Preparing for the Great Race

A Guide for Rookies and Returning Teams

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Welcome to The Great Race

The Great Race is designed for the enjoyment of the race participants and the spectators along the route. The race offers classic, vintage and antique car and rally enthusiasts an opportunity to engage in a competitive rally while enjoying their cars. The participants enjoy the camaraderie of automobile enthusiasts, develop their navigation and driving skills and compete for significant prize money in four competition categories. The terms “rally” and “race” are used interchangeably in this document.

The Great Race is a timed, navigation, controlled speed, endurance race. It is conducted on public roads with all specified speeds at or below the speed limits. The objective of the race is to match the precise time allowed for each section of the race by the rally master. The teams are issued Course Instructions each morning. The emphasis is on precision driving, speed control and accurate navigation. It is not difficult. However, excellent scores require skill on the part of both the driver and navigator.

This guide will provide you with information on the following subjects:

- Car Preparation
- Rally Equipment
- Speedometer Calibration
- Car Calibration
- Course Instructions
- The Four S’s of a Successful Rally
- Driver and Navigator Tips
- Resources and Links
- Course Instruction Examples

Note: This material has been prepared in accordance with the 2015 Great Race Event Regulations. However, all participants must abide by the latest issue of the Great Race Regulations. The latest Great Race Regulations supersede anything in this guide. Please read the regulations to be sure you and your car are in compliance.

Car Preparation

Eligible cars for The Great Race are vehicles manufactured in 1972 or earlier. Older cars receive a better age factor than newer cars, which affects the overall scoring. After selecting your car, the most important thing to do is to make sure the car is reliable. The car needs to be capable of travelling several thousand miles without mechanical problems. If the car is not reliable, all the other aspects of good rallying won't help much. Start early in your car preparation and put lots (hundreds) of miles on the car before leaving for the Great Race. Be sure the brakes are safe, the engine doesn't overheat, the windshield wipers work, etc.

Your car must meet all of the Great Race regulations. The following is a summary of the items necessary for good car preparation.

1. Required items:
    a. Two tail lights
    b. Two brake lights
    c. Turn signals
    d. Headlights adequate for night driving
    e. Seat belts
2. Mandatory items to be in the car during the race:
    a. First aid kit
    b. Tow rope
    c. Emergency flares
    d. One gallon of water
    e. Flash light
3. Allowable items for safety and reliability:
    a. Hydraulic brakes on all four wheels
    b. Alternator
    c. Electric cooling fan
    d. Overdrive
    e. Electronic ignition
    f. Electric fuel pump
    g. Other items per the Event Regulations
4. Spare parts that might be needed for your car.

A more complete checklist is included in Appendix F.

Rally Equipment

After you have your car properly prepared and reliable, the next thing to focus on is having the proper rally equipment. The proper rally equipment will make the rally much more fun and will greatly assist with better scores. Rookies often enter the Great Race with the objective of “just having fun” and therefore do not invest in the proper rally equipment. Usually by the second day of the rally, the competitive bug bites and they begin searching for the necessary equipment to improve their scores. It is much better to begin the rally with the proper equipment. The following items are strongly recommended for obtaining good scores on the Great Race. After your significant investment in the car, entry fee, hotels, transport, etc. don’t skimp on the rally equipment!!

Speedometer

An accurate speedometer that can be calibrated is essential for obtaining good scores. The official speedometer of the Great Race is the Timewise 825 electronic speedometer. Use of any other type of speedometer (other than the car’s stock speedometer) requires the specific approval of Great Race. The Timewise speedometer was specifically developed for Great Race type rallies. This speedometer costs about $1,000. Sources for purchasing a Timewise speedometer are included in the Appendix. The installation of the speedometer basically involves gluing two small magnets to one wheel, fabricating a bracket to hold the electronic pickup, mounting the speedometer for viewing by the driver, and connecting to a power source. There is a market for used speedometers and they can often be sold for a few hundred dollars below the purchase price if you do not plan to do further rallies.

You may not think that an accurate speedometer is needed, but consider that if your stock speedometer is only off by 1 per cent, your error will be 36 seconds per hour. Most teams, including rookies, will have scores of less than 10 seconds per hour. If you can’t tell the difference between 49 and 50 miles per hour on your stock speedometer, your error will be 2 per cent which amounts to 72 seconds per hour.

After installation of the speedometer, calibrate the speedometer in accordance with the speedometer instructions. During the race you will also have an opportunity daily to calibrate your speedometer on a specific course to make sure your speedometer agrees with the instruments used to construct the Course Instructions. The picture below shows a Timewise speedometer installed in a 1936 Packard.

Appendix C provides details on how to do the initial calibration of the Timewise speedometer and two methods for making additional calibration changes during the race.

Analog Clock

You should have an analog clock mounted on the dash or on the lapboard. This can be an inexpensive "Wal-Mart" type clock. Many competitors use a Sawtooth Rally Clock. This clock is the correct size, has a continuous motion, has minimal backlash on the hands and every second is numbered. Sources for these clocks are listed in Appendix A. The picture below shows a Sawtooth clock mounted on the dash where it can be read by both the navigator and driver.

Stopwatch

A good digital stopwatch is a necessity for accurate rallying. Be sure to get one that has a lap-split function and a time-of-day function. Most navigators wear their stopwatch on a lanyard around their neck but it is also possible to attach it to your lapboard. Wristwatches are also allowed. Check the event regulations for specifics.

Lapboard

A lapboard is the place to hold the route instructions, pens and pencils, and car calibration charts. Every navigator has their own preference for organizing these materials. There are two basic types of lapboards, flat style and roller style. The roller style scrolls the rally instructions by turning the rollers. Most teams use the flat style. The following picture illustrates a typical lapboard.

This particular board has three rings on the upper left for the route instructions. This allows easy flipping of pages as the rally progresses. Note that you will need to bring your own hole punch with you if you use this type of lapboard. On the right side of the board is an area for car calibration charts. In the center is a container for pens, pencils and markers. The board is covered with a clear sheet of vinyl that provides a cover for other items such as the daily starting order. Have fun designing and making your own lapboard.

Misc. Equipment

Be sure to have backup items with you such as spare batteries for the stopwatch and clock, extra pens and pencils, transparent colored markers, etc.

Car Calibration

After the car is ready and reliable and the rally equipment has been installed, the next preparation step is to calibrate the car. First a little background.

In order to have good scores you need to be able to drive your car consistently. This means accelerating the same every time, holding exact speeds, stopping the same every time and making turns the same every time. In addition you need to be able to make adjustments to account for losses and gains during the rally. Calibration charts are the basis for making these adjustments. Consistent driving and good calibration charts go together to achieve good scores.

Making calibration charts for your car is not hard, but it takes some time. An excellent method for making calibration charts was prepared a few years ago by Bill Loubiere, one of our long time Great Racers. Appendix C (Car Calibration) is based on his methods and matches the charts used in this guide.

The following examples show how to use these calibration charts. The example charts shown below were developed for a 1936 Packard 120B coupe. The charts for your car will be different depending on the performance capabilities of your particular car and your driving style. You can use these example charts as a guide to making your own or you can actually use these charts for the Great Race if you wish. Obviously it is better to make your own charts for your specific car. During the preparation of the charts you will also gain invaluable experience in driving your car consistently. However, if your do not have time to make your own charts, using these examples will be better than nothing.

There are other methods for calibrating cars and other types of performance charts. The methods described here have been found to work well for your first rally. Take a couple of days, or more, to practice driving your car consistently and making your own performance charts.

The first chart is for **ACCELERATION AND DECELERATION**.

ACCELERATION - DECELERATION (net time lost)

		END SPEED								
		0	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**
	0		**1**	**1.3**	**1.8**	**2.9**	**3.6**	**4.5**	**5.6**	**6.4**
	15	**1**		**0.3**	**0.8**	**1.9**	**2.6**	**3.5**	**4.6**	**5.4**
START	**20**	**1.2**	**0.2**		**0.5**	**1.6**	**2.3**	**3.2**	**4.3**	**5.3**
SPEED	**25**	**1.3**	**0.3**	**0.1**		**1.1**	**1.8**	**2.7**	**3.8**	**4.6**
	30	**1.9**	**0.9**	**0.7**	**0.6**		**0.7**	**1.6**	**2.7**	**3.5**
	35	**2**	**1**	**0.8**	**0.7**	**0.1**		**0.9**	**2**	**2.8**
	40	**2.4**	**1.4**	**1.2**	**1.1**	**0.5**	**0.4**		**1.1**	**1.9**
	45	**2.8**	**1.8**	**1.6**	**1.5**	**0.9**	**0.8**	**0.4**		**0.8**
	50	**3.3**	**2.3**	**2.1**	**2**	**1.4**	**1.3**	**0.9**	**0.5**	

The times on this chart are NOT the actual acceleration and deceleration times. The chart shows the NET time lost when accelerating and decelerating. At the start of a timed section of the race, the Course Instructions might say to accelerate from a stop to 40 mph. From the chart you can see that accelerating from 0 to 40 mph results in a net time lost of 4.5 seconds. You have two options to correct for this time lost. One is to start 4.5 seconds before the instructed time. The other is to make up for the lost time after starting at the instructed time. The method for making up time will be discussed later.

