

# YAMAHA R-100

*Natural Sound AM/FM Stereo Receiver*

*Computer Controlled Sound System*

*10 Station Random Access Memory*

*New Computer Servo Lock Tuning System*

*Zero Distortion Rule Amplification*

*Unique Yamaha Spatial Expander*

*Dynamic Noise Canceller, Cordless Integrated Remote Control Unit*

*100 Watts RMS (8 ohms) Power per Channel, Less than 0.01% Distortion*



# Behind the Superior Yamaha Sound

Yamaha's foundation as a manufacturer spans more than a hundred years in a number of specialized fields. Since the company began as a producer of reed organs, it has expanded steadily until today, Yamaha music instruments, sound

reinforcement gear, music education and popularization programs, motor products, sports equipment, and of course, audio products, are renowned worldwide for their highly refined performance. Naturally, the many years spent in intensive research and development in all these fields has resulted in a vast and varied store of technology. Moreover, the finely balanced interrelationship between the many Yamaha in-house technologies, production facilities and product groups creates a

highly efficient network that makes it possible to achieve optimum quality and performance in every product. Yamaha audio know-how, however, does not stop at technology. Each and every new audio product must face the most demanding challenge imaginable: the critical ears of Yamaha music instrument designers. Unless the reproduce sound is exactly like the real thing, the product is not considered finished. Yamaha gives you vast technology tamed by musical sensitivity—a claim no other audio manufacturer can honestly make.

## THE AUDIO WORLD'S TOP-OF-THE-LINE RECEIVER

### POWER AND SOPHISTICATED OPERATION SET NEW LEVELS OF PERFORMANCE

The incorporation of new computer technology and the sophisticated circuitry found in Yamaha's top-line separate component systems has made possible the creation of the highest performing AM/FM stereo receiver yet developed—the Yamaha R-100.

It's not only big on power, at 100 watts per channel, but loaded with advanced audio technology for exceptional reproduction quality and more convenient, flexible operation.

Microcomputer control has been introduced to provide features that contribute directly to greater listening pleasure.

Evidence of this is the unique Computer Controlled Sound System

(CCSS), which is the first application of a microcomputer to tonal response in any receiver. Other features like Zero Distortion Rule amplification circuitry and new Computer Servo Lock Tuning have been adapted from Yamaha's finest separate components. And the protection circuitry has been further refined to provide full amplifier protection while providing low-impedance, high-current speaker drive capability.

In sound reproduction performance, sophisticated operation, and reliability, the Yamaha R-100 is truly top of the line—and top of the receiver field.

### THE AMPLIFIER: MORE SOPHISTICATED TECHNOLOGY FOR HIGHER PERFORMANCE

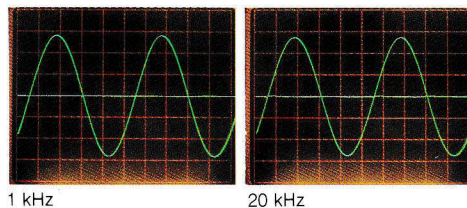
At 100 watts per channel, the R-100 offers more than enough power for any listening situation. But it takes a lot more than power to deliver truly natural sound—the R-100 has it all. Yamaha's Zero Distortion Rule power amplification system, for example, effectively

cancels all distortion originating in the power stage for unprecedented amplification precision, and a super-

efficient heat pipe is used to maintain the optimum operating temperature. Further, componentry throughout has been painstakingly selected for uncompromising

#### Output Distortion Waveform

Aux to Sp Out, Half Rated Power, 8 ohms



overall reproduction performance.

The end result is an amplifier section that would excel even as a separate component, with exceptionally low distortion and unmistakably pure, natural sound reproduction.

