

# Blaupunkt München RDM 169 Car Audio Head Unit

Reviewed by Charles Hansen  
and Edward T. Dell, Jr.

Blaupunkt, Robert Bosch Corp., 2800 South 25th Ave., Broadview, IL 60155, 708-865-5654, [www.blaupunkt.com](http://www.blaupunkt.com). Dimensions: single DIN, 7.325"W × 7.5"D × 2.25"H. Price: \$480 US. Warranty: 12 months.

The Blaupunkt München RDM 169 is a single-DIN head unit with AM/FM tuner/CD/CD changer capabilities. "München" is the German word for what we call Munich, and Blaupunkt means "blue point." Interestingly, the München was manufactured in Portugal, rather than Germany or the Far-East.

The faceplate (Photo 1), with its large multi-color display, flips open for access to the CD slot and Blaupunkt's key card security system. A clock display is included as one of its features. The radio is also supplied with a steering-wheel-mounted infrared (IR) remote control.

## FEATURES

The München provides four pre-amp outputs, a line-level subwoofer output, internal amps rated at 4 × 40W, and digital parametric equalization (EQ). Two line inputs accept signals from a compatible remote-mounted CD changer, and the head unit provides bus control input/output and power connections to the

changer. The volume-control display indication varies from "0" to "66," and a triangle-shaped horizontal bar graph displays the dynamic audio level.

You can save your own custom EQ settings in the user mode. You access the low- and high-frequency digital parametric EQ with the DPE button on the front face. These DSP filters have a variable center frequency, boost/cut, and Q (bandwidth) adjustments. The low filter is variable from 32Hz to 500Hz in 13 steps (1/3 octave). The high filter is variable from 630Hz to 10kHz, also in 1/3-octave steps.

You can boost or cut the response over a display-indicated range of "+8" to "-8." These parameters change just over 1dB per step. You can vary the filter quality (Q) in three steps, with bandwidths from two octaves down to 3/4 octave.

In addition to the user-adjustable EQ settings, there are six factory-presets: Linear, Rock, Disco, Jazz, Classic, and Vocal. The manual includes a page with tips on how to adjust the EQ. If you thoroughly muck up the sound, pressing the DPE button for two seconds will deactivate the EQ function.

The München's user interface is quite extensive, but fairly easy once you master the operating in-

PHOTO 1:  
RDM 169 front view.



structions. The volume control is a large rotary knob, not one of those hard-to-see/use sets of up/down buttons on some car radios. A button in the center of the volume control turns the power on ("WELCOME"), puts the unit in mute, and turns it off ("GOODBYE"); and its icy "blue point" glows when the power is on.

You select the tuner, CD, and CD changer by individual push-buttons under the volume control. You can program CD tracks (and CDs with the external changer) in any selected or random order. You can assign names to up to 30 CDs (99 CDs in changer mode). The internal CD slot is lighted with a red bar and securely holds the CD during insertion and ejection so it won't fly out of the München while you are cornering your BMW at 100ths.

A round four-way rocker on the right side and two groups of four vertical menu-identified soft keys handle the other functions. These become station selector buttons in the tuner mode. FM stations are automatically identified with their

call letters using RDS<sup>1</sup>, and you can assign your favorite stations one of 23 program types (News, Jazz, Classical, and so on) via the PTY function.

The display is quite readable and offers viewing-angle and brightness adjustments. However, I would not try to operate the menu-driven functions while driving—they require too much attention to the radio display.

You can operate the unit with the ignition off via the "permanent" +12V DC connection. In this mode, the unit shuts down automatically after one hour to prevent battery drain.

## INSIDE THE AMPLIFIER

The head unit, which is extremely rugged, is constructed of heavy gauge steel, and the top cover is perforated to enhance cooling of the power amplifier module. A heavy mounting bracket holds the unit securely in place.

