important, but less commonplace, is satisfactory resistance to shock and vibration. The DCD-1800R is very good in this respect, though severe vertical blows (stronger, in our judgment, than it's ever likely to receive in normal use) did cause mistracking. In listening, two members of our staff, working independently, came to the same conclusion: that the sound of this player may indeed have a perceptible edge over that of many or even most of the models we have encountered recently. If so, however, it is a very subtle advantage, and the evaluation is a subjective one grounded on aural memory, which is notoriously fallible. But whatever degree of excellence individual listeners may wish to assign the player on that basis, its documentable excellence is beyond question.

YAMAHA R-9 AM/FM AUDIO-VIDEO RECEIVER

Dimensions: 17 by 5½ inches (front panel), 15 inches deep plus clearance for controls and connections. AC convenience outlets: two switched (60 watts max. total), one unswitched (200 watts max.). Price: \$799. Warranty: "limited," two years parts and labor. Manufacturer: Nippon Gakki Co., Ltd., Japan; U.S. distributor: Yamaha Electronics Corp., USA, 6660 Orangethorpe Ave., Buena Park, Calif. 90620.



f you're familiar with any mainstream Yamaha receivers of the last few years (there have been a few atypical mutants), or even the company's separates, you should feel right at home with the R-9. The salient innovations are its provisions for video sources, some features specifically designed for TV audio, and wireless remote control. This is not a full-fledged AM/FM/TV receiver, however, as it includes no TV tuner and only enough video circuitry to permit singleswitch selection of sources that deliver both sound and pictures (VCRs, for example).

Considering the number of options involved, the layout is excellent both fore

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and aft. The line-level audio inputs are ranged in a single vertical row, which also includes jacks for preamp output and main-amp input. You can replace their jumpers with the leads for a speaker equalizer or other processor, which will then be inserted between the source selectors and the volume, mode, tone, and other controls. This is a more sensible place than the usual position after the VOLUME, because the levels at this point in a receiver's circuitry are standardized at roughly 1-volt maxima; the alternative can present an attached processor with a wide range of signal levels, putting a premium on its dynamic range.

To the left is a video group consisting

FM TUNER SECTION

Except as noted, data are for the local reception mode.

R-9(1)			
		1	 1.0
			 area.
	 		 -
	 		 -
-	 		 ~
	 	 	 -

requerey response					
	L ch	+ 1/2, - 3/4 dB, 20 Hz to 15 kHz			
	R ch	+ 1/2, -1 dB, 20 Hz to 15 kHz			
Channel separation		\geq 33 dB, 20 Hz to 15 kHz			

of pin-jack triplets for left and right audio and for the video itself. Below it are pin jacks for the phono input and springloaded connectors for antenna input. The latter work well for the leads from the supplied AM loop antenna, but the 45degree angle at which the conductors must be inserted makes it rather awkward for 300-ohm FM twinlead. You have to trim one side shorter than the other and simultaneously manipulate the lead with one hand and the two release buttons with the other-a difficult proposition even if this section of the panel were less cramped. There also is provision for stripped 75-ohm coax, but not for direct plug-in of an F connector.

o the right of the inputs are binding posts for three sets of bared-wire loudspeaker leads. If you use all three, speaker pairs B and C will be in series with each other (acceptable for background-music extension speakers) and in parallel with A, which therefore will be the speaker pair of choice for serious listening. If you use only two (A and B), they will be in parallel, with the oddity that pair B will be turned off if you switch on the unused C connections.

The front panel groups the tuner controls at the upper left and along the middle rank, just above the flip-down door, and the main source selectors and some of the major options at the upper right. Behind the door are speaker selectors, tone and mode controls, and the recording selector, which includes options for dubbing in either direction between the two decks for which connections are supplied. Thus, the main selectors serve as monitor switches: You would, for example, switch between TUNER and TAPE 1 to monitor, respectively, source and tape when recording off the air onto Tape 1.

