BMW R100S SPORT 1000

Two big pistons and numerous small improvements add more sport to the Sport without taking away any posh.

Debating the relative merits of a BMW motorcycle is like arguing about religion or politics: You never win.

First of all, even BMW freaks don't agree on much of anything. Some say the new Beemers are much better than ever, others claim they're just as good as always and still others swear the factory has caved in under the pressure of Japanese domination and allowed mediocrity to become part of those once-classic motorcycles. This last group nonetheless feels that BeeEms are still the best road-going bikes around.

Some non-BMW people quickly point out that good, bad or otherwise, the Bavarian bikes cost up to twice as much as some other brands which appear to offer comparable amounts of overall performance. And other riders have classified BeeEms as having the capacity to perform only one task well—like long-distance touring, for instance. In any case, *everyone* agrees on only one single point: BMWs cost a lot of money.

People buy BMWs, however. In fact, they consume everything Bavarian Motor Works builds. Most of those people don't buy BMWs because of asphalt-shriveling quarter-mile times or staggering horsepower numbers or knee-dragging cornering ability or economical price, because BMW motorcycles don't possess those qualities. The characteristics which endear these opposed twins to their followers do not necessarily translate into numbers or graphs—characteristics like a BeeEm reputation for long-term low-maintenance reliability, touring comfort, high-speed stability, Old World craftsmanship, high resale value, excellent fuel economy, low center of gravity and an engine design that allows the simplicity of an ungadgeted twin with smoothness surpassed only by a multi or a counterbalanced twin.

Time, however, marches on. And where BMW once stood alone, it now has competition to deal with—serious competition specifically designed to steal some of that company's previously-captive audience. With 100cc more displacement and a number of other small but significant refinements, BMW hopes to ward off the brunt of that challenge in 1977 and maintain its coveted piece of the action.

THE BIKE: The 1000cc R100S replaces the 900cc R90S of the past few years, but it

is not the top-of-the-line model. That distinction is now held by the bike we previewed last month, the fully-faired R100RS, which differs from the R100S mostly in the cosmetics department. There's also an R100/7 model, which is an unfaired single-disc-brake version, along with a 750cc R75/7 and a 600cc R60/7.

The R100S received its displacement increase by having the bore size enlarged from 90mm to 94mm, which combines with the 70.6mm stroke to yield 979.9cc. The previous compression ratio was maintained, however, so it remains at 9.5:1.

The pistons in the 1000 are obviously different than those in the 900 because they are larger, but they're the same weight so as not to upset the engine balance. BMW's technical department also claims the new pistons are just as strong as the old, so their life expectancy should be equivalent to those of the 900.

The intake valves are larger on the 1000, and complementing that improvement are the 40mm Bing constant-velocity carburetors which replace the 38mm slide/needle Bings found on the R90S. The valve covers are also new, having been given their first major redesign since Christ was a corporal. In addition to looking more modern, the squared-off, flat-black covers are harder to drag on the pavement during fast cornering.

Other engine improvements include a beefed-up main engine case to handle the increased loads, an improved crankcase ventilation system, lighter pushrods and a refined rocker arm mounting system. Also, the cylinder cooling fins were made shorter for less noise radiation, but thicker for better cooling.

Otherwise, the horizontally-opposed two-cylinder air-cooled four-stroke engine remains the same as the 900cc versions. The longitudinal (running front-to-rear), one-piece forged crankshaft uses plain insert bearings on the connecting rod big ends and both main bearing journals. A large, automotive-type, single-plate dry clutch delivers the power to the five-speed gearbox which also lies in a longitudinal plane in its own little area behind the crankshaft. A universal joint on the end of the transmission output shaft then feeds power to the driveshaft which runs inside the right swingarm leg, terminating in a hypoid ring-and-pinion gearset at the rear wheel.

Pushrod-operated rocker arms, which get their orders from a single "underhead" cam, pop open the overhead valves. A dual-row chain drive at the front of the engine spins the cam, which lies directly under the crankshaft. The pushrods reach out to the rockers through external pushrod tubes beneath the cylinders.

All this engine business is housed within a huge, multi-piece aluminum casting that also serves as an accessory case. The AC generator, the rectifier and the breaker assembly are under the front engine cover, the electric starter lives above the crankshaft and the disposable paper air filter element is housed in the rear of the massive engine casting.