The rear panel (not shown) has five receptacles, a grounding stud, antenna jack, and a plug-in 10A fuse. Connector wiring harnesses

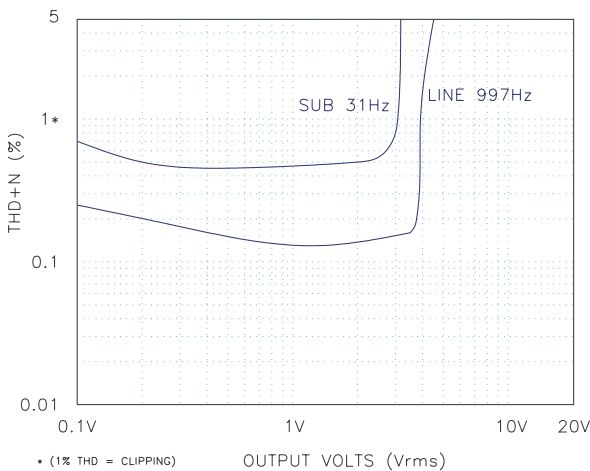
are supplied for power and ground, adjustable illumination, cellphone mute, antenna motor control, speakers, line outputs, and subwoofer output. The four line output "flying lead" RCA connectors are all gold-plated. Additional re-

ceptacle pins are provided for the remote CD changer, so you will need a compatible plug and wiring harness.

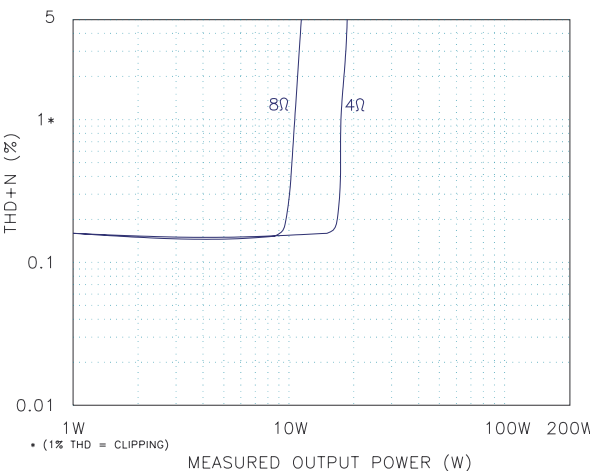
The installation instructions are very rudimentary. Unless you are fairly proficient in auto radio in-

**TABLE 1  
MEASURED PERFORMANCE**

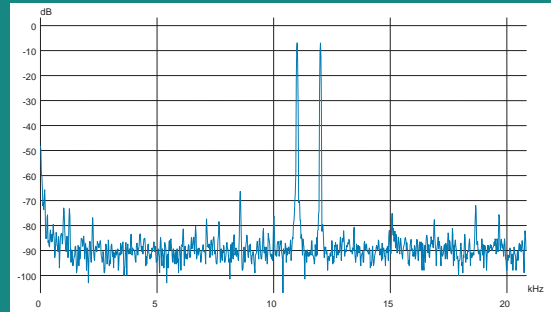
PARAMETER	MANUFACTURER'S RATING	MEASURED RESULTS
Line-out level	3.2V, 1% THD+N 4.8V maximum	3.8V, 1% THD+N 4.8V maximum
Output impedance	100Ω	100Ω
Frequency response	±1dB, 20–20kHz	±0.7dB, 8–20kHz
Usable dynamic range	–90dB	
Subwoofer out level	3V, 1% THD+N	3.1V, 1% THD+N
Internal amplifier levels	4 × 25W, 1% THD+N 4 × 40W maximum	4 × 17.5W, 1% THD, 4Ω 4 × 27W maximum, 4Ω
IMD 11kHz + 12kHz	N/S	0.022% 1kHz product
Signal-to-noise	–90dB	–78dB (see text)
Channel error	0.25dB	0.12dB
Frequency response	20–20kHz	±1dB, 8–20kHz
FM mono sensitivity	0.7μV at S/N ratio of 26dB	<10dBf
Usable FM sensitivity	7.8dBf	<10dBf
FM stereo sensitivity	N/S	21dBf
FM frequency response	20–16kHz	±3dB, 20–11kHz
FM stereo separation	N/S	35dB



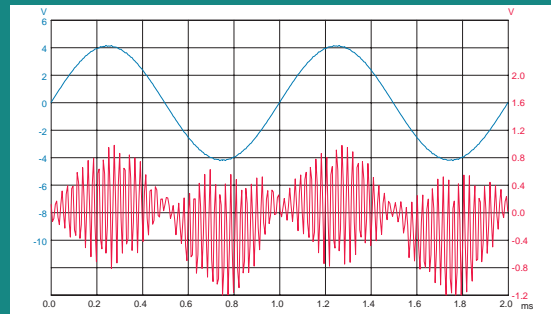
**FIGURE 1: Preamp THD+N versus output voltage.**



