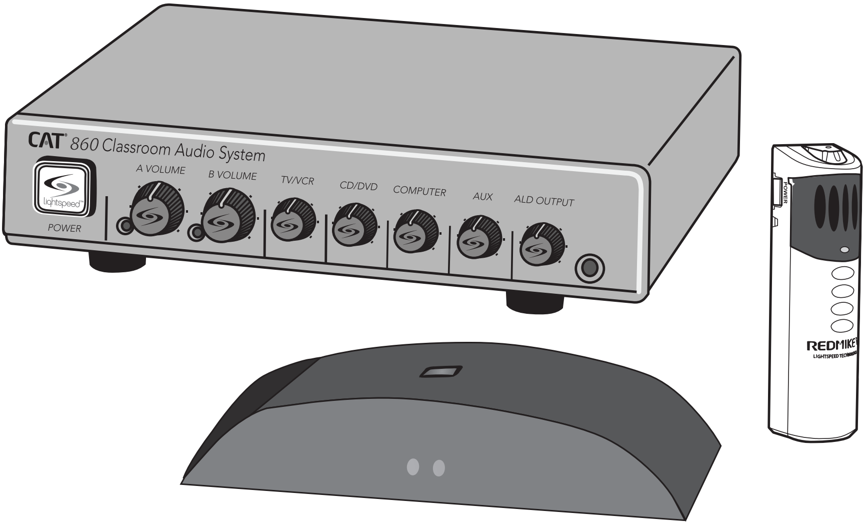
lightspeed™

CAT 860

Classroom Audio System


CAT® 860 Classroom Audio System
A VOLUME
B VOLUME
TV/VCR
CD/DVD
COMPUTER
AUX
ALD OUTPUT
POWER
lightspeed™
REDMIKE
LIGHTSPEED TECHNOLOGIES
POWER

User Manual

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System Management Functions Group

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IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use the apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding- type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/ accessories specified by the manufacturer.
12. Use only with a cart, stand, tripod, bracket or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/ apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lighting storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. When the mains plug or appliance coupler used as the disconnect device, it shall remain readily operable.
16. Please keep the unit in a good ventilation environment.

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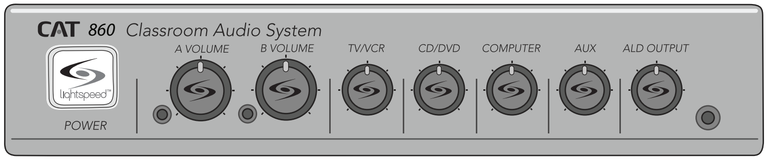
4. Troubleshooting
3. Optional Accessories
2. Setup & Use
1. Overview

SECTION 1:

OVERVIEW

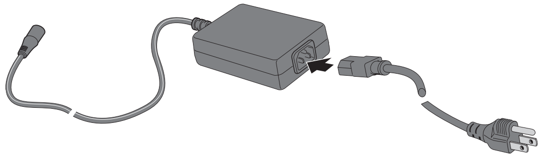
SYSTEM COMPONENTS AND UNPACKING

The standard configuration of the CAT 860 will contain:

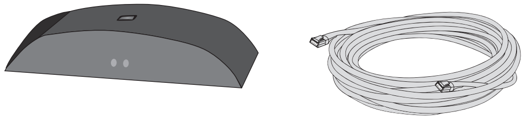

CAT 860 Classroom Audio System
lightspeed
POWER
A VOLUME
B VOLUME
TV/VCR
CD/DVD
COMPUTER
AUX
ALD OUTPUT

CAT 860 Amplifier

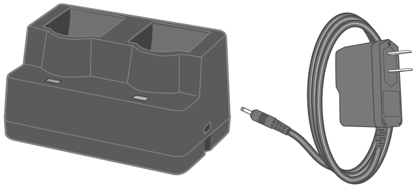
Amplifier Power Supply



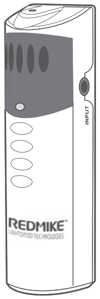
ISR Infrared Sensor/ Receiver and Cable



Charging Cradle and Power Supply



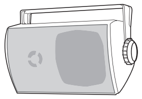
REDMIKE®
Classroom
Microphone


INPUT
REDMIKE
LIGHTSPEED TECHNOLOGIES

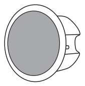
5. Warranty, Safety & Specifications
4. Troubleshooting
3. Optional Accessories
2. Setup & Use
1. Overview

Speakers and Speaker Wire
Systems can be configured with a variety of different speaker types, including the following:

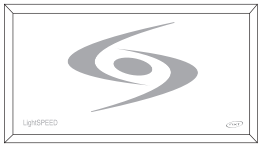
WMQ (x 4)



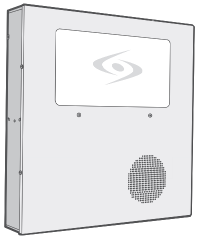
DRQ (x 4)



NXQ (x 1)


LightSPEED

MCQ (x 1)



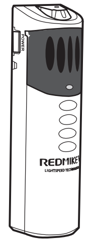
Standard Components

AMP-860	Audio amplifier/mixer
PS-24V-2.5	24V/2.5A power supply for CAT 860
RX-ISR	Infrared sensor/receiver with mounting bracket
CA-PSE50	50’ plenum-rated Cat 5e cable
RMT	REDMIKE classroom microphone with battery
BA-NH2A27	AA NiMH rechargeable sensing battery for REDMIKE
AC-RMLC2	REDMIKE lavaliere cord
BC-RMCC	REDMIKE cradle charger
PS-5V-1.0	5V/1.0A power supply for cradle charger
SPEAKERS	Contact Lightspeed at 800.732.8999 for speaker info

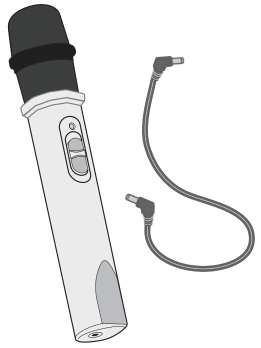
OPTIONAL COMPONENTS

Optional equipment which may be part of your CAT 860 system:

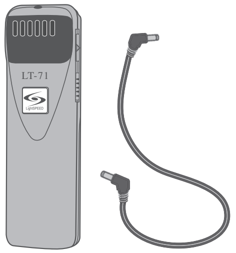
REDMIKE® VC
Volume Control
Microphone



REDMIKE Share
Handheld Mic &
Charger Cable



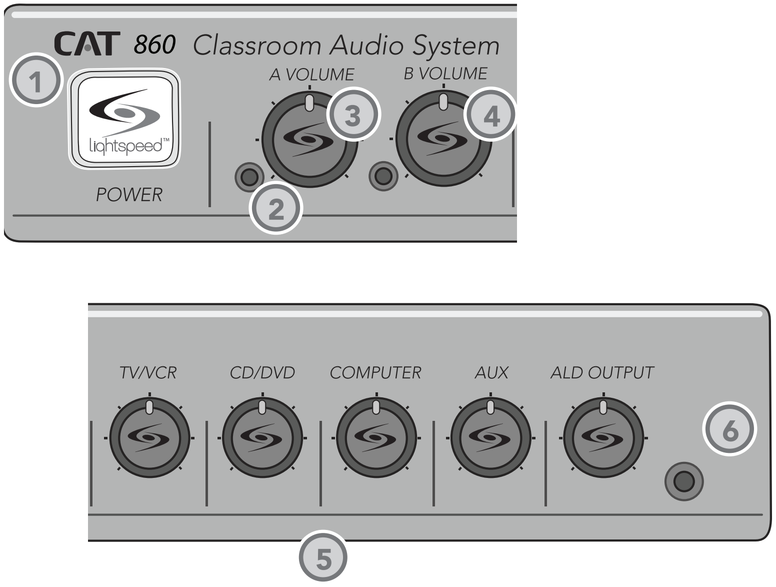
LT-71 LightMic
and Charger
Cable



Optional Components

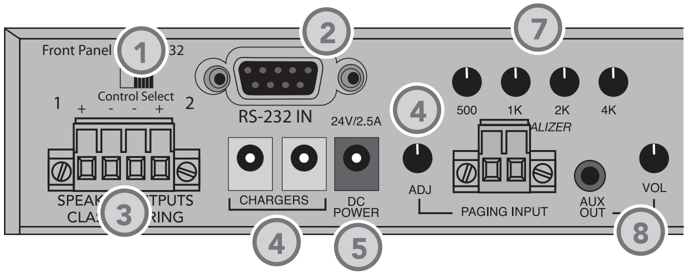
RMV	REDMIKE VC microphone with battery
RMS	REDMIKE Share handheld microphone with battery pack
LT71	LightMic microphone with batteries
BA-NH2A27	AA NiMH rechargeable sensing battery for REDMIKE
BA-NH2APK	NiMH rechargeable battery pack for REDMIKE Share
BA-NH1	AA NiMH rechargeable battery for LT71 (2 per microphone)

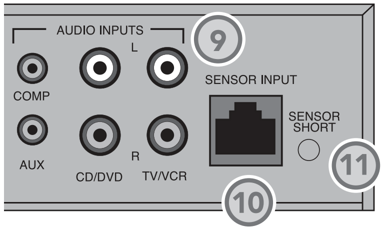
FRONT PANEL CONTROLS



1. **POWER SWITCH/INDICATOR:** Press this button to turn the CAT 860 ON (pushed in) or OFF. When the POWER is switched on, the blue LED indicator will light.
2. **AUDIO INDICATORS:** These lights flash red when audio (voice) from the microphone is detected.
3. **A VOLUME:** Controls the volume of the teacher microphone (set to channel A).
4. **B VOLUME:** Controls the volume of the student or second teacher microphone (set to channel B).
5. **AUDIO INPUT VOLUMES:** Control the volume of the audio coming from the media source (computer, TV/VCR, CD/DVD, etc.) connected to the corresponding input on the rear panel.
6. **ALD OUTPUT AND VOLUME:** This jack sends mixed audio to external equipment such as an assistive listening device (Personal FM System) or recording device. Use the volume control to set the optimum signal level for the device.

REAR PANEL CONTROLS



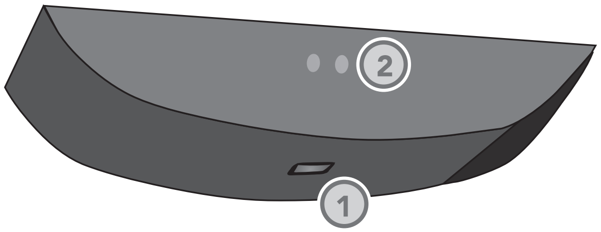


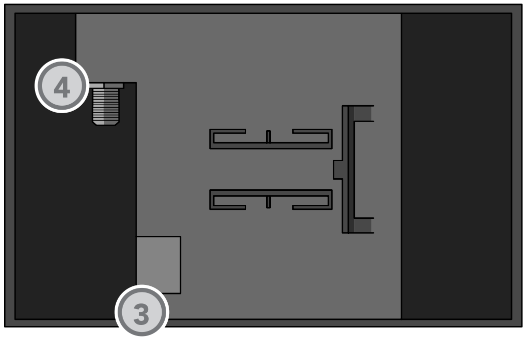
1. **CONTROL SELECT:** Both microphone and aux input volume can be adjusted from the front panel controls or remotely from a controller via the RS-232 Serial Interface. This switch selects either front panel control or RS-232 control. Front panel controls are ignored during RS-232 operation.
2. **RS-232 IN:** A 9 pin connector to connect the CAT 860 to an external controller.
3. **SPEAKER OUTPUTS (1–4):** These binding post connectors are used to connect the CAT 860 to the speakers. Depending on speaker, all outputs may not be used.

*Note: Wiring to these terminals should follow the Class 2 wiring methods as outlined in the National Electric Code.

4. **CHARGERS:** These jacks can be used to charge the optional LightMic or handheld mic as an alternative to connecting them to the REDMIKE cradle charger.
5. **DC POWER:** Plug the 24 V power supply into this jack.
6. **PAGING INPUT AND ADJ:** Connect the input from optional PageFirst sensor here when interface with a buildings paging system. Use the ADJ control to adjust the sensitivity if needed.
7. **EQUALIZER (4-BAND):** Adjust these controls upon installation to properly equalize the system to produce optimium audio quality from the microphone(s).
8. **AUX OUT AND VOL:** This jack sends audio to external equipment such as an assistive listening device (Personal FM System) or recording device. Use the volume control to set the optimum signal level for the device.
9. **AUDIO INPUTS:** These connections accept an audio signal from other technology so all multimedia can be distributed evenly throughout the classroom.
10. **SENSOR INPUT:** The infrared microphone audio from the ISR is connected to this input via CAT 5 cable. Connect additional sensors to the CAT 860 to cover large or odd-shaped classrooms.
11. **SENSOR SHORT:** This LED glows red when there is a short in the ISR or cable. The system will not operate, but is protected from damage when the LED is lighted.