The second chart is for **STOP & GO PAUSE TIMES**

	STOP & GO PAUSE TIMES (15 sec stop)								
				OUT SPEED					
		15	20	25	30	35	40	45	50
	15	13	12.7	12.2	11.1	10.4	9.5	8.4	7.6
IN	20	12.8	12.5	12	10.9	10.2	9.3	8.2	7.4
SPEED	25	12.7	12.4	11.9	10.8	10.1	9.2	8.1	7.3
	30	12.1	11.8	11.3	10.2	9.5	8.6	7.5	6.7
	35	12	11.7	11.2	10.1	9.4	8.5	7.4	6.6
	40	11.6	11.3	10.8	9.7	9	8.1	7	6.2
	45	11.2	10.9	10.4	9.3	8.6	7.7	6.6	5.8
	50	10.7	10.4	9.9	8.8	8.1	7.2	6.1	5.3

The Course Instructions for stop signs usually say to stop at the sign, pause for 15 seconds, and proceed at the assigned speed. Since the race cars cannot decelerate and accelerate instantaneously as assumed by the Course Instructions, you can make up for the deceleration and acceleration errors by changing the 15 second pause time to a lesser amount depending on the speeds involved. ***Note: Always check the course instructions carefully since sometimes the instructed pause time may be different than 15 seconds.*** To use the chart simply begin with the "IN" speed on the left of the chart and move to the "OUT" speed across the top to find the new pause time. For instance, in Appendix E, Instruction #51, you are doing 30 mph before a stop sign and will leave the stop sign at 40 mph, the pause time would be 8.6 seconds rather than the instructed 15 seconds. By changing the pause time there is no need to make up time for the deceleration and acceleration losses. However, if you have to wait for traffic longer than your planned pause time, you will need to make up the difference between your planned and actual pause times.

The third chart is for **TURNS**.

	TURNS (time lost)								
				OUT SPEED					
		15	20	25	30	35	40	45	50
	15	0	0.3	0.8	1.9	2.6	3.5	4.6	5.4
IN	20	0.2	0.5	1	2.1	2.8	3.7	4.8	5.6
SPEED	25	0.3	0.6	1.1	2.2	2.9	3.8	4.9	5.7
	30	0.9	1.2	1.7	2.8	3.5	4.4	5.5	6.3
	35	1	1.3	1.8	2.9	3.6	4.5	5.6	6.4
	40	1.4	1.7	2.2	3.3	4	4.9	6	6.8
	45	1.8	2.1	2.6	3.7	4.4	5.3	6.4	7.2
	50	2.3	2.6	3.1	4.2	4.9	5.8	6.9	7.7

Again the Course Instructions assume that you can make instantaneous speed changes at the apex of a turn and do not slow down below the assigned speed(s) while making the turn. This chart gives the time lost when making the turn. In order for this chart to work, the technique for each turn must be the same as used for developing the chart. This example chart is again based on the 1936 Packard. The car is slowed to 15 mph for the apex of the turn, shifted into second gear and then accelerated to the new speed. Your car will be different based on performance, minimum turn speed, etc. Once you have determined how you will executed turns, you can develop the chart to match your technique.

As an example using the chart above, if a turn is approached at 40 mph and the exit speed is 35 mph, the time lost is 4 seconds. (See Appendix E, instruction #36). This loss must then be made up after you leave the turn.

How to Make Up Lost Time

Let's use the example above for a 40 – 35 turn. After leaving the turn you need to make up 4 seconds. The easy way is to use the "ten per cent rule". Simply drive 10 per cent above the instructed speed for 10 times the seconds needed to be made up. So for this example, drive 38.5 mph (10 per cent faster than 35 mph) for 40 seconds (10 times the 4 seconds lost) and then return to the assigned speed of 35 mph and you will be back on time.

Another example would be an additional delay due to traffic at a stop sign. If your pause time for a 30 – 40 stop is 8.6 seconds (see **Stop & Go** chart above) and you actually pause for 13 seconds due to traffic, you need to make up 4.4 seconds. To do this, drive 44 mph (10 per cent above 40) for 44 seconds (10 times 4.4 seconds).

This method works the same way for losing time. To lose time, drive 10 per cent below the instructed speed for 10 times the seconds needed to be lost.

Another useful formula is used for making up time when you drive slower than the specified speed due to traffic or other conditions. Simply divide the difference between your actual speed and the assigned speed by the assigned speed and multiply by the time driven at the reduced speed. This will result in the number of seconds lost.

$$\frac{Assigned\ Speed - Actual\ Speed}{Assigned\ Speed} X\ \ Time\ at\ Reduced\ Speed\ (seconds) = Lost\ Time\ \text{(sec)}$$

As an example, lets say you catch up with traffic and have to slow from the assigned speed of 40 mph to 30 mph for 20 seconds. Your lost time would be 10 divided by 40 times 20 which equals 5 seconds.

$$\frac{40 - 30}{40}\ \text{X}\ \ 20\ =\ 5$$

COURSE INSTRUCTIONS

In the Appendices there are two examples of course instructions. Appendix D is a generic example with descriptions and explanations of the various elements used in the Course Instructions. Appendix E is a copy of the actual Course Instructions for the 2014 Great Race Hagerty Trophy Run. The Trophy Run Course Instructions are annotated with notes on how to use the instructions. These annotations are based on using the performance charts described in this book for a 1936 Packard.

Course Instructions are usually provided to each team 30 minutes before your assigned start time each morning before you depart from the hotel. You may use this time to make notes on your Course Instructions.

The following are some notes on how to use the Course Instructions in Appendix E.

Speedometer Calibration

After completion of the speedometer calibration run (Instruction 18) the example shows an actual time of 28min47.3s compared to the correct time of 28min43.2s. This is an error of 4.1 seconds late. Appendix C describes how to make the necessary adjustment to the speedometer.

Transit Zones

The proper understanding and execution of transit zones is an important key to staying on time in the Great Race. Pay particular attention to understanding how to execute transit zones.

Instruction 18 indicates the start of a transit zone (hour glass is full). This transit zone continues until instruction 26 (hour glass is empty). Instruction 18 indicates that this transit is about 5 miles long and you are allowed 55 minutes to complete this transit. Since this transit occurs before the time-of-day restart at instruction 26, the time of 55 minutes is shown as a guide so you will arrive at instruction 26 at the right time. Notice that in this example the transit zone includes lunch. Instruction 21 shows that it takes about 10 minutes from the lunch location to the time-of-day restart. When you reach instruction 24 you are about 3 minutes from the restart in instruction 26.

The transit zone between instructions 65 and 70 is after the time-of-day restart (instruction #26) and is between check points. It is critical that this type of transit zone be executed exactly. Instruction 65 shows a transit zone of 10 miles in length and you have exactly 30 minutes for this transit. Since the odometers are covered in the race cars, the 10 miles is indicated as a guide. You must determine the exact time of day when your car passes the “STOP AHEAD” sign indicated in instruction 65. Write this time down in hours, minutes and seconds. As soon as you can, add the 30 minutes to your “IN” time and write this new time in instruction 70 as your “OUT” time. You must depart from the “SPEED LIMIT 25” sign indicated in instruction 70 exactly 30 minutes after your “IN” time in instruction 65. Notice that restrooms and gas are available on this transit and it takes about 10 minutes to get from the rest rooms to instruction 70. You should arrive at instruction 70 a few minutes early. Wait until it is close to your “OUT” time and pull up to the sign and depart at your “OUT” time at the assigned speed. Note that the rally cars are usually no longer exactly one minute apart after this type of transit, so make sure you depart on your “OUT” time for this transit.

At instruction 84 another transit zone is indicated. In this case the transit zone begins at the end of the timed section of the race and is a guide for returning to the Observation Checkpoint in instruction 88. This transit is about 9 miles long and takes about 30 minutes.

Stop Signs

Stop signs (instructions 27, 29, 30, etc.) are straight forward. Pull up to the stop sign, pause for the time indicated in your performance chart and then depart at the assigned speed. Since the pause time in your performance chart takes into account the losses for braking and acceleration, there is no loss or gain to be made up after the stop sign. However, if there is traffic and you leave sooner or later than your pause time, the difference will have to be made up using the 10% rule.

Turns

Instructions 31, 32, 36, etc. are turns. At a turn, slow to the speed your performance chart is based on, make the turn and accelerate to the indicated speed. If you are using the charts for a 1936 Packard, you should slow to 15 mph at the apex of the turn and then accelerate to the new speed. From your performance chart you will find the loss for a particular turn. Use the 10% rule to make up this time as soon as practical after the corner.

Speed Changes

Instruction 28 says to change your speed from 35 to 30 at a “SPEED LIMIT 35” sign. The best way to do this maneuver is to split the speed change at the sign. Decrease your speed just before the sign, cross the sign at 32.5 mph and continue slowing down until you reach 30 mph. This gain and loss cancel each other and you are back on the correct time. Instruction 59 indicates a speed increase from 30 to 35 so the split speed at the sign is 32.5.

THE FOUR “S’s” OF A SUCCESSFUL RALLY

Safety First

A good score is not worth a safety risk. Drive safely at all times and if an unsafe situation arises, safety is more important than the race. You can usually make up any lost time or use a time allowance for unsafe conditions. During the race you will often make abrupt changes of speed and/or direction. Any cars around you who are not in the rally will not be expecting these changes. Signal your intentions! Occasionally you will have to make up time**.** Even though the race is conducted on lightly travelled roads, do not pass if you cannot see. If another competitor is trying to overtake you, give them as much room as you can safely. Above all, obey the traffic laws. Reckless driving, running stop signs or signals, or receiving a ticket will result in a penalty or disqualification for the day.

