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CLEAR-COM ENCORE

RM-702 TWO-CHANNEL REMOTE STATION

INSTRUCTION MANUAL

RM-702 Two-Channel Remote Station Instruction Manual

Part Number 810343Z Rev. 4

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IMPORTANT SAFETY INSTRUCTIONS

Please read and follow these instructions before operating this product.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Only use attachments/accessories specified by the manufacturer.
10. 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.
11. Unplug this apparatus during lightning storms or when unused for long periods of time.
12. 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.
13. **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 station is used improperly. They also refer you to important operating and maintenance instructions in the manual.





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



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

Figure 1: Safety Symbols

EMC AND SAFETY

The RM-702 station meets all relevant CE and FCC 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.

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 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 from a main station or power supply to all remote stations, and the other wire carries two-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. Low-impedance mic input lines 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 have auxiliary program inputs with local volume control, allowing 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 on the type of main and remote stations selected (and assuming that enough DC power is available) remote stations can be distributed along a mile of wire. Remote stations bridge the intercom line at a very high impedance and place a minimum load on the line. The audio level always

remains constant, and does not fluctuate as stations leave and join the network.

DESCRIPTION

The RM-702 is one of a series of professional intercom stations specifically designed for the broadcast industry. This two-channel, one-rack-space station is ideal for ENG and EFP trucks, production studio consoles, and small TV facilities. The station can be tailored to your needs through its programmable *talk* button options. The RM-702 is compatible with all Clear-Com party-line intercoms.

The station also incorporates an internal single-channel program interrupt system (IFB). When activated, one or more stations can interrupt the program to a talent with Clear-Com's wired or wireless talent receivers. Direct connection to Clear-Com's IFB system is easily accomplished through a 1/4 in. (0.62 cm) phone jack on the rear panel intended to directly connect to a Clear-Com MA-704.

The RM-702 remote speaker/headset station allows selectable two-channel talking and/or listening on a Clear-Com intercom system. The operator can communicate on either of the channels separately or on both at once. Illuminated dual-action *talk* buttons provide electronic momentary or latching capability. The latching feature may be disabled if desired. The talk buttons can also be remote controlled for footswitch or other use. Monitoring activity is possible through the speaker or headset or both at once.

The RM-702 features *visual call signaling* to attract the attention of operators who have removed their headsets or turned off their speakers.

This station accepts dynamic headsets. The station accepts two different lengths of plug-in gooseneck microphones, 9 in. (22.86 cm) and 18 in. (45.72 cm), to allow for different operating locations/positions.

The station's speaker can be turned on or off by a convenient front panel switch when private conversation via the headset is desired. A *speaker dipping* circuit provides an additional amount of acoustic output before feedback. This feature helps to reduce feedback when stations are placed in close proximity to each other. The station accepts a balanced *program* input for monitoring external audio in the headset or speaker. Individual sidetone controls for each channel allow the operator to vary the level of his/her own voice as heard in the headset/speaker.

Studio announce allows control of a paging speaker in a studio. A front panel button activates this function and an associated relay.

The RM-702 installs in a standard 19 in. (48.26 cm) equipment rack, using only one rack space. The station provides two 3-pin, XLR connectors for input and loop-through on each channel.

OPERATION

Normal operation of the RM-702 requires access only to the front panel controls. For intercom operation, set the *listen level* controls for each channel to the desired level and press the *talk* switches when talking. If a headset is being used, set the *sidetone* control for the receiving channel for the desired amount of sidetone in the earphone. If the panel mic and speaker are being used, set the sidetone control for minimum feed-through to the speaker to prevent feedback.

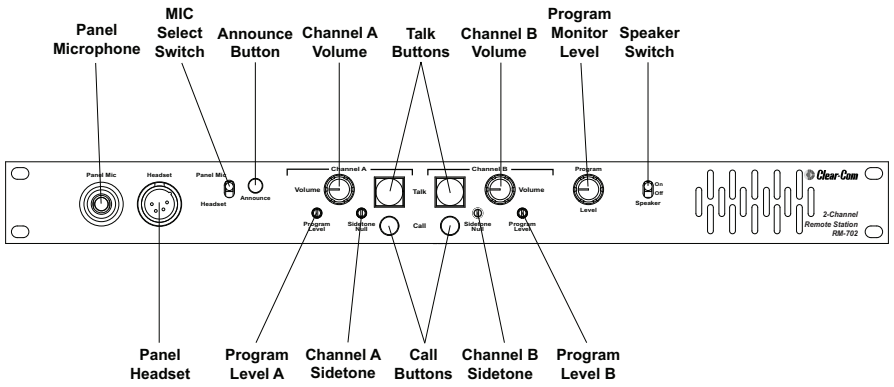


Figure 1-1: RM-702 Front Panel

The rest of this section is a detailed description of each control.

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. The latching function can be defeated with a rear-panel DIP switch.

- **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 illuminates yellow when a talk is activated and blue when talk is not active.
- **CALL INDICATION:** The *call* button will flash red when a *call* signal is received on that channel.
- **AUTO-CALL ON TALK:** Each channel can be set to send a *call* signal when the *talk* function is active. This function is used to activate IFB circuits or any other call-activated function available on other stations. A DIP switch on the rear panel activates this function.

- **SPEAKER DIP FUNCTION:** Pressing either *talk* button will reduce the output level of the speaker by a set amount to avoid feedback.

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 *call* button for that channel will flash red while the *call* button is pressed indicating the presence of a call signal on the line.

VOLUME CONTROLS

Each channel has a separate *volume* control for monitoring incoming audio. 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.

SIDETONE CONTROLS

Each channel has a *sidetone null* control. This control sets 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 sidetone 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 sidetone control.

PROGRAM SEND LEVEL CONTROL FOR CHANNEL A AND B

Both channels A and B have a *program send level* control that sets the volume of program audio being sent to that channel when the program is activated.

SPEAKER ON/OFF SWITCH

The switch marked *speaker on/off* is used to turn the speaker on and off.

MIC SELECT SWITCH

The *mic select* switch enables the operator to select which microphone is active.