The engine unit is cradled in a hefty double-loop frame whose twin downtubes encircle the engine on three sides. A large-diameter single backbone tube connects the steering head to the rear downtubes under the aft section of the 6.3-gallon gas tank. And some new gusseting at the steering head adds needed rigidity to the chassis.

The rear frame section is a bolt-on affair that includes the seat support and upper shock mounts, with diagonal bracing struts triangulating the upper shock mounts and swingarm pivot. On the left side, the swingarm itself is conventional, but on the right, it is merely a short, hollow flanged tube which houses the driveshaft.

A refined version of the plush, long-travel BMW suspension is used on the R100S. The leading-axle front fork gives 7.2 inches of wheel travel and new Boge rear shocks permit 4.3 inches in the rear. The factory stiffened the damping rates very slightly and went to a dual-rate shock spring on the '76 R90S in an effort to improve the sporty handling without hurting the touring ride, and those features are carried over on the '77 models.

Dual hydraulic calipers working on drilled discs give the R100S its up-front whoa-power, while a large, wide drum brake provides stoppage at the rear. The new-style 3.25 x 19 Continental front tire

PHOTOGRAPHY: ART FRIEDMAN, LARRY GRIFFIN

has a ribbed tread in the middle, with a universal block tread on the sides. The rear 4.00 x 18 Continental uses a standard block-type pattern.

BMW's stylists have sworn off the traditional black and white colors, so the R100S is painted a beautiful deep candy red with gold pinstriping.

The 6.3-gallon gas tank is standard, and has a lockable flush-mount aircraft-style cap. The tank is steel, but the handlebar-mount fairing, both fenders, seat base and side covers are molded in a rigid pressed fiberglass-type material. The small windshield bubble is made of Lexan.

The instrumentation is quite complete, featuring a tach, speedo, trip odometer, voltmeter and electric clock. There's also a bank of idiot lights for the turn signals, oil pressure, generator charging, neutral and low front brake fluid level in the master cylinder reservoir, which is cable-operated and located beneath the front of the gas tank.

Conspicuous by its absence is the ingenious hydraulic steering damper found on previous late-model BMWs. (The engineers deemed it unnecessary on the R100S with the new steering head reinforcements.) They *did*, however, realize the need for a good horn and subsequently chose one of the super-loud Fiamm units which really sounds off when you mash the button. BMW motorcycles were also the first vehicles to receive Department of Transportation approval on their powerful quartz-halogen headlights.

The R100S is a real crowd-accumulator. Everywhere we parked it people would congregate to stare and admire. And well they should. With the custom-looking, candy-red paint, bikini fairing and elaborate instrumentation, the R100S looks exactly like what it is: A classy, expensive—and to some folks, very exotic—motorcycle.

ENGINE AND GEARBOX: Since there are no kickstarters on BMWs nowadays, the electric-start method is the only way to get the engine breathing. The '77 models have a lower gear ratio on the starter drive, so the electric motor can spin the engine without groaning, which was a cold-weather complaint on the 900cc models.

Using the choke lever on the left engine case closes butterfly valves in the carburetor intakes for richer starting. Pushing the lever to full choke also speeds up the idle for hands-off warmups.

The R100S engine is typically BMW-quiet, with very little intake and exhaust noise, and only a mild clicking of the valve train. The bike motored past our decibel meter at a pleasant 85.9 db, sounding all the while like a healthy, mechanically-quiet Volkswagen Beetle. The traditional torque reaction is present, too, as the chassis rocks gently to the right when the throttle is blipped. Once underway, though, the "rocking couple," as the engineers like to call it, is not noticeable unless you disengage the clutch and rev the engine briskly.

The R100S has more displacement and a lower rear end ratio than the R90S (3.09 on the 1000 vs. 3.0 on the 900), so pulling out from a dead stop is a snap, even when riding double on an uphill start. The clutch is more progressive than on the last BMW we tested, and the heavy-flywheel character of the engine deters sudden stalling or jerking.

Despite the lowered gearing and the raised displacement, the R100S doesn't *feel* blindingly quick. Our first impression indicated it wasn't appreciably faster than the 900cc version, and dragstrip testing later bore out our feelings. The R100S turned a 13.20-second/101.7-mph quarter, as opposed to a 13.24/99.8 best run on the R90S.

