

Model 990

7.1 Channel Preamp/Processor



Outlaw®

Owner's Manual

Version 1.0

Please Read First



CAUTION: To reduce the risk of electric shock, do not remove the cover. No user serviceable parts inside. Refer to qualified personnel.

WARNING: To reduce the risk of fire or electric shock, do not expose this appliance to rain or moisture.



The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electrical shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: Important Safeguards

- **Read Instructions**—All the safety and operating instructions should be read before the unit is operated.
- **Retain Instructions**—The safety and operating instructions should be retained for future reference.
- **Heed Warnings**—All warnings on the unit and in the operating instructions should be adhered to.
- **Follow Instructions**—All operating and use instructions should be followed.
- **Cleaning**—Unplug the unit from the wall outlet before cleaning. The unit should be cleaned only as recommended by the manufacturer.
- **Attachments**—Do not use attachments not recommended by the unit manufacturer as they may cause hazards.
- **Water and Moisture**—Do not use the unit near water—for example, near a bath tub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool.
- **Accessories**—Do not place the unit on an unstable cart, stand, tripod, bracket, or table. The unit may fall, causing serious injury to a child or adult, and serious damage to the unit. Any mounting of the unit should follow the manufacturer's instructions, and should use a mounting accessory recommended by the manufacturer.
- **Ventilation**—Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the unit and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the unit on a bed, sofa, rug, or other similar surface. The unit should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided. There should be free space of at least 16 cm (6 in.) and an opening behind the unit.
- **Power Sources**—The unit should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supplied to your home, consult your unit dealer or local power company.
- **Grounding or Polarization**—The unit may be equipped with a polarized alternating current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature. If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug should still fail to fit, contact a licensed electrician to replace your obsolete outlet. Do not defeat the safety purpose of the polarized plug.
- **Power-Cord Protection**—Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords where they enter a plug, or a convenience receptacle, and the point where they exit from the unit.

- **Outdoor Antenna Grounding**—If an outside antenna or cable system is connected to the unit, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Article 810 of the National Electrical Code, ANSI/NFPA 70, provides information with regard to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna-discharge unit, size of grounding conductors, location of antenna-discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.
- **Lightning**—For added protection for the unit during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system. This will prevent damage to the unit due to lightning and power-line surges.
- **Power Lines**—An outside antenna system should not be located in the vicinity of overhead power lines or other electric light or power circuits, or where it can fall into such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.
- **Overloading**—Do not overload wall outlets, extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.
- **Object and Liquid Entry**—Never push objects of any kind into the unit through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the unit.
- **Servicing**—Do not attempt to service the unit yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.
- **Damage Requiring Service**—Unplug the unit from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - When the power-supply cord or plug is damaged,
 - If liquid has been spilled, or objects have fallen into the unit,
 - If the unit has been exposed to rain or water,
 - If the unit does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the unit to its normal operation,
 - If the unit has been dropped or damaged in any way, and great care should be exercised in handling, and the unit should be examined by qualified service personnel.
- **When the unit exhibits a distinct change in performance**—this indicates a need for service.
- **Replacement Parts**—When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards.
- **Safety Check**—Upon completion of any service or repairs to the unit, ask the service technician to perform safety checks to determine that the unit is in proper operation condition.
- **Wall or Ceiling Mounting**—The unit should be mounted to a wall or ceiling only as recommended by the manufacturer.
- **Heat**—The unit should be situated away from heat sources such as radiators, heat registers, stoves, or other units (including amplifiers) that produce heat.

IMPORTANT SAFETY NOTE

Before connecting a new component such as the Model 990 to your audio or home theater system it is always good practice to make certain that all components are turned off, and preferably unplugged from their AC power source. Many modern electronics products feature automatic turn-on circuits that may be activated during an installation, causing the potential for damage to electronic components and/or speakers. Such damage is not covered by product warranties and Outlaw Audio specifically disclaims responsibility for any such damage.

Precautions

Verify The Line Voltage

Your new Model 990 has been factory configured for 120 (+/- 3%) volt AC lines. Connecting the unit to a line voltage other than that for which it is intended can create a safety and fire hazard, and may damage the Model 990. If you have any questions about the voltage requirements for your specific model, or about the line voltage in your area, contact Outlaw Audio before plugging the unit into a wall outlet.

NOTE: It is always a good idea to avoid using any audio or video equipment on the same AC circuit as equipment with motors, such as air conditioners or refrigerators. This will lessen the possibility of power variation and electrical start-up noise affecting your sound system.

Power Cord

The removable power cord that is shipped with the Model 990 is specifically designed to be used with this product. DO NOT use any other power cord, as that may reduce the unit's performance and possibly create a safety hazard. In particular, DO NOT use standard IEC type power cords designed for computers and other business equipment products, as they have a three prong plug that is not meant for use with the 990. Should the power cord require replacement, use an identical type, or contact Outlaw Audio for service.

Handle the AC Power Cord Gently

When disconnecting the power cord from an AC outlet, always pull the plug, never pull the cord. If you do not intend to use the Model 990 for any considerable length of time, disconnect the plug from the AC outlet. If the power cord is replaced, make certain that it is of similar gauge. As with all electrical devices, do not run power cords under rugs or carpets or place heavy objects on them. Damaged power cords should be replaced immediately with cords meeting factory specifications.

AC Fuse

The fuse is located inside the chassis and is not user-service-able. If power does not come on, contact your authorized service station.

Wiring

Cables that are run inside of walls should have the appropriate markings to indicate compliance with, and listing by the UL, CSA or other standards required by the UL, CSA, NEC or your local building code. Questions about cables inside of walls should be referred to a qualified custom installer, or a licensed electrician or low-voltage contractor.

Installation Location

To assure proper operation and to avoid the potential for safety hazards, place the unit on a firm and level surface capable of supporting its weight. When placing the unit on a shelf, be certain that the shelf and any mounting hardware can support the weight of the unit and any additional items in the equipment rack, or on the shelf.

When positioning the Model 990 in its final location, make certain that it has adequate ventilation on all sides, as well as on the top and bottom. In particular, it is a good idea to provide at least two or three inches of room above the unit for air circulation. DO NOT place CDs, DVDs, videotapes, owner's manuals, or other paper on top of, or beneath, the unit, or in-between multiple amplifiers in a stack. This will block airflow, causing heat build-up, degraded performance, and may create a possible fire hazard.

If the unit is to be enclosed in a cabinet or rack, make certain there is adequate air circulation. Sufficient ventilation should be provided so that hot air may exit, and cool air may enter the cabinet. In some instances, a small cooling fan may be required to insure adequate airflow through the cabinet. If you are in doubt as to the ventilation requirements for your specific installation, please contact us. Also, do not place the Model 990 directly on a carpeted surface, as this will inhibit airflow underneath as well as create a potential fire hazard.

Avoid installation in humid locations, in extremely hot or cold locations, or in areas that are exposed to direct sunlight or space heating equipment.

Do Not Open The Cabinet

There are no user serviceable components inside this product. Opening the cabinet may present a shock hazard, and any modification to the product will void your guarantee. If water or any metal object, such as a paper clip, coin or a staple, accidentally falls inside

the unit, disconnect it from the AC power source immediately, and contact Outlaw Audio for further instructions.

Recording Copyright

Recording of copyrighted material for other than personal use is illegal without permission of the copyright holder.

Note to CATV system installer

This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC, ANSI/NFPA 70, which provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

FCC Information for User

CAUTION: ANY changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

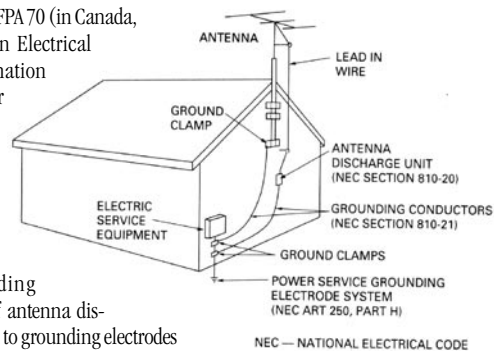
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Outdoor Antenna Installation

Safe Antenna and cable Connection

If an outside antenna or cable system is connected to the equipment, be sure the antenna or cable system is grounded so as to provide some protection against built up static charges and voltage surges. Section 810 of the national Electrical Code, ANSI/NFPA 70 (in Canada, part 1 of the Canadian Electrical Code) provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes and requirements for the grounding electrode.



Keep Antenna Clear of High Voltage Power Lines or Circuits

An outside antenna system should be located well away from power lines, electric light or power circuits and where it will never come into contact with these power sources if it should happen to fall. When installing an outside antenna, extreme care should be taken to avoid touching power lines, circuits or other power sources as this could be fatal. Because of the hazards involved, antenna installation should be left to a professional.

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Record your Model 990's serial number and date of purchase here. The serial number is found on the back panel.

Serial Number _____

Date of Purchase _____

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Model 990

7.1 Channel Preamp/Processor

Thank you for purchasing the **Outlaw Audio Model 990 Preamp/Processor**. Because the Model 990 combines the very latest audio processing technologies with an up-to-date set of inputs and outputs, it works with practically any audio and video equipment you might want to use—from old-fashioned vinyl records to PCs, digital TV tuners, and the latest Super Audio CD and DVD-Audio players. And its clean design and intuitive controls make it one of the easiest surround processors to use.

To get the maximum performance and enjoyment from your Model 990, please take a few minutes to read this manual. It contains everything you need to know to connect, configure and use your new preamp/processor. You'll learn how to make your Model 990 work with all of the other components in your system, and how to adjust its settings for the best possible performance.

If you have any questions about your Model 990, its installation or operation, please contact us via e-mail at customerservice@outlawaudio.com or via telephone at 866-OUTLAWS (688-5297).

IMPORTANT NOTE: *The Model 990 is shipped from the factory with the following default settings:*

Output Configuration	5.1 channels
Loudspeaker Size	small
Crossovers	100 Hz

We chose these settings because they are a safe starting point for any speaker configuration. However, you will likely get much better performance by either using the Model 990's auto setup routine (see page 26), or manually configuring the processor through the Speaker Size submenu (see page 28).

If your system will be operated in a less than 7.1-channel configuration, some surround modes will not be available to you.

Model 990 Features

Your new Outlaw Audio preamp/processor is built with top-quality components for state-of-the-art audio performance, and offers flexible audio processing to meet the needs of any speaker system. No matter what source material you want to play, the Model 990 provides the right surround-sound processing technology—as well as other options to heighten your enjoyment of movies and music. The Model 990 features:

- **Auto Setup**

Using a supplied microphone, automatically detects how many speakers are in your system, and automatically sets speaker size, delay and output levels.

- **8 Digital Inputs (2 coaxial, 5 optical, 1 USB)**

Each input is assignable, so it can be used for any source device.

- **2 Digital Outputs (1 coaxial, 1 optical)**

For use with digital recorders or distribution systems.

- **DVI Digital Video Input/Output (2 input, 1 output)**

For the best possible picture with DVI- or HDMI-equipped digital TV tuners, satellite receivers and DVD players.

- **High-Bandwidth Component Video Switching**

HDTV-compatible component switching for use with digital set-top boxes and progressive-scan DVD players.

- **6 Composite and S-Video Inputs**

High-quality video circuitry for connection to your video sources.

- **9 Analog Audio Inputs with Bypass Capability**

All analog audio inputs may be switched to bypass mode for pure analog sound, or used with surround-sound processing.

- **Phono Input**

For record players with moving-magnet cartridges.

- **Balanced Audio Outputs**

For a professional-style, low-noise connection to amplifiers with balanced inputs.

- **Video Output Conversion**

All analog video signals are cross converted to component video, so every video signal (except DVI) is available on the component output jacks.

- **Stereo Audio Upsampling**

Converts incoming stereo digital audio to 24-bit/192-kilohertz high-resolution sound for an audiophile-quality listening experience.

- **High-performance AM/FM stereo tuner with 30 presets**

- **Audiophile-Quality Digital-to-Analog and Preamplifier Stages**

Provide maximum performance for critical music listening.

- **Dolby Digital EX® and Pro Logic IIx®***

Dolby Digital decoding delivers 5.1-channel digital surround sound from DVD, satellite, cable and digital TV sources. EX adds an additional rear-surround channel. Pro Logic IIx converts stereo sound to 5.1, 6.1 or 7.1 channels, and also converts 5.1 sources to 7.1.

- **DTS®, DTS-ES® and Neo:6®*****

The full suite of DTS decoding and processing is available to provide up to 6.1 channels of sound from virtually any analog source as well as DTS-encoded programs.

- **7.1-Channel Analog Input**

For connection of multi-channel source devices, such as Super Audio CD and DVD-Audio players, as well as future high definition DVD players.

- **Dolby Headphone®***

Creates a surround-sound effect with ordinary headphones.

- **Dolby Virtual Speaker®***

Creates a surround-sound effect when only two speakers are connected.

- **Four-Way Crossover**

Allows you to optimize the bass reproduction and power handling of your system by setting different crossover frequencies for front, center, side surround and rear surround speakers.

■ RS-232 Port

Allows control through compatible computer products and keypad systems, as well as easy updating of the Model 990's operating software.

■ Multi-room Capability with Zone 2 Remote

Video and audio from any source device connected to the Model 990's analog audio and video inputs can be routed to a second room, with separate volume control and source selection through a dedicated Zone 2 remote. The multi-room output can also be used to record a different source than the one being played in the main room.

■ Two Low-Voltage Triggers

One trigger turns on and off whenever the Model 990 does; this trigger is useful for automatic on/off of compatible power amplifiers (including all Outlaw models). A separate trigger can be assigned to activate or deactivate depending on which input is selected, and is especially appropriate for use with relay-controlled products such as projection screens, blinds and lighting systems.

Unpacking

Your preamp/processor comes in a carton and packing materials designed to cushion it from shocks and vibration of shipping. We strongly suggest you save the carton and packing materials to use if you move, or if the unit ever needs to be shipped back to us for any reason.

To minimize the size of the carton in storage, flatten it by carefully opening the top and bottom flaps and folding the carton flat. Other cardboard inserts may be stored in the same manner. Packing material that cannot be collapsed should be saved along with the carton in a plastic bag.

Although the Model 990 is not particularly heavy, it does demand care when you lift it, because of the protruding front-panel volume knob and the many rear-panel connectors.

Accessories

After unpacking the Model 990, please check that the following accessories are in the box:

- Main remote control with batteries
- Zone 2 remote control with batteries
- AC power cord
- Auto setup microphone
- FM antenna
- AM loop antenna
- 75-to-300-ohm adapter for FM antenna
- Owner's manual

* Manufactured under license from Dolby Laboratories.

**Manufactured under license from Digital Theater Systems, Inc. US Pat. No. 5,451,942 and other worldwide patents issues and pending.

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Model 990 Front Panel

1 Standby/On indicator (see page 34)

Glows amber when the unit is in standby mode and turns blue when the unit is on. This light remains blue if zone 2 is active but the sound in the main room is off.

2 STANDBY/ON button (see page 34)

When the MAIN POWER switch on the rear panel is in the ON position, pressing this button turns the unit on. The amber Standby/On indicator turns blue.

3 IR sensor

The IR sensor receives commands from the remote control. Do not block or cover it. If the unit is inside a cabinet or behind tinted glass doors you may need to use an optional external IR sensor.

4 Front panel display (see page 10)

Indicates selected input, assigned audio input, AM/FM frequency and preset, volume level, mute, which channels are active, and which channel outputs are activated in the Speaker Size menu. Can be set to turn off automatically 15 to 60 seconds after use.

5 CURSOR LEFT and RIGHT buttons (see page 24)

Used to navigate on-screen menu and select AM/FM presets.

6 ENTER button (see page 24)

Used to activate functions in on-screen menu.

7 CURSOR UP and DOWN buttons (see page 24)

Used to navigate on-screen menu, tune AM/FM frequency, select surround modes and activate or deactivate tone controls.

8 MENU button (see pages 23-33)

Activates on-screen menu.

9 INPUT button (see page 34)

Activates input select function for main room; CURSOR UP and DOWN buttons select input. Does not affect Zone 2 source.

10 SURROUND MODE button (see page 34)

Activates surround mode select function for main room; CURSOR UP and DOWN buttons select surround mode.

11 TONE button (see page 37)

Activates tone control on/defeat function for main room; CURSOR UP and DOWN buttons select tone control mode.

12 MUTE button (see page 34)

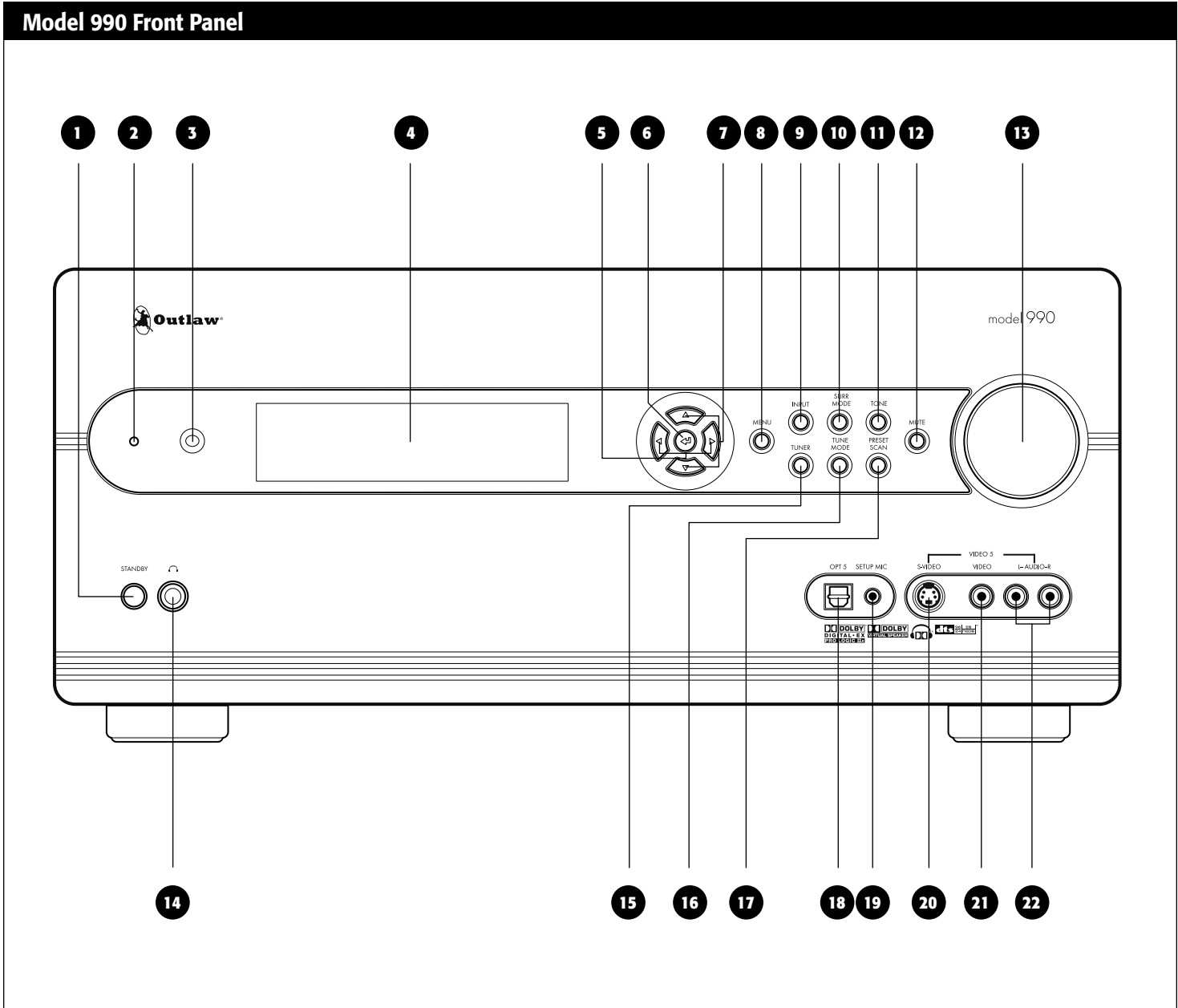
Mutes the volume of the Model 990. Does not affect Zone 2 volume. Pushing the button again restores the sound. Hold the button down for three seconds to activate the headphone jack and mute the Model 990's main outputs.

13 VOLUME knob (see page 34)

Adjust volume level for main room. Does not affect Zone 2 volume.

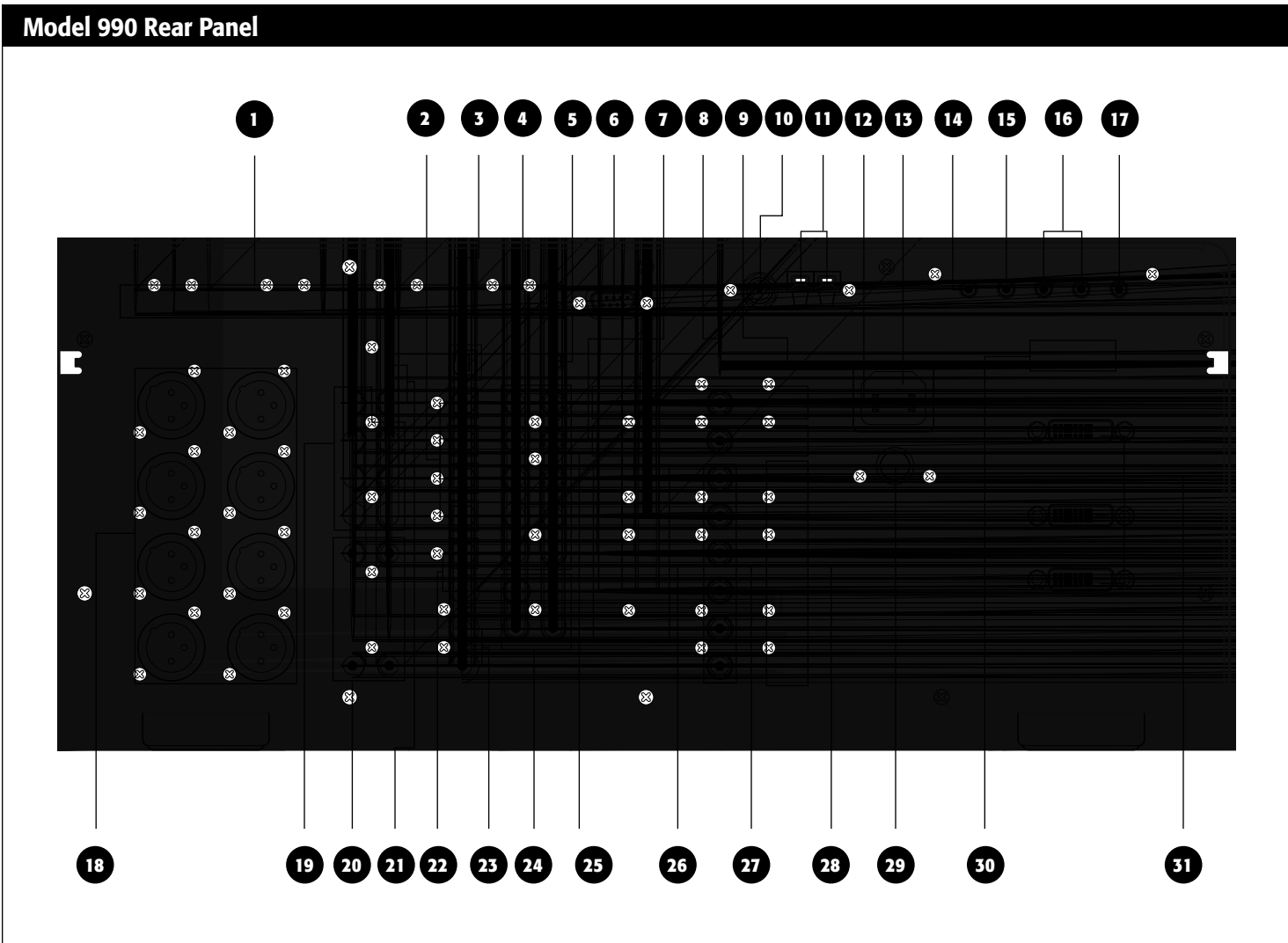
14 Headphone jack (see page 37)

Provides connection for headphones.