There are provisions for two video inputs, each with a stereo/mono switch for its audio. Video 1 also has a set of outputs so you can use it for a VCR and record from whatever feeds Video 2. Another pin jack serves as the main video output (to a monitor that will accept the signal in this form or to a modulator that will convert it to RF to feed a TV receiver's antenna input). The main outputs for the associated audio are the R-9's speaker terminals. You choose Video 1 or 2 at the top of the front panel, and the audio and video outputs from the chosen source become available at the main monitor and recording selectors.

Among the mode options-which do not affect the feed to the tape outputs (straight audio or audio-video)-are a mono/stereo switch, a simulated-stereo option, and what Yamaha calls its Dynamic Noise Canceller. This last is a single-ended noise reducer, apparently similar to DNR in that it's a dynamic filter. On weak FM signals, it can be heard abruptly gating the hiss, but all such circuits exhibit some side effects when the signal is very noisy and presumably are intended as a last recourse. Results usually are better when the signal contains only a small amount of hiss, which can then be completely and unobtrusively removed. The simulated stereo delivers an apparent increase in loudness together with a rather blurry impression of openness-again, about par for this sort of feature.

The R-9's wireless remote control, which is supplied with the receiver, can be used to switch it between on and standby. That is, when you press the remote OFF, the R-9 can be reawakened by pressing the remote ON; if you turn off the receiver at its own front-panel switch, it can't be turned back on remotely. In addition, you can use the remote to adjust the volume control (via a motor drive whose effect can easily be assessed from across the room, thanks to an LED calibration mark on the knob), to switch a 20-dB "mute," and to select Video 1 or 2, any of the main monitor options, and any of the station presets.

Yamaha has provided memory slots for 16 stations, in any mix of AM and FM, on eight buttons, plus a ninth to switch between "banks." As delivered, the R-9 is labeled for FM 1 to 8 on the upper bank and AM 1 to 8 on the lower one. The labels are on a slider that can be withdrawn from the left end of the front panel. Yamaha supplies translucent labels for all U.S. FM station frequencies plus AM 9 to 16 and FM 9 to 16, so that you can substitute them for the premounted ones once you have decided on programming. This is a very appealing feature, available on only a few other tuners and receivers.

FM SENSITIVITY & QUIETING

								1000			
DB [1	1	1	1	-	1	-	Ř 9	(2)	
- 10							+	-			
- 20 -	1					_	-	_			
- 30	ľ.										
		1									
- 40	K	1	1						-		
-50	1		1	1		-	-	+	-	-	
-60		1.		1	1		-	+	-		
DREA	10	20	1.	10 1				80		- 100	
DBFO	10	20 .		+0	-) 1			00	50	100	
	stere	e quie	ting ((noise	e), loc	al m	node				
	stere	eo quie	ting	(nois	e), DX	m	de				
	- mon	o quie	ting (noise), DX	mo	de				
Stereo	sensitiv	ity (fo	r 50-	dB no	ise su	ippi	essi	on)			
local	38 dE (38 1	3f at 98 /2 dBf a	MHz. at 90 l	with I MHz: 3	0.48% 37 1/2 i	THD JBf a	+ N at 106	6 MHz	0		
DX	34 dE	3f at 98	MHz.	with	1.3% T	HD -	+ N				
Mono s	ensitivi	ty (for	50-d	B noi	se su	ppre	essio	n)			
local m	ode			13	1/4 dB	f at !	98 MI	tz			
DX mot	le an thro	chold	Imor	12	1/2 dB	at	98 MI	+z	101		
Auto-st	an une	siluiu	(1110)	10)				211	101		
Stereo	thresho	ld						20	1/n dD	,	
DX mor	le							19	1/2 dB	F	
Stereo	S/N rat	io (at	65 dl	Bf)				68 1/4 dB			
Mono S	/N rati	o (at 6	5 dB	f)				77 1	dB		
CAPTI	REBAT	10									
local m	ode	10						1 df	3		
DX mod	le							2 df	3		
SELECT	IVITY			loc	al mo	de		DX	mode	B	
alterna	te-chan	nel		29	1/4 dB			67	1/2 dB		
adjacer	nt-chani	nel		4 d	B			13	1/2 dB		
HARM	DNIC DI	STOR	TION	(THC	(+N)						
local m	ode			ste	200 200			mo	no		
at 1 kH:	72			0.0	376			0.0	56%		
at 6 kH	2			0.2	2%			0.1	7%		
DX mod	ie				ń.						
at 100 l	łz			1.5	5%			0.095%			
at 1 kH	2			0.5	8%			0.36%			
CTEDE		INTE	0.00	4.C	TION			1.1	U 70		
local m	ode	INTE	TINIU	DULA	HUN			0.0	5%		
DX mor	ie							0.7	6%		
INTER	NODUL	ATION	DIST	ORT	ION (r	non	0)				
local m	ode							0.0	25%		
DX mor	X mode				0.23%						
AM SU	PPRES	SION						62	3/4 dB		
PILOT	19 kHZ) SUPP	RES	SION				47	1/2 dB		
SUBCA	RRIER	(38 kł	z) SI	JPPR	ESSIC	N		78	dB		
	IFIER	SEC	TIC	IN	ł						
Mossure	d in Auto	Class	h mod	0. 200	text						
DATED		n Grd55 A	• 1100	21	dDM/	105		Vat	honel		
HAILU	PUVE	n		21	UDWV (120	watt	5) / Cha	nnei		
OUTPU	T AT CI	LIPPIN	G (at	1 kH	z; both	1 ch	anne	ls dr	iven)		