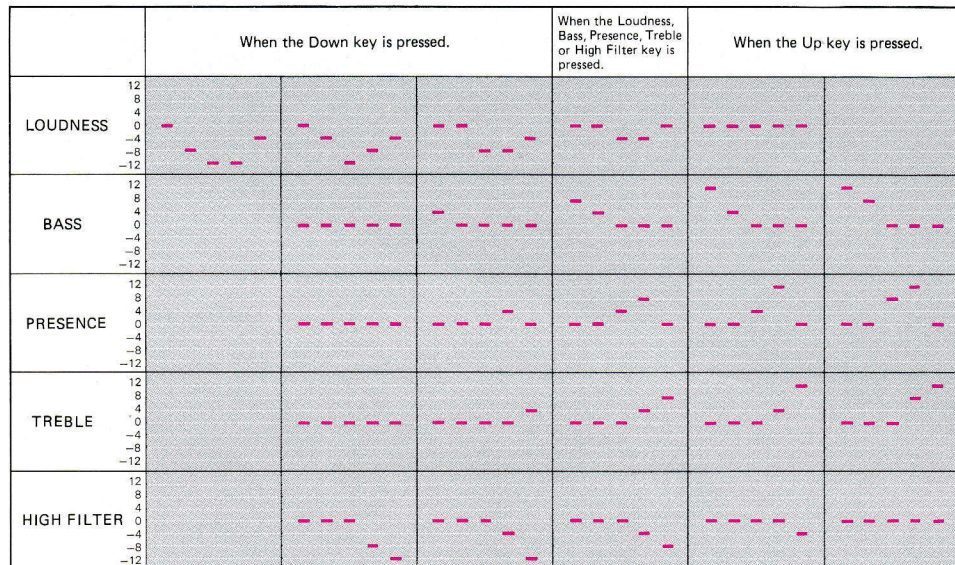
#### Computer Controlled Sound System (CCSS)

An original Yamaha microcomputer system gives you unsurpassed control over the receiver's tonal response to achieve ideal overall sound—with the exclusive one-touch Computer Controlled Sound System. The Computer Controlled Sound System is essentially a 5-band graphic equalizer, but it is fully controlled by a specially designed microcomputer rather than the usual linear manual controls.

CCSS offers five preset idealized response curves that can be selected at the touch of a button: Bass, Loudness, Presence, Treble, and High Filter. The Bass button emphasizes the low frequency range for richer, fuller bass sound; the Loudness button restores accurate tonal perspective at low volume levels; the Presence button emphasizes the mid-range, to add definition to voices and music instruments; the Treble button emphasizes the high frequency range for extra clarity and brilliance; and the High Filter button alters the response curve to reduce high frequency noise (hiss) from tapes and FM broadcasts. What's more, an LED response curve display shows you the exact level of each band.

Once you've selected a curve from the five presets provided, you can use the UP and DOWN buttons to emphasize and de-emphasize the selected curve, respectively. For example, suppose you select the Bass

Some of the extensive response variations possible with the preset response curves.

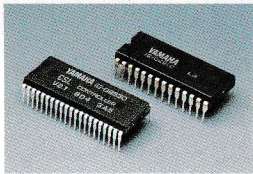


## THE TUNER: UNSURPASSED RECEPTION, SOPHISTICATED OPERATION

Microcomputer technology in the R-100 puts added performance right where you need it—in improved reception quality, and in easier, more flexible operation. This directly reflects the Yamaha philosophy that incorporated technology should be functional, not ornamental. You'll notice it in a different way—the R-100 simply provides superior reception and greater operating convenience.

### New Computer Servo Lock Tuning

To ensure optimum reception quality under all reception conditions, the R-100 incorporates an original Computer Servo Lock tuning system that actually selects the optimum tuning mode according to reception conditions. When the incoming signal is strong and steady, a high-performance FM servo tuning mode is engaged to deliver the music with emphasis on maintaining the very best possible sound quality. For signals that are not capable of providing exceptionally high sound quality and are apt to drift and vary in signal conditions, the CSL microprocessor engages the super-stable PLL tuning mode, which not only "locks in" to the station's frequency for rock-steady reception, but is capable of delivering optimum sound quality under less-than-optimum reception conditions. Having the Computer Servo Lock tuning system is like having two tuners—each dedicated to providing the highest quality under different reception conditions—and a sophisticated computer that makes the choice as to which tuner to use for you automatically.

