will assist in locating a shorted or overloaded channel. Within approximately 7 seconds of automatically cutting off power to an overloaded intercom line, the MS-440 will attempt to turn power on again. This allows momentary short or overload conditions to clear automatically. Shorts are normally caused by miswiring or damaged cables. Overloads are generally caused by connecting too many beltpacks and stations to an intercom line. The push-button marked Reset in the upper left corner of the front panel may also be used to quickly reset the NO Fail power supply protection circuitry for each of the four intercom lines.

When the station is first turned on the normal indication of LEDs is the green "Power" light on and all four red "Short" lights off.

SELECTING MICROPHONES AND ENABLING THE SPEAKER

To select the desired microphone, move the Microphone Select switch to the appropriate position.

The Mic On/Off push-button allows turning the microphone off. The microphone will be turned on automatically whenever a Talk function is activated as it is assumed that you wish to talk. The green led indicates when the microphone is active. If one or more Talks are active you may turn the microphone off without unlatching the active talks.

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

LISTENING TO INTERCOM CHANNELS

To listen to an intercom channel, press the Listen button for the desired channel. The green led above the button indicates when a listen is on.

The Listen Level control (below the Call button) for that channel is usually set to full on position and the listening volume is set by the Intercom Volume control to the left of the speaker.

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

TALKING ON INTERCOM CHANNELS

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

The latching function can be defeated on an individual channel with an option dip switch beneath the Access panel (Latch Disable Dip Switch).

The button will be illuminated dimly while the talk function is on.

Another option allows the automatic setting of a listen function whenever a talk is active (Auto-Listen Dip Switch) for each channel.

THE ALL TALK FUNCTION

Pressing the button marked All Talk, sends the selected microphone to all channels while the button is pressed (momentary only).

MONITORING MAIN PROGRAM

The Main Program input is the one on the XLR connector on the rear panel. To listen to the main program in the speaker or headphone, adjust the Program Level control just below the Link and ALL Talk push-buttons.

SENDING AND RECEIVING CALL SIGNALS

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

If the Auto-Call option is selected for that channel, activating a Talk button will also send a Call to that channel.

Receiving a Call signal is indicated by a flashing Talk button.

LINKING INTERCOM CHANNELS TOGETHER (MS-440)

A push-button allows the connecting of intercom channels (B, C, and D) to channel A. The Link push-button is latching in action. The led below the channel A Talk button indicates when all channels are linked together. In the latched position the entire station operates as one party line.

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

THE ANNOUNCE FUNCTION

A single push-button sends the active microphone to the Announce output on the rear panel. Any active Talks are disabled while the Announce button is held. Talk and Listen latches are not reset but the microphone does not go to the intercom line while the Announce function is active. A set of relay contacts are activated to control some external device.

There is an option which allows program audio to be fed to the Announce Output. If this option is enabled, the Announce push-button interrupts this audio when it is pressed. Program audio feed to the Announce Output is selected by setting jumper J11 on the Main board to the ON position.

HIDDEN FRONT PANEL OPTIONS AND ADJUSTMENTS

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

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

DIP SWITCH OPTIONS

The unit is shipped with all dip switches in their default positions (up).

The following functions are enabled with dip switches:

INTERRUPT ENABLE: Three dip switches enable the PROGRAM INTERRUPT function on channels B, C, and D. Program Interrupt is not available on channel A.

AUTO-CALL: Four dip switches (one for each channel) enable automatically sending a CALL signal whenever a TALK is active on the enabled channel.

AUTO-TALK/LISTEN: Four dip switches (one for each channel) enable automatically setting the LISTEN function whenever a TALK is active on the enabled channel.

TALK LATCH DISABLE: Four dip switches (one for each channel) disable the latching action of the selected channel.

PROGRAM ON/OFF: Four dip switches (one for each channel) enable feeding the Main Program input to the selected intercom channel. The Main Program input is the one on the XLR-3F on the rear panel.

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

LINE LENGTH: Four dip switches (one for each channel) allow the optimization of the nulling circuitry for each channel. The default (up position) is for SHORT lines (less than 400 ft). The down position is for LONG lines (greater than 400 ft).

HIDDEN ADJUSTMENT CONTROLS

Various adjustments are available beneath the front access panel.

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

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

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

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

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

To adjust the NULL control on a given channel:

1 Turn the SIDETONE ADJUST control just below the Headset connector to minimum

2 Set a TALK to the channel to be adjusted or send some program to the channel and adjust the NULL control for the channel for minimum level in the headphone. If the headset microphone is being used, hum or gently scratch it for a continuous signal source to null on. If a good null is not attainable, switch the LONG/SHORT dip switch (to the far right of the hidden adjustments) for the channel to its opposite setting. Use the setting that produces the best results.

3 Repeat the adjustment for all four channels on the station.

4 Adjust the SIDETONE ADJUST control for the desired amount of sidetone in the headset.

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

Each channel has two program sources:

1 The Main Program that is input from the rear panel XLR connector may be enabled for a given channel with the PROGRAM ON/OFF dip switches for the channel.

2 The Auxiliary input connector has four individual program inputs for each channel. These inputs cannot be disabled with front panel dip switches.

REAR PANEL OPTIONS

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

INTERCOM LINE TERMINATION (MS-440)

The MS-440 has switch selectable intercom line termination networks. The RM-440 is a remote station and therefore does not have terminating networks available. If more than one MS-440 is installed on the same intercom lines then all of the terminations in all of the stations except one must be disabled.

CAUTION: If the LINK function is to be used on a MS-440 and there is more than one MS-440 in the system, it can only be used on the unit that provides termination.

The terminations are enabled or disabled with switches on the rear panel. Each channel is marked clearly on the panel. Set the switches to the OFF position to disable the terminations in the station. **The MS-440 is shipped from the factory with all four lines terminated.**

Abnormal Indications on the Power Distribution 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. After approximately 7 seconds, the MS-440 will attempt to turn power on again. This allows momentary short or overload conditions to clear automatically. The push-button marked Reset in the upper left corner of the front panel may also be used to quickly restore power.

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