UUTPUT AT CLIPPING	(at I kHz; both channels driven)		
8-ohm load	22 dBW (160 watts)/channel		
4-ohm load	23 3/4 <u>d</u> BW (235 watts)/channel		
DYNAMIC POWER (at	l kHz)		
8-ohm load	23 dBW		
4-ohm load	25 1/4 dBW		
2-ohm load	see text		
DYNAMIC HEADROOM	(re rated power, 8-ohm load)		
	+ 2 dB		
HARMONIC DISTORTIO	ON (THD; 20 Hz to 20 kHz)		
at 21 dBW (125 watts)	≤ 0.034%		
at 0 dBW (1 watt)	< 0.01%		
EREQUENCY RESPONS	F		

+ 0, - 1/4 dB, 18 Hz to 27.6 kHz

+ 0, -3 dB, 12 Hz to 97.6 kHz

ABOUT THE dBW

We currently are expressing power in terms of dBW---meaning power in dB with a reference (0 dBW) of 1 watt. The conversion table will enable you to use the advantages of dBW in comparing these products to others for which you have no dBW figures.

WATTS	dBW	WATTS	dBW
1.0	0	32	15
1.25	1	40	16
1.6	2	50	17
2.0	3	63	18
2.5	4	80	19
3.2	5	100	20
4.0	6	125	21
5.0	7	160	22
6.3	8	200	23
8.0	9	250	24
10.0	10	320	25
12.5	11	400	26
16.0	12	500	27
20.0	13	630	28
25.0	14	800	29

RIAA PHONO EQUALIZATION

DB					
-5					
R-9 (3)					
HZ 20 50 100 200	500 1K 2K	5K 10K 20K			
fixed-coil	+ 1/4, - 1/2 dB -16 3/4 dB at 5 l	. 20 Hz to 20 kHz; Hz			
moving-coil	+ 1/4, -3 dB, 20 Hz to 20 kHz; -22 dB at 5 Hz				
SENSITIVITY & NOISE (1	e O dBW; A-weigh	ting)			
	sensitivity	S/N ratio			
aux input	15 mV	82 dB			
fixed-coil phono	0.26 mV	75 1/2 dB			
moving-coil phono	17 μV	75 dB			
PHONO OVERLOAD (1-kH	z clipping)				
fixed-coil phono		120 mV			
moving-coil phono		8.2 mV			
INPUT IMPEDANCE					
aux input	35k ohms				
fixed-coil phono	48.2k ohms; 280 pF				
moving-coil phono	220 ohms				
OUTPUT IMPEDANCE (to	tape)				
from aux input		direct			
from tuner section		2,700 ohms			
from phono inputs		215 ohms			

105

67 dB

DAMPING FACTOR (at 50 Hz; re 8 ohms)

