# By Ron Schneiders

## The technique of enduro time keeping for the rider who wants to win

# KEEPING TIME

• Have you ever heard this one? "Well, I like to ride enduros sometimes, but I can't be bothered with all that timekeeping stuff. My bike doesn't even have a speedometer." This oft-heard statement usually suggests a sort of nonchalant pride, as though the guy were a super-racer who condescends to ride "baby" events on off-weekends, but surely can't be expected to take them seriously. My response to that attitude is always one of understanding: I nod my head and say, "Yeah, I know what you mean. Time-keeping can be a real drag." And I keep my hand stuffed deep in my pocket so he won't see that I'm wearing two watches.

But plain trail riding doesn't cost anything, and the only reason for paying an enduro entry fee is to have a chance to win something. Guys who ride enduros without bothering to keep time contribute their entry fees, but voluntarily give up any legitimate chance of winning.

If you don't keep time because you can't afford the necessary equipment, you might have my sympathy—but not if you're driving 150 miles to an event every other weekend and paying a $6 entry fee. A good-quality, brand-new speedometer costs less than $50. A $15 Timex watch will certainly do for starters and that's all that you absolutely need.

Some enduro stars have written that timekeeping is easy. Obviously it's not or there would be 50 guys zeroing every run. On the other hand, since there are probably 3000 reasonably good timekeepers across the country, it's not impossibly difficult either. If you read the rest of this article with the realization that you are going to have to work in order to master the principles, there's a pretty good chance you might beat me out of my next trophy.

*What is an Enduro?* Riders often have very strange ideas about just what an enduro is. Some think of enduros as being torturous rides through impossible country that only super-riders can survive. Most have the idea that an enduro basically is concerned with maintaining exactly some "average speed," and there are a few in every event who think that an enduro is a head-to-head competition like a motocross, and they therefore race everyone that they see. Obviously none of these are correct—or at least seldom so.

Enduros are points-scored events. Usually a contestant is given 1000 points at the beginning of the enduro and he loses points for mistakes. The rider with the highest remaining score is the winner. Some clubs don't bother with this bit of sophistication: they just hand out points for mistakes and total them up at the end, with the lowest score winning. There is no difference, but since the first method is more common, we will talk about "losing" points through this article.

There is nothing in any set of enduro rules detailing any course requirements in terms of difficulty. A valid, AMA championship enduro could be run entirely on asphalt roads if the promoter so desired. Nor are there any rules requiring a rider to maintain any average speed. In fact, in AMA definition, "Speed is not a determining factor" in enduros. The only rules relating to speed averages are those that require a rider to be not more than one hour late or not more than 15 minutes early under penalty of disqualification. Even those have nothing to do with the contest really; they are a matter of convenience (The promoter doesn't want to be there all night!) and safety.

An enduro reduced to its essence is a contest in which the competitor is required to follow a course and to be at certain points on the course during certain prescribed time periods. Most of these designated points are called "Secret Checks." The rider must arrive at a given secret check not at a particular instant (like 12:04:00), but in a definite time *interval:* one minute. If his scheduled time of arrival is 12:04, he has from 12:04:00 to 12:04:59. If he is opposite the check flag or sign any time within that interval, he loses no points. If he arrives *after* that interval, he loses one point for each full minute after his scheduled time. At 12:05:02 he would lose one point, for he would be three seconds beyond his time interval allowance. Being early *generally* costs more, and there is no interval ahead of the schedule time. If the same rider arrived at 12:03:59, he would be "early" and would lose two points for being "a minute" early, although in fact he is only one second ahead of his schedule time. Each additional minute early costs an additional two points, under most rules. Some clubs and associations impose even stiffer penalties for being more than two minutes early, and some charge only one point per minute early. Hence the validity of "speed is not the determining factor"; it costs more points to go fast than it does to go slow.

Because the rider actually has an interval, rather than a precise time, during which he must appear at a check, most good riders don't try to stay precisely on their scheduled time but rather ride in the middle of their interval, in effect riding 30 seconds "late" all the time.

Besides the secret checks, there are two other types of checks: known checks, at which the rider may arrive up to 15 minutes early without penalty (under most rule systems), and the "tiebreaker" check, which does, hopefully, just what the name implies. At the tiebreaker check, the rider's time is noted to the second, rather than the minute, and he is considered to have "zeroed" the tiebreaker if he arrives exactly 30 seconds after his schedule time. If he is due at the tiebreaker check at 2:17, he will get zero points, or a perfect score, if he arrives at 2:17:30. If he arrives at either 2:17:27 or at 2:17:33, he will lose 3 *tiebreaker points.* These do not affect his score on the printed results in any way unless he ties with someone on the basis of secret check points. Since the tiebreaker check is also a secret check, the rider must arrive within his one minute interval or he will lose secret check points.

*Your Riding Number and the Schedule.* Signing up for an enduro is not like signing up for a race. You usually enter an enduro some weeks ahead of the event by filling out an application and mailing it to the promoter along with a check for the entry fee. When your entry is accepted, you will receive an acknowledgment and several other pieces of paper–sometimes. This part varies so much with the locality that it's difficult to generalize, but the one thing that you will always get is your *number.* Your number not only identifies you for the scorers, but it is also the basis for your timekeeping all the way through the event. And, most importantly, it tells you the time at which you will start. To find your starting time, add your number to *Key Start Time.* Usually there will be several riders on each minute, so numbers will be assigned 18A, 18B, 18C, etc. The 18 tells you that you will be starting on the 18th minute. If key start time is 8:00 a.m. a rider with number one will start at 8:01; you will start at 8:18.

In addition to your number, you will usually receive a schedule, or route sheet, such as those shown in Figures 1 and 2. The schedule contains the speed averages, key times, and mileages between key points. Sometimes, especially in some of the Eastern enduros, this information is combined with course information keyed to the speedometer reading. Then, along with the speed to be maintained, you will have instructions such as "Go L (left) at 9.3," "Go R (right) at 11.5," "Go R on asphalt at 13.3," etc. These instructions are often cut into strips about two inches wide, taped end-to-end and put in a route sheet holder. Though they are of course more elaborate than those accompanying this article, there is no difference in principle. They are just a bit more confusing because there is more to them. But this extra information is necessary where marking the terrain is not practical.

Sometimes there is no printed schedule at all. The promoters simply post signs when there is a speed change, telling you the key time and the new speed average. Riders who are used to having a schedule two weeks ahead of time so they can work out all the problems are often quite dismayed to run up against this system, but again the principles are the same. It keeps them honest.

