



NORTHEAST RALLY CLUB

Thunderbolt Rally

General Rally Instructions

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Welcome to the Thunderbolt Rally

Welcome to the first bi-annual Thunderbolt Rally. The purpose of the rally is two fold. First and primarily it is for the enjoyment of the rally participants. This rally offers classic car collectors and rally enthusiasts, who would like to travel to the East Coast, an opportunity to engage in an automobile rally while enjoying cars of particular interest. These participants thereby enjoy not only the camaraderie of automobile enthusiasts but also the competitiveness of the rally format in general and the speedometer only format in particular.

Secondly, it serves as a fund-raising process whereby the local Millville Community can display their appreciation of the Thunderbolt Youth Club by supporting the Thunderbolt Rally through their sponsorships and cooperative participation.

This document is divided into three chapters. The first chapter describes the basic concept of the rally, the equipment required and the competition classes. The second chapter describes the rally instructions and how to read and follow them. The third chapter has more detailed information on preparing for the rally and running it.

If you have any questions after reading this document, which I am sure you will. Please feel free to ask one of the veterans to help clarify it for you. They will be glad to help and it boosts their egos.

Speedometer Only Format

This is a time/speed rally. You are scored on the accuracy with which you follow the instructions, not how fast you complete the course. The rally course was designed to enable the participants to always be driving the assigned speeds, except for accelerating from stops and turns and decelerating for stops and turns. Therefore with an accurate speedometer if you are on speed you will stay on time (assuming you were on time to begin with).

The instructions will tell you which roads to follow, where to turn, what speeds to maintain and when to change speed. This is not a “trick” type rally. The instructions are not designed to trick you into taking a wrong turn or driving at an incorrect speed. You must, however, pay close attention to what the instruction is telling you to do and match the instructions to the signs and intersections you encounter.

Rally Segments

The rally is divided into segments of which there are three types.

1. **Transit** – A segment of the rally during which you will not be scored and speeds are not provided. The purpose is to get you from one timed segment of the rally to the next. Breaks such as pit stops and meals will always be scheduled in a transit. You will be given the approximate mileage of the transit and the total length of time you have to complete it. The time provided will be sufficient to complete the transit as well as any breaks without driving above the posted speed limits.
2. **Calibration** – This is a segment of the rally where you are provided a speed to travel and the exact time it should take to complete the segment traveling at the assigned speed. This segment is normally the second segment of the day and is used to calibrate your speedometer. Refer to the Speedometer Calibration section of chapter three. You will not be scored during this segment.
3. **Timed** – This is a segment during which you may be scored. These segments make up the bulk of the rally. In a timed segment you are told the precise speeds to travel and exactly where to change speed. Secret checkpoints are located in timed segments and the time, at which you pass the checkpoint, is recorded and used to calculate your score. You will not be told how long it will take to complete a timed segment.

In addition to your speedometer you must also have a timepiece synchronized to the Official Event Clock. This is used to start the rally on time and to restart timed segments of the rally after transits. The Official Event Clock will be available before the start of the rally each day so you can synchronize your timepiece with it.

Rally Equipment

Allowed Equipment

Participants are allowed the use of one speedometer. It may be either the vehicle's original equipment or an add-on speedometer. If it is an add-on, it must be an analog speedometer with a face diameter of no more than 4 inches and markings no finer than 1 MPH. If an add-on speedometer is used, the vehicle's original speedometer must be disconnected or masked.

There are typically two types of add-on rally speedometers. The first is adjustable only prior to installation and not on a daily basis. An example of this is a Jones Speedometer. The second provides a convenient way to adjust the speedometer at any time. An example of this is the Timewise Speedometer. Either type is allowed, however, the speedometer type will determine under which class the participant competes.

The participants may have two timepieces in the vehicle. The first is an analog time of day clock with a face no larger than 9 inches and markings no finer than 1 second. This clock may not be of the electronic variety that resets its time based on external signals. The second allowed timepiece is a stop watch.

A clip board, pencil and paper are also allowed as well as performance notes for your driver and vehicle.

Prohibited Equipment

The following equipment may not be used during this rally: cell phones, additional timing devices (such as wrist watches), GPS equipment, binoculars, calculators, computers, tachometers, odometers or additional speedometers. Contestants should mask or disconnect any prohibited equipment already installed in the vehicle. In some cases, when using the original vehicle speedometer it is not convenient to mask the odometer. In those cases the odometer will not be masked, however, it is not to be used to calculate time and to do so would be considered cheating and not within the spirit of the event. If someone operates with prohibited equipment they are ineligible for prizes.

Required Safety Equipment

All vehicles must be licensed and have the required equipment to be legally operated in their state of registration. In addition, the following equipment is required to be in your vehicle when you go through technical inspection and while you are rallying:

1. One operational dry chemical fire extinguisher at least 2 ½ lbs. A/B/C
2. One first aid kit
3. One tow rope or chain
4. Emergency flares or reflectors.

Competition Classes

Competitors in Northeast Rally Club events compete in one of three classes. The first two classes are based on the type of rally speedometer used. The third class is for rookie teams who have no rally experience.

INTRODUCTION

1. **Pro:** This class is unlimited in speedometer equipment as defined in the Allowed Equipment section.
2. **SOP:** Seat Of the Pants class may use the original speedometer, or a replacement speedometer that is not adjustable (once installed). This permits competitors to enjoy the sport by not being restricted to an original speedometer that fluctuates +/- 5 MPH, and is therefore not competitive
3. **Rookie:** A team where both competitors have never participated in an automobile rally of any nature. Rookies may compete using Pro or SOP equipment.

