

**McIntosh Laboratory Inc., Binghamton, NY
Design Engineering Department**

PRODUCT PREVIEW

**MHT200
A/V SYSTEM CONTROLLER**

Project 1189

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PROMOTIONAL HIGHLIGHTS

- 8x100 Watt Built-in Power Amplifiers for Two Zones
- Infrared Remote Control for Two Zones
- 8 Discrete Channels for Zone A Preamplifier
- 24 Bit DSP Processing for Dolby Digital, DTS and Pro Logic
- 'Stereo 96 kHz' mode ensures throughput purity
- 7.1 Processing for Expansion Modes
- 24 Bit A to D and D to A Converters (96kHz)
- 8 Channel Input for use with an External Processor
- Integral Noise Source for System Calibration
- Switchable Dynamic Compressor for Late Night Viewing
- Automatic Calibration for Speaker Levels and Delay (Professional microphone included)
- Super Tracking Volume Control
- 12 Character Alphanumeric Florescent Display
- Automatic Signal Format Switching Between ProLogic II, Neo:6, Dolby Digital and DTS Processing
- Dolby Digital EX and DTS ES Discrete Processing

- Re-assignable Input Selection with Custom Naming
- On-Screen Display for Operational Functions (Video message overlay) and Setup Menu
- Front Panel Control of Zone A and Zone B Input Selection and Volume
- 8 Audio and 7 Video Input Selections
- Component, Super and Composite Video Switching
- Optional AM/FM TM-1Tuner Module
- 6 Digital Audio Inputs
- Matched and Buffered Video Circuits
- RS232 Port for Control with Crestron, AMX, and Vantage Control Systems
- Connection for WK-3, WK-4 Keypads
- IR Input Jacks for Xantech Compatible Sensors
- Serial Data Output Ports for All Input Selections
- Bass and Treble Tone Controls
- 5 Trim Preset Memories for Tone and Level Settings
- Auto Memory for Each Input's Preferred Mode
- Permanent Memory for All System Calibration Settings
- Power Control Jacks (4) for Zone A, Zone B, Video and Accessory Components
- Auto Muting
- Control of Lights, Drapes, with the HC-1 Home Controller

FEATURES AND BENEFITS

BUILT-IN POWER AMPLIFIERS

Eight 100-watt power amplifiers with Power Guard are built in. These power amplifiers are the standard McIntosh balanced complimentary circuit built with discrete surface mount components. Six are intended for Zone A Home Theater and two for Zone B. However, all eight can be re-assigned for custom installation. A low-pass line level output is provided for a powered subwoofer.

All one needs for a Two Zone A/V system is speakers, video monitors and a Zone B keypad or sensor.

IR REMOTE CONTROL FOR TWO ZONES

A master control microprocessor receives and decodes signals from separate IR sensors or keypads. The Zone A sensor is located on the MHT200 front panel. A second sensor or keypad must be connected to Zone B. The addition of speakers and a monitor makes Zone B a fully functional second zone.

DOUBLE RESOLUTION 24 BIT DSP PROCESSING

The unit contains a 24-bit Digital Signal Processor to decode Dolby Digital/Pro Logic, DTS and the 6.1 Expansion Modes. The DSP module uses proprietary filtering and processing algorithms. Motorola's original

algorithms are only 24-bits; the MHT200 algorithms are double resolution (48bits).

24 BIT A/D AND D/A CONVERSION

A 24 bit stereo Analog to Digital converter is used on the analog input and four 24-bit stereo Digital to Analog converters are used at the DSP module output.

EXTERNAL PROCESSOR INTERFACE

In addition to an internal processor, the MHT200 also provides an 8-channel input that can be used with an external processor.

INTEGRAL SYSTEM CALIBRATION

The MHT200 has internal sequential switching of a special noise generator for system calibration (SYS CAL). Calibration can be performed manually, or automatically with the supplied professional microphone.

SWITCHABLE DYNAMIC COMPRESSION

A LATE NIGHT pushbutton switches a dynamic audio compressor ON/OFF for Dolby Digital soundtracks. It restricts the dynamic range of the movie sound effects so that a bomb-blast doesn't wake the baby.

ADJUSTABLE SPEAKER TIME DELAY

Adjustable time delay compensates for speakers that are placed at varying distances. It insures that sound from all speakers arrives at the listening position when it should. This improves Front channel imaging, and correctly merges the Surround channels into the sound field.