- 15 TUNER button** (see page 37)
 Selects AM/FM tuner for main room. Pushing repeatedly selects between AM and FM in both main room and Zone 2.
- 16 TUNE MODE button** (see page 37)
 Selects between FM and FM stereo in both main room and Zone 2. The selected mode appears on-screen.
- 17 PRESET SCAN button**
 Advances AM/FM tuner to next preset in both main room and Zone 2. Frequency and band appear on front panel and on-screen.
- 18 Optical 5 input** (see page TK)
 Optical digital audio input. Can be assigned to any video or audio input.

- 19 Setup Mic input** (see page 26)
 Connect the included setup microphone here.
- 20 S-Video 5 input** (see page TK)
 This comes in particularly handy for quick hookup of a video game system or a camcorder.
- 21 Composite video 5 input** (see page TK)
 This can be used for video game or camcorder hookup, and also works with most digital cameras.
- 22 Stereo analog audio inputs** (see page TK)
 These are particularly useful for video game systems, camcorders, and portable music players.



Model 990 Rear Panel

1 Component video inputs (see pages 16, 20)

Use these three sets of jacks to connect devices with component video outputs, such as a DVD player or a digital TV tuner. If the device has a DVI or HDMI output, use that connection instead.

2 Optical digital audio inputs (see pages 14, 15)

Use these inputs to connect digital audio devices such as DVD players, CD players, and digital TV tuners. These inputs are assignable to any video or audio source.

3 USB connector (see page 20)

This connector carries digital audio from any USB-equipped computer. Like the RS-232 connector, it can be used to upload new software into the Model 990. This input is assignable to any video or audio source.

4 Component video output (see pages 16, 21)

Use this output to connect to a video display that accepts component video.

5 USB OPR/SVC switch

In normal operation, leave this switch in the OPR (up) position to have the USB jack serve as an input. Use the SVC (down) position only when upgrading the system software.

6 RS-232 port (see page 23)

This connector can be used either for control of the Model 990 by a touch-screen, such as an AMX or Crestron, or for uploading new software into the Model 990.

7 Zone 2 audio/video output (see page 22)

Use these jacks to feed stereo analog audio and composite video or S-Video to a video display and an audio system in a second zone.

8 Composite video output (see pages 16, 21)

Connect this output to the composite video input of your video display. Use this only if the display does not have an S-Video or component video input.

9 S-Video output (see pages 16, 21)

Connect this output to the S-Video input of your video display. Use this only if the display does not have a component video input.

10 FM antenna input (see page 22)

Use this to connect an FM antenna. This jack accepts a 75-ohm coaxial cable. To use a 300-ohm "twin-lead" connection or the supplied FM antenna, connect the supplied 75-to-300-ohm balun between the antenna lead and this jack.

11 AM antenna input (see page 22)

Use this to connect the supplied AM loop antenna or any other external AM antenna.

12 Video 1 record output (see pages 16, 21)

Connect these audio and video jacks to the input of a VCR or a DVD recorder, so you can record whatever source is being played in the main room. If the recorder has an S-Video input, use that connection instead of composite video.

13 AC input (see page 23)

Connect the supplied AC power cord here. Do not use standard IEC type power cords.

14 Trigger output 1 (see page 23)

This jack provides a 12-volt DC output whenever the Model 990 is switched on. Usually, this jack is used for automatic turn-on of a compatible amplifier equipped with a DC trigger input.

15 Trigger output 2 (see page 23)

This jack provides a 12-volt DC output whenever certain inputs are selected; through the Model 990's on-screen menu, you can select which inputs activate the trigger. This jack is most often used in conjunction with video inputs, so you can automatically turn on a projector and/or lower a screen when a video input is selected.

16 IR inputs (see pages 18, 22)

Connect an external infrared sensor to these inputs. This configuration allows remote control of the Model 990 even if it is installed in a cabinet with solid doors. It also allows control of the Model 990 from a second room.

17 IR output (see page 22)

Use this output to feed an infrared flasher attached to another piece of audio/video gear. Any infrared remote signal received by the Model 990's front-panel sensor or by an external sensor connected to the Model 990 will be relayed through this jack, so concealed audio/video devices can be controlled by remote.

18 Balanced audio outputs (see pages 17, 22)

These outputs carry 7.1-channel audio from the Model 990 to an external amplifier or amplifiers equipped with balanced inputs. These are professional-style outputs that carry the plus and minus audio signals separately from the ground signal. This arrangement automatically cancels out any noise that enters the cable connecting the Model 990 and the amplifier.

19 Preamp audio outputs (see pages 17, 22)

These outputs carry 7.1-channel audio from the Model 990 to an external amplifier or amplifiers.

20 7.1-channel audio input (see page 21)

Use this input group to connect a device with analog multi-channel outputs, such as a DVD-Audio or Super Audio CD player. You may assign any of the DVI or component video inputs to appear with this audio input, as well as the composite or S-Video inputs specifically designated for use with the 7.1 audio input.

21 Subwoofer outputs (see page 17)

Connect either or both of these outputs to the input of a powered subwoofer or to the amplifier that feeds a passive (non-powered) subwoofer. Note that the output at the SW1 and SW2 jacks is identical. Two are provided to make it easier to install multiple subwoofers.

22 Digital audio outputs (see pages 15, 21)

Connect these to a CD recorder, MiniDisc recorder, a computer or any other audio recording device that accepts digital inputs. Both optical and coaxial outputs are provided.

23 Coaxial digital audio inputs (see pages 15, 21)

Use these inputs to connect digital audio devices such as DVD players, CD players, and digital TV tuners. These inputs are assignable to any video or audio source.

24 Phono input and ground connector (see page 15)

Use these to connect a record player equipped with a moving-magnet (MM) cartridge.

25 Analog audio connections (see pages 14, 15, 20)

This group includes input connectors for analog audio devices, such as cassette tape decks or older CD players. There are also two outputs for feeding analog audio recorders.

26 Analog audio inputs (see pages 16, 20, 21)

Use these inputs to connect analog audio from video devices, such as a VCR, a cable box or a laserdisc player.

27 Composite video inputs (see pages 16, 20, 21)

Use these inputs to connect older video devices, such as a VCR, a cable box or a laserdisc player. If the device and your video display have S-Video or component video connections, use those instead.

28 S-Video inputs (see pages 16, 20, 21)

Use these inputs to connect S-Video-equipped devices such as DVD players, satellite receivers, and S-VHS VCRs.

29 MAIN POWER button (see page 23)

Connects and disconnects the Model 990 from AC power. When this switch is on, the Standby/On indicator on the front panel illuminates. When it is off, all power is cut and the front STANDBY/ON switch will not function.

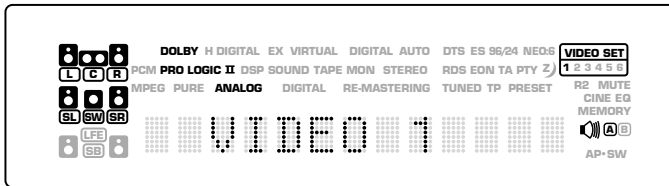
30 Serial number

Write this number in the space provided on page 4 for future reference.

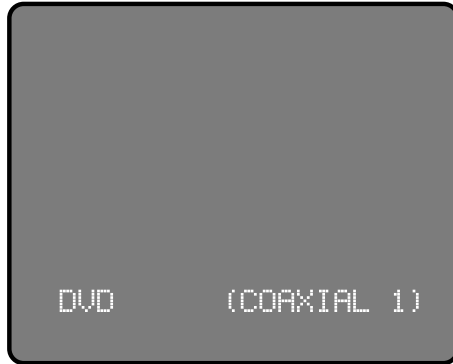
31 DVI inputs/output (see pages 20-21)

This digital video connection provides the best possible picture when you are using a DVI- or HDMI-equipped video source and video display. (Inexpensive DVI-to-HDMI adapters are readily available.) Analog video sources and on-screen menus do not appear on the DVI output.

Model 990 Front Panel and On Screen Display



Example of Front Panel Display when an input source is selected.



Example of On Screen Display when an input source is selected.



Example of On Screen Display when the Main Menu is selected.

Front Panel and On-screen Display (OSD)

The front-panel display and on-screen display (OSD) provide visual feedback of the current settings, surround modes, and configuration menus of the unit. Information is constantly displayed at the front panel whenever the Model 990 is turned on.

To use the OSD, the unit must be connected to your display device using either the COMPOSITE VIDEO OUTPUT or S-VIDEO OUTPUT jacks. You may also view the OSD using the COMPONENT VIDEO OUTPUT, but the picture may blank temporarily when you activate the menu system. If both S-Video and composite video signals are input into the Model 990, the OSD can be viewed only through the S-VIDEO OUTPUT jack.

The information presented in the front-panel display will in most cases reflect what is displayed in the OSD, but certain operations require that you use one or the other.

Remote Controls

The Model 990 comes with two remote controls. One is a relatively large, full-function unit that controls all of the Model 990's functions and can also be programmed to control other devices in your audio/video system. The other is a smaller, simpler remote designed specifically for use in a second room, using the Model 990's Zone 2 multi-room audio/video output.

Main Remote

The primary remote control for the Model 990 is a preprogrammed universal remote that offers every function available from the front panel of the preamp/processor, plus many more. All of these functions are displayed on-screen, and many are also displayed on the Model 990's front panel.

This remote also controls as many as seven other devices in your system. It contains an extensive library of IR codes for other devices. Touching any button activates the remote's backlighting for five seconds.

1 SETUP button (see pages 41-42)

Holding down this button for three seconds causes the remote to enter setup mode. In this mode, you can enter an entire set of codes for another device to be controlled, or learn codes directly from another remote.

2 Device control selector buttons (see pages 41-42)

These buttons select the device that the remote will control. Push the TNR button to control the Model 990.

3 Numerical keypad buttons (see pages 37, 41-42)

Use these buttons for control functions requiring you to enter numbers.

4 MUTE button (see page 34)

This button mutes the Model 990's sound in the main room. It does not affect the second zone output. Mute status is shown on the front panel.

5 VOLUME UP and DOWN buttons (see pages 34, 42)

These buttons control the Model 990's volume in the main room. They do not affect the second zone output.

6 SLEEP button (see page 36)

Touch this button to activate the sleep timer. The first push sets the sleep timer at 90 minutes; subsequent pushes set the timer for 60, 45, 30, 20, 15 or 10 minutes. When the timer finishes counting down, it turns the Model 990 off. Once the timer is set, pushing this button displays the remaining time on both the front panel and the on-screen display.

7 TEST button (see page 35)

This button activates the test tone for calibrating the Model 990's channel levels without having to go through the on-screen menu system. It also activates the program guide on most satellite receivers and cable boxes.

8 Cursor control buttons (see page 24)

These buttons navigate the Model 990's on-screen menus, as well as the on-screen menus of DVD players and other devices, which the remote is programmed to control. The cursor up and down buttons are also used to adjust certain parameters of the Model 990.

9 SYNC (see page 36)

Delays audio to maintain proper synchronization of picture and sound. Useful especially with video displays and processors that have a high degree of latency (processing delay), and also with digital TV broadcasts, which

are often out of sync. Each push of the button increases delay by 1 millisecond. The on-screen display indicates the amount of delay. After delay is set, pushing the button again resets delay to 0.

10 DOLBY MODES (see page 34)

Selects desired Dolby Digital mode, such as Dolby Digital 5.1, Dolby Digital EX, or Dolby Virtual Surround. The mode selections appear on the front panel and the on-screen display. Also functions as rewind button for other devices controlled by the remote.

11 TUNE MODE (see page 37)

Selects between FM and FM stereo in both main room and Zone 2. The selected mode appears on-screen.

12 Source selector buttons (see pages 34, 42)

These buttons select which input is active in the main room. The selected source appears on the front panel and the on-screen display.

13 NIGHT button (see page 36)

Activates dynamic range compression to limit peaks for late-night viewing. Repeated presses select minimum, medium and maximum compression levels. The compression level is shown on the on-screen display.

14 Status LED Indicator (see page 41)

Indicates when the remote control is in Programming or Learning mode and flashes to indicate success or failure of these functions.

15 POWER button (see pages 34, 42)

Turns off the Model 990. Also turns other components controlled by the remote on and off.

16 MENU button (see pages 23-33)

Activates the Model 990's on-screen menu. Also serves as enter button for numeric keypad when controlling other devices.

17 STEREO button (see page 35)

Deactivates surround sound and switches to conventional stereo. Stereo status is indicated on the front panel and the on-screen display.

18 CHANNEL UP and DOWN buttons (see page 37)

Adjusts AM/FM radio tuning frequency. Frequency appears on both the front panel and on-screen. Also serves as channel selector when controlling other devices.

19 DIRECT button (see page 37)

This button allows you to directly access a radio station when the tuner is active. Press it once, then enter the station's frequency using the numeric keys.

20 MR button (see page 40)

This button turns the sound and picture on and off in Zone 2 when the Model 990 is turned off.

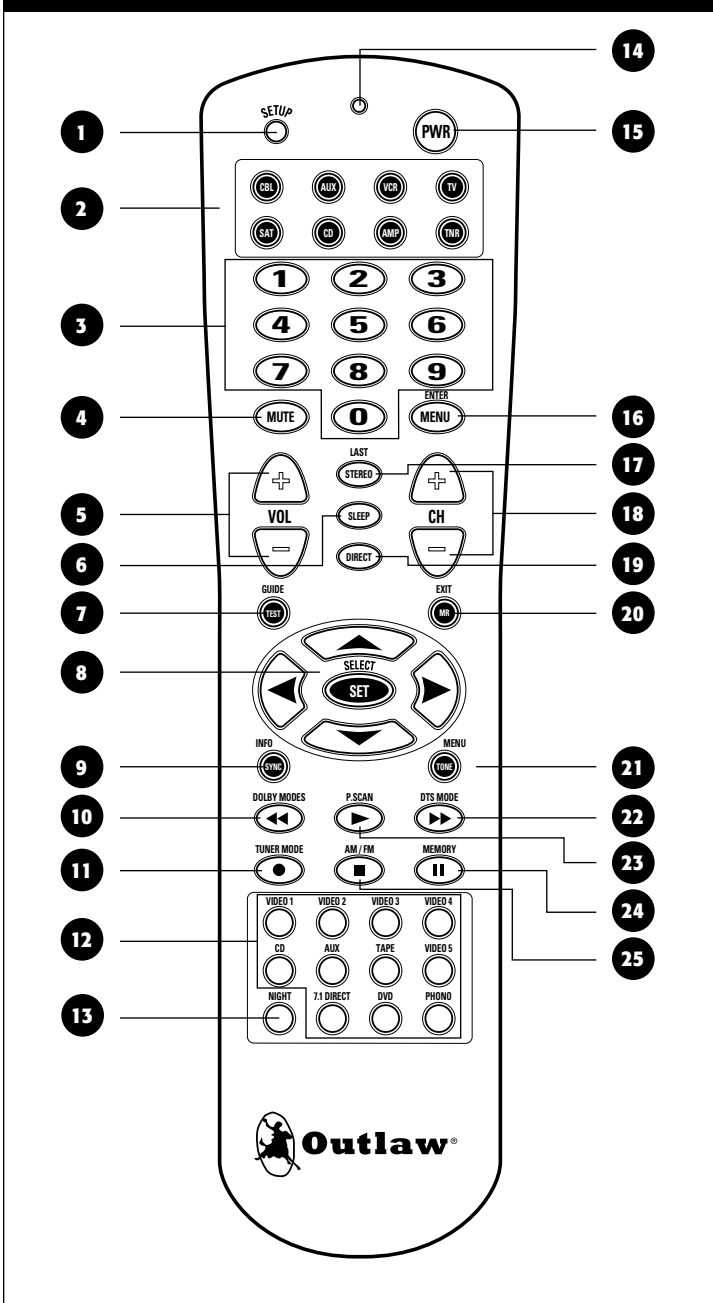
21 TONE button (see page 37)

Activates tone control defeat mode. Press this button once, then toggle tone control defeat on and off with the cursor up and down buttons. Tone control status appears on the front panel and on-screen.

22 DTS MODE button (see page 34)

Selects desired DTS mode, such as DTS 5.1, ES, or Neo:6. The mode selections appear on the front panel and the on-screen display. Also functions as rewind button for many other devices controlled by the remote.

Model 990 Remote Control



23 PRESET SCAN button

Advances AM/FM tuner to next preset in both main room and Zone 2. Frequency and band appear on front panel and on-screen.

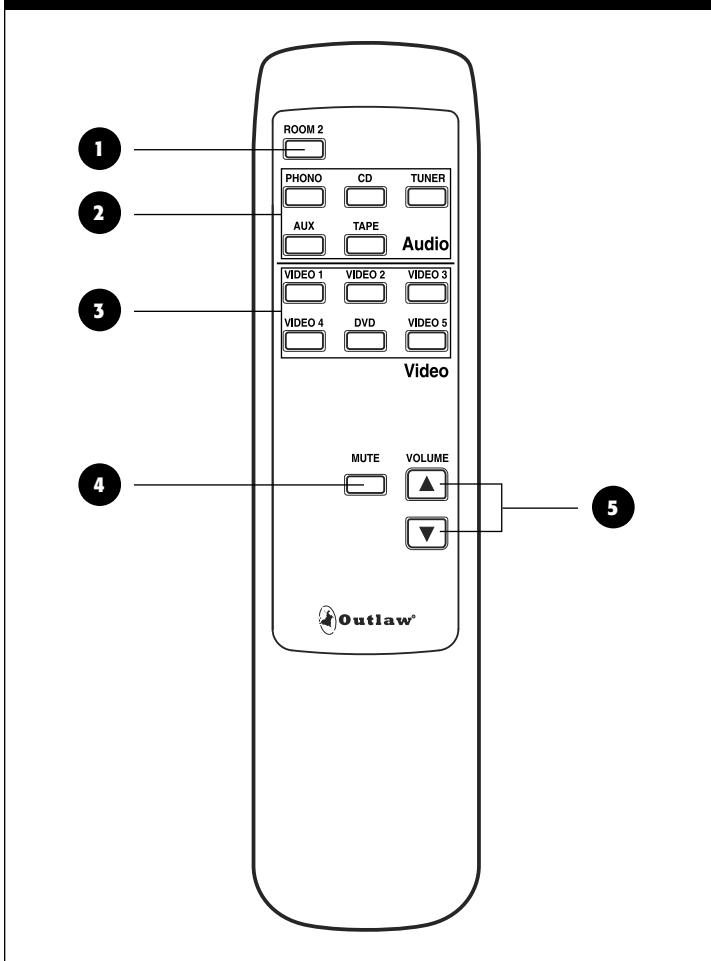
24 MEMORY button (see page 37)

Use this button to select a station memory with the internal AM/FM tuner; press the button then enter the number of the desired memory. Holding this button down for three seconds activates automatic channel scan, which scans the band you are on for the next highest active frequency/station.

25 AM/FM button (see page 37)

Switches to AM/FM tuner. Repeated button pushes switch between AM and FM bands in main room and second zone.

Model 990 Room 2 Remote Control



Zone 2 Remote

This is a simple remote intended solely for use in a second room fed by the Model 990's Zone 2 audio/video output. You will need to install an infrared sensor in Zone 2, connected to one of the Model 990's IR inputs, in order for this remote to function, as it has different remote codes than the main room remote. For that reason, it cannot be used with the Model 990's built-in sensor.

- 1 ROOM 2 button** (see pages 39-40)
Activates the Model 990's Zone 2 video and audio outputs. Turns on the Model 990's power if power is off.
- 2 Audio source selector buttons** (see page 40)
Selects audio-only source for Zone 2: Phono, CD, AM/FM Tuner, Aux or Tape. Does not affect source selection for main room.
- 3 Video source selector buttons** (see page 40)
Selects video/audio source for Zone 2: Video 1, Video 2, Video 3, Video 4, Video 5 or DVD. Does not affect source selection for main room.
- 4 MUTE button** (see page 40)
Mutes sound in Zone 2. Does not affect sound in main zone.
- 5 VOLUME UP and DOWN buttons** (see page 40)
Control volume in Zone 2. Does not affect volume in main zone.

Surround Format Information

The Model 990 incorporates today's most advanced surround-sound technologies, including every existing variant of Dolby and DTS surround sound. Available processing technologies include Dolby Digital, Dolby Digital EX, Dolby Pro Logic IIx Movie and Music modes, DTS, DTS ES-Matrix and ES Discrete, DTS Neo:6, Dolby Headphone, and Dolby Virtual Speaker. It also offers 5-Channel Stereo and 7-Channel Stereo modes.

You may note that the Model 990 includes fewer surround-sound modes than many other surround processors, such as "stadium," "concert hall," "jazz club," etc. This was a conscious omission on our part—we consider such modes artificial-sounding and useless. Our customers have told us they don't use them, either, and would rather not have to scroll past them when selecting surround-sound modes. If you want to hear surround sound from stereo sources, you will achieve the best results by using Dolby Pro Logic II or DTS Neo:6.

The table below lists the surround processing choices available within each mode. Depending on the selected source (analog or digital) and your loudspeaker configuration, certain processing options may not appear or operate.