Scoring

Your score is based on how closely you arrive at scoring checkpoints compared to the time you would have arrived if you ran the course perfectly. The perfect time is determined by the Rally Master using a rally computer to measure the course. You will receive 1 penalty point every second you are early or late at a checkpoint. If you are late the maximum penalty points you will receive at a single checkpoint is 120. If you are early, the maximum penalty points you will receive is 300. You will receive a penalty score of 180 for a missed checkpoint. Cars failing to start will receive a Did Not Start (DNS). If you miss the last checkpoint of the day or are more than 30 minutes late arriving at the finish you will receive a Did Not Finish (DNF). The scores you receive at each checkpoint of the day are added and then multiplied by the age factor (old car handicap) to determine your score for the day. Your event score is calculated by dropping your one highest checkpoint score for Saturday and Sunday, adding the remaining scores and multiplying by the age factor. If you receive a DNS or DNF on Saturday or Sunday, you will not be scored for the event.

After completion of the last checkpoint there is a published transit time to the finish. Competitors will have an additional 30:00 to arrive at the finish or be scored as a DNF. Cars receiving a DNS or DNF will be out of competition for that day.

On Friday the Practice Rally will utilize the Do It Yourself (DIY) checkpoint technique. The location of these checkpoints is noted in the Course Instructions, along with a designated line to record such times. During the Transit Zone run to the finish you should transfer these times to the Checkpoint Timesheet, provided, to be turned in at the Finish Control. From this your scores will be determined and posted. You may calculate your own scores using the provided score sheet, and the True Times that are exchanged when you turn in your time sheet. You have 20:00 minutes to challenge a checkpoint time once you have received your True Times. **WARNING:** at least one of the checkpoints will have a hidden checkpoint crew actually timing your progress through that control. Your submitted arrival time must agree within two (2) seconds of their recorded time. This is to prevent someone from submitting a false time based upon what they “wanted” to have. The penalty for submitting a “FALSE” score will be 180 seconds.

Route Instructions

The route instructions are very similar to those used in the Great Race with the exception of their copyrighted Cameo's. We use Tulip diagrams, which have existed for over 50 years and are used in rallies all over the world to depict the intersections. A Tulip is a visual picture of the intersection taken from overhead (theoretically). Your vehicle is the large black dot, always at the bottom, and the direction of travel is indicated by the bold line ending in an arrowhead. If signs are available they may be depicted using a sign locator symbol. Every effort has been made to accurately note where the sign is located: left side of the road, right side of the road or overhead (center).

Instruction Format

Refer to Figure 1 Sample Instruction for examples of the instructions described here. The instructions consist of five columns:

1. **Instruction Number.** The first column contains the instruction numbers which run consecutively 1, 2, 3 ... through the last instruction of the day. The instructions are executed in order and one instruction must be completed before the next instruction may be executed. An instruction is completed when the last speed change specified by the instruction has been completed. If the instruction does not indicate a speed change, then the instruction is completed when the sign or intersection has been passed.
2. **Sign.** The second column is labeled "A" and, if used, contains the sign at which the instruction is to be executed. After completing the previous instruction, the first sign encountered that matches the sign depicted in column A is used to execute this instruction. For a sign to match the information depicted in column A must be on the actual sign. The reverse is not true. The actual sign may contain information that is not depicted in column A. Figure 1 Sample Instruction number 2 shows a stop sign. This instruction is executed at the first stop sign encountered after turning right out of the parking lot depicted in instruction 1.
3. **Direction of Travel Tulip.** The third column labeled "B" always contains a Tulip. It will also contain a sign locator with the location of the sign depicted in column A. If there is no sign in column A then the Tulip must be an intersection and the instruction is executed at the intersection. If the direction of travel is indicated as straight through the intersection, the instruction is executed at the center of the intersection. If the direction of travel indicates a turn or turns, the instruction is executed at the apex of the first turn. Also included with the Tulip may be street names to help identify the instruction. If a street name is not included, the first intersection encountered that matches the Tulip is to be used to execute the instruction. Figure 1 Sample Instruction number 1 has no sign and shows an intersection with two turns. The execution point of this instruction is at the first right turn and the instruction is considered completed after the second right turn out of the parking lot. Figure 1 Sample Instruction number 2 has a sign in column A so the execution point of the instruction is at the stop sign. The direction of travel Tulip in column B shows a left turn at a "T" intersection with the stop sign located at the intersection to the right of the road on which we are traveling and before the cross road at the top of the "T."

4. **Time and Speed.** The fourth column labeled “C” is the command function for speeds and timing. This column contains all of the required time and speed information for the rally. Times are specified in one of three formats:
 - a. **hh:mm:ss** indicates an official start time represented in the 12 hour time of day format. This indicates you should start this instruction at the specified time plus your start position for the day in minutes. Typically this time will be found in the first instruction of the day, the first timed instruction of the day and the first timed instruction after lunch. Column C of Figure 1 Sample Instruction number 1 indicates this rally starts at 1:30:00 from the first right turn in the parking lot. If you have start position 7 you would start from that location at 1:37:00. Since we do not rally at night all official start times are assumed to be during daylight hours.
 - b. **XhYYmZZs** or **YYmZZs** indicates an elapsed time X hours, YY minutes and SS seconds. How this time is used depends on the segment type of the instruction. For a transit this time will only be seen in the first instruction of the transit and indicates the length of time allocated to the transit. Figure 1 Sample Instruction number 1 indicates this first transit of the day has been allocated 15 minutes and 0 seconds.

For calibration instructions there will be two times in each instruction. The leftmost time is the time from the previous instruction to this instruction. The rightmost time is the time from the first calibration instruction to this instruction. This is shown in Figure 1 Sample Instruction numbers 8 and 9. The sign in column A of instruction 8 is 14 minutes and 39 seconds from sign at the start of the calibration segment (not shown). The sign in column A of instruction 9 is 1 minute and 12 seconds from the sign in instruction 8 and therefore 15 minutes and 51 seconds from the start of the calibration segment. Note that instruction 8 shows the sign on the left.

For a timed segment instruction this is the time from the start of the instruction to a speed change that ends the instruction. Figure 1 Sample Instruction number 23 demonstrates the use of an elapsed time. At the curve warning sign that looks like a chair your speed changes to 15 MPH. Exactly 1 minute and 20 seconds later your speed changes to 30 MPH.