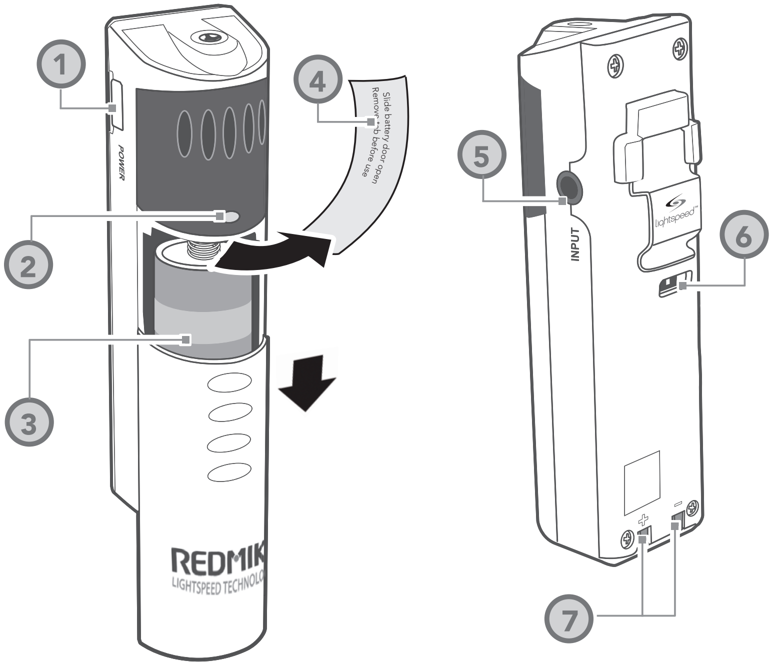
INFRARED SENSOR/RECEIVER (ISR) CONNECTIONS





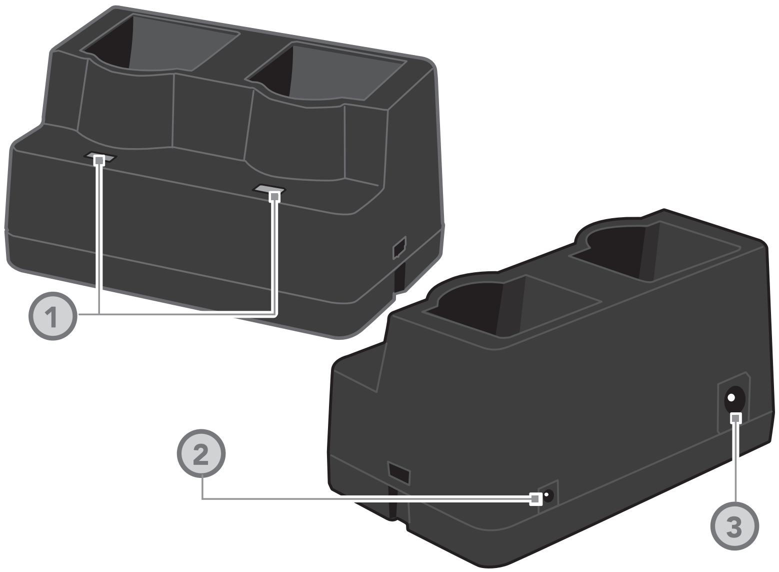
1. **POWER INDICATOR:** This light will glow blue when the ISR is receiving power from the CAT 860.
2. **A/B IR INDICATORS:** These lights glow when the corresponding microphone (set to channel A or B) is turned on and transmitting. A steady light indicates a strong signal.
3. **SENSOR OUT:** Connect the CAT 5 sensor cable to this connection to send audio from the microphones to the CAT 860 amplifier.
4. **IR EXPANSION:** Connect up to three passive IR sensors (IR-SR70F) to this connection for larger classrooms. For more than one additional sensor a 3-way coax splitter is required (HS3).

REDMIKE CONTROLS AND CONNECTIONS



1. **POWER BUTTON:** Press this button to turn the REDMIKE ON, press again to turn it OFF (mute).
2. **POWER/LOW BATTERY INDICATOR:** A BLUE light indicates the REDMIKE is on and fully charged. A RED light indicates a charge is needed.
3. **BATTERY COMPARTMENT:** To access the battery compartment, slide the door downward. The battery should only be replaced by a Lightspeed AA rechargeable sensing battery (part # BA-NH2A27).
4. **YELLOW PROTECTIVE TAB:** Slide the battery compartment door open to remove this disposable protective tab before use. NOTE: do not attempt to remove the tab without first opening the compartment door, as it may tear, leaving fragments.
5. **AUDIO/MICROPHONE INPUT:** Use this input to plug in a laptop, MP3 player or other audio source to wirelessly transmit audio to be played through the system. Alternatively, an external microphone can be connected.
6. **CHANNEL SELECT SWITCH (CH A/B):** This switch allows for selection between Channel A or B. If you are using a single microphone, we recommend using Channel A.
7. **CHARGER CONTACTS (+ -):** These contacts interface with the charging tabs in the BC-RMCC cradle charger for daily charging. Simply place the REDMIKE in the charger.

CRADLE CHARGER CONTROLS AND CONNECTIONS



1. **CHARGE INDICATORS:** The light glows RED while the REDMIKE is charging. When fully charged, the light will glow GREEN. A blinking RED light indicates that no battery is sensed, (REDMIKE Yellow Protective Tab may not have been completely removed—see page 10, item 4.) A blinking Green LED means a non- Lightspeed battery has been installed (possibly an alkaline battery).
2. **DC POWER PORT:** Connect the DC power cord here.
3. **OPTIONAL CHARGING PORT:** Plug the charging cord for the optional LT-71 or the REDMIKE Share microphones here.

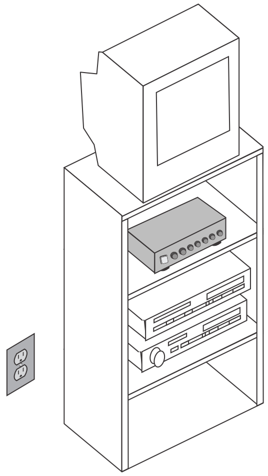
SECTION 2:

SET-UP & USE

1. LOCATION OF THE AMPLIFIER

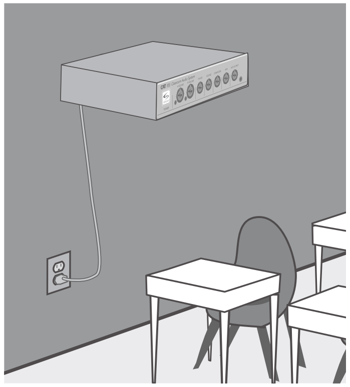
First, find a suitable location to set-up the amplifier. It is best to put the amplifier in a stable location near the other equipment to be used. It can be set in a cabinet, on a tabletop, or mounted on the wall with the included bracket.

Media Cabinet Set-up



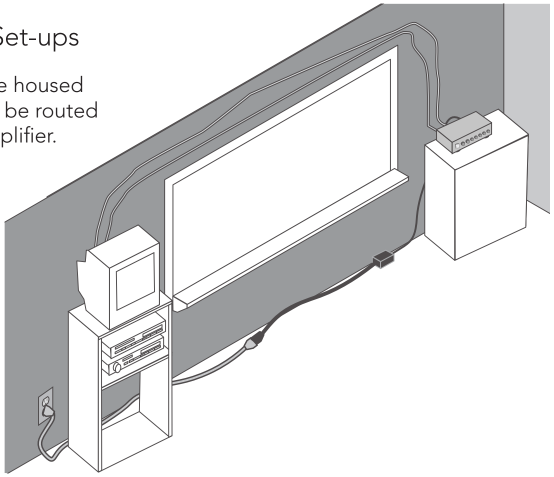
Wall-mount Set-up

The included wall bracket is specifically designed to support the CAT 860.



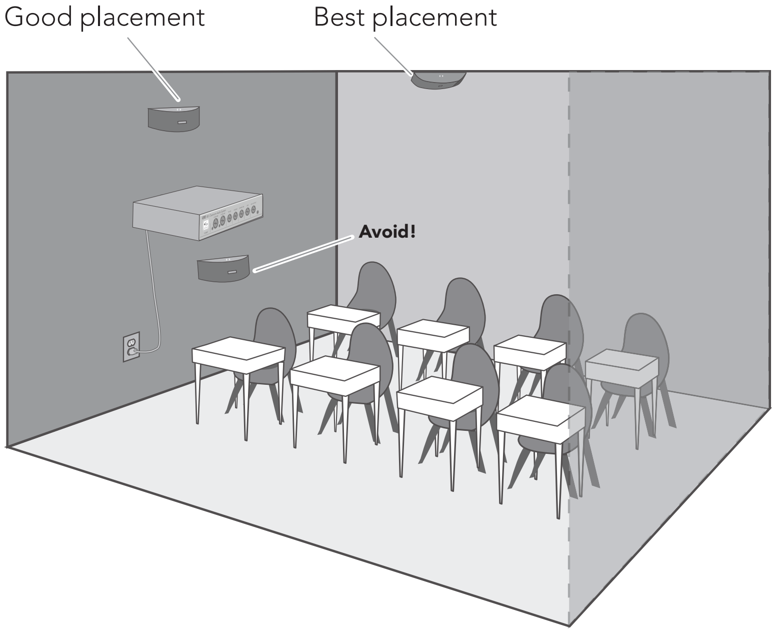
Avoid Separated Set-ups

Components should be housed together. Wires should be routed back directly to the amplifier.

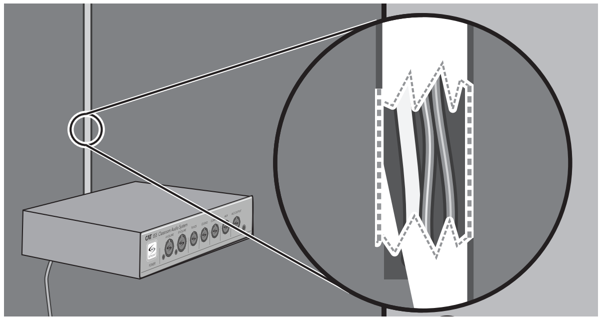


2. IR SENSOR/RECEIVER (ISR) INSTALLATION

Next, find a suitable location for the ISR. Poor location will cause substandard performance of the CAT 860 Classroom Audio System. The ISR should be as high as possible in the room – the ceiling is the best location, centered along the longest wall in the room. When possible, use a conduit to protect the wires (not included). Poor choices for placement are corners, on walls at heights lower than 7 feet (2 meters), or in places where the line of sight from the ISR to the receiver is or could be obstructed.



Conduit is Recommended



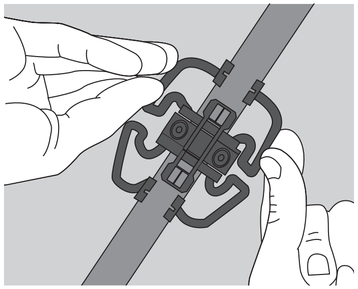
2. IR SENSOR/RECEIVER (ISR) INSTALLATION

CONT'D

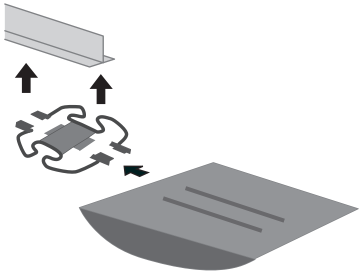
Once you find a suitable location for the ISR, follow these instructions to mount it. There are different instructions for mounting depending on if the ISR will be mounted to a suspended ceiling grid or secured to a wall / solid vertical surface.

Suspended Ceiling Mount

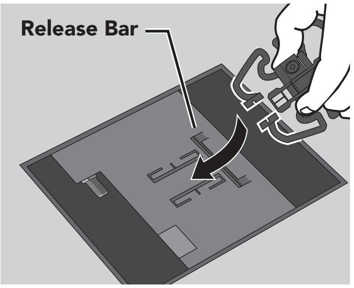
1. Attach the bracket to the ceiling tile grid (t-bar).
   a. Slide the tabs onto the outsides of the t-bar, starting with one corner.
   b. Attach the second tab around the other side of the t-bar.
   c. Repeat with the other side of the bracket so it is connected at all four points.



clip connects to t-bar on ceiling



2. Slide the ISR onto the bracket until it "clicks" into place.
   a. Guide the mounting rails onto the bracket, oriented as pictured.
   b. Once secure, the ISR locks into place.
   c. To remove the ISR, press the release bar down and slide the ISR off the bracket.



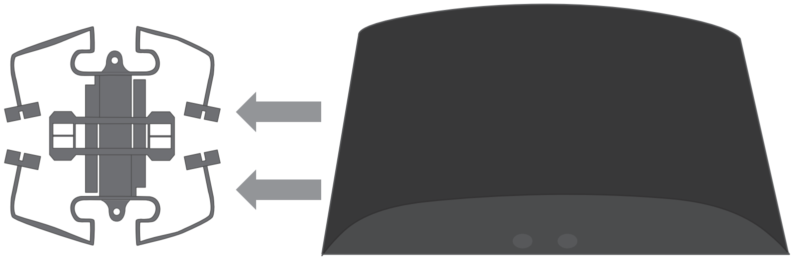
3. Uncoil the Cat 5 sensor cable. Connect one end of the cable to the ISR. Secure wire overhead and route it back to the system.
4. Connect the other end of the Cat 5 sensor cable into the SENSOR INPUT jack on the CAT 860 amplifier.