Calibration can be performed manually, or automatically with the supplied professional microphone.

SUPER TRACKING VOLUME CONTROL

The electronic volume control has a tracking accuracy of better than 0.5dB for all eight channels.

BLUE 12 CHARACTER ALPHANUMERIC FLORESCENT DISPLAY

The multi-function display normally indicates Zone A INPUT SELECTION and % VOLUME. Also, when the Zone B button has been pushed, Zone B INPUT and VOLUME are displayed.

When the TUNER is selected or an adjustment is made, station frequency, station preset, and signal strength are momentarily displayed.

If the SURROUND MODE is changed the new MODE is momentarily displayed.

If a TRIM selection is adjusted, the amount of trim is momentarily displayed.

REMOTE SELECTION OF MODE AND TRIM

All SURROUND MODES and TRIM SELECTIONS can be made and adjusted from the comfort of an easy chair with the hand held remote control.

AUTOMATIC SIGNAL FORMAT SWITCHING

The MHT200 normally decodes a PCM digital bit stream into either a stereo or multi-channel Dolby Pro Logic II signal. When the bit stream changes to one of the Dolby Digital modes, the processor recognizes the change, lights the Dolby Digital indicator and switches to AC-3

processing.

If DTS is detected in the PCM bitstream, the DTS indicator lights and DTS mode is engaged.

ON SCREEN DISPLAY FOR OPERATION & SETUP

An "overlay" type of On Screen Display is provided for operational functions. Changes in INPUT, VOLUME, TRIM, and MODE selections are momentarily displayed on the monitor.

In the SETUP mode, on screen menus are provided for all speaker size selections, room calibration, and custom sound enhancements. Initial system setup is a one time set-and-forget procedure.

FRONT PANEL CONTROL OF BOTH ZONES

A front panel pushbutton switches the INPUT SELECTOR, DISPLAY and VOLUME CONTROL between Zone A and Zone B. A red LED above the pushbutton indicates when they are assigned to Zone B.

RE-ASSIGNABLE INPUT SELECTION

Excluding the Tuner, there are 7 A/V inputs that can be re-assigned for multiple sources of the same type. For example, if you have two DVD players, and only one VCR Recorder, the VCR 2 input can be reassigned to display DVD 2 when selected.

All six Digital inputs may also be assigned to any A/V source.

8 INPUT SOURCE SELECTIONS

They are TUNER, AUX, CD, SAT, TV, DVD, VCR 1 and VCR 2. Excluding TUNER, each audio input has a matching Composite Video and S-Video input. Also, there are two assignable Component Video inputs. This allows the flexibility to re-assign any input for A/V sources.

6 DIGITAL AUDIO INPUTS

Zone A has 6 assignable Digital Audio inputs, 3 coaxial and 3 optical. These accept CD PCM, Dolby Digital, or DTS bit streams.

2 DIGITAL OUTPUTS

The Digital Outputs, 1 coaxial and 1 optical, can feed an external digital processor, which in turn could connect to the 8 EXTERNAL INPUTS. This would create an external A/V Digital Processor Loop.

SERIAL DATA OUTPUT PORTS

A serial data output port is provided for each input selection, system Sum, Zone A Sum, and Home control. These ports can be used to transfer control data to compatible equipment.

DSP BYPASS CIRCUIT

Stereo 96kHz mode bypasses all DSP processing, and directly connects the A-D input to the D-A outputs. Stereo 96kHz mode also allows playback of 24bit/96kHz LPCM soundtracks.

AUTO MUTING

The outputs are muted for 2 seconds during power up. This prevents hearing annoying clicks and pops generated by other equipment. They are also muted

momentarily during mode changes and input selection.

RS232 PORT

An RS232 port is provided for external control systems such as Crestron or Elan.

AUTO-MEMORY OF PREFERRED MODE SETTING

Zone A is able to memorize the MODE settings last used for each input. Mode memorization will allow the unit to custom configure itself to the way people use it. For example; a user can select Stereo while in Tuner, then switch to TV and listen to Dolby Pro Logic II. When the user switches back and forth between inputs they will have the desired mode automatically selected.

PERMANENT MEMORY

The MHT200 has a non-volatile memory so no power is required to maintain calibration, not even a battery.