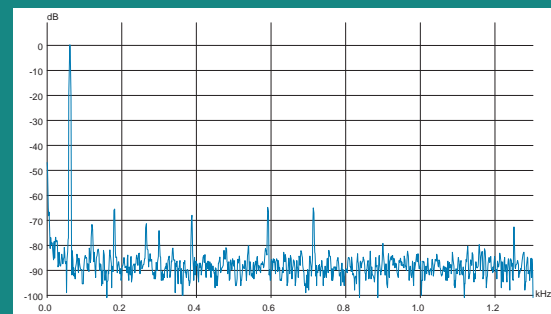
**FIGURE 2: Amplifier THD+N versus output power.**



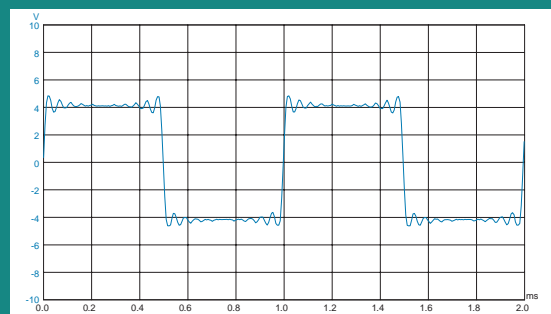
**FIGURE 3: Spectrum of 11kHz + 12kHz intermodulation signal.**



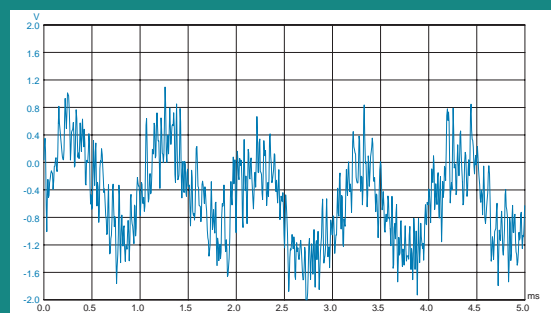
**FIGURE 4: Residual distortion.**



**FIGURE 5: Spectrum of 61Hz sine wave.**



**FIGURE 6: 997Hz square wave response.**



**FIGURE 7: Undithered 1kHz sine wave at –59.94dBFS.**

Reviewed by Edward T. Dell, Jr.

The problems associated with reviewing an automotive tuner/amplifier seemed daunting, to say the least. However, since the manufacturer's rep was offering, and our versatile test magician was eager to try something quite different, I agreed to try to review Blaupunkt's München RDM 169 US Radio/CD unit for automobiles.

Although Chuck Hansen believed the installation instructions were rather slim, I thought they seemed doable—provided you could figure out how to get the old unit out of the dash. Apparently these units are fairly uniform in size and fasten in place with one large captive machine screw in the center of the back plate. I opted to have the unit installed locally by a pro. Prices for this range from \$80 to \$100.

If you plan on replacing your unit, among other things, I strongly commend what is probably the best mail-order supplier in the autosound business, Crutchfield (1 Crutchfield Park, Charlottesville, VA 22911-9097, www.crutchfield.com, 800-955-3000). This company believes in do-it-yourself and offers very impressive help with any product they sell. Their catalog has vital information on product specifications and automobile data. They have a technical service to guide you to the right decisions about upgrading the sound in what you drive.

TEST DRIVE

I drive a Mazda '97 626 V6 with a stock sound system consisting of four 6 x 8 coax drivers: two in the doors and two on the back deck, with two 1" tweeters in the dash, pointed at the windshield. The head unit is an FM/AM radio with cassette tape, so I had no way to compare the recorded sound in the players of the two units directly, but I did know what stations I was able to receive on the old unit.

The RDM 169 is a digital tuner, with an integral CD player, one of the first whose special capability is its sensitivity and its ability to lock onto a weaker station successfully. It also has the capability of separating closely spaced stations for clear reception. In my area, we are 750' above sea level and are at the end of New Hampshire's White Mountain chain, and 90 miles from Boston's wide range of stations. Reception here is not

easy, but this tuner doubled the number of stations I am able to receive.

The 33 pages of instructions are not easy to master quickly. The flexibility of the unit is the reason. It has two parametric equalizers: one covers 32–500Hz, the other 630Hz to 10kHz, with ±8 steps for each. These are useful for adapting the system to your car's acoustics. The system stores 12 FM and AM stations each in presets, and is equipped for RDX, the new system responding to station programming content in 23 categories, as well as automatic clock setting. I cannot imagine anyone finding the München unit deficient in programmability.