- c. **(XhYYmZZs)** or **(YYmZZs)** indicates an approximate elapsed time from this instruction to the end of the transit. This time will only be seen in transit instructions and is used as a reference only.

In addition to time, an approximate distance in miles (X.Ymi) is provided in column C of the first instruction of each transit. You may ask why since your odometer is not allowed. This is provided as an aid so you have an idea of what your average speed must be to complete the transit on time. If you subtract any time allocated to breaks from the time allocated to the transit, then divide the approximate mileage by the remaining allocated time, you will know the average speed you must achieve. How do you know the length of time allocated to a break? You can usually estimate this based on the approximate elapsed times provided in parenthesis.

Speeds are indicated by CAS SS MPH, which is a command to “Change Average Speed” or “Continue Average Speed” at SS miles per hour. Speed commands will only be seen in the first instruction of a

calibration run and in timed segment instructions. Transit instructions will never contain a CAS command. For those instructions travel at the posted legal speed or what traffic will allow. For a calibration segment this speed indicates the speed at which the entire calibration segment is to be run. A timed segment instruction may contain 0, 1 or 2 CAS commands. If there is not a CAS command for a timed instruction, continue at the last assigned speed. If there is one CAS command it may or may not be preceded by a time. If it is not preceded by a time, the speed change occurs at the execution point for the instruction. This is referred to as a simple speed change and is shown in Figure 1 Sample Instruction number 24. This is a right turn at a 4-way intersection with a simple speed change from 30 MPH (from instruction 23) to 45 MPH at the apex of the turn.

If the CAS is preceded by a time, continue at the previously assigned speed. Then execute the speed change at the elapsed time after the execution point for the instruction. This is referred to as a timed speed change. If there are 2 CAS commands they will be separated by an elapsed time. In this case the first speed change occurs at the execution point for the instruction and the second speed change occurs at the elapsed time after the execution point for the instruction. This is a compound speed change: a simple speed change followed by a timed speed change. Figure 1 Sample Instruction number 23 shows this situation. At the curve warning sign a simple speed change to 15 MPH occurs followed by a 1 minute and 20 second timed speed change to 30 MPH. Be sure to start timing the 1 minute and 20 second interval at the curve warning sign.

5. **Comments.** The fifth column is for additional information to assist you in course following or other guidance, such as the end of one segment and the start of another segment. The instruction at the start of each segment will indicate the segment just completed (End Transit, End Calibration or End Timed Portion) and the segment that starts with this instruction (Begin Transit, Begin Calibration or Begin Timed Portion). Other information that may appear includes:
 - a. Comes Quick or Comes Very Quick indicates the next instruction is close.
 - b. Look Sharp indicates the sign or intersection may be hard to see or easy to miss.
 - c. 1st right indicates this right hand turn is the first paved road to the right after the last instruction.

The comments are provided to help you identify the execution point for the instruction. They are not required. If the information in columns 2 and 3 (labeled A and B) match the actual sign and or intersection, that is where you execute the instruction.

The comment in Figure 1 Sample Instruction number 1 indicates that this is the start of the rally and it is the start of a transit segment (BTZ or Begin Transit Zone). The comment in Figure 1 Sample Instruction number 2 indicates that this instruction (the stop sign) comes quickly after the right turn out of the parking lot in instruction 1. The comments in instructions 8 and 24 are more for clarification of the sample instructions and would not normally be included in your rally instructions.

ROUTE INSTRUCTIONS

Sample Instructions

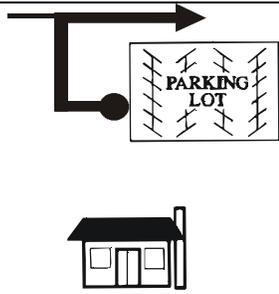
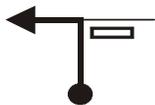
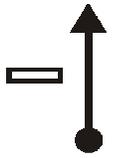
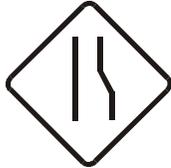
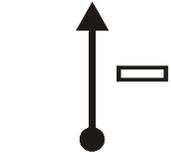
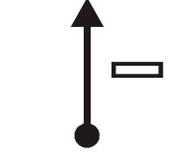
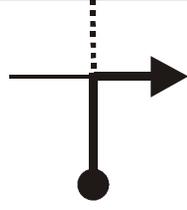
	A	B	C	D
1			<p>1:30:00 15m00s 7.0mi</p>	<p>Start of Rally BTZ Begin Transit Zone</p>
2				<p>Comes quick</p>
...				
8			<p>1m39s 14m39s</p>	<p>sign on left</p>
9			<p>1m12s 15m51s</p>	
...				
23			<p>CAS 15 MPH 1m20s CAS 30 MPH</p>	
24			<p>CAS 45 MPH</p>	<p>Dead end straight ahead</p>

Figure 1 Sample Instruction

Instruction Execution

You must complete the instruction you are working on before executing the next instruction. For example, you are in a “timed speed change” maintaining 20 MPH for 3m00s then changing to 30 MPH. The next instruction calls for a left turn at a side road to the left. After 2 minutes into the “timed speed change” you see an opportunity to turn left on a side road. That is all that road is - an opportunity to make a mistake. You must continue on your present path for an additional 1 minute to complete the instruction you are working on. Then, and only then, do you start to look for the side road to the left.

Execution Point

When looking for the execution point of an instruction with a sign depicted in instruction column A, you use the first sign encountered that is identical to the depicted sign. Occasionally it may be necessary to override this rule. If that is necessary the information to do so will be indicated in column A along with the sign. For example, you may see 2nd blinker in column A along with the picture of a blinker light. In this case you would not turn at the first blinker light, but at the 2nd. Another condition that may occur is a new sign erected after the last route check and discovered the day of the rally. If this sign matches the sign you are looking for, an emergency instruction on bright colored paper and marked “TR – NO” will be attached to the new sign. Do not execute at this sign.