PROGRAM MONITOR LEVEL CONTROL

The *program 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.

ANNOUNCE BUTTON

The *announce* 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 for activating external switching, as needed when the announce button is pressed.

The button illuminates amber when pressed. Pressing the *announce* 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 the section on internal options and adjustments.)

2 INSTALLATION

This section discusses the installation of the RM-702 in an intercom system including typical applications, overall installation theory, detail of each connector, and adjustments.

INSTALLATION OVERVIEW

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

- Intercom line connection
- Line termination
- Station powering
- Cable considerations

INTERCOM LINE CONNECTION

The RM-702 provides male and female XLR-3 connectors for each intercom line, which are looped through.

CONNECTING OR ISOLATING RM-702 CHANNELS

An internal jumper in the RM-702 unit allows you to defeat the power-channel isolation of the unit, as described in the following procedure.

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

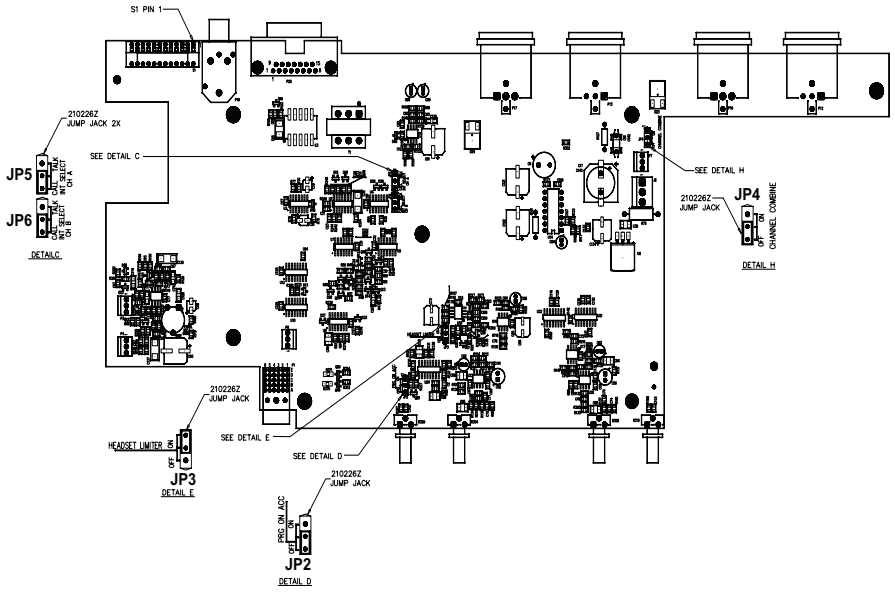


Figure 2-2: RM-702 PCB Layout

To connect or isolate RM-702 channels:

1. Please observe anti-static procedures. The circuit cards can be damaged by static electricity. Please ground yourself and tools before touching any circuit cards.
2. Remove the cover of the RM-702.
3. On the main circuit board, locate the JP4 three-pin jumper.

   The jumper is located on the rightmost upper portion of the circuit card, when viewed from the front of the unit. The label "J4" appears behind the jumper. A jumper plug is placed over pins 2 and 3.

4. Do one of the following:

   • To connect the two channels, place the jumper plug over pins 1 and 2.

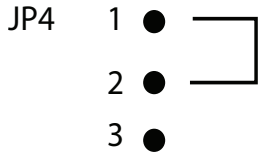


Figure 2-3: Jumper Set to Connect Channels

   • To isolate the two channels, place the jumper plug over pins 2 and 3.

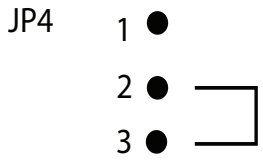


Figure 2-4: Jumper Set to Isolate Channels

The RM-702 unit is shipped with the jumper plug over pins 2 and 3 to maintain the power-channel isolation. Power-channel isolation ensures that if one channel loses power, the other channel will continue to operate.

5. Replace the cover of the RM-702.

LINE TERMINATION

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 *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*.

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.

The RM-702 does not provide termination on the intercom line. 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.

The termination of an intercom line (or channel) is a 220 Ohm resistor in series with a 4.7 K Ohm that is paralleled with a 10 uF capacitor.

STATION POWERING

Typical Clear-Com systems are powered by a main station or a power supply.

Clear-Com power supplies can be paralleled to increase the number of remote stations that can be operated in a system.

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:

- DC resistance of the ground or common conductor affects crosstalk. For runs longer than 500 ft. (152.5 m), do not use wire smaller than 20 gauge.

- 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. For runs less than 500 ft. (152.5 m), a cable made of 24-gauge wire is acceptable. For runs longer than 500 ft. (152.5 m), use a 20-gauge cable or larger.

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 of less than 500 ft. (152.5 m) and 18-gauge cable for runs greater than 500 ft. (152.5 m). 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.

DESCRIPTION OF FRONT PANEL CONNECTORS

HEADSET CONNECTOR (FRONT PANEL)

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

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

Wiring

Pin 1 --- Mic common

Pin 2 --- Mic hot

Pin 3 --- Headphone common

Pin 4 --- Headphone hot

PANEL MIC CONNECTOR (FRONT PANEL)

Clear-Com provides two plug-in panel microphones for use on the RM-702. The GM-9 is 9 in. (22.86 cm) long and GM-18 is 18 in. (45.72 cm) long. The microphone is of the electret type. The microphone has a built-in 1/4 in. (0.64 cm) phone jack for a connector. A mating receptacle is mounted on the RM-702.

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.