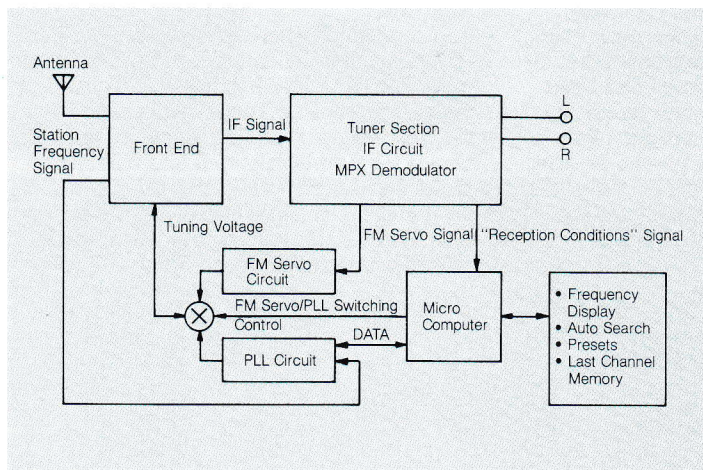


New CSL ICs

### 10-Station Random Access Station Memory

Station programming is a particularly handy feature because it lets you tune a number of your favorite stations at the simple touch of a button. With the R-100 10-Station Random Access Station Memory you have more flexibility and control at your fingertips than ever before. Not only does it allow you to

### New CSL Tuning System Block Diagram



preset the frequency of 10 AM and/or FM stations in any combination or sequence, but it automatically memorizes the status of the station as well. That is, the RX mode—DX or LOCAL—and Auto/Manual tuning mode are memorized in addition to the station's frequency, so whenever you recall the station, you're ready to listen without having to reset these other controls.

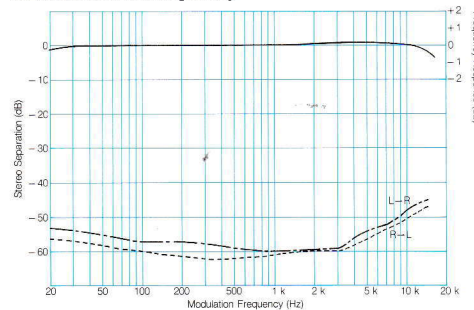
### Manual/Auto Pushbutton Search Tuning

When searching for a station, the R-100 lets you do it in style—either manually or automatically. Manually, you push the rocker button on either the UP or DOWN side to adjust the tuning frequency in increments until you reach the desired frequency, which is indicated on the bright digital frequency display. In the Auto mode, the R-100 scans the broadcast band either upward or downward, depending on which side of the tuning button you pressed, and automatically stops at the next station, perfectly tuned in. To go to the next station, simply press the button again. Of course, once any station is selected, it can be programmed into the microprocessor memory for instant one-button recall at any time.

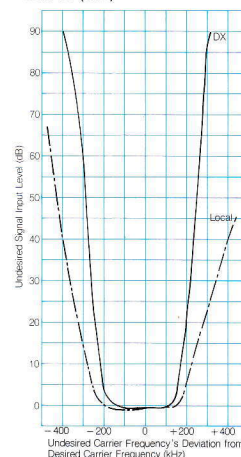
### Automatic RX Mode Selection

When tuning to a weak, noisy station, reception is improved if a receiver has narrow (DX) selectivity to reject outside interference. Conversely, when a strong station is received, a receiver with broad (LOCAL) selectivity will provide more accurate, distortion-free music reproduction and increased stereo separation. Unfortunately, most receivers have a constant selectivity which provides

### FM Frequency Response/Stereo Separation vs Modulation Frequency



### Undesired Signal Input Level (dB)



adequate reception under most—but not all—conditions. Not the R-100. Selectivity is adjusted to DX (narrow bandwidth selectivity) or LOCAL (broad bandwidth selectivity) depending on the quality of the incoming signal. And this is done automatically, so optimum reception quality is assured regardless of the quality of the broadcast signal!

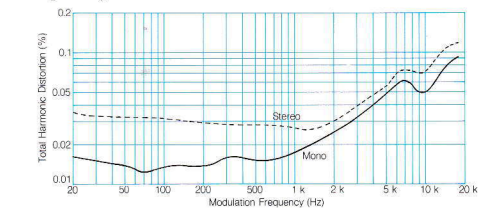
### Signal Quality Meter

Conventional meters of this type show signal strength. The 10-segment LED meter on the R-100 shows signal quality (the presence and degree of multipath interference) as well. With this, you can position your antenna for optimum reception merely by checking the quality of the signal indicated by the meter.