If you lose a significant amount of time, don’t sacrifice safety to make it up. Instead, submit a time allowance for the time you have lost in accordance with the event regulations. Time allowances are acceptable for unsafe situations, or situations that are beyond your control, but are not allowed for items such as mechanical breakdowns, flat tires, navigation errors, wrong turns, etc. Refer to the event regulations. Do not continue to make up time after passing a checkpoint. You are automatically on time the instant you reach a checkpoint. At a checkpoint the previous leg is complete with whatever errors were incurred and the next leg begins with no penalty.

Start on Time

Starting on time each morning and at other restart times during the race is the responsibility of the driver and navigator. There is nobody from the race organization to tell you when to start. You must start in accordance with the Course Instructions. After you leave a time-of-day restart point (examples are Appendix D instruction #12 and Appendix E instruction #26) and get to a check point, it is assumed that you started at the time-of-day restart point on time. There are two components of starting on time. First, your clock must be calibrated with the clock used by the race officials. Second, you must actually start at the indicated time. This may sound simple but even the most experienced veterans make a mistake on this from time to time. The race officials will have a radio timed to the national time standard (WWV) where you pick up your Course Instructions each morning so you can set your clock. If you leave the time-of–day restart point (example is instruction 26 in Appendix E) on the wrong minute, it will take a lot of make up to get back on time, assuming you even recognize that you left on the wrong time.

Stay on Course

Following the directions in the Course Instruction precisely is much more important than trying to maintain perfect times when executing stop signs, turns, etc. A wrong or missed turn will usually cost several minutes. Also getting lost is not fun. Work on maintaining the correct course before you focus on staying on time. Always focus on the instruction you are working on and the next instruction. This is especially important if the next instruction has a “comes quick” indicated in column D (see instructions 41, 43,and 46 in the Appendix E). The navigator should always advise the driver of the next sign or intersection that you are looking for because the navigator will have times when his head is down making calculations or checking times. Be sure the driver knows what is coming up next. You must complete all of one instruction before moving to the next instruction. Example: Appendix D, Instruction #14.

Stay on Time

After you have mastered the first 3 of the 4 S’s, then the important thing is to stay on time. This means executing each maneuver consistently and in accordance with your performance charts. It also means being able to make up for errors and losses to be on the correct time at each check point. The errors associated with stops and turns are usually in seconds and not minutes. So for rookies, concentrate on the first 3 S’s where the errors are usually in minutes.

DRIVER AND NAVIGATOR TIPS

After a couple of rally days each team will develop their own methods of working together in the car. Here a few of the tips that teams have shared from past rallies.

1. Develop a consistent method of communicating in the car. Develop and use the same words every time to describe a road sign. For instance instruction 46 in Appendix E might be described as a "soft right curve". Instruction 50 might be described as a "soft offset right curve".
2. Work as a team. There are no "navigator" or "driver" errors, there are only team errors. Remember that after an error has occurred it takes both the driver and the navigator to make the correction. Work as team to find difficult road signs such as street names where you need to make a turn.
3. During timed sections of the race, confine your communications to only those that are necessary to following the course instructions. Save your comments about the scenery or why you made the last error until you are in a non-timed part of the race.
4. Drivers should repeat the instruction he hears from his navigator for a double check. For instance, after several left turns in close order, it is easy for the driver to hear "left" or the navigator to say "left" when the actual next instruction is a right turn.
5. Be sure to cross off each instruction when it is completed. Sometimes there are identical instructions that follow each other and it is easy to miss the second instruction. It is also easy to repeat an instruction if it is not crossed off. Use a large transparent marker for this.
6. At restarts points such as time–of–day restarts, end of transit zones, etc., do not pull up to the starting point until it is your "minute". The car in front of you may be late arriving and may need room to do a proper start.
7. Usually it is best to make up losses as soon as it can be done safely. Since you don't know where the next check point will be, you don't want to arrive at the check point with accumulated errors.
8. Course Instruction Tips
   After you receive your course instructions each morning, make the following notations on the pages. See Appendix E for examples.
   - Transfer the designated speed from the bottom of one page to the top of the next page. This prevents flipping pages back to check on the correct speed.
   - Mark all speeds not shown on the instructions. (Appendix E instruction 40)
   - Highlight all "comes quick" or other special items in Column D. If a "comes quick" occurs at the top of a page, make a special note on the previous page to alert you to the "comes quick".

APPENDIX A

Resources and Links

1. Great Race instruction videos on the subjects described in booklet can be found at www.greatrace.com/how-to-videos.

2. Current Great Race event regulations can be found at http://www.greatrace.com

3. Timewise speedometers can be obtained from http://home.comcast.net/~timewise1/products/825.html. Contact is Jack Christiansen at 847-550-5052.

4. Used Timewise speedometers are sometimes available from Great Race, Rex Gardner, or Bill Croker (whcroker@gv.net)

5. Sawtooth Rally Clocks: VCRA (Vintage Car Rally Association) sometimes has these clocks for sale. Go to www.vintagecarrally.com or contact Rex Gardner at 918-801-2406.

6. VCRA has information on other rallies similar to the Great Race

7. Coker Tire Challenge: The Coker Tire Challenge rally is held each year in September in Chattanooga, TN. For information go to www.cokertirechallenge.com or contact the Great Race

8. Northeast Rally Club: www.northeastrallyclub.com

APPENDIX B

CAR CALIBRATION

You have decided to enter the Great Race and the guidelines strongly suggest that you should calibrate the performance of your car. Actually, you need to calibrate the car, the navigator and the driver. The car and the driver / navigator team need to be calibrated together, so that they can perform in the race the same as they do during the calibration.

The Great Race and similar rallies have a basic assumption that makes it challenging. This assumption is that a car can stop instantaneously and accelerate to speed instantaneously. Of course, your car cannot do this. Accordingly you will lose time on many of the maneuvers in the Course Instructions. These losses will add up to very large time errors and resulting poor scores. By calibrating your car you will know the size of these losses as they occur and can make corrections.

There are several methods for doing this calibration. What follows is a relatively simple way for rookies. This method will calibrate your car, give the driver experience in consistent driving, and give the navigator experience using the stop watch. The numbers used as examples are purely for illustration and do not reflect the actual performance of a particular car. Actual performance charts for a 1936 Packard are included in the text on Pages 7-9. If you do not have time to calibrate your car, the 1936 Packard charts are better than nothing.

First, you will need a location to do your calibrations. The location should have a straight section of road about a half mile long with little or no traffic. You will also need a way to turn around safely near each end of the course. You may be able to find a little used road out in the country or maybe in a very large mall parking lot. You will be traversing this course at different speeds ranging from 15 to 50 mph and making frequent stops. The exact length of the course is not important since you will be making time comparisons for different runs. A course that takes about 40 seconds to traverse at 50 mph is about right. Mark each end of the course with a visible marker. An orange traffic cone or a stick with a flag will work. You may want to use a shorter course for the lower speed runs to save time.

Run the course at speeds of 15, 20, 25, 30, 35, 40, 45 and 50 mph. Make at least 4 runs at each speed and record the times. Run the course in both directions. You need at least 4 runs to get a good average time. If you have a lot of variation, make more runs.

The following chart is typical of the times you might get:

Time in Seconds

Speed	Run 1	Run2	Run 3	Run 4	Average
15	132.1	130.6	133.9	135.4	133
20	98.6	99.8	101.4	100.2	100
25	79.2	80.8	79.6	80.4	80
30	65.9	66.9	67.5	66.5	66.7
35	56.8	58	55.6	58	57.1
40	50.3	49.7	49.8	50.2	50
45	42.9	45.5	43.9	45.3	44.4
50	41.1	38.9	40.4	39.6	40

Now you are ready to determine the time lost during acceleration. Note that this is **NOT** the time it takes to accelerate to a certain speed. It **IS** the time lost between driving at a constant speed and accelerating from 0 to that speed.

Drive to the starting marker at one end of the course and stop. Have the navigator give a start count 3, 2, 1, GO (or if you prefer 1, 2, 3, GO). Start the stopwatch at GO and the driver should accelerate to whatever speed you are measuring and after reaching that speed, continue to the end of the course at that speed. The start needs to be consistent each time. (A side note that is helpful is for the navigator to always end a countdown with the word GO. The driver often forgets when he should begin the maneuver, so the term GO is always the indication for the driver to execute.) You may want to make these accelerations at a little less than full throttle. This will allow for the driver to make a seat of the pants adjustment during the race to allow for something like an uphill road when leaving a stop sign. On the actual race you want the acceleration to be exactly the same as the chart. Continue these runs at each speed until you have a consistent set of numbers to make a good average. You will have a chart that looks something like this:

Time in Seconds

Speed	Run 1	Run 2	Run 3	Run 4	Average
15	133.8	134	134.6	134.4	134.2
20	101.1	101.9	102.1	101.3	101.6
25	81.9	82.5	83.2	81.2	82.2
30	70.4	69.5	69.2	70.5	69.9
35	59.9	60.5	61.5	61.7	60.9
40	54.5	56	54.8	55.5	55.2
45	51.3	50.2	50.4	50.9	50.7
50	48.6	46.8	49	44.4	47.2

Now, using the averages you can determine the time lost on acceleration. The difference between the average run time at constant speed and the average run time starting from a stop is the time lost in acceleration and will look like this:

Time in Seconds

Speed	Average Run Time	Average from Stop	Loss on Acceleration
15	133	134.2	1.2
20	100	101.6	1.6
25	80	82.2	2.2
30	66.7	69.9	3.2
35	57.1	60.9	3.8
40	50	55.2	5.2
45	44.4	50.7	6.3
50	40	47.2	7.2

Now you are ready to determine the loss on deceleration. The process is similar to the one you just did but this time enter the course at the desired speed and brake to a stop at the end of the course so that the front wheels of the car are at the end marker when stopped. Stop the stopwatch when the car "rocks" back after the stop. Your numbers will look something like this:

Time in Seconds

Speed	Run 1	Run 2	Run 3	Run 4	Average
15	135.1	132.9	134.2	133.8	134
20	100.9	101.1	101.5	101.3	101.2
25	81	80.9	81.6	81.7	81.3
30	68.9	70.4	68.3	66.8	68.6
35	59.1	58.8	59.5	59.8	59.3
40	51.5	52.3	53.5	52.7	52.5
45	47.5	47	47.1	47.6	47.3
50	43.3	44	43.9	43.2	43.6

Again, subtract the difference between the average times for each speed and you will have the time lost in deceleration for each speed.