4 INDEPENDENT POWER CONTROL JACKS

Jacks are provided for power control of audio accessories, video accessories, Zone A and Zone B power amps.

HOME CONTROL

The MHT200 provides for expanding your control to other devices in the home. With the use of the HC-1 HOME CONTROLLER, one has 6 circuit closures that are programmable for PUSH ON, PUSH OFF, or MOMENTARY (push and hold) type of operation; three circuit closures for PUSH ON, PUSH OFF only and 4 sequenced closures or openings operated from a single button. Also included in the HC-1 is a 12VDC power supply capable of delivering 1.5 amperes to these contacts for operation of external relays etc.

PERFORMANCE SPECIFICATIONS

PREAMP SECTION

FREQUENCY RESPONSE

STEREO MODE

LEFT, CENTER and RIGHT FRONT channels,
+0,0.5dB from 20Hz to 20kHz

DOLBY PRO-LOGIC II MODE and MUSIC MODES

LEFT, CENTER and RIGHT FRONT, LEFT and RIGHT SURROUND channels, +0, -0.5dB from 20Hz to 20kHz

If SMALL speakers are programmed for use, the above channels employ high pass filters with a corner frequency of 80Hz and a 12dB per octave rolloff.

DD, DTS, and 8 CHANNEL EXTERNAL INPUT

All Channels, +0, -0.5dB from 20Hz to 20kHz.

SUBWOOFER This channel has an electronic low pass filter with an 80Hz corner frequency and 24dB per octave rolloff in ALL MODES except External.

RATED PREAMP OUTPUT

2V at LEFT FRONT, CENTER, RIGHT FRONT, LEFT SURROUND, RIGHT SURROUND and SUBWOOFER

OUTPUT IMPEDANCE

Less than 600 ohms all outputs

MAXIMUM VOLTAGE OUTPUT

8VRMS from all outputs

TOTAL HARMONIC DISTORTION

All channels, 0.05% from 20Hz to 20kHz

SENSITIVITY

Line Level: 100mV IHF

Dolby Level: 200mV input

External Processor Reference Level: 200mV input

SIGNAL TO NOISE RATIO, A-WEIGHTED

All outputs greater than 90dB below reference level.

MAXIMUM INPUT SIGNAL

High Level: 6V

INPUT IMPEDANCE

High Level: 20K ohms

VOLTAGE GAIN

High Level to Tape: 0dB.

High Level to Preamp Output: 14dB

TONE CONTROLS

Bass and Treble variable 12dB boost to 12dB cut

POWER AMPLIFIER SECTION

POWER OUTPUT (LF, C, RF, LS, BS, RS)

100 watts into 4 ohm loads minimum sine wave continuous average power output per channel. The output RMS voltage is 20 across 4 ohms.

POWER OUTPUT ZONE B

100 watts into 4 ohm loads minimum sine wave continuous average power output per channel. The output RMS voltage is 20 across 4 ohms.

OUTPUT LOAD IMPEDANCE

NORMAL 4, or 8 ohms.

RATED POWER BAND

20Hz to 20kHz

TOTAL HARMONIC DISTORTION

0.05% maximum harmonic distortion at any power level from 250 milliwatts to rated power per channel from 20Hz to 20,000Hz, all channels operating.

DYNAMIC HEADROOM

1.8dB

FREQUENCY RESPONSE

+0, -0.25dB from 20Hz to 20kHz

+0, -3.0dB from 10Hz to 100kHz

INPUT SENSITIVITY

1 volt input for 100 watts output

INPUT IMPEDANCE

20k ohms

A WEIGHTED SIGNAL TO NOISE RATIO

92dB (112dB below rated output)

INTERMODULATION DISTORTION

0.05% maximum if instantaneous peak output does not exceed twice the output rating per channel, with all channels operating, for any combination of frequencies from 20Hz to 20,000Hz.

OPTIONAL TUNER SECTION FEATURES AND BENEFITS

NEW TUNING SYSTEM

Seek or Manual Tuning in the FM or AM band.
Electronic memory for 9 FM and 9 AM stations.
Exact digital display of tuned frequency.
Automatic muting when changing stations.

MEMORY SEARCH

Auditions each preset station for 5 seconds automatically, either FM or AM.

DMOS-FET RF AMPLIFIER

Better sensitivity and better cross modulation rejection

DOUBLE BALANCED MIXER

Better spurious response rejection and better local oscillator isolation.