But then, the displacement increase and gearing change were not intended to make the bike a drag racer. The purpose was to give the R100S more highway-usable mid-range acceleration, which is something it has in spades. Downshifts are seldom necessary when overtaking slower cars unless there's a need to get past in a minimum of time. Even going uphill, top-gear-only acceleration is usually forceful enough to whisk you around slower vehicles in a rush.

The mid-range power is a real bonus when riding two-up. Unless your passenger is a 375-pound Sumo wrestler or a National Football League defensive end, chances are that power-wise, you'll barely notice his or her presence.

The constant-velocity, vacuum-slide carburetors are in part responsible for the R100S' lack of sheer ferocity when the throttle is snapped WFO; but on the other hand, they're also the main reason why there's nary a flat spot or hesitation anywhere in the rpm range. And the amount of power and response you get when opening the throttle is nicely proportional to *how far* you open it. Unlike most other CV carbs we've seen, the Bings are not overly sensitive to very small throttle openings, so the BeeEm is easy to deal with in slow-moving, stop-and-go traffic situations.

The immense torque of the 1000 makes the overall gear ratios less critical than on some higher-revving multis. As things stand, the R100S can inch along at a walking pace in first and easily reach about 110 mph in fifth, with at least two usable gears at every speed in between. The engineers at BMW felt that with a 55-mph national speed limit in this country, gearing the bike down to allow a slightly higher cruising rpm in top gear would be beneficial to the overall performance without making the engine work too hard.

The BMW gearbox is still a bit clunky when you shift it, however. The first-to-second change is the hardest one to do right and is only smooth and silent if you execute the move with absolute perfection. Second-to-third usually goes a bit smoother and the third-to-fourth and fourth-to-fifth shifts are not much different from other bikes.

Smooth downshifting also requires the proper touch when engaging the lower two or three gears. The second-to-first shift is the trickiest, often resulting in a chirp of the rear tire and a sudden pitch forward. If you work diligently at it, however, you can ultimately learn to shift the Bimmer in both directions quite smoothly and quietly.

The cubic centimeter/carb size increase hasn't damaged the BMW's mileage figures at all. We averaged 44.3 miles per gallon during the test, with a high of about 49 mpg and a low of 38 during a back-road play race. With the 6.3-gallon gas tank, this means you can stay mounted for about 270 miles before looking for fuel.

HANDLING: The R100S feels much lighter than the 465-pound motorcycle it is—and that's no accident. One of the main advantages of a horizontally-opposed engine is the low center of gravity it supplies. In addition, the steering geometry—28 degrees of steering angle and 3.5 inches of front wheel trail—is quite fast by current standards and thereby gives a light feel.

The benefits of such a design are easily and quickly recognized. When you first straddle the BMW you are immediately rewarded with the sensation of being on a lighter motorcycle than the numbers indicate. And the first time you effortlessly toss it back and forth in an ess-bend you begin

to understand how a low center of gravity has a positive effect on handling.

From a sheer pavement-racing standpoint, the BMW's chassis isn't as good as some; but from a Real World position, it affords one of the great comfort/handling compromises of all time. And again, the opposed engine is instrumental in allowing such behavior, for it is highly unlikely that an equal compromise could be obtained with a higher center of gravity.

When you bank the BeeEm into a hard, fast turn, the soft, long-travel suspension compresses considerably, which changes the geometry and the wheelbase while using up much of the ground clearance. Surprisingly, though, the 1000 doesn't waver or wander around when this happens, but it does cause a feeling of mild uncertainty as the bike settles down on the suspension. Slower corners cause less suspension compression, although the nature of some medium- or low-speed turns will cause the grounding of a few chassis parts if rounded enthusiastically.

The biggest and most common grounding problems arise when the throttle is snapped shut in a hard corner. Since shaft-driven bikes "jack up" and increase their ground clearance under power and "squat" when shut off, the motorcycle's extremities can bang the ground rather hard if you suddenly back off the throttle when leaned way over. If at all possible you should avoid doing so and at least roll the throttle back smoothly or apply the rear brake with the throttle still open when you need to scrub off a little speed in a corner.

With the power off, the brake pedal, exhaust pipe and footpeg are the first to touch down on the right, and the sidestand and peg rubber get it on the left. With the power on, the right valve cover usually drags first, and the sidestand alone kisses the tarmac on the left, although the right circumstances will also get the left valve cover on the ground.