Dolby Digital

This digital audio format provides 5.1-channel surround sound. Dolby Digital source material includes DVDs, digital TV broadcasts, many PlayStation 2™ video games, all Xbox™ video games, laserdiscs, some satellite-delivered and digital cable programming, and D-VHS tapes.

Dolby Digital EX

Movie soundtracks encoded with Dolby Digital Surround EX contain an extra back surround channel, added to the soundtrack during mixing, which places audio behind the listener. This additional channel provides more detailed imaging behind the listener, enhancing depth, ambience, and sound localization. One or two additional surround speakers may be used. A list of movies EX-encoded movies can be found on the Dolby web site, www.dolby.com.

Dolby Digital EX mode can also be engaged during playback of Dolby Digital material that is not EX-encoded. However, the results will be unpredictable. An alternative is to use Dolby Digital + Pro Logic IIx Movie mode, which is designed for use with 5.1-channel material.

Dolby Pro Logic IIx

Dolby Pro Logic IIx is the latest version of Dolby's Pro Logic technology, which dates back to 1977. Pro Logic II is a substantial improvement over the original Pro Logic process; Pro Logic IIx is a new 7.1-channel version of Pro Logic II. It can be employed only when back surround speakers are connected. Otherwise, the Model 990 will provide only standard Pro Logic II processing.

The Pro Logic IIx Movie mode is intended for Dolby Surround-encoded movie and TV soundtracks. It also works well for video games, especially those encoded in Pro Logic II. Use this mode for VHS tapes, standard TV broadcasts, and DVDs encoded in Dolby Digital 2.0.

The Pro Logic IIx Music mode converts stereo music into surround sound. Use it with any stereo music source, including CDs, FM radio, and MP3 players. The Music mode includes three controls, which are adjustable through the Model 990's on-screen menu:

D	A	Display Text	Name	Description
●	●	PL IIx MOVIE	Pro Logic IIx Movie	Use for 7.1-channel surround-sound playback for movies or videogames from any 2-channel source
●	●	PL IIx MOVIE + DOLBY VS 5-SP WIDE	Pro Logic IIx Movie + Dolby Virtual Surround 5-Speaker Wide	As above, but used to expand the soundfield when front left and right speakers are positioned close to TV
●	●	PL IIx MUSIC	Pro Logic IIx Music	Use for 7.1-channel surround-sound playback for music from any 2-channel source
●	●	PL II MOVIE	Pro Logic II Movie	Use for 5.1-channel surround-sound playback for movies or videogames from any 2-channel source
●	●	PL II MOVIE + DOLBY VS 5-SP WIDE	Pro Logic II Movie + Dolby Virtual Surround 5-Speaker Wide	As above, but used to expand the soundfield when front left and right speakers are positioned close to TV
●	●	PL II MUSIC	Pro Logic II Music	Use for 5.1-channel surround-sound playback for music from any 2-channel source
●	●	DTS NEO:6 CINEMA	DTS Neo:6 Cinema	Creates 6.1-channel sound for stereo movie or TV soundtracks
●	●	DTS NEO:6 MUSIC	DTS Neo:6 Music	Creates 6.1-channel sound for stereo music
●	●	7-CH STEREO	7-Channel Stereo	Creates a 7-channel program from any stereo source
●	●	5-CH STEREO	5-Channel Stereo	Creates a 5-channel program from any stereo source
●		DOLBY DIGITAL	Dolby Digital	5.1-channel processing for all Dolby Digital-encoded sources
●		DOLBY DIGITAL + DOLBY VS 5-SP WIDE	Dolby Digital + Dolby Virtual Surround 5-Speaker Wide	As above, but used to expand the soundfield when front left and right speakers are positioned close to TV
●		DOLBY DIGITAL EX	Dolby Digital EX	6.1-channel processing for Dolby Digital soundtracks encoded with Surround EX
●		DOLBY DIGITAL + PL IIx MOVIE	Dolby Digital + Pro Logic IIx Movie	7.1-channel processing for 5.1-channel Dolby Digital movie soundtracks
●		DOLBY DIGITAL + PL IIx MUSIC	Dolby Digital + Pro Logic IIx Music	7.1-channel processing for 5.1-channel Dolby Digital music video soundtracks
●		DTS	DTS	5.1-channel processing for all DTS-encoded sources
●		DTS ES-MATRIX	DTS	6.1-channel processing for 5.1-channel ES-Matrix-encoded DTS sources
●		DTS ES-DISCRETE	DTS	6.1-channel processing for ES-Discrete-encoded DTS sources
●		DTS + DOLBY VS 5-SP WIDE	DTS + Dolby Virtual Surround 5-Speaker Wide	Same as standard DTS, but used to expand the soundfield when front left and right speakers are positioned close to TV
●		DTS + PL IIx MOVIE	DTS + Pro Logic IIx Movie	7.1-channel processing for 5.1-channel DTS movie soundtracks
●		DTS+ PL IIx MUSIC	DTS + Pro Logic IIx Music	7.1-channel processing for 5.1-channel DTS music video soundtracks

Panorama provides an extension of the front stereo image to the surround channels, creating an enveloping, wraparound effect.

Dimension enables adjustment of the surround effect. Turn this control toward the rear to enhance the surround effect for “dry”-sounding recordings, and toward the front to decrease it for highly reverberant recordings.

Center Width blends sound from the center channel into the left and right channels to create a more seamless front soundstage. At one extreme, no sound is mixed from center into left and right; at the other extreme, this control can completely deactivate the center speaker so a phantom center image is created from just the left and right front speakers.

Pro Logic IIx processing can also be applied to 5.1-channel material, either Dolby Digital or DTS, to create 7.1-channel sound.

DTS

This format is similar to Dolby Digital, but uses a higher sampling rate. In its standard form, DTS provides 5.1-channel surround sound. It is available on CD, DVD, laserdiscs, PlayStation 2 video games, and D-VHS tapes. Audio-only DTS discs may be used with any CD, DVD, or laserdisc player with a digital audio output, but DVD discs with DTS audio must be used on players with the “DTS Digital Out” logo.

DTS-ES

DTS-ES is an extension of the original DTS format that adds an additional back surround channel to a soundtrack. DTS ES-Matrix titles provide the sixth channel by a matrix process, while DTS ES-Discrete media delivers a true,

discrete back surround channel. Both DTS ES formats are backward-compatible with the original DTS process, and will deliver a 5.1-channel output when no center or back surround speakers are available.

The Model 990 will automatically sense the availability of either DTS ES format and automatically switch the processing mode when required.

DTS Neo:6

This processing mode can create up to six full-bandwidth channels from any matrix-encoded 2-channel source. It offers two modes, Cinema and Music. Use the Cinema mode for movie soundtracks, the Music mode for stereo music.

Additional Information

More info about the Model 990's various surround-sound technologies can be found at the www.dtsonline.com and www.dolby.com.

Stereo Listening Modes

The Model 990 also offers advanced technology for stereo listening. Not only does it offer a stereo mode, it also offers additional modes that enhance fidelity.

Stereo

This mode routes sound only to your front left and right speakers, and to your subwoofer if one is connected.

7-Channel Stereo/5-Channel Stereo

These modes expand the sound from a stereo recording into all channels of your surround-sound system. Because they process the sound only minimally, these modes are popular for piping music through the room for a party—you'll get fairly consistent sound all around the room.

Bypass

This mode also routes sound only to your front left and right speakers and subwoofer, but it does not route sound through the Model 990's digital signal processor (DSP). It also deactivates the Model 990's video circuitry, and bypasses the tone controls. It can deliver a somewhat cleaner sound than Stereo mode.

Upsample

This mode uses the latest technology from the world of high-end audio to achieve maximum fidelity from CDs and stereo DVDs. It does this by increasing the word depth and sampling rate of standard-resolution digital audio. For example, it converts CD audio, which has 16-bit word depth and a 44.1-kilohertz sampling rate, into high-resolution, 24-bit/192-kilohertz audio. Rather than simply converting the data, it "fills in the cracks" between the original samples to extract details lost when the original recording was downsampled for CD or DVD. The result is greater delicacy, depth, and dynamic range.

Connecting Your Model 990

Before proceeding, please observe the following precautions when connecting devices to your new Model 990.

- Do not plug the power cord into your Model 990 until all other connections have been made.
- Always refer to the instructions that came with the components that you are connecting to your Model 990.
- For all analog connections, the red input jacks (R) are used for the right channel, white input jacks (L) are used for the left channel, and yellow input jacks are used for the center channel.
- Make sure to insert all plugs and connectors securely. Improper connections can result in noise, poor performance, or damage to the equipment.
- Do not bundle audio/video connection cables with power cords and speaker cables. This may adversely affect the picture and sound quality. For example, run all the power cords down one side of the cabinet, all the signal cords down the other side, and the speaker wires down the center.
- When connecting devices to the digital inputs and outputs, you may also consider hooking up the analog connections to and from the components to ensure that all signals can be employed by the preamp/processor (especially if you plan to use the Model 990's multi-zone capability).
- When using an optical input or output jack, always use a high-quality optical fiber cable.

IMPORTANT NOTE: We strongly recommend that before you connect any loudspeakers to your amplifiers, you complete all needed connections and setup procedures to your Model 990 as outlined below. This will reduce the chance that a misconnection or other error will produce audio output that might damage your speakers or other components.

Given the wide variety of components that can be used with your Model 990, there are numerous ways in which your system can be connected. To help you with this task, we have provided a chart (page 19) to record which components are connected to the Model 990, as well as which type of input (analog, coaxial, S-Video, etc.) is used. Keep this chart for future reference.

In many cases, there will be several possible ways to connect a particular device. Use the diagrams on the following pages as a guideline. The information in this section contains some of the more common situations you might encounter in your system. Always consult the owner's manual that came with the component you are connecting for more information on the source component's connections.

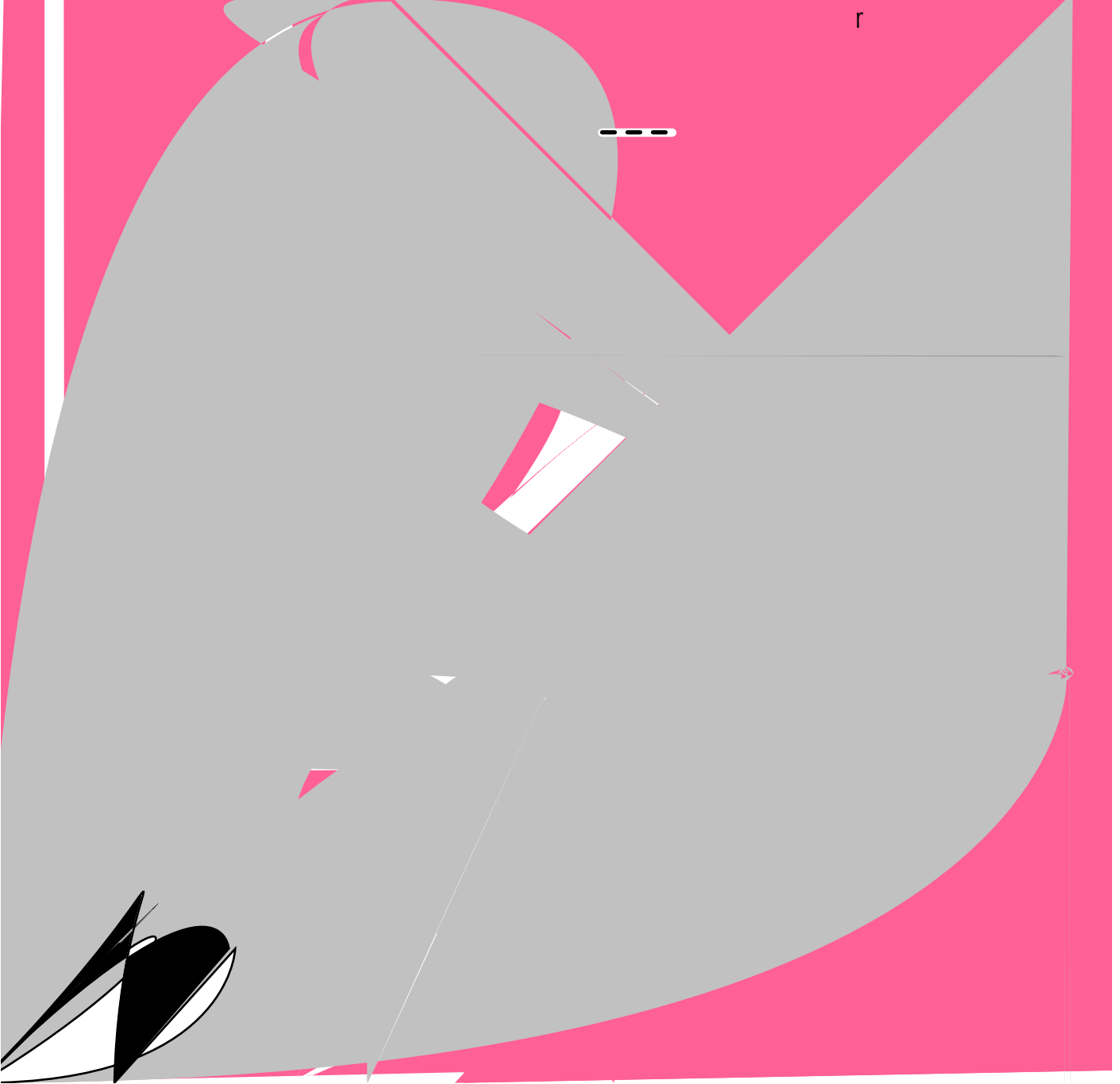
Connecting Audio Components

CD Player or Music Server

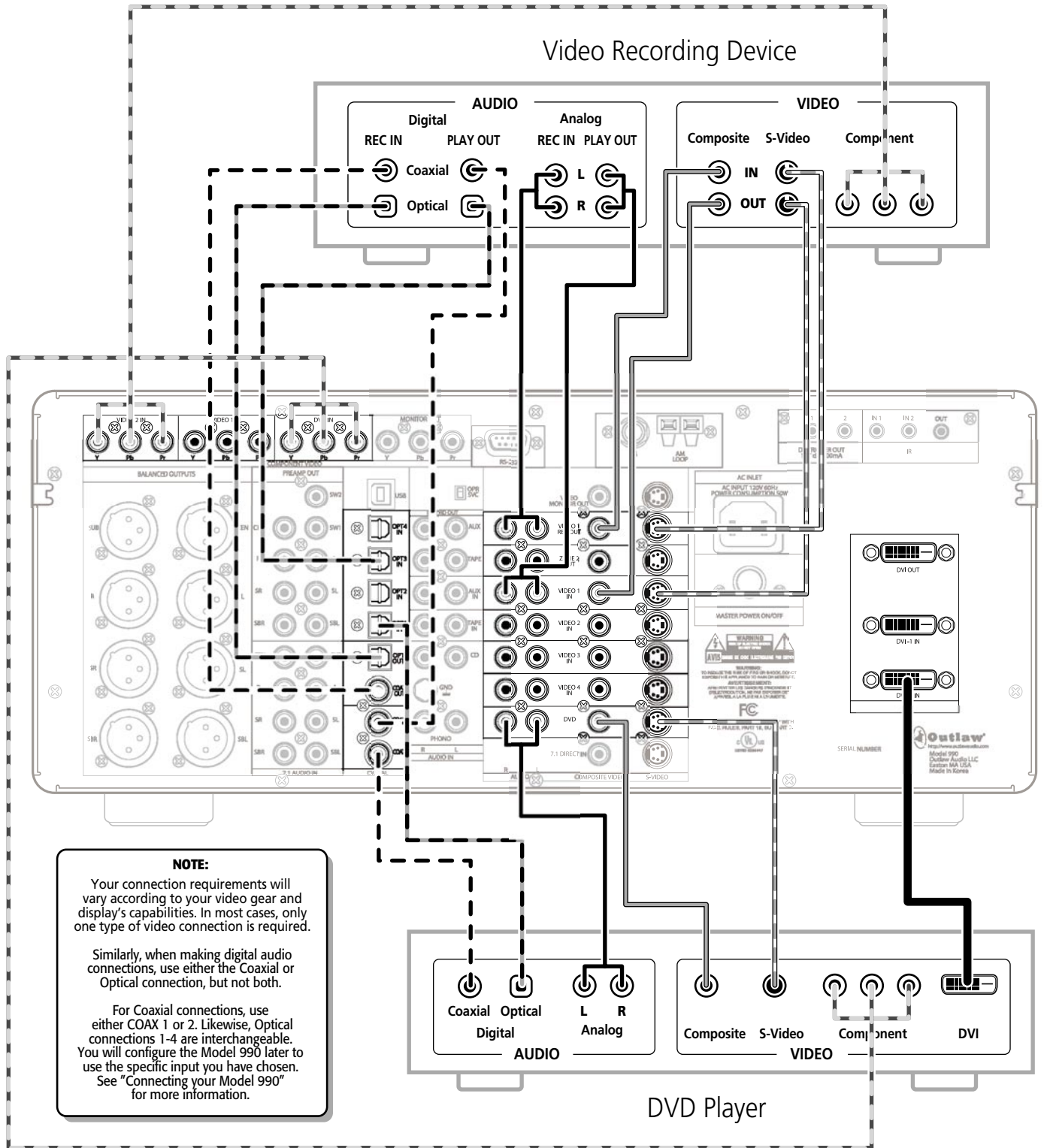
Analog Connect the L and R channel outputs on the CD player or music server to the CD jacks on the Model 990.

Digital If your CD player or music server has a digital output jack, connect it to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks, depending on the type of connector used by the CD player. Later, you will configure the Model 990 to use the specific input that you have chosen. For now, note which digital input you used on your system chart.

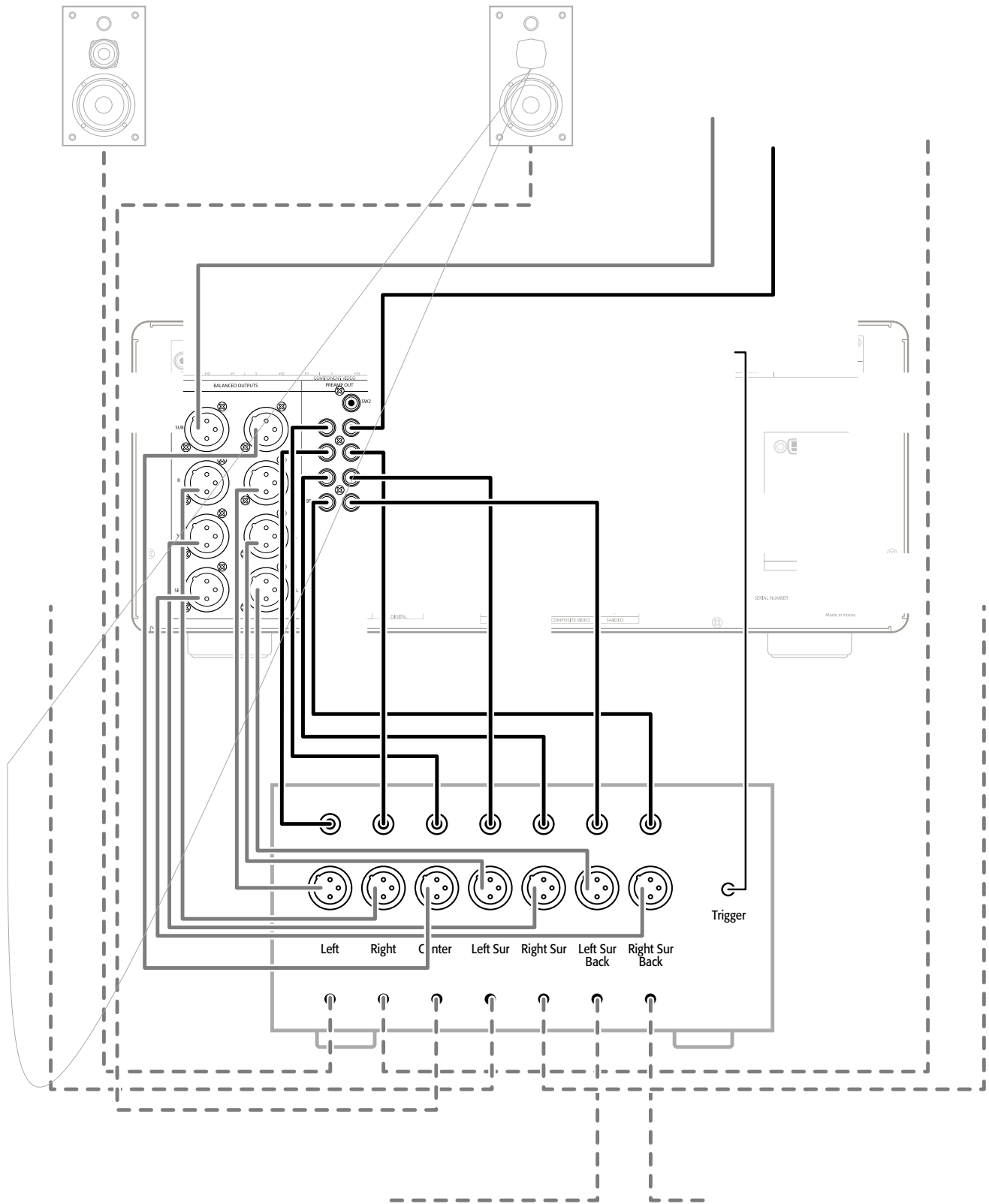
Connecting Audio Equipment to the Model 990