*Speed Averages.* Somewhere along the line, between the time the rider pays his entry fee and the time he actually starts riding, he will be given at least one and usually several schedule speeds "to maintain." The schedule speed is actually a guide. It says, "If a perfect rider rode this course at precisely this speed, he would arrive at the *secret* checks precisely at the *beginning* of his time interval." We have already seen that a practical rider wants to arrive at checks in the *middle* of his time interval, and that he *must* arrive in the middle of the time interval to do well on the tiebreaker checks. So trying to match the "perfect" rider is not a very wise procedure, but if you are not yet willing to concede this point, consider these two facts. First, since the schedule speed starts at the beginning of the time interval, you could ride very accurately, to arrive at the end of a long section only one second early and lose two points. That's double the penalty for one-hundredth the error. But if you were 1 minute 59 seconds late, you would only lose one point.

The second point is best illustrated by example: Suppose the command is, "Go 6 miles at 30 miles per hour." If there were a tiebreaker check at the six-mile point, a perfect score at the tiebreaker would be earned by averaging precisely 28.8 mph, not 30!

The statement, "Go x miles at y mph" is just a convenient fiction; it is not meant to be taken literally. It is the established method of telling you how to figure out where the checks might be.

Let's look at another aspect of this type of command, the fact that the speed is given in miles-per-hour. In the world of automobiles, where the normal speeds are between 20 and 80 mph, miles-per-hour is a logical, convenient measure. For things that move much faster, though, it is not so convenient. Mach numbers are used to designate the speed of jet aircraft, and the speed of atomic particles is given as some fraction of the speed of light.

In enduros, the problem is reversed. When you must be accurate to within 30 seconds, using mph as your basic unit of

## Fig. 1

STICKY WICKET ENDURO

| | *Go* | *At* | *Total* | *Key Time* | *Your Time* |
|---|---|---|---|---|---|
| Start | 10.0 | 20 mph | 0.0 | 7:00 | |
| Speedo check | | | 5.0 | 7:15 | |
| Speed change | 16.0 | 24 mph | 10.0 | 7:30 | |
| Speed change | 7.0 | 21 mph | 26.0 | 8:10 | |
| Gas stop | 0 | 0 | 33.0 | 8:30 | |
| 10 minutes | | | | | |
| Speed change | 3.9 | 13 mph | 33.0 | 8:40 | |
| Speed change | 6.9 | 17.25 mph | 36.9 | 8:58 | |
| Speed change | 15.2 | 24 mph | 43.8 | 9:22 | |
| Finish | | | 59.0 | 10:00 | |

## Fig. 2

DIRT DIGGERS
RED GARTER ENDURO

Riding Number 21

| *Check* | | *Miles Average* | *Total Miles* | *Key Time* | *Your Time* |
|---|---|---|---|---|---|
| #1 | Ballenger Camp–1st loop start | | 0.0 | 7:00 | |
| | Go | 5.0 @ 20 mph | 5.0 | 7:15 | |
| | Go | 9.3 @ 18 mph | 14.3 | 7:46 | |
| | Go | 3.9 @ 9 mph | 18.2 | 8:12 | |
| | Go | 8.0 @ 15 mph | 26.2 | 8:44 | |
| | Go | 2.8 @ 6 mph | 29.0 | 9:12 | |
| | Go | 28.8 @ 24 mph | 57.8 | 10:24 | |
| #2 | Ballenger Camp–1st loop finish– | | 57.8 | 10:24 | |
| | Lunch Stop–26 min. out, Reset speedo no mileage thru camp | | | | |
| #3 | Ballenger Camp–2nd loop start | | 57.8 | 11:00 | |
| | Go | 5.0 @ 20 mph | 62.8 | 11:15 | |
| | Go | 6.6 @ 9 mph | 69.4 | 11:59 | |
| | Go | 10.5 @ 18 mph | 79.9 | 12:34 | |
| | Go | 7.7 @ 21 mph | 87.6 | 12:56 | |
| | Go | 9.2 @ 12 mph | 96.8 | 1:42 | |
| | Go | 16.5 @ 18 mph | 113.3 | 2:37 | |
| #4 | Ballenger Camp–2nd loop finish– | | 113.3 | 2:37 | |

speed is about as unwieldy as using a steam shovel to build a sand castle. In order to make the scoring system of an enduro work, checks must be located at exact minutes and exact tenths of a mile. You probably know that 60 mph is the same as one mile per minute, and that 30 mph is the same as .5 miles per minute. Speed averages in terms of miles-per-minute turn out to be quite convenient for enduro riders. We can now translate the basic command "Go 5 miles at 20 mph" to "Go 5 miles at slightly less than a rate of 1 miles per 3 minutes."

You might be astute enough to notice that 1 mile per 3 minutes is not the only possible alternate form of 20 mph. Twenty mph also equals .333 miles per one minute or .1 mile per 18 seconds. Why did we choose one mile per 3 minutes rather than one of the other forms?

Here is a fact that seems obvious but is often overlooked: all of our normal timekeeping instruments are designed to be read in hours, minutes, and seconds. They can't be read in decimal parts of a minute or second. If you take some quantity, for instance 40 minutes, and divide it by another quantity so that it produces an even number, you're okay. Forty minutes divided by four equals 10 minutes. Forty minutes divided by five equals 8 minutes. All perfectly good and usable. But 40 minutes divided by some number like 31 equals 1.29 minutes, and what can you do with that? In our system 1.29 minutes is not usable until it's been further converted into 77.4 seconds, or 1 minute 17.4 seconds. Our clocks and watches simply won't read 1.29 minutes.

Here are the basic considerations for reducing speed averages to usable forms for enduro riders: mileages can be reduced as low as tenths because that is as accurate as our odometers can measure; time can be reduced to the nearest even minute. Applying these rules:

$$\frac{24\text{ mi}}{1\text{ hr}} = \frac{24\text{ mi}}{60\text{ min}} = \frac{2.4\text{ mi}}{6\text{ min}} = \frac{.4\text{ mi}}{1\text{ min}}$$

We now have a usable rate of speed: .4 miles to be traveled in 1 minute. In an enduro where the whole event was run at 24 miles per hour, you could mount a watch next to your speedometer, set the odometer to zero and the watch to 12:00 at the start and ride a very close schedule by simply making sure that the odometer reading increased .4 miles for every minute that elapsed. But most clubs are not obliging enough to run the whole thing at 24 mph, so you must learn to reduce other speeds in mph to usable values.

The procedure is:

A. Substitute 60 minutes for one hour.
B. Divide the top and bottom of the fraction by 10.
C. Divide the top and bottom by any other number that will preserve whole minutes on the bottom and no worse than tenths on the top.

Thus: $12\text{ mph} = \frac{12\text{ mi}}{60\text{ min}} = \frac{1.2\text{ mi}}{6\text{ min}} = \frac{.2\text{ mi}}{1\text{ min}}$

That's easy. Let's try a harder one.

$$21\text{mph} = \frac{21\text{ mi}}{60\text{ min}} = \frac{2.1\text{ mi}}{6\text{ min}} = \frac{.7\text{ mi}}{2\text{ min}}$$

That's as far as you can go with this one. If you further divide to get down to one minute, you'll wind up with .35 miles, which your odometer can't handle. Here's one that looks even worse.