The CD player operates smoothly when you open the faceplate and insert a disk. There are facilities for adding a remote ten-disk player that you can program from the head unit. Opening the faceplate, you also see a data card containing the programming preferences of the driver. Remove it on leaving the car and the unit will not function, a deterrent for thieves. A second card is provided for another driver, allowing alternative programming.

The unit also comes with an infrared thumb control mounted on the steering wheel. The small button receiver is installed on the dashboard. This unit allows the driver to change or search for stations and volume level and to mute the system, without looking away from the road. Facilities are available for automatically muting the system while using a telephone. The unit also has preamp outputs for five channels of separate amps and speakers. These are only a few of the really impressive range of features.

LISTENING IMPRESSIONS

Sound quality must be evaluated using the speaker drivers already in the car, of course. I listened carefully to our standard set of test tracks from the *Hi-Fi News* Test CD III on my house system, which is tri-amplified into Audio Concepts Sapphire 3/Sub 1 bandpass subs, using a much modified Magnavox player with Parts Connection's Assemblage DAC 2.1. My impression is that although the car is a very different

environment, and that the stock speaker drivers are probably a significant limitation, the material sounds remarkably similar, despite the confined compartment.

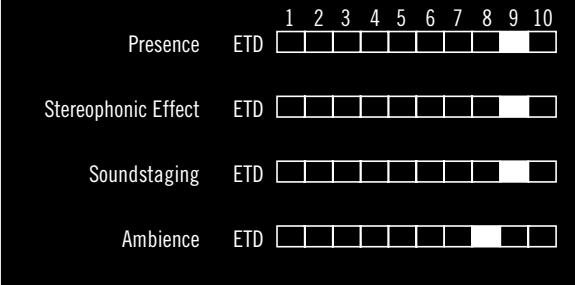
Both the Handel and Parry of the first two tracks recorded out of doors almost convince you the car has become a convertible. The trumpets in the Vivaldi Concerto are just a bit bright with the system at factory settings. You can tame this by adjusting the equalizer down one step. Both of the Peter and the Wolf segments were very crisp and detailed, with excellent articulation of the instruments. The Purcell had a remarkable presence which I rarely hear in broadcast material in my car.

Although the bass response in my auto has always seemed limited, it certainly was not in any one of the Corkhill examples, and in No. 13 the upper registers sounded like water droplets on velvet. The same was true for the Rio Napo selection, where the rich, wide range sound almost feels like it might soak into your skin.

The unit, in addition to all else, looks rather like an elegant Christmas display and even beeps a "good-bye" when the ignition key turns things off. The sensitivity is outstanding and the sound quality bears a very respectable comparison to a good high-end system. Unfortunately, it makes you wonder seriously whether new speakers would make it even better, and...yes there's also the temptation of a changer in the trunk.

If you really want a serious upgrade for your automobile's sound system with elegant and effective sound management, amazing convenience and marvelous sound, the München RDM 169 is a prime choice.

SONIC CHARACTERISTICS RATINGS



stallation, you should leave this to the experts. Be sure not to lose the right-angle antenna adapter that plugs into the 10mm jack on the radio and adapts to the conventional US automotive antenna plug.

TOPOLOGY

A schematic was not provided. I could see many surface-mount components on the main PC board, visible through the cooling holes. The four internal power amplifiers appear to be contained in a single large metal, heat-sunk, power-integrated circuit.

High-quality auto radios such as the Blaupunkt usually include an

RF amplifier stage prior to the tuner section and high-quality automatic volume control (AVC) circuitry. This helps compensate for the continuously varying signal strength caused by constantly changing antenna orientation and RF obstructions.

MEASUREMENTS

I tried to input my distortion test-set oscillator to the preamp via the CD changer line inputs, but I could not fool the controller into believing the changer was present. Thus, I made all my measurements, except for the tuner, using a number of CD test discs in the internal CD

player. There was a very low level of hiss with my ear against the speaker, but the München was otherwise quiet (not that this is of primary importance, since the automotive background noise level generally exceeds 65dB).

There was no noise during power-up or shutdown. The unit draws 1.1A DC at 14.4V DC in mute mode, and de-energizes itself below 9.1V DC. Surprisingly, the CD player/amplifier inverts polarity. The CD changer line-input impedance was 10k3 for both inputs. The line-output impedance measured a low 100Ω, and sub out measured 330Ω.