2. IR SENSOR/RECEIVER (ISR) INSTALLATION

CONT'D

Wall/Solid Ceiling Mount

1. Screw the bracket to a place high on the wall or in the middle of the solid ceiling. Mount the bracket horizontally as shown above.
2. Uncoil the Cat 5 sensor cable. Connect one end of the cable to the ISR. Route the wire back to the CAT 860 amplifier, securing it along with way using surface raceway where possible.
3. Slide the ISR onto the bracket until it "clicks" into place.
   a. Guide the mounting rails onto the bracket, oriented as pictured.
   b. Once secure, the ISR locks into place.
   c. To remove the ISR, slide a ruler or screwdriver behind the ISR to press the release bar down and slide the ISR off the bracket
4. Connect the other end of the Cat 5 sensor cable into the SENSOR INPUT jack on the CAT 860 amplifier.



3. INSTALLATION OF AMPLIFIER WALL-MOUNT BRACKET

The CAT 860 systems include a bracket for optional wall-mounting.

A. Determine the location:
   a. It should be located near a power outlet.
   b. Height should allow for access to front control panel, but also be in compliance with building and ADA regulations.

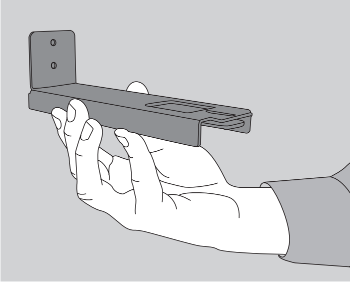
B. Screw the bracket to the wall at the two screw hole points with the included hardware. Attach to a stud when possible; use the drywall mollies when studs are not available.

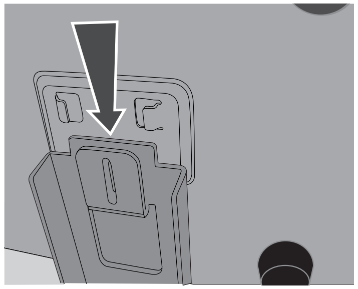
C. Slide the CAT 860 onto the bracket using the channel on the bottom of the amplifier.

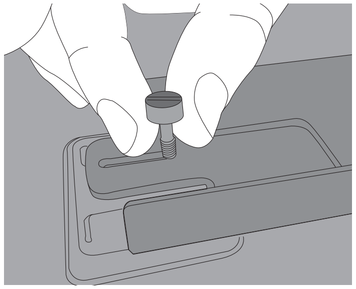
D. Secure the CAT 860 to the bracket by tightening the screw on the bottom.

E. Now that the CAT 860 is secure, it can be slowly pulled out and pivoted for better access to the back panel. Push the CAT 860 back in, to lock into place.

F. The power supply can be set on the back of the bracket and secured with ties if desired.





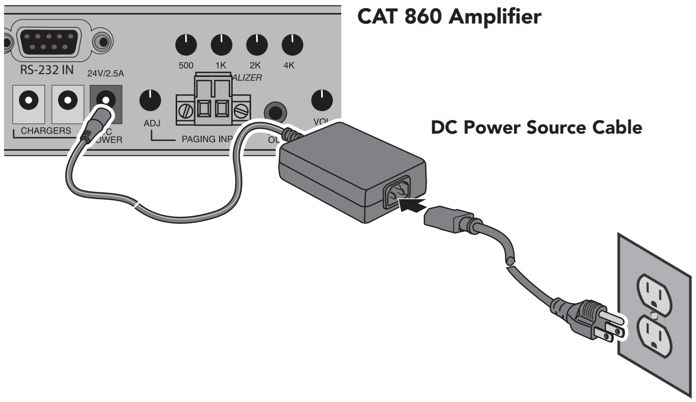


4. SPEAKER INSTALLATION

1. Locate the speaker installation instructions packed with your speaker(s).
2. Follow instructions and mount speaker(s).
3. Return to this manual to complete the set up of your system.

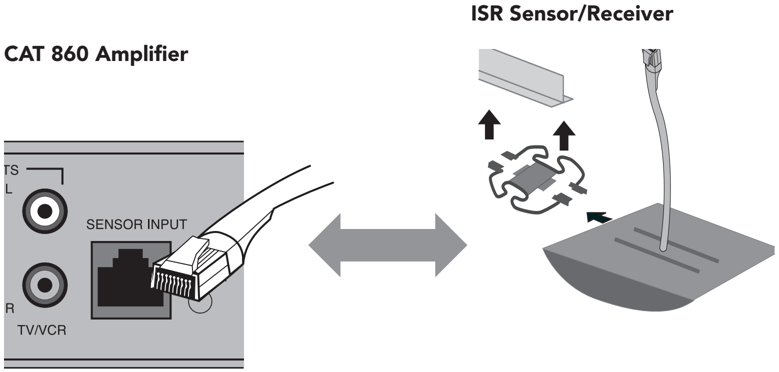
5A. CONNECT THE POWER SUPPLY

1. Ensure the power button is depressed in the OFF position.
2. Connect the CD end of the power supply to the black power jack labeled DC POWER.
3. Connect the black AC power cable from the power supply to a wall outlet.



5B. ISR CONNECTION

1. Ensure the power is still switched off.
2. Check the connection from the ISR to the CAT 860. Ensure the sensor cable is securely attached and locked into place.

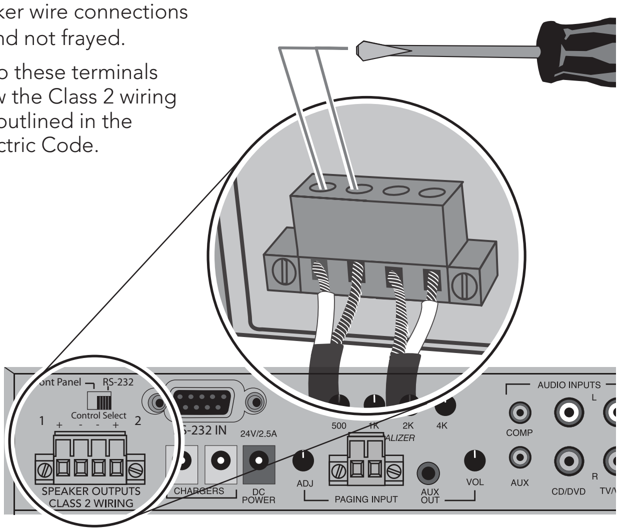


5C. SPEAKER CONNECTION(S)

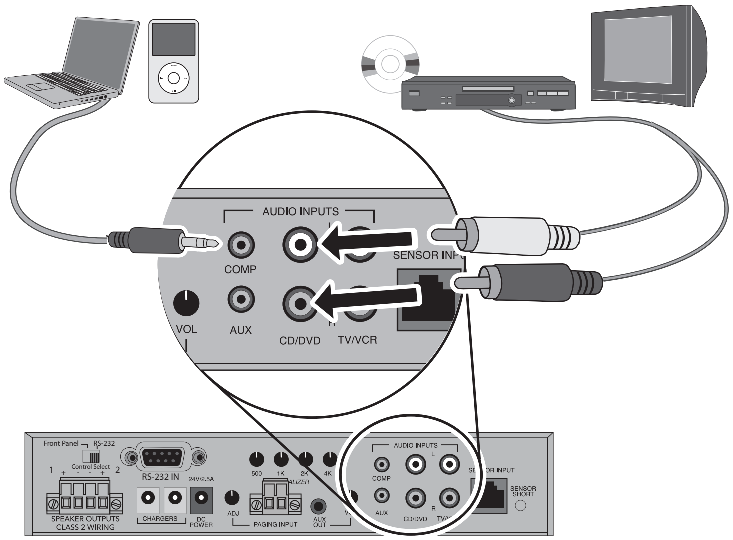
Next, connect the CAT 860 to the speakers. Then, be sure any auxiliary audio sources are connected to the corresponding labeled input on the CAT 860.

1. Ensure speaker wire connections are secure and not frayed.

*Note: Wiring to these terminals should follow the Class 2 wiring methods as outlined in the National Electric Code.


Front Panel
RS-232
Control Select
1
2
SPEAKER OUTPUTS
CLASS 2 WIRING
RS-232 IN
24V/2.5A
CHARGERS
DC POWER
500
1K
2K
4K
ADJ
PAGING INPUT
AUX OUT
VOL
AUDIO INPUTS
L
R
COMP
AUX
CD/DVD
TV/V

5D. AUDIO INPUT CONNECTIONS

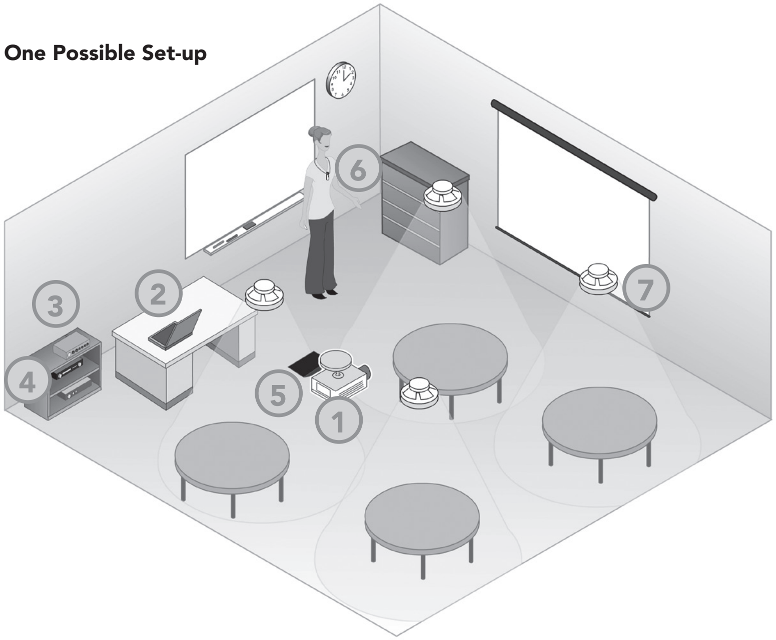

AUDIO INPUTS
COMP
AUX
VOL
CD/DVD
TV/VCR
SENSOR INPUT
SENSOR SHORT
Front Panel
RS-232
Control Select
SPEAKER OUTPUTS
CLASS 2 WIRING
RS-232 IN
CHARGERS
DC POWER
PAGING INPUT
AUX OUT

6. AUDIO INTEGRATION

The next step in setting up your CAT 860 system is to connect it to the other multimedia devices in your classroom. You may have a computer, television, DVD/VCR player, a visual projection system or other devices. Below are instructions on how to integrate TV/VCR, CD/DVD or computer directly into the CAT 860.

1. Ensure the power is switched off and the audio input volume controls are turned all the way down.
2. Connect the appropriate RCA or 3.5mm audio cable (not included) from the audio source into the corresponding input jack on the rear panel of the CAT 860.
3. With both the CAT 860 and the audio source power on, adjust the corresponding volume control on the CAT 860 until the desired level is achieved.

One Possible Set-up



1. PROJECTOR
2. LAPTOP
3. CAT 860
4. DVD
5. ISR SENSOR
6. TEACHER'S MICROPHONE
7. SPEAKERS

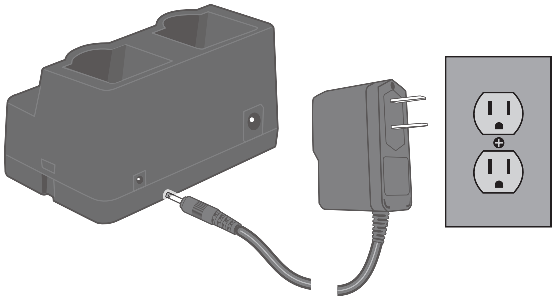
7. CHARGING THE REDMIKE

Before use, the REDMIKE should be charged. It will take 8-9 hours for the REDMIKE to obtain a full charge. A fully charged REDMIKE will last for over 7 hours of use. If microphones are used daily, they should be kept in the cradle – microphones can be left in a charging cradle constantly for up to 2 weeks without causing degradation to battery life.

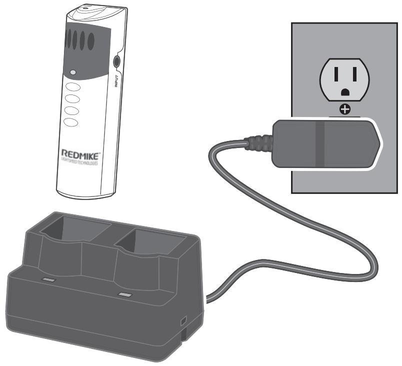
A red light on the charging cradle indicates the REDMIKE is charging. A green light indicates that charging is complete and a full charge has been reached. A blinking light indicates a charging or sensing error. See Troubleshooting section for more information.