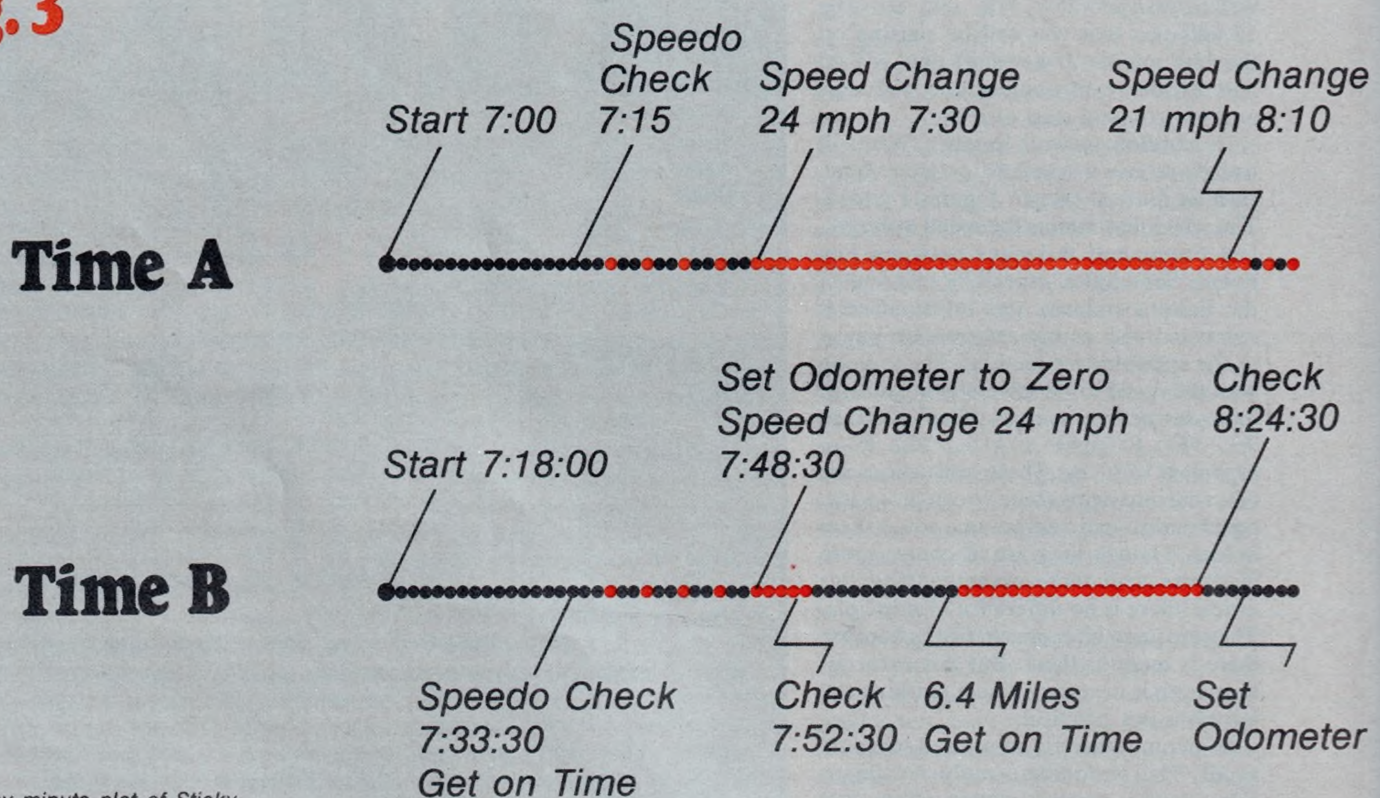
$$13\text{ mph} = \frac{13\text{ mi}}{60\text{ min}} = \frac{1.3\text{ mi}}{6\text{ min}}$$

That's as far as you can go. Fig. 1 shows all the speed averages from 3 mph to 36 mph reduced to usable values, but you should figure them out for yourself so that you are sure you understand the process.

WHERE ARE THE CHECKS?

If an enduro rider had to spend his entire ride every weekend keeping time, expecting checks continuously from the starting line to the finish line, the sport would be pretty grueling, and there would probably be fewer people in it. Fortunately, this is not the case. There are two rules almost all clubs observe which limit rather drastically the number of places where checks can be located; this ensures

**Fig. 3**




*Minute by minute plot of Sticky Wicket Enduro as scheduled (A) and as actually ridden (B) by rider #18. Red dots are potential checks.*

that a rider will have between 25 and 75 percent of the run free to ride without the bother of timekeeping.

The first rule states that there will be no two checks within five miles of one another. In some localities this is changed to three miles for runs less than 100 miles long, but the principle is the same.