LINEAR PHASE, PIEZOELECTRIC IF FILTERS

Never require adjustment and provide lower distortion.

PLL MPX

Better separation, lower noise and lower distortion.

AUTOMATIC STEREO BLEND SYSTEM

Background noise is reduced for weak FM Stereo stations, with little loss of stereo image.

19kHz PILOT AND 38kHz CARRIER SUPPRESSION CIRCUITS

Noise free tape recording.

ADJACENT CHANNEL MULTIPLEX INTERFERENCE REJECTION CIRCUIT

Reduced background chatter due to adjacent channels.

AM ANTENNA CIRCUIT WITH A FARADAY SHIELDED LOW IMPEDANCE FERRITE ROD ANTENNA

Locally generated interference is rejected.

Even static crashes from lightning are significantly reduced.

RAA1 REMOTE AM ANTENNA IS INCLUDED

The AM antenna can be located away from sources of interference.

FM SECTION SPECIFICATIONS**USABLE SENSITIVITY**

14dBf which is 1.4uV across 75 ohms

50dB QUIETING SENSITIVITY

Mono - 19dBf which is 2.4uV across 75 ohms

Stereo - 35dBf which is 15uV across 75 ohms

SIGNAL TO NOISE RATIO

Mono 75dB

Stereo 70dB

FREQUENCY RESPONSE

Mono +0 -1dB 20Hz to 15,000Hz

Stereo +0 -1dB 20Hz to 15,000Hz

HARMONIC DISTORTION

Mono 0.3% at 100Hz

0.3% at 1000Hz

0.3% at 10,000Hz

Stereo 0.45% at 100Hz

0.45% at 1000Hz

0.65% at 10,000Hz

INTERMODULATION DISTORTION

Mono 0.25%

Stereo 0.45%

CAPTURE RATIO

1.2dB

ALTERNATE CHANNEL SELECTIVITY

75dB

SPURIOUS REJECTION

100dB

IMAGE REJECTON

75dB

AM SECTION SPECIFICATIONS**SENSITIVITY**

20uV External Antenna Input

SIGNAL TO NOISE

48dB at 30% modulation

58dB at 100% modulation

HARMONIC DISTORTION

.5% Maximum at 50% modulation

FREQUENCY RESPONSE

50Hz to 6kHz NRSC

ADJACENT CHANNEL SELECTIVITY

55dB Minimum IHF

IMAGE REJECTION

65dB Minimum from 540 to 1600kHz

IF REJECTION

80dB Minimum

FRONT PANEL INFORMATION

The illuminated glass front panel contains 4 single shaft rotary controls. There is a blue 12 character alphanumeric vacuum florescent display in the center of the panel. It is surrounded by LED status indicators. Above the display are the DOLBY DIGITAL, EX, PRO LOGIC II, DTS, DTS ES, NEO:6, NEO:6, STEREO 96KHZ and EXPAND indicators. Below the display are the six Zone A POWER GUARD indicators. There are 7 push buttons, a headphone jack, a calibration microphone jack, and a rocker switch at the bottom of the front panel.

ROTARY CONTROLS

INPUT SELECTOR

The INPUT selector is a rotary encoder with 18 click steps per rotation. Input selections are TUNER, AUX, CD, SAT, TV, DVD, VCR 1 and VCR 2. The selected input is shown on the fluorescent display.

TRIM SELECTOR

The trim select is a rotary encoder with 18 click steps per rotation. There are eight positions used, OFF, SUBWOOFER, SURR SPKR, CENTER SPKR, TREBLE, BASS, TUNE, and DISPLAY. LEDs indicate the TRIM selection.

VOLUME

VOLUME control of the MHT200 is done by a PRECISION DIGITALLY CONTROLLED ATTENUATOR. The human interface element is a ROTARY ENCODER. Together they provide .5dB resolution, .1dB accuracy and smooth effortless rotation. VOLUME level is displayed in % of maximum Volume.

SURROUND MODE

The SURROUND MODE selector is a rotary encoder with 18 click steps per rotation. There are eight positions used. The SURROUND MODES are:

MUSIC 1: ProLogic II Music Mode processing. This brings out the natural ambient information in the music track. This is especially useful for surround encoded or acoustically ambient material. 2 channel soundtracks are expanded into 5 channels with optional subwoofer.