Roadrace-like carryings-on aren't really what BMWs are all about, though. Ridden in a normal touring fashion—or even in a reasonably sporting mode—the R100S has sufficient cornering clearance to please virtually anyone. Cornering with two heavy people aboard, however, may cause turning worries due to lack of ground clearance, and the main reason for this is the exceptional amount of suspension travel built into the R100S.

The ease with which the BeeEm can be laid over into a turn makes it fun to ride, both on twisty roads and on city streets. Even with its narrow handlebars, the amount of pressure needed to glide the bike into a corner is negligible. The quickness of the steering is responsible for part of this responsiveness, and the low center of gravity pretty much does the rest. And once you get the bike banked into the turn, it has virtually no tendency to fall inward if you slow down a little or sit up if you speed up a little—a trait that is quite pronounced on many high-mass multi-cylinder vertical-engined motorcycles. Best of all, you can jam the BeeEm into a turn while braking hard and it cooperates by leaning over more easily than those bikes with higher centers of gravity.

We've never tested motorcycles that have been able to outdo the BMWs in cornering on rough pavement. On the Bavarian machines, you can zing around some horrendously-rough turns that, at three-quarters the speed on another bike, would leave you ready for a heart transplant. The long-travel suspension units just keep pumping up and down on those choppy corners, allowing the bike and rider to continue along relatively unaffected.

Of course, you don't have to go around corners to get the full benefit of the BeeEm's suspension sophistications. It soaks up the lumpiest, bumpiest pavement better than anything we've ever sampled. If a big bump jars you on an R100S, it would have rattled your teeth on most other bikes.

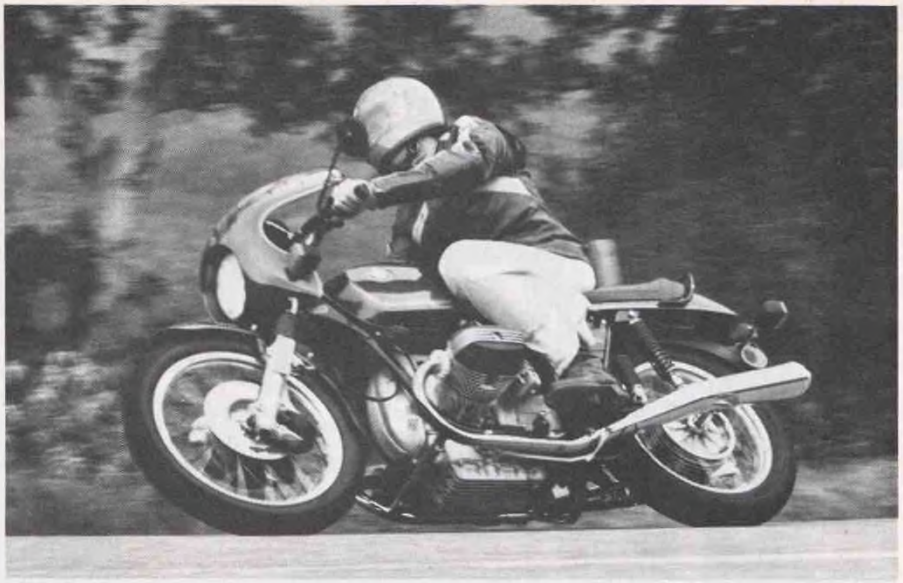
The "S" model is surprisingly stable at high speeds for a bike with so little front wheel trail. Running past or near the 100-mph mark isn't at all disconcerting—unless you have no experience at those speeds, in which case the speed itself is intimidating regardless of the motorcycle's stability.

Occasionally, and quite inconsistently, our Beemer would lapse into a mild low-frequency wobble at very high speeds—sometimes while turning and sometimes while going dead straight. It never wobbled enough to cause much concern, just enough to make us wonder why it was happening. We have no specific data to reinforce it, but we believe the wobble was induced and sustained mostly by the presence of the handlebar-mounted fairing and its interaction with the wind pressure on its surface.

We also found the BMW to be very maneuverable at crawling speeds. All our testers could make a feet-up U-turn on a narrow country road with room to spare, and we never felt the need to put our feet down when stopping until the machine came to a complete halt. Blipping the throttle with the clutch disengaged did upset the bike's rock-steadiness at a walking pace because of the engine's torque reaction.