Time in Seconds

Speed	Average Run Time	Average with Stop	Loss on Braking
15	133	134	1
20	100	101.2	1.2
25	80	81.3	1.3
30	66.7	68.6	1.9
35	57.1	59.3	2.2
40	50	52.5	2.5
45	44.4	47.3	2.9
50	40	43.6	3.6

Now you can make the actual chart that you will use during the race. The format below is organized in a manner that is easily used during the race. After you fill in the first vertical column and the top row with the numbers from your tests, you can then use simple math to fill in the blanks. For instance if the loss on acceleration from 0-30 is 3.2 seconds and the loss from 0-50 is 7.2 seconds, loss from 30 to 50 would be the difference, or 4.0 seconds. Put 4 in the junction between 30 and 50.

		ACCELERATION								
		0	15	20	25	30	35	40	45	50
B	0		1.2	1.6	2.2	3.2	3.8	5.2	6.3	7.2
R	15	1		0.4	1	2	2.6	4	5.1	6
A	20	1.2	0.2		0.6	1.6	2.2	3.6	4.7	5.6
K	25	1.3	0.3	0.1		1	1.6	3	4.1	5
I	30	1.9	0.9	0.7	0.6		0.6	2	3.1	4
N	35	2.2	1.2	1	0.9	0.3		1.4	2.5	3.4
G	40	2.5	1.5	1.3	1.2	0.6	0.3		0.9	2
	45	2.9	1.9	1.7	1.6	1	0.7	0.4		0.9
	50	3.6	2.6	2.4	2.3	1.7	1.4	1.1	0.7	

You can now make a chart for pause times at stop signs. The Course Instructions usually say to pause at stop signs for 15 seconds. Of course you must adjust your pause times to allow for braking and acceleration losses. To determine these pause times for each combination of IN and OUT speeds, add the lost time due to braking to the lost time for acceleration and subtract from 15 seconds. For instance, for a 40 IN-30 OUT stop sign, add 2.5 (40 to 0 braking loss) to 3.2 (0 to 30 acceleration loss) and subtract from 15 to get 9.3 as shown in the Stop & Go pause chart. The result is the actual time you should pause at the stop sign so that you are back on time after you reach the OUT speed. You chart will look like this based on the braking and acceleration chart.

STOP & GO PAUSE TIMES (15 sec. stop)

		OUT speed							
		15	20	25	30	35	40	45	50
	15	12.8	12.4	11.8	10.8	10.2	8.8	7.7	6.8
IN	20	12.6	12.2	11.6	10.6	10	8.6	7.5	6.6
Speed	25	12.5	12.1	11.5	10.5	9.9	8.5	7.4	6.5
	30	11.9	11.5	10.9	9.9	9.3	7.9	6.8	5.9
	35	11.6	11.2	10.6	9.6	9	7.6	6.5	5.6
	40	11.3	10.9	10.3	9.3	8.7	7.3	6.2	5.3
	45	10.9	10.5	9.9	8.9	8.3	6.9	5.8	4.9
	50	10.2	9.8	9.2	8.2	7.6	6.2	5.1	4.2

You can do the same thing for turns. A good way to make a turn is to always slow from the IN speed to 15 mph, make the turn, and accelerate to the OUT speed. If you brake and accelerate for corners the same way as you do for stop signs, then you can use the same braking and acceleration numbers from your chart. Take the time lost from braking from the IN speed to 15 mph and add the acceleration loss from 15 mph to the OUT speed. You will end up with a chart that looks like the one below. The time lost in a corner must be made up after the OUT speed is reached in order to be back on time.

TURNS (time lost)

		OUT speed							
		15	20	25	30	35	40	45	50
	15	0	0.4	1	2	2.6	4	5.1	6
IN	20	0.2	0.6	1.2	2.2	2.8	4.2	5.3	6.2
Speed	25	0.3	0.7	1.3	2.3	2.9	4.3	5.4	6.3
	30	0.9	1.3	1.9	2.9	3.5	4.9	6	6.9
	35	1.2	1.6	2.2	3.2	3.8	5.2	6.3	7.2
	40	1.5	1.9	2.5	3.5	4.1	5.5	6.6	7.5
	45	1.9	2.3	2.9	3.9	4.5	5.9	7	7.9
	50	2.6	3	3.6	4.6	5.2	6.6	7.7	8.6

The three charts you have made (Braking - Acceleration, Pause Times for Stops, and Turns) are all you will need for your first few rallies. As you gain experience with the charts you may want to make some adjustments. For instance, if you find that you spend more time at 15 mph during a corner you may want to increase the times lost in that chart.

APPENDIX C

TIMEWISE SPEEDOMETER CALIBRATION

Proper calibration of the Timewise speedometer is critical to achieving good scores in the Great Race. This appendix describes initial setting of the speedometer and two methods for making adjustments to the calibration based on the speedometer calibration runs provided each day during the Great Race. Calibration of the speedometer is also described in the instruction book provided with the speedometer. Also refer to the video on this subject on the Great Race website.

A. INITIAL SETTING OF THE FACTOR

This procedure is for wheel sensors only. For driveshaft mounted sensors, consult the Timewise manual.

- Inflate the tires to the proper operating pressure.
- Put a chalk mark on the tire and the road.
- Roll the car forward 5 revolutions of the tire.
- Mark the road again where the tire chalk mark meets the road.
- Measure the distance between the chalk marks to the nearest 10^{th} of an inch. Eliminate the decimal point and this is the factor to enter into the computer. For instance if your measurement is 431.5 inches, the factor is 4315.
- Looking at the back of the speedometer the four holes with the factor switches must be at the bottom or 6 o'clock position.
- Set the factor by adjusting the switches starting on the left.

TIP: Mark the direction of the factor on the back of the speedometer with a paint pen or marker to avoid any uncertainty when setting the speedometer in a hurry during the race.

B. ADJUSTMENT METHOD #1

This method is easy to do without a calculator during the race.

- Divide the initial speedometer factor by 3600. This will give the number of "clicks" the speedometer must be changed for each second per hour that you are early or late on the speedometer calibration runs. This factor will remain constant for your speedometer installation.

  EXAMPLE: Assume your initial factor is 4315. Divide this by 3600 and the answer is 1.198. Round this to the nearest 10^{th} which would be 1.2 "clicks" per second per hour.

  Tip: Put this number on the back of the speedometer for easy reference when making speedometer changes during the race.

- Do the speedometer calibration in accordance with the Great Race Course Instructions.
- Determine which way the factor must be changed. Remember:

  If you are FAST (early arrival) on the course, INCREASE the factor.
  If you are SLOW (late arrival) on the course, REDUCE the factor.

- Determine the difference in seconds between the correct time and your actual time for the speedometer calibration run. Convert this difference into seconds per hour.

EXAMPLE: Refer to Appendix D, instruction #18. The correct time for the calibration run is 28 min. 43.2 seconds and your actual time is 28 min. 47.3 seconds. The difference is 4.1 seconds in 29 minutes. Multiply this by 2 to change this into seconds per hour. So your error is 8.2 seconds per hour.

- Multiply the error by the adjustment factor of 1.2 (1.2 x 8.2). This gives an adjustment of 9.84 “clicks”. Round this off to 10 “clicks”.
- REDUCE the factor (remember in this example you are SLOW on the course) on the speedometer by 10 “clicks”. The new factor is 4315 – 10 = 4305. Set the new factor in the speedometer.

ADJUSTMENT METHOD # 2

This method is more difficult to do on the course without a calculator. Calculators are <u>not</u> allowed to be used during the race.

- Run the speedometer calibration course in accordance with the Great Race Course Instructions.
- Convert the correct time into seconds. 28 min. 43.2 sec. equals 1723.2 seconds.
- Convert your actual time into seconds. 28 min. 47.3 sec. equals 1727.3 seconds.
- Since in this example you are SLOW on the course you want to REDUCE the factor. So divide the correct time by the actual time and multiply times the initial factor to get the new factor.