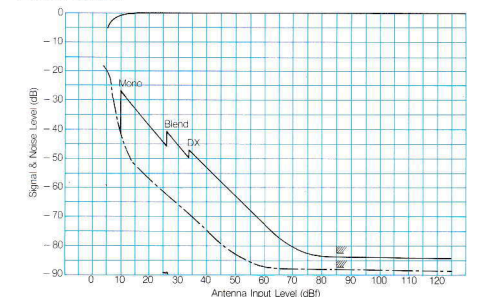
### Auto Blend

When a weak, noisy station is tuned in, this feature effectively improves sound quality at a slight loss in stereo separation by blending the high frequency portions of the left and right channel stereo signals, thereby cancelling out-of-phase hiss and noise. The reduction in noise and improvement in overall sound quality is significant, so the slight loss of separation won't even be noticed. Once again, this feature is automatically activated by the internal microprocessor system whenever it is needed, so you don't have to push buttons and make adjustments to get the best sound.

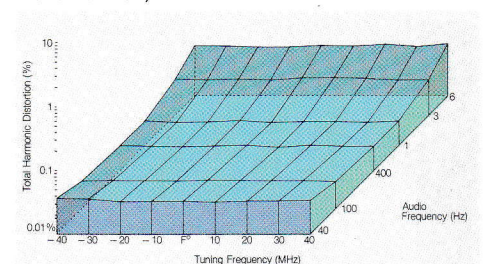
### FM Total Harmonic Distortion vs Modulation Frequency



### FM Antenna Input vs Output Level, Noise Level



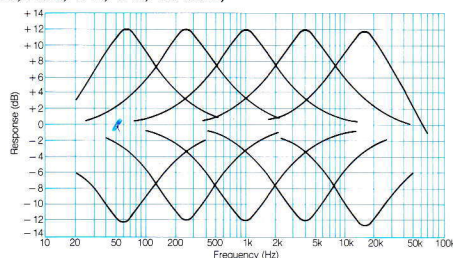
### Total Harmonic Distortion vs Tuning and Audio Frequency (Antenna Input...80 dBμ Modulation Mode...St-Left)



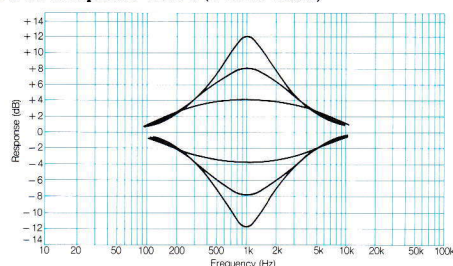
curve but need a little more boost in the bass range to get just the sound you wanted. Simply press the UP button and the amount of bass boost is increased a notch. Boost can be decreased by pressing the DOWN button. The Loudness curve can be emphasized and de-emphasized—corresponding to the Fletcher-Munson loudness curves—to precisely compensate for the ear's loss of sensitivity to high and low frequencies at low listening levels. This means you can get full subjective tonal response, and therefore full musical impact, at any listening level. Now, once you've got exactly the response curve you need, it can be programmed into any one of three memory locations provided! Next time you're listening to the same source or need the same response, just touch the appropriate memory button and your programmed response curve will be recalled immediately.

When you really need a special response curve that is not obtainable with the presets provided, each of the five equalizer bands can be adjusted individually and the resultant curve memorized as above. The Yamaha Computer Controlled Sound System gives you more response tailoring control with more convenience and features than offered by any other receiver currently available.

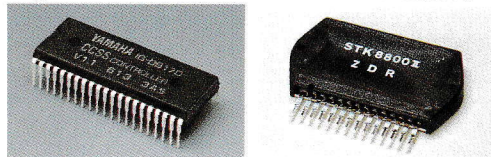
**CCSS Response Curves (Center Frequencies: 60, 250, 1 k, 4 k, 16 kHz)**