The line-output frequency re-

sponse was within ±0.7dB from 8Hz to 20kHz, at 0.5V RMS. THD versus frequency increased from a low of 0.031% at 17Hz to 0.82% at 20kHz, using a line-output level of approximately 2V RMS.

Hum and noise (maximum volume, no source selected) measured -78dB. This reading was limited by the internal amp/preamp, which proved sensitive to the very low 120Hz ripple in my test bench 12V DC power supply. It has been my experience that car radio amplifier ICs have fairly low (-50dB) power-supply rejection ratios (PSRR), but that is usually not a problem when using battery power.

The line-output THD+N versus output voltage at 1kHz is shown in *Fig. 1*. Since I was using the internal CD player as the signal source, I engaged my test-set 27kHz low-pass filter to limit the out-of-band noise. Maximum output voltage at 1% THD was approximately 3.8V RMS (resolution was limited by the volume-control steps). The preamp clipped at  $\pm 11V$  p-p with the volume control at "66," while playing the 997Hz 0dBFS CD test track.

The sub frequency response was down -3dB at 4Hz and 61Hz, and -12dB at 127Hz. The sub THD+N versus frequency was higher than the line output, measuring from 0.37% at 17Hz to 2.6% at 127Hz, all at 1V RMS output. Sub THD+N versus output voltage at 31Hz is also shown in *Fig. 1*. The output did not clip at its upper limit. The second harmonic increased above 3.1V RMS starting at the lower half-cycle of the waveform, until it eventually replaced the fundamental.

## CD TESTING

Volume-control tracking was excellent, varying less than 0.12dB between four channels, from 0.2W to 10W output. Unity gain occurred at about "40" on the display indicator.

I checked the maximum range of the parametric equalizer at three frequencies, using the default Q level. At 100Hz and 1kHz, the output was  $\pm 8dB$ , exactly as indicated on the display. The high EQ had a wider range of  $\pm 9.8dB$  at 10kHz. Neither the 100Hz nor the 10kHz frequency showed more than 0.1dB variation at 1kHz.

Even so, if you attempt to use the upper end of the LF EQ with the lower end of the HF EQ, there will be some overlap interaction between the  $\frac{1}{3}$  octave frequencies, even at the tightest Q setting. The LF 500Hz and HF 630Hz responses (set for +8dB) were still up at +5.5dB at 630Hz and 500Hz, respectively.

Assuming the München CD section meets the Red Book spec of 2V RMS at 0dBFS, the overall gain at 2.83V RMS output into 8 $\Omega$  loads is 17.6dB. The power amplifier uses bridge-connected output stages whose 0.25 $\Omega$  output impedance at 1kHz was quite respectable for an integrated circuit amplifier. It increased to 0.31 $\Omega$  at 20kHz.

The amplifier frequency response measured  $\pm 1dB$  from 8Hz to 16kHz at an output of 2.83V RMS into both 4 $\Omega$  and 8 $\Omega$ . It dropped to -1.9dB at 20kHz. There was no gain peaking when I connected a load of 8 $\Omega$  paralleled with a 2 $\mu F$  cap. Likewise, the amplifier was unfazed by the complex impedance of an IHF simulated speaker load.

THD+N versus frequency with 1W into an 8 $\Omega$  load ran from 0.045% at 17Hz to 0.86% at 20kHz. *Figure 2* shows THD+N versus output power into 4 $\Omega$  and 8 $\Omega$  at 1kHz, again using the test-set 27kHz low-pass filter to limit the out of band noise. The München showed absolutely no strain right up to the point of maximum power.

The power amp clipped at  $\pm 25V$  p-p, with the volume control at "52" while playing the 997Hz 0dBFS CD test track. The 1% THD point occurred at 17.5W into 4 $\Omega$ , and 9.2W into 8 $\Omega$ . Maximum power, at greater than 20% THD, was 27.5W into 4 $\Omega$  and 16.5W into 8 $\Omega$ .

## HOT TUNES

The left side of the radio was hot after this testing. In many cases the vehicle dash will provide some additional heatsinking. The München drew 6.9A at 14.4V DC (almost 100W) with the CD operating and all four channels putting out 10W at 1kHz. Clearly the Blaupunkt-specified  $4 \times 25W$  at 1% THD and  $4 \times 40W$  maximum are optimistic (by about 1.6dBW). It may be the car audio industry doesn't need to adhere to the FTC power rating rules that apply to commercial home hi-fi equipment.