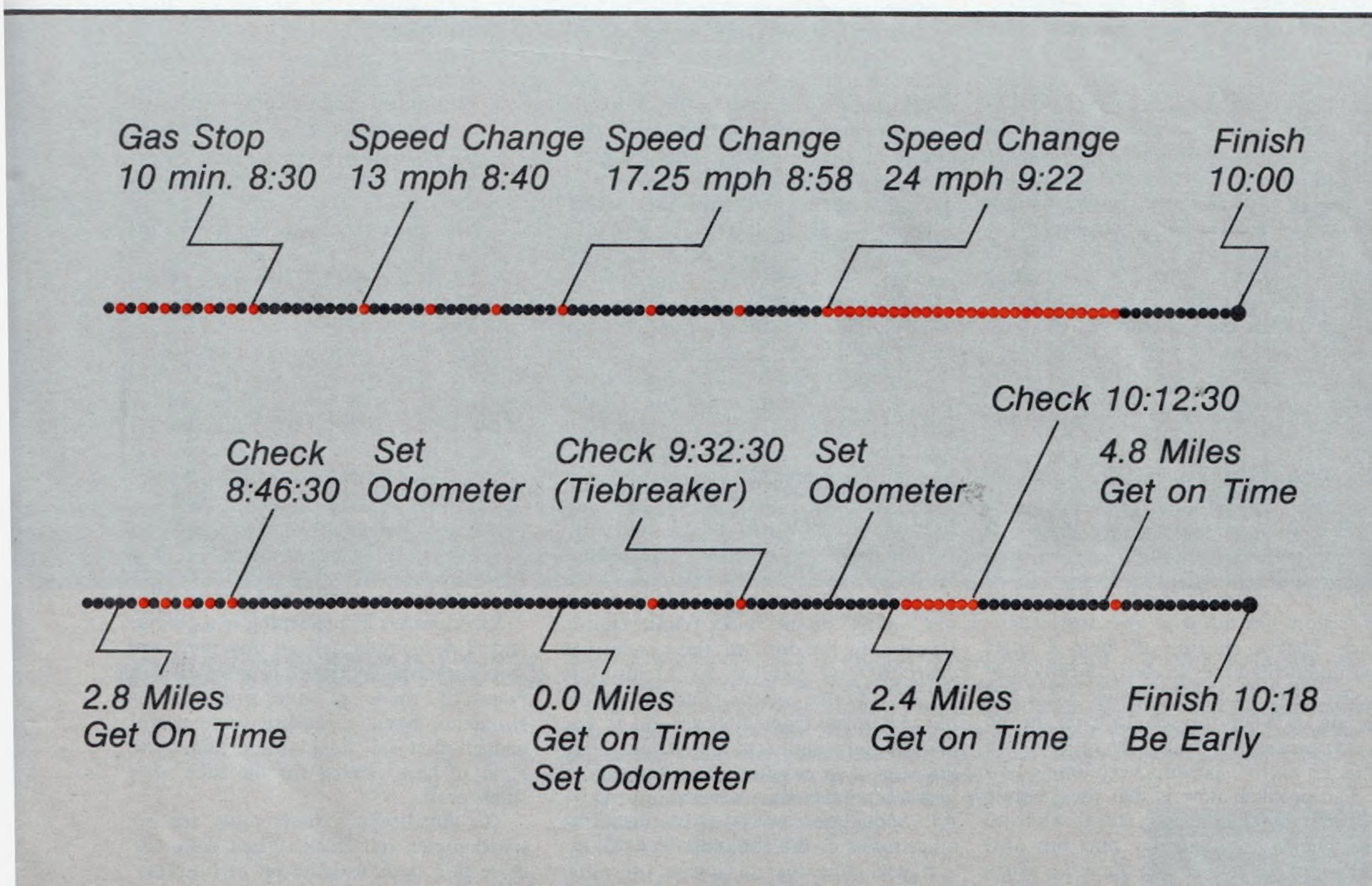
The second rule we have already touched: All checks must be located *both* on exact minutes *and* on exact tenths of a mile. That is a check cannot be scheduled to fall at 2.23:15; it must fall at exactly at 2.23. And mileage can't read 6.65 at a check; it must be exactly 6.60. No fractions of a minute or a tenth are allowed.

Let's consider now the Sticky Wicket enduro, whose schedule appears in Fig. l. Although this enduro was never run, it is quite typical except that it is shorter than normal. Accompanying the schedule for the Sticky Wicket is a sort of graph, or time continuum, in Fig. 3. Each minute of the Sticky Wicket enduro is represented by a circle on the graph. Since the enduro is three hours long, there are 181 such circles. Note that some of the circles are filled in red. The red circles represent the minutes in which checks can be located. The thing that will strike most people immediately is that the density of red dots varies tremendously through the time period. Some parts of the enduro have no dots at all and some are solid. Those who understand this pattern have a tremendous advantage, so let's examine the schedule.

To begin with, there are three areas that have no red dots at all, the beginning, the end, and the gas stop in the middle. The gas stop is ten minutes long, so there are ten blank dots. The schedule at the beginning of the run calls for 20 mph, which can be reduced to one mile per three minutes. At that rate it takes 15 minutes to go the first five miles to the speedometer check—free territory. The start is a known check; there can be no checks within five miles of it, hence there is no red in the first 15 dots. The finish of the run is also a known check, so there can be no other checks within five miles of it, but in terms of time it's shorter than the stretch at the beginning of the run because the schedule calls for 24 mph at the end of the run. This is .4 miles per minute, so your free territory is only 12 minutes (actually 12.5, but always figure your free territory as the shorter interval when it doesn't work out evenly, for safety's sake).

Looking over the rest of the schedule and comparing it to the graph, you will notice some interesting things about the patterns. First, the 24 mph schedule is the most dense in terms of red dots, with every circle filled in in those sections. These are the most difficult to ride well because there is the possibility of a check every single minute. There are other speed averages which are the same—all the popular ones, as you might have guessed! 6, 12, 18, 24, 30, and 36 mph. Notice that these schedule speeds have in common the fact that they are all divisible by 6, and so, in reducing them to usable speed averages, they all come down "something" per *one* minute.

Here is a rule: If the speed average is divisible by six, there can be a check every minute, if by three, a check every two minutes (see 21 mph on the chart), if by two, a check every three minutes (see the 20 mph section). Any whole numbered speed average can have checks at least every six minutes (for example, the 13 mph section. Checks are possible every 1.3 miles). On top of this, there are probably an infinite number of really weird averages that will produce some legitimate checks, such as 17.25 mph. This average actually occurred in a recent AMA enduro. To find out where the checks can be with an average like this, first reduce it to an improper fraction, 69/4, divide it by 60, giving you 69/240, and simplify according to rules that were given earlier: 23/80 = 2.3/8, which means ride 2.3 miles per eight minutes. Since there can be a check every eight minutes, there are three red dots in the section.



By now our 180 minute enduro has been reduced to 88 minutes of strict timekeeping, because those are the only minutes where checks are possible. This, of course, discounts free territory beyond secret checks which are unknown to us at the start of the enduro.

Now let's begin "riding" the enduro and see what happens. You begin by riding as fast as you comfortably can for the first five miles. At that point you check your speedometer and wait until you're on time, which is 30 seconds past your minute. The speedometer check is 15 minutes from the start, so if your number is 18, and the key start time is 7:00, then you will leave the speedometer check point at 7:33:30 (15 minutes plus 18 minutes plus 30 seconds plus 7:00) and ride one mile every three minutes. The balance of that section is uneventful.

One of the initial enduro riding practices which you should master is resetting the speedometer's tripmeter to zero miles at each speed change. Resetting leaves you fewer numbers to deal with than running on total miles. Since you have to do a certain amount of figuring in your head, regardless of the system or devices available, it's more simple to compute your time at 8.8 miles into a 24 mph section than 93.2 total miles into the run.

At 7:48 you zero the tripmeter and start the 24 mph section, and you must ride very carefully now because there is a possibility of a check every minute. Sure enough, at 7:52, just four minutes after you entered the section, at 1.6 miles, there is a check. *But this now gives you 12 minutes of free time because there can be no other check within five miles* or 4.8 miles to work out to an even minute. You ride as fast as is comfortable, just keeping a casual eye on the speedometer to make sure you don't go past 6.4 miles. At 8:04:30 you start again clicking off miles at .4 miles per minute. You have only gone 20 minutes when there is another check in this same section, at 8:24, 14.4 mileage.