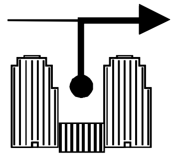
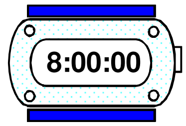
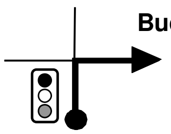
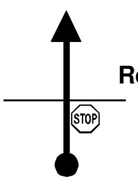
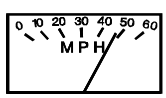
  Correct time / Actual time x Factor = New Factor

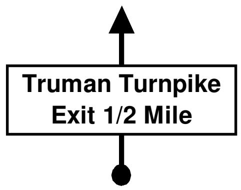
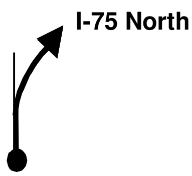
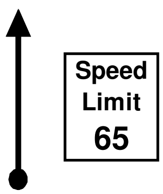
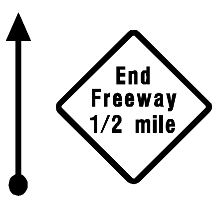
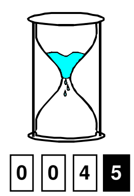
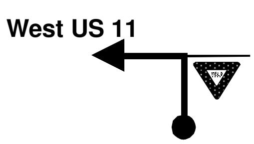
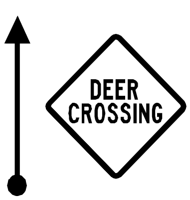
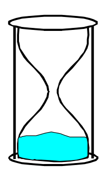
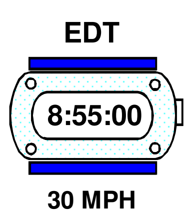
  1723.2 / 1727.3 X 4315 = 4304.7 So the new factor is 4305.

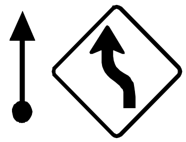
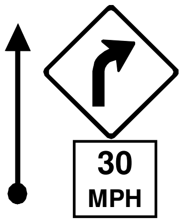
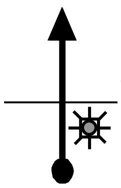
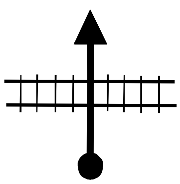
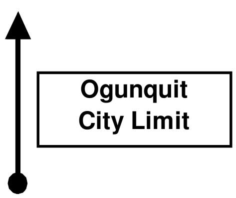
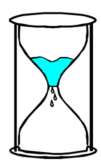
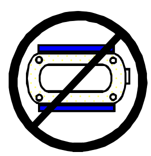
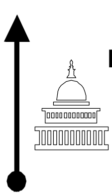
  If you are FAST on the course the formula is reversed to INCREASE the factor.

  Actual time / Correct time X Factor = New Factor

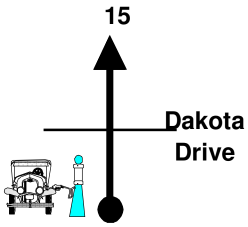
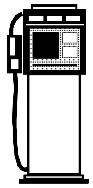
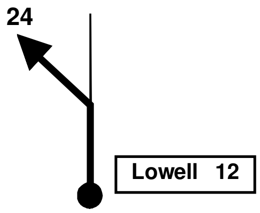
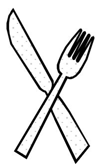
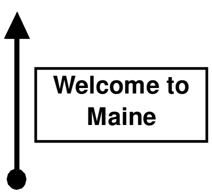
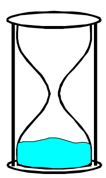
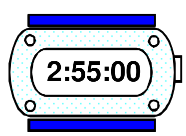
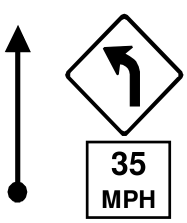
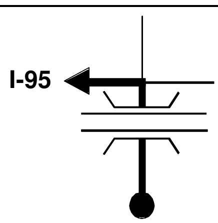
SPECIAL NOTE: If for some reason the speedometer does not return to zero, (usually due to loss of power to the speedometer while the car is moving), stop the car, disconnect power to the speedometer, remove the face glass, and gently move the needle back to zero.

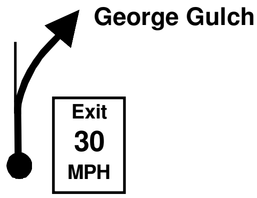
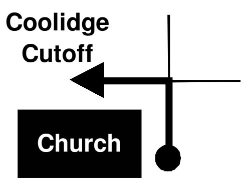
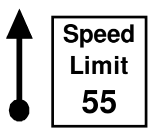
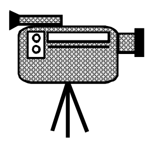
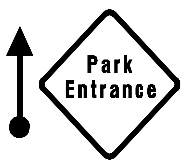
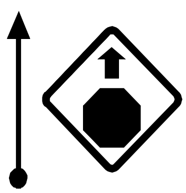
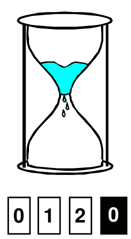
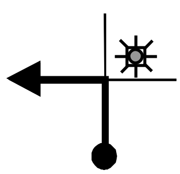
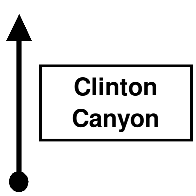
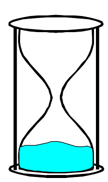
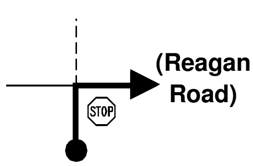
	A	B	C	D
1	 Coker Tire Headquarters	 0 0 8 0	EDT  20m00s	Start or restart time. The official start or restart time for the vehicle with assigned start position zero. Leave here at 8:00:00 plus your assigned start position in minutes. Begin Tire Warm-up of approximately 8 miles; take 20 minutes to complete the Tire Warm-up. The Tire Warm-up begins here and ends at the beginning of the Speedometer Calibration Run. Turn right at a T-shaped intersection out of Coker Tire Headquarters.
2	 Buchanan Blvd			Turn right onto Buchanan Blvd at a crossroad at a Traffic Light.
3	 Leaving Chattanooga City Limit			Pass a sign on your right reading in whole or in part "Leaving Chattanooga City Limit".
4	 Roosevelt Rd			Go straight to cross Roosevelt Rd at a crossroad at a Stop Sign.
5	Jefferson Junction 	 0 2 1 0	26m00s 50 MPH * 0m00.0s	Pass a sign on your left reading in whole or in part "Jefferson Junction". End Tire Warm-up. Begin Speedometer Calibration Run of approximately 21 miles; take 26 minutes to complete the Speedometer Calibration Run. Begin average speed of 50 miles per hour. The Speedometer Calibration Run begins here and ends at the beginning of the next Transit.
6	 Mile 3 4 3		1m49.3s 1m49.3s	Speedometer Calibration point. Pass a sign on your right reading "Mile 343". Cumulative speedometer calibration time is 1 minute 49.3 seconds; interval time (from instruction #5) is 1 minute 49.3 seconds.

	A	B	C	D
7			5m32.0s 7m21.3s	Speedometer Calibration point. Pass an overhead sign reading "Truman Turnpike Exit 1/2 Mile". Cumulative speedometer calibration time is 7 minutes 21.3 seconds; interval time (from instruction #6) is 5 minutes 32.0 seconds.
8				Bear right onto Interstate 75 North
9			8m40.7s 16m02.0s	Speedometer Calibration point. Pass a sign on your right reading "Speed Limit 65". Cumulative speedometer calibration time is 16 minutes 2.0 seconds; interval time (from instruction #7) is 8 minutes 40.7 seconds.
10			9m15.8s 25m17.8s **9m00s**	Pass a sign on your right reading "End Freeway 1/2 mile". End Speedometer Calibration Run. Cumulative speedometer calibration time is 25 minutes 17.8 seconds; interval time (from instruction #9) is 9 minutes 15.8 seconds. The official time (for scoring purposes) is 26 minutes as specified in instruction #5. Begin Transit of approximately 4½ miles; take 9 minutes to complete the Transit.
11			**(0m30s)**	Turn left onto West US Highway 11 at a Yield Sign at a T-shaped intersection. The time to the end of the Transit is approximately 30 seconds.
12				End Transit at the referenced sign. Time-of-day restart. Leave this point at 8:55:00 plus your assigned start position in minutes. Begin average speed of 30 miles per hour.

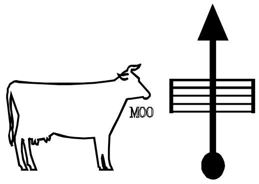
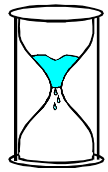
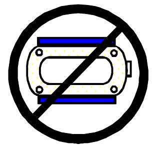
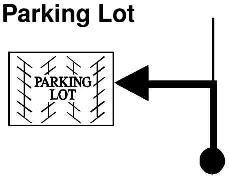
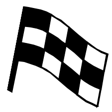
	A	B	C	D
13			**40 MPH**	Change average speed to 40 miles per hour at the referenced sign.
14			**30 MPH** **0m36s** **45 MPH** **1m12s** **50 MPH**	At the referenced sign, change average speed to 30 miles per hour for 36 seconds, then change average speed to 45 miles per hour for 1 minute 12 seconds, then change average speed to 50 miles per hour.
15	 **Sherman Street**		**0 MPH** **0m15s** **45 MPH**	Go straight to cross Sherman Street at a crossroad at a Blinker. Pause 15 seconds, then change average speed to 45 miles per hour.
16				Grade level Railroad Crossing. Continue previous average speed (in this case 45 miles per hour) since no speed is given.
17		 0 7 5 0	 **(3h25m00s)**	End timed portion. The timed portion of the stage resumes at the next restart, if there is one; otherwise, this is the end of the timed portion of the stage. In this case the timed portion resumes at instruction #23. Begin Transit of approximately 75 miles at the referenced sign; take approximately 3 hours 25 minutes to complete the Transit.
18	 **Hamilton County Court House**		**(2h55m00s)**	Hosted Pit stop. After refreshments, leave here 2 hours 55 minutes prior to your end-of-transit time. (Pit stops always occur within Transits, and the time given is included in the specified transit time.)