CHANNEL SEPARATION (at 1 kHz)

In the manual tuning mode, which switches the tuner to mono, the main up/down control steps by half-channel (100 kHz) increments on FM, full-channel (10 kHz) increments on AM. In addition, there's a fine-tuning control that divides step size by ten: to 10 kHz on FM and 1 kHz on AM. (You're more likely to need this feature to detune a station that's suffering interference from a neighbor than to follow a station's carrier away from its assigned frequency.) Once you've tuned the station, you must switch to the automatic mode to receive it in stereo and store it in memory, because the presets remember the mode as well as the frequency. In automatic, the tuner will progress to the next receivable station at each press of the main tuning bar, though the fine-tuning still responds manually once the receiver has arrived at the nominal center frequency.

nother switch chooses between DX (distant) reception, local reception, and automatic (which switches between the other two modes on the basis of signal strength). Greatest sensitivity and selectivity are achieved in the DX mode, greatest separation and lowest distortion in LOCAL. For tuners with switchable IF (intermediate frequency) bandwidth, we use the wide position as the reference setting because that's what delivers the most perfect reception of good signals. The R-9 evidently does more than vary IF bandwidth from mode to mode, but for consistency we stayed with LOCAL as the reference setting for bench testing. Most of our listening was in DX, however, because we found that the automatic switching chose that mode unless signal strength was very highhigher than it is on most of the stations that we use for testing.

The "signal quality" display lights up pairs of LEDs at intervals of close to 6 dB from 20 to 44 dBf, which is the most important part of the range. For owners of rotatable antennas, this leaves unreported the range above, where many very listenable but not quite optimum stations can be received in most locales, and that below, where antenna orientation is critical to achieving listenable results. The latter can be managed fairly easily by ear, however, and the former profits relatively little from antenna tweaking. So we'd rather have the display as it is than with bigger steps between thresholds to cover a larger range.

The FM section tested out very well at Diversified Science Laboratories, with excellence most evident just where you'd expect it: the DX-mode sensitivity and selectivity, the LOCAL capture ratio and channel separation, and the frequency response in both modes. Pilot suppression, on the other hand, is only good, but this is a comparatively minor point and certainly does not detract from the tuner's overall high level of performance. And fine as the lab data are, we were, if anything, even more impressed by the results we obtained in the listening room, where borderline stations came in with unusual clarity and freedom from noise.

The phono section can be switched for use with either fixed-coil (movingmagnet or moving-iron) cartridges or low-output moving-coil models. Either way, the sound is protected from warpfrequency interference by a nonswitchable infrasonic filter that rolls off at approximately 14 dB per octave below 12 Hz. The moving-coil setting provides some additional infrasonic rolloff, plus a little at the extreme top of the treble (where many moving-coil models are a little peaky, making the attenuation welcome). Both phono modes introduce a very slight treble emphasis, which extends right to the top of the audio band in the fixed-coil setting. The fixed-coil phono response also shows a very slight increase in the deep bass, before the infrasonic filter takes hold. These rises don't exceed 1/2 dB (relative to 1-kHz output) and therefore lie at the very threshold of audibility, even assuming a relatively "perfect" pickup with no greater colorations of its own.

Other measurements of the preamplifier section are fairly typical of what we have come to expect from Yamaha, which means that they are very good. The tone controls—for bass, midrange, and treble—supply a little more than 10 dB of boost or cut at about 35 Hz, 1.2 kHz, and 15 kHz, respectively, in their extreme settings. This is a little more play than is typical of midrange controls, a little less than is usual for the other two. But for most purposes, they should prove quite effective.

The loudness compensation is unusually complex. It is controlled by a ring encircling the volume knob (where the BAL-ANCE usually is), which can be turned only counterclockwise from its 12-o'clock calibration, where it is disengaged. If you want to reduce the volume without a perceived loss of bass, you turn this ring down instead of the volume knob. At the lab's lowest test setting, it produced 391/2 dB of attenuation in the midrange, $32\frac{1}{2}$ dB in the high treble, and $14\frac{1}{2}$ dB at 20 Hz. At more useful in-between settings, the relationship between midrange and treble remained about the same, but the extreme setting's upward slope of about 6 dB per octave throughout the bass and even the lower midrange was replaced by shelving in the deep bass, below about 100 Hz.