If a sign is depicted in instruction column A and a “simple speed change” is called for, the CAS should be executed at that sign, regardless of what Tulip is depicted in column B. For example, a side road left warning sign is shown in column A, the Tulip in column B calls for a left turn and column C calls for a CAS 30 MPH. You would change to 30 MPH at the side road left warning sign, before the intersection, not at the apex of the left turn.

Course Signs

The instructions use numbered route markers, street signs, speed limit signs, curve warning and other yellow caution signs to indicate the execution point for an instruction. These signs are depicted in instruction column A. In addition, street names, route numbers and building names may be used in column B to help identify intersections. Any names listed in column B along with the intersection Tulip will usually be on signs, however, these signs do not indicate the execution point of that instruction. They only indicate that this is the correct intersection.

For a sign depicted in instruction Column A, a corresponding small rectangle sign locator will be found along with the direction of travel Tulip in column B. This identifies the location of the sign as to the right, left or overhead. The position of street names, route numbers and building names in column B do not necessarily indicate the exact location of that sign along the roadway, although every attempt is made to do so. If you encounter an instruction to turn right at an intersection with Chicken House Drive and the road sign is actually located on the left at that intersection, you should execute that instruction by turning right.

Every effort has been made to verify the spelling of signs and road names. However, if you are instructed to turn right on BEECHY and you find a street named BEACHY, you should make the turn at that intersection. If you are looking for CAIN AVE and you find CAIN AV you are there. If you see a street name or route number in parentheses () that means that the name or route number is not identifiable at that point, but that is the name or route number of the road.

Completing Instructions – Navigator take notice!

This section is of prime importance to the navigator. As each instruction is completed, you have to have a way to mark it completed. This is a physical mark on the instruction that tells you this instruction is done. DON'T DO IT AGAIN! There is nothing worse than being in a maze with four unnamed side road left turns in a row and you forgot which instruction you just completed. If you have a nosey driver you may want to tell her how you mark an instruction completed and make it easy for him to see.

Course Following

All signs and intersections are not depicted in the instructions. If you encounter an intersection that is not in the instructions, you use the Main Road Rule to determine which way to go.

Main Road Rule

This rally uses the Main Road Rule (MRR) for proceeding through intersections that are not covered by the active instruction (the instruction you are presently working on). The principle of the MRR is to continue on the road you are on by observing the painted center or edge line road markings or curve warnings signs. Also observe the placement of stop and yield signs to determine lesser roads that must give way to the road you are on. If there are no markings or signs, follow the road that has the same texture and color or appears to be an extension of the road you are on. If all else fails, proceed as straight, or nearly straight as possible. Again, this is not a 'trick' rally. Every effort has been made to include in the instructions any intersection that might be confusing.

Unpaved Roads and Dead Ends

Normally the rally does not include unpaved roads, dead ends, no outlets or private drives. If one of these roads is part of an intersection depicted in an instruction it will be represented by a dotted line. There are, of course exceptions to this rule. For example, on a transit you may turn into a private drive for lunch or take a gravel road to a scenic outlook. Occasionally you may see or pass a dead end or no outlet sign before you actually enter the dead end or no outlet. In these cases you will usually be given a comment in column D telling you to ignore the sign. This means ignore the meaning of the sign, not the sign itself. If the sign is depicted in column A as an indicator that this is the execution point of the instruction, you execute at the sign. If you are looking for an intersection that includes a sign or street name that identifies it, and the actual intersection that matches includes one of these forbidden roads, execute the instruction at that intersection even if the offending road is not indicated in the Tulip as a dotted line.

Running a Time/Speed Rally

A time/speed rally is all about accuracy and not speed. To be successful you need to be extremely lucky or have a very good understanding of how your vehicle performs. The latter is not simple, but it is the surest way to be successful and enjoy your experience. To enjoy your rally there are four S's that you want to keep in mind. They are listed here in order of importance. If you are a rookie, concentrate on the first three S's as they are the most important and if ignored, can cause you to accumulate the largest error.

The 4 S's

Safety is your primary concern. Always be aware of the other vehicles around you. You will often make abrupt changes of speed and/or direction. Any people around you who are not in the rally will not be expecting these changes, especially if you are in a newer vehicle. Signal your intentions!

Occasionally you will have to make up time. Even though we are on lightly traveled roads, do not pass if you cannot see. If another competitor is trying to overtaking 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. Any incident involving alcohol will result in expulsion from the event.

If you lose a significant amount of time, for any reason, do not sacrifice safety to make it up. Instead, submit a time allowance for the time you lost (refer to the Time Allowance section). If you are behind you may be able to safely make up some time until you encounter the next checkpoint. At the checkpoint every second you are late is converted to a penalty point and your time is reset to zero. DO NOT continue to make up time after passing a checkpoint. You are automatically on time the instant you reach the checkpoint. Instead if you know or have an idea how far behind you were at the checkpoint, turn in a time allowance. Your penalty points for that checkpoint will be reduced by the number of seconds claimed in the time allowance.

Start on Time or you will end up accumulating minutes of penalty points. Set your time of day clock correctly using the Official rally clock before the start of the day's event. When you have a chance during the rally (such as at pit stops or lunch) check your clock with competitors' clocks to be sure it is still correct. Double check whenever you write down a time. It is very easy to make a one minute error by misreading the clock. When the second hand is in the fourth quadrant, the minute hand is pointing to the next minute, not this minute. Hint: after writing down a time, wait for the second hand to pass the 12 and read the minute again. If it is the same as the minute you wrote down, you wrote down the wrong minute.

Stay on Course or again it will cost you minutes worth of penalty points. A missed sign not only results in missing a speed change, but quite often it can result in missing a turn. This leads to being off course by minutes. Always be aware of the instruction you are working on and the next instruction. This is especially important if the next instruction has a "comes quick" comment. The driver should always be aware of the sign and or intersection you are looking for. If not, the driver should ask the navigator to tell him what it is. The navigator will have times when his head is down writing information, calculating or watching the clock. Be sure the driver knows what is next before you do this.

