





■ PERFECTION IS A pretty tough word. If you think about what it means, you begin to realize that in order for it to be applied to a motorcycle, that motorcycle has to be faultless, devoid of anything that is substandard. The Yamaha RD400C is the closest thing to a perfect motorcycle that we've ever run up against. As a matter of fact, there is only one item that keeps it from being the world's first perfect motorcycle, but we won't tell you what that is. . . at least not until we've told you about the rest of this beauty.

## Cycle World Road Test

Initially, an onlooker's impression would be that the RD350 has been punched out to 400cc and alloy "mag" wheels added, along with a disc brake at the rear. But it goes much deeper than that. So deep that we suggest you toss aside most of what you remember about the RD350 (except for the acceleration and handling), and learn from the start all about how well the Yamaha engineers did their homework before producing the RD400C.

The engine displaces 396cc. That's 49cc more than the RD350. This is accomplished by increasing the stroke from 54mm out to 62mm. Of course, with an increased stroke comes a new crankshaft; and with a new crank comes the need for new cases. Inside these cases there must be components that can absorb the increased torque and horsepower. The primary gears are RD350 carryovers, but the clutch hub has redesigned rubber cushion dampers to soften the power delivery to the six-speed transmission.

The ratios in the transmission have been changed. First through third are higher than before, but spaced about as far apart as the first three gears on the 350. Fourth, fifth and sixth are more closely spaced than the same gears on the 350 were. In fact, the overall ratio in fifth gear is the same as sixth on an RD350. Naturally then, sixth gear on the 400 is taller than sixth on the 350; but top speed remains nearly identical, since the longer-stroking 400 doesn't rev out to the 8700 rpm of the 350, falling about 700 turns short.

Apart from more efficient porting in the cylinders to yield an increase throughout the rpm range, there are a few new features for Yamaha that make the machine much more usable and comfortable than before at low rpm. Each cylinder sports a bypass hole that runs at a 45-degree angle from a point 20mm above the exhaust port, directly to the exhaust passage.

This is very similar in design and purpose to the bypass hole on Suzuki's RM370 motocrosser. Suzuki has incorporated it to facilitate starting. Yamaha does the same, but has realized two additional benefits that are particularly suited to street application. First, low-rpm surging has been reduced; second, the exhaust note is quieter at low speeds. When the engine starts churning—at about 3500 rpm—the bypass hole is open for such an infinitely short time that its effects virtually disappear.

But the bypass hole is not the only thing that Yamaha has provided to reduce the RD's low-rpm surge. Each piston has a small cutaway (4mm high x 10mm wide), on the bottom edge of the front skirt. These cutaways allow for a direct passage from the crankcase to the exhaust port for just a few rotational degrees before and after Top Dead Center. Relieving crankcase pressure in this manner was shown to be effective in reducing surging. Of course, there is a small power loss at low rpm when the throttle is applied, but since the RD400 has much more low-end grunt than the 350, the little that is lost is never missed. Cafe and Production racers can install RD350 >



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# YAMAHA RD400C



# RD400C



pistons and eliminate the crankcase relief, upping overall performance at the expense of increased surging. At the engine speeds they run, who cares about a little surging?

The cylinder heads are identical to the RD350's, except for a beefier spark plug area that allows the use of a 3/4-in. reach plug. Testing showed that a 3/4 reach plug had a wider heat range than the old 1/2-in. reach plugs. Yamaha has taken this into account, so all of its machines (with the exception of the GT80 and GT80 MX models), will require the longer plug.

Carburetors are new. While the venturi size remains at 28mm, the new mixers have an external pilot air circuit. Testing on the TY-series trialers, which have a similar carb, showed that small droplets of gas were forming in the carburetor bell next to the air pilot intake. When the machines were ridden around at low speed for a short while and then had the throttles yanked open, an over-rich condition would occur. The new carbs on the RD400 have eliminated that problem.