COMFORT AND RIDE: BMW motorcycles have built a reputation for comfort, and for the most part the R100S lives up to that reputation. But a few items which individually appear to be insignificant nitpicks can collectively become quite annoying—especially when you consider that there *are* motorcycles which do not hassle you in such a manner.

The basic seating position proves quite nice on long rides and not too bad in the city, despite the narrow handlebars and the lean-forward posture you must assume. Actually, many riders *prefer* this handlebar design to the "American" high-rise type. The BeeEm makes you lean on your hands at slow speeds, which is slightly less comfortable than with high bars; but even with the little fairing, the wind holds you up at road speeds, whereas you must continually pull yourself for-



ward with high bars because the wind is trying to blow you over backward. Of course, handlebars are largely a matter of rider preference, so no one type would please everyone.

We spent nearly 12 hours in the BeeEm's saddle one day and went away with no butt sores, hand blisters or backaches. We weren't too crazy about the hard, thin Magura grips or the heavy throttle return springs, although we liked the "Power Bend" Magura-type lever shape. The footpegs are of a new type this year, sporting a square profile with more rubber thickness, and they're also quite comfortable.

The seat was comfortable to sit on for long periods and for a variety of rear ends, indicating it was thoughtfully shaped and padded. The seat cover, however, is too slick, and allows the rider to slide forward during hard braking. Regardless of where the rider is sitting before he begins a quick stop, he usually ends up against the rear of the gas tank.

The slick seat aggravates another annoyance—the contact the rider's shins often make with the hard plastic tubes leading from the airbox to the carbs—especially on the right. When the rider slides forward during braking, his shins bang the tubes even harder, which can be painful and at worst makes it difficult to exert the desired pressure on the brake pedal.

The opposed engine is generally smooth and easy on the rider, although the power impulses shudder the fairing at certain rpm and blur the mirrors at the same time. It's a low-frequency, low-rpm, shaking that does this, and it makes rear-view observation impossible while it's going on. The only other vibe-prone rpm is around 4500, which also tends to fuzz the mirror images, although it isn't very bothersome to the rider. He'll know it's there, but it won't numb his hands, feet or seat. Shorter-stemmed mirrors or rubber-insulated types might help rear vision considerably on the R100S.

BMWs still come with the Hella handlebar switches we disliked so much during our previous BeeEm test. They're laid out in a most unusual fashion, with the critical functions in the most difficult-to-reach positions. The turn signal switch is on the right and goes up-for-left and down-for-right instead of a more natural right-for-right and left-for-left. The engine kill switch is also on the right side but is virtually impossible to operate with your right hand on the twistgrip. And to blow the horn, you must move your left thumb from the bottom of the grip over a protruding blade on the high/low beam switch—which is where horn buttons *usually* are—and move it to the horn button on the top of the switch housing. Despite logging close to 1500 miles on the bike during an entire month, we frequently—and quite accidentally—flashed the high beam when we wanted to blow the horn, and we often signaled for a turn/lane change in one direction when we actually went in the other direction. Honestly, it's not a good arrangement, regardless of whether or not it's standardized, because it's inconvenient.

On the plus side, the headlight is unquestionably the best in the business and the Fiamm horn is bettered only by those bikes which have *two* Fiamm horns—one of which is the fully-faired BMW R100RS.

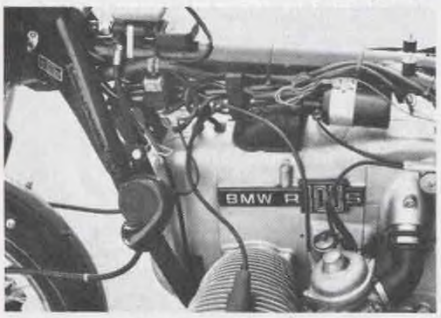
Also a real bonus is the super-duper, long-travel suspension which delivers a fantastic ride. It cushions the big blows so well that most other street bikes feel primitive by comparison. Only the late-model Yamaha streeters even approach the BeeEm's ability to soak up the heavy roughness. That factor alone allows a rider to put in long hours in the saddle without feeling like he's spent the day on the working end of a pile driver.

However, the BMW suspension is *not* quite as supple as the suspensions on those Yamahas when traveling over small ripples, like on the expansion-jointed concrete-slab freeways found in Southern California. The fork in particular doesn't respond fully to small undulations such as this, and the rider is made even more aware of the situation because he is leaning on the handlebars. The problem never reaches uncomfortable levels, though, and is undoubtedly made more noticeable because of the bike's unsurpassed ride under other conditions.