Appendix D

	A	B	C	D
19			(2h10m00s)	Refueling stop. Refuel in this area, then continue straight across Dakota Drive onto 15. Leave here 2 hours 10 minutes prior to your end-of-transit time. (Refueling stops always occur within Transits, and the time given is included in the specified transit time.)
20				Bear left onto 24 at a sideroad after the referenced sign.
21			(45m00s)	Hosted meal stop (usually lunch). After lunch, leave here 45 minutes prior to your end-of-transit time. (Meal stops always occur within Transits, and the time given is included in the specified transit time.)
22			(3m00s)	Rest Stop. Leave here 3 minutes prior to your end-of-transit time. (Rest stops always occur within Transits, and the time given is included in the specified transit time.)
23			EDT  30 MPH	End Transit at the referenced sign. Time-of-day restart. Leave this point at 2:55:00 plus your assigned start position in minutes. Begin average speed of 30 miles per hour.
24			1m12s 40 MPH	At the referenced sign, continue previous average speed (in this case 30 miles per hour) for 1 minute 12 seconds, then change average speed to 40 miles per hour.
25			50 MPH	Go under a bridge, then turn left onto Interstate 95. Change average speed to 50 miles per hour at the apex of the intersection. Begin Free Zone.

<table>
<tr><th></th><th>A</th><th>B</th><th>C</th><th>D</th></tr>
<tr><td>26</td><td></td><td></td><td>30 MPH</td><td>Bear right toward George Gulch. Change average speed to 30 miles per hour at the referenced sign.</td></tr>
<tr><td>27</td><td></td><td></td><td>45 MPH</td><td>Turn left onto Coolidge Cutoff at a crossroad at the referenced landmark. Change average speed to 45 miles per hour at the apex of the intersection (since there is no referenced sign).</td></tr>
<tr><td>28</td><td></td><td></td><td>50 MPH</td><td>End Free Zone.</td></tr>
<tr><td>29</td><td></td><td></td><td>30 MPH</td><td></td></tr>
<tr><td>30</td><td></td><td></td><td>20m00s</td><td>Begin Transit of approximately 12 miles; take exactly 20 minutes to complete the Transit.</td></tr>
<tr><td>31</td><td></td><td></td><td>(0m45s)</td><td>Turn left at Blinker.
The road may or may not be named.
The time to the end of the Transit is approximately 45 seconds.</td></tr>
<tr><td>32</td><td></td><td></td><td>25 MPH</td><td>End Transit at the referenced sign. Leave this point 20 minutes after instruction #30. Begin average speed of 25 miles per hour.</td></tr>
<tr><td>33</td><td></td><td></td><td>0 MPH
0m15s
25 MPH</td><td>Turn right at Stop Sign.
The road ahead may be unpaved, private, dead end, etc. The road to the right is Reagan Road but may not be identified.
Pause 15 seconds, then continue at an average speed of 25 miles per hour.</td></tr>
</table>

Appendix D

	A	B	C	D
34		 0 2 0 0	 **30m00s**	Cattle guard (the cow may not be present). End timed portion; this is the end of the timed portion of the stage. Begin Transit of approximately 20 miles to the finish line; take 30 minutes to complete the Transit.
35	**Hemmings Motor News Parking Lot** 			Finish Line. End Stage. Stop at Observation Checkpoint; submit any Time Allowance Requests.

APPENDIX E

2014 Great Race Hagerty Trophy Run

Appendix E is a copy of the actual Course Instructions for the 2014 Great Race Hagerty Trophy Run.

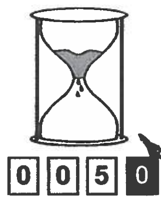
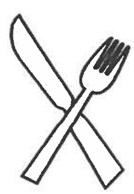
These instructions have been annotated to assist you in understanding how the instructions work. Where information is shown for stop signs and turns, the pause and lost times have been taken from the calibration charts described in this book for a 1936 Packard.

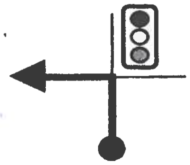
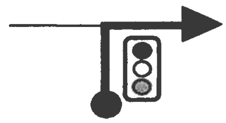
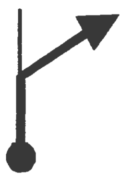
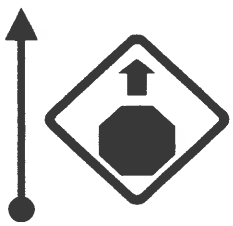
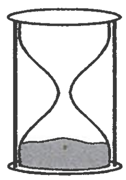
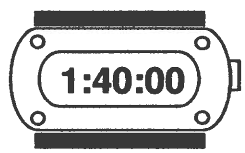
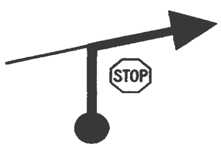
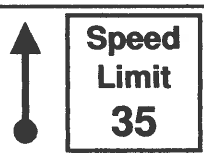
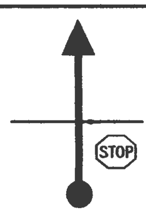
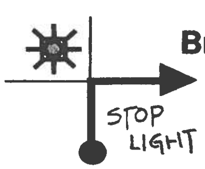
Also for this example an Assigned Starting Position (A.S.P.) of 42 has been assumed. Note that this is not your car number. A different starting position will be assigned to your car for each day.

This Trophy Run began at noon. Since your assumed starting position is 42 your start time is 12:42. You will normally receive your Course Instructions 30 minutes before your start time which in this case is 12:12.

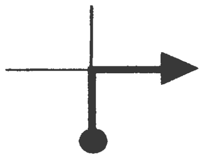
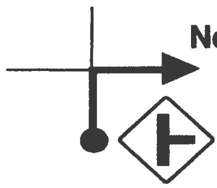
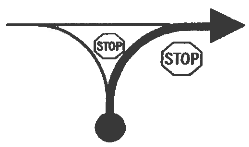
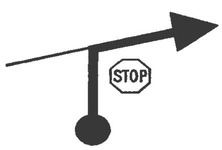
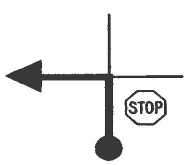
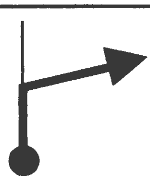
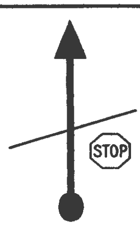
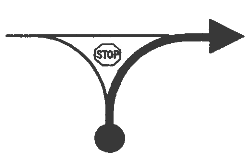
	A	B	C	D
1	(US 1 North) Ogunquit Playhouse	COKER 0090	EDT 12:00:00 16m00s	You may encounter Support Vehicles without penalty today in Ogunquit and on the Tire Warm-up
2	Beach St Shore Rd	APPROX. 9 MILES TO INSTRUCTION #6	TAKES APPROX. 16 MIN. TO INSTRUCTION #6	the Official Start tomorrow morning is on Beach St
3	To I-95 109 Cumberland Farms			5th
4	I-95			turn into middle lane
5	I-95 North Toll Booth I-95 South		(1m30s) APPROX. 1 MIN. 30 SEC. FROM #5 TO #6	comes very quick-- use rightmost toll booth $1.50
6	Speed Limit 65	0 10 20 30 40 50 60 MPH 0240	50 MPH 29m00s * 0m00.0s	SPEEDOMETER CHECK ... IS AT 50 MPH; TAKES APPROX. 29 MIN. AND IS 24 MILES START STOP WATCH AT THIS SIGN.

	A	B	C	D
7	Kennebunk Kennebunkport		4m03.4s 4m03.4s	INTERVAL TIME CUMULATIVE TIME
8	Eastern Trail		3m16.3s 7m19.7s	sign on left
9	Kennebunk River		1m10.7s 8m30.4s	
10	Biddeford		2m30.4s 11m00.8s	
11	University of New England		1m54.4s 12m55.2s	
12	Saco Old Orchard Beach		2m53.3s 15m48.5s	sign overhead
13	Freeport		4m00.8s 19m49.3s	
14	Go Maine		2m13.4s 22m02.7s	
15	Scarborough		1m45.1s 23m47.8s	(sign on right)
16	Casco Bay Region		2m10.9s 25m58.7s	

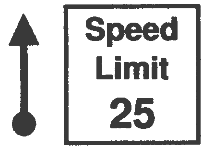
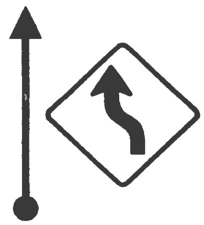
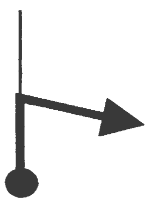
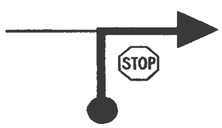
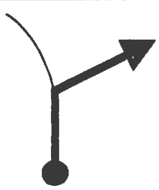
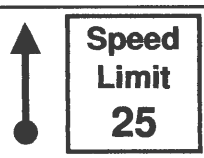
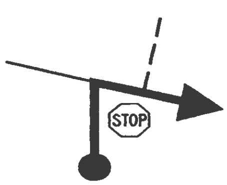
	A	B	C	D
17	Auburn Lewiston Augusta		2m23.3s 28m22.0s	stay on I-95
18	Payne Rd 1/2 Mile		0m21.2s 28m43.2s **55m00s**	comes quick ASSUME YOUR ACTUAL TIME IS 28M47.3S. YOU ARE 4.1SEC. LATE SEE APPENDIX "C" FOR HOW TO ADJUST YOUR
19	Exit 45	END OF SPEEDO CHECK. BEGIN TRANSIT OF APPROX. 5 MILES & TAKES 55 MIN TO GET TO INSTRUCTION #26		SPEEDOMETER.
20	Maine Mall Rd Exit			1st exit
21	(Maine Mall Rd)	**no-host** 	**(10m00s)**	food court inside the mall Cracker Barrel additional food ahead
22	Gorham Tim Hortons		**(8m00s)**	Tim Hortons to the right (off-course): McDonald's, Burger King, Pizza Hut/WingStreet ahead (off-course): Wendy's