Ignition is taken care of by a conventional battery/coil system with higher secondary coil windings for greater spark output. On the primary side, an ignition resistor has been installed to cut down voltage flow across the points, increasing point life and adjustment intervals.

The lighting coils are also beefed up to take on the additional task of the new double-bulb taillight and brighter (by 5 watts) headlight. The new headlight is replaceable with a GE 6014 heavy-duty truck bulb. In many places this bulb can be obtained for under \$2, which compares favorably with the \$7 Yamaha unit. The difference is that the Japanese unit is a double-sealed beam; i.e., a sealed beam within a sealed beam. If a car spits up a loose rock that breaks the outer lens, you don't necessarily lose your light. With a regular sealed beam, you do. The choice is yours, but at least you have a choice. All electrical connections are under the right side cover for easy accessibility.

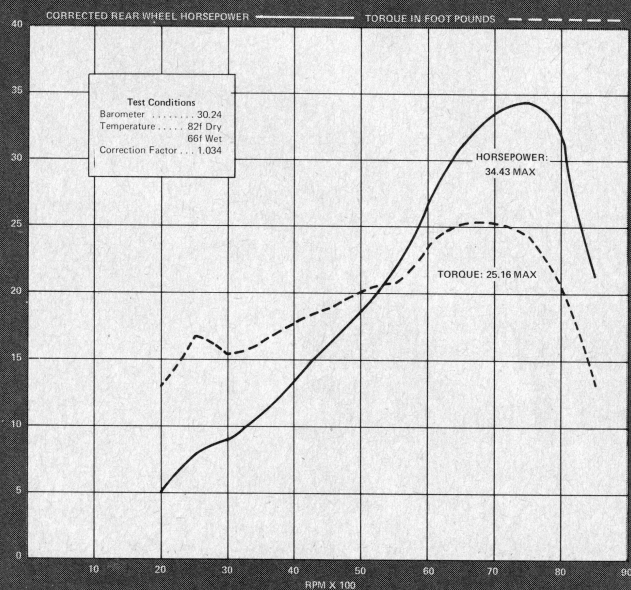
Yamaha is the first major manufacturer to utilize alloy wheels as original equipment. The cast seven-spoke wheels on the RD400 weigh only 100 grams more than the spoke wheels of the defunct 350, so the weight increase is negligible. The tires are standard tube tires of rayon bias ply. There is a new tread pattern and a harder, longer-lasting, but less-sticky compound.

Attached to each wheel is a disc brake. The front brake is the same as last year's, but the caliper has been moved to the rear of the fork leg. Testing has shown us that the bike handles better at slow speed with this modification. There is a different master cylinder, with a new cap secured by four Phillips-head screws, rather than the twist-off caps of yore. No longer will the cap vibrate itself loose, nor will the neighbor kids be tempted to fill your reservoir with rocks, smashed spiders or dead frogs. Immediately beneath the sealing cap is a section of frosted white plastic that runs the circumference of the squarish reservoir, affording easy level checking of fluid without having to remove the cap.