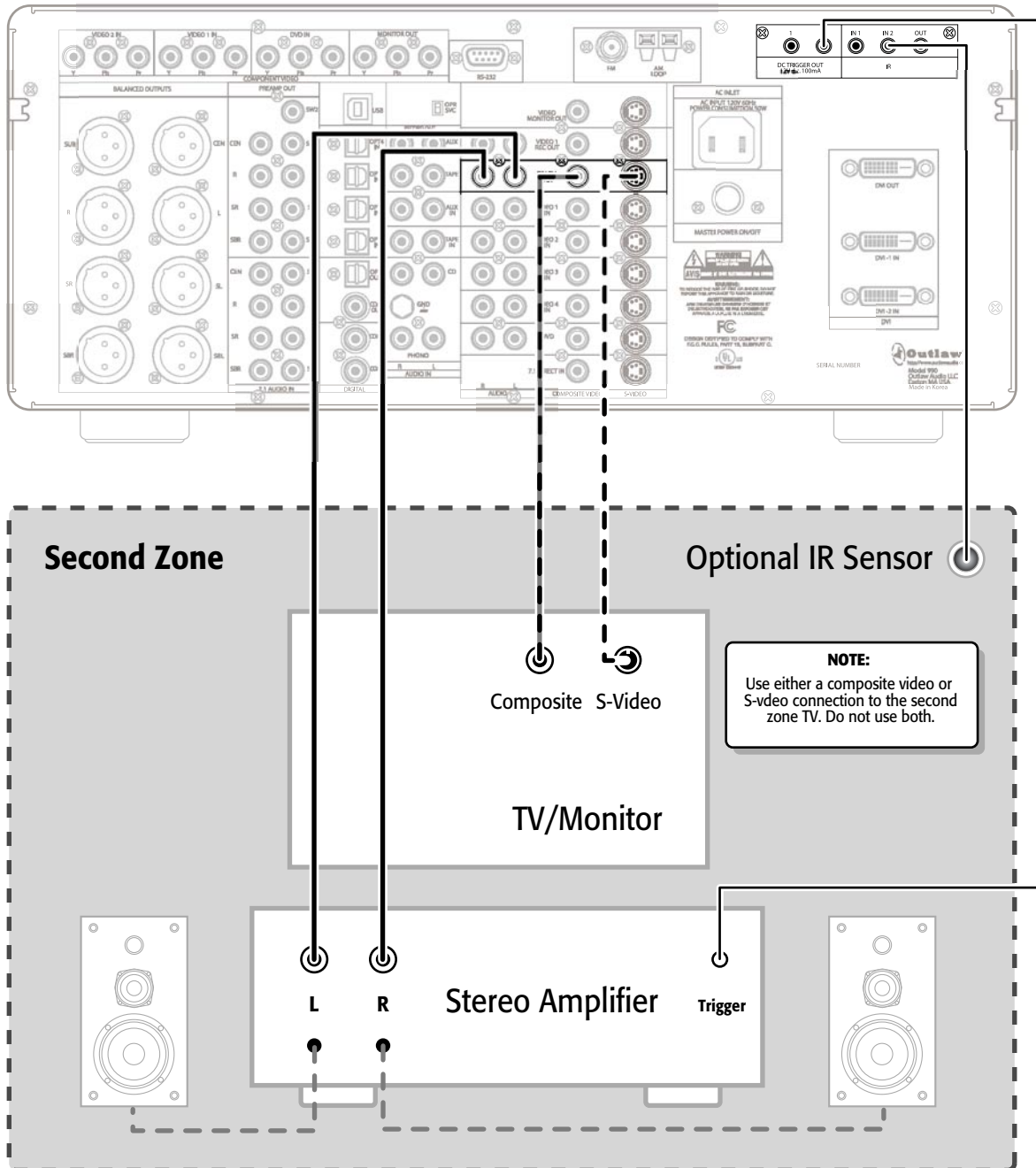
Connecting Video Equipment to the Model 990



Connecting an External Amplifier to the Model 990



Connecting the Model 990 to Audio/Video Equipment in a Second Zone



Connection Record Chart

DVD		VIDEO 1		VIDEO 2		VIDEO 3		VIDEO 4	
Device _____		Device _____		Device _____		Device _____		Device _____	
Surr Mode _____		Surr Mode _____		Surr Mode _____		Surr Mode _____		Surr Mode _____	
Video		Video		Video		Video		Video	
Composite	<input type="checkbox"/>	Composite	<input type="checkbox"/>	Composite	<input type="checkbox"/>	Composite	<input type="checkbox"/>	Composite	<input type="checkbox"/>
S-Video	<input type="checkbox"/>	S-Video	<input type="checkbox"/>	S-Video	<input type="checkbox"/>	S-Video	<input type="checkbox"/>	S-Video	<input type="checkbox"/>
Component 1	<input type="checkbox"/>	Component 1	<input type="checkbox"/>	Component 1	<input type="checkbox"/>	Component 1	<input type="checkbox"/>	Component 1	<input type="checkbox"/>
Component 2	<input type="checkbox"/>	Component 2	<input type="checkbox"/>	Component 2	<input type="checkbox"/>	Component 2	<input type="checkbox"/>	Component 2	<input type="checkbox"/>
Component DVD	<input type="checkbox"/>	Component DVD	<input type="checkbox"/>	Component DVD	<input type="checkbox"/>	Component DVD	<input type="checkbox"/>	Component DVD	<input type="checkbox"/>
DVI 1	<input type="checkbox"/>	DVI 1	<input type="checkbox"/>	DVI 1	<input type="checkbox"/>	DVI 1	<input type="checkbox"/>	DVI 1	<input type="checkbox"/>
DVI 2	<input type="checkbox"/>	DVI 2	<input type="checkbox"/>	DVI 2	<input type="checkbox"/>	DVI 2	<input type="checkbox"/>	DVI 2	<input type="checkbox"/>
Audio		Audio		Audio		Audio		Audio	
Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>
Coaxial 1	<input type="checkbox"/>	Coaxial 1	<input type="checkbox"/>	Coaxial 1	<input type="checkbox"/>	Coaxial 1	<input type="checkbox"/>	Coaxial 1	<input type="checkbox"/>
Coaxial 2	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>
Optical 1	<input type="checkbox"/>	Optical 1	<input type="checkbox"/>	Optical 1	<input type="checkbox"/>	Optical 1	<input type="checkbox"/>	Optical 1	<input type="checkbox"/>
Optical 2	<input type="checkbox"/>	Optical 2	<input type="checkbox"/>	Optical 2	<input type="checkbox"/>	Optical 2	<input type="checkbox"/>	Optical 2	<input type="checkbox"/>
Optical 3	<input type="checkbox"/>	Optical 3	<input type="checkbox"/>	Optical 3	<input type="checkbox"/>	Optical 3	<input type="checkbox"/>	Optical 3	<input type="checkbox"/>
Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>
Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>
USB	<input type="checkbox"/>	USB	<input type="checkbox"/>	USB	<input type="checkbox"/>	USB	<input type="checkbox"/>	USB	<input type="checkbox"/>
CD		AUX		TAPE		PHONO		DC TRIGGER	
Device _____		Device _____		Device _____		Device _____		1 _____	
Surr Mode _____		Surr Mode _____		Surr Mode _____		Surr Mode _____		2 _____	
Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>	Analog	<input type="checkbox"/>	VIDEO 1 REC OUT		EXT REMOTE	
Coaxial 1	<input type="checkbox"/>	Coaxial 1	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>				
Coaxial 2	<input type="checkbox"/>	Coaxial 2	<input type="checkbox"/>			Device _____		1 _____	
Optical 1	<input type="checkbox"/>	Optical 1	<input type="checkbox"/>						
Optical 2	<input type="checkbox"/>	Optical 2	<input type="checkbox"/>			7.1 IN		2 _____	
Optical 3	<input type="checkbox"/>	Optical 3	<input type="checkbox"/>						
Optical 4	<input type="checkbox"/>	Optical 4	<input type="checkbox"/>			Device _____		Video	
Optical 5	<input type="checkbox"/>	Optical 5	<input type="checkbox"/>						
USB	<input type="checkbox"/>	USB	<input type="checkbox"/>			Audio		Composite <input type="checkbox"/>	
MONITOR OUT		ZONE OUT		DIG OUT COAX		Analog <input type="checkbox"/>		S-Video <input type="checkbox"/>	
Device _____		Device _____		Device _____					
Video		Video		DIG OUT OPT		Coaxial <input type="checkbox"/>		Component <input type="checkbox"/>	
Composite	<input type="checkbox"/>	Composite	<input type="checkbox"/>	_____		Optical <input type="checkbox"/>		DVI <input type="checkbox"/>	
S-Video	<input type="checkbox"/>	S-Video	<input type="checkbox"/>	_____					
Component	<input type="checkbox"/>	Audio		_____					
DVI	<input type="checkbox"/>	Analog	<input type="checkbox"/>	_____					

Audio Recorder

A recording device such as a cassette deck, MD recorder, DAT deck, or CD recorder can be connected to the Model 990 using either or both of the following methods.

Analog Connect the L and R audio outputs on the recorder (usually marked PLAY) to the TAPE IN jacks on the rear of the Model 990 and connect the L and R audio inputs (usually marked REC) to the RECORD OUT/TAPE jacks of the Model 990.

Digital If your recorder has a digital output jack, connect it to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the Model 990, depending on the type of connector used by the device. Later, you will configure the Model 990 to use the specific input that you have chosen. For now, note which digital input you used on your system chart. If your recorder has a digital input jack, connect it to either the coaxial (COAX OUT) or optical output (OPT OUT) jack on the Model 990. The signal from the selected digital input source of the Model 990 will be sent to the recorder.

Computer

Computer audio can be connected to the Model 990 in a variety of ways. You will get the best sound using any of the digital audio connections. You can also use your computer to record sound from the other devices connected to the Model 990.

Analog Using an 1/8-inch stereo miniplug to dual-RCA adapter cable, connect the audio output minijack on the computer's sound card to the TAPE IN jacks on the rear of the Model 990. Likewise, connect the audio input minijack to the RECORD OUT/TAPE jacks of the Model 990.

Digital If your computer has a USB jack, you may connect it to the Model 990's USB input. You may have to use an adapter to convert the flatter USB-A jack used on most computers to the squarish USB-B jack found on the Model 990. Use the USB input only for stereo audio; if you attempt to play a Dolby Digital or DTS soundtrack through it, it may produce loud noise that could damage your speakers or your hearing. Also, the audio from the USB input will not appear on the Model 990's coaxial or digital audio outputs.

Alternatively, if your computer has a digital audio output jack, you can connect it to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the Model 990, depending on the type of connector used by the computer. Later, you will configure the Model 990 to use the specific input that you have chosen. For now, note which digital input you used on your system chart. If your computer has a digital input jack, connect it to either the coaxial (COAX OUT) or optical output (OPT OUT) jack on the Model 990. The signal from the selected digital input source of the Model 990 will be sent to the computer.

MP3 Player

You can use any analog audio input to connect an MP3 player to the Model 990, but you may find it easiest to use the front (VIDEO 5) input. Use a 1/8-inch stereo miniplug to dual-RCA adapter cable to connect the MP3 player's audio output minijack to the L and R input jacks on the front of the Model 990.

Turntable

Connect the L and R channel outputs on the turntable to the PHONO jacks on the Model 990. Attach the turntable's grounding cable to the binding post located just above the Model 990's PHONO jacks.

Connecting Video Components

Before making connections to any video devices, it will help to understand how the Model 990 routes the video portion of the signal.

- Any signal that appears at one of the composite video input jacks (DVD, VIDEO 1-5 IN) is automatically sent to the composite and S-Video VIDEO MONITOR OUT and VIDEO 1 REC OUT jacks, and to the component MONITOR OUT jacks.
- Any signal that appears at the S-Video input jacks (DVD, VIDEO 1-5 IN) is automatically sent to the composite and S-Video VIDEO MONITOR OUT and VIDEO 1 REC OUT jacks, and to the component MONITOR OUT jacks.
- Any signal that appears at the component video (DVD, VIDEO 1-2 IN) input jacks is automatically sent to the component video MONITOR OUT jacks only.
- Any signal that appears at the DVI video (DVI-1 IN, DVI-2 IN) input jacks is automatically sent to the DVI OUT jack only.

NOTE: To provide the greatest flexibility, you should connect a composite or S-Video cable from all of your video devices to the Model 990, even if you are already using a component video or DVI connection. This will allow all of your video sources to be visible in the second zone, if you are using the Model 990's multi-zone capability.

Also, because the Model 990's on-screen display does not appear on the DVI OUT jack, you should always use a component, S-Video, or composite video connection in addition to the DVI connection.

DVD Player

Composite Connect the composite video output from the DVD player to the DVD composite video input jack on the rear of the Model 990 using an RCA-type video cable.

S-Video If there is an S-Video output on the DVD player, and you have an S-Video input on your TV or monitor, connect it to the S-Video DVD input on the rear of the Model 990 using an S-Video cable. S-Video delivers a better picture than composite connections and should be used whenever possible—unless you can use component or DVI connections, which deliver better pictures than S-Video.

Component If the DVD player has component video outputs, connect them to the component DVD IN jacks on the rear of the Model 990.

DVI/HDMI If the DVD player has a DVI or HDMI video output, and your video monitor has DVI or HDMI input, connect the DVD player to the DVI-1 IN or DVI-2 IN jack on the rear of the Model 990. For HDMI-equipped DVD players, use an HDMI-to-DVI adapter.

Analog Audio Connect the L and R channel outputs on the DVD player to the DVD analog audio jacks on the rear of the Model 990.

Digital Audio Connect the digital output jack on the DVD player to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the rear of the Model 990, depending on the type of connector used by the DVD player. Later, you will configure the Model 990 to use the specific digital audio input that you have chosen. For now, note which digital input you connected to on your system chart.

Multi-Channel Audio If your DVD player supplies a multi-channel audio output for DVD-Audio or SACD playback, connect the six outputs from your player to the 7.1 AUDIO IN jack set on the rear panel of the Model 990. Use the L, R, CEN, SUB, SL, and SR jacks; ignore the jacks labeled SBL and SBR. (These are intended to accommodate 7.1-channel audio technology if it appears in the future.) Be careful to match the connections—L to L, right surround to SR, center to CEN, and so on. If your player includes a built-in Dolby Digital decoder with 5.1-channel analog audio outputs but no DVD-A or SACD capability, we suggest that you do not use them. Use one of the Model 990's digital audio inputs instead—you'll get better sound.

NOTE: You must use the 7.1 AUDIO IN multi-channel audio input for SACD and DVD-Audio players in order to hear the high-resolution digital sound these players provide. Do not use the DVD player input.

Video Recorder

A video recording device such as a VCR, PVR (such as TiVo®, Replay®, Dish-Player®, or similar device) or DVD recorder can be connected to the Model 990 using the following methods.

Composite Connect the composite video output from the recording device to the VIDEO 1 IN composite video input jack on the rear of the Model 990. Connect the recording device's composite video input to the VIDEO 1 REC OUT composite video jack of the Model 990.

S-Video If there is an S-Video output on the recording device, connect it to the S-Video VIDEO 1 IN S-Video jack on the rear of the Model 990. Connect the S-Video input to the VIDEO 1 REC OUT S-Video jack. S-Video delivers a better picture than composite connections and should be used whenever possible, unless you can use component or DVI connections.

Component If the recording device has a component video output, and your TV has a component video input, connect the recording device to one of the component video input jacks (VIDEO 1 IN, VIDEO 2 IN, or DVD IN) on the rear of the Model 990.

DVI/HDMI If the recording device has a DVI or HDMI video output, and your video monitor has DVI or HDMI input, connect the recording device to the DVI-1 IN or DVI-2 IN jack on the rear of the Model 990. For HDMI-equipped recording devices, use an HDMI-to-DVI adapter.

Analog Audio Connect the L and R audio outputs on the recorder to the VIDEO 1 IN audio jacks on the rear of the Model 990 and connect the L and R inputs of the recorder to the VIDEO 1 REC OUT audio jacks on the Model 990.

Digital Audio If your recording device also has a digital audio output jack, connect it one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the rear of the Model 990, depending on the type of connector used by the device. Later, you will configure the Model 990 to use the specific input that you have chosen. For now, note which digital input you used on your system chart.

If your recording device also has a digital input jack, connect it to either the coaxial (COAX OUT) or optical (OPT OUT) output jack on the rear of the Model 990, depending on the type of connector used by the device. The signal from the selected digital input source of the Model 990 will be sent to the recorder.

Digital TV Tuner/Cable Box/Satellite Receiver

Composite Connect the composite video output from the TV tuner to a composite video input jack (VIDEO 1-4 IN) on the rear of the Model 990.

S-Video If there is an S-Video output on the TV tuner, and you have an S-Video input on your TV or monitor, connect it to the S-Video input jack (VIDEO 1-4 IN) on the rear of the Model 990.

Component If the TV tuner has a component video output, and your TV has a component video input, connect the TV tuner to one of the component input jacks (VIDEO 1 IN, VIDEO 2 IN) on the rear of the Model 990.

DVI/HDMI If the TV tuner has a DVI or HDMI video output, and your video monitor has DVI or HDMI input, connect the TV tuner to one of the the DVI inputs (DVI-1 IN or DVI-2 IN) on the rear of the Model 990. For HDMI-equipped TV tuners, use an HDMI-to-DVI adapter.

Analog Audio Connect the L and R channel outputs on the TV tuner to the analog audio input on the rear of the Model 990 that corresponds to the video input (VIDEO 1-4 IN) you used.

Digital Audio Connect the digital output jack on the TV tuner to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the rear of the Model 990, depending on the type of connector used by the TV tuner. Later, you will configure the Model 990 to use the specific digital audio input that you have chosen. For now, note which digital input you connected to on your system chart.

Video Display Connections

A video display device such as a television or a video projector can be connected to the Model 990 using the following methods.

Main Zone

Composite Connect the composite video input from the display to the composite (yellow) VIDEO MONITOR OUT jack on the rear of the Model 990.

S-Video If there is an S-Video input on the display, connect it to the S-Video VIDEO MONITOR OUT jack on the rear of the Model 990.

Component If your display has a component video input, connect it to the component video MONITOR OUT jacks on the rear of the Model 990. You should connect this in addition to an S-Video or composite video connection.

DVI/HDMI If your video display has a DVI or HDMI video input, connect it to the DVI OUT jack on the Model 990. If the display has only an HDMI input, use an HDMI-to-DVI adapter.

NOTE: Because the Model 990's on-screen display does not appear on the DVI OUT jack, you should always use a component, S-Video, or composite video connection in addition to the DVI connection.

Analog Audio If your TV has an internal tuner and offers an analog audio output for its internal tuner, connect the L and R channel outputs on the TV to an analog audio input (VIDEO 1-4 IN or AUX IN) on the rear of the Model 990.

Digital Audio If your TV tuner has a digital audio output, connect it to one of the coaxial (COAX 1 or 2) or optical (OPT 1-4 IN) input jacks on the rear of the Model 990, depending on the type of connector used. Note, that with some cable set-top boxes, it is advisable to make both an analog and digital audio connection. Later, you will configure the Model 990 to use the specific digital audio input that you have chosen. For now, note which digital input you used on your system chart.

Second Zone

Composite Connect the composite video input from the display to the composite (yellow) ZONE 2 OUT jack on the rear of the Model 990.

S-Video If there is an S-Video input on the display, connect it to the S-Video ZONE 2 OUT jack on the rear of the Model 990. Normally, an S-Video connection delivers a better picture, but S-Video performance degrades in cable runs longer than about 25 feet unless you use high-quality cable. If you must run a cable further than 25 feet to your second zone, you may find a composite video cable to be the most cost-effective solution.

Antenna Connections

The Model 990 has an internal AM/FM tuner with separate external connections for each radio band.

FM Antenna

Connect the supplied FM dipole antenna to the two screw terminals on the supplied 75-to-300-ohm balun. Push the balun's coaxial connector onto the connector labeled FM on the back of the Model 990.

The supplied FM antenna is for indoor use only. For best signal reception you must fully extend the antenna. Experiment with the antenna's position to obtain the strongest signal. You can attach it to a wall or other surface using push pins, tacks, or small nails.

If FM reception is poor with the supplied indoor antenna, we recommend using an amplified indoor or outdoor antenna. You can connect a 75-ohm type FM antenna directly to the Model 990 without using a balun.

AM Antenna

Connect the supplied AM antenna to the push terminals labeled AM LOOP on the rear panel of the Model 990. Start by pressing in the lever on the bottom of one of the terminals. Next, insert one of the antenna wires. Release the lever and repeat the process with the other lever and the other wire.

Experiment with the antenna's position to obtain the strongest signal.

Amplifier Connections

IMPORTANT NOTE: Before attempting to make any connection to your power amplifier, make sure the amplifier is turned off and/or disconnected from AC power. Failure to do so can result in severe damage to your amplifier and/or loudspeakers.

Main Zone

DC Trigger

The Model 990 has two DC TRIGGER OUT jacks.

DC TRIGGER OUT 1 is always used to turn on other devices when the Model 990 is powered on, and to turn them off when you turn off the Model 990. We recommend this jack with a compatible power amplifier, such as those available from Outlaw.

Use a cable tipped at each end with a 1/8-inch (3.5mm) mono phone plug to connect the Model 990's DC TRIGGER OUT 1 jack to the amplifier's DC Trigger Input jack.

DC TRIGGER OUT 2 is an assignable trigger that activate devices that you want to use only with specific inouts. For example, you can activate DC TRIGGER 2 for video inputs, to lower a projection screen and turn on a video projector. This way, your video system turns on automatically when you select a video input on the Model 990. You can also use DC TRIGGER 2 to close motorized drapes or shades, or dim automated lighting.

To select whether or not an input triggers DC TRIGGER OUT 2, see page 25.

Use a cable tipped at each end with a 1/8-inch (3.5mm) mono phone plug to connect the Model 990's DC TRIGGER OUT 2 jack to the DC Trigger Input jack on the component you want to control. You may have to use an adapter, depending on what type of input jack the other component uses.

RS-232 Port

The Model 990's RS-232 port can be used to control the Model 990 through a computer touchscreen remote, or to upload new software into the Model 990.

NOTE: When making connections to the RS-232 port, be certain to use a "straight-through" male-to-female serial cable with DB-9 connectors on each end. DO NOT use a serial cable designed for "null modem" use.

Power Connection

Insert the supplied power cord into the AC input of the rear panel of the Model 990. Use only the supplied power cord—do not substitute a standard IEC type power cord.

CAUTION: Before you plug the power cord into an AC wall outlet, confirm that oil connections to the Model 990 have been made correctly.

WARNING: Never disconnect the power cord from the Model 990 while the other end is plugged into an AC outlet. Doing so may cause an electric shock. Always connect power by plugging into the AC outlet last and disconnect by unplugging from the AC outlet first.

Input Configuration

Your first step in setting up the Model 990 is to configure its inputs. In this step, you will tell the Model 990 which signals you are feeding it from each source device. You can also customize each input, assigning it a new name, a default surround mode, a default lip-synch delay, etc.

Before you begin input configuration, make sure all of the connections have been made from your Model 990 to your source components, amplifier(s), and speakers.

First, you turn on both the Model 990 and your video display.

To turn the Model 990 on:

1. Press the **MASTER POWER ON/OFF** button on the unit's rear panel until it latches.

The Standby/On indicator on the front panel will glow amber.

2. Press the **STANDBY** button on the front panel, or any input select button (such as DVD, VIDEO 1, or CD) on the remote control.

The Standby/On indicator will turn blue, and the front-panel display will illuminate.

