

**TM 04-1**

**Gene's Technical Inspection Manual**

for

**Rocky Mountain Vintage Racing**

by



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*Traci Pearson, Editor*

**The RMVR Philosophy**

*“The primary objective of the sport of vintage and historic automobile racing is to promote the preservation of these cars in a racing format which emphasizes driver safety and etiquette... All racing is dangerous, and only the proper attitude of the driver and careful preparation of cars will diminish the danger and enhance our appreciation of this sport.”*

Tech is one of the primary means for the proper execution of this philosophy. Doing your duties conscientiously in Tech will better ensure this sport is enjoyable for you as well as the driver.

We welcome any comments or suggestions, as this manual will be revised on a continuing basis.

The purpose of this manual is to give Tech Inspectors an idea what is required to work Tech. This manual was initially written by Gene and compiled with input from other Tech workers and drivers. We are interested primarily in *safety*. We expect Tech Inspectors to be familiar with the RMVR Handbook, Operations Manual, and Car Eligibility Handbook. We are not primarily concerned with eligibility rules, but inspectors should know in general what is legal. If eligibility violations are noticed, the Tech Chief will notify Eligibility and the Race Steward.

We recommend that you get a copy of the “RMVR General Rules.” You can find this in the most recent *Handbook* or download it from the RMVR website. In particular, read through the “General Safety Equipment Requirements.” This manual will highlight some of the more important safety requirements, but you should be aware of all of them and have

the “General Safety Equipment Requirements” handy for reference.

We furnish Tech Inspectors with a cap (for identification purposes) and all necessary equipment. Personal items such as a tire tread depth gauge, a small tape rule, and a small rod mirror often come in handy. We have tech tools available: a jack that will fit under very low cars, a crack detector kit, an electronic stethoscope, a multi-meter, leather welding gloves, and miscellaneous hand tools. The Hot Pit Kit includes plumber’s straps, fasteners, and colored tape to perform emergency repairs.

The car owner/entrant is primarily responsible for inspecting their race car and making sure it is race ready.

## Required Pre-Season Annual Tech Inspection

An Annual Tech Inspection is required before the first race of the season and is accepted as the Tech Inspection for the first event. Owners will inspect the car and fill out the Annual Tech form, then have an automotive professional or Tech-approved inspector check the car and sign the form. Automotive professionals can inspect their own cars, but we strongly recommend the car be inspected by a second party. See “Appendix A – Annual Tech Inspection” on page 8 for inspection details.

If the Tech Team is unfamiliar with the inspector’s signature or it appears the car was not thoroughly checked during Annual Tech, Tech will reinspect the car.

Check previous entries in the Log Book for deficiencies or contact reports. Make sure they have been corrected and write that in the Log Book.

Look over the Annual Tech Form and make sure it is correctly filled out and signed by the driver, write any comments on the form, then sign it yourself. In the car’s Log Book, write any corrections required before the car can race, record that the Annual Tech Inspection has been completed, put an Annual Tech sticker in Log Book, and sign the Log Book.

## Pre-Race Tech Inspections

Each car is inspected before each race. The following sections describe a number of items to watch for. Also, check the car’s Log Book for any previous faults that needed to be corrected before the car can race again.

It is the driver’s responsibility to make sure the car is safe for the benefit of those racing with them. Tech checks the car quickly and confirms it is ready to race. Normally, inspection doesn’t take long. If the Tech Inspector has any doubts about condition of car, they should make a careful, thorough inspection. It might prevent a serious accident.

### Driver Safety Equipment

*Always* check the driver’s equipment, mainly to make sure driver didn’t forget to bring it.

- Check Snell label inside helmet—it should read Snell SA-95 or newer—then put RMVR sticker on outside of helmet so we won’t have to search for Snell label at every event. The sticker is good for the entire racing season.

Catie will be checking racing driver’s licenses at Registration. We Tech on Friday afternoon before the race and drivers won’t be registered then, so check licenses and record the numbers on the Tech Inspection Form. Most tracks are open Friday afternoon for practice, and drivers on the track should be licensed.