The 24 mph section is the one most likely to separate the winners from the also-rans. At 24 mph there is little room for error. If you get just two minutes behind, at 24 mph, then it will take almost 20 minutes of riding at an average of 30 mph to catch up. And if the section is scheduled at 24 mph, the odds are pretty good that you can't average 30 mph at all. Watching really good enduro riders in sections like this is an awesome experience. They're clicking off their .4 miles per minute like they're electronically controlled, and it doesn't matter what the terrain is. When the second hand on the watch sweeps past the six, the fourth tenth rolls up on the speedo, every time.

The problem now is that the 24 mile per hour section ends very shortly and you must figure out how far into the next section to go before you have to worry about a check. There is 1.6 miles left in the 24 mph section, so you will have 3.4 free miles in the 21 mph section. You will be riding that section at the rate of .7 per two minutes, and five such intervals would be 3.5 miles into the section, which is .1 miles too many. So you stop 2.8 miles into that section and get back on time: 8:36:30.

Ten minutes later there is another check hidden in a ravine just .7 miles before you break out onto the highway for the 10 minute gas check. After you have gassed up and gobbled a candy bar you notice something funny. The next section is only 3.9 miles long and there has been only .7 miles since the last check, a total of 4.6 miles, so you don't have to keep time at all in the 13 mph section! The next section is the weird one, 17.25 mph, but you like that one because there are only three places for a check. You reset your speedometer at the speed change and leave a bit ahead of schedule because you want to hit the first possible check location, 2.3 miles down the trail, dead on the money, which will be 9:24:30. But there is no check. The next possible place is at 4.6 miles, and you have to hit that one at 9:32:30. You roll in exactly on time according to your watch and you're really happy because it turns out to be the tiebreaker. Their clock doesn't quite agree with yours, however, and they award you -7 seconds at the tiebreaker. This now gives you free territory until you're well into the last section. You get back on time six minutes (2.4 miles) into the section and there's another check 11 minutes (4.4 miles) into the section. You feel in your bones that that should be the last one, but you check anyway. Damn. There is one legal check location remaining between you and the end of the run because it's 10.8 miles to the known finish check. You don't really think the club would be sneaky enough to put a check there but you make sure you're on time anyway, exactly 10:04:30, 9.6 miles into the section. When you're safely past that one, you can turn it on until the finish.

The second line on the chart shows the way you actually rode the run. Of the original 180 possible check locations, there were only 44 minutes that you had to be on time. Neat, huh?

## THE BASIC EQUATION

Now that we've done a bit of riding, it's back to the classroom for more arithmetic. You were probably able to follow our "riding" on the Sticky Wicket enduro by counting the dots, but there is no such chart for real enduros. As a substitute there is a simple equation that you probably remember from high school. If you haven't quite made it to high school, learn this and skip a grade. The formula is Distance equals Rate times Time. $D = RT$. Sometimes, however, we want the other forms of the equation, $T = D/R$.

If you remember to always use *miles* and *minutes* in these equations, you will never get in trouble. Let's take some examples. The schedule speed is 21 mph and you have gone 12 minutes into the section. What should your odometer read? $D = RT = .7/2 \times 12 = 4.2$ miles.

Easy, right? Now let's try one with time. Again, the schedule speed is 21 mph and you have gone 1.4 miles. How much time should have elapsed?

$T = D/R = 1.4/.7 \div 2 = 4$ minutes

It may have occurred to you that I picked the values for that problem pretty carefully so that they would come out even, and you'd be right. Here's one that doesn't. Same schedule, but the distance is 24.3 miles.

$T = D/R = 24.3 \div .7/2 = 48.6 \div .7 = 69.43$ That value is minutes, don't forget.

To change a decimal into seconds simply multiply by 60: .43 x 60 equals 25.8 seconds. Since 69 minutes is the same as 1 hour and 9 minutes, 69.43 equals 1:09:25.8. While you should be able to perform these operations, in your actual riding you will work out ways to avoid such troublesome problems.

Using the schedule supplied, make up your own questions similar to those we have posed and work them out. The whole basis of enduro timekeeping is being able to perform these calculations. You must do them until the process is almost automatic. You must be able to:

1. Find distance on the basis of time and speed.
2. Determine your start time for any section.
3. Determine what your odometer reading should be at any distance (correcting for error).
4. Simplify any speed average to a usable value.
5. Determine where checks can be located.
6. Given a check location and a time, determine whether or not you are on time.

Once you can do these, virtually without thinking about it, you have the enduro timekeeping about half whipped. Unfortunately, being able to do the calculations while sitting in a warm living room is a far cry from being able to do the calculations while sliding sideways down a muddy road in the middle of a cloudburst. The next step is to develop or adopt a system that works for the enduros in your area and fits your skills and personality.

*Speedometers* Timekeeping is a precise and fairly complicated art and there are several thousand riders trying to learn it. Naturally, there are some precision instruments that are needed, some useful gadgets that you might want, and quite a bit of junk offered for the sake of a small profit.

The timekeeper's basic tools are his speedometer and clock. When either of those fail, he is usually out of business.

*(Continued)*

When we talk about a speedometer, we are in fact talking about an odometer, and in fact some riders remove the speedometer needle entirely so that it doesn't distract them. The odometer must have several characteristics:

1. It must be well built, rugged, and precise.
2. It must be reasonably accurate and it helps if the internal gearing can be changed to accommodate a change in wheel diameter.
3. It must be driven from the front wheel. The rear wheel often spins without going anywhere, in mud, sand, or on hills. This leads to a highly inaccurate mileage with an inconsistent error.
4. It must be resettable by tenths, both forwards and backwards.

The standard in the sport is the VDO speedometer which meets all the criteria except for No. 3, which is of course dependent on the bike not the speedometer. The latest Japanese enduro speedos are also quite durable when properly shock mounted. There are now some kits out that will adapt the VDO speedo to various bikes that do not have front-wheel-drive provision. The kits include a front-wheel-drive mechanism. A kit available from Webco fits Yamaha and Suzuki. It retails for about $65. A kit containing speedometer, cable, drive unit, and mounting equipment for Husqvarnas is available from Motorcycle City, Lompoc, California, at approximately $65. Many early (pre-1973) Japanese speedometers and most Smiths speedometers are not adequate for several reasons, but primarily because they cannot be reset by tenths. The Spanish speedometer, Veglia-Bressel, which comes on Bultacos, has worked very well for me, but these are not readily available for other makes of bikes. To assure accuracy and dependability your speedometer should not only be rubber shock mounted but also sealed against air (dust) and water leaks.