Stay on Time means traveling at the correct speeds and making up time lost at stops and turns. The penalty points associated with this type of error are usually in the seconds, not minutes. Be very careful when you try to correct this type of error. It is a common mistake for the navigator to be calculating the time lost or watching the clock, as you make up time, and in the process you miss the next sign. As a result, instead of saving a few seconds in penalty points you lose minutes when all of a sudden you are off course. Hint, for rookies this is especially true. Concentrate on the first 3 S's and save your self minutes of error.

One thing that is easy to prevent is traveling at the wrong speed. The navigator should continually remind the driver what the assigned speed is. You can't tell the driver too often. Hint: if you can turn your speedometer, turn it so the assigned speed is always at the same position. This makes it much easier for the driver to remember the assigned speed.

Driver and Vehicle Performance

In order to determine how much time you lose during speed changes you must understand how the course is measured and how the driver and vehicle perform. All speed changes in the rally are measured as if they are instantaneous. Since your vehicle can not achieve this kind of performance, you need to know how much time you lose when you make a speed change. There are three basic maneuvers that you will perform involving speed changes. They are straight speed changes from s_1 to s_2 , pauses from s_1 down to 0 then 0 up to s_2 , and turns from s_1 down to s_2 then up to s_3 .

Straight speed changes are the easiest to handle. If you accelerate or decelerate at a constant rate from s_1 to s_2 , and you pass the execution point at the speed halfway between s_1 and s_2 ($(s_1+s_2)/2$), then the time you gain or lose before the execution point is offset by the time you lose or gain after the execution point. As a result you remain on time. For example, if you are traveling at 25 MPH and the next instruction is a CAS 45 MPH at a Speed Limit 50 MPH sign, start accelerating before the sign, pass the sign at 35 MPH and continue on to 45 MPH. The time you gain by accelerating before the sign will be the same as the time you lose after the sign and when you reach 45 MPH you will be back on time. For small speed changes, this method is quite accurate. For larger speed changes it is less accurate because just as your vehicle cannot change speed instantaneously most vehicles cannot accelerate at a constant rate. Nor is it easy to decelerate at a constant rate and stop exactly at the stop sign or pass the sign exactly at the halfway speed. To master this technique requires practice, practice and more practice.

Pauses are more complex because they involve a deceleration to 0 followed by acceleration to a final speed. You will always lose time during both the deceleration and the acceleration. However, pauses also include a length of time to stay at 0 after the deceleration. This is typically 15 seconds. Therefore, if you remain at 0 for less than the specified time, you can end up on time or ahead of time after completing the acceleration. This allows you to use pauses to make up time lost in other maneuvers.

The straight speed change technique may be used for pauses. It allows you to calculate how much time you lost or gained during the pause. First, record the time (t_1) or start your stop watch when your speed reaches halfway to 0 during deceleration. Next, record the time (t_2) or stop the stop watch when you reach the halfway speed during acceleration. The difference between these two times (t_2-t_1), or the time measured by the stop watch, is the amount of time lost during the pause. Subtract this time from the time allocated for the pause and you will know how much time you are ahead or behind after completing the pause. If the calculated time is negative, you spent that much time more than was allocated and you are behind. If the number is positive you

spent less time than was allocated and you are ahead. Again, using the straight speed change technique assumes constant deceleration and acceleration which is not normally achieved.

Another method for handling pauses requires that you understand the concept of elapsed time and error time. For example it may take 24 seconds (elapsed time) to accelerate from zero to 50 MPH, but once 50 MPH is achieved the car will probably be about 8 seconds late (error time). This same relationship will hold true for decelerating to a stop as well, but instead of error time equaling $1/3$ of the elapsed time (or $1/2$ for high HP, fast cars) the stop error will be $1/2$ of the elapsed time, i.e., elapsed time to stop from 50 MPH = 8 seconds the error time will probably be 4 seconds. Experienced competitor's practice the pause maneuver using a rally computer or a measured course to calculate both elapsed and error time.

If you have not practiced the pause maneuver or are a rookie, trying to measure the pause times and calculate the time lost may end up costing you more that it will save (remember the first 3 S's). Instead, just use a rule of thumb. If the speeds are high, 50 MPH to 0 to 50 MPH, stop for the allocated time minus 12 seconds. If the speeds are low, 10 MPH to 10 MPH, stop for the allocated time minus 2 seconds. Always be sure you stop long enough to check for other traffic and accelerate safely.

Turns are the most complex maneuver because you decelerate to a safe turning speed (typically 15 MPH), proceed around the turn at that speed and then accelerate to the final speed. The only way to determine the time you lose in a turn is to practice with a rally computer or a measured course. If you have not done that, then try a rule of thumb similar to that for pauses. If the turn is high speed, 50 MPH to 50 MPH, assume you lost 7 seconds. If it is a low speed turn, 20 MPH to 20 MPH, assume a loss of only 1 second.

Speedometer Performance

Speedometer Calibration is important because the accuracy of speedometers varies greatly from highly accurate rally speedometers to highly inaccurate stock speedometers. In all cases, your speedometer will most likely not match the equipment used by the rally master to measure and time the course. Therefore, a speedometer calibration run is usually included at the start of each rally day after a short transit that will warm up your tires. The rally master uses this calibration run to calibrate his measuring equipment. In the instructions you are told at what speed to run the calibration course and you are given the elapsed times to various signs along the route of the course assuming you are driving the assigned speed. Your task is to run the speedometer calibration run as published to determine your speedometer error. To begin this maneuver pass the first calibration run sign at the designated speed. Note your time in seconds, or start a stopwatch. Maintain that speed exactly throughout the run. Your error is the early or late time in seconds from the published time. Example; if the published time is 20 minutes, zero seconds, and your elapsed time was 20:08, you were 8 seconds late. Your speedometer correction becomes 24 seconds per hour, or 2 seconds per 5 minutes determined as follows: one hour = 60 minutes; 60 minutes divided by 20 minutes = 3; 3 times 8 seconds = 24 seconds per 60 minutes = 2 seconds per 5 minutes. This is the error rate that must be corrected, to drive on time, assuming your speedometer error is linear. In all probability it is not.