### Engine Compartment

Most RMVR entrants take pride in their cars and keep them clean and well prepared. If a car is dirty, has untidy wiring or plumbing, has leaks or rust, inspect the car very carefully. If you think it necessary, insist that the owner put the car up on stands and remove the wheels. If the car appears to have leaks, have the owner run the engine so you can check for leaks in lines under pressure (cooling system, oil system, fuel system).

- All RMVR cars are required to have two throttle return springs. Check throttle linkage for play and binding.

- Formula Fords are required to have a threaded fitting where the fuel line attaches to the carburetor.
- Formula Ford starters tend to work loose, as do starters on other cars using the same cylinder block. Always shake starters and make sure they are tight.
- Check that catch tanks (32 oz. minimum) are installed for cooling and oil system. Make sure hoses are firmly clamped.
- Shake engine to check for loose mounts.
- Check security of electrical wiring. Make sure battery is firmly held down and the hot terminal is taped over. A covered battery box is required on Sports Racers.
- Check firewall and transmission cover—no holes larger than pencil diameter are permitted. Tape won't do for patches; we require riveted or screwed-on metal patches to cover oversize holes. Holes with wires must have rubber grommets.

### Vehicle Interior

- Check rollover bar, braces, and harness mounts carefully, especially if they are bolted to floor pan. Floor pan should be free of rust, and mounts should have at least a 3/16" plate on underside. Harness mounts can use large washers.
- Top of rollover bar must be at least 2" above top of driver's helmet. Have driver(s) sit in car with helmet on if you have any doubts or if driver has new helmet. Rod ends on rollover bar brace ends are not safe and must be replaced by solid brazed or welded rollover brace ends. Fore/aft bracing must be at an angle of 30 degrees or more from the mainhoop (measured from vertical).
- Check driver's seatback hinges; suggest brace if needed behind seatback to prevent seatback collapse.
- Check seat mounting rails and floor pans. If you have doubts about seat mount integrity, reject car and insist on professional repair to make car safe.
- Passenger seatback, if folding type, should be secured with belt or cord so that it can't flop forward during braking.

- Check gauge on fire extinguisher to make sure it is full (this is where that rod mirror comes in handy). Make sure extinguisher is firmly mounted. Advise driver to shake dry powder extinguisher to make sure powder is loose, not caked—shake extinguisher or hit with rubber hammer to loosen caked powder. Extinguisher should be mounted within reach of driver while strapped in.
- Check trunk and interior for loose objects and have the driver remove any before car goes on track.

### Vehicle Exterior

- Shake exhaust system to check for looseness.
- Rear-view mirrors should be mounted firmly and adjustment feature should not be loose.
- On Production Cars and Sports Racers, one working brake light is required. If they don't work, ask owner to fix them. If they can't be fixed, have driver inform Pit/Grid crew, and they will tell other drivers in that session that car's brake lights do not work. Non-working brake lights are not a reason for rejecting car, but make sure owner makes a real effort to repair them.
- Glass headlights must be taped or covered. Clear plastic covers are acceptable, but corner workers can't see them and car may be black flagged during race. Caution owners about this and suggest they tape them.

### Fuel System

- Racing-type snap-open fuel tank and oil tank caps sometimes come open during sessions and a fire can result. Make sure they are wired or taped shut.
- Check all Formula and Sports Racing cars for mandatory, approved fuel cells. If the fuel cell uses foam baffling, a static ground wire is required from the fill cap plate to the frame.
- Cars with electrical pumps: Have driver switch on pump to check connections for leaks.

## Suspension & Running Gear

- Tires should not protrude beyond body at wheel well or rub on body.
- Fender flares are not legal. If you have a question about them, consult with someone from the Car Eligibility committee.
- Treaded tires must have at least 1/16" tread depth; racing slicks must have visible wear indicator holes.
- Formula Cars and Sports Racers must have dual brake systems.
- Gripping depth of lug bolt or nut must be greater than the diameter of the lug.
- Check for play in tie rod ends (have owner move steering wheel back and forth while you check for play if you can't reach it), steering rack, steering shaft U-joints. Some removable steering wheels have play at the hub. Don't mistake this for play in steering system.
- If there appear to be leaks in brake system, check foot pedal with heavy pressure to see if pedal is firm.
- Check brake pads/linings for wear. Check drums/discs for wear, rough surfaces, glaze, or cracks.
- Check brake cylinders, lines, and fittings for leaks and check fluid reservoirs for adequate fluid level. If fluid looks cloudy, ask owner when it was last changed. Brake fluid should be changed at least once each season.
- Check for any play in suspension, drive line, U-joints.
- Check wheel bearings for play and listen with electronic stethoscope while rotating wheel if you have any doubts about bearings. Bolts with Nyloc nuts should protrude at least one thread from end of nut.