*Clocks.* People have a lot of weird ideas about clocks for enduros. Mostly they revolve about the idea of accuracy. Accuracy, however, is not really a problem. Let's say that you bought the cheapest, worst Timex ever offered in a cut-rate drugstore. Let's assume that it lost or gained erratically up to one minute every twenty-four hours. I have never known a new Timex which was that bad, but let's assume that it is. You set it very carefully at the beginning of the run. If the run goes for six hours and if you don't reset it during that period, it could be off as much as 15 seconds by the end of the run. On an average, your clock might be off seven or eight seconds at the tiebreaker. There probably aren't half a dozen clubs in the country that will put on an enduro and get their check clocks all matched to within ten seconds. But even if all the clocks are matched to within one second, so what? Ten seconds is equivalent to 250 feet at 24 mph. If you miss one turn by 100 feet and have to come back for it, you've blown that much accuracy on distance measurement. A system is only as accurate as the least accurate component.

The real problem with clocks is durability and reliability. Strapped to your wrist, they work well, but you can't read them. On the handlebars they shake themselves to pieces, unless they are very carefully shock proofed. Everyone has different ideas about solving clock reliability and readability problems. Among California's experts the rage is the aircraft eight-day instrument clock. They are reasonably accurate, have big readable numbers and sweep second hands. Unfortunately, they are very expensive new both to purchase initially and to repair, and based on my experience, they need adjustment often. After somewhat over $200 in repair bills, I gave up on them, but quite a few riders use them very successfully. Another disadvantage of the aircraft type is that they are not waterproof and they are too big to fit in commercial enduro watch holders. If they are not enclosed, and not sealed, they may have a short life expectancy.

In other parts of the country pocket watches of the railroad type are usually the standard, and they are usually mounted in magnifying, waterproof holders. N-Duro Specialties, Mauldin, South Carolina, makes the best that I've seen. The watches themselves range from $4 Westclox Pocket Bens to $400 Hamiltons. A good compromise is the Bulova Caravelle at about $22. It has a feature called Inca-bloc construction that does help it survive most vibration. One of these *mounted according to the instructions* in an N-Duro holder will serve most riders adequately. N-Duro also offers a leather wrist holder for this type of watch.

*Other Equipment* The type of system that you use will determine what you need to cope with your schedule or route sheet. If you were fortunate enough to have purchased a Bultaco Matador, you received with it a device called a route sheet holder. If you own some other kind of bike, you can buy a route sheet holder from N-Duro Specialties, Webco, or one of several other companies for about $9. This device holds paper or plastic tape the same size as adding machine and cash register tape. You start with it rolled up on one roller like toilet paper and as the run progresses, you roll it an inch at a time onto another roller. There are "universal" tapes available for normal schedules that you can buy, or you can make one up for each run. Some riders like to put their schedule piecemeal onto file cards or IBM cards and clip them to the handlebars, peeling them off one by one as the run progresses. This idea is not too practical in any wet or muddy country.

In most runs, the rider must carry his score card with him and present it to the checker at each check. It is important that this card be carried some place where it will not get dirty, lost, or mutilated, and where, at the same time, it can be easily reached. This last is very important. In a fast schedule run, the loss of two or three minutes at checks while fumbling for a card stuffed in a Barbour jacket pocket can be crucial. One good solution to this problem is an envelope taped to the back of the front number plate, with the card fitted carefully so that it is reasonably snug, but with a little bit sticking out of the envelope so that the rider can grab it as he comes into a check.

*Systems* What we have been discussing so far might be called the Theory of Timekeeping, and with minor modifications it would apply not only to enduros but to road runs, sports car rallies, and other such events. As far as the theory is concerned, it also matters little whether the event is held in Fresno, California, or Bangor, Maine. But applying the theory is something else. To apply the theory with any hope of success you must have a system, which in this context means simply a method of doing things, coping with practical problems and local conditions. Each rider must develop a system of his

*(Continued on page 90)*

**KEEPING TIME** *Continued from page 61*

own suited to his needs, his weaknesses, and the type of enduros that he most frequently rides. Don't expect everything that you try to work. The experts spend years figuring out the best ways to do things. To develop a system you must do some clear thinking about the runs that you ride and your own personality.

Although most enduros are run under more or less similar rules, there is a lot of variation in what you might call "character." I tend to classify enduros as one of the following: (1) race type, (2) pack-and-carry, (3) timekeeper, or (4) the family-fun type. These, of course, are not meant to be hard categories, and a good run might contain elements from all four categories. Determining the types of runs that are held in your area is an important first step in building your system.

*Race type enduros* are popular in many areas, particularly where it is impossible to hold hare-and-hound or cross-country races. All that is necessary to do to make a race-type enduro is put the averages high enough so that most or all of the riders will fall behind and stay behind. If the only enduros that are held in your area are race-types *or* if you are so slow that any enduro at all is a race-type for you, it's silly to spend much time or money on costly timekeeping systems. The winning equation for these runs (and you) is simple: The faster you go, the fewer points you lose. Bad weather, getting lost, mechanical delays or lack of good judgment can make a race out of any enduro, though, so don't make the assumption that all enduros will be races in a given area because one or two were.

The *pack-and-carry enduro,* or "survivor's enduro" as it's sometimes called, is another in which timekeeping is often irrelevant. These enduros are characterized by schedule speeds of 12 mph and less, and motorcycles with a rear sprocket approaching the size of the rear wheel. These runs are very popular in farming communities, where the event is a sort of two-wheeled expendable tractor contest. If those are the types of enduros in your area, spend your time bullet-proofing the machine and doing push-ups rather than learning to keep time.

The *timekeeper's enduro* is one where there is more emphasis on precise timekeeping while maintaining moderate speed averages. The Greenhorn Enduro of two years ago was a good example of that type of run. In something over 30 checks, the winner of that event dropped only 3 points, zeroing about 28 checks over two days of riding. Half a dozen riders tied for second place with -5 points, and the worst score to merit a trophy was -20. This means even many "B" riders zeroed at least ten checks! To be competitive in this type of event, you need a very refined timekeeping system, intense concentration, and mechanical luck. When the difference between second and fifth place is a matter of less than 30 seconds in a 500-mile event, you may want to consider a very good watch, or maybe two of them. Enduros requiring this degree of precision are seldom run on a regular basis outside of the desert areas where the weather can be counted on to be consistent, but good dry weather can turn a contemplated stinker into a timekeeper's event anytime anywhere.

Surprisingly enough, exact precision is also needed at *family* or *fun-type enduros.* In these the course is usually easy so there may be many riders with very good scores. In such an event run last year three riders zeroed the entire course and rode side-by-side through the tiebreaker (at which time was recorded to the nearest *ten* seconds), and the sponsor wound up awarding three duplicate first-place trophies. While you must have accurate equipment in order to have a chance to win, the sponsor's equipment is often pretty flakey, so the best timekeeping in the world might net you a spot behind somebody who made mistakes corresponding to those of the sponsor. You keep time yourself on those runs and hope that the clocks are accurate and the checks are in the right spots and the mileages are accurate. If both their setup and your system are precise, you win; if yours is off and theirs is on, you lose; but if their system is off it's a crap game. Lucky 7, the kid on the Mini Enduro, is the winner, folks. Step right up and pay your entry fee!