This differs from Dolby Pro Logic II Movie (Cinema 1) mode by maintaining the wide left and right image, instead of harshly steering in-phase material to center. The Center and Surround steering is adjustable in the Setup menu.

MUSIC 2: Neo:6 Music Mode processing. This mode also brings out the natural ambient information in the music track. 2 channel soundtracks are expanded into 6 channels (includes Back Surrounds) with optional subwoofer. The Center steering is adjustable in the Setup menu.

MUSIC 3: This is a "Party Music Mode" where L is sent to LF and LS, R is sent to RF and RS, and L+R is sent to the Center channel. The EXPAND LED will light.

MUSIC 4: MUSIC 4 simulates a club or smaller room. The Surrounds have a fast decay, and is suitable for pop and rock music. The sum of the left and right signals is sent to the Center speaker. The EXPAND LED will light.

STEREO: In STEREO all program material is down mixed to a standard stereo signal.

STEREO 96KHZ: This mode is only available for 2-channel analog signals, or 96/24 encoded LPCM digital signals. During this mode, all DSP processing is bypassed. The A-D input is connected directly to the D-A outputs to maintain signal purity.

When rotating the front panel Mode knob, this mode will not be available when DD, DTS, or standard PCM signals are detected.

CINEMA 1: Is Pro Logic II decoding of 2-channel analog and PCM digital sources. Or, Dolby Digital and DTS 5.1 decoding of corresponding soundtracks.

CINEMA 2: Is DTS NEO:6 decoding of 2-channel analog and PCM digital sources. Or, Dolby Digital EX and DTS ES Discrete and Matrix decoding of corresponding soundtracks.

The Back Surround channels are activated for each of these cases.

EXTERNAL: Selection of the EXTERNAL eight channel input bypasses internal digital processing. Volume control and Muting remain in signal path. All Setup level calibrations are maintained.

PUSHBUTTON SWITCHES

TRIM UP and DOWN

The TRIM UP and DOWN pushbuttons are used to adjust the amount of TRIM desired; audio level in the case of SUBWOOFER, SURR SPKRS, CENTER SPKRS, TREBLE and BASS or the light intensity of the FLORESCENT DISPLAY when it is selected.

If the optional tuner is installed, the tuner presets may be adjusted up or down when TUNER is selected.

LATE NIGHT

LATE NIGHT is a feature of Dolby Digital. It provides sound compression for night time listening. Push ON, push again for OFF. There is a red LED above the button that indicates compression ON.

ZONE B

The ZONE B pushbutton switches the INPUT SELECTOR, DISPLAY and VOLUME CONTROL from Zone A to Zone B. The LED above the switch indicates when the controls are assigned to Zone B.

SETUP

A small inconspicuous pushbutton is located between the ZONE B and SYS OFF buttons. When pushed and held for 3 seconds, the VFD lights to indicate the MHT200 is in the SETUP mode.

SYS OFF

SYS-OFF is a pushbutton switch that turns off all Zones.

STANDBY/ON

Pushbutton to cycle the MHT200 between STANDBY and ON. The LED above the pushbutton indicates STANDBY.

AC POWER SWITCH

The MHT200 may be switched completely OFF when not in use for long periods of time. No need for STANDBY operation because the memories are permanent and require no power. However this switch must be in the ON position for REMOTE operation.

HEADPHONE JACK

A front panel headphone jack is provided for private listening. When headphones are plugged into the jack the MHT200 automatically mixes down to STEREO and all other outputs are muted. Zone B is not affected.

CALIBRATION MICROPHONE JACK

A front panel jack is provided for the McIntosh professional quality microphone. During Setup, the installer can choose to have the MHT200 automatically calibrate both the Level and Delay of all 8 speakers in the system.

REAR PANEL INFORMATION

The rear panel contains the many input and output connectors required for a HOME THEATER system. They are arranged in vertical rows.

Moving from Left to right, top to bottom they are:

Row 1.

1. Fuse Holder and International AC Power Socket

Row 2.

1. 2 Component Video Inputs,
2. 1 Component Video Output
3. Zone A and B Keypad Connector
4. IR Sensor Power ON/OFF Switch
5. IR Sensor Input Mini Jacks for Zone A and B
6. Four Power Control Mini Jacks

Row 3.

1. 11 Data Output Mini Jacks, TUNER, AUX, CD, SAT, TV, DVD, VCR 1, VCR 2, SUM A, SUM, and HOME

Row 4.