	A	B	C	D
23				2nd
24			(3m00s)	Subway on right (look sharp)
25			(0m30s)	look sharp
26			EDT  20 MPH	limited parking TIME-OF-DAY RESTART A.S.P. #42 LEAVES AT 2:22:00 (1:40 + 42 = 2:22)
27			0 MPH 0m~~15s~~ P 10.2 35 MPH	PLANNED PAUSE TIMES ARE FROM CHART ON "STOP & GO". (P= PAUSE)
28			30 MPH	CHANGE SPEED AT THE SIGN.
29			0 MPH 0m1~~5~~s P 10.2 30 MPH	
30			0 MPH 0m1~~5~~s P 9.5 35 MPH	

35 WHEN INSTRUCTIONS ARE RECEIVED, WRITE SPEED FROM PRECEEDING PAGE HERE

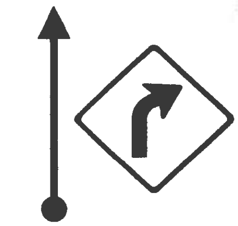
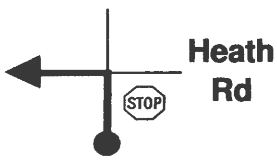
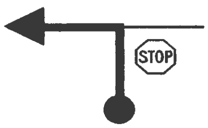
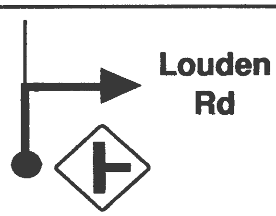
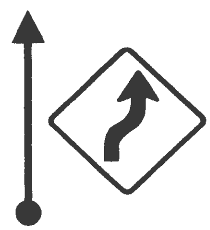
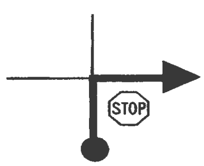
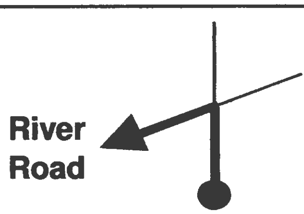
	A	B	C	D
31	 Burnham		30 MPH -2.9	SEE CAR CALIBRATION CHART FOR "LOST TIME" ON A 35 MPH "IN" AND A 30 MPH "OUT" TURN.
32	 Nonesuch Rd		20 MPH -.5	AT THE SIGN DROP TO THE SPEED OF 20 MPH AND THEN TURN (LOST TIME ON A 20-20 TURN)
33			0 MPH 0m~~15s~~ P10.9 30 MPH	
34			0 MPH 0m~~15s~~ P10.2 30 MPH	
35			0 MPH 0m~~15s~~ P8.2 40 MPH	
36	 Hearn Rd		35 MPH -4	look sharp (LOST TIME ON A 40-35 TURN)
37	 Ash Swamp		0 MPH 0m1~~5~~s P10.1 30 MPH	
38			0 MPH 0m1~~5~~s P10.2 30 MPH	

30

	A	B	C	D
39			**20 MPH**	
40			20	WHEN INSTRUCTIONS RECEIVED, WRITE THE SPEED IN ALL SECTIONS WHERE IT IS MISSING.
41	 **(Ricker)**		**25 MPH** -1	comes quick-- look very sharp
42			**0 MPH** **0m1~~5~~s** P12.4 **20 MPH**	
43	 **Lincoln**		**25 MPH** -1	comes very quick
44			**20 MPH**	
45			**0 MPH** **0m1~~5~~s** P 12.5 **20 MPH**	

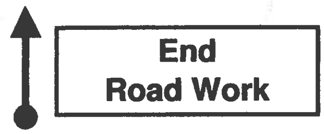
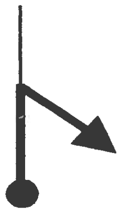
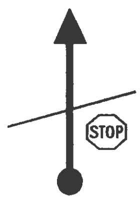
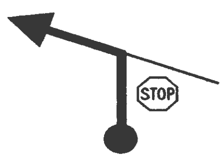
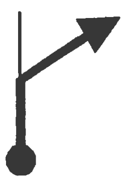
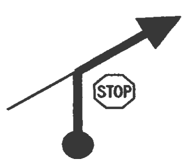
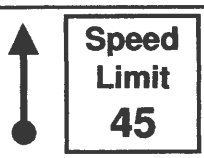
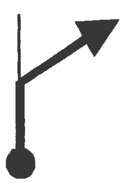
46 → COMES QUICK →

20

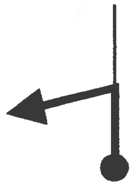
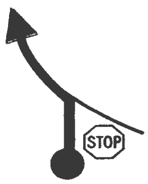
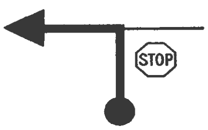
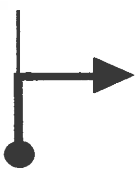
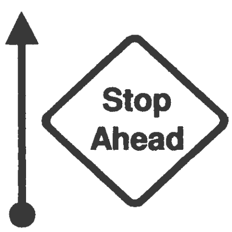
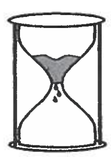
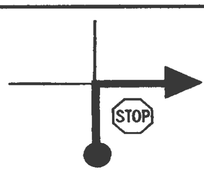
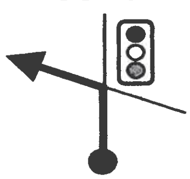
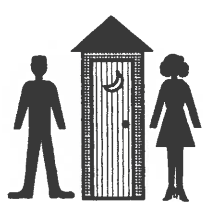
	A	B	C	D
46			20 1m39s 30 MPH	comes quick HOLD SPEED AT THE SIGN. START STOPWATCH AND HOLD 20 MPH FOR 1 MIN. 39 SEC. THEN GO TO 30 MPH.
47			0 MPH 0m1~~5s~~ P 9.5 35 MPH	
48			0 MPH 0m1~~5s~~ P 9.4 35 MPH	
49			30 MPH −2.9	
50			25 MPH 1m12s 30 MPH	
51			0 MPH 0m1~~5s~~ P 8.6 40 MPH	possible construction zone
52			35 MPH −4	after 

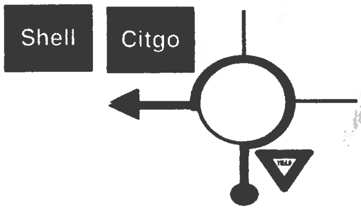
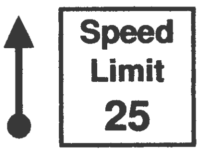
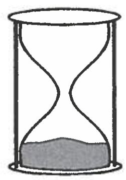
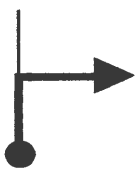
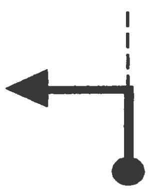
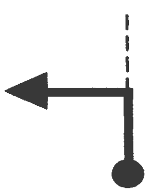
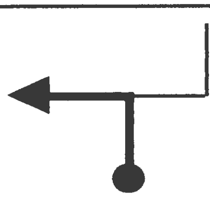
53 COMES QUICK

35

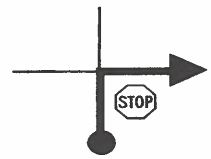
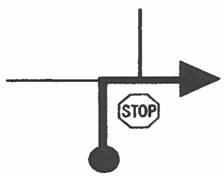
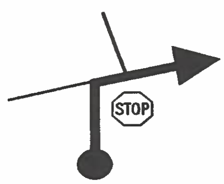
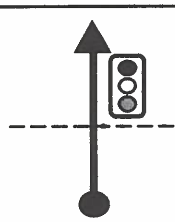
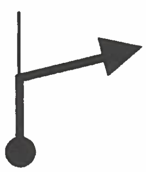
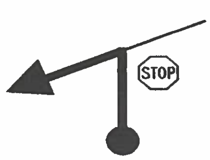
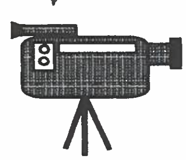
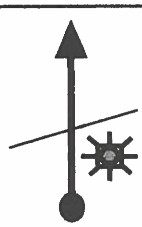
	A	B	C	D
53			35	comes quick
54	 Murch Rd		25 MPH -1.8	look sharp
55	 Buzzel		0 MPH 0m~~15~~s P10.8 30 MPH	
56	 35		0 MPH 0m~~15~~s P11.8 20 MPH	
57	 John St		20 -.5	1st paved road-- look sharp
58			0 MPH 0m~~15~~s P10.9 30 MPH	
59			35 MPH	
60	 Clarks Woods		30 MPH -2.9	look sharp