To configure an input:

1. Press the **MENU** button on the front panel or the remote to display the Main Menu.

The Main Menu appears on-screen:

MAIN MENU	
> INPUT	CONFIG
AUTO SETUP	
SPEAKER	SIZE
SPEAKER	X-OVER
SURROUND	CONFIG
CHANNEL	CALIBRATE
DELAY	ADJUST
SYSTEM	CONFIG
MULTI-ROOM	CONFIG

2. Press **SET** on the front panel or the remote.

The Video Input Configuration Selection screen appears:

VIDEO INPUT CONFIG	
> DVD	CONFIG
VIDEO 1	CONFIG
VIDEO 1	CONFIG
VIDEO 1	CONFIG
VIDEO 1	CONFIG
VIDEO 1	CONFIG
7.1 DIRECT	CONFIG
GO TO AUDIO INPUTS	
RETURN TO MAIN MENU	

3. If you are configuring a video input, skip to the Step 4. If you wish to configure an audio-only input (such as CD or Aux), press the ▲ button until the onscreen narrow points to "Go to Audio Inputs," then press SET.

The Audio-Only Input Configuration Selection screen will appear:

```
AUDIO INPUT CONFIG
> TUNER      CONFIG
  CD         CONFIG
  AUX        CONFIG
  PHONO      CONFIG
  TAPE       CONFIG

GO TO VIDEO INPUTS
RETURN TO MAIN MENU
```

4. Press ▲ or ▼ on the front panel or the remote to move the on-screen arrow to the input you want to configure, then press SET.

The Configuration Screen for that input will appear:

```
DVD          CONFIG
> NAME:      DVD
  AUDIO      :COAXIAL 1
  VIDEO      :COMP 1
  OSD MSG    :ON
  SURR MODE  :UPSAMPLE
  LIP SYNC DELAY:000mS
  TRIGGER 2  : OFF
  RETURN TO VIDEO INPUTS
  RETURN TO MAIN MENU
```

Renaming Video Inputs

Although the Model 990's video inputs are already named, you may rename them to better reflect the identity of your video sources—for example, you might rename the VIDEO 2 input to SATELLITE. Of course, you cannot rename the input selector buttons on the remote control, but you can change the way the names appear on the Model 990's front panel and on-screen display.

To rename an input:

1. With the arrow pointing to NAME, press SET.

A cursor will start to flash above the first letter in the input name:

```
DVD          D CONFIG
> NAME:      DVD
  AUDIO      :COAXIAL 1
  VIDEO      :COMP 1
  OSD MSG    :ON
  SURR MODE  :UPSAMPLE
  LIP SYNC DELAY:000mS
  TRIGGER 2  : OFF
  RETURN TO VIDEO INPUTS
  RETURN TO MAIN MENU
```

2. Press ▲ or ▼ to find the letter, number, or symbol you want. Uppercase and lowercase letters are available, as are numbers 0-9, various punctuation symbols, and blank spaces.
3. Once you have selected the letter, number, or symbol, press ► to move on to the next letter. Repeat the process for each letter in the name.
4. When you are finished renaming the input, press SET to continue configuring the input.

Audio Input Selection

Now you need to tell the Model 990 which audio input is used for the source device you are configuring. You may want to reference the system chart you filled out when you connected your source devices to the Model 990.

To select the audio input:

1. Press ▼ once to move the on-screen arrow to Audio.
2. Press ◀ or ▶ to scroll through the available audio inputs.

The input choices appear as follows as you scroll through them:

```
ANALOG→COAXIAL 1→COAXIAL 2→OPTICAL 1→
OPTICAL 2→OPTICAL 3→OPTICAL 4→OPTICAL 5→
USB
```

If you connected the source to the analog inputs, select ANALOG.

If you connected the source to one of the optical inputs, select the appropriate one by choosing OPTICAL 1-5.

If you connected the source to one of the coaxial inputs, select the appropriate one by choosing COAXIAL 1 or 2.

If you connected the source to the USB input, select USB.

Video Input Selection

Now you need to tell the Model 990 which video input is used for the source device you are configuring. You may want to reference the system chart you filled out when you connected your source devices to the Model 990.

To select the video input:

1. Press ▼ once to move the on-screen arrow to Video.
2. Press ◀ or ▶ to scroll through the available video inputs.

The input choices appear as follows as you scroll through them:

```
DVI 1→DVI 2→COMP-DVD→COMP 1→COMP 2→
S-VIDEO→COMPOSITE
```

If you connected the source to the composite input for that source, select COMPOSITE.

If you connected the source to the S-Video input for that source, select S-VIDEO.

If you connected the source to one of the component inputs, select the appropriate one by choosing COMP 1, COMP 2, or COMP-DVD.

If you connected the source to one of the DVI inputs, select the appropriate one by choosing DVI 1 or DVI 2.

On-screen Message On/Off

When you adjust the volume or select a different input, a confirming text message appears on the screen of your video monitor. You can deactivate this function for specific inputs if you wish. The on-screen menu system will still function even when on-screen messages are deactivated.

To turn on-screen messages on and off:

1. From the Configuration screen for the input you want to adjust, press ▲ or ▼ to move the on-screen arrow to OSD MSG.
2. Press ◀ or ▶ to turn on-screen messages on and off for that input.

Default Surround Mode Selection

You can set a default surround mode for each stereo source. When you switch to that input from another input, the Model 990 will switch to the default surround mode for that input.

NOTE: *The Model 990 defaults to Dolby Pro Logic II(x) Movie mode with any source device supplying Dolby Digital 2.0 or PCM sources. If you wish to set a different default mode for listening to CDs with your DVD player, you can do using the analog audio outputs of your DVD player, or an additional digital output if your DVD player is equipped with one. Simply connect the analog outputs of your DVD player to the Model 990's analog CD inputs, or connect the additional digital output to an unused digital input of the Model 990. You will need to configure the CD input appropriately, as described in the Input Configuration section on page 23.*

To select a default surround mode:

1. From the Configuration screen for the input you want to adjust, press ▲ or ▼ to move the on-screen arrow to SURR MODE.
2. Press ◀ or ▶ to scroll through the available surround modes.

The surround mode choices vary depending on what type of signal the input is currently receiving.

If you are using an analog input, or a digital input receiving a 2-channel signal, or if the video source is stopped or turned off, the choices appear as follows as you scroll through them:

STEREO→BYPASS→UPSAMPLE→PLIIx MOVIE→PLIIx
 MUSIC→DVS WIDE→NEO:6 CINE→NEO:6 MUSIC→7CH
 STEREO→5CH STEREO

Lip Sync Delay

Because video is more data-intensive than audio, processing video takes longer. As a result, sometimes the video will lag behind the audio, causing a lip sync error. The problem may vary with each source device. In particular, digital TV tuners (or the stations they receive) seem to cause lip sync problems more than do DVD players. The Model 990 lets you delay the audio to fix this problem. It also lets you set a different lip sync delay for each input, in increments of one millisecond.

You can also adjust lip sync delay directly from the remote, without using the on-screen menu. See page 36 for instructions. Lip sync delay is not available for audio-only inputs.

To set lip sync delay:

1. Play the source for which you want to adjust lip sync delay.
2. From the Configuration screen for the input you want to adjust, press ▲ or ▼ to move the on-screen arrow to LIP SYNC DELAY.
3. Press ▶ to increase the amount of lip sync delay, or ◀ to decrease it.

The audio will mute when you are increasing or decreasing lip sync delay. Wait a second and the audio will reappear. Watch the actors' lips and listen to the dialogue to see if your lip sync setting is correct.

Trigger 2 On/Off

DC TRIGGER OUT 2 is an assignable trigger, activated only when you select certain inputs. This is used to activate devices that you want to use only at particular times. For example, you can activate DC TRIGGER 2 for all of your video inputs, and use it to lower a projection screen and turn on a video projector. This way, your video system turns on automatically when you select a video input on the Model 990. You can also use DC TRIGGER 2 to close motorized drapes or shades, or dim automated lighting.

To configure an input to trigger DC TRIGGER OUT 2:

1. From the Configuration screen for the input you want to adjust, press ▲ or ▼ to move the on-screen arrow to TRIGGER 2.
2. Press ◀ or ▶ to turn Trigger 2 on or off for this input.

You have now finished setup for this input. If you wish to configure more inputs, press ▲ or ▼ to move the on-screen arrow to RETURN TO VIDEO INPUTS or RETURN TO AUDIO INPUTS, then press SET.

Speaker Configuration

Once you are finished configuring the inputs, it is time to configure the Model 990 for your particular loudspeaker system. You can perform this task automatically or manually, but before proceeding, please read the following information carefully.

Speaker Placement

The best speaker placement for your particular room will depend on its size, furnishings, seating arrangement, and the acoustical properties of the space (including room size, wall type, coverings, and various other factors).

Due to the complex nature of these variables, it is impossible to recommend any one-size-fits-all placement. You may have to experiment with various placement options to determine the best configuration for your specific situation. Please note that proper configuration and placement of your speakers is critical for achieving the best possible surround-sound reproduction.

Here are some basic recommendations you should consider when positioning your speakers:

Front left, center and right speakers

- These speakers should be placed at the same relative height from the floor and a similar distance from any walls. Most speakers sound best when located with the tweeter at ear height when you're seated. Typically, the further away from the walls the speakers are, the better they will sound.
- Ensure that the speakers are aimed at the listener's ears within your chosen seating position.

Surround left and right speakers

- Place these speakers so that their height is approximately 1 meter (3 feet) higher than that of the listener's ears, if feasible.
- Place these speakers to the sides of, or slightly behind, the primary listening position.

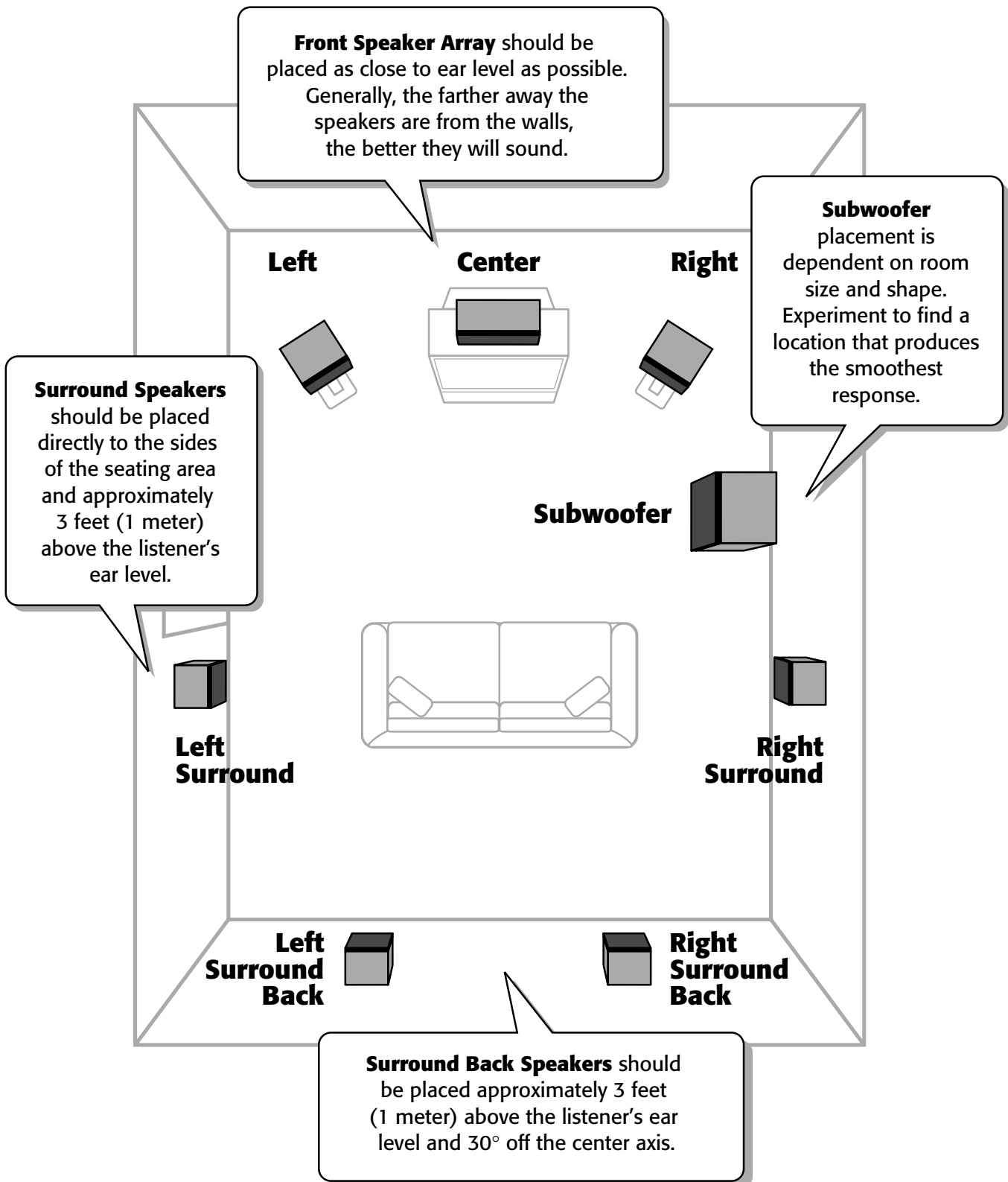
Surround back left and right speakers

These speakers are required for Dolby Digital EX, DTS ES, Dolby Pro Logic IIx, and 7-Channel Stereo. They are also desirable—though not required—for DTS Neo:6.

- Place these speakers behind the listener so that the angle between each speaker and the listener is approximately 30 degrees.
- Place these speakers so that their height is 1 meter (3 feet) higher than that of the listener's ears.

NOTE ON DIPOLE SURROUND LOUDSPEAKERS:

Speaker Placement



Speaker Configuration

4. Connect the supplied setup microphone to the Setup Mic input jack on the lower right of the front panel.
5. Position the microphone as close as possible to the position your head will usually be in when you are listening.

You can simply hold the microphone a foot or so in front of your face, or for the most accurate setup, move over one seat and hold the microphone where your head would be if you were sitting in your favorite chair.

The setup microphone has a standard 1/4-20 threaded socket on the bottom, so it can be mounted on a photo or video tripod. If you have a tripod handy, you may find it easier to place the mic on the tripod than to hold the mic in place during the setup procedure. Using a tripod will also let you leave the room during setup, so you do not have to listen to the loud test tones.

6. Press SET.

The Auto Setup status screen should appear:

```

    AUTO SETUP
  > START SETUP  :NO
    CHANNEL      :
    SPEAKER CHECK :
    DELAY        :
    OUTPUT LEVEL :

    RETURN TO MAIN MENU
  
```

7. Press ► to the front panel or the remote to start automatic setup. You should hear a loud test tone coming from the front left speaker. The test tone will play in all of your speakers one at a time.

The Auto Setup status screen displays the channel being tested, whether or not a speaker is detected in that channel, and the delay and level settings for that channel:

```

    AUTO SETUP
  > START SETUP  :YES
    CHANNEL     :CENTER
    SPEAKER CHECK :YES
    DELAY       : 13ft
    OUTPUT LEVEL : -4 dB

    RETURN TO MAIN MENU
  
```

If the setup microphone is not plugged in, your amplifier is not turned on or connected to the Model 990, or no front speakers are connected to the amplifier, an error screen appears:

```

    AUTO SETUP
  > START SETUP  :NO

    Front speaker or microphone is disconnected.
    After turning power off, check front speaker or
    microphone connection

    RETURN TO MAIN MENU
  
```

Check to make sure the microphone is connected. If it is not, connect it and restart the automatic setup procedure by pressing ►. If the microphone is connected, check to see if your amplifier is turned on. If it is not, turn it on and restart the automatic setup procedure by pressing ►. If the microphone is connected and the amplifier is on, shut off both the amplifier and the Model 990, then check your connections between the Model 990 and the amplifier, and between the amplifier and the speakers. Once you have confirmed that the connections are good, restart the auto setup procedure.

After the auto setup procedure is finished, the confirmation screen appears:

```

    AUTO SETUP
  START SETUP  :NO

    Due to small front speaker, center speaker
    will be set to small automatically.

  >  SAVE      IGNORE
  
```

8. Press SET to save the settings. The new settings will overwrite the Model 990's existing settings
9. If you do not want to overwrite the Model 990's existing settings, press ► on the front panel or the remote so that "Ignore" flashes, then press SET.
10. Once you have finished automatic setup, press SET to return to the main menu, or press MENU to exit the menu system.

NOTE: In order to properly recognize your subwoofer, it may be necessary to set the sub's crossover control to an active position before running the auto setup. After auto setup, be sure to reconfigure the subwoofer's crossover option to your desired behavior.

Manual System Setup

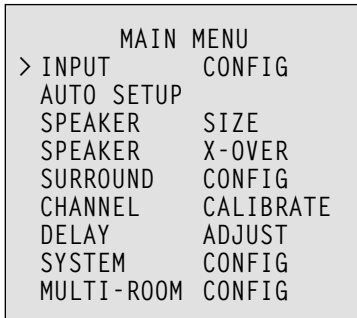
Although the Model 990's automatic setup procedure provides accurate calibration of channel balance and delay, some enthusiasts may wish to adjust these functions manually. Setup can be performed from the front panel or the remote control, but either way, you will need to turn on your video display so you can see the Model 990's on-screen display.

Before you begin manual setup, make sure all of the connections have been made from your Model 990 to your source components, amplifier(s), and speakers, and that the Model 990 and your video display are turned on.

To begin manual setup:

1. Press the MENU button on the front panel or the remote to display the Main Menu.

The Main Menu appears on-screen:



Speaker Size Selection

For maximum audio performance, you must tell the Model 990 what speaker configuration you are using (assuming you have not already gone through auto setup). Through the Speaker Size Menu, you will tell the Model 990 whether or not you have a center speaker, side surround speakers, back surround speakers, and a subwoofer. You will also tell the unit what size your speakers are, so it knows whether or not it is safe to route deep bass signals to them.

Generally speaking, a small, bookshelf-type (or smaller) speaker is considered “small,” and a large, floorstanding speaker is considered “large.” If you have questions concerning the proper size setting for a certain speaker, you may want to consult the speaker’s manufacturer for a recommendation.

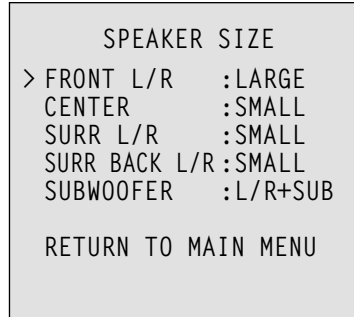
For most of the speaker settings, you will choose from “large,” “small,” or “none.” The subwoofer setting is different, though. If your front speakers are set to “small,” your only options with the subwoofer are “yes” and “no.” If your front speakers are set to “large,” your subwoofer setting can be “no,” “LFE only,” or “L/R+sub.” If you have medium-sized front speakers, you may get better results with the “L/R+sub” setting, which blends some of the bass from the left and right speakers into the subwoofer. If you have very large front speakers, you will probably get the best results with the “LFE only” setting.

NOTE: The Model 990 does not allow some speaker combination settings in order to avoid errors. You can set the subwoofer to “no” only if you have large front speakers. If you have small front speakers, the subwoofer setting will automatically be “yes.” If your front left and right speakers are set to “small,” your center speaker will automatically be set to “small.” If you have no side surround speakers, the back surround channels will automatically be deactivated.

To set speaker size:

1. From the main menu, press ▲ or ▼ to move the on-screen arrow to SPEAKER SIZE. Press SET.

The Speaker Size menu appears:



2. To set the size of the front left and right speakers, press ◀ or ▶.
3. Once you have set the front speaker size, press ▼ to move on to the other speakers, and ◀ or ▶ to adjust the size of those speakers.
4. When you have the size set for all of the speakers in your system, press ▼ until the on-screen arrow is on RETURN TO MAIN MENU, then press SET.

Subwoofer Crossover Adjustment

To optimize the bass performance and power handling of your speaker system, you must tell the Model 990 what subwoofer crossover points to use for the front left/right, center, side surround, and back surround speakers (assuming you have not already gone through auto setup). The Model 990 allows you to set crossover points (ranging from 40 Hz to 200 Hz) for each of these speakers, so that you can get the best sound fidelity even if your system uses different types of speakers for front left/right, center, and surround channels.

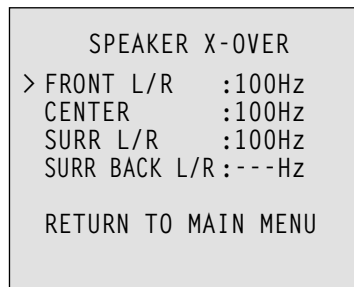
If you have questions concerning the proper size setting for a certain speaker, you may want to consult the speaker’s manufacturer for a recommendation. The rule of thumb is, if you hear distortion from a particular speaker during passages where the bass is loud, that speaker’s crossover is probably set too low. Increase the crossover frequency until the distortion disappears.

Generally speaking, a medium-sized tower speaker works well with a 40 Hz crossover point. A standard-sized home theater satellite (or LCR-type) speaker works well with an 80 Hz crossover point. Slim, on-wall speakers designed to go with plasma TVs tend to work well with a 100 or 120 Hz crossover point. And miniature satellite speakers—the ones measuring 4 to 7 inches high—often demand a crossover point of 150 or 200 Hz.

To set the subwoofer crossover points:

1. From the main menu, press ▲ or ▼ to move the on-screen arrow to SPEAKER X-OVER. Press SET.

The Speaker Size menu appears:



2. To set the crossover point of the front left and right speakers, press ◀ or ▶.

- Once you have set the front speaker crossover point, press ▼ to move on to the other speakers, and ◀ or ▶ to adjust the crossover point of those speakers.
- When you have the crossover point set for all of the speakers in your system, press ▼ until the on-screen arrow is on RETURN TO MAIN MENU, then press SET.

Channel Level Calibration

For proper surround-sound presentation, all of the channels in your system must be balanced, so that they all play at the same volume as heard from your favorite listening chair. If one or two channels are louder than the others, it will make surround effects less convincing.

If you have not balanced your channels using auto setup, you should use the manual Channel Calibration menu. You can also use this menu to “tweak” the level of the channels if the auto setup results aren’t quite to your liking.

Although it is possible to adjust channel levels by ear, we strongly suggest you use a signal-pressure level (SPL) meter instead. RadioShack makes a very good and inexpensive one, model 33-4050. Set the meter for “C” weighting and “slow” response.

To calibrate channel levels:

- From the main menu, press ▲ or ▼ to move the on-screen arrow to CHANNEL CALIBRATE. Press SET.

The Channel Calibration menu appears:

```

CHANNEL CALIBRATION
> TEST TONE : MANUAL
FRONT LEFT : 0 dB
CENTER : -1 dB
FRONT RIGHT : 0 dB
SURR RIGHT : -4 dB
SURR BACK R : ---dB
SURR BACK L : ---dB
SURR RIGHT : -2 dB
SUBWOOFER : -10dB
RETURN TO MAIN MENU

```

- Press ◀ or ▶ to select the test tone mode: AUTO, MANUAL, or OFF.