DESCRIPTION OF REAR PANEL CONNECTORS

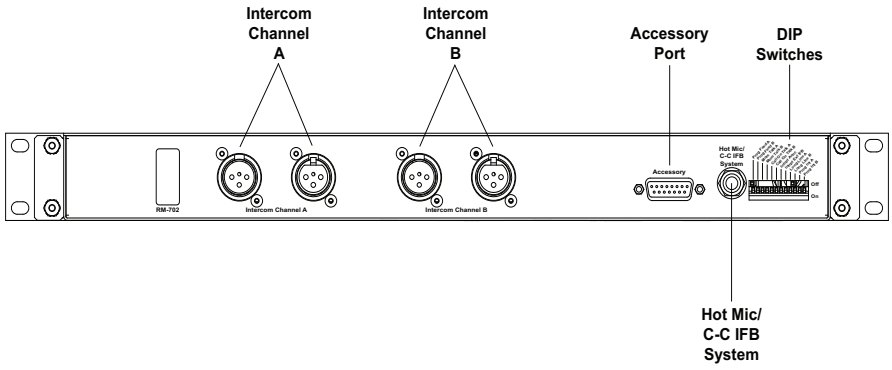


Figure 2-5: RM-702 Rear Panel

INTERCOM LINE CONNECTORS (REAR PANEL, XLR-3 2 MALE & 2 FEMALE)

The RM-702 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
Pin 3 --- Audio

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

A 1/4 in. (0.64 cm) phone jack marked IFB/HOT mic provides an output signal from the selected microphone. This output is intended to work with Clear-Com's MA-704 IFB control panel. A control signal into this connector from the MA-704 causes all active *talks* from the station to cease and only sends the IFB output.

The pin description of the connector is as follows:

Tip --- Microphone audio output
Ring --- Control signal (>15 VDC)
Sleeve --- Ground (shield)

ACCESSORY (REAR PANEL, DB-15F)

The accessory DB-15F connector on the rear panel provides *program* input, *announce audio* output, *announce relay* contacts, and *foot switch* inputs for activating a *talk* on either channel. The pin assignment of the connector is as follows:

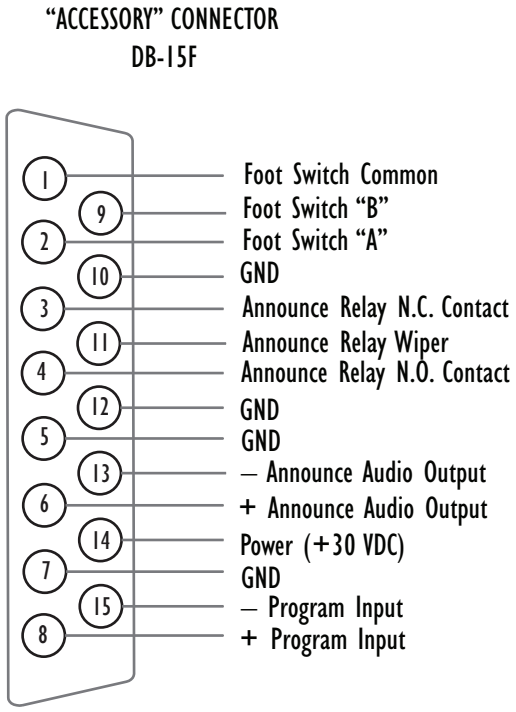


Figure 2-6: Viewed from the rear of the connector

DESCRIPTION OF OPTIONS AND ADJUSTMENTS

DIP SWITCH OPTION SWITCHES (REAR PANEL)

Twelve DIP switches on the rear panel enable various options in the station:

- PROGAM ENABLE A: Enables *program* audio on channel A when set to the *on* position.

- PROGRAM ENABLE B: Enables *program* audio channel B when set to the *on* position.
- MOM TALK A: Setting the *momentary talk A* switch to the *on* position will disable the latching function of the channel A *talk* button. In this mode, the *talk* button must always be held in continuously while the operator is talking on channel A.
- MOM TALK B: Setting the *momentary talk B* switch to the *on* position will disable the latching function of the channel B *talk* button. In this mode, the talk button must always be held in continuously while the operator is talking on channel B.
- CALL ON TALK A: If the *call on talk A* switch is set to the *on* position, a call signal will be placed on channel A whenever the *talk* function is activated. This can be used to activate any *call*-activated functions available on other stations.
- CALL ON TALK B: If the *call on talk B* switch is set to the *on* position, a call signal will be placed on channel B whenever the *talk* function is activated. This can be used to activate any *call*-activated functions available on other stations.
- INTRPT ANNC: If the *interrupt announce* switch is set to the *on* position, pressing the *announce* button will disconnect the microphone from the intercom line(s). This will allow announcements to be made without being heard over the intercom channels.
- INTRPT EXT IFB: When the *hot mic* output is connected to Clear-Com's IFB system and the *interrupt external IFB* switch is set to the *on* position, pressing a key on the IFB system will disconnect the selected headset or panel microphone from the intercom line(s). This allows the RM-702 microphone to be used to cue talent without affecting intercom line communication.
- LONG LINE A: If a long cable run on channel A is unavoidable and approaches 1,000 ft. (305 m) or more, set the *long line A option* switch to the *on* position. The ability to set a sidetone null on channel A depends upon properly setting this switch.
- LONG LINE B: If a long cable run on channel B is unavoidable and approaches 1,000 ft. (305 m) or more, set the *long line B option* switch to the *on* position. The ability to set a sidetone null on channel B depends upon properly setting this switch.
- PROGRAM INTERRUPT A: Interrupts the *program* audio to channel A while a *call* signal is sent on channel A (default).

  You can change this option so that a *talk* signal, rather than *call* signal, interrupts the *program* audio on channel A. You do this by re-setting an internal jumper. See the next section, "Re-Setting Program Interrupt Options," for instructions.
- PROGRAM INTERRUPT B: Interrupts the *program* audio to channel B while a *call* signal is sent on channel B (default).

You can change this option so that a *talk* signal, rather than a *call* signal, interrupts the *program* audio on channel B. You do this by re-setting an internal jumper. See the next section, "Re-Setting Program Interrupt Options," for instructions.

The RM-702 is shipped from the factory with all DIP switches in the *off* position. To enable a function, place that DIP switch in the *on* position.