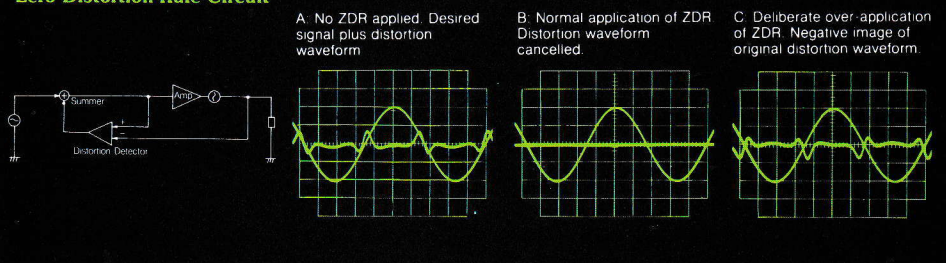
**CCSS Response Curve (1-kHz Band)**



**Original Yamaha CCSS IC Zero Distortion Rule IC**



### Zero Distortion Rule Circuit



### Zero Distortion Rule Power Amplification

The same revolutionary system used in Yamaha's highly acclaimed separate component series amplifiers, Yamaha Zero Distortion Rule power amplification brings remarkable reproduction purity to the R-100. Simply, this unique circuit design completely eliminates any distortion generated in the power amplifier stage by actually comparing the input signal to the output signal, determining which portions of the output signal are distortion—i.e. are not present in the input signal, and summing the inverted distortion-only signal with the input signal so that the amplifier's distortion is effectively cancelled. In addition to eliminating distortion occurring in the power amplifier circuitry, the Zero Distortion Rule system also obviates thermal distortion originating in the power transistors themselves, and distortion that normally arises due to back EMF (Electro-Motive Force) from the speakers. Zero Distortion Rule gives the R-100 audibly superior natural sound reproduction.

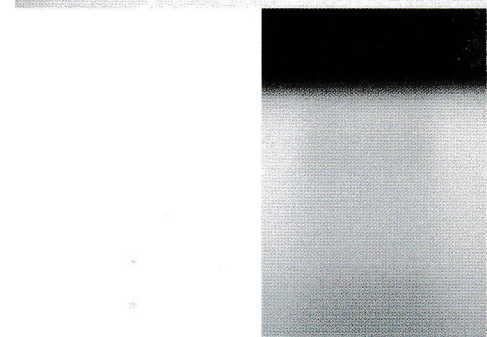
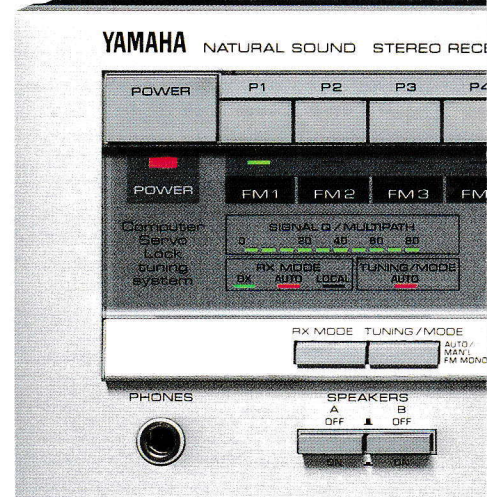
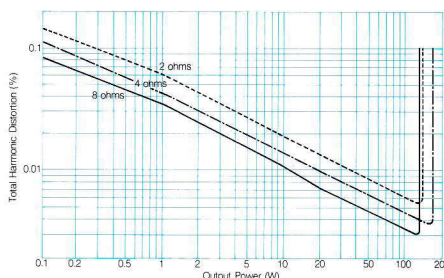
### Improved Protection Circuitry

Refined protection circuitry provides fail-safe insurance against amplifier damage due to shorted speaker leads or excessive power surges, while at the same time offering significantly increased high-current drive capability. This means that low-impedance speakers, and even paralleled speaker systems can be safely driven without the amplifier shutting off prematurely.

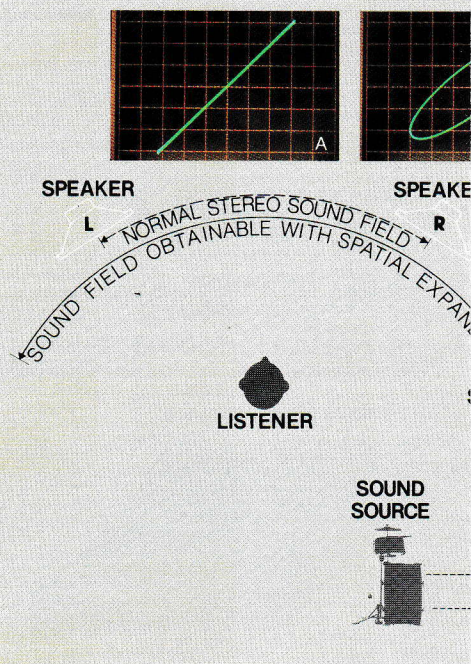
### New Stereo Spatial Expander

The R-100 takes you beyond stereo—to the realm of super stereo, thanks to a special Yamaha Spatial Expander. In normal stereo systems, the scope of the playback field is defined by the physical distance between the speakers, and all music sounds emanate from somewhere between the two. Not with the Yamaha Spatial Expander. This continuously variable control creates the same acoustic effect as actually placing your speakers farther apart, which dramatically broadens the stereo sound field. The result is