The enduros most places will not fall rigidly into any of the four classes. They will be mixtures which depend a bit on the weather and on the host club. You should assess the precision-requirements in your area. If you have never seen an event in your area with scores as close as those in the Greenhorn example, there is little point in buying a matched set of $200 clocks. On the other hand, trying to make do with wrist watch and nonresettable speedometer or gadgets like the "Dial-A-Enduro" in Southern California is ridiculous. Think about it and figure out what you need for the runs that are most common in your area.

In designing the system that you are going to use to keep time, besides the question of precision you must consider what information you are going to have available before the run. Some systems, notably the preparation of a scroll, are fine for most riders if they have the schedule a week ahead of time, but completely unworkable if you find out the speed average the moment you start the section.

The systems described in the following few paragraphs are offered as examples of some ways to tackle the problems. In all probability none of them will fit your needs exactly, but hopefully they will provide you with some ideas. Before trying to adopt one for your own use, ask yourself four questions: (1) Is the system sufficiently precise? (2) Will I have enough information beforehand to use this system on all my runs? (3) Is this system overly complex, precise, or expensive for my area? (4) Is this a system I can handle on the trail? For this last question, take into account your ability to work problems, particularly when you're tired, and your ability to remain organized.

*The Boy Scout Method* This is the method for people who become easily confused, or who have a difficult time working math problems in their heads. It can be extremely precise. The one major requirement is that you have the schedule several hours or days in advance of the run. In this method the rider makes out a minute-by-minute or mile-by-mile log of the run on adding machine tape or three-by-five cards. The tape is called a "scroll" by its enthusiasts, and it is simply rolled through a route sheet holder as the run progresses. Very little thinking is required. Just match the time and distance on the scroll to that on your watch or speedo. A disadvantage is that if the club makes an error in measuring the mileage and puts out a correction the day of the run, your carefully and tediously prepared scroll suddenly becomes waste paper.

*The Hard Way* A surprising number of winning riders do all their calculations in their heads as they're riding, even on very complex schedules. They rely only on a very good watch and speedometer, and occasionally on a circular slide rule and brief route scroll.

The instructions for the event are often just taped to the gas tank, or copied onto tape for use in a route sheet holder. The two advantages of doing it this way are that there's very little to go wrong and the system works regardless of the form of the input. Here's an example of how the conversation goes when working it in your head. Suppose you started a section at 9:28, the average was 21 mph, and the speedometer now reads 10.7. You say to yourself something like, "The simplified speed average for 21 mph is .7 per two minutes. The next mileage for a possible check will be 11.2. Time to this point is 16 two-minute periods, or 32 minutes. 9:28 plus 32 is 10:00. I must arrive at 11.2 at 10:00:30." When that point passes you say to yourself, "My next coordinates are 2:30 and 11.9." If you forget, then you have to go through the whole process again.

It's a lot easier for 24 mph and other more common speed averages. Your conversation for 24 mph goes, "24 mph equals .4 per one minute. The next mileage is 10.8, which is 27 minutes added to 9:28 is 9:55." And then, "coming up 11.2 at 9:56." It's always understood that 9:56 is actually 9:56:30. "Coming up 11.6 at 9:57." Playing mental chess helps. "Coming up 12.0 at 9:58." Or trying to remember all the hands from a night of bridge. "Coming up 12.4 at 9:59." Don't forget to correct the speedo. "Coming up 12.8 at 10:00." And so on until you decide

ENDURO SPEED AVERAGES
REDUCED TO USABLE VALUES

| | |
|---|---|
| 3 mph | .1 mile per 2 minutes |
| 4 mph | .2 mile per 3 minutes |
| 5 mph | .5 mile per 6 minutes |
| 6 mph | .1 mile per minute |
| 7 mph | .7 mile per 6 minutes |
| 8 mph | .4 mile per 3 minutes |
| 9 mph | .3 mile per 2 minutes |
| 10 mph | .5 mile per 3 minutes |
| 11 mph | 1.1 miles per 6 minutes |
| 12 mph | .2 mile per minute |
| 13 mph | 1.3 miles per 6 minutes |
| 14 mph | .7 mile per 3 minutes |
| 15 mph | .5 mile per 2 minutes |
| 16 mph | .8 mile per 3 minutes |
| 17 mph | 1.7 miles per 6 minutes |
| 18 mph | .3 mile per minute |
| 19 mph | 1.9 miles per 6 minutes |
| 20 mph | 1.0 mile per 3 minutes |
| 21 mph | .7 mile per 2 minutes |
| 22 mph | 1.1 miles per 3 minutes |
| 23 mph | 2.3 miles per 6 minutes |
| 24 mph | .4 mile per minute |
| 25 mph | 2.5 miles per 6 minutes |
| 26 mph | 1.3 miles per 3 minutes |
| 27 mph | .9 mile per 2 minutes |
| 28 mph | 1.4 miles per 3 minutes |
| 29 mph | 2.9 miles per 6 minutes |
| 30 mph | .5 mile per minute |
| 31 mph | 3.1 miles per 6 minutes |
| 32 mph | 1.6 miles per 3 minutes |
| 33 mph | 1.1 miles per 2 minutes |
| 34 mph | 1.7 miles per 3 minutes |
| 35 mph | 3.5 miles per 6 minutes |
| 36 mph | .6 mile per minute |

to take up hang gliding, or earn the District No. 1 plate.

*The Easy Way* The new way to keep time is to use a computer. There are several available. One of the better ones is manufactured by Enduro Works of San Jose, California. It's a small unit, about 4″ x 4″ x 2″, weighs about one pound, operates on a 9V radio battery, and costs about $125. To use the unit you simply dial in a speed average (1–99 mph), set the unit to zero, and from then on it clicks off the number of miles that should be covered to maintain that rate of speed. For timing it employs a crystal-controlled 2 megacycle oscillator, which means that it should be extremely accurate.

With the computer arrangement you don't have to worry about what information you receive beforehand. To go with the computer you need a consistent speedometer which is resettable by tenths and an accurate watch. At exactly the moment that you are supposed to leave a check point, you turn on the computer. Your speedometer is set to zero and from then on all you have to do is keep the computer and the speedometer reading the same. When the speedometer registers 22.7 miles, the computer should also.

Unfortunately, this system is not quite as simple as it sounds. If, for instance, you arrive at a check 6 minutes late and there is a speed change at that check, you will have to plug some mileage figure into the computer and this value you will have to figure out in your own built-in computer. Speedometer errors, your own and the sponsoring club's, will also have to be compensated. The computer eliminates a lot of the drudgery but not the necessity of thinking. There are two real disadvantages to a computer. First, it can fail, like any mechanical thing; second, the computer is programmed for speed average where, as we have seen, the important thing is check location.