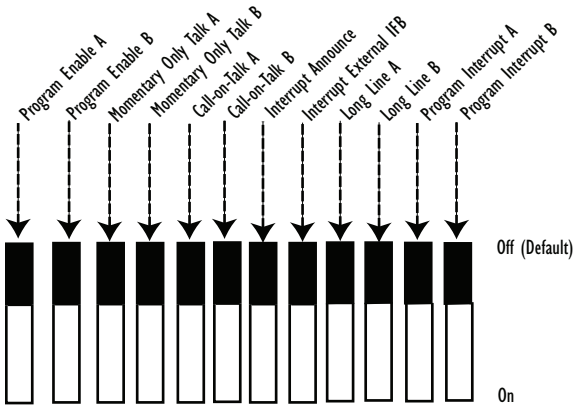


Figure 2-7: DIP switches

RE-SETTING PROGRAM INTERRUPT OPTIONS

When you set one of the rear-panel *program interrupt* DIP switches to *on* for a particular channel (A or B), any *call* signal activated on that channel interupts the *program audio* during the call signal.

You can change this option so that activating a *talk* signal, rather than a *call* signal, interrupts the program audio for the duration of the signal. You do this by re-setting an internal jumper on the station's internal circuit board.

To re-set the program interrupt option:

1. Please observe anti-static procedures. Static electricity can damage a circuit card. Please ground yourself and tools before touching the circuit card.
2. Remove the cover of the RM-702 by removing the eight Phillips screws.
3. On the main circuit board, locate one of the following:
   - **For channel A**: The *JP5* three-pin jumper, located in the center of the circuit board.
   - **For channel B**: The *JP6* three-pin jumper, located in the center of the circuit board.
4. A jumper plug covers two of the three pins on each jumper. To change the program-interrupt option on your station, do one of the following:
   - **For channel A**: Move the jumper plug so that it covers pins 1 and 2. This causes *talk* signal activation to interrupt the program audio.

• **For channel B:** Move the jumper plug so that it covers pins 1 and 2. This causes *talk* signal activation to interrupt the program audio.

In the default position, the jumper plug covers pins 2 and 3, which causes *call* signal activation, rather than *talk* signal activation, to interrupt the program audio.

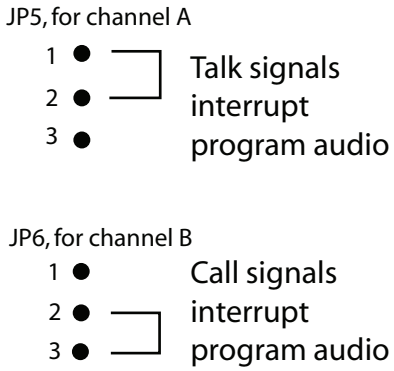


Figure 2-8: Changing Program Interrupt Options

PANEL MIC LEVEL ADJUSTMENT (INTERNAL)

The microphone preamplifier for the panel microphone has an internal gain adjustment control. This gain can be adjusted for different operating conditions. As shipped from the factory, the control is set to minimum gain such that the panel microphone and a headset microphone have the same volume when worked at about 2 in. (5.08 cm).

To adjust the panel microphone gain, you must open the unit. Ground yourself and tools before touching the circuit board, as circuit boards can be damaged by static electricity. Remove the top cover of the unit, and locate the jumper labeled “R161.” It is located on the leftmost side of the circuit board, toward the front of the unit when facing it. Use a small screwdriver to turn the control clockwise to increase gain or counterclockwise to decrease gain.

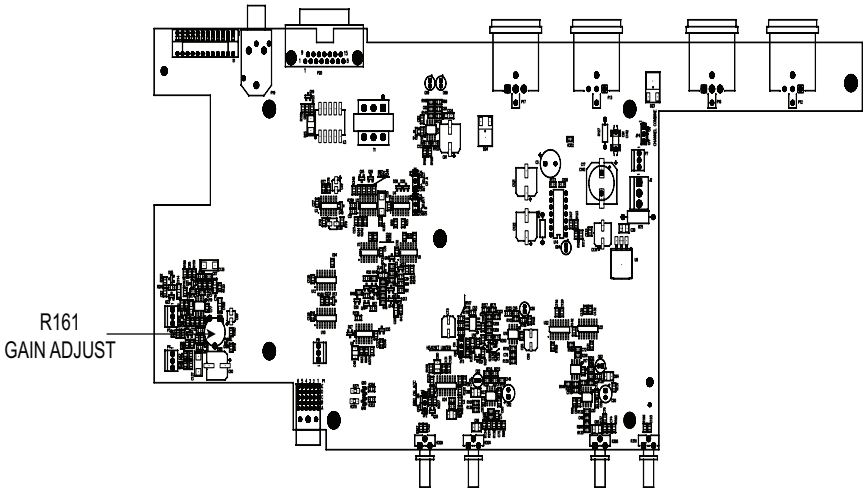


Figure 2-9: Location of Panel Mic Gain Adjust Control R161

INTERCOM LINE LENGTH COMPENSATION (REAR-PANEL DIP SWITCHES)

The receive circuits of the intercom channels have been optimized for an intercom line length of up to 1,000 ft. (304.8 m). The capacitance of the intercom line must be compensated for in the receive circuits if a good sidetone null is to be achieved. When using a speaker, a good sidetone null is necessary to achieve a usable listening level.

A set of two rear-panel DIP switches have been provided to compensate for lines longer than 1,000 ft (304.8 m). Each intercom channel has its own DIP switch.

To change the setting of the *line length compensation* DIP switches, move either the *long line A* or *long line B* DIP switch to the "on" position for intercom lines longer than 1,000 ft. (304.8).

PROGRAM FEED ON ANNOUNCE

You can set up the announce feature so that program audio is sent out on the announce line as well as the announce audio. You set this option up by using an internal jumper on the circuit board.

To send out program audio along with announcements:

1. Please observe anti-static procedures. Static electricity can damage a circuit card. Please ground yourself and tools before touching the circuit card.
2. Remove the cover of the RM-702 unit by removing the eight Phillips screws.
3. Locate the *JP2* three-pin jumper on the centermost front portion of the circuit card.

   A jumper plug covers pins 2 and 3 of the jumper. This is the *off* position.