Speedometer Error Tracking: Once you know your speedometer error how do you deal with that error? Easily. Make yourself a time of day log to do this. Write down your start time for each timed segment; say it is 2:36:00. If your error correction is 2 seconds late for every 5 minutes of competition, you would then write :41 under the :36 and along side - 2. In addition to a time of day log everyone should keep a late/early column. Once you have logged your 5 minutes of elapsed time (:41) write 2 (seconds of course) under your late column. (Technique - you may want to insert a small t by that 2 to indicate where (the source) it came from. Later

when you are reviewing your scores you may find this distinction useful. Do not attempt to make up the 2 seconds every time you log them in your late column unless it is convenient, i.e., followed by a stop sign.

Make Up or Lose Time

To making up lost time or lose time if you are early, the simplest technique is to use the 10 % rule. You do this by changing your designated speed by 10 %. Once done, for every minute you drive at that speed you have made a correction of 10 %, or 6 seconds (1 minute = 60 seconds x .10 = 6 seconds). A 20 % correction makes a change of 12 seconds/minute. A 50 % correction makes a change of 30 seconds/minute. Note that it is easy to decrease your speed by 50 %, not so to increase it legally at the higher speeds. Once again, late by 5 seconds, drive 10 % faster for 50 seconds and you are back on time.

Remember you can also make up time by staying at a pause (stop sign) for less than the allocated time. Just make sure you do stop and that you proceed safely.

Communications

Communications between the driver and navigator are critical. The navigator must describe each instruction to the driver. This includes describing signs, intersections, and direction of travel and speed changes. These communications must be done quickly, efficiently and precisely. If the driver has to continually look at the instructions he is not watching his speed or the road. Therefore you need to develop a language that both the driver and navigator can understand to describe the instructions to each other. When you are practicing or after you have been given a set of instructions in advanced, review the various signs and intersections you see and assign phrases to them. This will become your language for communications during the rally.

One thing the navigator must communicate to the driver is when to execute the instruction. In the case of a sign, the rule is to execute when the front tire passes the sign. For intersections is in the center of the intersection or at the apex of the turn. As described in the section on straight speed changes, your speed change is not instantaneous. Therefore the driver needs to begin the speed change before reaching the execution point. For a speed change at a sign or intersection the driver can watch the sign and speedometer and handle the change without help. The navigator may want to remind the driver of the half speed at which she should pass the sign. For all timed speed changes, on the other hand, the start of the speed change is based on time, not the location of a sign. One way to handle this is for the navigator to tell the driver when to go. This may include a count down or just the word "GO" or "NOW" or "###." The point is that you need to have an understanding of how the navigator will communicate when to start the speed change. The driver needs to know what word triggers his action. Once this is determined, be consistent. Another way some professionals handle timed speed changes is that the navigator positions the clock so the driver can see it and tells the driver the second at which the instruction execution is to occur. The driver then looks at the second hand the same as he would watch the approach of a sign or intersection.

Another part of communicating instructions is for the driver to repeat what he heard and the navigator double check it with the instruction. After several left turns or side road left signs it is easy for the navigator to say turn left or the driver to hear turn left when it is really a right turn, especially at the end of a long day.

Checkpoints

Checkpoints are set up as “passage controls”, that is you do not stop when you encounter them. The time between each checkpoint is referred to as a leg. So checkpoint 1 ends leg 1, checkpoint 2 ends leg 2 and so on. The last checkpoint of the day ends the last leg of the day. If there are 6 checkpoints there will be 6 legs.

Checkpoint Timing

Timing is from checkpoint to checkpoint, and not cumulative. Therefore, when you get to a checkpoint any early or late error you have accumulated during that leg is recorded the second you arrive. The error is then assigned to the leg that ends at that checkpoint. At that same identical second you depart for the next checkpoint with all your error and mistakes forgiven, starting with a score of zero for the next leg. If you had been off course and went through a checkpoint without making up all your lost time, you are now stuck in a new position. Do not speed up to pass other cars to get back in your original position. If you do, you will be early at the next checkpoint. This is a common mistake made by rookies.

If you are out of position and you encounter an instruction with an Official Start Time. Then at that instruction you will add your order of start position to the Official Start Time to get the time you will leave that sign. All the competitors will then be back in their original positions. Note this only occurs with an Official Start Time (hh:mm:ss). Typically this will only be encountered in the first instruction of the rally, the first instruction of the first timed segment of the day, and the first instruction of the first timed segment after lunch.

Checkpoint Time Recording

You do not have to do anything when you pass a checkpoint, however it is nice to wave or acknowledge the checkpoint crew in some way. Late model cars must run with lights on, and maybe flash as you approach the checkpoint. Checkpoint crews can get very busy and any help identifying your vehicle is greatly appreciated.

You are also strongly advised to write down the time of day or at least the second that you cross a checkpoint, just in case a timing malfunction occurs. Writing your time, however, is no excuse for missing the turn or speed change you may be looking for, and may be only seconds away. As you approach a checkpoint, be sure the driver is looking for the next instruction, it may be very close!

If you are not timed due to a time recording error, you will be asked to supply the checkpoint time you recorded. If you cannot supply the time you will be scored with a composite time to the subsequent checkpoint. If this was the last checkpoint of the day you will be assigned a composite score based upon the average of your previous scores. That particular leg will not be discarded due to a timing error that you could have remedied, except for your failure to record your time.

Checkpoints will remain open for 20 minutes after the last car is scheduled to arrive. If you arrive after that time you will not be scored and will receive a 180 point penalty for missing the checkpoint. If it is the last checkpoint of the day you will receive a DNF.