## Finishing Tech Inspection

After you complete the inspection, check the inspection sheet to make sure it is completely filled out and signed where required. If there are two drivers for the same car, make sure both sign the sheet.

If you found any serious faults that must be corrected, write them on the inspection sheet and in the Log Book (to ensure next race inspector confirms correction). Don't issue Tech sticker until faults are corrected to your satisfaction.

Sign the inspection sheet and write that the car is ready to race. Sign the Log Book and write that the car is ready to race. Have the entrant sign the Log Book and make sure the race location and date are written in. Give the driver a signed and dated Tech sticker to display prominently on the car. Keep the signed Tech form; this is essential as it releases you and the club from liability.

If a car is especially clean and well prepared, you may indicate this in Log Book. It makes the owner feel that we appreciate their efforts. If vehicle is properly prepared for inspection—the Log Book and Tech Sheet are properly filled out, gear laid out, hoods and trunks open, necessary body work removed for inspector access—then the car is eligible for Tech Award given for each race.

During your inspection, do not allow the drivers/car owners to rush you. Take all the time you need to do a thorough job. RMVR has someone on the Tech crew who is an expert on about any type of car you will encounter. Ask for help if you need help. Don't take driver/owner's word for anything. Make your own decision. If the driver/owner appears uncooperative, do not argue. Treat the driver with utmost respect and courtesy at all times. If the incident warrants, report to the Tech Chief who will bring it to the attention of the Race Steward. If the situation warrants, the Chief Steward has assured us violators will be trailered. Safety and the mechanical integrity of the car is more important than the ego of the driver and inspector. A failed inspection is preferred to an incident on the track. The most well-designed, -constructed, and -prepared cars fail quite regularly.

## Hot Pit

We always welcome Tech Inspectors who would like to work the Hot Pit. At the Hot Pit, we inspect cars that are given meatball or black flags or cars that driver or owner thinks may have some fault. We make sure they are safe to go back on the track; otherwise, we direct them to the pits. We watch cars on track for unstable handling or braking, smoke, or leaks. We listen to the radio for corner worker reports on cars that may need to be called in, and make decisions to call a car in or not. We have tools and equipment to make minor repairs, tape loose bodywork or catch tanks, etc., clean visors or windshield if requested, adjust mirrors, or give the driver a drink of water. If a car goes off the track (4 wheels off), we check it over carefully for suspension damage before it is allowed to go back on the track.

We have a canopy, folding chairs, and water. We keep a log of all incidents that concern us. If contact between cars occurs, or a car going off the track is damaged, we check cars over carefully, fill out an incident report listing all damage, and determine if car must be repaired before it can re-enter the track. We hold cars at the Hot Pit if the Steward wants to talk to driver/owner. At the end of the session we stop any cars that appear to have faults that need correcting and give driver the information. You will be thoroughly briefed on Hot Pit operation, safety, and radio procedures before each race. Hot Pit work can be interesting, instructive, and useful. Hot Pit crews will be furnished with Tech shirts.

## Appendix A – Annual Tech Inspection

In general, the Annual Tech Inspection follows the steps on the Tech Inspection Form, but the inspection is more thorough. (See “Required Pre-Season Annual Tech Inspection” on page 2 for more information.)

## General

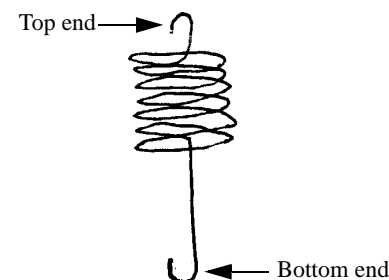
If car is dirty, tell owner to take it to a car wash and clean it thoroughly. Dirt can hide a lot of faults. Remove all body panels that will come off easily on Formula Cars and Sports Racers. Remove seats. Set car on stands; don't go under a car supported by jacks only. Use lift if available, especially on unit construction cars like Porsches which require a thorough examination of floor pan and sills, suspension mounting points, etc., for rust.