REDMIKE incorporates alkaline protection into the microphone design. Always use a Lightspeed rechargeable sensing battery. Replacement AA NiMH batteries may only be purchased through Lightspeed Technologies (part # BA-NH2A27). Do not attempt to charge alkaline batteries. They can overheat and expand creating a significant hazard and damaging the microphone (this is not covered by warranty).

1. Plug power cord into the cradle charger and then plug the AC end into an electrical outlet.
2. Ensure that the REDMIKE is turned OFF.



3. Place the REDMIKE into the cradle. The LED on the cradle will glow RED indicating charging has started. When the REDMIKE is fully charged the LED on the cradle charger will change to GREEN.

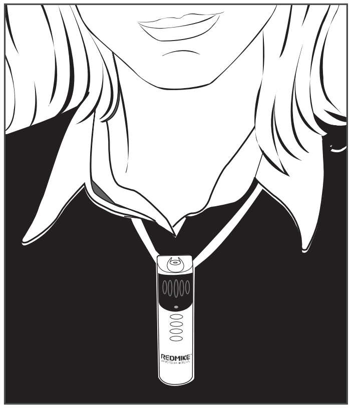


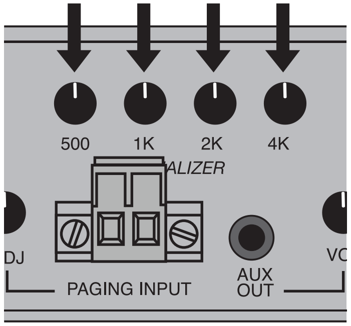
8. SETUP AND OPERATION OF REDMIKE

Once the REDMIKE is charged, follow these steps to set it up for use.

1. Turn the CAT 860 power on. The blue LED will glow.
2. Remove the REDMIKE from the charging cradle and turn it on.
3. Slip the REDMIKE with lanyard around the neck and position the top of the microphone just below the collarbone. NOTE: Positioning of the REDMIKE is critical for proper volume adjustment.
4. While speaking in a normal voice slowly increase the volume of the corresponding channel on the CAT 860 until your voice is barely audible. Each REDMIKE has its channel pre-set to either A or B, as indicated on the back of the Mic.

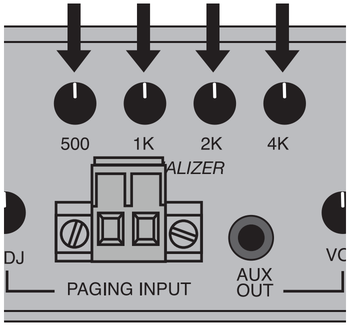
   REMEMBER: This equipment supplements the user's voice so they are able to speak in a conversational tone. Having the volume set too high will result in feedback and listener fatigue.
5. Once initial volume level is set, walk around the room and listen for audio dropout and overall audio quality. Fine-tuning the audio is accomplished by making minor adjustments to the 4-Band Equalizer on the back panel of the CAT 860.
6. If a second REDMIKE was purchased, repeat steps 2-4.





9. AUDIO EQUALIZATION OF THE CAT 860

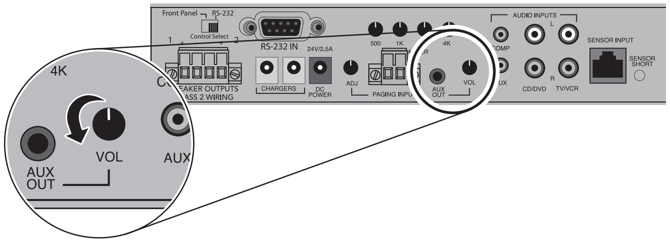
The CAT 860 uses a 4-band audio equalizer designed to optimize and fine-tune the microphone sound quality for the classroom. Below are some tips on proper system equalization:


500
1K
2K
4K
ALIZER
DJ
PAGING INPUT
AUX OUT
VO

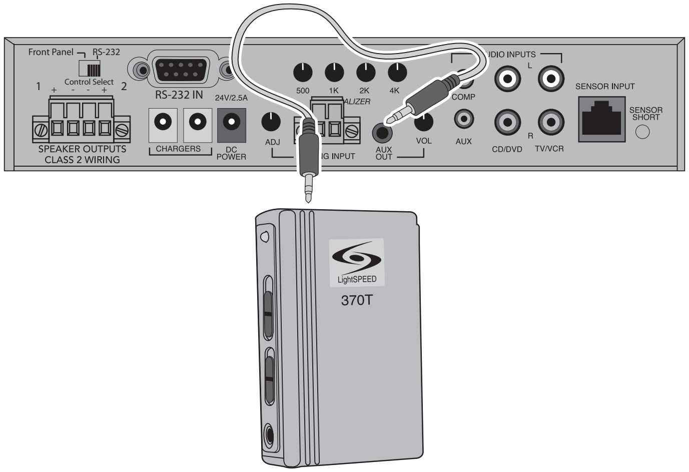
- The voice should be natural, very clear and without any audio feedback (ringing)
- Walk the room listening for the overall quality and any feedback that is present
- If there is a lot of audio feedback, it is likely the volume is too high. Ensure the volume is at the appropriate level, a second person is helpful to determine this.
- If feedback is still present with the audio set at the right level, make the following EQ adjustments:
  - – High pitched ring: lower the 2K and/or 4K adjustment by _ turn
  - – Lower pitched ring: lower the 500 and/or 1K adjustment by _ turn
- If you notice the sound is "muddy" or has too much bass:
  - – Lower the 500 adjustment by _ turn and/or
  - – Raise the 2K or 4K adjustment by 1/8 turn
- Note: the EQ adjustments should be preset at "12:00." This is the nominal level and any adjustments (up or down) should be made from this level.

10. OUTPUT TO PERSONAL ASSISTIVE LISTENING DEVICE (ALD)

1. Turn the ALD (Assistive Listening Device) volume control on the back panel all the way down (fully counterclockwise).


Front Panel
RS-232
Control Select
RS-232 IN
24V/2.5A
SPEAKER OUTPUTS CLASS 2 WIRING
CHARGERS
DC POWER
ADJ
PAGING INPUT
AUX OUT
VOL
AUDIO INPUTS
COMP
AUX
CD/DVD
TV/VCR
SENSOR INPUT
SENSOR SHORT
4K
VOL
AUX
AUX OUT

2. Determine the size and type of audio input jack on the device as many manufacturers' products differ in connector size and shape. The Lightspeed LES-370 Personal FM System requires a 3.5 mm to 3.5 mm patch cable (part# CA-MMC3535, not included).
3. Connect a patch cable from the ALD's microphone jack or AUX input to one of the following 3.5mm audio jack on the CAT 860:
   - "ALD OUT" on the front panel
   - "AUX OUT" on the back panel
4. Adjust the volume control on the ALD's receiver to maximum output. NOTE! This is to set the maximum allowable signal from the CAT 860.
5. With the CAT 860 and ALD turned on, speak into the REDMIKE and slowly adjust the corresponding volume control on the CAT 860 until the appropriate audio level is obtained in the ALD.


Front Panel
RS-232
Control Select
RS-232 IN
24V/2.5A
SPEAKER OUTPUTS CLASS 2 WIRING
CHARGERS
DC POWER
ADJ
500
1K
2K
4K
ALIZER
G INPUT
AUX OUT
VOL
AUX
COMP
DIO INPUTS
CD/DVD
TV/VCR
SENSOR INPUT
SENSOR SHORT
LightSPEED
370T

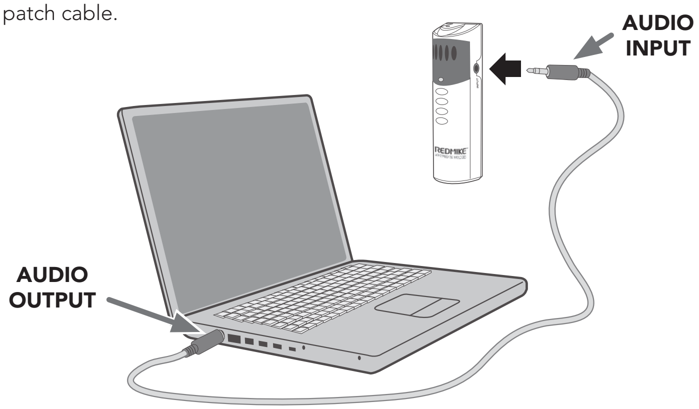
11. USING THE REDMIKE TO AMPLIFY EXTERNAL AUDIO EQUIPMENT

The REDMIKE includes a 3.5mm audio input jack to connect to an audio source like a laptop or MP3 player. The REDMIKE will transmit the audio signal to be played through the system.

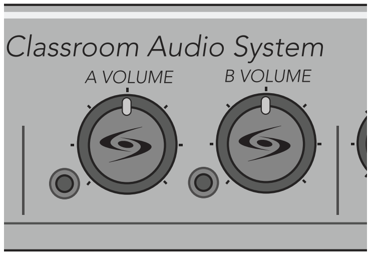
If your system includes two REDMIKEs, we recommend using Channel B (student mike) to amplify the external audio equipment so the teacher's volume on the Channel A (teacher mike) does not have to be adjusted.

To determine which REDMIKE is set to Channel B, you can look at the switch on the back of the mike or speak into one of the mics and watch which set of LED's glow on the front panel of the CAT 860 (A Volume or B Volume correspond to Channels A or B).

1. Plug your external audio equipment (for example, laptop), into the input on the REDMIKE labeled "INPUT" using a 3.5mm patch cable.



2. Adjust the volume on the CAT 860 receiver which corresponds to selected mic channel A or B.

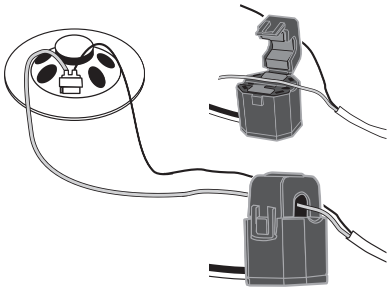


12. PAGEFIRST: PRIORITY MUTE

This optional feature interfaces with an independent classroom paging system. When the page is broadcast, all audio from the system is muted, ensuring important school-wide messages are never missed.

How it works:

1. PageFirst sensor clip is hung around the lead wires attached to the classroom paging speaker.
2. The clip is hard-wired to the CAT 860.
3. As a page is broadcast, the sensor clip detects the audio signal through induction and immediately mutes the CAT 860.
4. When the page is over, the audio from the CAT 860 returns to normal volume level.



(For full installation details refer to the install sheet included with the optional PageFirst sensor clip)

13. RS-232 SERIAL INTERFACE PROGRAMMING

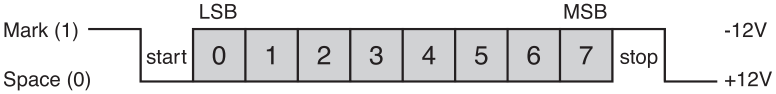
The CAT 860 uses standard RS-232 protocols as a serial link to an external control module such as an intelligent wall panel, or a personal computer. When the Control Select switch in the "RS-232" position, the serial link offers remote access to operational control circuitry within the CAT 860 for the purpose of controlling the volume of the audio input and output ports. Additionally, the serial links allows remote queries of internal CAT 860 system status.

Serial Interface Protocol

CAT 860 RS-232 SETTINGS

Sync. Method:	Asynchronous
Stop Bits:	Accepts 1 or 2 stop bits
Baud Rate:	9600 baud
Parity:	None
Data Size:	8-bits
Connector:	9-Pin, Female D-Sub

RS-232 Data Signals



RS-232 LOGIC WAVEFORM (8N1)

Command and parameter characters travel serially along the RS-232 signal link between the external controller and the CAT 860. The command and parameter information is in the form of two hexadecimal values contained in the 8-data bits of each RS-232 character. The above graphic illustrates a typical RS-232 logic waveform representing a character (Data format: 1 Start bit, 8 Data bits, No Parity, 1 Stop bit). The data transmission starts with a Start bit, followed by the data bits (LSB sent first and MSB sent last), and ends with a "Stop" bit.

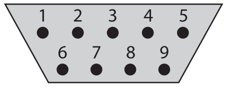
The voltage of Logic "1" (Mark) is between -3VDC to -15VDC, while the Logic "0" (Space) is between +3VDC to +15VDC.

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

Connector Signal Wiring

DTE PIN ASSIGNMENTS (DB-9)

1	DCD	Data Carrier Detect
2*	RxD	Received Data
3*	TxD	Transmitted Data
4	DTR	Data Terminal Ready
5*	GND	Ground (Signal)
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator



** Only 3-Pin Connection*

Command Structure

An external controller, in the form of an intelligent wall panel or a personal computer, can use the RS-232 serial link to remotely send commands to initiate actions or queries for the CAT 860. In response, the CAT 860 uses the RS-232 serial link to send acknowledgements or status data back to external controller.

There are two operational command sets; the Basic Command Set for audio switching and the Advanced Command Set for audio mixing. It is not recommended to intermix commands from the two command sets.