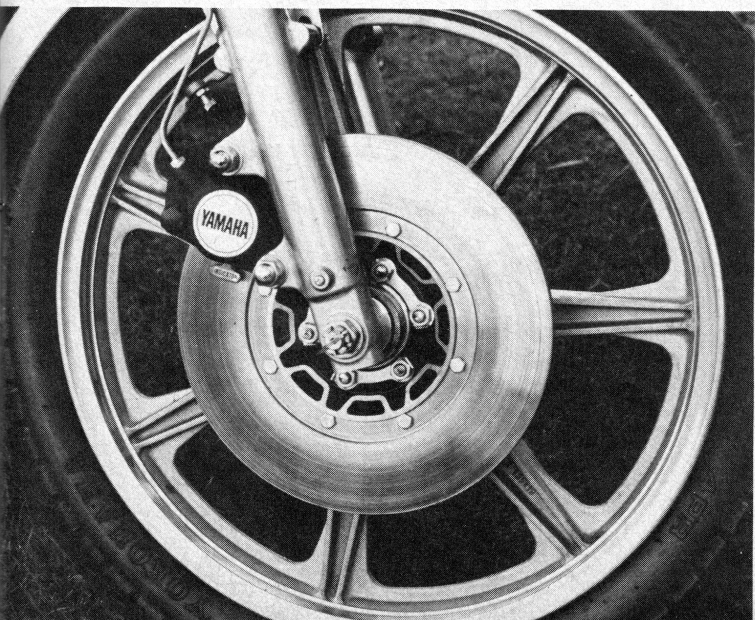
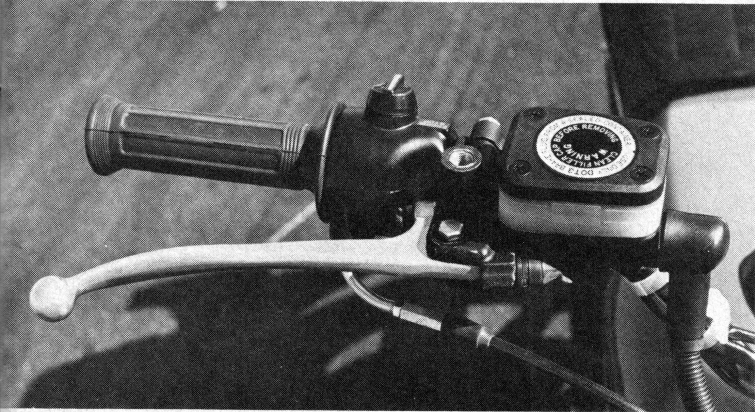
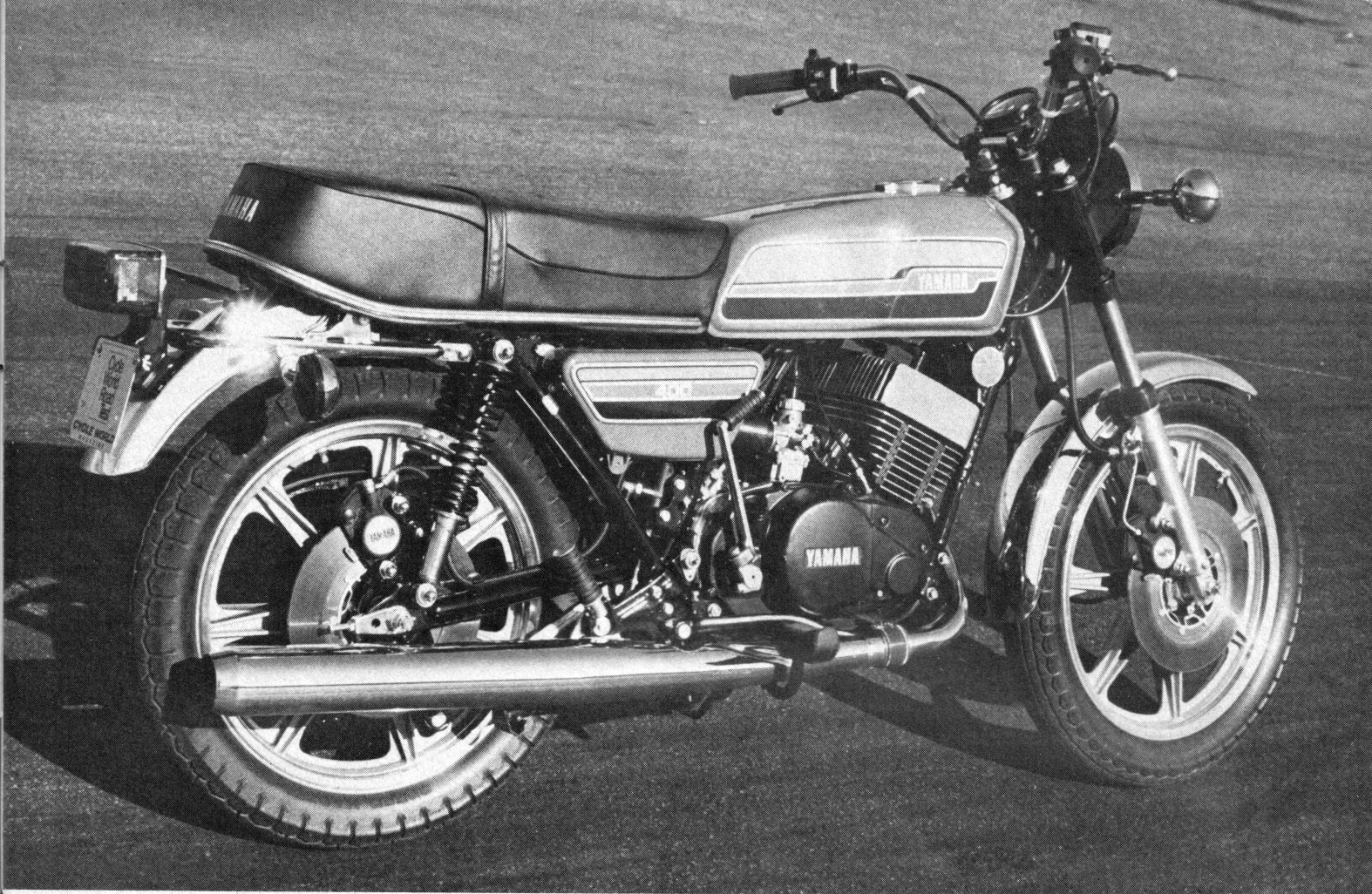
The rear disc brake is identical to the front one. They share the same disc and caliper. The reservoir for the rear resides behind the right sidecover with the electrics, and is attached with a hinge and a Phillips-head screw. Remove the screw and swing the reservoir out for easy replenishment. Like the front unit, this fluid depository's level can also be checked without disassembly of any sort.