In the AUTO mode, the test tone automatically advances from channel to channel every few seconds. In the MANUAL mode, you must press ▲ or ▼ to select which channel to calibrate. In the OFF mode, no test tone will appear; so you may fine-tune your system using program material, such as DVD soundtracks.

- Press ▼ to begin the calibration process.

The channel indicated by the on-screen arrow is the one you can adjust.

- Press ▶ to raise the level in the channel, or ◀ to lower it.

If you are using an SPL meter, hold it near your face and adjust the range dial so that the meter reads somewhere near 0. Note the reading, such as -3, 0, +2, etc. Your goal as you adjust the channels is to make all of them read the same on the meter as the front left channel does.

- If you are in MANUAL mode, press ▼ to move the on-screen arrow on to the other channels. In AUTO mode, the arrow will move down automatically in a few seconds. Press ◀ or ▶ to adjust the level of those speakers.

- When you have the level set for all of the channels in your system, press ▼ until the on-screen arrow is on RETURN TO MAIN MENU, then press SET.

Delay Adjustment

The purpose of delay adjustment is to make all the sounds from the different speakers in your system arrive at your ears at the same time. If a sound appears in two speakers at once but sound from one arrives at your ears earlier (usually because you are sitting closer to that speaker), it will diminish the surround effect.

Even if you have decided not to use the auto setup, you can easily set the proper delay for each channel. The Model 990 automatically calculates the proper delay based on the distance from your listening chair to each speaker. All you have to do is measure and write down the distance to each speaker, then enter these numbers in the Model 990's Delay Adjust menu.

To set delay for each channel:

- From the main menu, press ▲ or ▼ to move the on-screen arrow to DELAY ADJUST. Press SET.

The Delay Adjust menu appears:

```

DELAY ADJUST
> DELAY UNIT : FEET
FRONT LEFT : 14FEET
CENTER : 13FEET
FRONT RIGHT : 14FEET
SURR RIGHT : 6FEET
SURR BACK R : ---FEET
SURR BACK L : ---FEET
SURR RIGHT : 7FEET
SUBWOOFER : 16FEET
RETURN TO MAIN MENU

```

- First, select the units you used to measure (feet or meters) by pressing ◀ or ▶.
- Press ▼ to move the on-screen arrow to FRONT LEFT.
- Press ▶ to increase the distance, or ◀ to decrease it.
- Once you have set the delay for the front left channel, press ▼ to move on to the other speakers, and ◀ or ▶ to adjust the delay setting for those speakers.
- When you have the delay set for all of the speakers in your system, press ▼ until the on-screen arrow is on RETURN TO MAIN MENU, then press SET.

You have now completed basic manual setup of the Model 990. You may now configure surround modes, multi-room operation, and system preferences—all of which we will take you through in the following pages.

Surround Configuration

The Model 990's Surround Configuration menu lets you fine-tune some of the unit's surround-sound modes and processes.

To enter the Surround Configuration menu:

1. Press the MENU button on the front panel or the remote to display the Main Menu.

The Main Menu appears on-screen:

MAIN MENU	
> INPUT	CONFIG
AUTO SETUP	
SPEAKER	SIZE
SPEAKER	X-OVER
SURROUND	CONFIG
CHANNEL	CALIBRATE
DELAY	ADJUST
SYSTEM	CONFIG
MULTI-ROOM	CONFIG

2. Press ▼ four times to move the on-screen arrow to SURROUND CONFIG. Press SET.

The Surround Configuration menu appears:

SURROUND CONFIG	
> NIGHT MODE	: OFF
PANAROMA	: OFF
CENTER WIDTH	: STEP 3
DIMENSION	: 0
HP MODE	: DH2
2CH SUB OFFSET	: -6dB
RETURN TO MAIN MENU	

Night Mode

The Model 990's Night Mode suppresses the loud peaks in movie soundtracks and music videos so that the sound from your system does not disturb others while allowing the system to play the system loud enough so you can hear dialogue clearly. Night Mode works only with Dolby Digital soundtracks.

Night Mode can be set to three different levels: MIN, MID, and MAX. Maximum provides the greatest effect; use it when you want to keep the sound peaks at an absolute minimum. It can also be deactivated entirely for maximum dynamic range and fidelity.

To activate Night Mode:

1. From the Surround Conf g menu, press ▲ or ▼ to move the on-screen arrow to NIGHT MODE.
2. Press ◀ or ▶ to select the Night Mode setting.

The choices appear as follows as you scroll through them:

OFF→MIN→MID→MAX

3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Pro Logic II Adjustments

The Music mode of Pro Logic II (and Pro Logic IIX) provides three adjustments that let you fine-tune the effect to suit your tastes, the program material, and your speaker system. The adjustments are Panorama, Dimension, and Center Width. In order to hear the effects of these adjustments, you must be in Pro Logic II(x) Music mode with program material playing when you make the adjustments.

Panorama

Panorama extends the front stereo image to the surround channels, creating a more enveloping, wraparound effect. Panorama is a non-adjustable, on/off feature.

To activate Panorama mode:

1. From the Surround Conf g menu, press ▲ or ▼ to move the on-screen arrow to PANORAMA.
2. Press ◀ or ▶ to turn Panorama on or off.
3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Center Width

Center Width blends sound from the center channel into the left and right channels to create a more seamless front soundstage. At a setting of STEP 0, no sound is mixed from center into left and right. At the other extreme, STEP 7, this control can completely deactivate the center speaker so a phantom center image is created from just the left and right front speakers. STEP 3 is a good starting point for many systems and types of material.

To adjust Center Width:

1. From the Surround Conf g menu, press é or é to move the on-screen arrow to CENTER WIDTH.
2. Press ◀ or ▶ to adjust Center Width anywhere from STEP 0 to STEP 7.
3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Dimension

Dimension enables adjustment of the surround effect. Turn this control toward the rear to enhance the surround effect for "dry"-sounding recordings, and toward the front to decrease it for highly reverberant recordings. A setting of 0 is a neutral setting appropriate for most material. A setting of FRNT 3 provides the least amount of surround effect, and a setting of REAR 3 provides the greatest amount of surround effect.

To adjust Dimension:

1. From the Surround Conf g menu, press ▲ or ▼ to move the on-screen arrow to DIMENSION.
2. Press ◀ or ▶ to adjust Dimension anywhere from FRNT 3 to 0 to REAR 3.

3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Dolby Headphone Mode Setting

Dolby Headphone processing provides a surround-sound effect through ordinary headphones. Three different Dolby Headphone modes are available. DH1 simulates the acoustically controlled environment of a recording studio control room. DH2 simulates the sound of a typical living room. DH3 simulates the reverberance of a large concert hall. You can use any mode you like; for most material, DH2 will provide the most realistic experience. You can also set the headphone output to STEREO to turn off the Dolby Headphone effect.

To set Dolby Headphone mode:

1. From the Surround Conf g menu, press ▲ or ▼ to move the on-screen arrow to HP MODE.
2. Press ◀ or ▶ to select STEREO, DH1, DH2, or DH3.
3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

2-Channel Subwoofer Offset

Some listeners find that after they have properly calibrated the levels of their surround-sound system, the subwoofer sounds too loud when they play music. The Model 990 allows you to reduce the subwoofer level automatically when the unit is playing in 2-channel stereo. The level reduction can be as great as -8 decibels.

There is no “by the book” or “proper” way to set this control; you simply adjust it to your taste. Play some music you like, set the Model 990 for stereo playback, and adjust the Subwoofer Offset until it sounds good to you.

To adjust 2-Channel Subwoofer Offset:

1. From the Surround Conf g menu, press ▲ or ▼ to move the on-screen arrow to 2CH SUB OFFSET.
2. Press ◀ or ▶ to adjust the offset, from 0dB (no offset) to -8dB (maximum offset).
3. If you want to adjust other surround-sound parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

System Configuration

The Model 990's System Configuration menu lets you fine-tune various functions of the unit as well as a few sonic parameters.

To enter the System Configuration menu:

1. Press the MENU button on the front panel or the remote to display the Main Menu.

The Main Menu appears on-screen:

```
MAIN MENU
> INPUT      CONFIG
  AUTO SETUP
  SPEAKER     SIZE
  SPEAKER     X-OVER
  SURROUND    CONFIG
  CHANNEL     CALIBRATE
  DELAY       ADJUST
  SYSTEM      CONFIG
  MULTI-ROOM  CONFIG
```

2. Press ▼ seven times to move the on-screen arrow to SYSTEMCONFIG. Press SET.

The System Configuration menu appears:

```
SYSTEM CONFIG
> OSD TIME OUT :50SEC
  DISPLAY TIME OUT:50SEC
  VOLUME DEFAULT:LAST
  DEFAULT VOL SET :-26dB
  BASS           : 0 dB
  TREBLE         : 0 dB
  SLEEP          :OFF
  THEATER COMP  :OFF
  SYSTEM LOCK   :OFF
  RETURN TO MAIN MENU
```

On-screen Display Time Out

You can set the Model 990's on-screen menu to disappear automatically after a certain period of time: 15, 20, 30, or 50 seconds. You can also set it to remain on-screen until you turn it off. Use the ON setting to keep the menu on-screen as long as you wish. With this setting activated, hit the MENU button on the front panel or the remote to turn off the on-screen menu.

To adjust On-screen Display Time Out:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to OSD TIME OUT.
2. Press ◀ or ▶ to the desired time out setting.

The choices appear as follows as you scroll through them:

ON→15SEC→20SEC→30SEC→50SEC

3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Front-Panel Display Time Out

You can set the Model 990's front-panel display to disappear automatically after a certain period of time: 15, 30, 45, or 60 seconds. You can also set it to remain active all the time. Use the ON setting to keep the display active full-time.

To adjust Front-Panel Display Time Out:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to DISPLAY TIME OUT.
2. Press ◀ or ▶ to select the desired time out setting.

The choices appear as follows as you scroll through them:

ON→15SEC→30SEC→45SEC→60SEC

3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Default Volume Setting

You can adjust the volume setting that appears when you turn on the Model 990. The volume can come on at either the last setting you were using when you turned the Model 990 off, or at a default setting of your choosing.

To select last or default volume setting:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to VOLUME DEFAULT.
2. Press ◀ or ▶ to select LAST or DEFAULT volume setting.
3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

To adjust the default volume setting:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to DEFAULT VOL SET.
2. Press ◀ or ▶ to adjust the default volume setting.

You can set the volume as high as +8 dB or as low as -76 dB. The level should be high enough so you know the system is on, but not so high that it will hurt your ears. For most systems, a default volume setting of -30 dB is a good place to start.

3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Tone Controls

The Model 990 offers traditional bass and treble controls, each with a range of +/-6 decibels. The tone controls are not effective when the Model 990 is set to Bypass mode. They can also be bypassed using the TONE button on the front panel.

To adjust bass or treble:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to BASS or TREBLE.
2. Press ◀ or ▶ to adjust the level of bass or treble.
3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Sleep Timer

The Model 990's sleep timer automatically shuts the unit off after a predetermined amount of time, from 10 to 90 minutes. The sleep time can also be activated directly from the SLEEP button on the remote control, using the Model 990's front-panel display.

To activate the sleep timer from the on-screen display:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to SLEEP.
2. Press ◀ or ▶ to adjust the setting of the sleep timer.

The choices appear as follows as you scroll through them:

OFF→90min→60min→45min→30min→20min→15min→10min

3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Theater Compensation

Most movie soundtracks are not remixed for the home environment when a DVD release is prepared. They are instead mixed for a commercial cinema, which is a more acoustically absorptive environment than most homes. Thus, many movie soundtracks may sound bright or shrill over a home theater system. Activating the Model 990's Theater Compensation mode compensates for this effect, filtering out some of the high frequencies to make the sound more pleasant and less fatiguing.

To activate Theater Compensation:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to THEATER COMP.
2. Press ◀ or ▶ to turn Theater Compensation on and off.
3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

System Lock

After you have configured your Model 990, you may wish to prevent others from making further adjustments—or to prevent yourself from accidentally changing your settings. The System Lock feature lets you deactivate all of the Model 990's on-screen menus and adjustments (except, of course, the one that turns System Lock off again). You will still be able to see the Main Menu and all of its submenus, but the only option you can choose is RETURN TO MAIN MENU.

To turn System Lock on and off:

1. From the System Configuration menu, press ▲ or ▼ to move the on-screen arrow to SYSTEM LOCK.
2. Press ◀ or ▶ to turn System Lock on and off.
3. If you want to adjust other system parameters, press ▲ or ▼ to move the on-screen arrow to the desired item. (Of course, you will not be able to adjust these if System Lock is turned on.) Otherwise, press ▲ or ▼ to move the on-screen arrow to RETURN TO MAIN MENU, then press SET. Or simply hit the MENU button to return to your program.

Operation

Now that you have completed the initial setup and configuration of the Model 990, you will find it easy to operate. Read the following section to learn the basics of operating the Model 990, as well as a few tips and tricks that will enhance your enjoyment of your home theater system.

Direct Operation

In addition to entering settings into the Model 990 using the on-screen menu system, as described in various sections of this manual, many of the controls may be changed directly at any time using the remote control or the front-panel buttons. We will describe in this section how to make these adjustments.

Power

To turn the Model 990 on:

1. Press the MAIN POWER button on the unit's rear panel.

The Standby/On indicator on the front panel will glow yellow.

2. Press the STANDBY button on the front panel, or any source button (such as DVD, VIDEO 1, or CD) on the remote control. The Standby/On indicator will turn blue, and the front-panel display will illuminate.

To turn the Model 990 off:

- Press the STANDBY button on the front panel or the PWR button on the remote. The Standby/On indicator will turn yellow, and the front-panel display will disappear.

Source Selection

To select a source/input from the remote control:

- Press one of the source buttons (DVD, CD, VIDEO 1, etc.) on the remote control.

The front-panel display will show the selected source (or the name you have chosen for it if you have renamed that input). The on-screen display will also show the selected source unless you have set OSD MSG: OFF in the Configuration menu for that input.

To select a source/input from the front panel:

1. Press the INPUT button on the front panel.
2. Press ▲ or ▼ on the front panel to select the source.

The front-panel display will show the selected source (or the name you have chosen for it if you have renamed that input). The on-screen display will also show the selected source unless you have set OSD MSG: OFF in the Configuration menu for that input.

Volume Control

Use this control to adjust the volume level of all speakers in the main zone.

To adjust main volume level:

- Press the VOLUME UP or DOWN buttons on the remote, or turn the VOLUME knob on the front panel.

The volume level will be indicated on the front-panel display and the on-screen display (unless you have set OSD MSG: OFF in the Configuration menu for the currently used input). The range of the volume control runs from -76 dB to +8 dB. The main volume setting does not affect the volume setting in the second zone.

Holding down the VOLUME UP or VOLUME DOWN button on the remote will turn the level up or down quickly.

Muting the Volume

Use this control to turn the sound off momentarily, such as when interrupted by a phone call.

To mute the main volume:

1. Press the MUTE button on the front panel or the remote control.

The sound will mute and the word "MUTE" will blink on the front-panel display. The volume in the second zone will not be affected.

Holding down either MUTE button for too long will activate the headphone listening mode instead of the mute mode. To exit headphone mode, hold down either MUTE button for several seconds until the small red speaker icon appears on the right half of the front-panel display.

2. Press either MUTE button to restore the volume to its previous level.

The name of the selected source will reappear in the front-panel display.

Changing the Surround Mode

Use these controls to change the surround mode from the default selected during input configuration. Only the modes that can be used with the signal (stereo, Dolby Digital, or DTS) currently being played will be available for you to select. Seven-channel modes such as Dolby Pro Logic IIx Movie cannot be used unless you have seven speakers connected.

To change the surround mode from the front panel:

1. Press the SURR MODE button.

The selected surround mode will be shown on the front-panel display, and also on-screen provided you have set OSD MSG: ON in the Configuration menu for the currently used input.

2. Press ▲ or ▼ on the front panel to select the surround mode.

This method also allows you to select one of the Model 990's stereo modes, including stereo, bypass, upsample, 5-channel stereo and 7-channel stereo.

To change the surround mode from the remote:

1. Press the DOLBY MODES button or the DTS MODES button, depending on what type of signal you are listening to.

The selected surround mode will be shown on the front-panel display, and also on-screen provided you have set OSD MSG: ON in the Configuration menu for the currently used input. The DOLBY MODES button works with any type of signal. The DTS MODES button works only when you are playing stereo or DTS material.

2. Press the DOLBY MODES or DTS MODES button repeatedly to select the surround mode.

Changing Stereo Modes

The Model 990 offers several stereo listening models, including stereo, bypass, upsample, 5-channel stereo, and 7-channel stereo.

With stereo material, such as CDs or FM radio, all of these modes are available. With Dolby Digital and DTS material, most of these modes will be unavailable.

To change the stereo mode from the front panel:

1. Press the SURR MODE button.

The selected surround mode will be shown on the front-panel display, and also on-screen provided you have set OSD MSG: ON in the Configuration menu for the currently used input.

2. Press ▲ or ▼ on the front panel to select the surround mode.

This method also allows you to select one of the Model 990's surround modes.

To change the stereo mode from the remote:

1. Press the STEREO button.

The selected stereo mode will be shown on the front-panel display, and also on-screen provided you have set OSD MSG: ON in the Configuration menu for the currently used input.

2. Press the STEREO button repeatedly to select the stereo mode.

Channel Trim

Channel Trim allows you to fine-tune the channel levels to compensate for various soundtrack anomalies. For example, you may play a movie and find that the center (dialogue) channel sounds weak, making the movie hard to follow. Simply trimming the center channel up a decibel or two can fix the problem. Or another movie may have much more bass than normal; trimming the subwoofer channel down a few decibels should balance the sound correctly.

You can trim the channels while you are listening to a source, or you can trim the channels using the Model 990's internal test tone. The trim range is +15 dB to -15 dB.

To adjust channel level while listening to a source:

1. Press TEST on the remote control.

"TEST OFF" will appear on-screen (provided you have set OSD MSG: ON in the Configuration menu for the currently used input) and on the front-panel display.

2. Press SET on the remote control twice.

"FRONT LEFT" will appear on-screen and on the front-panel display.

3. Press ◀ or ▶ on the remote control until the channel you want to trim is displayed.

4. Press SET.

5. Press ▲ or ▼ on the remote to raise or lower the level of the channel.

The channel level will be shown on-screen and in the front-panel display. A channel level of 0 dB represents the normal level.

6. Press SET when you are finished adjusting the channel.

7. Press ◀ or ▶ to choose the next channel you want to trim, and repeat the process.

8. Press EXIT on the remote control to exit Channel Trim mode, or wait a few seconds for the display to disappear.

To adjust channel level using the test tone:

1. Press TEST on the remote control.

"TEST OFF" will appear on-screen (provided you have set OSD MSG: ON in the Configuration menu for the currently used input) and on the front-panel display.

2. Press SET on the remote control, then press ▲ or ▼ until "TEST ON" is displayed on-screen and on the front-panel display.

3. Press SET.

You will hear the test tone in the front left speaker, and "FRONT LEFT" will appear on-screen and on the front-panel display.

4. Press ◀ or ▶ on the remote control until the channel you want to trim is displayed.

5. Press SET.

6. Press ▲ or ▼ on the remote to raise or lower the level of the channel.

The channel level will be shown on-screen and in the front-panel display. A channel level of 0 dB represents the normal level.

7. Press SET when you are finished adjusting the channel.

8. Press ◀ or ▶ to choose the next channel you want to trim, and repeat the process.

9. Press EXIT on the remote control to exit Channel Trim mode, or wait a few seconds for the display to disappear.

To adjust channel trim from the on-screen menu:

1. Press MENU on the front panel or the remote control.

The Main Menu appears on-screen:

```

MAIN MENU
> INPUT      CONFIG
  AUTO SETUP
  SPEAKER    SIZE
  SPEAKER    X-OVER
  SURROUND   CONFIG
  CHANNEL    CALIBRATE
  DELAY      ADJUST
  SYSTEM     CONFIG
  MULTI-ROOM CONFIG
  
```

2. Press ▲ or ▼ to move the on-screen arrow to CHANNEL CALIBRATE. Press SET.

The Channel Calibration menu appears:

```

CHANNEL CALIBRATION
> TEST TONE : MANUAL
  FRONT LEFT : 0 dB
  CENTER     : -1 dB
  FRONT RIGHT : 0 dB
  SURR RIGHT : -4 dB
  SURR BACK R : ---dB
  SURR BACK L : ---dB
  SURR RIGHT  : -2 dB
  SUBWOOFER  : -10dB
  RETURN TO MAIN MENU
  
```

3. Press ◀ or ▶ to select "TEST TONE: OFF"
4. Press ▲ or ▼ to move the on-screen arrow to the channel you want to trim.
5. Press ◀ or ▶ to trim the channel level.
6. Press ▲ or ▼ to move to the next channel you want to trim, and repeat the process.
7. When you have the level set for all of the channels in your system, press ▼ until the on-screen arrow is on RETURN TO MAIN MENU, then press SET.

Recording a Source

You can record from any input source connected to the Model 990 when you have an audio or video recorder properly connected to the appropriate output jacks on the rear panel of the unit as outlined in the section titled "Connecting Your Model 990." You cannot monitor the output of the recorder through the Model 990 while recording is in progress.

To record from the currently selected input source:

1. Prepare your recording device.

Follow the recommended procedure from the recorder manufacturer regarding settings in order to make a recording.

2. Set the device to the record mode and begin recording.

The source audio signals appear at the RECORD OUT/TAPE and VIDEO 1 RECORD OUT audio jacks of the Model 990. If the source contains a video signal, the output appears at both the S-Video and composite VIDEO 1 RECORD OUT video jacks.

Any digital source selected (except USB) automatically appears at the COAX OUT and OPT OUT jacks.

NOTE: If you change the input source during recording, you will record the signals from the newly selected input source from that point on.

Night Mode Selection

The Model 990's Night Mode is intended for late-night listening. It suppresses the loud peaks in movie soundtracks and music videos so that the sound from your system does not disturb others. Yet you will still be able to play the system loud enough so you can hear dialogue clearly. Night Mode works only with Dolby Digital soundtracks.

Night Mode can be set to three different levels: MIN, MID, and MAX. Maximum provides the greatest effect; this is the one you'll want to use when you want to keep the sound peaks at an absolute minimum. It can also be deactivated entirely for maximum dynamic range and fidelity.

You can activate Night Mode through the on-screen menu (see page TK) or directly from the remote control.

To adjust Night Mode from the remote control:

1. Press the NIGHT button on the remote control.

The current setting of Night Mode appears on the front panel, and on the on-screen display provided you have set OSD MSG: ON in the Configuration menu for the currently used input.