The Basic Command Set treats the CAT 860 as a simple audio switcher where only one of four audio/video sources is enabled at one time. The two microphone channels are controlled as a pair independently from the audio/video sources. The low-cost serial controllers with their limited functionality will typically will be restricted to a subset of the Basic Command Set. These controllers usually cannot utilize the query commands, or the response packets. More capable high-end serial controllers can take advantage of the complete features of the Basic Command Set.

The Advanced Command Set treats the CAT 860 as an audio mixer which is aligned with the traditional usage for Lightspeed CAT 800 series products. The Advanced Command Set requires the more capable high-end serial controllers to utilize the CAT 860 to its greatest potential.

It is expected that each button press from the serial controller would use only a single action/query command packet. If a single button press must issue a string of multiple action/query command packets then each packet must be separated by at least a 10ms delay, or alternately, a new command packet must wait until the CAT 860 issues a response packet/character before it can be sent.

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

Summary of command and response transactions:

1. Action Command Functions for the Basic Command Set (Audio Switcher Operations):
   a. Enable One of Four Audio/Video Sources
   b. Increment and Decrement All Audio/Video Sources by 2dB
   c. Increment and Decrement Both Microphone Channels by 2dB
   d. Mute and Un-mute All Audio/Video Sources
   e. Mute and Un-mute Both Microphone Channels
2. Query Command Functions for the Basic Command Set (Audio Switcher Operations):
   a. Return Absolute Microphone Source Volume Setting
   b. Return Audio/Video Source Selection Status (TV/VCR, CD/DVD, COMP, or AUX)
   c. Return Absolute Audio/Video Source Volume Setting
   d. Return Mute/Un-mute Status for Microphone Source Inputs
   e. Return Mute/Un-mute Status for Audio/Video Source Inputs
3. Action Command Functions for the Advanced Command Set (Audio Mixer Operations):
   a. Select Control of Microphone Input Channel (A or B)
   b. Set Differential Microphone Input Channel Volume
   c. Set Absolute Microphone Input Channel Volume
   d. Select Control of Audio/Video Source (TV/VCR, CD/DVD, COMP, or AUX)
   e. Set Differential Audio/Video Source Volume
   f. Set Absolute Audio/Video Source Volume
   g. Select Control of Audio Output Channel (AUX)
   h. Set Absolute Audio Output Channel Volume
   i. Set Mute/Un-mute of Any or All Audio Inputs
4. Query Command Functions for the Advanced Command Set (Audio Mixer Operations):
   a. Return Microphone Input Channel Selection Status (A or B)
   b. Return Absolute Infrared Input Channel Volume Setting
   c. Return Audio/Video Source Selection Status (TV/VCR, CD/DVD, COMP, or AUX)
   d. Return Absolute Audio/Video Source Volume Setting
   e. Return Audio Output Channel Selection Status (AUX)

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

Summary of command and response transactions Cont'd:

   f. Return Absolute Audio Output Channel Volume Setting
   g. Return Mute/Un-mute Status for Audio Inputs
5. Action/Query Response Functions:
   a. Not Acknowledge (NACK) is the response for any aborted commands.
   b. Action Command response is to repeat back the command packet sent by the serial controller. Some action command packets do not have a <Param> character, but all response packets will have one or two <Param> characters.

      Example: CMD><Param><Param><EOT>

      Example: <STX><CMD><Param><EOT>
   c. The Query Command response is for the most part the query command repeated back to the serial controller. However, the response packet also includes one or two imbedded <Param> characters which contain the values of the pertinent CAT 860 registers.

      Example: CMD><Param><Param><EOT>

      Example:
      <STX><CMD><Param><EOT><STX><CMD><Param><Param><EOT>

      Example: <STX><CMD><Param><EOT>

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

Control Character Hex Value and Definition

STX	(0x02)	Start character of an action command packet.
EOT	(0x04)	End character of any command packet.
ACK	(0x06)	Only response character from the CAT 860 if action command (PING command only) is properly received and accepted.
NACK	(0x15)	Only response character from the CAT 860 if any command is corrupted or unsupported. The CAT 860 should send a NACK if: 1. The CAT 860 can not recognize the start or command characters. 2. The CAT 860 does not receive an end character after receiving a total of twenty characters after receiving valid start and command characters. 3. The CAT 860 does not receive an end character after waiting 50ms after receiving valid start and command characters.
CMD	(find hex value from Table 1)	This is the general symbol for the command character derived from Table 1.
Param	(find hex value from Table 1)	This is the general symbol for the parameter character(s) associated with the command character. They are derived form Table 1.

General Format for Action Command Exchange for Basic and Advanced Command Set:

In this example, the serial controller sends an action command packet to the CAT 860 and in response the CAT 860 repeats back the action command packet the serial controller. The <Param> characters can be absent from the action command packet, but all response packets will have one or two added <Param> characters containing the values of the pertinent internal CAT 860 register.

Controller:	<STX><CMD><Param><EOT>
CAT 860:	<STX><CMD><Param><EOT>

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13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

General Format for Query Command Exchange:

In this example the external controller sends query command packet to CAT 860. CAT 860 repeats back the action command packet in response which also includes one or two imbedded <Param> characters. The <Param> characters which are added to the query command packets contain the values of the pertinent internal CAT 860 registers.

Controller:	<STX><CMD><EOT>
CAT 860:	<STX><CMD><Param><Param><EOT>

General Format for Aborted Command Exchange (Both Basic and Advanced Command Sets:

In this example the external controller sends either an action or query command to CAT 860 and the command is either corrupted or unsupported. The <Param> characters can be absent.

Controller:	<STX><CMD><Param><EOT>
CAT 860:	<NACK>

Note: It is expected that each button press from the serial controller would use only a single command/query packet. If a single button press must issue a string of multiple command/query packets then each packet must be separated by at least a 10ms delay, or alternately, a new packet must wait until the CAT 860 issues a response packet/character before it can be sent.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS

Audio Input Functions for the A/V Source Group

1. ENABLE AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AVS p	0xE0	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x80 = Enable TV/VCR 0x81 = Enable CD/DVD 0x82 = Enable COMPUTER 0x83 = Enable AUX IN 0x84 = Enable All Inputs ** ** Power up default used to facilitate initial system installation.	Select (enable) one of four Audio/Video input sources to receive audio. The remaining three unselected Audio/Video input ports will be muted by sending the -79dB setting their corresponding volume control hardware registers. Note that muting inputs does not change the values in any of the volume-level EEPROM variables. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet to the serial controller. If the command is not received properly, the CAT 860 responds by sending a <NACK> character. Power up default initially has all six audio inputs enabled. The power up default settings for all six input volume-level EEPROM variables is the setting for -40dB.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

2. INCREMENT AUDIO/VIDEO SOURCES COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
IAVS	0xE1	**Command Packet:** The controller sends no <Param> character in the command packet.	Increment the volume of the selected audio input by 2 dB. This overrides any previous mute commands. The remaining three unselected audio/video source inputs remain muted. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet to the serial controller with an added imbedded <Param> character containing the value loaded. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

3. DECREMENT AUDIO/VIDEO SOURCES COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
DAVS	0xE2	**Command Packet:** The controller sends no <Param> character in the command packet.	Decrement the volume of the selected audio input by 2 dB. This overrides any previous mute commands. The remaining three unselected audio/video source inputs remain muted. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value loaded. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

4. INCREMENT MICROPHONE AUDIO INPUTS COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
IMAI	0xE3	**Command Packet:** The controller sends no <Param> character in the command packet.	Increment the volume for microphone channel A and B audio by 2 dB. This overrides any previous mute commands. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value loaded. If the command is not received properly, the CAT 860 responds by sending a <NACK> character

DECREMENT MICROPHONE AUDIO INPUTS COMMAND

DMAI	0xE4	**Command Packet:** The controller sends no <Param> character in the command packet.	Decrement the volume of the microphone channel A and B audio by 2 dB. This overrides any previous mute commands. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value loaded. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

5. MUTE AUDIO/VIDEO SOURCES COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
MAVS	0xE5	**Command Packet:** The controller sends no <Param> character in the command packet.	Mute all audio input volume by sending -79dB for each input (TV/VCR, CD/DVD, COMPUTER, and AUX). **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x81 indicating that the A/V audio sources are in the muted state. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

6. UN-MUTE ENABLED AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
UAVS	0xE6	**Command Packet:** The controller sends no <Param> character in the command packet.	Un-mute audio volume for the audio input selected by the most recent EAVS (<0xE0>) command stored in EEPROM. The remaining three unselected audio/video sources will remain muted. None of the input volume-level EEPROM variables are modified. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 indicating that the A/V audio sources are no longer in the muted state If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

7. MUTE MICROPHONE AUDIO INPUTS COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
MMAI	0xE7	**Command Packet:** The controller sends no <Param> character in the command packet.	The Mute microphone volume command sets both microphone channels (A & B) to -79dB. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x81 indicating that the microphone audio inputs are in the muted state. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

8. UN-MUTE MICROPHONE AUDIO INPUTS COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
UMAI	0xE8	**Command Packet:** The controller sends no <Param> character in the command packet. **Definition:** The un-mute microphone volume command reloads the previously set microphone volume levels.	**Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 indicating that the microphone audio inputs are no longer in the muted state. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

9. TOGGLE MUTE FOR ENABLED AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
TMAV	0xE9	**Command Packet:** The controller sends no <Param> character in the command packet.	The Toggle Mute command toggles between mute and un-mute for the audio/video source inputs. When set to mute, the 860 Aux Audio Inputs are set to -79dB. When set to unmute, the 860 resets the previously selected input to it's previous volume setting and the remaining three Aux Audio Inputs remain set at -79dB. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 if the resultant state is "un-muted" and 0x81 if the resultant state is "muted". If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

10. TOGGLE MUTE FOR MICROPHONE AUDIO INPUTS COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
TMMI	0xEA	**Command Packet:** The controller sends no <Param> character in the command packet.	This command toggles between mute and un-mute for the microphone audio inputs. When set to mute, the 860 microphone Channel A & B volumes are set to -79dB. When set to unmute, the 860 resets the microphone volumes to their previous volume setting. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 if the resultant state is "un-muted" and 0x81 if the resultant state is "muted". If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

11. QUERY ENABLED AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
QEAV?	0xEB	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the added <Param> character contains the "enable" status set by EAVS (<0xE0>). **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet to the serial controller with the added <Param> character containing the value indicating the "enable" status set by EAVS (<0xE0>). The possible values are shown below: 0x80 = TV/VCR Enabled 0x81 = CD/DVD Enabled 0x82 = COMPUTER Enabled 0x83 = AUX IN Enabled If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

12. QUERY ABSOLUTE VOLUME AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
QVAV?	0xEC	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the added imbedded <Param> character contains the absolute volume-level for the audio/video sources inputs. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet to the serial controller with the added <Param> character containing the absolute volume level for the audio/ video sources. The possible values are shown below: 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

13. QUERY ABSOLUTE VOLUME MICROPHONE AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
QVMI?	0xED	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the added <Param> character contains the absolute volume-level for the microphone audio inputs. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet to the serial controller with the added <Param> character containing the absolute volume level for the audio/ video sources. The possible values are shown below: 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

14. QUERY MUTE FOR AUDIO/VIDEO SOURCE COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
QMAV?	0xEE	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the added imbedded <Param> character contains the mute state for the audio/video sources. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 if the state is "un-muted" and 0x81 if the state is "muted". The possible values are shown below: 0x80 = Un-muted 0x81 = Muted If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

BASIC COMMAND SET FOR AUDIO SWITCHER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

15. QUERY MUTE FOR MICROPHONE AUDIO INPUTS COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
QMMI?	0xEF	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the added imbedded <Param> character contains the mute state for the microphone audio inputs. **Response Packet:** If the command is properly received, the CAT 860 responds by repeating back the command packet with an added imbedded <Param> character containing the value 0x80 if the state is "un-muted" and 0x81 if the state is "muted". The possible values are shown below: 0x80 = Un-muted 0x81 = Muted If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS

Audio Input Functions for the A/V Source Group

1. SELECT AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AICH p	0x90	**Command Packet:**	**Response Packet:**
		The controller sends only one <Param> character in the command packet. The possible values are shown below:	The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below:
		0x80 = TV/VCR**	0x80 = TV/VCR
		0x81 = CD/DVD	0x81 = CD/DVD
		0x82 = COMPUTER	0x82 = COMPUTER
		0x83 = AUX IN	0x83 = AUX IN
		0x84 = IR Channel A	0x84 = IR Channel A
		0x85 = IR Channel B	0x85 = IR Channel B
		0x86 = AUX OUT	0x86 = AUX OUT
		** Power up default	

Definition

This command determines which volume-level will be affected by the AIDI (<0x92>), AIDD (<0x93>), and AIAV (<0x94>) commands.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the <Param> character contains the selection status.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

Power up default is TV/VCR selected.