**Output Power vs Total Harmonic Distortion (1 kHz, Both Channel Driven)**



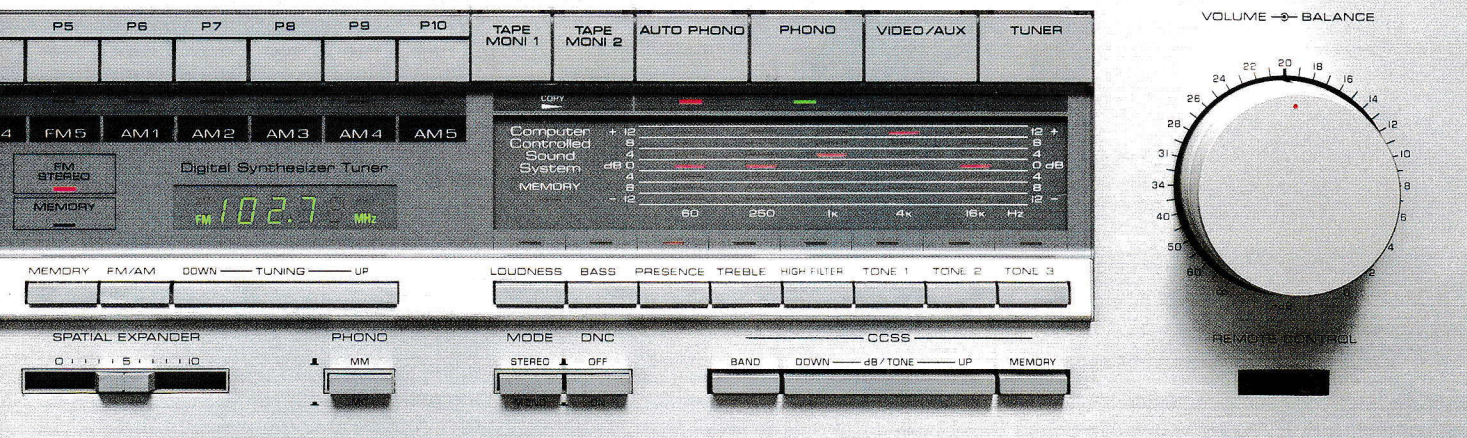
These oscillographs electronically illustrate the expansion. Oscillograph A represents a monaural signal. B is a normal stereo signal (same continuous signal both channels). C is an EXPANDED stereo signal. The fullness of the tremendous subjective expansion of the stereo image is evident.



# R-100

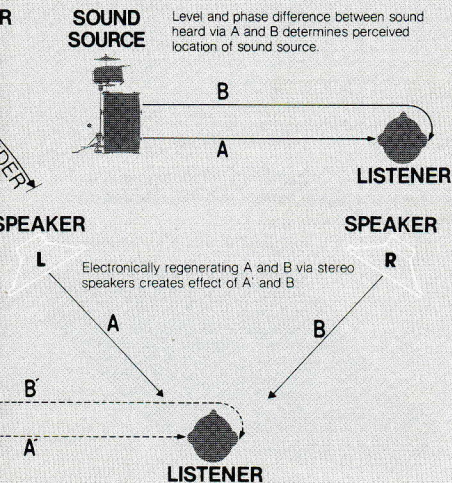
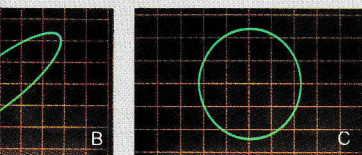
Natural Sound AM/FM Stereo Receiver

RECEIVER R-100



effect.

channels).  
The trace indicates  
the effect.