Contestants are free to question scores when they are posted. Twenty minutes after posting they will be official unless otherwise challenged. No challenges will be allowed for scoring discrepancies of 3 seconds or less.

Free Zone

A free zone is a section of instructions in a timed segment where you are guaranteed there will not be a checkpoint. The instruction where the free zone starts will have the comment “Begin Free Zone” in column D. The instruction where the free zone ends will have the comment “End Free Zone” in column D. While in

the free zone you will still be in competition – being timed - but you will not encounter a checkpoint. A free zone also exists for the first 2 minutes into a timed segment. This free zone is not marked in the instructions.

Time Allowance

A time allowance will be allowed for any reason other than “I think I was a little slow.” It should be submitted on the form provided to ensure all the pertinent data is supplied. If you get behind because of traffic, a mechanical failure or an off-course excursion, every effort should be made to safely place yourself back in line and not immediately behind or in front of another competitor. This is to help all competitors by attempting to keep a safe separation between vehicles. For instance, you fail to make a turn and get off course. Then, you get back to the turn you missed and you calculate that you are 1 minute and 5 seconds late. In addition, you are now on the bumper of the car that was following you. If you can safely overtake and make up the time, then do so. However, if you determine it is not safe, you should pull over and do a “stop and go” to take an additional 25 second delay. This will get you safely away from the car that is now in front of you. You then submit a 1 minute 30 second time allowance for that leg of competition.

Another example is when you find that you are running faster than the car ahead of you. Again if you are on that car’s bumper this is an unsafe condition that you must remedy. If you can overtake safely, do so. If not, perform a 30 second stop and go to attain a safe separation and turn in a 30 second time allowance for that leg. If, on the other hand, you are being overtaken by a faster competitor you have two choices. You may decide that you have made a mistake and are running too slow or you may decide that the competitor is running too fast. If you think you are running too slow, then speed up, but don’t wait until the competitor is trying to overtake. If you believe you are correct (who isn’t) and the competitor is too fast, make every effort to keep right and give the competitor the opportunity to safely overtake you.

If you decide to overtake another competitor, do not immediately cut in front of them and slow down so they are on your bumper. If you are going to overtake, this means you believe that by staying behind the other competitor you will be late. Stay behind them until you are late enough to overtake and continue on ahead of them to achieve a safe separation.

DO NOT speed up to attain a safe separation (unless you think you are slow). You can not turn in a time allowance to reduce penalty points for being early. It is up to the overtaking car to determine the appropriate course of action to attain a safe separation.

Priority on the road

Start of Timed Segment

Remember, normal traffic rules apply at all times. If you get cited for speeding you will receive a Did Not Finish (DNF) for the day. When you take your position along side the sign that starts a timed segment you do not own that spot on the road. When the car in front of you leaves, DO NOT pull up to the sign and block the road waiting for your start time to arrive. There is no guarantee of leaving exactly on time to the detriment of the traveling public that may be using that road. If you are parked nearby and arrive at the start sign 5 – 10 seconds before your start and leave on time that is a good technique. If you are parked nearby and cannot get to the start because of public traffic and leave 5 seconds late that is preferable to commandeering the road for 30-45 seconds prior, blocking the road, and backing up traffic just so you can leave on time. If you leave 5 seconds late you have 120 seconds to make that time up as you are in a free zone.

Competitors in Close Proximity

The rally Official Start Times ensure that all competitors start 1 minute apart. However, during the course of the rally two cars may end up in close proximity to one another. If that is the case these are the rules to follow;

- 1) The first car on the road has the right of way. It may be driving too slowly but it is in front. The overtaking car has two choices:
 - a) Stop and go in such a manner that you know your time loss and submit a time allowance for that amount of time. Do not follow right on someone's bumper. It will not make them go faster. Do not drive closer than the 3 second rule behind someone as any lesser spacing is unsafe for antique cars and brakes.
 - b) Pass the slower car and give them a sufficient safety margin behind you. Note the amount of time you gained (pass in a timed, controlled manner) and record that time. You had been gaining, so you should continue to pull away from the slower car. When you attain a safe separation, lose the amount of time you gained in the pass, and continue with your own rally.
- 2) If you are the slower car being passed, do not try to maintain the same spacing that occurred as the faster car pulled over in front of you. Remember that they are now fast and will be slowing at some point to return to their on time position.
- 3) If you are passed by the car that was behind you, one or both of you are in error. You should only decide to resume your original position by passing the car that just passed you if you believe you are the one in error. If once again you are passed, both cars should make a report to the rally master who will determine who was in error by examining the checkpoint scores. Any participant found to have been operating in an obstinate manner and not within the spirit of the event may be penalized up to the maximum for that checkpoint.

Emergency Instructions

In the event that signs are missing, added or changed, a “day-glow” poster of some color will be utilized. “TR” will be used along with the instruction number, if applicable. Possible combinations are not limited to but may include:

- “ignore” – ignore this matching sign (it is probably a new sign)
- “end leg” – the timed segment ends here and you are now starting a transit segment
- “20” for a curve warning sign that calls for speed guidance in the instruction, but is now missing.

When you see a brightly colored sign, pay close attention, it may be an emergency instruction. It is better to be cautious and lose a few seconds while checking a sign than miss an emergency instruction. If the sign has an instruction number on it that means execute that instruction here.

Protests

Protests are not in the spirit of the event but may be allowed. A protest committee of three will be selected by the organizers from the competitors. The protest must be submitted in writing and the protest committee may

or may not elect to interview you. Their decision will be final and binding upon the organizers and the competitors.

Critique

Competitors are encouraged to offer comments and suggestions offered for the improvement of next years rally. A form is provided and should be submitted at the end of the awards ceremony.