These items are included for controllers limited to only a single volume control, the three parameters on the left allow the AIDI (<92>), AIDD (<93>), AIAV, (<94>) and AIAV? (<95>) commands to have the same capabilities as the AODI (<A2>), AODD (<A3>), AOAV (<A4>), AOAV? (<A5>), IIDI (<B2>), IIDD (<B3>), IIAV (<B4>), and IIAV? (<B5>) commands.

That is, multiple commands will be able to independently affect the values of the same volume-level EEPROM variables which correspond to the IR CH-A, the IR CH-B, and the AUX OUT. This is true even if the two commands have been directed to the same volume-level EEPROM variable. In this case the EEPROM variable retains the value from the last command issued from the serial controller.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

2. QUERY SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AICH?	0x91	**Command Packet:** The controller sends no <Param> character in the command packet.	This command causes the CAT 860 to return a query response packet where the <Param> contains the selection status set by AICH (<0x90>). If the command is not received properly, the CAT 860 responds by sending a <NACK> character.
			Response Packet:
			The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below:
			0x80 = TV/VCR
			0x81 = CD/DVD
			0x82 = COMPUTER
			0x83 = AUX IN
			0x84 = IR Channel A
			0x85 = IR Channel B
			0x86 = AUX OUT

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group

1. DIFFERENTIALLY INCREASE VOLUME FOR SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AIDI p	0x92	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB step 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. Possible values are shown below: **<Param> #1:** 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AICH (<0x90>) command. The EEPROM variable is incremented by the amount indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AICH (<0x90>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

2. DIFFERENTIALLY DECREASE VOLUME FOR SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AIDD p	0x93	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB step 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AICH (<0x90>) command. The EEPROM variable is decremented by the amount indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AICH (<0x90>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

3. SET ABSOLUTE VOLUME FOR SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AIAV p	0x94	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB** 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB ** Power up default	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. Possible values are shown below: **<Param> #1:** 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AICH (<0x90>) command. The EEPROM variable is set the value indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register regardless of any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AICH (<0x90>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

4. QUERY ABSOLUTE VOLUME FOR SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AIAV?	0x95	**Command Packet:** The controller sends no <Param> character in the command packet.	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command causes the CAT 860 to return a query response packet where the first of two <Param> characters contains the selection status set by AICH (<0x90>) and the second contains the value stored in the volume-level EEPROM variable selected by the AICH (<0x90>) command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

5. SELECT AUDIO OUTPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AOCH p	0xA0	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x80 = Reserved 0x81 = AUX OUT** ** Power up default **Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x81 = AUX OUTt	This command determines which volume-level EEPROM variable will be affected by the AODI (<0xA2>), AODD (<0xA3>), and AOAV (<0xA4>) commands. If the command is properly received, the CAT 860 responds by repeating back the command packet where the <Param> character contains the selection status. If the command is not received properly, the CAT 860 responds by sending a <NACK> character. Power up default is AUX selected.
QUERY SELECTED AUDIO OUTPUT COMMAND			
AOCH?	0xA1	**Command Packet:** The controller sends no <Param> character in the command packet. **Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x81 = AUX OUT	This command causes the CAT 860 to return a query response packet where the <Param> contains the selection status set by AOCH (<0xA0>). If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

6. DIFFERENTIALLY INCREASE VOLUME FOR SELECTED AUDIO OUTPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AODI p	0xA2	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB step 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x81 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AOCH (<0xA0>) command. The EEPROM variable is incremented by the amount indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AOCH (<0xA0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio outputs, the power up default values for all volume-level EEPROM variables is set for 0dB.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

7. DIFFERENTIALLY DECREASE VOLUME FOR SELECTED AUDIO OUTPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AODD p	0xA3	**Command Packet:**	**Response Packet:**
		The controller sends only one <Param> character in the command packet. The possible values are shown below:	The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below:
		0x81 = one 1dB step	**<Param> #1:**
		0x82 = two 1dB steps	0x81 = AUX OUT
		0x83 = three 1dB steps	**<Param> #2:**
		0x84 = four 1dB steps	0xCF = 0 dB
		0x85 = five 1dB steps	0xCE = -1dB
		0x86 = six 1dB step	0xCD = -2dB
		0x87 = seven 1dB steps	0xCC = -3dB
		0x88 = eight 1dB steps	0xA7 = -40dB
		0x89 = nine 1dB steps	0x83 = -76dB
		0x8A = ten 1dB steps	0x82 = -77dB
			0x81 = -78B
			0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AOCH (<0xA0>) command. The EEPROM variable is decremented by the amount indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AOCH (<0xA0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio outputs, the power up default values for all output volume-level EEPROM variables is set for 0dB (i.e. maximum output).

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

8. SET ABSOLUTE VOLUME FOR SELECTED AUDIO OUTPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AOAV p	0xA4	**Command Packet:**	Response Packet:
		The controller sends only one <Param> character in the command packet. The possible values are shown below:	The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below:
		0xCF = 0 dB	**<Param> #1:**
		0xCE = -1dB	0x81 = AUX OUT
		0xCD = -2dB	**<Param> #2:**
		0xCC = -3dB	0xCF = 0 dB
		0xA7 = -40dB**	0xCE = -1dB
		0x83 = -76dB	0xCD = -2dB
		0x82 = -77dB	0xCC = -3dB
		0x81 = -78B	0xA7 = -40dB
		0x80 = -79dB	0x83 = -76dB
		** Power up default	0x82 = -77dB
			0x81 = -78B
			0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the AOCH (<0xA0>) command. The EEPROM variable is set the value indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by AOCH (<0xA0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all output volume-level EEPROM variables is set for 0dB (i.e. maximum output).

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the A/V Source Group Cont'd

9. QUERY ABSOLUTE VOLUME FOR SELECTED AUDIO OUTPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
AOAV?	0xA5	**Command Packet:** The controller sends no <Param> character in the command packet. **Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x81 = AUX OUT **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB	This command causes the CAT 860 to return a query response packet where the first of two <Param> characters contains the selection status set by AOCH (<0xA0>) and the second contains the value stored in the volume-level EEPROM variable selected by the AOCH (<0xA0>) command. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the Infrared Source Group

1. SELECT INFRARED INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
IICH p	0xB0	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x80 = IR Channel A** 0x81 = IR Channel B ** Power up default **Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x80 = IR Channel A 0x81 = IR Channel B	This command determines which volume-level EEPROM variable will be affected by the IIDI (<0xB2>), IIDD (<0xB3>), and IIAV (<0xB4>) commands. If the command is properly received, the CAT 860 responds by repeating back the command packet where the <Param> contains the selection status If the command is not received properly, the CAT 860 responds by sending a <NACK> character. Power up default is IR Channel A selected.

QUERY SELECTED INFRARED INPUT COMMAND

IICH?	0xB1	**Command Packet:** The controller sends no <Param> character in the command packet. **Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x80 = IR Channel A 0x81 = IR Channel B	This command causes the CAT 860 to return a query response packet where the <Param> contains the selection status set by IICH (<0xB0>). If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the Infrared Source Group Cont'd

2. DIFFERENTIALLY INCREASE VOLUME FOR SELECTED INFRARED INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
IIDI p	0xB2	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB step 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = IR Channel A 0x81 = IR Channel B **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the IICH (<0xB0>) command. The EEPROM variable is incremented by the amount indicated in the <Param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by IICH (<0xB0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

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14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the Infrared Source Group Cont'd

3. DIFFERENTIALLY DECREASE VOLUME FOR SELECTED INFRARED INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
IIDD p	0xB3	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB step 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = IR Channel A 0x81 = IR Channel B **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the IICH (<0xB0>) command. The EEPROM variable is decremented by the amount indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by IICH (<0xB0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the Infrared Source Group Cont'd

4. SET ABSOLUTE VOLUME FOR SELECTED INFRARED INPUT COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
IIAV p	0xB4	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB** 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB ** Power up default	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = IR Channel A 0x81 = IR Channel B **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command modifies the volume-level EEPROM variable which was selected by the IICH (<0xB0>) command. The EEPROM variable is set the value indicated in the <param> character.

Afterwards, the value in the EEPROM variable is unconditionally loaded into the corresponding volume control hardware register. This overrides any prior mute operation.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the first of two replacement <Param> characters contains the selection status set by IICH (<0xB0>) and the second contains the resultant value stored in the volume-level EEPROM variable which was modified by this command. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

For the audio inputs, the power up default values for all six input volume-level EEPROM variables is set for -40dB.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Audio Input Functions for the Infrared Source Group Cont'd

5. QUERY ABSOLUTE VOLUME FOR SELECTED INFRARED INPUT COMMAND

<CMD> Symbol	**Hex Value**	**<Param> Value**	**Definition**
IIAV?	0xB5	**Command Packet:** The controller sends no <Param> character in the command packet.	**Response Packet:** The CAT 860 sends two <Param> characters in the response packet. The possible values are shown below: **<Param> #1:** 0x80 = IR Channel A 0x81 = IR Channel B **<Param> #2:** 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0xA7 = -40dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB

Definition: This command causes the CAT 860 to return a query response packet where the first of two <Param> characters contains the selection status set by IICH (<0xB0>) and the second contains the value stored in the volume-level EEPROM variable selected by the IICH (<0xB0>) command.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

5. Warranty, Safety & Specifications
4. Troubleshooting
3. Optional Accessories
2. Setup & Use
1. Overview

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Input Muting Functions Group

1. MUTE SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
MSAI p	0xD0	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = TV/VCR, CD/DVD, COMPUTER, & AUX IN 0x87 = IR Channel A & IR Channel B 0x88 = All Inputs	**Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = TV/VCR, CD/DVD, COMPUTER, & AUX IN 0x87 = IR Channel A & IR Channel B 0x88 = All Inputs

Definition: This command sends the -79dB setting into the volume control hardware register(s) corresponding to the value in the <param> character. None of the corresponding volume-level EEPROM variables are modified.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the <Param> character contains the mute selection status.

If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

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5. Warranty, Safety & Specifications
4. Troubleshooting
3. Optional Accessories
2. Setup & Use
1. Overview

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

Input Muting Functions Group Cont'd

2. UN-MUTE SELECTED AUDIO INPUT COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
UMSI p	0xD1	**Command Packet:** The controller sends only one <Param> character in the command packet. The possible values are shown below: 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = TV/VCR, CD/DVD, COMPUTER, & AUX IN 0x87 = IR Channel A & IR Channel B 0x88 = All Inputs	**Response Packet:** The CAT 860 sends only one <Param> character in the response packet. The possible values are shown below: 0x80 = TV/VCR 0x81 = CD/DVD 0x82 = COMPUTER 0x83 = AUX IN 0x84 = IR Channel A 0x85 = IR Channel B 0x86 = TV/VCR, CD/DVD, COMPUTER, & AUX IN 0x87 = IR Channel A & IR Channel B 0x88 = All Inputs** **Power up default, and may be needed after using the Basic Command Set.

Definition: Based on the value in the <param> character, this command unconditionally sends the appropriate EEPROM variable content(s) into the corresponding volume control hardware register(s). None of the volume-level EEPROM variables are modified.

If the command is properly received, the CAT 860 responds by repeating back the command packet where the <Param> character contains the un-mute selection status.

If the command is not received properly the CAT 860 responds by sending a <NACK> character.

Note: The un-mute operations will override any mute operations performed as part of any command from the Basic Command Set.

14. RS-232 SERIAL INTERFACE COMMAND DEFINITION CONT'D

ADVANCED COMMAND SET FOR AUDIO MIXER OPERATIONS CONT'D

System Management Functions Group

1. QUERY MODEL AND SOFTWARE VERSION COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
MREV?	0xC0	**Command Packet:** (Controller sends no param value.)	**Response Packet:** This command causes the CAT 860 to return a query response packet containing up to sixteen <param> characters. Each <param> value represents one ASCII character of a string indicating the product model and software version. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

PING CAT 860 COMMAND

<CMD> Symbol	Hex Value	<Param> Value	Definition
PING	0xC1	(Controller sends no param value.)	This command causes the CAT 860 to respond with <ACK> only. If the command is not received properly, the CAT 860 responds by sending a <NACK> character.