## Driver Safety Equipment

1. Check the driver's safety equipment for wear and conformity to RMVR specifications. Check visor for pitting and scratching. If excessive, require new visor.

## Engine Compartment

- 9–11. Make sure throttle linkage has two return springs. On some Porsches (356's and 911's) external throttle springs on carburetor can cause full throttle sticking if installed upside down. Check and make sure the longer end of the spring is on the bottom (see sketch below). These springs are on rear of each carburetor.



Formula Fords must have a threaded fitting on carburetor for fuel line. All cars should have a threaded fitting on fuel line at carburetor. With the engine running, check all fuel line connections for leaks, and check water hose connections, oil lines, oil filter, and oil cooler.

Catch tanks (32 oz. minimum) must be mounted so they won't come off and hoses to them mounted so they won't come loose.

Check valve covers and pans for leaks. Check FV and Porsche pushrod engine valve covers and pushrod tubes carefully for leaks as oil will drip on exhaust pipe.

12. Battery should be firmly fastened down and the hot terminal covered. Sports Racers must have battery cover installed. Recommend a gel-type battery for all cars with battery located at extreme front or rear of car. If the car is equipped with an electrical cutoff switch, it should be marked. Urge car owners to install an electrical cutoff switch if the car does not have one.
13. Wiring should be neat, clean, and not close to moving or hot engine components.
14. Exhaust manifold must be firmly attached, not cracked, and not close to anything that can be damaged by heat.
15. Firewall (and transmission cover on front engine cars) must have no holes larger than pencil size. Holes must be covered with metal patches riveted, screwed, or bolted on—no tape patches allowed. Holes with wires must have rubber grommets.

### Vehicle Interior

16. Roll bars must be checked carefully to make sure they match the safety regulations. Consult the "General Safety Equipment Requirements" and pay particular attention to:
  - Top of roll bar must be at least 2" above top of helmet.
  - If ball joints are used on ends of braces, recommend they be replaced with solid welded joints.
  - Roll bar braces must be at a minimum 30° angle from roll bar (measured from vertical; Tech has a rule with protractor head to check them) and must be attached near top of bar.

Roll bar must be of required diameter for car weight. Roll bar and brace bolted to floor pan must be checked carefully to make sure floor pan is not rusted out—require mounts to be unbolted and lifted if you have any doubts.

Check both sides of floor pan. There should be a 3/16" thick plate on the bottom side and the bolts must protrude through nuts at least one thread. Nyloc nuts are best. If plain nuts are used, tell owner to check tightness of nuts after each practice or race session. Check welds on roll bar/braces carefully.

Bolt or pin diameter on removable roll bar braces should be 3/8" minimum diameter, 1/2" for heavy cars.

17. If you can see frame at suspension mountings, engine mounts, etc., check for cracks. On tube frame cars, check welded joints for cracks. Monocoque construction cars are difficult to check. If you can detect any movement in riveted plates when shaking suspension, car should not be approved until an expert checks it. (Consult Paul Morgan, Ken Petrie and crew, probably others in the club who know monocoque construction, if possible.) If riveted plate has just one rivet loose or missing, all rivets in plate should be replaced. Monocoque designs with adhesive between plates should have adhesive renewed when plates are repaired.
- 18–19. Check seat belts/harness for wear. Check date label on belts if you can find one. Belts must be less than 5 years old. There is no minimum width on substraps, but at least one is required. If belt end bolt is attached to floor pan, remove if necessary and check pan carefully for rust. Underside should have large diameter washer and bolt should protrude at least one thread from nut; Nyloc nuts are best.
20. The driver must use arm restraints or the car must have a window net.
21. Fire extinguisher (minimum 2 lb. dry chemical 10BC rating or Halon) should be firmly mounted within reach of driver in car. Inform owner that powder in extinguisher tends to pack down from car movement and extinguisher should be

shaken often to make sure powder is loose—smack with rubber hammer if necessary. Packed down powder won't come out when extinguisher is used and propellant won't extinguish fires.