The power amplifier uses Yamaha's Auto Class A circuit, which runs pure Class A for minimum distortion at low and moderate signal levels and switches into the more conventional Class AB mode only when the signal amplitude exceeds its ability to provide a proportional voltage swing. Because Class A is markedly less efficient than Class AB, drawing essentially the same current at idle as it does at full output, Yamaha gives you the option of switching to straight Class AB operation.

DSL measured distortion in both amplifier modes. When the R-9 was switched to Class AB, distortion at high frequencies did rise, though it consisted entirely of the second harmonic (the least objectionable form of harmonic distortion) and still didn't push above our reporting threshold of 0.01 percent. At 21 dBW (126 watts), where it presumably is operating Class AB even when switched to Auto Class A, there was no measurable difference between them. Nor could we detect an unequivocal difference in our listening.

The amplifier is powerful enough that, for most purposes, it should be able to operate in Class A virtually without interruption: Only transient peaks are likely to exceed the Class AB threshold. Its 8-ohm dynamic headroom is excellent, permitting the equivalent of 200 watts output in short bursts. Into 4 ohms, it delivered the equivalent of 335 watts. Both figures represent superb performance for a receiver. Results at 2 ohms were less clear-cut. Initially the lab's measurement was compromised by the protection circuitry, which didn't actually clip the waveform but did introduce considerable distortion above about 18 dBW (63 watts). Since this was so much less than Yamaha claims for the R-9, DSL ran the

test again from a cold start and got $25\frac{1}{2}$ dBW (355 watts). But after the receiver was allowed to warm up for a while on a series of tone bursts, the figure dropped to about $20\frac{1}{2}$ dBW (112 watts). Apparently, the action of the protection circuitry depends partly on the temperature of the output transistors. We therefore would suggest that if you run two pairs of speakers simultaneously, neither pair's impedance should drop significantly below 8 ohms at any point.

The R-9 is an excellent receiver of its type. Performance is without significant weaknesses and is, in fact, outstanding in some important respects, particularly in the FM tuner. Even more satisfying, perhaps, is the logic of the design, which makes it unusually easy to use for so complex a product. Admittedly, it is harder to master than many audio-only receivers, but when the relatively esoteric controls are hidden by the front-panel door, the R-9 is not particularly intimidating. And the clarity of the layout makes it possible to figure out most of what is not immediately apparent. When in doubt, there's always the owner's manual, which is above par-especially for beginners, since it avoids unnecessary technical details. (The technically inclined will, however, find the block diagram at the back unusually rewarding.) A fine job all around.

SPICA TC-50 LOUDSPEAKER WITH SERVO SUBWOOFER

TC-50 dimensions: 13 by 16 inches (back), 11½ inches deep. Servo subwoofer dimensions: 17½ by 16 inches (top), 14½ inches high. Price: TC-50, \$450 per pair; Servo, \$595 each. Warranty: "limited," five years parts and labor. Manufacturer: Spica, 1601 Paseo de Peralta, Santa Fe, N.M. 87501.

These two products are designed to be used together as a full-range loudspeaker system, though they actually are sold separately. The TC-50 speaker—or satellite, in the full configuration—is triangular in cross section, with the grille running down the slanted front. Behind it are a 6½-inch acoustic suspension woofer and a 1-inch dome tweeter. The Servo is a floor-standing sealed enclosure, whose 8-inch driver, behind the front grille, is powered by a built-in amplifier designed by PS Audio.

Both the TC-50s and the Servo are available in true oak or walnut veneers. The TC-50s can be used alone as full-range speakers, if you like. To extend the bass, you can add either a pair of Servos—one for each channel—or use a single Servo summing the two. We chose the latter option for our tests.

The satellite/subwoofer hookup scheme is much more complex than average. The satellites stay attached to your main amplifier terminals, just as they do when they're used without the Servo.