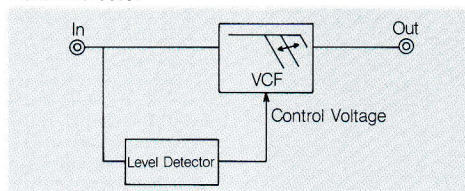


"big" sound that comes remarkably close to live listening. The Yamaha Spatial Expander not only expands the stereo imaging of the playback sound, but your musical enjoyment as well.

## Dynamic Noise Canceller

The Dynamic Noise Canceller is an exclusive Yamaha noise reduction system that increases the S/N ratio of any source. With conventional "dual process" NR systems, only previously encoded sources can be decoded during playback to effect noise reduction. The Yamaha Dynamic Noise Canceller, however, employs a sliding low-pass filter that automatically follows the upper limit of the program frequency content and filters out any noise above its highest frequency, while any noise within the program frequency range is eliminated by a psycho-acoustic effect known as "masking." The result is exceptionally quiet, noise-free reproduction from tape, disc, or tuner.

## Level Detector



## Auto Phono Function

This handy feature automatically switches the R-100's input selector to phono whenever turntable playback is initiated—with any turntable. When disc playback finishes, receiver input is automatically switched back to the previous source. When the Auto Phono function is on, there's no need to push buttons—just lower the stylus onto the record and the Auto Phono function is activated.

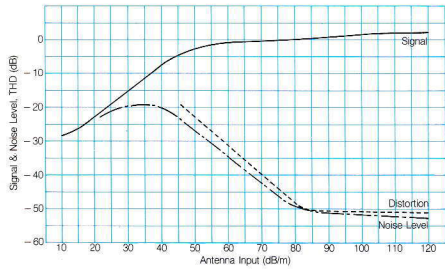
## Moving Coil/Moving Magnet Cartridge Selector

Top-quality MC (Moving Coil) cartridges are rapidly gaining popularity with serious audiophiles for their superb definition and clarity in disc reproduction, while the best MM (Moving Magnet) models are still an excellent choice for their high output and durability. With conventional receivers, the output level of MC cartridges is too low to be used directly, so a separate step-up transformer or MC head amplifier is required. Not with the R-100—a special system switches the gain of the phono equalizer amp stage for optimum performance with either MM or MC cartridges according to the setting of the front-panel MM/MC cartridge selector switch. With the R-100, you'll get the very best from either conventional MM cartridges or high-definition MC designs.

## Superior AM Performance

Great reception from the R-100 doesn't stop when you switch to AM. For equally high-quality AM reception, Yamaha installed a specially designed IF stage that helps to deliver the cleanest, highest quality AM sound around. The antenna is also special—it's a High-Q, low-impedance antenna specially developed by Yamaha for unsurpassed AM

### AM Antenna Input vs Signal and Noise Level, THD



reception. These and other features provide AM listening at its very best.

### Other Features

- A, B, or A + B speaker selection
- Tape monitor with copy function for deck to deck recording

- Built-in subsonic filter
- DC NFB PLL multiplex demodulator
- Memory backup
- Last channel memory

## REMOTE CONTROL TUNING FROM YOUR EASY CHAIR

The Ultimate in Operating Convenience—As a Standard Accessory!

You don't have to go to the R-100 every time you want to change an operating mode or function—the RS-100 remote control brings it to you. And it's included as a standard accessory with every R-100! Now you can control just about all of the R-100's functions—from volume control to adjusting the CCSS—from the comfort of your easy chair.



## R-100 SPECIFICATIONS

Minimum RMS Output Power per Channel—100 Watts (8 ohms) from 20 to 20,000 Hz at no more than 0.01% Total Harmonic Distortion