BRAKING: The R100S has the best front brake of any BMW we've tested so far, and we rate the bike's overall braking as very good.

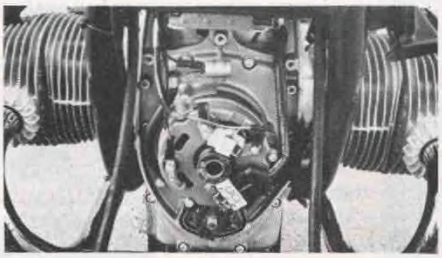
The dual front discs are nicely progressive and not lock-prone, although the front wheel *can* be skidded if you give a real he-man squeeze on the level. Unless you do something bizarre with the front brake, what you squeeze is what you get—a little bit of lever pressure gives a little bit of braking, a lot of pressure nets a lot of braking. And under anything but out-and-out racetrack use, the front brake never fades enough to cause concern.

The holes in the discs are intended to let



The front brake master cylinder is mounted out of harm's way on the low-slung frame backbone under the front of the gas tank.

The best there is: the super-loud Fiamm horn can be heard inside an air-conditioned car when the radio is playing.



The breaker points, AC generator and rectifying diodes (behind frame cross-tube) are conveniently located beneath the front engine cover.

The disposable paper air filter element hides in the top rear of the engine housing, which also functions as an airbox.

the front brake operate more-or-less normally in the wet. However, when we rode the bike in a heavy rainstorm, they acted like other disc brakes do in the wet: A very strong squeeze on the lever was needed for braking at first, although some of the braking power returned after the brake had been applied for a second or two. The holes cause the discs to emit a weird whirring noise when the brake is applied.

The rear drum brake is also pleasantly progressive and plenty powerful. Like the front, the rear wheel can be locked if you so wish but it usually doesn't happen accidentally. The rear brake will fade more than the front during severe usage, although there is still sufficient braking power to get the bike stopped. The rear brake lost none of its power when we rode in the rain.

The R100S does have some stopping difficulty, however, and it has little to do with the brakes themselves. First of all, with the extra-long suspension travel and soft springing, hard stops almost completely bottom the front fork. This severe nosedive reduces the front wheel trail, which wasn't all that lengthy to begin with. Coupled with the narrow bars that have less leverage, the reduced trail causes the bike to feel a tad squirrelly when panic-stopping.

In addition, some riders found it quite difficult to stop the bike comfortably and quickly because the right carb tube banged their shins in such a way as to make depressing the brake pedal difficult.

RELIABILITY DURING TEST: With the exception of the electric clock, nothing on our test bike gave the slightest hint of failure. The clock seemed vibration-sensitive and would lose several minutes an hour when the engine was run near the 4500-rpm mark—which is the point of greatest vibration. The BMW people replaced the clock at the 600-mile service check and the new one was much more—although not perfectly—accurate.

BeeEms have all their serviceable goodies quickly and readily available, so routine maintenance should be no hassle. Three Allen screws undo the point/generator/rectifier cover, there is no drivetrain to contend withand the plugs, valve covers and carbs poke right out in the open where they're easy to get at. And for sheer sim-

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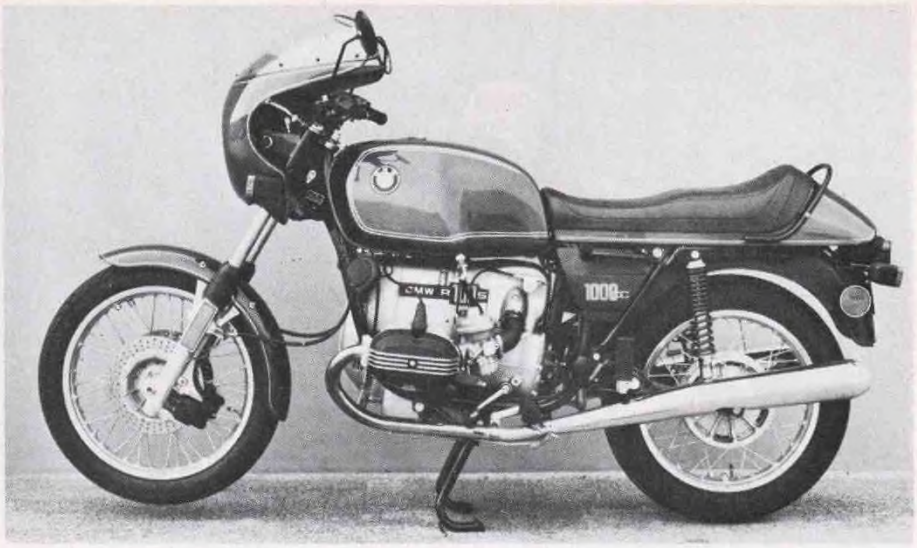