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13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

<CMD> Symbol	Hex Value	<Param> Value	Definition
Audio Input Functions			
AIDD p	0x93	(Controller sends only one param per CMD.) 0x81 = one 1dB step 0x82 = two 1dB steps 0x83 = three 1dB steps 0x84 = four 1dB steps 0x85 = five 1dB steps 0x86 = six 1dB steps 0x87 = seven 1dB steps 0x88 = eight 1dB steps 0x89 = nine 1dB steps 0x8A = ten 1dB steps	Differentially decrease volume for selected audio input channel. CAT 860 responds with <ACK> only.
AIAV p	0x94	(Controller sends only one param per CMD.) 0xCF = 0 dB 0xCE = -1dB 0xCD = -2dB 0xCC = -3dB 0x83 = -76dB 0x82 = -77dB 0x81 = -78B 0x80 = -79dB (These are the values returned in the <Param> character of a query response from the 860iR.)	Set absolute volume for selected audio input channel. CAT 860 responds with <ACK> only.
AIAV?	0x95	Controller sends no param value.	Query absolute volume for selected audio input channel. CAT 860 returns one param in the response packet

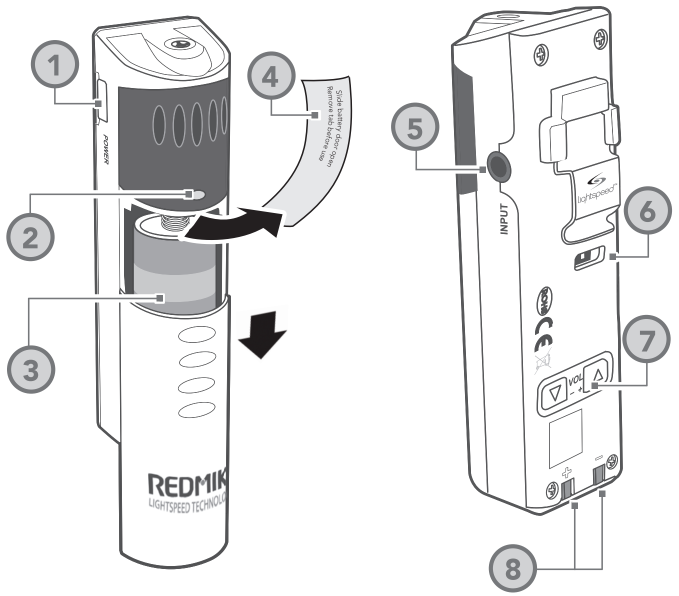
13. RS-232 SERIAL INTERFACE PROGRAMMING CONT'D

<CMD> Symbol	Hex Value	<Param> Value	Definition
Audio Input Functions			
MREV?	0xC0	Controller sends no param value.	Query model and software version. (Param string in response packet will be composed of up to sixteen ACSII alphanumeric characters.)
PING	0XC1	Controller sends no param value.	Ping CAT 860iR. CAT 860 responds with <ACK> only.

SECTION 3:

OPTIONAL ACCESSORIES

OPTIONAL REDMIKE VC (Volume Control) Controls and Connections



1. **POWER /MUTE BUTTON**
2. **POWER/LOW BATTERY INDICATOR:** A BLUE light indicates the REDMIKE VC is on and fully charged. A RED light indicates a charge is needed.
3. **BATTERY COMPARTMENT:** To open, slide the door downward. The battery should only be replaced by a Lightspeed AA rechargeable sensing battery (part # BA-NH2A27).
4. **YELLOW PROTECTIVE TAB:** Slide the battery compartment door and remove this disposable protective tab before use.
5. **AUDIO/MICROPHONE INPUT:** Use this input to plug in a laptop, MP3 player or other audio source to wirelessly transmit audio to be played through the system. Alternatively, an external microphone can be connected.
6. **CHANNEL SELECT SWITCH (CH A/B):** Use this to choose Channel A or B. If you are using a single microphone, we recommend using Channel A.
7. **VOLUME CONTROLS (UP - DOWN)**
8. **CHARGER CONTACTS (+ -):** These contacts interface with the charging tabs when the REDMIKE VC is placed in the BC-RMCC cradle charger.

REDMIKE VC : Charging

Before use, the REDMIKE VC should be charged. See page 20 and follow the same instructions for the REDMIKE.

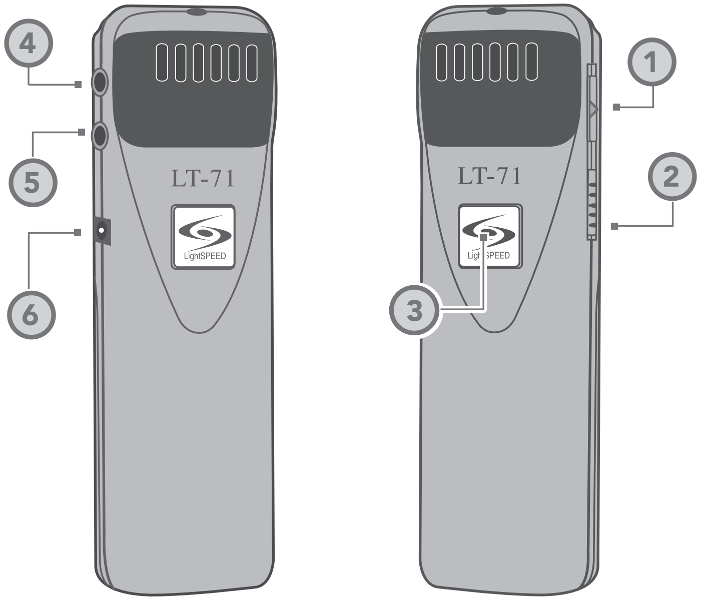
REDMIKE VC : Initial Set-up

See page 17 and follow the same instructions for the REDMIKE to setup the REDMIKE VC.

NOTE: A nominal volume level must be set on the CAT 805iX before adjusting controls on the REDMIKE VC.

The teacher can now use the controls on the REDMIKE VC to adjust the volume level from anywhere in the room. The microphone volume control has 4 steps up and 4 steps down from the mid point (9 levels total).

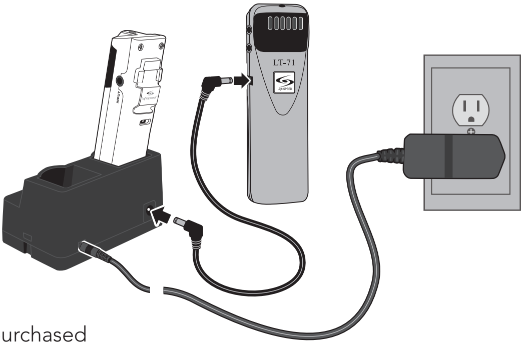
OPTIONAL LT-71: Controls and Connections



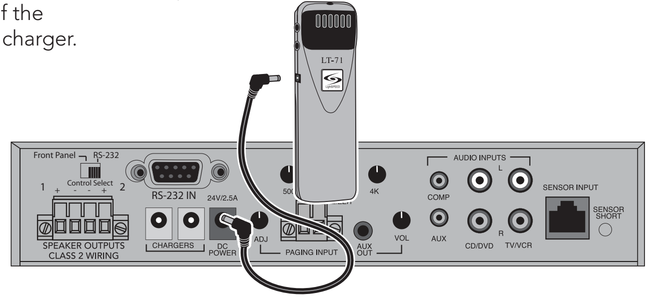
1. **ON/OFF/MUTE Switch**
2. **CHANNEL SELECT SWITCH (CH A/B):** Use this to choose Channel A or B. If you are using a single microphone, we recommend using Channel A.
3. **POWER/CHARGE INDICATOR:** A BLUE light indicates the REDMIKE VC is on and fully charged. A RED light indicates a charge is needed.
4. **EXTERNAL MICROPHONE INPUT (MIC):** Use the 3.5mm MIC jack for the optional TK-250 headset microphone (part# MC-TK250LTM).
5. **AUXILIARY (AUX):** Plug a laptop, MP3 player or other audio source into this jack to wirelessly transmit the audio signal to be played through the system.
6. **CHARGER INPUT (CHARGER):** Plug the charging cable from the charger into this jack for daily charging. The LED on the front will glow RED to indicate charging.

LT-71: Charging

1. Ensure that the LT-71 is turned OFF.
2. Make sure the cradle charger is plugged into a wall outlet. Connect one end of the charging cable into the jack labeled CHARGER on the side of the LT-71 and plug the other end into the charging jack on the rear of the REDMIKE cradle charger. The LT-71's rechargeable batteries are factory installed. The LED on the front of the LT-71 will glow RED when charging.
3. Leave the LT-71 plugged in overnight (8–10 hrs.) to obtain a full charge.

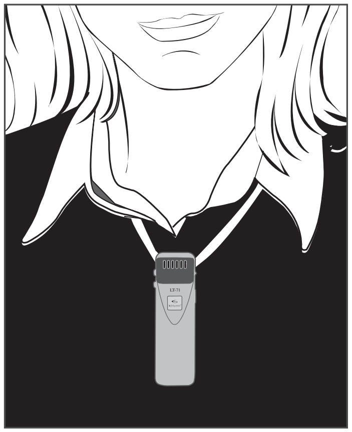


NOTE: If the system was purchased without a REDMIKE or REDMIKE VC, the LT-71 will utilize a charging cable. Simply connect the charging cables to the jacks labeled CHARGER on the back of the amplifier and connect the opposite ends to the jacks on the back of the cradle charger.


LT-71
Front Panel
RS-232
Control Select
1
2
+ - - +
SPEAKER OUTPUTS
CLASS 2 WIRING
RS-232 IN
24V/2.5A
CHARGERS
DC POWER
ADJ
PAGING INPUT
500
4K
AUX OUT
VOL
AUDIO INPUTS
L
R
COMP
AUX
CD/DVD
TV/VCR
SENSOR INPUT
SENSOR SHORT

LT-71: Initial Set-up

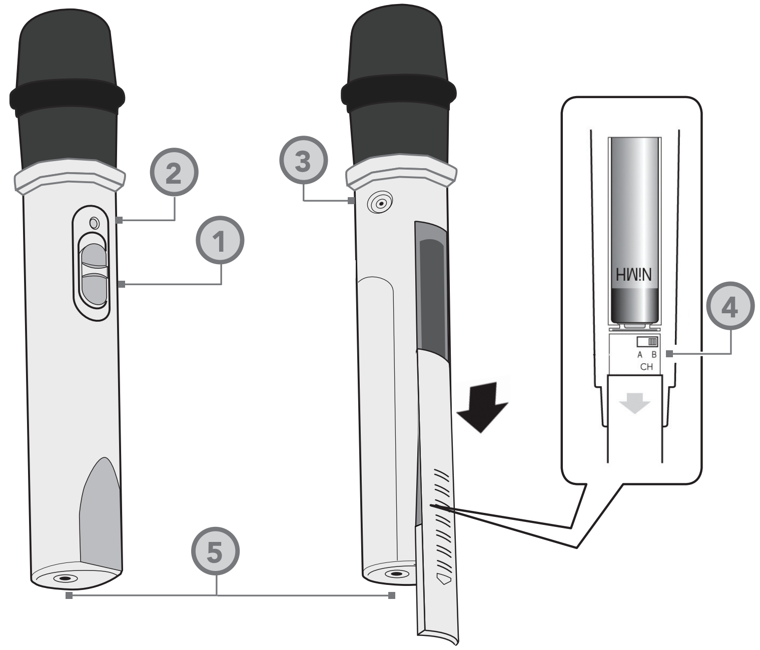
Once the LT-71 is charged, follow these steps to set it up for use.



1. Turn the CAT 860 power switch to the ON position. The RED LED on the switch will glow.
2. Turn on the LT-71 and set the operating channel to "B".
3. Slip the LT-71 with lanyard around the neck and position the top of the microphone just below the collarbone. NOTE: Positioning of the LT-71 is critical for proper volume adjustment.
4. While speaking in a normal voice slowly increase the volume for Channel B on the CAT 860 until your voice is barely audible.

   REMEMBER: This equipment supplements the user's voice so they are able to speak in a conversational tone. Having the volume set too high will result in feedback and listener fatigue.

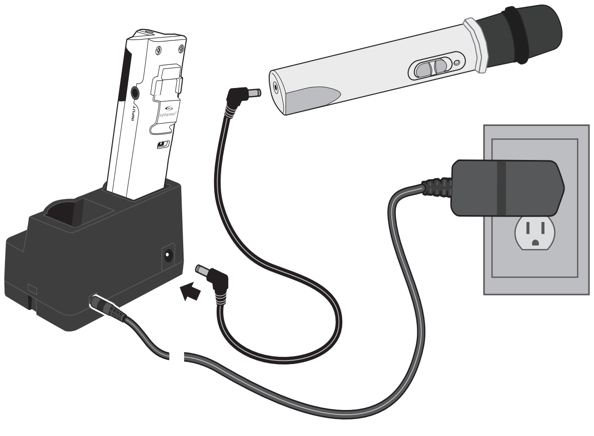
REDMIKE Share: Controls and Connections


2
1
3
4
5
NiMH
A B
CH

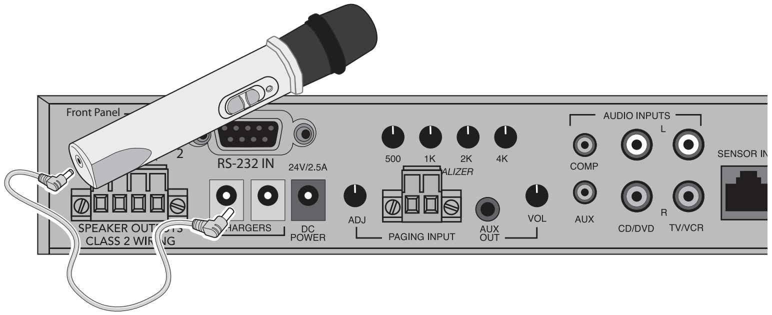
1. **POWER SWITCH**
2. **POWER/CHARGE INDICATOR:** this light glows blue when turned on and turns off to indicate low battery level. When charging, the light glows red.
3. **AUDIO INPUT:** plug a laptop, MP3 player or other audio device into this jack to wirelessly transmit the audio signal to be played through the system.
4. **CHANNEL SELECT SWITCH (CH A/B):** Located in the battery compartment, this switch is set to Channel B at the factory.
5. **CHARGER INPUT:** Plug the charging cable from the REDMIKE cradle charger or into this jack.