1. 3 Optical Digital Inputs
2. 3 Coaxial Digital Inputs
3. 1 Coaxial Digital Output
4. 1 Optical Digital Output
5. DB9 RS232 Connector

Row 5.

1. 7 S-Video Inputs, AUX, CD, SAT, TV, DVD, VCR 1 and VCR 2
2. 3 S-Video Outputs, MON A, VCR 1 and VCR 2

Row 6.

1. 7 Composite Video Inputs, AUX, CD, SAT, TV, DVD, VCR 1 and VCR 2
2. 4 Composite Video Outputs, MON A, VCR 1, VCR 2 and MON B

Row 7.

1. 8 Stereo Audio Inputs, TUNER, AUX, CD, SAT, TV, DVD, VCR 1, and VCR 2. If the optional TUNER is installed, the TUNER jacks become TUNER output jacks.
2. 4 Stereo Audio Outputs, ZONE A fixed, VCR 1, VCR 2, ZONE B fixed

Row 8.

1. EIGHT CHANNEL INPUT, LF, C, RF, LS, RS, BSL, BSR, and SUB
2. Zone B Stereo PREAMP OUTPUT

Row 9.

1. Zone A PREAMP OUTPUT, LF, C, RF, LS, RS, BSL, BSR and SUB
2. Second pair of Zone B Stereo PREAMP OUTPUT

Row 10.

1. 7 POWER AMP INPUTS, LF, C, RF, LS, RS, BSL, and BSR
2. L&R Inputs for Zone B POWER AMP
3. External Jumpers are used between the PREAMP OUTPUT jacks and the POWER AMP INPUT jacks. These jumpers may be removed and cables substituted to re-configure the POWER AMPLIFIER assignments.

Row 11.

1. A double row (+ & -) of 5 way binding posts for each of the eight power amplifier's speaker connections

Row 12.

1. Antenna connectors for the optional AM/FM Tuner

TECHNICAL DESCRIPTION**BUFFERED FET AUDIO SWITCHING**

All eight inputs of the MHT200 are buffered with high performance op-amps. This is done for several reasons. They provide a uniform high input impedance, protect the FET switches from static discharge damage, offer a very low source impedance for the FET switches and supply the necessary power and isolation for multiple Zone switching.

MATCHED AND BUFFERED VIDEO SWITCHING

All VIDEO switching in the MHT200 is done at 75 Ohms impedance. Each input is terminated with 75 Ohms. FET switches select the input in use. Then the signal is restored to its original value by a broadband VIDEO buffer amplifier with 75 Ohms output impedance. There are buffers for both Zone A and Zone B MONITOR outputs.

ANALOG TO DIGITAL CONVERSION

The output from Zone A input switching is fed to a decoder module with a 24-bit A to D converter. An Input Level Monitor is provided in the Setup menu to help match the levels of various sources, and prevent overload.

24-BIT DSP PROCESSING

The converted digital signal is fed to a 24 BIT DIGITAL SIGNAL PROCESSOR for decoding the various modes of operation

BASS and TREBLE boost and cut are done in the DSP processor.

24-BIT DIGITAL TO ANALOG CONVERSION

The output of the module has four 24-bit stereo D to A converters that feed the volume control stage.

VOLUME CONTROL

The volume control is an 8 GANG PRECISION DIGITALLY CONTROLLED VOLUME ATTENUATOR. The EXTERNAL inputs are fed directly to the VOLUME control when they are selected.

HIGH LEVEL AMPLIFIER

The high level amplifier section uses several high tech operational amplifiers. The amplifier stages have been optimized for the best transient performance and minimum distortion.

CONTROL LOGIC

All inputs, outputs, and data ports are controlled by logic circuits in the MHT200. The logic is changed by front panel switches or by a microprocessor IR decoder. It receives data from the front panel or external sensors and provides the command signals for input switching, data switching, processing and volume control.

POWER AMPLIFIER DESIGN PHILOSOPHY

The secret to high performance will sound very simple, but it is more difficult to carry out than it may seem. The principle used in the design of the MHT200 power amplifier section was to arrange every stage of voltage or current amplification to be as linear as possible.

This linear operation is accomplished by using several different techniques.