SPECIFICATIONS

Engine type	four-stroke
Cylinder arrangement	horizontally-opposed twin
Valve arrangement	overhead valve, pushrod-operated
Bore and stroke	94mm x 70.6mm
Displacement	979.9cc
Compression ratio	9.5:1
Ignition	battery/single point/dual coil
Charging system	12-volt, alternator, rectifier
Carburetion	two 40mm Bing constant-velocity
Air filter	disposable paper element
Lubrication	wet sump, 2.4-qt. (2.3L) sump capacity
Primary drive	helical gear, 1.5:1 ratio
Clutch	dry, 1 drive plate, 1 driven plate
Starting system	electric only
Transmission	5-speed, left-foot shift
Overall drive ratios	(1) 13.60; (2) 8.84; (3) 6.40; (4) 5.16; (5) 4.64
Pinion gear	11-tooth
Ring gear	34-tooth
Front fork	7.2 in. (183mm) travel
Rear shocks	Boge 3-way adjustable, 4.3 in. (109mm) rear wheel travel
Front brake	two single-action hydraulic calipers, two 10.25-in. (260mm) diameter perforated discs
Rear brake	drum, single-leading shoe, rod-operated
Front tire	3.25H19 Continental
Rear tire	4.00H18 Continental
Frame	tubular steel, double front downtubes
Steering head angle	28 degrees from vertical
Front wheel trail	3.5 inches (88.9mm)
Wheelbase	57.8 in. (146.8cm)
Length	90.9 in. (230.9cm)
Weight	465 lb. (210.9kg)
Weight distribution	46.2% front, 53.8% rear
Ground clearance	6.8 in. (173mm), at crankcase drain plug
Seat height	31.3 in. (795mm), unladen
Handlebar width	24.3 in. (109mm)
Handlebar grip height	39 in. (99.1cm)
Footpeg height	11.7 in. (297mm)
Instrumentation	speedometer, tachometer, odometer, voltmeter, electric clock, tripmeter resettable in tenths
Speedometer error	30 mph indicated, 30 mph actual 60 mph indicated, 61 mph actual
Gas tank	steel, 6.3 gal. (23.9L)
Gas consumption	44.3 mpg (18.8 km/L)
Best ¼-mile acceleration	13.20 sec., 101.7 mph
Stopping distance from 30 mph	34 ft. 4 in. (10.5m)
Stopping distance from 60 mph	136 ft. 1 in. (41.5m)
Sound level per SAE XJ 331a	85.9 db(A)
Suggested retail price	$4195 East and West Coasts