4. Remove the jumper plug from the pins and place it over pins 1 and 2. This is the *on* position.

   Program audio will now accompany the announce audio.

TYPICAL SYSTEM APPLICATIONS

ENG/EFP TRUCK

The following block diagram describes a typical ENG/EFP truck installation.

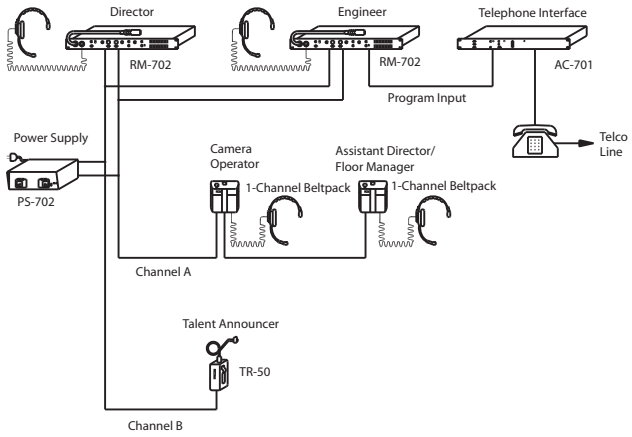


Figure 2-10: Typical ENG/EFP Truck Installation

The system has two 2-channel RM-702 rack-mount stations. The system is powered from a Clear-Com power supply that also provides the terminations for both channels.

Channel B is connected to talent receivers for announcers.

A telephone line interface is connected to the *program* input of station #2. It provides a program feed from the studio via a dial-up telephone line. Its DIP switch options are set to insert program audio on channel B and interrupt the program when a call signal is present on channel B. The option DIP switches for placing a *call* signal on channel B is set on both RM-702s. Now, whenever either RM-702 initiates a *talk* to the announcers, it interrupts the program feed (to the announcers).

CABLE/SCHOOL TELEVISION STUDIO

The following block diagram describes a typical cable or school television studio installation.

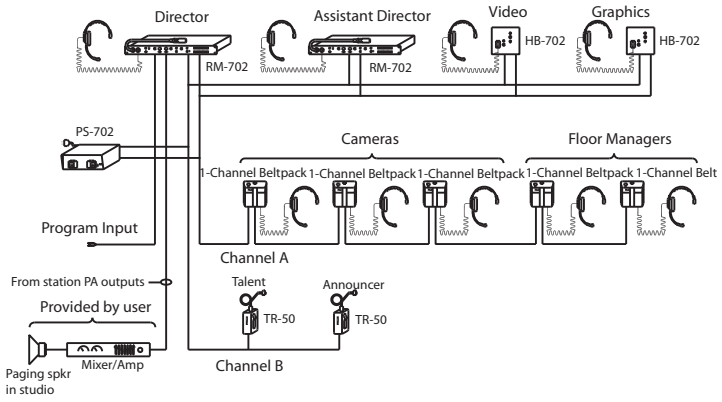


Figure 2-11: Typical Cable or School Television Studio Installation

The system has several 2-channel RM-702 rack mount stations and several wall mount 2-channel stations. The system is powered from a Clear-Com power supply that also provides the terminations for both channels.

A line of single-channel beltpacks is connected to channel A. The beltpacks are used for the cameras and floor managers. Normal communication between all parties is on channel A.

Channel B is connected to talent receivers for announcers. The program that is to feed the announcers is connected to the first RM-702. Its DIP switch options are set to insert program on channel B and interrupt the program when a *call* signal is present on channel B. The option DIP switches for placing a call signal on channel B is set on both RM-702s. Now, either RM-702 will interrupt the program feed to the announcer when a *talk* is initiated from it to the announcers.

A PA amplifier is connected to the *announce* output of the first RM-702 such that the operator of that station could talk directly to everyone in the studio.

ACTUAL APPLICATIONS

This section describes detailed instructions for various types of applications. A block diagram such as those in the previous section describing an ENG/EFP truck and a cable/school television studio should be developed for your application. The following sub-topics in this section describe in detail each of the major application types that might be encountered. The sub-topics in this section are:

- Intercom line wiring
- Program input
- Internal IFB operation
- External IFB (MA-704 and PIC-4704 connections)

- PA feed to studio output
- Remote control of talk switches
- Inadequate sidetone adjustment

INTERCOM LINE WIRING

The intercom line wiring has several purposes in the Clear-Com system:

- Connection of the audio intercom signal between stations.
- Delivery of DC power for remote stations (such as the RM-702) to operate from.
- Termination of the intercom audio line external to remote stations.

Connect the intercom lines of stations and power supplies using a shielded twisted pair cable with XLR 3-pin connectors (the same as used for balanced microphones). Refer to the installation overview section of this manual for more information.

The RM-702 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 are as follows:

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

The following application shows the practical connection of the intercom lines in the block diagram of the cable/school television studio.

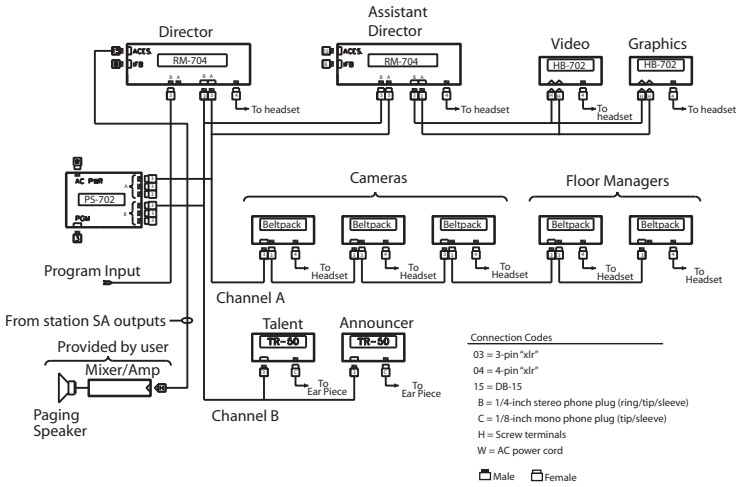


Figure 2-12: Connecting a Small Cable/School Television Studio

The entire system is wired using male/female microphone cables looped-through each station except for the HB-702s. The HB-702 has screw

terminals for the intercom lines. The PS-702 provides the DC power for the system and the line termination switches must be turned *on*.