REDMIKE Share: Charging

1. Ensure that the REDMIKE Share is turned OFF.
2. Make sure the cradle charger is plugged into a wall outlet. Connect one end of the charging cable into the jack labeled CHARGER on the bottom of the REDMIKE Share.
3. Plug the other end into the charging jack on the rear of the cradle charger.
4. The LED on the microphone will glow RED to indicate charging.
5. Leave the REDMIKE Share plugged in overnight (8-10 hours) to obtain a full charge.



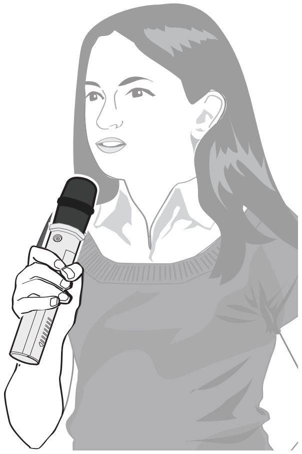
NOTE: If the system was purchased without a REDMIKE or REDMIKE VC, the REDMIKE Share will utilize the charger jacks on the back of the CAT 860.


Front Panel
2
RS-232 IN
24V/2.5A
500
1K
2K
4K
ALIZER
AUDIO INPUTS
L
COMP
SENSOR IN
SPEAKER OUT
CLASS 2 WI NG
HARGERS
DC POWER
ADJ
PAGING INPUT
AUX OUT
VOL
AUX
R
CD/DVD
TV/VCR

REDMIKE Share: Initial Set-up

1. Ensure the CAT 860 is ON. The RED LED on the power switch will glow.
2. Turn on the REDMIKE Share by sliding the switch to the top position.
3. Grip the barrel in the center section.
4. While speaking in a normal voice, increase the B VOLUME level until your voice is barely audible.

   REMEMBER: This equipment is designed to supplement and distribute the user's voice so they are able to speak in a conversational tone. Having the volume set too high will result in feedback and listener fatigue.

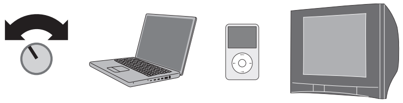


INITIAL SET-UP: OPTIONAL IR MEDIA CONNECTOR

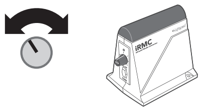
1. Turn off the second microphone. The iR Media Connector uses the same channel (channel B) as the optional second microphone (REDMIKE, LT-71, or REDMIKE Share). As a result, they cannot be used simultaneously. If you have a second microphone, turn it off before transmitting audio from the iRMC.

   NOTE: If you adjust the CH B volume on the classroom audio system, you will also be changing the volume for your second microphone. Return the CH B volume knob to the original position before turning the second microphone back on.
2. The iR Media Connector volume is preset for most standard audio signals. If you need to turn the volume up or down, follow this procedure:

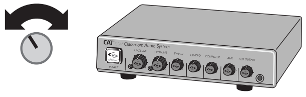
   A. Adjust the volume at the computer, television, or other audio source if possible.



   B. If the audio source does not have a volume control (such as many DVD players) adjust the volume at the iRMC.

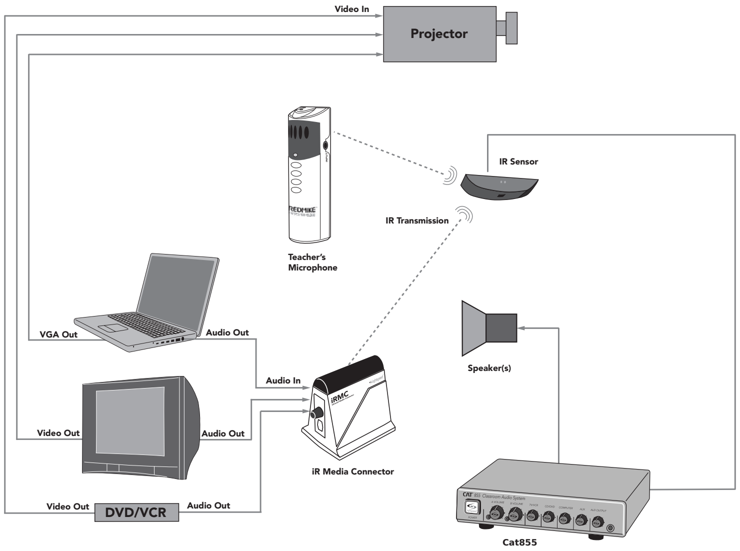


   C. If the first two options do not give optimum volume level, the last place to adjust the volume is the CH. B Volume on the CAT 860.



OPTIONAL IR MEDIA CONNECTOR AUDIO INTEGRATION

The iRMC is designed to integrate with the CAT 860 and multiple audio sources, allowing other instructional technologies to be clearly heard throughout the classroom.



OTHER OPTIONAL ACCESSORIES

IRMC	Infrared Media Connector
MC-TK250M	Noise-canceling headset microphone
AC-TCC7	Charging cable for REDMIKE Share and LT71
CA-RCA6	6' dual RCA audio cable
CA-MSC3535	3.5mm to 3.5mm stereo audio cable

SECTION 4:

TROUBLESHOOTING

COMMON PROBLEMS AND SOLUTIONS

Note: Most problems are directly related to low battery power. Please run through the "Battery Check" items first. For remaining troubleshooting, use known good, fully-charged batteries.

ALL PROBLEMS: Most Problems are related to low battery power.

SOLUTION: Battery Check

- Confirm batteries are charged each night.
- Confirm proper batteries are used. The REDMIKE requires the Lightspeed BA-NH2A27 rechargeable sensing battery for proper charging. The REDMIKE Share uses the BA-NH2APK rechargeable battery pack. The LT-71 requires two BA-NH1 AA rechargeable batteries.
- Make sure the microphones are turned off while charging so a full charge is attained. Full charge will last eight hours.
- Inspect the battery contacts. Clean and adjust if necessary.

PROBLEM: Hearing Static

SOLUTION: Follow these steps to eliminate static.

- Ensure sensor is in optimum location (refer to sensor placement in manual). A single sensor will cover a 1600 sq. ft. enclosed classroom.
- Ensure that no other REDMIKE/LT-71/REDMIKE Share is operating on the same channel.
- If the optional iR media connection is in use, set the microphone to Channel A.

PROBLEM: Low Volume or Feedback

SOLUTION: Follow these steps to eliminate low volume or feedback.

- Ensure microphone is positioned appropriately, just below the collar bone.
- Check volume level on the amplifier. If the volume is too high, feedback will occur. Adjust accordingly.
- Adjust the volume level on the back of the optional REDMIKE VC.

PROBLEM: No Sound From Speaker

SOLUTION: Follow these steps to produce sound from speakers.

- Turn the CAT 860 on. Confirm that the POWER light located on the front panel switch is on.
- Confirm signal is being received at the CAT 860. The IR signal light will be RED indicating a signal is being received.
- Confirm that REDMIKE is turned on. There will be a BLUE LED on the microphone to indicate it is powered on.

If you review these instructions and still have questions, write down the serial number and model number of your system and call Lightspeed Technical Services at 800.732.8999, 5 a.m. – 5 p.m., PST.

TIPS TO OBTAIN OPTIMUM AUDIO PERFORMANCE

- Speak in a natural voice. A normal conversational speech level will provide an adequate signal. It is not necessary to increase the intensity of your voice—the audio system provides adequate amplification (approximately 5 – 10 dB) above ambient room noises.
- Avoid wearing jewelry that may rub or bump against the microphone.
- Turn the REDMIKE off during private conversations with a student, parent, or other classroom visitor. You can also cover the LED lens on top of the REDMIKE to block the signal.
- Recharge batteries each night. When recharged nightly, operating time (actual usage) for the transmitters will last through a typical school day.

SECTION 5:

WARRANTY, SAFETY & SPECIFICATIONS

FIVE-YEAR LIMITED WARRANTY

Lightspeed Classroom Audio Systems are guaranteed against malfunction due to defects in materials and workmanship for a period of FIVE (5) YEARS, beginning at the date of the purchase invoice. If such malfunction occurs, the product will be repaired or replaced (at Lightspeed's option) without charge during the warranty period.

Lightspeed's Warranty Exchange Program applies to all infrared systems within the five (5) year warranty period. If an infrared product or component has an issue that requires service, a refurbished replacement will immediately be sent to the customer to minimize downtime. Customers will receive the exchange product(s) or component(s) within 2-3 days. A prepaid return label will be included with exchanged products so original malfunctioned equipment can be returned to Lightspeed. Any exchanged equipment will remain covered under the original five (5) year warranty.

1. Warranty on infrared microphones is FIVE (5) YEARS.
2. Warranty on Lightspeed NiMH rechargeable batteries is one (1) year.
3. Prepaid shipping label provided by Lightspeed for warranty repairs within the U.S. Customers outside the U.S. should refer to the Lightspeed website (www.lightspeed-tek.com) for warranty repair instructions.
4. Warranty does not extend to finish, appearance items, or malfunctions due to abuse or operation other than specified conditions, nor does it extend to incidental or consequential damages. Repair by other than Lightspeed or its authorized service agencies will void this guarantee. Information on authorized service agencies is available from Lightspeed Technologies, Inc.

Our Service Department (800.732.8999, 5 a.m. – 5 p.m., PST) will handle all your repair/replacement needs.

SAFETY WARNINGS AND CERTIFICATIONS

CAUTION

RISK OF ELECTRIC SHOCK DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK
DO NOT REMOVE COVER (OR BACK)
NO USER-SERVICEABLE PARTS INSIDE
REFER SERVICING TO QUALIFIED PERSONNEL

CERTIFICATIONS

C UL US LISTED
Audio/Video
Apparatus 44VE

This product is listed to UL standards and requirements for electrical safety by Underwriters Laboratories Inc.

This product conforms with the essential requirements of the following European Union Directives: 89/336/EEC, 92/31/EEC, 93/68/EED, and 2004/108/EC Electromagnetic Compatibility Directives.

Lightspeed Technologies launched a formal product recycle program in Europe that complies with the European Union Directive 2002/96/EC on Waste Electrical and Electronic Equipment ("WEEE Directive"). Please visit our website at www.Lightspeed-tek.com for more information.

ROHS

This product is manufactured using lead-free processes and is free of other materials harmful to the environment. It conforms to the most stringent new European guidelines for consumer products (RoHS).

SYSTEM SPECIFICATIONS

OVERALL SPECIFICATIONS

Power Output	12 W per channel (24 W total)
Amplifier Frequency Response	60 Hz to 20 kHz ±3 dB
Carrier Frequencies (IR)	2.06/2.54; 3.2/3.7 MHz
Signal-to-Noise Ratio	> 73 dB
Image and Spurious Rejection	> 70 dB

AMPLIFIER SPECIFICATIONS

Receiver Type	Superheterodyne
Receiver Sensitivity	6 μV for 60 dB S/N
Image and Spurious Rejection	> 70 dB
Dimensions (W x D x H)	8.6″ x 6.8″ x 2.2″
Weight	2.75 lbs.

TRANSMITTER SPECIFICATIONS

REDMIKE and REDMIKE VC

Audio Distortion	< 1 %
Built-in Microphone	Unidirectional Electret
Battery Power (1-year warranty)	1 AA NiMH Rechargeable Sensing
Audio Input	3.5 mm
Dimensions (W x D x H)	0.9″ x 1.0″ x 3.5″
Weight	2.1 oz.

LT-71 LightMic

Audio Distortion	< 1 %
Built-in Microphone	Unidirectional Electret
Battery Power (1-year warranty)	2 AA NiMH Rechargeable
Audio Inputs	Mic Level 3.5 mm, Line Level 3.5 mm
Dimensions (W x D x H)	1.375″ x .75″ x 4.625″
Weight	3.7 oz.

REDMIKE Share Handheld Microphone

Audio distortion	<1%
Built-in Microphone	Uni-directional electret
Battery Power (1-year warranty)	2 AA NiMH Rechargeable Battery Pack
Audio Input	3.5 mm
Dimensions (W x D x H)	8.25″ x 1.3″ x 1.3″
Weight (with batteries)	7.9 oz

ISR SENSOR SPECIFICATIONS

Operating Range	Up to 1600 square feet
Cable	50 ft., Plenum-rated Cat 5e
Mounting	Ceiling clip/Wall bracket
Dimensions (W x D x H)	9.4″ x 1.4″ x 5.2″
Weight	14.3 oz.

AC-MN860

LIGHTSPEED TECHNOLOGIES
11509 SW HERMAN ROAD / TUALATIN, OR 97062
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