22. Interior, trunk, and under-hood area should have no loose objects.
23. Check seat and seat mounts very carefully—if necessary, remove seat to check mounts. They should be firmly attached to a rust-free floor pan with no cracked welds. Bolted on seats should have a 3/16" thick plate on underside. Passenger seat back, if folding type, should be fastened so it can't move forward.

### Vehicle Exterior

26. Body panels should have no sharp edges. Doors, hood, and trunk lid must adequately latched. Recommend hood pins.
27. Windshield and windows should be free from cracks or chips and not excessively pitted. On coupes that have wind wings that can be turned back to direct air on driver (such as Porsche), insist that wings be closed while on the track. If driver insists on turning wind wings back to direct air on driver, insist that they replace glass with Lexan or wear full face shield.
28. Clear plastic headlight covers are legal but corner workers can't always see them and car may be called in. Advise driver to put a couple of strips of tape on clear plastic headlight covers.
29. One brake light must operate.
30. Check exhaust system for looseness and check mounts carefully.
32. At least two mirrors are required, and they must not be loose.
33. Some cars in RMVR are allowed to use fender flares, some aren't. Know the rules.

### Fuel System

35. Filler caps on some Formula cars have come off while car was running. Tell driver to check fuel, water, and oil filler caps before each session.
36. Fuel cell must be firmly mounted—check by shaking. Safety fuel tanks must be surrounded by metal, and filler cap plate must be grounded. On street-licensed cars which are not required to have a fuel cell, check stock tank, cap, and overflow very carefully, and recommend a fuel cell. Overflow hose should rise above tank as high as clearance permits and make a complete loop, then empty outside the car.

### Suspension / Running Gear

37. Remove at least one front and one rear wheel. If car has drum brakes, remove drum. Check brake pads, shoes, braking surface of drums and disks carefully. Check manufacturer's specifications if disks or drums appear to have been turned excessively.  
  
Reinstall drums, then check wheel cylinders for leaks while assistant applies heavy pressure to brake pedal. Ask owner when brake fluid was last changed; it should be changed at least once a year. If it appears cloudy, dark, or dirty, insist that brake fluid be changed and lines bled. Brake caliper bolts should be drilled and safety wired on all Formula and Sports Racing cars. Recommend it on all cars. Formula and Sports Racing cars must have dual braking system.
38. On most cars in RMVR, inside of wheels is so dirty that no cracks are visible to the naked eye. Have owner clean them if necessary, then check for gouges, dents, and cracks. MG and Triumph wheels tend to crack from lug holes to "drop center." FF and Cortina steel wheels also tend to crack. Check lug nuts, studs, or bolts for thread condition and cleanliness. Tires that protrude beyond wheel well or rub on body are not allowed.

**39.** Check front and rear wheel bearings with wheels jacked up. Use stethoscope while rotating wheel if you have any doubts about condition. If bearing condition seems faulty, insist that bearings and races be cleaned for close inspection and replaced if found faulty.

**40.** Shake suspension to check for looseness in bushings and ball joints.

Push down and release frame to check shocks. Check shocks for fluid leak. Check boots on rear axles of FV, VW, Porsche, BMW, etc., for leaks, and require screws and clamps to be tightened or boot replaced if necessary.

When radius rods on Formula or Sports Racing cars have a ball joint at either end, make sure locking nut is tight. If you can turn radius rod, and ball joint at end doesn't turn (watch threads), advise owner to tighten lock nut. Yoke on rear upright at lower front where radius rod attaches should be horizontal. They tend to work loose and turn from horizontal, causing the ball joint to bind on yoke and break.

Check rubber drive shaft donuts on Formula and Sports Racing cars (also on some Triumph GT-6's) for cracks and deterioration. Ball joints on suspension and steering components, if in single shear, should have large diameter washer to prevent ball pullout.

**41.** There should not be much play in steering, about 1" maximum at steering wheel rim. Check steering wheel hub, if removable type, for play. Check steering shaft U-joint, steering rack, or steering arm for play. Check tie rod ends for looseness. Insist that any excess looseness in steering assembly be adjusted out or new parts installed.