Performance Charts

Contestants are free to make whatever charts they feel will be useful to determine their error time from their cars performance during a speed change transition. If you have arrived for the start without such charts you may construct them during the practice rally using the following technique:

Determining Acceleration Error Time

Run the speedometer calibration run as published to determine your speedometer error. If there is a second speedometer, or you have time to rerun the calibration run do not pass the beginning of that run at speed, but stop, set your watch to time the maneuver and accelerate to the designated speed. When you go by the first timing sign you will be late by your acceleration error plus your speedometer error. Let's say your elapsed time to 45 MPH was 21 seconds and the perfect time to the first timing sign was 1:20. You know from your first run that you will be 1 second late at this mark because of speedometer error. If you are 8 seconds late (1:28 actual elapsed) you have good reason to believe that your acceleration error is 7 seconds. You know this because of two things. First, that you are 8 seconds late, not the expected 1 second late if you had not started from a dead stop. Secondly, 21 seconds divided by 3 equal 7, the same number you experienced. With sufficient time, either before the start of the practice rally or later, you could duplicate this maneuver for all your speeds, having converted the first timing mark to a distance then calculating time required for each cardinal speed at that distance. In this case we know the distance is exactly one mile, by the following math. Sixty MPH divided by 45 MPH = 1.333 minutes per mile. Since we use and time to seconds we must convert the .333 to seconds and we do that by multiplying .3333 by 60 to equal 20 seconds. Since the first time (conveniently) in this case was 1:20 we know the distance was one mile. Traveling these marks at 50 MPH will take you 72 seconds (1:12), $60 / 50 = 1.2$; $.2 \times 60 = 12$ seconds, plus the 60 seconds = 72. Warning: traveling at low speeds on a busy highway is not recommended. Remember it will take you 6 minutes to travel this distance at 10 MPH ($60/10 = 6$).

Determining Stop Error Time

Transfer this technique just used to a remote site between two signs that you have timed and calculated to a distance. Try to find one that is $\frac{1}{4}$ mile from a 90-degree road intersection and has both a $\frac{1}{4}$ mile sign straight ahead and $\frac{1}{4}$ mile after making the turn. This would be ideal, otherwise make your own signs by tying plastic trash bags from the motel to weeds. Once you know the time for the straight ahead marks for accelerating to each speed, you make a chart indicating elapsed times and error times. Next you do the reverse; enter the first mark at speed, start your watch, stop at a sign near the intersection (simulating a stop sign) and continue back to the same speed stopping your watch at the finish sign. The difference between the elapsed times becomes your error time to stop. You will have to measure the elapsed time for the stop maneuver itself separately. Now you are ready to do turns.

Determining Turn Error Time

If the turn after the intersection is exactly the same distance as the straight-ahead sign you know how long that takes for every speed. Now you have to come into that intersection at a speed, slow to a set speed that you will

slow to each and every time henceforth, and accelerate back to the entry speed. The difference between the elapsed straight-ahead time to the turn time is turn error for that speed.

Not all your turns on the rally will be to the same speed, so you will have to make some adjustments to determine the error for a maneuver that brings you in at, say, 30 MPH and exits the turn at 50 MPH. You could do this by timing while going straight ahead to the apex of the turn point and comparing that time to the elapsed time from the start to reaching (15) MPH, the difference being the time to slow to that turn entry speed. You want to make a chart that allows you to know your error to slow to the entry speed (say 15 MPH) and know your error to exit from that speed to a higher speed. The chart may be labeled in columns SLOW, GO, and TOTAL. This allows you to come up with an expected lost time for the above example of entering at 30 and getting a number for that Slow time, exiting up to 50 and getting a number for the Total time, subtracting the two to arrive a GO time. That is but one technique of many. You may develop a timing method that calculates this lost time. For example time from the beginning of braking to the turn speed (elapsed) and divide by 2 to arrive at an error (lost) time and add the product (error time) of multiplying the elapsed time from the entry speed to the capture of the new speed by .30 (suggested starting percentage or whatever your car uses in practice. In theory this would be .50 but theory ignores parasite drag at the higher speed numbers and the centrifugal force drag on the tires while cornering). Example: Time from braking to turn entry speed (50 MPH to 15 MPH) = 6 seconds, $6/2 = 3$. Time from 15 MPH to 50 MPH = 17 seconds, $17 \times .3 = 5.1$. Total = $3 + 5 = 8$ seconds turn error. Your car will be different.

Speed Changes

You may not need a chart for speed changes if you use the split sign technique. If you have difficulty splitting signs accurately you may want to develop a chart whereby you go right to the sign and execute to the new speed. Having used a rally computer or the signs that you used for acceleration error you may use a similar technique. Time the differences and chart the error. Remember you will be early if you go to the sign, then slow. You will be late if you go to the sign then speed up. You should apply these times to your late/early column.

If you choose to split the sign consider the following theory. Say the instruction calls for you to slow from 50 MPH at a sign to 30 MPH. One half of the spread of 50 to 30 is 10 ($50 - 30 = 20$, $20/2 = 10$) so the desired sign crossing speed is 40 MPH. The on time theory here is that you will be late for the distance prior to the sign as you slow from 50 to 40 and you will be early for the distance after the sign as you continue to slow from 40 to 30 MPH. In theory the amount of lateness will be equal to the amount of earliness, canceling each other out and you will be on time once you reach 30 MPH. The same thing can be said of an acceleration of 30 MPH to 50 MPH, crossing the sign again at 40 when accelerating to 50 MPH. If you have no charts you should use this technique for this rally. However, at some future point you should explore by trial and error, or with a rally computer, to see exactly where your car and driver end up when executing these maneuvers. One half of the speed difference may not be the point at which you should cross the sign. It may be $1/3$ or $2/3$ of the difference (or some other ratio) depending if you are going down or up in speed. Another technique is to adjust the capture speed by the speed you are off at the split point, i.e., target speed 40, actual speed 42, go to 29 instead of 30 and right back to 30 as the correction. That would give you the 2-MPH correction.

During the practice rally, now that you know what you need to know, make a blank chart and fill it in as you go, timing the elapsed time for every maneuver and recording that time. Then you can use the ratios or percentages described above to arrive at error, or lost time for each maneuver – Start error, stop error, turn error, etc.