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. The RM-702 does not provide termination on the intercom line.

PROGRAM INPUT

There are two different purposes for the program input: monitoring program in the speaker and headphone, or feeding the Channel A and B intercom lines with program material.

- **Monitoring Program:** To monitor program in the headphone or speaker:
  - Connect the program source to the proper pins on the DB-15.
  - Make sure the appropriate rear-panel *program enable* DIP switch is set to the *on* position. For channel A, set the *program enable A* DIP switch to *on*. For channel B, set the *program enable B* DIP switch to *on*.
  - Use the large knob labeled "Program Volume," located right next to the speaker on/off switch, to set the appropriate program volume level. This knob controls the program volume in the speaker/headphone.
  - Set either the A or B potentiometer marked *Program Level,* located under either the A or B channel's volume knob, to the lowest setting. This control affects the program volume going out onto the selected intercom line.
- **Feeding Channel A or B Intercom Line:** To feed the A or B channel with program material:
  - Connect the program source to the proper pins on the DB-15.
  - Make sure the appropriate (A or B) rear-panel *program enable* DIP switch is set to the *on* position. For channel A, set the *program enable A* DIP switch to *on*. For channel B, set the *program enable B* DIP switch to *on*.
  - Set the large knob, labeled "Program Volume," located right next to the speaker on/off switch, to the appropriate level. This knob controls the program volume in the speaker/headphone.
  - Set either the A or B potentiometer marked *Program Level*, located under either the A or B channel's volume knob, to the desired level. This control affects the program audio level on the intercom line.
  - If it is desired to interrupt this program feed, set the appropriate (A or B) rear-panel *Program Interrupt* DIP switch to *on* and ensure that the *Program Enable* DIP switch for the channel is set to *off*. When you do so, any time you activate a *call* signal, the program audio is interrupted for the duration of the call signal. There is an option to change this so that any time you activate a *talk* signal, the program audio is interrupted

for the duration of the talk signal. See the earlier section in this chapter, “Re-setting Program Interrupt Options,” for more information on setting this option.

- **To Connect To The Program Input:** The *program* input of the RM-702 is available in the DB-15 accessory connector on the rear panel.

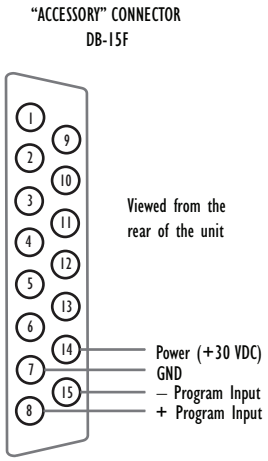


Figure 2-13: Connecting Program Sources

Connect a balanced input to pins #8 and #15 with the shield connected to pin #7.

To connect an unbalanced input, connect the signal to pin #8 and connect the shield to pins #15 and #7.

Connecting Party-Line Products As Program Sources: If other Clear-Com products (such as an AC-701 telephone interface) are to be used as a program source directly, use the following interconnection cable.

Pin #14 of the DB-15 accessory connector provides +30 VDC to power the external device. Connecting pins #7 and #15 together unbalances the program input. The output from the party line device is connected to pin #8 with a 1KOhm load to provide a partial termination.

Figure 2-14: Connecting Party-Line Products As Program Sources

INTERNAL IFB OPERATION

To use either channel A or B as an IFB feed, connect the program source to the program input (as described in the previous section) and set the *Program Interrupt A* (or B) DIP switch to the *on* position. The program will now be interrupted whenever there is a *call* signal present on channel B. If there are multiple RM-702s in the system, the program should only be fed into one of the RM-702s.

To interrupt the IFB program automatically when a *talk* rather than a *call* signal is active on channels A or B, you must reset an internal jumper as described in "Re-Setting Program Interrupt Options" earlier in this chapter.

EXTERNAL IFB (MA-704 AND PIC-4704 CONNECTION)

Clear-Com provides a stand-alone IFB system called a PIC-4704. The PIC-4704 provides four interruptible IFB feeds from two program sources, and is located in a central location. The MA-704 is a four-channel control head intended to work with the PIC-4704. An MA-704 is located at each location where program interrupt is to be initiated. Each MA-704 has its own panel-mounted microphone which, when mounted next to an intercom station with a panel mounted microphone, causes panel congestion with two microphones at a single location.

The RM-702 has a 1/4 in. (0.64 cm) phone jack output on its rear panel intended to connect directly to an MA-704 and provide a microphone feed to the MA-704. The MA-704 can be ordered without a panel-mounted microphone. When a button is pressed on the MA-704, a control signal will temporarily transfer the microphone in use on the RM-702 to the MA-704, muting any *talks* active on the RM-702.

To connect the RM-702 to an MA-704, use a two-wire shielded cable with 1/4 in. (0.64 cm) tip, ring, and sleeve jacks on each end. Connect the tip to the tip, the ring to the ring, and use the shield to connect the sleeve to the sleeve.

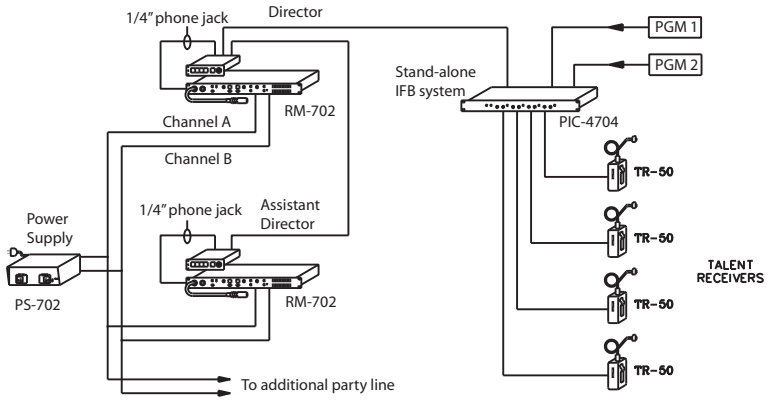


Figure 2-15: Typical External IFB System Using a PIC-4704 and MA-704 with a RM-702

PA FEED TO STUDIO OUTPUT

Pressing the button marked *announce* on the front of the RM-702 temporarily disables activity of the station and places the output of the selected microphone on the *announce audio output* terminals of the *accessory I/O DB-15* connector on the rear panel of the station. Isolated relay contacts are also available for controlling some external devices, such as a PA amplifier to another room.