## DYNAMOMETER TEST HORSEPOWER AND TORQUE

Engine Speed	BHP	Torque	Engine Speed	BHP	Torque
2000	5.05	13.28	5500	21.78	20.80
2500	7.91	16.61	6000	26.94	23.58
3000	8.84	15.46	6500	31.15	25.16
3500	10.90	16.36	7000	33.55	25.16
4000	13.55	17.80	7500	34.43	24.41
4500	16.16	18.86	8000	31.89	20.56
5000	19.10	20.06	8500	21.78	13.46

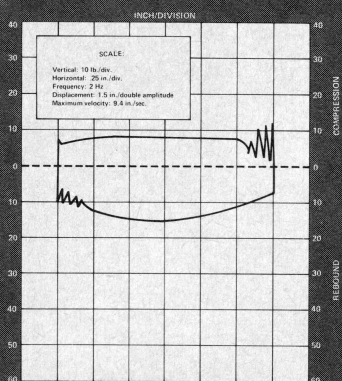








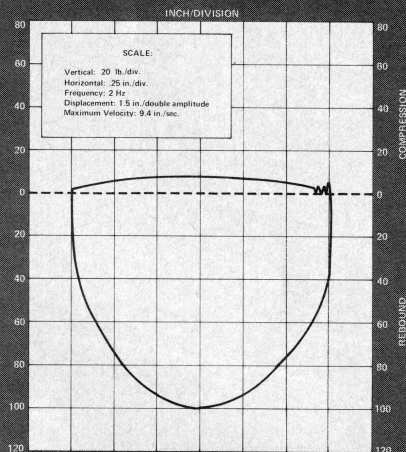
## SUSPENSION DYNO TEST FRONT FORKS



Description: Yamaha RD400 fork with HD 315 oil  
Fork travel, in.: 4.75  
Spring rate, lb./in.: 15  
Compression damping force, lb.: 8  
Rebound damping force, lb.: 15  
Static seal friction, lb.: 8.5

Remarks: Compression damping is ideal. Rebound damping is marginally light, but is not far enough off to warrant any modifications. Spring rate is atypical for Japanese units. Instead of using an appropriate weight spring with little or no preload for the bike, Yamaha has opted for an extremely soft spring with considerable preload. The result is a soft ride, even when the fork assembly is near maximum compression. BMW uses similar thought in the design of its components.