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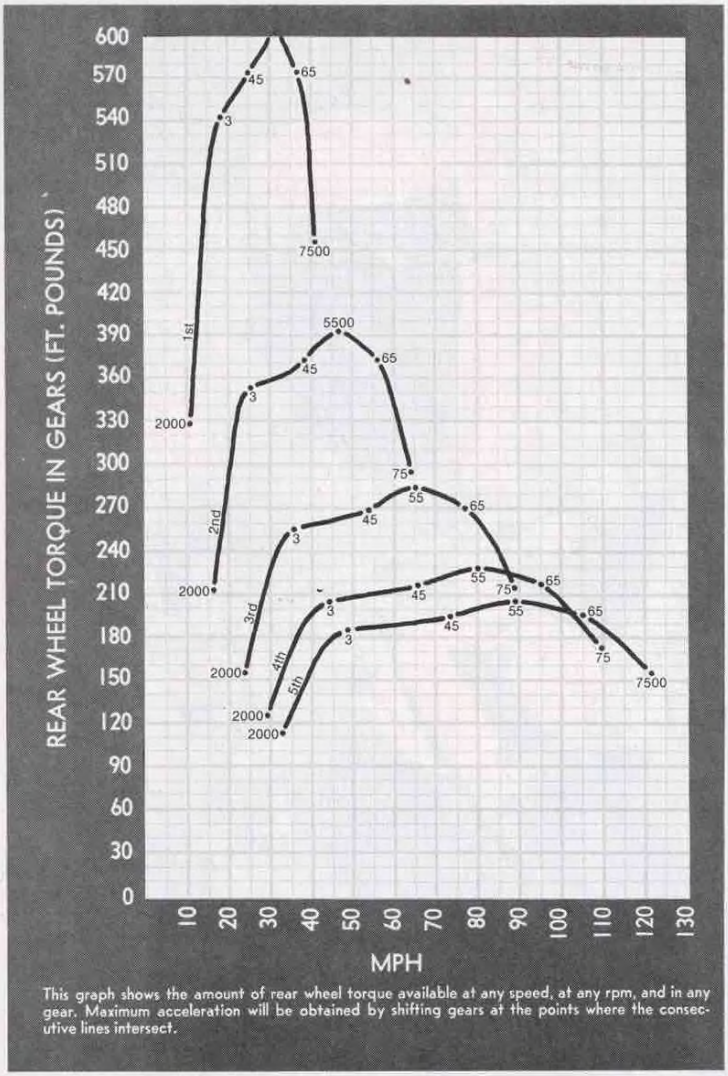
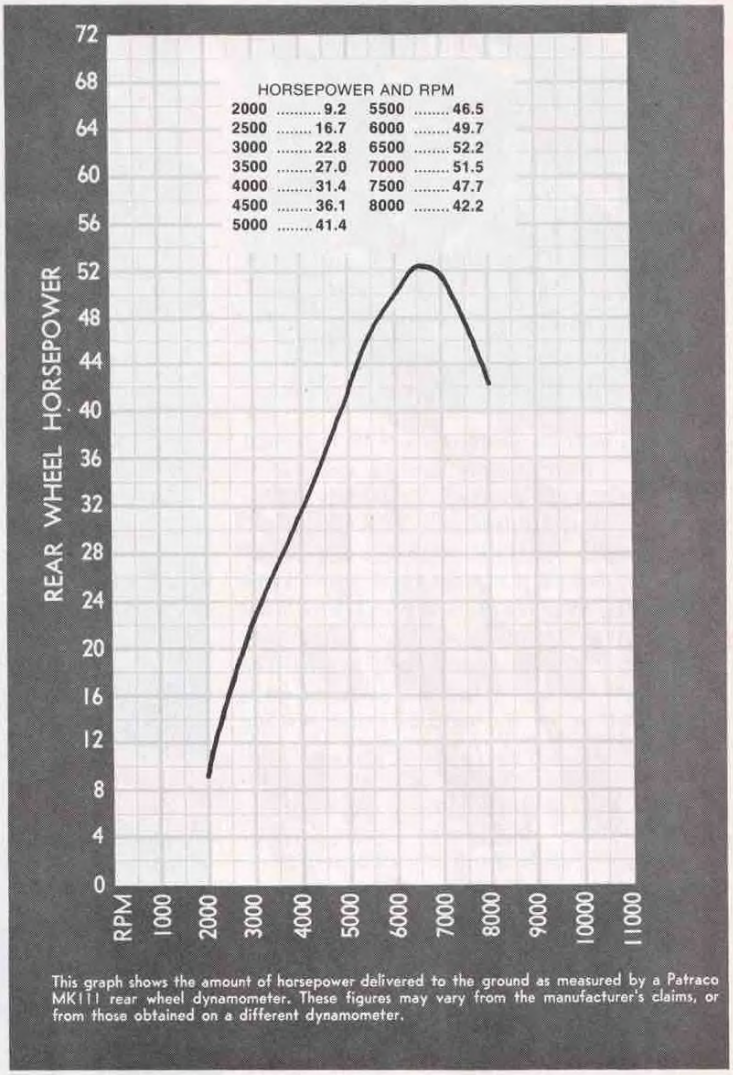


This graph shows the amount of rear wheel torque available at any speed, at any rpm, and in any gear. Maximum acceleration will be obtained by shifting gears at the points where the consecutive lines intersect.



This graph shows the amount of horsepower delivered to the ground as measured by a Patraco MK111 rear wheel dynamometer. These figures may vary from the manufacturer's claims, or from those obtained on a different dynamometer.