2. If you want to change the Night Mode setting, press NIGHT repeatedly until the mode you want appears on the front-panel display and on-screen.
3. Press EXIT on the remote control to exit Night Mode selection, or wait a few seconds for the display to disappear.

Sleep Timer

The Model 990's sleep timer automatically shuts the unit off after a predetermined amount of time, from 10 to 90 minutes. The sleep time can be activated through the on-screen menu (see page TK), or also directly from the remote control.

To activate the sleep timer from the remote:

1. Press SLEEP on the remote.

"SLEEP 90min" appears on the front-panel display and on-screen, provided you have set OSD MSG: ON in the Configuration menu for the currently used input. Also, the front-panel display will dim.

2. Press SLEEP repeatedly to reduce the amount of time before the Model 990 shuts off.

The choices appear as you repeatedly press the button:

90min→60min→45min→30min→20min→15min→10min→OFF

3. Press EXIT on the remote to remove the sleep timer display, or wait a few seconds for the display to disappear.
4. To check the amount of time left on the sleep timer, press SLEEP again.

The remaining time will be displayed on-screen and on the front-panel display.

Lip-Synch Delay

Because video is more data-intensive than audio, processing video takes longer. As a result, sometimes the video will lag behind the audio, causing a lip sync error. The problem may vary with each source device. In particular, digital TV tuners (or the stations they receive) seem to cause lip sync problems more than do DVD players. The Model 990 lets you delay the audio to fix this problem. It also lets you set a different lip sync delay for each input, in increments of one millisecond.

You can adjust lip sync delay directly from the remote or from the on-screen menu. To adjust lip sync delay from the remote, you must have OSD MSG: ON selected in the Input Configuration for the currently selected input.

Lip sync delay is not available for audio-only inputs.

To set lip sync delay from the remote:

1. Press the SYNC button on the remote.

"LIP SYNC DELAY" will appear on-screen, along with the setting in milliseconds.

2. Press ▲ or ▼ on the remote to increase or decrease the lip sync delay.

Watch the actors' lips and listen to their dialogue to see if your lip sync setting is correct.

3. Press SET to choose the new lip sync setting.

If you do not press SET within 5 seconds, the Model 990 will revert to the past lip sync setting for that input. Pressing SET will also make your new lip sync setting the new default for the currently selected input.

Adjusting Tone Controls

The Model 990 offers the familiar bass and treble controls, accessible through the menu system (see page 33) or from the remote control. The maximum boost or cut is plus or minus 6 decibels.

To adjust tone controls from the remote:

1. Press TONE on the remote.
“BASS 0” appears on the front panel display and also on-screen, provided you have set OSD MSG: ON in the Configuration menu for the currently used input.
2. Press ▲ or ▼ to boost or cut the bass.
3. When you are satisfied with the bass setting, press TONE again.
“TREBLE 0” appears on the front panel display and on-screen.
4. Press ▲ or ▼ to boost or cut the treble.
5. When you are satisfied with the treble setting, press TONE again.
“TONE DEFEAT OFF” or “TONE DEFEAT ON” will appear on the front panel display and on-screen.
6. Press ▲ or ▼ to turn the tone controls on and off.

NOTE: “TONE DEFEAT OFF” means your tone controls will be activated. “TONE DEFEAT ON” means the tone controls are bypassed.

Using the AM/FM Tuner

The Model 990 incorporates an AM/FM stereo tuner with 30 station-memory presets. You can mix AM and FM presets as you wish. Stations can also be tuned manually. To use the tuner, you must connect antennas to the AM and FM antenna terminals on the back of the unit.

To select the AM/FM tuner as your source:

- Press AM/FM on the remote or TUNER on the front panel.
The band and frequency will appear on the front panel display and also on-screen, provided you have set OSD MSG: ON in the Configuration menu for the currently used input.

To change the frequency (station) manually:

- Press CHANNEL UP or CHANNEL DOWN on the remote control, or ▲ or ▼ on the front panel.
The band and frequency will appear on the front panel display and on-screen.

To scan for the next frequency (station) automatically:

- Press CHANNEL UP or CHANNEL DOWN on the remote control, or ▲ or ▼ on the front panel. Hold the button down for one second, then release it.
The tuner will automatically scan up or down to the next active frequency. The band and frequency will appear on the front panel display and on-screen.

To enter a frequency (station) directly:

1. Press DIRECT on the remote.
A blinking cursor will appear after the band (AM or FM) on the front-panel display and on-screen.

2. Use the 10-key numerical keypad on the remote to enter the desired frequency.

For example, to enter 89.3 FM, simply punch in 893.

3. Press SET on the remote.

To change the band (AM or FM):

- Press AM/FM on the remote or TUNER on the front panel.
The band and frequency will appear on the front panel display and on-screen.

To change the FM mode (mono or stereo):

- Press TUNE MODE on the remote or the front panel.
The mode will be displayed on-screen. When the FM tuner is in stereo mode and tuned to a stereo station, a red “STEREO” indicator appears on the front-panel display.

To create FM station-memory presets automatically:

- Press and hold the MEMORY button on the remote for three seconds, then release it.
The tuner will automatically scan the FM band for all active stations, and create memory presets for each of them (up to 30 stations).

NOTE: AM station presets must be created manually.

To create an AM or FM station-memory preset manually:

1. Tune the station you want to enter into memory.
2. Press the MEMORY button on the remote.
A red “MEMORY” indicator will flash on the front-panel display.
3. Using the numeric keypad on the remote, enter the desired two-digit memory number (01 to 30) for that station.
You have five seconds to enter a number.
Once you have entered the number and the “MEMORY” indicator stops flashing, the station is memorized.

NOTE: If the memory number you have chosen was used for another station, that memory will be overwritten with the new station you just chose.

To tune a radio station that you have preset:

- Using the numeric keypad on the remote, enter the desired two-digit memory number (01 to 30) for that station.

Using Headphones

The Model 990's front headphone jack allows you to listen in private without disturbing others nearby. Thanks to the Model 990's Dolby Headphone processing, you can enjoy a realistic surround-sound effect even when using headphones.

To activate the headphone jack:

1. Plug in a set of headphones.
The Model 990 has a 1/4-inch headphone jack, which accommodates the 1/4-inch plugs found on most quality headphones. If you want to use portable-style headphones such as those included with portable CD or MP3 players, you will need a stereo 1/8-inch to 1/4-inch adapter, which is readily available at RadioShack and other electronics stores.

2. Play any audio or audio/video source, such as a CD player, a DVD player, or the AM/FM tuner.

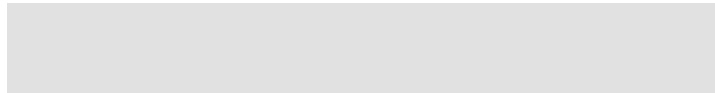
Turn the volume down so it is just loud enough to hear. This will prevent your hearing from being damaged if the signal is too in the

or the MUTE button on the remote for about 5 seconds.

The your speakers will your headphones. The panel will such as "Stereo" or "Pro Logic II + Dolby (

will disappear.

4. Using the VOLUME knob on the front panel or the VOLUME UP and DOWN buttons on the remote, adjust the



current() and

Using Dolby Headphone

Dolby Headphone processing provides a surround-sound effect through ordinary headphones. It works with any set of headphones; general0 , the the everyone's ears are shaped differently from the next person's, Dolby Headphone's effects may vary somewhat from listener to listener.

Three different Dolby Headphone modes are available. DH1 simulates the acoustical0 control0 simulates the sound of a t living room. DH3 simulates the reverse of a large concert You can use any mode you like; for most ma benefit0 will provide the most realistic experience.

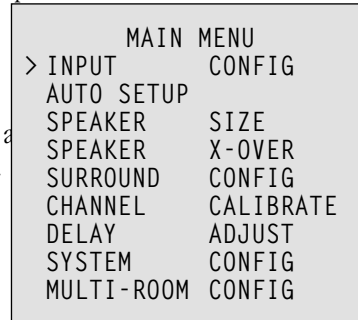
Dolby Headphone works in conjunction with Dolby Digital, DTS, or Dolby Pro Logic II Movie mode. When you play stereo material with Dolby Headphone activated, the Model 990 automatically activates Dolby Pro Logic II Movie mode to create the surround sound for Dolby Headphone to process. Other surround-sound modes, such as Dolby Pro Logic II Music or DTS Neo:6, cannot be used with Dolby Headphone.

NOTE: You may notice that the volume is lower in Dolby Headphone mode than in stereo. This is a normal effect encountered in all0 equipped with Dolby Headphone processing.

To activate Dolby Headphone processing:

1. Press the MENU button on the front panel or the remote.

The Main Menu appears on-screen: headphones Hold down the MUTE button on the front panel for about 3 seconds,

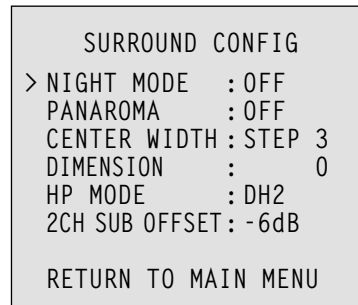


and % in display

tin Dred Din

2. Press four times to move the on-screen arrow to SURROUND CONFIG. Press SET.

The Surround Configuration menu appears:



or near

3. Press four times on the front panel or the remote to select HP Mode.
4. Press or on the front panel or the remote to select Stereo, DH1, DH2, or DH3.

Using Dolby Virtual Speaker

Dolby Virtual Speaker simulates the sound of a 5.1-channel surround-sound system in situations where you are using only two or three speakers. It also can be used in complete surround-sound systems: If your front left and right speakers are placed close to your video display, Dolby Virtual Speaker can make the sound more spacious, as if the speakers were placed further apart.

You can use Dolby Virtual Speaker in conjunction with Dolby Digital, DTS, or Dolby Pro Logic II Movie mode. When you play stereo material with Dolby Virtual Speaker activated, the Model 990 automatically activates Dolby Pro Logic II Movie mode to create the surround sound for Dolby Virtual Speaker to process. Other surround-sound modes, such as Dolby Pro Logic II Music or DTS Neo:6, cannot be used with Dolby Virtual Speaker.

When you are using two or three front speakers and no surround speakers, you can choose from two Dolby Virtual Speaker modes: Reference and Wide. In Reference mode, the breadth of the front soundfield will be determined by the distance between the left and right speakers. In Wide mode, the soundfield is expanded beyond the speakers for a more enveloping effect. Wide mode is particularly useful in systems where the left and right speakers are positioned close together.

To activate Dolby Virtual Speaker:

1. Play any audio or audio/video source, such as a DVD or CD. Press the DOLBY MODES button on the remote, or the SURR MODES button on the front panel.

The selected surround mode appears on both the front-panel display and on-screen.

2. Press DOLBY MODES or SURR MODES repeatedly until you see Dolby Virtual Speaker indicated on the front-panel display or on-screen.

For example, if you have five speakers connected and are playing Dolby Digital 5.1 material, you will see "Dolby Digital + Dolby VS 5-SP Wide" displayed. You will also see the word "VIRTUAL" at the very top of the front-panel display.

3. If you have two or three speakers selected, you can choose between Reference and Wide mode. Press DOLBY MODES or SURR MODES repeatedly until you see the mode you want—i.e., "Dolby Pro Logic II + Dolby VS 3-SP Ref" or "Dolby Pro Logic II + Dolby VS 3-SP Wide" on the front-panel display or on-screen.

To deactivate Dolby Virtual Speaker, press DOLBY MODES or SURR MODES repeatedly until you the surround or stereo mode you want is displayed.

Multi-Zone Operation

The Model 990 can provide an independent video and stereo sound feed to a second zone or room. Using this capability, you can, for example, watch a DVD movie in your home theater while listening to a satellite radio receiver in your bedroom—even though both the DVD player and the satellite radio receiver are connected to the Model 990. You can also control volume of the main zone and the second zone individually.

The second zone can operate even when the Model 990 is turned off in the main zone. A separate Zone 2 remote control is provided for use in the second zone. It provides on/off, source selection, volume control, and mute functions. You can also control the second zone from the main zone, using either the Zone 2 remote or the main remote and the on-screen menu.

You can also use the second-zone video capability to feed a second video monitor in the main zone, so, for example, you can keep an eye on a sports event or a news crawl while you are watching a movie.

Multi-Zone Connection Notes

- The Model 990's multi-zone capability works only with analog audio sources. If you are using a digital audio cable to connect, say, a DVD player to your Model 990, you should also connect a pair of analog audio cables from your DVD player to the DVD analog audio inputs of the Model 990. The digital audio connection will still work in the main zone, but you will also be able to use the analog audio from your DVD player in the second zone.
- The multi-zone video capability works only with composite and S-Video sources. Component and DVI video are not available on the Model 990's multi-zone output. In order to view in the second zone video sources connected via component or DVI, add a composite or S-Video connection as well.
- In the second zone, you will need an amplifier and a pair of speakers for sound, and a TV if you want to watch video sources. You can use any sound system with a line-level input, and any video monitor with a composite and/or S-Video input. You can also use the audio inputs on the TV in lieu of a separate sound system.
- In order for the Zone 2 remote to work in the second zone, you will need to install an infrared sensor in the second zone. The sensor must be connected to one of the Model 990's IR inputs.

Using Multi-Zone Capability from the Main Zone

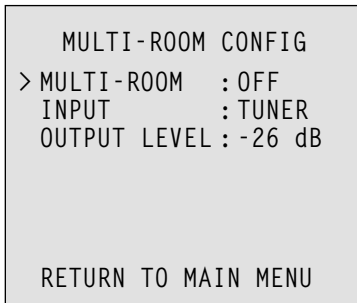
1. Press the MENU button on the front panel or the main remote to display the Main Menu.

The Main Menu appears on-screen:

MAIN MENU	
> INPUT	CONFIG
AUTO SETUP	
SPEAKER	SIZE
SPEAKER	X-OVER
SURROUND	CONFIG
CHANNEL	CALIBRATE
DELAY	ADJUST
SYSTEM	CONFIG
MULTI-ROOM	CONFIG

- Press ▲ once on the front panel or the main remote to select Multi-Room Configuration.
- Press SET on the front panel or the remote.

The Multi-Room Configuration screen appears:



- To turn the sound on and off in the second zone, press ► on the front panel or the main remote.
A tiny red “R2” indicator will appear on the front-panel display when the second zone is activated.
- To change the source being used in the second zone, press ▼ on the front panel or the main remote to select the Input function on the on-screen display, then press ► until the source you want appears.
- To raise or lower the volume in the second zone, press ▼ to select the Output Level function in the on-screen display, then press ► to raise the volume or ◀ to lower the volume.

You can also use the main remote to turn the second zone on and off even if the Model 990 is turned off.

To operate the second zone when the Model 990 is off:

- Press the MR button on the main remote.
The front-panel display will read either “Room: Off” or “Room: On.”
- Press ◀ or ► on the main remote to turn the sound in the second zone on and off.
- Press the PWR button on the main remote to deactivate this feature.

Using Multi-Zone Capability from the Second Zone

The Zone 2 remote can also be used in the main zone if you do not want to turn on your TV to use the on-screen display. Its operation is described below.

To use the Zone 2 remote in the main zone:

- To turn the sound and video on or off, point the Zone 2 remote at the infrared sensor and press the ROOM 2 button.
The front-panel display and the on-screen display in the main zone will briefly read “[R2]” plus the source selected in the second zone, i.e., “[R2]DVD.” Of course, you may not be able to see this in the second zone.
- To select a source, press the appropriate button, such as DVD or TUNER, on the Zone 2 remote.
- To control the volume, press the VOLUME UP or VOLUME DOWN button on the Zone 2 remote.
- To mute the sound in the second zone, press the MUTE button on the Zone 2 remote. Press MUTE again to restore the sound.

Remote Control Setup and Operation

The Model 990 remote control is preprogrammed with remote codes for 1,000 audio and video components. Programming is accomplished by simply punching in a four-digit code number that matches your equipment.

In addition to the Model 990 itself, the remote control can operate up to seven other audio and video devices in your home entertainment system. They are listed below:

- TVs, Monitors, Video Projectors
- VCRs, TV/VCR combination units
- Cable boxes, Internet set-top boxes
- Satellite receivers—DirecTV, Dish Network, Primestar, DBS, C-band
- Audio receivers, preamplifiers, surround processors
- Compact disc players, multi-disc changers
- DVD, laserdisc players
- Cassette tape players, DAT, MiniDisc, switchers, lighting, home control devices, and video scalers

For the best performance when operating your remote control, please follow the guidelines below:

- Remember to point the remote control toward the remote control sensor on the Model 990, not toward the TV screen. Place the 990 away from strong light such as direct sunlight or fluorescent light, which can prevent proper operation of the remote control.
- Using another remote control of a similar type or placing the Model 990 near equipment which also uses infrared control may cause operational interference.
- Do not put objects on the remote control. The buttons of the remote control may be pressed by mistake and drain the batteries.
- Make sure any doors covering the front of the 990 do not have colored or smoked glass. Placing the unit behind such doors may prevent proper remote control operation.
- If there is any obstacle between the remote control and the remote control sensor, the remote control will not operate.

The remote control also has many advanced features that can add ease and enjoyment to the operation of your home entertainment system. After becoming familiar with the layout of the buttons on the remote (see pages 10-11), follow the steps below to customize the remote for your particular setup.

Battery Installation

The remote control uses two AA 1.5-volt alkaline batteries (supplied). Please be sure to match the batteries with the + and - markings inside the battery compartment during installation.

NOTE: Do not mix new and old batteries or different kinds of batteries. To avoid corrosion, remove the batteries if the remote control will not be used for one month or more. Remove dead batteries immediately to avoid damage from corrosion.

To install batteries in the remote control:

1. On the back of the remote, push the tab and lift off the battery cover.
2. Insert two new AA alkaline batteries. Match the + and - marks on the batteries to the + and - marks in the battery case.
3. Press the battery cover back into place. The tab should click when the cover is locked.
4. Test the unit by pressing PWR and any mode key (i.e., AUX, CBL, VCR, etc.). If the batteries are inserted correctly, the LED will blink once.

NOTE: The batteries will usually last about six months under normal use. When batteries need replacement, the remote will blink twice with every key press. Simply replace them and the remote control will be restored to its full functionality, including favorite settings.

Setup Using Preprogrammed Codes

The Model 990 remote can be programmed to operate other audio or video components in your system. The TNR button is used exclusively for control of the Model 990. To program the remote to control another device, you must enter a four-digit code. Codes for a wide variety of devices and brands are provided in the following pages. More than one setup code number may work with your device. You should test the functions for each of the code numbers that work with your device to determine the best one for your particular unit.

The procedure for setting up the Model 990 remote to control a TV/VCR is different—see Programming TV/VCR Control below.

NOTE: Some devices, such as CD players and DVD players that do not have power buttons on their original remote controls, may not shut off during programming. For these devices, it may be necessary to first store the setup code number and then test functions like PLAY, STOP, etc, to determine if the correct number has been selected.

To program using four-digit codes:

1. Turn on the device you would like the remote control to operate, either manually or with its original remote control.
2. Find the four-digit setup code number for your device from the tables on pages 43 to 47.
3. On the Model 990 remote, press the component key (near the top of the remote) that corresponds to the device you want to control.

You can choose from CBL, AUX, VCR, TV, SAT, CD, or AMP.

NOTE: The codes for controlling DVD players are programmed into the AUX button.

4. Press and hold SETUP on the remote until the red LED at the top of the remote blinks twice, then release SETUP.
5. Enter the first four-digit code for your component.
The LED should blink twice. If it does not, then repeat steps 3, 4, and 5 above, using the same code.
6. Aim the remote at the component and press PWR once.
The component should turn off. If it does not respond, repeat steps 3, 4, and 5, trying each code for your brand until you find one that works. If it still does not work, try searching for the code (see Searching For Your Code, below).
7. Repeat the process for other components you wish to control with the Model 990 remote.

Programming TV/VCR Control

The Model 990 can control TV/VCR combo units, but the procedure is somewhat different than entering codes to control other components. As with other components, you must enter a four-digit code. Codes for many TV/VCR brands are provided in the following pages. More than one setup code number may work with your device. You should test the functions for each of the code numbers that work with your device to determine the best one for your particular unit.

If you want to control TV functions besides power on/off, you may need to enter a separate TV code, as described below.

To program TV/VCR control:

1. Turn on the TV/VCR, either manually or with its original remote control, and insert a video cassette.
2. Find the four-digit code for your TV/VCR from the tables on pages TK to TK. Your TV/VCR may have a separate TV code listed. If so, be sure to note both codes.
3. On the Model 990 remote, press VCR.
4. Press and hold SETUP until the red LED blinks twice, then release SETUP.
5. Enter the first four-digit code for your component.

If the code entry is performed correctly, the LED will blink twice. If it does not, then repeat steps 3, 4, and 5, using the same four-digit code.

6. Aim the remote at the TV/VCR and press PWR once. The TV/VCR should turn off. If it does not respond, repeat steps 3, 4, and 5, trying each code for your brand until you find one that works. If it still does not work, try searching for the code (see Searching For Your Code).
7. If your component has a separate TV code listed, press TV on the Model 990 remote control.

The LED will blink twice.

8. Enter the four-digit TV code for your TV/VCR combo.

If the code is entered correctly, the LED will blink twice. If it does not, then repeat steps 7 and 8 using the same four-digit code.

Searching for Your Code

If your device does not respond to the remote after you have tried all codes listed for your brand, or if your brand is not listed at all, try searching for your code.

To search for a code for your component:

1. On the Model 990 remote, press the button near the top of the remote for the type of device you want to control.
You can choose CBL, AUX, VCR, TV, SAT, CD, or AMP.
2. Press and hold SETUP until the red LED on the remote blinks twice, then release SETUP.
3. Enter 991.
The LED will blink twice.
4. Aim the remote control at the component and slowly alternate between pressing PWR and the button for the device you pushed in step 1.
5. Stop when the TV turns off.
6. Press SETUP once.
7. To search for the codes of your other components, repeat the process, using the appropriate button for the new device in steps 1 and 4.

Checking the Codes

If you have set up the Model 990 remote by searching for the codes, for future reference, you may wish to find out which four-digit code is operating your equipment.

To find the four-digit code for a device:

1. On the Model 990 remote, press the button near the top of the remote for the type of device you want to control.
2. Press and hold SETUP until the red LED on the remote blinks twice, then release SETUP.
3. Enter 990.

The LED will blink twice.

4. To view the code for the first digit, press 1.

After three seconds, the LED will blink to indicate the first code number (i.e., 3 blinks = 3). Count the blinks and write down the number.