There are some riders who have used these computers and have complained about difficulty in reading the digital numbers while riding. The second-by-second changing of the number(s) can play tricks on your eyes when having just a split moment to glance at the time.

*A Cheaper Easy Way* A device called the Dial-A-Enduro does about the same thing as the enduro computer but is a little more difficult to use and a little less accurate. Since it costs about $85 less than the computer, though, you may wish to put up with these shortcomings. It is available from Bonar Enterprises, P.O. Box 214134, Sacramento, California 95821, at $39.95 including the watch.

This unit consists of a shock absorbent pocket watch holder. A plastic disc fits over the watch. The disc is clear in the center so that the watch can be read, and it has a series of scales around the outside. During the course of an event, the minute hand of the watch will point to the numbers on the scales of the disc. These numbers are proportional to the number of miles that should be traveled at that point. Proportional to, not equal to. In order to get the number required for a given speed average, you take the number from the disc and multiply it by either one, two, three, or four according to a chart supplied with the unit. Although it sounds complicated, it only requires about an hour's practice to learn to use it.

The disadvantage of the unit is that it is not accurate enough for many enduros. The watch hand ends some distance from the numbers and is also slightly below them so parallax makes it impossible to read the device with a great deal of precision. The Dial-A-Enduro and other such devices are at their best in the rough-and-ready type enduros where no information is supplied before hand and winning scores are often in the neighborhood of 980. Good riders in precise enduros, though, generally use other systems.

If the enduros in your area are run at 20 and 24 mph only, a device offered by N-Duro Specialties, Inc., Mauldin, South Carolina, will work well. This again is a watch holder with numbers around the outer edge of the watch. The numbers in this case, however, are the mileages corresponding to your odometer reading directly. No multiplication is necessary. Just orient the watch correctly to start with and make sure to crank in a speedometer correction occasionally. It has one of the same disadvantages as the Dial-A-Enduro in that there is a lmit to the accuracy with which it can be read, partially due to a parallax problem. It's a bit cheaper than the Dial-A-Enduro, $9.95.

A rider with a bit of ingenuity could construct his own watch holder and fit discs around it to correspond to whatever schedule speeds are prevalent in his area. However constructed, though, the device is not likely to be sufficiently accurate for many enduros.

*A Personal System* My system probably isn't the best available for any specific locality, but it does work pretty well at all the enduros I've ridden, which covers a good part of the country. I use a Webco roll chart holder, nonmagnifying, which allows you to see about two inches of tape at a time. If I have the schedule ahead of time, sometimes I make a scroll, but most of the time I simply note the instruction, such as "Go 17.2 at 24 mph." Underneath I note the start time and the finish time for the section, and anything else that is pertinent, such as when free territory begins if it's the section before a known check. I also note the simplified speed average for the section, even if a familiar one, because when I'm tired I forget things easily. If it's an oddball average, I might also note where the checks can be. Usually there are only three or four places. If it's an eastern enduro I also have route instructions on the tape. I do the rest of the calculating mentally as I go along. For runs where I know they are not going to give me any information beforehand, I mount a little note pad on my handlebar and write the pertinent info on it when I get to the speed change. In my route sheet holder I have a tape of sort of universal information, the most important of which is the speed averages reduced to workable units. I reset my speedometer at every speed change, and usually correct it every five miles, while making some allowance for it at shorter intervals. My watch is carried in an N-Duro magnifying holder and never touched once it has been set and wound.

*Experts' Techniques* The experts in any field have their own pet solutions to problems and enduro riding is no exception. Some of the points here are neither startling nor sophisticated, just common sense things that may not have occurred to you.

If you have access to a machine shop, try Ben Bower's stunt. He takes a VDO speedometer and fits the nonresettable odometer at the top with a shaft so it can be reset. Then he can run both total mileage and point-to-point mileage.

It's always helpful to have the route sheet or schedule ahead of time so you can plan your attack. But if the club doesn't send you one, get to the run early. Usually they will hand them out when you sign up.

Don't assume that key time and real time are going to be the same, or even close. At one National Championship, key time was a half-hour later than real times because the club didn't figure it would take the sun so long to get up! At a 200-mile event, the opposite occurred. Key time was 7:00 but it occurred about 6:40 because that's when it got light enough to see.

Speedometer error is extremely important, especially in close runs. If your speedometer is different from the club's layout speedometer by .2 miles in five, that's four miles in a 100-mile run, or 10 minutes at 24 mph! The best way to cope with speedometer error is to arrange it so the zero on the tenth scale has just come up when you get to the starting line. Ride to the five-mile check and if a number (say 3) has just come up when you get there, you will plan to set your Speedo back or forward as the case might be every five miles, or even more often if the error is large. If it's between numbers, reading exactly 1½ tenths, that's 3 tenths every ten miles. You would be quite accurate if you set it back .1 every three miles also. You're always early at the speedo check, though, so think it out and figure the most accurate *and practical* way. Stick a little piece of gummed paper on your speedo glass at the top and note your correction.

Here are three tips from a nonexpert rider.

"Riding on key time" means setting your watch so that it reads Key Start Time (for instance, 7:00) when it is your turn to start, regardless of what the real or official time is. The advantage of this method is that your schedule is "right" just as it comes in the mail with all the times for the speed changes already figured. If there are check cards, the times on the check cards should agree with your watch if you're on time. It's a popular way to do it, especially among casual riders.

The disadvantage of riding on key time is that your watch doesn't agree with anyone else's in the whole world. Another disadvantage is that it's very easy to get your watch a minute off while you're setting it. A third is that you can't check the club's clocks when you get into the checks. With so many clubs using flip card systems at their checks, this is becoming an irrelevant objection, however. Actually, the pros and cons just about balance on this question, but there is one further observation: when you're riding on key time you don't have your buddies and other pests always asking for the time and mileage and whatever. You just tell them your watch is broken and it looks so far from reality that nobody questions you any further.

When you are behind and know it, don't check your time and distance every two minutes to confirm the fact that you're behind, because you must always slow down a little bit and you may even have to stop to do the calculation and this just causes you to lose more time. Once you have established that you are, say, four minutes behind, set some period and ride as fast as you can for that period, then check again. If the schedule is 20 mph or more, multiply the amount late by five and ride that period of time (20 minutes) before thinking about the schedule again. If the schedule is 10 mph, double the late time, and so on.

*The Best System* This is expensive, but it works better than anything else. There are two versions of this method, one for the East and one for the West. In the East, you bribe the organizers of the run to put you on the same number with Ron Bohn. In the West you bribe the organizers to put you on the same number with Bob Steffan. Then all you have to do is keep up.

Good luck. ◉