1. Each transistor is selected to have nearly constant current gain (Beta) over the entire range of currents at which the transistor must operate.
2. The load impedance presented to each amplification stage is made to be as uniform as possible for all signal levels.
3. The input impedance of stages is increased and linearized where possible by using emitter degeneration.
4. Resistors and capacitors in the signal path are carefully selected to have exceedingly low voltage coefficients (low change of resistance or reactance with applied voltage).
5. Output transistors have matched uniform current gain, high current gain-bandwidth product, low output capacitance, and large active-region safe operating area. These characteristics and the automatic tracking bias system eliminate crossover distortion. The distortion graphs show clearly that distortion

does not increase at low power output levels.

CIRCUIT OPERATION

The power output amplifier uses two balanced stages of voltage amplification followed by three stages of current amplification. All stages are complimentary balanced, which effectively cancel even number harmonics. This means that the amplifying stages have less total harmonic distortion and less negative feedback is required.

HIGH ENERGY STORAGE

Huge main filter capacitors are used to guarantee an excellent signal to noise ratio and the energy storage necessary for the wide dynamic range that "Digital Audio" demands.

PROTECTION CIRCUITS

Some manufacturers of receivers and power amplifiers advertise that their products do not require or use protection circuits and that such circuits compromise performance. McIntosh Laboratory agrees that diligent measures are required to allow unrestricted performance, but we also insist that protection circuits are desirable and necessary to prevent amplifier or loudspeaker damage due to abnormal circumstance and that they actually enhance performance. The MHT200 incorporates seven protection circuits to enhance its performance, assure its reliability and to protect loudspeakers.

POWER GUARD

Power Guard, a unique feature of McIntosh amplifiers, assures that each channel of the MHT200 will deliver full power free of clipping distortion. Clipping is caused when an amplifier is asked to produce more power output than its design is capable of delivering with low distortion. Amplifiers that are overdriven may deliver large quantities of power when they are clipping but they have more than 40% harmonic distortion. In this mode, the sound is grossly distorted and the extra energy content of the clipped signal will damage most loudspeakers. The McIntosh Power Guard circuit protects your ears and your speakers from this kind of damage.

The Power Guard circuit consists of a waveform comparator, which monitors the wave shape of the amplifier input and output signals. Normally there is no disparity between these signals and the comparator produces no output. When the amplifier is driven beyond its maximum power capacity a difference will develop. If the disparity exceeds 0.3% (equivalent to 0.3% total harmonic distortion) the comparator output causes the amber power guard indicator to light.

If there is a further increase in the disparity the comparator output then controls an electronic attenuator at the amplifier input. It reduces the amplifier gain, thus

holding the amplifier output to a low distortion value. Overdrive by 14dB is possible before the output distortion exceeds 2%.

POWER LINE INRUSH PROTECTION

Turn on inrush current is cushioned by thermistors in the power transformer primary circuit. A soft start is achieved that eliminates component stress during turn-on.

SENTRY MONITOR

All power transistors have limits for the maximum amount of power they can handle. The MHT200 output transistors and power supply have been designed to allow very high current flow into a properly matched load impedance. If, however, a short circuit or very low value of load impedance is applied to the output of the MHT200, destructive current levels could be reached if it was not controlled by the Sentry Monitor circuit. This circuit senses the dynamic operating time, voltage, and current of the amplifier output stage and controls the current flow confining it to nondestructive limits. Sentry Monitor does not limit the power output available from the amplifier.

THERMAL CONTROL

All power transistors have limits for the maximum amount of heat they can tolerate. The MHT200 uses a highly efficient amplifying circuit which produces relatively little heat for the output power produced. The amplifier has oversized heat sinks to dissipate transistor-generated heat. Natural convection airflow is sufficient for cool operation. Should the cooling air be blocked or should the amplifier operating temperature become too high, thermal cutouts within the amplifier will turn off the speakers. POWER GUARD indicators will light continuously to show thermal protection is operating. When the amplifier has cooled, it will automatically turn on again.

TURN-ON DELAY

The MHT200 has a turn-on delay circuit that delays amplifier operation for about 2 seconds after power turn on. This prevents pops or thumps generated in other equipment from causing annoying noises or damaging your loudspeakers.

DIRECT CURRENT FAILURE PROTECTION

A circuit is provided that turns off the speakers if for any reason a DC voltage appears at the speaker terminals. This prevents speaker damage.

From the McIntosh Design Engineering Department

Preliminary	Jan 16, 2003	JMH
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