## REAR SHOCKS



Description: Yamaha RD400 shock  
Shock travel, in.: 3.0  
Wheel travel, in.: 3.75  
Spring rate, lb./in.: 80  
Compression damping force, lb.: 8  
Rebound damping force, lb.: 100

Remarks: The relationship between compression and rebound damping is excellent. The damping rate allows for a soft ride and is sufficient for a solo rider. For riding either double or at maximum speed, both compression and rebound damping should be increased approximately 8 lb. The quality of the standard shock is not sufficient to warrant modification for serious riding. For such an application replacement shocks are necessary.

Tests performed at Number One Products

RD350 frame geometry remains. Steering geometry has been altered slightly by a pair of forks that are 1 in. longer than before. The forks have a Teflon bushing immediately below the seals to cut down initial friction resistance over small bumps. The forks are otherwise identical to those on the RD350.

Shock absorbers are totally new. The first RD400 prototypes had shocks that worked well on the race track, but beat you to a pulp on the street. Yamaha replaced those shocks with a pair of S&Ws that cured the stiff street ride, yet still offered excellent cornering manners. The machine was shipped back to Japan with the after-market shocks installed, and the dampers that are on the 400 now are what came out of Japan's exposure to the S&Ws. While the shocks are not the equals of those after which they were patterned, they do a very good job of absorbing small bumps but maintaining stiffness when the machine is stuffed into a turn.

The RD400's twisty-road behavior is still much attuned to its racing heritage. The new frame resists twisting and flexing just as well as the old one. The front end sticks better (within the limits of the tires) because the engine was moved forward 20mm, shifting the weight bias more toward the front.

The relocated engine was necessary because of a new, massive airbox. The new airbox really cuts down a lot on the intake roar, but Yamaha insists that noise reduction was not the primary motivation to develop it. Performance, they say, was the reason. The larger container has required a major redesigning of the frame in that area, but the chassis is still as sturdy as ever. The only concession that Yamaha has made to the noise factor is a rubber "snorkel" that dampens much of the noise emitted by the carburetors at full song.

If you are ever running your RD400 up in the mountains, high enough so that the altitude begins to deteriorate performance, pull off to the side of the road and remove the snorkel. It is accessible from under the seat. Performance will return. As you descend, stop at approximately the same elevation as before and refit the snorkel before continuing down. Without the snorkel there is, of course, more intake roar, but at least the performance won't suffer.

Performance, as long as we're steered in that direction, is one thing that the new 400 does not lack. Power comes on strongly at 4000 and gets really peppy at 5000. The front wheel can still be lofted easily, but now more at the whim of the rider than at that of the machine. The power rush is nowhere near as severe as before, making the RD an easier, more pleasant machine to ride. There is enough torque to putt around with traffic or pull away from a wet, mossy corner without fearing loss of traction due to wheelspin. Yet the machine retains, if not improves on, its original top-end power. . .for the days when you feel like tackling Racer Road.

Keeping this more docile, yet spirited, machine in tune is also easier. The points are not as difficult to set as before and each carburetor has a small plug that can be removed to adjust the synchronization of the slides at full throttle. There is a new oil pump, as well. It is also adjusted at full throttle, eliminating the need to take into account the amount of cable slack, as was necessary on the 350. The new pump is also much more efficient. RD350s got about 150 miles to a quart of oil. The new pump delivers between 350-500 miles to a quart. We rode the thing hard and got 480 miles before the new oil indicator light told us we were low on injection oil.