*Figure 3* shows the amplifier output spectrum reproducing a combined 11kHz + 12kHz SMPTE intermodulation distortion (IMD) signal at 1W into 8 $\Omega$ . The 1kHz IMD product is 0.022%. Crosstalk performance wasn't bad for such a compact unit with four output channels. It measured -72dB at 1kHz and -62dB at 16kHz.

The distortion waveform for 1W into 8 $\Omega$  at 997Hz is shown in *Fig. 4*. The upper waveform is the amplifier output signal, and the lower waveform is the monitor output (after the THD test-set notch filter), not to scale. Even with the

test-set 27kHz low-pass filter engaged, the 44.1kHz digital sampling frequency and noise dominate the 0.21% distortion residual signal. I should mention here that this distortion tester does not have the four-pole 22kHz LP filter available in modern DSP-based testers.

The spectrum of a 61Hz CD-generated sine wave at 1W into 8 $\Omega$  is shown in *Fig. 5*, from 0 to 1.3kHz. The THD+N measured 0.059%, and the harmonics are distributed throughout the spectrum. The second, third, fourth, and fifth measure -72dB, -65dB, -83dB, and -84dB, respectively. However, additional nonharmonic responses occur at 387Hz (-69dB), 591Hz (-65dB), and 713Hz (-65dB).

The 8V p-p square wave into 8 $\Omega$  at 997Hz (*Fig. 6*) exhibits the Gibbs Phenomenon ringing associated with the steep digital filters used in the DSP section of the receiver. For the same reason, the 10kHz square wave was rounded over into nearly a sine-wave shape.

When I tried to capture reproduction of an undithered 1kHz sine wave at -90.31dBFS, I got nothing but noise on the scope. At this level the signal consists of  $\pm 1$  bit of data, producing two different voltage levels that are symmetrical about the horizontal axis (time). As a result, *Fig. 7* shows an undithered 1kHz sine wave at -59.94dBFS. Even here, the sine wave is dominated by out-of-band high-frequency noise, which is consistent with the residual distortion in *Fig. 4*.

The München ignored defects on the Pierre Verany Test CD #2 out to track 37, which has a 3mm-long section of blank data. At the last defect test, track 38 (a cavernous 4mm, 3.08ms defect), the unit put out one or two audible clicks over the 500Hz test tone, but for the most part dealt with it well. The Red Book requirement is only 0.2mm maximum. Mobile operation imposes much greater opportunity for mechanically induced skips, so this defect margin is definitely appreciated.

## FM TUNER TESTS

My FM stereo signal generator is tuned to 98.1MHz because there is

no nearby station on this channel. A few of the more sensitive FM tuners can pull in one distant station (85 miles) in mono at this frequency. The München could do this if it was manually tuned; however, its station seek function passes right over 98.1MHz with a whip antenna.

This is a reasonable default performance for a car radio auto-tune circuit. It would undoubtedly do better in a vehicle in which the sheet-metal body functions as an image reflector for the  $\frac{1}{4}$  whip. You can also change the sensitivity of the seek run or activate automatic bandwidth switching (SHARX) to accept stations with poorer reception.

Frequency response measured  $\pm 3dB$  from 20Hz to 11kHz. The HF response dropped rapidly above 11kHz and was down -17dB at 16kHz. As with the CD player, the FM tuner inverted polarity (audio signal to the FM modulator compared to the line/speaker output of the radio).

Stereo sensitivity was approximately 21dBf, using a 75 $\Omega$  RF signal at the antenna input adapter. I can reduce the output of my signal generator to 10dBf using the full range of an external 0-70dB RF attenuator. The mono sensitivity of the München was below this level. Note that Blaupunkt lists this sensitivity as 0.7 $\mu V$  at a rather low 26dB (the IHF level is 50dB) without specifying impedance. A signal of 0.7 $\mu V$  is equal to 8.2dBf at 75 $\Omega$ .

Stereo separation at 1kHz was 35dB. While you can toggle between mono and stereo in DCS mode, you cannot defeat the mono-blend circuit.

The München FM tuner has reasonable trade-offs in stereo performance, frequency response, selectivity, and sensitivity given the compromised listening environment of an automobile. ♦

## REFERENCES

1. RDS is the radio data system that allows text or other information to piggy-back on the standard FM radio signal. It uses a 57kHz subcarrier (triple the 19kHz stereo pilot signal) that is divided by 48 in the receiver to recover 1.1875kHz NRZ (non-return to zero) digital data.