5. Repeat step for each of the other three digits. Press 2 for the second digit, 3 for the third, and 4 for the fourth. Count the blinks and write down the numbers.
6. To check for the codes of your other components, repeat steps 1 through 5, but substitute the appropriate key in step 1 for the new component you are checking.

Re-Assigning Device Buttons

If you wish to control a second device of a type already programmed into the Model 990 remote (i.e., if you want to use two DVD players), you will need to re-assign an unused device button (CBL, AUX, VCR, TV, SAT, CD, or AMP) to operate the second device.

To reassign an unused device button:

1. On the Model 990 remote, press and hold SETUP until the LED blinks twice, then release SETUP.
2. Enter 992.

The LED will blink twice.

3. Press the button for the device already programmed (i.e., CBL), then press the button for the unused device (i.e., TV).

The LED will blink twice.

4. The button for the unused device is now ready to be programmed for the second component. See Setup Using Preprogrammed Codes.

Volume Control Punch-Through

You can program the Model 990 remote so that the VOLUME UP, VOLUME DOWN, and MUTE buttons on the remote will control those functions on the Model 990 even when the remote is set to control another device.

To set volume control punch-through:

1. On the Model 990 remote, press and hold SETUP until the LED blinks twice, then release SETUP.
2. Enter 993.
3. Press the TNR key on the Model 990 remote.

The LED will blink twice.

Operation

After you have programmed the remote control for your equipment, use the following procedures to operate the components of your home entertainment system:

To operate a system component that you have programmed:

1. On the Model 990 remote, press the button near the top of the remote for the device you want to control (CBL, AUX, VCR, TV, SAT, CD, or AMP)
2. Aim the remote control at the device and press the POWER button to turn on the device.
3. Press the buttons that send out the commands you desire.

NOTE: Some audio/video devices have separate buttons for POWER ON and POWER OFF. To operate these devices on the remote, press the corresponding device button to turn the equipment ON and press the POWER button to turn the equipment OFF.

Please try all the functions of this remote control with your equipment. The most common functions are labeled on the remote. However, some of the secondary functions might be stored under a button that has a different name from the one on your original remote control.

Source Selection Buttons

Pressing a source button (VIDEO 1, DVD, etc.) at the bottom of the remote control performs the following functions:

- If the Model 990 is in Standby mode, powers up the unit.
- Selects that source on the Model 990.

Backlighting

Pressing any button on the Model 990 remote illuminates all the buttons on the remote control for about 5 seconds. The backlight is extended an additional 5 seconds with any button press while the backlight is on.

Setup Codes

CABLE CONVERTERS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
ABC	0003, 0017
Americast	0899
Bell South	0899
General Instrument	0276, 0476, 0810
GoldStar	0144
Hamlin	0009, 0273
Jerrold	0003, 0276, 0476, 0810
Memorex	0000
Motorola	1106
Pace	0237
Panasonic	0107, 0000
Paragon	0000
Philips	0305, 0317
Pioneer	0144, 0533, 0877
Pulsar	0000
Quasar	0000
Regal	0273, 0279
Bunco	0000
Samsung	0144
Scientific Atlanta	0017, 0477, 0877
Starcom	0003
Toshiba	0000
Zenith	0000, 0525, 0899

CD PLAYERS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
Aiwa	0157
Burmester	0420
Cal. Audio Labs	0029
Carver	0157, 0179
DKK	0000
Demon	0003, 0873
Emerson	0305
Fisher	0179
Garrard	0420
Genexxa	0032, 0305
Harman/Kardon	0157, 0173
Hitachi	0032
JVC	0072
Kenwood	0028, 0190, 0826, 0037, 0626, 0681
Krell	0157
LX	0305
Linn	0157

MCS	0029
MTC	0420
Magnavox	0157, 0305
Marantz	0157, 0626, 0029
Mission	0157
NSM	0157
Onkyo	0101, 0868
Optimus	0032, 0468, 0420, 0179, 0305, 1063, 0000, 0037, 0145
Panasonic	0029
Parasound	0420
Philips	0157, 0626
Pioneer	0032, 0468, 0305, 1062, 1063
Polk Audio	0157
Proton	0157
QED	0157
Quasar	0029
RCA	0053, 0032, 1062, 0468, 0305, 0179
Realistic	0179, 0420
Rotel	0157, 0420
SAE	0157
Sansui	0157, 0305
Sanyo	0179
Scott	0305
Sears	0305
Sharp	0037, 0861
Sherwood	1067
Sonic Frontiers	0157
Sony	0000, 0490
Soundesign	0145
Tascam	0420
Teac	0420
Technics	0029
Victor	0072
Wards	0053, 0157
Yamaha	0036, 0888

DVD PLAYERS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
Apex	0672
Denon	0490
Fisher	0670
GE	0522
Gradiente	0651
Hitachi	0573, 0664
Hiteker	0672
JVC	0623, 0558
Kenwood	0682, 0534

Konka	0719, 0711, 0720, 0721
Magnavox	0503, 0675
Marantz	0539
Mitsubishi	0521
Onkyo	0503
Optimus	0571
Oritron	0651
Panasonic	0490, 0677, 0632
Philips	0539, 0503
Pioneer	0571, 0525, 0632
Proscan	0522
RCA	0522, 0571
Samsung	0573
Sharp	0630
Sony	0533
Toshiba	0503
Yamaha	0490, 0545
Zenith	0591, 0503

HOME AUTOMATION

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
GE	0240
One For All	0167
Radio Shack	0240
Security System	0167
Universal X10	0167
X10	0167

SATELLITE RECEIVERS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
AlphaStar	0772
Chaparral	0216
Echostar	0775, 1005
GE	0566
General Instrument	0869
HTS	0775
Hughes Net. Sys.	0749, 1142, 1749
Philips	1076, 1142, 0722, 0724, 0749
Proscan	0392
RCA	0506, 0392, 0143, 0855
Radio Shack	0869
Samsung	1109
Star Choice	0869
Zenith	0856

TELEVISIONS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
AOC	0019, 0030
Admiral	0093, 0463
Aiko	0092
Aiwa	0701
Akai	0030
Aaron	0179
America Action	0180
Anam	0180
Audiovox	0092, 0180, 0451, 0623
Baysonic	0180
Bdmr	0019
Bell & Howell	0016, 0154
Bradford	0180
Brockwood	0019
Broksonic	0236, 0463
CXC	0180
Candle	0030, 0056
Camivale	0030
Carver	0054
Celebrity	0000
Cineral	0451, 0092
Citizen	0056, 0030, 0060, 0092
Concerto	0056
Contec	0180
Craig	0180
Crosley	0054
Crown	0180
Curtis Mathes	0060, 0030, 0016, 0047, 0051, 0054, 0056, 0093, 0145, 0154, 0166, 0451, 1147, 1347
Daewoo	0092, 0623, 0019, 0624, 0451
Daytron	0019
Denon	0145
Dumont	0017, 0019
Electroband	0000
Emerson	0236, 0180, 0178, 0179, 0463, 0624, 0623, 0019, 0154
Envision	0030
Fisher	0154
Fujitsu	0179, 0683
Funai	0180, 0171, 0179
Futuretech	0180
GE	0047, 1347, 0051, 0178, 0451, 1147, 0093
Gibraltar	0017, 0019, 0030
GoldStar	0178, 0019, 0030, 0056
Gradiente	0056, 0053
Grunpy	0179, 0180

Hallmark
Hans Jensen

Hitachi 0125, 0056, 0076
Infinity 0054

JCB	0000
K	0130
KTV	0180, 0030
Kenwood	0030, 0019
Konka	0707, 0632, 0628, 0638, 0703
LG	0056
LXI	0154, 0047, 0054, 0156, 0178
Logik	0016

TV/VCR COMBOS

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
American High	0035 (for TV use 0051)
Brocksonic	0002, 0294,
Colt	0072
Curtis Mathis	0035 (for TV use 0051)
Daewoo	0278
Emerson	0002, 0294, 0479
Funai	0000
GE	0035 (for TV use 0051), 0060 (for TV use 0047), 0048 (for TV use 0093), 0240
Hitachi	0035 (for TV use 0051), 0000
HQ	0000
Lloyds	0000
MGA	0240
Magnavox	0081 (for TV use 0054), 0035 (for TV use 0051), 0000
Magnin	0240
Memorex	0037, 0162 (for TV use 0250)
Mitsubishi	0048 (for TV use 0093)
Orion	0002, 0294, 0479
Panasonic	0035 (for TV use 0051), 0162 (for TV use 0250)
Penney	0035 (for TV use 0051), 0240, 0162 (for TV use 0250)
Quasar	0035 (for TV use 0051), 0162 (for TV use 0250)
RCA	0060 (for TV use 0047), 0035 (for TV use 0051), 0048 (for TV use 0093)
Sansui	0000, 0479
Sanyo	0240
Sharp	0048 (for TV use 0093)
Sony	0032 (for TV use 0000)
Symphonic	0000
Zenith	0000

VCRs

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
Admiral	0048, 0209
Adventure	0000
Aiko	0278
Aiwa	0000, 0037
Asha	0240
Audiovox	0037
Beaumarck	0240
Bell & Howell	0104
Broksonic	0121, 0184, 0002, 0209, 0479
CCE	0072, 0278
Calix	0037
Canon	0035
Carver	0081

Citizen	0278, 0037
Colt	0072
Craig	0037, 0072, 0047, 0240
Curtis Mathes	0035, 0060, 0162
Cybermex	0240
Daewoo	0278, 0045
Denon	0042
Dynatech	0000
Electrohome	0037
Electrophonic	0037
Emerex	0032
Emerson	0184, 0002, 0209, 0278, 0121, 0479, 0000, 0037, 0043
Fisher	0047, 0104
Fuji	0033, 0035
Funai	0000
GE	0035, 0060, 0048, 0240
Garrard	0000
Go Video	0432
GoldStar	0037, 0038
Gradiente	0000
HI-Q	0047
Harley Davidson	0000
Harman/Kardon	0038, 0081
Harwood	0072
Hitachi	0042, 0000
Hughes Net. Sys.	0042
JVC	0067
KEC	0037, 0278
KLH	0072
Kenwood	0067, 0038
Kodak	0035, 0037
LXI	0037
Lloyd's	0000
Logik	0072
MEI	0035
MGA	0043, 0240
MGN Technology	0240
MTC	0000, 0240
Magnasonic	0278
Magnavox	0035, 0081, 0563, 0000, 0039, 0149
Marantz	0081, 0035
Marta	0037
Matsushita	0035, 0162
Memorex	0104, 0047, 0479, 0000, 0037, 0048, 0035, 0240, 1037, 0039, 0162, 0209, 1162, 1262
Minolta	0042

Mitsubishi	0043, 0048, 0067
Motorola	0035, 0048
Multitech	0000, 0072
NEC	0038, 0067, 0104
Nikko	0037
Noblex	0240
Olympus	0035
Optimus	0162, 1062, 1162, 0048, 1262, 0037, 1048, 0104, 0432
Orion	0479, 0002, 0184, 0209
Panasonic	0035, 0162, 1162, 1262, 1362, 0616, 1062
Penney	0035, 0240, 0037, 0042, 0038
Pentax	0042
Philco	0035, 0209, 0479
Philips	0081, 0035, 0618, 1081, 1181
Pilot	0037
Pioneer	0067
Polk Audio	0081
Prof tronic	0240
Proscan	0060
Protec	0072
Pulsar	0039
Quasar	0035, 0162, 1162
RCA	0060
RadioShack	0000, 1037
Radix	0037
Randex	0037
Realistic	0000, 0104, 0047, 0048, 0037, 0035
ReplayTV	0614, 0616
Runco	0039
STS	0042
Samsung	0045, 0240
Sansui	0479, 0000, 0067, 0209
Sanyo	0047, 0104, 0240
Scott	0184, 0121, 0043, 0045
Sears	0037, 0042, 0000, 0035, 0047, 0104
Semp	0045
Sharp	0048
Shintom	0072
Shogun	0240
Singer	0072
Sony	0033, 0032, 0000, 0035, 0636, 1032
Sylvania	0035, 0081, 0000, 0043
Symphonic	0000
TMK	0240
Teac	0000

Technics	0035, 0162
Teknika	0000, 0035, 0037
Thomas	0000
Tivo	0618, 0636
Toshiba	0045, 0043
Totevision	0037, 0240
Unitech	0240
Vector	0045
Vector Research	0038
Video Concepts	0045
Videosonic	0240
Wards	0035, 0060, 0000, 0047, 0240, 0042, 0048, 0072, 0081, 0149
White Westinghouse	0072, 0278, 0209
XR-1000	0072, 0000, 0035
Yamaha	0038
Zenith	0039, 0000, 0033, 0209, 0479

VIDEO ACCESSORIES

<i>Manufacturer/Brand</i>	<i>Setup Code Number</i>
Panasonic	1120
Pioneer	1010
Sensory Science	1126
Sharp	1010

Care and Maintenance

Cleaning

When the unit becomes dirty, wipe it with a clean, soft, dry cloth. If necessary, first wipe the surface with a soft cloth slightly dampened with mild soapy water, then with a fresh cloth dampened with clean water. Wipe dry immediately with a dry cloth. NEVER use benzene, thinner, alcohol or any other volatile cleaning agent. Do not use abrasive cleaners, as they may damage the finish of the metal parts. Avoid spraying insecticide, waxes, polishing agents, or any aerosol product near the unit.

When You Are Away

If you will not be using your home theater system for an extended period of time, it is always a good idea to turn the unit off using the MAIN POWER button on the rear panel of the Model 990. This will prevent the automatic turn on circuits from accidentally turning the system on during your absence.

Troubleshooting

Your new Model 990 is designed to provide years of trouble-free operation. However, the complexity of today's sophisticated home theater systems means that you might encounter an occasional problem with your system involving the Model 990. Listed below are some of the more common issues you could encounter. For additional hints on using the Model 990 or resolving problems we suggest that you look at the Model 990 section of our website at www.outlawaudio.com, or enter the Model 990 Section of our Outlaw Saloon. If your problem persists, please call us at 866-OUTLAWS (688-5297) or 866-OUTLAWS (688-5292).

System Reset

In rare cases the Model 990's internal processor may freeze or lock-up causing abnormal operation. This is common to all microprocessor-controlled devices when the unit is subject to excessive static discharge, AC line noise, or power spikes.

In most cases it is easy to solve this problem by simply unplugging the Model 990 from its AC power source for about five minutes. After waiting, reconnect the power cord and turn the unit on. If the unit functions normally, no further action is needed.

In the event that the unit still does not operate properly, it may be necessary to manually reset the processor. Note, however, that when the processor is reset you will lose all settings including digital audio assignments, surround mode settings, speaker configurations, tuner presets and any other memory items. For this reason we strongly recommend that you record these settings on the chart provided on page 19 of this manual so that it is easy to restore them after resetting the processor.

To perform system reset:

1. Turn the rear-panel MAIN POWER switch on. The Standby/On indicator on the front panel will glow amber.
2. Press and hold ENTER and MENU buttons on the front panel.
3. Release the buttons when the Model 990 briefly turns on. "SYSTEM RESET" appears in the front-panel display. The unit will then turn off.
4. Press STANDBY/ON button on front panel or one of the source selector buttons on the remote to resume normal operation.

If the manual reset does not solve the problem, contact Outlaw Audio for further advice.

Symptom	Possible Cause	Solution Options
Unit does not turn on when remote or front panel buttons are pressed	No AC Power	Make certain AC power cord is plugged into a live outlet Make certain rear panel MAIN POWER switch is ON
No sound from digital audio source	Input not properly selected	Make certain the correct digital input is associated to the source
No DTS when a DVD is playing	Incorrect bitstream output from DVD player	Check the DVD player's setup menus to make certain DTS output is selected Check the disc menu to make certain DTS is selected
No sound from rear surround speakers	Incorrect speaker configuration	Check Speaker Configuration menu to make certain that surround speakers are set to "small" or "large"
Intermittent buzzing in tuner	Interference from local sources	Move or relocate the antenna Move the antenna or unit away from computers, fluorescent or neon lights, or appliances with motors
Unit does not respond to remote commands	Low remote battery power Remote set to different device Remote sensor is obscured	Change the batteries Press the TNR button to make sure the remote is outputting 990 codes Make certain the front-panel remote sensor is not blocked or connect an external remote sensor
No sound from one or more channels	Poor connections Incorrect surround mode Incorrect speaker configuration	Check interconnects to the amplifier and connections from the amplifier to the speakers Check surround mode to make certain it provides output to all speakers Check Speaker Configuration menu to make certain all speakers are set to "small" or "large"

Model 990 Specifications

Preamplifier Analog Section

Input Impedance @ 1V	
Phono (MM)	2.5mV / 47k Ω
Line (CD, Tape, Video)	200mV / 47k Ω
IMD @ 60Hz to 7kHz	
	.09% (4:1 SMTPE, 8 Ω , output 1V)
Output Level (1k Ω load)	
Tape Mon Rec	200mV
Pre Out	1V
THD @ 1V	
	.05% (1kHz)
Maximum Output	
	9V
Volume Range (Main)	
	-76dB to +8.0dB (1dB resolution)
Bass Management	
High-Pass Slope (Small Speaker Setting)	Crossover Frequency (Adjustable 40/60/80/100/120/150/200Hz) 12 dB/octave (2nd order)
Low-Pass Slope (Subwoofer)	24 dB/octave (4th order), 40-200Hz as above
Tone Control	
Bass Center Frequency/Range	100Hz \pm 6dB
Treble Center Frequency/Range	10kHz \pm 6dB
Frequency Response	
Phono (MM)	30Hz to 20kHz \pm 1dB
Line	10Hz to 100kHz \pm 1dB
S/N Ratio (ref. 2.3Vrms)	
	>102dB
IMD (CCIF at 15kHz & 1 kHz)	
	0.01%
S/N Ratio (ref. 2.0Vrms A-weighted)	
	97dB

FM Tuner Section

Usable Sensitivity (THD 3%, S/N 30dB)	17.2dBf
50db Quieting Sensitivity	
Mono	25.2dB
Stereo	43.2dB
S/N Ratio (60dBf)	
Mono	72dB
Stereo	68dB
THD (65dBf)	
Mono	0.2%
Stereo	0.3%
Stereo Separation	
	40dB typ.
Capture Ratio	
	3.0dB
IF Rejection Ratio	
	120dB
Frequency Response	
	20 Hz to 15 kHz \pm 1.5dB

AM Tuner Section

Usable Sensitivity	12.5mV
S/N	51dB
Selectivity	30dB

Video Section (NTSC Format)

Bandwidth	
Composite & S-Video	6 MHz - 3dB
Component	>100MHz
Input Sensitivity @ 75 Ω	
Composite & S-Video	1.0Vp-p
Component R-Y Signal	0.5Vp-p
Component B-Y Signal	0.5Vp-p
Component Y Signal	1.0Vp-p

Digital Audio

All digital audio inputs and outputs are to S/PDIF electrical (75 Ω , 0.5Vp-p), S/PDIF optical (Toslink), or AES / EBU (110 Ω , 5Vp-p) standards as appropriate.

Processor	Crystal CS49400
Audio Converters	
Digital to Analog	Analog Device AD1852 24-bit/192kHz
Analog to Digital	AKM AK5380
Stereo Asynchronous Sample Rate Converter	
	Analog Device AD1896

General

Supply Voltage	120V, 60Hz only
Power Consumption	50W
Dimensions	
Width	17.38 inches / 441.5 mm
Height	7.75 inches / 196.9 mm
Depth	17.75 inches / 450.9 mm
Weight	28 lbs. / 12.7 kg
Trigger Outputs 1, 2 (User Assignable)	Sequential Delay 50 mA @ 12 VDC

Outlaw Audio Limited Warranty

This warranty protects the owner of the Outlaw Model 990 Preamp/Processor (the PRODUCT) for five (5) years from the date of purchase.

This warranty covers all defects in material and workmanship with the following specific exceptions. These are:

- Damage caused by improper installation or adjustment
- Damage caused by accident, unreasonable use or neglect
- Damage from failure to follow instructions contained in this Owner's Manual
- Damage from the performance of repairs by someone not authorized by Outlaw Audio
- Any unit on which the serial number has been effaced, modified, or removed
- Damage occurring during shipment
- Units which have been altered or modified in design, appearance or construction.

This warranty covers only the actual defects within the PRODUCT itself. IT DOES NOT cover costs of installation in (or removal from) a fixed installation, or normal setup, claims based on any misrepresentation by the seller, or performance variations resulting from installation related circumstances such as signal quality, AC power or incompatibilities with speakers and/or other system components.

During the warranty period, Outlaw Audio will, at its option, either repair the defect, or replace the defective product, or the defective parts, or components thereof at no charge to the owner for parts and labor covered by this warranty. If necessary repairs are not covered by this warranty, or if a unit is examined which is not in need of repair, you will be charged for the repairs and/or the examination. If non-warranted repairs are needed, we will notify you of the estimated cost and ask for your authorization to perform said repairs.

You must pay shipping charges incurred in getting your Product to the factory. We will pay the return shipping charges if the repairs are covered by

the warranty. Please save the original shipping cartons, as the unit MUST be returned in the original carton and packing. (Replacement cartons are available at a modest charge.)

If your product needs service, please call Outlaw Audio at 866-OUTLAWS (688-5297) or 866-OUTLAWA (688-5292).

You will need to present the original bill of sale to establish the date of purchase. In the event that the proof of purchase cannot be established with the original receipt, the warranty period shall be determined by the earliest date of manufacture shown on the unit, provided that the serial number label has not been altered in any manner, or by our records relating to that serial number.

In the event that you wish to return your Outlaw Product back to us, for any reason, please call to arrange for a Return Authorization Number. This will ensure that your problem is discussed with a service technician who will determine if there is a quick solution to your problem.

Outlaw Audio shall not be liable for, in any way responsible for, any incidental or consequential damages of any kind. Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion of incidental or consequential damages; therefore, the limitations and exclusions stated herein may not apply to you. This warranty gives you specific legal rights; and you may also have other rights that vary from state to state.

THERE ARE NO WARRANTIES GIVEN BY OUTLAW AUDIO THAT EXTEND BEYOND THE DESCRIPTION GIVEN HEREIN. ANY IMPLIED WARRANTIES OF FITNESS FOR PURPOSE SOLD, MERCHANTABILITY, DESCRIPTION, QUALITY OR ANY OTHER MATTERS ARE LIMITED TO THE TERMS OF THE EXPRESSED LIMITED WARRANTY STATED HEREIN.

Products are sold on the basis of specifications applicable at the time of sales. Outlaw Audio shall have no obligation to modify products once they have been sold.

This warranty is applicable only in the United States.

For applicability in other countries, please call Outlaw Audio.



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