### Other

**45.** Shake starter on Formula Fords and cars with similar Ford engine—they tend to become loose. Shake all engines to check engine mount rigidity. Recommend that all drain plugs (engine, transmission, oil tank) be drilled and safety wired.

Don't let the car owner/driver make the decisions. You make them. Be tactful, but don't let anyone intimidate you. Safety is our primary concern. If owner/driver gives you any trouble, call the Tech Chief or Chief Steward. Have a copy of the RMVR General Rules when making Annual Tech Inspections. It may prevent arguments.

## Appendix B – Car-Specific Problems

### Production Cars

Two methods of securing the hood should be used on all production cars.

**Triumph Spitfire, 1200, and GT-6:** Independent rear suspension requires special knowledge.

**Sprites and Midget:** 1" rebound block should be added to front suspension. Heavy-duty front and rear springs are allowed.

**Alfa:** Check the rear torque brackets on each side of the rear axle housing mounts; they should be reinforced.

**1965–69 Chevy (except Corvette):** Check the left engine mount, as it tends to fail. If it hasn't been replaced recently, suggest the owner consider replacing it.

**Corvette:** Corvettes with independent rear suspension require special knowledge to check side play at top of rear wheel.

**Anglia, Cortina and Cortina GT:** The Ford rear axles tend to fail where the bearing pushes into the axle. These can be replaced with newer, stronger axles.

**Elan:** Check the rubber drive donuts and rear stub axles, as they tend to fail. Suggest the owner replace them if they haven't been replaced recently.

**Super 7:** The front-end chassis tends to fail. Additional 3/4" x 0.048" mild steel tubing should be added.

**MGB:** Non-stock front springs may be used.

**Porsche:** Rear wheel spacers may be used when 60mm wide front brakes are used.

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Porsche 356's and 911's are in class by themselves, and experience is necessary to know what to look for. There are several experts in club to consult.

**Spitfire:** Rear suspension camber compensator may be used.

### **Historic Class**

Emphasis on condition: rust, play in suspension, steering, etc. Knowledge of car structure is important.

### **Formula Cars**

Check starter motor mounting. Check the steering U-joints for proper assembly.

**FV:** Check for valve cover and rear axle boot leaks. Check for play at upright joints (links) of the trailing arm. If they are adjusted to take out play, toe-in is affected and must be checked and possibly adjusted. Check for play at the joint where trailing arms attach to torsion bar tubes.

**Royale SuperVee:** Make sure any fabricated parts were done professionally.

**FF:** Steel wheels can crack; check carefully. Ball joints can fail; an oversized washer can be installed so it will retain the yoke if the ball joint fails.

**FF and other Formula/Sport Cars using Triumph-Herald front uprights:** The front uprights can crack below upper ball joint mounting flange. Check with mirror.

**Hawke DL-2 FF:** The lower front "A" frame tends to separate from the spindle because the lower trunion breaks internally. Ask the owner if they checked all parts carefully recently or when they assembled it.

**Lola T-200 FF:** Some front stub axles fail because of modification done to original parts to compensate for wider Standard bearings. Make sure the owner used proper parts and did not modify any.

**Cars with drive shaft U-joints:** Check for play with car in gear. Check rubber U-joints for cracks and deterioration. Insist on replacement if they look unsafe.

### **Sports Racing Cars**

Some are similar to passenger cars and easy to check. Others are unlike anything you have ever seen and require special knowledge and experience. Most owners are especially helpful and glad to point out the differences, a fantastic learning experience. All can leak fluids, develop loose suspensions and structural integrity problems (unit construction—monocoques—require careful inspection for rust and loose riveting). All must have catch tanks, rollover bars and braces, and a harness. Bobsy cars have aluminum frames known to crack; carefully inspect weld joints.

### **Notes**

**We encourage you to submit any additions and suggestions to this manual. Forward your comments to any member of the Technical Inspection team or contact:**

Don Woeber  
3706 Dundee Court  
Fort Collins, CO 80525  
(970) 223-9546  
woden6@frii.net

Traci Pearson  
2616 W. 134th Circle  
Broomfield, CO 80020  
(303) 410-9101  
t\_writer@privatei.com

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**Year of the Wood Monkey**