To connect to the *announce* output, connect a shielded twisted-pair cable to pins #6 and #13 of the *accessory* connector and use pin #5 for connection of the shield.

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

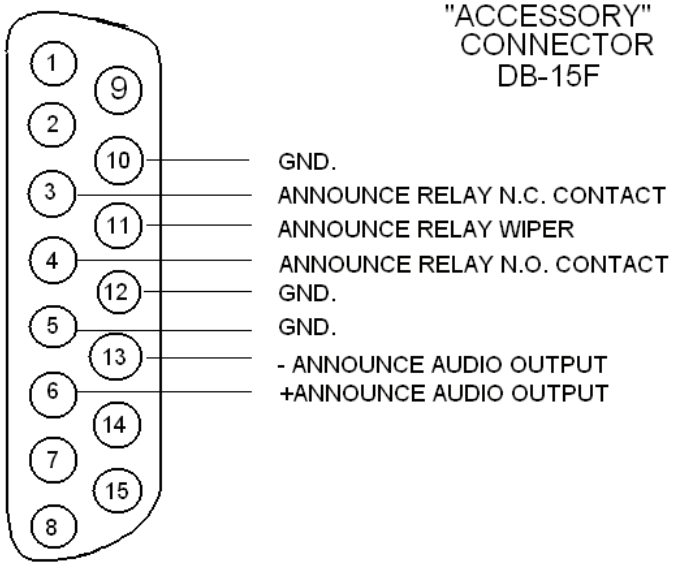


Figure 2-16: Connections for Announce Audio and Relay Outputs

REMOTE CONTROL OF TALK SWITCHES

The *talk* switches of the RM-702 can be remotely controlled with external contacts that are available on the *accessory* connector on the rear panel. A footswitch or remote pushbutton when wired to the accessory connector acts exactly the same as pushing a talk switch on the front panel. Both latching and momentary actions are active.

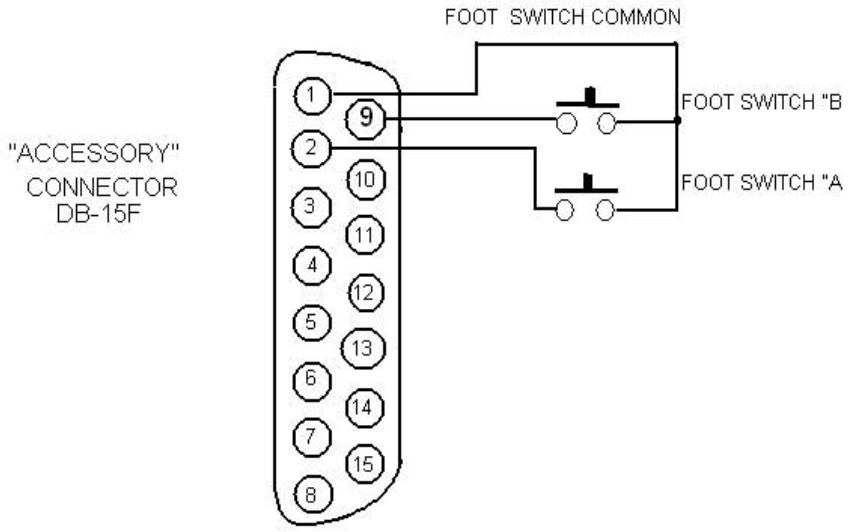


Figure 2-17: Connection of External Talk Switches

INADEQUATE SIDE-TONE ADJUSTMENT

The *receive* circuits of the intercom channels have been optimized for an intercom line length of up to 1,000 ft (305 m). The capacitance of the intercom line must be compensated for in the receive circuits if a good sidetone null is to be achieved. When using a speaker, a good sidetone null is necessary to achieve a usable listening level.

Two rear-panel DIP switches are provided to compensate for lines longer than 1,000 ft. (305 m). Each intercom channel has its own DIP switch, as described in "DIP Switch Option Switches" earlier in this chapter.

3 MAINTENANCE

INTRODUCTION

This chapter provides maintenance information.