30

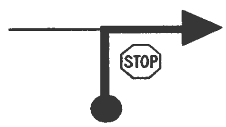
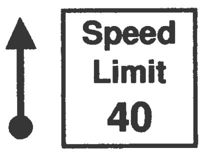
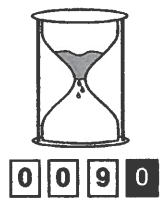
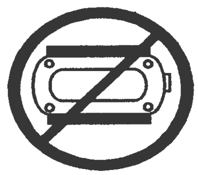
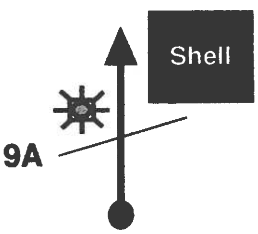
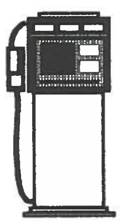
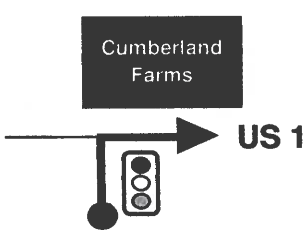
	A	B	C	D
61	Frost Rd 		20 MPH -1.2	look sharp-- small black-on-white sign
62			0 MPH 0m1~~5~~s P12 25 MPH	
63			0 MPH 0m1~~5~~s P12.4 20 MPH	
64	 (Kennebunk Pond)	BEGIN TIMED TRANSIT OF APPROX. 10 MILES TAKE EXACTLY 30 MIN.	25 MPH -1	comes very quick
65		 0 1 0 0	ENTER EXACT ARRIVAL TIME → 30m00s ENTER EXACT DEPARTURE TIME →	___:___:___ + 30:00 ___:___:___ TRANSFER THIS TIME TO INSTRUCTION #70 →
66	111 			
67	US 202 4 		(10m00s)	2nd  Gulf gas

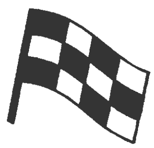
	A	B	C	D
68			(2m00s)	Citgo McDonald's/Shell
69	 Airport Rd		(0m20s)	
70			20 MPH	____:____:____ EXACT DEPARTURE TIME AT THIS SIGN (FROM INSTRUCTION #65)
71	 Gatehouse		25 MPH —1	
72	Baker Ln 		20 MPH —.6	sign may be twisted
73	Kostis 		20 —.5	
74			20 —.5	

20

	A	B	C	D
75			0 MPH 0m1~~5~~s P12 25 MPH	
76			0 MPH 0m1~~5~~s P12.4 20 MPH	
77		THERE WILL BE NO CHECK POINTS BETWEEN	0 MPH 0m1~~5~~s P10.9 30 MPH	
78		THESE INSTRUCTIONS (#76 TO #80)	0 MPH 0m1~~5~~s P8.6 40 MPH	
79	 Sam Allen		25 MPH -2.2	look sharp-- 1st named road
80			0 MPH 0m1~~5~~s P10.8 30 MPH	
81			0 MPH 0m1~~5~~s P10.2 30 MPH	

30

	A	B	C	D
82			0 MPH 0m1~~5s~~ P10.2 30 MPH	
83			0 MPH 0m1~~5s~~ P7.5 45 MPH	
84			 30m00s	END OF TIMED SECTION
85			APPROX. 9 MILES AND 30 MIN. TO GET TO THE OBSERVATION CHECKPOINT — INSTRUCTION #88	Shell additional fuel ahead
86		Reception and Hagerty Trophy Run Awards this evening at the Beachmere Inn, 62 Beachmere Pl, from 6:30:00 to 8:00:00. There is no parking at the Beachmere Inn. You must walk or take the shuttle between your hotel and the Beachmere Inn. Overnight race car parking is at the hotels.		Cumberland Farms gas Irving/Circle K gas Mobil Sunoco Do not go to your hotel until after you have been to the Observation Checkpoint at the finish line. Gibbs gas Gulf gas

	A	B	C	D
87				the Official Start tomorrow morning is on Beach St
88				stop at Observation Checkpoint
89				

Stage 1 tomorrow: Ogunquit, Maine, to Lowell, Massachusetts

Receive course instructions this afternoon at the finish of the Hagerty Trophy Run

Breakfast available: at the Ogunquit River Inn & Suites starting at 6:30:00; at the Ogunquit Resort Motel starting at 6:30:00; at the Meadowmere Resort starting at 6:30:00; at the Beachmere Inn starting at 6:30:00; at the Colonial Inn starting at 6:30:00; at the Mariner Resort Motel starting at 7:00:00

To reach the Start, a distance of ½ mile, leave the intersection of US 1 and Beach St in start position order at 0m30s intervals starting at 8:30:00 (example: start position 53 leaves at 8:56:30).

Official Start Time: 10:00:00

First Refueling Stop: 135 miles

Toll: $3

Appendix F - Rally Safety Check List

This list is provided as an example to prompt you to check out your car before heading off on a multi-day road rally. It's better to find an issue on the lift than on the side of the road.

The most important component of rally preparedness is to actually drive your car. We recommend 200 miles within the month prior to a rally. This will bring to light any issues before you ship your car to some far off destination. This is much better than discovering issues that might hamper your enjoyment of your driving experience.

Tires

All tires should be less than six years old with minimum tread of 4/32nds

Right Front
Tread Depth
Sidewall Integrity
Tread Integrity

Left Front
Tread Depth
Sidewall Integrity
Tread Integrity

Spare
Tread Depth
Sidewall Integrity
Tread Integrity

Right Rear
Tread Depth
Sidewall Integrity
Tread Integrity

Left Rear
Tread Depth
Sidewall Integrity
Tread Integrity

Wheels

- All spokes tight and true
- Valve stem grommets on tube tires
- Lugs properly torqued
- Knock offs tight

Rally Front Suspension (Verify for right and left)

- No play in ball joints
- No play in king and link pins
- Tie rod ends tight
- Shock absorbers: no leaks & functional
- No play; pitman arm, drag links, idler arms
- Suspension bolts & nuts properly torqued
- Cotter pins & other locking devices present
- Inspect condition of bushings, heim joints & pivot points
- Inspect condition of springs (leaf, coil, torsion)
- All components properly lubed
- No play in wheel bearings

Rear Suspension (Verify for right and left)

- Shock absorbers; no leaks & functional
- All suspension bolts & nuts are properly torqued
- All cotter pins & other locking devices present
- Inspect condition of bushings, heim joints & pivot points
- Inspect condition of springs (leaf, coil, torsion)
- Inspect all spring mounting hardware
- All components properly lubed

Brakes (Verify for all four)

- Inspect master cylinder for leaks, tight fittings
- Fluid level, master cylinder
- Power booster condition and function
- Brake fluid clean & clear
- Inspect calipers / wheel cylinders
- Adequate lining thickness
- Linings not contaminated
- Inspect all brake lines. Fittings tight, no leaks
- All mounting hardware properly torqued
- Pedal firm, proper position
- Wheel bearing seals
- Adjust and bleed brakes

Exhaust Components

- No Leaks
- All bolts tight
- Hangers in good condition
- Header and flange gaskets, no leaks

Drive Components

- Inspect U joints, CV joints, rotax couplings
- Inspect torque tube
- Condition of axle boots

Cooling System

- Inspect hoses and clamps
- Main & auxiliary fans function properly
- Coolant condition
- Radiator condition
- Adequate cold weather protection
- Radiator cap pressure test
- Overflow tank. No leaks, proper function
- Inspect freeze plugs & petcocks
- Inspect water pump for bearing play and seepage

Fuel System

- Inspect / change filter (s)
- Inspect all hoses and clamps
- Fresh fuel
- Verify proper fuel pressure
- Inspect fuel pump (s)

Electrical System

- Inspect wiring
- Brake lights
- Tail lights
- Head lights.
- Hi and low beams
- Dash lights
- Emergency flashers
- Windshield wipers
- Generator/ alternator; Proper output
- Battery condition
- Clean all battery connections
- Ground cables, engine to chassis

Transmission / Clutch

- Inspect master cylinder, slave cylinder
- Inspect shift linkage
- Tighten all brackets
- Inspect transmission mounts
- Check/change transmission oil & filter
- Inspect for leaks
- Engine Compartment Inspect all belts, hoses, clamps
- Inspect motor mounts
- Check/change engine oil & filter
- Inspect all hoses
- Tighten all brackets, inspect for cracks
- Air filters

Road Check

- All gauges operable
- Temperature within range
- Oil pressure within range
- Car tracks straight
- Brakes work correctly

Safety Equipment

- Fire extinguisher mounted within reach of driver
- Flares or reflective triangles
- First Aid kit
- Tow Rope
- Emergency Flares
- One gallon of water
- Flashlight

Spares / Tools Belts

- Hoses
- Water pump
- Fuel pump (s)
- Fuel filter
- Knock off hammer / Lug wrench
- Vehicle specific special tools
- Mobile phone
- Sense of humor

Rally Equipment

- Timewise speedometer installed and working
- Stopwatch checked out and new battery installed
- Analog clock installed and new battery installed
- Spare batteries for stopwatch and clock
- Lapboard fabricated and ready
- Special items required for lapboard such as hole punch
- Pens, pencils, marker pens, etc.
- Speedometer calibration tools (small screwdriver and flashlight)

Other Questions to Answer

- Has car been driven extensively (several hundred miles) to ensure its integrity?
- Have car calibration charts been prepared?