AUDIO SECTION	
Minimum RMS Output Power per Channel	
8 ohms, 20 to 20,000 Hz, 0.01% THD	100 W
4 ohms, 1 kHz, IHF Signal (Dynamic Power)	130 W
2 ohms, 1 kHz, IHF Signal (Dynamic Power)	130 W
Dynamic Headroom (IHF, 8 ohms)	1.5 dB
Power Bandwidth	
8 ohms, 0.012% THD, Half Rated Power	10 to 30,000 Hz
Damping Factor (8 ohms, 1 kHz)	more than 45
Input Sensitivity/Impedance	
Phono MM	2.5 mV/47 k-ohms
Phono MC	160 $\mu$ V/100 ohms
Aux/Tape/Tuner	120 mV/47 k-ohms
Input Sensitivity (New IHF)	
Phono MM	0.25 mV
Phono MC	16 $\mu$ V
Aux/Tape/Tuner	12 mV
Maximum Input Level (1 kHz, 0.02% THD)	
Phono MM	110 mV
Phono MC	7 mV
Output Level/Impedance	
Rec Out	120 mV/4.7 k-ohms
Headphone Output (0.02% THD)	0.81 V/270 ohms
Frequency Response	
Aux/Tape/Tuner, 20 to 20,000 Hz	+0 -1 dB
RIAA Deviation	
Phono MM	$\pm$ 0.5 dB
Phono MC	$\pm$ 0.5 dB
Total Harmonic Distortion (20 to 20,000 Hz)	
Phono MM to Rec Out (1 V)	0.008%
Phono MC to Rec Out (1 V)	0.008%
Aux/Tape/Tuner to SP Out (1W/8 ohms)	0.008%
Intermodulation Distortion	
Aux/Tape/Tuner, Rated Power/8 ohms	0.01%
Signal-to-Noise Ratio (IHF A Network)	
Phono MM (5 mV, Input Shorted)	88 dB
Phono MC (500 $\mu$ V, Input Shorted)	75 dB
Aux/Tape/Tuner (AM position, Input Shorted)	100 dB
Signal-to-Noise Ratio (New IHF)	
Phono MM	72 dB
Phono MC	74 dB
Aux/Tape/Tuner (AM Position)	81 dB
Residual Noise (IHF A Network)	140 $\mu$ V
Channel Separation (1 kHz)	
Phono MM (Input Shorted)	60 dB

Auto phono function is protected by U.S. patent No. 3956591.

Aux/Tape (5.1 k-ohms Shorted)	60 dB
Filter Characteristics	
Low (Subsonic, EQ Built-In)	15 Hz, -12 dB/oct
FM SECTION	
Tuning Range	87.5 to 108.0 MHz
50 dB Quieting Sensitivity (IHF, 75 ohms)	
Mono/Stereo	1.5 $\mu$ V (14.8 dBf)/20 $\mu$ V (37.3 dBf)
Usable Sensitivity (30 dB Quieting, 75 ohms, Mono)	0.75 $\mu$ V (8.8 dBf)
Image Response Ratio	75 dB
IF Response Ratio	95 dB
Spurious Response Ratio	95 dB
AM Suppression Ratio	66 dB
Capture Ratio	1.2 dB (Local)/2.5 dB (DX)
Alternate Channel Selectivity (IHF)	35 dB (Local)/85 dB (DX)
Signal-to-Noise Ratio (IHF)	
Mono/Stereo	88 dB/83 dB
Distortion	
Mono (100 Hz/1 kHz/6 kHz)	0.05%/0.05%/0.1%
Stereo (100 Hz/1 kHz/6 kHz)	0.07%/0.07%/0.15%
Stereo Separation (IHF)	
50 Hz/1 kHz/10 kHz	50 dB/50 dB/45 dB
Frequency Response	
50 to 10,000 Hz	$\pm$ 0.3 dB
30 to 15,000 Hz	+0.3 dB -0.5 dB
AM SECTION	
Tuning Range	510 to 1,620 kHz
Usable Sensitivity	250 $\mu$ V/m
Selectivity	25 dB
Signal-to-Noise Ratio	52 dB
Image Response Ratio	40 dB
Spurious Response Ratio	50 dB
Distortion (400 Hz)	0.3%
Output Level/Impedance (Fixed)	
FM 100% mod. 1 kHz	500 mV/5 k-ohms
AM 30% mod. 400 Hz	150 mV/5 k-ohms
GENERAL	
Power Supply	Matched to supply voltage and frequency of each area
Power Consumption	410 W (U.S.A. and Canada) 680 W (Europe, U.K. and Australia) 170 W (Other areas)
Dimensions (W x H x D)	435 mm x 122 mm x 386 mm 17-1/8" x 4-13/16" x 15-3/16"
Weight	11 kg (24 lbs. 3 oz.)

Specifications subject to change without notice.

For details please contact:

SINCE 1887



**YAMAHA**

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