The light is located on the instrument panel. There is no more need for an oil-level window in the oil tank, but there is a handy dipstick for skeptical riders. The bulb begins to flicker when the oil is down exactly one quart. Very convenient. The light also comes on in neutral as a means of checking that the



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## SPECIFICATIONS

List price	\$1219
Suspension, front	telescopic fork
Suspension, rear	swinging arm
Tire, front	3.25-18
Tire, rear	3.50-18
Brake, front, eff. dia. x width, in.	10.4 x 1.8
Brake, rear, eff. dia. x width, in.	10.4 x 1.8
Total brake swept area, sq. in.	194
Brake loading, lb./sq. in. (160-lb. rider)	2.7
Engine, type	two-stroke, reed-valve Single
Bore x stroke, in., mm	2.5 x 2.4; 64 x 62
Piston displacement, cu. in., cc	24.29; 398
Compression ratio	6.2:1
Actual bhp @ rpm	34.43 @ 7500
Actual torque @ rpm, lb.-ft.	25.16 @ 7000
Carburetion	(2) 28mm Mikuni
Ignition	Battery
Oil system	Autolube
Oil capacity, pt.	3.8
Fuel capacity, U.S. gal.	3.4
Recommended fuel	low-lead (regular)
Starting system	primary kick, folding crank
Lighting system	generator
Air filtration	dry paper
Clutch	wet, multi-disc
Primary drive	helical gear
Final drive	530 single-row chain
Gear ratios, overall:1	
6th	5.69
5th	6.16
4th	6.94
3rd	8.45
2nd	11.39
1st	16.48
Wheelbase, in.	53.5
Seat height, in.	33
Seat width, in.	10
Handlebar width, in.	29
Footpeg height, in.	13.5
Ground clearance, in.	9
Front fork rake angle, degrees	27.3
Trail, in.	4.3
Curb weight (w/half-tank fuel), lb.	367
Weight bias, front/rear, percent	43/57
Test weight (fuel and rider), lb.	537
Mileage at completion of test	829

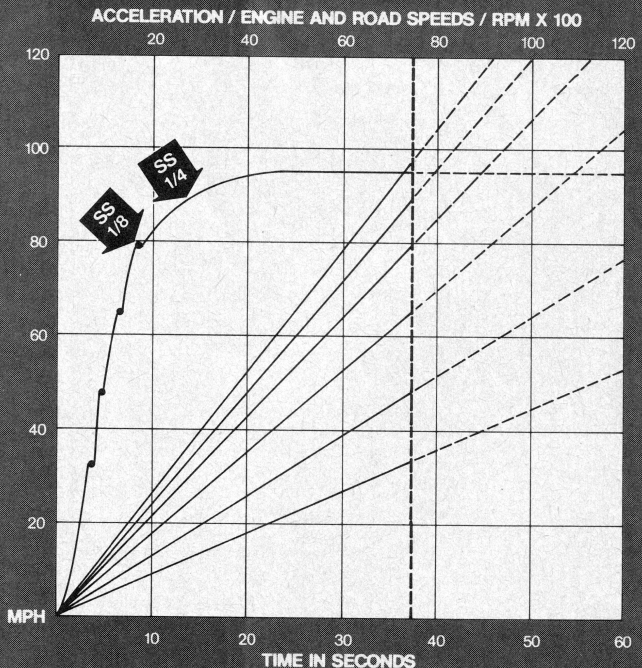
## TEST CONDITIONS

Air temperature, degrees F	63
Humidity, percent	56
Barometric pressure, in. hg.	30.24
Altitude above mean sea level, ft.	328
Wind velocity, mph	0
Strip alignment, relative wind:	