RM-702

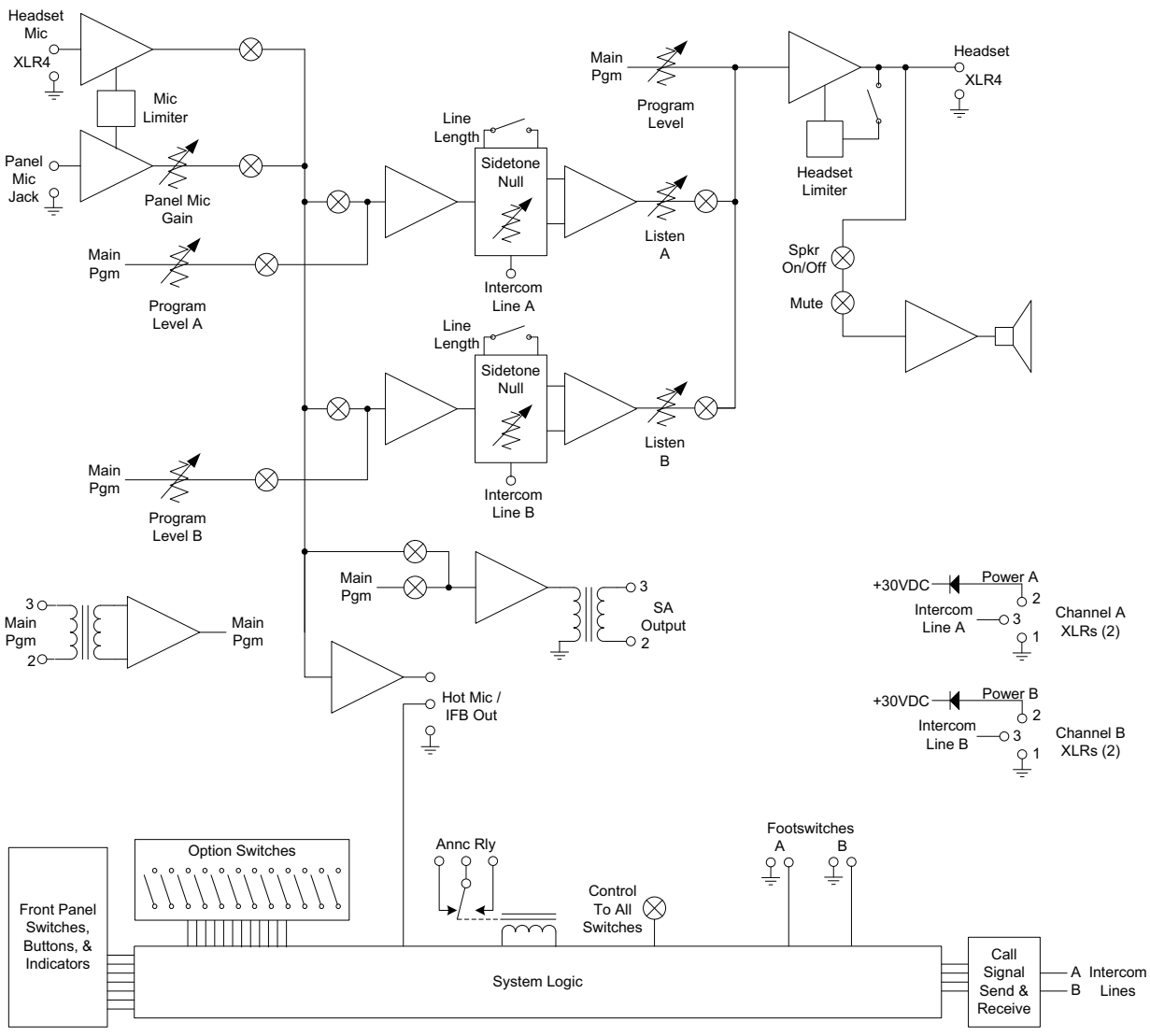


Figure 3-18: Audio Block Diagram for the RM-702

4 TECHNICAL SPECIFICATIONS

RM-702 TWO-CHANNEL STATION

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

Panel Microphone Input

Input Type	Electret
Input Impedance	>=2KΩ
Mic Limiter Threshold	0dBu ±3dB
Mic Limiter Range	>= 20dB

Headset Microphone Input

Input Type	Dynamic
Input Impedance	>= 1KΩ
Mic Limiter Threshold	0dBu ± 3dB
Mic Limiter Range	>= 15dB

Program Line Input

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

Headset Output

Load Impedance	>= 8Ω
Output Impedance	<= 25Ω
Output Limiter Threshold	+5dBu ± 3dB
Maximum Output Level before Distortion	>= 17dBu

Speaker Output

Load Impedance	>= 4Ω
Max Output Level before 1% Distortion	20dBu ± 2dBu

Party Line Output

Off Noise	< -74dBu
Output Impedance	>10KΩ

Party Line Input

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

Stage Announce/Balanced Line Out

Type	Balanced

Output Impedance	>= 200Ω
Load Impedance	>= 600Ω

IFB/Hot Mic

Type	Unbalanced
Output Impedance	180Ω
Load Impedance	>= 600Ω

Frequency Response

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

Max Distortion

Panel Mic - Party Line	<= 0.5%
Headset Mic - Party Line	<= 0.5%
Headset Mic - Line Out	<= 0.5%
Program Input - Party Line	<= 0.2%
Program Input - Headset Out	<= 0.2%
Program Input - Speaker Out	<= 0.5%
Party Line - Headset Out	<= 0.2%
Party Line - Speaker Out	<= 0.5%

Noise

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

Max Gain

Panel Mic - Party Line	>= 37dB
Headset Mic - Party Line	41dB ± 2dB
Headset Mic - Hot Mic Out	55dB ± 3dB
Headset Mic - Announce Out	55dB ± 3dB
Program Input - Party Line	>= -16dB
Program Input - Headset Out	>= 18dB
Program Input - Speaker Out	>= 24dB
Party Line - Headset Out	>= 34dB
Party Line - Speaker Out	>= 40dB

Min Gain

Panel Mic - Party Line	<= 25dB

Power

Input Voltage Range	20-30 VDC
Input Current (Idle)	<= 90mA
Input Current (Max)	<=110mA

Rear Panel Connectors

Intercom:	(2) XLR-3M (1 per channel) (2) XLR-3F (1 per channel)
Hot Mic / IFB Interface:	(1) 1/4 in. (0.64 cm) phone jack
Accessory	(1) DB-15F

Rear Panel Controls

(12) Option switches

Front Panel Connectors

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

Front Panel Controls & Indicators

(1) Panel / headset mic switch
(1) Announce button
(2) Program send level controls
(1) Program monitor level control
(2) Listen controls
(2) Sidetone null controls
(2) Talk buttons
(2) Call buttons
(1) Speaker ON-OFF switch

Environmental

32 - 122^{o} F (0 - 50^{o} C)

Dimensions

Dimensions:	19 in. W x 1.75 in. H x 7.0 in. D (483 mm x 44.5 mm x 178 mm)

Weight

Weight:	5.2 lbs. (2.36 Kg)

Notice About Specifications

While Clear-Com makes every attempt to maintain the accuracy of the information contained in its product manuals, that information is subject to change without notice. Performance specifications included in this manual

are design-center specifications and are included for customer guidance and to facilitate system installation. Actual operating performance may vary.

LIMITED WARRANTY

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.

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.

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.

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Gold-standard solutions

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