## PERFORMANCE

Top speed (actual @ 7835 rpm), mph	95
Computed top speed in gears (@ 7500 rpm), mph	
6th	97
5th	89
4th	79
3rd	65
2nd	48
1st	33
Mph 1000 rpm, top gear	11.4
Engine revolutions/mile, top gear	4650
Piston speed (@7500 rpm), ft./min.	3000
Lb./hp (160-lb. rider)	15.6
Fuel consumption, mph	45
Speedometer error:	
50 mph indicated, actually	47
60 mph indicated, actually	57
70 mph indicated, actually	66
Braking distance:	
from 30 mph, ft.	34
from 60 mph, ft.	121
Acceleration, zero to:	
30 mph, sec.	3.1
40 mph, sec.	4.0
50 mph, sec.	5.1
60 mph, sec.	5.8
70 mph, sec.	7.2
80 mph, sec.	9.3
90 mph, sec.	15.0
Standing one-eighth mile, sec.	8.571
terminal speed, mph	78.87
Standing one-quarter mile, sec.	14.144
terminal speed, mph	89.64





# RD400C

bulb is still operating. Put the bike into gear and off it goes.

One of the longest-awaited features in motorcycling is Yamaha's new self-canceling turn signals. They begin with a new switch that is self-centering. Flip it to either side and the switch returns to center. For early cancellation, just push the switch's lever straight in. But if you don't cancel the turn signal, it will cancel itself in 150 meters or 15 sec., whichever is greater. This takes a little explanation.

Suppose that you pull into a turn lane, hit the turn signal and have to wait a minute or two for the light to change before you make your turn. The turn signal will not cancel in 15 seconds, but will wait until the 150 meters have been covered. Now, suppose that you are cruising along at a good clip, say 75 mph (yes, Elmer, we know that 75 mph is illegal, but at close to 50 mpg, the energy conspiracy crybabies can stuff it). At that rate, covering 150 meters is a matter of just a few seconds. In this situation, tripping the turn signal would result in 15 seconds of flashing before cancellation, assuring you of sufficient time to make a safe lane change. We think that this system is outstanding and can't wait until the day when all manufacturers implement it or something similar. We hope it happens before the government do-gooders step in, mandate it and then take the credit for themselves.

Yamaha has succeeded in mating increased top end performance with improved low end torque, quieter operation, vastly improved gas mileage and a more comfortable ride. The engine vibrates, but the rider is isolated from shaking by rubber mounts at the engine, footpegs and handlebars. There's also a new seat that has got to rate as one of the finest, if not *the* finest posterior supporter ever to come across the Pacific. The handgrips are not the kind you want to throw away and replace, but rather the kind you would use to *replace* crummy grips. Everything is there, EXCEPT...except a good horn. This motorcycle has all that a sport-minded commuter would want, except an audible horn. The standard unit wouldn't make a hungover wino flinch, let alone inform some quadraphonically-deafened cigar-puffing lardo that he is blindly stuffing his gas-sucking smogmobile into the lane you are occupying.

The RD350 is no more. No longer will RD owners leave eyeball imprints on their faceshields from unrequested wheelies, or curse their machine as it struggles through traffic, yearning for a little more room to stretch its legs and breathe. Nor will Grandma Highbuttons and the rest of the bus stop set clutch their shopping bags to prevent them from being vacuumed away by an RD as it whistles past with its headlight painting patterns against the clouds.

The RD350 is no more. But it will not be mourned at all. The RD400C has more than the RD350 it replaced. It has equalled it in a few ways and surpassed it in countless others. You can take the RD400 to the mountain twisties on the weekend, just like the old 350, and then ride it to work on the crowded freeways as if it were a four-stroke commuter special.

Normally, when we get a good machine for test, we are reluctant to return it to the manufacturer when we are through testing it. But this time we are much more than reluctant. If Yamaha thinks that we're going to give this baby back without bucking a lot, they've got another think coming. Unless, of course, they want it to install a better horn for us. We've always wanted a *perfect* motorcycle in our stable. 